Assessment of Developing of the Grain Market Stability

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Abstract*: *The grain market has strategic importance for economy of the Russian Federation. This is reflected in the provision of national needs and income from the sale of grain. Russia is situated on a large territory and has regions with sufficient bioclimatic potential for grain production and regions, which are located in harsh natural and climatic conditions, which are not suitable for commercial agriculture. The main task of the national grain market is uninterrupted provision of needs. The possibility of filling of the interregional market with grain can be provided only on condition of high stability of development of all regional grain markets of the Russian Federation subjects, located in the southern and central parts of the country. The object of the research was the grain economy of the Tambov region. The research has shown that almost all economic laws of agricultural development are violated due to the lack of availability of agricultural producers resources. The intraregional demand for grain, which is increased by 47.7% for 2013-2017 years, is fully satisfied. The current situation of grain prices does not allow receiving sufficient income. The level of the profitability of grain production in 2017 amounted to only 17.4%, exceeding the official inflation rate by only 13.4%. The main problem of agricultural producers of grain is the lack of resources for the production process. The unfavorable economic conditions determines the system character of the problems of the grain market. Under these circumstances, the sustainability of the grain market can be assessed only as conditionally sufficient.

Index Terms*: *development measures, economic laws, evaluation, grain market, integral rate, sustainability.

I. INTRODUCTION

Russia is one of the world's agricultural empires. It supplies grain, sunflower oil, fish, flax seeds and many other agricultural products to external markets. The grain market is no exception. It is worth noting, that the food supply of the internal space of the country is the national priority. That means that the needs of livestock and grain processing industries for the necessary production, within the technological cycles of baking, pharmacological, chemical and other industries, must be fully met. Because Russia is located on the huge territory, which covers the area of three natural areas, the objective point is the presence in its composition of the regions of donors of grain resources and scarce regions. The movement of goods, including food purpose, led to the development of the transport network of roads and railways. Storage and transportation of grain is necessary practice for supporting system in each region of the country. On this basis, the development of the grain market should be permanent and resistant. It has positive impact on building of economic development potential and counter external threats from partners and business partners. [1]. The sustainability of the grain market reflects its ability through the regulation of stages of reproduction (production, distribution, exchange, and consumption) will provide the maximum "distance" of the point of reaching the limit state of existence. It must be noted, that market does not have an effect on the economic situation of its participants. Thus, the stability of the market cannot be reduced to the sum of the stability of its participants. However, that composition of representatives of the spheres of production and trade may vary over time, but this process does not effect on a significant change in the main trends of the grain market in general. Particular interest in the stability of the grain market is caused by the fact that its development is considered as one of the strategically important directions of the country's economy. The objects of the study were the economic entities of the grain economy in the Tambov region.

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II. PROCEDURE FOR PAPER SUBMISSION PROPOSED METHODOLOGY

A. *Block Diagram*

The set of methods used in the study (such as monographic, method of analysis and synthesis, settlement and constructive method, economic and statistical methods) allowed to obtain results which are characterized by its reliability. The grain market is an integral part of the Russian economy. The market is subordinated to objective economic laws: cost, supply and demand, diminished marginal utility, increased compensation of surplus product rate, prices of final products of agro-industrial complex, efficiency of agro-industrial complex, limit crop capacity, preferential development of means of production [2]. In the market economy, the cost is not identical to the price, as it is considered in the ideal case and finds expression in the classics [3]. In modern Russia, the factors of price change for any product are supply and demand, but the monetary policy of the economic mega-regulator (Central bank) has a great influence on them. In this regard, we consider the dynamics of

grain sales prices in the Tambov region in the representation of the value of gold as a solid value (Fig. 1).

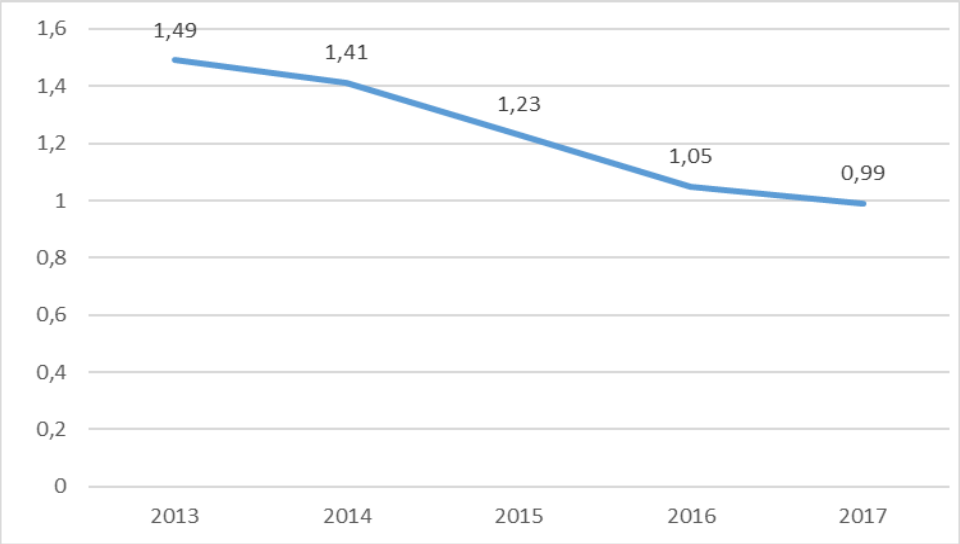

Fig. 1 shows the dynamics of sales price of 1 ton of wheat in the Tambov region for 2013-2017 years, conventional units
The source: author's calculations, the conventional unit is equal to the value of 1 troy ounce of gold

Table I. The characteristics of grain demand in the Tambov region for 2013-2017 years

The indicators	2013	2014	2015	2016	2017	Ratio of 2017 to 2013 in %
The consumption of bread and bakery products, kg per person per year	153	155	154	155	154	100,7
The potential capacity of the market of grain, thousand tons	3 355	3 731	3 585	4 001	4 323	128,8
The actual capacity of the market of grain, thousand tons	2 470	3 006	3 056	3 194	3 650	147,7
Percentage ratio of actual to potential demand	74	81	85	80	84	+10,0
Share of expenditure on food purchases in total expenditure of the population in %	26,8	32,7	30,5	30,3	30,9	115,3
including the purchase of bread products	4,6	5,4	5,4	5,3	5,2	113,0
The coefficient of demand elasticity of grain at the price	-	1,164	0,813	1,015	1,282	-

The demand for grain does not have a stable dependence on the price of its implementation. This largely reflects to the position of stabilization of the absolute values of purchasing grain from wholesalers, which are the grain-processing factories in the province. They are the enterprises engaged in flour, alcohol, starch and treacle production. They are the buyers of 66.2% of all grain sold in the region. This share for the period for 2013-2017 years increased by 5% and in absolute terms amounted to 2.4 million tons (Table II).

Table II. The structure of the actual demand for the grain for the main groups of consumers, 2017, %

Potential demand channel	2013	2014	2015	2016	2017	Deviation of 2017 from 2013 (+, -), %
The food industry	61,2	63,1	66,6	67,2	66,2	5,0
including flour mill	13,6	10,5	10,9	11,2	9,9	-3,7
The provender industry	14,9	18,5	19,7	20,7	21,9	6,0
The alcohol industry	15,9	20,3	22,5	22,4	23,1	7,2
The starch and treacle industry	16,8	13,8	13,5	13,0	11,3	-5,4
The animal husbandry	38,8	36,9	33,4	32,8	33,8	-5,0

The plants of the alcohol industry was 23.1%, carried out the largest volume of grain purchase in 2017 year, the smallest was flour mills (9.9%). Animal husbandry organizations (poultry farms, pig-breeding complexes and farms) focused on production of cattle-milk, meat of cattle. They purchased 33.8% of grain sold in the region, which is 5% less than in 2013 year. But changes in the absolute values of demand from these buyers showed an increase of 28.3%. The presence of effective demand is always the basis of the corresponding proposal. Concerning grain, it is rendered by the agricultural organizations and farms which are carrying out cultivation of grain ear, grain crops and corn on grain. The share of households in the structure of gross grain harvest by categories of farms does not exceed 4%, and they practically do not participate in the sale of grain. The main producers in the grain market are agricultural organizations that produce 67-70% of the total gross harvest. In 2017 year, farms of all categories in the Tambov region produced 4.1 million tons of grain, at the same time, 80.8% of it were put up for sale (see Table II). The agricultural producers of the Tambov region provided an increase in grain production for the period for 2013-2017 years by 38.4%, at the same time, the main factor that ensured it was an increase in yield by 88.2% - from 16.3 to 30.3 centners/hectare.

Table II. Characteristics of grain supply in the Tambov region for 2013-2017 years

The indicators	2013	2014	2015	2016	2017	Deviation of 2017 from 2013 (+, -), %
The gross grain harvest (in farms of all categories), thousand tons	2995,1	3122,3	34 47,6	32519,0	4145,5	138,4
The volume of sales of grain (in farms of all categories), thousand tons	1429,5	2582,4	2717,5	2847,1	3350,0	234,3
The level of tradability of grain, %	47,7	82,7	78,8	87,6	80,8	+33,1
The annual pice of grain sales by agricultural producers, rubles/tonnes	6142,69	6298,73	8232,52	8491,05	10401,54	169,3
The size of the market of grain, million rubles	8,8	16,3	22,4	24,2	34,8	396,8
The elasticity of supply of grain at the price	-	1,762	0,805	1,016	0,961	-

The positive point is the increasing of the marketability of grain up to 33.1%. However, the refusal to grow forage crops is accompanied by their purchase on the side. The preparation of feed is carried out in specialized shops immediately before distribution. For the period for 2013-2017 years there was almost a fourfold increase in the size of the regional grain market. It is worth noting, that supply in the regional grain market reacts weakly to price growth. The reason for this situation is the impossibility of flexible changes in the structure of grain crops within the grain wedge. Agribusiness is characterized by a low rate of adaptation to dynamic changes in market conditions. Many grain-producing regions are not faced with the law of diminishing utility. Rau V. V. points out that the growth potential of grain exports has such areas as China, India, Pakistan, Indonesia and other countries [4]. The degree of economic favor in the territory of placement is important for economic entities. Its size is much larger than in the industrial sector of the economy. Thus, agricultural producers are forced to create insurance reserves of grain in the event of natural damage to products in storage. Unfortunately, the grain market situation in agriculture does not provide the formation of prices. The level of profitability of grain production in agricultural organizations of the Tambov region in 2017 year decreased to 17.4%. The high value of this indicator in 2014-2016 years was supported only by the devaluation of the national currency (Fig. 3).

Fig. 3. The level of profitability and the coefficient of possibility of grain production development in agricultural organizations in the Tambov region for 2011-2017 years.
The source: author's calculations

But in fact, this value is an «economic bubble», which was made from the comparison of costs and prices relating to different time periods. A. I. Altukhov emphasizes on the possibility of expanded reproduction of grain agribusiness which is possible only if its profitability at the level of 30-35% [5]. But, in our opinion, this condition should be maintained at the same price parameters for production resources.

The main problem of the production sector in the grain agribusiness is the low level of technical and technological equipment [6]. But, this problem can be solved with the intensive development and implementation of analogues. Currently, the main limiting factor in increasing grain production are the low material and technical base (Fig. 4).

Fig. 4. The load of arable land per 1 tractor, the area of grain crops per 1 combine harvester and power supply of 100 hectares of acreage in the Tambov region for 2011-2018 years, hectares
The source: unified interdepartmental statistical system

For example, the load of arable land per one tractor exceeds the standard value by more than three times and crops per one combine by 3.4 times. The low rate of annual renewal of equipment, which amount is an average for 2013-2017 years was 4%. The complete renovation of the machine and tractor fleet will take 25 years, which will not allow to overcome in the near future the technical backwardness from the countries of Western Europe. What is more, there are no qualitative changes in the composition of the machine and tractor fleet during its renovation. Deficit of technical means of production inevitably leads to excessive use of labor resources. In other words, if there is no development of means of production [7]. Insufficient application of organic fertilizers in pure vapors provokes further mineralization and toxication of soils [8]. This reduces the quality of the land. According to Tambovstat, annually crops

of grain were introduced to 0.4 tons of manure, which is in 5 times less than the recommended amount. The lack of modern agricultural machines, low volumes of fertilizers – all this is the evidence of an extensive way of conducting the industry.

B. Algorithm

Thus, the laws of effective grain production in the agricultural sector of the Tambov region are violated. Systemic problems of grain market development are supported by unfavorable macroeconomic conditions (high cost of credit, tax burden, etc.) [9]. It is worth noting that there were attempts to develop a universal methodology for assessing the sustainability of the grain market [10]. Z. M. Ilyina applies an adaptive approach to assessing the sustainability of the food system. The introduction of some changes in the particular indicators allowed applying for this methodological development of the stability of the grain market. To do this, we should present the dynamics of this value over a number of years. The method of assessing to the stability of the grain market provides the following sequence of actions:

1. The identification of the main factors influencing on the state of the market and their classification into groups
2. The calculation of individual indicators of the statuses of factors.
3. The calculation of the integral index of stability of the grain market by one year.

The evaluation of the dynamic series of the integral stability index.

III. RESULT ANALYSIS

The list of specific indicators for assessing the stability potential of the regional grain market is presented in Table III.

Table III. Private and integrated indicators for assessing the potential stability of the regional grain market and the method of their calculation

The indicator	Method of calculation
The coefficient of the bioclimatic potential	$K_{БКП} = {БКП_i}/{БКП_{etalon}}$, where $БКП_i$ – the value of bioclimatic potential of the i-region; $БКП_{etalon}$ – the value of bioclimatic potential of the region, taken as a standard
The coefficient of the organizational compliance with agro technical requirements	$K_{агротех} = {Д_i}/{Д_{rec}}$, where $Д_i$ – the actual proportion of grain in the structure of arable land, %; $Д_{rec}$ – recommended share of grain wedge in the structure of arable land by the system of regional agriculture, %
The coefficient of the intraregional grain needs	$K_{обесп} = {П}/{O_p}$, where П – the need for grain processing organizations in grain, tones; O_p – total sales of grain by agricultural producers of all categories of management, tons
The coefficient of the fertility of arable land	$K_п = {Б_i}/{Б_{etalon}}$, where $Б_i$ – the fertility score of arable land of the i-region; $Б_{etalon}$ – the fertility index of the soils in the region, adopted as a standard
The coefficient of the security of the sown area of grain crops	$K_{оп} = {П_ф}/{П_н}$, where $П_ф$ – the area of grain crops per 1 actual inhabitant, hectares; $П_н$ – the area of grain crops per 1 inhabitant is normative (necessary for the production of all types of food agricultural raw materials or resources for which is grain), hectares
The coefficient of the employment	$K_{то} = {K_{то_i}}/{K_{то_{etalon}}}$, where $K_{то\ i}$ – the employment in the i-region, employees; $K_{\ то\ etalon}$ –the labor supply in agriculture in the region, taken as a standard, workers
The coefficient of the energy efficiency	$K_э = {Э_i}/{Э_{etalon}}$, where $Э_i$ – energy supply per 100 hectares of agricultural land in the i-region, horsepower.; $Э_{etalon}$ – energy supply per 100 hectares of agricultural land in the region, taken as a standard, horsepower.
The coefficient of the technical support	$K_{тех} = {Н_н}/{Н_ф}$, where $Н_н$ – the load area of grain crops per 1 combine normative, hectares; $Н_н$ – actual load area of grain crops per 1 combine, hectares
The coefficient of the social stability	$K_{сс} = {З_ф}/{З_н}$, where $З_ф$ – the actual level of employment, %; $З_н$ – the normative level of employment, %.

The coefficient of the development opportunity	$K_р = {УР_ф}/{УР_д}$, where $УР_ф$ – the actual level of profitability of grain production, % ; $УР_д$ – the level of profitability sufficient for expanded reproduction (equal to 35%), %
The coefficient of the development of the competitive environment	$K_к = {И_{сх}}/{И_{пром}}$, где $И_{сх}$ – the price index for agricultural products; $И_{пром}$ – the price index for industrial resources used in agriculture
The coefficient of the share of profitable agricultural organizations	$K_{др} = {Д_i}/{Д_{etalon}}$, where $Д_i$ – the share of profitable agricultural organizations in their total number in the i-region, %; $Д_{etalon}$ - share of profitable agricultural organizations in their total number in the region, taken as a standard %
The coefficient of the potential yield	$K_у = {У_{макс}}/{У_{сред}}$, where $У_{макс}$ – maximum grain yield in the farms of the studied region, centner / hectare; $У_{сред}$ – average grain yield in the studied region, centner / hectare.
Integral coefficient of the impact factors of the group	$И_{i(g)} = \frac{1}{n(g)} * \sum_{i+1}^{n(g)} И_j$, where g –the number of market stability factors group; $И_j$ – the index for the influence of the g-group; n(g) – the number of factors which should be included in the calculation of the integral index of the group g
The comprehensive indicator of the sustainability potential of the grain market	$И_{уст} = \sqrt[n]{\prod И_{i(g)}}$

The criteria for assessing the integrated indicator of potential stability of the grain market are presented in Table IV.

Table IV. The criteria for the evaluation of integrated indicator of stability of the grain market

The interval of value	Interpreting of the state
Less than 0,8	The market is not able to adapt to changes in the external environment, does not have sufficient stability
[0,8-1,0]	The market retains the potential for economic growth
More than 1,0	The market can provide increase of stability of participants of grain economy in the conditions of dynamically changing external environment

The results of the calculation of a comprehensive indicator of the stability potential of the grain market in the Tambov region for 2013-2017 years are shown at Fig. 5.

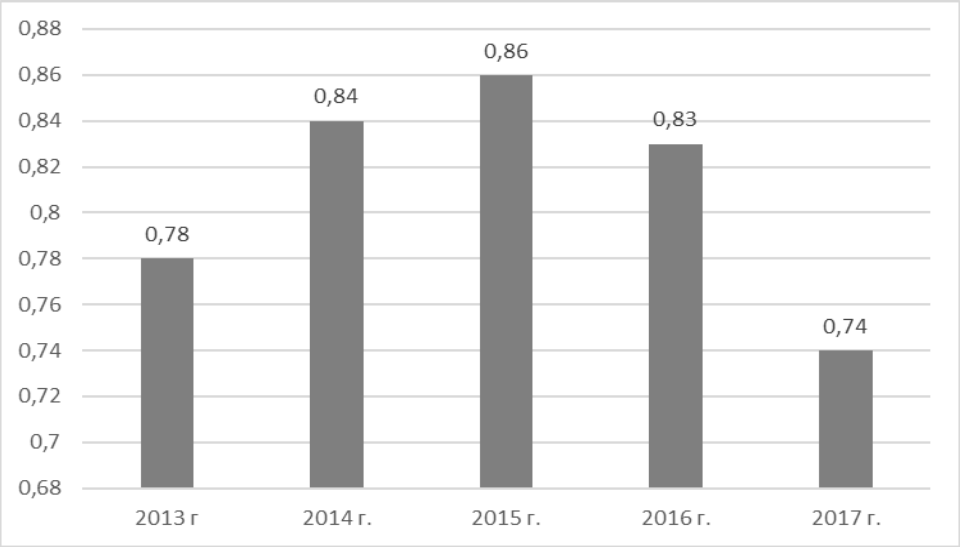

Fig. 5. The comprehensive indicator of the stability potential of the grain market in the Tambov region for 2013-2017 years

The calculations showed that as for 2017 year in the Tambov region, it does not have sufficient ability to effect on the external environment. The main purpose is to equalize the market conditions of the grain market in the country. However, their impact is often insufficient. From the time of harvesting (November-December), the minimum consists in very small volumes of acquisition in the state funds (up to 1-2% of the total grain sales) (Table V).

Table V. The level of marketability of grain, the share of grain sales in organized trade in the Russian Federation for 2007-2016 years [6], [11]

Years	Gross grain harvest, million tons (paragraph 1)	Sales volume of grain by farms of all categories, thousand tons (paragraph 2)	The volume of grain procurement interventions, thousand tons (paragraph 3)	The volume of sales of grain on the exchanges, thousand tons (paragraph 4)	Ratio, %			
					Of paragraph 2 to paragraph 1 (level of marketability)	Of paragraph. 3 to paragraph 2	Of paragraph. 4 to paragraph 2	Of paragraph. 4 to paragraph 3
A	1	2	3	4	5	6	7	8
2013	92385	59279	611	3192	64,2	1,0	5,4	522,4
2014	105315	73559	1184,2	366	69,8	1,6	0,5	30,9
2015	104786	74824	1399	2381	71,4	1,9	3,2	170,2
2016	120672	83134	1767,4	1335	68,9	2,1	1,6	75,5

The number of measures, which would neutralize the negative impact of external nature, should supplement such institutional directions. These include:

1. The commissioning of deposits and abandoned lands. In the Tambov region, up to 9.2 thousand hectares are abandoned lands. Their introduction into the economic turnover would require at least 185 million rubles, but the expansion of the grain wedge would be at least 4.8 thousand hectares and can potentially provide an income of 1.2 billion rubles.

2. The improving of exchange trade by creating a network of branches of the National commodity exchange in grain-producing regions. It will improve the commercial traffic on the most profitable channels.

3. To set minimum guaranteed prices at their fair level, providing the average industry rate of return.

4. To establish the lower limit of grain sales prices in organized trade at fair prices.

5. To fix the terms of grain procurement interventions for the period of August-September, which is the time period after the mass harvesting.

6. To put into practice the conclusion of forward contracts for the supply of grain. It will help to have a clear idea of the possible sales of grain outside the region or country [12].

7. To provide the construction of facilities for deep processing of grain in order to produce products with high added value. It will allow solving the dual task: to provide high-skilled jobs and to provide the population increase. The most attractive type of business is the production of dry gluten. On the one hand, it is in demand on the world market and it has an increasing trend, on the other – is a high-tech product, which sourcing is quite limited.

8. The elimination of shortage for grain storage and transportation. For example, in the Tambov region, the total capacity of grain storage is actually 3.6

million tons with a gross grain harvest of 4.1 million tons, the missing part of infrastructure facilities is 1.3 million tons of one-time storage [13].

9. To improve the organizational and economic mechanism of intersectoral interaction through the distribution of profits from the sale of the final product of grain processing.

To determine the priority of grain market development in the Tambov region, which will create the basis for the transformation of the regional grain economy into a high-tech complex.

IV. CONCLUSION

The grain market has strategic importance for the country. The sustainability of its development is a key for the success for participants of the grain economy. Unfortunately, grain production has problems with the background of unfavorable macroeconomic conditions. On the one hand, they do not allow to implement objective economic laws, on the other hand, they require large financial investments and deep organizational and economic improvement. In General, the development of the grain market can be considered as conditionally stable.

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