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## CONCEPT OF FRACTAL ORGANIZATION OF ORGANIC BUSINESS SYSTEMS

**Purpose.** *The purpose of the article is determining the possibilities of fractal approach, as the one that enables not only flexibility and viability, but also, management efficiency improvement, new competencies of the company formation, self-renewal ability formation and conflicts of interest between structural subdivisions in complex vertically integrated structures elimination, to the organization of implementation of organic business entities.*

**Methodology / approach.** *The methodological basis of the research is general scientific and specific methods of economic phenomena and processes cognition. Therefore, the following methods have been applied: logical generalization (in determining the properties and benefits of agricultural business systems of the fractal type); comparison (when the practice of functioning of properties of organic products is analyzed); abstract-logical (when features of the functioning of network structures in fractally organized business systems are designed); monographic (in the study of the recent concepts of the functioning of fractal organized business systems); graphic (for visual presentation of the cooperation network of vertically integrated structure members); heuristic (when formulating conclusions and generalizations, as well as when justifying the directions for future research of the business system).*

**Results.** *The essence of fractal business organization and the properties of fractal type business systems have been identified which include heterarchy, structure complexity, self-organization, self-optimization, openness, as well as autonomy and elements. The fractally organized business systems benefits in agribusiness compared with agrarian business systems with a traditional structure and management system have been determined. The existence of objective prerequisites for organic farms fractalization has been substantiated, which is already inherent in some of fractally organized business systems properties. The properties and features of fractally organized business systems of network structures functioning have been defined.*

**Originality / scientific novelty.** *For the first time the substantiation of fractal type business systems formation in agriculture is proved, organic production in particular (previously expediency of fractal type business systems was studied only for industrial enterprises use). In particular, potential subjects of fractalization in organic production are identified, which include complex diversified agricultural business systems; the properties and advantages of fractally organized organic farms are identified and formalized, that are defined for a single fractal as well as a business system in general; the network structure of fractally organized organic farms is substantiated, particularly the relationship structure, network interaction rules, properties and values of fractally organized business structures in organic farming. In addition, the identification and formalization of the factors that affect Ukrainian organic production development got further development.*

**Practical value / implications.** *To ensure the fulfillment of obligations by all parties as well as maintaining the basic principles of fractal organization in the field of goal-setting the function of the institutional environment is proposed. As PE "Gallex-Agro" is the vivid example of interconnections network that corresponds to the features of fractal business systems design,*

*vertically integrated structure of member's interaction network is designed at its case.*

**Key words:** *fractal system, fractal, organic production, agrarian business system, vertically integrated system.*

**Introduction and review of literature.** The modern development of the world economy is characterized by the deepening of globalization and integration processes, internationalization of economic systems, gradual shift from economic to geo-economics development of states. Therefore, the issue of adapting existing business forms to new business conditions is getting more and more relevant. The choice of the optimal form of economic activity organization can ensure the maximum use of latent prospects and opportunities that provide new economic realities and transformational processes.

Fractal approach to the business entities organization is one of the economic research directions that meet the modern conditions. It is based on the fractal geometry positions about natural systems self-similarity [1]. The peculiarity of this purely mathematical theory is the adaptation possibility of its methodical tools to the study and the management of chaotic dynamics of economic systems. In particular, it is logical to assume that the principles of fractal structure of complex natural systems with a high vitality level, sustainability, flexibility and self-renewal ability can be used in the organization of the functioning socio-economic subjects with similar properties. The fractal approach in the business entities activities can be used in several areas: 1) determination of optimal structure of economic agent; 2) substantiation of internal network of economic entity interconnections; 3) setting and achieving goals within a complex business system methodology development.

Agricultural, in particular organic, production is to a large extent adapted to the fractal transformations. The urgency of finding reserves to increase the productivity of organic producers is due to the inseparability of the development of organic production from ensuring the health of the world's population, protecting the environment and saving non-renewable resources. Increasing the volume of organic production, directly or indirectly will contribute to the achieving Sustainable Development Goals approved at the UN Summit in 2015, namely: Zero Hunger (2); Good Health and Well-being (3); Clean Water and Sanitation (6); Affordable and Clean Energy (7); Responsible Consumption and Production (12); Climate Action (13); Life on Land (15). Currently, there is a significant potential for the organic agricultural development. The performance of organic farming in light of four key sustainability metrics: productivity, environmental impact, economic viability and social wellbeing, was examined by J. Reganold and J. Wachter [2]. Applying principles of self-organizing and spreading change by minimum intervention provides facilitative environments that better sustain change by the organic management implementation were analyzed by T. Karp [3].

The fractal geometry principle that was initiated by the French mathematician B. Mandelbrot is the methodological basis of this study [4]. The studies of R. Kronover, E. Freder, M. Schreder etc are devoted to the fractal structure

of objects of various nature [5; 1; 6]. In socio-economic sciences, the fractal approach is used in two directions: for the chaotic dynamics of financial and economic systems modeling and for organization of functioning process of business systems [7–9]. The second of these practical directions of the fractal approach implementation, which was proposed by H. Varneke was used in the study [7]. But, the fractal organizations of business issues were investigated mostly as a promising direction of industrial production development. In return, despite the objective preconditions for modern business structures in the agroindustrial complex fractalization (in particular, diversification of economic activity and network structure), the prospects of their use corresponding fractal approach are practically not studied.

The concept of “fractal organization” was introduced into economic theory by the American economist M. Whitley. She stressed that the fractally organized structures have the highest quality [10]. The idea of fractal structure is based on such a feature of natural systems as self-similarity [1]. In complex business systems, self-similarity is associated with the similarity of their elements in business processes, organizational structure, management system, goals hierarchy. H. Varneke understands the socio-economic system, which is formed by practically independent structural units – fractals as the fractal organization. Fractals are characterized by the self-organization ability, self-renewal and self-optimizing in a dynamic external environment [7]. The fractal business organization is based on the fact that entrepreneurial activity (at own risk activity in order to obtain the effect) concentrates on all business entity structure levels, not only on the upper ones [11]. Economic activity fractal organization is inextricably linked with the complex business systems functioning. Business system is a set of components which interacts with each other and forms a new feature that is not characteristic for individual elements. Under the agrarian business system is meant a formal or informal subject of agribusiness (with obligatory production of agricultural products).

Agrarian business systems which produce organically certified products are the research object of the article. Organic model of change for large-, small- and medium-scale enterprises was designed by D. Bhattacharyya [12]. Management data from a long-term cropping systems trial to estimate the maximum farm size for a conventional rotation and an organic rotation, subject to appropriate yield penalties for management delays and number different machinery complement scenarios was used by T. Delbridge and C. Fernholz [13]. Organic production and consumption trends were analyzed and directions and tools for their development in Ukraine were proposed by Y. Kyrylov, S. Thompson and V. Hranovsk [14]. Diversification practices reduce organic to conventional yield gap were studied and hierarchical meta-analytic model to generate an estimate of the yield gap was built by L. Ponisio and L. M’Gonigle [15]. Since one of the significant peculiarities of the global food market is the circulation of a wide range of ecological produce, it is reasonable to consider the identification parameters of organic agriculture, which include the use of ecology protection technologies for production with principles of organic farming; maintaining crop rotation; the production and processing of agricultural raw materials

while meeting regulating organic standards; compliance with certification demands at all stages of bringing organic products to end users, including processing, storing, packaging, transportation, promotion and sale; and the availability of organic certificates and product labeling [16].

The institutional support for organic certification of agricultural and food products as the complex system of regulation of social relations on the use of natural resources in the field of manufacturing processing and marketing of agricultural products was determined by J. Moroz, J. Tsal-Tsalko and O. Chaikin [17]. While key actors during the market development are and should be its participants, the state can play an important role in organic agriculture development by establishing national legal and regulatory framework that will contribute to the development of this economy sector [18]. The Ukrainian economy continues globalization with its agriculture integrating into the world economy, which pushes manufacturers to focus on innovative business areas that can ensure competitiveness on the international market [19]. O. Maslak highlights that less expensive types of organic agricultural products are produced mainly in medium-sized enterprises of collective organizational form [20]. At the same time, the problems of agribusiness organization forms, structures of optimization of internal and external networks of cooperation of producers of organic products are not studied by economists.

The search for alternative methods of organic production ensures development not only at the national level but also at the international level. Given the need to intensify the organic movement, international and national policies for the development of the organic sector significantly contribute to the introduction of environmentally certified agricultural production.

Currently the Ministry of Agrarian Policy and Food of Ukraine has started three basic program documents that are oriented on organic agriculture support, namely: Strategy for Agrarian Sector Development “3 + 5”, Single and Comprehensive Strategy for Agriculture and Rural Development in Ukraine for 2015–2020 and Strategy for Improving the Management Mechanism in the Field of Use and Protection of Agricultural Land of State Ownership and Disposal [17]. However, despite the active participation of the state in the organic production development stimulation in Ukraine, regulatory framework for organic certification and standardization is unregulated; access to the investment capital required at the initial stages of the transition to organic production technology is limited; the need to withdraw arable land out of the operational process for 2 years and the conversion period duration; the ecological conversion in livestock breeding complexity; the domestic demand solvency insufficiency causes the negative impact on the organic farms efficiency. The fractally organized agrarian business system in the organic economy creation is one of the potentially effective methods to solve above mentioned problems.

**The purpose of the article** is determining the possibilities of fractal approach, as the one that enables not only flexibility and viability, but also, management efficiency improvement, new competencies of the company formation, self-renewal



ability formation and conflicts of interest between structural subdivisions in complex vertically integrated structures elimination, to the organization of implementation of organic business entities.

*Methodology.* The study of organic business fractalization problem was conducted in several stages. The first stage is theoretical generalization of the study object – fractally organized business system and testing the hypothesis about the validity of fractalization of agricultural systems. The result of the first stage is the theoretical analysis of the study object – agricultural business systems of fractal type, organic business systems in particular. At this stage, the properties, structure, network of organic producers with fractal structure internal relationships would be substantiated.

We emphasize that the need for this theoretical study is due to lack of information about the study object. At the second stage, the results of which will be covered in the following articles, the process of functioning of the agrarian business system of fractal type will be formalized, mathematical models of its management, models of interrelations between inputs and outputs of system will be designed.

Therefore, this study is the fundamental theoretical generalization of concept of fractal organization of agricultural business systems in general and organic business systems in particular. The methodological basis of this study is the systematic approach to the knowledge of socio-economic processes and phenomena, and the theoretical basis – fractal theory, fractal geometry, agricultural economics, complex systems theory issues. The study goals achievement will be done by projecting the theoretical provisions of the fractals theory and fractal geometry on the economic sphere.

The application of the system approach in this study involves representation of the study object in the form of a system. In particular, basic properties of complex systems (these properties are widely covered in systems theory) are studied in the context of fractal business entities. The main properties of complex systems include: a) branching structure (equipotency of the system); b) the existence of relationships and interdependence of components functioning (system integrity); c) the formation of an additional effect that is not inherent in the elements of the system (emergence of the system); d) target orientation of the system operation (target activity); f) functioning in unstable and stochastic external environment (system openness); e) the desire of the system to continuously restore stable effective state that is, to ensure balance (system adaptability).

In the process of fractal organization of the formation of a theoretical model of organic production it is necessary to follow the principle of continuity of systems theories, fractals and agricultural economics and management. For these reasons, this study should include three sub-steps:

- 1) identification of key characteristics of fractals and projection of such characteristics on agricultural (including organic) business systems;
- 2) study of the structure of fractally organized business systems, the processes of their goal-setting research;
- 3) study of fractally organized mechanisms of interaction of farms' structural

elements. Particular attention should be paid to the analysis of the autonomy of the elements.

**Results and discussion.** Substantiation of expediency of application of fractal approach in the organization of economic activity of organic farms should be preceded by their current state and analysis of development prospects. The development of organic production implies a steady trend of increasing the number of farms, the area of organic agricultural land, as well as expanding the market for organic products. It should be noted that the decisive role is played not so much by the fact that there is a tendency to increase these indicators, as the nature of this trend.

According to the results of the regression analysis of time series of key indicators of organic production (the number of organic farms, the area of organic agricultural land and the consumption capacity of organic products) the clear trend towards their increase is revealed. At the same time, the tendency of their increase corresponds to exponential growth for the number of farms and linear for land area and market size (Table 1).

*Table 1*

**The main indicators of trends in organic production of Ukraine**

Indicator	The equation of the indicator trend	Coefficient of determination	Growth rate function	Dynamics of interpretation
Number of organic farms	$y = 89.89e^{0.16t}$	0.92	$y'' = -67.66 + 26.64t - 1.94t^2$	By 2012, there was a slowdown in the growing dynamics of the indicator; in 2012–2015 – there was a rapid increase in the indicator; further growth rates are gradually decreasing
Area of organic agriculture lands	$y = 236014 + 21522t$	0.86	$y'' = -1.44 + 0.78t - 0.0069t^2$	The gradual slowdown of the area increase in 2013, reduction of the indicator rate increase in 2013–2015, resumption of a gradual increase in the rate of area increase
Capacity of the consumer market for organic products	$y = -5.48 + 3.65t$	0.97	$y'' = -1.44 + 0.78t - 0.0069t^2$	Stable increase of market growth

*Note.*  $t$  – serial number of the year; models are developed on the basis of time series for 2009–2019.

*Source:* calculated by authors according to official data of Organic Federation of Ukraine [21].

According to the results of the analysis of the speed and growth rates of these indicators (the analysis was performed using the method of differential calculus given in: B. Shulyak, 2018) [22] it was determined, that only the capacity of the consumer market for organic products is increasing at the steadily increasing rate. Instead, the organic land area increases and the organic farms number accelerates, and then slows down. In this study, demand has been identified as the external stimulant and organic farms development engine. Concerning internal factors affecting the efficiency of organic products producers' economic activity, they indirectly affect the total number of organic producers and certified land area. The positive effect of choosing the optimal business organization form (internal factor) will facilitate the stabilization of the positive upward trends in number of organic producers and certified land area. In order to evaluate the impact of the policy measures on organic farming development and alternative opportunities for organic farming development provision, on the basis of the prepared model various options were calculated and scenario analysis was carried out by A. Galnaitytė and I. Kriščiukaitienė [23]. The positive impact of the optimal form of agribusiness organization choice will promote stabilization of positive tendencies in agricultural lands area and increase in number of organic products producers. Further research is aimed at substantiating the feasibility of introducing the fractal approach to organic farms business organization, as one that will maximally stimulate the development of organic business in Ukraine.

In order to apply the fractal theory to organization of business systems, they must meet certain conditions. Fractally organized business system consists of independent and self-sufficient elements – fractals. Fractals are similar to each other and to the holistic system and also interact with each other, creating a common integrated system effect and individual fractals effects. The ability of quick and effective external challenges adaptation is the main goal of business organization of fractal type transition. This means that fractalization is beneficial only to open systems which closely interact with the external environment and significantly depend on its influence.

The agribusiness subjects in general and organic products producers in particular, meet the specified characteristics. A significant part of organic farms and their associations is characterized by activities diversification. Typically, diversification involves the complexity of the enterprise organizational structure which is a sign of a complex system. In addition, agricultural producer's integration deepening, both food chain horizontally and vertically, is a characteristic feature of agrarian business development.

However, some factors significantly limit the possibility of fractal transformations in agribusiness implementation. The components autonomy is one of the main properties of a fractal type system. Autonomy refers to the decisions making independence of the business system components that is impossible without management decentralization. The vast majority of large agrarian structures in Ukraine, on the contrary are characterized by a high level of centralization and therefore without previous transformations are not ready for the fractally organized

systems rice acquisition.

Each individual business system unit goals system must not contradict to the goals and interests of other units. The contractual form of vertical integration entities meets this requirement. Agricultural consortiums, regional clusters, network associations, informal associations, based on the conclusion of long-term contracts and licensing agreements (on terms of franchising in particular) belong to them. Agroholding structures are the exact opposite to the listed types of vertically integrated associations. The parent company owns the majority of the subsidiaries property and usually fully controls their activities in strategically important areas of management. The management system in agroholdings is centralized.

Fractal business organization is also unprofitable for small businesses. This is due to the fact that the structural elements of fractal business systems must have resources and the competences necessary for independent decision-making. In fractal type systems, managerial relationships between departments are converted into coordination. This means, that separate fractals do not execute orders from above (management) and they make decisions on their own risk and fear in order to obtain the desired effect. In other words, divisions of the fractal system independently make business decisions, but necessarily taking into account a common goal of all fractals. Small agricultural businesses do not meet the specified requirements, because they are characterized by: 1) small size and small structural division number; 2) the complexity and high cost of engaged staff, sufficiently qualified to make business decisions, which is required for each individual fractal; 3) insignificant (sometimes even negative) relationship level between “fractalization effect” and “personnel management expenses”. So, the objects of this study are complex diversified agrarian business systems that can be transformed into fractal-type systems. Fractal approach to organizing agrarian business systems use provides a number of significant benefits that are extremely important for operational adaptation to fast-moving external calls (Table 2). The advantages of the level of structural elements of a business system of fractal type should be separated from the system-wide advantages.

*Table 2*

**Properties and advantages of agricultural business systems of fractal type**

Property		Advantage	
type	essence	type	the nature of occurrence
1	2	3	4
<i>The fractal level</i>			
Self-optimization	Ability of quick goals, network of internal and external communications change	Flexibility and adaptability	Ability to respond promptly to external challenges
Targeting	Determination of the goals, which provide fractal viability and achieving strategic goal of the business system	Improvement of management efficiency	Adoption of managerial decisions not only at the highest level of the system, but also at the individual fractals level
Autonomy	Independence by setting goals and determination of ways for their achievement		



*Continuation of table 2*

1	2	3	4
Openness	Fractals are combined into a single network of links with each other. Fractals have equal access to information and knowledge of the business system	New competencies creation (skills and abilities)	Expanding alternatives to achieving goals through the possibility of self-formation of internal and external contacts
Co-competition	Deepening the interaction of fractals with simultaneous competition between them (for resources, consumer)	Integrative effect obtainment	Increasing the efficiency of fractals and increasing the level of their competitiveness
<i>The level of agrarian business system</i>			
Self-optimization	The ability to quick change in structure (first of all, branch), dimensions	Vital capacity and self-renewal	The ability to turn external challenges into benefits and additional capabilities
Self-organization	The ability to quick change in goals, network of internal and external interconnections	Flexibility and adaptability	Ability to respond promptly to external challenges
Targeting	There is a general purpose for the whole business system (goals) which is taken into account by forming partial fractal goals	Eliminating the conflict between fractals with antagonistic interests	The consistency of the goals of the fractals with each other and with the goals of the business system as a whole
Heterarchy	Replacement of management links (hierarchy) with coordination links (coordination of fractal actions)	Efficiency increase of business system at the expense of adequate goal-setting within fractals	It is active in taking managerial decisions on the nature of fractals functioning

*Source:* authors' research.

Many functioning organic farms have only certain properties of fractally organized business systems (Table 2). Conditionally such producers of organic products can be attributed to agrarian business systems with a partial fractional organization. They include: 1) diversified farms; 2) integration of organic producers (for example, agricultural servicing cooperatives); 3) association of commodity producers of agricultural organic raw materials with other members of the food chain (vertically integrated structures). However, obtaining all of the above advantages results in the formation of all the properties reflected at the same time in Table 3.

Fractal organization of economic activity is based on network links between the elements of agrarian business system. Problems and prospects of network interaction of business entities are gradually becoming more and more relevant among economists. To a large extent, this is due to the development of globalization processes, which stimulates the integration of business entities, deepening cooperation and the transformation of competition into co-competition. Currently, there are several areas for research of economic relationships networks that differ in

the term “network” meaning interpretation. In particular, the interaction in business systems network is considered as: 1) descriptive characteristics of internal and external connections [24]; 2) the logic of the organization of communications and the way of their management [24]; 3) relations, which have value and are characterized by the certain efficiency [25]. Since these approaches take into account various aspects of network interaction, so they are not mutually exclusive but, on the contrary, complement each other.

*Table 3*

**Properties of functioning organic producers (real cases)**

Property	Enterprise example	The form of properties' manifestation
1	2	3
Self-organization in the form of the ability to change the network of external connections	Private Joint-Stock Company “Etno Produkt”, Kyiv oblast	Ability to change contractors quickly in case of external conditions changing (demand, mismatch of current Private Joint-Stock Company “Etno Produkt” counterparty products requirements). Ability of quick respond to demand changes and formation of new product chains
Targeting in the form of coordinating the goals of structural units with the strategic purpose of the system	PE “Gallex-Agro”, Zhytomyr oblast	The purpose of the activity is the production of safe food under conditions of environment restoration and ensuring the rural areas development. Structural units (for example, Organic Milk Ltd., Organic Meat Product Ltd.), on the one hand, are completely self-sufficient with their goals and development strategies, but on the other hand – act within the reach of the PE “Gallex-Agro” goal
	Agricultural service cooperative “Rodynyi Dobrobut”, Kiev oblast	The environment preservation is one of the strategic orientations. The goals of each individual cooperative member, regardless of the direction of its activities (cow breeding, vegetable growing) are consistent with the organically oriented management direction
Autonomy in goals setting and determination of ways for their achievement	PE “Gallex-Agro”, Zhytomyr oblast	One of the “Organic Milk” Ltd. competitors (“Gallex-Agro” structural unit) is Private Joint Stock Company “Zhytomyr Butter Plant”. Despite this, PE “Gallex-Agro” (the face of “AhroVestHrup” LLC) within 2017–2018 supplied the butter factory with organic raw materials for the organic ice cream production
Openness, which provides for equal access of divisions to the information and knowledge of the business system	Agricultural service cooperative “Rodynyi Dobrobut”, Kiev oblast	Openness of absolutely all production and financial business processes
	Agricultural service cooperative “Panfrut Ukraine”, Kiev oblast	Open access to the other cooperative members information about the technologies they use, market conditions, suppliers, consumers, etc.
Co-competition between structural subdivisions	“Svarog” Corporation, Khmelnytsky oblast	Vertically integrated structure members compete for the technique, resources and investments. Product storage area collaboration, formation of sufficient products

*Continuation of table 3*

1	2	3
Self-optimization, which manifests itself as the ability of the organizational and production structure rapid change	PE “Hranit Agro”, Poltava oblast	Under conditions of market conjuncture change the enterprise is able to rebuild the production structure quickly. In particular, the company refused to produce livestock products as the result of which livestock producers were excluded from the structure
	PE “Gallex-Agro”, Zhytomyr oblast	After increase in demand for berry yogurt PE “Gallex-Agro” began to grow raspberries and strawberries, created a new production unit, oriented on gardening and berry growing
	“Dedden-Agro” Ltd., Rivne oblast	For balanced ecological agriculture (provision with organic fertilizers) it has been entered into structure an operating company, which produces livestock products

*Source:* authors’ research.

Networks of links can be deployed as horizontally as vertically along the food chain. In organic production, an effective form of horizontal (quasiintegrated) [26] networks is based on relations’ system of agricultural servicing cooperation. Cooperative members, maintaining autonomy and independence, significantly increase their own competitiveness level and efficiency through information, experience, technology, resources, etc. Example, before cooperation “Panfrut Ukraine” farm servicing cooperative members were forced to sell produced products to processors at a disadvantageous price. Their failure to form large batches of organic products was the reason of this situation. As a result, organic farms lost much of their added value. After co-operation “Panfrut Ukraine” members were able to lease and download storage capacity together combining capital resources and batches of products. Now they are linked by close informal relationships, based on trust and information openness to each other. The formation of social capital through the accumulation of mutual obligations, trust, reputation and image is the other advantage of horizontal network of interconnections between organic farms [27].

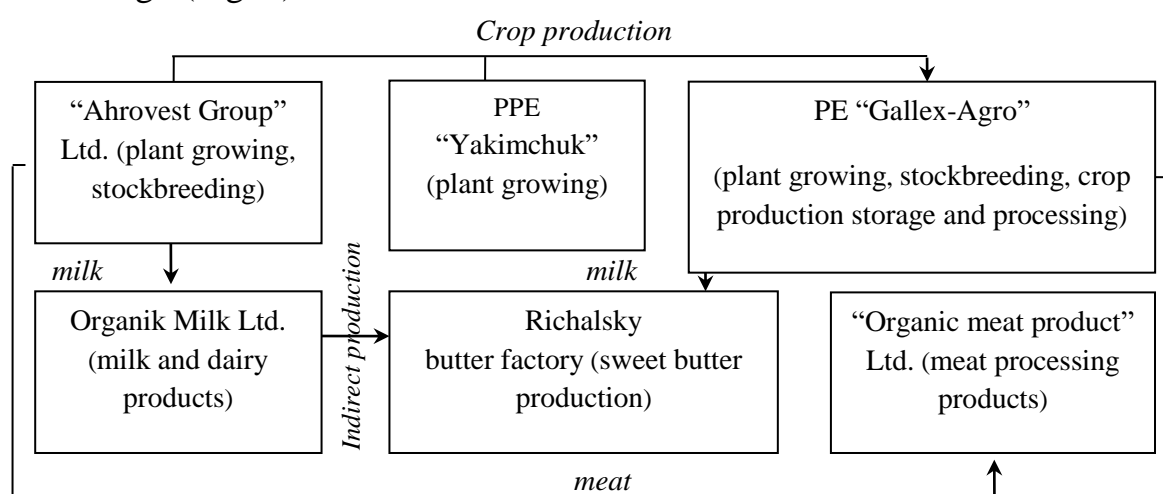
The vertical-line relationship in organic production is built along the value-added chain. The relevance of deepening close relationships between suppliers, producers of organic raw materials and end-use products is caused by the need to certify the products of all the food chain members. In addition, qualitative parameters of the final organic product depend on intermediate units of products and quality and safety of services. The structure of vertical network of interconnections can include finance, science, education, public administration.

Fractal organized business systems always provide for equality of all participants. However, in practice, some members of vertically integrated agrarian associations are much larger and therefore more influential than others. In Ukraine, a similar type of relationship is characteristic to organic farms attracting to the structure of process of agroholding associations. Mostly, in such cases, specialists in agroholdings (agronomists, zootechnics, mechanics, etc.) do not understand the peculiarities of the technological processes of organic production. They do not take

into account that usually technologies of organic products' production are fundamentally different from the traditional way of farming. However, having a decisive voice in decisions making, specialists of agroholding structures prefer unacceptable technologies for organic farming, but they are customary for traditional, agricultural production. As a result, sooner or later organic producers discontinue existing or turn into traditional ones (in the best case are oriented towards the production of environmentally friendly products).

In order to avoid the concentration of power in a limited circle of members of vertically integrated structures, it is important that the network of relationships is subject to a system of rules and principles that will form the internal institutional environment of the association.

The function of the institutional environment should be to ensure the fulfillment of obligations by all parties as well as maintaining the basic principles of fractal organization in the field of goal-setting. PE "Gallex-Agro" is the vivid example of network of interconnections that corresponds to the features of fractal business systems design (Fig. 1).



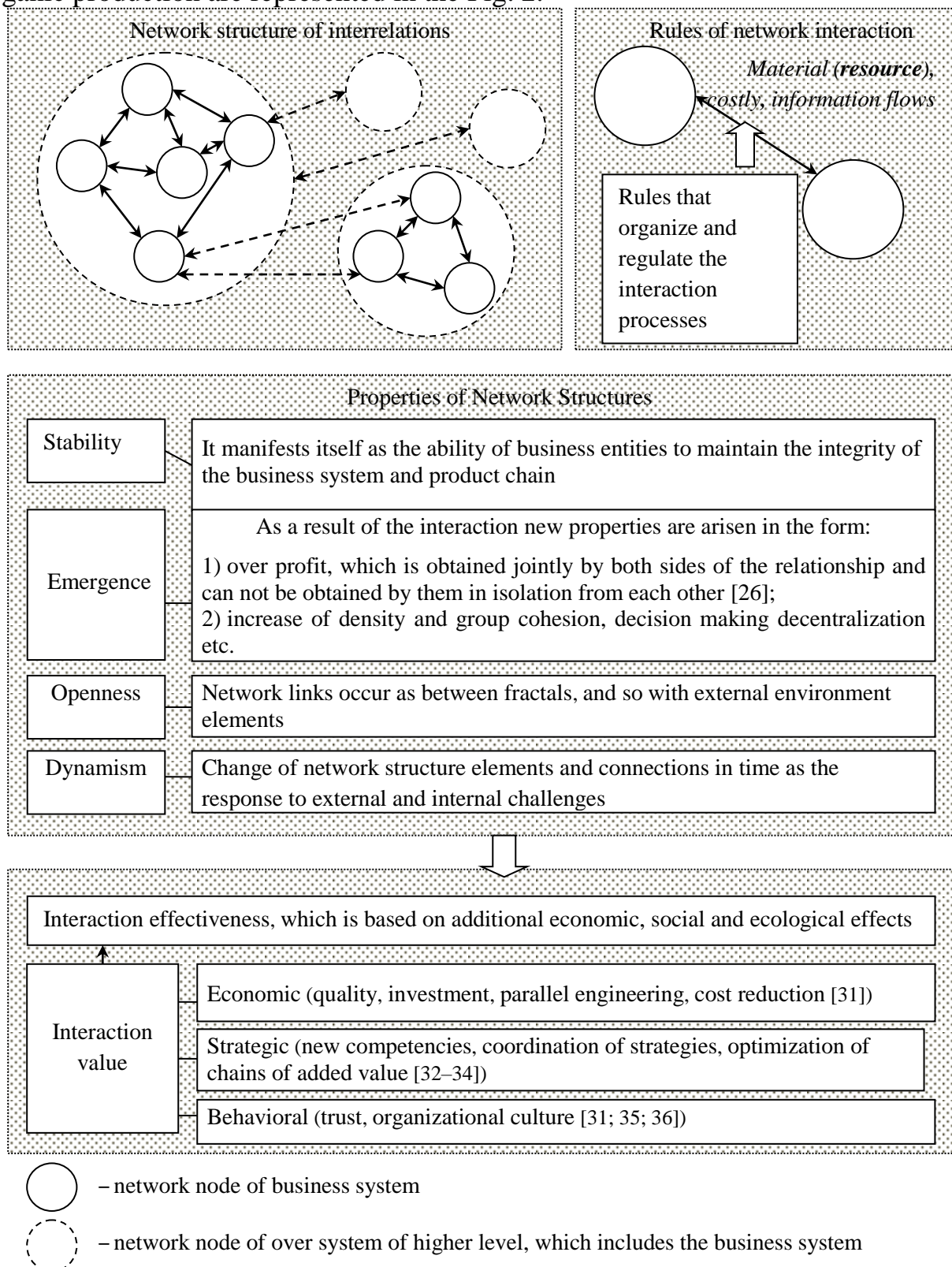
**Fig. 1. Network of interaction of members of vertically integrated structure, PE "Gallex-Agro"**

Source: authors' research.

The basis of the creation of a network of interactions of organic producers with each other and with other economic entities is a system of motives that motivate to establish and develop relationships.

According to the expected effect, the motives are divided into: 1) economic (the possibility of reduce of specific costs by optimizing business processes [28; 25], formation of resource interdependencies, [29], decrease of uncertainty of resource flows, transaction costs reduce, improvement of information provision, distribution of risks [30]; 2) social (support of rural areas welfare, restoration of family values, social infrastructure development); 3) ecological (facilitation of the ecological standardization and certification procedure). Generalized scheme and basic properties of network structures that are the basis of fractally organized business systems in

organic production are represented in the Fig. 2.



**Fig. 2. Functioning features of network structures in fractally organized business systems**

Source: authors' research.

Building a network of relationships with partners and contractors is especially



beneficial for businesses that want to produce organically certified products, but due to certain factors cannot. As an example, we can name the Ukrainian berry business that has started to develop rapidly in recent years.

Co-operative movement with the creation of deep network interactions is significantly intensified in the field of growing and selling organic berries in Ukraine. Small farmers who grow organic berries, but are not able to independently form sufficient batches for export, are united. In order to overcome this problem the first agricultural servicing cooperatives began to be established in Ukraine (“Kyivsky” (Kyiv region), “Snovianka” (Chernihiv region), “Nadiya” (Ternopil region), “Pokrova” (Lviv region), “Healthy Food Co-operative” “Vira” (Lviv region), “Zhukovskii Dar” (Chernihiv region), “Clean Flora” (Ivano-Frankivsk region), “The First National Agrarian Cooperative” (Khmelnysky region), “Ecom” (Ivano-Frankivsk region). Over time, the gradual deepening of the relationship between cooperatives members has led to the emergence of completely new types of interactions. The most typical characteristics of organic berries producers’ modern relations networks are:

1) significant expansion of cooperation spheres. In particular, if at first it was only about formation of export batches, currently it is processing (“Milka” agricultural service cooperative), agricultural machinery share use (“The First National Agrarian Cooperative”) etc.;

2) dynamism, that implies the continued involvement of new cooperatives members and desire to expand the system structure. For this purpose, experienced commodity producers teach new partners by sharing their experience, information and technology;

3) new interaction forms. For example, franchise for organic raspberries “Small Fruit” opening (Agricultural Service Cooperative “Kyivsky”). On the one hand, franchisor involves the unit, that provides it with organic raw materials, necessary for the formation of export batches of homogeneous organic berries. On the other hand, the agricultural producer obtains full informational, consulting and legal support. The advantage of such a system is that the role of the franchisor is played directly by the producers – members of the cooperative “Kyiv”, within which more than 60 farms are united.

**Conclusions.** The deep transformations of economic environment, high level of uncertainty and randomness of external factors of functioning and development of economic entities, strengthening globalization and integration processes cause an objective need for searching new forms of organization of business systems. Business-systems of fractal type is characterized by such properties as heterarchy, structure complexity, self-organization, self-optimization, openness, goal-setting taking into account all participants interests, autonomy and elements (fractals) co-competition. The acquisition of these properties by the business system enables not only to eliminate flexibility and viability but also, improve management efficiency, form new competencies of the company and self-renewal ability, avoid conflicts of interest between structural subdivisions in complex vertically integrated structures.

Agrarian business systems, organic producers in particular, are the most organizationally prepared for fractalization. Usually, they have one or more properties of fractal type business systems. Above all, there are self-organization and self-optimization ability; goal-setting, which eliminates fractals conflicts of interest; autonomy of fractals goals setting; their openness and co-competition.

The horizontal network (between producers of organic products) and vertical (along the value added chain) internal interconnections lie at the basis of fractal organization economic activity. Limited number of participants' power concentration avoidance is the condition of network interaction within a fractal type business system. In order to fulfill this condition, it is necessary to form fractals interaction rules and principles system and in the future to control their implementation. The set of interaction rules and principles creates the business system internal institutional environment which function is to ensure the fulfillment of obligations by all parties as well as maintaining of functioning the fractal organization basic principles and development. The properties of network structures include endurance, openness and dynamism.

In this study further research will be aimed at the formalization of the process of functioning of agrarian business system of fractal type, its management mathematical models design, as well as relationships between input and output parameters of the system models.

In addition, further research is planned to carry out a scenario of modeling the potential effects of fractalization participants by comparing the results of their activities before and after integration.

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