Prospects for the crop production development and the government support impact

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Abstract. Crop growing is the main branch of agriculture in the Samara region, forming 73.8% of production. Therefore, from a developmental perspective, it is necessary to identify the most important factors influencing its development. The purpose of the study is to determine the impact of government support on the performance of the crop production industry. As part of this, it is necessary to solve the following tasks: - analyze the state of crop production in 2018-2022; - identify the main directions of government support and reveal the degree of influence on the development of crop production; - calculate the effectiveness of individual government support measures for the development of the industry. The significant profitability of crop production, which is the result of counter-sanctions introduced in 2014, and significant export potential, has led to the fact that the modern system of state support for the industry is a system aimed at financing potential areas of development: the introduction of new technologies, digitalization and automation of production processes, etc. Therefore, despite the decrease in the relative size of state support (PSE) to 1.3%, the industry is experiencing sustainable development. The main source of funding is the federal budget (about 51% of industry funding). Among the most important areas in the period 2018-2024 can be distinguished: land reclamation (2.1 billion rubles), development of crop production (1.8 billion rubles), modernization and technical re-equipment (1.8 billion rubles), insurance (1.2 billion rubles), purchase of elite seeds (1.0 billion rubles), etc.

1 Introduction

Crop production is one of the most important branches of agriculture. Every year it produces a large amount of food products that provide the country's population with the nutrients and energy necessary to lead a healthy and active lifestyle [1-5]. Due to higher profitability in regions with the necessary climatic conditions, crop production becomes the main driver of agricultural development as a whole. In accordance with the current edition of the Doctrine of Food Security of the Russian Federation, crop production is
characterized by complete self-sufficiency both in the main types of products and in selection achievements (seeds) [6, 7].

The main resource used in crop production is agricultural land. In the 2000s and 2010s in almost all regions the situation with their use looked bad. Large tracts were withdrawn from agricultural use due to lack of processing capabilities (lack of financial resources, equipment, etc.). However, in the last decade the situation has changed significantly. The introduction of counter-sanctions in 2014 in response to the sanctions policies of Western countries and restrictions on subsidized imports of agricultural products led to an increase in the profitability of agriculture in general and crop production in particular [8-10].

Currently, in any country in the world, government support for agriculture (including the crop production industry) is formed as a compromise between three theories: liberalization of world trade, versatility of agriculture and food security. This is also typical for the Russian Federation. On the one hand, in accordance with the requirements of the World Trade Organization, unrelated support was introduced in 2012. On the other hand, the Food Security Doctrine of the Russian Federation was developed and is being implemented, the requirements for self-sufficiency in agricultural products become more stringent with each edition. On the third - they are being implemented targeted programs for the development of rural areas. However, priority remains with the second concept and this makes it possible to achieve significant results [11-14].

In relation to the crop production industry, an approach has been formed for a long time, implemented in practice, which is that the goal of supporting crop production is the development of innovative approaches and technologies, as well as priority areas. Taking into account the fairly high profitability of the industry, this ensures the progressive and balanced development of the industry, allowing the creation of competitive world-class production.

2 Materials and methods

The object of the study is agricultural enterprises and peasant (farm) farms specializing in the production of crop products.

The purpose of the study is to determine the impact of government support on the performance of the crop production industry. As part of this, it is necessary to solve the following tasks: - analyze the state of crop production in 2018-2022; - identify the main directions of government support and reveal the degree of influence on the development of crop production; - calculate the effectiveness of individual government support measures for the development of the industry.

The study used historical, abstract-logical methods, collective methods of questioning experts, and econometric methods.

3 Results

The Samara region is located in the southwestern part of the Russian Federation and has significant potential for the development of crop production. Despite the fact that its territory is located in a zone of risky agriculture due to the sharply continental climate and low rainfall (270-400 mm), the region is a large producer of crop products [15, 16]. Due to climate change, the last severe drought was observed in 2010, and due to the development of technology, the average yield of grain crops, for example, has increased. If in 2000 the regional average was 12.6 cwt/ha, then in 2022 it was 32.1 cwt/ha. This was achieved through the widespread use of fertilizers (mainly mineral), plant protection products, modern equipment and technologies. Elements of digitalization and automation are used, such as navigation systems, parallel driving systems, agricultural drones, etc.
Table 1. Crop production indicators in the Samara region.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sown area, thousand hectares</td>
<td>2096.7</td>
<td>2113.6</td>
<td>2127.9</td>
<td>2181.2</td>
<td>2217.3</td>
</tr>
<tr>
<td>Sown area of grain and leguminous crops, thousand hectares</td>
<td>1120.8</td>
<td>1099</td>
<td>1144.8</td>
<td>1150.7</td>
<td>1167.9</td>
</tr>
<tr>
<td>Gross grain harvest, thousand tons</td>
<td>1830.6</td>
<td>1892.6</td>
<td>2923.6</td>
<td>1952.2</td>
<td>3656.7</td>
</tr>
<tr>
<td>Productivity of grains and legumes, cwt/ha</td>
<td>17.5</td>
<td>17.7</td>
<td>26.1</td>
<td>17.4</td>
<td>32.1</td>
</tr>
<tr>
<td>Investments in fixed assets, million rubles</td>
<td>2787.5</td>
<td>3043.0</td>
<td>3986.5</td>
<td>4334.1</td>
<td>6016.0</td>
</tr>
<tr>
<td>Number of tractors, thousand units</td>
<td>3.8</td>
<td>3.9</td>
<td>3.8</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Total mineral fertilizers applied, thousand tons</td>
<td>22.8</td>
<td>25.7</td>
<td>37.9</td>
<td>51.1</td>
<td>53.4</td>
</tr>
<tr>
<td>Balanced financial result in crop production, million rubles.</td>
<td>6065</td>
<td>5343</td>
<td>16025</td>
<td>17806</td>
<td>13835</td>
</tr>
<tr>
<td>Profitability of products sold in crop production, %</td>
<td>26.7</td>
<td>25.2</td>
<td>51.5</td>
<td>57.7</td>
<td>33.8</td>
</tr>
</tbody>
</table>

As can be seen from the data in Table 1, the cultivated area in the Samara region in 2018-2022 grew by 5.8%. This is mainly due to the fact that over the past 15 years, the area of agricultural land not used for production has decreased from 500 thousand hectares to 50 thousand hectares [17]. The introduction of land into circulation is associated with the increased attractiveness of the industry and the high profitability of crop production, which during the period under review ranged from 25.2% to 57.7%.

![Fig. 1. Elements of the system of state support for crop production in the Samara region.](image)

There is a constant increase in investment in fixed capital. The main source is own and borrowed funds. Currently, the state subsidizes the rate on investment loans obtained from commercial banks. Budgetary financing of investments is currently very limited and constitutes a minimal share of the total amount (2.8% in 2022). This is due to legal restrictions on such practices.
The number of tractors used in crop production has not increased significantly. At the same time, the load on 1 tractor increased to 580 hectares, which indicates the use of more powerful machines and the use of elements of resource-saving technologies [18-20].

One of the indicators of a more streamlined use of agricultural technologies in crop production is the widespread use of fertilizers, especially mineral ones. One of the largest producers of nitrogen fertilizers, JSC Togliatti Azot, is located in the Samara region, which allows them to be provided to agricultural producers on time and at an affordable price. As a result, over the past five years, the application of mineral fertilizers has increased by 2.34 times. The share of fertilized areas increased from 34.9% to 64.9% [21-27].

All these changes in the crop production industry became possible thanks to the use of government support instruments. The main directions are presented in Fig. 1. Among them, the most important are: agricultural insurance (this is due to the climatic characteristics of the region); unrelated support for crop production (features of the requirements of the World Trade Organization); support for the development of crop production; purchase of elite seeds (stimulating variety change and variety renewal); renewal of the machine and tractor fleet (usually in the form of compensation for part of the costs of purchasing equipment); development of perennial plantings (this is associated not only with the restoration of plantings of traditional crops - apple trees, plums, raspberries, etc., but also with the emergence of new ones - for example, grapes) [28-34].

Table 2. State support for crop production in the Samara region, thousand rubles.

<table>
<thead>
<tr>
<th>Direction of expenses</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024 (plan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidies for unrelated crop support</td>
<td>609724</td>
<td>382405</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subsidies for the purchase of elite seeds</td>
<td>191491</td>
<td>178457</td>
<td>148429</td>
<td>166543</td>
<td>130173</td>
<td>155279</td>
<td>121237</td>
</tr>
<tr>
<td>Subsidies for planting and caring for perennial plantings</td>
<td>47353</td>
<td>47354</td>
<td>47354</td>
<td>41640</td>
<td>55996</td>
<td>116639</td>
<td>102452</td>
</tr>
<tr>
<td>Subsidies for payment of insurance premiums in the field of crop production</td>
<td>43568</td>
<td>151062</td>
<td>74556</td>
<td>168604</td>
<td>260553</td>
<td>277269</td>
<td>239572</td>
</tr>
<tr>
<td>Subsidies for the development of crop production</td>
<td>4382</td>
<td>25477</td>
<td>202400</td>
<td>397628</td>
<td>233676</td>
<td>575187</td>
<td>346373</td>
</tr>
<tr>
<td>Subsidies for vegetable and potato production</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11536</td>
<td>57009</td>
<td>73493</td>
</tr>
<tr>
<td>Subsidies for modernization and technical re-equipment</td>
<td>179066</td>
<td>392870</td>
<td>284518</td>
<td>202452</td>
<td>202452</td>
<td>301470</td>
<td>202452</td>
</tr>
<tr>
<td>Subsidies for land reclamation</td>
<td>180940</td>
<td>343151</td>
<td>267705</td>
<td>274231</td>
<td>706386</td>
<td>184710</td>
<td>100019</td>
</tr>
<tr>
<td>Subsidies for environmental purposes</td>
<td>25839</td>
<td>10548</td>
<td>209400</td>
<td>170535</td>
<td>159854</td>
<td>141860</td>
<td>156781</td>
</tr>
<tr>
<td>Subsidies for land surveying</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3233</td>
<td>1745</td>
</tr>
<tr>
<td>Total, million rubles</td>
<td>1282.4</td>
<td>1531.3</td>
<td>1234.4</td>
<td>1421.6</td>
<td>1760.6</td>
<td>1812.7</td>
<td>1344.1</td>
</tr>
</tbody>
</table>

As a result of subsidies, there is a significant increase in the area of perennial plantings. Thus, in 2022 alone, it increased from 8.7 thousand hectares to 9.3 thousand hectares, and the area of plantings at fruiting age increased from 6.9 thousand hectares to 7.3 thousand hectares. The main payments are associated with the establishment of intensive gardens. So in 2022, 79.8% of subsidies were paid for planting 460.8 hectares of gardens (Surgutskoye OJSC, Koshelevsky Posad LLC) (Table 2) [35].
Improving the quality of seed material is associated with the organization of its timely replacement with quality seeds, with the exclusion from the technological process of using mass reproduction commercial grain as seeds. Currently, regional enterprises are fully provided with seeds that meet the requirements of the technological process. During the period under review, the share of the area sown with elite seeds reached 9.1% (7.8% in 2018), including 16.5% in crops of spring grains and leguminous crops (15.3% in 2018), in winter crops - 14.9% (11.8% in 2018). [36-38]

In the field of agricultural insurance in crop production in 2022, a slight increase in insured sown areas is visible. If in 2018 the area of insured crops was 114.9 thousand hectares, then in 2022 it increased to 146.0 thousand hectares (or by 27.1%). This practice indicates that in the event of an emergency (massive loss of crops as a result of drought, freezing or other weather anomalies), this will not be associated with an excessive burden on the regional budget to compensate for damage to producers, but will be regulated within the framework of market mechanisms (through payments from insurance companies) [39-42].

Unrelated support after 2019 in the conditions of the Samara region was discontinued, since its payments did not allow solving the problems of stimulating the development of promising areas of agricultural production. It was replaced by measures for the development of crop production, which are adapted to support qualitative changes in the technological process in the industry [43].

Support for modernization and technical re-equipment at the regional level has made it possible to reverse the negative trend associated with equipping agricultural enterprises with machinery. The number of tractors in the Samara region decreased from 1992 to 2018. Only during the period under review was it possible to achieve a steady increase in this indicator (by 5.3%).

Support for reclamation activities is associated with the gradual restoration of the irrigation system in the steppe part of the region, created back in Soviet times. Reconstruction of the canal system, creation of modern pumping stations, and introduction of water-saving technologies (drip irrigation) will reduce the dependence of the region's agriculture on drought, which is the main source of risk in these territories.

Support for environmental areas is primarily associated with subsidizing measures to maintain soil fertility of agricultural lands and combating quarantine weeds and pests.

In general, government support for crop production has a positive effect on the results of crop production. If subsidies directly affect the financial results of agricultural enterprises, then an econometric model was built to test the hypothesis of a positive relationship between gross yield and support.

\[ Y = 46475.4 + 42.26x_1 - 52.53x_2 + 2.0x_3 \]

where \( Y \) is the gross harvest of grain and leguminous crops, thousand tons;
\( x_1 \) - sown area of grain and leguminous crops, thousand hectares;
\( x_2 \) - mineral fertilizers applied, thousand tons;
\( x_3 \) – state support for the crop production industry, million rubles.

The coefficient of approximation (R²) was 75.1%, indicating a strong statistical relationship. The impact of government support is positive.

<table>
<thead>
<tr>
<th>Table 3. Efficiency of state support for crop production.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Volume of crop production, billion rubles.</td>
</tr>
<tr>
<td>State support for crop production, million rubles.</td>
</tr>
<tr>
<td>PSE, %</td>
</tr>
</tbody>
</table>
As can be seen from the data in Table 3, the relative amounts of state support for crop production are declining. If in 2019 the PSE indicator was 2.4%, then in 2022 it decreased to 1.3%. The main source of funding is the federal budget (51% for 2018-2024). This was due to a reduction in funding in 2022-2023 from the regional budget.

4 Conclusion

The development of crop production in the Samara region was influenced by many factors: natural conditions, counter-sanctions introduced in 2014, state support, etc. Currently, due to high profitability, crop production operates within the framework of a state support system aimed at stimulating promising areas of development: the introduction of new technologies, digitalization and automation of production processes, etc. Therefore, despite the reduction in the relative size of state support (PSE) to 1.3%, the industry is experiencing sustainable development.

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