Use of Socio-Economic Indicators in Ecosystem Services of Natural Grassland of Pampa Biome in Southern Brazil

Daniela Schmidt Schossler [1,], Lúcio André de Oliveira Fernandes [1], Teresa Cristina Moraes Genro [2], Isadora Angarita-Martinéz [3], Bruno Teixeira [1] and Ángel Sánchez Zubieta [4]*

[1] Pelotas Federal University
[2] Embrapa Southern Livestock
[3] BirdLife Internacional
[4] Rio Grande do Sul Federal University
* Corresponding author email: daniela@campoejardim.eco.br;

Key words: Grasslands, ecosystem services, payment for ecosystem services, livestock

Introduction

Sustainable management of ecosystem services in grasslands constitutes as tool of mitigation and adaptation to climate change issues (Secretariat of the Convention on Biological Diversity, 2014). Payment for Ecosystem Services (PES) is a public policy aiming to stimulate farmers to preserve natural resources and environment in many parts of the world. To create PES schemes, clear and objective indicators of Ecosystem Services (ES) coming from grasslands are needed (Tejeiro and Stanton, 2014)., Through funding from the Alliance for the Grasslands (www.alianzadelpastizal.org), BirdLife International promotes sustainable livestock management in Southern America. This project studied properties in the Pampa biome certified through the Grasslands Conservation Index (GCI), created to measure their productivity and environmental conservation capacity. The CGI index does not only indicate the conservation values, but also the productive capacity of the grassland, in the hope of having a positive impact on rural development. The objective of this project was to assess the validity of the GCI and other indicators for future application of PSE policies in natural grasslands in the Pampa biome.

Material and Methods

Two properties in Lavras do Sul, State of Rio Grande do Sul, Brazil, were selected for this study; a preserved natural grassland (P) and a natural grassland in recuperation (R). Soil management practices in P includes mowing, stocking rate adjustment and exclusion of areas aiming to increase seed bank in the soil. In R, the evaluation was made following two years of rest from wheat and corn grain production, with soil traditional cultivation and without fertilization. In each property there were three transects in following the relief: top, middle and lower. In each of them, nine samples were taken. Samples collection was made on January 8, 2015. Soil Organic Carbon and soil stored C from the 0-20 cm layer was calculated according to Embrapa (1997). On each transect, percentage of covered soil was visually evaluated. The GCI was calculated by the following formula: GCI= (native field percentage x vegetal coverage index x species with forage value) x (property agro diversity x ecological system value). This socio-economic indicator looks at what is happening in the surrounding countryside; finally, it takes into account if ranches' grasslands are embedded in an Area of Special Ecological Value (ASEV), as declared by the government or the conservationist community, or if they are part of a zone where grasslands are being replaced actively and extensively. The formula indicators were transformed into a 0 to 10 scale, where more is better. Forage biomass value was estimated accepting that 2,300 kg ha^{-1} is 10. This level of dry matter is considered the best to achieve a moderate grazing intensity in natural grassland at Pampa biome. A C percentage of 5% was considered as 10 in the scale from 0 to 10. The monetary value of C stock used the maximum value of C from CO (6.3 g.cm2) versus the mean density multiplied by the voluntary marked value ($4.8) was considered a 10.

Result and Discussion

The present study considered some useful indicators to assess natural grassland's sustainability potential. Figure 1 shows sustainability tendency of two properties with different state of preservation. An increment in the value of the indicator implies a higher sustainability (Fernández and Woodhouse, 2008).

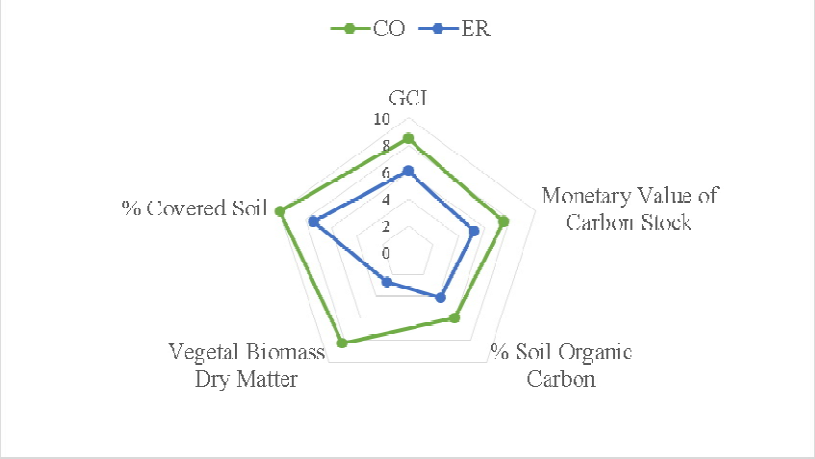

Figure 1. Radar graphic of interaction between socio-economic and ecological indicators of Ecosystem Services of two properties from natural grasslands with different preservation status (P: preserved and R: in recuperation).

The economic performance was directly influenced by forage biomass and by covered soil percentage. The GCI, soil Organic Carbon percentage and monetary value of C stocked are sensitive when there is alteration on above mentioned quantitative indicators, forage biomass and by covered soil percentage. The behavior of the measured indicators in the field demonstrate that GCI is a strong index. Except GCI, all other indicators were measured in this research field. There is a correlation with variables measured in soil and plants.

Conclusion and Implications

Indicators used in this study are easy applicable. The GIC earned recognition of the Agricultural Minister of the State of Río Grande do Sul, in Brazil, not used operationally. This can be an important tool for the local development of PSE schemes. This kind of public policies can assist improving equity and sustainable development opportunities (Peh and Merriman, 2015) in natural grasslands like those of Pampa biome.

References

Empresa Brasileira de Pesquisa Agropecuária, 1997. National Center for Soil Research. Manual soil analysis methods, 2 ed., Rio de Janeiro: Embrapa Soil, p.212.

Fernandes, L. A. O.; Woodhouse, P.J, 2008. Family farm sustainability in southern Brazil: An application of agri-environmental indicators. *Ecological Economics*, v. 66, p. 243-257.

Peh, K. and Merriman, J. 2015. Potential contributions of TESSA to the development of a Payments for Ecosystem Services scheme. In book: Ecosystem Services Assessment, Valuation and Market-based Approaches. What's Going on in Protected Areas, Edition: Year 2 - Number 5. Publisher: CURSA (pas) SAGGI, pp.11-14

Secretaria Da Convenção Sobre A Diversidade Biológica (SCDB). Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal: Technical Series n. 41, 2009.

Tejeiro G.; and Stanton, M., 2014. Sistemas Estaduais de Pagamento por Serviços Ambientais: Diagnóstico, lições aprendidas e desafios para a futura legislação. São Paulo: Instituto O Direito por um Planeta Verde, 157p.