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## **New Approaches to Developing the Integral Indicator Methodology for Estimating the Financial Efficiency of Agricultural Entities in Poland, the Republic of Moldova, and EU Countries**

**Abstract.** Economic literature pays a great deal of attention to economic and financial efficiency, expressed in terms of competition, concentration, productivity and profitability. This paper provides an all-embracing framework for the various existing theories in this area and illustrates these theories with practical applications. Currently, changing the size of the production potential in agricultural units in the Republic of Moldova depends to a great extent on the influence of different trends in the modification of production resources: the reduction of labor resources and agricultural land, quantitative and qualitative changes in fixed assets, and in current assets, etc.

The notion of resource potential means the totality of the volume of all resources (natural, labor, material, intellectual, information, etc.) on specific enterprises, territories, branches, regions. Evaluating a broad field of research, the paper describes profit maximizing food products and demonstrates how several widely-used products can be fit into this framework. The authors also present an overview of the current major trends in the food sector and relate them to the assumptions for food products, thereby displaying their relevance and timeliness. The results include a set of recommendations for future research on this topic.

The design, methodology and approach of this research is to explain why efficiency can help obtain a profit surplus, and to measure this efficiency. For quality of methodology we apply a range of statistical methods, as well as the strategic capability of organisations – made up of resources and competences. One way to approach the strategic capability of an organisation is to consider its strengths and weaknesses (for example, where it has a competitive advantage, profit, efficiency or disadvantage).

Based on our research and results, we sought to understand the concepts of financial efficiency and to apply these concepts to practical situations. At the start of each analysis entrepreneurship plays an important role. Most organisations have to innovate constantly to obtain profit and efficiency for food products. They need to be first into a market, or simply a follower of customers in developing new products and services. Original studies in Moldova and Poland regarding farm concentration in terms of Gini Coefficient, Gini Index and Concentration Index of the utilized agricultural area. Original calculus formula to determine the Concentration Index of the UAA for the top 10% largest farms in Moldova and UK.

**Keywords:** agro-sector, European Union, correlation and regression, financial efficiency, food product, financial economy, productivity & profitability, resource efficiency

**JEL Classification:** A11, A12, A23, A29, B22, C16, R13, Q14, P48

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## **Introduction**

Nearly 14 million farmers manage in the EU and the average farm size is 15 hectares. The biggest agricultural holdings are located in Czech Republic (the average farm size is 90 hectares) and Denmark (60 hectares) and the lowest in Romania (3 hectares), Poland (6 hectares), Bulgaria (6 hectares), Hungary (7 hectares) and Italy (8 hectares) (Eurostat 2014).

Land fragmentation and the system of small farms is known as the European Model of Agriculture (EMA) (Kowalczyk, Sobiecki 2011). Fragmented agriculture, family farms and, what should be stressed, very diverse, characterize European agriculture. There are many agricultural enterprises and organic farms, nevertheless very small and medium-sized farms have a dominate position (Musiał, Drygas 2013).

European agriculture still represents a fragmented model of agriculture and is in a large part family-managed. Very often, the land is cultivated from generation to generation: when retired owners pass the farm in the hands of their children (Poczta 2010). The use of direct payments under the Common Agricultural Policy of European Union is for sure an incentive to keep small farms, as well as significantly affect the increase in land prices (Światły, Turnau, Majchrzak 2011). What's more, introduced modulation (reduction of direct payments for the largest farms) will cause in splitting the big farms into smaller ones (Zegar 2008).

Although European Model of Agriculture is fragmented and based on family farms, the concept of "small farm" is not very clear. For the criterion of defining the utilized agricultural area can be taken, as well as economic output, added value, allocation of production, work force, the source of income, etc. (EU Agricultural Economic Briefs: What is a small farm? 2011; The European Model of Agriculture – Challenges Ahead 2006]). Because of the size, the "small farm" may be the farm of 2 hectares in Poland, Romania or Moldova, while in France or Great Britain, we may consider small farm with the area of 30 or 50 hectares.

## **Materials and Methods**

This paper presents the resource potential component which has an essential share in production potential and is of great importance in the resultant indicators, which are determined by the ratio between the obtained results (production, income, profit) and the efforts (or resources used). The research aimed to highlight the importance of resource potential in agricultural enterprises and was conducted using the following methods: monographic method, table method, mean and relative size method, correlation and regression method. Practical investigations were carried out on the basis of data from agricultural enterprises in the Republic of Moldova. The issue of increasing yields on the use of agricultural production resources is very important. To solve it successfully relates directly to a country's economic security and its constant supply of agricultural products.

## Results and Discussion

Lingering bureaucracy and a lack of transparency often make the formation and operation of private enterprises costly and burdensome. Labor regulations are rigid in the Republic of Moldova. The nonsalary costs of employing a worker are high, and restrictions on work hours remain inflexible. The IMF reports that the cost of the bank bailout following a massive banking scam amounted to 12 percent of GDP, forcing the government to cut agricultural subsidies. Trade is extremely important to Moldova's economy; the value of exports and imports taken together equals 117% of GDP. The average applied tariff rate is 2.5%. In general, foreign and domestic investors are treated equally under the law. Long-term financing remains difficult. Overall, the financial sector is stable but shallow, and financial intermediation remains constrained by structural impediments (Index of Economic Freedom, 2017).

Besides the tasks that confront society with the need to make agriculture more efficient, there are also other economic, social and political problems which require large expenditures. The forces of industrial production, which provide the means and objects of work for agriculture, have their restrictions. The possible range for expanding the reproduction of fixed assets and current assets for agricultural use is limited by the biological laws that govern the process of planting.

Making a overview of scientific treatments and the practical problem of assessing the full potential of resources, we believe that the value method is best – one based on the calculation of statistical indicators and economic-mathematical methods. This allows to determine the exact weight of each resource in the production of product. They are original, but we would like to present our own vision, taking into account that partial resources are estimated in different units of measure (agricultural land - in hectares, fixed assets and current assets - in monetary units and labor resources in natural indicators (persons)). For comparability they (agricultural land area and labor) need to be evaluated in terms of value.

For the value estimation of the full potential of resources, the following methodology was elaborated and proposed to apply in the agricultural units expressed by the relation in E. Timofti, 2008, and intensive agriculture and effective potential was based on rational use of resources (Agricultural Science - Chisinau, 2008).

$$V \cdot P \cdot R = S_{av} + MF + FR + Cm$$

where:  $V \cdot P \cdot R$  - the full potential resource potential, thousands of lei;

$S_{av}$  - the value of agricultural land, thousand lei / grade-ha;

$MF$  - the value of the means of production, thousands of lei;

$FR$  - Remuneration Fund (the value-equivalent of the labor potential), MDL thousand of lei;

$cm$  - direct costs of materials, thousands of lei.

We consider that, when estimating the value of agricultural land, it is necessary to consider quantifying their productive capacity through land retention.

According to the Law on normative price and the means of sale-purchase of land no. 147-149 of 2001 (Law, 2001), the value of the agricultural land in the Republic of Moldova was estimated at the normative price of 289.53 lei per hectare. Therefore, at the level of the republic, the value of the agricultural land can be estimated in the following way:

$$S_{a.v} = S_{ta} (ha) \cdot \bar{B} (grad / ha) \cdot \bar{P} (lei),$$

where:

$S_{a.v}$  - the area of the agricultural land expressed in value (the value of the agricultural land), thousands of lei;

$S_{ta}$  - the area of agricultural land in hectares;

$\bar{B}$  - the weighted average rating of grading, grade-hectares;

$\bar{P}$  - the normative price for one hectare unit, lei.

The studies regarding the zoning and the quality of agricultural lands have shown that the productive potential in the Republic of Moldova is appreciated by the average value of the natural scarcity of 64 hectare (Land Cadaster, 2006). However, in relation to the fact that the regions, districts, agricultural units are located in different natural-climatic conditions, with different fertility of the soil, we determined the average credit rating on the development regions of the Republic of Moldova. Thus, the agricultural land in the North development region was appreciated with the highest average score of 70.0 hectare, followed by Chisinau - 64 degree-hectare, the Central region - 59.9 degree-hectare, South - 59.2 degree-hectare and ATU Gagauzia - 56 degree-hectare.

For each agricultural unit, rayon, region the determination of the value of agricultural land is proposed by the following methodology:

$$S_{a.v} = \frac{S_{ita_c} \times B_i \times \bar{P}}{\bar{B}}$$

where:  $S_{ita_c}$  - the area of the agricultural cadastral land **and** agricultural unit, (rayon, region);

$B_i$  - Rate of evaluation (degree-ha) of **the** agricultural unit (district, region).

The calculation of the value of the differentiated agricultural land according to the proposed method takes into consideration the following main components per district (region, enterprise):

- the absolute size of agricultural land in each unit under study;
- soil quality;
- the price of a differentiated degree-ha depending on the soil quality.

Estimation of labor resources is possible from the point of view of the remuneration of the average annual work of a worker employed in the agriculture of the studied units. This is explained by the fact that the increase in the level of labor remuneration must be conditioned on obtaining a larger quantity of agricultural production. It follows that the higher the level of remuneration of an average annual worker, the higher the amount of labor resources, hence the potential.

Table 1. Potential of partial and integral production resources in agricultural entities in the Republic of Moldova for two periods of 2011-2016

Indicator	On average per entity, year		Average 2014-2016, in % versus 2011-2013
	2011-2013	201-2016	
The value of agricultural land, thousand lei ratio grade-ha	10453	10040	96.0
The average annual value of the means of production, thousands MDL	3230.5	3831.1	118.5
Remuneration fund (the value-equivalent of labor potential), thousands of lei	535.0	630.3	117.7
Direct cost of materials, thousands of lei	1532.4	1823	118.9
Total value of the full potential of resources, thousands of lei	15750.9	16324.4	103.6

Source: calculated by the authors and based on the data in the specialized forms on the activity of agricultural enterprises.

Our data analysis demonstrates that, compared with the average of 2011-2013, resource potential on average for agriculture changed as follows:

- Value of fixed productive fund resending and direct cost of materials is increasing, corresponding to: 18.5%, 17.7% and 18.9%.
- The value of agricultural land has decreased by 4%.
- The value of the full resource potential increased by 3.6%.

This shows that the growth rate of the main resources (except for agricultural land) was high, but the value of the agricultural land, which in the structure of the resource potential constituted more than 60%, influenced an increase in the value of the full resources potential only 3.6%.

Table 2. Efficiency of the potential of partial and integral resources in the agricultural entities of the Republic of Moldova for two periods of the years 2011-2016

The indicator	On average, an agricultural entity		Average 2014-2016 in% compared to 2011-2013
	The year		
	2011-2010	2014-2016	
The surface of the agricultural land, ha	610	542	88.8
The value of global agricultural production (in comparable prices), thousands of lei	2450.2	2577.4	105.1
Agricultural land yield, lei:			
• to 1 ha	4016.4	4755.3	118
• to 1 leu worth	0.234	0.256	109
The yield of productive fixed assets, lei	0.75	0.67	89.1
Remuneration fund yield, lei	4.57	4.09	89.5
Yield of direct material costs, lei	1.60	1.41	88.1
Return of full resource potential, lei	0.155	0.158	102.0

Source: calculated by the authors based on the data in Table 1.

Data from Table 2 show that all levels of partial resource yields (except agricultural land expressed in value) are in decline. That is, the link between the growth rates of resources and their returns is inversely proportional. Ensuring the full potential of entities with full potential reduces the partial yields of resources. The full resource potential is up 2% on average, but compared to the full resource potential it is down 1.6 pp. The situation allows us to conclude that agriculture in agricultural entities in the Republic of Moldova is characterized by a low efficiency in using the resource potential. Not creating adequate systems necessary for structural changes to take place or to ensure efficient development, the Department of Agriculture did not create conditions for extended reproduction.

Another methodology for estimating the full potential of resources and determining yields is to propose indices, based on the value estimation of all resources expressed in the following relationship:

$$I_{PIR} = \frac{\frac{Ri_{t.a.}}{R_{t.a.}} + \frac{Ri_{m.f.}}{R_{m.f.}} + \frac{Ri_{f.r.}}{R_{f.r.}} + \frac{Ri_{c.m.}}{R_{c.m.}}}{\frac{S_{a.v.}}{S_{a.v.}} + \frac{VMF_i}{VMF} + \frac{Fr_i}{Fr} + \frac{Cm_i}{Cm}} = \sum \frac{Ri_{integral}}{R_{integral}} \div \sum \frac{Pi_{integral}}{P_{integral}} =$$

$$\bar{I}_r \div \bar{I}_p$$

where:

$I_{efic.econ.PIR}$  - the index of the efficiency of using the full potential of resources;

$Ri_{t.a.}, \bar{R}_{t.a.}$  - return on agricultural land and agricultural units (district, region) and the average for the country (Timofti 2008), lei;

$Ri_{c.m.}$  - direct cost of raw material on  $i$  agricultural units (rayon, region) and on average on the republic, lei;

$Ri_{f.r.}, \bar{R}_{f.r.}$  - return on fixed asset goods for farming **and** agricultural units (district, region) and the average for the country, lei;

$S_{a.v.}, \bar{S}_{a.v.}$  - return on labor remuneration fund **and** agricultural units (district, region) and the average for the country, lei;

$VMF_i, \overline{VMF}$  - the value of agricultural land at 1 enterprise in units **and the** average for the republic, MDL thousand;

$Fr_i, \bar{Fr}$  - the value of the fixed assets, thousands of lei

$Cm_i, \bar{Cm}$  - the labor remuneration fund at 1 enterprise in units **and** media on the republic, thousands lei;

$Cm_i, \bar{Cm}$  - direct material costs to one enterprise **and** units and the average for the republic, thousands of lei;

$\sum \frac{Ri_{integral}}{R_{integral}}$  - the sum of the individual indices of the overall resource yield used;

$\sum \frac{Pi_{integral}}{P_{integral}}$  - the sum of the individual indices of the full (potential) global resource potential;

$\bar{I}_r$  - the average full yield index;

$\bar{I}_p$  - the average index of total resources;

$i$  - number of the researched set;

If:

- $I_{efic.randamentului} PIR > 1$ , then the full potential of resources is used more efficiently on the researched units, the yield exceeds existence of the potential of resources;
- $I_{efic.randamentului} PIR = 1$ , then the full potential resource yield remained at the same level, and
- $I_{efic.randamentului} PIR < 1$ , then the rate of full resource potential yield has fallen.

Based on the data of the agricultural enterprises on the districts of the development regions of the Republic of Moldova, the proposed methodology was applied by calculating the main types of resources in an enterprise and the indicators of the yield of global agricultural production on average per enterprise based on resources. The following indices were then determined:

- the individual indices of each resource;
- individual indices of partial returns;
- the sum of the individual resource potential indices;
- the sum of individual returns on resources;
- average index of full resource potential;

- the average full yield index;
- the efficiency index of the full resource potential.

In 2013 - Romania -52.13% of UAA was worked by the farms with over 50 ha  
 - the 20th position in the EU.  
 - EU-28 -66% of the UAA is worked by the farms with over 50 ha.

Table 3. The share of UAA worked by the farms with over 50 ha in the selected EU countries, 2013 (%)

The highest share of UAA worked by selected countries (%)				The lowest share of UAA worked by selected countries (%)			
Country	% UAA	Country	% UAA	Country	% UAA	Country	% UAA
Slovakia	93.34	France	86.23	Malta	0	Greece	41.97
Czech Republic	92.70	Denmark	83.81	Slovenia	12.76	Italy	43.97
United Kingdom	88.37	Estonia	81.95	Cyprus	30.07	Ireland	50.73
Bulgaria	88.02	Germany	78.23	Poland	30.79	Croatia	51.43
Luxembourg	87.99	Hungary	74.27	Austria	37.91	Romania	52.13

Source: trends in farm structure and land concentration in Romania and the European Union's agriculture, A. Popescu, I.N. Alecu, T.A. Dinu, E. Stoian, R. Condei, H. Ciocan, based on Eurostat Database.

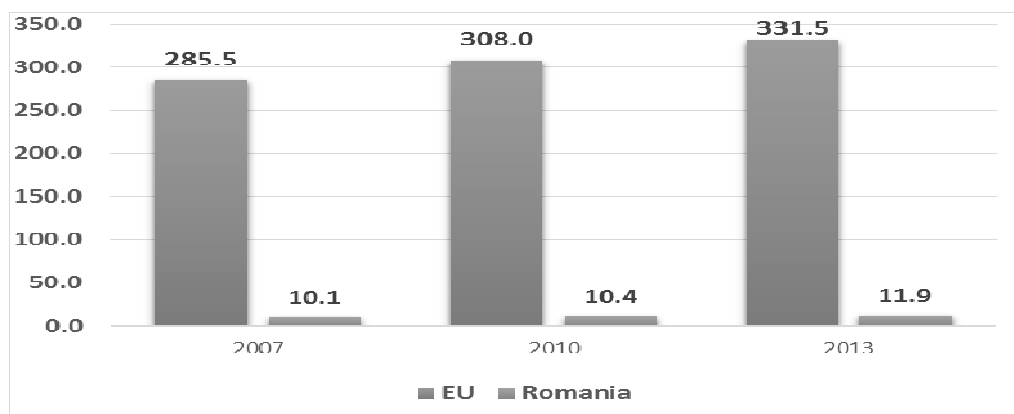


Fig. 1. Standard Output in Romania and the EU-28, 2007-2013 (Euro Billion)\

Source: see Table 3.



In 2013 - Romania carried out Euro 11.9 Billion SO by 18.4% more than in 2007.

- EU-28, Euro 331.5 Billion SO by 16.09% more than in 2007;

- Romania's contribution to the EU SO: 3.61% compared to 3.54% in 2007.

It comes on the 8th position after France (17.16%), Germany (13.94%), Italy (13.20%), Spain (10.85%), United Kingdom (6.61%), Poland (6.57%) and Netherlands (6.18%).

All these 8 countries totaled Euro 259 Billion SO, representing 78.12% of the EU-28 SO.

## **Conclusions**

This work and the model presented herein provide a base of support and suggest a robust set of opportunities for enriched inquiry regarding the effective use of strategic entrepreneurship and the benefits that can accrue to multiple stakeholders as a result.

- The concentration process is going slowly, but in the analyzed period progress was noticed.
- The number of holdings declines both in the EU-28 and Romania and the farm size is increasing with a positive impact on economic efficiency in terms of standard output.
- In the EU, 18 countries have over 16.1 ha/holding (EU mean) and 12 countries have a normal distribution of farms as the top 10% largest farms are working between 41% and 69% of the UAA.
- The EU policy must continue to support small and medium-sized farms in order to assure a higher concentration of land, production and efficiency.

1. Research shows that all levels of partial yields (excluding farmland expressed in terms of value) are in decline. The link between the growth rates of resources and their ranks is inversely proportional. If the full potential resource had declined by an average of 2014-2016 compared to 2011-2013 by 3.6%, then their yield increased only by 2%, i.e. by the difference of 1.6 pp

2. The grouping of the agricultural enterprises in the North Development Region according to the average indices of the full potential of resources shows that the indices of efficiency of the full potential resource efficiency in the first two groups are 1.8 and 1.28, respectively, and in the groups III and IV the indices show efficiency is down 10% and 36%, respectively, compared to the average for all units surveyed.

3. Determining the efficiency indices of utilization of the full potential of resources according to the proposed methodology allows the following:

- on the basis of individual indices it is possible to compare each resource, the partial randmanet on each unit studied (enterprise, district, region) with the level of comparison ;
- based on the full yield index of the resources used, the share of all resources is appreciated used to obtain the result on each unit studied against the basis of comparison ;
- on the basis of the full yield index the efficiency of the use of the full potential of the resources compared to the comparison base is appreciated;
- TAD maintain efficiency index render full potential resource use permits Apre the rate of over-achievement (non-achievement) of full return on resources.

The obtained result does not differ from the actual data that allows using the given model in the practice of forecasting the potential of resources used.

4. The full potential of resources in the Moldovan enterprises in the years 2011-2016 has been used inadequately; with the exception of agricultural land
- Agricultural businesses are expanding extensively;
  - Labor force is used inefficiently;
  - Direct material costs are not recoverable.
5. The advantages of the proposed methodology resumes to emphasize how we can obtain a profit, as well as measure the efficiency in agricultural entities applying monographic method, table method, mean and relative size method, correlation and regression method.

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