

## Artículo de investigación

## The improvement of the model to develop the infrastructure of the grain product subcomplex as the essential attribute to increase the efficiency and ramp up of Russian grain export

### Совершенствование модели развития инфраструктуры зернопродуктового подкомплекса как необходимого атрибута повышения эффективности и наращивания объемов экспорта российского зерна

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#### Abstract

The directions of ramp up and increment of grain export efficiency and its interregional exchange in Russia are considered in Russia. The key element to achieve this strategic goal is the development of the production and logistics infrastructure of the grain-product subcomplex. The research shows the condition of the storage infrastructure is unsatisfying, its renewal is carried out at a slow rate, the major part is presented by on-the-floor storage objects of Soviet production, for this reason they are practically worn out. Increasing of capacity of deep-water ports and diversification due to Far East direction have been presented as the important direction of the development of export potential. The research proposes the model of the development of the production and logistics infrastructure of the grain-product subcomplex. It is based on the system of measures of state and economic regulation. The validity of the proposed

#### Аннотация

В статье рассматриваются направления увеличения объемов и повышения эффективности экспорта зерна, а также его межрегионального обмена в России. Ключевым элементом в достижение этой стратегической цели является развитие производственно-логистической инфраструктуры зернопродуктового подкомплекса. В исследовании показано неудовлетворительное состояние инфраструктуры хранения, обновление которой происходит медленными темпами, а большая часть ее представлена объектами напольного хранения еще советского производства, поэтому они практически полностью изношены. В качестве важного направления развития экспортного потенциала представлено увеличение мощностей глубоководных портов и диверсификация за счет дальневосточного

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model is determined by 5 principles: the realizable projects must be coordinated with state measures, to take into account the existing structure of regional grain production, to stimulate business investment activity, to increase the availability and efficiency of grain storage and transportation to the final consumer.

**Key words:** Grain, grain product subcomplex of agro-industrial complex (A.I.C.), grain production, grain market, food safety, interregional exchange, grain export, state and economic regulation, production and logistics infrastructure, strategic development, efficiency

направления. В исследование предложена модель развитие производственно-логистической инфраструктуры зернопродуктового подкомплекса, основанная на системе мер государственного и экономического регулирования. Действенность предлагаемой модели определяется соблюдением пяти принципов: реализуемые проекты должны координироваться с мерами государства, учитывать сложившуюся структуру регионального производства зерна, стимулировать инвестиционную активность бизнеса, повышать доступность и эффективность хранения и транспортировки зерна до конечного потребителя.

**Ключевые слова:** зерно, зернопродуктовый подкомплекс АПК, производство зерна, зерновой рынок, продовольственная безопасность, межрегиональный обмен, экспорт зерна, государственное и экономическое регулирование, производственно-логистическая инфраструктура, стратегическое развитие, эффективность

## Introduction

Grain is a strategically important product for Russia as the country's fodder supply depends on its providing, grain is also a stable inflow of foreign currency earnings for the country and a financial donor for the development of the other areas of agricultural production. This determines the backbone role of grain product subcomplex of A.I.C. in Russia. However, to provide increasing demands of domestic grain market and export it is necessary to make corresponding changes in the improvement of the condition of production and logistics infrastructure, which does not respond the strategic goals of the development of grain product subcomplex at present (Pinkovetskaia and Kryukova, 2018).

The development of storage and processing infrastructure and the increment of possibilities and grain logistics conditions serve as multiplicative direction, which solves several strategic tasks of grain product subcomplex at once. Firstly, it is reduction of transport and logistics expenses, it makes Russian grain more achievement-oriented in the world market and increases the efficiency of exporters, providing further stimulation to increase domestic grain production. Secondly, grain is used in a great

number of related sectors, that is why its price reduction decreases expenses of Russian enterprises. They use it in their production, including meat-and-milk production, import substitution is one of the top-priority tasks in Russian economy. Thirdly, it will contribute to the improvement of specialization and the division of labor due to the improvement of interregional and intersectoral exchange.

## Methodology

Model validity of the development of production and logistics infrastructure of grain product subcomplex of A.I.C. is determined by observance of the set of principles.

1. *Coordination with the state.* The investment attractiveness of new infrastructural projects for business will increase significantly if they are implemented with the participation of the state in the form of direct financial support for concessional lending, as well as accompanied by the implementation of related state projects for the construction and expansion of roads connecting these objects with an existing road network.

2. Accounting of the existing structure of production, processing and export of grain. The need to create a storage infrastructure should come from the actual volumes of grain production, taking into account its modern territorial distribution structure; the intensity of grain flow on main lines; the ratio of export potential and port capacity, taking into account the geography of importers of Russian grain.
3. Stimulation of investment activity of subcomplex business units. The development of production and logistics infrastructure must activate investment processes at all stages of the reproduction chain of the grain product subcomplex of A.I.C., increasing the volume of grain production and its processing.
4. Accessibility: the appliance of the model to develop infrastructure must provide business with more approachable modernization and realization of infrastructural projects and its realization must provide the growth of income from the export for direct producers.
5. Efficiency: the directions of the improvement of the model to develop the infrastructure of grain product subcomplex must contribute to reduction of transport and logistics expenses, increasing the efficiency of interregional exchange and grain export.

## The results

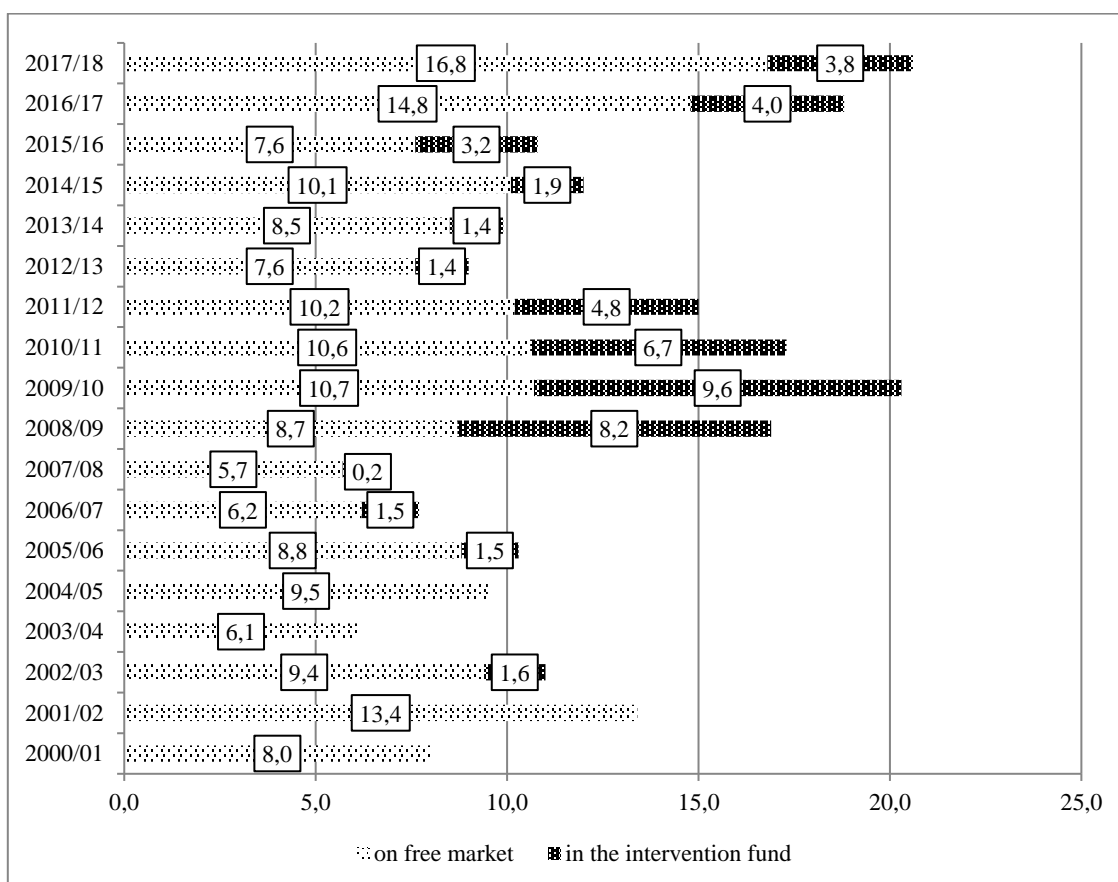
In Russia the unresolved problem is the lack of storage capacity necessary to meet requirements of the sector, its yield is seasonal. Whereas the requirement of it is increasing due to significantly increased yields that exceed even the results of the Soviet period. However, there is no increase in modern capacities of grain storage which is sufficient to such changes in its gross yield. Especially, stockpiling enterprises have the problem situation, their capacities do not have positive dynamics. At the same time the processing enterprises have a progress which is determined, first of all, by the construction of new high-tech livestock breeding complexes that provide demand on the production of animal feed. Since 2000 the total value of implemented capacities has been slightly more than 8 million tons of all at once grain storage. It is 6.9% compared to the average value for the period since 2014, which is characterized by yields of more than 100 million tons (table 1). For this reason Russia had 146 million tons of storage capacities at the beginning of 2018 and the amount of modern storage capacities with useful lifetime of less than 20 years is only 5.5%. Out-of-date infrastructure, especially on-the-floor storage, determines the loss and reduction of the quality of stored grain, the growth of expenses for electrical energy, moreover, its modernization is not reasonably, as it was built in the Soviet times and it is not complied with modern technologies. At the same time the requirement of new capacities grows in intensity as a result of the changed structure of the spatial location of grain seeds, which has become increasingly export-oriented recently due to the increase of grain export.

**Table 1.** The grain balance in Russia during the interval between 2014 and 2018, Mt

Indicators	Year					Average value
	2014	2015	2016	2017	2018	
Gross yield	105.3	104.8	120.7	135.4	113.3	115.9
Import	0.9	0.8	1.0	0.7	0.6	0.8
Industrial consumption	21.0	20.9	22.4	23.5	23.4	22.2
on seeds	10.9	10.7	11.3	11.4	11.1	11.1
on feed for cattle and poultry	10.1	10.2	11.1	12.1	12.3	11.2
Converted to flour, cereals, animal feed and the other purposes	46.4	48.2	51.7	56.5	52.5	51.1
Loss	1.0	1.1	1.2	1.2	1.2	1.1
Export	30.1	30.7	33.9	43.3	54.8	38.6
Personal consumption	0.1	0.1	0.1	0.1	0.1	0.1

Turning Russia into a global leader of grain export (first of all, wheat) involves the creation of an appropriate infrastructure for storage, logistics and transshipment. The size of grain export has increased by 80% for 5 years and it is almost 55 million tons. Moreover, the necessity of a more intensive increase in the capacities of elevators and granaries is still determined by the need for their long-term storage in order to avoid

loss of yield to meet the growing requirements of the domestic market. At the same time due to the high gross yield grain stocks are growing in free and open market and the intervention fund. The stability in the formation of grain stocks in free and open market and the intervention fund began to appear clearly from the season of 2008-2009, when the size of stocks significantly increased in relation to the previous periods (figure 1).



**Fig.1.** Grain stocks in the domestic market in Russia at the end of the seasons 2000/01-2017/18, Mt

The growth of stocks in the intervention fund indicates that the country's leadership has understood the necessity of the formation of stable grain stocks to provide food safety (Zyukin, 2018b). The justification of this perspective is based on the experience of bad harvest due to the drought in 2010, when the own production was not enough to satisfy domestic needs and to prevent foreign political pressure so as Russia could provide food safety for its population independently of sanctions (Zyukin, 2018a).

In all the current unfavourable state of the storage infrastructure determines the increase of

transport and logistics expenses, it is added by the decrease of the grain quality, as a result, it influences the rise in prices for grain and the decrease of competitiveness of its export. Therefore, the modernization and the increase of modern capacities of grain storage are one of the directions of the Strategy, though a clear mechanism to achieve it has not been presented yet (The long-term strategy to develop the grain complex..., 2019).

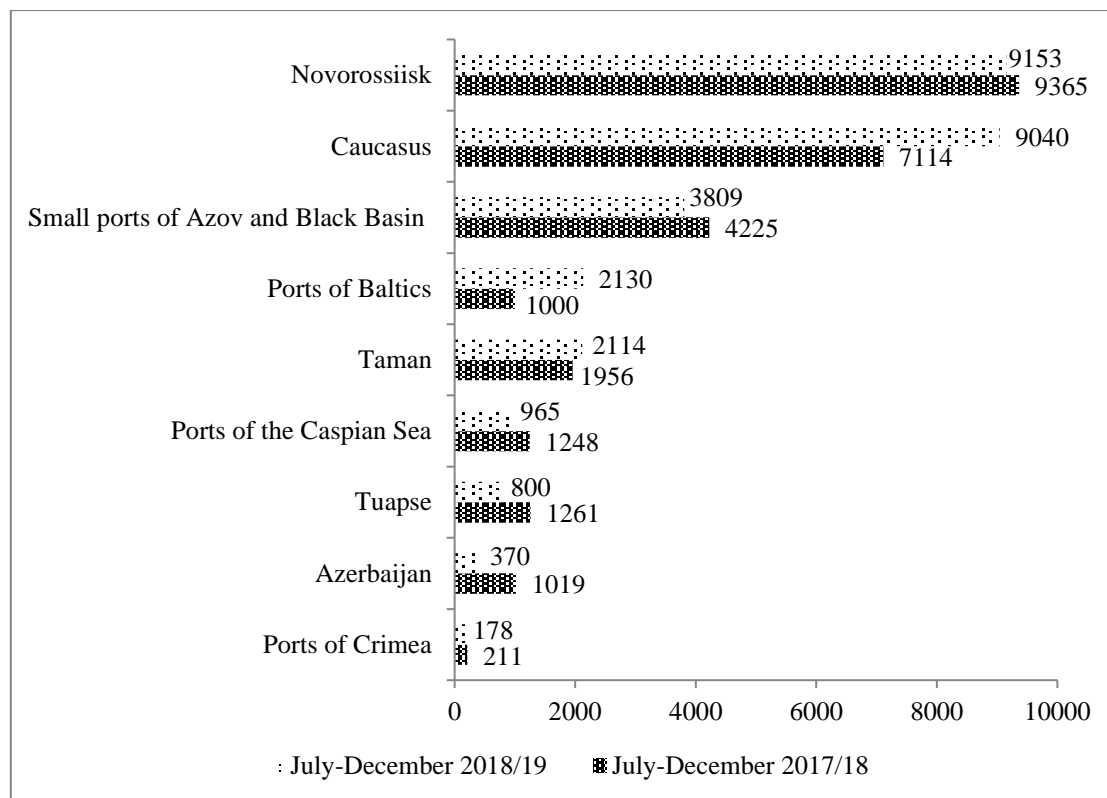
The implementation of large projects to construct of elevator capacities is advisable to carry out with the possibility of a more efficient organization of the movement of grain flows for

export. This is important to realize in conjunction with the development of the railway network, therefore, it is impossible to work without providing the state coordination between agribusiness and Russian Railways (which is a state business structure). Even large business cannot realize this project and it loses the efficiency without the connection with the railway system. As a result, the payback time increases. The experience of North America shows that the development of the storage infrastructure and the transportation of grain are more important in international market, so the state took part in its development (Fuller, Yu, Fellin, Lalor and Krajewski, 2003).

The implementation of the proposed infrastructure projects allows us to solve the important problem of grain transportation not only domestically but also for export, as it helps to improve the processes of coordination between all participants in the grain market. In particular, it can enable to improve the condition of the local grain market in large grain sowing regions (which have export potential, but they are far from the port capacities) due to sanitization. The presence of such storage terminals directly connected by the railway network with the port capacities enables to realize the innovative projects to stimulate agro export more effective, for example, “from the field to the port” oriented to debottlenecking of “narrow places” taking into

account restrictions on freight nodes (Agibalov, Tkacheva and Zaporozhtseva, 2018).

In addition to the development of the road network, a key issue in improving the logistics of grain flows for export is to increase the capacity of the port infrastructure, especially with regard to deep-sea port terminals. With a foundation of the existing infrastructure it is impossible to solve the problems of a qualitative transition to a new level of Russia as a grain exporter. It was created under the other specifics of functioning of the Soviet grain product subcomplex of A.I.C. So, at that period of time grain consumption exceeded its production, so there was no talk of large-scale export. It is necessary to diversify the production and logistics infrastructure to increase export supplies of Russian grain and to find new distribution areas. In particular, it is important to develop the infrastructure in Far East for further cooperation with the countries of Southeastern Asia, as today there is already an excessively high concentration of deliveries through the ports of Azov and Black Sea basin. According to the data of the company “Rusagrotrans” (which is railway infrastructure operator transporting grain cargo, agricultural and mineral and raw bulk goods in specialized hopper wagons) the main directions of export in the season from July till December in 2017/2018 and 2018/2019 were ports of Azov and Black Sea basin (figure 2).



**Fig. 2.** The main directions of grain export from July till December in 2017/2018 and 2018/2019, thousand tons

Russian port Novorossiisk is the largest port due to the volume of transshipments of export grain. The volume of transshipments has increased by 27.1% in port Caucasus and it has increased by 2.1 times in ports of Baltics. The grain transshipment in Azerbaijan decreased by 64% in real time. It can show that there is gradual re-orientation of Russian export to the own ports, not without the influence of the competition between Russia and Azerbaijan for the transportation of goods through the transportation corridor “North-South” and “East-West”. Through the small ports of the Azov-Black Sea basin the third volume of grain is shipped after Novorossiisk and Caucasus. At the same time shipping is the least through Far

Eastern infrastructure, Siberian grain is also exported through the Caspian Sea and Azov and Black Sea basin. Whereas the market of Pacific basin shows the high dynamics. The perspective of the development of this direction is determined by population processes. They are the most dynamic in the countries of Africa and Eastern and Southeastern Asia where the requirement of food and grain is growing, in particular (Sexton, 2013). Vietnam buys more than 2.5 million tons of grain, and the Philippines buys more than 1 million tons. It will be more comfortable and beneficial to deliver goods through Far Eastern ports, if the necessary transport and logistics infrastructure is created (table 2).

**Table 2.** The dynamics of export of Russian grain by major importers in 2014-2018, th. tons

Country	2014	2015	2016	2017	2018	Increment of growth, th. tonnes
Egypt	4079	4585	5893	7843	9592	5513.0
Turkey	5791	4698	3691	5026	6837	1046.0
Vietnam	15	0	130	1688	2592	2577.0
Iran	2249	2 301	1899	2172	2565	316.0



Sudan	877	356	860	1455	2149	1272.0
Saudi Arabia	1767	3 000	1392	1627	2111	344.0
Nigeria	710	878	1412	1386	1975	1265.0
Bangladesh	195	892	1912	1923	1863	1668.0
Lebanon	318	498	1237	1434	1395	1077.0
Indonesia	228	233	174	1184	1374	1146.0
Philippines	51	0	16	156	1023	972.0
Yemen	984	680	889	1435	1343	359.0

At the same time the impact on the Azov-Black Sea basin probably will not decrease under the diversification of deliveries through Far East, as export to the countries of Africa and the Arabian Peninsula is dynamically increasing. The creation of effective production and logistics infrastructure stimulates the increase of grain production due to innovative technologies in the eastern regions in the country, allowing to increase export potential of the country, diversifying the directions of deliveries and partners.

### Discussion

The infrastructural problems affect grain husbandry at all stages: from harvesting in the field till dispatching to final buyer. Altukhov A.I. finds the following problems as the main problems in the sectors of cereal-processing industry, which require urgent action: the creation of relatively favorable investment climate to have a technical and technological modernization of grain processing enterprises; increase of production of the grain volume with definite indicators due to its intended use and properties of location of the production base of grain processing enterprises throughout the country; the development of modern system of indicative planning in the sectors of grain processing production on the base of the use of purpose-oriented programme and their development (Altukhov, 2016).

Altukhov A.I. finds the transition of the sectors of grain processing industry to innovative and investment type of the development under the use of more effective investment mechanism of its innovative functioning, its commitment to the building of grain product cluster under the state and private partnership and rational distribution of production capacity of grain storage and enterprises of milling, baking, pasts, confectionery, starch, brewing, distillation and compound feed industries on the territory of the country as the solutions of these problems (Altukhov, 2016).

In the opinion of Popkov E.V. and Kucherenko O.I., the building of quick-mounting granaries, the installation of high-technology grain drying and grain-cleaning equipment, the usage of perspective technologies of grain storage can increase manufacturing capacity of grain storage in agricultural enterprises. Another perspective variant to store grain is building ring granaries, which are installed in a short period of time on a flat field (Popkova and Kucherenko, 2016).

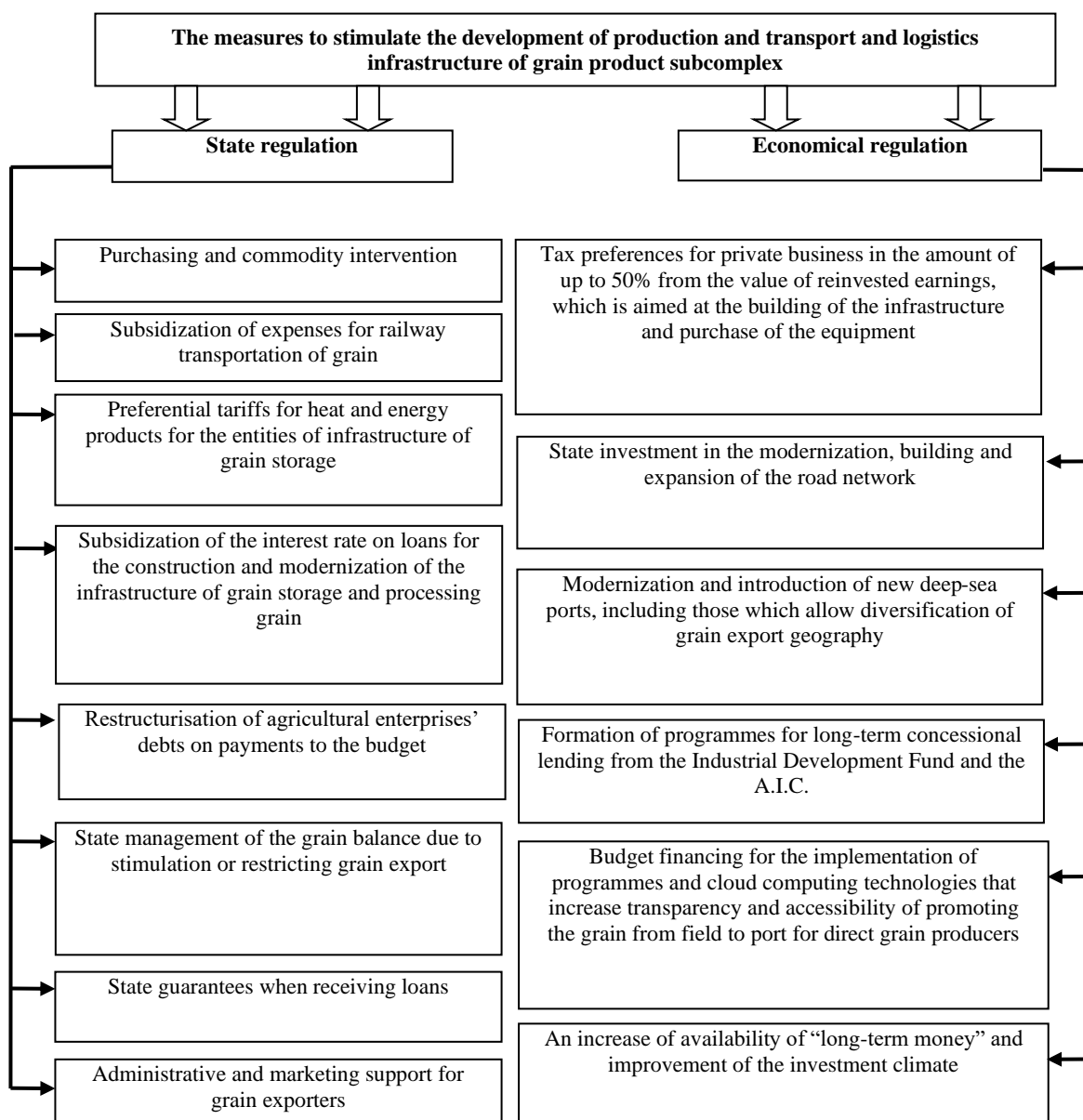
The creation of the appropriate level of logistics infrastructure is determined by state economic policy, which should be aimed at the development of the system of agricultural production, including grain farming. In the opinion of Mikitaeva I.R. (Mikitaeva, 2017), complex approach to solve this problem should meet the requirements of the regions in grain, providing warehousing and logistics services adequate to the business requirement, generating a demand for labour for the local labour market and an increase in tax revenues for the regional budget.

Morkovin D.E. thinks that public-private partnership represented by grain Commodity Credit Corporation should be used to maintain the income level of agricultural producers while reducing the pressure on the federal budget. This business- entities will realize the functions of purchasing and storing grain. It will provide removal of grain surplus from the local grain markets. Due to government benefits and subsidies for transportation tariffs there will be realized the movement of the production at competitive price for export from territorial entity of the RF, which do not have wide possibilities to do it (Morkovkin, 2019). However, in our opinion, the experience of the "United Grain Company" is not successful and has shown that there are significant weaknesses in its work. In Russia under modern conditions the activity of the state companies is connected to corrupt practices and as a result, it cannot provide the maximum efficiency. In this regard we think that it is necessary to increase the

regulatory role of the state, under the frame of its action there will be provided a redistribution of export revenues in favor of enterprises, which directly involved in cereal husbandry (Zyukin, 2019).

At this stage in the system of possible ways to develop the infrastructure of grain market, allowing to optimize the processes of interregional grain exchange and to support stability of grain export under the decrease of the logistics expenses the Government builds on the government regulations and supporting. Whereas the economic tools of the regulations are weakly operationalized or are not implemented at all.

The increasing volume of grain export and its domestic consumption, stimulating a more active movement of goods' flows in interregional exchange determine the search of directions and tools to improve the model of the development of production and trade and logistics infrastructure of grain production subcomplex of A.I.C. in Russia. The key to achieve this strategic goal is the complexity of applying both state and economic regulation measures, but in the future the second group of measures should have the priority under the optimal variant of the development (figure 3).



**Fig. 3.** The model of state and economical regulation of the development of production and trade and logistics infrastructure of grain production subcomplex of A.I.C. in Russia



Paying attention to the importance of grain as the product to develop the domestic agrifood market it is necessary to manage the grain balance in the country, stimulating or, on the contrary, restrain exports. As a result, it is impossible to put a stop to the measures of state regulation, but they must become more effective. There are also some directions of the state regulation and support which compensate for shortcomings of the financial model and the transport system, in particular, the inaccessibility of "long money" on the realization of the infrastructural projects and high tariffs to transport grain for interregional exchange and for export.

### Conclusions

Grain product subcomplex is one of the most important elements of A.I.C. in Russia, which has made significant progress recently: grain export has exceeded 50 million tons, while the growing needs of the domestic market are fully provided. At the same time there is a number of systematic problems which do not allow to reach more effective level of functioning of subcomplex. The key problem is production and trade and logistics infrastructure which does not meet the perspectives of the further increase of the harvest and trade flows of grain. Firstly, the infrastructure to store grain and produce animal feed is characterized by an unsatisfactory condition with a low share of high-tech elevators. It is complemented by a mismatch in its location under the changed realities of the structure of the territorial production of grain and by types of grain crops. Secondly, the activation of export and increasing of flows of interregional exchange have shown that there is a lag in the capacity of the system of roads and ports, in particular, in deep-sea terminals. Thirdly, the mechanism of state regulation and support is not enough effective to provide a more equitable distribution of incomes from export in support of direct grain producers. Besides, there is still the inaccessibility of attracting "long money" to realize private projects of modernization and building of storage infrastructure, processing and transportation of grain. Moreover, the minimal use of economical regulation tools to create conditions for attracting direct investment through tax preferences, modernization of transport and port infrastructure as part of federal programmes, the installation of cloud computing technologies in the field of increasing informatization and simplifying producers' access to grain for export.

The key directions in this situation are the optimization of placement and modernization of

the storage system and processing of grain; the improvement of the system of road and rail transportation of grain due to the basic principles of marketing and logistics; the development of cloud computing technologies and the other innovations in the field of informatization, which provide increased access and effectiveness of grain export for grain producers and a lower purchase price for domestic consumers; modernization and diversification of the port infrastructure in favor of deep-sea ports, allowing to expand the geography of Russian export and increase pass-through function. The model of state and economical regulation is the fundamental element to achieve the objectives of the development of the infrastructure of the grain product subcomplex of A.I.C. The further perspectives of increasing the production and export of grain will depend on the model's sustainability and effectiveness. Over the long run it is necessary to focus on transition in favor of the use of economic instruments of market regulations. However, the state cannot remove itself in any case and must be present in the grain market controlling the balance of grain, paying attention to significance of grain production subcomplex in the development of A.I.C. and maintaining of food independence.

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