# COST ESTIMATION OF THE FUTURE HARVEST AS AGRICULTURAL LOAN COLLATERAL

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**Abstract**

The aim of this work is to attempt developing recommendations which may improve the overall banking technique of future cropping cost estimating.
Objectives that have been set to achieve this aim are: to analyze alternative techniques of future cropping cost estimating; to perform calculation according to the selected techniques for 10 agricultural companies from different regions of Ukraine; to compare the techniques by means of hierarchy analysis method.

**Keywords**: Cost Estimation, Agricultural Companies

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## 1 Motivation

Agriculture of any country has always been and remains the main source of food industry. The state of things in this industry is directly proportional to the volume of funds, especially investments, allocated for its development. The financial crisis gave rise to a change in priorities emphasizing the increase of agricultural enterprises lending. Special attention is paid to agricultural sector behavior in the crisis period. Agriculture remains the most stable sector of Ukrainian economy. It demonstrates positive dynamics and credit solvency (Figure A.1) [6, p. 89].

Positive situation in this sector has led to the definition of agro - crediting as a prior direction for the majority of Ukrainian banks. The statistics of the Ministry of Agriculture and Food confirms the main issue of this paper. According to these data, agricultural producers obtain 8.85 billion UAH credits in 2010, which is 53.9% more than in 2009.

Changes in the Resolution № 650 of the National Bank of Ukraine dated November 3, 2009 stimulated further development of agro – crediting [8]. According to this regulation, the future harvest is considered as agricultural loan collateral. Megabank provides the internal information that almost every second project of agro - crediting portfolio guarantees the future harvest. This situation has some positive features: high liquidity, ease of disposal, ease of distribution, and the possibility of self-cropping by means of bank hired farming machines and outside preservation.

However there are specific characteristics of agricultural enterprises, which cause the existence of significant credit risk for this category of borrowers. Risk in agriculture is in the lack of harvesting which takes place under the natural factors influence. In connection with it there is a problem of banks and borrowers concerns in the future cropping cost estimating.

The situation is complicated by the lack of the future cropping cost estimating statutory technique, which causes the conflict of banks' and borrowers' interests. Banks try minimizing their own risks, underestimating the future cropping cost, while farmers do not agree to pledge the significant areas of underestimated crops and limit freedom of their own business.

The aim of this work is to attempt developing recommendations which may improve the overall banking technique of future cropping cost estimating.

Objectives that have been set to achieve this aim are: to analyze alternative techniques of future cropping cost estimating; to perform calculation according to the selected techniques for 10 agricultural companies from different regions of Ukraine; to compare the techniques by means of hierarchy analysis method.

## 2 Primary Economic Elements

The collateral value is estimated by the bank risk control department. To reduce risks banks try to underestimate future cropping cost estimating (FCCE), using low crop yield regional Ukrainian indices. In our paper the alternative techniques of future cropping cost estimating are compared with the Harsun's technique. For this purpose there is universal index of cropping cost estimating. (Herein is the crop cost of 1 ha). Below there is 1 ha cropping cost estimating standard formula, used in banking (1):

$$FCCE = CYL*CYECC*PAMP, \quad (1)$$

where FCCE – future cropping cost estimating;
CYL – cropping yield level per 1 ha kg / ha (the worst regional Ukrainian prediction);
CYECC – cropping yield expert correction coefficient;
PAMP – predicted average market price per 1 ton of cropping yield.

Cropping yield expert correction coefficient is based on the data of risk control experts who use available media information, farmers' information and their own experience. These data are quite subjective. Their use in calculations may lead to the results that do not satisfy both sides of the lending process.

The reduction of future cropping cost estimation prima facie (at first glance) may seem very attractive to banks. But banks may face the problem of increasing reserves for the law debt security credit operations. An alternative technique that may be used to estimate 1 hectare cropping cost is the technique developed by A. Harsun, which largely takes into account the specific character of every agro borrower's business [14]. The technique is based on borrower's rating algorithm subject to the agro-climatic conditions of their placement area and the following criteria:

− Actually achieved results;
− The used techniques and their correspondence to agro climatic zone;
− Crop rotation and sown area structure;

The further steps of Harsun's technique of cropping cost estimating (FCCE) are given below:

Step 1. The company's agro-climatic zone - steppe, forest-steppe or woodlands was located. (Figure A.2).

Step 2. Tillage system, which the company – borrower used, was determined.

Step 3. Crop rotation, which the company - borrower used, was determined.

Step 4. Factors of potential husbandry level of the company – borrower, which includes agro-climatic zones, tillage systems and crop rotation, were determined. (Table A.1).

This technique conventionally divides economy on the 25% with high rating (A), 50% with middle rating (B) and the 25% with low rating (C) company - borrowers.

Step 5. The company – borrower's true to life crop yield, which depends on a husbandry rating, was determined. Correcting coefficient (CC) depends on the crop and agro-climatic zoning.

Step. 6. One hectare cost, which was counted by means of multiplying the calculated crop yielding level by the average price.

Future cropping cost estimating (FCCE) for 10 farms located in different regions of Ukraine was calculated in this paper. The sampling consists of two companies from the steppe zone, seven companies from the forest-steppe zone, and one company from the woodland zone. Calculations were performed by means of both techniques, which are discussed in this paper. Calculations figured on A. Harsun's technique showed that only 3 enterprises were of B rating, the remaining 7 were of C rating.

Based on the State Statistics Committee data of 2007 – 2012, the calculated crop yielding level and Estimated Prices for Major Crops per 1 ton of production in different regions of Ukraine in 2013 were figured on the linear regression method. The data are given in Tables A.2 and A.3 [12, 13].

The highly liquid crop yielding with a wide domestic and export demand was accepted as collateral. The following crops are rational to accept as collateral at a given period: spring barley; winter barley for the southern regions of Ukraine; corn for grain, taken into account the Food and Agriculture Organization (FAO) limits; soybeans, except transgenic ones; sunflower; winter rape, for households with at least three years of this crop growing experience. Winter wheat can be used as collateral, but with the restriction of its share in the crop total volume due to the significant fluctuations of yield and prices, high risk of getting forage crop and the state export limitation.

## 3 Analysis

The both techniques based results of future crop cost estimating (FCCE) for winter crops; corn; sunflower and soybean are presented in Tables A.4 and A.4. As we can see from the data presented in Figure A.3, the cost of 1 ha of wheat according to general banking estimation technique is 2 785 UAH. If we take the lowest cost of the same index according to Harsun's technique, it will be 3 496 UAH for the enterprises 2 and 7 of Sumy region. Both of these companies were rated C, and they can provide the future crop yield only as additional collateral at the rate of 70% of the calculated crop yielding level (CCYL). The CCYL for wheat in Sumy region is the lowest in the forest-steppe zone. At the same time the relative deviation is 1.26 towards Harsun's techniques.

Similar dynamics of the future crop cost estimating (FCCE) is observed for sunflower. The low cost of 1 ha of sunflower accounts for the enterprise 5 and makes up 6 121 UAH. According to general banking technique estimation it is 3 776 UAH. The relative deviation is 1.62 towards Harsun's techniques.

The average relative deviation of the results according to Harsun technique for winter crops fluctuates from 1.66 to 2.23 against the overall banking estimation technique. For corn, sunflower and soybean this figure varies from 0.96 to 2.73.

Therefore, having based on these results, it may be said that the overall banking estimation technique, which uses the lowest level of productivity in Ukraine to estimate collateral cost, leads to cost underestimation in 1.5 - 2 times. In their calculations, banks do not analyze the specific character of borrower's productivity. Hence the nature of the conflict between banks' and borrowers' interests becomes quite clear.

The choice of the most appropriate banking practice technique of future cropping cost estimation is realized through the effective credit risk control of the bank. The analysis of alternative techniques is carried out by means of hierarchy analysis method. This method allows determining the higher priority technique which will influence the decision-making. To analyze the factors and criteria, the hierarchy analysis method was used. It is presented in Figure A.3. The comparison and evaluation of techniques was carried out on the basis of experts' opinion.

The pairwise comparison matrix is filled with the help of the environment "Expert Choice" program resulting in a priority vector at every hierarchy level. Having compared both techniques according to certain criteria, we received the resultant vector of priorities (Table 1).

**Table 1.** The resultant vector of priorities' value

| Overall banking estimation technique | A. Harsun's technique |
|---|---|
| 0,314 | 0,686 |

Thus according to the experts' opinion, the technique, which considers the peculiarities of the economic activity of each individual borrower and allows to estimate future cropping cost g (FCCE) for the economy in view of its geographical location, tillage and crop rotation, is much more efficient for the bank.

## 4 Conclusions

Today, agriculture is the most dynamic, stable and attractive investment sector of Ukrainian economy. The topical problem is determining the future cropping cost estimation, received as loan collateral.

During the research two techniques determining the future cropping cost estimation were analyzed. They are overall banking technique aimed at maximizing the undervaluation and minimizing risk factors and a new technique, developed by an agro-consulting expert A. Harsun, aimed at considering peculiarities of each individual borrower's business activities.

The research proves that the use of the technique proposed by A. Harsun has a number of advantages in banking. They are:

- reducing the amount of reserves for credit transactions generated in the agricultural borrowers' portfolio;
- simplifying operations and interaction between bank departments which review loan application;
- reducing credit risks by means of considering agricultural borrowers peculiarities and identifying risks at the loan applications stage;
- reaching understanding between the lending process players about the collateral cost;
- using future crops as the main collateral guarantee in case of company's rating.
- proposing a certain course of action, which balance the banks' and farmers' interest.
- creating the borrowers' working groups, which consider agricultural enterprises' lending.
- revealing facts of existing conflicts between borrowers, banks, and landowners in provision of future crops as agricultural loans collateral.
- promoting the future cropping cost estimating statutory technique, which would consider the future crop yield as agricultural loan collateral and which would take into account the technological features of any business conducting by borrowers.

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## Appendix

**Figure A.1.** Dynamics of production sectors of Ukrainian economy in the years 2008 – 2011

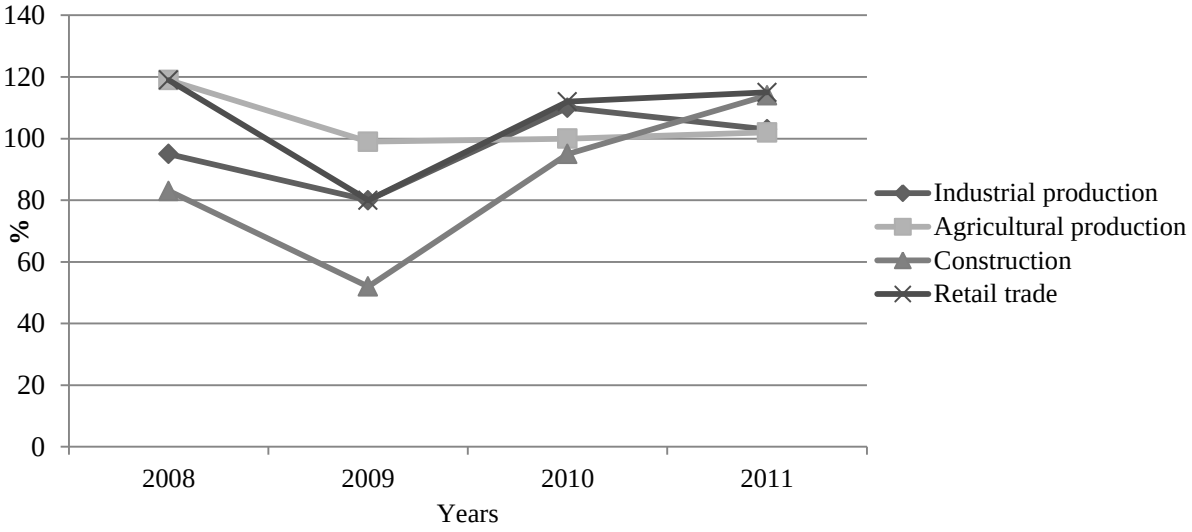


**Figure A.2.** Agro-climatic zones of Ukraine


**Table A.1.** The Use of Future Crop Yield as Banking Collateral Subjected to the Enterprise Rating

| Company rating | Main Loan Collateral | Additional Loan Collateral |
|---|---|---|
| A (high) | Yes, in FCCE amount | Yes, in the middle company's crop yielding amount for the last 3 years * CF |
| B (middle) | Yes in FCCE * CC | Yes, company's crop yielding amount in FCCE – FCCE * CC |
| C (low) | No | Yes, in FCCE * CC amount |

**Table A.2.** Calculated Level of Crop Yield (CLCY) for 2013

| Culture | Barley, c/ha | Wheat, c/ha | Soybean, c/ha | Sunflower, c/ha | Corn, c/ha | Ripe, c/ha |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Agro-climatic zone Steppe | | | | | | |
| UKRAINE | 26,36 | 34,47 | 21,55 | 19,59 | 62,54 | 18,88 |
| CRIMEA | 25,6 | 32,7 | 28,66 | 13,66 | 87,69 | 13,73 |
| DNIPROPETROVSK | 23,57 | 34,08 | 15,52 | 21,5 | 44,57 | 17,6 |
| DONETSK | 23,13 | 34,83 | 8,83 | 18,17 | 39,14 | 17,47 |
| ZAPORIZHZHIA | 22,28 | 31,18 | 27,06 | 17,7 | 37,21 | 16,64 |
| KIROVOGRAD | 26,95 | 37,71 | 20,52 | 21,56 | 68,89 | 16,69 |
| LUHANSK | 19,53 | 25,32 | 8,74 | 14,25 | 32,53 | 16,36 |
| NIKOLAEV | 28,44 | 36,47 | 21,79 | 18,97 | 57,89 | 15,58 |
| ODESSA | 28,96 | 35,35 | 15,75 | 17,19 | 50,19 | 14,63 |
| KHERSON | 27,42 | 34,91 | 34,19 | 15,04 | 57,34 | 17,58 |
| MINIMUM | 19,53 | 25,32 | 8,74 | 13,66 | 32,53 | 13,73 |
| Agro-climatic zone Forest-steppe | | | | | | |
| VINNITSA | 33,73 | 46,89 | 21,57 | 21,43 | 86,91 | 21,65 |
| KYIV | 29,96 | 27,78 | 22,64 | 22,3 | 77,08 | 15,02 |
| POLTAVA | 22,84 | 32,7 | 21,86 | 23,35 | 71,78 | 19,93 |
| SUMY | 20,17 | 26,85 | 18 | 19,47 | 65,98 | 18,79 |
| TERNOPIL | 30,84 | 38,77 | 18,44 | 16,92 | 65,64 | 22,05 |
| KHARKIV | 22,16 | 31,2 | 16,22 | 23,14 | 48,71 | 17,23 |
| KHMELNICKY | 30,95 | 43,38 | 19,04 | 20,56 | 68,96 | 23,84 |
| CHERKASSY | 35,57 | 43,69 | 22,48 | 24,8 | 89,23 | 22,33 |
| CHERNIVTCI | 27,26 | 37,71 | 23,49 | 17,21 | 56,28 | 19,3 |
| MINIMUM | 20,17 | 26,85 | 16,22 | 16,92 | 48,71 | 15,02 |
| Agro-climatic zone Marshy woodlands | | | | | | |
| VOLYNSKA | 25,56 | 32,98 | 24,05 | 6,81 | 72,01 | 27,22 |
| ZHYTOMYR | 27,04 | 31,99 | 19,66 | 17,45 | 75,84 | 16,56 |
| ZAKARPATSKA | 23,04 | 25,21 | 4,52 | 13,81 | 47,63 | 13,69 |
| IVANO-FRANKIVSK | 32,24 | 36,43 | 19 | 23,15 | 55,86 | 20,9 |
| LVIV | 29,24 | 35,33 | 14,06 | 24,1 | 59,28 | 26,68 |
| RIVNE | 30,83 | 37,93 | 15,42 | 17,83 | 51,2 | 21,78 |
| CHERNIHIV | 21,12 | 24,95 | 16,61 | 19,54 | 59,44 | 18,66 |
| MINIMUM | 21,12 | 24,95 | 4,52 | 6,81 | 47,63 | 13,69 |

**Table A.3.** Estimated Prices for Major Crops in 2013

| Wheat | Barley | Rape | Corn | Sunflower | Soybean |
|---|---|---|---|---|---|
| 1860,2 | 1746,6 | 4651,8 | 2065,7 | 5087,3 | 4282,0 |

**Table A.4.** Comparative Calculation of the Cropping Cost of 1 ha of Winter Wheat, Barley, Canola in 2013
According to the Overall Banking Estimation Technique and Harsun's Technique

| Zone | Company | Value 1 ha, UAH. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Wheat | | | Barley | | | Rape | | |
| | | Overall banking Technique | Harsun's Technique | Relative Deviation | Overall banking Technique | Harsun's Technique | Relative Deviation | Overall banking Technique | Harsun's Technique | Relative Deviation |
| Steppe | 4 | 2 785 | 4 749 | 1,71 | 2 047 | 3 477 | 1,7 | 3 821 | - | - |
| | 5 | 2 785 | 4 546 | 1,63 | 2 047 | 3 532 | 1,73 | 3 821 | 6 542 | 1,71 |
| **Zone Middle Deviation** | | | | **1,67** | | | **1,71** | | | **1,71** |
| Forest | 1 | 2 785 | 5 049 | 1,81 | 2 047 | - | - | 3 821 | 8 206 | 2,15 |
| | 2 | 2 785 | 3 496 | 1,26 | 2 047 | 2 466 | 1,2 | 3 821 | - | - |
| | 6 | 2 785 | 6 106 | 2,19 | 2 047 | 4 124 | 2,01 | 3 821 | - | - |
| | 7 | 2 785 | 3 496 | 1,26 | 2 047 | 2 466 | 1,2 | 3 821 | - | - |
| | 8 | 2 785 | 5 649 | 2,03 | 2 047 | 3 784 | 1,85 | 3 821 | 8 872 | 2,32 |
| | 9 | 2 785 | 5 049 | 1,81 | 2 047 | 3 771 | 1,84 | 3 821 | 8 206 | 2,15 |
| | 10 | 2 785 | 5 648 | 2,03 | 2 047 | 3 784 | 1,85 | 3 821 | 8 872 | 2,32 |
| **Zone Middle Deviation** | | | | **1,77** | | | **1,66** | | | **2,23** |
| Marshy woodlands | 3 | 2 785 | 4 295 | **1,54** | 2 047 | 3 571 | **1,75** | 3 821 | - | - |

**Table A.5.** Comparative Calculation of the Cost of 1 ha of Maize, Sunflower and Soybeans in 2013
According to the General Banking Estimation Technique and Harsun's Technique

| Zone | Company | Value 1 ha, UAH. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Corn | | | Sunflower | | | Soybean | | |
| | | Overall banking Technique | Harsun's Technique | Relative Deviation | Overall banking Technique | Harsun's Technique | Relative Deviation | Overall banking Technique | Harsun's Technique | Relative Deviation |
| Steppe | 4 | 7 392 | - | - | 3 776 | 7 720 | 2,04 | 2 110 | - | - |
| | 5 | 7 392 | 7 107 | 0,96 | 3 776 | 6 121 | 1,62 | 2 110 | 10 248 | 4,86 |
| **Zone Middle Deviation** | | | | **0,96** | | | **1,62** | | | **4,86** |
| Forest | 1 | 7 392 | 8 136 | 1,1 | 3 776 | - | - | 2 110 | - | - |
| | 2 | 7 392 | 8 178 | 1,11 | 3 776 | 7 924 | 2,1 | 2 110 | 5 395 | 2,56 |
| | 6 | 7 392 | 10 772 | 1,46 | 3 776 | 8 722 | 2,31 | 2 110 | 6 465 | 3,06 |
| | 7 | 7 392 | 8 178 | 1,11 | 3 776 | - | - | 2 110 | - | - |
| | 8 | 7 392 | - | - | 3 776 | - | - | 2 110 | 5 707 | 2,71 |
| | 9 | 7 392 | 8 136 | 1,1 | 3 776 | 6 886 | 1,82 | 2 110 | 5 527 | 2,62 |
| | 10 | 7 392 | - | - | 3 776 | 8 368 | 2,22 | 2 110 | 5 707 | 2,71 |
| **Zone Middle Deviation** | | | | **1,17** | | | **2,11** | | | **2,73** |
| Marshy woodlands | 3 | 7 392 | - | - | 3 776 | - | - | 2 110 | - | - |

**Figure A.3.** Hierarchal Structure Method of Future Cropping Cost Estimating as Banking Collateral