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PERFORMANCE ANALYSIS IN AGRICULTURE USING DATA ENVELOPMENT ANALYSIS

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Objective and research hypotheses

- *The objective* of the article is to evaluate the financial performance of Romanian agriculture, at national and regional level, based on a set of indicators that highlight the position and financial performance, using as a reference system the EU agriculture.
- *The research hypotheses:*
 1. The EU agriculture performance is superior compared to Romania agriculture
 2. The performance of agricultural holdings at Romanian regional level shows an oscillating evolution

Literature review

- Data Envelopment Analysis (DEA) is a non-parametric linear programming method that is used to evaluate the efficiency of decision-making units (DMUs), such as: organizations, institutions, countries, sectors of activity
- DEA method involves combining multiple inputs and outputs and transforming them into an efficiency index. This approach starts from establishing an "efficiency frontier" (score 1), for all DMUs. If the score is high, the economic system analyzed is efficient.

Data and methodology

- The information comes from the European Commission's Farm Accounting Data Network (FADN) database which contains information on farms in EU member countries
- The indicators used are calculated as financial rates that express the profitability, liquidity, solvency and efficient use of resources, both in agricultural holdings in Romania at national and regional level and in the EU as a whole, for the period 2014-2017
- The evaluation of performance in agriculture, at regional level, using DEA was done through two results-oriented models (output oriented), CRS and VRS model

Data and methodology

- The results and resources of Romanian agriculture, register lower values compared to the EU average:
 - the total production is approximately 6 times lower in RO
 - gross income and the net added value are about 5 times lower in RO;
 - net income is approximately 3,5 times lower in RO;
 - the net worth is about 8 times lower in RO;
 - the total assets held by EU agriculture are 9,5 times higher and the current assets are 10 times higher.

Data and methodology

- the indicators that highlight the performance are higher in the case of agricultural holdings for RO compared to the EU:
 - ROA average is 8,21% higher, economic rate of return is 8,75% higher in RO;
 - current liquidity is about 45% higher and general solvency is with 80% higher in Romania;
 - average of total assets turnover is 34% higher in RO.
- regional performance in RO is achieved with DEA
 - output variable: ROA. Input variable: economic rate of return, total asset turnover, total production, net worth, net value added, current liquidity, general solvency, gross income.

Data and methodology

- the agricultural holdings for a single region (North-East) register a relative efficiency for the entire period-both models, CRS and VRS. In VRS model, it carries out a high performance activity those for South Muntenia, South West Oltenia, North West.
- the average efficiency score for the commercial farms in RO is 95% in 2014, recording an oscillating evolution with the tendency to decrease, so that compared to 2014 it decreases by 7,5% in 2015, 2,5% in 2017, in 2016 remains the same value as in 2014.

Data and methodology

- In 2014, 35% of the total agricultural holdings did not reach the expected level of performance and are in three regions with efficiency scores below "1"
- In 2017 there is an unfavorable evolution, 62% of the total farms, haven't reached the level of performance and are located in five regions.

Conclusions

- the variables that highlight the performance of EU agriculture is superior compared to Romanian agriculture are: total production, gross income, net income, net value added, total assets, thus verifying *research hypotheses no. 1*.
- On the other hand, the financial indicators such as the return on assets, the economic return, the current liquidity, the general solvency, the total asset turnover, highlight the fact that the performance of Romania's agriculture is superior compared to the EU.

Conclusions

- The results at regional level highlight the oscillating performance, with the decreasing tendency, of agricultural holdings in RO, although our country has significant resources and a favorable agricultural potential, thus verifying *research hypotheses no. 2*
- a reorganization of agricultural holdings is required so that an efficient use of the resources will take place, which will lead to the development, progress and performance