Challenges to agriculture in the Russian Far East: lessons from crises

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Abstract. This article examines agriculture in the Russian Far East through the prism of recent crises. A comparative analysis of the indicators of food self-sufficiency in the Russian Federation and its macro-regions is carried out; forecast estimates of the level of their food self-sufficiency are predicted. In order to identify a group of commodity producers capable of overcoming the challenges that the agriculture in the Far East has faced, a factor model of the growth rate of agricultural production in the Far East is built, its adequacy is proven, and elasticity coefficients are calculated. The category of land users that should become a vector for overcoming the crisis in the region’s agricultural sector is determined.

1. Introduction
At the present stage, the Russian economy is functioning by integrating into the world economy. This is enshrined in official documents on the state's accession to the World Trade Organization and Russia’s participation in integrations through the European Economic Community, the Commonwealth of Independent States, and the Shanghai Cooperation Organization. It has also been confirmed by practical steps towards the creation of free trade zones and the development of trade and economic ties with Asian and Latin American countries. Therefore, the Russian agricultural economy cannot but be affected by global shocks and challenges [1, 2].

In 2014 Russian agriculture in the Far East and Russian agriculture in general, have been subjected to a series of simultaneous shocks, such as restrictions on food imports from a number of countries, a sharp increase in prices and raw material costs due to the ruble depreciation [3]. The COVID – 19 coronavirus pandemics also imposed challenges on the agricultural sector of the country and the Far East region. The pandemic situation generates many problems in various sectors of the domestic economy, including agriculture, which so far has not yet fully recovered from the negative impact of the 2014 crisis.

This study examines the impact of challenges imposed on agriculture of the Far Eastern Federal District (FEFD) of Russia; the efficiency of the import substitution of agricultural products program is critically analyzed; the category of agricultural commodity producers, which is the main subject of overcoming the crisis phenomena in the industry, is identified.

2. Materials and methods
The methodological framework of the study is a systematic approach and complexity in solving scientific problems, as well as factorial analysis, and correlation and regression analysis. Statistical
data on the state of the agricultural sector of the FEFD (for the period of 2014 - 2018, and while creating a factor model – for the period of 1998 - 2018) were used, which are necessary for the correct analysis of the crises impact on the agriculture of the region. The empirical framework of the article is the result of the author’s study of the level of the Far Eastern agricultural products self-sufficiency.

3. Results and Discussion
Challenges to agriculture in the far Eastern Federal district from the 2014 crisis were caused by: a) reduced physical availability of resources for crop and livestock production; b) reduced economic availability of food as a result of rising prices and falling incomes of the general population. Indeed, under the conditions of economic sanctions and food embargo, the food costs increased markedly. In two years since the embargo had been introduced by Russia in 2014 – 2016, food prices rose by 32%, which is 1.2 times faster than inflation; in three years since sanctions had been imposed and the embargo had been introduced (2014 - 2017), food prices rose 1.5 times [4]. At the same time, the cost of commodity basket in the Far East is 31% higher than the average Russian value [5].

In terms of rising food prices, the increase in the cost of agricultural products is a smaller share than the cost increase in other processing and commodity movements of agricultural products from consumers to producers. This is explained by the fact that, on the one hand, food products price indices are significantly higher that the agricultural products price indices, and, on the other hand, by the fact that the share of agricultural commodity producers in the structure of retail prices is no more than 40%. The 2014 crisis clearly emphasized the threats to agriculture in the Far East, determined by disparity between agriculture and other fields of the agroindustrial complex.

The most important tool of the economic policy of the Russian Federation in the agricultural sector is the Food Security Doctrine, which emphasizes the need to develop and maintain domestic production at a fairly high level, set by threshold values. Economic accessibility, in turn, traditionally involves providing the population with food, regardless of its source of origin. But from the point of view of food security (as well as the security of the state in general), in our opinion, we should consider the economic availability of food together with food self-sufficiency.

In this regard, it is interesting to compare levels of self-sufficiency in the Far East and in other macroregions of Russia. The Far East is the largest region in the country (it takes 36% of the whole area), but the least populated (only 6% of the total population). Therefore, in the framework of this research the analysis of FEFD self-sufficiency indicators is feasible in comparison with the Siberian Federal District (SFD) and the Central Federal District (CFD). The SFD was chosen for comparison for being in the second place (after the Far East) among macroregions of the Russian Federation, which accounts for 30% of the country’s area and 12% of the population; the CFD is an object of our interest as a region with the highest concentration of production and population density (4% of the whole area and 27% of the total population of Russia).

A comparative analysis of the indicators of food self-sufficiency in the Russian Federation and its macro-regions is carried out for the commodity headings, which are “problematic” from the point of view of import and self-sufficiency. At the same time, we differentiated our analysis by time intervals: 2012 – 2014 and 2015 – 2018. We also found predicted values of self-sufficiency for 2020 (table 1).

It should be noted that the forecast estimates are obtained using trend models in the form of polynomials of various degrees. The forecast results are quite reliable, as evidenced by the coefficients of determination (from 0.6 to 0.9).

The import substitution program (as a tool of overcoming the 2014 crisis) made it possible to achieve the target indicators of food security for the main commodity groups by 2018 (except for milk and dairy products – 84% and fruit - 34%), and by the end of 2020 – only domestic production of fruits and berries will remain in the problem field (42% against the criterial 60%).

Similarly to Siberia, the Far East has formed negative trends in self-sufficiency with fruits, vegetables, and dairy. Over the years of implementation of the import substitution policy, the indicators show a desire for growth, although, the growth is clearly not high enough to solve the problems of food supply in the regions.

The level of meat self-sufficiency in the Far East is the lowest among all regions chosen for the evaluation (35% in 2018, 46% - forecast for 2020).
Table 1. A comparative analysis of the indicators of food self-sufficiency in the Russian Federation and its macro-regions (percent).

|          | 2012 | 2013 | 2014 | 2016 | 2018 |
|----------|------|------|------|------|------|
| Food security cutoffs (C ≥ 90%) |      |      |      |      |      |
| RF       | 89   | 82   | 90   | 94   | 95   |
| CFD      | 67   | 65   | 66   | 68   | 69   |
| SFD      | 72   | 73   | 70   | 72   | 74   |
| FEFD     | 73   | 72   | 64   | 68   | 59   |
| (2014 from 2012) |      |      |      |      |      |
| Deviation (±) | 1   | -4   | 15   | -1   | -12  |
| Food security cutoffs (C ≥ 60%) |      |      |      |      |      |
| RF       | 31   | 33   | 34   | 37   | 33   |
| CFD      | 30   | 27   | 30   | 26   | 28   |
| SFD      | 16   | 16   | 14   | 16   | 16   |
| FEFD     | 13   | 10   | 10   | 12   | 11   |
| (2018 from 2015) |      |      |      |      |      |
| Deviation (±) | 3   | 0    | -18  | 0    | -25  |
| Food security cutoffs (C ≥ 85%) |      |      |      |      |      |
| RF       | 76   | 79   | 82   | 89   | 91   |
| CFD      | 81   | 91   | 96   | 106  | 110  |
| SFD      | 81   | 81   | 82   | 85   | 84   |
| FEFD     | 22   | 23   | 26   | 23   | 26   |
| (2020 from 2017) |      |      |      |      |      |
| Deviation (±) | 6   | 7    | 19   | 15   | 51   |

|          | 2012 | 2013 | 2014 | 2016 | 2018 |
|----------|------|------|------|------|------|
| Milk and dairy products (C ≥ 90%) |      |      |      |      |      |
| RF       | 80   | 78   | 79   | 80   | 81   |
| CFD      | 60   | 57   | 58   | 59   | 60   |
| SFD      | 94   | 91   | 94   | 95   | 94   |
| FEFD     | 43   | 42   | 41   | 42   | 43   |
| (2018 from 2015) |      |      |      |      |      |
| Deviation (±) | -1  | 4    | 0    | -2   | 9    |

Table 2. A comparative analysis of the profitability/loss ratio of agricultural organizations of the Russian Federation and its macroregions.

|          | Plant Breeding | Animal Breeding |
|----------|---------------|----------------|
|          | RF    | CFD   | SFD   | FEFD  | RF    | CFD   | SFD   | FEFD  |
| 2005     | 6.4   | 4.1   | 1.7   | -4.0  | 9.5   | 11.0  | 13.0  | -14.4 |
| 2010     | 12.4  | 7.9   | 11.8  | 8.2   | 8.6   | 11.7  | 13.0  | -3.4  |
| 2014     | 20.2  | 20.5  | 10.0  | 10.3  | 18.3  | 28.3  | 14.5  | -6.2  |
| 2015     | 35.4  | 40.0  | 20.6  | 19.0  | 15.4  | 20.5  | 12.7  | -4.4  |
| 2016     | 30.3  | 31.0  | 19.9  | 15.8  | 9.8   | 12.4  | 9.8   | -10.6 |
| 2017     | 17.2  | 13.2  | 12.4  | -1.4  | 12.0  | 16.2  | 9.9   | -13.7 |
| 2018     | 20.6  | 23.7  | 10.6  | 1.3   | 12.8  | 18.6  | 90    | -10.8 |

*Food security cutoffs (according to the Russian Federation Presidential Decree of January 21, 2020, № 20 “Concerning Approval of Food Security Doctrine of the Russian Federation”).

It is true that in recent years, large dairy and pig breeding complexes were put into operation in the far Eastern region as part of the creation of so-called "Priority Development Areas" (PDA), and significant investments were attracted to the region. For example, Mercy Trade LLC with a capital investment of more than 20 billion rubles; Rusagro Primorye LLC (about 21 billion rubles); Green Agro LLC (4.7 billion rubles). Although, it is not enough. It is necessary to increase the efficiency of livestock industry in general, avoiding "point interventions" in agricultural holdings.

Indeed, livestock production in the Far East has been consistently unprofitable over a long period. For comparison, in the CFD, in the SFD, and in Russia in general, the profitability ratio of agricultural organizations (ACO) in livestock farming are positive (table 2).
Without governmental support, unprofitability does not allow the Far Eastern DRO making capital investments in the preservation of fixed assets or keeping current funds at a level sufficient for a “moderate” fall [6].

To determine the category of land users that can contribute to overcoming the challenges of various nature to the agriculture of the Far East, the authors constructed a factor model of the growth ratio of agricultural production in the FEFD:

\[
RG = 81.82 - 0.97 \cdot R_{S1} + 1.06 \cdot R_{S2} - 1.27 \cdot R_N + 12.85 \cdot \Delta P_1 - 1.14 \cdot \Delta P_2,
\]

(1)

\(RG\) – agricultural production growth ratio in the FEFD (%);
\(R_{S1}\) – Acreage accession rate in agricultural holdings in the FEFD (%);
\(R_{S2}\) – Acreage accession rate in peasant farms in the FEFD (%);
\(R_N\) – Households of the population accession rate in the FEFD (%);
\(\Delta P_1\) – Absolute variation in agricultural output of peasant farms in the FEFD (comparable prices, billion rub);
\(\Delta P_2\) – Absolute variation in agricultural output of households of the population in the FEFD (comparable prices, billion rub).

The elasticity coefficients for the corresponding factors showing how the percent of exogenous variable changes when the corresponding factors change by one percent are in brackets.

The adequacy of the model (1) is proven by a system of indicators. The correlation coefficient of 0.8 indicates a close relationship between the growth ratio of agricultural output and selected characteristics. The average approximation error of 6% confirms the correctness of the chosen mathematical form of the model. It is also confirmed by the fact that the Durbin-Watson value is more than the upper limit of the table value \((d = 2.26 > d_2 = 2.21)\). The volume of the source information array used in the modeling is sufficient to identify a stable pattern, which is confirmed by the calculated value of the F-test \((F = 2.0\) with the test significance 0.05).

After analyzing elasticity coefficients of the model, it was concluded that agricultural organizations of various legal statuses and peasant farms can have a positive impact on the growth ratio of agricultural production in the region. But farmers of the region occupy a relatively small niche in the agricultural economy (about 10%). Therefore, the agricultural corporations are the main subject of overcoming challenges in the region’s agriculture.

The global structural crisis is a serious challenge to the agriculture-based economy of the regions. It is complicated by a foreign policy shock from falling oil prices, a cyclical crisis associated with a drop-in investment activity, and a demographic crisis. In our view, negative changes in Russian economy that occurred in response to the 2014 crisis are largely the result of accumulated structural problems.

Structural changes in the Far Eastern agriculture and related branches of food industry are negative and are characterized by many structural “distortions” [7]. Structural problems are peculiar for agriculture in many Russian regions [8, 9]. In times of crisis, formation of the optimal structure of the agricultural sector is inseparable from solving problems of its innovative development [10]. In the context of the 2014 crisis, the industrial composition of economics in general, including agriculture based economy, is changing towards the consumer sector to the detriment of innovation and investment. This is another serious challenge to agriculture caused by the crisis of recent years.

Let us now refer to the situation of 2020. The pandemic poses serious challenges for the global economy, and, therefore, for the agro-industrial complex and its central link - agriculture. The world economy is hit by recession, which is already compared with the great depression of the 30s of the last century. The COVID-19 coronavirus pandemic has significantly deepened negative trends in the food supply in the Far East of the Russian Federation, "causing large-scale administrative restrictions on the movement of persons and goods both across borders and across the territories of a large number of states" [11].
The expert assessments of the current situation allow calling this situation a crisis in agriculture. According to leading Russian economists, due to the coronavirus pandemic and its consequences, Russia's Gross domestic product may fall by 10-20%, and the average annual oil price will not exceed $ 25. For the agricultural sector, as a sector of the economy that needs various measures of governmental support, the consequences of the “shocks” of the 2020 pandemic will definitely get more severe. The coronavirus pandemic “exposed serious gaps in food security ... in the Russian Far East. Dependence on food supplies can cost our country dearly,” says Elena Serova, Director for Agricultural Policy at the Higher School of Economics [12].

Self-isolation, limitation of activities of a number of enterprises, decrease in effective revenue of the population, growth of the expenditure part of the budget of the country in reducing its revenues, decline in investment activity is a small part of the factors that negatively affect the media sphere of the Russian Far East in particular. There is a high probability of an economic crisis, rising unemployment, increasing inequality, "claims" to the effectiveness of government, and deepening structural problems decrease in real incomes of the population after the pandemic.

Attention should also be paid to the difficulties severed in connection with the Covid-19 pandemic, such as the following: agricultural logistics and delivery of agricultural products and raw materials; lack of modern facilities for agricultural products storage; high dependence not only on a number of foreign components, technologies, and qualified specialists, but also on the ordinary labor power.

4. Conclusion

Threats to the development of the FEFD agro-sphere caused by crisis events of recent years are mostly of a medium- and long-term nature, significantly affecting the region's population supply with high-quality, environmentally safe, and economically affordable food products. Changing in the structure of the economy and agricultural products export requires long-term consistent work of the government in cooperation with private sector, aimed at increasing the produced value added, increasing labor productivity, balancing domestic production and changing the position of the Russian Far East in the international division of labor.

For a number of commodity lines (including food products), a trend of increasing imports in 2017-2018 was formed (after its reduction in 2015-2016) [13]. In other words, it should be carefully said that the Russian Far East and the Russian Federation in general have managed to overcome import dependence on food products.

According to the authors, the most important lesson to be learned from the last decade should be the awareness of the need to move from the service economy to the development of the real sector. Agriculture has a primary role to play in this process.

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