

**IMPROVEMENT OF SCIENTIFIC AND METHODOLOGICAL APPROACHES TO
THE CLASSIFICATION OF AGRICULTURAL LANDS**

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The existing scientific and methodological approaches to the classification of agricultural lands both in Ukraine and abroad are analysed. It is established that modern classifications of lands should be formed based on such principles as complexity, exhaustiveness, hierarchy and legality; meet the requirements of automated technologies for maintaining the state land cadastre and land monitoring; take into account the recommendations of the European Economic Commission at the UN.

Comprehensiveness of identifying of all potentially possible land uses, which will facilitate effective state control over land use in accordance with their intended purpose will be ensured through a comprehensive approach to the development of land classification; its consistency with other current state classification systems in the field of nature management and the use of clearly defined target criteria, parameters and features, the system of which is determined by the specific scope and requirements of the relevant user groups – through a systematic approach.

A fragment of 3-digit classification of agricultural lands is proposed, in which hierarchically placed interrelated indicators characterizing the legal regime of land use (legal block of land classifier) and their physical condition (physical block of land classifier) are placed hierarchically. In order to legally consolidate the categories “type, subtype, variety of lands” that form the basis of the physical block of the land classifier, it is necessary to make appropriate changes to the national land legislation.

Key words: *agricultural lands, land classification, land category, intended purpose.*

Formulation of the problem. The existing system of classification of agricultural lands has long been successfully used in the state land cadastre and as a statistics tool and solved a range of issues related to land use planning. It is, however, characterized by a number of significant shortcomings and therefore there is a need of further improvement of scientific principles and methodological approaches to its formation, especially in the transition to automated technologies of state land cadastre and the widespread use of remote sensing methods in the land monitoring system. A hierarchical model was used in the development of the land classifiers, but their content was formed not by establishing all possible components of the generalized classifier and then removing the inappropriate ones, but by entering the most common and well-known components into the classifier. So, it does not meet the criteria of complexity and completeness. In this regard, the problem of classification of land in general and agricultural land in particular is traditionally complex and, so far, not fully resolved.

Analysis of recent research and publications. The works of Babmindra D.I., Dobryak D.S., Dorosh Y.M., Dorosh O.S., Kanash O.P., Martyn A.H., Pomelov O.S., Rozumnyi I.A. and others are devoted to the problem of land classification. They highlighted various scientific and methodological approaches to solving this problem [3,4,6,7].

The purpose of the article is to analyze the existing scientific and methodological approaches to the classification of agricultural lands and to substantiate the ways of their improvement at the present stage of development of land relations.

Presenting main material. Generalization of foreign and domestic experience in the formation of land classification systems allows us to formulate key scientific and methodological approaches to solving this problem [3-7, 9, 10]. In particular, a comprehensive approach to the development of land classification will ensure identification of all potential uses of land, which will prevent the future establishment of “arbitrary” types of purpose by public authorities and local government and promote effective state control over the use lands in accordance with their intended purpose.

The system approach involves the formation of land classification as one of the subsystems of natural resources classification, which will ensure its consistency with

other existing state classification systems in the field of nature management and the use of clearly defined target criteria, parameters and features.

In addition, the classification of lands should be based on the norms of national land legislation and relevant by-laws; solving problems of land classification at different stages and appropriate levels requires the use of modern mathematical methods: methods of discrete mathematics, methods of cluster analysis, search theory and other methods of mathematical statistics; land classification largely depends on information processing and analysis technologies (in particular, automated information processing technologies have stricter requirements for the use of a system of classifiers and data analysis compared to paper ones); land classifiers should be open, and their support should be centralized (if in the process of functioning of the automated system of state land cadastre of Ukraine there are situations not provided by the relevant classifiers, then after proper justification the body responsible for maintaining classifiers may decide to add additional values, which should be notified in a directive manner to those involved in maintaining the cadastre); in the process of developing national land classifiers, the recommendations of the European Economic Commission (EEC) at the UN should be taken into account.

According to these recommendations given in the “Standard Statistical Classification of Land Use of the EEC”, the land classification system must meet the following criteria [9, 10]:

1) meeting the information needs of users at the local, national and international levels; at the local level – for the purpose of planning and regulation of land use; at the national level – in order to improve the mechanisms of land reform, forecasting its indicators, environmental protection, etc.; at the international level – for the purposes of comparative analysis of the use of national land resources on the basis of certain sets of criteria;

2) provide an opportunity to objectively calculate the area and description of land plots in accordance with their coverage (buildings, water, plantations, etc.) and collect information on the existing structure of land use;

3) provide information on the types of activity on the land plot (purpose of the land plots); on the impact of land use on the environment; on planning the development of the land use structure and on alternative land use options;

4) the classification system should cover the entire territory of the country and ensure the calculation of land areas and the consolidated balance of all land categories.

Thus, among the positive aspects of the EEC land use classification system are: 1) this classification is based on a clear system of criteria that can be successfully used in the development of national classifiers; 2) it is related to the classifier of economic activities. But it has some shortcomings: 1) there are no requirements to provide the necessary information on the mechanism of land taxation and registration of rights, because in developed countries the basis for taxation is usually the market value of land, but in Ukraine to solve this problem the classification system must include information on the land use, its legal regime, granting, etc .; 2) the hierarchical model adopted in the EEC classification system, which is based on the mixed use of criteria for types of land cover and types of land use, does not take into account the requirements of other criteria of the classification system development.

Finally, the EEC classification system should be considered as conceptual, and therefore it cannot be fully implemented in the process of developing national classifiers. In this case, it is not the scheme of land classification that should be taken as a basis, but the methodological approach used in establishing the criteria, structuring of lands and types of functional use.

Updated scientific and methodological approaches to the classification of agricultural land, of course taking into account changes in current national land legislation (primarily the Law of Ukraine No.711 “On Amendments to Certain Legislative Acts of Ukraine on Land Use Planning”, which enters into force on 24.07.2021 [8]), were reflected in the development of the classifier of types of land use, a fragment of which is presented in table 1.

According to the first part of Article 19 of the Land Code of Ukraine (hereinafter – LCU), “the lands of Ukraine are divided into ... categories according to the intended purpose”, which according to the second part of Article 18 of the same Code “have a

special legal regime” [1], therefore, they should be the basis of the proposed land classification system.

Table 1

Fragment of the classifier of types of lands intended purpose (legal regime of the land plot block)

Land category <i>(intended purpose)</i>		Intended purpose		Type of intended purpose <i>(direction of activity within land category)</i>	
code	name	code	name	code	name
1	2	3	4	5	6
01	Agricultural lands	01.01	For the production of agricultural products	01.01.01	For conduction of commodity agricultural production
				01.01.02	For farming
				01.01.03	For personal farming
				01.01.04	For individual gardening
				01.01.05	For collective gardening
				01.01.06	For haymaking and cattle grazing
				01.01.07	For subsidiary agriculture
				01.01.08	For backyard
		01.02	For conduction of agricultural research and educational activities	01.02.01	For research and educational purposes
				01.02.02	For promotion of the best practices in agriculture
		01.03	For agricultural production infrastructure	01.03.01	For accommodation of the infrastructure of wholesale markets for agricultural products
				01.03.02	For placement of outbuildings and yards

In the column “Category of lands” of table 1 according to the sequence (or priority) of categories listed in part one of Article 19 of LCU, agricultural lands are specified under code 01. By analogy with them, other categories of land will have codes from 02 to 09.

According to the first part of Article 22 of the LCU, “agricultural lands are lands provided for the production of agricultural products (code 01.01), conduction of agricultural research and educational activities (code 01.02), agricultural production infrastructure (code 01.03), including infrastructure of wholesale markets for agricultural products, or intended for these purposes” [1].

According to the third part of the same Article of the LCU, “agricultural lands are transferred to the ownership and provided for use to:

- citizens – for personal farming, gardening, horticulture, haymaking and cattle grazing, conducting commodity agricultural production, farming;
- agricultural enterprises – for conduction of commodity agricultural production;
- agricultural research and educational institutions and rural secondary schools – for research and educational purposes, promotion of the best practices in agriculture;
- non-agricultural enterprises, institutions and organizations, religious organizations and associations of citizens – for subsidiary agriculture;
- wholesale markets for agricultural products – to place their own infrastructure” [1].

Taking into account the above-mentioned norms of LCU and the Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine Concerning Land Use Planning”, codes for types of land use have been assigned (column 3 of table 1).

A block describing the physical parameters of land plots within this category is connected with the block of the Land Classifier, which characterizes the legal regime of lands of the corresponding category (Table 2). Table 2 shows the indicators that determine the physical condition of the land use (class, type and subtype of land), consistent with the current land legislation category “land”.

Table 2

Fragment of the classifier of land types (physical characteristics of land plots block)

Class of lands		Type of lands		Subtype of lands		Lands	
code	name	code	name	code	name	code	name
1	2	3	4	5	6	7	8
01	Cultivated agricultural land	01.01	Arable lands	01.01.01	Land of intensive use (slope steepness up to 1°)	01.01. (01-03). 01	Arable land
				01.01.02	Land of extensive use (slope steepness 1-3°)		
				01.01.03	Land of soil protective use (slope steepness 3-5°)		
		01.02	Improved meadow lands				
		02.01	Gardens	02.01.01	Fruit gardens	02.	

02	Land under permanent cultures	02.02	Plantations	02.02.01	Grape plantations (vineyards)	(01-03). (01-04). 01	Perennial plantings
				02.02.02	Hop plantations		
				02.02.03	Plantations of ornamental perennials (flower beds)		
				02.02.04	Berry plantations		
		02.03	Nurseries	02.03.01	Fruit nurseries		
03	Natural meadow lands	03.01	Hayfield lands	03.01.01	Hayfield drylands	03.01. 01(02). 01	Hayfields
				03.01.02	Hayfield wetlands		
		03.02	Pasture lands	03.02.01	Pasture drylands	03.02. 01(02). 01	Pastures
				03.02.02	Pasture wetlands		

According to paragraph “a” of the second part of Article 22 of LCU, “agricultural lands include: a) agricultural land (arable land, perennials, hayfields, pastures and fallow lands); b) non-agricultural lands (field paths and roads, field protective forest belts and other protective plantings, except those classified as lands of other categories, lands under farm buildings and yards, lands under infrastructure of wholesale markets of agricultural products, lands of temporary conservation, etc.)” [1].

According to Annex 4 of “List of lands according to the Classification of Land” to the Procedure for maintaining the State Land Cadastre, approved by the Cabinet of Ministers of Ukraine No. 1051 from 17.10.2012, arable land includes “agricultural land that is systematically cultivated and used for growing crops, including perennial grasses (GOST 26640-85), greenhouses and hothouses; arable land does not include hayfields and pastures that have been ploughed for the purpose of their radical improvement and are constantly used under grass fodder crops for haymaking and cattle grazing, as well as between rows of gardens used for crops”; perennial plantations include “areas occupied by plantations for fruits, berries, grapes, hops; planting of essential oil crops, nurseries (except forest); plantations of ornamental perennials (flower beds) for decorative design of territories, as well as for the sale of flowers; medicinal perennials (belladonna, foxglove, sage and others)”; hayfields include “agricultural lands that are systematically used for haymaking (GOST 26640-85), which should include lands evenly covered with wood and shrubs up to 20 percent of their area”; pastures include “agricultural lands that are systematically used for cattle grazing (GOST 26640-85), which should include lands evenly covered with wood and

shrub vegetation up to 20 percent of the area”; fallow lands include “arable lands, which were previously ploughed, and later for more than a year since autumn were not used for sowing crops” [2].

These definitions of agricultural lands to a greater extent determine the nature of land use than their physical characteristics as an object of monitoring, which complicates the process of their identification when using remote sensing methods. The solution to this problem may be the introduction into the classification system of agricultural land, along with the category “land” a category “land class” (Table 2).

According to Pomelov O.S. (2013), “classes (types, subtypes) of land are determined by objectively existing physical properties, actual condition and nature of land use, which are clearly established on the ground and separated from other classes (types, subtypes) by the land contour” [7]. Based on this, the key condition is a clear identification of classes (types, subtypes) of land and the establishment of boundaries of the relevant contours on the ground, which is essential in the context of the use of remote sensing methods in land monitoring. In turn, the land contour should be understood as the part of the earth's surface that is allocated by a certain criterion (sign), has a closed boundary, beyond which the indicator of this criterion acquires a different meaning.

Taking into account these requirements, within the category of agricultural land there are 3 classes of land, which objectively differ in the physical condition of its surface (Table 2):

- cultivated agricultural lands (code 01) – lands that are systematically (or periodically) cultivated with direct mechanical impact on the soil (ploughing, disking, harrowing, etc.) and used for crops, including perennial grasses with the term of use provided by the crop rotation scheme;
- lands under permanent cultures (code 02) – agricultural lands occupied by artificially created tree-shrub vegetation (plantations) or plantations of herbaceous perennials, intended for harvesting fruits, food, technical and medicinal plant raw materials, as well as for landscaping;

- natural meadow lands (code 03) – agricultural lands covered with natural meadow grasslands used for harvesting meadow perennial grasses, including lands on which measures have been taken to improve natural grasslands, but which do not fall under the definition of arable land and are not included in them; this type of land should include areas that were previously “considered” as improved meadow lands (including former cultivated lands) after 7 or more years after siltation, if during this period no measures were taken to improve grassland.

Within the class of “cultivated land” there are 2 types of lands:

- arable land (code 01.01) – agricultural land that is systematically cultivated (ploughed) and used for crops, including perennial grasses with the term of use provided by the crop rotation scheme;
- improved meadow lands (code 01.02) – agricultural lands that are systematically cultivated and used, mainly for growing meadow perennial grasses with a term of use provided by the re-allotment scheme.

The type “arable land” includes 3 subtypes of land according to the intensity of possible use, which is determined by the location within the respective land plots of field or soil protection crop rotations with different ratio of row (technical) crops, cereals and perennial grasses.

Lands of intensive use (code 01.01.01) with slopes steepness up to 1° , and accordingly low level of erosion danger, are suitable for placement of intensive field crop rotations with the maximum saturation of row crops; lands of extensive use (code 01.01.02) with slopes steepness of $1-3^{\circ}$, and accordingly the average level of erosion danger, suitable for placement of field crop rotations with the maximum saturation of continuous crops and the absence of row crops; lands of soil protective use (code 01.01.03) with slopes steepness of $3-5^{\circ}$, and accordingly high level of erosion danger, suitable for placement of grain-grass and grass crop rotations with the maximum saturation with perennial grasses.

Within the class of “land under permanent crops” there are 3 types of land:

- gardens (code 02.01) – perennial trees planted to produce fruits and berries;

- plantations (code 02.02) – perennial plantations for growing special technical, medicinal and ornamental crops;
- nurseries (code 02.03) – perennial plantings intended for growing planting material of fruit and berry crops.

Type of land “plantations”, in turn, by type of crops is divided into 4 subtypes of land: grape plantations (code 02.02.01), hop plantations (code 02.02.02), plantations of ornamental perennials (flower beds) (code 02.02.03), berry plantations (code 02.02.04).

Within the class “natural meadow lands” there are 2 types of land:

- hayfield lands (code 03.01) – agricultural lands that are constantly occupied by perennial grasses and are systematically used for haymaking;
- pasture lands (code 03.02) – agricultural lands that are constantly occupied by perennial grasses and are systematically used mainly for grazing.

These types of land by the degree of hydro morphism of their soil cover are divided into 2 subtypes:

- drylands (code 03.01(02).01) – hayfields (pastures) lands, located on elevated and well-drained relief elements, moistened mainly by precipitation, as well as located in river valleys that are not systematically flooded and floods do not cause changes in vegetation;
- wetlands (code 03.01(02).02) – hayfields (pastures), located on low and poorly drained relief elements, in conditions of excessive moisture, which are determined by the moisture-loving composition of grassy vegetation.

Without claiming the exhaustiveness of the proposed scheme of classification of agricultural land, given the need to agree on the purpose of land and their physical characteristics, it should be noted that lands of other categories can be similarly structured, of course, taking into account their legal use and actual natural condition.

Conclusions. Analysis of foreign and domestic experience in the formation of classification systems in the land sector shows the need for integrated and systematic methodological approaches to the development of land classification, which will ensure its comprehensive nature to determine all potential uses of land, and its

consistency with other current state classification systems in the field of nature management.

The key principles of building a land classification should be:

- legality – the classification of lands should be formed in compliance with current national land legislation and relevant bylaws;
- openness – land classifiers should be open, and their support should be centralised;
- technologic – automated information processing technologies provide strict requirements for the use of a system of classifiers and data analysis, and solving problems of land classification at different stages and appropriate levels requires the use of modern mathematical methods;
- harmonization with international norms – the development of national land classifiers should be carried out taking into account the recommendations of the European Economic Commission.

The proposed fragment of the classifier of agricultural lands consists of two hierarchically structured, interconnected blocks. The basis of this classifier is the legal block, the indicators of which characterize the legal regime of land use. Indicators of the second (physical) block characterize the physical condition of the land surface, which can be controlled using remote sensing methods. A similar scheme of agricultural land classifier can be used in structuring lands of other 8 categories according to their exhaustive list defined by the Land Code, which should legally enshrine the terms “class, type and subtype of land” that form the basis of the physical block of land classifier.

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**УДОСКОНАЛЕННЯ НАУКОВО-МЕТОДИЧНИХ ПІДХОДІВ ДО
КЛАСИФІКАЦІЇ ЗЕМЕЛЬ СІЛЬСЬКОГОСПОДАРСЬКОГО ПРИЗНАЧЕННЯ**

Проаналізовано існуючі науково-методичні підходи до класифікації земель сільськогосподарського призначення як в Україні, так і за кордоном. Встановлено, що сучасні класифікації земель повинні формуватись на основі таких принципів як комплексність, системність, вичерпність, ієрархічність та законність; відповідати вимогам автоматизованих технологій ведення державного земельного кадастру та здійснення моніторингу земель; враховувати рекомендації Європейської Економічної Комісії при ООН.

Вичерпність та всеосяжність щодо визначення усіх потенційно можливих способів використання земельних ділянок, що сприятиме здійсненню дієвого державного контролю за використанням земель відповідно до їхнього цільового призначення забезпечуватиметься за рахунок комплексного підходу до розробки класифікації земель; її узгодженість із іншими чинними державними класифікаційними системами в галузі природокористування та використання чітко визначених цільових критеріїв, параметрів та ознак, система яких обумовлена конкретною сферою застосування та вимогами відповідних груп користувачів - за рахунок системного підходу.

Запропоновано фрагмент 3-розрядної класифікації сільськогосподарських земель, в якій ієрархічно розміщені взаємопов'язані показники, що характеризують правовий режим використання земельних ділянок (правовий блок земельного класифікатора) і їхній фізичний стан (фізичний блок земельного класифікатора). Для юридичного закріплення категорій «вид, підвид, різновид земель», що складають основу фізичного блоку класифікатора земель необхідно внести відповідні зміни до національного земельного законодавства.

Ключові слова: *землі сільськогосподарського призначення, класифікація земель, категорія земель, вид цільового призначення.*

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СОВЕРШЕНСТВОВАНИЕ НАУЧНО-МЕТОДИЧЕСКИХ ПОДХОДОВ К КЛАССИФИКАЦИИ ЗЕМЕЛЬ СЕЛЬСКОХОЗЯЙСТВЕННОГО НАЗНАЧЕНИЯ

Проанализированы существующие научно-методические подходы к классификации земель сельскохозяйственного назначения как в Украине, так и за рубежом. Установлено, что современные классификации земель должны формироваться на основе таких принципов как комплексность, системность, полнота, иерархичность и законность; отвечать требованиям автоматизированных технологий ведения государственного земельного кадастра и осуществления мониторинга земель; учитывать рекомендации Европейской Экономической Комиссии при ООН.

Полноту и всеохватность по определению всех возможных способов использования земельных участков, что будет способствовать осуществлению действенного государственного контроля за использованием земель в соответствии с их целевым назначением обеспечиваться за счет комплексного подхода к разработке классификации земель; ее согласованность с другими действующими государственными классификационными системами в области природопользования и использования четко определенных целевых критериев, параметров и признаков, система которых обусловлена конкретной сферой применения и требованиями соответствующих групп пользователей – за счет системного подхода.

Предложено фрагмент 3-разрядной классификации сельскохозяйственных земель, в которой иерархически расположены взаимосвязанные показатели, характеризующие правовой режим использования земельных участков (правовой блок земельного классификатора) и их физическое состояние (физический блок земельного классификатора). Для юридического закрепления категорий «вид, подвид, разновидность земель», составляющих основу физического блока классификатора земель необходимо

внести соответствующие изменения в национальное земельное законодательство.

Ключевые слова: *земли сельскохозяйственного назначения, классификация земель, категория земель, вид целевого назначения.*