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## Credit and Investment support for the development of Ukraine's agricultural and economy sector

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**Abstract.** One of the key problems of the modern agricultural sector of the national economy is the achievement of stable economic growth. In this context, the system of credit and investment support occupies the main place in the expanded reproduction of this priority industry for the economy of Ukraine. The research aims to review the main trends in credit and investment provision of the agrarian sector of the national economy and to determine further investigations in this direction. It has been established that for the formation of an effective system of credit and investment support for the agricultural sector, it is necessary to consider such positions as the influence of bank lending and climate shocks on the investment decisions of farmers, global and regional trends in the direction of the gross accumulation of fixed capital and fixed assets in agriculture, mechanisms for fixing conditions for the transfer of investment resources for use by agro-industrial companies, financial inequality between the



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urbanized and rural areas. It has been proven that bank lending is the key tool in all forms of credit and investment support for the agricultural sector. This is especially true during the period of martial law in Ukraine. Using the method of economic and mathematical modelling, it can be argued that bank lending is a strategic financial resource in the formation of credit and investment support for the agricultural sector. A system of credit and investment support is proposed, which is primarily based on the improvement of the system of state regulation of the agrarian sector. It has been proven that to increase the level of effectiveness of the system of credit and investment provision of the agricultural sector, attention should be paid to such an instrument as project financing and a review of the very structural composition of the state regulation of agricultural production, considering the practice of European Union. Such approaches can be used by state authorities when developing a strategy for the development of the agrarian sector in the conditions of martial law and the post-war period, as well as making infrastructural changes in the process of interaction between the banking and agrarian sectors of the national economy

**Keywords:** agricultural business; bank lending; state financial support; investment; financial resources; martial law; profitability

## INTRODUCTION

The agrarian sector of an economy is increasingly in need of financial investments necessary for the renewal and technological modernization of production. At the same time, despite the continuation of martial law, it is necessary to develop a clear action plan for credit and investment support of the agricultural sector of the economy, reconstruction of destroyed agrarian infrastructure, restoration of land fertility, further introduction of innovative production technologies and agrarian business.

The large-scale war launched by Russia against Ukraine had a significant impact on the economy and its agricultural sector. L. Vdovenko (2022) singled out the key challenges for the agrarian industry in the conditions of martial law, among which the reduction of sown areas; the blocking of agricultural product sales markets; the impossibility of functioning of seaports of Ukraine; destruction of the infrastructure of agro-industrial production; processing and storage. I. Osadchuk *et al.* (2020) stated that Ukraine, despite an unfavourable general economic climate, can use the experience of countries that managed to achieve significant success in the development of innovative activity and increasing the competitiveness of the agricultural sector, namely the USA, France, England, Poland, Germany, Japan.

S.K. Dary and H.S. James Jr. (2019) considered the relationship between investments in trade credits and the profitability of U.S. agricultural and food companies for the period 2001-2014. The authors concluded that investing in trade credit significantly increases the profitability of agricultural-food companies, which is consistent with financial, transactional, operational, and commercial theories of trade credit. A. Grau and A. Reig (2018), who analyzed the impact of trade credit on the determinants of profitability during the crisis in Europe, reached the same conclusion. Modelling method results confirmed that trade credit affects firm profitability depending on the state and such indicators as size, specificity (industry), market share, and firm reputation.

In the example of China, Z. Chen *et al.* (2022) built a model that suggests, in terms of overall impact; formal financial lending in rural areas improves the

performance of family farms, whereas informal financial lending in rural areas had little effect on the efficiency of family farms. They proved that family livestock farms and mixed-family farms are more positively affected by formal rural financial lending than family horticultural farms. M. Donckt *et al.* (2022) presented a new analytical database of aggregate investment flows to fixed assets in agriculture, forestry, and fisheries. The main finding of the study is the regions with the highest average growth rates of investment flows between 1995 and 2017 (i.e., Asia-Pacific and Africa) have shown the most significant increase in their contribution to global agricultural value added. S. Newman and F. Tarp (2020) emphasize the need of considering the impact of climate shocks on farmers' investment decisions. The research results showed that farm households, on average, manage to balance consumption after climate shocks by reducing savings and borrowing. In the long run, households exposed to climate shocks invest less in productive assets, leading to lower consumption levels.

When forming an investment strategy for the development of the agricultural sector, it is important to select investment instruments, which can be used to manage innovative transformations. A. Mykhalov *et al.* (2021) proposed a mechanism for fixing the conditions for the transfer of investment resources for use by agro-industrial companies. C. Lin & L. He (2020) examined the impact of Targeted Easing (TE), an unconventional monetary policy instrument initiated by the Chinese Central Bank to lower reserve requirements for targeted agricultural financial institutions (banks). Agricultural enterprises with lower agency costs, greater financial constraints and higher levels of creditworthiness are found to benefit significantly more from TE policies than their competitors. An indisputable scientific development is an issue raised by A. Daoud *et al.* (2019) regarding the mandate and competence of the International Monetary Fund (IMF) that extends to the policy in the field of food and agriculture, but there is unofficial evidence that IMF still conducts such a policy. It was found that

about 2% of all IMF conditions (1,105 out of 58,406) directly relate to issues of food and agriculture.

The research by L. Tang & S. Sun (2022), using regional-level panel data from 2004 to 2018, estimates the impact of agricultural financial support on the income gap between urban and rural areas in China. It is shown that due to fiscal incentives, financial institutions have more incentives to increase agricultural credit, and income inequality between urban and rural areas has decreased significantly throughout the study period, especially in underdeveloped areas.

The research conducted by M. Patynska-Popeta & T. Zinchuk (2022) on the management of the financial potential of territorial communities, including rural ones, created an algorithm for post-war restoring of local finance, which includes the estimation of military damage, renovation of 'central government – local authorities' communications, formation of effective management levers and its synchronization with the tasks set according to the EU membership plan. N. Tanaklevska & V. Oliynik (2019) proposed a methodical approach to determining the volume of investments required for the agrarian sector of the economy and evaluating the effectiveness of the investment program for the development of the agrarian sector of the region. When determining the key positions of investment and credit provision of the agrarian sector of the economy, the methods and forms of state financial support are an important lever. In this direction, studies conducted by L. Petliuk & N. Miedviedkova (2021), T. Sokolovska et al. (2020), and P. Nesenenko (2022) deserve attention.

The research aims to analyse the development of theoretical and methodological approaches to the substantiation of prospective directions of credit and investment provision of the agrarian sector of the economy of Ukraine.

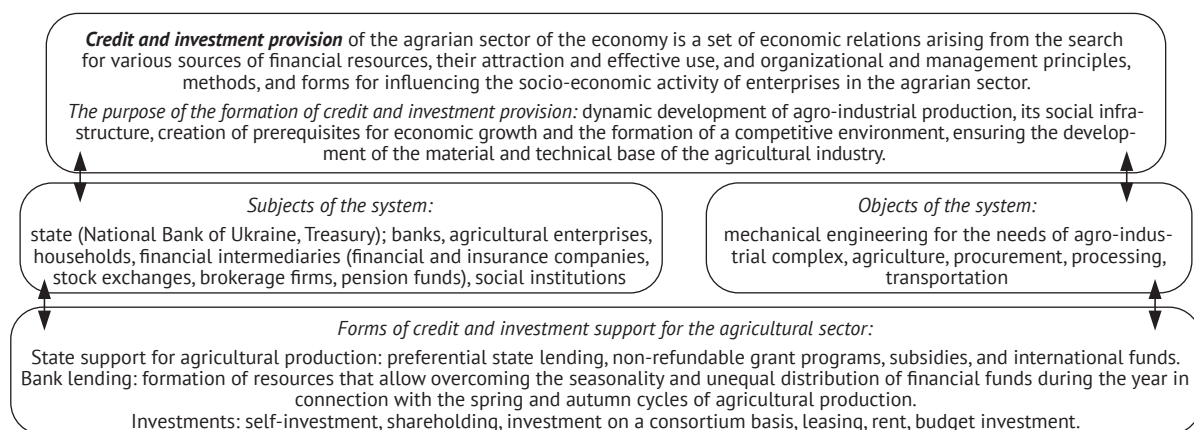
## CONCEPTUALIZATION OF THE CREDIT AND INVESTMENT SUPPORT SYSTEM FOR AGRIBUSINESS

To start with, it is advisable to define the main concepts of the research topic. I. Berzhanir (2020) defines the crediting mechanism of the agro-industrial complex as economic relations to provide agro-industrial enterprises

with a source of financing under the conditions of return, payment, security, term, aimed use and differentiation, accompanied by the specificity of agro-industrial enterprises. S. Arzhevitin et al. (2021) consider agricultural credit as an independent form of credit relations. Its specificity lies in the fact that lending takes place on preferential terms, which requires a strict accounting of the budgetary and extra-budgetary resources spent on it and an assessment of the effectiveness of their use; the purpose of the loan, consideration of the needs of the borrower; requires predicting potential risks, as well as planning costs and calculating profits.

Considering the security investment component, the definition provided by Yu. Kyrylov and V. Hranovska (2019) deserve attention: it is a complex dynamic system, the purpose of which is to encourage and support the continuous growth and advancement of agriculture and the economy by seeking the attraction, distribution, and investment of monetary, material, and intellectual resources of various origins, considering the combined influence of macro- and micro-environmental factors to achieve promising socio-economic goals. Based on the above, the authors of the paper formed a system of credit and investment support for the agricultural sector of the economy (Fig. 1).

Accordingly, to perform further research, it is necessary to form an empirical base and analyse the use of forms of credit and investment support in the agricultural sector. According to the results of the "Survey on War Damage in the Agriculture of Ukraine", prepared by the Center for Research on Food and Land Use of KSE Institute together with the Ministry of Agrarian Policy and Food of Ukraine, the total losses due to the full-scale war in agriculture reached 6.6 billion dollars (2022). In the structure of damages, the largest losses are recorded as a result of the destruction or partial damage of agricultural lands and unharvested crops – 1.9 billion dollars; the total amount of losses due to damage or destruction of agricultural machinery is estimated at 2.9 billion dollars, granaries – 1.1 billion dollars; the estimated value of the dead livestock is more than 362.5 million dollars, perennial plantations – 349 million dollars, other factors of production – 95.4 million dollars.



**Figure 1.** The system of credit and investment provision of the agrarian sector of the economy

**Source:** systematized by the authors

Direct damage cannot be done before the end of the hostilities. However, comprehensive financial support is necessary for the formation of the financial potential of agrarian sector enterprises through

the mechanism of state financial support and bank lending. Current forms of state support for the agricultural sector of the national economy are presented in Table 1.

**Table 1. Characteristics of forms of state financial support of the agricultural sector of the national economy**

The direction of financial state support	Characteristic
Grants for business creation (as of February 17, 2023) UAH 1.3 billion has been included in the 2023 state budget. At the end of 2022, 70 applications for the development of gardens and 7 applications for the construction of greenhouses with a total cost of UAH 371 million were signed.	Grants for greenhouse farming UAH 76.90 million (area – 18.93 ha), including by regions: Dnipropetrovsk – UAH 27.9 million (area – 6.65 ha); Zakarpattia – UAH 14.0 million (area – 3.22 hectares); Vinnytsia – UAH 7.0 million (area – 1.62 ha); Volyn – UAH 7.0 million (area – 1.6 ha); Kyiv – UAH 7.0 million (area – 1.6 hectares); Zhytomyr – UAH 7.0 million (area – 1.76 hectares).  Grants for horticulture, berry growing and viticulture 344.4 million UAH (area – 1143.21 ha), including by regions: Odesa – 25.81 million UAH (area – 60.29 ha); Kyiv – UAH 46.08 million (area – 228.88 hectares); Lviv – UAH 41.71 million (area – 151.08 hectares); Volyn – UAH 9.75 million (area – 15.72 hectares); Chernivtsi – UAH 266.54 million (area – 41.82 hectares); Ivano-Frankivsk – UAH 35.36 million (area – 81.25 hectares); Zakarpattia – UAH 68.20 million (area – 191.83 ha); Cherkasy – UAH 0.40 million (area – 10 hectares); Rivne – 4.73 million UAH (area – 20.93 ha); Khmelnytskyi – UAH 10.00 million (area – 25 hectares); Poltava – UAH 10.00 million (area – 25 hectares); Zhytomyr – UAH 153.20 million (area – 46.91 ha); Dnipropetrovsk – UAH 27.23 million (area – 91.12 ha); Vinnytsia – UAH 10.00 million (area – 25 hectares); Ternopil – UAH 11.2 million (area – 28 ha).
Support of farms and other producers of agricultural products	– budget subsidy per unit of cultivated agricultural land (1 hectare) for carrying out agricultural activities – in the amount of UAH 3100 per hectare, but not more than UAH 372 000 for one recipient;  – special budget subsidy for keeping cattle (cows) in all productivity areas – in the amount of UAH 5,300 per cow, but no more than UAH 530 000 for one recipient.  In 2022, budget subsidies (ha) were provided to 21 467 recipients on 424 631.9 ha; special budget subsidies for keeping cows – to 10 247 recipients for 62 090 cows.
Grant support from FAO and EU (2023)	FAO will provide producers with investment funds in the amount of:  – up to 370 000 hryvnias (10 000 USD) for small farms;  – up to 925 000 hryvnias (25 000 US dollars) for agricultural small and medium-sized enterprises, agricultural cooperatives, and associations of producers.  Grant support is provided for Lviv, Ivano-Frankivsk, Zakarpattia and part of Chernivtsi regions.
Farming support	Partial compensation of costs to farms related to the provided agricultural advisory services (except for newly created ones), for 90% of the cost, but not more than UAH 10 000.  Financial support for newly created farms to obtain agricultural advisory services (provided once in an amount not exceeding 36 000 hryvnias, subject to a contract previously concluded by the end of the current budget period).  The program “Granting loans to farms” – provides financial support on a revolving basis in an amount not exceeding UAH 500,000 for a period of up to five years with the provision of the obligation to return budget funds.
Credit program “5-7-9”	The credit limit increased from UAH 60 million to UAH 90 million. In 2022, under the “5-7-9” program, UAH 90.85 billion in loans were issued to more than 40,000 farmers. In March of last year, the government expanded this program: farmers received up to UAH 60 million at 0% annual interest, and 80% of the amount could receive state guarantees against the grain.  Among the TOP-5 regions in terms of loans received are Kyiv Region (UAH 14.9 billion), Vinnytsia Region (UAH 8.8 billion), Kirovograd Region (UAH 8.3 billion), Dnipropetrovsk Region (UAH 6.5 billion), Odesa Region (5.8 UAH billion).  The largest number of loans to farmers were issued by PrivatBank, Oschadbank, Raiffeisen Bank, Ukrgasbank, Ukreximbank, Kredi Agricole Bank, and PUMB.  The Entrepreneurship Development Fund concluded agreements with 44 banks.

**Source:** systematized by the authors based on Ministry of Agrarian Policy and Food of Ukraine (2023); KSE (2022); AgroPolit.com (2023)

Regarding bank lending to the agricultural sector of the national economy, it should be noted that despite

the martial law in Ukraine, the volume of lending by banks is constantly growing (Table 2).

**Table 2.** Dynamics of the volume of bank lending to the agricultural sector and indicators characterizing the creditworthiness of the industry in 2016-2022

Indicators	Year						
	2016	2017	2018	2019	2020	2021	2022
Volumes of loans granted (total)	829 932	822 114	859 740	744 648	724 157	752 324	754 371
Volumes of lending to the agricultural sector	55 374	59 706	67 675	61 600	61 486	82 600	118 504
The output of agricultural products, UAH million	634 040	703 893	842 925	838 038	887 822	1 359 369	-
Total profitability (loss) of the industry, %	24.7	16.0	13.7	16.1	13.6	36.4	-
Share of loans to the agricultural sector, %	6.67	7.26	7.87	8.27	8.49	10.98	15.71
The efficiency of production of agricultural products per UAH 1 of credit provision for the agricultural sector	11.45	11.79	12.46	13.60	14.44	16.46	-

**Source:** calculated by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Despite the lack of official data on the development of the agricultural sector of the national economy in 2022, it is still possible to state the utilization of received loans by agricultural enterprises is effective. This is evidenced by the efficiency index of agricultural production per UAH 1 of credit support for the agricultural

sector, which is increasing annually. It is also going about the overall level of creditworthiness of the industry, which is confirmed by the level of overall profitability, growing over the analysed period. Finally, it is advisable to analyse the volume of capital investments in the agricultural sector of Ukraine (Table 3).

**Table 3.** Dynamics of capital investments in the agricultural sector of the national economy, thousand UAH

Year	Capital investments (total)	Including:								The share of capital investments in the agricultural sector in the total amount, %
		Capital investments in tangible assets	including:				Capital investments in intangible assets	including:		
			Land plots	Existing buildings and structures	Construction and reconstruction of buildings	Machinery and equipment		Concessions, patents, licenses, trademarks, and similar rights	Purchase of software	
2016	49497.7	49231.6	95.4	572.2	7452.9	37676.5	266.2	2.5	34.6	14.05
2017	63262.9	62664.5	152.6	8400.2	9648.1	48433.0	598.4	10.8	49.6	14.32
2018	65559.6	64252.9	192.9	2162.6	12152.8	44844.0	1306.6	5.2	56.5	11.42
2019	59332.9	57936.3	316.6	1085.6	11988.2	37537.1	1396.7	41.2	38.3	9.48
2020	36442.1	35756.7	4243.1	6800.6	1656.9	23056.0	685.4	10.0	33.886	8.68
2021	49127.4	48198.6	7888.5	7431.4	2655.1	32576.2	928.8	843.6	85.2	9.29

**Source:** calculated by the authors based on State Statistics Service of Ukraine (2023)

According to the research results, during 2016-2021, capital investments in agriculture had a changing trend in terms of total volumes, and in 2021 they decreased by 0.75%, although compared to 2020, they increased by 34.81%. According to the share of the volume of capital investments in the total volume of investments in the economy of Ukraine, a gradual decrease is observed. Thus, in 2021, compared to 2016, the weight decreased by 4.76%.

### CREDIT AND INVESTMENT DRIVERS OF THE AGRICULTURAL PRODUCTION

For the quantitative assessment of the relationship and the degree of influence of bank loans on the efficiency of agricultural business, indicators of the effectiveness of agricultural enterprises were chosen (Table 4). It should be noted that interruptions in the work of statistical accounting in 2022, which are related to war events, do not allow data to be operated later than

2021. This imposes certain restrictions on the depth and representativeness of the sample and directly affects the degree of extrapolation of the results obtained by the authors in connection with the military transformation of the economy and industry. However, the available data panel reflects the generalized level of the financial and economic state of the agricultural business of Ukraine on the eve of the war. First, it is necessary to establish the presence and density of a statistical relationship between indicators of the agricultural enterprises' activity and bank crediting of agribusiness, which was performed using the calculation of the correlation coefficient and its interpretation according to Chaddock's scale.

The data presented in Table 4 show that most of the presented indicators of the efficiency of agribusiness functioning are undoubtedly directly related to bank lending – the closest connection is shown by the general indicators of the industry's performance (gross value added, output). The relatively weak relationship between lending and profitability indicators can be explained, from the authors' point of view, by the peculiarities of these indicators' formation: expenses (operational or general) in the denominator include mandatory items and expenses of future periods, which disperse the received in current time result (net or operating profit).

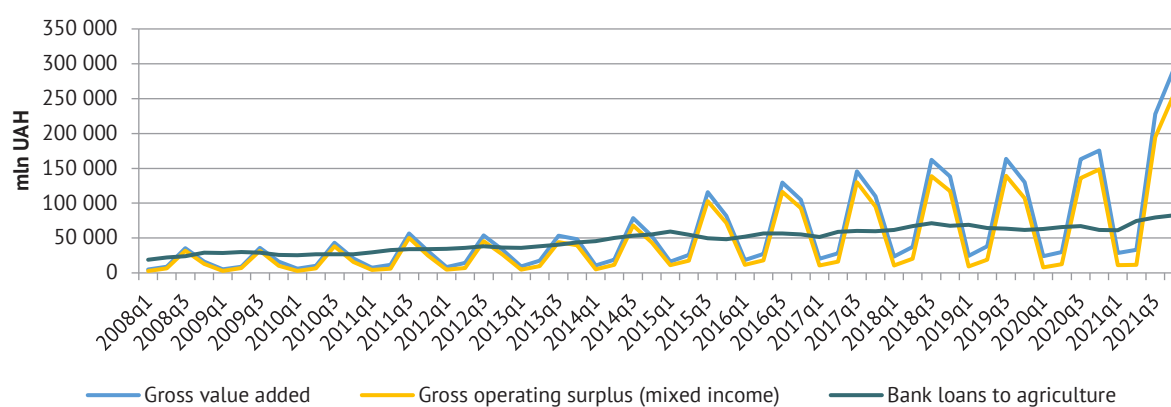
**Table 4.** Correlations between bank lending and performance indicators of agricultural enterprises in Ukraine for the period 2008-2021

Indicators	Correlation coefficients	Direction and tightness of correlations
1. Gross value added	0.950472	direct, very high
2. Output	0.950275	direct, very high
3. Capital investments	0.901215	direct, very high
4. Financial result before taxation	0.806742	direct, high
5. Net profit	0.820935	direct, high
6. Profitability from operating activities	0.421955	direct, moderate
7. General level of profitability	0.512578	direct, noticeable

**Source:** developed by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Unfortunately, the available retrospective database does not allow for a more thorough analysis of the relationship of indicators or to obtain a reliable model of the impact of bank lending on agribusiness: the data set consists of 14 annual observations. To remove this restriction, it is necessary to determine the indicators

with reliability and greater frequency (since credit data are monthly). Among open data satisfying this condition, quarterly values of gross value added and gross operating surplus (mixed income) of agricultural enterprises were obtained (Fig. 2). Thus, the sample contains 56 observations of each variable.

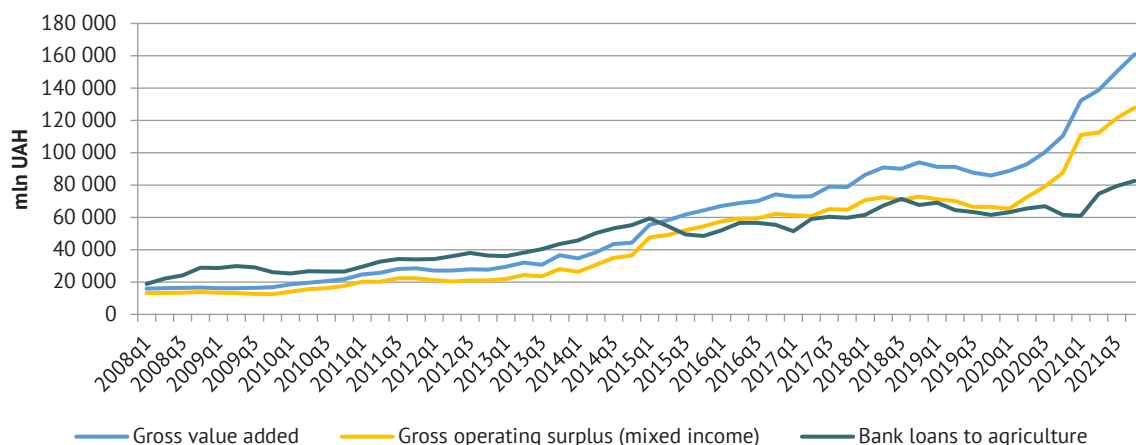


**Figure 2.** Dynamics of bank loans, gross value added and gross operating surplus of agriculture of Ukraine in 2008-2021

**Source:** developed by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Figure 2 shows that the gross value added, and gross operating surplus have a pronounced seasonality, while the dynamics of lending are not so closely related to the quarterly frequency. In this case, seasonality must be

smoothed concerning the performance of other econometric procedures. This task was performed using the TRAMO/SEATS method without manually configuring the module. The smoothed series are presented in Figure 3.



**Figure 3.** Seasonally adjusted dynamics of bank loans, gross value added and gross operating surplus of agriculture of Ukraine in 2008-2021

**Source:** developed by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Since the indicators are presented in actual prices (excluding inflation), the curves in Figure 3 show a pronounced upward trend. It is interesting that up to 3Q 2015, the volume of loans exceeded other curves: this may indicate not so much the low efficiency of agricultural lending, but distorted statistics of real agricultural production to avoid “excess” taxation. Thus, the

comparison of lending volumes with official data on the results of the industry is the simplest indicator for evidence of “shadowing” the economy, as the authors wrote earlier e.g. (Kovalenko et al., 2022).

Next step the presence of correlation between the variables should be analysed and the strength of the relationship between them should be interpreted (Table 5).

**Table 5.** Correlations between bank loans and generalized indicators of the agricultural economy of Ukraine in 2008-2021

Indicators	Gross value added								
	no lag	1	2	3	4	8	12	16	
1. Loans, total	0.931	0.919	0.904	0.889	0.896	0.914	<b>0.951*</b>	0.911	
2. Loans, the domestic currency	0.932	0.917	0.898	0.876	0.875	0.884	0.944	<b>0.976*</b>	
3. Loans, foreign currency	0.716	0.698	0.690	0.691	0.712	<b>0.725*</b>	0.686	0.617	
4. Short-term loans	<b>0.886*</b>	0.878	0.869	0.859	0.871	0.881	0.800	0.738	
5. Long-term loans	0.862	0.840	0.819	0.802	0.805	0.838	0.932	<b>0.934*</b>	
Gross operating surplus (mixed income)									
	no lag	1	2	3	4	8	12	16	
1. Loans, total	0.926	0.912	0.897	0.883	0.888	0.909	<b>0.941*</b>	0.885	
2. Loans, the domestic currency	0.921	0.902	0.881	0.858	0.854	0.866	0.938	<b>0.967*</b>	
3. Loans, foreign currency	0.726	0.712	0.708	0.712	0.736	<b>0.745*</b>	0.673	0.571	
4. Short-term loans	0.878	0.874	0.870	0.864	0.880	<b>0.898*</b>	0.798	0.713	
5. Long-term loans	0.859	0.832	0.808	0.788	0.787	0.819	<b>0.918*</b>	0.909	

**Note:** \* – the highest correlation coefficient in a line

**Source:** developed by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Examining the data in Table 5 using Chaddock's scale, it can be concluded there is a direct, mostly high, and very high interdependence between the gross value added and gross operating surplus of agricultural enterprises on the one hand, and bank loans for agribusiness (in terms of currencies and ranges) – with another. The correlation analysis is conducted considering the presence of lags between the provision of a loan and the realization of its effect on the indicators of the agricultural sector. It is worth noting that lags are quarterly, so 2 lags are half a year, 4 lags are a year, 8 lags are 2 years, etc.

The relationship between gross added value and lending illustrates the strategic nature of external financing of agriculture: the closest dependence between indicators is realized 3-4 years after a loan provision. It is also necessary to determine the presence of processes of connections' fade after 9-12 months after providing a loan compared to the immediate effect. Gross value added shows the closest relationship with loans in domestic currency after 4 years, while foreign currency loans, in general, have a much weaker effect. This testifies to the predominantly hryvnia lending nature of agriculture, which is explained by its export orientation: for the purchase of fertilizers and equipment abroad, agribusiness uses its foreign exchange earnings, while loan funds are directed to financing the

internal expenses (seed material and livestock feed, wages, lease payments, taxes). The correlation coefficient between the value added and lending in terms of maturity also seems very logical: short-term loans have the greatest effect immediately after borrowing, and long-term financial instruments are used for investment purposes that pay off after a few years.

The relations between gross operating surplus (mixed income) and indicators of agribusiness lending generally repeat the correlation map of gross value added, although they are characterized by less strength. Logical contradictions are observed only when considering loans by maturity: statistically the strongest relationship between profit and "short" crediting is observed with a lag of 2 years, while with long-term loans the best ratio is observed 3 years after the grant. These controversial results can be explained by the complex nature of the indicator: the gross surplus combines the financial results of many agricultural corporations, some of which in the current period could receive losses.

Using obtained in Table 5 results of correlation analysis one-factor regressions of the dependence of agricultural indicators on bank lending (in terms of currencies and maturity) can be constructed. The characteristics of the models estimated by the method of least squares are presented in Table 6.

**Table 6.** The main characteristics of the estimated models of the dependence of gross value added and gross surplus of agriculture of Ukraine on bank loans

Dependent variable (Y)	Independent variables (X)	Lag of X	Coefficients		Adjusted R <sup>2</sup> , %	Neutral level of X (Y = 0), million UAH
			X	constant, million UAH		
Gross value added	Loans, total	-12	2.35	-31 841.21	90.13	13 550.29
	Loans, the domestic currency	-16	4.13	-41 913.70	95.15	10 160.56
	Loans, foreign currency	-8	4.80	1 252.73*	51.49	-260.97
	Short-term loans	-	4.22	-27 922.48	78.02	6 611.16
	Long-term loans	-16	4.20	-25 874.46	86.82	6 157.35
Gross operating surplus (mixed income)	Loans, total	-12	1.88	-25 304.04	88.20	13 451.83
	Loans, the domestic currency	-16	3.31	-33 464.05	93.40	10 118.99
	Loans, foreign currency	-8	3.99	-839.04*	54.56	210.10
	Short-term loans	-8	4.23	-24 929.06	80.22	5 891.91
	Long-term loans	-12	2.75	-14 794.89	83.90	5 379.79

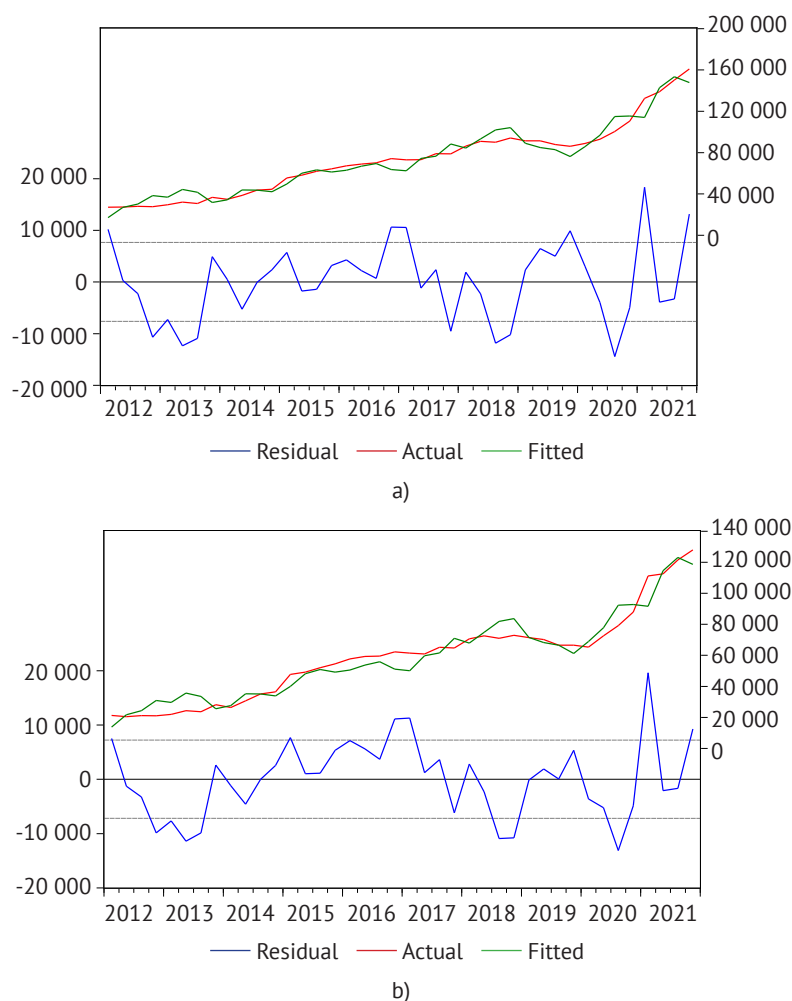
**Note:** \* – p-value is greater than the critical value (0.1)

**Source:** developed by the authors based on State Statistics Service of Ukraine (2023); National Bank of Ukraine (2023)

Presented in Table 6 data show that most of the obtained models are quite adequate (adjusted R<sup>2</sup>>75%), and the coefficients for the variables are significant (p-value significantly below 0.01). At the same time,

models with loans in foreign currency, as expected, have middling quality, explaining about 50% of the dynamics of dependent variables with a statistically insignificant constant (Fig. 4).





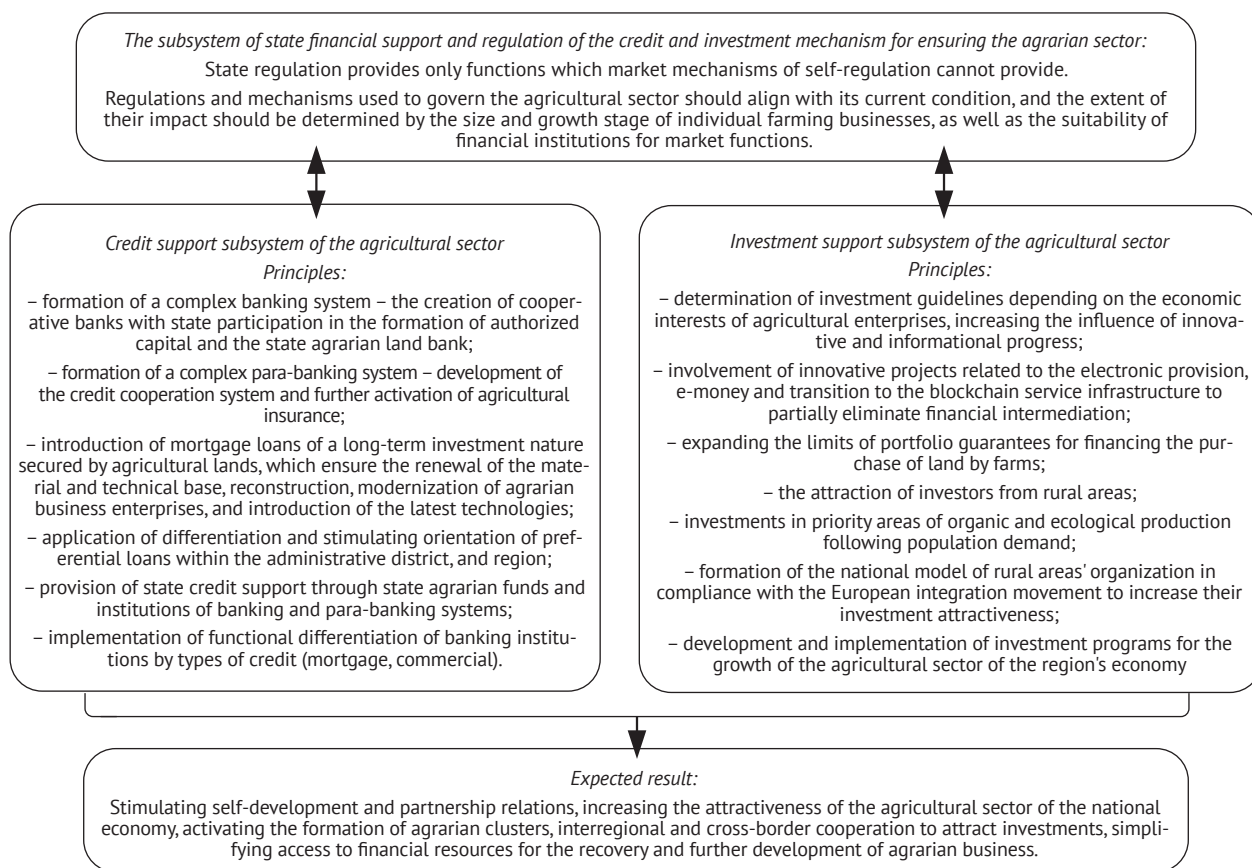
**Figure 4.** Actual and fitted level of (a) gross value added and (b) gross surplus of agriculture of Ukraine in 2012-2021  
**Source:** developed by the authors

The influence of bank lending on agribusiness is best explained by the model of dependence of gross value added on loans in national currency (Fig. 4a). Focusing on the estimated coefficients and the neutral level of the regressor, it can be argued that the neutral level of lending (at which the current contribution of the industry to GDP will remain) is slightly more than UAH 10 billion every quarter, and each hryvnia of credit to agricultural corporations above the neutral level will bring UAH 13 to gross value added 4 years later. The equation for the same explanatory variable turned out to be the most accurate in terms of the impact on gross surplus (Fig. 4b): to maintain the current level of profitability of agriculture, it is necessary to credit it for 40 billion hryvnias annually, and each hryvnia of additional bank lending after 4 years will bring 3.31 UAH gross surplus.

#### **STRENGTHENING THE ROLE OF CREDIT AND INVESTMENT SUPPORT IN AGRICULTURE**

As the authors have already proved, bank lending, which is present both in state financial support

measures and in the investment mechanism, is the key to almost all forms of credit and investment mechanisms for the development of the agrarian sector. This is especially obvious during the period of martial law in Ukraine. Therefore, it is appropriate to consider this fact when determining the strategic directions of credit and investment support for the agricultural sector from the standpoint of not only providing agricultural enterprises with the necessary financial resources but also forming an effective state mechanism for supporting banks in this process. This is confirmed by Yu. Aleskerova *et al.* (2018) note that preferential lending to the agricultural sector occupies a special place in the state support system. However, the formation of an effective system of credit mechanisms to support the agricultural sector requires appropriate legal support and a guarantee of its application for a long period. Therefore, the system of credit and investment provision of the agricultural sector must be formed precisely from the position of state financial support (Fig. 5).



**Figure 5.** The system of credit and investment support for the development of the agrarian sector of the national economy

**Source:** created by the authors

It should be noted that the implementation of the presented system of credit and investment support is impossible without state regulation of these processes. Therefore, it is advisable to review the strategy of the agrarian sector development, considering challenges of the martial law and the post-war period in Ukraine. In particular, the ways to overcome the existing limitations of agricultural development, proposed by L. Vdovenko (2022), are appropriate, in particular, the creation of an alternative logistics network for the export of agricultural products; minimization of bureaucratic procedures for agricultural enterprises (producers' requests to obtain the necessary licenses and certificates); regulation of price policy regarding means of agro-industrial production; free access to factors of production and sales for all subjects of agrarian business; expansion of bank lending programs for small and medium-sized businesses under conditions acceptable to farmers; the use of foreign investors' funds for the development and restoration of the agricultural sector of the economy.

The financial condition of agricultural enterprises in terms of martial law in Ukraine is also affected by such a fact as territorial binding, which excludes relocation; the acute shortage of labour resources is associated with migration and mobilization of the rural

population; working capital; fuel; plants treatment products; fertilizers and seeds; blocking the export of grain leads to the lack of funds for farmers to finance their activities; forecasts regarding the future harvest do not inspire certain hope, because of a large number of cultivated areas in the regions of Ukraine are either under occupation or under shelling in the active phase of hostilities (Sakun *et al.*, 2022).

The issue of the introduction of project financing as a form of credit and investment support for the agricultural sector, which is partially investigated in the scientific works of S. Naumenkova *et al.* (2020), M. Kamysbaev *et al.* (2019), requires in-depth research at the level of state support for the agrarian sector. The system of state regulation of the agricultural sector itself is also in need of further research and measures for alignment with EU standards. The agrarian policy of EU member states is aimed at supporting the income of agricultural enterprises at a level sufficient for extended reproduction, provision of food products for the population, processing, and light industry. The decisive role in EU agrarian policy is occupied by product programs, which are inherently much more complex and involve the use of various support mechanisms for certain producers in the sector.

## CONCLUSIONS

The analysis of leading research and specialists in the field of agricultural production allows to conclude that the system of credit and investment provision of the agricultural sector is a complex concept, which should be understood as a set of economic relations arising from the search for various sources of financial resources, their attraction and effective use of organizational and management principles, methods, forms for influencing the socio-economic activity of agrarian enterprises. State financial support for agricultural production, bank lending and investment are defined as the main formats of credit and investment provision. The analysis of the presented forms proved that the key instrument is a bank loan. Based on the study of the impact of bank credit on the performance indicators of agricultural enterprises, it was proved that this relationship depends on the terms of granting and the type of currency. It has also been established that the relationship between gross value added, surplus, profitability and crediting is strategic in the external financing of agriculture. It has been proven that the formation of an effective system of credit mechanisms to support the agricultural sector requires appropriate legal support and a guarantee of its application for a long period. Therefore, the system of credit and investment provision of the agrarian sector must be formed precisely from the position of state financial support. At the same time, the forms and methods of regulation must correspond to the real state of the agricultural sector, and the scale of influence depends on the level

of development of agrarian business and the functional suitability of financial institutions. In the conditions of martial law, the role of the state is increasing concerning the need to create an agricultural-food system considering the challenges and directing financial policy vectors to the financial support of the agrarian sector of the national economy through the improvement of existing credit and investment instruments, giving them weight in terms of impact on the results of the activities of agricultural enterprises, which contributes to the national and global food security following the latest practice in the field of state regulation of the agrarian sphere of European Union.

Prospects for further research consist in determining effective forms of credit and investment support for the agricultural sector to increase the level of its financial stability, based on the introduction of unconventional and innovative instruments, for instance, project financing, secondary mortgage, purchase order financing, and escrow-based lending.

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## CONFLICT OF INTEREST

None.

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**Анотація.** Однією з ключових проблем сучасного аграрного сектору національної економіки є досягнення стабільного економічного зростання. У цьому контексті система кредитно-інвестиційна підтримка посідає головне місце у розширеному відтворенні даної пріоритетної галузі для економіки України. Метою статті був огляд основних тенденцій кредитно-інвестиційного забезпечення аграрного сектору національної економіки та визначення подальших розвідок у цьому напрямку. Для проведення дослідження були використані загальнонаукові та спеціальні методи пізнання, а саме: системний та діалектичний підходи; розрахунково-аналітичний та коефіцієнтний аналіз; кореляційно-регресійний аналіз; логічного узагальнення та інші. Встановлено, що для формування дієвої системи кредитно-інвестиційного забезпечення аграрного сектору слід враховувати такі позиції як вплив банківського кредитування, кліматичних шоків на інвестиційні рішення фермерів, глобальних та регіональних тенденцій у напрямку валового накопичення основного капіталу та основних фондів у сільському господарстві, механізми фіксації умов передачі інвестиційних ресурсів для використання агропромисловими компаніями, фінансової нерівності між містом та селом. Доведено, що у всіх формах кредитно-інвестиційного забезпечення аграрного сектору, ключовим інструментом є банківське кредитування. Особливо це прослідковується у період воєнного стану в Україні. З використанням методу економіко-математичного моделювання аргументовано, що банківське кредитування виступає стратегічним фінансовим ресурсом при формуванні кредитно-інвестиційного забезпечення аграрного сектору. Запропоновано систему кредитно-інвестиційного забезпечення, яка впершу чергу спирається на удосконалення системи державного регулювання аграрного сектору. Доведено, що для підвищення рівня дієвості системи кредитно-інвестиційного забезпечення аграрного сектору, слід звернути увагу на такий інструмент як проєктне фінансування та перегляд самої структурної композиції державного регулювання сільськогосподарського виробництва з урахуванням практики Європейського Союзу. Такі підходи можуть використовувати органи державної влади при розробці стратегії розвитку аграрного сектору в умовах воєнного стану та повоєнний період, а також внесення інфраструктурних змін у процес взаємодії банківського та аграрного секторів національної економіки

**Ключові слова:** агробізнес; банківське кредитування; державна фінансова підтримка; інвестування; фінансові ресурси; воєнний стан; рентабельність