



UDC 336:648

Regional aspect of the efficiency of lending to the agricultural sector of the Ukrainian economy

Svitlana Cheremisina*

Doctor of Economic Sciences, Associate Professor
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-1546-7714>

Iryna Tomashuk

Postgraduate Student
National Scientific Centre "Institute of Agrarian Economics"
03127, 10 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-3010-0558>

► **Abstract.** Ukrainian agriculture has shown resilience, adaptability, and production flexibility during the war. At the same time, the priority issues are the lack of financial resources for business operations, the restoration of damaged facilities and ensuring technological discipline. In this context, the issue of lending to agricultural enterprises is of great relevance. The purpose of this study was to improve and develop methodological tools for assessing the credit burden and efficiency of lending in agriculture by region of Ukraine. The study employed several methods of cognition: comparative analysis, tabular, graphical, statistical, computational-constructive, abstract-logical. In 2015-2022, lending to agricultural producers increased by 2.4 times (by 43.5% or UAH 35.9 billion in 2022 alone). The share of loans attracted is dominated by Kyiv Oblast (31%). The share of lending to the agricultural sector increased by 2.6 times (from 6.1% to 15.7%). Ukrainian agrarians are lent mainly in the national currency (76.4% of disbursed loans) and for terms up to one year (54.4%), with terms of 1 to 5 years (41.2%). In 2015-2021, the loan burden per business entity and per employee almost doubled. The highest lending efficiency was demonstrated by farms in Zakarpattia, Zhytomyr, Rivne, Luhansk, and Chernivtsi oblasts. During the first year of the full-scale war, the efficiency of lending in agriculture fell by 48% (from 8.63 to 4.49 thousand UAH). Agricultural enterprises need support from both the state and credit institutions. The practical significance of this study is determined by the improvement of tools for measuring the level of credit burden and assessing the effectiveness of lending in the agricultural sector of the economy by regions of Ukraine, which can be used by public and sectoral authorities in the regional practice of monitoring and intensifying the practice of state financial support for rural producers

► **Keywords:** credit burden indicator; efficiency indicator; state support; agriculture

► Introduction

Lending to business entities in the agricultural sector of Ukraine has been one of the determining factors not only for their efficient operation and sustainable development, but also for the survival and preservation of their production and resource potential. With the outbreak of a full-scale war, the problem of a shortage of working capital required to purchase plant and animal protection products,

seeds, fertilisers, and fuel has become catastrophically acute. The restoration of destroyed and damaged industrial buildings, facilities and equipment is still an extremely challenging task. According to surveys, since the beginning of the war, about a quarter of agricultural producers have lost access to finance altogether, and another 20% report significant difficulties in obtaining funds (Restoration

► **Suggested Citation:** Cheremisina, S., & Tomashuk, I. (2023). Regional aspect of the efficiency of lending to the agricultural sector of the Ukrainian economy. *Ekonomika APK*, 30(5), 46-58. doi: 10.32317/2221-1055.202305046.

*Corresponding author



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of agricultural production..., 2023). Expanding real opportunities for access to finance and to cheap credit is a priority for rural producers and the state and a key to a speedy post-war economic recovery. Consequently, a comprehensive retrospective assessment of the comparative efficiency of lending to the agricultural sector of the economy is becoming increasingly important.

Among Ukrainian scholars, the following have made a significant contribution to the investigation of modern problems of agricultural lending: Yu.O. Lupenko & S.V. Andros (2019) identified the main factors of demand for credit resources from agricultural enterprises, measured the impact of bank loans on the development of the agricultural sector of the economy, considered the main obstacles to lending by financial institutions to Ukrainian farmers, and proposed effective solutions to eliminate these obstacles. O.A. Sergienko & A.S. Gula (2018) assessed the efficiency of lending to the agro-industrial complex from a regional perspective. The authors have developed and tested a methodological approach to assessing and analysing the levels of performance and lending of agro-industrial complex (AIC) entities, based on the results of using cluster analysis methods and a spatial multi-element matrix of correspondence of the components under study (level of performance of AIC and lending volumes). O. Chygryn & O. Ivakhnenko (2020) investigated the main problems faced by participants in the bank lending market in the agricultural sector. The authors examine the main obstacles to lending to agricultural enterprises by banking institutions, the main risks of banking institutions themselves, and measure the relationship between the profitability of agricultural enterprises and interest rates on bank loans in terms of their impact on the further development of the business entity and the agrarian economy as a whole.

S. Arzhevitin *et al.* (2021) identified, measured, and analysed the main factors that constrain lending to Ukrainian agricultural enterprises, and substantiated effective solutions to improve the agricultural lending system. L. Avramchuk & N. Desyatnik (2021) emphasised the need to strengthen the role of the state in making clear decisions aimed at creating favourable conditions for access to credit resources for agricultural producers of all sectors of the agricultural economy. A. Bilochenko (2023) focused on the problems of credit provision of Ukrainian agricultural enterprises with credit resources under martial law. The author examined the dynamics of bank lending after the outbreak of war and outlined the real prospects for its expansion in the post-war economic recovery.

M. Nehrey & O. Trofimtseva (2022) thoroughly investigated the problems of the functioning of the agricultural sector of Ukraine in the context of war and substantiated the need for its support from both the state and foreign funds, organisations, and states. Particular emphasis was placed on expanding state support for the agricultural sector in the financial sector by providing access to cheap loans and launching new grant programmes. O. Shpanel-Yukhta (2022) summarised the specific features of bank lending in Ukraine in the context of Russia's large-scale military aggression and found that, despite the martial law, bank lending to certain market segments grew (specifically, lending to agriculture, the introduction of credit support programmes for business during the war).

Among the world researchers, the following authors have made a significant contribution to the study of the problems of bank lending to the agricultural sector of the economy. C.A. Ngong *et al.* (2022) conducted an in-depth study of the impact of bank credit on agricultural productivity in the Economic and Monetary Community of Central Africa (CEMAC) from 1990 to 2019. The authors conclude that CEMAC governments should encourage efficient ways to increase the flow of bank credit to private agricultural enterprises through effective bank intermediation.

M. Rizwan *et al.* (2019) conducted a comprehensive study of the state, efficiency, current problems, and practical solutions to improve the efficiency of lending to rural producers in Pakistan. Proceeding from the study's findings, the authors propose that the government and other stakeholders review agricultural lending policies and simplify procedures for granting loans to farmers. A. Khanal & O. Omobitan (2020) investigated the factors influencing credit constraints and measured their impact on farm productivity (Tennessee, USA). The authors emphasise that improving the capacity and methods of agricultural lending in rural institutions can improve access to credit and increase the financial efficiency of small farmers.

At the same time, the research is aimed at identifying mechanisms and measuring the impact of bank lending on economic performance and opportunities for further development of rural producers. Considering this, the existing developments require structural systematisation, additional methodological substantiation, and practical adaptation to the extremely difficult business conditions faced by Ukrainian farmers during a full-scale war. The purpose of this study was to retrospectively measure the efficiency of lending to Ukrainian agriculture, considering regional differentiation.

To fulfil the purpose set, the tasks of the study were defined as follows:

- ▶ to compare the regional dynamics of lending to agricultural producers before and during the full-scale war;
- ▶ to substantiate the calculation tools and determine the dynamics of the credit burden and efficiency of lending in agriculture by regions of Ukraine;
- ▶ to make a comparative assessment of the dynamics of the efficiency of lending to agriculture and the entire non-financial sector of Ukraine's economy.

▶ Materials and Methods

The study employed the following methods: comparative analysis – to compare the dynamics of lending to agricultural producers in the regional aspect with the relevant indicators on average in Ukraine; tabular – to visualise the findings of the study; and graphical – to illustrate the current dynamics and comparative characteristics of lending efficiency. The statistical method was used to find the dynamics of credit burden indicators in agriculture. The computational-constructive method was used to analyse and compare the dynamics of indicators of efficiency of lending to agriculture in Ukraine in general and in the regional aspect. The abstract-logical method was used to formulate conclusions.

The study also used the following information base of the State Statistics Service (dynamics of production and

sales of agricultural products, number of business entities, number of employees) (Official website of the State..., n.d.); information and analytical data of the monetary statistics of the National Bank of Ukraine (NBU) (loans granted to agricultural entities, regional breakdown of lending to the agricultural sector of the economy, interest rates on loans granted) (Financial Sector Statistics, n.d.); operational data of the Ministry of Agrarian Policy and Food of Ukraine on the state of state support for farmers and the implementation of the "Affordable Loans 5-7-9%" programme (Strategy of the Ukraine's..., 2023).

The indicator of the share of lending to agriculture in the total volume of lending to sectors of the Ukrainian economy was calculated according to the following formula:

$$IL_{ij} = \frac{Lag_{ij}}{Ltotal_{ij}} \times 100\%, \quad (1)$$

where IL_{ij} is the share of lending to the agricultural sector of the i^{th} region in the j^{th} period, %; Lag_{ij} is the amount of loans granted to rural commodity producers of the i^{th} region in the j^{th} period, UAH million; $Ltotal_{ij}$ is the total amount of loans issued to business entities of the non-financial sector of the economy of the i^{th} region in the j^{th} period, UAH million.

The loan burden indicator in agriculture (per 1 enterprise) is calculated using the following formula:

$$LW_{enij} = \frac{Lag_{ij}}{NEn_{ij}}, \quad (2)$$

where LW_{enij} is the credit load of the i^{th} region in the j^{th} period, thousand UAH per 1 enterprise; NEn_{ij} is the number of economic entities in agriculture of the i^{th} region in the j^{th} period, units.

The indicator of the credit burden in agriculture (per 1 employed person) is calculated using the following formula:

$$LW_{emij} = \frac{Lag_{ij}}{NEm_{ij}}, \quad (3)$$

where LW_{emij} is the credit load of the i^{th} region in the j^{th} period, thousand UAH per 1 employed worker; NEm_{ij} is the number of employed workers in agriculture of the i^{th} region in the j^{th} period, persons.

Lending efficiency (in terms of agricultural output) is calculated using the following formula:

$$EPL_{ij} = \frac{AgP_{ij}}{Lag_{ij}}, \quad (4)$$

where EPL_{ij} is the efficiency of agricultural lending in the i^{th} region in the j^{th} period, produced agricultural products per 1000 borrowed loans; AgP_{ij} is the volume of production of agricultural products of the i^{th} region in the j^{th} period, thousand UAH.

Lending efficiency (by agricultural products sold) is calculated using the following formula:

$$ESL_{ij} = \frac{SP_{ij}}{Lag_{ij}}, \quad (5)$$

where ESL_{ij} is the efficiency of agricultural lending in the i^{th} region in the j^{th} period, realised agricultural products per 1000 borrowed loans; SP_{ij} – volume of sold agricultural products of the i^{th} region in the j^{th} period, thousand UAH.

The efficiency of lending to the non-financial sector of Ukraine's economy and its regions is calculated using the following formula:

$$EEC_{ij} = \frac{GRP_{ij}}{Ltotal_{ij}}, \quad (6)$$

where EEC_{ij} is the efficiency of lending to the economy of the i^{th} region in the j^{th} period, produced gross regional product per 1000 borrowed loans; GRP_{ij} is the production volume of the gross regional product of the i^{th} region in the j^{th} period, thousand UAH.

► Results and Discussion

A comprehensive analysis of the overall and regional dynamics of lending to agricultural entities revealed a steady upward trend. In 2015-2022, the total volume of loans to agricultural producers increased 2.4 times, from UAH 48.4 billion to UAH 118.5 billion (Table 1). Kyiv Oblast is the leader in terms of loans attracted, accounting for 31% (or UAH 36.6 billion) of the total volume of loans to the Ukrainian agricultural economy. Kharkiv (7.3%), Dnipro (6.9%), Odesa (6.1%), Lviv (5.1%), Vinnytsia (4.5%) and Kirovohrad (4.4%) oblasts are the next largest lending regions for agricultural producers. Zhytomyr, Chernihiv, Sumy, Kirovohrad, Luhansk, and Zaporizhzhia oblasts are leading in terms of loan growth. During the analysed period, the total volume of loans granted to agricultural producers increased by 16.4, 13.1, 9.1, 8.0, 7.0, and 6.9 times, respectively.

Table 1. Regional dynamics of lending to agricultural producers, (end-of-period balances), 2015-2022, UAH million

Oblast	2015	2016	2017	2018	2019	2020	2021	2022	2022-2015, %
Ukraine	48 425	55 374	59 706	67 675	61 600	61 486	82 600	118 504	241.2
Vinnytsia	815	719	903	1251	1659	1937	2647	5273	606.7
Volyn	345	436	673	781	925	785	911	2212	550.4
Dnipropetrovsk	4223	6256	6971	8211	8139	5120	6130	8129	207.3
Donetsk	336	294	100	238	459	345	868	600	218.8
Zhytomyr	103	149	359	501	503	524	860	1786	1 640.8
Zakarpattia	73	73	118	147	155	104	168	249	354.8
Zaporizhzhia	635	1063	1597	1837	2185	2387	3753	4289	690.4
Ivano-Frankivsk	224	272	202	506	438	515	795	1163	474.6
Kyiv	26 178	27 532	30 063	27 941	18 416	19 870	25 232	36 614	120.5
Kirovohrad	594	1114	1372	1751	1858	2100	2474	5218	797.6

Table 1, Continued

Oblast	2015	2016	2017	2018	2019	2020	2021	2022	2022-2015, %
Luhansk	73	94	114	176	265	260	516	480	700.0
Lviv	2439	2864	1468	2291	2544	2965	4264	6019	241.8
Mykolaiv	2103	2253	1028	1457	1754	1738	2336	3344	158.8
Odesa	2074	1708	2240	3598	3895	4702	4421	7301	362.7
Poltava	2075	1783	1692	2079	2321	1776	2651	4595	219.2
Rivne	340	392	429	676	683	740	539	1085	345.9
Sumy	330	652	1017	1416	1441	1413	2303	2814	914.2
Ternopil	627	1080	1166	1469	1740	1708	2760	4699	676.9
Kharkiv	1911	2944	4019	5464	5625	6066	9315	8687	545.3
Kherson	405	551	670	1185	1250	1197	1838	1753	485.9
Khmelnyskyi	1257	1285	1145	1559	1570	1829	2980	4834	325.1
Cherkasy	870	947	1305	1610	2232	1824	2471	3388	407.7
Chernivtsi	163	298	185	230	227	261	369	604	398.2
Chernihiv	233	616	870	1301	1315	1320	2001	3369	1 308.2

Note: data excludes the territories temporarily occupied by the Russian Federation and parts of the territories where military operations are (were) conducted

Source: compiled by the authors of this study based on Financial Sector Statistics (n.d.)

A noticeable increase in the share of lending to agriculture in the total volume of lending to sectors of the Ukrainian economy has been identified. Thus, in 2015-2022, the all-Ukrainian share of agricultural loans in the

volume of lending to the non-financial sector increased from 6.1% to 15.7% (Fig. 1).

This positive trend is typical for all regions of Ukraine (Vernihorova, 2021).

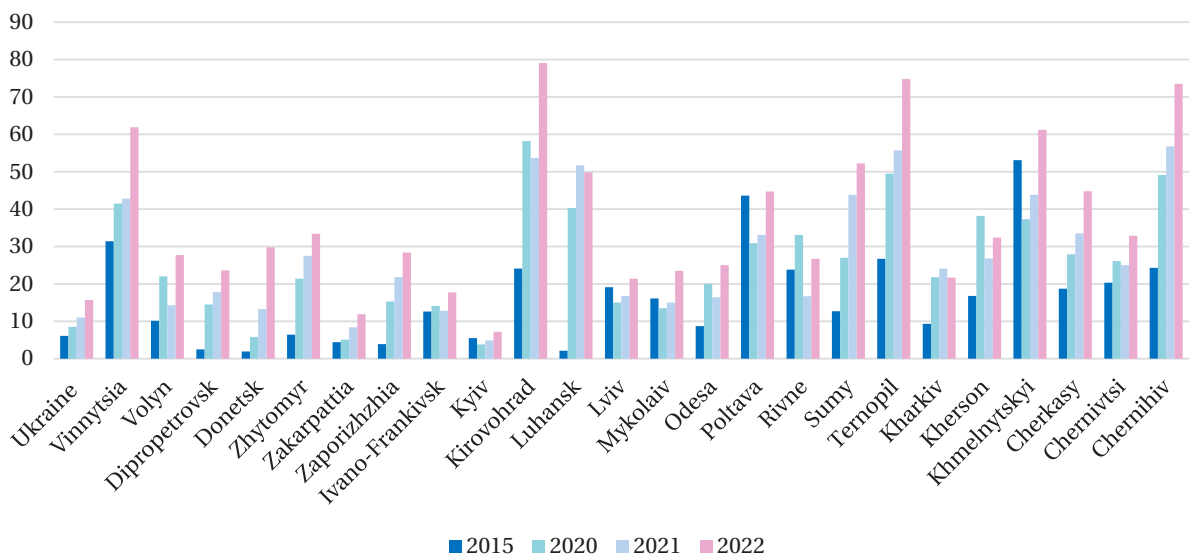


Figure 1. Regional dynamics of the share of lending to agriculture in the total volume of lending to sectors of the Ukrainian economy, %

Note: data excludes the territories temporarily occupied by the Russian Federation and parts of the territories where military operations are (were) conducted

Source: compiled by the authors of this study based on Financial Sector Statistics (n.d.)

The largest share of agricultural loans in the regional economy was recorded in Kirovohrad (79.1%), Ternopil (74.8%), Chernihiv (73.5%), Volyn (61.9%), Khmelnytskyi (61.2%), and Sumy (55.2%) oblasts. A retrospective structural analysis of agricultural loans revealed the following.

Ukrainian farmers receive loans mainly in the national currency. In 2015-2022, the share of hryvnia-denominated loans increased from 59.1% to 76.4%. Accordingly, the share of foreign currency loans decreased from 40.9% to 23.6% over this period (Table 2).

Table 2. Structure of loans granted to agricultural producers, 2015-2022, %

Year	Total	Including by timeframe			including							
					in national currency				in foreign currency			
		up to 1 year	1-5 years	over 5 years	total	Including by timeframe			total	Including by timeframe		
						up to 1 year	1-5 years	over 5 years		up to 1 year	1-5 years	over 5 years
2015	100.0	45.6	42.0	12.4	59.1	21.5	27.3	10.3	40.9	24.1	14.8	2.1
2016	100.0	44.2	35.7	20.1	68.9	23.9	26.7	18.3	31.1	20.3	9.1	1.7
2017	100.0	30.2	38.5	31.4	77.0	20.2	28.8	27.9	23.0	9.9	9.6	3.4
2018	100.0	36.3	44.7	19.0	73.8	23.2	34.5	16.1	26.2	13.1	10.2	2.9
2019	100.0	43.3	50.7	5.9	71.2	26.8	40.7	3.7	28.8	16.6	10.0	2.2
2020	100.0	48.9	46.6	4.5	70.1	35.6	32.2	2.3	29.9	13.3	14.4	2.2
2021	100.0	45.1	49.6	5.3	71.6	30.8	38.1	2.7	28.4	14.4	11.5	2.6
2022	100.0	54.4	41.2	4.3	76.4	41.5	32.8	2.1	23.6	13.0	8.4	2.2
2022-2015, +/- %	-	8.9	-0.8	-8.1	17.3	20.0	5.5	-8.2	-17.3	-11.1	-6.3	0.1

Source: compiled by the authors of this study based on Financial Sector Statistics (n.d.)

In terms of term structure, as of the end of 2022, the share of short-term loans increased from 45.6% to 54.4%, and their volume increased from UAH 22.1 billion in 2015 to UAH 64.5 billion in 2022. Medium-term loans with a maturity of 1 to 5 years accounted for 41.2%. The share of long-term loans with a maturity of 5 years or more decreased from 12.4% to 4.3% (from UAH 6 billion to UAH 5.1 billion) during the analysed period.

The average cost of loans to agricultural businesses, according to the statistical reporting of Ukrainian banks, was 16.7% per annum in national currency at the end of 2022, and 5% in foreign currency. Therewith, the cost of short-term hryvnia loans differed from long-term loans by only 0.8%. Short-term loans in foreign currency were much cheaper – 3.1% compared to 5.4% per annum (Table 3).

Table 3. Average cost of loans to agricultural entities, 2015-2022, %, in UAH

Period	in national currency			in foreign currency		
	total	short-term	long-term	total	short-term	long-term
2015						
at the beginning of the year	16.4	16	22.2	8.5	8.3	13.2
at the end of the year	20.7	20.7	20	7.9	8.2	3.7
changes during the year	4.3	4.7	-2.2	-0.6	-0.1	-9.5
2016						
at the beginning of the year	19.8	19.5	25.6	8.2	8.2	8
at the end of the year	17.4	16.8	21.1	7.1	6.6	9.9
changes during the year	-2.4	-2.7	-4.5	-1.1	-1.6	1.9
2017						
at the beginning of the year	14.5	14.1	21.9	6.9	6.8	7.1
at the end of the year	16.1	16	17.8	5.9	5.6	6.7
changes during the year	1.6	1.9	-4.1	-1	-1.2	-0.4
2018						
at the beginning of the year	14.9	14.5	22.1	6.4	6.2	7.8
at the end of the year	20	19.7	20.5	5.3	4.5	7.4
changes during the year	5.1	5.2	-1.6	-1.1	-1.7	-0.4
2019						
at the beginning of the year	20.5	20.6	20	4.3	4.2	7.3
at the end of the year	15.2	13.9	19.2	4.4	6.9	3.9
changes during the year	-5.3	-6.7	-0.8	0.1	2.7	-3.4
2020						
at the beginning of the year	13.6	13.4	20.6	3.6	3.5	7

Table 3, Continued

Period	in national currency			in foreign currency		
	total	short-term	long-term	total	short-term	long-term
at the end of the year	9.3	8.9	12.5	4.6	4.7	4.1
changes during the year	-4.3	-4.5	-8.1	1	1.2	-2.9
2021						
at the beginning of the year	7.8	7.5	15.1	3.6	3.5	6.9
at the end of the year	10.2	9.5	12	2.6	2.5	6
changes during the year	2.4	2	-3.1	-1	-1	-0.9
2022						
at the beginning of the year	10.2	9.8	15.4	5.1	4.8	6.0
at the end of the year	16.7	16.0	16.8	5.0	3.1	5.4
changes during the year	+4.5	+6.2	+1.4	-0.1	-1.7	-0.6
2023						
at the beginning of the year	16.9	16.2	17.1	5.6	3.7	6.0
by 1.07	19.3	18.0	19.4	6.4	4.0	6.5

Source: compiled by the authors of this study based on Financial Sector Statistics (n.d.)

During the first year of the war, the cost of loans to agricultural producers in national currency increased by 1.6 times – from 10.2% at the beginning to 16.7% at the end of the year. The average cost of loans in foreign currency stayed almost unchanged, while short-term lending fell by 1.7% p.a., from 4.8% at the beginning of the year to 3.1% at the end of the year. Local currency loans continue to rise in price. In the first half of 2023, the average cost of such loans increased by 2.6%, from 16.7% to 19.3%. The interest rate on short-term loans increased from 16% to 18%, and on long-term loans – from 16.8% to 19.4%. Given the disappointing inflation forecasts of the National Bank of Ukraine, this trend will continue and the interest rate on hryvnia loans will increase (Shyian *et al.*, 2020).

A retrospective analysis of the dynamics of the credit burden of the agricultural sector of Ukraine's economy revealed the following destructive changes. The total loan burden per business entity in agriculture increased by 1.9 times in 2015-2021, from UAH 684.7 thousand to UAH 1 271.6 thousand. In the regional context, the highest growth rates were observed in the farms of Zhytomyr, Chernihiv, Zaporizhzhia, Sumy, Luhansk, Kharkiv, and

Ternopil oblasts – by 8.5, 8.5, 7.3, 6.7, 6.0, 5.5, and 5.5 times, respectively (Table 4). The leaders in terms of the absolute loan burden per agricultural enterprise as of the beginning of 2022 are Kyiv (UAH 7970 thousand), Kharkiv (UAH 2617 thousand), Lviv (UAH 2260 thousand), Ternopil (UAH 1772 thousand), Sumy (UAH 1330 thousand), and Khmelnytskyi (UAH 1329 thousand) regions. While the average Ukrainian credit load indicator is UAH 1272 thousand per business entity, Kyiv region enterprises are almost 6.3 times higher. The lowest levels of loan burden are in Zakarpattia (UAH 114.2 thousand), Chernivtsi (UAH 301 thousand), Luhansk (UAH 326 thousand), Donetsk (UAH 472 thousand), and Mykolaiv (UAH 491 thousand) oblasts. On average in Ukraine, the loan burden per person employed in agriculture stood at UAH 143.4 thousand at the beginning of 2022, almost double the level of 2015. Similarly, to the previous indicator, the leaders in terms of loans per employee are Kyiv, Kharkiv, and Lviv oblasts – UAH 600.1, UAH 296.1, and UAH 186.6 thousand, respectively. The lowest figures (up to UAH 50 thousand per employee) were recorded in Zakarpattia, Zhytomyr, Luhansk, Rivne, and Chernivtsi oblasts.

Table 4. Dynamics of the loan burden in agriculture, 2015-2021, UAH thousand

	2015		2017		2019		2021		2021 in % to 2015	
	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee
Ukraine	684.7	75.4	858.6	93.9	897.0	101.0	1271.6	143.4	185.7	190.3
Vinnitsia	190.2	17.3	225.9	21.9	422.4	40.9	696.6	69.9	366.3	405.1
Volyn	244.2	25.2	536.7	51.3	773.4	75.9	795.6	79.9	325.9	317.2
Dnipropetrovsk	651.0	105.4	1136.6	193.6	1346.4	249.3	1045.7	186.6	160.6	177.0
Donetsk	170.2	16.8	49.4	5.3	229.8	24.7	471.5	48.5	277.0	288.4
Zhytomyr	62.0	4.5	229.1	15.0	303.9	21.2	528.9	38.8	852.4	856.7
Zakarpattia	56.9	9.7	49.9	13.8	75.9	19.0	114.2	23.9	200.9	247.4
Zaporizhzhia	135.0	20.9	381.5	56.3	548.4	84.1	990.2	147.1	733.2	703.4

Table 4, Continued

	2015		2017		2019		2021		2021 in % to 2015	
	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee	per 1 business entity	per 1 employee
Ivano-Frankivsk	200.9	21.0	193.9	16.2	406.3	38.3	843.9	87.9	420.1	419.5
Kyiv	8008.0	549.5	9132.1	655.4	5466.3	409.1	7969.7	600.1	99.5	109.2
Kirovohrad	134.4	19.2	312.2	42.6	419.7	59.4	575.8	80.7	428.5	420.9
Luhansk	54.4	5.8	77.9	8.7	171.1	20.0	326.2	40.6	600.1	697.0
Lviv	1203.8	162.4	798.7	103.1	1404.0	164.5	2259.7	290.1	187.7	178.6
Mykolaiv	419.1	84.1	201.2	40.3	354.7	74.4	491.1	103.2	117.2	122.7
Odesa	344.1	61.7	355.3	64.1	684.3	125.2	1017.7	168.9	295.8	273.5
Poltava	542.9	41.1	445.7	34.1	590.7	53.6	670.0	65.4	123.4	159.4
Rivne	318.4	24.7	470.4	30.3	738.4	52.9	554.0	42.4	174.0	171.3
Sumy	197.7	13.0	630.9	38.8	848.1	57.1	1330.4	93.7	672.9	721.6
Ternopil	320.9	43.0	737.0	74.3	1132.8	109.0	1772.6	172.0	552.4	400.0
Kharkiv	473.0	54.8	1075.2	122.5	1528.9	176.0	2617.3	296.1	553.3	540.3
Kherson	111.1	16.2	186.4	26.2	362.7	53.9	576.0	80.8	518.3	497.6
Khmelnyskyi	531.7	45.3	505.1	42.3	687.4	60.5	1329.2	116.3	250.0	257.0
Cherkasy	288.6	22.0	426.7	33.1	704.1	60.7	813.6	72.7	282.0	330.8
Chernivtsi	111.3	16.5	132.2	20.3	170.2	28.1	301.2	49.9	270.7	302.0
Chernihiv	138.7	7.3	547.9	26.4	785.1	40.6	1181.2	63.9	851.7	880.0

Note: data excludes the territories temporarily occupied by the Russian Federation and parts of the territories where military operations are (were) conducted

Source: authors' calculations based on Financial Sector Statistics (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

Compared to the significant increase in the loan burden in agriculture, lending efficiency indicators were much more modest. Agricultural production per 1 thousand UAH of loans in Ukraine increased by 1.74 times in 2015-2021, from 4.95 to 8.63 thousand UAH (Table 5). However, a considerable increase in this indicator (from 3 to 1.5 times) was recorded only in Kyiv, Mykolaiv, Dnipro, Poltava, Rivne, and Lviv oblasts. The outsiders of the growth rate of lending efficiency are farms in Chernihiv Oblast, where agricultural production per unit of loans decreased by 60% – from UAH 42.6 thousand to UAH 17.0 thousand. In Sumy Oblast, the decrease was 59% (from UAH 29.8 to UAH 12.2 thousand), in Zhytomyr Oblast – 56.5% (from UAH 78.3 to UAH 34.0 thousand), in Zaporizhzhia Oblast – 52.6% (from UAH 15.8 to UAH 7.5 thousand), in Luhansk Oblast – 51.8% (from UAH 55.3 to UAH 26.4 thousand). In 2021, agricultural producers in Zakarpattia, Zhytomyr,

Rivne, Luhansk, and Chernivtsi oblasts demonstrated the highest lending efficiency (from UAH 25 to 47 thousand). Kyiv Oblast, as the absolute leader in terms of loan burden, was recognised as a complete outsider in terms of lending efficiency, with UAH 1.62 thousand of agricultural output per thousand of loans attracted. Admittedly, this is explained by the regional specific features of registration of many business entities and their legal affiliation with the city of Kyiv and Kyiv Oblast. The first year of the full-scale war had adverse consequences for the efficiency of lending to the agricultural sector. In Ukraine, agricultural production per UAH 1 thousand of borrowed loans almost halved compared to 2021 – from UAH 8.63 to UAH 4.51 thousand. The largest decrease in the efficiency index was recorded at 8.63 in the farms of Kherson (95%), Zaporizhzhia (82%), Luhansk (78%), Donetsk (62%), and Kirovohrad (59%) oblasts (Zakharchenko, 2017).

Table 5. Dynamics of lending efficiency indicators (agricultural production per thousand UAH of attracted loans), 2015-2022, thousand UAH

	2015	2016	2017	2018	2019	2020	2021	2022	2021 in % to 2015
Ukraine	4.95	4.60	4.17	3.98	11.05	9.96	8.63	4.51	174.4
Vinnitsia	22.36	29.65	22.62	18.06	34.46	25.14	22.47	9.22	100.5
Volyn	18.65	15.04	10.21	9.08	17.88	21.16	18.75	7.49	100.5
Dnipropetrovsk	3.59	2.43	2.19	1.91	5.22	7.11	7.26	4.43	202.5
Donetsk	20.65	25.55	76.81	29.23	44.14	56.23	24.14	9.24	116.9

Table 5, Continued

	2015	2016	2017	2018	2019	2020	2021	2022	2021 in % to 2015
Zhytomyr	78.28	63.13	27.71	22.21	54.40	49.76	34.02	13.68	43.5
Zakarpattia	56.11	54.31	34.08	29.26	57.15	82.23	46.76	31.72	83.3
Zaporizhzhia	15.84	9.34	6.01	4.47	12.42	10.05	7.51	1.65	47.4
Ivano-Frankivsk	25.43	21.31	29.85	12.07	30.37	26.73	18.27	12.25	71.8
Kyiv	0.54	0.56	0.50	0.66	2.22	1.72	1.62	0.88	298.8
Kirovohrad	18.52	10.81	7.56	7.14	19.37	12.09	15.01	6.16	81.1
Luhansk	55.28	51.24	39.71	28.10	54.52	49.24	26.64	8.52	48.2
Lviv	3.70	3.23	6.69	4.45	9.04	8.10	6.06	4.44	163.7
Mykolaiv	4.26	4.31	8.59	6.43	14.81	11.38	12.44	4.88	292.3
Odesa	5.13	6.96	5.27	3.32	7.26	3.67	7.49	3.11	145.9
Poltava	8.03	9.65	8.46	8.54	18.75	21.75	15.96	9.19	198.8
Rivne	18.85	17.15	16.45	10.71	24.53	23.32	32.65	15.53	173.2
Sumy	29.84	15.63	10.02	8.02	20.94	22.15	12.24	9.39	41.0
Ternopil	12.99	7.89	8.12	6.70	13.94	14.20	9.96	5.58	76.7
Kharkiv	7.68	5.32	3.51	2.74	6.84	6.22	3.98	1.88	51.8
Kherson	26.76	20.39	16.69	9.49	22.85	22.58	16.74	0.86	62.6
Khmelnytskyi	9.23	9.77	12.28	9.25	22.88	19.12	13.34	7.39	144.6
Cherkasy	16.81	15.82	10.16	10.11	18.04	17.38	17.31	11.02	103.0
Chernivtsi	26.30	14.38	24.39	20.65	45.15	39.18	30.27	16.99	115.1
Chernihiv	42.60	16.84	12.56	9.33	23.74	24.33	16.98	7.99	39.9

Note: data excludes the territories temporarily occupied by the Russian Federation and parts of the territories where military operations are (were) conducted

Source: authors' calculations based on Financial Sector Statistics (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

Determining and analysing the dynamics of the volume of agricultural products sold per unit of loans attracted, as another indicator of credit efficiency, revealed a more significant downward trend (Table 6). Thus, the average value of this indicator in Ukraine in 2015-2021 decreased by 3.8% (from UAH 7.0 to UAH 6.7 thousand). The largest (3-4 times) decrease in efficiency for this indicator was found in the farms of Chernihiv, Sumy, Zhytomyr, Luhansk, Zaporizhzhia, Kirovohrad, and Kharkiv oblasts. Only 5 oblasts of Ukraine showed an increase in the efficiency of lending in relation to the volume of agricultural products sold: Kyiv (by 174.3%), Mykolaiv (by 138.0%), Zakarpattia (by 128.2%), Lviv (by 124.0%), and Rivne

(by 121.0%). In 2021, agricultural producers in Luhansk Oblast demonstrated the highest value of the absolute lending efficiency indicator – UAH 19.79 thousand of sales per UAH 1 thousand of loans attracted, and the lowest value – in Kyiv region (UAH 2.35 thousand). According to the Official website of the State Statistics Service of Ukraine (n.d.), in 2022, the total volume of agricultural sales in Ukraine increased by 10% compared to 2021, from UAH 553 billion to UAH 633 billion. A comparison of this indicator with the available volumes of loans granted to rural producers in 2022 revealed a 21% decrease in lending efficiency, from UAH 6.69 thousand to UAH 5.31 thousand per 1 thousand loans.

Table 6. Dynamics of lending efficiency indicators (agricultural products sold per thousand UAH of loans attracted), 2015-2021, thousand UAH/thousand UAH

	2015	2016	2017	2018	2019	2020	2021	2021 in % to 2015
Ukraine	6.96	5.26	5.97	5.83	6.64	7.16	6.69	96.2
Vinnycia	36.84	27.25	24.83	21.99	17.64	14.04	14.81	40.2
Volyn	16.67	11.67	9.85	10.05	8.07	10.82	12.06	72.4
Dnipropetrovsk	4.91	2.48	2.67	2.27	2.51	4.46	4.79	97.5
Donetsk	21.72	27.62	97.79	40.99	22.28	35.37	16.38	75.4
Zhytomyr	64.34	46.86	26.55	22.34	27.17	26.37	17.19	26.7
Zakarpattia	6.39	6.71	7.42	6.52	5.15	9.08	8.19	128.2
Zaporizhzhia	18.54	11.45	8.76	7.23	6.90	7.59	5.83	31.5

Table 6, Continued

	2015	2016	2017	2018	2019	2020	2021	2021 in % to 2015
Ivano-Frankivsk	19.67	14.08	27.51	11.86	14.33	14.23	8.64	43.9
Kyiv	1.35	1.18	1.42	1.86	2.77	2.43	2.35	174.3
Kirovohrad	32.02	13.43	11.05	10.29	11.36	9.91	10.97	34.3
Luhansk	66.65	62.04	59.58	39.60	28.27	37.23	19.79	29.7
Lviv	3.06	2.10	5.72	4.95	4.57	4.09	3.80	124.0
Mykolaiv	6.18	5.63	15.67	10.71	8.16	7.85	8.52	138.0
Odesa	6.22	8.67	8.02	5.61	4.01	2.44	5.11	82.1
Poltava	16.44	14.30	16.17	13.09	12.55	18.46	14.47	88.0
Rivne	15.31	11.04	12.08	10.16	9.71	8.94	18.53	121.0
Sumy	45.82	21.60	18.37	13.91	15.60	19.06	12.73	27.8
Ternopil	15.54	8.40	9.93	9.08	7.70	9.55	7.91	50.9
Kharkiv	9.47	6.12	6.13	3.74	3.91	4.70	3.31	35.0
Kherson	26.74	20.81	18.15	11.62	10.42	12.56	10.40	38.9
Khmelnitskyi	13.73	10.33	14.57	13.62	14.01	13.16	10.70	78.0
Cherkasy	28.60	19.86	15.83	15.11	11.68	14.53	13.72	48.0
Chernivtsi	13.94	5.75	11.63	10.19	9.60	13.17	8.07	57.9
Chernihiv	84.89	26.39	26.06	19.75	21.38	24.96	20.27	23.9

Note: data excludes the territories temporarily occupied by the Russian Federation and parts of the territories where military operations are (were) conducted

Source: authors' calculations based on Financial Sector Statistics (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

Analogous calculations of the efficiency of lending to the non-financial sector of the economy, namely the dynamics of the ratio of gross regional product to total lending,

showed a positive growth rate of almost 3 times in 2015-2022. However, the absolute performance indicator in monetary terms was lower than in the agricultural sector (Fig. 2).

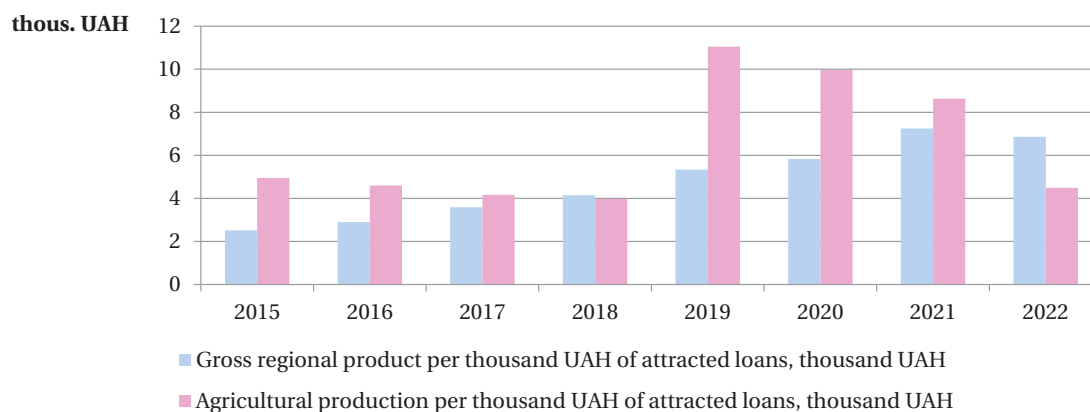


Figure 2. Comparative dynamics of the efficiency of lending to agriculture and the non-financial sector of Ukraine's economy, 2015-2022

Source: authors' calculations based on Financial Sector Statistics (n.d.); Official website of the State Statistics Service of Ukraine (n.d.)

Thus, while in 2015, the efficiency of lending to the agricultural sector was twice as high as the overall economic indicator, in 2021 it was only 20% higher. In turn, 2022 considerably changed this trend. The efficiency of lending in agriculture fell by 48% (from UAH 8.63 to UAH 4.51 thousand) and was 30% lower than the overall economic indicator. However, during the war, state-owned and commercial banks continue to lend actively.

It aims to ensure that Ukrainian farmers are not only able to carry out their current activities, but also to restore and modernise their production facilities and adapt them to the new challenging environment. During the first year of the war, agricultural lending increased by 43.4% (or UAH 35.9 billion). Therewith, short-term lending increased by 73% (from UAH 37.3 billion to UAH 64.5 billion) (Fig. 3).

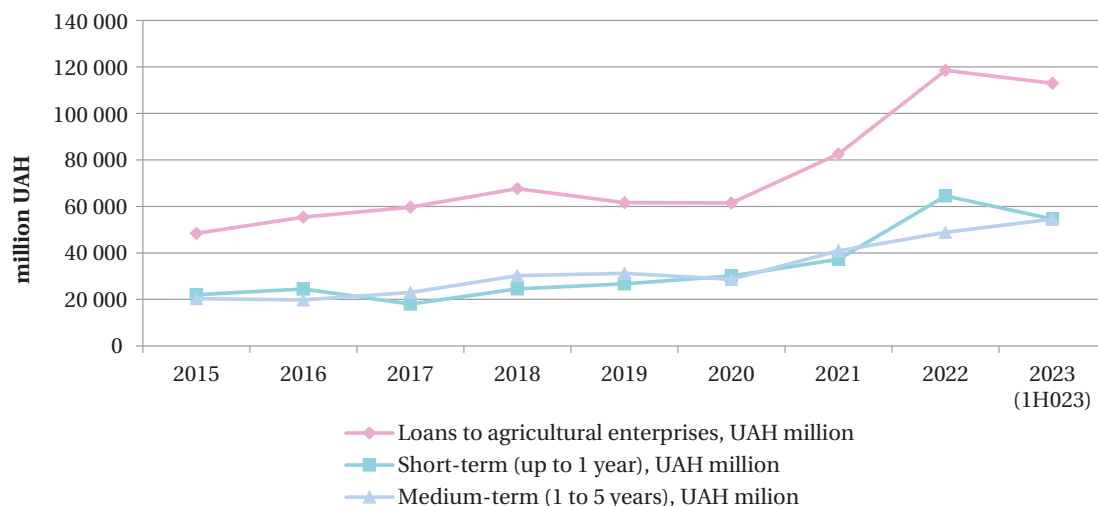


Figure 3. Current dynamics of lending to agriculture in Ukraine, 2015-2023 UAH million

Source: compiled according to statistical data from Financial Sector Statistics (n.d.)

In the first half of 2023, lending dynamics slowed slightly. The total amount of loans to agricultural enterprises decreased by 4.7% (or by UAH 5.5 billion). By maturity, short-term loans decreased by 15.4% (by almost UAH 10 billion), while medium-term loans increased by 11.7% (or almost UAH 6 billion).

Comparing the findings with the studies of other scholars, the complex of factors of demand for credit resources by agricultural enterprises, outlined by Yu.O. Lupenko & S.V. Andros (2019), it is necessary to add a catastrophic increase in the shortage of working capital among farmers as a result of a full-scale war. In contrast to the study by O.A. Sergienko & A.S. Gula (2018), who assessed the effectiveness of lending to the agro-industrial complex using the methods of cluster analysis and spatial multielement matrix, this paper substantiates and tests a structured toolkit for calculating credit load indicators and indicators of lending efficiency in agriculture by region of Ukraine.

The authors of this study can agree with the need to determine the relationship between the profitability of agricultural enterprises and interest rates on bank loans as a solid leverage to influence the further development of the business entity, as proved by O. Chygryn & O. Ivakhnenko (2020). It is worth supporting the opinion of scientists S. Arzhevitin *et al.* (2021) on the need to improve the mechanism for ensuring the availability of bank loans, develop effective loan products for the agro-industrial complex, and strengthen state support for lending to farmers. Unlike A. Bilochenko (2023), who assessed the dynamics of bank lending after the outbreak of war, this paper assesses the efficiency of agricultural lending and analyses the dynamics of state financial support. In continuation of the research by M. Nehrey & O. Trofimtseva (2022), who consider it necessary to expand state support for the agricultural sector in the form of providing access to cheap loans, this study analyses the positive dynamics of preferential lending to farmers during the war by region. O. Shpanel-Yukhta (2022) recognised the positive dynamics of growth in bank lending to agriculture in Ukraine during the war, while this study provides a ranking of banking institutions by agricultural lending in 2022-2023.

The conclusions of C.A. Ngong *et al.* (2022) argue that it is the prerogative of governments to encourage banking institutions to lend to the agricultural sector, and the authors of this study agree with them. M. Rizwan *et al.* (2019) and A. Khanal & O. Omobitan (2020) also focus their research findings on the need and priority of state influence on the activation and optimisation of bank lending mechanisms for agricultural producers (Shpychak *et al.*, 2022).

An interesting practice is the methodological substantiation and practical testing of measuring the impact of bank lending on improving the efficiency of green agricultural production in China, carried out by H. Wang & L. Du (2023). The possible application of the Panel Tobit economic-mathematical model in further research will help to structurally assess the regional differentiation of the impact of the size and cost of credit on agricultural production efficiency. The study by Y. He & L. Tauer (2023) deserves attention, as it focuses on an integrated assessment of the performance of American credit associations and the results of farms. M. Appiah-Twumasi *et al.* (2022) investigated the impact of innovative agricultural financing methods on the economic efficiency of Ghanaian farmers. A positive effect of the efficiency of innovative financing was established, which, according to the authors, indicates that the national policy should promote the creation of additional sources of informal financial opportunities for poor rural farmers in the form of rural savings and loan associations (Guliyev & Azizov, 2022).

R. Shibli *et al.* (2021) assessed the positive impact of agricultural credit on technical efficiency and crop yields of Malaysian farmers. The impact of credit on the agricultural productivity of Colombian farmers was also assessed by J. Rivera-Acosta & X. Xu (2023). As measurement indicators, the authors used natural indicators of the return on agricultural production per hectare and per employed worker. M.G. Koricho & M.H. Ahmed (2022) considered the impact of access to credit on the technical efficiency of smallholder maize farmers in Ethiopia. The authors conclude that credit services increase technical efficiency and help small farmers achieve the highest possible level of production from a given set of inputs.

According to the Official website of the State Statistics Service of Ukraine (n.d.), in 2022, Ukraine's economy posted a significant negative financial result of UAH 174.2 billion. Net profit amounted to UAH 731.3 billion, while a loss of UAH 906.5 billion completely offset the profitability of 66.2% of enterprises. Virtually all sectors of the country's economy, with the exception of agriculture, trade, finance, and insurance, suffered significant losses. Agriculture, forestry, and fisheries ended the first year of the war with a net profit of UAH 88.3 billion, almost twice as much as the wholesale and retail trade sector. Therewith, 78.6% of agricultural producers ended 2022 with a net profit of UAH 125.8 billion, while 21.4% of enterprises were unprofitable with a result of UAH 35.7 billion. Although the profitability of agriculture fell by 2.7 times (from UAH 240 billion to UAH 88.3 billion) compared to pre-war 2021, and the industry itself has suffered and continues to suffer significant losses and destruction, the loss ratio of the agricultural sector of the economy was the lowest compared to other areas of activity.

Therefore, support for the agricultural sector of the economy should be strengthened and expanded, both by the state and by credit institutions. The Ministry of Agrarian Policy, aware of the importance and need to support Ukrainian farmers, continues the State Programme "Affordable Loans 5-7-9%" to facilitate their access to bank credit resources under martial law and the programme of state guarantees (Strategy of the Ukraine's..., 2023). In 2022, 43 648 companies took advantage of concessional lending for a total of UAH 95.5 billion. Since the beginning of 2023, 10 743 agricultural enterprises have received loans worth UAH 53.7 billion under all lending programmes, including almost UAH 32 billion under the government programme "Affordable Loans 5-7-9%". In terms of regions, the largest amounts of credit resources were disbursed to farmers in Kyiv (UAH 10 billion), Vinnytsia (UAH 5.0 billion), Dnipro (UAH 4.8 billion), Kirovohrad (UAH 4.2 billion), and Odesa (UAH 3.8 billion) regions. According to the National Bank of Ukraine (Financial Sector Statistics, n.d.), the main drivers of agricultural lending during the war were Credit Agricole Bank, which provided loans worth UAH 11 billion, Privat Bank (UAH 9.5 billion), Oschadbank (UAH 8.9 billion), ProCredit Bank (UAH 5.4 billion), FUIB (UAH 5.0 billion), and Ukrgasbank (UAH 3.2 billion).

Similar to other sectors of the economy, the war has had a substantial impact on Ukrainian agriculture, reducing the efficiency of lending and reducing sales. Nevertheless, the agricultural sector stays one of the most resilient and profitable sectors, requiring further support from the government and lending institutions to ensure sustainable development and economic recovery.

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► Conclusions

The substantiation and practical implementation of the methodological approach to retrospective monitoring of the regional dynamics of credit burden indicators and the efficiency of lending to agricultural producers have revealed the following. In 2015-2022, lending to agricultural businesses showed a stable growth trend from UAH 48.4 billion to UAH 118.5 billion. Zhytomyr, Chernihiv, and Sumy oblasts are leading in terms of loan growth, while Kyiv, Kharkiv, and Dnipro oblasts are leading in terms of the volume of loans to the agricultural sector of the region. In 2022, agricultural lending increased by 43.4%. There has been a considerable increase in the share of lending to agriculture in total lending to the national economy – from 6.1% in 2015 to 15.7% in 2022. In the challenging conditions of a full-scale war, the cost of loans to agricultural producers in national currency increased 1.6 times – from 10% at the beginning to 16.7% at the end of 2022. In the first half of 2023, loans gained another 2.6% in price, from 16.7% to 19.3%.

The loan burden of the agricultural sector per business entity increased by 1.9 times in 2015-2021, from UAH 684.7 thousand to UAH 1 271.6 thousand. As of the beginning of 2022, the loan burden per person employed in agriculture stood at UAH 143.4 thousand, almost double the level of 2015. The leaders in terms of loan burden are Kyiv, Kharkiv, and Lviv oblasts. Lending efficiency in Ukraine increased by 1.74 times in 2015-2021, from UAH 4.95 to UAH 8.63 thousand of agricultural output per UAH 1 thousand of loans attracted. The volume of agricultural products sold per unit of loans attracted decreased by 3.8% (from UAH 7.0 to UAH 6.7 thousand). It was found that in 2015-2021, the efficiency of lending to the agricultural sector of the economy was twice as high as the overall economic indicator. However, during the first year of the full-scale war, the efficiency of lending in agriculture fell by 48% (from UAH 8.63 to UAH 4.51 thousand) and was 30% lower than the overall economic indicator.

Difficult realities require the improvement and development of mechanisms for state support for bank lending to the agricultural sector. This primarily concerns further optimisation of the regulatory framework for bank lending, simplification of the procedure for obtaining a bank loan, improvement of the mechanism for reducing the cost of loans, and introduction of effective economic incentives for commercial banks that intensify their lending relations with agricultural businesses.

► Acknowledgements

None.

► Conflict of Interest

The authors of this study declare no conflict of interest.

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Регіональний аспект ефективності кредитування аграрного сектору економіки України

Світлана Георгіївна Черемісіна

Доктор економічних наук, доцент
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0003-1546-7714>

Ірина Олегівна Томашук

Аспірант
Національний науковий центр «Інститут аграрної економіки»
03127, вул. Героїв Оборони, 10, м. Київ, Україна
<https://orcid.org/0000-0003-3010-0558>

► **Анотація.** Сільське господарство України проявляє стійкість, адаптивність і виробничу гнучкість під час війни. Водночас пріоритетними проблемами є недостаток фінансових ресурсів для господарської діяльності, відновлення пошкоджених потужностей та забезпечення технологічної дисципліни. В цьому контексті, питання кредитування аграрних підприємств має значну актуальність. Метою дослідження було удосконалення та опрацювання методичного інструментарію оцінки кредитного навантаження та ефективності кредитування у сільському господарстві за регіонами України. У процесі дослідження використано ряд методів: порівняльного аналізу, табличний, графічний, статистичний, розрахунково-конструктивний, абстрактно-логічний. Протягом 2015-2022 рр. обсяги кредитування сільськогосподарських товаровиробників збільшилися у 2,4 рази (тільки 2022 р. – на 43,5 % або на 35,9 млрд грн). За часткою залучених кредитів переважає Київська область (31 %). Питома вага кредитування аграрного сектору економіки зросла у 2,6 рази (від 6,1 до 15,7 %). Українські аграрії кредитуються переважно у національній валюті (76,4 % виданих кредитів) та на строки до року (54,4 %), від 1 до 5 років – 41,2 %. Протягом 2015-2021 рр. кредитне навантаження в розрахунку на один суб'єкт господарювання та на одного зайнятого зросло майже вдвічі. Найвищу ефективність кредитування демонстрували господарства Закарпатської, Житомирської, Рівненської, Луганської та Чернівецької областей. За перший рік повномасштабної війни ефективність кредитування у сільському господарстві впала на 48 % (від 8,63 до 4,49 тис. грн). Аграрні підприємства потребують підтримки, як з боку держави, так і з позиції кредитних установ. Практична значущість проведеного дослідження визначається удосконаленням інструментарію вимірювання рівня кредитного навантаження та оцінки ефективності кредитування в аграрному секторі економіки за регіонами України, що можуть бути використані органами державного та галузевого управління в регіональній практиці організації моніторингу та активізації практики державної фінансової підтримки сільських товаровиробників

► **Ключові слова:** показник кредитного навантаження; індикатор ефективності; державна підтримка; сільське господарство