Regional problems of livestock production and import substitution

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Abstract. Currently, the direction of the development of the agro-industrial complex of the Russian Federation is import substitution, maintaining a balance of consumption and production, ensuring the country's food security and reducing the volume of agricultural imports. Based on the analysis of food resource balances, it was revealed that the domestic production of meat and meat products, as well as milk and dairy products in the Rostov Region does not cover domestic consumption and continues to be formed through imports. The material for the study was the data available on the official website of Rostovstat, on the basis of which an analysis was made of the balance of food resources of livestock and an analysis of the self-sufficiency of the population with food. When performing the work, methods of comparative and categorical analysis, synthesis and generalization, tabular data visualization techniques were used. The study characterizes the food dependence of the region’s meat resources on imports in 2016-2018 as dangerous, since the coefficient of dependence of consumption on imports is above 50%. The level of food dependence of dairy resources, eggs and egg products on imports is safe – the coefficient of dependence of consumption on imports is less than 25%.

1. Introduction
Currently, the current direction of the development of the agro-industrial complex of the Russian Federation is import substitution, maintaining the balance of consumption and production, ensuring the country's food security and reducing the volume of imports of agricultural products [1-4]. The domestic literature discusses the problems of food production and assessing their quality, the risks of dependence on external suppliers, the sustainable development of the agricultural sector and the development of domestic exports [5-9]. In foreign literature, one can note an extensive layer of studies devoted to socio-economic problems [10-14], problems of the development of agricultural production, including import substitution under the conditions of sanctions and the globalization of the economy [15-18]. However, very few scientific developments are devoted to the study of the model of balance of livestock production on the example of a specific region. This is the novelty of our research.
2. Materials and methods
The study used statistical data available on the official website of Rostovstat [19], based on which an assessment of the economic availability of products, an analysis of the structure of the balance of livestock food resources, an analysis of self-sufficiency of the population with food and an analysis of food dependence on imports were produced. The methodological approach is represented by calculations of indicators of food security and their assessment. Economic availability of food was defined as the ratio of actual consumption of basic food products per person per year to the rational consumption rate approved by the Ministry of Health of the Russian Federation (2016 No. 614). Based on the analysis of the balance of livestock food resources, the level of food self-sufficiency in the region was determined, which is the ratio of gross production to the sum of production and personal consumption. Criteria for assessing the level of food security in the region allow us to establish the most critical feature of food dependence on the external market.

3. Results and discussion
During the analyzed period, in the Rostov Region, the production of meat and meat products on average per capita increased by 2.0 kg/year, milk and that of dairy products – by 7 kg/year, eggs and egg products – by 22 pieces/year to the level of 2012 (introduction Russian Federation to the World Trade Organization) [19, p. 135, 429] (Table 1).

| Indicator                        | Meat and meat products, kg per year/person | Milk and dairy products, kg per year/person | Eggs and egg products, piece per year/person |
|---------------------------------|-------------------------------------------|--------------------------------------------|---------------------------------------------|
|                                 | 2012 | 2018 | 2012 | 2018 | 2012 | 2018 | 2012 | 2018 |
| Production                      | 62   | 64   | 253  | 260  | 419  | 441  |      |      |
| Consumption                     | 71   | 73   | 278  | 256  | 311  | 336  |      |      |
| Consumption rate                | 73   | 73   | 325  | 325  | 260  | 260  |      |      |
| Economic availability, ceiling = 100 % [4] | 97.3 | 100.0 | 85.5 | 78.8 | 119.6 | 129.2 |      |      |

The average per capita consumption of meat and meat products in the Don region during the period under review increased by 2.0 kg/year, eggs and egg products – by 25 pieces/year. The decrease in milk and dairy products consumption by 22 kg per year/person over the six-year period after Russia's accession to the WTO is a negative trend. These data allow us to conclude that per capita consumption of meat and meat products were not provided by their per capita production as in 2012 (the deficit is 11 kg per year) and 2018 (deficit 9 kg per year) and milk and dairy products (deficit - 25 kg per year) in 2012.

The calculated values of affordability, first, show that per capita consumption by the population of the Don region of meat and meat products in 2018 reaches a threshold 100% indicator and can be considered adequate. Second, they characterize the average per capita security in the category "eggs and egg products" as 29.2 % higher than the rational consumption level but, unfortunately, that of the “milk and dairy” group is 21.2 % below the norm. Not reaching the threshold values of the food security Doctrine of the Russian Federation in the Rostov region is covered by imports from other regions of the country. Food imports should not exceed the region's food security threshold.

One of the priority aspects of the development of agriculture in the Rostov region is the growth of export volumes. Balances of basic food products in physical terms reflect the movement of products from production to final consumption and characterize the sources of their formation and channels of use of food resources for a calendar year. The resource and expenditure parts of the balance are added by articles on interregional import and export of products.

For 6 years after Russia's accession to the WTO, the volume of food resources of livestock in the Don region has increased, but the current growth is unstable. If the total resources of the group"meat
and meat products” in 2012 amounted to 389.0 thousand tons, by 2016 they increased by 73.6 thousand tons and amounted to 462.6 thousand tons, and in 2018 – to 461.0 thousand tons. The final indicator of dairy resources in 2012 was 1373.9 thousand tons, in 2016 it increased by 1.7 thousand tons and amounted to 1376.6 thousand tons, and in 2018 it decreased by 20.3 thousand tons and amounted to 1355.3 thousand tons. The total resources of the group “eggs and egg products” in 2018 amounted to 2102.3 million units, which is 221.1 million units more than in 2012 and 190.0 million units less than in 2016 [19, pp. 432-435].

Using the relative values of the balance structure, we determine the share (specific weight) of its parts in the total amount of resources and changes over time. Analysis of the balance sheet structure for 2012-2018 shows a reduction in domestic production of meat and meat products, which led to a natural change in the structure of meat resources: the share of production decreased by 9.5%, while the share of regional imports (including foreign imports) increased by 9.2% and the share of consumption decreased by 10.3% (Table 2).

### Table 2. Analysis of balance structure of main livestock production in Rostov Region, 2012-2018.

| Year | Production | Import | Total resources | Export | Consumption amount | Year-end inventory |
|------|------------|--------|-----------------|--------|--------------------|--------------------|
|      |            |        | Meat and meat products |        |                    |                    |
| 2012 | 68.1       | 27.2   | 100.0           | 18.6   | 77.4               | 4.01               |
| 2016 | 55.6       | 41.1   | 100.0           | 31.5   | 64.5               | 3.7                |
| 2018 | 58.6       | 36.4   | 100.0           | 28.9   | 67.1               | 4.0                |
|      |            |        | Milk and dairy products |        |                    |                    |
| 2012 | 78.5       | 17.9   | 100.0           | 7.7    | 88.8               | 3.4                |
| 2016 | 79.2       | 18.7   | 100.0           | 16.7   | 81.4               | 1.8                |
| 2018 | 80.9       | 17.3   | 100.0           | 16.6   | 81.7               | 1.6                |
|      |            |        | Eggs and egg products, million pieces |        |                    |                    |
| 2012 | 94.8       | 3.8    | 100.0           | 22.4   | 76.1               | 1.4                |
| 2016 | 98.2       | 5.6    | 100.0           | 32.7   | 64.2               | 3.0                |
| 2018 | 88.3       | 7.8    | 100.0           | 25.2   | 77.5               | 3.0                |

Consumption of meat resources is 1.2 times higher than their production in 2016 and 1.1 times higher in 2012 and 2018. Despite this, the region increases the share of meat exports (including foreign exports) by 1.7 times in 2016 and 1.6 times in 2018 to the level of 2012.

The share of milk and dairy products production is growing evenly by 2.4% and amounts to 78.5-80.9%. The share of imports, including foreign imports, is growing in 2016 by 0.8% and decreasing by 0.6% in 2018 to the level of 2012, and the share of consumption of dairy resources is reduced by 7.7% and, at the same time, exceeds the share of production of this group of products, ranging from 88.8 to 81.7%. The share of export of dairy resources in 2018 is stable compared to the level of 2016 and 2.1 times higher than the level of 2012.

The assessment of structural changes in the group “eggs and egg products” shows an uneven decline in production from 94.8 to 88.3% (by 6.5%). The share of imports increased from 3.8 to 7.8%, the share of consumption is lower than the share of production and is 76.1-77.5%, that is, egg production in the region is characterized by a growth trend and significantly exceeds their consumption.

It should be noted that the food market also influences the change in the structure of personal consumption, which is under pressure from external socio-economic factors.

Thus, the structural and dynamic analysis of food balances allowed us to assess the dynamics and factors of reproduction and distribution of livestock products in the Rostov region, including at the expense of imported and exported supplies. At the same time, the factors of growth in the volume of livestock food resources are different. Imports of meat and meat products are increasing, while their regional production is decreasing. For milk and dairy products, the growth in consumption is outstripped...
by the growth in production and export is growing. The data obtained in the study confirm that part of
the livestock production of the Don region continues to be formed at the expense of imports. To illustrate
this problem, we have determined the size of the production-consumption balance, the change in
inventory, and the import-export balance in physical terms (Table 3).

Table 3. Analysis of balances between import and export of animal products in Rostov region,
2012-2018

| Year | Balance production consumption | Inventories as of the end of the year - stocks as of the beginning of the year | Balance Importation-Exportation |
|------|--------------------------------|---------------------------------------------------------------------------|--------------------------------|
|      | Meat and meat products, thousand tons |                                           |                                |
| 2012 | -35.8                           | -2.2                                                                 | 33.7                            |
| 2016 | -42.8                           | 2.0                                                                  | 44.9                            |
| 2018 | -39.4                           | -5.0                                                                 | 34.5                            |
| Growth rate, % | 110.1                        | 2.3 times                                                            | 102.4                           |
| Milk and dairy products, thousand tons |                                           |                                |                                |
| 2012 | -141.8                          | -2.6                                                                 | 139.3                           |
| 2016 | -31.0                           | -3.6                                                                 | 27.6                            |
| 2018 | -11.5                           | -17.7                                                                | 9.0                             |
| Growth rate, % | 8.1                           | 6.8 times                                                            | 6.5                             |
| Eggs and egg products, million pieces |                                           |                                |                                |
| 2012 | 351.3                           | 0.0                                                                  | -350.0                          |
| 2016 | 613.1                           | 18.0                                                                 | -594.1                          |
| 2018 | 353.4                           | -17.7                                                                | -364.7                          |
| Growth rate, % | 100.6                         | 0.0                                                                  | 104.2                           |

In unfavorable years the carrying values of balances in production and consumption are as follows:
1) in the analyzed period, the consumption (personal plus production) of meat products exceeds their
production by 10.1% in the dynamics of growth and 2) the consumption of dairy product in the region
exceeds production, but this deficit decreased by 91.9% during the study period.

Changes in balance sheet inventory by year were calculated as the difference between inventory at
the end and beginning of the period. The resulting negative difference indicates a decrease in stocks of
meat resources in 2012 and 2018, dairy resources - for the entire period of the study and egg resources
in 2018. This means that part of last year’s stock of livestock products was spent this year. The positive
difference in stocks characterizes the increase in stocks of meat products in 2016 and egg products in
2018.

Positive values of the balance in imports and exports for the period 2012-2018 indicate an excess of
imports, including foreign imports, over exports, including foreign exports: meat resources in the
dynamics of growth (by 2.4%) and dairy resources in the dynamics of reduction (by 93.5%). Intensive
import of meat and dairy resources in 2016 slowing down in 2018. The export of egg products, which
increased by 1.7 times in 2016, also decreases by 1.7 times by 2018.

To find the net import from the imported product of the region, we subtracted the exported product,
then, to calculate the coefficient of dependence on imports, the result was divided by the consumption
of this product. Based on the balance of resources of livestock products, we calculated the level of food
self-sufficiency of the region, which indicates that the Rostov region covers its needs for milk production
by 97-99%. However, in retail trade, only 30% of dairy products are represented by producers of the
region. The reason is the lack of processing capacity (Table 4).
Table 4. Analysis of self-sufficiency indicators of Rostov region with livestock products, 2012-2018, %

| Indicator | Threshold value | Commodity group | 2012 | 2016 | 2018 |
|-----------|----------------|----------------|------|------|------|
| Level of self-sufficiency, % | at least 85% | Meat and meat products | 88.1 | 85.9 | 87.3 |
| | at least 90% | Milk and dairy products | 88.4 | 97.2 | 99.0 |
| Coefficient of dependence on importation, % | 10-20% - safe; 25-30% - threshold; above 50% - dangerous | Meat and meat products | 11.2 | 15.6 | 11.2 |
| | | Milk and dairy products | 11.8 | 2.5 | 0.8 |

Over the past six years after Russia’s accession to the WTO, in the Rostov region there are still difficulties with the self-sufficiency of meat products. Although the threshold level of self-sufficiency (at least 85%) by meat and meat products (in terms of meat) was overcome in 2016-2018, the degree of ensuring food security of the region by meat resource is assessed as permissible. Because the region provides itself with its own meat resources by 55.6-58.6% (share in the total resources, Table 2), and the rest is imported and imported from other regions. Difficulties with the meat products self-sufficiency are associated with an insufficient number of cattle and processing enterprises necessary to improve the quality and volume of products.

The coefficient of dependence on imported products has changed over the years: slightly for meat products - from 11.2% in 2012 and 2018 to 15.6% in 2016; for dairy products - sharply decreased (by 14.7 times) compared to the level of 2012 and in 2018 amounted to 0.8%. The study characterizes the food dependence in meat and dairy resources of the region on imports in 2012-2018, as safe, since the coefficients of dependence of consumption on imports are below 20%.

4. Conclusion
As a result of the study, a negative trend in reducing the consumption of milk and dairy products by 22 kg per year/person was established. It was revealed that during the six-year period after Russia joined the WTO, the food dependence of meat and dairy resources of the Rostov Region on imports was assessed as safe. The excess of the export of eggs and egg products over the import means that the Don region satisfies the needs of its population through its own production and exports products when supply exceeds demand. Export development and integration of the regional economy into the world market may be the main long-term objective of import substitution.

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