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H.-D. Matthes

Rostock University, Germany

J. Matthes

Rostock University, Germany

W. Jentsch

Rostock University, Germany

V. Pastushenko

Rostock University, Germany

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**LONG TERM OBSERVATION OF THE GRASSLAND VEGETATION USED
INTENSIVELY OR EXTENSIVELY AND ECOLOGICALLY**

H.D. Matthes¹, J. Matthes², W. Jentsch³ and V. Pastushenko¹

¹University Rostock, Department of Agricultural Science, 18059 Rostock

²Vorweden 1

³E.-André-Str. 44, 18069 Rostock, Germany

Abstract

The aim of the present paper was to study alterations of the grassland flora from 55 plots following a more extensive management under long term observation within 6 years. Extensification of grassland use leads to an increase of the numbers of plant species by 32%, “Red-list-species” included. The moisture number of the soils slightly increased and the reaction and nitrogen numbers decreased. Results are presented for different vegetation units.

Keywords: Grassland, extensification, plant diversity, soil, indicator values

Introduction

A program on the development of strategies on the use of intensively restricted agricultural productive land in view of the ecological, free enterprise and social aspects in Germany was drawn up in 1990. Also in this program was the implementation of analysis of vegetation studies for areas, on which intensive management should have been replaced by extensive management. This analysis should include those with decreasing intensity of used grassland and farm animals, changes in composition of species, productivity and feed quality.

In the last years, research on diverse branches of extensification of agriculture increased (Matthes, 1991), especially under the aspects of diminution overproduction, preservation of landscape, biological diversity, especially “Red-list-species”, environment and increase of quality of animal products. The number of ecologically producing farmers increased, despite high restrictions in the use of fertilizers and plant-protective agents for instance. The lower yield should be adequately compensated by higher landscape care and high quality of animal products because of using well-defined feedstuffs (Matthes et al., 2000; Pastushenko, et al., 2000). Aim of the present paper was to study the flora of grassland, following extensive management, under long term observation and accurate registration.

Material and Methods

Grassland areas for registration of the plant flora and population were established, in 1990 and the first registration was started. The second one was carried out in 1996 on each of 55 comparable areas of a 25m² size in diverse districts (Table 1)

The 55 grassland plots had a different event of management. The variety of area can be characterised as follows:

- Intensively used grassland until 1990: 150 kg N/ha, >2 large animal units/ha;
- Extensively and ecologically used grassland from 1990 to 1996: No artificial fertilizer, 0.8 large animal units/ha, cattle grazing;
- No water regulations, increase in water level (eg. Speckerlakes);
- Only limited grassland or pasture care.

The estimation method of plant population was carried out following Braun-Blanquet (1964) based on the combined estimate of the individual numbers (abundance) and the ecological numbers (dominance) with the help of an 8-bit estimation scale. The assessment of

the grassland changes was based on the analyses of the moisture, reactions and nitrogen numbers according to Ellenberg et al. (1992).

Results and Discussion

The comparable evaluation of the observations in 1990 and 1996 resulted in a significant increase in floral and vegetation diversity. The changes of these numbers differ from place to place showing an increase at all places with one exception (Table 2), caused by cultivating grassland more extensively. The increase of the total number of plant species about all plots was attended by an improvement of the portion of the “Red-list-species” (RLS) from 5 to 16 in the year 1990 to 1996. New “Red-list-species” were: *Lychnis flos-cuculi*, *Juncus gerardii*, *Carex nigra*, *Ranunculus flammula*.

The management alterations were evaluated by moisture number, reaction number and nitrogen number of the soil. Some mean indicator values of grassland soil in 1990 and 1996 were: moisture number 5,5 und 5,7; reaction number 6,4 and 5,9; nitrogen number 6,2 and 5,8.

Grassland soil moisture increased slightly. This especially applies to grassland with an open drainage system. On the other hand the nitrogen number, as an ecological indication, and the reaction number decreased almost without exception. Some indicator values of grassland soils were classified in 1996 and the corresponding values from 1990 were adjoined. The clearly visible restraining of the covering value of *Agropyron repens* (Ar) corresponds to the nutrient decrease in the soil. In the soil of Ar-grassland all 3 indicator values decreased markedly. *Agropyron repens*-*Festuca rubra*-grassland: moisture number 1990 4,9, 1996 4,5; reactions number 1990 6,7, 1996 5,5; nitrogen number 1990 6,6, 1996 5,3; and on *Agropyron repens*-*Dactylis glomerata*-grassland: moisture number 1990 5,5, 1996 5,0; reaktions number 1990 7,0, 1996 5,3; nitrogen number 1990 7,5 and 1996 6,7.

The other vegetation units show increasing moisture numbers and slightly decreasing reaction and nitrogen numbers (Holcus lanatus-Dactylis glomerata-grassland and Holcus lanatus-Dactylis glomerata - grassland , Juncus spec continuance .

Generally extensification brought about an increase in the number of plant species. This is a protracted process. Fewer effect was observed in alterations of main forage grasses as *Poa pratensis*, *Lolium perenne*, *Festuca pratensis*, *Holcus lanatus* and *Agropyron repens*. Grazing caused a decrease in *Agropyron repens* cover. The number of *Dactylis glomerata* decreased too. Particularly increase of steadiness existed with *Poa trivialis*, *Agrostis stolonifera*, *Phleum pratensis*, *Poa annua*, *Deschampsia cespitosa*, *Alopecurus geniculatus*, *Bromus hordeaceus* and *Carex hirta*. A high increase was registered in the plant numbers of *Trifolium repens*, *Ranunculus repens*, *Cerastium holosteoides*, *Plantago major* and *Leontodon autumnalis*. As mentioned earlier a slight increase of RLS (Fukarek, 1991) was observed. Summarizing from 55 plots three RLS were found on five plots in 1990 and seven RLS from 112 species (6%) on 16 plots in 1996, respectively.

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Table 1 - Number of the observation areas

District	Place	Number of plots
“Müritz National Park”	(1) Kargow	27
National Park “Vorpommersche Boddenlandschaf”	(2) Darß / Zingst	6
	(3) Hiddensee	4
“Nossentiner / Schwinzer Heide nature park”	(4) Karow	7
	(5) Krakow	4
“Usedom nature park”	(6) Thurbruch	7
	Total	55

Table 2 - Changes of grassland vegetation by transition from intensive to extensive management

Year	Mean number of plant species per plot	Total number of plant species about all plots	Changes 1996 compared with 1990
1990	13.6 (100%)	85 (100%)	Number of newly discovered species 47
1996	18.3 (135%)	112 (132%)	Number of species not found again 19

Place	n	Mean number of plant species per plot			Total number of plant species about all plots per place		
		1990	1996		1990	1996	
1	27	13.9	18.4	(132.4%)	67	89	(132.8%)
2	6	12.0	20.3	(169.2%)	32	45	(140.6%)
3	4	14.5	15.8	(109.0%)	30	39	(130.0%)
4	7	12.7	20.1	(158.3%)	37	59	(159.5%)
5	4	12.6	19.8	(157.1%)	25	44	(176.0%)
6	7	14.9	14.7	(98.7%)	35	42	(120.0%)