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## Organizational and economic mechanism of agriculture modernization



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*The article substantiates the preconditions for the modernization of Russian agriculture. The effectiveness of the authorities' measures to stimulate the sector transfer to the intensive way of development is briefly described and evaluated. The article defines main disadvantages of the organizational and economic mechanism of the production modernization in the agricultural sector, consisting in different orientation of operations tools regulating the agrarian and industrial complex, absence of the accounting of climatic conditions and industry specialization. The methodological recommendations with regard to the allocation of budget support funds between different types of agricultural producers depending on their susceptibility to the use of scientific and technological progress are defined.*

*Agriculture, modernization, organizational and economic mechanism, susceptibility of agricultural producers to the use of scientific and technological progress.*

At present, Russia has objective preconditions for transferring agriculture to intensive development. Firstly, there is a need to increase its own production of agricultural products. In order to ensure food security of the country, it is necessary to reduce the share of imported milk and meat in the total volume of consumption, which amounted in 2012 to 21.5% and 25.6%, respectively. Secondly, the competitiveness of domestic products and productivity in the agricultural sector is to be improved up to the level of the best foreign farmers in a short period

of time. Otherwise, the latter can occupy a significant share of the national food market. It will suffice to note that as a result of high economic openness due to Russia's accession to the WTO, only for the last year the volume of import of butter increased by 50%, of pork – by 9.2%, of poultry meat – by 7%, of fish – by 4.5% [3]. Thirdly, it is necessary to achieve the ambitious goals, specified in a number of strategic documents, in which agriculture is considered one of the priority sectors of economy.

At the same time, it is obvious that under the conditions of annual crop areas disposal of turnover, deterioration of soil agrochemical properties and the low level of development of the material and technical base of the majority of agricultural producers, it is only possible to increase the volume of manufactured products if actively applying scientific and technological achievements and creating favorable environment for large-scale investments in the sector.

State government authorities adopted a number of measures, in order to modernize the agriculture. In particular, the authorized capital of JSC Russian Agricultural Bank increased by 160.3 billion rubles in the 2008–2012 period, so that to promote access to credit resources for agribusiness entities. In 2011 it was decided to deliver agricultural machinery from JSC Rosagroleasing warehouses with 50% discount, in order to create additional opportunities for technical modernization of production. Zero income tax rate was legislatively established for the entities of the agricultural sector. The rate of VAT for sale of breeding animals was reduced to 10%.

It should be noted that the use of available tools made it possible to “start up” modernization processes in agriculture. So, for the last five years 73 new broiler poultry facilities were launched, 200 operating broiler poultry facilities were reconstructed, 417 new dairy farms and complexes were built, 891 farm was upgraded. Russian agricultural producers acquired more than 100 thousand tractors, 35 thousand grain and 10 thousand fodder harvesters in the 2008–2012 period. Besides, qualitative changes took place in the machine and tractor fleet: the share of equipment with the lifetime of up to 3 years increased by 5–6 percentage points, as compared with 2006 [3]. However, these processes have been “local”, without affecting the majority of agricultural producers.

The main problem of the slow modernization rate in the industry is that certain tools of organizational and economic mechanism do not function. As a result, the effectiveness of its other components reduces sharply. Thus, the authorities are still unable to adjust pricing in the markets of agricultural products. According to the Federal State Statistics Service, in 2012, agrarians sold carrots, cabbage and potatoes cheaper than in 2008. Selling price of poultry, cattle milk, wheat was higher only by 20–25%. At the same time, the price of insecticides grew 1.8 times, of electric power – 1.6 times. The cost of tractors increased by 44%, of fertilizers – by 32% (*tab. 1*).

Unfortunately, the use of the tools of public procurement and commodity interventions of agricultural products does not have significant adjusting effect on price, and consequently on the revenue of producers. This is caused by the fact that the annual volume of agricultural production, sold in the country’s markets, is negligibly small and intervention starting date is often delayed; as a result, market prices have time to descent to an extremely low level, or on the contrary, to increase unreasonably.

In addition to commodity and purchasing interventions the authorities have been also taking other measures for the regulation of food market conditions: organization of agricultural fairs, incentives to create and promote regional brands. On the whole, however, this does not resolve the issue concerning sales of products at prices that are fair for farmworkers. Such situation is caused by the fact that the share of foreign capital in the food industry remains high. At present, foreign companies own about 60% of the milk processing market, 70% of the juice market, more than 80% of the market for frozen vegetables, fruits and brewing and about 90% of the market for canned fruits and vegetables [4]. Such multinational corporations as PepsiCo, Carlsberg, Coca-Cola, Danone have been actively buying Russian brands,

Table 1. Average sale prices of agricultural products and of industrial goods and services acquisition for agrarians throughout the Russian Federation, thousand rubles per unit

Production	2008	2009	2010	2011	2012	2012 to 2008, %
Garden carrot, ton	9.5	10.2	11.3	12.2	7.5	78.8
Cabbage, ton	8.0	6.9	11.0	10.8	6.5	81.6
Potato, ton	8.2	8.3	9.5	10.3	7.6	93.2
Tomatoes, ton	44.1	48.5	52.6	47.0	47.7	108.2
Chicken eggs, one thousand	2.5	2.4	2.3	2.5	2.7	109.4
Poultry, ton	45.1	54.2	53.0	54.5	55.2	122.4
Raw milk, ton	11.0	10.4	12.4	14.1	13.6	123.5
Wheat, ton	5.1	4.3	3.9	5.1	6.4	125.6
Pigs, ton	61.0	69.3	69.7	76.4	83.2	136.5
Nitrogen-based mineral or chemical fertilizers, ton	22.6	18.5	21.8	25.7	29.8	131.9
Agricultural universal tractors, unit	2049.5	2554.7	2054.2	2193.9	2946.1	143.7
Lubricating oils of all kinds, ton	33.4	34.9	31.9	40.0	51.0	152.9
Electric power, megawatt hour	2.2	2.8	3.4	3.8	3.5	161.9
Insecticides, kg	0.8	0.8	0.9	1.1	1.5	179.7

Source: Data of the Federal State Statistics Service. Available at: <http://www.gks.ru/wps/wcm/connect/rosstat/rosstatsite/main/price/#>

thus increasing the level of monopoly power in the food industry and getting the opportunity to influence the level of prices for agricultural raw products.

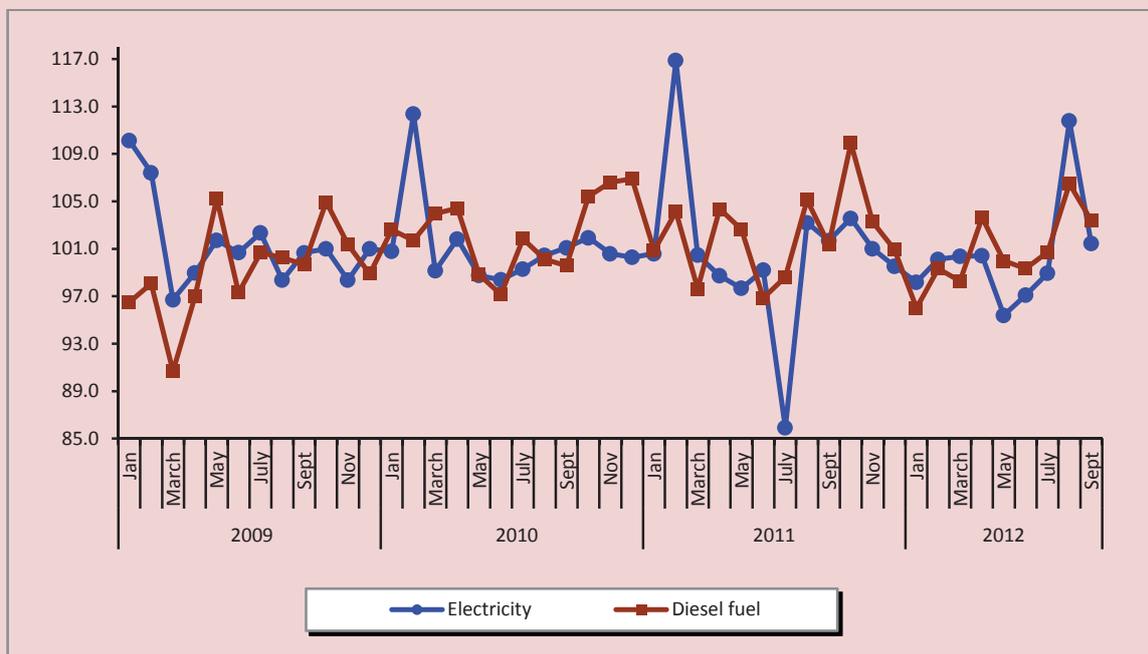
With the tools available the authorities are not able to adjust seasonal price fluctuations in the market of agricultural products either. The analysis of the data of the Federal State Statistics Service reveals that in 2009–2012 the rise in prices (tariffs) of diesel fuel and electricity, purchased by agricultural producers, as a rule coincided with the beginning of the fieldwork (*fig. 1*). Moreover, sale price of milk declines in spring and winter, and increases only in summer and autumn months (*fig. 2*). In this situation, the majority of agribusiness entities experience shortage of own funds for sowing and fodder procurement campaigns, and have to borrow funds, thus incurring additional expenses on loan servicing.

Low profitability and investment attractiveness of agricultural production is a consequence of the fact that the set of market regulation tools is not effective. Thus, according to the accounting reports of the RF Ministry

of Agriculture, in 2012 the level of profitability of agricultural enterprises by overall activity, even including the subsidies, amounted to only 14.6%.

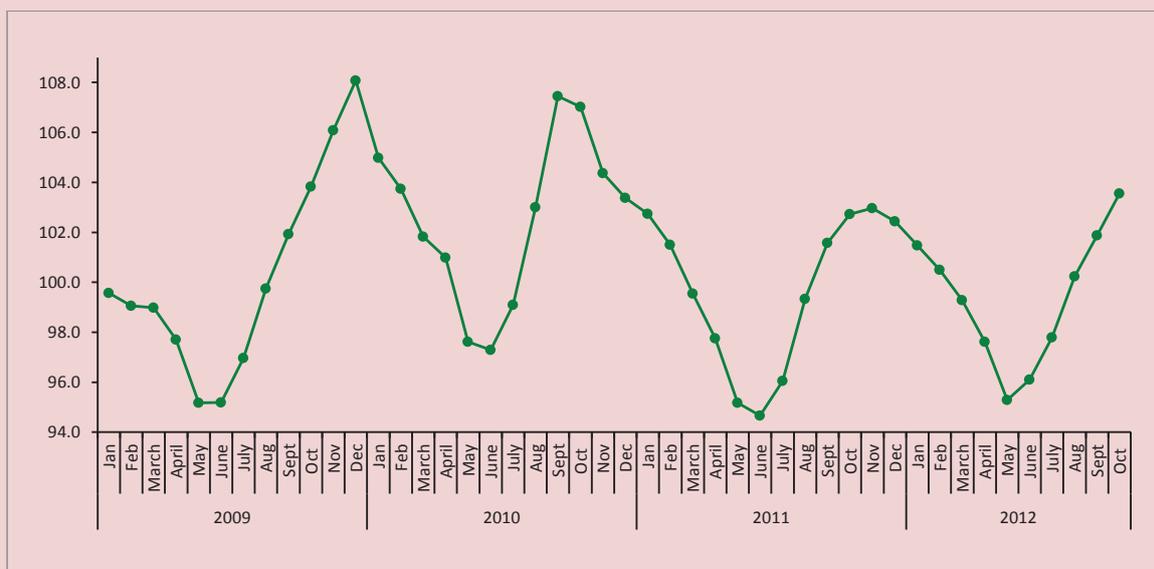
The state will compensate part of the production and investment expenses of the agrarians, in order to reduce losses from market failures. For one thing, however, the amount of budget support remains low. In particular, this is evidenced by the fact that only 0.58% of GDP is allocated to agriculture in Russia, whereas in the USA – 1.3%, in EU – 2.8%. Secondly, most of the budget funds are allocated in recent years to partially recover credit interest expenses, so, in fact, not for the production development, but for the development of market infrastructure, which is connected with financial institutions. Besides, the attractiveness of the agricultural sector for the bank remains low under the conditions of the unprofitability and debt load of the majority of economic entities, low liquidity of the existing assets. Therefore, the current tools of state support are available only for a limited number of enterprises.

Figure 1. Rates of growth (decline) in Russia-averaged prices of diesel fuel and electricity, purchased by agricultural producers, as a percentage of previous month



Source: the author's calculations. Data of the Federal State Statistics Service. Available at: <http://www.fedstat.ru/indicator/data.do>

Figure 2. Rates of growth (decline) in Russia-averaged prices of milk, sold by agricultural producers, as a percentage of previous month



Source: the author's calculations. Data of the Federal State Statistics Service. Available at: <http://www.fedstat.ru/indicator/data.do>

Consequently, the measures of economic stabilization and development of the Russian agricultural sector have little impact on its condition and do not consider the peculiarities of modernization processes to the fullest extent.

As was rightly pointed out by the academician of the Russian Academy of Agricultural Sciences I.G. Ushachev, another disadvantage of the established mechanism is that it is not differentiated with respect to each group of producers, does not take into account natural and economic differences of regions, as well as industry specialization [5].

It should be added that the existing principles of budget funds allocation also require adjustments. In most cases, in order to determine agricultural entities that can be the recipients of subsidies (grants), the authorized executive body holds a contest for the inclusion of entities in a programme, as all the funds are allocated on a programme-oriented and goal-oriented basis. The decision is made based on such criterion parameters as the number of created jobs, the availability of production assets, livestock inventory, total area of land, no outstanding tax liability, payback period of the investment project. However, the indicators of agricultural producers' susceptibility to use innovations are not sufficiently considered by the contest committee. Therefore, it is unclear, which of the applicants has more opportunities

for production modernization. In this regard it is reasonable to expand the applied system of indicators and make the assessment by two criteria – resource and effective (tab. 2). The first criterion reflects the assets (financial) security for agricultural production, the possibility of intensification. The second criterion characterizes the effectiveness of assets (funds), i.e. their quality.

The generalization of the available scientific developments showed that the susceptibility of agrarians to the use of scientific and technological achievements is still estimated by applying range of partial indicators. As a result, it is impossible to get a comprehensive overview of processes existing in the agricultural economy and their causes. Moreover, it is difficult to typologize agricultural producers and to elaborate differentiated support measures. Due to these circumstances, the author finds it necessary to calculate the integral index value by the 4-stage methodology.

*Stage I – the substantiation of the indicators structure.* When selecting partial indicators, several important requirements are to be considered. Firstly, they should reflect all aspects of the study object and be compatible with the existing accounting and statics system. Secondly, the indicators should describe the region's specialization in producing agricultural products. Thirdly, it is advisable

Table 2. Assessment criteria and indicators of susceptibility to the use of scientific and technological achievements in agriculture

Resource criterion	Effective criterion
1. Value of fixed assets per 100 ha of arable land, thousand rubles	1. Labour costs to produce 1 metric centner of product, man-hour
2. Amount of power capacities, hp per 100 ha of arable land	2. Cost of agricultural output per unit of financial costs for production, rubles / rubles
3. Electricity consumption per 100 ha of arable land, kWh	3. Crop yield increase per 1 ha, %
4. Volume of mineral fertilizers per 1 ha, kg application rate	4. Productivity increase per 1 head of cattle, %
5. Feed consumption for 1 metric centner of product, metric centner of fodder units	5. Loss reduction when growing and harvesting agricultural crops and livestock, %
6. Share of specialists with higher education in the total number of personnel, %	6. Improvement of product qualitative characteristics (for example, fat, protein content of milk), %
	7. Share of areas sowed with elite agricultural seeds, %
	8. Share of breeding animals in the total livestock number, %
	9. Number of cattle heads per 1 operator
	10. Comfort level of agricultural machinery, technological operations
	11. Humus average indicator, %
	12. Share of acid soils, %

to use the indicators that have crucial effect on the susceptibility of agribusiness subjects to the use of scientific and technological achievements. Partial indicators have been determined, taking into account the above-mentioned requirements that can be applied to the regions, dominated by dairy breeding, and include the following:

- Amount of power capacities, hp per 100 ha of arable land;
- Volume of mineral fertilizers, kg application rate per 1 ha;
- Share of brood cows in the total livestock number, %;
- Number of cows per 1 operator, heads;
- Value of fixed assets, thousand rubles per 100 ha of arable land;
- Share of specialists with higher education in the total number of personnel, %;
- Cost of agricultural output per unit of financial costs for production, rubles / rubles.

*Stage II – the calculation of partial indices* in the form of normalized data by the method of multidimensional comparative analysis (by matching actual values with the best values in the sample). In case the impact of the indicator on the size of the partial index is positive ( $I_k$ ), the actual value ( $V_{act}$ ) is correlated with the maximum value ( $V_{max}$ ) considering its main

characteristics, in case it is negative – the ratio between the minimum value ( $V_{min}$ ) and actual value is determined:

$$I_k = \frac{V_{act}}{V_{max}} \quad I_k = \frac{V_{min}}{V_{act}} \quad (1)$$

*Stage III – the calculation of integral index* ( $I_i$ ) as a sum of partial indices:

$$I_i = \sum_{k=1}^n I_k \quad (2)$$

*Stage IV – interpretation of an integrated assessment of agricultural producers* within the margins of the integral index. In accordance with the Gaussian distribution, it is possible to determine five levels of susceptibility: low ( $I_i < 1.4$ ), below medium ( $1.4 < I_i < 2.8$ ), medium ( $2.8 < I_i < 4.2$ ), above medium ( $4.2 < I_i < 5.6$ ), *high* ( $I_i > 5.6$ ).

The approbation results of the proposed methodology on the materials of the Vologda Oblast show that the high-level group invariably comprised mainly agricultural enterprises of Vologdsky and Cherepovetsky districts, the group with above-medium level – agricultural enterprises of Sheksninsky and Gryazovetsky districts. These enterprises are also the main recipients of budget funds (*tab. 3*).

Table 3. Allocation of subsidies provided to agricultural enterprises in 2012, in terms of the Vologda Oblast municipalities

District	District's share in:					
	Volume of subsidies		Number of agricultural enterprises		Volume of agricultural output	
	Million rubles	As a percentage of total	Units	As a percentage of total	Million rubles,*	As a percentage of total
1. Vologdsky	203.0	25.7	29	12.4	125.6	35.3
2. Cherepovetsky	74.2	9.4	24	10.3	71.2	20.0
3. Sheksninsky	63.2	8.0	16	6.9	35.0	9.8
4. Gryazovetsky	122.3	15.5	11	4.7	33.9	9.5
<b>Altogether (1-4)</b>	<b>462.6</b>	<b>58.6</b>	<b>80</b>	<b>34.3</b>	<b>265.7</b>	<b>74.6</b>
Other districts	327.2	41.4	153	65.7	90.6	25.4
Total	789.8	100.0	233	100.0	356.2	100.0

\* in comparable prices of 1994.

The enterprises of Syamzhensky, Nyuk-sensky, Babushkinsky and Vytegorsky districts are constant outsiders of the rating, where, for example, the capital-labour ratio was from 10 to 27 times lower than that of the leader, and the energy supply – from 3 to 7.5 times lower.

In accordance with obtained results, the author considers it appropriate to provide the principal amount of budget support (50–60% of funds) to 15% of the organizations that upon assessment achieved the highest values of the integral index, i.e. the enterprises that are the most susceptible to the use of innovations, and are concentration points of production. The main development potential of the industry is focused in them; therefore, there is high probability that the funds invested in the modernization will have significant effect. At present, the amount of budget support to the agricultural sector is diluted between producers. In 2011, for example, 55% of the funds were accumulated in 36% of organizations (*tab. 4*). As a consequence, no significant positive changes are observed in the state of their material and technical base.

Organizations that are most susceptible to the use of innovations should have the right to receive additional subsidies for 5–7 years. At that, these enterprises will not be able to participate in the next selection in 2 years. The system of budget funds allocation, organized by the aforementioned principles, implies the

possibility to annually support from 30% up to 45% of agricultural enterprises starting from the third contest.

The acceleration of the modernization of the agricultural sector requires not only changes in methodological approaches to the allocation of the funds of budget support. It is obvious that in order to accomplish the task, it is extremely important to rationalize price ratios in the inter-industry exchange, to improve the efficiency of tools regulating the market of agricultural products, raw products and food, to stimulate the development of consumer cooperation.

The standpoint of scientists [2, 6], who identify the development of innovation infrastructure as an essential prerequisite for the acceleration of the agricultural modernization, is beyond doubt, as well. The world and national experience proves that for example, in the regions with effectively operating agronomic parks, information and advise services, it is possible to unite the efforts concerning the organization of educational, research, innovation activities; to improve the quality of training specialists for the agro-industrial complex, as well as to ensure the transfer of innovations to production.

Undoubtedly, Russian agriculture cannot be transferred to the intensive way of development mainly on the basis of foreign equipment and technologies, considering that

Table 4. Allocation of subsidies in 2011, in accordance with the susceptibility level of agricultural producers to the use of scientific and technological achievements

Fact (2011)		Forecast		
Share in the number of organizations receiving subsidies, %	Share in the volume of the received budget funds, %	$I_i$ values	Share in the number of organizations receiving subsidies, %	Share in the volume of the received budget funds, %
36.2	54.8	$I_i > 5.6$	15	50–60
27.6	22.3	$4.2 < I_i < 5.6$	20	15–20
17.7	16.5	$2.8 < I_i < 4.2$	30	10–15
11.2	5.7	$1.4 < I_i < 2.8$	20	6–9
7.3	0.8	$I_i < 1.4$	15	4–7

domestic agricultural science came up with practical solutions for producers, corresponding to the 5th–6th waves of innovation. In this connection it is necessary to create favorable conditions for commercialization and mass distribution of the developments. The state should play the main part in this process. The RAS full member S.Yu. Glazyev points out, “under the conditions of maturing “knowledge-driven economy” the state cannot but assume the functions of the intellectual and information centre on the regulation and strategic planning of economic development, of maintaining the scientific and technological

environment, including the fundamental knowledge and exploratory research base, institutes of applied research and experimental development, preproduction network and mechanisms for the implementation of new technologies” [1, p. 13].

The authorities have the tools of fiscal, monetary, price, antimonopoly and foreign economic policies for creating favourable macroeconomic conditions for Russia’s agricultural modernization. It is essential that each of them is appropriate for the tasks of the industry’s transfer to the intensive way of development.

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