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Methodology for Assessing the Financial and Economic Security of the Agro-Industrial Complex

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***Abstract*: Enough attention has been paid to studying the threats that cause the global food shortage. At the same time at the regional level, a number of scientists have worked at researching and solving the relevant issues. However, the issue of optimizing indicators and proposals for developing the methodology for assessing the financial and economic security of the agro-industrial complex has not been raised. In this respect, the relevance of this methodology is particularly enhanced under the conditions when the quality of management at the regional level requires efficient decisions. The purpose of the article is to consider monitoring of the financial and economic security of the agro-industrial complex through the method of its assessment using the example of the Republic of Crimea.**

***Index Terms*: agro-industrial complex, financial and economic security, food security, region, state regulation.**

I. INTRODUCTION

The population of the planet is steadily growing. The number of people who starve or eat quite poorly is increasing in the world. On the Earth there are seven billion people, and the population increases by 77 million annually. By 2050, there will be nine billion people on our planet. In the context of this rapid growth of the population, over 850 million people go to bed hungry. Another 1 billion do not get enough nutrients in their diet. This says about the global food security. In their column, Paul Polman and Daniel Servitie speak on how to solve this global problem. They are co-chairs of the G-20 B-20 subdivision, which deals with the problem of ensuring food security in the world. This problem is touched on by both geneticists, and suppliers of seeds, fertilizers and plant protection products, as well as manufacturers of agricultural equipment, who spend millions of dollars on innovations in order to improve the agricultural productivity [1]. Farmers of the world are challenged to feed nine billion people by 2050 (by the way, the increase by almost 2,500,000,000 people due to developing countries is projected). However, the food security of every country is one of the key functions of the state, because stable food production, its availability and consumption through their own production and import are possible only under the control of state bodies. Only the state can properly take care of food stocks by using mechanisms to support producers of basic food products, export and customs and tariff policy regulation. Only the state can solve the problem of social protection of poor people [1]. Enough attention has been paid to studying the threats that cause the global food shortage. At the same time at the regional level, a number of scientists have worked at researching and solving relevant issues [2]-[8]. However, the question of optimizing indicators and proposals for developing the methodology for assessing the financial and economic security of the agro-industrial complex has not been raised. In this respect, the relevance of this methodology is particularly enhanced under the conditions when the quality of management at the regional level requires efficient decisions. The purpose of the article is to consider monitoring of the financial and economic security of the agro-industrial complex through the method of its assessment on the example of the Republic of Crimea.

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II. METHODS

A. General description

In the context of the current development of market relations and the intensification of competition in the goods and services markets, the increasing discriminatory influence of some countries on the political and economic situation of Russia form the need to enhance the research related to the state economic security. In this situation, assessment methods and instruments to improve the economic security of agriculture and the agro-industrial complex, as a whole, are brought to the fore [9]. At the moment, the Russian agro-industrial complex still does not fully ensure food and economic security that is as important as industry in the system of the national economy, and acts as a stabilizer.

Therefore, the system of economic security becomes an integral attribute of complex processes that occur in the state and in its individual structures [9].The economic security criterion is an assessment of the economy state in terms of the most important processes that show the essence of economic security. For the economic security, not the indicators themselves but their threshold values are critical. Thresholds are limit values that when noncomplied with impede the normal development of various elements of reproduction and contribute to the formation of negative, destructive tendencies in the area of economic security under consideration. In this regard, it is possible to say that beyond the threshold indicators, the national economy loses its ability for dynamic self-development, as well as competitiveness in foreign and domestic markets [9].

In this work the attention will be paid to one of the most important elements of the economic security system of the agro-industrial complex – financial security. The financial security is the state of the financial system of an economic entity in the agro-industrial sector when there is financial stability, solvency and minimal risk of bankruptcy, and which increases the value of business [9]. It is possible to say that the financial security is the basis and in all terms is related to the economic security of the agro-industrial complex. That is why the assessment will be based on financial indicators.

B. Algorithm

Based on the available data, the methodology for assessing the financial and economic security of the agro-industrial complex was developed, the indicators were selected and classified into three blocks: agricultural enterprises block, agricultural efficiency block, and agricultural development block (Table I). Based on the consolidated indicators for these blocks, an integral indicator of the financial security of agriculture is defined, and the development and efficiency of the agro-industrial complex of the region are assessed.

Table I. Methods to Assess the Financial and Economic Security of the Agro-Industrial Complex

Agricultural enterprises block
Agricultural production
Average monthly salary
Indicator of profit and loss before tax
Indicator of profitable enterprises
Sales profit
Operating margin of sales
Consolidated indicator of the activities performed by agricultural organizations
Agricultural efficiency block
Gross regional product
Growth rate of the GRP
Labor productivity
Production from 1 ha
Returns on assets
Consolidated indicator of agricultural efficiency
Agricultural development block
Investments in the basic capital of enterprises of the agro-industrial complex
Rate of crop production growth
Rate of livestock production growth
Rate of agricultural lands growth
Rate of animals growth
Consolidated indicator of the agriculture development
Integral indicator of the financial security of agriculture

Source: compiled by the authors.

The agricultural enterprises block includes the following indicators (Table II).

Table II. Agricultural Enterprises Block

Agricultural enterprises block	*Optimal value*
Agricultural production	medium
Average monthly salary	medium
Indicator of profit and loss before tax	max
Indicator of profitable enterprises	max
Sales profit	medium
Operating margin of sales	Standard value – 1
Consolidated indicator of the activities performed by agricultural organizations	*Standard value – 1*

Source: compiled by the authors.

According to Tables I, II, values are given by years of the agricultural production and the average value is defined using the following formula (1):

$$Average\ value = \frac{\sum value\ for\ tHe\ period\ under\ consideration}{\text{number of periods}}, \quad (1).$$

Similarly, the values of the average monthly salary are defined and the average optimal value is calculated using formula (1).

The indicator of profit and loss is calculated by using the following formula:

$$\text{Indicator of profit and loss} = \frac{Profit\ before\ tax}{Loss\ before\ tax}, \quad (2).$$

The following is the maximum value of the profit and loss indicator for the entire period under consideration.

The indicator of profitable enterprises is calculated by using the following formula:

$$Indicator\ of\ profitable\ enterprises = \frac{Number\ of\ profitable\ enterprises}{Total\ number\ of\ enterprises} * 100, \quad (3).$$

Based on the obtained results, the maximum value for the entire period is calculated.

The following are the values of profits from sales of agricultural enterprises, and the average value is calculated using formula (1). The operating margin of sales is calculated using the following formula:

$$Operating\ margin\ of\ sales = \frac{Profits\ from\ sales}{Gross\ regional\ product}, \quad (4).$$

It is calculated as a coefficient. Therefore, its standard value is 1.

Based on the above indicators, the consolidated indicator of the activities performed by agricultural organizations (APAO) is calculated using the following formula:

$$Consolidated\ indicator\ of\ APAO = \frac{agricultural\ production + average\ monthly\ salary + ratio\ of\ proft\ and\ loss + ratio\ of\ profitable\ enterprises + sales\ profit + operating\ marhin\ of\ sales}{Number\ of\ indicators\ (6)}, \quad (5).$$

The standard value of the indicator under consideration is 1. If the value is lower than 1, this indicates non-efficiency of the activities performed by agricultural organizations.

The agricultural efficiency block will be considered (Table III).

Table III. Agricultural Efficiency Block

Agricultural efficiency block	*Optimal value*
Gross regional product	medium
Growth rate of the GRP	1.025
Labor productivity	medium
Production from 1 ha	medium
Returns on assets	medium
Consolidated indicator of agricultural efficiency	*Standard value – 1*

Source: compiled by the authors.

According to Table III, the values are given by year of gross regional product, and the average value is calculated using the following formula (1).

The growth rate of the agricultural GRP is calculated using the following formula:

$$Growth\ indicator\ of\ agricultural\ GRP = \frac{Current\ gross\ regional\ product}{Previous\ gross\ regional\ product.}, \quad (6).$$

Labor productivity can be calculated using the following formula:

$$Labor\ productivity = \frac{Gross\ regional\ product}{Average\ number\ of\ workers}, \quad (7).$$

Next, the average value of the calculated indicators for the period under consideration is defined using formula (1).

Production from 1 ha is calculated using the following formula:

$$Production\ from\ 1\ ha = \frac{Crop\ products}{(All\ cultivated\ areas + areas\ of\ perennial\ plantings)}, \quad (8).$$

On the basis of the calculated indicators, the average value is calculated. It is the basis for analysis.

Using formula

$$Returns\ on\ assets = \frac{Gross\ regopnal\ product}{Capital\ fund} \quad (9),$$

the return on agricultural assets is calculated, and the average value is defined (1).

Based on the above indicators, the consolidated indicator of efficiency of agriculture is calculated using the following formula:

$$Consolidated\ indicator\ of\ agrilcutural\ efficiency = \frac{(GRP + GRP\ growth\ rate + LP + Production\ from\ 1\ ha + Returns\ on\ assets)}{Number\ of\ indicators\ (5)}, \quad (9).$$

The standard value of the indicator under consideration is 1. If the value is lower than 1, this indicates the non-inefficiency of agriculture.

The last block is the agriculture development block (Table IV).

Table IV. Agricultural Development Block

Agricultural development block	*Optimal value*
Investments in the basic capital of enterprises of the agro-industrial complex	medium
Rate of crop production growth	1.05
Rate of livestock production growth	1.05
Rate of agricultural lands growth	1.01
Rate of animals' growth	1.02
Consolidated indicator of the agriculture development	Standard value – 1

Source: compiled by the authors.

According to Table IV, the values are given by years of investment in the basic capital of agricultural enterprises, and the average value is defined using formula (1).

Next, the growth rates of crop and livestock production are calculated, whose optimal value is 1.05, as well as the growth rate of agricultural land, whose optimal value is 1.02, and the growth rate of animals, whose standard value is 1.02.

Based on these indicators, the consolidated indicator of agricultural development is calculated using the following formula:

$$Consolidated\ indic.\ of\ agric.\ develop.\frac{(Investments\ in\ basic\ capital + Growth\ rate\ of\ crop\ production + Growth\ of\ cattle\ production + Growth\ rate\ of\ agricultural\ lands + Growth\ rate\ of\ animals)}{Number\ of\ indicators\ (5)}, (10).$$

The standard value of the indicator under consideration is 1. If the value is lower than 1, this indicates insufficient development of agriculture.

Based on the calculated consolidated indicators for each block, the total integral indicator of the financial security of agriculture (FSA) is calculated. In order to do this, the following formula is used:

$$Integral\ indicator\ of\ FSA = \frac{(Agricultural\ enterprises\ block + agricultural\ efficiency\ block + agricultural\ development\ block)}{3}, (11).$$

Based on this indicator, the financial security of agriculture is assessed.

Thus, based on the coefficient analysis of the financial and economic state of the agro-industrial complex that acts as an instrument for managing the improvement of the economic security of the agro-industrial complex, it is possible to analyze the efficiency of the agricultural sector and those areas of its activity that need improvement and greater attention.

III. RESULTS

A. General Assessment of the Economic Security of the Crimean Agro-Industrial Complex

The economic security of the agro-industrial complex is an optimal interaction in the following chain: "providing the means of production – agricultural production – processing of agricultural products – marketing – consumption" that provides the population with food, enables participants of interrelations to stay profitable, financially sustainable, solvent and efficiently use their potential (production, investment, innovation, and scientific), as well as provides opportunities for expanded reproduction, taking into account the activities of environmental and social factors.

It means that the essence of the above concept comes to ensuring the food security of the country and the efficient functioning of the agro-industrial complex.

Based on this, the indicators that most fully reflect all these components were put into blocks. They were discussed in detail in paragraph 2.2. In this paragraph, based on the above indicators, the coefficients that reflect the total results and efficiency of the activities of the Crimean agro-industrial complex were defined.

First of all, the Crimean agricultural enterprises will be considered (Table V).

Table V. Crimean Agricultural Enterprises Block (2014 – 2017)

Agricultural enterprises block				
	2014	2015	2016	2017
Agricultural production	0.8008	1.0802	1.1410	0.9780
Average monthly salary	0.8180	0.9144	1.1167	1.1509
Indicator of profit and loss before tax	0.0544	0.3372	1.0000	0.8152
Indicator of profitable enterprises	0.8797	0.9819	0.9897	1.0000
Sales profit	0.6160	1.4891	0.8668	1.0282
Operating margin of sales	0.4579	1.1434	0.6785	0.7874
Consolidated rate of indicators of the activities performed by agricultural organizations	0.6045	0.9910	0.9654	0.9600

Source: compiled according to [10].

The final indicator of the block under consideration is the consolidated coefficient of the indicators related to the performance of agricultural organizations, which reflects the efficiency of the agricultural producers' activity. In the period from 2015 to 2017, it was steadily decreasing and amounted to 0.9600 at the end of 2017, which was lower than the standard value 1. The indicator of profit and loss before tax had the main negative impact on the resulting coefficient. In 2017 it was 0.8152, which was lower by 0.1848 than in 2016, despite the fact that in 2016 the value of this indicator for the entire period under consideration was better.

The indicator of agricultural production had slightly less negative impact on the consolidated coefficient. In the period from 2014 to 2016 it had positive dynamics, but in 2017 it decreased from 1.1410 down to 0.9780, which also reduced the consolidated coefficient of the indicators related to the performance of agricultural organizations.

In general, the coefficient is close to the normative value. However, the variability of the main indicators is observed. This says about the unstable activity of agricultural enterprises. First of all, it affects agricultural production, i.e., the imperfection of technology, low competence in complying with crop rotation, taking into account the natural, soil and climatic conditions and biological characteristics of crops. It is also related to the cost of production. Due to the lack of resources and poor transport logistics, producers increase the cost of production, which decreases their products competitiveness.

Next, the Crimean agricultural efficiency block will be analyzed (Table VI).

Table VI. Crimean Agricultural Efficiency Block (2014 – 2016)

Agricultural efficiency block				
Indicator	2014	2015	2016	2017
Gross regional product	1.0287	0.9959	0.9768	0.9985
Growth rate of the GRP	2.7551	0.9445	0.9569	0.9973
Labor productivity	1.1126	1.0237	0.9369	0.9268
Production from 1 ha	0.7259	1.1085	1.1432	1.0224
Returns on assets	1.4281	1.2283	0.7648	0.5789
Consolidated indicator of efficiency of agriculture	1.4101	1.0602	0.9557	0.9048

Source: compiled according to [10].

The final indicator of this block is the consolidated indicator of the agricultural efficiency. In the period from 2014 to 2017, it had negative dynamics. At the end of 2017 it was 0.9048, which was below the standard value. This decrease was caused, primarily, by the decrease in returns on assets by 0.1859 down to 0.5789, and, in general, the returns on assets over the entire period under consideration had negative dynamics due to the significant increase in the basic capital, with the decreasing, like in 2015 and 2016, or slightly increasing (as to the basic capital) gross regional product, like in 2017.

In addition, the final indicator was affected by the decrease in production from 1 ha, due to the decrease in crop production with the increase in acreage. During the period under consideration, this indicator had changeable dynamics. The best value of this indicator was in 2016 – 1.1432, and the worst one was in 2014 – 0.7259.

As compared to the first indicators issues, labor productivity had less negative impact on the final indicator. During 2014 – 2017 it had negative dynamics. Consequently, the worst value was obtained in 2017. Such decrease was due to the fact that the number of workers during the periods under consideration was increasing, but the production was decreasing.

The agricultural development block will be considered (Table VII).

Table VII. Crimean Agricultural Development Block (2014 – 2017)

Agricultural development block				
Indicators	2014	2015	2016	2017
Investments in the basic capital of enterprises of the agro-industrial complex	0.8919	0.9467	1.1387	1.0227
Rate of crop production growth	2.8477	1.4120	1.0701	0.8465
Rate of livestock production growth	2.9230	1.1322	0.9104	0.7636
Rate of agricultural lands growth	0.9343	0.9748	1.0535	1.0143
Rate of animals' growth	0.8207	1.0382	0.8110	1.0601
Consolidated indicator of the agriculture development	1.6835	1.1008	0.9967	0.9414

Source: compiled according to [10].

In 2014 – 2017 the consolidated indicator of the agricultural development was constantly decreasing and in 2017 it was 0.9414, which was lower than the standard value – 1.

First of all, the growth rate of crop production had impact on the decrease. It had been declining since 2014 due to the lack of water resources, as well as difficult climatic conditions and frosts [11], [12].

In addition, the consolidated indicator was adversely affected by a slowdown in the growth of livestock production. It started declining in 2016 due to the African swine fever in the Crimea in 2016. It resulted in the death and elimination of a considerable number of animals. Besides, the poultry stock decreased due to the transition to a new production technology, as well as due to the interruption of the supply of compound feed for birds from the mainland of Russia.

Besides, the decrease in investments in the basic capital had impact on the consolidated indicator. In 2017 it decreased by 0.1160 down to 1.0227 due to the decrease in the state support of the industry.

Based on the above, it is possible to make the conclusion that in 2014 and 2015 the indicator of agricultural development had been higher than the standard value, but in 2016 and 2017 it decreased. To a greater extent, this was due to the decrease in crop and livestock production.

Based on the results of the consolidated indicators for each of the above blocks, the integral indicator of the financial security of the Crimean agriculture for 2014 – 2018 will be analyzed (Table VIII).

Table VIII. Indicators of the Agricultural Financial Security in the Crimea

Indicators	2014	2015	2016	2017
Consolidated rate of indicators of the activities performed by agricultural organizations	0.6045	0.9910	0.9654	0.9600
Consolidated indicator of efficiency of agriculture	1.4101	1.0602	0.9557	0.9048
Consolidated indicator of the agriculture development	1.6835	1.1008	0.9967	0.9414
Integral indicator of the financial security	1.2327	1.0507	0.9726	0.9354

Source: compiled according to [10].

The integral indicator of the financial security of agriculture for 2014 – 2017 was negative. In 2017 it was 0.9354, which was lower by 0.0646 than the standard value. However, it is necessary to note that 2014 should not be taken into account due to the difficult economic situation that took place during the transition of the Crimea to the Russian Federation. During this period there were serious changes, there was a strong price jump, which considerably increased the growth rates of many indicators. It means that the data for 2014 do not show the actual state of the economy and the agricultural complex of the Crimea of that period.

Consequently, the best indicator was in 2016, and the lowest one was in 2017. To a greater extent, the decrease in the consolidated indicator of agricultural development had impact on the decline in the integral indicator of the financial security of agriculture in 2017. In its turn, it decreased due to the negative dynamics of growth rates of crop production and livestock production.

In addition, the consolidated indicator of agricultural efficiency had negative impact on the decline in the integral indicator of the financial security. It was decreasing throughout the whole period under consideration.

The consolidated indicator of the activity performed by agricultural organizations had the least impact as compared to the above indicators. It decreased due to the reduction of agricultural production and the indicator of profit and loss before tax.

IV. CONCLUSION

According to the analysis, it is possible to see that today the Crimea has many opportunities it has not used in agriculture. Agrarians should pay special attention to the rational use of the available resources (natural, human and capital). The main natural resource of agricultural production is agricultural land. This is the main component of the strategic resource and national wealth of the region. As a result of noncompliance with scientifically based crop rotations, inadequate use of organic and mineral fertilizers, plant protection products, the soil fertility decreases, and the crop yields decline. It causes the reduction in crop production. It is also necessary to develop livestock breeding, create good conditions for keeping and constantly take preventive measures.

In addition, the weak development of the production, market, transport infrastructure, and the increasing monopolization of trade chains in the Republic of Crimea affect the development of agriculture and its financial and economic security. This causes losses of agricultural products due to their late sale. Besides, agricultural producers have limited access to sales markets and very often sell their products at below-cost prices in order to reimburse at least a part of the costs.

At the present stage of the development of the agro-industrial complex in the Republic of Crimea, there are many problems the agricultural producers face. The list of the above problems is not final. The unsolved problems that arise affect the development of the agricultural sector. It is necessary to study the main threats to the Crimean agro-industrial complex and how to eliminate them.

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