Analysis of the impact of state support on the efficiency of agricultural production in the context of digitalization in the Volgograd region

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Abstract. The article presents a model for analyzing the impact of state support for agricultural production on the efficiency of enterprises in the livestock sector of the Volgograd region in the conditions of digitalization. The developed model is integrated into the electronic information environment of not only state bodies, but also agribusiness enterprises and allows using software tools to analyze the effectiveness of state support in three main areas: the development of material and technical base, reimbursement of agricultural production costs, and reimbursement of borrowed sources of financing. The result of using the model mechanism is interactive reporting, which provides information to state authorities for the purpose of monitoring the implementation of state support for agricultural production, assessing the completeness of coverage of agricultural enterprises with state support, modeling the amount of financial support to agribusiness enterprises to monitor the implementation of set values of performance indicators, as well as the rapid development of measures to improve performance. The method of distribution of agribusiness enterprises by zones of state support effectiveness is proposed. This method allows the state authorities of the subject of the Russian Federation to develop targeted support measures or change the amount of support financing depending on the level of efficiency of agribusiness enterprises. The analysis of the impact of state support for agricultural production on the efficiency of enterprises in the livestock sector of the Volgograd region.

1. Introduction

State support for agricultural production is a priority of the state agricultural policy, ensuring the country's food security at the appropriate level. In order to ensure the targeting and effectiveness of state support for agribusiness enterprises, state bodies should organize proper monitoring of the implementation of effective indicators of food security. Agribusiness enterprises, in turn, need to be motivated to meet a certain level of agribusiness performance indicators in order to receive not only profit, but also support from the state. In this regard, the development of the methodology for assessing the effectiveness of state support for agricultural production in the context of digitalization for both government agencies and agribusiness enterprises is of particular importance.

Issues of evaluating the effectiveness of state support for agricultural production are discussed quite actively in the scientific community. The authors base their assessment of the effectiveness of state support for agricultural production on macroeconomic, regional and microeconomic performance indicators (the level of competitiveness of agricultural products, investment growth, income level of
agricultural producers, and others) [1,2], indicators of the average amount of state support per 100 rubles. revenue [3], an indicator of the effectiveness of support, calculated through indicators of growth in gross or commodity output from support and the volume of support [4], a consumer support indicator [5], indicators of the impact on sustainability[6], and others. The proposed methods of evaluating the effectiveness of state support for agricultural production are General in nature and do not take into account the specifics of the areas of state support for agricultural production. In this regard, it is necessary for both state bodies and agricultural enterprises to have a reliable picture of the impact of state support on the efficiency of agricultural enterprises, taking into account the specifics of the areas of state support for agricultural production.

Digitalization of agriculture in Russia is aimed at "creating and developing a national agricultural management platform" [7]. In the conditions of universal digitalization, there is a rather large range of problems in agricultural production: a limited market for offers of ready-made software solutions; low investment motivation, low level of equipment with computer systems and complexes, unavailability of high-speed Internet access, integration imbalance with existing digital technologies, lack of ability to aggregate and interpret information from digital platforms for the purpose of making management decisions, insufficient state support for the introduction of digital technologies [8-14].

Solving problems of aggregation and interpretation of information in the conditions of digitalization is a necessary condition for effective decision - making process of agribusiness enterprises [15]. Thus, it is becoming more and more urgent to solve the problem of developing a methodology for analyzing the impact of state support for agricultural production on the efficiency of agricultural enterprises in the conditions of digitalization.

The purpose of this research is to develop a methodological approach to the analysis of the impact of state support on the efficiency of agricultural production in the conditions of digitalization.

This goal led to the formulation and solution of the following tasks:

• to develop a model for analyzing the impact of state support on the efficiency of agricultural enterprises in the conditions of digitalization;

• using the proposed methodology, to analyze the impact of state support on the efficiency of agricultural production in the Volgograd region in the conditions of digitalization.

The object of research is the results of the activities of agricultural enterprises under the influence of state support for agricultural production.ru

The subject of the research is the methodology for analyzing the impact of state support on the efficiency of agricultural production in the conditions of digitalization

2. Materials and methods
The information base of the study is the data Of the Committee of agriculture of the Volgograd region [16], an independent source of information about Russian organizations rusprofile.ru.

The research is based on the application of methods of systematization, grouping, classification, generalization and modeling. Quantitative measurement of economic processes in the study was carried out using methods of economic and statistical analysis using computer programs.

For the purposes of the study, a statistical sample of agricultural enterprises receiving all types of state support with organizational and legal forms was conducted: limited liability companies, joint-stock companies.

3. Results
In the Volgograd region, measures of state support for agribusiness enterprises are aimed at:

• to develop the material and technical base of agricultural production;

• reimbursement of agricultural production costs;

• reimbursement of borrowed sources of financing.

Strengthening and modernizing the material and technical equipment of agricultural production directly affects the growth of profits of agricultural enterprises. Updating the fleet of agricultural production equipment is a priority task not only for agricultural producers themselves, but also for state...
policy [17]. The tasks of state support for the development of the material and technical base of agricultural production are technical and technological modernization of fixed assets that support agricultural production, introduction of innovative equipment and technologies, reproduction of non-current biological assets [18, 19].

State support for agricultural enterprises aimed at reimbursing agricultural production costs is aimed at reducing the cost of agricultural products, ensuring the development of a risk insurance system, the development of livestock breeding and elite seed production, the production of livestock products, the laying of long-term plantings and care for them.

The creation of a favorable investment climate is facilitated by state support in the form of subsidizing borrowed sources of financing [20]. This support measure is aimed, firstly, at increasing investment attractiveness, and secondly, at reducing the risks from inefficient attraction and use of borrowed funds [21].

The model developed by us for analyzing the impact of state support for agricultural production on the efficiency of agricultural enterprises is integrated into the electronic information environment of both the state and agricultural enterprises (figure 1). The results of the model is interactive reporting, which is a set of indicators on the effectiveness of state support for agricultural production.

![Figure 1. Model for analyzing the impact of state support for agricultural production on the efficiency of agricultural enterprises in the conditions of digitalization. Source: Authoring Kovalenko O A.](image)

Based on the results of the proposed model, state bodies will be able to monitor the implementation of state support for agricultural production, assess the completeness of coverage of agricultural enterprises with state support, model the amount of financial support, agribusiness enterprises will be able to monitor the implementation of set values of performance indicators, as well as promptly develop measures to improve performance.
According to the proposed methodology, we will analyze the impact of state support for agricultural production on the efficiency of enterprises in the livestock sector of the Volgograd region in the conditions of digitalization.

Support for the development of the material and technical base of agricultural production is implemented in the Volgograd region through the allocation of grants and subsidies to agricultural producers for the modernization of agricultural facilities, the purchase of machinery and equipment, technological equipment for dairy farming on lease, the purchase of breeding young cattle of dairy direction, as well as subsidies for capital expenditures on hydro-reclamation activities.

We will evaluate the effectiveness of state support for the development of the material and technical base of agricultural production by analyzing the return on assets (figure 2), as well as the return on fixed assets (figure 3).

Figure 2. Dynamics of return on assets of agricultural enterprises of the Volgograd region that received state support for the development of the material and technical base of agricultural production in 2018. Source: Authoring Kovalenko O A, based of the rusprofile.ru [16].

According to figure 2, the dynamics of return on assets is positive. The average profitability of the studied economic entities increased by 2 times in 2018. The return on assets of livestock enterprises that received state support also increased by 1.7 times in dynamics. If we consider economic entities separately, not all of them have achieved an increase in return on assets (table 1).

Table 1. Dynamics of return on assets of agricultural enterprises of the Volgograd region that received state support for the development of the material and technical base of agricultural production in 2018*.

| Agrucultural enterprises | 2014 | 2015 | 2016 | 2017 | 2018 | Average, +/- |
|--------------------------|------|------|------|------|------|--------------|
| NPG "Gardens of Pridonya" LLC | 0.260 | 0.180 | 0.156 | 0.175 | 0.281 | +0.105 |
| Stepnoy LLC | 0.228 | 0.038 | 0.196 | 0.067 | 1.220 | +1.153 |
| Donskoye Agricultural enterprise, LLC | 0.058 | 0.067 | 0.186 | 0.225 | 0.292 | +0.066 |
| LLC "USR 1" | 0.132 | 0.045 | 0.210 | 0.192 | 0.497 | +0.305 |
| Leader LLC | 0.098 | 0.071 | 0.204 | 0.349 | 0.159 | -0.190 |
| Zarya LLC | 0.026 | 0.434 | 0.739 | 0.239 | 0.446 | +0.208 |
| LLC "vegetable Grower" | 0.016 | 0.133 | 0.176 | 0.039 | 0.041 | +0.003 |
| JSC Agrofirma "Vostok" | 0.137 | 0.160 | 0.164 | 0.101 | 0.177 | +0.076 |
| The average value of profitability of | | | | | | +0.216 |

* Source: Authoring Kovalenko O A, based of the rusprofile.ru [16].
It should be noted that almost all economic subjects of the sample have a positive effect from state support in the development of the material and technical base of agricultural production, except for LLC "Leader". LLC "Leader" was not able to achieve results of activity even in the previous year.

Of the eight economic entities that received state support for the development of the material and technical base of agricultural production, seven (87.5%) belong to the crop production industry, and one (12.5%) to the livestock industry (poultry farming). Return on assets represents the overall picture of performance, both under the influence of the use of fixed and working capital. A more accurate picture of the effectiveness of state support for the development of the material and technical base of agricultural production is provided by the indicator of the profitability of fixed assets (figure 3).

![Figure 3. Dynamics of profitability of fixed assets of agricultural enterprises of the Volgograd region that received state support for the development of the material and technical base of agricultural production in 2018. Source: Authoring O A Kovalenko, based of the rusprofile.ru [16].](image)

The economic effect of the use of fixed assets by economic entities, taking into account state support for the development of the material and technical base, is +0.015 points or 3%, for the livestock industry - +0.081 points or 32.6% (table 2).

### Table 2. Dynamics of profitability of fixed assets of agricultural enterprises of the Volgograd region that received state support for the development of the material and technical base of agricultural production in 2018*

| Agricultural enterprises               | 2014  | 2015  | 2016  | 2017  | 2018  | Average, +/- |
|----------------------------------------|-------|-------|-------|-------|-------|--------------|
| Plant growing                          |       |       |       |       |       |              |
| NPG "Gardens of Pridonya" LLC          | 0.357 | 0.250 | 0.205 | 0.230 | 0.289 | +0.059       |
| Stepnoy LLC                            | 0.944 | 0.069 | 0.339 | 0.121 | 0.773 | +0.653       |
| Donskoye Agricultural enterprise, LLC  | 0.613 | 0.395 | 0.592 | 0.486 | 0.412 | -0.074       |
| LLC "USR 1"                            | 0.748 | 0.380 | 1.692 | 1.257 | 1.348 | +0.091       |
| Leader LLC                             | 0.290 | 0.167 | 0.519 | 0.173 | 0.419 | -0.755       |
| Zarya LLC                              | 0.057 | 1.319 | 1.503 | 0.412 | 0.497 | +0.085       |
| LLC "vegetable Grower"                 | 0.192 | 0.382 | 0.350 | 0.063 | 0.041 | -0.022       |
| Animal husbandry                       |       |       |       |       |       |              |
| JSC Agrofirma "Vostok"                 | 0.401 | 0.451 | 0.437 | 0.249 | 0.330 | +0.081       |
| The average value of profitability of assets | 0.450 | 0.427 | 0.705 | 0.499 | 0.513 | +0.015       |

*Source: Authoring O A Kovalenko, based of the rusprofile.ru [16].
A map of the effectiveness of state support for the development of the material and technical base of agricultural production in the Volgograd region in terms of return on assets and return on fixed assets is shown in figure 4.

**Figure 4.** Map of the effectiveness of state support for the development of the material and technical base of agricultural production in the Volgograd region in terms of return on assets and fixed assets. Source: Authoring Kovalenko O A, based of the rusprofile.ru [16].

The assessment of the profitability of fixed assets showed inefficient provision of state support for the development of the material and technical base of agricultural production to LLC Agricultural enterprise Donskoye (-0.074 points or 15%), LLC Leader (-0.755 points or 64%), LLC vegetable Grower (-0.022 or 35%).

We suggest dividing the effectiveness of state support for agricultural enterprises into three zones: the zone of inefficiency, the zone of threat to efficiency, and the zone of efficiency.

The basis for the distribution of agricultural enterprises by zones of efficiency of state support is based on the calculation of the deviation of the indicator used for evaluation from the indicator taken as a unit. The indicator is compared with the absolute increase of the indicator used for evaluation, increased by one. This determines the level of materiality of the deviation. If all the indicators used to assess the effectiveness of state support for agricultural enterprises have negative deviation values, then such an enterprise belongs to the zone of inefficiency. If at least one indicator deviates from 0 to 5% or has a negative deviation value, then the agribusiness enterprise falls into the zone of efficiency threat. If all indicators deviate from the indicator by 5% or higher, the agribusiness enterprise is included in the efficiency zone.

The distribution of agricultural enterprises in the Volgograd region by zones of efficiency of state support for the development of the material and technical base of agricultural production according to 2018 data is presented in figure 5.

In the zone of inefficiency in obtaining state support for the development of the material and technical base of agricultural production in 2018, LLC "Leader" is located, in the zone of efficiency threat-LLC "vegetable Grower" and LLC "Agricultural enterprise "Donskoe". JSC Agrofirma Vostok, representing the livestock industry, effectively used state aid.

If an agribusiness enterprise has fallen into a zone of inefficiency on the part of state authorities, it is necessary to monitor the current situation and analyze the possibilities for the exit of agribusiness enterprises from the crisis situation.

The next direction of state support for agricultural enterprises in the Volgograd region is reimbursement of agricultural production costs, which is implemented by providing subsidies for produced and sold livestock products, to increase productivity in dairy cattle breeding, and reimbursement of part of the costs of agricultural producers; for payment of the insurance premium accrued under the contract of agricultural insurance in the field of crop production, laying, care of...
perennial fruit, berry plantations and (or) vineyards, for 1 hectare of sown area of agricultural crops, maintenance of breeding stock of farm animals. In 2018, 78 agro-industrial enterprises of the Volgograd region received state support for reimbursement of agricultural production costs, including 7 or 9% of enterprises in the livestock industry.

| Agricultural enterprises | Zone of inefficiency | Zone of threat to efficiency | Zone of efficiency |
|--------------------------|-----------------------|-----------------------------|-------------------|
| Plant growing            |                       |                             |                   |
| NPG "Gardens of Pridonya" LLC |                     |                             |                   |
| Stepnoy LLC              |                       |                             |                   |
| Donskoye Agricultural enterprise, LLC |           |                             |                   |
| LLC "USR 1"              |                       |                             |                   |
| Leader LLC               |                       |                             |                   |
| Zarya LLC                |                       |                             |                   |
| LLC "vegetable Grower"   |                       |                             |                   |
| Animal husbandry         |                       |                             |                   |
| JSC Agrofirma "Vostok"   |                       |                             |                   |
| Average return on assets |                       |                             |                   |

**Figure 5.** Distribution of agricultural enterprises in the Volgograd region by zones of efficiency of providing state support for the development of the material and technical base of agricultural production in 2018. Source: Authoring Kovalenko O A.

To assess the state support aimed at reimbursing the costs of agricultural production, we suggest analyzing the cost-effectiveness of the return on production costs (figure 6), as well as the return on sales (figure 7).

According to the data presented in figure 6, we can see a negative trend in the return on cost of production of agricultural enterprises in the Volgograd region. It is particularly necessary to note the low profitability of enterprises in the livestock industry. However, the ROI value does not exceed the limit. The negative dynamics of cost-effectiveness indicates, on the one hand, an increase in the cost of agricultural products, on the other – a forced reduction in prices on the market for agricultural products. The dynamics of the return on sales of agricultural enterprises in the Volgograd region that received state support for reimbursement of agricultural production costs in 2018 is also negative (figure 7). The average return on sales of livestock enterprises is less than 10%, which determines the high risk of transition to the loss-making zone.
Figure 7. Dynamics of profitability of sales of agricultural enterprises of the Volgograd region that received state support for reimbursement of agricultural production costs in 2018. Source: Authoring O A Kovalenko, based of the rusprofile.ru [16]

The distribution of enterprises in the livestock sector of the Volgograd region by zones of efficiency of providing state support for reimbursement of agricultural production costs in 2018 is shown in figure 8.

| Agricultural enterprises | Zone of inefficiency | Zone of threat to efficiency | Zone of efficiency |
|--------------------------|----------------------|-----------------------------|--------------------|
| JSC "Agrofirma Vostok"  |                      |                             |                    |
| JSC "Krasnodon poultry Farm" |                  |                             |                    |
| JSC "Volzhskaya poultry Farm" |                   |                             |                    |
| Kolkhoz Plemzavod named after Kalinin |              |                             |                    |
| KHK JSC "Krasnodonskoe" |                      |                             |                    |
| Stepnoye farm LLC        |                      |                             |                    |
| Plemzavod collective farm named after Lenin |                  |                             |                    |

Figure 8. Distribution of enterprises in the livestock industry of the Volgograd region by zones of efficiency of providing state support for reimbursement of agricultural production costs in 2018. Source: Authoring Kovalenko O A.

In the zone of inefficiency in providing state support for reimbursing the costs of agricultural production in the livestock industry in 2018, there is LLC pH "Stepnoye", in the zone of efficiency threat – JSC "Agrofirma Vostok", Collective farm Plemzavod named after Kalinin and KHK JSC "Krasnodonskoe". Effective state assistance for cost recovery was provided in 2018 for JSC "Krasnodon poultry Farm", JSC "Volzhskaya poultry Farm" and the Lenin collective farm breeding Plant.

In the third direction of providing state support for repayment of borrowed sources of financing, we suggest analyzing the dynamics of the return on borrowed and equity capital.

In 2018, 51 agribusiness enterprises received state support to reimburse borrowed sources of financing in the Volgograd region, including 4 or 7.8% of enterprises in the livestock industry.
The return on borrowed capital shows how effectively borrowed sources of financing are used. From the point of view of state support, the dynamics of return on borrowed capital characterizes the influence of the state on smoothing the risk of failure to provide financial resources for the normal functioning and further development of the enterprise (figure 9).

![Figure 9. Dynamics of return on borrowed capital of agricultural enterprises of the Volgograd region that received state support for repayment of borrowed sources of financing in 2018. Authoring Kovalenko O A, based of the rusprofile.ru [16].](image)

Return on equity describes the level of confidence of the owner about the effectiveness of funds invested in the business. Government assistance to reimburse borrowed sources of financing is aimed at increasing investment attractiveness, affecting the share of borrowed capital (figure 10).

![Figure 10. Dynamics of return on equity of agricultural enterprises of the Volgograd region that received state support for repayment of borrowed sources of financing in 2018. Source: Authoring Kovalenko O A, based of the rusprofile.ru [16].](image)

According to figure 9, it is clearly visible that the state task of smoothing the risk of failure to provide financial resources for the normal functioning and further development of agricultural enterprises in the Volgograd region has been fulfilled. The economic effect was +0.451 points or 29.5% for agricultural enterprises in the Volgograd region, and +0.122 points or 31.2% for livestock enterprises.

The dynamics of return on equity of agricultural enterprises in the Volgograd region is negative, but despite this, enterprises managed to keep this indicator at the level of more than 20%. This means that for each invested ruble, the owners of the agro-industrial complex of the Volgograd region generated 23.7 kop of net profit, and the enterprises of the livestock industry – 29.3 kop.

Next, we will distribute the enterprises of the livestock industry in the Volgograd region by the zones...
of efficiency of providing state support for reimbursing borrowed sources of financing in 2018 (figure 11).

| Agricultural enterprises                              | Zone of inefficiency | Zone of threat to efficiency | Zone of efficiency |
|--------------------------------------------------------|----------------------|-----------------------------|-------------------|
| JSC "Krasnodon poultry Farm"                           |                      |                             |                   |
| Volgograd-Edilbay LLC                                  |                      |                             |                   |
| Topagro LLC                                            |                      |                             |                   |
| Plenzavod collective farm named after Lenin            |                      |                             |                   |

Figure 11. Distribution of enterprises in the livestock industry of the Volgograd region by zones of efficiency of providing state support for reimbursement of borrowed sources of financing in 2018. Source: Authoring Kovalenko O A.

State aid for the reimbursement of the borrowed funding sources have not influenced the effectiveness of activities of OOO "Volgograd-Edil'bay". The insignificant effect of state aid for the reimbursement of the borrowed funding sources have had upon efficiency of activity of LLC "Topagro". State assistance to reimburse borrowed sources of financing for JSC "Krasnodon poultry Farm" and the Lenin collective farm breeding Plant is effective.

It should be noted that such enterprises of the livestock industry as JSC "Krasnodon poultry Farm", the Lenin collective farm breeding plant received two types of state support, which affects their position in the efficiency zone. In General, the coverage of livestock enterprises in the Volgograd region averaged only 9.8 % (figure 12).

Figure 12. Structure of agricultural enterprises of the Volgograd region that received state support for agricultural production. Source: Authoring Kovalenko O A.

The structure of agro-industrial enterprises of the Volgograd region that received state support for agricultural production allows us to judge the unavailability of state aid for livestock enterprises due to their loss-making, violated payment discipline, so these are mandatory conditions for receiving any type of state support.

In relation to the livestock industry, in our opinion, the state agrarian regional policy of the Volgograd region should provide for subsidizing unprofitable livestock farms that contribute to the food security of the region.
4. Conclusion
The conducted research allowed us to obtain the following results:

1. A model analysis of the influence of state support of agricultural production performance of agricultural enterprises in conditions of digitalization, being integrated in the electronic information environment of both the state and agricultural enterprises that provide public authorities the opportunity to control the implementation of the state support of agricultural production, evaluation of completeness of agricultural enterprises state support modelling of the amount of financial support, agro-industrial enterprises can monitor the implementation of set values of performance indicators, as well as the rapid development of measures to improve performance:

2. The method of distribution of agribusiness enterprises by zones of state support effectiveness has been developed, which allows identifying the facts of inefficient provision of state support for each agribusiness enterprise. This method will allow the state authorities of the subject of the Russian Federation to develop targeted support measures or change the amount of support funding depending on the level of efficiency of agricultural enterprises:

3. The analysis of the impact of the state support of agricultural production on the efficiency of the enterprises of the livestock industry of the Volgograd region with the use of computer programs, which showed that effective for enterprises.

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