

## SYSTEMATIC APPROACH IN FORMATION OF CONCEPTUAL PRINCIPLES OF AGRIOLOGISTICS

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The article deals with the issue of constructing agrilogistics concept based on a systematic approach. Current trends in the development of the agricultural sector show the necessity of an effective agrilogistics as the integrated control element. Basic principles of a systematic approach to the agrilogistics concept are defined.

**Key words:** agriculture, agrilogistics, agrilogistic-chain supplies, material flow, agrilogistic system, systematic approach.

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## СИСТЕМНИЙ ПІДХІД У ФОРМУВАННІ КОНЦЕПТУАЛЬНИХ ЗАСАД АГРОЛОГІСТИКИ

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Висвітлено питання побудови концепції агрологістики на основі системного підходу. На підставі тенденцій в розвитку аграрного сектору обґрунтовано необхідність запровадження ефективної агрологістики як інтеграційного елемента системи потокового управління. Визначено основні принципи системного підходу в концепції агрологістики.

**Ключові слова:** аграрний сектор, агрологістика, агроланцюг постачання, матеріальний потік, агрологістична система, системний підхід.

### Problem statement

Changes in the competitive encirclement in the agricultural sector conditioned because of number of objective reasons, one of which is the impact of the logistics component in the management of enterprises and the formation of the supply chain of agricultural products. Agrilogistics as science involves the study of the processes of material, informational and related to them cash flows prevailing in the market for agricultural products and distributed by its manufacturer to consumers. Agrilogistics covers all activities of the enterprise, from the planning cycle of agricultural production and finishing with the implementation of the final consumer. In order to build an effective agrilogistics it is necessary to include cost control, efficient management of storage materials and finished products, providing information support, development of transport scheme of supply, maintenance service, formation of distribution network and others.

Modern agrilogistics built on integrated system relationships, where participants provide a coherent mechanism combined activity with a maximum effect of utility. Integration of agrilogistics not only provides the appropriate level of competitiveness of agricultural products, but also acts as a mechanism to minimize costs and receive a proposal to lower product prices. Its achieved not by reducing the quality of the product, but by avoiding a number of risks in supply harmonious interaction of all participants of agrilogistic chain [1]. Significant export potential of Ukraine, makes it necessary to improve and develop agrilogistics functioning which should be aimed at providing time-independent supply of agricultural products with minimal costs.

The issue of logistics management is relevant for small agricultural enterprises, and large integrated agricultural holdings and can not be solved without the proper level of financial support. That is why, in terms of facilitating the implementation of EU agricultural products in the European markets, system solutions in agrilogistics ensure effective promotion of the formation of product streams with the highest level of expected realizable income.

### **Analysis of recent research and publications**

The question about conceptual and theoretical-methodological principles covered in scientific publications domestic and foreign scientists. In the works of Hadzhynskyy A.M., Lukinskyy V.S. Anikina B.A., Rodkina T.A., Krykavskyy E.V. and others. problems of the conceptual foundations of the theory and practice of logistics are investigated. Research in the direction of agrilogistics published in works of Kosareva T.V., Smirnova I., Perebiynis I.V, which focuses on the features of the agricultural sector and the use of the provisions of the general theory of logistics management in agriculture. However, further research needs agrilogistics to be built on reasonable conclusions based on the general strategy of agricultural development, restructuring and globalization of economic space.

Ukraine has the potential to obtain stable increasing pace of deals in agricultural production, due to a number of favourable geographic, climatic, resource conditions. The key is not only a success in the cultivation of agricultural products, but also the effectiveness of the implementation of actions for maintaining and supplying the final consumer and the current crop of previous marketing years. That is why the issue is exacerbating by the introduction of system solutions in agrilogistics that are currently associated with both the theoretical and methodological bases of agriculture, and the possibilities of their practical application.

### **Objectives**

The objectives of the paper are to investigate agrilogistics conception based on a systematic approach. To find out key objectives and conceptual statements of agrilogistics and changing agricultural market that allow agrilogistics position as a main component to obtain the maximum effect from the expectations of opportunities in the agricultural sector in terms of integration and globalization of trade relations based on tendencies of development of Ukraine's agriculture.

### **Materials**

Today Ukraine's agricultural sector has a large number of manufacturers, each of which has its own legal framework and statutory characterized by different degrees of integration management. According to the State Department of Statistics of Ukraine on July 1, 2012 the number of agricultural producers in Ukraine amounted to 55,866 enterprises, of which the largest proportion of occupied farms – 72.9 %, agricultural companies – 14.5 %, other – 12.6 % where there were forms of enterprise ownership [2, p. 133]. Amount of public support to agricultural producers in 2012 were 6974.1 million hrn. which exceeded the level of 2011 by 61.1 % [3, p. 64]. According to preliminary estimates, the increase in gross agricultural output increased in 2013 by 13.7 % compared to the 2012 crop In the figure was 118.1 %, and stockbreeding – 104,8 % to 2012. Important that the highest level of profitability of crop production, was in 2012 – 22.3 %. Less profitable stockbreeding industry, the profitability of which in 2012 amounted to 14.3 %. [4].

However, as noted in the Ukrainian Agrarian Confederation, from farmers, there are two main problems: the harvest and logistics. The first one related to the provision of technical and economic conditions of cultivation and rational use of the resource potential. Second one – is to save the collected tonnage production, transportation and sale to the final consumer. [5] Privacy agrilogistics shown on the export potential of Ukraine, and with it the replenished budget. Thus, the amount of grain exports in 2013/2014 marketing year was carried out in the framework of the expected and the forecast was 28 million tonnes of Ukrainian grain (in anticipation of 30 million tons of external sales), despite the lack of wagons, grain, grain storages, complexity of the port. It is necessary to build terminals, both sea and river. There is a need more than 60 million tons of grain storage at the same time and existing facilities in

Ukraine are designed for capacity of 34 million tons. Lack of storage facilities and warehouses forcing manufacturers to sell products collected from the field, without the price, however, getting a diminished level of income compared with expecting. At the same time, keeping with wrong conditions reduces the quality of the products and this is displayed on the ultimate proceeds from the sale. So agrilogistics requires a systematic approach to solve the problem of logistics financing projects and providing uninterrupted circulation movement of material flows with the ultimate sale of agricultural products.

Logistics has deep historical roots and is mentioned since Roman times as a military discipline [6, p.15]. The modern interpretation of logistics theory comes from sources streaming control in operations management, where the main element of control are the operations carried out at the plant, connected to the chain by a given sequence and functional purposes. Thus logistics is like integrator relationships between parts of the chain of operations and serves as a coherent ideology and optimal control of the point where there is stream to the point where it should end. Logistics is the science that studies the theory and practice of material and associated information flows [6, 7, 8]. The object is the material flow, which is the basis of material production and consumption acts as source of value. Uncertainty and value of material flow is identified with the movement of information and financial flows that are supporting and investigated to the movement of the flow. E.V. Kryvavskyy emphasizes the perception of logistics as the efficient management of material flow counting the points of origin and making available to the final consumer [8].

Agrilogistics considered as sectorized functional subsystem in the overall system of a particular enterprise, region and state. In T.V. Kosarev's [9] paper he defines AIC logistics as the science and practice of management of economic flows in production, distribution, exchange and consumption of agricultural products. Velichko O.P. stresses on peculiarities biological nature of logistics flow [13]. With all the statements we can agree, however, and there are many controversial issues. Agrilogistics can recognize the science of optimal management of material and generated their information and financial flows in agriculture and agricultural production directed by the manufacturer of raw materials to the final consumer of agricultural products. It should be noted that researchers tend to look at agrilogistics original source – can be the formation of the material flow. Material flow in agrilogistics represented as raw materials, finished products, semi-finished, biological assets, services and others which generated in the course of agricultural operations. So it presented in the form of goods and materials (fertilizers, seeds, pesticides, feed, equipment etc.), and as “human goods” (plants, animals and other biological assets). The specificity of relationships formed in agrilogistics caused by many factors, among which should be highlighted:

1. Priority of land resources. The primary resource in economic activity is land that properly affects both technical and economic elements of logistics operations and the property relations that are formed within agrilogistics systems. Amount of acreage has a significant role in predicting the gross collection of cultures. In 2013, total sown area of all farms in Ukraine amounted to 28,329.3 thousand hectares, of which 69.9 % is processed agricultural enterprises, 30.1 % – households. In addition, the appearance of the agrarian market of major agricultural holdings led to redistribution of land. Thus, in 2011 the agricultural holding “Ukrlandfarminh” expanded its land holdings to 430 thousand hectares, land bank of investment holding NCH is 400 thousand hectares, agricultural holding “MHP” its disposal, land 300 thousand hectares

2. Significant effect of farm restructuring. Agroholdings significantly influence the development of agriculture as a whole. The main objective is to increase agricultural holdings exports, reduce costs, increase capitalization and attract investors. This effect is achieved through the integration of production and supply chains.

3. Significant impact of environmental and natural risks. The dependence of the field work from the weather makes clear strict management in operational performance graphics cards under process of growing and harvesting. The high profitability of individual crops (sunflower, canola, corn, etc.). Attract producers of high gain, which is achieved with errors in technological conditions, ecological balance and the quality of land resources.

4. Availability of seasonal changes in demand and supply agricultural products. Seasonality of agricultural production makes maintaining a temporary regulations on coordination of operations within

the marketing year. Significant amounts received both products require efficient storage and distribution, both on own and rent storage facilities.

5. Price disparity between the value of the final product and the means of production. Significant disparities in the cost of the final product of agriculture and industry require precise coordination of financial flows based budgeting and cost recovery, ongoing monitoring and forecasting the prices of seeds, energy resources, protection grew, food and services.

6. Significant dependence on transport infrastructure. Organization of delivery methods of agricultural production requires in many cases intermodal transport mode for long distances. At the same time, price fluctuations fuel and lubricants during the planting season farmers are forced to borrow at the expense of future crops.

7. Significant effects of state regulation. In many areas of agribusiness present the impact of “the invisible hand of the state”, which manifests itself in the promotion of lending to individual businesses, inserting quotas, permits, state support in the form of grants and others.

Agrilogistics aimed at solving major problems:

- Compliance with international quality standards in food safety;
- Transition to an innovative model of management in the supply chain;
- Introduction of new technologies for collecting, processing, transportation, storage and distribution of agricultural products;
- Improving the competitiveness of agricultural products in domestic and international markets;
- Improving the investment attractiveness of the agricultural sector;
- The growth of farmers’ income.

Material flow moving within agrilogistic system defined by specific levels of the economy: the micro level (within the company), the meso level (within the region), the macro level (within the state), mega (in the global world space). Agrilogistic system should present itself like an economic system defined on a set of elements and management processes with materials in agriculture with established structured communications and logistics purposes.

Agrilogistic system operates according to the principles of a systematic approach and system analysis. Using a systematic approach to agrilogistics involves identifying the main characteristics, which enable management to adapt with external changes and to maintain a stable operation mode. The main properties agrilogistic systems are:

1. Complexity, which is characterized by the number of elements, subsystems, modes of interaction.
2. Hierarchy that reflects the generally lower level of ordering items in relation to the elements of top-level logistic management.
3. Emergence (diambiguation), ability of the whole composition to perform a given function goal that is impossible to achieve its individual parts separately.
4. Structuring implies internal organizational structure.
5. Involves changing dynamics of system performance over time.
6. Uncertainty information displayed on risk behaviour under the influence of the environment.
7. Adaptability, the ability to change its structure and produce many variations of choice behaviour under the influence of the environment.
8. Self-organization, the ability to form new shapes with higher levels of organization.
9. Synergies, the ability to obtain a significant effect on the level of result of self-organization and self-reproduction.

The basic principles of a systematic approach in management agrilogistic systems are:

The principle of the systems. Processes and elements that are defined by the system have unique causal relationships that are manifested in the properties of a whole. That is why the system has the following properties in the case of destruction, none of its chains will not be able to implement them

The principle of decomposition. The structure of agrilogistics and agrilogistic chains provides a synthesis of its components from highest to lowest level.

The principle of modeling describes each agrilogistic system should have the ultimate level of formalization, the model should be described by a specific number of parameters, units and restrictions.

The principle of uncertainty is the probabilistic nature of the agrilogistic system properties.

The principle of effectiveness, in order to change behaviour of agrilogistic system it is necessary to involve external influence that exceeds the critical value.

The principle of coherence, whereby changes in the characteristics of each level agrilogistic systems should be coordinated with each other.

The principle of subsidiarity and adequacy, completeness is defined by decisions made at different levels of the hierarchy.

The principle of purpose, describes the functionality of the agrilogistic system which concerns the prescribed purpose.

An alternative (of multiple) choice associated with the ability to choose behavior according to the reaction on encirclement and dedication.

Integration properties agrilogistic systems to achieve the main goal of logistics: put the products of the required quality in a certain amount at the right time in a certain place at minimal cost. With this construction agrilogistic system passes all stages of the process control scheme: Aim → Strategy → Technology → Business → Processes → Logistic functions → Operation. Agrilogistic system focused on the size of the enterprise, and on its purpose. That is why, the maintenance of equilibrium processes in the system ensure its sustainable operation relies on providing a certain level of administration. The conceptual difference agrilogistic management system in this case is the inclusion of a central element of the administration, which has a number of information and analytic functions. The objectives of the logistics administrator are: optimal management of conflicts in the rural environment; construction and monitoring of virtual supply chains materials and agricultural product; advising on priority queues requests and results processing; optimization of internal delays traffic information flows; electronic monitoring of logistics operations; controlling of the full costs of logistics chain etc.. Criteria for the effectiveness of the logistics management can be defined: minimization of the complete logistics costs; maximizing profits in the supply chain; maximize the present value of income in the logistics system.

From the perspective of optimal dynamic control administration operates in performance objectives and existing service requests for information logistics administrator. Administrator mode requests received information about events and state processes in the logistics system. Administrative hierarchy is in real time according to the incoming orders flow and handle synchronization control actions. Source is the same logistics system that serves the generator flow of information. Their main characteristics are: the number and amount of requests (messages) direction, the movement, intensity, maintenance costs, the degree of certainty. Contour logistics management will understand how the chain connections of key logistics nodes impact on traffic flows in the logistics system. Contour of logistics management should be integrated into the organizational structure, built by the possible models: hierarchical, network and virtual.

### **Conclusions**

Formation of export potential of Ukraine is inseparably connected with the development and introduction of modern materials management models that rely on agrilogistics to minimize total costs. The greatest effect is achieved in integrated supply chain, implemented on the basis of large agricultural holdings by integrating raw material bases and industrial processing enterprises. In order to obtain consistent effect agrilogistic management systems are built based on the concept of administration where the administrator correct system behaviour and by submitting influences keeps the system in equilibrium.

### **Prospects for further research**

Modern agrilogistics requires further research in the direction of its functional blocks and formal models, including agrilogistics of crop and stockbreeding. Particular attention should be paid to the estimation of financial and information management, global orientation in space, compliance partnerships.

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