

# RESEARCH ON THE IMPROVEMENT OF GRASSLANDS IN THE UPPER BASIN OF THE SUCEAVA RIVER BY MEANS OF ORGANIC FERTILIZATION

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## Abstract

The objective of the present study is to analyze the influence of organic fertilization on the production and the floristic composition of *Agrostis capillaris* L. and *Festuca rubra* L. grasslands in the upper basin of the Suceava River. The study will be used, as a starting point, to identify the necessary measures for the sustainable management of these grasslands. The study was conducted during several field trips between 2009 and 2011, in Poiana Cerbul, Putna village, where we set up a fertilization experiment comprising five variants and three repetitions. The field samples were collected and were sent to the laboratory for analysis, in order to highlight the main aspects of the floristic composition and production for each variant. By means of fertilization, we have achieved a distinct and very significant increase in both total DM production and the amount of crude protein produced per area unit. Under the influence of organic fertilization, the share of Fabaceae family species, having a high forage value, has increased, while that of other botanical families has decreased.

**Key words:** organic fertilizer, production, biodiversity

## INTRODUCTION

Sustainable management of grassland ecosystems can only be achieved by acknowledging and correlating the existing vegetation and the site conditions with the actions taken to improve them and with the manner in which they are used.[4] [5] [7] [11].

Differentiated application of the measures meant to improve the natural grasslands in the upper basin of the Suceava River, while maintaining the structural and functional balance established in the grassland ecosystems, cannot be put into practice without a prior study on the influence of fertilization on grasslands production and their biodiversity [8] [9] [12] [13].

Therefore, during our research, we aimed to achieve the following objectives:

- the influence of organic fertilization on vegetation and on the productive level of the studied pasture;
- the influence of organic fertilization on crude protein content of feed (CP);
- identifying the optimum amount of

manure that can be used to fertilize *Agrostis tenuis* + *Festuca rubra* grasslands.

## MATERIAL AND METHOD

In order to achieve our goals, the study has undergone the following stages:

In order to achieve our objectives, we have organized a single factor experience comprising five variants and three repetitions on a *Agrostis capillaris* and *Festuca rubra* meadow of the village Putna, Suceava County, situated at 47°04'41.25" North latitude, 25°03'29.73" East longitude and 611 metres altitude. The sample surface was 12 sq m;

We have used the following fertilization variants: V1 – control (unfertilized), V2 – 20t/ha annually, well fermented manure, V3 – 30t/ha annually, well fermented manure, V4 – 40t/ha annually, partially fermented manure (slightly fermented), V5 – 50t/ha annually, partially fermented manure (slightly fermented);

Two types of manure were used for fertilization: well fermented manure (over two years old), and partially fermented manure (up to a six months old). The manure

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fertilization took place in early spring, in keeping with the local practice;

The analysis of vegetation, regarding the species components, and overall coverage layer was made using the Braun-Blanquet scale [1] [2] [3] [6] [10] and the CP content was determined by the Kjeldahl method.

## RESULTS AND DISCUSSIONS

Research conducted over two years has shown that application of organic fertilizers causes significant changes in the level of production and biodiversity of vegetation.

Measurements made during 2010 and 2011 on the amount of forage harvested variants revealed the following:

a) yields for fertilized variants (V2, V3, V4 and V5) were higher than the production of the control version, that has not been fertilized (V1). The differences are distinct and very significant;

b) the highest yield was obtained by fertilization with 50 t/ha annually, partially fermented manure (V5), 3006 kg/ha DM compared to 1094 kg/ha DM was harvested (Table 1. Compared to the control variant, production has increased by 174.8%;

c) for variants V3 (30 t/ha annually, well fermented manure) and V4 (40 t/ha annually, partially fermented manure), the yields were 2429 and 2894 kg/ha DM, being 122.0% and 164.5% higher than the production of the control version (V1);

d) V2 is the variant with the smallest increase in production, having been fertilized with 20 t/ha annually, well fermented manure,

with a harvest of 1819 kg/ha, an increase of only 66.3% compared to the V1 control variant.

All organically fertilized variants have registered very significant increases of the production (by 60%), which highlights the importance of manure in productivity growth of *Agrostis capillaris* and *Festuca rubra* grasslands in the upper basin of the Suceava River.

The beneficial influence of organic fertilization, in respect to crude protein content was confirmed by comparison to the control variant (Table 1). The highest crude protein content was obtained from the V5 version: 12.55 – 13.37% DM, and the lowest value, among the fertilized variants, was obtained from the V2 version: 10.05-10.43% DM. Compared to the control (V1), crude protein increases were situated in the 14.1 to 46.3% range.

In both years of study, augmenting the applied manure dose caused a distinct and very significant increase in both total DM production and the amount of crude protein produced per area unit.

In both years of study total production of DM content and amount of CP obtained were positively correlated with the amount of manure applied, while the regression coefficient values are significant and very significant (Figure 1).

In addition to determining quantitative changes, organic fertilization resulted in a series of changes in the vegetation. Thus, the average coverage was different, depending on the quantity and quality of manure applied to the variants (Table 2).

Table 1 The influence of organic fertilization on DM production, CP content and obtained

Variants	DM production (kg/ha)			CP content (% din DM)		CP (kg/ha)		
	2010	2011	2010-2011	2010	2011	2010	2011	Average 2010-2011
V1 (Mt)	441 <sup>Mt</sup>	1747 <sup>Mt</sup>	1094 <sup>Mt</sup>	8,79 <sup>Mt</sup>	9,14 <sup>Mt</sup>	39 <sup>Mt</sup>	160 <sup>Mt</sup>	99 <sup>Mt</sup>
V2	1187**	2452**	1819**	10,05*	10,43***	119**	256**	187**
V3	1437**	3421***	2429***	10,59**	10,90***	152***	373***	262***
V4	2320***	3468***	2894***	10,81**	12,06***	251***	418***	334***
V5	2388***	3624***	3006***	12,55***	13,37***	300***	485***	392***
DL	5%	463	430	446	1,16	0,24	49	48
	1%	672	625	649	1,69	0,36	71	70
	0,1%	1009	937	973	2,54	0,53	107	105

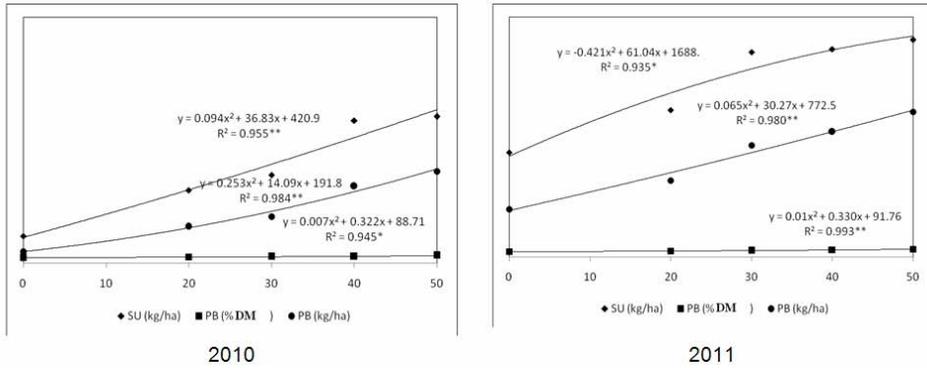


Figure 1 Correlations between the applied manure doses and parameters DM production, CP content and obtained

The lowest average coverage was recorded in the control variant, with an 87.27% increase. This item is proportional to the increasing amount of fertilizer applied to fertilized variants, the registered growth being over 99%. The differences between the variants are very significant, but those between years are not.

The chemical composition of the feed is determined by permanent grassland floristic structure, which is composed of species belonging to different botanical family.

Botanical species have a specific chemical composition and a specific contribution to balancing the nutritional value of permanent grassland fodder. Thus, we have studied the influence of manure application on biodiversity. The data revealed a decrease of the number of species subject to fertilization, in all variants (Table 3). The greatest

biodiversity was found in the control variant. Regardless of the year under review, the differences are very significant.

The change, in terms of specific composition, was present mainly in the species from the "miscellanea" category, rather than the Poaceae and Fabaceae plants.

The study also revealed significant differences in terms of species from different families participating in the vegetation cover. While the control variant (unfertilized) comprised a greater share of species belonging to the Poaceae family and other families included in the "miscellanea" category, the fertilized variants account for a very significant increase in the percentage of Fabaceae family species, with high forage value and for positive effects on feed quality (Table 4).

Table 2 The influence of organic fertilization on plant cover

Variants	Plant cover (% , average/variant)			Variant average
	2010	2011	2012	
V1 (Mt)	86.07	88.97	86.77	87.27
V2	98.83	99.77	99.67	99.42
V3	99.80	99.93	100.00	99.91
V4	99.90	99.97	99.93	99.93
V5	100.00	99.97	99.90	99.96
Yearly average	96.92	97.72	97.25	97.30

Table 3 The influence of organic fertilization on biodiversity (number of species)

Species family	No. of species per variant					Average
	V1 (Mt)	V2	V3	V4	V5	
Poaceae	8	7	8	5	9	7.4
Fabaceae	5	4	5	4	4	4.4
Miscellanea	42	35	34	38	36	37.0
Total	55	46	47	47	49	48.8

Table 4 The influence of organic fertilization on average cover of group species

Species family	Plant cover (% , average per variant)					Average
	V1 (Mt)	V2	V3	V4	V5	
Poaceae	61.36	53.08	56.35	57.01	54.11	56.38
Fabaceae	3.54	37.84	34.02	33.50	35.74	28.93
Miscellanea	22.37	8.64	9.63	9.49	10.15	12.06
Total	87.27	99.56	100	100	100	97.37

## CONCLUSIONS

Study results revealed that organic fertilization results in a production increase of 66.3% to 174.8%.

Laboratory analysis of the variants, during the two year experiments, show increases in crude protein content of the forage obtained in the fertilized variants, compared to the control, statistically, between 14.1% and 46.3%.

Fertilization induced changes in the vegetation structure by significantly increasing coverage, the participation high forage value species, and a decrease in biodiversity, characterized by the number of species identified.

Given the results of the experiments, we consider that it is recommended to use manure to fertilize *Agrostis capillaris*+ *Festuca rubra* grasslands.

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