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Impact of Credit and Investment Resources on the Productivity of Agricultural Sector

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Abstract
The current state of financial provision of agriculture in Ukraine is generally unsatisfactory; therefore, the problem of financing the agrarian sector of the economy in the form of lending and investing appears. The purpose of the article is to assess the impact of external financial support of enterprises in the form of lending and investing on agricultural productivity, as well as an assessment of the risk of overdue loans in the regional section of the agrarian sector of the Ukrainian economy. It is investigated the dependence of income (proceeds) on sales of products, proceeding from the needs of agricultural lending in ensuring the efficiency of its economic activity. Thus, lending and investing in agriculture contributes to increasing sales volumes and revenue (sales) growth from sales, as well as stimulating the development of agrarian enterprises, but the correlation between the analyzed indicators is insignificant. The evaluation results indicate a significant risk of overdue loans to agrarian enterprises for all regions of Ukraine, due to low technical efficiency and high level of delinquency. Significant differentiation of regions according to the level of technical efficiency has been revealed, which may indicate significant reserves of its increase. At the same time, it was found that the interest rates on agricultural loans are not a decisive factor for delays in loans granted to enterprises. In order to improve the situation, it is necessary to increase the volume of external financing and the link density between the parameters: lending – investment – the growth of production and sales, which will allow the formation of a functioning environment, taking into account the possibilities of optimizing costs in each region of the state.

Key words: risks, lending, investment, agriculture, risk assessment, agrarian enterprises.

1. Introduction

The current state of agriculture development necessitates the obtaining of additional financial resources, because of its own sources of financing is not enough, so there is a problem of financing agriculture in the form of lending and investing, which in its turn determines the non-return of credit resources risk. One of the most important motivating factors in agricultural development is lending, which is relevant, since agricultural production is seasonal in nature and requires timely and sufficient agricultural producers financial support.

Taking into consideration the considerable attention of economists, it should be pointed out that there are ongoing risks in the activities of agricultural enterprises, due to the peculiarities of the industry functioning. Therefore, in the context of lending and investing in agriculture of Ukraine, there is a need to study the external financing of the

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industry and state policy in this area.

The analysis of recent publications shows that scientists are investigating the issue of lending to agricultural commodity producers [1; 2], capital investment relations with the agrarian sector productivity [3], risk management in agribusiness [4] etc.

It is worthwhile mentioning I. Voloshin's research, who substantiates the mechanism of credit risk management under the conditions of rapid growth of lending volumes. The author proposed a dynamic model for covering credit risks with reserves, that depend on the effect of credit growth rate on credit risks level [5].

It is worthwhile mentioning the model of credit scoring for the agricultural loan portfolio offered by Ar. Bandyopadhyay. The mentioned above model will help mitigate the risks of lending to agriculture. The logistic model reflects the main characteristics of the risk in the agricultural sector, which will not only allow the bank to diversify its risk and optimize its business profits, but also strengthen the bank's relations with the borrower and will allow the bank to expand the number of business entities through the transparency of the decision-making process for granting loans [6].

M. S. Vaschyk states just to the point that «lending to agricultural enterprises for commercial banks as the main suppliers of credit resources has always been and remains an area of high risk compared with other industries». The author notes that in lending to agricultural enterprises there are difficulties in measuring the risks associated with this group of borrowers, as well as the lack of specialized staff of most banking institutions for their monitoring and evaluation [7].

V. V. Kovalenko, O. M. Zveyryakov, D. S. Gaidukovich have also developed in this domain practical recommendations for diagnosing credit risks and assessing their impact on the lending activity of commercial banks in Ukraine. The proposed methodology is based on marginal net interest income [8].

In his turn, N. Hatz analyzes the economy experience, and takes into account the increased risk of lending to agriculture, considering government support for effective risk management policies. The author proposes several proven risk management methods and some common mistakes that are observed in the analysis of banks [9].

O. A. Kirichenko, I. V. Kudrya investigate the risk of lending to small and medium-sized enterprises in the agrarian sector of the economy under financial crisis condition. The authors propose a new approach to crediting agrarian enterprises on the basis of credit risk management in the credit co-operation system [10].

C. Castro and K. Garcia explore the risk model for agricultural lenders by identifying two risks that are endemic to agriculture: commodity variability and climate. Researchers determine how to integrate the default risk model into standard credit risk portfolio modeling methods [11]. Scientists also point out that lending is the most important motivating factor for activating innovation activity of enterprises [12], as it does in the majority of agricultural enterprises the amortization not allow the necessary accumulation of funds to finance innovation projects [13]. Researchers also study the methodology for assessing the level of financial security to members of groups of enterprises (which include agro-industrial enterprises) [14].

With a high degree of scientific research positive assessment of this issue, some aspects of credit risk management remain controversial and require comprehensive scientific study.

2. The purpose of the research

The purpose of the article is to assess the impact of external financial support of enterprises in the form of lending and investing on agricultural productivity, as well as the assessment risk of overdue loans in the regional sector of agrarian one of the Ukrainian economy.

3. Results

The purpose of the enterprises in agriculture is to maximize profits, as well as income (revenue) from products sales; therefore, all factors influencing industry efficiency in the regions of Ukraine should be taken into account. It should be pointed out that agriculture is influenced by various factors, including natural, financial and economic ones. In addition, the effectiveness of agriculture depends on state regulation, the government's ability to reduce risks for producers of products.

The experience of economic relations in Ukraine allows identifying two main interrelated directions for the further development of domestic agriculture: enterprises lending and investment. The crediting of agrarian enterprises (C) involves the creation on the one hand of an efficient banking network that can provide significant resources for agriculture, on the other – minimizing non-repayment loans the risk. Investing in agriculture (I) involves direct investment in production under favorable conditions for entrepreneurial activity.

Taking into consideration the influence on the income (revenue) from the sale of agricultural products (Y) of the lending and investment processes of enterprises, we considered using the correlation-regression analysis of the following dependency options:

- income (proceeds) from sales of the given credit resources products;
- income (revenues) from sales of the volume of investments of products;
- volume of investments from the given credit resources;
- volumes of overdue loans granted to agrarian enterprises from the value of interest rates.

Dependence of income (proceeds) on sales of products from granted credit resources during 2013–2016 is characterized by a low correlation coefficient ($r = 0.25$). Thus, on the basis of the dynamics of recent years, it is not possible to assess the influence level of such a factor as the provision of credit resources to enterprises of agriculture on the pace of ensuring income growth (revenue) from sales of products (in 2016 the growth rate in comparison with 2000 is 68.6%, and in comparison with year 2013 it is 0.7%).

Dependence of income (revenue) on sales of products from investments in agriculture during 2013–2016 is characterized by an even lower correlation coefficient as compared to the previous case ($r = 0.06$). Low correlation coefficients show a small impact on lending and investment in the process of production and sales of agricultural products, which allows us to conclude that there are significant risks of non-repayment of loans and loss of investment.

The analysis dependence of the amount of investments in agriculture on the loans granted by enterprises was carried out over a significant time period – during 2010–2016 (Fig. 1), since in this case the possibility of stimulating the investment process through

the use of the credit mechanism is determined.
It is important that the correlation coefficient (r = 0.68) indicates a sufficiently high density of relationship between credit resources and investments. On the basis of the regression equation, one can conclude that in the absence of credit resources for rural enterprises, the volume of investment will be 27335 million UAH.

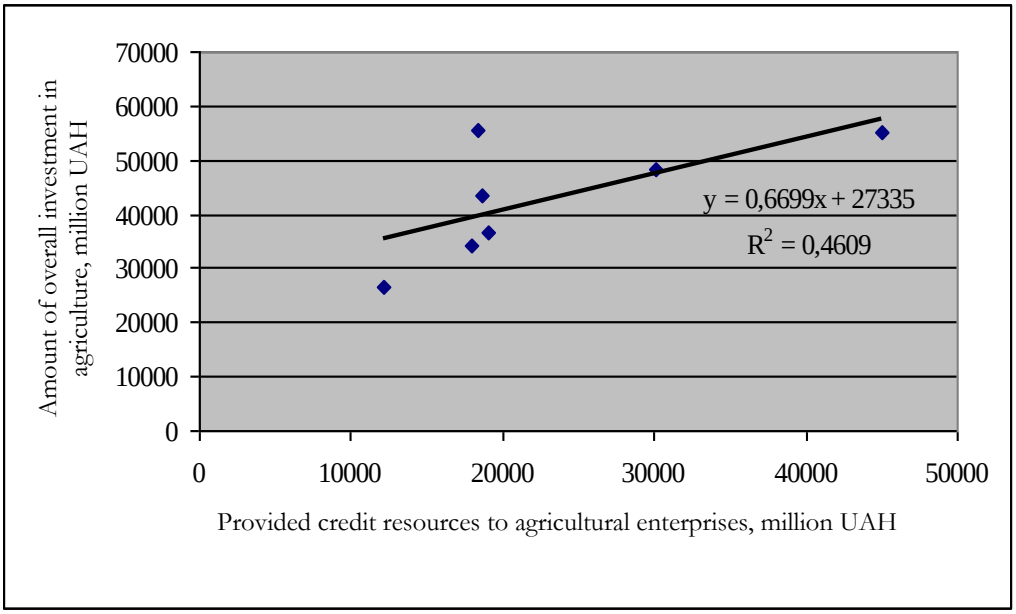

Figure 1: *Dependence the amount investments in agriculture from the granted credit resources to enterprises*
Source: formed by the authors on the basis of [15, 16].

The interest rate on agricultural loans is not a determining factor for delinquency of loans granted to enterprises, since the correlation coefficient indicates a low density of relationship between these indicators (r = 0.45) (Fig. 2). However, it does not remove from the agenda the urgent issue of the need for a substantial reduction in interest rates on loans provided to agrarian enterprises.
The results of the correlation-regression analysis proved that it is impossible to determine the efficiency of agriculture in Ukraine by means of parametric estimation of dependencies which is based on the volume of loans and investments, as well as to assess the level of risk of non-repayment of loans and investment losses. On the basis of the calculations done though, it can be concluded that there is no policy of stimulation at the state level, since there is a system of opaque credit use relations. Moreover, the availability of lending does not fully ensure the process of investing in agriculture.
Taking into consideration the above-mentioned peculiarities, we assessed the efficiency of lending and investing in agriculture in Ukraine through the non-parametric method of analysis of the functioning environment (AFE) in the context of individual regions. The calculations are based on M. Farrell's [17] methodological approach, where the productive index (Y) is the volume of output (services rendered), while the productive

resources are the number of employees (L) and the value of fixed assets (K).

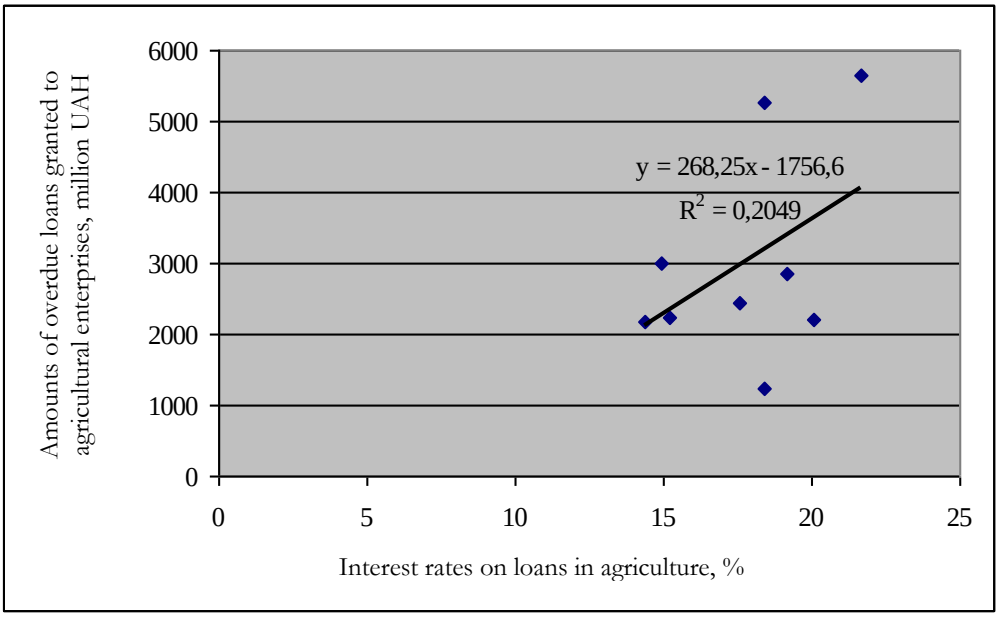

Figure 2: *Dependence overdue loans granted to agricultural enterprises from interest rates during 2008–2016*
Source: formed by the authors on the basis of [15].

This method application has made it possible to get rid of the dependence on the existing tendency of «opaque priorities», formed due to the lack of sufficient level of communication density, and to determine the level of technical efficiency of activities in agriculture (Table 1).

Thus, the indicator of income (revenue) from sales of products (Y) is effective as a characteristic of the overall agrarian production productivity. Indicators that provide income are provided credit resources and volume of investments. For agriculture in the Kyiv region and in Kyiv, the ratio of income (sales) to the sale of products provided loans exceeds the unit (1.77). For all other regions, it ranges from 0.01 (Zhytomyr region) to 0.41 (Dnipropetrovsk region). The coefficient of coverage income (proceeds) from the sale of products of investment volume – from 0.03 (Transcarpathian region) to 0.29 (Kirovograd region) (Fig. 3).

Thus, the line of technical efficiency has the following form: 5 (Zhytomyr region) – 6 (Transcarpathian region) – 9 (Kyiv region and Kyiv).

The line 6 – (6-1) is the boundary of the division of the functioning environment into two parts, which distinguish:

- Regions where there is a risk of delinquency of loans granted to agricultural enterprises;
- Regions for which there is no risk of delinquency of loans granted to agricultural enterprises.

Table 1: Coefficiecovering income (revenue) from the sale of products provided loans (C / Y) and investment volume (I / Y) by regions of Ukraine, 2016

Region №	Region name	C / Y	I / Y
1	Vinnytska	719 / 21319.1 = 0.03	3202.5 / 21319.1 = 0.15
2	Volynska	436 / 6558.5 = 0.07	740.3 / 6558.5 = 0.11
3	Dnipropetrovska	6 256 / 15183.4 = 0.41	3047.6 / 15183.4 = 0.20
4	Donetska	294 / 7513.1 = 0.04	707.8 / 7513.1 = 0.09
5	Zhytomyrska	149 / 9406.8 = 0.01	1305.4 / 9406.8 = 0.14
6	Transcarpathian	73 / 3964.9 = 0.02	102.7 / 3964.9 = 0.03
7	Zaporizhska	1 063 / 9928.0 = 0.11	2301.5 / 9928.0 = 0.23
8	Ivano-Frankivska	272 / 5795.3 = 0.05	509.1 / 5795.3 = 0.09
9	Kyivska and Kyiv city	27 532 / 15544.7 = 1.77	3792.2 / 15544.7 = 0.24
10	Kirovohradska	1 114 / 12037.5 = 0.09	3485.2 / 12037.5 = 0.29
11	Luhanska	94 / 4816.3 = 0.02	727.5 / 4816.3 = 0.15
12	L'vivska	2 864 / 9255.4 = 0.31	1080.5 / 9255,4 = 0,12
13	Mykolaivska	2 253 / 9714.0 = 0.23	2301,4 / 9714.0 = 0.24
14	Odeska	1 708 / 11881.2 = 0.14	2393.8 / 11881.2 = 0.20
15	Poltavska	1 783 / 17212.6 = 0.10	3169.8 / 17212.6 = 0.18
16	Rivnenska	392 / 6723.2 = 0.06	513.6 / 6723.2 = 0.08
17	Sumska	652 / 10192.5 = 0.06	1928.3 / 10192.5 = 0.19
18	Ternopilska	1 080 / 8523.8 = 0.13	1506.2 / 8523.8 = 0.18
19	Kharkivska	2 944 / 15647.8 = 0.19	2862.5 / 15647.8 = 0.18
20	Khersonska	551 / 11232.2 = 0.05	2212.3 / 11232.2 = 0.20
21	Khmelnytska	1 285 / 12548.6 = 0.10	1737.1 / 12548.6 = 0.14
22	Cherkaska	947 / 14983.7 = 0.06	2551.1 / 14983.7 = 0.17
23	Chernivetska	298 / 4285.7 = 0,07	236.2 / 4285.7 = 0.06
24	Chernihivska	616 / 10372.2 = 0.06	2067.3 / 10372.2 = 0.20

Source: formed by the authors on the basis of [15, 16].

The calculation of the passage of this line (parallel to the I / Y axis) is based on finding the position (Kpk / Y = 0.02), where Kpk is the amount of overdue loans granted to agrarian enterprises in Ukraine (5273 million UAH); Y – income (revenue) from the sale of agricultural products in Ukraine (254640.5 million UAH).

The absence of the risk of overdue loans is observed in the aftermath of the agricultural activities of the Zhytomyr (5) and Transcarpathian (6) region, since technical efficiency is achieved (the coefficient of technical efficiency is equal to one), as well as Luhansk region (11). Activity in agriculture in Luhansk region does not provide technical efficiency, however, for this region the following equality is fulfilled: (Klo / Y = Kpk / Y = 0.02).

The value of the risk of overdue loans is determined by the method of calculating technical efficiency, and in this case, the line of technical efficiency will be the line: (6-1) – 6-9 (Table 2).

Technical efficiency calculation of (TE) (on the example of position 12 (Lviv region) is carried out by the formula (1):

$$TE = (0 – (12 – 1)) / (0 – 12) \quad (1)$$

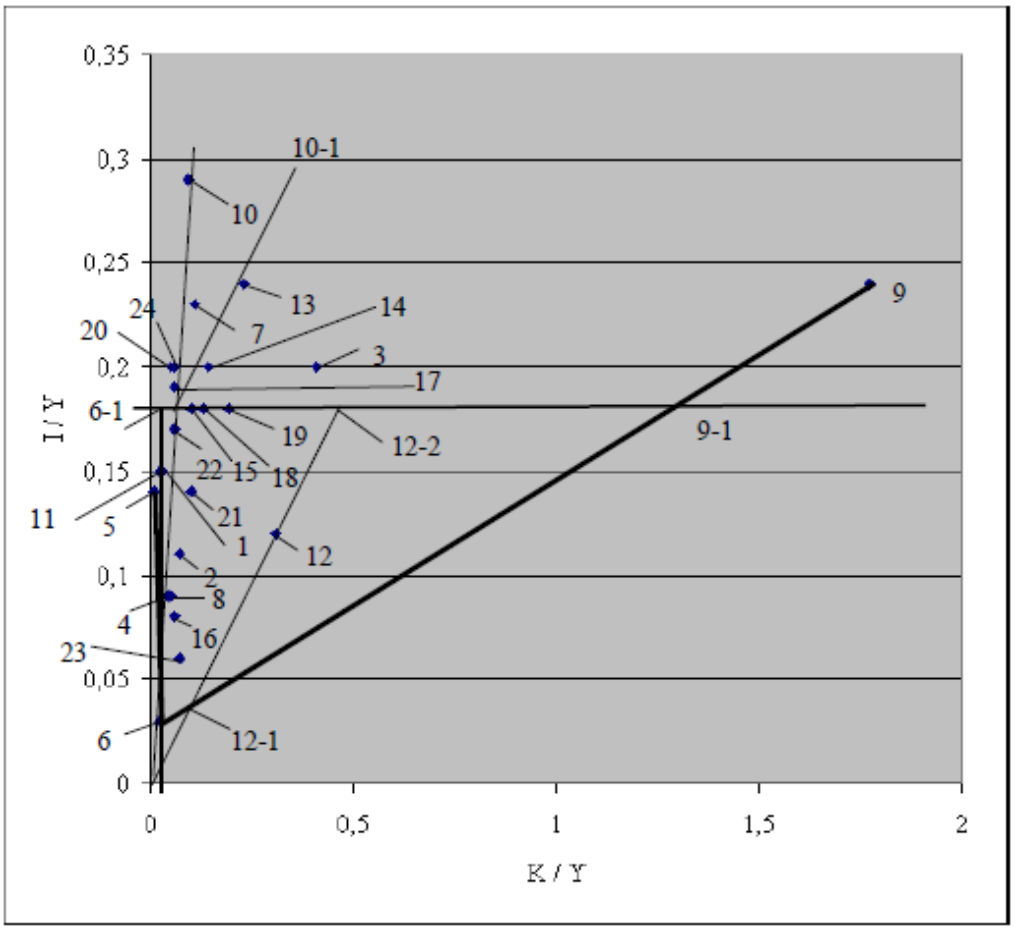

Figure 3: *The environment of effective use of loans and investments made by regions of Ukraine, 2016*
Source: formed by the authors on the basis of [15, 16].

Thus, the highest rating is observed for agriculture in the Chernivtsi region (technical efficiency is 0.55). Accordingly, the risk of non-repayment loans for this region: 1 – 0.55 = 0.45. In addition to Chernivtsi, the risk of non-repayment loans is less than 0.50 characterizes the activity in agriculture in Vinnytsya (0.46) and Donetsk (0.50) regions.

The lowest technical efficiency is observed on the results of activity in the agriculture of Mykolaiv region (0.13). Accordingly, the risk of overdue loans for this region is quite large (1 – 0.13 = 0.87).

As calculations show, a significant risk of overdue loans to agricultural enterprises is for all regions of Ukraine, due to low technical efficiency and high level of delay. In such conditions, only four regions (Zhytomyr, Transcarpathian, Kyiv region and Kyiv city, and Luhansk) have justified their investments and reached optimal production of agricultural products.

We offered to assess the adequacy of investing in agriculture as:

- sufficient level of investment;

- exceeding an adequate level of investment;
- insufficient level of investment.

Table 2: Assessment of the risk of overdue loans by the level of technical efficiency

Region №	Region name	Technical efficiency	Rating of regions by the amount of technical efficiency
1	Vinnytska	0.54	2
2	Volynska	0.28	10
3	Dnipropetrovska	0.18	12
4	Donetska	0.50	3
5	Zhytomyrska	-	-
6	Transcarpathian	-	-
7	Zaporizhska	0.18	12
8	Ivano-Frankivska	0.34	6
9	Kyivska and Kyiv city	-	-
10	Kirovohradska	0.18	12
11	Luhanska	-	-
12	L'vivska	0.32	7
13	Mykolaivska	0.13	15
14	Odeska	0.15	14
15	Poltavska	0.20	11
16	Rivnenska	0.37	5
17	Sumska	0.32	7
18	Ternopilska	0.17	13
19	Kharkivska	0.18	12
20	Khersonska	0.30	8
21	Khmelnytska	0.46	4
22	Cherkaska	0.32	7
23	Chernivetska	0.55	1
24	Chernihivska	0.29	9

Source: formed by the authors on the basis of [15].

Line (6-1) – (9-1) is an average indicator of the adequacy of direct investment in agriculture in Ukraine. It was formed through the coordinate of 0.18 provided that the axis K / Y is parallel. Calculation was made as: 45042.4 million UAH / 254640.5 million UAH = 0.18, where 45042.4 million UAH – dynamics of investments in agriculture of Ukraine for 2016; 254640.5 – income from the sale of agricultural products in Ukraine.

As a result, there are three groups of areas in terms of investment sufficiency. An adequate level of investment in agriculture in 2016 is characterized by Poltava (15), Ternopil (18) and Kharkiv (19) regions.

The excess of the level of investment in agriculture in 2016 is characterized by Dnipropetrovsk (3), Zaporizhzhia (7), Kyiv (9), Kirovograd (10), Mykolaiv (13), Odesa (14), Sumy (17), Kherson (20) and Chernihiv (24) regions.

The insufficient level of investment in agriculture in 2016 is characterized by the following: Vinnyts'ka (1), Volyn (2), Donetsk (4), Zhytomyr (5), Transcarpathian (6),

Ivano-Frankivsk (8), Lugansk (11), Lviv (12), Rivne (16), Khmelnytsky (21), Cherkasy (22) and Chernivtsi (23) regions.

An adequate level of investment for the three regions (Poltava, Ternopil and Kharkiv) is characterized by the fact that for each of them the boundary condition is fulfilled: I / Y = 0.18. Determine the amount of excess of an adequate level investment on the example of calculating the parameters of the Kirovograd region (10) by the formula (2):

$$PDI = (10 – (10 – 1)) / (0 – 10) \quad (2)$$

The result of the calculation is characterized by the share over which a sufficient level of investment in agriculture in Ukraine has been exceeded.

The magnitude of the investment insufficiency on the example of calculating the parameters of the Lviv region (12) is calculated by the formula (3):

$$NDI = (12 – (12 – 2)) / (0 – 12) \quad (3)$$

The result of the calculation characterizes the share that is insufficient to a certain level of investment in agriculture in Ukraine.

The aggregate indicators of sufficiency and insufficiency of investments in agriculture of Ukraine (Table 3) make it possible to determine the need of the whole industry for development in the context of the national economy.

Table 3: Sufficiency (insufficiency) of investments in agriculture of Ukraine

Region №	Region name	Excessive investment level (EIL)	Insufficient investment of research institute
1	Vinnytska	-	0.17
2	Volynska	-	0.38
3	Dnipropetrovska	0.08	-
4	Donetska	-	0.50
5	Zhytomyrska	-	0.20
6	Transcarpathian	-	0.83
7	Zaporizhska	0.21	-
8	Ivano-Frankivska	-	0.50
9	Kyivska and Kyiv city	0.25	-
10	Kirovohradska	0.37	-
11	Luhanska	-	0.17
12	L'vivska	-	0.33
13	Mykolaivska	0.25	-
14	Odeska	0.09	-
15	Poltavska	-	-
16	Rivnenska		0.55
17	Sumska	0.05	-
18	Ternopilska	-	-
19	Kharkivska	-	-
20	Khersonska	0.09	-
21	Khmelnytska	-	0.22
22	Cherkaska		0.05
23	Chernivetska	-	0.67
24	Chernihivska	0.09	-
In Ukraine		1.48	4.57

Source: formed by the authors on the basis of [16].

Based on the results of the research (Table 3), we observe, in some regions, the sufficiency and relative excess of the level of investment in agriculture compared to the average in Ukraine, but in general, there is a significant deficiency in the state: IIL / EIL = 4.57 / 1.48 = 3.09 times.

4. Conclusions

As a result of the assessment of the external financial support of enterprises in the form of lending and investing on the productivity of the agrarian sector of the Ukrainian economy, an insignificant correlation between revenue (profit) from sales of products and the volume of attracted loans and investments was revealed. The conducted research has proven that at present there is not enough credit resources for the development agriculture in Ukraine, as well as inefficient investment of the enterprises of the industry. As a result, investments and loans to agriculture do not substantially justify themselves due to their insufficient size, unevenness and a significant risk of overdue due to technical inefficiencies. Significant differentiation of regions according to the level of technical efficiency has been revealed, which may indicate significant reserves of its increase. In a context of weak investment and credit policy, even the growth of production and sales of agricultural products is not an indicator of the attractiveness of this activity within the development of the national economy.
A prerequisite for improving the situation is considered to be the increase in the volume of external financing and the achievement of a tight relationship between the parameters: lending – investing – growth in production and sales, which will enable the formation of a functioning environment, taking into account the possibilities of optimizing financial costs for each region of the state.

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