Grain production analysis in the Krasnoyarsk Territory

M G Ozerova, N G Filimonova and I N Ermakova
Krasnoyarsk State Agrarian University, 90, Mira, 660049, Krasnoyarsk, Russia

E-mail: ozerova_m71@mail.ru

Abstract. The article is devoted to issues of grain production efficiency in the Krasnoyarsk Territory. During the study, factors affecting the increase in production volumes were identified. In order to create a sustainable development of the grain sub-complex, the need for state support measures, including preferential lending, sectoral subsidies, export benefits, etc. has been determined. It is assumed that the combination of efforts of farmers and the state to improve the technical and technological conditions of production will form the basis for the stable development of the industry.

1. Introduction
The production of grain in the agro-industrial complex takes a leading position, as it determines the food security of the country, provides the population with food and forms the financial well-being of agricultural producers. The grain share of domestic production in the total grain resources of the domestic market over the past four years is 140-150%, which indicates an excess of the level of self-sufficiency in grain, based on the Doctrine of Food Security of the Russian Federation, and the creation of reserves for the formation of export potential. The dynamics of grain production in Russia is presented in table 1.

Table 1. Dynamics of grain and leguminous crops production in Russia.

| Indicators                  | 2015       | 2016       | 2017       | 2018       | 2019       | Relation 2019 to 2015, % |
|----------------------------|------------|------------|------------|------------|------------|--------------------------|
| Croplands, thousand ha     | 46609      | 47100      | 47705      | 46339      | 46660      | 100.1                    |
| Share in croplands structure, % | 59.3       | 59.4       | 59.6       | 58.2       | 58.4       | -0.9                     |
| Crop yield, dt/ha          | 23.7       | 26.2       | 29.2       | 25.4       | 26.7       | 112.7                    |
| Gross yield, thousand tons | 104729     | 120677     | 135539     | 113255     | 121200     | 115.7                    |

The industry shows high yields and, accordingly, gross grain harvesting at constant croplands, which indicates high-intensity production. However, despite the high performance, grain producers are experiencing a number of problems.

2. Literature review
The work of many domestic scientists is devoted to the development of the grain production sub-complex: A I Altukhova, P M Emelyanova, K S Ternov, A K Kamalyan, I G Ushachev and others. They
note the high role of the industry, whose products determine not only food and forage resources, but also are used for technical purposes. Thus, "the main purpose of the operation of the grain sub-complex is to ensure the production of such a quantity, assortment and quality of grain and its processed products that would satisfy the country's needs for bread products, seeds, fodder grains and grain for technical processing, to create the necessary reserves and export resources at minimum cost and increase the competitiveness of the final products of the sub-complex" [1].

The authors do not always agree on the structure of the grain sub-complex, since its complex inter-sectoral relationships, of high national economic importance, lead to opinions about its significant poly-structure. Nevertheless, most of them allocate three main areas: the funds production for the grain industry, the grain production and its sale and storage.

It remains absolutely obvious that to counter the natural elements, farmers should "use a system of modern scientifically based and zonal-adapted technologies... provided with a complete complex of machines and mechanisms for their use" [2]. However, it is here that the main reason for the vulnerability of grain producers to weather conditions is seen. The solution lies in an adequate state mechanism supporting investment lending, sector subsidies, export benefits, etc.

3. Data and methods

Krasnoyarsk Territory is one of the leading grain producers in Russia, ranking 18 among the constituent entities of the Russian Federation and 4 among the regions of the Siberian Federal District. Let's consider in more detail the analysis of grain production in the Krasnoyarsk Territory (table 2).

**Table 2.** Dynamics of grain and leguminous crops production in the Krasnoyarsk Territory [3, 4, 5].

| Indicators                          | Years                  | Relation 2019 to 2015, % |
|------------------------------------|------------------------|---------------------------|
| Croplands, thousand ha, including wheat | 2015: 1045.9, 707.5 | 2016: 1056.1, 732.5 | 2017: 1048.3, 703.2 | 2018: 951.2, 599.2 | 2019: 914.5, 562.9 | 87.4, 79.6 |
| Share in croplands structure, %    | 67.8                   | 67.6                      | 67.9                   | 63.5                   | 61.2                   | 6.6 |
| Crop yield, dt/ha, including wheat | 22.0                   | 22.5                      | 20.4                   | 20.5                   | 23.9                   | 108.6 |
| Wheat                              | 21.8                   | 21.6                      | 19.8                   | 19.8                   | 23.8                   | 109.2 |
| Gross yield, thousand tons, including wheat | 2258.4 | 2357.5 | 1922.9 | 1890.0 | 2182.3 | 96.6 |

The given indexes show a decrease in bulk cereal yield, namely wheat (almost 12 %), despite high yields. This reason is associated with a decrease in croplands in favor of expanding the fodder crops production.

The main grain producers in the region are agricultural organizations and peasant farms (table 3). In 2019, their share accounted for 99.7% of grain production. It is the tendency of the agricultural organizations to increase croplands under fodder crops that leads to their reduction under cereals, which accordingly leads to a decrease in gross production. In this regard, for peasant farms, the prospect of expanding grain production opens up, as evidenced by the growth of sown areas and yields.

The main grain producers are located in the western zone of the Krasnoyarsk Territory, among which farms of the Uzhursky and Nazarovskiy districts can be distinguished. Natural-climatic conditions, high level of production technology make it possible to achieve a high level of crop yields. For example, in the Uzhursky district up to 33.1 dt/ha, Nazarovskiy up to 26 dt/ha. Annually, agricultural producers increase the croplands under winter crops. So since 2016, their volume has grown by almost 18%.
Table 3. Grain and leguminous crops production by farm category [3, 4, 5].

| Indicators                                      | Years          | Relation 2019 to 2015, % |
|------------------------------------------------|----------------|--------------------------|
| Croplands, thousand ha. including               |                |                          |
| Agricultural organizations                      | 877.2          | 866.0                    | 833.6       | 744.1       | 708.4       | 80.8        |
| Peasant farms                                  | 163.1          | 184.9                    | 211.0       | 203.8       | 202.7       | 124.3       |
| Individual farms                               | 3.1            | 3.1                      | 3.7         | 3.4         | 3.4         | 109.7       |
| Crop yield, dt/ha                              |                |                          |
| Including                                      |                |                          |
| Agricultural organizations                     | 22.7           | 23.3                     | 21.4        | 21.5        | 25.2        | 111.0       |
| Peasant farms                                  | 18.6           | 18.9                     | 16.6        | 16.8        | 19.6        | 105.4       |
| Individual farms                               | 22.1           | 22.2                     | 19.0        | 19.3        | 18.4        | 83.3        |
| Gross yield, thousand tons, including          |                |                          |
| Agricultural organizations                     | 1950.3         | 1998.8                   | 1601.3      | 1544.6      | 1778.6      | 91.2        |
| Peasant farms                                  | 296.8          | 348.0                    | 314.5       | 339.0       | 397.4       | 133.9       |
| Individual farms                               | 6.8            | 6.8                      | 7.0         | 6.5         | 6.3         | 92.6        |

Stable grain production volumes depend on the use of resource-saving technologies, including the use of energy-saving equipment, the introduction of integrated plant protection, the effective use of mineral fertilizers, the use of intensive type varieties (table 4).

In this regard, it should be noted that the highly productive wheat variety Novosibirskaya-31 is especially popular among farmers and occupies almost 40% of all croplands. This choice is not accidental, since the potential of this variety is from 50 to 80 dt/ha of yield (in the Territory the best performance was achieved at the level of 19.8%).

The intensity of grain cultivation is determined by the use of mineral and organic fertilizers in agricultural technology, the use volume which increased by almost 20% compared to 2016 (table 4). In general, it should be noted that about 90% of spring sowing of grain crops is carried out using resource-saving technologies.

Table 4. Efficiency assessment of cereals and leguminous crops production [3, 4, 5].

| Indicators                                      | Years          | Relation 2019 to 2015, % |
|------------------------------------------------|----------------|--------------------------|
| Application of mineral fertilizers per 1 ha of sowing, kg | 30.6           | 38.7                     | 44.0        | 40.2        | 34.5        | 112.7       |
| Application of mineral fertilizers per 1 ha of sowing, t  | 1.0            | 1.0                      | 1.0         | 1.1         | 1.2         | 120         |
| Sowings per 1 harvester-thresher, ha             | 356            | 369                      | 381         | 353         | 360         | 101.1       |
| Profitability (loss) level without account of subsidies, % | 34.1           | 31.6                     | 6.3         | 4.1         | 5.2         | 15.2        |
| Profitability (loss) level with account of subsidies, % | 46.3           | 43.3                     | 16.7        | 17.3        | 18.7        | 40.4        |
However, it should be noted that the grain production profitability is catastrophically declining (by 2019, without account of subsidies by 84.8%). This is primarily due to a decrease in grain sales prices by 15% compared to 2016. So, prices for rapeseed seeds and peas decreased significantly. And also it is due to an increase in production costs, for example, an increase in prices by 29% for diesel fuel, by 15.9% for automobile gasoline, by 6.8% for electricity, etc.

From the data presented, it becomes clear that without state support for agricultural producers it is impossible to carry out extended reproduction (table 5).

Table 5. State support of agricultural goods producers in the plant growing area [3, 4, 5].

| Indicators                                                                 | Years     | Relation 2019 to 2017, % |
|----------------------------------------------------------------------------|-----------|--------------------------|
| Subsidies to support programs and events, thousand rubles.                 | 346478.9  | 366569.0                 |
| Subsidies for decoupled support, thousand rubles                           | 515098.9  | 666602.0                 |
| State support of short term crediting, thousand rubles                     | 119004.5  | 96955.0                  |
| For reimbursement of the interest rate part on investment credits (loans), thousand rubles | 69369.0   | 40803                    |
| Total for plant growing area, thousand rubles                             | 1069951.3 | 1170929.0                |
| Yield per 1 ruble of state support, rubles                                | 9.5       | 9.4                      |

Nevertheless, it is necessary to state the fact of a reduction in certain areas of subsidies, the most significant is decrease in the reimbursement of the interest rate of investment credits. In general, despite the fact that the expenses for crop production increased several times, the total amount of state support for the development of the industry increased by 0.9%. This also led to a reduction of 2.1% in yield by 1 ruble of budget financing.

4. Results and discussion

The analysis of the grain complex allows us to conclude that the Krasnoyarsk Territory has the potential to increase its production. This need is due to the growing animal husbandry industry and its provision with mixed feeds, as well as the prospects for deep processing of grain for the production of high value added products (gluten, amino acids, bioplastic, etc.).

In order to create a platform for the development of grain production, it is necessary to take into account the following main problems:

- competition in the world grain market, which determines the domestic market conditions;
- high dependence on natural and climatic conditions;
- soil fertility deterioration, including due to lack of application of mineral and organic fertilizers;
- insufficient material and technical base, lack of digital technology use opportunity;
- high infrastructure costs that do not allow to sell grain far beyond the region;
- complexity of access to external markets [6, 7].

5. Conclusions

The formation of a highly efficient grain production industry should be carried out in several directions, including the development of domestic breeding and seed production, the reduction of grain price volatility due to state regulation measures, the development of the material and technical base of production, the reduction of infrastructure costs through the construction of storage facilities and the regulation of transport tariffs, and the improvement of the technological efficiency of production processes. A special role must be given to the export component of grain production for this,
accordingly, it is necessary to continue state financing of export-related activities, namely preferential crediting, subsidizing logistics costs and product certification, and compensating for the costs of building added value grain processing plants. The set of proposed measures is already being implemented in state programs, but the data presented by us indicate the need to increase the level of state support to the size that allows producers to conduct extended reproduction.

References
[1] Altukhov A 2015 Economics of agricultural and processing enterprises 6 2-7
[2] Krylatyk E and Mazloyev V 2014 National economy: ensuring food security in the context of integration and globalization (Moscow: INFRA-M) p 67-76
[3] 2016 Agricultural complex of the Krasnoyarsk Territory in 2016 (Krasnoyarsk) p 7-14
[4] 2017 Agricultural complex of the Krasnoyarsk Territory in 2017 (Krasnoyarsk) p 8-13
[5] 2018 Agricultural complex of the Krasnoyarsk Territory in 2018 (Krasnoyarsk) p 8-13
[6] Petukhova M and Mamonov E 2020 agro-industrial complex: economy, management 7 61-9
[7] Eroshenko F, Oganyan L, Storchak I and Shestakova E 2020 Agro-Industrial Complex: economy management 3 54-67