Agrologistics: the concept, significance, types

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Abstract. The article raises the question of the importance of the agricultural sector for solving economic issues in countries where agricultural production is one of the main directions of the economy. The role of agrologistics for the development of agribusiness and obtaining effective results from the implementation of agricultural activities is noted. The essence of agrologistics as an interdisciplinary direction in the agricultural sector is revealed. The types of agrologistics are considered. On the example of Russia, their problems are analyzed and appropriate solutions are proposed.

1. Introduction

Due to the current difficult economic situation in many countries, due to the coronavirus pandemic, complicated by other problems (for example, the presence of a number of sanctions by some states against Russia), the significance of the most powerful sectors of the economy is of particular importance for each country. For example, for Russia, agribusiness is one of these strong economic sectors. It was agribusiness that became one of the means of overcoming the protracted crisis that began from the moment sanctions were imposed by Western partners. However, it should be understood and accepted as a fact that the agricultural sector itself cannot develop separately from other sectors of the economy. Moreover, it is important for other areas of great importance for society and the state, for example, for food security [1], and at the global level [2], which is important, given other problems of modern society and the state [3]. Its effective development is impossible without a developed transport infrastructure [4; 5]. For example, for Russia, the problem of agrologistics is one of the major problems for this business sector.

Agrologistics is a relatively new interdisciplinary field in the agricultural sector, including the management of supply chains of agricultural products and raw materials from production to delivery to the consumer, combining agricultural production, marketing, management, and logistics. At the same time, agrologistics refers to the branch types of logistics and is responsible for material flows in the agro-industrial complex [6]. Accordingly, the macrologistic system of agrologistics fits into the classical scheme (Figure 1):

![Material flow diagram](https://via.placeholder.com/150)

**Figure 1.** Macrologistic system.
Agrologistics is associated with the application of logistics methods and provisions in the field of agricultural production, aimed at minimizing labour costs, resource costs, transport costs, by optimizing transportation routes, and ultimately reducing the cost of agricultural products.

The peculiarity of transport is that it does not process raw materials and does not create products, but by means of transport, services are provided for the delivery of relevant products to its consumer with a minimum duration of time, with the solution of related issues (customs, documentation, cargo safety, etc.) [7].

However, its role in the economy is very important:

- according to experts, due to outdated transport infrastructure, Russia loses 20-25% of the entire grain crop, while in economically developed countries this figure is equal to 1-2% [8],
- building optimal routes and correctly determining the effective distance is very important for planning the budget for the delivery of fertilizers, seeds, herbicides, and crops;
- excessive financial losses (which could be avoided) will affect the overall financial position of the agricultural enterprise
- the extra expenses that were initially laid down for inflated distances are one of the methods of embezzlement in the agricultural sector, which takes the situation to a different level, requiring attention from law enforcement agencies.

The Russian transport system consists of road, rail, aviation, sea, river and pipeline transport [9]. For the agricultural sector, rail, road and river transport are the most important.

2. Railway agrologistics

Railway transport is of great importance for the agricultural sector of the economy (for example, most grain is transported by rail). In Russia, 2/3 of all freight traffic is carried out by railway transport. However, the very state of railways and related infrastructure is becoming an increasing problem. The main reasons are the heavy load on this means of transport and significant wear and tear of rolling stock, as well as a lack of investment in the development of the railway, which results in significant delays in the allocation of grain cars during active periods of agricultural exports. Thus, about 62% of grain cars already have a service life of 21 to 30 years, taking into account the maximum standard service life of 30 years. With the assumption that grain cars are a specific product, they will not be used for a whole year (in fact, they will not make a profit). Thus, the purchase of such cars is not too profitable for railway companies, and therefore, not a priority, but for the agricultural sector the issue of the need to purchase its own fleet of cars is raised, which poses another question: where to get funds for its formation and maintenance.

It should also be noted that there was a shortage of cars in 2015. By decision of the Government of the Russian Federation, the maximum service life of freight railway equipment was reduced. This led to the write-off of 200,000 transport units, more than half of which were in the low-sided car segment. As a result, operators of large car fleets began to inflate prices for shippers. In 2015-2017, rates for renting low-sided cars increased from 560 rubles to 2000 rubles per unit per day [10]. All that happens despite the fact that there is a constant increase in tariffs for rail transport, which puts an additional burden on domestic agricultural producers.

There are many other problems, which, given the importance of railway transport for agribusiness, makes it necessary to involve the state in their solution. An example is the Long-Term Development Program of open joint stock company "Russian Railways" (hereinafter - the holding) until 2025, approved by the order of the Government of the Russian Federation, which key initiatives for the development of transport and logistics services include [11]:

- building long-term relationships with customers in the holding, improving customer feedback, increasing their loyalty, by means of creating and implementing an automated customer relationship management system in the field of freight transport among other things;
• creation of an automated resource for maintaining a unified catalog of services in the field of cargo transportation in the holding company, which provides consumers with access to the entire range of services, conditions and parameters of cargo transportation;

• development of logistics capabilities to meet the needs of customers in complex services, including global transport chains, logistics outsourcing of industrial enterprises (a program for the development and modernization of freight yards is being worked out, which is estimated at 27.4 billion rubles);

• increasing the predictability of cargo delivery by improving transportation with agreed departure and arrival times, reducing delivery times;

• adapting transport products and services to the needs of shippers and developing new products and services;

• standardization of the service quality in the field of cargo transportation with the establishment of parameters of availability, timeliness and reliability of transportation, cargo safety, the range of logistics and terminal storage services, delivery speed;

• development of small and medium-sized cargo shipments;

• development of technology for piggyback transportation; and others.

Another example is the formation of a nodal freight multimodal transport and logistics centers, defined by a complex plan for the modernization and expansion of trunk infrastructure for the period up to 2024, approved by the order of the Government of the Russian Federation from September 30, 2018 No. 2101-R [12]. Under the conditions of the macroeconomic trends laid down in it, the increase in loading until 2025 under the basic scenario will be 18%, cargo turnover - 21%, and under the optimistic scenario – 30% and 37%, respectively.

It is also important to harmonize the carrier's liability for late delivery of goods and empty freight cars, which would help to align the competitive conditions of its activities with other means of transport and other railway carriers within the framework of the Eurasian economic Union (EEU). In general, the analysis of methods for improving the quality of use of freight cars shows that in modern conditions, the most relevant of them are:

• transport routing;

• increasing the load capacity of cars;

• modification of cars;

• organization of cargo transportation on "solid" lines of the schedule. [13]

3. Automotive agrologistics

Road transport acts as a set of discrete economic agents that do not have significant links between themselves and technological dependence on the track infrastructure (as for example, this is the case in the railway transport system: "train-route-track infrastructure"). At the same time, road transport is an important element of agrologistics, providing the necessary flexibility and throughput.

Among the problems of automotive agrologistics that need to be addressed are:

1. For farmers, as well as for other road users, there is an urgent question about the quality of the latter. To solve the problem of improving roads in Russia, we should use the positive experience of other countries [14, 15], namely:

• strengthen control over the quality and management of road construction and repair work. To do this, you need to invite representatives from independent companies, including international experts.

• greater implementation of public-private partnership forms. This is very common in other countries when building bridges, roads, tunnels, and other infrastructure. However, for the
effective implementation of such forms, it is important to determine the mechanism for obtaining profit by a private investor. For example, this is:

- charge for use of motorways (despite the fact that you must first make such roads to introduce a fee for them).
- compensation by the state to investors at the expense of the budget if they do not receive profit. At the same time, we can immediately state that for Russia this should become the rule, not the exception, given the income of the population in general, and the financial capabilities of many companies in the agricultural sector, in particular, and its ability to implement additional spending, including budget refunds for toll roads.

2. Agricultural producers often exceed the weight standards when transporting their goods by road. Although this is an advantage for them directly, since fewer trucks are used, which makes grain deliveries more mobile and also reduces transport costs, this negatively affects the quality of roads. As a result, this turns against the farmers themselves, who are forced to carry cargo on broken roads. The solution to this problem is seen in the fact that the state:

- implemented the rationing policy in this area more clearly;
- exercised control (which would be a preventive measure to possible violations) on a permanent basis;
- has legally established serious sanctions against violators (so that the possibility of consequences for violators is commensurate with the fact of violation of regulatory requirements).

3. It is necessary to rethink the existing approaches to the organization of transport work in the agricultural sector, based on the awareness of their shortcomings and applying the achievements of scientific technologies that are quite accessible.

- when using the calculation of the optimal route on waybills, for accurate planning of the transport budget in the fields, you can use the technology of GPS: Agrologistics. The system will find the best routes and calculate the exact distances between fields, farms, and warehouses. Moreover, it will automatically insert the distance in the process map, which will reduce errors in manual operations;
- it is necessary to control transport transposition along the established routes. Moreover, to achieve maximum effect, it is important to do this from a unified management center. For example, in the solution of GPS: Agricultural Management for crop production, it is convenient to analyze the transport transposition. For these purposes, the analyst has a planned route and the actual track of vehicles.

Savings from using the new scenario only at the logistics planning stage can save more than 200 thousand rubles per 1000 hectares. [16]

4. River agrologistics

In many countries, river transport has not been widely used for various reasons. Including for solving transport problems in the field of agribusiness. Including in Russia, where river transport is not currently in demand. However, it should be noted that the prospects for development of this type of transport are very high. In particular, because river transport is much more profitable than rail and road, because it is less energy-intensive, although it is significantly inferior to the latter in the speed of cargo transportation. In this regard, many experts agree that the future of agribusiness is connected with river transport.

Until 1990, more than 160 million tons of cargo were transported along large rivers and shipping channels. Now the cargo traffic has significantly decreased. The main cargo is agricultural products...
(oilseeds and cereals). According to data provided by experts of the international company Baker Tilly, today the opportunities of domestic rivers are used by less than 1%, while in Germany and Romania this figure is from 13% to 27%. Due to the increase in prices for rail transport, it becomes obvious that the qualitative indicators of the waterway efficiency need to be improved, which is impossible without structural reforms.

This type of transport is considered promising for Russia due to the increase in prices for rail transport, although it is not as fast as others are. In addition, the river infrastructure is in poor technical condition. There are no modern elevators and shipping terminals built on water, which significantly reduces the capacity of river ports, river locks in most cases have exhausted the depreciation period, only about half of the internal waters of our country have guaranteed depths for safe navigation. The seasonality of river transport is considered another limitation for the development of river agrologistics. It is believed that the interest in river transport exists only in agricultural companies that have the same season of cargo transportation and navigation on the rivers. Companies that are engaged in transportation throughout the year are not interested in the development of river transport [17]. In order for river transport and river logistics to reach a new level and be fully used by farmers, it is necessary to solve a number of problems (Figure 2):

- dredging of rivers to increase their capacity
- creating equal competitive conditions in the river space
- updating river infrastructure
- availability of adequate tariff and other government policies

**Figure 2.** Optimization of river logistics.

5. **Conclusions**
In order to realize properly the huge agricultural potential of Russia, as a country with a powerful agricultural sector, it is necessary to:

- pay special attention to the development of transport infrastructure and improving its efficiency;
- carry out analytical work to identify existing problems (for example, knowledge of "weak" places allows you to concentrate point-to-point activities to strengthen them);
- to introduce new approaches to legislation, changing the current one and forming a new one [18];
- develop comprehensive programs (for example, food security [19], environmental engineering [20], etc.) to attract new participants to the agricultural sector and provide additional opportunities to solve existing problems there;
- generate human resource to train specialists in relevant areas at the appropriate level [21] and thus, modernize the education system under the expectations and demands of the agricultural market [22] in the context of creating conditions for realization of the right to education [23];
use the achievements of science and technology (new technologies and the process of
digitalization, taking into account its global nature [24] should centrally and purposefully
cover the agricultural sector, helping to optimize transport chains, ensuring the effectiveness
of solving logistics issues).

References
[1] Kurbatova S, Vlasov V and Aisner L 2020 Impact of risks and threats on the region's food
supply in the context of import substitution *E3S Web of Conferences International Conference
on Efficient Production and Processing (ICEPP-2020)* **161** 01089
[2] Vlasov V A 2020 Historical-legal aspect of the Genesis of formation and development of food
security at the global level *History of state and law* **1** 59-65
[3] Aisner L Yu, Eroshina A A, Ivanova N G etc. 2018 Actual psychological and pedagogical, philosophical, economic and legal problems of modern Russian society: Coll. monograph/*Ulyanovsk* Issue 3 403 p
[4] Tarkhanov O A, Sattarov V R 2019 Transport and logistics framework of strategic spatial
development of Russia *Problems of modern economy* **3** (71) 85-87
[5] Babich S V 2018 The role of transport in shaping the global world-economic system in Europe
*Law and state: theory and practice* **10** (166) 144-150
[6] Levkin G G, Popovich A M 2015 Fundamentals of logistics *Moscow - Berlin: DirectMedia* 387
[7] Kvitko K B 2020 Comparative analysis of international transport systems: infrastructure, ratings, transport corridors *Transport systems and technologies* Vol 6 1 15-29
[8] Agrologistics in Russia: problems and prospects
[9] Functional areas of logistics: contemporary issues of the study 2017 *Yekaterinburg* 253
[10] Barbariush A A 2017 Focus on the client. Information agency RZD-Partner.ru
[11] Long-term development program of open joint stock company "Russian Railways" until 2025
2019 Approved by the decree of the Government of the Russian Federation of March 19
[12] Comprehensive plan for the modernization and expansion of the main infrastructure for the
period up to 2024, approved by order of the Government of the Russian Federation 2101-R of
September 30, 2018
[13] Sokolov Yu I, Lavrov I M and Anikeeva-Naumenko L O 2008 Assessment of the extra-
transport effect of improving the quality of cargo transportation *Economics of Railways* **7** 24-33.
[14] Kibardina A S, Kraneva S G and Khalilullina A R 2020 Development of transport and logistics
potential of the countries of the Eurasian economic Union. *In the collection: vector of
development of management approaches in the digital economy materials of the II all-Russian
scientific and practical conference* (Kazan innovative University named after Timiryasov V G
Kazan) p 101-105
[15] Kurenkov P V, Kryazhev A N, Astafiev AV and Kazimirov M V 2016 Analysis of the
experience of implementing contrailer transport in the EU and the USA *Bulletin of transport* **5**
17-22
[16] Agrologistics: new technology of delivery optimization
[17] Abdurakhmanova L S, Bashirova A A 2019 Improving the efficiency of food supply through
the development of the system of agrologistics and wholesale distribution centers *Current issues
of the modern economy* **2** 08-115
[18] Kurbatova S M, Aisner L Yu and Naumkina V V 2019 Some aspects of the essence and legal
regulation of agriculture digitalization as one of the priorities of modern state policy of
agriculture development. *IOP Conf. Ser.: Earth Environ. Sci.* **315** 032021
[19] Vlasov V A 2010 Some problematic aspects of food security *Russian justice* **11** 18-24
[20] Kurbatova S M, Aisner L Yu and Naumkina V V 2020 Some legal aspects of environmental
engineering *IOP Conf. Ser.: Earth Environ. Sci.* **421** 072006
[21] Trashkova S M, Aisner L Yu 2017 Some normative and legal aspects of the development of
personnel support for rural economy branches as part of state policy at the present stage
[22] Kurbatova S M, Aisner L Yu 2019 Agricultural education Colloquium-journal No. 9-6 (33) Pp 39-41

[23] Mongush L, Rachinskii D V The right to education: some theoretical and practical issues 2016 Society: politics, Economics, law 2 142-144

[24] Rachinskii D V 2016 The global nature of the process of informatization Bulletin of the Buryat state University 3 9-13