

Fertilization as a factor of plant community change, higher productivity and water percolation on a mountain meadow

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Introduction

Permanent grasslands, which serve both productional and environmental purposes, are particularly important in mountainous areas. For many farms they are the only source of forage. Their major environmental functions are to prevent soil from erosion and to reduce rainwater run-off. Low input agriculture in mountainous areas is characterized by the use of organic fertilizers on grasslands, which is rare in lowlands. With regard to the effectiveness of organic fertilizers and their impact on the plant species composition of meadows there are divergent opinions.

The purpose of this study was to determine the effects of different types of fertilizers on the productivity and environmental characteristics of a mountain meadow.



Material and methods

•**Experimental field:** altitude 640 m, low intensively grazed grassland, brown, soil (pH=4.3, available P=8.0, K=56 and Mg=54 mg kg⁻¹). Plot size 18 m² (3 m × 6 m), four replicates.

•**Lysimeters:** 0.45 m deep and with a diameter of 50 cm, filled with a soil, from the profile on site including natural sod, connected to an external tank to measure percolating water output. Water measurements: continuously from the middle of April to the end of September 2005-2007.

•**Utilisation and evaluation:** meadow was mown twice in the summer, botanical assessments were made before the first cut.

•**Statistics:** One-way analyses of variance.

•Fertilization:

•No fertilizers - control

•mineral fertilizers - P₁₈K₅₀N₁₀₀

•farmyard manure - FYM 10 t ha⁻¹ (P₁₄K₅₅N₆₉)

•combined fertilizers - FYM 10 t ha⁻¹ + P₄N₃₁

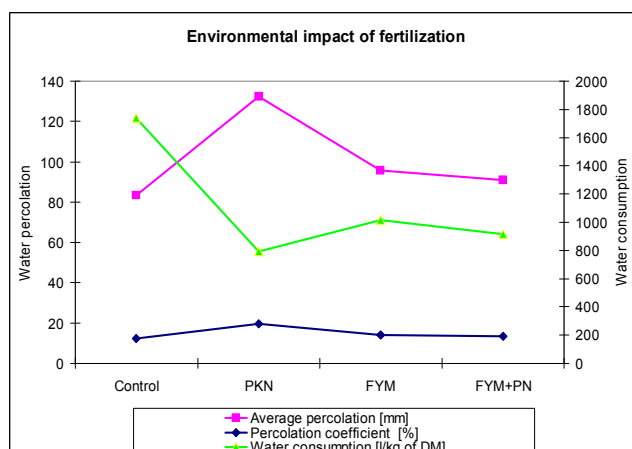
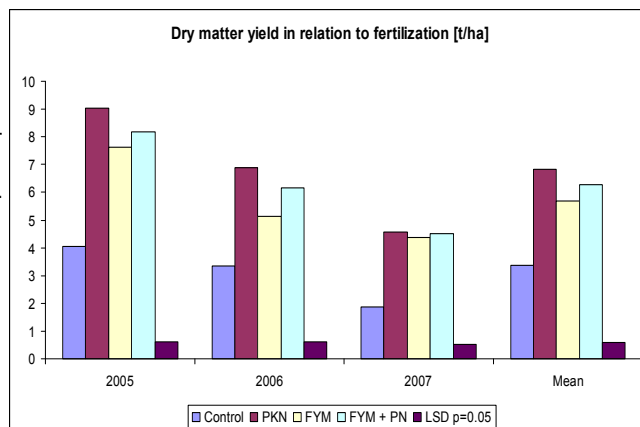
Fertilizers applied in each year. Manure was applied in early spring.



Results

Percentage of main species in the meadow sward at the start of experiment and after 3 years of different fertilization

Species	Initial state	Fertilization scheme			
		Control	P ₁₈ K ₅₀ N ₁₀₀	FYM	FYM + PN
<i>Festuca rubra</i>	27	40	10	15	13
<i>Agrostis capillaris</i>	12	17	2	8	6
<i>Cynosurus cristatus</i>	8	5	1	8	2
<i>Festuca pratensis</i>	6	1	40	17	25
<i>Poa pratensis</i>	6	2	10	10	13
<i>Anthoxanthum odor.</i>	5	5	-	2	+
<i>Deschamsia caesp.</i>	5	+	+	+	+
<i>Elytrigia repens</i>	1	+	17	2	5
<i>Trifolium repens</i>	6	7	-	10	3
<i>Lotus corniculatus</i>	1	2	-	4	+
<i>Alchemilla pastoralis</i>	5	5	4	8	8
<i>Taraxacum officinale</i>	4	4	3	7	7
<i>Achillea millefolium</i>	3	2	4	3	5
Others	11	10	9	6	13



Conclusions

Beneficial effects of mineral fertilization on the yield of meadow swards should be seen also in terms their environmental impact. Changes in species composition, water use and the density of sod suggest the application of manure or combined fertilizers which influence the development of sustainable multispecies swards with an acceptable yield and a good ability to retain rainwater.