

Efficiency of Subsidies and Inclusive Development of Agriculture During the Implementation of State Programs

Vadim Demichev^{1,*}, Anastasiya Nestratova¹

¹ Russian State Agrarian University – Moscow Timiryazev Agricultural Academy, Russia

*Email: yadi.demiche@mail.ru

ABSTRACT

The article evaluates the effectiveness of subsidies provided to agricultural organizations in the period 2006-2018, particularly in the context of the development of the inclusive economy. The latter implies the need to monitor not only economic and production, but also social and environmental performance. The study typifies the regions by the amount of subsidies provided, and evaluates the dynamics of economic, industrial, social, and environmental efficiency in the selected groups. On the basis of the regression analysis for a set of Russian regions, the factors of efficiency of subsidies and production of agricultural organizations are identified.

Keywords: *Regional agriculture, Inclusiveness, Subsidies, Efficiency.*

1. INTRODUCTION

The period from 2006 to 2018 is a unique period of time for the modern Russian agricultural economy. In the 1990s, until the crisis of 1998, when investment in agriculture decreased by 97% compared to 1990 [1], agriculture was actually "one on one" with all the economic problems that arose during that period. After the default in 1998, agriculture received macroeconomic grounds for the development, which actually exhausted themselves by 2002 [1]. These conditions remained until 2006, when the state adopted the Federal law on agricultural development and started implementing the priority national project, and later the state program for the agricultural development. During the period 2006-2018, which is the period of our study, about 1.6 trillion rubles of Federal subsidies were allocated to agriculture.

At present time, the state program has been extended until 2025, but it is already interesting to assess the effectiveness of state support for agriculture in terms of shaping the future agricultural policy of the state. When forming a new policy model, it is necessary to take into account domestic experience, as well as modern foreign practices of economic development. The most modern economic model in developed countries is the inclusive

development model [2,3,4]. This means a combination of economic growth, social equality and justice, and environmental conservation. Inclusivity implies alternative metrics for evaluating effectiveness that take into account not only economic growth, but also other aspects of the modern understanding of efficiency [8,9,10].

Subsidies are a tool for supporting domestic farmers, stimulating the development of production, and able to determine the priorities of agricultural modernization. The purpose of this study is to identify the main factors of the effectiveness of agricultural subsidies as one of the key tools for agricultural development, as well as to assess the economic, industrial, social and environmental effectiveness of agriculture as the basis for inclusive development.

2. RESEARCH METHODOLOGY

In the article, along with general scientific methods, statistical methods were also widely used, including:

Table 1. Interval series of distribution of Russian regions in relation to subsidies in the region to the average for the aggregate of regions (on average for the period 2006-2018)

No.	Number of regions	The amount of subsidies in the region to the average by region, times	Share in the amount of subsidies, %	The share of the total production, %
I	39	0.27	17.2	19.5
II	20	0.97	25.3	24.5
III	14	1.76	31.7	37.0
IV	5	3.71	25.8	18.9

Source: calculated by the author.

typological grouping, regression analysis, and calculation of dynamics indicators. The key data sources for the analysis were statistical collections of Rosstat ("Regions of Russia", "Agriculture in Russia", "Investments in Russia"), statistical publications of the Ministry of agriculture ("Agro-industrial complex of Russia"), as well as data from the all-Russian agricultural census of 2016 and other sources. The main indicator in the study was the indicator of budget subsidies attributed to the results of financial and economic activities of agricultural organizations [5].

3. RESEARCH RESULT

The distribution of investment activity across the Russian regions is uneven [6], which indirectly indicates a possible uneven distribution of subsidies. The latter may lead to the decrease in equal access of regions to opportunities for economic growth, and hence inclusive development.

To typify regions by the level of state support for agriculture, it is good to consider the differentiation of

regions by the amount of subsidies received. For this purpose, we will construct an interval series of the distribution of the Russian regions by one specific feature (table 1).

The total of 78 regions of the Russian Federation (federal cities, autonomous districts, and the Republic of Crimea were excluded from the total) is divided into 4 groups. In the first group (I), the average amount of subsidies was 27% of the national average. The agricultural organizations of the regions in this group in total received 17.2% of the total amount of subsidies during the study period. The next group (II), whose grants were approximately at the national average, received 25.3% of the total amount of subsidies. The last two groups of regions (III and IV) received 1.8 and 3.7 times more subsidies, respectively, compared to the Russian average. In other words, the share of 19 federal subjects accounted for 57.5% of subsidies for the entire study period. The fourth group includes such regions as Belgorod (6.1% of the total amount of subsidies for the period 2006-2018), Bryansk (3.6%), Voronezh (4%)

Table 2. Economic efficiency of production in the agricultural association (on average for 2006-2018)

Indicator	Group number				On average
	I	II	III	IV	
Amount of profit (loss)*, RUB based on:					
1 ha of arable land	-202	360	1056	291	499
1 thousand rubles of the cost of agricultural products	-5.64	16.01	31.82	6.29	15.80
Production profitability, %: **					
without subsidies	-12.97	-0.84	4.27	-4.30	-6.21
including subsidies	9.95	11.66	13.39	10.40	11.04
Profitability, %:					
investment in fixed assets*	36.17	53.99	55.63	53.24	52.11
subsidies'	-19.02	46.15	110.21	13.71	46.90

Source: calculated by the author. * - including subsidies. ** - calculated as the arithmetic mean for the period 2006-2018.

Table 3. Dynamics of indicators of economic efficiency of agricultural association

Indicator	Group number				On average
	I	I	III	IV	
Profit per 1 ha of arable land, thousand rubles:					
2006	0.26	0.20	0.73	0.39	0.42
2018	1.54	1.99	3.38	4.60	2.70
Profit per 1 RUB of agricultural products, thousand rubles:					
2006	0.02	0.02	0.05	0.02	0.03
2018	0.03	0.06	0.05	0.06	0.05
Profitability without subsidies, %:					
2006	-12.2	-3.9	6.4	-1.6	-6.1
2018	-6.7	3.3	6.8	-0.9	-1.3
Profitability including subsidies, %:					
2006	5.7	5.6	12.4	6.2	6.9
2018	12.8	11.7	13.0	8.0	12.2
The specific weight of unprofitable organizations, %:					
2006	39.9	38.7	29.6	34.5	37.4
2018	34.0	27.2	26.9	27.6	30.6

Source: calculated by the author.

regions, the Republic of Tatarstan (9.1%) and Bashkortostan (3.1%).

It is worth noting that the share of regions in the volume of subsidies received is higher than the share in the volume of production in the second and fourth groups. The share of the first and second groups in the total volume of agricultural production decreased by 4%, while the third and fourth groups increased by 7 and 1%, respectively.

The largest amount of profit per 1 ha of arable land and per 1 thousand rubles of the value of agricultural products is observed in the third group of regions (table 2). The highest value of profit per 1 ha of arable land on average in such regions as the Belgorod region (8052 rubles per 1 ha of arable land), the Krasnodar territory (4378 rubles), the Leningrad region (3886 rubles). The largest loss in the regions is the Murmansk region (26884 rubles), the Republic of Sakha (17565 rubles), and the Sakhalin region (7082 rubles).

Table 4. Dynamics of production efficiency indicators of agricultural associations (on average for the period 2006-2018)

Indicator	Region group number				On average
	I	II	III	IV	
Agricultural products per 1 ha of arable land, thousand rubles:					
2006	16.13	9.94	14.38	18.02	13.53
2018	51.47	32.66	65.78	73.73	52.43
Grain yield, hundredweight/ha:					
- average	17.5	20.0	25.1	27.0	20.1
- absolute increase	5.9	5.7	5.4	11.7	6.1
Milk yield per 1 cow, kg:					
- average.	3644	4426	4956	4520	4136
- absolute increase	1913	2653	2334	2579	2248

Source: calculated by the author.

Table 5. Dynamics of social performance indicators in rural areas

Indicator	Group number				On average
	I	II	III	IV	
Wages in the agricultural sector to the average for the economy, %:					
2006	51	52	53	51	52
2018	89	79	75	82	84
Commissioning:					
- residential buildings, thousand square meters:					
2006	52	83	344	300	128
2018	115	219	648	564	266
- general education institutions, educational places:					
2006	208	303	564	1295	366
2018	260	150	340	143	239
- highways under the Federal target program, km:					
2006	2.4	1.4	1.9	11.2	2.6
2018	4.7	19.3	9.6	32.2	11.1

Source: calculated by the author.

The average return on production, excluding subsidies, took a positive value only in the third group, which also has the highest return on investment in fixed assets and subsidies. Thus, the regions of the third group, where the volume of state support is higher than the Russian average, showed the greatest efficiency. For further comprehensive analysis of the selected groups, it is necessary to analyze the dynamics of factor and performance indicators.

The analysis of the dynamics allows to understand better the effectiveness of changes that occurred during the study period. It was possible to analyze which groups are the leaders of development, and which have developed at a slower pace. In dynamics (table 3), the best values of indicators were shown by groups II and IV, with the exception of the profitability indicator, the

largest increase in which was shown by groups I and II. Regarding group IV, this clearly shows that the increase in subsidies to these regions has led to an increase in the profitability of production per unit of resource. Minor changes in indicators in group III can be explained by high values in this group of indicators before the study period, since the group consists of agricultural regions of our country. In addition, the indicators of economic efficiency are influenced by the sectoral structure of the regional agro-industrial complex, where the predominance of animal husbandry underestimates the average values of profitability indicators.

While the greatest increase in grain yield there is in group IV, and milk yield per cow is in groups II and IV. High values of indicators in group IV indicate that significant state support resources brought to these

Table 6. Environmental performance indicators for selected groups of regions

Indicator	Group number				On average
	I	II	III	IV	
Coefficient of methane emissions from internal fermentation processes in 2015, kg/head per year					
cows	115	142	141	140	128
other livestock of cattle	58	59	56	77	59
Emissions of pollutants into the air from stationary sources, thousand tons:					
2006	136	150	802	180	262
2018	121	124	611	234	217

Source: calculated by the author.

Table 7. Dynamics of factor indicators of efficiency of state support for agricultural associations

Indicator	Group of regions				On average
	I	II	III	IV	
Mineral fertilizers per 1 ha of agricultural crops, kg of d.v.:					
2006	18.3	24.5	38.8	48.1	25.6
2018	47.4	45.3	62.0	80.3	51.7
Feed consumption per conventional head of cattle					
2006	26.5	29.8	29.7	29.9	28.1
2018	28.0	31.1	29.0	30.3	29.1
Energy capacity per 1 employee:					
2000	48.5	54.1	53.6	52.0	51.1
2018	75.2	83.1	81.9	70.9	78.1
Average amount of subsidies per 1 thousand rubles of the cost of agricultural products, RUB.	29.7	34.7	28.9	45.9	33.7
The amount of capital investment of the Federal budget by 1 ruble of the capital investment entities, RUB.	2.7	1.6	1.6	0.4	1.5
The share of animal husbandry in agricultural production in 2018, %	55	49	31	54	42
The average score of productivity of climate	107	126	133	140	119

Source: calculated by the author.

regions had a positive impact on the development and intensification of production. In the third and fourth groups of regions, the growth rate exceeded the national average.

In the regions of groups III and IV, the dynamics of social performance indicators is lower compared to the indicators of groups I and II (table 5). It is particularly worth noting the high values of such indicators as the commissioning of residential buildings in rural areas, the commissioning of general education institutions and the commissioning of highways in rural areas, for which the dynamics of indicators in groups I and II of regions is significantly higher than the national average and the dynamics of indicators in groups III and IV. The relatively low dynamics in the third and fourth groups can be explained by the higher level of rural development in the period preceding the study period.

An important aspect of the modern economy is its interaction with the environment (table 6). The funds allocated to the development should not disturb the ecological balance, but they also should strengthen it and preserve the natural environment [7]. Here it is worth noting the high levels of methane emissions in the regions of the fourth group, which is explained by the growth of meat cattle production in these regions.

The next important point is to consider the efficiency factors and answer the question of what, along with subsidies, contributed to or vice versa hindered the

effectiveness of state support and production efficiency in general.

In groups III and IV of regions, almost all indicators affecting the efficiency of production and subsidies are higher than in groups I and II. Particularly important indicators are the application of mineral fertilizers per 1 ha of crops, the ratio of subsidies to the average value for the population of regions, the amount of subsidies per 1 thousand rubles of agricultural products. The average score of productivity of climate.

Based on the factor indicators in table 7, regression models that reflect the relationship with performance indicators are built (table 8).

High value of coefficient of determination (R^2) confirms the existence of a relationship between successful performance and the following factors: the proportion of livestock in the region, the amount of subsidies per 1 ruble of production, power, and average productivity of climate, mineral fertilizers, the level of subsidies provided, the ratio of capital investments from Federal and regional budgets.

The subsidy rate per 1 RUB of the cost of agricultural products has a negative impact, which can be explained as follows. Relative to the cost of production, more subsidies were provided to livestock regions, where the profitability of production and grain yields are significantly lower.

Table 8. Regression models and their key characteristics

No.	Model	Result variable	R2	Direct connection	Feedback
1	$Y1 = 311.7 - 4.1X1$	Return on subsidies (Y1)	0.74	–	Specific weight of animal husbandry (X1)
2	$Y2 = -17.3 + 0.15X2 + 0.14X3 - 266X4$	Profitability of production (Y2)	0.81	Power Capacity (X2) Climate productivity score (X3)	The amount of subsidies per 1 ruble of output (X4)
3	$Y3 = -0.72 + 0.07X5 + 1.2X6 + 0.03X7 + 0.14X8 + 15.9X9$	Grain yield (Y3)	0.74	Adding mineral fertilizer (X5) Amount of subsidies to the regional average (X6) Ratio of capital investment of Federal and regional budget (X7) Climate productivity score (X8)	The amount of subsidies per 1 ruble of products (X9)

Source: calculated by the author. The table shows only statistically significant variables at the significance level of 5%.

4. DISCUSSION OF RESULTS

The statistical analysis of the effectiveness of subsidies, as well as the efficiency of production in the agricultural associations of the Russian regions indicates the following:

- the regions are not uniform in terms of the amount of subsidies provided, while some regions received subsidies significantly higher than their share in agricultural production.

- despite the fact that the relationship between the volume of provided subsidies and efficiency can be seen, the performance of subsidies in the regions of the selected groups is not directly proportional to the ratio of grants, which indicates that other factors of efficiency of subsidies and production.

- the greatest impact on the profitability of subsidies is exerted by such factors as the ratio of subsidies in the region in relation to subsidies on average in the aggregate, the share of livestock production and climate productivity, energy capacity per person employed in agriculture.

- subsidies are an effective tool for the development of agriculture and rural areas, as evidenced by a noticeable increase in indicators of economic, industrial and social efficiency, both on average in Russia and for certain groups of regions. At the same time, it is necessary to develop tools that strengthen social justice and increase the environmental friendliness of production while simultaneously developing agriculture.

5. CONCLUSIONS

State agricultural policy, along with issues of ensuring food security of our country, should include solving problems of social development and environmental sustainability. Economic growth in any type of economic activity should ensure not only an increase in the income of individual participants in the economic process, but also their fair distribution among all parties involved in this process (the state, society). Public subsidies can and should be an effective tool for sustainable and inclusive agricultural development.

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