Development of the Agro-Industrial Complex for Improving the Economic Security of the State

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Summary

Ensuring the economic security of agro-industrial complexes of Ukrainian regions has become a top-priority task of state regional policy, as their stable functioning is an essential element of economic security of the whole country. It is overcoming threats to the development of the agro-industrial complex that ensures its further effective functioning and has a significant impact on the economic security of our state. Methods: logical method; methods of system analysis; synthesis; economic and statistical method; method of expert assessment; SWOT analysis; economic and mathematical modelling and planning. Results. Characteristic features of economic security have been given. The essence and significance of the agro-industrial complex in improving the economic security of the state have been determined. It has been noted that in recent years, the agro-industrial complex, which acts as a driver of the domestic economy and has a direct impact on the development of the country, has been growing (in 2019 the cereal and legume harvest exceeded 75 million tons, 20,269 thousand tons of potatoes were dug, more than 15 million tons of sunflower, 9,688 thousand tons of vegetables and 2,119 thousand tons of fruits and berries were harvested, meat and egg production increased by 137.5 thousand tons (or 5.8%) and 545.5 million pieces (or 3.4%), respectively, the number of employed population in agriculture increased by 139.8 thousand people (or 4.9%), the labour productivity in crop production increased by UAH 294.4 thousand (or 44.6%), in livestock production – by UAH 311.3 thousand (or 61.8%)). Based on the system of production and economic indicators, the analysis of the state of the agro-industrial complex has been carried out. Taking into account the results of the obtained data and using SWOT-analysis, the major threats to the development of the agro-industrial complex have been identified. Ways of overcoming threats enhancing the economic security of Ukraine have been proposed.

Key words:
Economy, Economic Security, Food Security, Agro-Industrial Complex, Agriculture, Employment, Labour Productivity, Export.

1. Introduction

Achieving economic security is one of the vitally important problems of the development of any state. All spheres of human life contain risks and dangers that must be taken into account in defining and implementing goals set by society. The economic security of the country is crucial for its development, as it provides guidance for taking right socio-economic decisions. In the current socio-economic conditions, one of the major threats to the development of the agricultural sector of Ukraine and its modernization is the deformation of both the national economy and the agro-industrial complex, which is associated with a violation of the structure of production of material and technical resources, disparity in price relations, breaking of cooperative and integrated ties. In terms of national and food security, the continuation of this trend increases the threat of overdependence of the country on the world market, imports of food and engineering products, sale of natural resources, including strategic resources. It is obvious that the recovery of the agricultural sector of the Ukrainian economy is impossible without the growth in innovation and investment activity in agricultural industries, prospect of technical re-equipment, modernization of production.

Unsustainable development of the agro-industrial complex is the cause of the decreasing level of food and, consequently, economic security of Ukraine. At the same time, additional threats to the economic security of the industry are emerging in the circumstances of changing external economic conditions, resulting in higher prices in the world market of agricultural products, increasing degree of dependence of the domestic market and improving competition in the domestic market.

The goal of the article is to develop theoretical provisions, methodological approaches and practical recommendations for identifying threats to the development of the agro-industrial complex, directions of their neutralization in order to improve the economic security of Ukraine. Achieving this goal determines the performance of the following tasks during the study: to highlight theoretical provisions of the problem of ensuring economic security; determine the importance of the agro-industrial complex in improving economic security; identify threats to the development of the agro-industrial complex; develop practical recommendations for neutralizing threats, which have a significant impact on the improvement of economic security of the state.

2. Theoretical overview of sources

In national science, problems of the theory of economic security, approaches to its definition, levels and ensuring mechanisms have been studied in the works of many scientists.

Characteristic features of economic security were studied by Akimova [1], Akimova et al. [2], Deyneha, et al. [3], Gbur [4], Klymenko et al. [5], Povzun [6]. According to Tsvigun, in Ukraine, the priority of national interests in the field of economic security is to create a competitive, socially oriented market economy and ensure constant growth in the living standard and human well-being [7]. According to O. Skoruk, economic security is a complex economic category with a rather difficult internal structure [8].

In the scientific literature there are three important components of economic security: economic independence, resilience and stability of the national economy, the capacity for self-development and progress [9; 10]. In our opinion, they should be supported by high productivity of labour and capital, high efficiency of agricultural production, high level of its competitiveness in both domestic and foreign markets.

Such researchers as Zagorulko, Zalizko, Manaenko devoted their scientific papers to tendencies and problems of the agro-industrial complex of Ukraine [11; 12]. The scientists Saribekyan, Skorobogatova, Kuznetsova interpret the agro-industrial complex of Ukraine as a set of sectors of the national economy, including agriculture and fishery, food industry and processing of agricultural products, their logistic and financial support [13; 14]. Some relevant studies can be found in [15] and [16].

However, in spite of the availability of publications on this subject, the problem of identifying threats to the development of the agro-industrial complex and the development of directions to overcome them in order to improve the economic security of the country remains underexplored and relevant today.

3. Materials and methods

The legislation of Ukraine, statistical books of Ukraine, basic works of scientists and leading experts on the research problem were used in the context of the study.

In the process of studying and processing information sources, the logical method (in revealing the content of economic security), methods of systematic analysis and synthesis (for theoretical overview of scientific literature and identification of structural links between the development of the agro-industrial complex and the economic security of the country), economic and statistical method (for assessment of the state and identification of trends in the development of the agro-industrial complex), method of expert assessment (to determine weight coefficients of the major threats to the development of the agro-industrial complex), economic and mathematical (modelling – development of a model for involving unused agricultural land in circulation in order to improve the economic security of the state; planning – determination of the volume of agricultural production for the planning period) research methods were used.

The assessment of strengths and identification of the major threats to the development of the agro-industrial complex, overcoming which will enhance the economic security of Ukraine, was carried out on the basis of the method of SWOT-analysis.

In order determine weight coefficients of the major threats to the development of the agro-industrial complex, overcoming which will enhance the economic security of the state, the method of expert assessment was used. For this purpose, the quantitative and qualitative composition of experts was determined, the survey on weight coefficients of the major threats to the development of the agro-industrial complex was conducted, the consistency of experts' opinions was analysed using the concordance coefficient, and the reliability of expert survey results was evaluated using Pearson's test (χ^2). A group of the most competent experts, numbering 10 people, who had special knowledge and experience in the field of the agro-industrial complex development, were acquainted with scientific research methods and were able to give objective recommendations, was formed. This group included 4 doctors and 3 candidates of economic sciences of higher education institutions, as well as 3 directors of departments of agro-industrial development of regional state administrations. Based on the identified threats to the development of the agro-industrial complex, the neutralization of which will enhance the economic security of Ukraine, the selected experts were asked to assess their weight on a 1-10 scale.

The study of Evlanov & Kutuzov was used to analyse the results of expert assessments [17]. The level of consistency of experts' opinions was determined using the concordance coefficient and the methodology described by Grabovetsky [18] and recommendations given by Tymoshenko & Kotsyubivska [19]. The approach proposed by Ligonenko, Nosulich & Novikova [20] for trade enterprises was adapted for planning and forecasting crop production volumes.

4. Results

Economic security of the state in terms of development of the agro-industrial complex is a system of relations between sectors of the agro-industrial complex (provision of means of production, production itself, as well as processing of agricultural products and sale of finished products), in which a high level of competitiveness and protection of

agro-industrial enterprises against external and internal threats is achieved, and food security of regions and the country as a whole is ensured.

In order to assess the strengths and identify the major threats to the development of the agro-industrial complex, overcoming which will enhance the economic security of Ukraine, SWOT-analysis was used (Table 1).

Table 1: SWOT-analysis of the situation in the agro-industrial complex of Ukraine

S (strengths)	W (weaknesses)
Formed system of state support of the agro-industrial complex Significant consumer potential Existence of modern systemic companies Increasing manufacturing capabilities Availability of significant land resources High genetic potential of cattle	Outdated material and technical resources of the agro-industrial complex Shortage of qualified personnel in the country, low attractiveness of rural areas for young people Poor infrastructure development Price disparity Low attractiveness of business in the country Large number of unused agricultural lands
O (opportunities)	**T (threats)**
Increasing the profitability of state support Creation of the state land fund of agricultural lands Development of a monitoring system for unused agricultural lands Identification and registration of breeding animals Application of resource-saving technologies Attracting young people to the country	Loss of personnel (j_1) Reduction of specific weight of dairy cows (j_2) Aging of skilled personnel (j_3) Increased number of unused agricultural lands (j_4) Aggravation of social problems (j_5) Lost labour productivity (j_6) Increased energy prices (j_7) Increased disparity in prices for agricultural and industrial products (j_8) Existence of an outdated agricultural machinery fleet (j_9)

The results of the experts' assessment of the threats to the development of the agro-industrial complex of Ukraine, obtained as a result of SWOT-analysis, are presented in Table 2.

Table 2: Results of the assessment of threats to the development of the agro-industrial complex of Ukraine (points)

Threats	Experts									
	1	2	3	4	5	6	7	8	9	10
j_1	9	9	10	7	9	9	9	8	9	9
j_2	10	9	9	10	9	9	10	10	9	8
j_3	5	8	8	9	8	8	8	8	7	7
j_4	9	10	9	8	10	10	9	9	10	10
j_5	4	5	6	4	5	3	4	4	2	3
j_6	7	7	6	6	6	6	7	6	6	4
j_7	6	6	4	3	3	4	3	3	4	1
j_8	5	5	7	5	4	5	5	5	3	2
j_9	8	7	5	6	6	7	6	6	5	5
j_{10}	3	4	8	7	7	8	8	7	8	6
Total	66	70	72	65	67	69	69	66	63	55

Based on the obtained expert assessments of the weight of threats, it is possible to determine their weight coefficients:

$$g_i = \frac{\sum_{j=1}^{m}(Б_{ij} / Б_{cj})}{m} \qquad (1)$$

where g_i is a weight coefficient of the i-th threat to the development of the agro-industrial complex, No/units;
i – the number of the threat to the development of the agro-industrial complex, No/units;
j – the number of the expert, No/units;
m – the number of experts in the group, people;

$Б_{ij}$ – the number of points assigned to the i-th threat to the development of the agro-industrial complex by the j-th expert, points;

$Б_{cj}$ – the number of points assigned by the j-th expert to all the threats to the development of the agro-industrial complex of the corresponding group, points.

Values of weight coefficients of the threats to the development of the agro-industrial complex within each group are presented in Table 3.

Table 3: Weight coefficients of threats to the development of the agro-industrial complex of Ukraine

Threats	Weight coefficients
j_1	0.133
j_2	0.140
j_3	0.115
j_4	0.142
j_5	0.060
j_6	0.092
j_7	0.056
j_8	0.069

j_9	0.092
j_{10}	0.099
Total	1.00

According to the experts, the most significant threats to the development of the agro-industrial complex are j_4 - increased number of unused agricultural lands and j_2 - reduction of specific weight of dairy cows.

In order to determine the concordance coefficient, the threats were ranked based on the data in Table 3.

Table 4 - Ranking of threats to the development of the agro-industrial complex

Threats	Experts										Sum of ranks (r_i)
	1	2	3	4	5	6	7	8	9	10	
j_1	2.5	2.5	1	4.5	2.5	2.5	2.5	3.5	2.5	2	26
j_2	1	2.5	2.5	1	2.5	2.5	1	1	2.5	3	19.5
j_3	7.5	4	4.5	2	4	4.5	4.5	3.5	5	4	43.5
j_4	2.5	1	2.5	3	1	1	2.5	2	2	1	18.5
j_5	9	8.5	7.5	9	8	10	9	9	10	8	88
j_6	5	5.5	7.5	6.5	6.5	7	6	6.5	6	7	63.5
j_7	6	7	10	10	10	9	10	10	8	10	90
j_8	7.5	8.5	6	8	9	8	8	8	9	9	81
j_9	4	5.5	9	6.5	6.5	6	7	6.5	7	6	64
j_{10}	10	10	4.5	4.5	5	4.5	4.5	5	3	5	56

Based on the data in Table 4, concordance coefficients characterizing the level of consistency of experts' opinions on each threat were calculated:

$$\chi^2 = \frac{12 * \sum_{i=1}^{n} (\sum_{j=1}^{m} r_{ij} - \bar{r})^2}{m * n * (n+1) - \frac{1}{n-1} * \sum_{j=1}^{m} T_j}$$

(2)

$$\bar{r} = \frac{1}{n} * \sum_{i=1}^{n} \sum_{j=1}^{m} r_{ij}$$

(3)

$$T_j = \sum_{k=1}^{H_j} (h_k^3 - h_k)$$

(4)

where W is a concordance coefficient, No/units;

n – the number of threats, units;

m – the number of experts assessing the weight of the threats, people;

r_{ij} – the rank assigned to the i-th threat by the j-th expert, No/units;

$\bar{r}$ – the arithmetic mean of sum of ranks on the threats, No/units;

T_j – the indicator of connected ranks in the j-th ranking, No/units;

H_j – the number of groups of equal ranks in the j-th ranking, No/units;

h_k – the number of equal ranks in the k-th group of connected ranks when ranked by the j-th expert, No/units.

As a result of calculations performed using the above formulas, the value of the concordance coefficients $W = 0,82$ was obtained, which indicates a fairly high level of consistency of experts' opinions on the weight of the threats.

In order to determine the statistical significance of the concordance coefficients, Pearson's test was used:

$$\chi^2 = \frac{12 * \sum_{i=1}^{n} (\sum_{j=1}^{m} r_{ij} - \bar{r})^2}{m * n * (n+1) - \frac{1}{n-1} * \sum_{j=1}^{m} T_j}$$

(5)

where χ^2 – Pearson criterion.

Pearson criterion for the threats to the development of the agro-industrial complex was 67.85. To check the statistical significance of the concordance coefficients, it is necessary to compare the obtained calculated values of the Pearson criterion with its tabular values. The significance level is usually taken to be 0.05 or 0.01. Herewith, the number of degrees of freedom v is equal to $n-1$. Thus, to determine $\chi^2_{табл}$ on the threats, we take $\alpha=0.05$, $v=9$. According to the source [21] $\chi^2_{табл} = 16.92$. Since $\chi^2_{табл} < \chi^2$ (16.92 < 67.85), the hypothesis of consistency of experts'

opinions on the ranking of assessments of the weight of threats to the development of the agro-industrial complex, neutralization of which will enhance the economic security of Ukraine, is accepted, and the results of the expert survey are considered reliable.

Based on the conducted SWOT-analysis of the agro-industrial complex of Ukraine and determination of weight coefficients of the major threats to the development of the agro-industrial complex, overcoming which will enhance the economic security of the state, we can determine several ways to neutralize them. One of the main threats to economic security was the threat of increased number of unused agricultural lands. As part of this study, the author proposed an interpretation of the algorithm for involving unused agricultural lands in circulation, which will increase their number, crop areas, thereby increasing the economic security of regions and the state as a whole. The crucial role in this algorithm is assigned to the "State Land Fund", whose relations with the subjects of this algorithm are presented in Fig. 1.
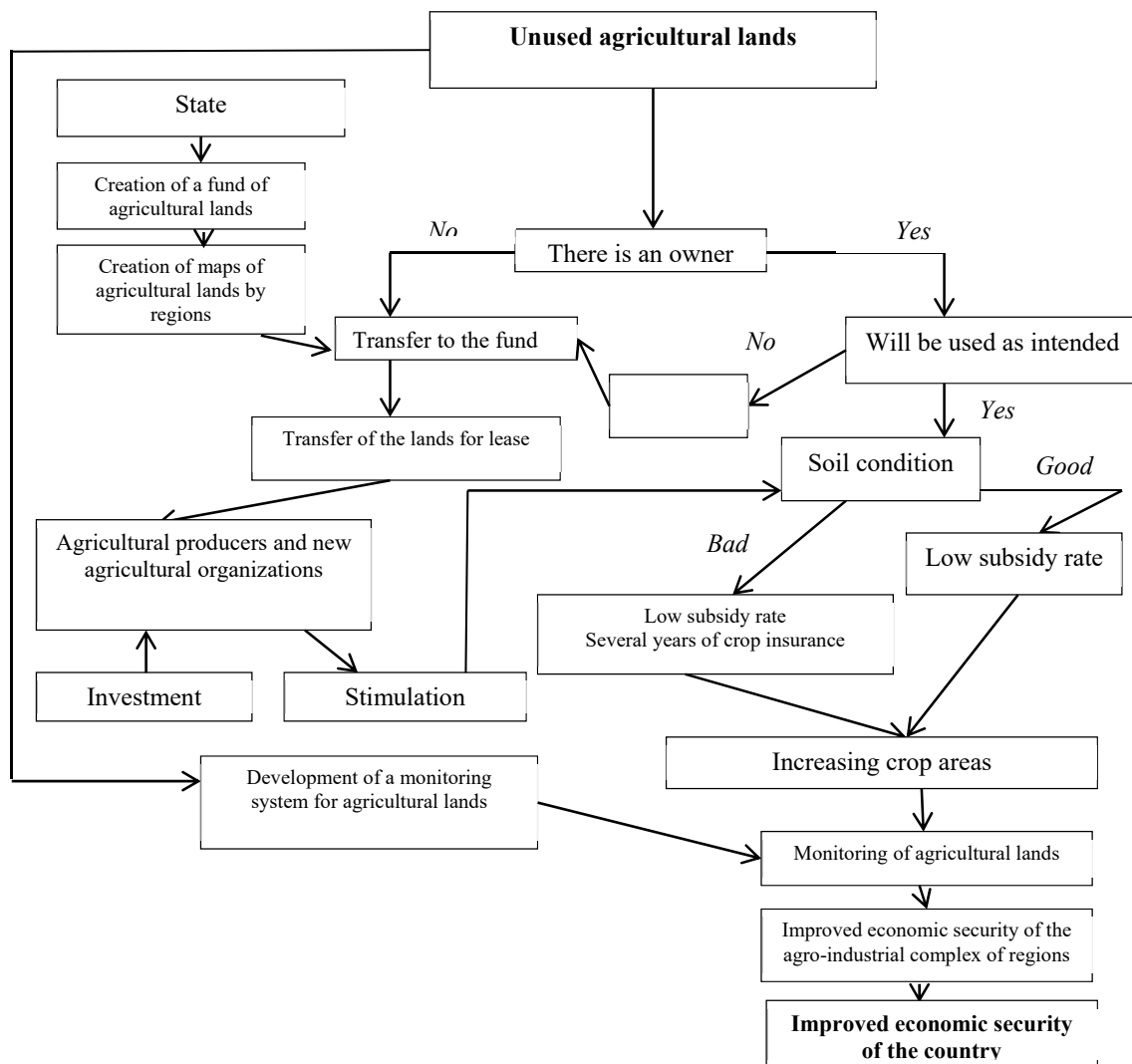

Fig. 1. Model of involving unused agricultural lands in circulation in order to improve the economic security of the state

The land owned by individuals and legal entities, but not used for its intended purpose, is purchased by the "State Land Fund" and transferred for a long-time lease to agricultural producers on the most adapted terms. Meanwhile, it is necessary to stimulate agricultural organizations through subsidies, which should depend on

the condition of the lands received: the worse the condition, the higher the subsidy rate and the lower the land tax. The crop insurance tool should also work during the first years of the land use. By placing an order for the production of agricultural products on the leased lands, the state obtains the opportunity to intensify the process of rational allocation of agricultural production, which is one of the key factors in increasing the competitiveness of producers in the country. The implementation of this algorithm will help increase crop areas, which in turn will result in increased indicators of the crop production, improved and increased fodder base, and have an impact on positive indicators of the livestock production. Ultimately, this will help increase the food and economic security of the state.

In the context of involvement of unused agricultural lands in circulation and increasing crop areas of the state, we calculate the planned indicators of the crop sector. Planning the volume of agricultural production (crop production – by groups, cereals and legumes, sunflower, vegetable crops) for 2020-2022 is based on the formula of the average annual rate of growth (geometric mean):

$$\overline{Rgr_i} = \sqrt[n-1]{\frac{ACP_n}{ACP_1}} * 100\% - 100\% \qquad (6)$$

where Rgr_i – the average annual rate of growth of agricultural production of the *i-th* group;
ACP_n – the volume of agricultural production of the *i-th* group in the base year (2019);
ACP_1 – the volume of agricultural production of the *i-th* group in the first study year (2015);
n – the number of study periods.
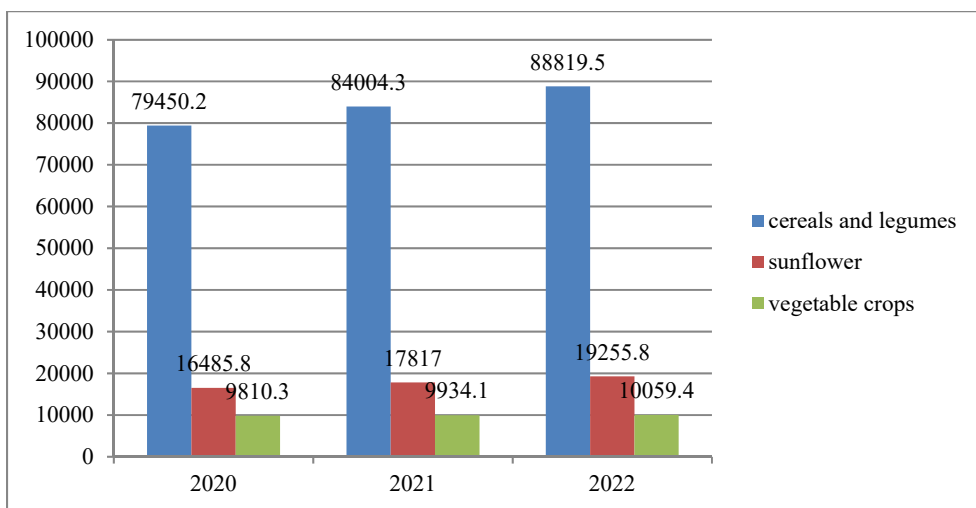The results of the calculations are shown in Fig. 2.

Fig. 2. Planned volume of crop production in 2020-2022, thousand tons

5. Discussion

According to modern scientific studies, the economic security of the state in the context of the agro-industrial complex development lies in the fact that it is necessary to ensure such a system of production and economic relations between different areas of the agro-industrial complex, which allows to smooth the consequences of disparity of agricultural product prices, reduce accounts payable and receivable, contributes to the reduction of rural unemployment and the development of social infrastructure of the country, attraction of investors, leads to the maximum use of innovative approaches in agricultural production, ensuring a high level of financial stability and competitiveness.

For this purpose, it is necessary to overcome the threats in the agro-industrial complex. According to foreign and domestic scientists, the only correct and radical way to neutralize them is to increase the productivity of agricultural enterprises on an innovative basis while increasing the purchasing power of Ukrainian citizens, which will ensure the economic security of the state.

In our opinion, this direction of overcoming threats consists in the development of a model for the involvement of unused agricultural lands in circulation in order to improve the economic security of the state and move to the model of "breeding animal".

6. Conclusions

Thus, ways of overcoming threats to the development of the agro-industrial complex of Ukraine have been determined in the context of this study. It is possible to improve the economic security of the state at the expense of the crop industry by realization of the algorithm for involvement of unused agricultural lands in circulation.

The practical significance of the obtained results lies in the possibility of their use in activities of state, regional and local authorities during the development and implementation of program documents in the field of economic security of the country.

Practical recommendations can also be applied in management activities, which will allow to minimize risks in the agricultural sector, ensure its further effective development; increase food and, as a consequence, economic security of Ukraine.

The effect of the implementation of proposals is also manifested in professional development of agricultural workers, more efficient use of production capacity and human resources of rural areas, stimulation of entrepreneurial activity of the population and restoration of the social potential of its growth. Thus, the proposed algorithms for increasing the efficiency and productivity of economic entities in the field of agriculture lay the groundwork for improving the economic security of the state.

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