

STUDY REGARDING ECONOMIC EFFICIENCY OF CHEMICAL AND ORGANIC FERTILIZERS APPLIED ON NATURAL MEADOWS OF *AGROSTIS CAPILARIS* AT PREAJBA - COUNTY GORJ

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Abstract: *The grasslands of Subcarpathian area of Oltenia, can give valuable production when applying chemical fertilizers, organic products or combinations between the two. This work was supported by the strategic grant POSDRU/159/1.5/S/133255, Project ID 133255 (2014), cofinanced by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007-2013.*

To determine the economic efficiency of natural grasslands, research has been undertaken within Fodder Crops and Pasture Research Center at Preajba - Gorj, belonging to the University of Craiova, where the grassland was fertilized with chemical fertilizers and organic, using 8 variants in 3 rehearsals.

It was determined a set of indicators of economic efficiency: raw product, variable costs, fixed costs, production costs, and the indices: total expenditure rate of profit, income taxes, net profit and net profit rate. Gross profit was calculated using gross profit margin from which were decreased fixed costs, gross profit margin being calculate as the difference between raw product and variable expenses.

Key words: *pastures, manure, fertilizers, profit, gross profit margin*

INTRODUCTION

In Gorj county permanent grasslands area is approximately 130,000 ha, of which about 100,000 ha and 30,000 ha are pasture meadows (Romanian Statistical Yearbook, 2013). Hay fields are often operate mixed, grazing take part always in early spring, regardless of weather conditions, out of necessity, preserved feed stock being exhausted. In these circumstances, the best possible exploitation of grassland areas represents a necessity[1],[5].

MATERIALS AND METHODS

For the best possible exploitation of natural grasslands, they must be well maintained and preserved, valuable species which they contain being sensitive to climatic and anthropogenic factors[2][3].

Determination of economic efficiency and choosing the best fertilization was the purpose of the experience. For this, the Experimental Centre for Culture meadow Preajba, jud. Gorj, was chosen as a representative area of natural grassland of *Agrostis capillaris*.

Experience was arranged in randomized blocks 8 variants in 3 repetitions, variations chosen being as follows:

Var. 1 = unfertilized;

Var. 2 = 5 t/ha manure;

Var. 3 = 10 t/ha manure;

Var. 4 = 15 t/ha manure;

Var. 5 = 20 t/ha manure;

Var. 6 = 10 t/ha manure + 50 kg/ha N + 50kg/ha P₂O₅ + 50kg/ha K₂O;

Var. 7 = 15 t/ha manure + 50 kg/ha N + 50kg/ha P₂O₅ + 50kg/ha K₂O;

Var. 8 = 20 t/ha manure + 50 kg/ha N + 50kg/ha P₂O₅ + 50kg/ha K₂O.

- For calculations of economic efficiency were determined a series of indicators:
- The crude product constructed by adding of grants (amounting to 156.89 euro / ha) to the main production,
 - Variable expenses on fertilizers, organic and chemical, mechanical works, seasonal workers and insurance,
 - fixed expenses of permanent labor employees which includes general expenses,
 - Gross margin, determined as the difference between crude product and variable expenses,
 - Gross profit,
 - Profitului rate, net profit,
 - Net profit rate.[4]

RESEARCH RESULTS

Total crude product had a maximum value for the solutions proposed for fertilization with 20 t / ha + 50 kg / ha N + 50 kg / ha P₂O₅ + 50kg / ha K₂O of 2346.59 lei, and a minimum of 1506.59 lei at fertilization with 5 t / ha manure. Witness registering 1398.59 lei.

Variable expenses have increased steadily with the applied dose from 385 lei to witness, at 909 lei for the highest doses.

Total production costs are 488.47 lei for witness 556.43 lei fertilized variant 5 t / ha manure, 614.93% to 10 t / ha manure applied, 666.14 lei in the case of 15 t / ha manure, 734.1 lei to 20 tons manure.

When combining the two types of fertilizers (chemical and organic), total expenditures reached 947.31 lei for version 10 t / ha manure + 50 kg / ha N + 50 kg / ha P₂O₅ + 50kg / ha K₂O, 1009.06 lei to 15 t / ha manure + 50 kg / ha N + 50 kg / ha P₂O₅ + 50kg / ha K₂O and 1061.81 lei for fertilization with 20 t / ha manure + 50 kg / ha N + 50 kg / ha P₂O₅ + 50kg / ha K₂O.- table 1.

Table 1

Economic efficiency of various treatments applied to natural grassland of *Agrostis capillaris*, Preajba – Gorj

No.	Specification	Variant	Quantity* (tons dry matter)	Unit price (Lei/t)	Value** (Lei)
1.	CRUDE PRODUCT		-	-	-
1.1.	Main production (average yield - kg / ha)	unfertilized	2,34	300	702
		5 t/ha manure	2,7		810
		10 t/ha manure	2,81		843
		15 t/ha manure	3,1		930
		20 t/ha manure	3,3		990
		10 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	4,35		1305
		15 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	4,92		1476
		20 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	5,50		1650
1.2.	Gross product from the marketable production	unfertilized	-	-	702
		5 t/ha manure	-	-	810
		10 t/ha manure	-	-	843

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		15 t/ha manure	-	-	930	
		20 t/ha manure	-	-	990	
		10 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	1305	
		15 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	1476	
		20 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	1650	
1.3.	Subsidies	(156,89 euro/ha, 1 euro 4,44 lei)	-	-	696,59	
1.4.	Total gross product, including subsidies	unfertilized	-	-	1398,59	
		5 t/ha manure	-	-	1506,59	
		10 t/ha manure	-	-	1539,59	
		15 t/ha manure	-	-	1626,59	
		20 t/ha manure	-	-	1686,59	
		10 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	2001,59	
		15 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	2172,59	
		20 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	-	-	2346,59	
2.	VARIABLE EXPENSES	-	-	-	-	
2.1	<i>Fertilizers</i>	unfertilized	-	-	-	
	<i>Fertilizers, manure</i>	5 t/ha manure	5	10	50	
	<i>Fertilizers, manure</i>	10 t/ha manure	10	10	100	
	<i>Fertilizers, manure</i>	15 t/ha manure	15	10	150	
	<i>Fertilizers, manure</i>	20 t/ha manure	20	10	200	
	<i>Fertilizers NPK (15:15:15) manure</i>	10 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	150 kg 10 tone	2 10	400	
	<i>Fertilizers NPK (15:15:15) manure</i>	15 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	150 kg 15 tons	2 10	450	
	<i>Fertilizers NPK (15:15:15) manure</i>	20 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O	150 kg 20 tons	2 10	500	
	2.2.	<i>Mechanical works with own means</i> (diesel / lubricants, spare parts, repair)	unfertilized	35 liters	6 15	225
			5 t/ha manure	36 liters	6 15	231
10 t/ha manure			37 liters	6 15	237	
15 t/ha manure			37 liters	6 15	237	
20 t/ha manure			38 liters	6 15	243	
10 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O			39 liters	6 15	249	
15 t/ha manure + 50N 50 P ₂ O ₅ 50K ₂ O			39 liters	6 15	249	
20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			39 liters	6 15	249	

2.3.	<i>Crop insurance</i>		-	-	40
2.4.	<i>Seasonal labor expenses</i>		2 Z.O	60	120
2.5	TOTAL VARIABLE EXPENSES	unfertilized			385
		5 t/ha manure			441
		10 t/ha manure			497
		15 t/ha manure			547
		20 t/ha manure			603
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			809
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			859
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			909
3.	FIXED EXPENSES				
3.1.	<i>Expenditure related to permanent employee workforce</i> = Mechanical work = No. hours x Rate / hour	unfertilized	9	10	90
		5 t/ha manure	10		100
		10 t/ha manure	10		100
		15 t/ha manure	10		100
		20 t/ha manure	11		110
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	11		110
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	12		120
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	12		120
3.2.	General expenses (3.5% of variable expenses)	unfertilized			13,47
		5 t/ha manure			15,43
		10 t/ha manure			17,39
		15 t/ha manure			19,14
		20 t/ha manure			21,10
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			28,31
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			30,06
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			31,81
3.3.	TOTAL FIXE EXPENSES	unfertilized			103,47
		5 t/ha manure			115,43
		10 t/ha manure			117,93
		15 t/ha manure			119,14
		20 t/ha manure			131,1
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			138,31
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			150,06
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			151,81
4.	TOTAL PRODUCTION EXPENSES	unfertilized			488,47
		5 t/ha manure			556,43
		10 t/ha manure			614,93
		15 t/ha manure			666,14
		20 t/ha manure			734,1
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			947,31
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			1009,06

		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O			1060,81
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* experimental results, ** determination and own calculation

Table. 2 provides an overview of the indicators.

Gross margin was 1013.59 lei at witness and increased to 1437.59 lei for the highest doses variant.

Gross profit exceeded 1,000 lei for both types of fertilizer combined (1054.28, 1163.53 and 1285.78 lei for, 10, 15 and 20 t manure in combination with 50N + 50 P₂O₅ + 50K₂O), and for other treatments was 900 lei (910.12 - witness 950.16 lei - 5 t / ha manure, 924.66 lei - 10 t / ha manure, 960.45 lei - 15 t / ha manure and 952.49 lei where were applied 20 t / ha manure).

Table 2

Synthetic indicators -Lei / ha *

No.	Specification	Variant	Value (Lei)
1.	Crude product	unfertilized	1398,59
		5 t/ha manure	1506,59
		10 t/ha manure	1539,59
		15 t/ha manure	1626,59
		20 t/ha manure	1686,59
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	2001,59
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	2172,59
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	2346,59
2.	Variable expenses	unfertilized	385
		5 t/ha manure	441
		10 t/ha manure	497
		15 t/ha manure	547
		20 t/ha manure	603
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	809
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	859
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	909
3.	Gross margin	unfertilized	1013,59
		5 t/ha manure	1065,59
		10 t/ha manure	1042,59
		15 t/ha manure	1079,59
		20 t/ha manure	1083,59
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1192,59
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1313,59
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1437,59
4.	Fixed expenses	unfertilized	103,47
		5 t/ha manure	115,43
		10 t/ha manure	117,93
		15 t/ha manure	119,14
		20 t/ha manure	131,1
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	138,31
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	150,06
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	151,81
5.	Gross profit	unfertilized	910,12
		5 t/ha manure	950,16
		10 t/ha manure	924,66
		15 t/ha manure	960,45
		20 t/ha manure	952,49
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1054,28
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1163,53

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		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1285,78
6.	<i>Total expenditures</i>	unfertilized	488,47
		5 t/ha manure	556,43
		10 t/ha manure	614,93
		15 t/ha manure	666,14
		20 t/ha manure	734,1
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	947,31
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1009,06
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1060,81
7	<i>The gross profit rate (%)</i>	unfertilized	186,32
		5 t/ha manure	170,76
		10 t/ha manure	150,44
		15 t/ha manure	144,18
		20 t/ha manure	129,74
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	111,29
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	115,30
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	121,20
8.	<i>Income tax</i>	unfertilized	145,62
		5 t/ha manure	152,03
		10 t/ha manure	147,95
		15 t/ha manure	153,67
		20 t/ha manure	152,39
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	168,68
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	186,16
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	205,73
9.	<i>Net profit</i>	unfertilized	764,5
		5 t/ha manure	798,13
		10 t/ha manure	776,71
		15 t/ha manure	806,78
		20 t/ha manure	800,1
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	885,6
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	977,37
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	1080,05
10	<i>Net profit rate (%)</i>	unfertilized	138,08
		5 t/ha manure	143,43
		10 t/ha manure	126,31
		15 t/ha manure	121,11
		20 t/ha manure	108,99
		10 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	93,48
		15 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	96,86
		20 t/ha manure + 50N + 50 P ₂ O ₅ + 50K ₂ O	101,81

own calculation

The gross profit rate recorded values as follows (Figure 1):

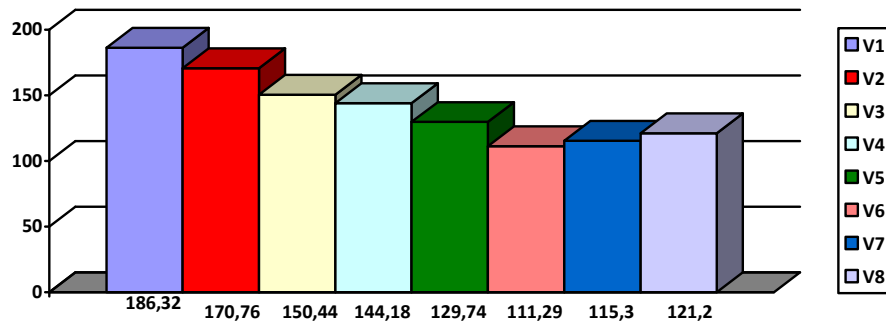


Figure 1 The gross profit rate (%)

- 186,32 % - unfertilized (V1),
- 170,76 % - 5 t/ha manure (V2),
- 150,44 % - 10 t/ha manure (V3),
- 144,18 % - 15 t/ha manure (V4),
- 129,74 % - 20 t/ha manure (V5),
- 111,29 % - 10 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V6),
- 115,30 % - 15 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V7),
- 121,20 % - 20 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V8).

Net profit recorded values below 1000 lei for most variants, except for the combination of 20 t / h manure with + 50N + 50 P₂O₅ + 50K₂O, 1080.05 lei.

Net profit rate on variant was as follows (fig. 2):

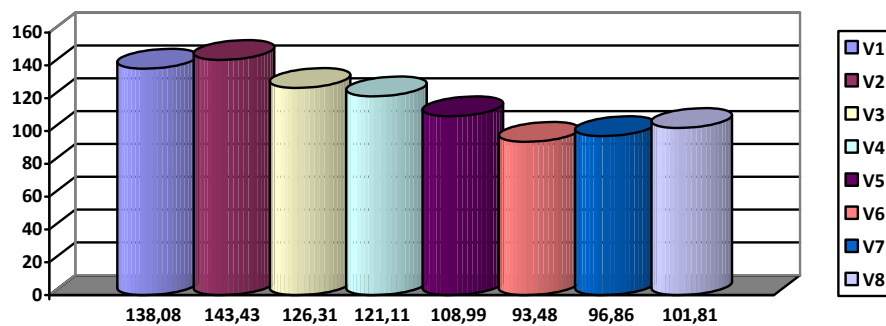


Figure 2 Net profit ratio (%)

- 138,08 % unfertilized (V1),
- 143,43 % 5 t/ha manure (V2),
- 126,31 % 10 t/ha manure (V3),
- 121,11 % 15 t/ha manure (V4),
- 108,99 % 20 t/ha manure (V5),
- 93,48 % 10 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V6),
- 96,86 % 15 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V7),
- 101,81 % 20 t/ha manure + 50N + 50 P₂O₅ + 50K₂O (V8).

CONCLUSIONS

The research began in 2014, subject to a postdoctoral scholarship so organic fertilizers were applied in the spring. Given that experience is the first year we can draw some conclusions as follows:

- The largest crude product was obtained at the variant fertilized with 20 t / ha manure + 50N + 50 P₂O₅ + 50K₂O (2346.59 lei) 2,000 lei values being also recorded at 10 t manure with 50N + 50 P₂O₅ + 50K₂O (2001.59 lei), as well as 20 t / ha manure + 50N + 50 P₂O₅ + 50K₂O (2172.59 lei)
- Gross margin was over 1,100 lei for combined fertilized variants (10, 15, 20 t / ha manure + 50N + 50 P₂O₅ + 50K₂O, respectively 1192.59, 1313.59, 1437.59 lei), but had above 1,000 lei also for the other variants,
- The gross profit has exceeded the total expenditure, with 86.32% at unfertilized, 70.76% for the variant fertilized with 5 t / ha manure, with 50.44% at the variant fertilized with 10 t / ha manure, 29, 74% when fertilized with 20 t / ha manure and for the combination of manure and chemical fertilizers, where advancing were 11.29, 25.30 and 21.20 % at variants 10, 15 and 20 t / ha manure + 50N + 50 P₂O₅ + 50K₂O,
- Net profit rate was maximal for the variant fertilized by 5 t / ha manure (143,43 %), followed by unfertilized varian (138,08%), then fertilized variants with 10, 15 and 20 t / ha manure (126.31, 212.11 and 108.99%).
- Combinations of organic and mineral fertilizers, have a net profit rate lower than in the case of manure alone, registering 93.48, 96.86 and 101.81% for the variants fertilized with 10, 15 and 20 t / ha manure + 50N + 50 P₂O₅ + 50K₂O.

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