

Rădoi, Raluca-Alexandra; Drăghici, Manea; Merce, Emilian; Necula, Diana Maria

## Conference Paper

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# THE MARGINAL PROFITABILITY OF THE PRODUCTION'S MAIN FACTORS IN AGRICULTURAL FARMS FROM ROMANIA DEPENDING ON THE ECONOMIC SIZE

RĂDOI RALUCA-ALEXANDRA<sup>1</sup>, DRĂGHICI MANEA<sup>2</sup>, MERCE EMILIAN<sup>3</sup>, ILIE DIANA-MARIA<sup>4</sup>

USAMV BUCHAREST<sup>1</sup>, ASAS BUCHAREST<sup>2</sup>, USAMV CLUJ-NAPOCA<sup>3</sup>, ICEADR<sup>4</sup>

Corresponding author email: raluca\_nec@yahoo.com

**Abstract:** *The economic dimension of the agricultural farm is intensively studied both by agricultural specialists, who usually want farms as large as possible, but also by agrarian economists who measure the profitability of the factors involved in obtaining agricultural production at the scale of the economic dimension. In addition to established technical-economic indicators, such as: gross product, profitability, labor productivity, which show the overall efficiency of the factors, specific indicators are also used that show the separate efficiency of the factors through the marginal profitability, calculated with the help of elasticity coefficients. The paper used data provided by FADN- Eurostat, to calculate the elasticity of the capital and labor force, consumed in the agricultural holding, for the period 2007-2020, calculating the Cobb-Douglas production function. The coefficients of elasticity were calculated and compared for the six classes of economic size of the agricultural holding, from the South Muntenia Development Region, in order to draw conclusions regarding the profitability on capital and labor force, at the scale level. The authors aim to continue their studies with the analysis of elasticity coefficients at the level of the development regions of our country and their comparison with similar indicators from farms at the level of some regions of the European Union countries.*

**Keywords:** *agricultural farm, coefficient of elasticity, Cobb-Douglas function, scale economy.*

**JEL classification:** D01, D24

## INTRODUCTION

The Cobb Douglas production function is widely used both as a theoretical model and as a tool for evaluating the profitability on capital, labor and technical progress (*Debertin D, 1986*). The Cobb Douglas function helps in the optimal use of production factors (*Pamphile D, et al, 2020*).

After a comparative study of several types of production functions, it was concluded that the Cobb Douglas function best highlights the contribution of capital factors and labor in agricultural production (*Rakotoarisoa N., 2020*).

The Cobb-Douglas function, through the indicators it provides, highlights the complexity of research on the assessment of the determinants contribution of the economic growth by economic sectors (*Betancourt EW et al, 2020*). The elasticity coefficients of the Cobb Douglas function help us to calculate the marginal effect of the factors and also the effect of the action of the law of diminishing yields of the factors (*Zaman Gh, et al., 2022*).

The present study followed the analysis of the elasticity coefficients that reproduce the marginal profitability of the factors, at the scale level on the economic dimensions of the farms in the South Muntenia Development Region, with the help of the production function of the form:  $Y(\text{prod}) = K^\alpha \cdot F^\beta \cdot \lambda t$ , where:  $Y(\text{prod})$  = farm-level production expressed in euros,  $K$  = farm-level capital, expressed in euros;  $F$  = labor force consumed at farm level, expressed in UAM (Annual Labor Units);  $\alpha$  = elasticity of capital;  $\beta$  = elasticity of labor and  $\lambda t$  = elasticity of technical progress over time.

## MATERIAL AND METHOD

In the analysis of the profitability of agricultural holdings, the physical dimension and the economic dimension of the agricultural holdings are used. The size of agricultural holdings can be approached as a physical dimension and an economic dimension.

The physical size of agricultural holdings refers to the agricultural area used (SAU) on average by the agricultural holdings, number of animals (UVM) on the agricultural holding, number of workers (AWU) on the agricultural holding and other physical units on the agricultural holding. In our country, due to the very small average physical size of 3.4 ha per holding, the Strategy for the development of the agri-food sector in the medium and long term 2020-2030 encourages the merging of agricultural land through voluntary association, by leasing or buying land ( *MADR, 2015* ). It is also recommended to register agricultural properties in the national cadastre system, optimize the way subsidies are granted for small holdings, facilitate the association of farmers, introduce a minimum commercial size ( *CE, 2020* ).

The economic dimension is one of the important criteria in accessing European funds for agriculture. The economic size of the farm is determined on the basis of the Total Standard Production (SO-Standard Output), expressed in euros (Reg. CE 1.242/2008), at the level of the farm. SO is calculated by multiplying the area, respectively the number of animals in the holding, with the coefficients of each crop, respectively species ( *Agroinfo, 2017* ).

Eurostat statistics provide a classification of agricultural farms into six classes of economic size, depending on the SO, but also a classification according to the weight occupied by a certain agricultural activity, in 8 groups and in 14 groups, by countries and regions of development, starting in 2004 ( *FADN, 2022* ).

The study of the elasticity coefficients was done with the help of the Cobb-Douglas function, with technical progress, by classes of economic size, grouped according to Eurostat statistics ( *FADN, 2022* ). CD functions were calculated for the 6 groups of economic size, for the period 2007-2020, for the South-Muntenia Development Region.

The form of the Cobb-Douglas function with technical progress was:

$Y(\text{Gross product (€/farm)}) = AK(\text{€/farm})^\alpha \cdot L(\text{UAM/farm})^\beta \cdot \lambda t$  (time), where:

A= constant coefficient;  $\alpha$ =elasticity coefficient of capital,  $\beta$ =elasticity coefficient of labor and  $\lambda$ =elasticity coefficient of technical progress in time period t.

In the final equation, the three elasticity coefficients were verified by simulating the increase of each factor by 1% and evaluating the percentage increase of the gross product. At the same time, the multiple effect of  $\alpha \cdot \beta \cdot \lambda t$  was calculated empirically, by simulating the simultaneous increase by 1%, of the three factors of the function ( *Necula Raluca et al., 2016* ). The significance of the function was evaluated by the coefficient of determination and the correlation coefficient, for transgression probabilities of 0.05(\*significant); 0.01(\*\* distinctly significant) and 0.001(\*\*\*)highly significant).

The calculation of the tendency of the coefficients of elasticity, for the 6 classes of economic size, was done with the second degree parabola equation and the maximum and statistical significance of the equation was calculated ( *Merce E., 2018* ).

## RESULTS AND DISCUSSION

The South Muntenia region borders the southern part of the Southern and Eastern Carpathians towards the Romanian Plain and has the Danube river as its natural border. The relief of

the region is characterized by variety, amphitheater-shaped layout and the predominance of low-altitude landforms. Plains and meadows occupy 70.7%, hills 19.8%, and mountains only 9.5% of the region's surface. The South Muntenia region has the largest area of agricultural land in the country (2,433,534 ha), of which arable land occupies most of the agricultural area (80.90%), followed by pastures (11.77%), hayfields (4.47%), vineyards (1.16%) and orchards (1.69%). The South Muntenia region stands out for its high share of rural settlements, so the share of the population in 2018 was 42.8% in urban areas and 57.2% in rural areas. The main sectors that contributed, in 2017, to the formation of the regional GDP in South Muntenia were: industry - with a weight of 36.24%; agriculture and fishing – with a weight of 7.51%; trade, services and others with 51% (of which constructions 5.27%) (ADR Sud – Muntenia, 2021).

The analysis in the South-Muntenia Development Region, for the period 2007-2020, followed 3 levels: 1) Analysis of the evolution of indicators: output (€/farm), assets (€/farm), labor input (AWU/farm) and SAU ( ha/farm), by classes of economic size; 2) Analysis of R(k) and R(AWU) ratios by classes of DE and 3) Analysis of elasticity coefficients, respectively elasticity coefficients, of capital and labor on the DE scale of agricultural farms, for the period 2007- 2020, in the South Muntenia Development Region.

### 1) Analysis of the evolution of indicators: output (€/farm), assets (€/farm), labor input (AWU/farm) and SAU (ha SAU/farm), by DE classes

From the analysis of the evolution, with the help of the annual growth rate, by size classes, of the gross product (Pb) and the total capital (k) at the level of farms, by DE classes , for the period 2007-2020, it was found that these indicators have growth trend during the analyzed period, in the 1st grade, (2.06% and 3.2%); in the 3rd grade (1.8% and 2% ) **and** in the 4th grade (1.5% and 0.4%).

**Table 1. The main indicators evolution per farm, by DE classes, for the period 2007-2020, in the South-Muntenia Development Region**

Economic dimension (DE)		2007	2010	2015	2019	2020	Average(MU)	Coef. Var. (%)
(1) 2 000 - < 8 000€	Output (mii €/farm)	4,8	7,3	6,5	6,3	6,2	12,6	<b>2,06</b>
(2) 8 000 - < 25 000€	Output (€/farm)	24,4	16,6	19,9	17,5	17,1	18,0	<b>-2,53</b>
(3) 25 000 - < 50 000€	Output (€/farm)	0,0	45,8	54,7	42,8	38,5	45,3	<b>1,76</b>
(4) 50 000 - < 100 000€	Output (€/farm)	0,0	90,9	89,2	83,2	80,5	32,7	<b>1,53</b>
(5) 100 000 - < 500 000 €	Output (€/farm)	553,9	271,8	303,3	239,4	297,7	28,0	<b>-6,25</b>
(6) >= 500 000€	Output (€/farm)	1194,6	2096,8	1351,3	1105,3	1563,8	21,4	<b>-0,60</b>
(1) 2 000 - < 8 000€	Assets (mii €)	21,4	26,3	28,2	32,4	27,2	14,7	<b>3,23</b>
(2) 8 000 - < 25 000€	Assets (mii €)	51,4	45,4	52,6	59,2	47,9	11,6	<b>1,10</b>
(3) 25 000 - < 50 000€	Assets (mii €)	0,0	84,8	86,7	107,7	74,6	44,3	<b>1,98</b>
(4) 50 000 - < 100 000€	Assets (mii €)	0,0	152,6	127,4	160,8	142,3	42,9	<b>0,36</b>
(5) 100 000 - < 500 000 €	Assets (mii €)	894,7	540,6	549,3	667,4	598,8	25,3	<b>-2,23</b>
(6) >= 500 000€	Assets (mii €)	2477,8	3688,2	2736,6	2941,7	3008,4	18,3	<b>1,33</b>
(1) 2 000 - < 8 000€	Labour input (AWU)	1,79	1,16	0,98	1,01	1,2	21,0	-4,31
(2) 8 000 - < 25 000€	Labour input (AWU)	3,15	1,40	1,15	1,14	1,5	35,1	<b>-7,52</b>
(3) 25 000 - < 50 000€	Labour input (AWU)		2,16	1,45	1,48	1,7	21,8	<b>-4,44</b>
(4) 50 000 - < 100 000€	Labour input (AWU)		2,81	1,80	1,71	2,5	16,4	<b>-4,42</b>
(5) 100 000 - < 500 000 €	Labour input (AWU)	21,99	6,90	3,83	3,72	6,5	74,7	<b>-12,78</b>
(6) >= 500 000€	Labour input (AWU)	42,06	33,23	14,32	14,95	23,5	41,7	<b>-7,65</b>
(1) 2 000 - < 8 000€	SAU (ha)	3,4	3,5	3,3	3,4	3,1	14,0	<b>-0,04</b>
(2) 8 000 - < 25 000€	SAU (ha)	14,6	11,5	10,1	9,9	9,7	19,9	<b>-2,99</b>

Economic dimension (DE)		2007	2010	2015	2019	2020	Average(MU)	Coef. Var. (%)
(3) 25 000 - < 50 000€	SAU (ha)	-	58,3	35,8	36,5	40,9	21,8	<b>-1,94</b>
(4) 50 000 - < 100 000€	SAU (ha)		157,8	97,6	91,4	118,0	23,7	<b>-5,00</b>
(5) 100 000 - < 500 000 €	SAU (ha)	546,5	511,5	374,3	375,2	431,7	17,6	<b>-2,85</b>
(6) >= 500 000€	SAU (ha)	1.907	1.649	1.399	1.340	1547,4	13,8	<b>2,68</b>

Data source: FADN, 2022, <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>

Of these, only in the 4th class, there is an increase in the gross product higher than the increase in the total capital. In classes 2, and 6, there is a decrease in the gross product on the farm, while the capital has increases. In the 5th grade, a simultaneous decrease in gross product (-6.3%) and capital (-2.2%) is observed (Table 1).

The analysis of the annual growth rate of labor consumption on the farm highlights that it decreased during the period 2007-2020, on all types of DE farms with rates between -12.8% on farms in the 5th class, to -4.3% for farms in the 1st class.

The analysis of the physical size of the farms results in a decrease between an annual rate of -5.0% for farms in the 4th class to -1.9% for farms in the 2nd class. The farms in the 1st class maintain their average size of 3.1 ha, compared to the value of 3.4 ha/farm at country level. As a growth rate, only farms from the 6th grade increased, respectively 2.68% (Table 1).

## 2) Analysis of R(k) and R(AWU) ratios by economic size classes.

The trend analysis of the link between the evolution of the gross product on the farm, the total capita on the farm and the labor consumption on the farm was done by analyzing the annual growth rate of the ratios: gross product/capital, gross product/labor consumption, gross product on the farm per 1 ha SAU, the ratio between Pb plant production and Pb animal production (V/A) and by the structure of the main crops (cereals, oleaginous and other crops).

From the analysis of the ratio R(k), respectively of PB/1€ capital, it appears that it is decreasing from one size class to another and what is interesting is that this decrease is increasingly larger as the size of the size class increases, from 0.56% in the 1st class, to -1.38% in the 2nd class and to -3.11% in the 6th class (Table 2).

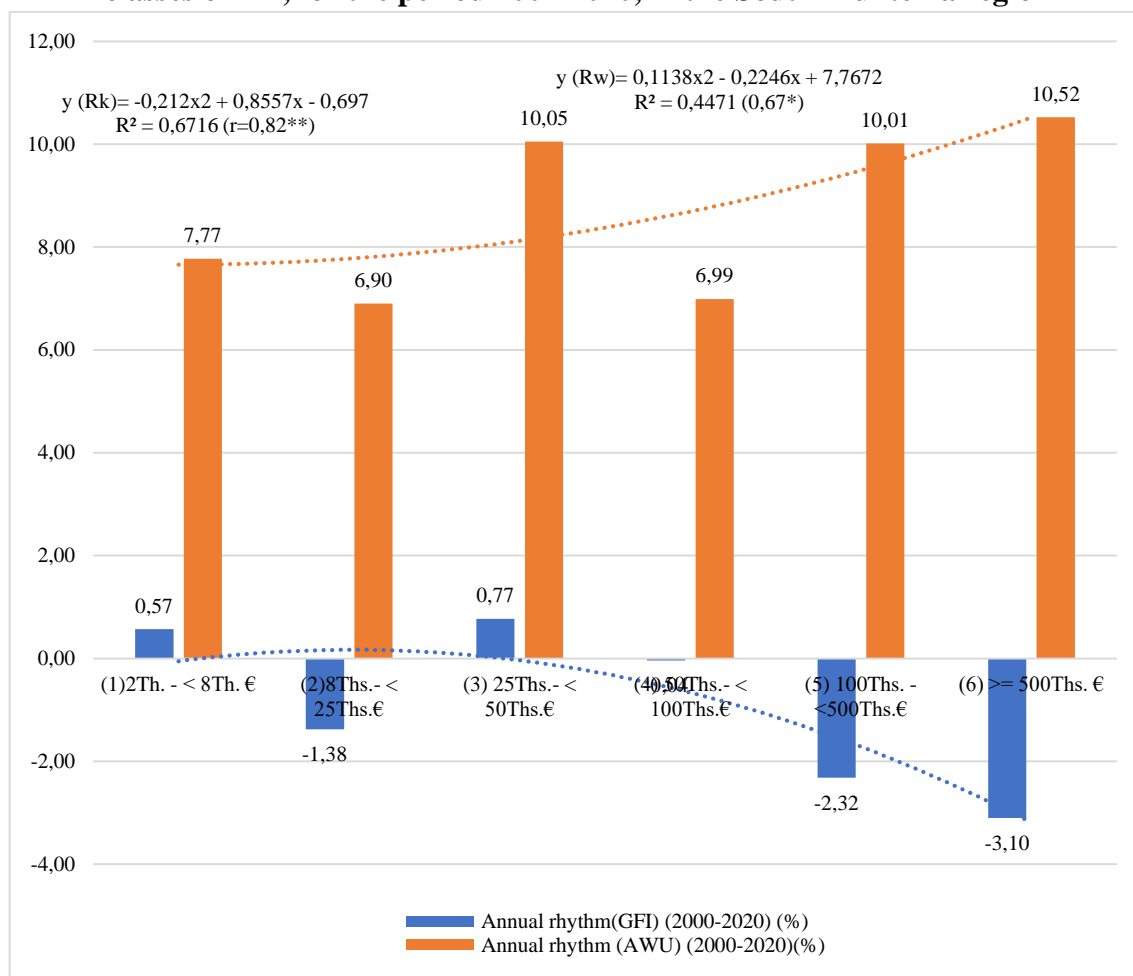
To measure the correlation between the rates of annual growth of the ratio R(k) and DE of the farms, we used the equation of the second degree, from which a distinctly significant correlation emerged ( $r=0.82^{**}$ ). This strong correlation very well mirrors the universal law of diminishing yields as one of the factors gets higher and higher.

**Table 2. The evolution of R(k) and R(F) ratios by economic size classes of farms, in the South -Muntenia development region, for the period 2007-2020**

Economic Dimension (DE)	Assets (Total)					Labor input (AWU) (Total)				
	Ratio (k)= (Gross Farm Income (€)) / (Total assets (€))				Rhythm R(GFI) (2000-2020)	Ratio (AWU)=(Gross Farm Income (€)) / (Total labor input (AWU))				Rhythm R(AWU) (2000-2020)
	2007	2020	difference	%	%	2007	2020	difference	%	%
(1) 2 thousand - < 8 thousand €	2.03	2.22	0.19	109.4	0.6	2704	6251	3,547	231.2	7.77
(2) 8 thousand- < 25 thousand €	2.33	2.20	-0.13	94.3	-1.4	7748	15345	7,597	198.1	6.91
(3) 25 thousand- < 50 thousand €	1.54	1.88	0.35	122.5	0.8	14472	28899	14,427	199.7	10.05
(4) 50 thousand- < 100 thousand €	1.48	1.64	0.17	111.2	0.0	23572	48637	25,066	206.3	6.99
(5) 100 thousand - < 500 thousand €	1.82	1.42	-0.40	77.8	-2.3	25189	64342	39,154	255.4	10.01
(6) >= 500 thousand €	2.17	1.19	-0.97	55.1	-3.1	28403	73935	45,533	260.3	10.52

Data source: FADN, 2022, <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>

**Figure 1. Annual growth rates, by classes of DE of GF (gross product/capital) and AWU, by classes of DE, for the period 2007-2020, in the South Muntenia region**



In the same way it was calculated to find out the correlation R(AWU) with DE of the farms and a significant correlation resulted ( $r=0.67^*$ ).

**Table 3. The evolution of R(k) and R(F) ratios by economic size classes of farms, in the Sud-Muntenia development region, for the period 2007-2020**

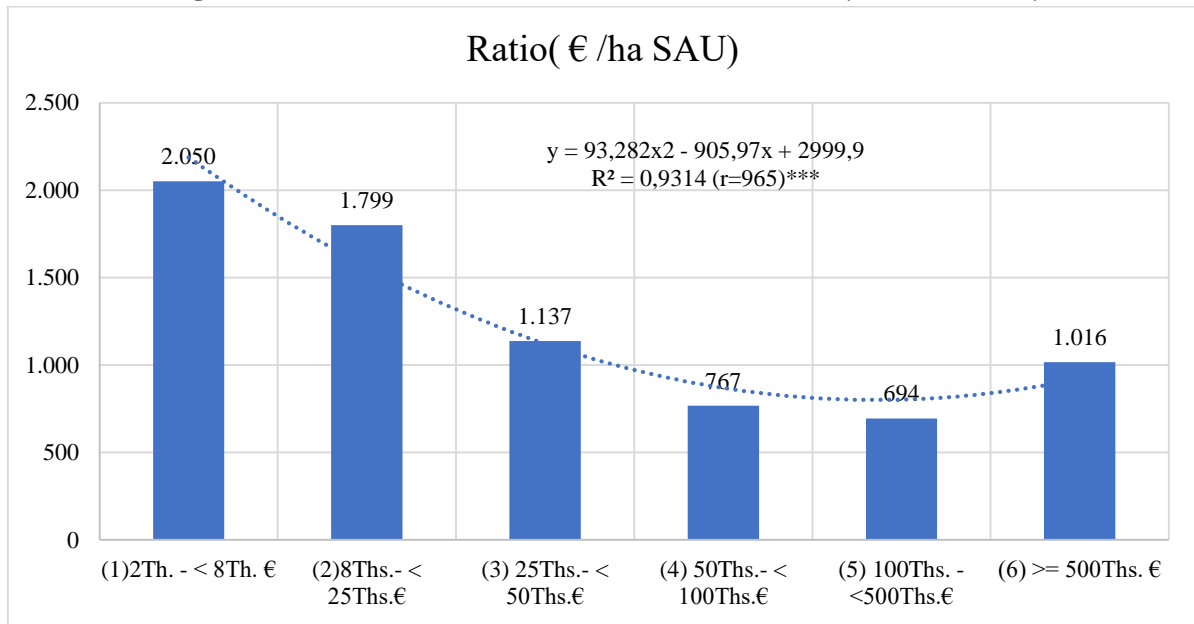
Economic dimension (DE)	Average reports 2007-2020					Structure of crops		
						Cereals	Oleaginous	Other cultures
	€/ha SAU	€/LU	€/ work	Ratio(V/A)	V/A	%	%	%
(1) 2Thousand - < 8Thousand €	2,050	948	5,528	0.73	0.73	40.3	6.9	52.8
(2) 8 Thousand- < 25 Thousand €	1,799	934	12,367	1.18	1.18	33.5	10.6	55.9
(3) €25,000- < €50,000	1,137	961	27,705	1.80	1.80	48.0	21.4	30.6
(4) 50 Thousand- < 100 Thousand €	767	947	35,448	5.51	5.51	54.9	27.9	17.2
(5) 100 Thousand -<500 Thousand €	694	1,134	55,440	17.42	17.42	58.1	32.9	9.0
(6) >= 500 thousand €	1,016	1.007	74,665	2.50	2.50	62.0	32.5	5.5

Data source: FADN, 2022, <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>

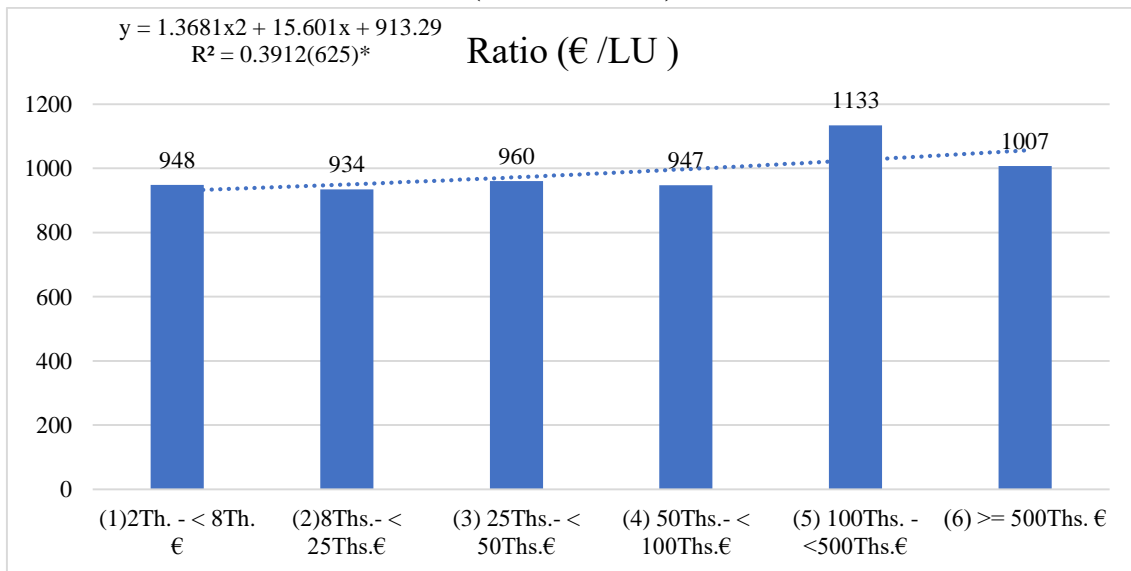
The dynamic analysis of Pb per ha SAU, by classes of DE, for the period 2007-2020, highlights a decrease by classes of DE, from 2050 €/ha SAU in the 1st class, to 694 €/ha SAU in the 5th grade. Approximated with the parabola of the second degree (Figure 2), it shows us a highly significant correlation ( $r=0.96^{***}$ ).

Analysis of livestock production per UVM (€/UVM), this is around €950/UVM (Table 3) with a slight increase in the 5th and 6th classes. As a trend, the correlation coefficient between value animal production on UVM and DE of farms is significant ( $r=0.62^*$ ).

**Figure 2. The correlation between €/ha OR Ratio (Th=thousand)**

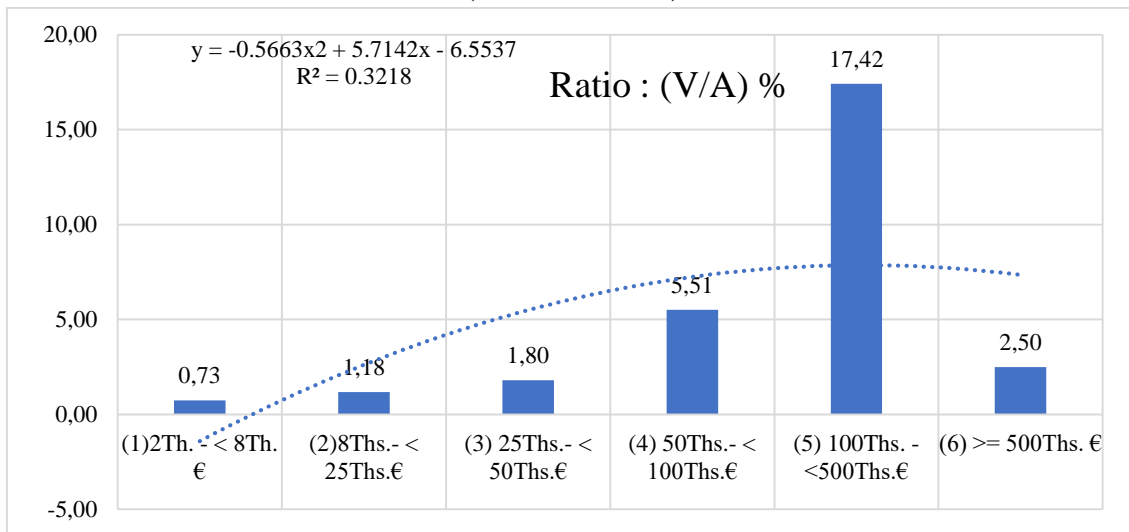


**Figure 3. The correlation between the Ratio and DE of the farm €/LU and DE of the farm (Th=thousand)**

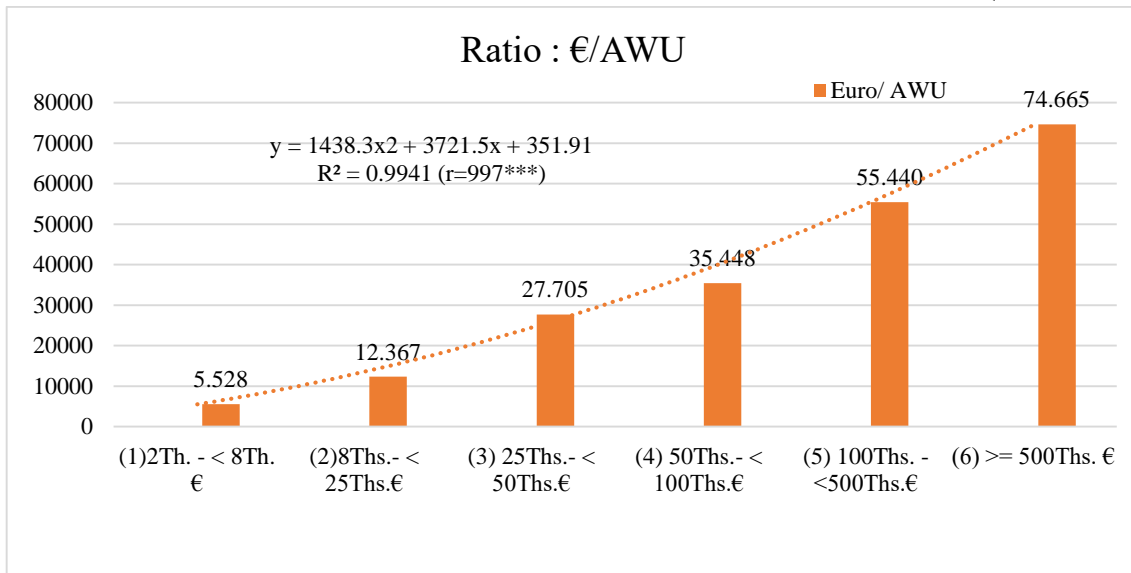


It is interesting to analyze the value ratio between plant and animal production. It increases from 0.73 in the 1st grade to 17.42 in the 5th grade, after which it decreases to 2.50 in the 6th grade, a ratio close to 1.80, which characterizes the 4th of DE. This indicator of 2.50 is explained by the fact that large farms have focused on raising animals, which are profitable by raising them in large combined farms (cattle, pigs, birds).

**Figure 4. The correlation between the V/A Ratio according to the DE of the farm (Th=thousands)**



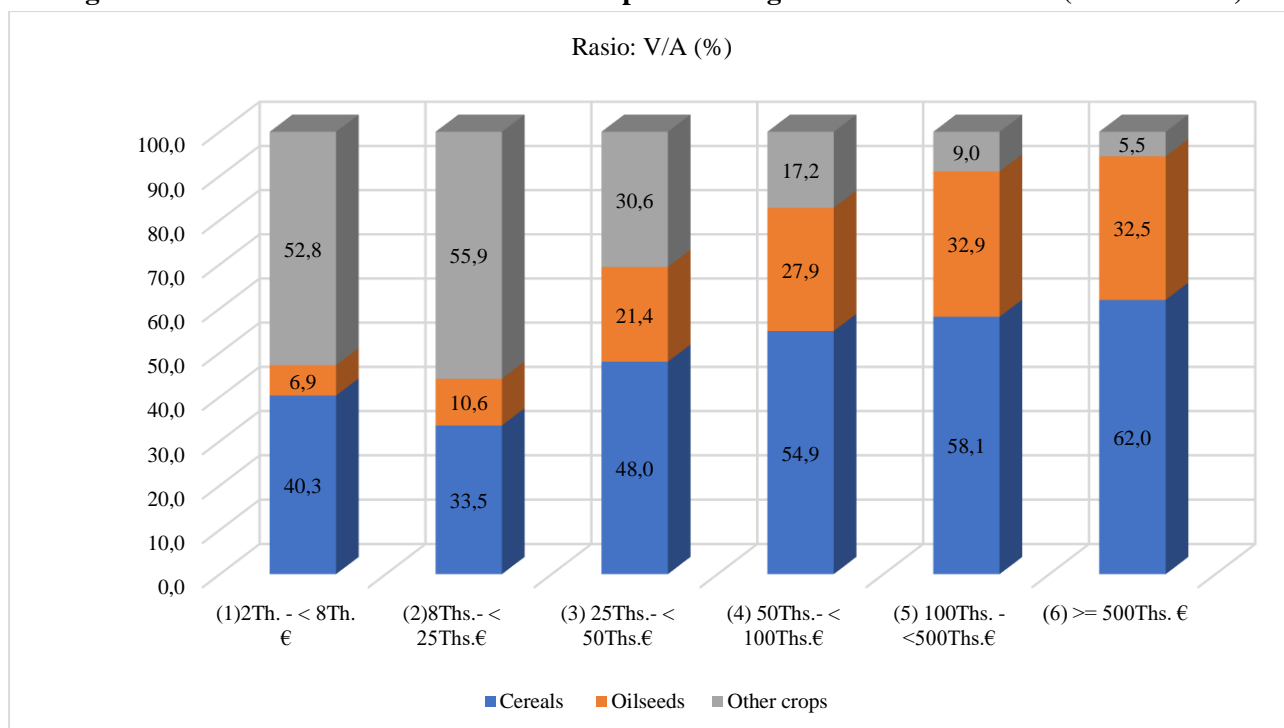
**Figure 5. The correlation between the €/AWU Ratio and the DE of the farm (Th=thousands)**



The dynamic analysis of Pb per AWU, by DE classes, for the period 2007-2020, highlights a continuous increase of the gross product per AWU, from 5528€/AWU in 2007 to 74665€/AWU in 2020. This the trend is statistically very significant depending on the economic size of the farm (r=0.997\*\*\*).



**Figure 6. The value structure of the main crops according to the DE of the farm (Ratio V/A %)**



From the analysis of the value structure of crops (Table 3, Figure 6), it is found that cereals represent 40.3% in the 1st class of DE and reaches 62.0% in the 6th class of DE. As well as oleaginous crops which represent 6.9% in the 1st class of DE and 32.5% in the 6th class of DE. Cereal crops and oleaginous plants together hold 47.2% in the 1st DE class and reach 94.5% in the 6th DE class, due to the orientation towards the most profitable crops and the most complete mechanization.

### 3) The elasticity coefficients analysis, respectively of the capital and the labor force on the DE scale of agricultural farms, for the period 2007-2020, in the South Muntenia Development Region.

The elasticity coefficient analysis gives us the opportunity to ascertain the qualitative part of the tendency of the return on capital and labor force by DE classes.

**Table 4. The correlation between the economic dimension and the CD elasticity coefficients and some technical and economic indicators that characterize the farms of the South-Muntenia Development Region, for the period 2007-2020**

Economic dimension (DE)	Cobb-Douglas				Meaning			Average farm indicators				
	a	$\beta$	$\lambda t$	$\alpha.\beta.\lambda.t$	R <sup>2</sup>	r	Sgnf..	SAU	Ratio (V/A)	Ratio (O/I)	LU	
	wave.	wave.	wave.	wave.	%	wave.	x	Ha	wave.	wave.	No.	LU/ha
(1) 2Th. - < 8Th. €	0.66	-0.59	-0.03	-2.45	0.63	0.79	**	3.07	0.74	1.30	3.48	1.13
(2) 8Th. - < 25Th.€	0.54	0.54	0.03	3.87	0.61	0.78	**	9.66	1.18	1.38	8.45	0.87
(3) 25 Th. - < €50 Th.	-0.05	0.35	0.04	4.27	0.32	0.57	*	40.93	1.80	1.29	17.98	0.45
(4) 50 Th.s- < €100 Th.	0.08	0.47	0.03	3.16	0.25	0.50	*	118	5.51	1.17	16.91	0.15
(5) 100Th. -<500Th.€	-0.14	0.69	0.05	5.80	0.62	0.79	**	432	17.45	1.05	31.28	0.06
(6) >= €500 Th.	0.58	-0.12	-0.03	-2.78	0.44	0.66	*	1,547	2.50	1.13	588.0	0.36
Coef. Determination (D)	0.61	0.42	0.67	0.64	x	x	x	0.96	0.95	0.88	1.00	x
Coef. Correlation.(C)	0.78**	0.65*	0.82**	0.80**	x	x	x	0.97***	0.97***	0.93***	0.99***	x
Min-Max determination of coef. $\alpha$ and $\beta$ of the CD function	Coef. parable							SAU	x	x	x	x

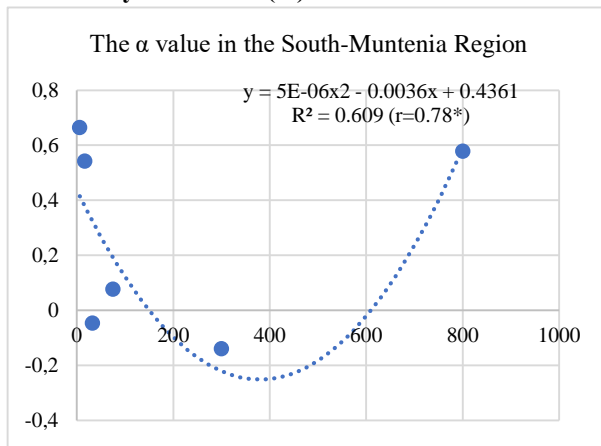
Economic dimension (DE)	Cobb-Douglas				Meaning			Average farm indicators				
	a	$\beta$	$\lambda t$	$\alpha.\beta.\lambda.t$	R <sup>2</sup>	r	Sgnf..	SAU	Ratio (V/A)	Ratio (O/I)	LU	
	wave.	wave.	wave.	wave.	%	wave.	x	Ha	wave.	wave.	No.	LU/ha
Economic dimension	a	$\beta$	of	b	c	R	Sgnf.	Ha	x	x	x	x
381.3 Th. euros	-0.248		0.000005	-0.004	0.436	0.780	*	562	x	x	x	x
379.8 Th. euros		0.825	-0.000005	0.004	0.047	0.652	*	366	x	x	x	x

Data source: FADN, 2022, <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>

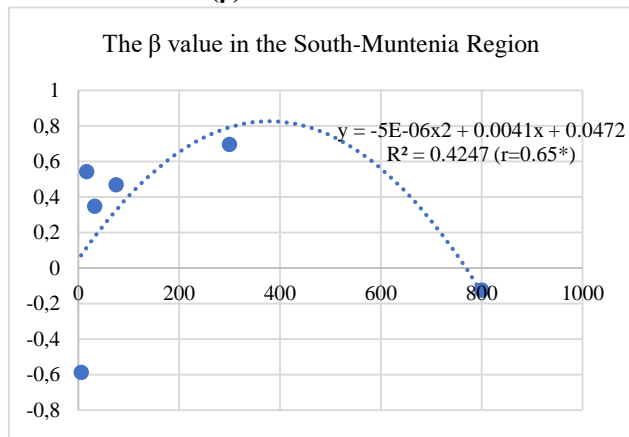
The analysis of the capital's elasticity coefficient ( $\alpha$ ), by classes of DE of farms in the South-West Oltenia Region, shows us that the contribution is positive in 4 classes of DE of farms. In the 1st grade of DE, it has the highest contribution of 0.66, in the 2nd grade of 0.54, it decreases to 0.08 in the 4th grade and increases in the 6th grade to 0.58. Overall, the trend calculated using a parabola of the second degree (Chart 6,  $r=78^{**}$ ) helps us to calculate the minimum trend of -0.248, which corresponds to a farm with an economic size of €380 Th. per farm and an area of farm of 562 ha.

The analysis of the labor force elasticity coefficient ( $\beta$ ) shows that it is positive in four classes 2nd (0.54), 3rd (0.35), 4th (0.47) I a 5th (0.69). It is negative in farms where the elasticity coefficient of capital ( $\alpha$ ) is also negative, respectively in the 1st (-0.59) and 6th (-0.12) classes. By calculating the trend with the parabola of the second degree, which is significant (Chart 7,  $r=0.65^*$ ), a maximum coefficient of 0.825 results, which would correspond to a farm with an economic size of €379 Th., respectively of a farm of 366 ha SAU.

**Figure 7. The correlation between the capital elasticity coefficient ( $\alpha$ ) and the DE of the farm**

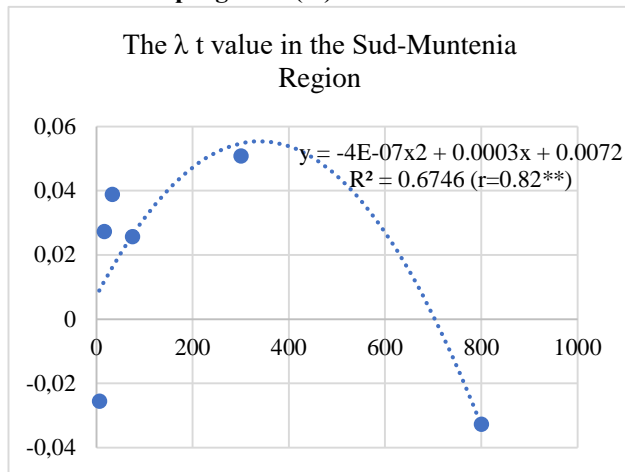


**Figure 8. The correlation between labor force elasticity coefficient ( $\beta$ ) and farm DE**

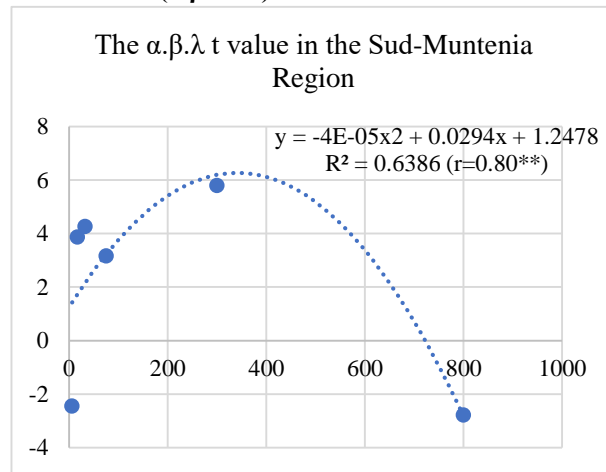


The analysis by classes of DE of the coefficient of technical progress ( $\lambda$ ), shows us that it has a negative value for farms in the 1st (-0.03) and 6th (-0.03) classes (Figure 9), which can be explained by an endowment with fixed assets. By approximating the trend with the parabola of the second degree, (distinct statistically significant,  $r=0.82^{**}$ ), it results that the trend has a maximum of 0.055, which corresponds to farms with an economic size of €340 Th. per farm, respectively of a farm of 330 ha SAU.

**Figure 9. Correlation between the elasticity coefficient of technical progress ( $\lambda t$ ) and DE of the farm**



**Figure 10. Correlation between the multiple elasticity coefficient ( $\alpha.\beta.\lambda t$ ) and DE of the farm**



The combined influence of the three coefficients was empirically calculated by simulating the three factors simultaneously with 1%, which resulted in the multiple elasticity coefficient of the three factors ( $\alpha.\beta.\lambda t$ ), which has negative values in class 1- a (-2.45) and 6th (-2.78) and positive in the other classes, with a maximum value of 5.80 in the 5th class of DE .

By approximating the trend with the parabola of the second degree, (distinct statistically significant  $r=0.80^{**}$ ), it follows that the trend has a maximum of  $\alpha.\beta.\lambda t = 6.26$ , for farms with an economic size of € 341 Th. per farm, respectively of a farm of 332 ha SAU.

## CONCLUSIONS

a) The marginal return on capital ( $\alpha$ ) on the scale of the economic size of agricultural farms from the analysis carried out demonstrates a rather important downward trend in classes 1 and 5 and falls under the law of diminishing yields.

b) The marginal profitability of labor on the scale of economic size of agricultural farms registers a very significant increase from -0.59 in the 1st class to 0.69 in the 5th class.

c) The marginal profitability of technical progress ( $\lambda t$ ) on the scale of economic size of agricultural farms shows negative values in classes 1 and 6 and positive values in the other classes. The trend analysis results in a maximum ( $\lambda t = 0.055$ ), for a farm size of €340 Th.

d) The combined marginal profitability of the 3 factors has a synergistic effect of  $\alpha.\beta.\lambda t = 6.26$ , which corresponds to a farm size of €340 Th.

e) The analysis of the marginal profitability trend demonstrates a minimum of capital ( $\alpha = -0.263$ ) for an economic size of €381.3 Th. per farm, a maximum of the labor force ( $b = 0.833$ ), a maximum of technical progress ( $\lambda t = 0.055$ ) and a maximum of the combined effect ( $\alpha\beta\lambda t = 6.26$ ). This demonstrates that the maximum profitability of the factors for the period 2004-2020, in the South Muntenia Development Region, is located at farms with an economic size between 340 and 380 Th. €/farm.

f) Contrary to the general perception that in very large farms in terms of area, the gross product would consist only of plant production, the analysis shows that the ratio (V/A) of 2.5, i.e. almost a third is obtained from production animal. This ratio is close in value to the 3rd and 4th DE classes.

g) We consider it necessary to continue the research also at the level of other development regions and some development regions in the countries of the European Union, with a view to a wider evaluation of the marginal profitability of the factors.

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