

## Article

# Analysis of Trends in Mortgage Lending in the Agricultural Sector of Ukraine

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**Abstract:** This study has the following objectives: to analyze the state of agrarian business lending and the market of banking services, establish the reasons for the insufficient level of mortgage lending implementation, and develop ways and tools to improve lending to the agrarian sector. The research methodology considers a systematic approach to the statistical analysis of bank lending in the agricultural sector of Ukraine, the development of criteria, and the implementation of the hierarchy analysis method for the reasonable selection of a loan product and banking institution. We conducted an analysis of the current state of lending to agricultural enterprises. We also analyzed lending trends, loan products, and basic lending terms by banks of Ukraine to agricultural enterprises. The share of bank lending of the working capital of the agricultural industry was estimated. The dynamics of preferential lending to the agricultural sector were determined. Its essence is that banks with partial repayment of loan rates are given loans at the expense of the state budget. The directions and volumes of borrowed loan resources usage by agricultural enterprises were considered. It is recommended to use the hierarchy analysis method by T. Saaty for choosing an effective loan product. We developed the criteria that could be applied when selecting a loan product. We also determined potential directions for the development of mortgage lending for the agricultural sector.

**Keywords:** agricultural sector; collateral liquidity; credit rates; hierarchy analysis method; land market; mortgage lending



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## 1. Introduction

The agro-industrial complex is one of the main sectors of Ukraine's economy. It provides about 10% of GDP and 40% of foreign currency export earnings. More than 41.4 million hectares of land in Ukraine are agricultural land. In particular, in the structure of land ownership, most of the land is in private ownership (about 31.0 million hectares), and 10.4 million hectares are in state and municipal ownership (Verkhovna Rada of Ukraine 2002).

The significant spread of military operations since February 2022 on the territory of Ukraine has led to a reduction in the amount of crops and the physical destruction of agricultural enterprises. The decrease in the cultivated areas of grain crops (by more than 30%) and the maritime blockade of export routes resulted in a global food crisis (de Sousa Nôia Júnior et al. 2022). The food crisis is worse due to the fact that the exports of Russia and Ukraine in previous periods accounted for more than 18% of the world grain market (Aleinikova et al. 2023). The blockade of Ukrainian seaports led to food shortages in some Third World countries and increased food prices. All this has resulted in significant

social shifts in these countries (Berazneva and Lee 2013; Perez 2013; Nickerson 2022). In particular, migration flows from them increased (Van Mol and de Valk 2016). Improving the world food security situation by encouraging other countries such as Australia, countries in Europe, and America to produce grain will not take years but decades. All this is due to a fundamental change in the structure of agricultural production in these countries, the formation of new logistics chains, etc. Solving the problem has two main factors. First, it is necessary to withdraw the aggressor's troops from Ukraine and resume production. The rapid reclamation of arable land destroyed by the war is a long process. So the efficiency of agriculture in Ukraine should be increased significantly. Scientists who studied the reasons for poor efficiency of agriculture in Ukraine indicated (Sodoma et al. 2019; Kharchuk 2020; Bakhur 2020; Guk et al. 2021; Lehkostup and Sainchuk 2022; Dvignun et al. 2022; Nehoda et al. 2022) that the development of agricultural production is insufficient not only because of the poor availability and transparency of loans, but also because of the lack of efficient tools for creditor risk management in agricultural land collateral.

Low competitiveness due to a lack of working capital (Zharikova and Pashchenko 2018) makes it difficult for agrarians to enter the large EU market, which could provide a sufficient level of producers' own profit to increase working capital. The working capital of Ukrainian agrarians is insufficient for production development (Dziamulych et al. 2020). The cooperation of banking institutions and insurance companies to reduce lending risks to agrarians is also not yet sufficiently successful (Zharikova and Cherkessenko 2021). The lack of guarantees and high risk decrease the possibility of borrowing in other countries (Shevchenko 2019; Mihaylenko and Krasnikova 2020; Samotoenkova 2019; Zaverbnyj 2021) and the use of international financial instruments, international crowdfunding in particular (Mohd Thas Thaker et al. 2020). Perhaps, in the future, a path similar to the discussed (Mohd Thas Thaker et al. 2020) integrated model of agriculture crowdfunding, which uses financing tools in the form of a crowdfunding platform, will be chosen. Moreover, this project is similar to the methods of cooperation tested by Ukrainian farmers of Western Ukraine at the beginning of the 20th century.

Mortgage lending is a vital factor of economic stimulation and stable development of the economy. At its expense, investing in a particular sector of the economy is made. The agriculture of Ukraine is the dominant food sector of the economy. Its state depends on the amount of funds invested in its development. Financial and credit resources, effective credit policy of the state, and solving social and economic issues play a decisive role in the financial provision of agricultural production. In the conditions of the formation of market relations, the further development of the country's agriculture is impossible without the effective functioning of mortgage lending to agricultural producers, which would consider the peculiarities of the agricultural sector and create favorable conditions for its development. Therefore, due to the financial crisis in Ukraine, which is significantly strengthened by military actions, the issue of the country's economic development and the need to improve mortgage relations become relevant.

In current conditions, the following state programs to support lending to agricultural businesses are functioning: subsidized purchase of agricultural machinery and equipment; subsidized loans; development of farms; development of the livestock industry; development of horticulture, viticulture, and hops; continued support due to the 5–7–9% program (about 60% of loans within the program); and support and development of private reclamation systems, as well as state grants for the development of state reclamation systems.

However, in the process of obtaining preferential state loans and attracting state subsidies in Ukrainian conditions, agrarians face significant problems. These problems, the complications of the lending process, and mechanisms and suggestions for their solution were considered by Ukrainian researchers in the following works (Perevozova et al. 2019; Yazliuk et al. 2020; Kramar et al. 2015; Tretiak et al. 2021; Aleskerova et al. 2018; Nitsenko 2020; Studinska and Prosov 2020).

The analysis of the above scientific works (Bakhur 2020; Samotoenkova 2019; Zaverbnyj 2021; Lehkostup and Sainchuk 2022) indicates that a wide range of borrowing

opportunities, which is inherent in developed and developing countries today, under crisis conditions, significantly worsened by the war, is almost absent in Ukraine. Additionally, the possibilities of mortgage lending are not used enough. All this creates a problem that needs analysis and solutions.

Jansson et al. (2013) studied the loan market and the state support of the loan market in EU countries. The experience of Poland and Hungary is in the works of authors Wigier et al. (2014). These authors point to the ambiguous effect of state regulation, a decrease in the efficient usage of resources, and the privilege of beneficiaries. The development of agricultural lending in France, the USA, and Brazil was studied by Westercamp et al. (2015). They found that state subsidies on interest rates based on loans from the World Bank and USAID are one of the most widely used development tools in the world.

Individual authors offer a methodology for comparative estimates of the mortgage lending market. The study of the Ukrainian mortgage market was completed in three areas: the preconditions for the mortgage market's development, its current situation, and risks. The integrated coefficient of the development level of the mortgage market in Ukraine was calculated. It is proven that the Ukrainian mortgage market is in an embryonic state compared to the corresponding EU market. The object of study is the mortgage market of Ukraine. The subject of the study is the methodological principles of the mortgage market. The study of the mortgage market as a financial mechanism for implementing the strategy of technological development of the national economy contributes to the understanding of efforts to overcome socio-economic issues of the country (Nitsenko and Havrysh 2016; Kvasha et al. 2019; Studinska and Prosov 2020; Sirant et al. 2022).

According to the study results, we suggest measures to solve the lending problems in the agricultural sector. Their essence comes to developing partnership mechanisms among the state, agricultural enterprises, and banking institutions. A unified regulatory and methodological framework for lending, secured by agricultural land, should be established. The article considers European land mortgage lending practices. In Ukraine, they might be adapted by directly raising public funds through authorized state credit institutions and private credit institutions operating on the market. The activities of private credit institutions, in contrast to the findings (Lemishko and Shevchenko 2021; Balanovska et al. 2021; Zayed et al. 2022), have not yet become widespread.

The estimate of the discount rate is decisive for a reliable economic valuation. This rate must be adjusted to the risks related to the company, its market sector, and the investment project's risks. The study suggested incorporating the risk premium in the discount rate. The novelty of the methodology is that the difference in risk groups according to their activities is a factor of adjusting the cost of capital to companies. It was applied to the Agrarian Industrial Complex (AIC) in Spain. The AIC is formed by industries that add value to agricultural production. The conventional method responds neither to the heterogeneity of economic activities that make up the AIC, nor to the differentiation of risks by groups (Marqués-Pérez et al. 2017).

The presented research has the following objectives: to analyze the state of agrarian business lending, the market of banking services, establish the reasons for the insufficient implementation of mortgage lending, and develop ways and tools to improve lending to the agrarian sector. As we can see from the analysis of literary sources, these issues require additional research.

The paper is structured as follows: Section 1 reviews the relevant literature related to the research topic; Section 2 describes the research methods; Section 3 describes the data used for the analysis; Section 4 presents the research results; Section 5 presents and discusses the main findings of the study; and Section 6 concludes it.

## 2. Materials and Methods

The methodological basis of the study is a systematic approach to the statistical analysis of bank lending in the agricultural sector of Ukraine. In the study, such methods as statistical observation, grouping, generalizing statistical characteristics, comparison, and analysis of

relationships were used. The usage of a systemic approach determined the study of internal cause-and-effect relationships, structural and functional, hierarchical, direct, and reverse relationships. All this made it possible to reveal complex processes of banking activity of lending in the state and study the nature of individual economic processes and phenomena. The hierarchy analysis method was applied to substantiate the criterion-based hierarchical system for choosing a banking institution. The hierarchy analysis method (HAM) is a structured method of organizing and analyzing complex decisions based on mathematics and psychology (Saaty 1990). It is applied to derive relationship scales from discrete and continuous pairwise comparisons in multilevel hierarchical structures. Comparison can be made on the basis of real or possible values that reflect possible advantages. The key idea of the method is to structure the decision-making problem based on a multi-criteria hierarchy. For implementing the method, the law of hierarchical continuity was introduced, according to which it is necessary that the elements of each level could be compared in relation to the elements of a higher level. Among the levels, matrices are built as follows: one matrix for comparing the relative importance of the criteria regarding the goal and a matrix for evaluating the relative importance of alternatives with respect to each of the second-level criteria. The number of matrices among the levels of criteria and alternatives is equal to the number of criteria. The total number of matrices equals the number of criteria plus one for evaluating the criteria related to the goal (Sallach 1972).

The procedure for using HAM can be described as follows:

1. Model the problem as a hierarchy containing the goal of decision making, alternatives for achieving it, and criteria for evaluating alternatives.
2. Establish priorities among the elements of the hierarchy, making a number of judgments based on a pairwise comparison of the elements.
3. Synthesize (combine) these judgments to obtain a set of common priorities for the hierarchy. Check the consistency of judgments.
4. Approach the final decision based on the results of this process.

The presence of a sufficiently wide range of loan products complicates the procedure of choosing the optimal lending model, the application of which will ensure the effective operation of the agricultural enterprise. For our study, following the rating of the stability of banks, those having the highest indicators of the overall rating (Minfin 2022) were selected. Four banking institutions that provide a standard set of services were considered. The criteria are position in the bank rating, bank reputation, credit limit, interest rates, and convenience of bank services (Table 1). To determine the units of measurement of bank reputation on the market, lending limit, lending period, and interest rates, the methodology of Minfin (2022) was applied. To determine the units of measurement of the position in the rating of banks, lending limit, lending period, and interest rates were used. The criterion measurement unit “The convenience of using bank services” was determined according to Loiko and Bashkyrtseva (2018). The criterion measurement unit “Bank reputation” was determined according to Kolesnik (2016).

The hierarchy analysis method requires clarity in the goal, criteria, and alternatives. The number of alternatives (banking offers) may increase. So certain requirements and restrictions must be observed when using the method.

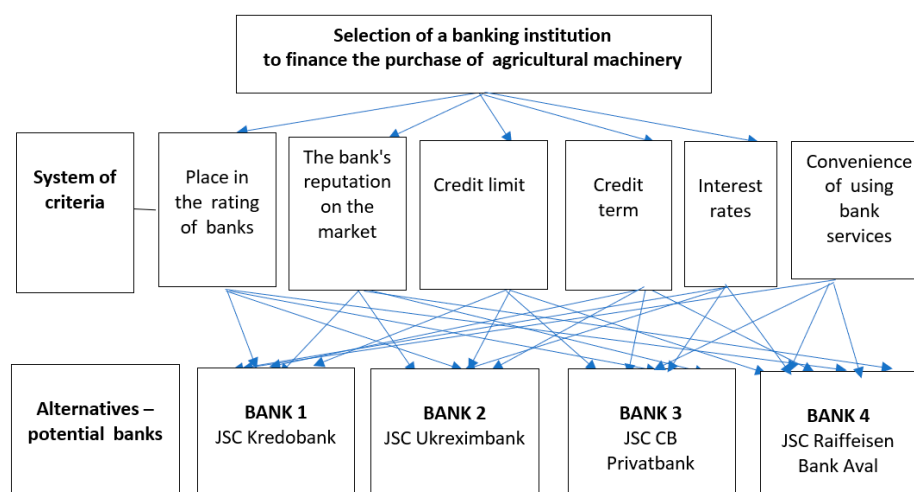
These requirements and limitations are determined primarily by the four axioms of the hierarchy analysis method. The presented study corresponds to those axioms. Let us consider them one by one.

We first look at the axiom of connectedness or inverse symmetry. If  $M(A,B)$  is the priority by which it is determined how many times the element of the hierarchy  $A$  has advantages in relation to the element  $B$ , then the following requirement must be fulfilled:  $M(A,B) = \{M(A,B)\}^{-1}$ . That means that if element  $A$  prevails over element  $B$  twice, then element  $B$  prevails over element  $A$  by 0.5 times. Our study meets this requirement.

The axiom of homogeneity requires that the order of criteria at all levels should be close, and their paired scores should be in the same range. The compliance of the presented study with this axiom is confirmed by comparing the values.

The axiom of synthesis requires that the priorities of elements of higher levels do not depend on elements of lower levels of the hierarchy. Therefore, in this study, the interaction of the hierarchy levels was evaluated, and the direct dependence of the elements of different levels was not established.

Let us consider the following axiom. The result of the analysis will meet the researcher's expectations only when these expectations, alternatives, and criteria are correctly represented in the hierarchy. This is confirmed by the analysis of model adequacy and, in particular, by the analysis of Figure 1.



**Figure 1.** The hierarchical system of choosing a banking institution according to the Saaty method. Source: Developed by the authors.

For choosing an effective loan product, it is recommended to use the hierarchy analysis method by T. Saaty. The hierarchical system of choosing a banking institution that provides a standard set of services has the following structure.

The requirements and limitations of the method can also include the condition of a sufficient amount of information and technological limitations regarding excessively large numbers of alternatives ( $n$ ). A pairwise comparison will have an excessively large value of  $C_n^n$ , which will require a significant amount of time for calculations and a significant amount of computing resources, which reduces the possibilities of using the method for Ukrainian farmers who do not have such technology. The number of alternatives on the Ukrainian market of bank loans meets this requirement (Table 1).

**Table 1.** Original data for using the hierarchy analysis method.

	Criteria	Units of Measurement	Alternatives	
K1	Position in the rating of banks	Rating estimate	A1	Bank 1
K2	Bank reputation	Points	A2	Bank 2
K3	Lending limit	UAH	A3	Bank 3
K4	Lending period	Months	A4	Bank 4
K5	Interest rates	%		
K6	The convenience of using bank services	Rating estimate		

### 3. Data Analysis

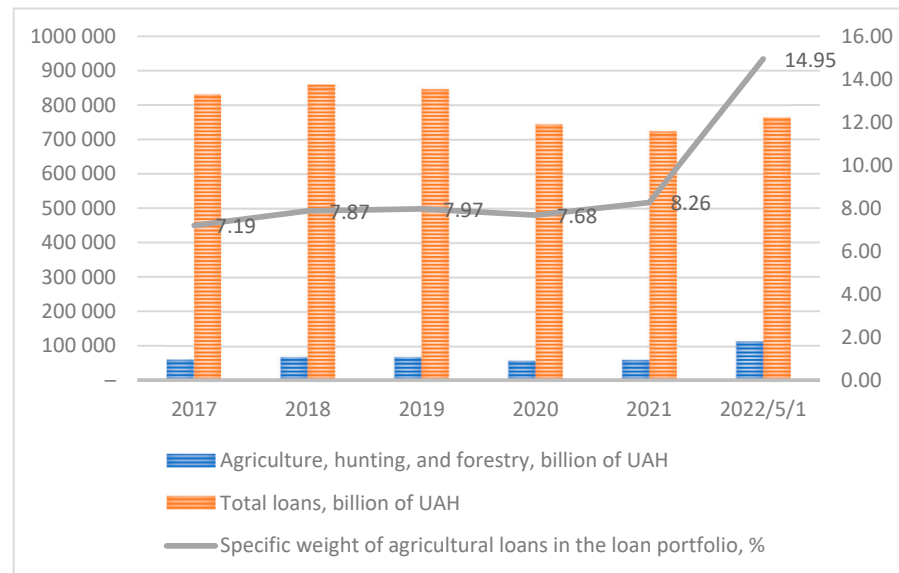
Land mortgage lending as a financial instrument in agriculture is based on using a rather specific object as collateral—land usage as agricultural real estate. It is necessary to consider the peculiarities of managing agriculture itself, the success of which is an essential part of ensuring the return of the loan issued by the bank.

The problem of the development of the process of mortgage lending of agricultural land in Ukraine includes the high riskiness of lending secured by land plots due to the uncertainty of their liquidity, which is because their sale lasts much longer than the sale



of an apartment or a lot of land allocated for low-rise buildings construction, due to the underdevelopment of the land market infrastructure.

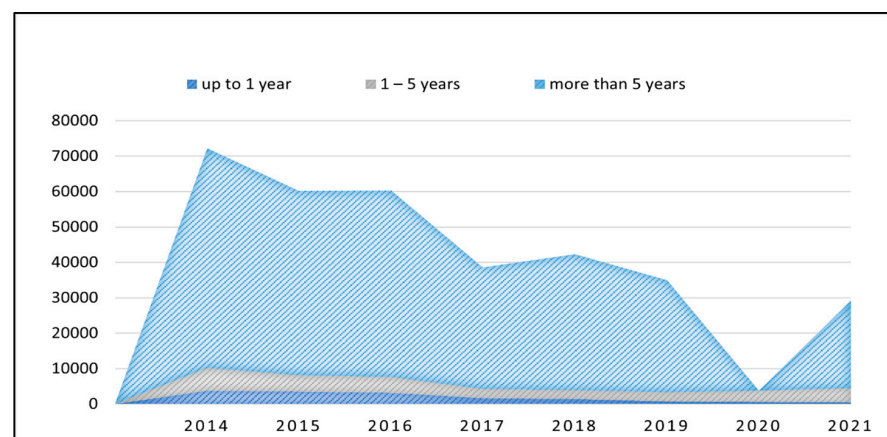
According to statistical data of the National Bank of Ukraine, in the period from 2017 to 05.01.2022, the share of agricultural loans in the loan portfolio of Ukrainian banks was within 7–14.95% (Figure 2).



**Figure 2.** Loan portfolio of Ukrainian banks, 2017–2022. Source: Compiled by the authors using data from the State Statistics Service of Ukraine and the [National Bank of Ukraine \(2022\)](#).

During the analyzed period, namely from 2021 to 05.01.2022, the volume of loans was the largest, and accordingly, the share of loans that came to the agricultural sector was high—14.95%. This fact confirms that banks have begun entering into relations with clients of the agricultural sector willingly and lend to them.

The factor influencing the volume of mortgage lending is its maturity (Figure 3). The largest amount of loans with a maturity of more than 5 years was provided in 2014 for UAH 61,922 million. In 2021, the volume decreased to UAH 29,251 (two times less).



**Figure 3.** Volumes of mortgage lending by maturity. Source: Compiled by the authors using data from the Bulletin of the [National Bank of Ukraine \(2022\)](#).

A fund was created for partially guaranteeing loans in agriculture. It provides partial guarantees for credit obligations of small- and medium-sized enterprises ([Verkhovna Rada of Ukraine 2021](#)). The main criteria for agricultural producers are micro-, small-, and medium-sized business entities whose main activity is agricultural production and who

own or use agricultural land in an amount not exceeding 500 hectares. Farmers receive loans according to the “5-7-9 Available Loans” program. Subject to participation in the program, a reduction in the interest rate is possible.

Information on the state of attracting preferential loans by economic entities of the agro-industrial complex, in the direction of state financial support of measures in the agro-industrial complex by reducing the price of loans, is presented in Table 2.

**Table 2.** Attracting preferential loans by economic entities of the agro-industrial complex in the direction of state financial support.

Name of State Support	Amount of Funds Received, UAH	Number of Recipients
2019		
State support for the livestock industry	2,433,576,120	1179
State support of the hops, berries, and orchards industry	397,878,900	210
Provision of loans to farms	225,083,000	595
Financial support in the agricultural sector by making loans cheaper	449,872,336	966
Financial support for the development of farming	420,446,654	5944
Financial support for agricultural producers	640,793,815	4315
2020		
Financial support for the development of farming	65,566,900	176
Financial support for agricultural producers	3,965,818,473	11,538
2021		
Financial support for the development of farming	50,000,000	127
Financial support for agricultural producers	4,662,394,874	11,198

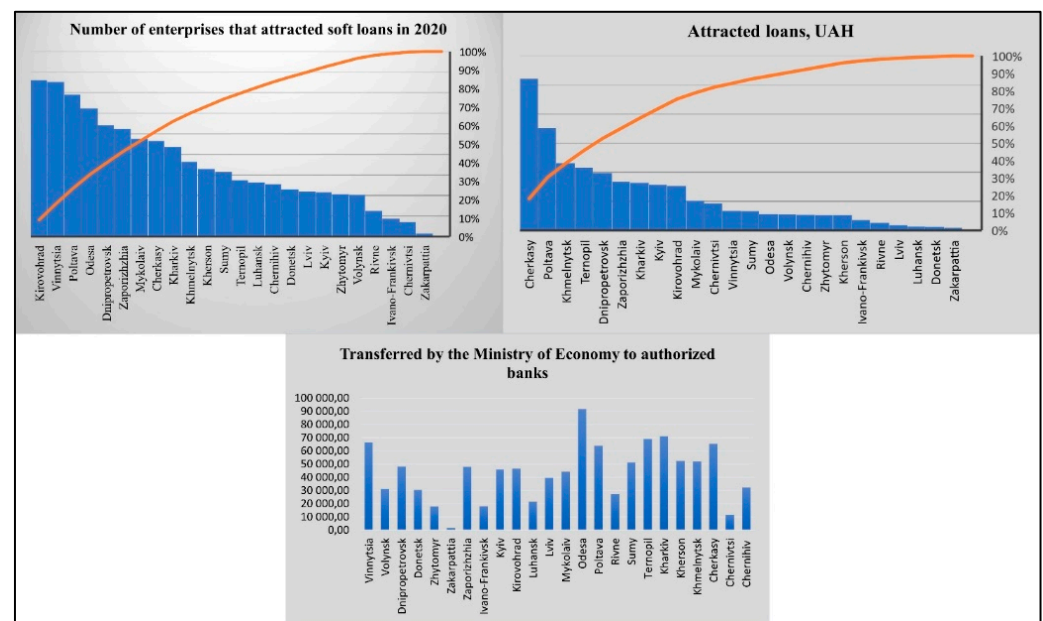
Source: Completed by the authors based on data from the [Ministry of Agrarian Policy and Food of Ukraine \(2021\)](#).

Another aspect of facilitating financing in the agricultural sector is the introduction and legislative consolidation of future “income from harvest” as collateral for loans. This project, supported by IFC and Switzerland, allows small farmers to receive loans for production resources even without securing their land. Over the past five years, 2000 small farmers have received loans worth USD 1 billion through securing income from harvest (agricultural receipts) (IFC 2019).

A characteristic feature of the national mortgage market is its high concentration level on a territorial scale. Information on the attraction of soft loans by economic entities of the agro-industrial complex in 2020, in the direction of state financial support of measures in the agro-industrial complex by reducing the cost of loans, is presented in Figure 4.

The largest volumes of loans were in Kyiv (36% of the total amount of loans and 23% of their total number) and the Kyiv region (19% and 15%, respectively). This is followed by loans issued in the Kharkiv region (8% and 9%, respectively), Lviv region (5% of the volume and 5% of the number), Dnipropetrovsk region (5% of the total volume of loans and 6% of the number), and Odesa region (4% of the volume and 6% of the number).

A review of the gross added value per hectare of the agricultural sector in Ukraine compared to other European countries, for example, Germany, clearly shows that there is unused potential. Similarly, the relatively low average yield in Ukraine for Europe, especially considering the supply of production factors, allows us to draw conclusions about the stagnation of investments in some branches of production (as well as production technology). In Germany, an average of 74.5 hundredweight/hectare of winter wheat was harvested in 2019 (BMEL 2020), while in Ukraine, according to the State Statistics Service, the yield of winter wheat in 2019 was 41.7 hundredweight/hectare.



**Figure 4.** Attracting soft loans by economic entities of the agro-industrial complex in 2020 in terms of regions. Compiled by the authors using data from the Bulletin of the [Ministry of Agrarian Policy and Food of Ukraine](#) (2021).

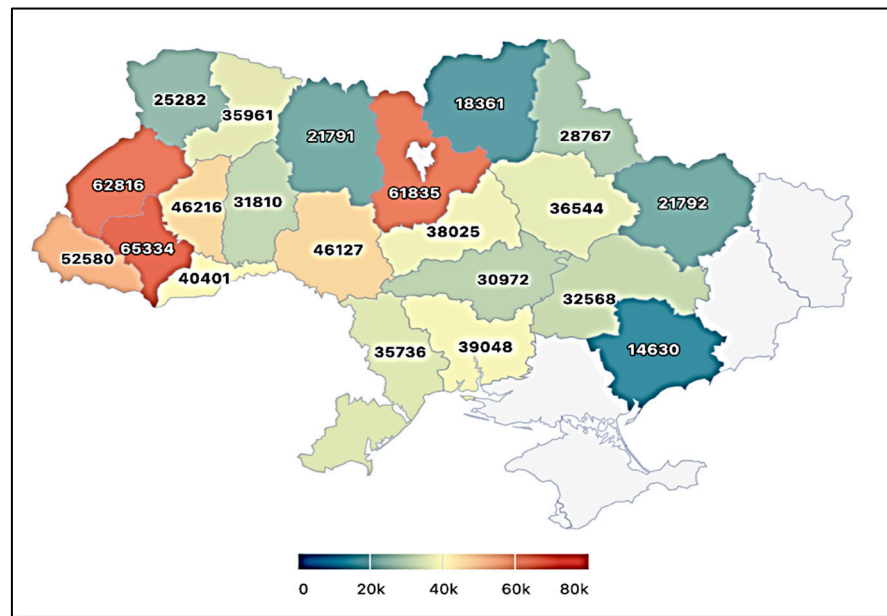
Apart from the yield potential and the added value creation, Ukraine undertook the development of a “greener”, i.e., sustainable, economy within the framework of cooperation with the European Union (EU), which is stated in Chapter 6 of the Agreement about the 14th Association with the EU. Ukraine’s efforts to harmonize its standards with EU standards cannot be achieved without investments. In particular, regarding the environmental requirements of the new GAP and the Green Deal, which, among other things, include a significant reduction in CO<sub>2</sub> emissions, as well as pesticides and fertilizers, the corresponding changes are possible only through investments, for example, in modern machinery or the modernization of systems and equipment.

Therefore, world experience shows that land mortgages allow agricultural producers of developed countries, on the one hand, to expand agricultural production by using fixed assets acquired at the expense of mortgage loans and, on the other hand, to accelerate capital turnover and receive additional profit.

On 1 July 2021, the agricultural land market officially started in Ukraine. The agricultural land market has been operating in Ukraine for a year and a half, and this is one of the most global reforms of recent years. The Big War temporarily stopped its operation. However, in May, after the state registries started working again, sales resumed. The average value of agricultural land in Ukraine reached almost 38,000 UAH/hectare.

According to the calculations of the Ministry of Agrarian Policy and Food, during the year of functioning of the land market, Ukrainians sold their land plots for UAH 7 billion. According to the platform data, before the attack of the Russian Federation in February 2022, 10,000 hectares of land on average was sold per week. Currently, sales have fallen four times to 2.5 thousand hectares per week. In total, as of the end of October 2022, 289,000 hectares were sold, which is less than 1% of the total area of 42.4 million hectares of agricultural land in the country. The most expensive agricultural land is in the Lviv, Ivano-Frankivsk, and Kyiv regions. The lowest prices are in the front-line regions: the Kharkiv and Mykolaiv regions. There are practically no sales in the temporarily occupied Zaporizhzhia and Kherson regions (UNIAN 2022) (Figure 5).

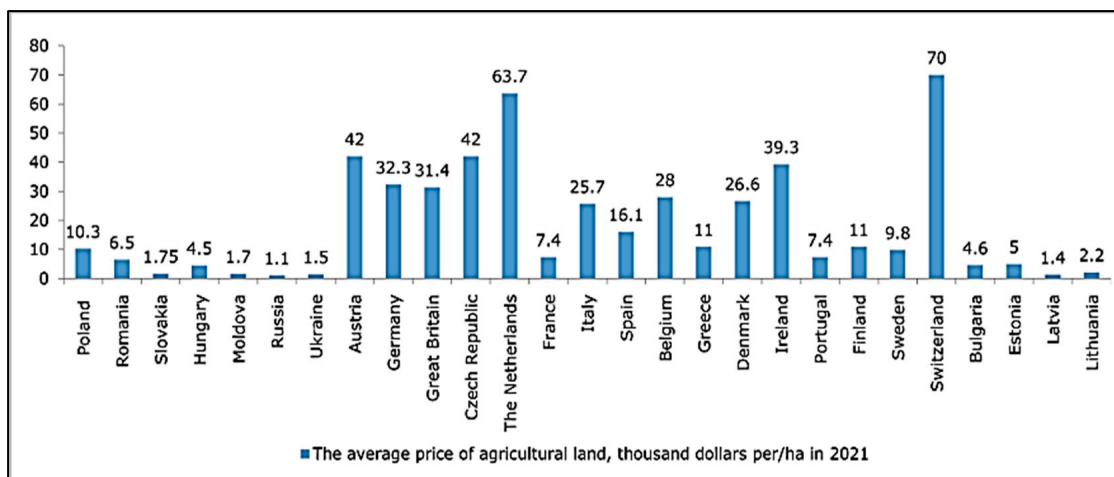




**Figure 5.** The cost of agricultural land by region of Ukraine as of 2022. Source: [UNIAN \(2022\)](#).

Figure 6 presents a comparative analysis of prices for 1 hectare of land in Ukraine and European Union member states. As we can see, the position of Ukraine remains on the same level as countries such as Moldova, Russia, and Latvia. All this indicates the underdevelopment of the land market in Ukraine, which affects mortgage lending.

According to the experts of the All-Ukrainian Agrarian Council, the interest rate for the land purchase should be at the level of the current rental rate. The latter is formed by the market at the junction of supply and demand and enables the farmer to earn and invest in other resources. Today, according to the calculations, the average market value of the land price is USD 1000–1500 per hectare. For example, the rental rate—UAH 5000 per hectare—is approximately USD 178. So, in terms of interest, this means that a 2% annual loan in dollars and 5% in hryvnias may be acceptable for a farmer. In the presence of the Loan Guarantee Fund, at the current price of 1000–1500 USD/ha, and the possibility of compensating the interest rate so that it was no more than 5% in hryvnias, farmers will be able to purchase land under its pledge without stress. In addition to the interest rate, the down payment that farmers are willing to pay should also be considered ([Agribusiness Today 2020](#)).



**Figure 6.** Comparative analysis of the average price of agricultural land, thousand USD per ha as of 01.01.2021. Source: [Lemishko and Shevchenko \(2021\)](#).

#### 4. Results

The research criteria are the place in the bank rating (as of 2022), bank reputation, credit limit, interest rates, and convenience of using banking services. The reputation of a financial institution is an indicator that can become an objective criterion for choosing a partner bank in market instability and lack of access to financial indicators of banks. Thus, the positive business reputation of the bank and its shareholders demonstrates its reliability; and not because such banks have more money or a better business model but because reputation today is a reliable means of social control. The guaranteed and trusted rating should be based on reliable information. For example, it could be banking regulations promptly monitored by the NBU. It is not easy to recognize a reliable bank based on its financial indicators. Firstly, the indicators, available to all, are published on the regulator's website with a long delay—a month or two, and sometimes more. Therefore, the only body that can judge the state of a financial institution is the NBU, which not only knows the operational indicators of banks but also can judge which indicators of the bank's work are real and which are not.

We systematized the assortment of loan products for financing working capital and investing in agricultural enterprises, the main conditions on which banks are ready to lend to the agricultural sector according to the official websites of the banks of Ukraine (Table 3). All this confirms the availability of a significant number of loan products for agricultural producers, which considerably complicates the decision-making process.

**Table 3.** Loan products of banks for financing agricultural enterprises.

Bank	Type of Loan Product	Lending Limit	Lending Term	Interest Rate %
JSC Raiffeisen Bank Aval	Overdraft	UAH 4,500,000	36 months	18.45–20.45%
	Credit line	UAH 37,000,000	18 months	13–14%
	Partnership programs	UAH 37,300,000	60 months	up to 14.5%
	Investment loan for the purchase of agricultural machinery and equipment	UAH 37,300,000	60 months	18.5–20.0%
JSC UkrSybbank	Current activity of agricultural business	UAH 5,000,000	12 months	Up to 8.5%
	Agrocredit “Investing”	Advance payment from 30%	Up to 60 months fixed assets, Up to 36 months corporate rights	Hryvnia—from 11.40% US dollar—from 5.95% Euro—from 5.20%
JSC Ukreximbank	Agrocredit “Investing”	Advance payment from 30%	Real estate, corporate rights—up to 60 months Other purposes—up to 36 months	Hryvnia—from 11.40% US dollar—from 5.95% Euro—from 5.20%
	Agrocredit “Agricultural machinery”	15% and more—for new agricultural machinery 20% and more—for other agricultural machinery	New agricultural machinery—up to 7 years Other agricultural machinery—up to 5 years	Hryvnia—from 11.40% US dollar—from 5.95% Euro—from 5.20%
JSC “Credit Agricole Bank”	Lending for business development	Up to 75%—collateral property—object of lending Up to 90% other property	Up to 60 months—fixed assets	Hryvnia—15% US dollar—6.5% Euro—5.5%
	Financing the purchase of agricultural machinery (equipment)	X	Up to 60 months—fixed assets	Hryvnia—15% US dollar—6.5% Euro—5.5%

**Table 3.** *Cont.*

Bank	Type of Loan Product	Lending Limit	Lending Term	Interest Rate %
JSC CB “Pryvatbank”	Credit line “Agroseason”	From UAH 500,000	36 months	17% per annum
	Loan for the purchase of fixed assets	From UAH 100,000	1–3 years	UIRD + 7% per annum or from 0% per annum
	Leasing of agricultural machinery	From UAH 300,000 to 5 million	5 years	From 0.01% per annum
JSC “Kredobank”	Agricultural machinery for small- and medium-sized businesses	Unlimited, advance payment from 10%	Up to 60 months	Hryvnia—13.75% US dollar—6.0% Euro—4.5%
	Agricultural investment	Unlimited, advance payment from 30%	Up to 84 months	Hryvnia—13.75% US dollar—6.0% Euro—4.5%

Source: data of official websites of banks of Ukraine; JSC Raiffeisen Bank Aval (2022); JSC Credit Agricole Bank (2022); JSC Kredobank (2022); JSC Ukreximbank (2022); JSC Ukrsibbank (2022); JSC CB Privatbank (2022).

The results of determining the vector of global priority by potential banks using the hierarchy analysis method are presented in Table 4.

**Table 4.** The results of determining the vector of global priority by potential banks using the hierarchy analysis method.

	Priority Vectors						Global Priority (GP)
	K1	K2	K3	K4	K5	K6	
	0.444	0.027	0.100	0.049	0.152	0.228	
Bank 1	0.355	0.143	0.085	0.110	0.424	0.085	0.259
Bank 2	0.067	0.046	0.291	0.037	0.103	0.290	0.144
Bank 3	0.534	0.669	0.042	0.427	0.050	0.042	0.297
Bank 4	0.044	0.143	0.582	0.427	0.424	0.582	0.300
Total							1.00

Source: Developed by the authors.

By comparing the values of global priorities, the ratings of all banks are determined. In our example, the maximum priority of 0.3 was found in bank No. 4. According to the estimate carried out by the MAI, preference should be given to JSC Raiffeisen Bank Aval.

Today, it is also possible to choose a bank and loan product with the help of IT-online platforms. For example, the product of the AgriAnalytica company is a communication platform for participants of the Ukrainian agricultural market, whose main task today is to simplify the access of agricultural producers to financing. The online platform of the “Cabinet of an Agrarian” company unites financial institutions, suppliers, buyers, consultants, investors, international donor projects, and insurance companies into a single ecosystem of agricultural companies. Today, 26 banks are represented on the platform (Aggeek 2020).

Currently, the demand of agricultural producers for loan resources is not fully satisfied. According to the calculations of the “European Fund for Southeast Europe” investment fund, the Ukrainian agricultural sector lacks credit resources of USD 8.7 billion and the total demand for agricultural loans in Ukraine, according to experts’ estimates, reaches USD 12 billion (EFSE 2019).

## 5. Discussion

Specific factors of the agrarian industry are seasonality and the cyclical nature of work; the influence of natural, economic, and weather conditions; non-uniformity of sales volumes; unevenness of income; and unregulated circulation of land plots by owners of land shares within agricultural land usage as an object of agricultural real estate (Tretiak et al. 2021; Kucher et al. 2022).

In general, the experience of EU member states can be very relevant and useful for Ukraine. In the 1990s, in conditions similar to Ukraine, a more radical method of agricultural land market development was chosen, which led to a drastic difference between the current socio-economic development of Ukraine and the EU member states. The speed of reforms and liberalization of the agricultural land market is directly proportional to the economic growth and well-being of the population in the new EU member states (Agropolit 2017).

The objective need to use loan resources in agricultural production is determined by the special conditions of its functioning, the reduction of self-financing opportunities, and the slow development of investment processes. Access to financing also influences urgently needed climate change adaptation and sustainable production methods (Schierhorn et al. 2018). The results of a current study by Seven and Tumen (2020), which evaluated data series of 104 developing and industrialized countries, revealed a positive impact of a developed agricultural financing system on agricultural productivity. Doubling agricultural loans will lead to a 4–5% increase in agricultural productivity. All this shows that agricultural loans in developing countries mainly lead to increasing the share of agriculture in GDP, and in industrially developed countries, they lead to higher labor productivity (Seven and Tumen 2020).

The yield potential of Ukraine can also be seen given the less intensive cultivation of sunflowers in other European countries. In Ukraine, over ten years, the yield has doubled since 2000 thanks to knowledge transfer, new technologies, and quality seeds (Storozhuk et al. 2019) and was 25.1 hundredweight/hectare in 2019; the German yield level was 20.5 hundredweight/hectare. Of course, difficult access to financial resources cannot be considered the sole cause of unused yield potential, but we can assume that it must have played its role.

Lack of funds prompts agricultural producers to turn to commercial banks and other institutions to obtain loan resources.

State support is a defining component of agro-policy in terms of regulating the financial balance of the industry, in the structure of which lending has a significant share. Loan resources are necessary for mainly seasonal agricultural production, and difficulties in obtaining them through the network of commercial banks lead to the need for state stimulation, which has different mechanisms and forms. It is also possible to reduce the cost of loans due to the implementation of international support programs from the German-Ukrainian Fund, the European Investment Bank, and the European Bank for Reconstruction and Development (Miuller 2020).

One cannot agree with the authors who, based on the analysis of crediting instruments and mechanisms in other countries, indicate their prospects in Ukraine (Bakhur 2020; Samotoenkova 2019; Zaverbnyj 2021; Lehkostup and Sainchuk 2022; Mohd Thas Thaker et al. 2020). The analysis presented in this paper confirms that under the crisis conditions in Ukraine, aggravated by the war, the possibility of using these tools and mechanisms is significantly worse. The possibilities of mortgage lending are used insufficiently. The activities of private credit institutions, in contrast to the findings (Lemishko and Shevchenko 2021), have not yet become widespread precisely because of the limitation of mortgage lending opportunities. For the same reason, in contrast to the findings of Zharikova and Cherkesenko (2021), banking institutions and insurance companies did not acquire combined efforts to provide loans to agricultural enterprises.

As the given data show, mortgage lending in Ukraine is developing quite dynamically, thanks to the state mortgage program, which provides for partial compensation of interest on loans, which makes them more affordable for the agricultural sector. The range of loan products is expanding. Along with classical lending, such financing models as promissory notes and partner programs are becoming widespread.

Thanks to mortgage lending, the need to withdraw financial resources from production turnover disappears, the efficiency of land use increases, and the possibility of long-term lending of fixed assets appears. The volume of mortgage lending in the GDP of EU member

states is 35%, and in Ukraine it is 6.1%. At the same time, a share of this indicator of 5–10% indicates a fragmented mortgage market. If this share is more than 20%, it is the advanced market.

A vital condition for mortgage relations development in the agricultural sector of Ukraine is the creation of an extensive infrastructure of the mortgage market, the constituent elements of which should be various financial and credit institutions engaged in mortgages secured by agricultural land. It is also necessary to use the general methodological foundations of building mortgage systems, considering the national specificity of domestic law and the specificity of agricultural production, the dissemination of leading experience, conducting scientific research, and other activities.

The banking system's need for mortgage lending can be ensured by diversifying the loan portfolio of existing banks and creating specialized mortgage banks. The central place in this system should be occupied by the universal State Land (Mortgage) Bank, which, in addition to regulating processes on the land market, would provide the entire range of banking services for agricultural formations.

An important direction of capitalization of agricultural production is using land as the principal resource in the market turnover, i.e., providing the possibility of using land plots as collateral for the purpose of obtaining mortgage loans for agricultural enterprises. The usage of land mortgages will allow agricultural enterprises to increase the amount of loans received, extend credit terms for a long time at significantly lower interest rates, and significantly expand the availability of credit.

To a certain extent, the development of mortgage lending will depend on how optimal the loan repayment terms are, the amount of the first payment, the interest rate for the loan and the order of its payment, and the ratio between the value of the collateral and the amount of the loan. The creation of credit institutions with the participation of the state and the provision of state guarantees with the use of subsidized interest rates for credit will be a guarantee of creating more attractive conditions for mortgage lending to the agricultural sector for both creditors and borrowers.

All other things being equal, a loan secured by liquid collateral and a state guarantee is a less risky investment for a bank and other credit institutions than in several other cases. Additionally, this is a reliable argument for the expansion of lending and the establishment of lower interest rates for using such loans. That is, today is the time to decide which practice of mortgage lending will be the most effective for us and will stimulate the development of farming in the countryside, the usage and revival of land, and on this basis, the growth of production, the creation of financial markets in the country, and overcoming poverty.

This study used the hierarchy analysis method (Saaty 1990). The Data Envelopment Analysis (DEA) method was considered as an alternative. This method can be used to measure corporate indicators in a compound way using quantitative and qualitative characteristics (Sarkis 2007). Variables included in the estimate were selected by stepwise regression. The benchmarking module of R Statistics was applied during the calculations (Fenyves et al. 2015). DEA can conduct traditional indicator analysis, especially if the goal is to obtain more information about operational and technical efficiency. Based on the study of selected corporate data, we concluded that DEA could be used to compare and analyze the efficiency of banks only as an additional tool because it does not provide, like the hierarchy analysis method, a clear possibility of comparing alternatives by priorities.

## 6. Conclusions

Access to capital significantly influences the stability and development of enterprises in the agricultural sector. Increasing labor productivity, introducing innovative technologies and sustainable practices, investing in human capital, and, thus, prerequisites for competitiveness are complicated in the absence of financing opportunities. The competitiveness of the Ukrainian agricultural sector is vital for entering new domestic and foreign markets, maintaining and growing the industry, and consequently developing rural areas.



Ukrainian farmers need financial resources to implement the latest highly effective technologies to increase production efficiency and productivity. These resources under modern realities, significantly complicated by the high-intensity hostilities on the territory of Ukraine, which led to the withdrawal of arable lands from circulation and the destruction of the fixed assets of agricultural enterprises, determine, first of all, the need for cheap and long-term loans. Modern lending instruments, primarily bank mortgage lending, have not yet been widespread in the agricultural sector. This is confirmed by the analysis of the current state of lending to agricultural enterprises.

The importance of mortgage lending for the capitalization of the agricultural sector is growing significantly in the conditions of crisis phenomena in the national economy, because the development of the mortgage credit system on a market basis can lead the country not only away from the investment crisis but also away from the inflationary crisis, diverting funds from current circulation to domestic accumulation. The use of mortgages makes it possible to anticipate the depreciation of creditors' financial assets by providing them with liquid real estate, which contributes to the stable functioning of the state's financial system.

Ukrainian banking structures have developed new forms of lending to spread the lending practice. All this is facilitated by the state policy of partial repayment of bank loan rates to farmers, which has increased the number of banking institutions that offer credit to agrarian enterprises.

It should be noted that bank offers are similar regarding the object of credit, repayment schedule, terms, and cost. In such conditions, it is very challenging to make the right choice of a bank and loan product that would increase the efficiency of agricultural production. Along with a wide range of similar offers, the choice is also complicated by an insufficient knowledge level about the specifics of bank lending.

This is confirmed by the systematization of credit offers of leading banks of Ukraine, the analysis of agricultural lending trends, and the estimate of the share of bank lending of the working capital of the agricultural industry. The dynamics of concessional lending to the agricultural sector were also determined. The directions and volumes of use of loan resources by agricultural enterprises were detailed.

It was established that the number of software tools for optimizing the choice of the form and terms of lending is increasing. The increase in software tools and a wide range of offers in the banking credit sector of Ukraine have made it relevant to offer manufacturers an analysis method when choosing a banking institution and credit product. The problem of choice can be solved by Saaty's method of analyzing hierarchies or IT-online platforms. For this, we have developed criteria that can be used when choosing a credit product.

A high level of risk, especially under conditions of military aggression, requires a mortgage mechanism that would ensure the protection of the borrower's interests. Such a mechanism can provide standardized redemption procedures for mortgaged land plots with insurance instruments (primarily state guarantees).

The analysis of the Ukrainian market of banking services was carried out. The reasons for the insufficient level of implementation of mortgage lending were established. The ways and tools for improving lending to the agricultural sector were suggested.

The aim of further research will be to improve the mortgage lending system in the agricultural sector of the economy, find alternative types of credit support for agricultural enterprises, and adapt state programs to the global experience of credit support for these enterprises. Therefore, the adoption of relevant legislative norms and the introduction of proposals for the spread of mortgage lending in Ukraine, given in the presented article, will allow agricultural enterprises to increase the amount of received loans and the time for which they are given. This will also facilitate lending conditions at significantly lower interest rates and expand loan offers. In general, this will allow the formation of a reliable and efficient mortgage lending market in Ukraine. During the war, many bank branches changed their location and personnel. This fact dynamically and unevenly affects the main criteria used in this study: "Position in the rating of banks", "Banking reputation", and

“Convenience of using banking services”. All this should be considered in future studies. Additionally, the subject of further research should be the criterial determination of the effects of state aid on the provision of bank loans to agricultural enterprises. Another criterion that should be studied is the geographical proximity of banking institutions to the location of agricultural enterprises (Alessandrini et al. 2003).

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