THE IMPACT OF FINANCIAL MANAGEMENT PERFORMANCE ON THE SUSTAINABLE DEVELOPMENT OF AGRICULTURAL ENTERPRISES IN THE REPUBLIC OF MOLDOVA

Dmitrii TRACI, Aurelia LITVIN, Anatol RACUL

State Agrarian University of Moldova, 44 Mircesti Str., 2049, Chisinau, Republic of Moldova, Emails: dtrach.72@mail.ru, a.litvin@uasm.md, anatol.racul@gmail.com

Corresponding author: anatol.racul@gmail.com

Abstract

This paper aimed to present an assessing method of the impact of financial management performance in the agricultural enterprises of the Republic of Moldova by using the nonparametric modelling of economic efficiency. Data Envelopment Analysis it was defined as the rating of the economic efficiency determined on the basis of financial indicators of the performance management. Assessed functional relations are based on the econometric criteria of precision evaluation and are classified according to the types of agricultural activities defined by the National Bureau of Statistics. The typology of agricultural enterprises is established by clustering techniques based on the Euclidean metric.

Key words: *agricultural enterprises, data envelopment analysis, econometric models, typology*

INTRODUCTION

The Republic of Moldova is an ex-Soviet county located in eastern Europe and can be evaluated as a transitional economy since its declaration of independence in 1991. Since independency the country introduced a marked economy and in this way the prices and financial interest rates are liberalized and thus the preferential credits to state enterprises has been removed. After the economic crisis and energy shortages the economy began to change and has shown steady annual growth of between 7% and14%. The rate of overall unemployment was reduced to 5% in 2015 and agricultural production to the relative weight of the service sector in the economy of Moldova began to dominate GDP [5].

Agriculture is the main direction of development in the Moldovan economy employing 50% of the labor force and give 60% of GDP, provide two-third of the country export (mainly food, alcohol, and tobacco, production). The share of population that lives in the rural areas now is representing 65% and dominate on the human resource market in the country. Different type of the agricultural outputs includes winter wheat, tobacco, sun flower, grapes, corn, fruits, vegetables and a large variety of animal products. It is possible to obtain because the country have very fertile soils and enough chip human resources. Evidently the Republic of Moldova have main comparative advantage in developing agricultural sector by using rich naturals resources, workforces with the highly cultured population. There are many obstructions in performing and registering the agricultural enterprises because of the too costly, useless time spending and very bureaucratic office work.

Regarding to the necessity to ensure a sustainable development of the agrifood sector by using the accounting techniques and financial methods it is necessary to define the theoretical part of the field and the authentication of the economic practices in the activity of agricultural enterprises. That is why the developing of the agrarian business, which requires an increasingly market competitive environment, assumes that the managerial decision-making process is based on the precise, pertinent and complete information regarding the economical and financial performances of the agricultural enterprise during the past and the present management leadership of the periods by establishing the future economic and financial

development strategy on production growth, increasing profit, ensuring financial balance, liquidity flow, profitability at the minimum level of risk [3].

In the agricultural sectors of the Republic of Moldova financial analysis is a very useful instrument for the scientific substantiation of the decisions that the business leaders in the area have at their disposal. In order to define the past, present and future of economic and financial performance of the agricultural enterprise, the technics based on financial analysis starts with the necessity to specify the object and the field of activity in agrifood sector and to consider the technical, human, financial and commercial potential characterizing its activity in terms of financial needs, profitability and risk. As a result of the processing of financial data, we have the possibility to ensure an equilibrium in the medium and long-term agricultural activity of the enterprise. For this purpose, it is necessary to evaluate the possibilities of realizing the cash accumulations and increasing the profitability of the enterprise. A very important component in the evaluation of company's growth resources is to defined the ways to maintain the financial independence of the economic entity in agricultural sector by identifying the capacity of the enterprise's financial and patrimonial potential, the sufficiency of financial resources and liquidity, the quality of the asset portfolio of cost-effective assets of the enterprise in rural area and its reliability in the market business environment [4].

The SWOT analysis identifies the weaknesses of the enterprise's financial assets by highlighting the insufficient financial resources, reduced self-financing capacity, fragility of the financial structure, fragility of the financial balance, low liquidity of assets, fragility of production profitability and capital indebtedness. An important link in optimizing the activity of the economic agent in agriculture is to highlight the risks that may lead to destabilization of the business sustainability of the enterprise or even lead to bankruptcy and guarantee the business relations of the enterprise with its own

partners that are suppliers, customers, banks, holders of financial securities, public authorities interested in jointly doing business safely, without the risk of financial malfunctions and imbalances, insolvency.

Financial management approach in the Republic of Moldova is designed to evaluate the assessment of enterprises to be restructured in the agricultural sector and those that have to be merged or liquidated and that involves the support of shareholders as owners in making the most appropriate optimal decisions.

MATERIALS AND METHODS

The performance of an economy, its efficiency and the efficiency of production factors represent the key elements of the financial analysis. Over the past two decades, specific methods for assessing financial management performance have been developed and most of them could be applied at microeconomic level. These methods can also be successfully implemented at the national economy level in order to assess the financial management performance for the improving of the agricultural policy in the Republic of Moldova.
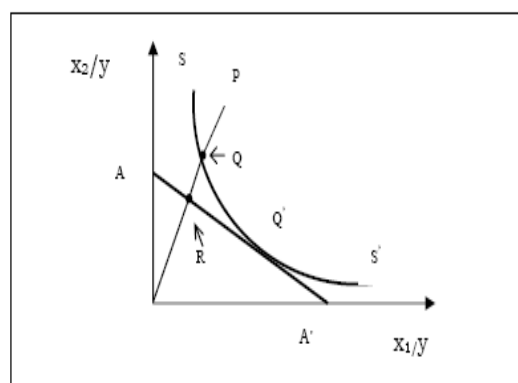

Fig. 1. Evaluation of financial management performance according to the indicators of technical efficiency and allocative efficiency
Source: [8].

According to Farrell, a firm's financial management performance consists of two components: technical efficiency (TE) that reflects a firm's ability to obtain the maximum output from a given set of inputs and allocative efficiency that reflects firm's

ability to use optimal proportion of inputs, setting the respective prices and production technology. These two criteria of a firm's financial performance are properly combined in order to ensure the measure of the total economic efficiency [6].

Figure 1 shows the performance evaluation for the firm that are using two inputs (*x1, x2*) to produce a single output (*y)* in the hypothesis of constant returns to scale. It is also supposed that we know the isoquant of the fully efficient firms that is equivalent to the related production function.

The evaluation technique of the financial performance indicator requires VRS (Variable Return to Scale) option and the results obtained are presented in Table 1. The primary data by mathematical processing with formula 1 are presented in the information on the financial situation of 742 agricultural enterprises in the Republic of Moldova (according to CAEM code of the National Bureau of Statistics - NBS). According to Table 1, TE assessment (financial management performance) depends on the values of the Y-factor and the inputs presented by the exogenous factors X1..X5.

The system of financial indicators used for the assessment of financial management performance in the agricultural sector of the Republic of Moldova is represented by:

1. Rate of financial return

$$Y = \frac{\text{net income}}{\text{own capital}}$$

2. Commercial profitability ratio

$$X1 = \frac{\text{net income}}{\text{sales revenue}}$$

3. Overall liquidity ratio

$$X2 = \frac{\text{circulating assets}}{\text{current liabilities}}$$

4. Total indebtedness degree (leverage effect)

$$X3 = \frac{\text{current debts} + \text{long term debts}}{\text{proper capital}}$$

5. Financial autonomy ratio

$$X4 = \frac{\text{proper capital}}{\text{proper capital} + \text{long term liabilities}}$$

6. Increase in sales

$$X5 = \frac{\text{sales revenue 2016}}{\text{sales revenue 2015}}$$

7. Economic profitability ratio

$$X6 = \frac{\text{gross income}}{\text{total assets}}$$

8. Partial liquidity ratio

$$X7 = \frac{\text{total circulating assets} - \text{materials} - \text{goods} - \text{production under manufacturing process}}{\text{total current liabilities}}$$

9. Total indebtedness ratio

$$X8 = \frac{\text{total current liabilities} + \text{total long term liabilities}}{\text{total liabilities}}$$

10. Increase in assets

$$X9 = \frac{\text{total assets 2016}}{\text{total assets 2015}}$$

Using the duality of linear programming, we can determine an equivalent envelopment form of this problem:

$$\begin{cases} \min_{\theta,\lambda} \theta \\ -y_i + Y\lambda \geq 0 \\ \theta x_i - X\lambda \geq 0 \\ N_1\lambda \leq 1 \\ \lambda \geq 0 \end{cases} \quad (1)$$

where:
θ-represents financial performance parameter;
n -is the number of economic agents;
Y-represents the vector of outputs, n-dimensional, which is given by the financial profitability ratio of the agricultural enterprises;
X-represents the vector of inputs, n-dimensional, which is given by the financial indicators:
X1 - commercial profitability ratio;
X2-overall liquidity ratio;
X3-total indebtedness degree (leverage effect);

X4 - financial autonomy ratio;

X5 -increase in sales;

N1-is a n-dimensional vector with 1 component;

λ- represents the variables of the linear programming problem to be solved.

The value of technical efficiency θ≤1, where a value equal to 1 represents a limit point on the frontier, i.e. a company with technically absolute performance.

The processing of primary data was carried out by using the software DEA_UASM developed within the State Agrarian University of Moldova.

Table 1. Evaluating technical efficiency of agricultural enterprises activating in the Republic of Moldova in the financial year 2016

Nr	Main agricultural activity CAEM	Employ ed staff	Financial profitability ratio	Commercial profitability ratio	Overall liquidity ratio	Total indebtedness degree	Financial autonomy ratio	Increase in sales	Technical efficiency
			Y	X1	X2	X3	X4	X5	TE
1	A0111	10	0.080	0.083	3.098	0.884	0.625	1.073	0.205
2	A0111	25	0.132	0.029	1.346	1.311	0.790	1.183	0.430
3	A0111	11	0.029	0.168	2.214	0.154	0.951	1.342	0.092
4	A0111	2	0.563	0.779	5.114	0.509	0.798	2.804	0.346
5	A0111	3	0.025	0.022	9.069	0.121	0.955	0.716	1.000
6	A0111	8	0.151	0.085	2.369	5.288	0.198	0.915	0.220
7	A0111	4	0.126	0.241	10.311	0.090	0.947	0.997	0.800
8	A0111	22	0.021	0.012	3.185	1.999	0.417	1.103	0.231
9	A0130	30	0.239	0.220	30.632	0.327	0.768	1.252	1.000
10	A0111	7	0.123	0.228	6.353	0.078	0.980	1.420	0.343
11	A0111	10	0.221	0.157	2.724	0.583	0.770	1.173	0.311
12	A0147	26	0.006	0.004	1.150	1.045	0.572	0.934	1.000
13	A0141	10	0.072	0.093	57.385	1.216	0.453	1.351	1.000
14	A0146	162	2.687	0.079	5.880	22.457	0.047	1.343	1.000
15	A0322	20	0.027	0.263	3.154	0.164	0.938	1.955	0.044
16	A0147	19	0.033	0.062	0.587	0.896	0.855	0.756	0.229
17	A0111	3	0.663	0.047	2.484	3.865	0.287	2.021	1.000
18	A0111	2	0.149	0.161	0.117	9.661	0.555	5.342	0.228
19	A0111	3	0.387	0.170	1.066	4.206	0.233	4.076	0.899
20	A0111	1	0.054	0.015	0.730	3.037	0.323	1.343	1.000
...									
The arithmetic average of financial management performance									0.5843

Source: Own calculations based on data of NBS.

RESULTS AND DISCUSSIONS

Financial management performance was evaluated according to CAEM codes applying the DEA data envelopment methodology for different sectors of Moldova's agriculture. In the Table 2 presents the comparative analysis of economic enterprises activating in different agricultural sectors indicating their financial management performance. For example, it is obvious that grape cultivation represents a high financial performance as this sector ensures a value added of the high production process. At the same time, the activities related to the sheep breeding and fish breeding sectors record low efficiency and require substantial capital investments in order to redress these areas of economic activity. According to Table 2, the comparative analysis of different sectors involved in obtaining agricultural production gives the possibility to optimize the agricultural policies of the decision makers in the field of financial investments [1].

The evaluation of financial management performance requires the identification of economic indicators that significantly influence the TE value determined by the nonparametric DEA method. The ratio method is based on the comparison between absolutely different values of the categories and items of the balance sheet or of the

balance sheet annexes that are closely related to each other and characterize the overall financial situation or financial situation per sectors. Therefore, the ratio method highlights significant aspects of the balance sheet, the results account and the cash flow statements. The profitability ratios are synthetic indicators, which assess in a relative form the profitability level or the ability of the enterprise to generate profit. The profitability ratio, as an indicator, may have several forms of expression, depending on the way the effect indicator or the results indicator is reported (income, liquidity or other partial indicators of profitability) to a global activity indicator (turnover, operating income, value added) or to the advanced or consumed economic means in order to obtain the respective result (as effort indicators). The most important profitability ratios are the following: economic profitability ratio, financial profitability ratio, profitability ratio of consumed resources and income profitability ratio [2].

Table 2. Evaluation of the financial management performance in different sectors of the agricultural activity of the Republic of Moldova

Nr.	CAEM	Classification of agricultural, forestry and fish breeding activities	TE
1	A 0111	Cultivation of cereals (excluding rice), leguminous and oleaginous plants	0.577
2	A 0113	Cultivation of vegetables and melons (water melons), plants with tuberous roots	0.625
3	A 0121	Grape cultivation	0.673
4	A 0124	Cultivation of stone and seeded fruits	0.607
5	A 0125	Cultivation of fruit bearing shrubs, strawberries, walnuts and other fruit trees	0.575
6	A 0141	Dairy cattle breeding	0.507
7	A 0145	Sheep and goat breeding	0.426
8	A 0146	Pig breeding	0.640
9	A 0147	Poultry breeding	0.610
10	A 02	Forestry and forest exploitation	0.661
11	A 03	Fish breeding and aquaculture	0.450

Source: Own calculations based on data of NBS.

The ratio of economic profitability measures the overall performance of a company, regardless of the way of financing and the tax system. This ratio can be expressed in several forms, depending on how the effort indicator is expressed. We can use:
• the return on assets, when the effort indicator is represented by the overall or operating assets;
• the return on invested capital, when the effort indicator is represented by the invested capital.
By dividing the net income to the sum between fixed assets and circulating assets, the return on assets is calculated. Using its value, the efficiency of asset allocation and usage performed by the company's is estimated. Furthermore, by dividing the net income (or total return of any investment) to the total amount of invested capital, the return on investment is calculated. This financial ratio is of particular interest to all investors (current or potential), as it is usually used as a benchmark when comparing it to the profitability of other placements, like bank deposits, bonds or even investments in other companies. Still, it is relevant also for managers, as a high value yields an efficient management of invested capital.

By comparing the weighted average cost of capital (WACC) with the chosen economic profitability ratio, there can be the following:
• when $X6 > WACC$, this means the obtained overall profitability is higher than the cost of capital, thus increasing the economic value of the enterprise;
• when $X6 < WACC$, this means the obtained overall profitability is lower than the cost of capital, thus decreasing the economic value of the enterprise.
The rate of financial return (Y) estimates the efficiency of capital allocation. Considering this, the rate of financial return is pivotal for shareholders, as by judging its level and evolution, one can decide upon further investing and supporting the company.

Table 3. Results of the mathematical processing showing the dependence of the financial management performance on the economic profitability ratio

Dependent variable: TE
Independent variable: Economic profitability ratio
Exponential model: Y = exp (a + b*X)
Coefficients

Parameter	Least Squares Estimate	Standard Error	T Statistic	P-Value
Intercept	-0.8506	0.0324944	-26.1768	0.0000
Slope	0.623593	0.107828	5.78323	0.0000

NOTE: intercept = ln(a)
Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	13.7698	1	13.7698	33.45	0.0000
Residual	304.662	740	0.411705		
Total (Corr.)	318.432	741			

Correlation Coefficient = 0.207948
R-squared = 4.32425 percent
R-squared (adjusted for d.f.) = 4.19496 percent
Standard Error of Est. = 0.641643
Mean absolute error = 0.537343
Durbin-Watson statistic = 2.07738 (P=0.1460)
Lag 1 residual autocorrelation = -0.0408293

Source: Own calculations based on data of NBS.

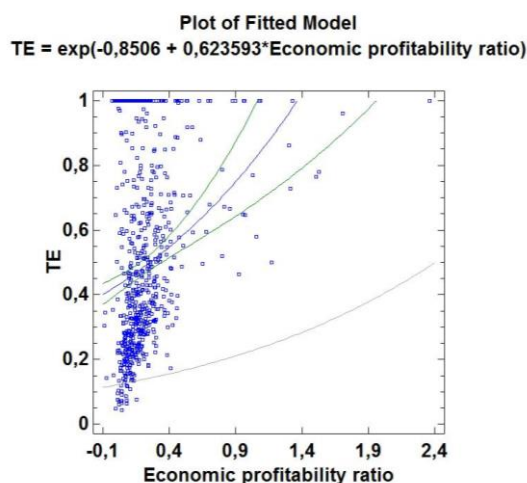Financial profitability is basically influenced by the existence of two factors:

-the use of the borrowed capital within the capital structure of the enterprise;

-the deductibility of expenses from interest by introducing them into the enterprise's expenses (as financial expenses) and the existence of the "tax shield" effect.

In addition, it is necessary that the rate of economic return is higher than the cost of the borrowed capital; otherwise the use of borrowed capital becomes inefficient.

Financial profitability ratio can be calculated by reporting the net profit to the size of the proper capital, thus, based on the calculation ratio of this ratio it results that in order to increase its level it is necessary that the net profit increases at a rate higher than the increase in proper capital. Further, the model of the functional relationship between the economic profitability ratio indicator and the TE performance financial management performance assessed by the nonlinear regression method using the STATGRAPHICS Centurion software is presented.

$$TE = e^{-0,8506+0,623593*X6} \qquad (2)$$

Microeconomic Analysis of the Economic Efficiency Ratio behavior presented in Figure 3 by evaluating the elasticity coefficient of the TE factor highlights a relatively high increase of the financial management performance along with the increase of the economic efficiency.

Plot of Fitted Model
TE = exp(-0,8506 + 0,623593*Economic profitability ratio)

Fig. 3. Graph of dependence between TE and Economic profitability ratio
Source: Own calculations based on data of NBS.

Taking into account data presented in Table 3 and the results of the nonlinear regression, we can mention that the Intercept = -0.8506 and Slope = 0.623 according to the formula (2) for

the average values of the factors X6 = 0.223 and Y = 0.584 the elasticity is e_6=0.116. The validity of the proposed mathematical model is good due to the Fisher criterion significant value F = 33.45 and the correlation coefficient R = 0.207 between the causal factor X6 and the endogenous factor TE shows a strong bond and the precision of the calculation is satisfactory. analysis which allows to make a classification of the evaluated sample by homogenous groups of centroids with similar financial performance characteristics The process of cluster analysis requires to set some limits on the number of economic indicators included and the share of the variables' contribution to financial management performance.

Table 4. Clustering of agricultural enterprises according to the financial management performance

No.	Economic indicators	Profitable and liquid enterprises	Profitable and illiquid enterprises	Unprofitable and liquid enterprises	Unprofitable and illiquid enterprises
	The target cluster	1	2	3	4
1	Number of enterprises in the cluster	213	15	43	471
2	Financial management performance, TE	0.99	0.51	0.55	0.41
3	Employed staff, persons	13	257	138	16
4	Materials, mil MDL	0.22	8.31	3.63	0.40
5	Goods, mil MDL	0.08	5.31	0.15	0.14
6	Circulating assets, mil MDL	2.30	110.43	23.08	3.96
7	Own capital, mil MDL	3.46	89.37	33.63	4.92
8	Long term debts, mil MDL	2.18	45.33	5.79	2.09
9	Current debts, mil MDL	1.25	67.84	8.30	2.49
10	Sales revenue, mil MDL	4.03	169.71	31.88	6.27
11	Gross profit, mil MDL	0.87	31.32	7.35	1.58

Source: Own calculations based on data of NBS.

The significance of this value of the economic performance indicator allows us to conclude that the contribution of this factor is substantial for this financial performance. Thus, the 1% increase in the Economic Efficiency Ratio requires an increase of TE by 0.116%. This assessment allows us to assess the financial importance of each factor included in the mathematical processing model and enables the optimization of financial policies in the agricultural sector. In this way, the non-parametric techniques for assessing financial management performance give the opportunity to define optimal solutions for financial investment in the agricultural sector.

In order to carry out a more thorough analysis of agricultural enterprises in terms of financial management performance it is necessary to perform the grouping of economic enterprises according to criteria of profitability, liquidity, sales revenues and other economic indicators. The definition of the types of agricultural enterprises is achieved by means of a cluster analysis which allows to make a classification of the evaluated sample by homogenous groups of centroids with similar performance characteristics The process of cluster analysis requires to set some limits on the number of economic indicators included and the share of the variables' contribution to financial management performance.

Altogether, 742 agricultural enterprises were analyzed by grouping them in accordance with the criteria of financial performance. The specificity of grouping the agricultural enterprises required the use of the Ward method to define the distance between the four clusters identified by the STATGRAPHICS Centurion software.

According to formula 3 the advantage of this approach in choosing the method of agricultural enterprises clustering consists in the use of the "Euclidean metric distance" function to assess the distance between the space points:

$$\text{dist} = \sqrt{\sum_{i=1}^{n}(x_i + y_i)^2}$$

(3)

As a result of the mathematical processing of primary data the typology of agricultural enterprises was identified by defining four different types of the economic agent: profitable and liquid enterprises, profitable and illiquid enterprises, unprofitable and liquid enterprises, unprofitable and illiquid enterprises [7].
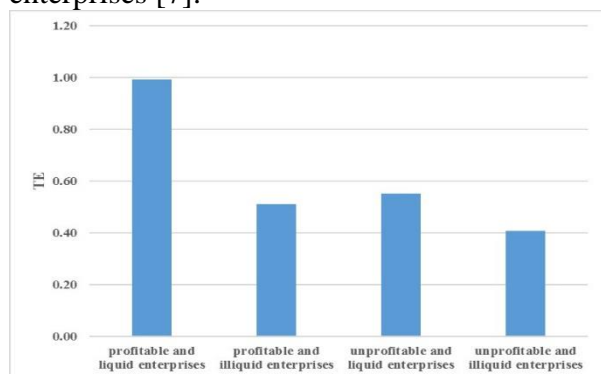

Fig. 4. Classification of agricultural enterprises depending on the financial management performance
Source: Own calculations based on data of NBS.

The characteristics of the economic indicators of each cluster are shown in Table 4. High profitability enterprises that ensure good liquidity of resources are included in the 1st cluster and they represent 63% of the total sample. These agricultural enterprises are not large (on average the staff consists of 13 persons), but the financial management performance records high rates and the TE value of the majority in the cluster is situated on the efficient limit (where TE=1). According to Figure 4, the financial performance management of agricultural enterprises is at maximum for profitable and liquid economic agents.

CONCLUSIONS

Referring to agricultural enterprises activating in the Republic of Moldova, we could mention that the encountering difficulties can affect any aspect of their activity, the cessation of payments being the most serious effect of the low financial performance in their activity. The depreciation of economic and financial indicators, especially profitability and liquidity, push businesses into the so-called hell-spiral of difficulties. The econometric analysis of primary data

gives us the possibility to picture the situation of the enterprises in terms of profitability and liquidity, which can define its financial performance by grouping them into four clusters as follows:
(i) profitable and liquid enterprises;
(ii) profitable and illiquid enterprises;
(iii) unprofitable and liquid enterprises;
(iv)unprofitable and illiquid enterprises.
The first class of enterprises has a good viability and their activity requires maintaining the indicators at the same level, which is relatively simple to achieve. Second cluster of enterprises could solve their difficulties by attracting circulating capital from external sources, it is suggested to take long-term credits and loans for which the interest rate is lower and therefore their profitability will not be affected. Similarly, another solution for the latter would be to optimize the cash flows by:
• accelerating cash inflows and, in particular, offering cash payment discounts, advance payment with subsequent delivery of products, reducing the commercial credit period offered to customers, accelerating the collection of receivables with expiration date, refinancing receivables through bills of exchange, the sale of the non-active part of fixed assets, the leasing of unused material assets;
• slowing out cash outflows by increasing the commercial credit term offered by suppliers, converting short-term financial debt into long-term debt, reducing the volume and composition of investment programs, reducing fixed production costs, reducing the capitalization of financial means.

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