How species community are affected by an increase in biomass of Campos grassland, seven case studies.

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Introduction

Species-rich native grasslands coversmore than 70% of Uruguay land area and provide the forage base for livestock production (Bilenca & Miñarro, 2004). Low income and degradation of natural resources by over stocking rate are seen as major problems of sustainability in grassland-based livestock family production systems. Grazing management is the main strategy that can be used by farmers to improve their systems. In seven beef-cattle systems based on native grasslands located in east Uruguay, we search to increase productive and economic results by the re-design of the farming system - specifically by adjusting farmer's grazing practices-. A co-innovation approach was applied to promote changes in management practices (Albicette et al., 2016a). The main goal of controllinggrazing management was that the increase in forage mass offers a way to improve the animal nutrition, the grassland growth, the resilience to extreme climatic events and the biodiversity preservation (Ruggia et al., 2015). We expected that those changes in management at least maintain the biodiversity.

Materials and methods

A modified Braun-Blanquet abundance scale proposed by Mueller-Dombois and Ellenberg (1974) was used to measure plant species composition in one paddock of each of the seven farms, at two moments: one prior to adjust the grazing management (T0), an the other between one and two years later (T1). The aerial cover of all vascular plant species with a minimum score of 5% was visually estimated in 30 to 60 0,25-m^2 quadrats per paddock. Species richness and the Shannon Index (Shannon and Weaver, 1949) were calculated for every paddock at each moment. In the same sampling area we measure amount of dry matter of forage (kg DM ha^{-1}) estimated every 45-50 days by the comparative yield method (Haydock & Shaw, 1975). Although in all farms an increased in their forage mass availability was observed, changes in grazing management had different impacts in each of them. Spring dry matter (kgDM ha^{-1}) was evaluated to show forage mass evolution,during one or two years. The rainfall was above the average (1100 mm y^{-1}) in 2012 and 2014 (1466 and 1800 respectively); however 2013 was close to an average year, despite its spring and summer rainfalls were above the average.

Results and Discussions

More than 150 species were identified in the evaluated paddocks, but individual richness was between 35 to 67 species depending on the paddock and time. Average species richness at 56,4 and 51,3for T0 and T1 respectively, while Shannon Index varied from 2,42 to 3,31, being observed on average, difference of 0,08 between evaluations (Table1). These values of species richness and Shannon Index are within the ranges cited by other studies on Campos grassland in Uruguay and the region. The evolution of forage mass along period was between a reduction of 948 and increase of 2144 kg DM Ha^{-1}.. The changes in the Shannon Index (H) were strong positively correlated with the change in forage mass according to the following equation: Changes in the Shannon Index (H) = 0,0002*(change in biomass) - 0,1666; R^2 = 0,7443; p = 0,0124 (Figure 1). This relation indicates that the adjustment in grazing intensity improved the Shannon Index (H) only when forage mass increases at least 1000 kg DM Ha^{-1}.

Conclusions

The increase of the forage mass caused a slight change in the structure of the pasture and the biodiversity.. The period evaluation between 1 and 2 years was not enough to assess major changes at the community level. However, we detected a positive relation between the change in the forage mass and the diversity of species, which could be relevant to restore overgrazed grasslands and need to be further studied.

Table 1: Richness and Shannon W. indices at T0, T1 and difference for each farmer.

	Richness(n)			ShannonW(H)		
Farmer	**T0**	**T1**	**dif.**	**T0**	**T1**	**dif.**
1	47	35	-12	2,72	2,42	-0,30
2	61	56	-5	3,25	2,93	-0,32
3	55	39	-16	3,10	2,86	-0,24
4	66	67	1	3,28	3,31	0,03
5	43	54	11	2,70	3,04	0,34
6	58	52	-6	3,15	3,07	-0,08
7	65	56	-9	3,06	3,06	0,00
Average	**56,4**	**51,3**	**-5,1**	**3,04**	**2,96**	**-0,08**