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INFORMATION SUPPORT FOR MARKET CONFORMITY OF THE MONETARY VALUATION OF AGRICULTURAL LAND

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Abstract. *The article substantiates directions for the information support of market conformity in the normative monetary valuation of agricultural land. The subject of the study is the set of information resources and organizational-technological mechanisms that determine the completeness, timeliness, and reliability of the data underlying the valuation. The aim of the study is to identify problems in information support and to develop directions for its improvement under the conditions of a functioning market for agricultural land in Ukraine. The methodological basis comprises a systemic analysis of the current information support system across its components – the State Land Cadastre, the State Register of Property Rights to Immovable Property together with land market turnover data, land management and soil survey materials, and the national spatial data infrastructure together with public electronic registers and open data – a comparative legal analysis of the relevant regulatory acts, and the processing of an array of land market transaction data for the period from July 2021 to May 2026 using a standardized methodology for calculating the weighted average market*

price. It is established that information constitutes the foundational basis of valuation rather than an auxiliary or technical element, since no methodological solution can compensate for the absence, obsolescence, or unreliability of primary data, and information support therefore determines the actual limits of attainable valuation accuracy. Five interrelated problems are identified: incomplete population of the State Land Cadastre with valuation data; the absence of a market price monitoring system and the closed nature of price data held in the state register; fragmentation and non-interoperability of information resources, which prevents the formation of an integrated information profile of a land parcel; the obsolescence and low spatial detail of the soil information base, which forms a structural limit on valuation accuracy; and a collision between data transparency requirements and personal data protection, sharpened by security restrictions under martial law. In response to these problems, six mutually conditioned directions are substantiated: completing the population of the State Land Cadastre with valuation data and updating records on the condition of land; establishing a national system for monitoring prices of agricultural land as a derivative analytical layer built upon existing register data; integrating information resources and forming a structured information profile of the land parcel; updating the soil information base through the application of remote sensing of the Earth combined with reference ground surveys; developing open valuation data and the anonymized disclosure of price information while preserving the level of personal data protection; and forming an information-analytical framework for the mass appraisal of agricultural land. It is substantiated that the market conformity of valuation is currently constrained not by an absence of information as such, nor by an absence of legal constructs for working with it, but by the absence of derivative information products suitable for valuation purposes, so that the identified problems are predominantly implementational rather than constructive in nature. It is further shown that the proposed directions are mutually complementary and mutually reinforcing: their partial implementation yields a disproportionately small effect, since a fully populated cadastre without a price indicator preserves the rent-normative character of the valuation, while a

price indicator without integration with parcel characteristics remains a merely reference indicator incapable of affecting the valuation result.

Keywords: *normative monetary valuation, agricultural land, market conformity, information support, State Land Cadastre, price monitoring, land market, open data.*

Relevance

The normative monetary valuation of agricultural land is by its nature a computational procedure whose result is fully determined by the composition, completeness, and quality of the input data. Pursuant to the Law of Ukraine “On Land Valuation”, valuation is carried out on the basis of the data of the State Land Cadastre, land management materials, and data on the qualitative condition of land and its productivity [1], while the Methodology of Normative Monetary Valuation of Land Plots establishes the specific list of indicators used in the calculation [2]. In view of this, information is not an auxiliary or technical element of the valuation system: it constitutes its essential foundation, since no methodological solution can compensate for the absence, obsolescence, or unreliability of the primary data. Information support therefore represents the level at which the actual limits of attainable valuation accuracy are determined, and hence the limits of its market conformity as well.

The introduction of market circulation of agricultural land by the Law of Ukraine of 31 March 2020 No. 552-IX, which entered into force on 1 July 2021, fundamentally changed the information context in which valuation operates [3]. For the first time in the years of independence, an array of data on the actual prices of purchase and sale agreements for agricultural land was formed in Ukraine – an information resource that the normative monetary valuation system did not possess at the time of its establishment and that is, by definition, the most direct indicator of market value. Yet this array has still not been integrated into the information circuit of valuation: the current Methodology does not provide for the use of market price

data as an input indicator of the calculation [2], and the transaction data array itself does not have the status of an official source of valuation information. A situation arises in which the information most relevant to market conformity exists but remains outside the valuation system.

At the same time, the information base on which valuation actually relies is largely inherited in character. The rent-normative construction of agricultural land valuation is based on indicators derived from the materials of the 1988 economic valuation of land and the large-scale soil surveys of the second half of the twentieth century, refined through soil bonitation and subsequent indexation [2]. Data on the qualitative condition and productivity of land, which are a mandatory source of valuation [1] and are formed on the basis of land management works [4], largely reflect the condition of the soil cover of decades past. The intervening period encompasses fundamental changes in the structure of land use, production technologies, and the agrochemical condition of soils, and in recent years the direct physical impact of hostilities as well. The information basis of valuation therefore describes not the object whose value is being determined today.

A key element of the current valuation information support system is the State Land Cadastre – the unified state geoinformation system of data on land [5; 6]. It is precisely to the cadastre that data on the normative monetary valuation of land plots are entered, and it is precisely an extract from it that constitutes the document legally certifying its value. However, the population of the cadastre remains incomplete: according to the official data of the State Service of Ukraine for Geodesy, Cartography and Cadastre, data on more than 15.4 million agricultural land plots with a total area of about 32.3 million hectares have been entered into it, whereas the cadastre is populated with information on normative monetary valuation to approximately one half [7]. As a result, for a significant proportion of land plots the valuation has either not been carried out at all or its results exist outside the cadastre – in paper technical documentation that ensures neither prompt access nor the possibility of automated processing.

An equally significant problem is the fragmentation of the information resources relevant to valuation. Data on land plots are concentrated in the State Land Cadastre [5], data on property rights and registered agreements, including their price parameters, in the State Register of Property Rights to Immovable Property [8], and materials on the qualitative condition of soils in land management documentation [4]. These resources were created at different times, by different holders, for different purposes, and according to different data models. Their interaction is predominantly episodic, which precludes the formation of an integrated information profile of a land parcel in which cadastral, legal, price, and soil-qualitative characteristics would be combined at the level of an individual object of valuation.

The resolution of these problems must take place within the legal framework already established in Ukraine for the national spatial data infrastructure [9; 10] and the principles governing public electronic registers [11]. These acts introduce the principles of interoperability, the once-only entry and multiple use of data, and the electronic interaction of registers, which directly correspond to Ukraine's commitments under the Association Agreement with the European Union [12] and to the approaches of Directive 2007/2/EC (INSPIRE) [13] and Directive (EU) 2019/1024 on open data and the re-use of public sector information [14]. However, the application of these principles specifically to the purposes of normative monetary valuation remains scientifically undeveloped: the current Methodology contains no provisions on information interaction, data formats, or requirements as to the timeliness of data [2].

A separate dimension of the problem is formed by the need to reconcile two divergent requirements – the transparency of valuation and the protection of personal data. Market conformity of valuation by its nature requires the publicity of price information: without access to data on the actual prices of agreements, neither landowners, nor territorial communities, nor the scientific community are able to verify the soundness of valuation indicators. Legislation on access to public information recognizes such access as the general rule [15], while legislation on the protection of personal data establishes restrictions on the processing and

dissemination of data that identify a natural person [16]. Since the overwhelming majority of agreements in the agricultural land market are concluded with the participation of natural persons, the identification of an information-legal construction that ensures the publicity of price indicators subject to the anonymization of data on their participants acquires independent scientific significance.

An additional factor sharpening the information problem is martial law. Hostilities, the temporary occupation of part of the territories, the contamination of land with explosive objects, and the destruction of the soil cover have fundamentally changed the actual condition of significant areas of agricultural land, while access to a number of public registers and geospatial data has been restricted for reasons of national security. As a result, a gap has arisen between the real condition of land and its information representation: valuation is based on data describing the pre-war condition of the object, whereas its actual productive and market characteristics have undergone substantial changes.

It should be emphasized that the information dimension of the market conformity of normative monetary valuation is relatively autonomous with respect to the organizational, economic, and institutional dimensions. Organizational support determines the subjects of valuation, their functions, and procedures; economic support, the methodology of value formation and the fiscal consequences of its application; institutional support, the rules within which valuation functions as a social institution. Information support encompasses a different, independent subject: the composition, sources, quality, timeliness, accessibility, and suitability for automated processing of the data on which valuation is based, as well as the mechanisms for their collection, storage, integration, and disclosure.

Analysis of recent research and publications

The problem of the market conformity of agricultural land valuation is the subject of active scholarly debate, in which a shift of the research emphasis from the calculation methodology to the information basis of valuation is increasingly

evident. Cherevko and Hryso, analysing the relationship between valuation and land price in Ukraine in comparison with the experience of European countries, conclude that the current methodological approaches do not ensure an adequate level of conformity between valuation results and the needs of the real market [17]. Palekha and co-authors, considering directions for the development of valuation activity in Ukraine in line with contemporary challenges and global trends, emphasize the need to modernize its organizational and technological foundations [18]. Common to these works is the recognition of a gap between valuation and the market; however, its resolution is largely sought within the framework of improving the methodology, while the information preconditions of market conformity remain on the periphery of the analysis.

The studies devoted to the information-analytical support of valuation come closest to the information dimension of the problem. Dorosh, Kuryltsiv, Bratinova, and Myronov, in defining the composition and sources of the information-analytical support of agricultural land valuation, establish that the data available in state registers do not make it possible to determine the value of land plots objectively, and that the sources of information must ensure its timeliness, completeness, reliability, and currency [19]. Kuryltsiv and Myronov, in substantiating mass valuation of land as a precondition for optimizing the taxation system, emphasize that the information available in state registers is insufficient to satisfy the requirements as to the integrity and quality of the input data of mass valuation systems [20]. These works closely approach the subject of the present study, yet they focus predominantly on the composition of the valuation information model without encompassing the mechanisms for integrating market price data into the valuation circuit.

In the international scholarly literature, information support of valuation is considered in the format of formalized valuation information models and data-processing technologies. Buuveibaatar, Lee, and Lee present a valuation information model built on the Land Administration Domain Model standard (LADM, ISO 19152) for the purposes of mass valuation and taxation [21]. Wei and co-authors summarize the development of hedonic real estate valuation models in the era of big

data [22], while Shulgan and Nikolaichuk demonstrate the construction of an economic-statistical model of the market value of land plots by means of geographic information systems on the basis of a sales price database [23]. The need to move towards the systematic provision of high-quality market data as a precondition for the effective functioning of the land market is substantiated by Loughrey, Donnellan, and Hanrahan using the example of the European Union land market [24]. These approaches confirm the technological feasibility of integrating data for valuation purposes but require adaptation to the national information infrastructure.

The functioning of the agricultural land market in Ukraine following its introduction has become the subject of a number of empirical studies. Ibatullin, Dorosh, Sakal, and co-authors, analysing the market with the use of modern data-processing tools, establish that the prices of land plots were for a long time maintained at the level of their normative monetary valuation, which indicates a substantial under-capitalization of land as a factor of production [25]. Lunova, characterizing the conjuncture and problems of market formation, points to its limited volume and the immaturity of price signals at the initial stage of functioning [26]. These works record the existence of market price data but do not raise the question of granting them the status of an official source of valuation information.

A separate line of research concerns the functioning of the land cadastre and registers, in particular under martial law. Kuryltsiv and Kryshenyk, examining the administration of the land cadastre system under martial law, reveal the need to protect cadastral data from unauthorized access while simultaneously ensuring the rights to enter and use data [27]. Gordieiev and Plichko analyse the state and prospects for the development of the real estate cadastre in Ukraine [28]. These studies outline the legal and security framework for working with data within which the collision between transparency and data protection must be resolved.

Finally, an independent body of work is devoted to the condition of the soil information base and the application of remote sensing of the Earth. Dmytruk and Zhukova substantiate the necessary components of a soil monitoring infrastructure in response to the consequences of the war, assigning remote sensing the role of a

basic tool for obtaining data [29]. Bonchkovskyi and co-authors demonstrate the application of remote sensing for assessing war-induced damage to the soil cover [30], while Solokha and co-authors document the scale of soil degradation and contamination resulting from the armed conflict [31]. These results confirm both the acuteness of the problem of the currency of soil data and the availability of technological means for its resolution.

Despite the intensification of research on the information-analytical support of valuation and the accumulation of empirical data on land market turnover, the information dimension of the market conformity of valuation as an integral subject has not yet received systematic treatment. Unresolved questions remain concerning the composition and sources of data capable of ensuring that market realities are reflected in valuation results; the mechanisms for integrating land market price information into the valuation circuit; the requirements as to the currency and spatial detail of the soil information base; and the organizational and technological conditions for combining the publicity of price indicators with the protection of personal data. It is precisely to the resolution of these tasks that the present study is devoted.

Aim and objectives of the study

The aim of the study is to develop scientifically substantiated directions for the information support of the market conformity of the normative monetary valuation of agricultural land under the conditions of a functioning land market in Ukraine and the adaptation of the national public data system to European principles.

The achievement of this aim entails: disclosing the essence and composition of the information support of valuation, delimiting the information dimension from the organizational, economic, and institutional ones; analysing the current information support system across its principal components; assessing the state of population, currency, and suitability of the available information resources for valuation purposes; identifying the principal problems and limitations of information support; substantiating directions for its improvement, defining for each of them the

composition of the required data, the sources of their formation, the requirements as to currency, and the mechanisms of information interaction; and developing the structural and functional characteristics of a system for monitoring prices of agricultural land and of an information-analytical framework for the mass appraisal of land.

Materials and methods of the study

The source base of the study comprises four groups of materials. The first group is formed by the legislative and subordinate regulatory acts of Ukraine in the sphere of land valuation, the maintenance of the State Land Cadastre, the state registration of property rights to immovable property, the functioning of the national spatial data infrastructure, public electronic registers, access to public information, and the protection of personal data [1–11; 15; 16]. The second group comprises the acts of European Union law in the sphere of spatial information and open data [13; 14], as well as the Association Agreement between Ukraine and the European Union with respect to the commitments on harmonizing the national spatial data infrastructure [12]. The third group is formed by the official data of the State Service of Ukraine for Geodesy, Cartography and Cadastre on the state of population of the State Land Cadastre [7]. The fourth group comprises the array of transaction data of the agricultural land market, processed by the author using the author's own methodology [32].

The transaction data array encompasses information on purchase and sale agreements for agricultural land plots concluded during the period from July 2021 – the moment of the introduction of market circulation of such land – to May 2026. The volume of the initial array amounts to more than 444 thousand records, each of which contains information on the area of the land plot, the price of the agreement, the date of its conclusion, and its territorial reference. Given the considerable volume and heterogeneity of the initial array – the presence within it of agreements that by their nature do not reflect a market price (donations, agreements between related parties, exchanges of shares, and agreements with signs of unreliable price

declaration) – a standardized methodology for filtering and calculating the weighted average market price, developed by the author, was applied for the purposes of the study [33].

The methodology provides for the selection from the initial array of agreements that simultaneously satisfy two criteria: the area of the land plot falls within the range from 0.1 to 50 ha, and the price of the agreement falls within the range from 8,000 to 250,000 UAH/ha. The first criterion excludes from the calculation both micro-plots, whose price per unit area is systematically distorted by the scale effect, and agreements concerning consolidated tracts that fall outside the typical single commodity transaction on the agricultural land market. The second criterion cuts off agreements with an anomalously low price, which as a rule indicates a gratuitous or preferential character of alienation or an understatement of the price in the contract, as well as agreements with an anomalously high price that are not representative of mass turnover. The weighted average market price for the filtered set of agreements is calculated as the ratio of the total value to the total area of the filtered plots, which, unlike a simple average price, correctly accounts for the influence of agreements of different scale on the overall price level.

In assessing the applied methodology from the standpoint of the reliability of the results obtained, it should be noted that the official aggregated indicators of the average price of agricultural land published by the State Service of Ukraine for Geodesy, Cartography and Cadastre are not used in this study as an independent source of price information. The reason is that the official aggregation is calculated over the totality of all registered agreements without filtering out atypical and potentially non-market transactions, and is therefore vulnerable to distortion by statistical outliers. The filtering methodology applied in the study, by contrast, is aimed at removing such outliers and forming a sample that, with an acceptable degree of reliability, reflects the typical conditions of market circulation of agricultural land, and it is for this reason that it is defined as the basis for assessing the gap between market prices and the results of normative monetary valuation within this study.

To address the tasks set, a complex of general scientific methods was applied. The method of systemic analysis was used to consider the information support of valuation as an integral set of interrelated components – cadastral, registration, land-management, and geospatial. Structural-functional analysis was applied to determine the functional role of each component of the information system in ensuring the market conformity of valuation. The method of comparison was used in juxtaposing the composition of data, the access regimes, and the level of interoperability of the various information resources. Generalization was applied to formulate typologically unified problems of information support on the basis of disparate factual data. Statistical grouping was used in processing the array of land market transaction data. The abstract-logical method was applied to substantiate the directions for improving the information support of the market conformity of normative monetary valuation.

Results of the study and their discussion

Information support of normative monetary valuation is understood in this study as the set of information resources, data sources, procedures for their formation, updating, integration, and provision, together with the technological and legal mechanisms of access to them, which collectively determine the actual capacity of valuation to reflect the real characteristics of a land parcel and the market conditions of its circulation. Structurally, the current system of such support encompasses four relatively autonomous components: the State Land Cadastre as the basic source of official data on land; the State Register of Property Rights to Immovable Property and the data on market turnover derived from it as a source of price information; land management, soil survey, and soil bonitation materials as the basis of the rent-normative indicators; and the national spatial data infrastructure, public electronic registers, and the open data regime as the general framework of information interaction.

The State Land Cadastre, the legal principles of whose maintenance are defined by Law No. 3613-VI [5] and Procedure No. 1051 [6], potentially encompasses in its

composition of data virtually all indicators required for the calculation of normative monetary valuation: identification, spatial, and qualitative characteristics of land, data on designated purpose and use restrictions, and the valuation data themselves. The principal cadastral document concerning an individual parcel is the Land Book, which, under Article 25 of Law No. 3613-VI, combines these indicators in a single information profile of the object [5]. Moreover, subparagraph 14 of paragraph 24 of Procedure No. 1051 provides for the calculation of the valuation value by the cadastre software on the basis of data on the parcel and data on land valuation within the administrative-territorial unit [6]; that is, a technological core for the automated determination of valuation has already been formed in Ukraine. However, this potential is realized only within the limits of the actual population of the cadastre: according to the official data of the State Service of Ukraine for Geodesy, Cartography and Cadastre, data on more than 15.4 million agricultural land plots with an area of about 32.3 million hectares have been entered into it, whereas the cadastre is populated with information on normative monetary valuation to approximately 51 per cent [7]. It is also of fundamental importance that no group of cadastral data contains information on the market prices of land plots: the cadastre describes the object of valuation but not the market in which that object circulates.

The sole official source of data on the actual prices of agreements concerning agricultural land plots is the State Register of Property Rights to Immovable Property, the principles of whose maintenance are defined by Law No. 1952-IV [8]. The presence of the cadastral number as a common identifier technically enables the juxtaposition of the register's price data with the characteristics of the parcel in the cadastre. At the same time, the legal regime of the price data substantially limits their use: they are entered into the register only where present in the documents submitted for registration, and are provided exclusively to the owner of the property and to state authorities and local self-government bodies [8]. The consequence is a situation in which the information most relevant to the market conformity of valuation exists, is complete in its coverage of transactions, and is linked to the

cadastral number, yet is inaccessible to valuers, to the scientific community, and to landowners themselves with respect to adjacent objects.

The third component of information support is formed by land management materials, which shape the qualitative characteristics of land. Pursuant to Articles 36–37 of Law No. 858-IV, soil surveys and the soil bonitation derived from them determine the bonitation scores of agro-production soil groups which, under the current Methodology, differentiate valuation by the productivity of the land [4; 2]. The chain of formation of this information – survey, bonitation, entry into the cadastre, use in the calculation – is normatively closed; however, its primary link is reproduced extremely rarely: a continuous large-scale soil survey in Ukraine was last carried out in the second half of the twentieth century, and subsequent bonitation works were predominantly of the nature of recalculation on the same cartographic basis. The periodicity of bonitation established by legislation – not less than once every 7 years [1] – concerns the comparative assessment procedure itself but does not provide for the mandatory updating of primary soil surveys.

The fourth component is formed by the legal framework of information interaction, shaped by Law No. 554-IX on the national spatial data infrastructure [9], Procedure No. 532 on its functioning [10], and Law No. 1907-IX on public electronic registers [11], which introduce the principles of interoperability, the once-only entry and multiple use of data, and the electronic interaction of registers. These principles correspond to Ukraine's commitments under the Association Agreement with the European Union [12] and to the approaches of Directive 2007/2/EC (INSPIRE) [13] and Directive (EU) 2019/1024 on open data [14]. It is of fundamental importance that the State Land Cadastre and the State Register of Property Rights are classified by Law No. 1907-IX as base registers, for which the formation of shared data arrays is provided [11], while Procedure No. 532 defines cadastral data as the basis of the base geospatial data [10]. Yet the application of these principles specifically to the purposes of normative monetary valuation remains unrealized: valuation data have not been formalized as an independent

thematic geospatial dataset, and the possibility of forming shared arrays is not used to combine price and cadastral data.

Summarizing the analysis conducted, it should be stated that Ukraine possesses all the information resources necessary for carrying out a market-conforming valuation of agricultural land: a cadastre with a developed structure of data and a built-in mechanism of automated calculation, a complete array of price data linked to the cadastral number, a normatively closed chain of formation of the qualitative characteristics of land, and a modern legal framework of information interaction aligned with European principles. The problem lies not in the absence of resources but in their unsatisfactory population, the obsolescence of primary data, the isolation of price information, and the absence of derivative information products suitable for valuation purposes.

The analysis conducted provides grounds for identifying five interrelated problems that in aggregate limit the capacity of normative monetary valuation to reflect market realities.

Incomplete population of the State Land Cadastre with valuation data. According to the official data of the State Service for Geodesy, Cartography and Cadastre, the cadastre is populated with information on normative monetary valuation to approximately 51 per cent against a total record of more than 15.4 million land plots [7]. This directly blocks the implementation of the normatively established mechanism of automated valuation calculation [6], generates fiscal differentiation unrelated to the characteristics of the land, and precludes continuous comparisons of valuation with market prices. The problem is of a resource-organizational rather than a technological nature: the cadastre as a system is capable of storing and calculating valuation data, the limitation being the pace of integration of the existing technical documentation.

Absence of a market price monitoring system and the closed nature of price data. The state possesses a complete array of price data, yet these are provided only to the owner of the property and to authorities [8], while a derivative valuation information product is absent. The processing of the array of purchase and sale

agreements for the period from July 2021 to May 2026 (more than 444 thousand records) using a single standardized methodology [33] revealed a growth in the excess of the market price of arable land over the normative monetary valuation from 4.2 per cent in 2021 to 70.7 per cent in January–May 2026, and of the coefficient of such excess from 1.04 to 1.71 [32]. Regional differentiation is also substantial: in 2025 the weighted average market price of arable land ranged from 36.0–38.4 thousand UAH/ha in Mykolaiv and Odesa oblasts to 70.5–70.7 thousand UAH/ha in Poltava and Ternopil oblasts [32]. It is telling that these data were obtained through the independent processing of the primary array rather than from an official information resource; that is, the information required for revising the norms and verifying the fairness of a transaction price does not have the status of an official valuation indicator.

Fragmentation and non-interoperability of information resources. Cadastral, price, land-management, and register data exist in isolation from one another, despite the presence of a common identifier – the cadastral number – and an established legal basis for their combination: Law No. 1907-IX provides for the electronic interaction of base registers with the formation of shared data arrays [11], while Procedure No. 532 defines the cadastre as the basis of the base geospatial data [10]. Thus, neither legal nor technological obstacles to integration exist – only its targeted designation for valuation purposes is lacking. The practical consequence is the impossibility of forming an information profile of a land parcel – a structured set of data combining the price of the last agreement, the bonitation score, the area, the composition of lands, and the current valuation value for a single object – without which the construction of mass valuation models is impossible.

Obsolescence and low spatial detail of the soil information base. The chain “survey – bonitation – cadastre – calculation” is normatively closed, yet its primary link is reproduced extremely rarely, and the periodicity of bonitation established by legislation – not less than once every 7 years [1] – does not provide for the mandatory updating of primary surveys. The consequence is a systematic discrepancy between the formal validity of soil data and their actual currency, which takes into account

neither degradation processes nor the consequences of hostilities. An additional dimension is low spatial detail: the areals of agro-production soil groups were defined for planned land use in large tracts, whereas the modern market operates with parcels of several hectares, as a result of which adjacent parcels of differing actual productivity receive an identical bonitation score and, accordingly, an identical valuation.

Collision between data transparency and data protection under martial law.

The requirements of the transparency of valuation information and the protection of personal data are resolved in Ukraine on the principle of mutual exclusion: access to price data is closed entirely, with the exception of the owner of the property and the authorities [8]. At the same time, the protection of personal data [16] is by its purpose aimed at making the identification of a person impossible, not at concealing the economic parameters of property circulation, so that the anonymization of data – the removal of information on the parties to an agreement while retaining the price, area, and date – would eliminate the collision without weakening the protection of privacy, in line with the principles of Directive (EU) 2019/1024 [14] and Law No. 2939-VI [15]. Martial law sharpens the problem in a different dimension: restrictions on access to registers and geospatial data, introduced without differentiation by the degree of sensitivity of the data, are combined with the absence of a systematic representation of the actual condition of affected land, as a result of which its valuation is carried out on pre-war data, which leads to an overstatement of the taxation base. A systematization of the identified problems is presented in Table 1.

Table 1

Systematization of the problems of information support of the market conformity
of the normative monetary valuation of agricultural land

No.	Problem	Information resource	Consequence for the market conformity of valuation
1	Incomplete population of the cadastre with valuation data (population – about 51%)	State Land Cadastre	Blocking of automated valuation calculation; fiscal differentiation unrelated to the characteristics of the land

No.	Problem	Information resource	Consequence for the market conformity of valuation
2	Absence of a market price monitoring system and closed nature of price data	State Register of Property Rights to Immovable Property	Information asymmetry among market participants; growth of the valuation–price gap to 70.7%
3	Fragmentation and non-interoperability of information resources	Cadastré, register of rights, land management documentation	Impossibility of forming an information profile of a parcel as the basis of mass valuation models
4	Obsolescence and low detail of the soil information base	Land management materials; bonitation data in the cadastre	Structural limit on valuation accuracy: adjacent parcels of differing productivity receive an identical valuation
5	Collision between transparency and data protection under martial law	Register of rights; national spatial data infrastructure	Impossibility of verifying valuation; valuation of affected land on pre-war data

Source: systematized by the author.

The identified problems are connected by a clear hierarchy of conditionality: even the complete population of the cadastre will not ensure the market conformity of valuation without an official price indicator; the presence of such an indicator will yield no practical effect without the integration of price data with parcel characteristics; integrated data will not ensure valuation accuracy on an obsolete soil basis; and a result inaccessible to market participants will not perform the function of a benchmark. It is essential that none of the problems is of the nature of an absence of legal grounds for its resolution: the available legal and technological possibilities are simply not applied to valuation purposes, which determines the implementational rather than the constructive orientation of the directions for improvement substantiated below.

The directions of information support substantiated below are aimed not at rebuilding the information architecture but at applying already existing legal and technological possibilities to the purposes of normative monetary valuation. Together they form a sequence: populating the data on the object of valuation, forming the data on the market, combining the former with the latter, improving the quality of the primary qualitative information, ensuring access to the result, and building an analytical framework that transforms data into valuation indicators.

Completing the population of the State Land Cadastre with valuation data and updating records on the condition of land. The implementation of this direction

envisages the continuous integration into the cadastre of the results of previously conducted valuations, stored in the form of paper technical documentation [1]; the priority conduct of valuation for the territories of those communities for which the cadastre does not contain the relevant data – given that it is precisely the entry of such territorial data that activates the mechanism of automated valuation calculation for all parcels within the community [6]; and the elimination of spatial errors in the data on parcel boundaries. A separate element of the direction should be the supplementation of the cadastre structure with attributes for recording war-induced damage to land – indicating the ground, date, and spatial boundaries of the affected part of the parcel – which would make it possible to reflect the actual condition of land in the same resource that is used for the valuation calculation.

Establishing a national system for monitoring prices of agricultural land. This direction is key to the market conformity of valuation, as it ensures the transformation of the primary price data of the State Register of Property Rights into an official, methodologically homogeneous, and regularly updated indicator of the market value of land. A fundamental requirement for the system is that it be built on primary transaction data rather than aggregated data: the methodological homogeneity of price indicators is achieved at the level of the individual agreement – through the filtering out of atypical transactions by area and price, the differentiation of agreements by type of land, and weighting by area, since a simple arithmetic mean price is systematically shifted towards small agreements with atypical price parameters [33]. The proposed system encompasses four sequential components: a primary transaction array formed through the interaction of the State Register of Property Rights with the State Land Cadastre; a data-cleaning procedure with the filtering out of atypical agreements; base price indicators – the weighted average price per hectare, the median price, and the interquartile range – in quarterly computation; and derivative analytical indicators, in particular the ratio of the market price to the normative monetary valuation, disclosed in anonymized machine-readable format through an access service on the national geoportal. The system requires neither the creation of a new register nor the collection of additional primary

information: all source data are already accumulated by the state within existing procedures of rights registration, and monitoring is a derivative analytical layer over them, which is consistent with the principle of the once-only collection and multiple use of information [11]. The indicators of the system should acquire the status of an official source of information for valuation purposes through their inclusion in the Methodology of Normative Monetary Valuation as input data when revising the norms [2].

Integrating information resources and forming an information profile of the land parcel. The direction envisages the targeted use of the electronic interaction of base registers already provided for by legislation [11] to form a structured information profile of a land parcel encompassing four groups of data: identification-spatial, qualitative, and legal-restrictive (available in the cadastre [5; 6]), and economic-valuation, which require the combination of cadastral data with the price data of the register of rights by the cadastral number [8]. Implementation should rely on the technological model of Procedure No. 532: the formalization of valuation data as an independent thematic geospatial dataset with its own specification, metadata, and access service [10; 9]. The practical result of the direction is the elimination of the structural obstacle of fragmentation: the information profile of a parcel is the elementary unit of data without which the construction of mass valuation models is impossible, and its availability at the same time enables the owner of a parcel to obtain an integrated understanding of its value parameters.

Updating the soil information base through the application of remote sensing of the Earth. Since the conduct of a new continuous large-scale soil survey is a methodologically impeccable solution but one incompatible with the pace of development of the land market, a combined approach is expedient in which ground surveys retain the function of a reference basis, while continuous spatial coverage is ensured by means of remote sensing of the Earth – for detecting the spatial heterogeneity of the soil cover, recording degradation processes, and establishing the actual condition of land damaged as a result of hostilities. Article 36 of Law No. 858-IV, in defining the aim of soil surveys, does not limit the methods of obtaining

the relevant information [4], while remote sensing data are by their nature geospatial data within the meaning of Law No. 554-IX [9]. The substantive result of the direction should be a transition from a contour to a gradient representation of soil quality, in which the value for a specific parcel is determined as spatially weighted, with a periodicity of updating the remote-sensing component aligned with the periodicity of valuation – not less than once every 5 years [1].

Developing open valuation data and the anonymized disclosure of price information. The direction resolves the collision between the transparency and protection of data through a transition from the principle of their mutual exclusion to the principle of balancing through anonymization: the formation of a dataset in which, for each agreement, the cadastral number, area, composition of lands, designated purpose, date, and price are retained, but the information identifying the parties is removed. Such a dataset contains no personal data within the meaning of Law No. 2297-VI [16], while retaining full analytical value, and its disclosure in the form of open data corresponds to the principles of Directive (EU) 2019/1024 [14] and Law No. 2939-VI [15]. The implementation of the direction envisages a delimitation of the legal regimes of identified and anonymized price data without weakening the protection with respect to the former, as well as a review of the security restrictions of the wartime period by the criterion of the actual sensitivity of specific data, since aggregated and anonymized price indicators contain no information of defence significance.

Forming an information-analytical framework for the mass appraisal of land. This synthesizing direction transforms the results of the preceding five directions into valuation indicators through four sequential components: an input data array formed by the information profiles of parcels supplemented with price monitoring indicators and updated soil quality characteristics; analytical models of the dependence of the market price on parcel characteristics; a procedure for verifying the models on a control sample of agreements with the calculation of accuracy indicators; and a procedure for the regular updating of the models as the array of agreements is replenished. A fundamental requirement for the framework is

transparency: unlike the current rent-normative construction, whose indicators are established administratively, the results of mass valuation are empirically verifiable by juxtaposing the calculated values with the actual prices of agreements. A technological core for such a framework already exists in Ukraine: subparagraph 14 of paragraph 24 of Procedure No. 1051 provides for the calculation of valuation by the cadastre software on the basis of data on the parcel and the territory [6], so that the matter concerns not the creation of a new calculation system but the replacement of the source of the indicators on which it relies. The relationship between the identified problems and the substantiated directions for their resolution is presented in Table 2.

Table 2

Correspondence of the directions of information support to the identified problems of the market conformity of normative monetary valuation

Problem	Direction of resolution	Legal or technological basis of implementation
Incomplete population of the cadastre with valuation data	Completing the population of the cadastre and updating records on the condition of land	Mechanism of automated valuation calculation (subpara. 14, para. 24 of Procedure No. 1051)
Absence of a market price monitoring system	Establishing a national system for monitoring prices of agricultural land	Principle of the once-only collection and multiple use of data (Art. 3 of Law No. 1907-IX)
Fragmentation and non-interoperability of resources	Integrating resources and forming an information profile of the parcel	Electronic interaction of base registers (Art. 7 of Law No. 1907-IX); requirements of Procedure No. 532
Obsolescence of the soil information base	Updating the soil information base through the application of remote sensing of the Earth	Soil surveys (Art. 36 of Law No. 858-IV); geospatial data regime (Law No. 554-IX)
Collision between transparency and data protection	Developing open valuation data and the anonymized disclosure of price information	Presumption of openness (Law No. 2939-VI); purpose of personal data protection (Law No. 2297-VI)
Problems 1–5 in aggregate (implementational dimension)	Forming an information-analytical framework for the mass appraisal of land	Cadastre software as the calculation core (subpara. 14, para. 24 of Procedure No. 1051)

Source: developed by the author.

The juxtaposition presented demonstrates that the proposed directions form not a set of separate measures but a mutually conditioned system with a defined sequence of implementation, the partial implementation of which yields a

disproportionately small effect: a populated cadastre without a price indicator preserves the rent-normative valuation, while a price indicator without integration with parcel characteristics remains a reference indicator incapable of affecting the valuation result. It is also telling that a legal or technological basis of implementation exists for each of the directions, and that in most cases it is contained not in special legislation on land valuation but in general legislation on public registers, geospatial data, and access to information, which confirms the implementational rather than constructive nature of the identified problems and points to the targeted application of the available legal and technological possibilities as the key instrument of their resolution.

Mechanisms of practical implementation and application.

Practical implementation of the price monitoring system. It is expedient to designate as the operator of the system the State Service of Ukraine for Geodesy, Cartography and Cadastre as the holder of the State Land Cadastre and the administrator of its software [7]. The technological cycle of the system encompasses four operations performed in automated mode. First, a primary transaction array combining the price of an agreement with the area, composition of lands, and designated purpose of the parcel is formed from the State Register of Property Rights to Immovable Property in interaction with the State Land Cadastre by the cadastral number as a common identifier [8; 11]. Next, the array undergoes a cleaning procedure with the filtering out of agreements atypical by area and price according to a single standardized methodology [33]. On the cleaned array, base indicators – the weighted average price per hectare, the median price, and the interquartile range – are computed quarterly, broken down by oblasts, districts, territorial communities, and natural-agricultural districts, together with the derivative indicator of the ratio of the market price to the normative monetary valuation. Finally, the results are disclosed in the form of anonymized machine-readable datasets with an access service through an application programming interface on the national geoportal [10; 14]. The regulation of the system – the designation of the operator, the periodicity of updating, data formats, and the procedure of access – is ensured by a subordinate

act without the need to create a new register, since all source data are already accumulated by the state within existing procedures of rights registration [11].

Application of the monitoring indicators by state authorities and local self-government bodies. The price indicator thus formed has a direct sphere of practical application. The central executive authority responsible for shaping state policy in the sphere of land relations obtains an objective empirical basis for revising the norms of capitalized rental income and the coefficients in the Methodology of Normative Monetary Valuation, in particular for bringing the valuation into conformity with the actual ratio to market prices, which as of the beginning of 2026 reached an excess of the valuation by the market of 70.7 per cent [2; 32]. The State Service for Geodesy, Cartography and Cadastre, as the operator, obtains an instrument for controlling the quality of valuation – the ability to identify territories with a systematic deviation of the normative monetary valuation from the market level and to plan the sequence of its revision. For the bodies of the State Tax Service, updated and complete cadastral valuation data mean a more correct base for levying the land payment, and hence a reduction both in the shortfall of revenues and in the excessive fiscal burden on individual payers. Bodies of local self-government and territorial communities, which have at their disposal significant tracts of agricultural land, obtain price benchmarks for planning land-payment revenues to local budgets, for substantiating the starting price for the sale or lease right of communal parcels at land auctions, and for determining the amount of lease payment. At the same time, the openness of anonymized price data eliminates the information asymmetry in the market: the owner, the potential buyer, and the valuer obtain the ability to relate the price of a specific agreement to the recorded market level in the relevant locality.

Practical implementation of the mass valuation framework. The introduction of the information-analytical framework for mass valuation does not require the creation of a separate calculation system, since the technological core is served by the existing software of the State Land Cadastre, which already performs the automated calculation of valuation on the basis of data on the parcel and the territory [6]. The practical mechanism envisages the sequential performance by the system

operator of four operations: the formation of an input array from the information profiles of land parcels supplemented with price monitoring indicators and updated soil quality characteristics [10; 11]; the construction of analytical models of the dependence of the market price on parcel characteristics on a subset of objects with known agreement prices; the verification of the models on a control sample of agreements not used in their construction, with the calculation and disclosure of accuracy indicators; and the regular updating of the models as the array of agreements is replenished. The disclosure of accuracy indicators broken down by territories and categories of parcels transforms valuation from an administratively established quantity into an empirically verifiable one, creating an objective basis for revising its results should systematic deviations be identified.

Examples of phased implementation. Given the uneven activity of the land market across regions, it is expedient to begin the practical implementation of the mass valuation framework with a pilot testing on the territory of selected communities with a high turnover of land – primarily the forest-steppe oblasts, where the density of transaction data is sufficient to construct statistically reliable models. At the pilot stage, the results of mass valuation are juxtaposed with the actual prices of agreements and with the current rent-normative valuation, which makes it possible to calibrate the models and assess the limits of their applicability for scaling to territories with lower market activity. The results of the pilot implementation have a twofold practical application: for bodies of local self-government – as a basis for updating the land-payment base and substantiating decisions on the disposal of communal land; for the central authority – as an empirical basis for decisions on the transition to mass valuation on market principles on a nationwide scale. Combining the mass valuation framework with the recording of war-induced land damage in the cadastre structure envisaged above additionally enables the adjustment of the valuation of affected parcels according to their actual rather than pre-war condition. Such a phased approach – from pilot communities to a nationwide framework – reconciles the scientific soundness of the transition with the organizational capacity to ensure it.

Conclusions and prospects for further research

The study has developed directions for the information support of the market conformity of the normative monetary valuation of agricultural land. Information support has been considered as the set of information resources, data sources, procedures for their formation, updating, integration, and provision, together with the technological and legal mechanisms of access to them, which determine the actual capacity of valuation to reflect the real characteristics of a land parcel and the market conditions of its circulation. It has been established that information is not an auxiliary element of the valuation system: it constitutes its constitutive foundation, since no methodological solution can compensate for the absence, obsolescence, or unreliability of primary data, and hence information support itself determines the actual limits of attainable valuation accuracy.

The analysis of the current information support system, carried out across its four components, has shown that the State Land Cadastre potentially encompasses in its composition of data virtually all indicators required for carrying out valuation, and that the mechanism of automated calculation of its value by the cadastre software has already been normatively established [6]. The State Register of Property Rights to Immovable Property accumulates a complete array of price data linked to the cadastral number of the land parcel, yet access to these data is restricted to the owner of the property and public authorities [8]. Land management, soil survey, and soil bonitation materials form a normatively closed chain of formation of the qualitative characteristics of land, the primary link of which is reproduced extremely rarely [1; 4]. The general framework of information interaction – the national spatial data infrastructure, the system of public electronic registers, and the open data regime – has been formed at a level that generally corresponds to European principles [9; 11; 15], yet its potential with respect to valuation remains largely unrealized.

On this basis, five interrelated problems of the information support of the market conformity of valuation have been identified: the incomplete population of the cadastre with valuation data, which blocks the implementation of the automated

calculation mechanism; the absence of a market price monitoring system and the closed nature of price data, as a result of which the state lacks an official indicator of market value while market participants are in a state of information asymmetry; the fragmentation and non-interoperability of information resources, which precludes the formation of an information profile of a land parcel; the obsolescence and low spatial detail of the soil information base, which forms a structural limit on valuation accuracy; and the collision between the requirements of transparency and data protection, sharpened by the security restrictions of martial law. A hierarchy of conditionality of these problems has been established, in which the resolution of each subsequent problem is impossible without the resolution of the preceding one.

In response to the identified problems, six mutually conditioned directions for improvement have been substantiated: completing the population of the State Land Cadastre with valuation data and updating records on the condition of land; establishing a national system for monitoring prices of agricultural land as a derivative analytical layer over the existing register data; integrating information resources and forming an information profile of the land parcel; updating the soil information base through the application of remote sensing of the Earth; developing open valuation data and the anonymized disclosure of price information; and forming an information-analytical framework for the mass appraisal of land. For each of the directions an available legal or technological basis of implementation has been established, and in most cases it is contained not in special legislation on land valuation but in general legislation on public electronic registers, geospatial data, and access to public information [6; 10; 11; 14].

The main conclusion of the study is that the market conformity of the normative monetary valuation of agricultural land is currently constrained not by a lack of information as such, nor by an absence of legal constructs for working with it, but by the absence of derivative information products suitable for valuation purposes. The state possesses a complete array of price data, a developed structure of cadastral data, a normatively closed chain of formation of the qualitative characteristics of land, and a modern framework of information interaction, yet it does not transform

these resources into official valuation indicators. The problem is predominantly of an implementational nature, and the key instrument of its resolution is the targeted application of the available legal and technological possibilities to the needs of valuation activity. The proposed directions are mutually complementary and mutually reinforcing: their partial implementation yields a disproportionately small effect, since a populated cadastre without a price indicator preserves the rent-normative character of the valuation, while a price indicator without integration with the characteristics of land parcels remains a reference indicator.

Prospects for further research are connected with determining the components of the adaptation of the information base of the normative monetary valuation of agricultural land at the present stage. In particular, further elaboration is required for the composition and structure of the specification of the valuation geospatial dataset, the methodological parameters of the procedures for cleaning and weighting transaction data, the criteria for verifying mass valuation models and the indicators of their accuracy, and the organizational and technological mechanisms for combining ground soil surveys with remote sensing data for the purposes of valuation activity.

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ІНФОРМАЦІЙНЕ ЗАБЕЗПЕЧЕННЯ РИНКОВОЇ
ВІДПОВІДНОСТІ ГРОШОВОЇ ОЦІНКИ ЗЕМЕЛЬ
СІЛЬСЬКОГОСПОДАРСЬКОГО ПРИЗНАЧЕННЯ

Анотація. У статті обґрунтовано напрями інформаційного забезпечення ринкової відповідності нормативної грошової оцінки земель сільськогосподарського призначення. Предметом дослідження є сукупність інформаційних ресурсів та організаційно-технологічних механізмів, що визначають повноту, актуальність і достовірність даних, на яких ґрунтується оцінка. Мета дослідження полягає у виявленні проблем

інформаційного забезпечення та розробленні напрямів його вдосконалення в умовах функціонування ринку земель сільськогосподарського призначення. Методологічну основу становлять системний аналіз чинної системи інформаційного забезпечення за її складовими (Державний земельний кадастр, Державний реєстр речових прав на нерухоме майно та дані ринкового обігу, матеріали землеустрою і ґрунтових обстежень, національна інфраструктура геопросторових даних та відкриті дані), порівняльно-правовий аналіз нормативно-правових актів, а також опрацювання масиву транзакційних даних ринку земель за період липень 2021 р. – травень 2026 р. за стандартизованою методикою обчислення середньозваженої ринкової ціни. Установлено, що інформація становить формотворчу основу оцінки, а не її допоміжний елемент, оскільки жодне методичне рішення не здатне компенсувати відсутності, застарілості чи недостовірності первинних даних. Виявлено п'ять взаємопов'язаних проблем: неповноту наповнення кадастру оціночними відомостями; відсутність системи моніторингу ринкових цін та закритість цінових даних; фрагментарність, розрізненість та несумісність інформаційних ресурсів; застарілість та низьку просторову деталізацію ґрунтово-інформаційної бази; колізію прозорості й захисту даних в умовах воєнного стану. Відповідно до виявлених проблем обґрунтовано шість напрямів: завершення наповнення кадастру оціночними відомостями; створення національної системи моніторингу цін на землі сільськогосподарського призначення; інтеграцію інформаційних ресурсів та формування інформаційного профілю земельної ділянки; оновлення ґрунтово-інформаційної бази із застосуванням дистанційного зондування Землі; розвиток відкритих даних оцінки та знеособлене оприлюднення цінової інформації; формування інформаційно-аналітичного контуру масової оцінки земель. Обґрунтовано, що ринкова відповідність оцінки обмежується нині не браком інформації як такої, а її ізольованістю від загального оцінного контуру, тоді як запропоновані напрями є взаємодоповнювальними, а їх часткова реалізація дає непропорційно малий ефект.

Ключові слова: нормативна грошова оцінка, землі сільськогосподарського призначення, ринкова відповідність, інформаційне забезпечення, Державний земельний кадастр, моніторинг цін, ринок земель, відкриті дані.