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IMPROVEMENT OF LAND INFORMATION SYSTEM OF AGRICULTURAL LANDS IN UKRAINE

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Висвітлено сутність державного земельного кадастру, досліджено аспекти його функціонування земельно-кадастрової системи. Представлено роль земельного кадастру для створення ефективної системи управління землями сільськогосподарського призначення. Описано значення земельної інформаційної системи земель сільськогосподарського призначення в сфері управління та раціонального сільськогосподарського землекористування.

Ключові слова: *земельні ресурси, система управління земельними ресурсами, земельний кадастр, кадастрова система, сільськогосподарське землекористування, земельно-інформаційна система, земельно-кадастрова інформація.*

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Introduction. Land is one of the most important natural resources that are used by people as a means of production to meet the needs of society. In current market conditions land is one of the main components of the economy. Land use cover different spheres of human activity: agriculture, industry, forestry, etc.

Currently, Ukraine is in the process of establishing a market economy. In the sphere of land management have many of outstanding issues that have arisen in the process of land reform. Making large-scale changes in land relations of Ukraine led to unsustainable land use, reducing of land protection and reproduction of land resource potential of agricultural land.

Therefore, becomes important the question of solving the problems of management and use of land resources. This means finding effective methods and measures to ensure efficient land management. And this effective system should contribute to the conservation of soil fertility, reproduction of land resource potential and be based on social, legal, technical, environmental and economic aspects of agricultural land use.

Land Management is not possible without information about the land, which is the primary basis for developing measures for effective land management. Land information system of land cadastre is an important method of information support of land management.

Under these conditions, the important theme of research is problems of land use, reproduction, fertility and protection of land that would be based on the information about land resources.

Objectives and Methodology. The main objective of the research is to determine the capabilities of modern land information system of land cadastre for effective land management. The existing cadastre information system of Ukraine has been researched and analyzed. The problems of the state land cadastre, such as information support of agricultural land management are researched. The land information system through the introduction and consideration of environmental and economic performance of agricultural land is improved.

The Information Support of Land Administration System

In Ukraine the main purpose of land administration system (LAS) at the national level is the creation and maintenance of the system of land relations and land use in the region. This allows to ensure a sufficient level of social and environmental living conditions, the effectiveness of different areas of business, social and other activities, conditions of storage and recovery properties of the environment, including land resources.

In order to make the best use of national resources, every country implements strategies for land-use planning and development so as to improve the physical infrastructure

and create a better environment. Land-use planning is the process of allocating resources, especially rights to use land in particular ways, in order to achieve maximum efficiency while respecting the nature of the environment and the welfare of the community [1].

LAS is based on information about land. Formation of information system of land resources is performed by the land organization, monitoring of land, land cadastre (Fig. 1).

Land cadastre is an important method of LAS, which involves cadastral works. State Land Cadastre contains a set of information and documents about the location and legal status of land parcels, land evaluation, quantitative and qualitative accounting of land, land classification, distribution land among land owners and land users.

While having a cadastre is not mandatory for a LAS, all modern economies recognize its importance, and either incorporate a cadastre or its key components in their LAS. But all LAS require some form of spatial data infrastructure (SDI) to provide the spatial integrity for rights, restrictions and responsibilities relating to land, and the resulting land information. An SDIs play an essential role in supporting

LAS, they also have a wider role in supporting sustainable development objectives. Achievement of sustainable development is not possible without a comprehensive understanding of the changing natural environment, and monitoring the impact of human activities by integrating both the virtual representations of the built and natural environments. An SDI can provide the institutional, administrative, and technical basis to ensure the national consistency of content to meet user needs in the context of sustainable development [2].

Land administration systems deal with information about land parcels. One feature of a land parcel is the location of its boundaries and how these relate to neighbouring properties [3].

Land administration data can be used to monitor the impact of land-use planning on the environment. Increasingly, environmental restrictions are being recorded on the registers.

Cadastre information is part of the state land cadastre and necessary for effective land management, the main purpose of which in terms of economic reform is to provide the necessary information of state and local gover-

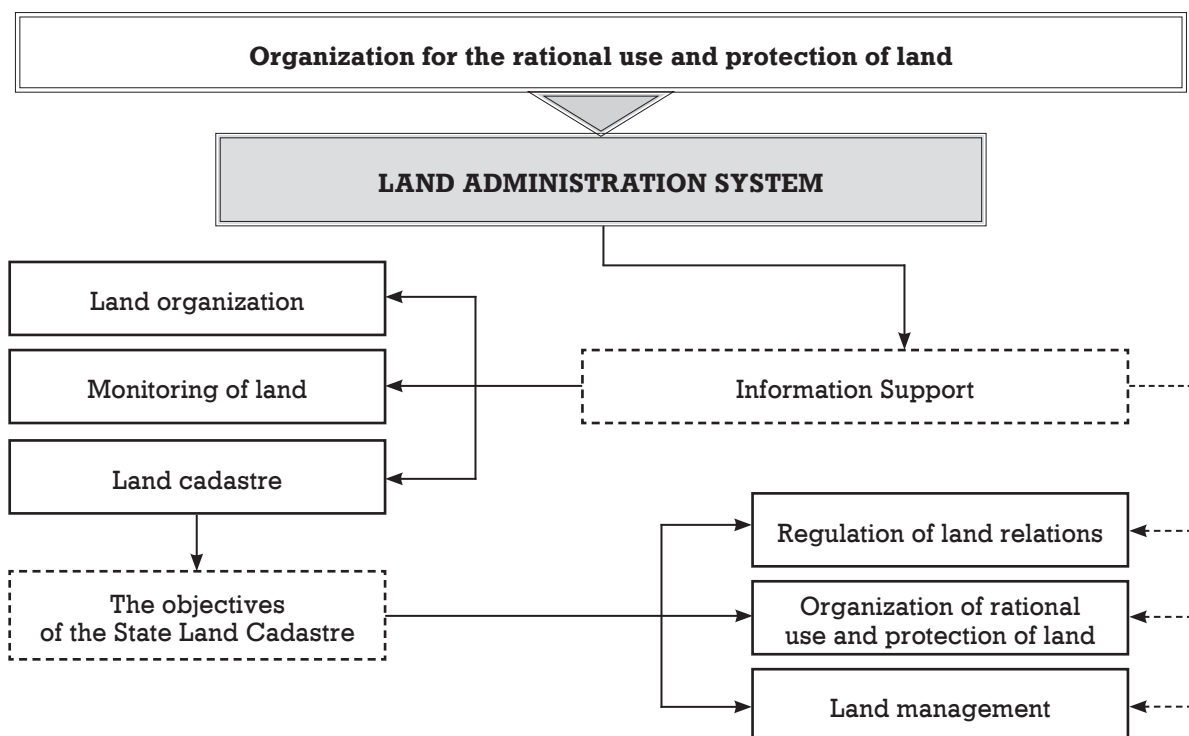


Fig. 1. Information Support of Land Administration System

nments, stakeholders for the rational use and protection of land.

The legal definition of the modern understanding of the state land cadastre is reflected in Law of Ukraine « State Land Cadastre» [4].

State Land Cadastre is a state geographic information system. Database of land information system have information about the state border of Ukraine, special purpose use and functional use of land, data of limitations in land use, data of quantitative and qualitative accounting of land, land assessment, distribution land among land owners and land users.

Ecological and economic problems of agricultural land

It is necessary to pay attention to land management as the part of agricultural enterprises and government agencies. Organization of land use, preservation and reproduction of soil fertility, compliance of ecology requirements, reservation of environment, etc are important. Effective land management is a major challenge of modern sustainable development of economy. Because, rational land use pays an important role not only in agricultural development, but also the economic development of the country in the whole.

Agricultural lands provide important areas of open space and wildlife habitat, while the proximity of agricultural land in natural areas. But any significant change in the agricultural system will be felt in all sectors and the ecosystem. Producers try use management practices that reduce the negative impact of the economy on sensitive areas. Agricultural practices affect the environment, while the choice of society to influence decision-making on agricultural production and land management. In this model, spatial data were a manipulated within a geographic information system, while multiple attribute decision making methodology was used to represent the crop choice decisions made by farmers. The attributes that made these decisions include the presence of suitable land, enough water, and harvest expected value and profitability. Description of agricultural production and practices as state level statistics. These statistics are useful, but they can not be used for future of different policy options on various aspects of agricultural system. Three component parts from this model provide a means to study the different agronomic, economic

and environmental characteristics land in the agricultural system. As a result, the model is thus able to combine economic and biophysical information from the decision-making process [5].

Agriculture of Ukraine is the most powerful extensive industry sector that includes 41.56 million hectares of agricultural land (54% of territory of Ukraine), including 32.49 million hectares arable land (53.8%) and 7.63 million hectares of natural grasslands — meadows and pastures (12.6%) [6].

Modern ecological-and-economical problems of Ukraine are a serious obstacle to further economic development. Rapid and unsustainable use of non-renewable natural resources and the exploitation of renewable resources at a rate that exceeds the possibility of recovery are realities of our time. Agricultural land use was no exception. The main problem in the system of agricultural land use is the transformation of land relations Ukraine to market generated without effective mechanisms for reform.

State policy in the agricultural sector accelerated on sufficiently and not-motivated of privatization land and property caused the destruction of major agricultural production. But in the formation of new productive forms of production was not effective. Agricultural lands have been used in agricultural production declined by 8.6 million hectares in 20 years of land reform in Ukraine. The tendency of creating unsustainable agricultural land use is enhanced as a result of blocking the market of private farmland. In addition, the land use for agricultural production was mainly conducted by owner, land tenant, which led to exhaustion of soil [7].

Environmental-and-economical feasibility of territorial redistribution of land resources based on relevant national and regional forecasting developments in Ukraine has not conducted. Implementation of transformation of structure of land resources deepened ecological imbalance of land resources, caused the loss of efficiency land use and land protection, natural ability to restore soil fertility. The current system of agricultural production and land use in Ukraine does not meet the requirements of sustainable environmental management. The ratio of environmentally acceptable ratio of cropland square, natural grasslands and forest plantations are violation.

Excess of development of land resources (72% instead of admissible 60–65% of the total area) is typical for Ukraine. The critical plowing of area (almost have not analogues in the world — reaching 53.8% instead of the allowable 40%, for comparison, in Britain — 18.5%, U.S.A. — 25%, Hungary — 37%, France — 48%), lack of forest area (15.7% instead of the conventionally optimal 20%) and environmentally stabilizing components of the landscape in general (forests, wildlands flood-plain, natural grassland, etc. 37% instead 40–45%). Share of eroded lands in Ukraine is 57.4% of the country's area. The eroded areas of cropland reaches 60–80 hectares and increase every year. According to experts estimate on half of the agricultural land needs recultivation after various types of pollution [6].

Violation of balance components of agricultural landscapes, including the ratio of cropland, natural lands, forest ecosystems and water resources, environmental despoliation resulting to degradation of agricultural landscapes and especially soil (reduced soil productivity, soil puddling, disbalance ecosystem, etc).

The water and wind erosion are especially dangerous dimensions. It is 6 million hectares constantly exposed, and the area of land damaged by water erosion is about 13.3 million hectares, including 10.6 million hectares of cropland. The annual loss of agricultural products only from erosion exceeds 8.10 million tons of grain-crops [6].

As consequence of violation of scientifically based cropping systems leads to that the natural fertility of agricultural land decreases. Almost all area, a decrease of humus content in the soil is observed. Total in Ukraine negative balance of humus and humus average loss is 0.6–0.7 ton on hectare [7].

The main reason for the deficit balance of humus and nutrients is the lack of application of organic and mineral fertilizers. This results in reduction of crop yields.

The volume of mineral fertilizers in recent years declined almost 5 times. In 1990 there were 4.2 million tons made active substances, including nitrogen — 1.8, phosphate — 1.3, potassium — 1,2 million tons, per 1 ha of cultivated area there was 141 kg of active ingredient, in 2010 — by 1060.6 thousand tons of active substance 670.4, 237.8, 152.4 thousand tons or 50.5 kg of active ingredient per

1 hectare. The volume of organic fertilizers decreased from 8.6 tons per 1 ha in 1990 to 0.56 tons per 1 ha in 2010 [7].

None of the major tasks of the state land cadastre, defined by law, is not currently running, including: completeness of the information is not provided on all land (according to the State Agency for Land Resources of Ukraine as of 2010 in the state register of land accounted semantic mapping and needs only 10 million of land, or about 40% of the total).

Thus, we can conclude that in Ukraine the next ecological and economic problems of agricultural land exit:

- legal uncertainty of regulation of land use;
- reduction of agricultural land;
- shredding patterns of agricultural production;
- violation environmentally acceptable ratio of arable land;
- soil degradation and contamination;
- no surveying work on the rationalization of land use and land protection.

The Role and Aspects of State Land Cadastre System

UN Land Management Guidelines talk about land management as «the process of determining, recording and disseminating information on ownership, value and use of land in the implementation of land management policy [8].

The International Federation of Surveyors defines a cadastre as a parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities) [9].

The cadastral infrastructure includes a unique identification of the land parcels deriving from the cadastral surveys. The cadastral identification is then seen as the core component of any land information system. The focus will be on providing land information to the mass market to support the land market, financial and business sectors, environmental management, land administration, urban systems and community information systems [2, 10].

A cadastre is a set of records about land that consists of two parts: a series of maps or plans showing the size and location of all land parcels together with text records that describe the attributes of the land. The function of the cadastre is to collect and make available

graphic and textual information in support of title registration, property valuation and land resource management [1].

Traditional cadastre and land registration systems are currently undergoing major changes worldwide. On such changes, the emerging trends focus on easy access to land, security of land tenure, establishment and operation of efficient land markets, formalization of property rights, incorporating customary and informal settlement areas, development of land information systems (LIS), etc. These trends have encouraged many nations to adopt land information systems by re-engineering their land administration systems, and to support the long-term sustainable development including market economy.

In most countries, the cadastral system is just taken for granted, and the impact of the system in terms of facilitating an efficient land market and supporting effective land-use administration is not fully recognized. The reality is that the impact of a well functioning cadastral system can hardly be overestimated. A well tailored cadastral system is in fact acting as a backbone in society [10, 11].

Digital information about land is central to the policy framework of modern land administration and sustainability accounting. The cadastre, or the large scale, land parcel map

related to parcel indices, is the vital information layer of an integrated land management system, and, in future, will underpin information systems of modern governments [2].

The nature of the state land cadastre was researched and identified as the following conceptual framework of functioning of land cadastre:

The legal aspect of land cadastre system deals with social land relations mediated by the state legal system, which provides the legal definition of inventory (Fig. 2). Legal content of land cadastre describes it as apparatus of state land administration system in sphere of agriculture that protects land rights and sustainable land use.

The economic aspect of land cadastre system is the result of cadastre. The State adopts economically sound management decisions in sphere land use agribusiness, which based on information about state land resources (Fig. 3). The economic content land of land cadastre determines its ability to provide an effective system of land payments, to support the assessment of land, the economic incentives for sustainable land use and sustainable development of the agricultural sector.

The ecological aspect of land cadastre system is interpreted as the state making management decisions in sphere of environ-

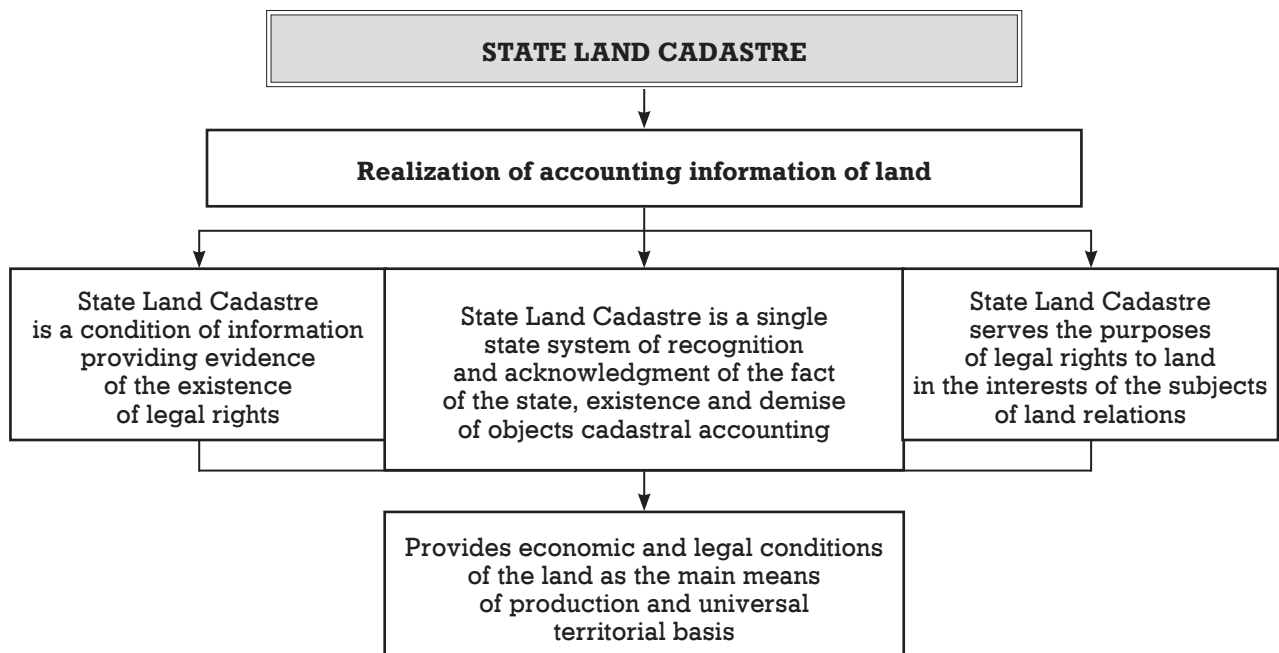


Fig. 2. The legal nature of the State Land Cadastre

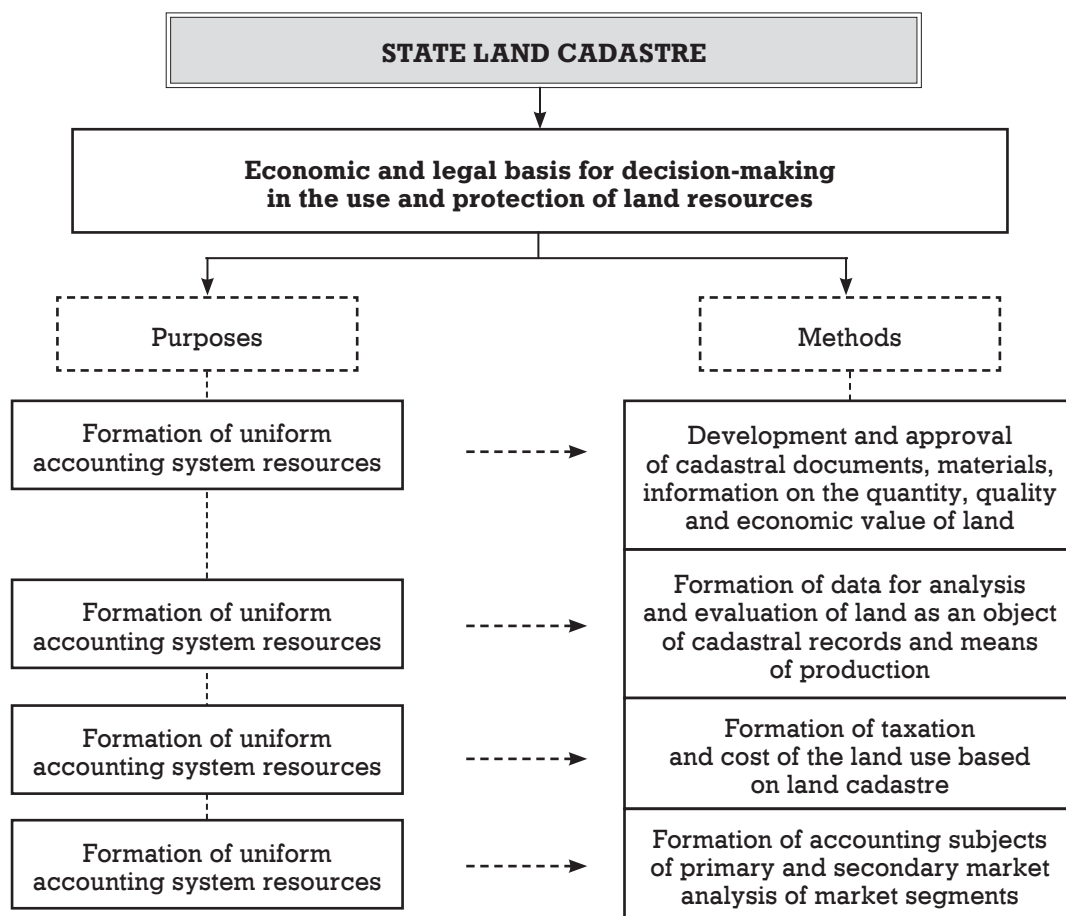


Fig. 3. The economic nature of the State Land Cadastre

mental protection that based on land use data, through optimization the structure of land, implementation the evaluation of degradation and soil pollution of agricultural land, organization ecosafety agricultural land use (Fig. 4).

The ecological content of land cadastre defines its ability to provide an effective system of environmental restrictions landowners and landusers, to create environmental regulations and standards ecosafety land use, based on the use the state land cadastre data.

The state land cadastre in agriculture is a unique geographic information system data on land (legal, quantitative, qualitative, environmental and economic indicators), which is based on the legal, environmental and economic aspects. The purpose of implementation land cadastre is to ensure: sustainable land use, planning, land taxation, environmental protection, ecosafety agricultural production, guaranty and protection of the rights of land ownership.

But the state land cadastre system has its own drawbacks. The main one is that all tasks of the state land cadastre within the law are designed to perform only one purpose — to regulate land relations. The land management, organization of sustainable land use and protection of lands, the land evaluation are reduced to solving only the legal aspect of tasks. And this is problem of our country, because we pay attention to organization of guaranty the rights of the state and land use for economic benefits, but it does not exempt people from that the environment must be protected.

The information support for the land cadastre has a key problem. This is the completeness of data about land parcels that should be in information database of state land cadastre. But there is a problem. The qualitative characteristics of agricultural land are not included in information database of land cadastre in Ukraine. This happened because of govern-

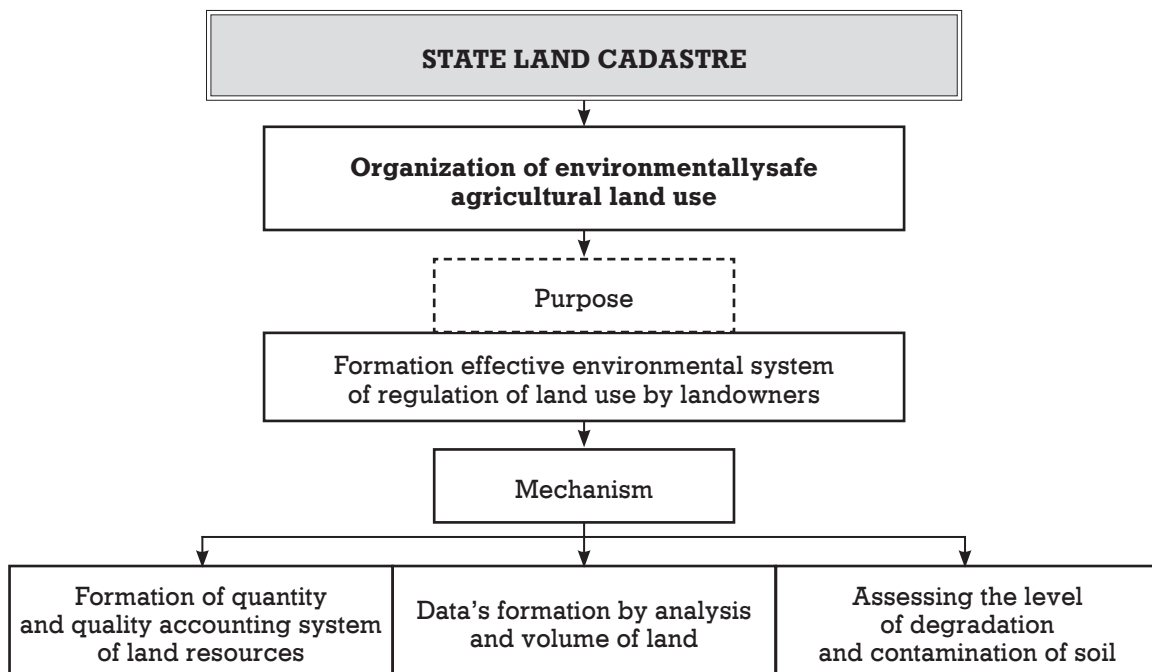


Fig. 4. The ecological nature of the State Land Cadastre

ment policies aimed on the regulation of land relations, namely guaranteeing rights to land. On the one hand it is good, but on the other hand- foundations for sustainable development in land use are not included in it. The transition to a market economy in Ukraine is not provided with the necessary of land administration system transformation.

State Land Cadastre as an informational basis of land management should be integrated information system to be multi-purposed. Now, the state land cadastre in Ukraine is an information system of a narrow focus, containing a set of information and documents about the location and legal status of these sites, their evaluation, land classification, quantitative and qualitative characteristics. Multipurpose Cadastre is the basis for taxation, registration of ownership of land and contains information about the natural state of land parcels.

In Europe, there is an information system that combines comprehensive accounting information system resources. This is «System of Environmental and Economic Accounting» (SEEA), created by the Statistics Division of the United Nations (UN) in 1993, and it is a system of environmental and economic accounting. SEEA purpose is reflection of existing relationships and economic environment and

ensure information framework for integrated environmental and economic policy. System of integrated environmental and economic accounting is a tool that can help monitor the depletion of natural resources and environmental degradation environment. Subsystems within the SEEA contain detailed information on specific resources or sectors, including: energy, water, fisheries, land and ecosystems, agriculture [12].

For further economic development transition based on sustainable development of land resources is require. The information which contains information database of land cadastre should be expanded with the number of indicators. The ecological and economic indicators of state agricultural land must be added.

However, while the cadastral concept is simple, implementation is difficult and complex. However it needs to be extended to incorporate the evolving and complex rights, restrictions and responsibilities operating in a modern society concerned with delivering sustainable development as well as the social context of people to land relationships [2]. Important role in maintaining the cadastre integrated land management information is not only the right character, but ecological, economical about land-use.

Improvement the formation mechanism of information systems of agricultural land

The improving of the information system of agricultural land in Ukraine is based on concept of Multipurpose Cadastre. This means combining all the data of different orientation (ecologic, economic, legal, value) in integrated information system with the natural, economic and legal grounds. The accounting agricultural land in the land cadastre describes all land characteristics about natural properties, quality, environmental and economic indicators. The improvement of the formation mechanism of information systems of agricultural land must be based on the concept of multi-purpose

cadastre and have basis of SEEA. Figure 5 shows how to construct information system of agricultural land.

The improvement of the formation mechanism of information systems of agricultural land will allow to obtain information about how land is used.

The selection of indicators of agricultural land is based on such legislative and legal documents as the Land codex of Ukraine, 2001, The Law of Ukraine «On State Land Cadastre», 2011, Resolution Cabinet of Ministers of Ukraine «On Approval of the State Land Cadastre», 2012, Order of the Ministry of Agrarian Policy and Food of Ukraine «On Approval of the Order of the passport agro-

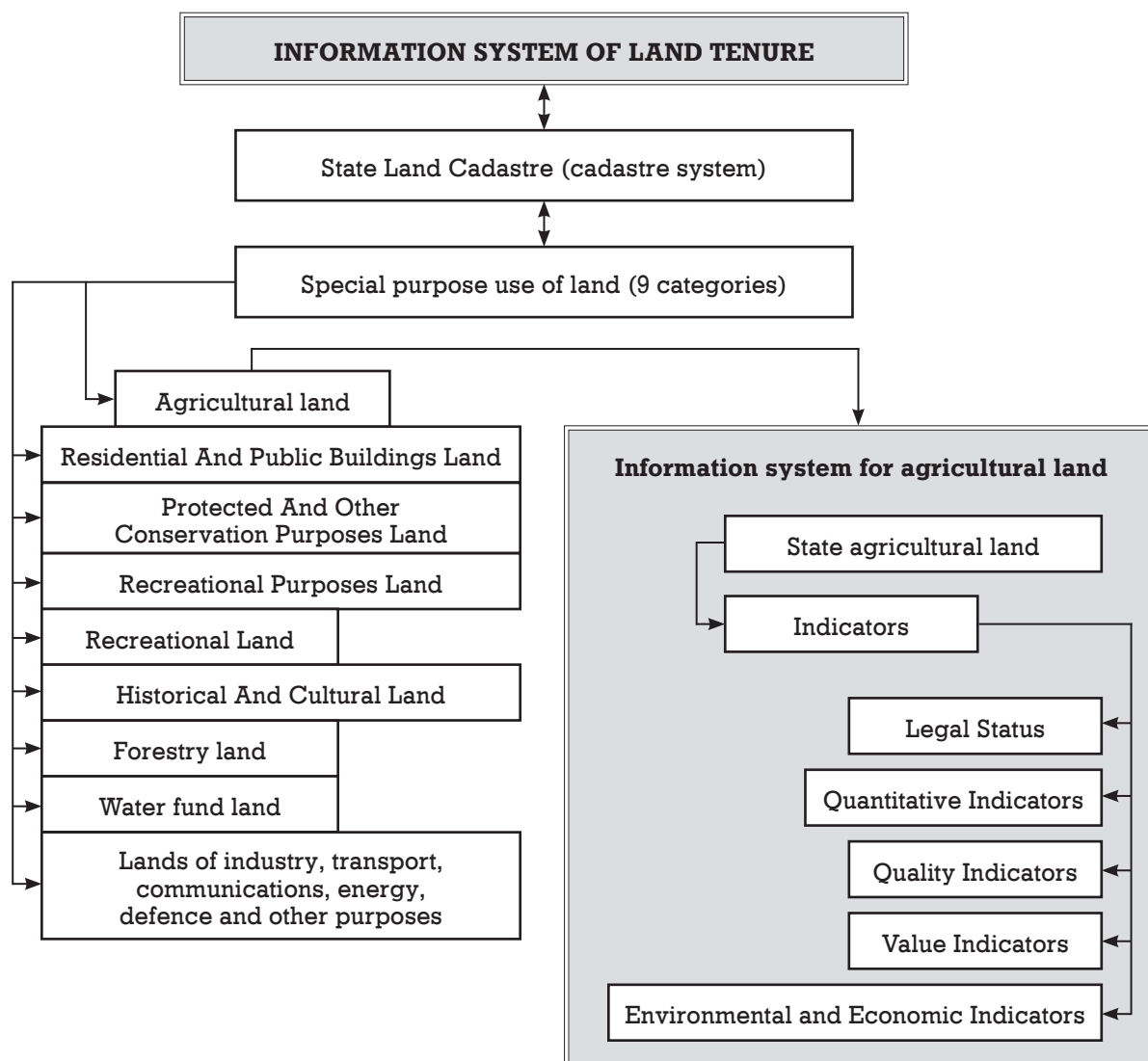


Fig. 5. Scheme of the construction of information system of agricultural land

chemical field, land», 2011 [4, 13–15] as well as literary publications of research in sphere of information support of land use are formed (Table 1): legal status, quantitative and qualitative indicators, value indicators, ecological and economic indicators.

Land Information System (LIS) is the most suitable systematic approach to developing an effective land administration and management in Bangladesh. This paper focuses on the challenges that must be addressed in the development of sustainable land management policies and controls for the planning and control of growth in Bangladesh [3].

The cadastral domain model can be described as an information model, which is an application independent description of information. The aim is to focus on the information itself and not the technical environment where it is stored. The main focus for the cadastral domain model has been to concentrate on the

different parts of real property information, including real property rights, and especially the relations between the different kinds of real property information, not limited to where the information is physically stored and managed today. Great effort has been taken to focus on the information itself and not the technical environment in which the information is stored [16].

In setting up a computerized system it is necessary to determine which conventional records, registers and plans are to be included and how these relate to other applications such as land registration, cadastre, taxation, area planning, community tasks, etc. A crucial issue is where, how and by whom the maintenance of the data will be carried out. It is also necessary to determine what conditions of access will be needed by different users, such as the times when clients can visit the land administration offices, the

Table 1

Indicators of agricultural land

Group indicators with certain characteristics of land	List of indicators
Legal Status	description of land: cadastral number, purpose, structure of land, location
	property rights
	information about landowners
	restrictions / encumbrances of using
	land documents
Quantitative Indicators	description of the land (in quantitative terms): land area, land square, coordinates, perimeter, etc.
	geology and geography:
	restrictions / encumbrances of using (in quantitative terms): area, perimeter, coordinates
Quality Indicators	biological
	agrophysical
	agrochemical
	anthropogenic, negative symptoms
Value Indicators	regulatory evaluation
	expert evaluation
Environmental and Economic Indicators	indicators efficient use of land resources
	indicators of the intensity of land use
	indicators of site territory
	qualitative assessment

level of fees, standardized and specific inquiry forms, delivery of data carriers, delivery of update material, opportunities for online access, etc. [1].

At the heart of the computerized land administration system there will be a processing centre that must be equipped to meet the requirements of the systems design in the most efficient way. The range of systems may extend from a single or series of personal computers networked together through to a series of interconnected processors on different systems levels. The hardware, the software, including the database software, and the communication equipment all have to be evaluated and the optimum configuration selected. Furthermore, the procedures to be adopted and the requirements for data security and data protection must be defined.

Formation of an information system of agricultural land is intended to solve the problem of obtaining complete information about land for use planning and effective management of agricultural land, sustainable development of land use in modern conditions of economic development.

CONCLUSIONS

The state land cadastre in agriculture is a unique geographic information system data on land (legal, quantitative, qualitative, environmental and economic indicators), which is based on the legal, environmental and economic aspects. The purpose of implementation land cadastre is to ensure: sustainable land use, planning, land taxation, environmental protection, ecosafety agricultural production and to guarantee and protect the rights of land ownership.

State Land Cadastre as an informational basis of land management should be integrated information system and to be multi-purpose. The improvement of the formation mechanism of information systems of agricultural land will allow to obtain information about how land use is use.

Formation of an information system of agricultural land is intended to solve the problem of obtaining complete information about land for use planning and effective management of agricultural land, sustainable development of land use in modern conditions of economic development.

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КОНЦЕПТУАЛЬНІ ОСНОВИ ОРГАНІЧНОГО ЗЕМЛЕКОРИСТУВАННЯ

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Уточнено сутність та зміст теоретико-методологічного апарату щодо органічного землекористування. Сформовано концептуальні основи сутності органічного землекористування з урахуванням теоретико-методичних засад обґрунтування його впровадження.

Ключові слова: *екологізація сільського господарства, органічне землеробство, органічне землекористування.*

Розвиток аграрного сектора спроможний здійснити потужний вплив на економічне зростання в Україні, яке можливо забезпечити за умови раціонального використання, охорони та відтворення продуктивності земельних ресурсів. Сучасне використання сільськогосподарських земель характеризується руйнуванням, забрудненням та виснаженням ґрунтового покриву, зменшенням вмісту гумусу, збільшенням площі еродованих орних земель, кислих ґрунтів, порушенням сівозмін, недотриманням технологій обробки ґрунту, невеликим обсягом внесення добрив, особливо органічних, негативним балансом поживних речовин. З огляду на це, актуалізується розробка методологічного забезпечення управління процесом охорони та раціонального використання ґрунтів, у тому числі екологізації всіх етапів сільськогосподарського виробництва.

Органічне землекористування узгоджується із загальноприйнятою в світі концепцією сталого розвитку, оскільки забезпечує: збереження та відновлення якісних параметрів навколишнього природного середовища (НПС); продовольчу безпеку держави без шкоди екології та довкіллю; населення якісними продуктами харчування; соціальне та економічне зростання сільської місцевості. Крім того, наша держава розглядається світовою спільнотою як потенційний постачальник якісної й порівняно недорогої органічної продукції, що сприятиме розвитку агробізнесу в державі, збільшить її експортний потенціал на постійно зростаючих екологічно зорієнтованих ринках збуту сільськогосподарської продукції.

Дослідженню проблематики еколого-спрямованого розвитку сільського господарства, теоретико-методологічних та