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Development of the entrepreneurial ecosystem for the agricultural sector in Ukraine during wartime

Mykola Pugachov*

Doctor of Economic Sciences, Professor
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-7507-5870>

Oleksandr Shpykuliak

Doctor of Economic Sciences, Professor
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0001-5257-5517>

Valerii Zhuk

Doctor of Economic Sciences, Professor
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-1367-5333>

Yuliia Bezdushna

Doctor of Economic Sciences, Professor
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-5924-0805>

Kateryna Ksenofontova

Researcher
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-8412-9666>

► **Abstract.** Enterprises that conduct and ensure the production of agricultural products, their processing and promotion to domestic and foreign markets objectively function in a close relationship, which provides certain savings it also makes the entire chain vulnerable to the negative impact of external factors. The purpose of the study was to conduct an economic assessment of trends in its development under the influence of wartime. Its economic essence, structure, and functional characteristics were theoretically justified, namely: the features of the development of the agricultural sector of Ukraine and the nature of its transformations under the influence of multidirectional changes in the conditions of wartime influence are determined. The interdependence of efficiency and economic efficiency of enterprises belonging to ecosystem sectors was established and methodically justified. Trends in the formation of economic results in a destructive institutional environment were systematised and updated. The problems of modern trends in the development of the ecosystem were methodically processed and the assessment of the following was conducted: structural changes in the composition of business formations, employment of the population in business formations; changes in the material base, the volume of products sold and the profitability of ecosystem enterprises. The assessment was conducted across distinct stages of armed aggression, analysing various sectors of the ecosystem: "agriculture"; "food production"; "manufacture and trade of agricultural resources"; "trade

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*Corresponding author



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of agricultural products”; and “trade of food products”. The assessment also considered the primary size groups, namely large enterprises and small to medium-sized enterprises. The high tightness of the relationship between the parameters of activity of enterprises of the ecosystem of the agricultural sector was proved, which has a systemic character, and the factor of income from the sale of agricultural products was highlighted as the most substantial for its functioning. The results contributed to understanding the patterns of interdependence between the size and effectiveness of management in agricultural ecosystem enterprises operating as an integral entity under wartime conditions. This understanding is crucial for achieving sustainability, enhancing competitiveness, and, most importantly, ensuring the economic and physical preservation of each specific enterprise

► **Keywords:** entrepreneurship; business ecosystem; economic structures; economic activity; institutional structure; agriculture

► Introduction

The main factor in the development of the agricultural sector of the economy in Ukraine is the military: formally – martial law, and functionally – wartime. Business entities are forced to adapt to difficult situations in the organisation of production, staffing, and search for available sales channels. The military factor in general destructively affects the development of the entrepreneurial ecosystem of the agricultural sector of the Ukrainian economy. Accordingly, the meaning of research developments in the current state and performance of enterprises in various aspects of economic activity in agriculture is updated to determine strategic priorities for ensuring sustainability. According to this statement of the problem and to prove the projected hypothesis that agricultural business represents resistance to destructive influences, there are grounds for the examination of the problems of development of the community of agricultural business as an ecosystem, including such aspects as: structural changes in the composition of business formations; employment of the population; sales of manufactured products; trends in production costs; formation of revenue and profitability of economic activity.

Business entities, and therefore ecosystem participants, can have different plans and expectations while making joint efforts to achieve a common goal – value creation. They demonstrate a willingness to cooperate, considering all types of consumer behaviour, which depends not only on external factors but also on the characteristics and worldview of the buyer (Balaniuk *et al.*, 2023). The need to understand the management of entrepreneurial ecosystems in the context of complex relationships and conditions that define the work of modern business is an urgent problem for researchers (Shelenko *et al.*, 2024).

Businesses, for effective functioning in the entrepreneurial ecosystem, need reliable business models that should be aimed at their stable operation and development and that will allow them to differentiate and achieve sustainable competitive advantages. However, according to U. Pidun *et al.* (2022a) in entrepreneurial ecosystems, some characteristics distinguish them from other management models in such parameters as: modularity; customisation; multilateralism; coordination. Thus, an effective entrepreneurial ecosystem should demonstrate how businesses generate value for their customers and identify areas of collaboration with partners, customers, and suppliers, while considering the unique combination of resource availability. L. Paschuk & E. Tavoletti (2023) note that entrepreneurial ecosystems can be developed externally – through the creation of a favourable environment

for entrepreneurship, so they can be the subject of the influence of state policy for the development of the industry.

U. Pidun *et al.* (2022a) define the following types of entrepreneurial ecosystems that can be found in practice: decision ecosystems (create and/or provide a product or service by coordinating different participants); transaction ecosystems (select partners by determining the best match between the actual needs of the customer and the specific offer of the manufacturer). The success of the ecosystem model: at the launch stage (the model can quickly provide access to opportunities that can be too expensive or time-consuming to create in one firm); after the launch of the ecosystem (they can scale much faster than a separate business since their modular structure makes it easy to add partners); ecosystems are very flexible and sustainable (their modularity provides both great diversity and high development capacity) (Pidun *et al.*, 2022b). The perception of an entrepreneurial ecosystem as a permanent structure can also be fragile due to unrealistic or permanent changes and uncertainty during wartime and risks.

The analysis of literature sources and publications of researchers on the problems of entrepreneurship gives grounds, based on the practical and methodological nature of this socio-economic phenomenon, to reasonably note its multipolarity. In the organisational and functional plan of institutionalisation, this is extrapolated to the qualification of the entrepreneurial ecosystem as a component of the market mechanism that forms the economic capabilities of society, the state, society, and the individual to achieve certain goals in life.

A special context of theoretical, methodological, and empirical assessments of the development of the entrepreneurial ecosystem is expressed in the institutional identification of the category “enterprise”. The basis of the economic essence of entrepreneurial activity is not only the organisational structure but also the socio-cultural sphere, traditions, customs, and morals (Malik, 2023b), which characterise the entrepreneurial ecosystem as a socio-economic model of interaction that can manifest itself in cooperation (Malik, 2023a), depends on social capital. When examining entrepreneurial ecosystems or business ecosystems in Ukraine, the wartime factor is considered. The problem of the development of agricultural entrepreneurship in Ukraine as a nationally identical ecosystem of economic knowledge exchange has been implemented in practice under the latest conditions – wartime (Malik, 2023a; 2023b).

The actual aggressive impact of Russia’s war against Ukraine entails devastating consequences, irretrievable

losses, and the destruction of property complexes of agricultural business ecosystems. O. Skydan *et al.* (2023) argue that the Russian invasion has led to the destruction of established processes and logistics chains in the agricultural sector. Such realities of the current state of Ukrainian agriculture have and will have a destructive impact on the development of business structures, villages, and territorial communities. The physical destruction of the economic structure exerts unprecedented pressure on society and the state in matters of food, economic, and energy security. The study aimed to provide a theoretical substantiation of the economic essence and functional characteristics of entrepreneurial ecosystems of the agricultural sector of Ukraine and economically assess trends in its development under the influence of wartime.

► Materials and methods

The study presents the results of the research obtained during the implementation of the project “Develop methodological approaches to determining losses, assessing the impact of military aggression and compensation policy on the development of agricultural entrepreneurship” No. 2022.01/0145 of the competition “Science for the restoration of Ukraine in the war and post-war periods” at the expense of grant support from the National Research Foundation of Ukraine (Project competition for..., 2022).

The ecosystem of entrepreneurship in the agricultural sector of Ukraine has long been in a state of transformation and adaptation to the conditions of various instabilities. The methodology of institutionalism was applied to the analysis of formation, development, and functioning of the entrepreneurship ecosystem in the agricultural sector. Its practicality consists in analysing the evolutionary changes in the composition and structure of entrepreneurial entities that guide business transactions in the agricultural market.

For the empirical analysis of changes in the parameters of the ecosystem of agricultural entrepreneurship, methods of dynamic series analysis were applied using indicators of growth rates and average growth rates

calculated for periods that characterise the main stages of Russian aggression identified based on abstract-logical analysis: pre-war period (2010-2013); the beginning of the first phase of armed aggression (2014); latent period with the localisation of the conflict in the South-Eastern regions (2015-2021); the period of acute phase of Russian armed aggression (2022 and 2023). The official website of the State Statistics Service of Ukraine (n.d.), in particular: “The number of enterprises by types of economic activity divided into large, medium, small, and microenterprises”; “the number of employees engaged at enterprises by types of economic activity divided into large, medium, small, and microenterprises”; “the volume of products sold (goods, services) of enterprises by types of economic activity divided into large, medium, small, and microenterprises”; “financial results before taxation of enterprises by types of economic activity divided into large, medium, small, and microenterprises”; “non-current and current assets, equity, and liabilities of large and medium-sized enterprises by type of economic activity”. Updating information as of 2023 on the latest data set was postponed by the state statistics service of Ukraine due to martial law for an indefinite period, so the corresponding analysis table and correlation analysis used data for 2010-2022 inclusive. However, given a sufficient number of dynamic series and a wide range of institutional changes covering the selected period, this allows considering the main trends in changes in business conditions and does not reduce the validity of conclusions. A special feature of the study was the use to determine the composition of the ecosystem of groups of enterprises aggregated by the same types of economic activity, directly related to the production, processing, and further promotion of agricultural products.

Correlation analysis was used to determine the interdependence of enterprise activity parameters in the ecosystem. The analysis was conducted based on deviations of the actual values of indicators from the calculated ones obtained from the trend equations (Table 1) to offset the trend of increasing the values of indicators over time, including due to inflationary factors.

Table 1. Trend equations for enterprise activity parameters within the agricultural entrepreneurship ecosystem (based on data from 2010-2022)*, **

Materials and methods	Number of employees	Operating Profit (OP)	Financial outcome	Value of fixed and intangible assets
<i>Agricultural production</i>				
$\hat{y} = -0.1865x^3 + 2.7071x^2 - 10.741x + 56.375$ $R^2 = 0.9138$	$\hat{y} = -0.8513x^3 + 13.697x^2 - 78.062x + 674.59$ $R^2 = 0.9623$	$\hat{y} = 145.24x^{0.7042}$ $R^2 = 0.8693$	$\hat{y} = 17.72x^{0.8944}$ $R^2 = 0.392$	$\hat{y} = -0.9909x^3 + 16.347x^2 - 41.949x + 109.78$ $R^2 = 0.998$
<i>Food production:</i>				
$\hat{y} = -0.0202x^3 + 0.3327x^2 - 1.5529x + 6.6108$ $R^2 = 0.8023$	$\hat{y} = -0.8746x^3 + 15.167x^2 - 81.67x + 410.41$ $R^2 = 0.9813$	$\hat{y} = 0.0641x^4 - 1.557x^3 + 12.642x^2 - 37.396x + 27.009$ $R^2 = 0.874$	$\hat{y} = -0.0202x^3 + 0.3327x^2 - 1.5529x + 6.6108$ $R^2 = 0.8023$	$\hat{y} = -0.3504x^3 + 6.0156x^2 - 16.746x + 69.812$ $R^2 = 0.9946$
<i>Production and trade of agricultural resources:</i>				
$\hat{y} = -0.0065x^3 + 0.1018x^2 - 0.3934x + 1.51$ $R^2 = 0.9413$	$\hat{y} = -0.0484x^3 + 0.5919x^2 - 1.4923x + 27.824$ $R^2 = 0.7361$	$\hat{y} = 17.364x^{0.6892}$ $R^2 = 0.8445$	$\hat{y} = 0.0089x^4 - 0.194x^3 + 1.3567x^2 - 2.8706x + 1.2761$ $R^2 = 0.6179$	$\hat{y} = -0.0061x^3 + 0.0733x^2 + 0.4527x + 2.0081$ $R^2 = 0.9583$

Table 1, Continued

Materials and methods	Number of employees	Operating Profit (OP)	Financial outcome	Value of fixed and intangible assets
<i>Trade of agricultural products</i>				
$\hat{y} = -0.0255x^3 + 0.3863x^2 - 1.5407x + 5.0698$ $R^2 = 0.8538$	$\hat{y} = -0.0169x^3 - 0.0853x^2 + 2.8928x + 20.74$ $R^2 = 0.6811$	$\hat{y} = 74.26x^{0.5956}$ $R^2 = 0.8365$	$\hat{y} = -0.2493x^3 + 3.7712x^2 - 14.622x + 8.3158$ $R^2 = 0.6935$	$\hat{y} = -0.0967x^3 + 1.2364x^2 - 0.4229x + 8.2396$ $R^2 = 0.9693$
<i>Trade of food products:</i>				
$\hat{y} = -0.0233x^3 + 0.3738x^2 - 1.6648x + 5.2571$ $R^2 = 0.8111$	$\hat{y} = -0.2382x^3 + 4.0733x^2 - 18.948x + 55.444$ $R^2 = 0.9791$	$\hat{y} = -0.4705x^3 + 8.0337x^2 - 21.975x + 84.639$ $R^2 = 0.9755$	$\hat{y} = 0.0641x^4 - 1.557x^3 + 12.642x^2 - 37.396x + 27.009$ $R^2 = 0.874$	$\hat{y} = 0.0661x^4 - 1.3357x^3 + 8.4406x^2 - 16.556x + 19.092$ $R^2 = 0.6742$

Note: * \hat{y} – calculated value of the parameter obtained from the trend equation; ** R^2 (coefficient of determination) – characterises the level of reliability of approximation (approximation) of the values of the obtained model to the actual values of parameters

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

The dynamics of changes in most indicators are described by the polynomial approximation method, which allows considering their changing fluctuations under the influence of natural and socio-economic factors. However, changes in the volume of products sold by sectors of agriculture, production and trade of material resources for agriculture, and trade in agricultural products are described using a power function that reflects a high dependence on the growth of the exchange rate due to the directing these industries to foreign markets. High values of the coefficients of determination indicate the reliability of the approximation of trend equations.

► Results and Discussion

The activity of agricultural entrepreneurship entities-participants in the development of the entrepreneurial ecosystem of economic activity in the agricultural sector of the Ukrainian economy, in the last two years was somehow institutionally blocked by the destructive influence of wartime conditions. Among the blocking factors: limited access to the channels of sales of products, in particular, export; a cardinal increase in the cost of forming factors of production and the volume of transaction costs of exchange; deterioration of the quantitative and qualitative characteristics of the personnel potential of enterprises and labour – rural areas (Shyian *et al.*, 2023).

In the conditions of wartime, the institutional conditions for the development of agricultural entrepreneurship radically changed, which determined the levels of acquired economic effects and social results of management. Thereby, in the development of entrepreneurship in general and agricultural enterprises in particular, the tasks have not changed – the conditions for achieving the goals have changed. Institutional changes affect the organisational and economic functionality of economic entities.

From empirical assessments of the processes taking place in the agricultural sector of the economy, it is known about multidirectional changes in the structure and composition of enterprises. The sector is formed institutionally as part of subjects formalised by status: type (agricultural enterprises, farms); organisational and legal form (economic companies, private, state, municipal enterprises, cooperatives, farms, etc.); size of the enterprise (micro-, small-, medium-, large-sized); type of economic activity. Such characteristics of entrepreneurship are due

to a long evolution to market conditions. Therewith, none of the subjects, including the relevant state authorities, has superior power and control, which makes traditional approaches to ensuring the development of agricultural production ineffective in the face of military threats.

Among the economic concepts that explain the mechanisms of development of economic communities, an ecosystem approach was chosen for this study, focusing on the subjects of the business system and ways of interaction between them. R. Röntynen (2024) notes the lack of hierarchy as a characteristic feature of ecosystems that “arise spontaneously – from the totality of relationships between individual agents and external influences”. This statement is fully suitable for explaining the practice of functioning of the agricultural sector of the Ukrainian economy in the context of critical phenomena accompanying martial law.

J.F. Moore (1996) defined the entrepreneurial ecosystem, or, we consider it appropriate to use the definition of the entrepreneurship ecosystem (auth.), as “a growth-oriented synergistic economic community of mutually supporting customers, suppliers, treating producers and other stakeholders, trade associations, standardisation bodies, trade unions, state, and quasi-state institutions”. The study agrees with this definition in general and proposes to methodically qualify it from an institutional standpoint as a set of market stakeholders involved in transactions in the area of “production-distribution-exchange-consumption” for profit. More broadly – the economic, productive, social, and economic aspects of the effect of increasing benefits to meet market demand (Moore, 1996).

It is reasonable to fully agree with B. Spigel & R. Harrison (2018), who concluded that the functioning of ecosystems stems from the socially embedded nature of the entrepreneurship process, which includes a wide range of actors, resources, and opportunities. Notably, the ecosystem performs the functions of institutionalising social capital, using the rules, norms, and traditions of organising social interaction to form a supportive business environment (Yatsiv *et al.*, 2024). The definition of characteristics and development of the entrepreneurial ecosystem in the agricultural sector are related to industry specifics. First, with the influence of natural factor, seasonality of production, properties of agricultural products and food, etc. This study agrees with B. Pohrishchuk *et al.* (2023) that

a separate destabilising factor is the low level of entrepreneurial activity of the rural population. This factor affects the method of production and storage of products, the organisation of labour and management, and, in particular, the organisation and implementation of business transactions in general. Thus, the development of the entrepreneurial ecosystem in Ukraine takes place in the context of the institutional uncertainties of wartime. It is worth agreeing with I. Kalenyuk & I. Uninets (2021) on the expediency of using the economic status to interpret the essence and functionality of an ecosystem “when economic phenomena and processes are part of the interaction of biological, physical, environmental, and other processes”.

Traditional definitions of entrepreneurship we consider to be the qualification of its essence as an ecosystem. In this sense, the imperative of evolutionism is methodologically implemented, because: economic structures of entrepreneurial activity are formed in an evolutionary way, and their typology and structuring depend on the trajectory of society's Development (Malik, 2023b). Entrepreneurship is defined as an institutional system of economic interactions (Malik, 2023b), which functions, among other things, in conditions of wartime uncertainty (Zhuk et al., 2023). Other researchers assume that if the economic system assumes the presence of entrepreneurial structures, then its integral component is entrepreneurial ecosystems as an environment for the growth of firms (Porev, 2018). Thus, the importance of the entrepreneurial ecosystem as a mechanism for accumulating and spreading innovations through the corresponding model of their diffusion – academic and university structure is noted.

There is also an opinion, which can be considered appropriate, that entrepreneurial ecosystems are not only innovation parks but also other partner associations (Paschuk, 2021). Positioning of entrepreneurial ecosystems takes place at various institutional levels – micro-, meso-, and macro-level interactions in a competitive market environment. As quite rightly stated L. Paschuk (2021), an entrepreneurial ecosystem is a collection of legal entities and individuals of different sectors, different in nature of activities, which functions for the development of innovation and entrepreneurship by

combining the efforts of different groups of stakeholders. Based on the above and the provided methodological generalisations – entrepreneurial ecosystems are classified according to institutional, organisational, and economic characteristics – at the following levels: *integrated structures* – coalition (cooperatives, clusters, holdings); *the institute of regulation* – the infrastructure of self-regulatory organisations (professional, interprofessional, industry associations); *business entities* – enterprises of various organisational and legal forms (business companies, private, state-owned enterprises); *scientific and educational infrastructure* – academic and university entrepreneurship (scientific and industrial parks, startup systems); *industries* – agricultural (agricultural enterprises, farms); *organisational and economic socialisation of economic management* – economic (classical enterprises) and social entrepreneurship (social enterprises). These methodological provisions for determining the essence of entrepreneurial ecosystems denote the institutional structure of the economic system of the national economy, the agricultural complex in particular.

In the agricultural sector of the Ukrainian economy, a nationally identical entrepreneurial ecosystem has been formed based on the institutional approach (auth.), projected onto the community of “organisms of the business world” (Moore, 1996). The entrepreneurial structure of the ecosystem is formed by business entities, i.e., enterprises of various types in the form of ownership (state, collective, individual, municipal), sizes (micro-, small-, medium-, and large-sized enterprises), organisational and legal forms (economic societies of various types, cooperatives, public, private, municipal enterprises, etc.), and institutional statuses (individuals-entrepreneurs, legal entities) (Fig. 1). The study also believes that in the analysis of the development of the entrepreneurial ecosystem in the agricultural sector of the Ukrainian economy, it is methodologically motivated to characterise it according to the definitions of institutional subsystems such as: integrated formations – respectively agricultural holdings and cooperatives, clusters, organisations of producers; ecosystems for the creation and diffusion of innovations – structures of academic and university entrepreneurship, etc.

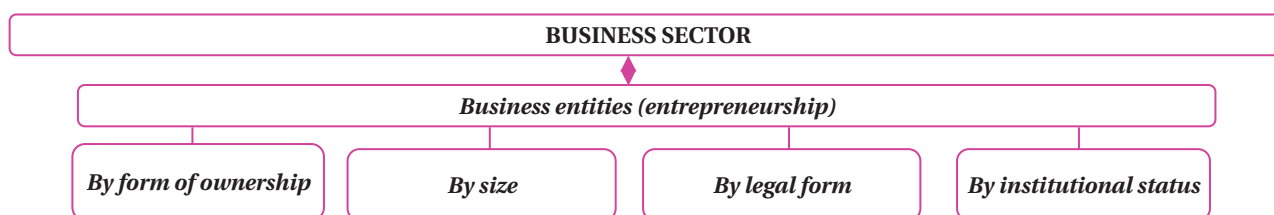


Figure 1. Entrepreneurial ecosystem of the agricultural sector of Ukraine*

Source: compiled by the authors

In the market-oriented evolution of the economic mechanism, a relatively well-established entrepreneurial ecosystem has been formed in Ukraine (Fig. 2), which has acquired structural adaptation to national and global institutions, and conditions of functioning based on sustainability. Due to this, Ukraine has become a global player in the global agricultural markets, and enterprises have gained a substantial level of competitiveness.

The analytical attention is focused on conducting empirical assessments of the evolution of development and determining the effectiveness of the entrepreneurial ecosystem of the agricultural sector, in particular, considering the conditions of wartime. *The object of the study is the institutional set of enterprises by size – micro-, small-, medium-, large-.* The dimension criterion comprehensively considers all possible business statuses. That is why

this criterion was chosen to conduct research to identify the features, specifics, and institutional foundations of the

development of this ecosystem in Ukraine in the current difficult period.

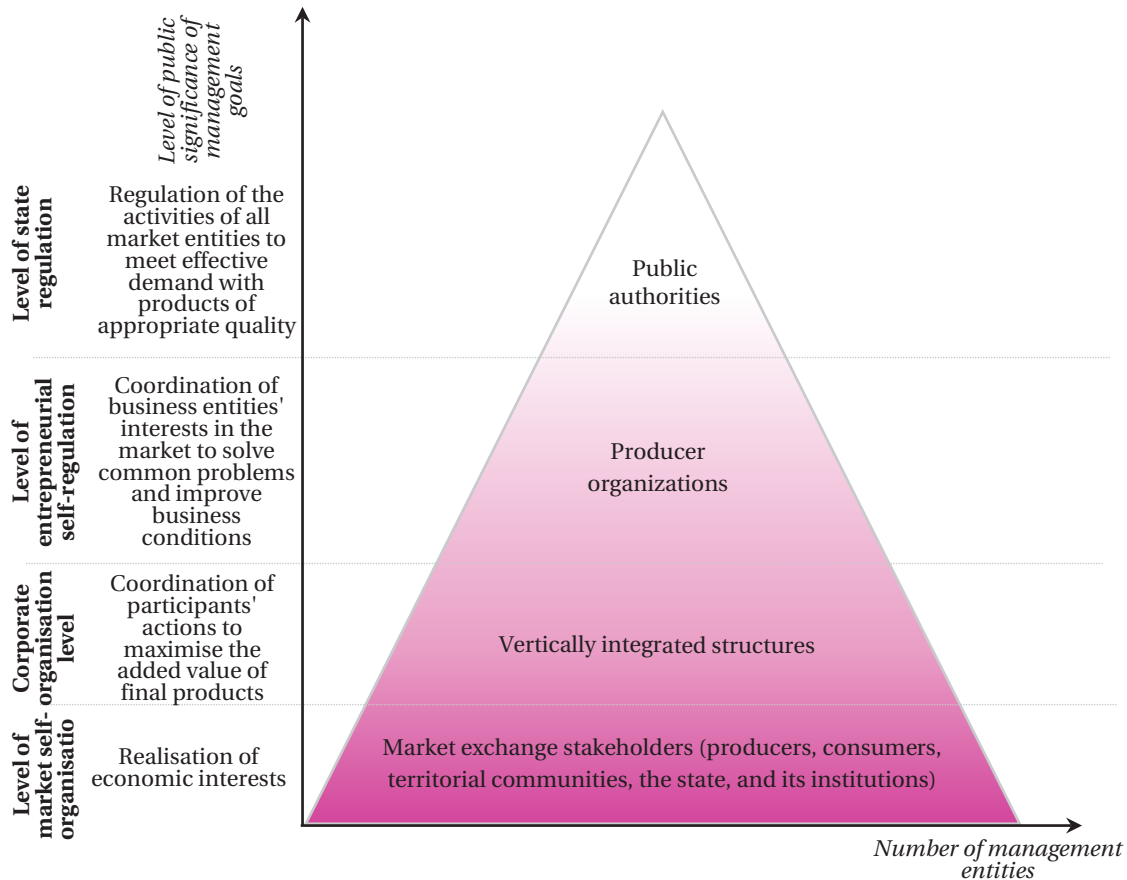


Figure 2. Institutional structure of the agricultural entrepreneurship ecosystem

Source: compiled by the authors

Agriculture with a plume of related industries occupies an important place in the national economy. The ecosystem of agriculture includes enterprises that conduct economic activities in the following aggregated groups of economic activities: directly agriculture; food production,

production and trade in material resources for agriculture; trade in agricultural products; trade in food industry products. Including the period of recent wartime history, structural changes in the composition of entrepreneurial formations occur (Table 2).

Table 2. Structural changes in the composition of entrepreneurial formations in Ukraine (agricultural activities), un.

Types of economic activity (NACE)	Periodisation of structural changes									
	2010	2013	Pace of change, 2010 – 2013%	2014	2014 to 2013, %	2015	2021	Pace of change, 2015 – 2021%	2022/2023	2022 to 2021, %/ 2023 to 2021, %
Business sizes										
All businesses										
Agriculture	49,060	47,826	99.2	44,180	92.4	44,897	46,070	100.6	31,740/ 39,638	68.9/ 86.0
Food production:	5,444	5,321	99.2	4,637	87.1	4,657	5,293	101.9	3,985/ 4,609	75.3/ 87.1
Production and trade of material resources for agricultural enterprises	1,019	1,180	105.0	1,107	93.8	1,127	1,572	105.1	1,216/ 1,375	77.4/ 87.5
Trade in agricultural products	3,311	3,749	340.5	3,454	92.1	3,499	4,313	103.2	2,616/ 3,776	60.7/ 87.5

Table 2, Continued

Types of economic activity (NACE)	Periodisation of structural changes									
	2010	2013	Pace of change, 2010 – 2013%	2014	2014 to 2013, %	2015	2021	Pace of change, 2015 – 2021%	2022/2023	2022 to 2021, %/ 2023 to 2021, %
Business sizes										
Trade of food products:	3,563	3,811	102.3	3,308	86.8	3,328	3,977	102.7	2,500/ 3,189	62.9/ 80.2
Small businesses										
Agriculture	45,972	45,246	99.5	41,885	92.6	42,668	44,231	100.8	30,221/ 38,202	68.3 86.4
Food production:	4,276	4,296	100.2	3,742	87.1	3,785	4,414	102.4	3,211/ 3,868	72.7/ 87.6
Production and trade of material resources for agricultural enterprises	929	1,082	105.2	1,015	93.8	1,033	1,460	105.3	1,114/ 1,283	76.3/ 87.9
Trade in agricultural products	3,138	3,534	104.0	3,281	92.8	3,360	4,140	103.4	2,501/ 3,648	60.4/ 88.1
Trade in food industry products	3,336	3,597	102.5	3,139	87.3	3,180	3,801	102.8	2,354/ 3,037	61.9/ 79.9
Large and medium-sized enterprises										
Agriculture	3,088	2,580	94.2	2,295	89.0	2,229	1,839	96.9	1,519/ 1,436	82.6/ 78.1
Food production:	1,168	1,025	95.7	895	87.3	872	879	99.7	774/ 741	88.1/ 84.3
Production and trade of material resources for agricultural enterprises	90	98	102.9	92	93.9	94	112	102.9	102/ 92	91.1/ 82.1
Trade in agricultural products	173	215	107.5	173	80.5	139	173	100.0	115/ 128	66.5/ 74.0
Trade in food industry products	227	214	98.1	169	79.0	148	176	100.6	146/ 152	83.0/ 86.4

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

The dimension of enterprises in conditions of war-time uncertainty and market turbulence objectively affects their competitiveness and institutional stability. The latter means the actual ability of the enterprise to remain in the market, that is, to function with an excess of economic benefits over costs. In the opposite case, that is, with negative performance, farms go bankrupt, and entrepreneurs wind down their businesses. Under the conditions of the military factor, there is simultaneous physical destruction of the business. As can be seen from the table, this trend took place already at the first stage of the beginning of the Russian armed aggression against our state in 2014. Since at that time the occupation and fighting were geographically localised in the Luhansk, Donetsk regions and Crimea – regions specialised in non-agricultural economic activities, the decrease in the number of enterprises occurred to a greater extent in the food industry (by 12.9%) and food trade (by 13.2%). Since the beginning of large-scale armed aggression in 2022 and until now, the risks of losing an enterprise due to destruction as a result of military operations have been extremely high throughout the entire territory of the state. According to the analysis of structural changes in the composition of entrepreneurial formations that make up the national agroecosystem (Table 2) a substantial

decrease in them occurred in all its segments. Substantial changes occurred in the group of small enterprises, where the reduction in the number compared to 2021 amounted to 31.7% for agriculture, 38.6% for enterprises that traded in agricultural products, and 38.1% – for food trade. The latter segments have suffered substantially for all groups of enterprises due to the physical damage to the domestic logistics infrastructure and the blocking of traditional ways to supply Ukrainian agri-food products to world markets. In 2023, the number of enterprises increased to about 87% of the level of 2021 in all parts of the business ecosystem of the industry, except for the food trade, where growth occurred at a slower pace. This is due to the fact that large and medium-sized enterprises have acquired a relatively stable competitive position in this group, the number of which in 2023 increased to 86.4% in 2021. However, in other industries, the recovery was mainly at the expense of small businesses that demonstrate sustainability while operating within the current market niche, inheriting the flexibility and adaptability of this form of business. Large and medium-sized business entities are less resistant to conditions of uncertainty and high risk of business.

A separate factor that has a substantial impact on the possibility of doing business in segments of the agricultural

entrepreneurship ecosystem is changes in the size and employment structure of the economically active population. Active military operations have led to the

intensification of migration processes, which leads to a decrease in the number of people employed in ensuring the functioning of these sectors of the economy (Table 3).

Table 3. Employment trends in the development of entrepreneurial formations in Ukraine (agricultural activities), thousand people

Types of economic activity (NACE)	Periodisation of structural changes									
	2010	2013	Pace of change, 2010 – 2013%	2014	2014 to 2013, %	2015	2021	Pace of change, 2015 – 2021%	2022/2023	2022 to 2021, %/ 2023 to 2021, %
Business sizes										
All businesses										
Agriculture	688.4	613.8	96.3	561.1	91.4	528.5	478.9	97.8	406.8/ 379.4	84.9/ 78.9
Food production:	352.8	344.5	99.2	298.0	86.5	278.9	272.0	98.7	233.9/ 226.7	3.4/ 83.3
Production and trade of material resources for agricultural enterprises	31.2	27.2	95.5	26.3	96.5	27.6	28.4	101.1	23.4/ 21.0	82.2/ 73.8
Trade in agricultural products	27.1	24.2	72.3	24.3	100.6	29.1	28.8	102.5	23.8/ 24.3	82.6/ 84.4
Trade in food industry products	51.4	40.0	92.0	32.3	80.9	29.1	42.2	103.9	34.5/ 36.2	81.7/ 85.8
Small businesses										
Agriculture	209.6	227.2	102.7	208.1	91.6	193.9	220.3	100.8	181.5/ 168.4	82.4/ 76.5
Food production:	41.2	37.8	97.2	31.5	83.4	30.9	34.0	101.1	29.2/ 29.5	85.9/ 86.7
Production and trade of material resources for agricultural enterprises	6.9	7.3	102.2	7.0	95.6	6.6	9.5	104.4	8.0/ 7.5	85.0/ 79.8
Trade in agricultural products	12.4	11.6	97.8	10.9	94.4	10.5	13.1	102.6	10.7/ 11.4	81.3/ 86.9
Trade in food industry products	18.0	15.3	94.8	13.4	87.8	12.9	15.6	102.2	11.8/ 11.5	75.5/ 74.0
Large and medium-sized enterprises										
Agriculture	478.8	386.6	93.1	352.9	91.3	334.6	258.7	95.7	225.3/ 211.0	87.1/ 81.0
Food production:	311.6	306.7	99.5	266.5	86.9	248.0	238, tsh1	98.4	204.7/ 197.3	86.0/ 82.9
Production and trade of material resources for agricultural enterprises	24.3	19.9	93.5	19.2	96.8	21.1	19.0	99.8	15.4/ 13.4	80.9/ 70.8
Trade in agricultural products	14.6	12.6	95.0	13.4	106.3	18.6	15.7	102.3	13.1/ 12.9	83.7/ 82.3
Trade in food industry products	33.4	24.7	90.4	18.9	76.6	16.2	26.6	105.0	22.7/ 24.6	85.4/ 92.7

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

Notably, employment in conventional agriculture and related sectors has been influenced by changes in the institutional model of management, wherein the development of large-scale integrated structures has led to a decrease in the number of employed individuals,

particularly in medium-sized enterprises affiliated with such formations. This situation has increased the role of small enterprises, which serve not only as places of employment but also as the primary arena for the entrepreneurial initiatives of the economically active population

in rural areas. Consequently, the decline in employment within this group of enterprises significantly contributes to the reduction in their number. In terms of industry, the agricultural product trade has experienced the greatest loss in terms of employed workers, corresponding with the trend of decreasing numbers of enterprises in this sector. Despite an increase in the number of enterprises in 2023, employment levels across production sectors continue to decline. Small enterprises, particularly those where the majority of the workforce comprises the owners and their family members, have proven to be particularly vulnerable. Consequently, the trend in the number of businesses is closely aligned with the variation in employment levels. The impact of the war has exerted a fundamentally destructive influence on the operation of small enterprises, effectively selecting them based on the availability of labour – an important characteristic of the current situation. A significant number of workers have been mobilised, some members of the population remain

in temporarily occupied territories, and a substantial portion has become refugees, relocating to other countries. As a result, the sector is suffering from a shortage of labour resources, which is adversely affecting productivity. Notably, at present, the impact of this factor is not readily perceived. However, from a strategic perspective, it poses a threat of exerting a fundamentally destructive influence on the operation of small enterprises by selecting them based on the availability of labour – a salient characteristic of the current context.

Another critical factor directly influencing the feasibility of entrepreneurship within the agricultural sector and its related industries is the preservation of the material base for production activities. The competitiveness of modern agriculture and the sectors that support it is ensured through the use of productive agricultural machinery, livestock complexes, and logistical equipment. The condition of the material base is evaluated based on the residual value of fixed assets and intangible assets (Table 4).

Table 4. Trends in the preservation of the material base of entrepreneurial formations in Ukraine (agricultural activities), billion UAH

Types of economic activity (NACE)	<i>Periodisation of structural changes</i>							
	2013	2014	2014 to 2013, %	2015	2021	Pace of change, 2015 – 2021 %	2022	2022 to 2021, %
Business sizes								
<i>All businesses</i>								
Agriculture	81.8	85.5	104.6	103.7	338.7	121.7	332.3	98.1
Food production:	56.2	60.4	107.5	68.0	154.3	114.3	151.2	98.0
Production and trade of material resources for agricultural enterprises	2.4	3.2	132.6	4.4	8.4	115.0	7.3	86.8
Trade in agricultural products	8.8	12.6	143.8	13.4	34.6	115.5	30.9	89.4
Trade in food industry products	10.5	9.7	92.6	10.4	16.6	107.9	21.0	126.9
<i>Small businesses</i>								
Agriculture	30.0	31.8	106.1	39.1	136.5	123.1	139.7	102.3
Food production:	4.1	4.7	115.3	5.1	13.3	116.0	13.1	98.3
Production and trade of material resources for agricultural enterprises	0.5	0.6	106.0	0.6	2.2	121.6	1.9	88.6
Trade in agricultural products	1.4	1.9	140.4	1.4	2.9	106.2	3.5	121.4
Trade in food industry products	1.1	1.4	133.9	1.2	1.7	103.0	2.0	112.3
<i>Large and medium-sized enterprises</i>								
Agriculture	51.8	53.7	103.7	64.6	202.2	120.9	192.7	95.3
Food production:	52.1	55.7	106.8	63.0	141.1	114.2	138.2	97.9
Production and trade of material resources for agricultural enterprises	1.9	2.6	140.1	3.8	6.3	113.3	5.4	86.2
Trade in agricultural products	7.4	10.7	144.4	12.0	31.7	116.8	27.4	86.5
Trade in food industry products	9.4	8.3	88.0	9.2	14.8	108.6	19.1	128.6

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

The favourable conditions of the world markets of agricultural products ensured the rapid development of the material base of agricultural activities: the average annual increases in the residual value of fixed assets and intangible assets reached 15-20% in all sectors of the agri-food ecosystem and in enterprises of all sizes. The armed aggression against Ukraine caused direct losses related to the direct destruction of the production base, logistics equipment, and loss of property in the occupied territories. Notably, for the group of small enterprises in agriculture and trade in agricultural products in 2022, it

was possible to maintain an increase in fixed assets, which is due to the peculiarities of the territorial location and specialisation of such enterprises, as well as the unique capabilities of such enterprises to relocate production to safer territories of the country. The main source of funds received to finance current activities and investments in the further development of enterprises is income from the sale of manufactured products. Therefore, this factor is determined as specific and determinative in its effectiveness in influencing the development of business sectors for the production of agri-food products (Table 5).

Table 5. Trends in sales of products of entrepreneurial formations in Ukraine (agricultural activities), billion UAH

Types of economic activity (NACE)	<i>Periodisation of structural changes</i>									
	2010	2013	<i>Pace of change, 2010 – 2013%</i>	2014	<i>2014 to 2013, %</i>	2015	2021	<i>Pace of change, 2015 – 2021%</i>	2022/2023	<i>2022 to 2021, %/ 2023 to 2021, %</i>
Business sizes										
<i>All businesses</i>										
Agriculture	94.8	153.9	117.5	205.2	133.3	349.7	891.0	123.3	651.9/ 752.6	73.2/ 84.5
Food production:	158.4	227.2	112.8	265.7	117.0	339.6	742.7	115.8	672.6/ 778.5	90.6/ 104.8
Production and trade of material resources for agricultural enterprises	13.5	18.1	110.3	21.7	119.8	34.6	91.3	122.8	74.0/ 84.9	81.0/ 93.0
Trade in agricultural products	63.2	74.2	89.7	100.9	136.0	156.9	334.4	118.7	232.4/ 270.2	69.5/ 80.8
Trade in food industry products	66.7	67.0	100.1	74.5	111.2	80.1	211.3	116.1	190.7/ 248.5	90.3/ 117.6
<i>Small businesses</i>										
Agriculture	21.9	48.1	130.0	64.4	133.9	116.4	325.7	126.1	254.3/ 288.1	78.1/ 88.4
Food production:	8.4	12.0	112.7	13.9	116.3	21.2	43.0	117.5	43.8/ 55.3	101.8/ 104.8
Production and trade of material resources for agricultural enterprises	3.3	4.1	107.9	5.3	127.8	7.3	22.2	122.7	18.4/ 23.4	83.0/ 105.5
Trade in agricultural products	19.1	19.7	101.1	24.5	124.1	36.1	67.0	115.5	54.3/ 61.6	81.1/ 92.0
Trade in food industry products	15.6	16.8	102.5	18.8	112.4	23.5	60.4	118.1	51.9/ 61.3	3.4/ 94.6
<i>Large and medium-sized enterprises</i>										
Agriculture	73.0	105.9	113.2	140.9	133.0	233.2	565.3	122.0	397.7/ 464.5	70.4/ 82.2
Food production:	150.1	215.2	112.8	251.8	117.0	318.4	699.7	115.7	628.8/ 723.2	89.9/ 103.4
Production and trade of material resources for agricultural enterprises	10.3	14.3	111.4	16.9	118.0	28.4	70.0	122.6	61.1/ 61.5	88.9/ 89.0
Trade in agricultural products	44.1	54.5	107.3	76.4	140.4	120.9	267.4	119.6	178.0/ 208.6	66.6/ 78.0
Trade in food industry products	51.1	50.2	99.4	55.6	110.8	56.6	150.9	115.3	138.8/ 187.2	92.0/ 124.1

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

As noted above, the situation of global agri-food markets for the period covered by the study was extremely favourable, which allowed increasing the volume of products sold in value terms for all industries and size groups of enterprises of agri-food activities with an average annual rate of more than 20% in agriculture and more than 15% in other industries. This increased the attractiveness of the agricultural sector for doing business and stimulated the creation of new enterprises here, but formed a specific export-oriented production structure. The beginning of large-scale military operations was accompanied by the blocking of the seaports of the Black and Azov seas and the physical destruction of logistics infrastructure, which disrupted the traditional ways of promoting products to external markets and caused substantial losses in sales volumes in terms of value, even under the inflationary factor. The greatest stability was demonstrated by enterprises engaged in the production and trade of food products, which, except for representatives of the fat and oil industry, met the needs of the internal market. In the field of agriculture, large enterprises with public status, qualified management, and a positive reputation have sufficient potential to restore the pace of development. Secure

product delivery routes have been developed and value-added chains have been revised. As part of European integration, businesses establish partnerships with European counterparties. Thus, KSG Agro has signed a memorandum of cooperation with the Polish company Makarony Polskie for joint processing and trade of finished products (KSG Agro has partnered..., 2022). However, a substantial drop in the cost of products sold among medium-sized enterprises offset the result for the group. This can be explained by the narrow specialisation of medium-sized enterprises in the production of purely export-oriented products, in particular, grain, the prices of which have fallen substantially on the Ukrainian market. In addition to the price factor, the physical volume of sales of these crops has also decreased due to the desire of producers to optimise harvesting costs. In 2023, the adaptation of enterprises to the crisis phenomena allowed the decline in sales volumes to stop all parts of the ecosystem.

In the conditions of unfavourable external factors, business entities realise their internal potential in accordance with the established development strategies. The success of this is realised in the possibility of maintaining profitability as a motivational basis for doing business (Table 6).

Table 6. Profitability trends in entrepreneurial formations in Ukraine (agricultural activities), billion UAH

Types of economic activity (NACE)	2013	2014	Periodisation of structural changes					
			2014 to 2013, %	2015	2021	2021 to 2015, %	2022/2023	2022 to 2021, %/ 2023 to 2021, %
Business sizes								
All businesses								
Agriculture	15.0	21.5	143.2	102.0	238.5	233.8	85.7/ 60.1	35.9/ 25.2
Food production:	3.8	-14.9	-492.1	-15.7	12.7	181.0	3.9/ 33.7	30.6/ 265.1
Production and trade of material resources for agricultural enterprises	-0.006	-1.3	N/S	0.3	4.4	1,338.1	2.4/ 5.5	54.8/ 125.5
Trade in agricultural products	-0.8	-10.5	-1,244.2	-12.0	6.6	155.3	-11.7/ 2.6	-276.5/ 39.4
Trade in food industry products	1.1	-9.8	-1,020.3	-7.0	1.9	127.0	1.4/ 4.9	74.5/ 259.9
Small businesses								
Agriculture	4.3	7.1	165.5	34.1	88.3	259.4	28.3/ 24.6	32.1/ 27.8
Food production:	-0.9	-1.3	136.4	-0.8	-0.009	1.1	-2.6/ -0.9	N/S/ N/S
Production and trade of material resources for agricultural enterprises	-0.1	-0.7	458.5	0.0	1.2	4,610.0	0.4/ 1.4	36.3/ 118.8
Trade in agricultural products	-0.8	-4.2	-498.1	-3.9	0.3	107.2	-0.7/ 0.8	-335.3/ 168.8
Trade in food industry products	-0.2	-1.5	658.9	-1.0	0.6	165.6	-0.032/ -1.2	-105.2/ -298.2
Large and medium-sized enterprises								
Agriculture	10.7	14.4	134.3	67.9	150.1	221.0	57.4/ 35.5	38.2/ 23.6
Food production:	4.7	-13.7	-387.6	-14.9	12.7	185.3	6.5/ 34.6	51.1/ 272.1

Table 6, Continued

Types of economic activity (NACE)	Periodisation of structural changes							
	2013	2014	2014 to 2013, %	2015	2021	2021 to 2015, %	2022/2023	2022 to 2021, %/ 2023 to 2021, %
	Business sizes							
Production and trade of material resources for agricultural enterprises	0.1	-0.7	-457.4	0.3	3.2	1,067.2	2.0/ 4.1	61.5/ 1427.9
Trade in agricultural products	0.0004	-6.3	<i>N/S</i>	-8.1	6.3	178.8	-11.0/ 1.9	-273.9/ 30.2
Trade in food industry products	1.3	-8.3	-738.2	-6.0	1.3	120.8	1.4/ 6.1	114.3/ 469.2

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

The production potential accumulated during favourable periods and the stable market position of agricultural producers allowed ensuring positive financial results (balances) of small, medium, and large enterprises of the sector, although with a substantial decrease in the volume of profits received. Against the background of the need to restore damaged machinery and equipment, profitability was provided by enterprises of all size groups for the production and trade of material resources for agriculture, which in the conditions of the first phase of military aggression turned out to be unprofitable. Small enterprises for the production and trade of food products became unprofitable in 2022, while large enterprises in these sectors provided minimal profit losses. The highest level of unprofitability is demonstrated by trade in agricultural products from blocking ports and the physical destruction of logistics infrastructure. In 2023, commercial enterprises of all sizes managed to adapt to unfavourable conditions and increase profits, but not in favour of agriculture, where profitability decreased.

The effectiveness of the functioning of the entrepreneurial system is associated with the achievement of high financial results by agricultural enterprises (Lupenko &

Lupenko, 2024) which should be agreed with, but the qualitative component is also important – financial results should not just be high, they should ensure a balance of benefits and costs at a level sufficient for extended reproduction.

In the entrepreneurial ecosystem of the agricultural sector, especially under the influence of wartime, such a result is difficult to ensure objectively – due to the existing institutional conditions. In addition, due to the dependence on the natural factor; diversity of forms of management; special, dependent on the social capital of territorial communities nature of the diffusion of innovations, etc. (Christensen *et al.*, 2019; Nair, 2020).

Enterprises of various sectors of the ecosystem of agricultural entrepreneurship show a specific reaction to the shock of Russian armed aggression, but it is necessary to be aware of the high level of interdependence between its various sectors, which has a well-established systemic nature. The calculated values of paired coefficients of the correlation matrix of the relationship between the number of enterprises in different sectors (based on deviations of the actual values of the indicator from the calculated ones – built based on trends in their development) indicate a close direct relationship between them (Table 7).

Table 7. Correlation matrix of interdependence of the number of enterprises between ecosystem sectors

	Number of agricultural enterprises	Number of food production enterprises	Number of enterprises for the production and trade of material resources for agricultural enterprises	Number of enterprises selling agricultural products	Number of food industry trade enterprises
Number of agricultural enterprises	1				
Number of food production enterprises	0.904	1			
Number of enterprises for the production and trade of material resources for agricultural enterprises	0.852	0.891	1		
Number of enterprises selling agricultural products	0.662	0.823	0.846	1	
Number of enterprises selling food products	0.8	0.901	0.978	0.895	1

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

The close relationships between enterprises in the agricultural production sectors indicate the presence of a substantial factor that affects the development of the ecosystem in general. Paired correlation coefficients between changes in the number of enterprises

and the parameters of the main factors discussed above in agriculture indicate a stable direct relationship between changes in the quantity, changes in the cost of products sold and the financial results of the sector's enterprises (Table 8).

Table 8. Correlation matrix of interdependence of activity parameters of enterprises in the agricultural sector

	Number of enterprises	Number of employees	Sales volume	Financial outcome	Value of fixed and intangible assets
Number of enterprises	1				
Number of employees	0.267	1			
Sales volume	0.813	0.621	1		
Financial outcome	0.756	0.574	0.941	1	
Value of fixed and intangible assets	-0.022	0.404	0.341	0.462	1

Source: calculated per data of Official website of the State Statistics Service of Ukraine (n.d.)

This confirms the above thesis about the predominant value of income from sales of products among the factors that determine the life of agricultural enterprises. It is believed that the profitability factor (financial results) is derived from the volume of products sold, so this

study can be abstracted from it. Income from the sale of agricultural products as a primary link in the food chain has a cumulative effect on the functioning of enterprises in the ecosystem of agricultural entrepreneurship in general (Table 9).

Table 9. Correlation matrix of interdependence of enterprise activity parameters by ecosystem sectors

	Number of enterprises	Number of employees	Sales volume	Financial outcome	Value of fixed and intangible assets	Sales volume in agriculture
<i>Food production enterprises</i>						
Number of enterprises	1					
Number of employees	0.606	1				
Sales volume	0.674	0.853	1			
Financial outcome	0.561	0.494	0.669	1		
Value of fixed and intangible assets	0.635	-0.187	-0.018	0.233697	1	
Sales volume in agriculture	0.906	0.615	0.838	0.660	0.471	1
<i>Enterprises in production and trade of material resources for agriculture</i>						
Number of enterprises	1					
Number of employees	0.247	1				
Sales volume	0.233	0.667	1			
Financial outcome	0.410	0.610	0.883	1		
Value of fixed and intangible assets	0.895	0.555	0.492	0.659	1	
Sales volume in agriculture	0.752	0.534	0.649	0.846	0.908	1
<i>Enterprises trading agricultural products</i>						
Number of enterprises	1					
Number of employees	0.572	1				
Sales volume	0.703	0.460	1			
Financial outcome	0.162	0.431	0.522	1		
Value of fixed and intangible assets	0.272	0.569	0.276	0.461	1	
Sales volume in agriculture	0.649	0.274	0.819	0.621	0.002	1
<i>Enterprises trading food industry products</i>						
Number of enterprises	1					
Number of employees	0.396	1				
Sales volume	0.560	0.714	1			
Financial outcome	0.189	0.136	0.114	1		
Value of fixed and intangible assets	0.024	-0.148	0.079	-0.356	1	
Sales volume in agriculture	0.730	0.552	0.763	0.406	0.297	1

Source: calculated per data from the Official website of the State Statistics Service of Ukraine (n.d.)

Agriculture produces a raw material base for the functioning of processing and trade economic activities and generates demand for activities related to the production and supply of material resources for the needs of the industry. Therefore, the influence of this factor is stronger than that of endogenous factors for sectors.

Thus, a comprehensive analysis of the parameters of the functioning of the entrepreneurial ecosystem allowed formulating the thesis about the presence at the national level of the business community of agricultural sector subjects and related industries that are not connected by a clear hierarchical structure, but are connected by a chain of production, processing and promotion of agricultural products, which allows considering them together as an ecosystem of the agricultural sector. Between the parameters of activity of enterprises related to different sectors of the ecosystem of agricultural entrepreneurship, a close relationship with the allocation of income from the sale of agricultural products is observed as the main factor that produces a cumulative effect on the functioning of enterprises in the ecosystem of agricultural entrepreneurship in general.

The objectivity of these statements is confirmed in relevant theoretical studies that form the methodology of the ecosystem approach and practical research devoted to the problems of the functioning of agri-food industries in wartime conditions.

When reviewing the entrepreneurial ecosystem as a theoretical concept, its characteristics, given by R. Röntynen (2024), are considered to be appropriate: complexity; self-organisation; dynamism; interconnection and coevolution; collaboration, collaborative creativity and stakeholder engagement; the presence of added value that is generated in the ecosystem and justifies its existence. Based on the results of an empirical study, this list can be supplemented with a sign of sustainability – as the ability of an ecosystem to return to the established development trajectory, disrupted due to the impact of crisis phenomena. Thus, the dynamics of the volume of products sold are expressed in dollar terms (to eliminate the inflationary factor) – one of the main system parameters that formalises the flows of output products has a wavy appearance (Fig. 3). After a substantial decrease in the volume of sales of the first period of armed aggression in 2014-2015, all links restored sales volumes inclusive to record figures in 2021. The acute phase of the war in 2022 led to a rapid drop in this indicator, but in 2023 the volume of sales was increased. The restoration of ecosystem parameters is achieved, among other things, through a unique combination of large and small forms of doing business in the Ukrainian agricultural business, of which the former has wide opportunities for expanded financing of activities, and small entrepreneurs demonstrate a substantial level of flexibility and adaptability in adverse conditions.

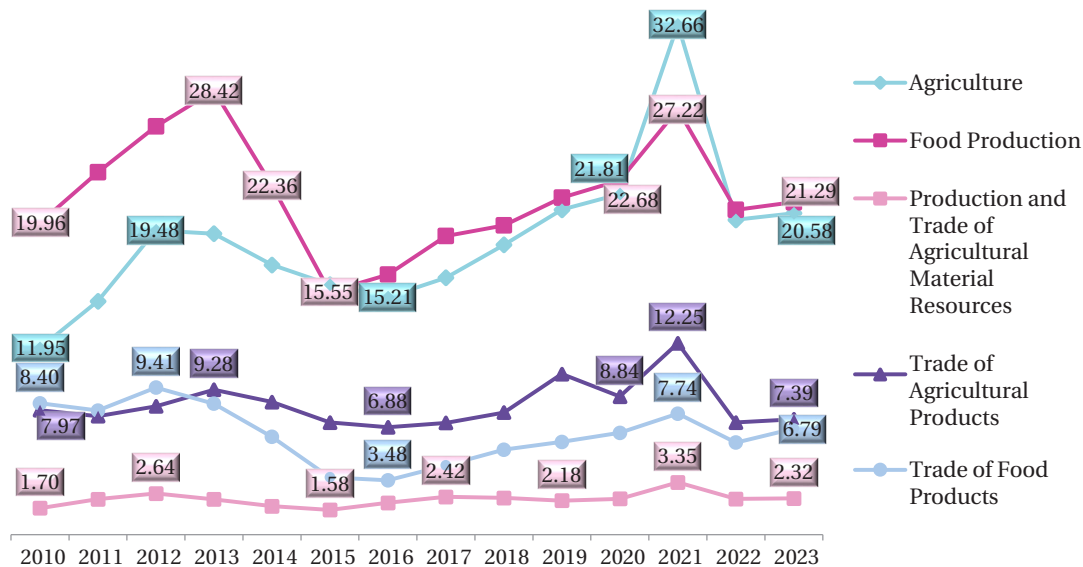


Figure 3. Dynamics of sales volumes of entrepreneurial formations in Ukraine (agricultural activities), billion US dollars

Source: compiled by the authors

The obtained empirical results regarding the stable nature of the dynamics of changes in sales volumes and the substantial impact of sales in agriculture allow expanding the hypothesis proposed by R. Röntynen (2024) about the existence of a coordination locus in entrepreneurial systems – “a central agent that unites all participants and provides the necessary tools for creating and distributing value” as a guarantor of the institutional sustainability of the system. It is proposed to extend these properties not only to the subjects (agents) of the system but also to its

elements. Indeed, the essential importance of Ukrainian agricultural products on world markets makes the chain of their production, processing and promotion a centre around which entrepreneurs coordinate their efforts, motivated by the goal of making a profit. However, the proof of this hypothesis and the determination of the specifics of the sale of agricultural products, in particular, in wartime conditions, should be the subject of a separate study.

The use of the ecosystem approach opens up wide opportunities for further research of the state and pros-

pects for the development of entrepreneurship in the agricultural production sector. O. Vigren (2024), based on the processing of 42 publications by methods of qualitative analysis, identifies seven conceptual areas of ecosystem research: ecosystems as local formations; ecosystems that were formed around technologies or chains of value creation; using the concepts of “ecosystem” to understand the processes of transformation of the industry; identifying the mechanisms for creating added value through synergistic interaction of ecosystem subjects; determining the logic and conditions of ecosystem development; ways of forming ecosystems as purposeful projects; outlining the role characteristics of typed groups of ecosystem subjects (agents) and ways to interact between them.

In a conceptual context, a study by X. Zhang *et al.* (2024) based on bibliometric analysis, where researchers distinguish between entrepreneurial and business ecosystems. The first concept provides for the concentration of research interest on forming effective entrepreneurial systems as a result of combining entrepreneurial initiatives with available resources, cultural characteristics, and social networks of specific territorial communities. The second focuses on cases of deliberate and intentional development of a community of producers, suppliers, consumers, and other stakeholders who collectively develop their capabilities in implementing the direction outlined by the company(s) leader.

All these concepts have a substantial potential for research in the context of solving relevant issues of the functioning of agricultural entrepreneurship. In their development, it is worth noting L. Blagodyr's (2022) assertion regarding the institutional conditioning of intentional entrepreneurial ecosystem development in light of the global trend towards digitalisation; however, much depends on local initiatives and regional traditions.

I. Chernii & O. Panukhnyk (2024) should also be agreed with, since the activity of subjects of the business environment in modern conditions of uncertainty is characterised by instability, and primarily the inconsistency of processes that occur. Within the subjects themselves, the question of the need for a more detailed analysis of the characteristic features of digital business ecosystems that are being formed in Ukraine at the local level arises (Shveda *et al.*, 2024). The proposed methodology for structuring the entrepreneurial ecosystem is a starting point for the development of further research on the basics and features of its functioning in the agricultural sector of the Ukrainian economy.

► Conclusions

This study examined the possibilities of applying an ecosystem approach to assessing the state and trends in the development of the agricultural sector of the Ukrainian economy in wartime conditions. In accordance with this, its purpose and objectives were formulated and a hypothesis was put forward regarding the sector's

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resistance to destructive external influences. Based on the generalisation of scientific publications on the problems of the ecosystem approach, its prospects for conceptualising the mechanisms of functioning and development of the agricultural sector as an economic community of independent enterprises without a clearly defined hierarchy in the context of crisis phenomena of martial law are clarified.

The investigation of the dynamics of the main parameters of the entrepreneurial ecosystem of the agricultural sector, formalised by aggregated groups of economic activities, indicates its relative stability. After a substantial reduction in the number and volume of products sold in all parts of the ecosystem, caused by the socio-economic shock from the beginning of the acute phase of military aggression in 2022, in 2023 the values of these parameters stabilised and began to grow. The correlation analysis showed a close relationship between the parameters of activity of enterprises belonging to different sectors of the ecosystem of agricultural entrepreneurship with the allocation of income from the sale of agricultural products as the main factor that produces a cumulative effect on the functioning of enterprises of the ecosystem of agricultural entrepreneurship in general.

The obtained empirical results on the sustainable nature of the dynamics of changes in sales volumes and the substantial impact of sales in agriculture on the functioning of other parts of the entrepreneurial ecosystem of the agricultural sector allow determining production, processing, and promotion of agricultural products as the central element around which entrepreneurs of the agricultural sector coordinate their efforts. This makes the definition of the specific features of the sale of agricultural products in wartime the subject of a separate study in the context of assessing the impact of military aggression on the development of agricultural entrepreneurship. As for further research on entrepreneurial ecosystems, the presented methodological approach to their structuring is the starting point for the development of further investigation on the basics and features of its functioning in the agricultural sector of the Ukrainian economy.

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► Conflict of interest

None.

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Розвиток підприємницької екосистеми аграрного сектору України в умовах впливу воєнного часу

Микола Пугачов

Доктор економічних наук, професор
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0002-7507-5870>

Олександр Шпикуляк

Доктор економічних наук, професор
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0001-5257-5517>

Валерій Жук

Доктор економічних наук, професор
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0003-1367-5333>

Юлія Бездушна

Доктор економічних наук, професор
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0002-5924-0805>

Катерина Ксенофонтова

Дослідник
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0002-8412-9666>

► **Анотація.** Підприємства, що здійснюють та забезпечують виробництво сільськогосподарської продукції, її переробку та просування на внутрішні та зовнішні ринки об'єктивно функціонують в тісному взаємозв'язку, що забезпечує певну економію трансакційних витрат, але й робить весь ланцюг вразливим до негативного впливу зовнішніх чинників. Метою дослідження було здійснити економічну оцінку тенденцій її розвитку в умовах впливу воєнного часу. Теоретично обґрунтовано її економічну сутність, структуру та функціональні характеристики, а саме: визначено особливості розвитку аграрного сектору України, характер його трансформацій під впливом різнонаправлених змін в умовах впливу воєнного часу. Встановлено й методично обґрунтовано взаємозалежність результативності, економічної ефективності підприємств, що відносяться до секторів екосистеми. Систематизовано і актуалізовано тенденції утворення результатів господарювання в деструктивному інституційному середовищі. Методично опрацьовано проблематику сучасних тенденцій розвитку екосистеми та здійснено оцінку: структурних змін у складі підприємницьких формувань, зайнятості населення у підприємницьких формуваннях; змін матеріальної бази, обсягу реалізованої продукції та прибутковості підприємств екосистеми. Оцінка проведена за виділеними етапами збройної агресії в розрізі секторів екосистеми: «сільське господарство»; «виробництво харчових продуктів»; «виробництво та торгівля матеріальними ресурсами для сільського господарства»; «торгівля продукцією сільського господарства»; «торгівля харчовою продукцією» та за основними розмірними групами великі та середні – малі підприємства. Доведено високу тісноту зв'язку між параметрами діяльності підприємств екосистеми аграрного сектору, що має системний характер та виокремлено чинник доходу від реалізації сільськогосподарської продукції як найбільш значущого для її функціонування. Отримані результати роблять внесок в розуміння закономірностей взаємозалежності розмірів і результативності господарювання підприємств аграрної екосистеми як цілісного утворення в умовах воєнного часу, що визначає її спроможність досягти критерію стійкості, конкурентоспроможності, а головне – збереження кожного конкретного підприємства – як економічно, так і фізично

► **Ключові слова:** підприємництво; бізнес-екосистема; господарські структури; економічна діяльність; інституційна структура; сільське господарство