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Agriculturisation and trade-offs between commodity production and cultural ecosystem services: A case study in Balcarce County

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ABSTRACT

Increased production of commodities in Latin America has transformed the rural landscape with a potential loss of cultural ecosystem services (CES). The aim of our study was to assess the extent and mechanisms by which the agriculturisation process in Balcarce County in the Pampas region of Argentina has affected the supply of CES of the rural landscape and consequently, the well-being of local inhabitants. Data were obtained through exploratory interviews with selected inhabitants of Balcarce County (Argentina). We focused on people's perceptions regarding landscape changes in the last two decades and the rural landscape aspects that provide identity, sense of place and cultural heritage. Interviews were qualitatively analyzed through content analysis. Results showed that twenty years ago the landscape sustained food provision along with CES. Agriculturisation has implied an undeniable increase of commodity production (i.e. soybean) and economic benefits at the expense of a significant loss of natural environments and changes in the rural livelihoods that sustain CES. The *sierras* (low mountains) emerge as the last remnants of natural environments sustaining identity, sense of place and cultural heritage.

1. Introduction

In recent decades Latin American countries have experienced a sustained increase in the production of new agricultural commodities and an appropriation of rural areas by external agents, through the sale or lease of land to investors (often international). These lands are transformed into major food crops, biofuels or both, thereby exacerbating social conflicts, poverty and vulnerability of rural communities (Overbeek et al., 2012). In Argentina this process of increasing and continuous use of lands for agriculture in detriment of other uses is known as "agriculturisation" (Manuel–Navarrete et al., 2005). In the Pampas region of the country, this process began in the 1970s and is characterized by intensive use of machinery and chemicals, as well as expansion of crops, predominantly soybean, over natural grasslands or traditional crops - cattle rotation, whereby cattle production is concentrated in feedlots or displaced to marginal areas (Manuel-Navarrete and Gallopín, 2007; Reboratti, 2006). This process led to significant increases in yields (from 3.7 million soybean tons in 1980/81 to 58.8 million in 2015/16; MAGyP, 2017), but also to unemployment, rural depopulation (Morello et al., 2006) and loss of natural ecosystem and native biodiversity (Herrera et al., 2013). At the same time, average farm size increased 25% (whole country) while 24% of small and medium size farmers (farms size from 10 to 500 ha) withdrew from agriculture between 1988 and 2002 (SAGyP, 2002). Thus, a new agricultural model emerged, based on the incorporation of new technologies, large amounts of invested capital, low rural employment, productive concentration and land leasing, with a significant loss of small and medium farmers, who often chose to rent or sell their farms, leading to the simplification of the rural social structure and the weakening of local communities (Iscaro et al., 2014; Gras and Hernández, 2016; Reboratti, 2006). The resulting rural exodus and the concentration of land in large farms gave place to a phenomenon labeled as "*agriculture without farmers*" (Teubal, 2009).

Land use and cover change (LUCC) has been recognized as the most important single factor influencing the conservation of

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natural environments (Vitousek et al., 1997). Globally, some adverse impacts of LUCC have resulted in modified biodiversity, altered functional processes and diminished provision of ecosystem services to society (De Groot et al., 2002; Balvanera et al., 2006; Díaz et al., 2006; Metzger et al., 2006). Ecosystem services -the "aspects of the ecosystem" that contribute directly or indirectly to human wellbeing (Fisher et al., 2009; MEA, 2005)- are both a concept and a framework to understand people-nature relationships. MEA (2005) classified ES in provisioning, regulating and cultural services. Cultural ecosystem services (CES) are defined as ecosystem contributions to non-material benefits (e.g. capabilities and experiences) that arise from human-place relationship (Chan et al., 2012). Examples of CES are identity, spirituality and sense of place, which are important components of sustainable development and human well-being (Brown, 2005; Buijs et al., 2006; Cheng et al., 2003) and are the focus of this study. Their importance lies on the fact that cultural values of the landscape are irreplaceable and once degraded these services are unlikely to be replaced by technologies or other goods, so that their recognition and the observation of their dynamics is fundamental to evaluate the impact of socio-environmental alterations on human wellbeing (Hernández-Morcillo et al., 2013). In turn, most CES are experienced and appreciated directly and intuitively by social actors, being this intangibility, subjectivity and un-easy quantification of CES in biophysical or monetary terms which makes them difficult to incorporate into the decision-making processes (Daniel et al., 2012).

The relations between landscapes, human values and wellbeing have long been explored from different disciplines, such as health (e.g. Conradson, 2005), rural sociology (e.g. Barbic, 1998), landscape ecology (e.g. Nassauer, 1995a) and geography (e.g. Liu and Opdam, 2014). These studies set the bases for the study of the relationships between CES flows and human values and wellbeing. However, under the ecosystem services framework, there are few studies that investigate the way in which changes in land use are perceived and valued by people and their impact on the supply of CES, being necessary a better comprehension of the relationships between ES and wellbeing (Bennett et al., 2015; Carpenter et al., 2009; Chan et al., 2012; Daniel et al., 2012; Plieninger et al., 2013). This underrepresentation of CES in ES studies is more pronounced in South America (Balvanera et al., 2012), and are scarce the studies of trade-offs between CES and other services (Hernández-Morcillo et al., 2013). In the Pampas region of Argentina few studies analyzed the effects of landscape transformations on the provision of CES or the social values and wellbeing these ecosystem services sustain. Some studies examined the agricultural transformation and its relation with rural depopulation, the perceptions of family farmers on global changes, and their values and social reproduction strategies in face of rural transformation (e.g. Litre et al., 2007; Stratta Fernández and De los Ríos Carmenado, 2010). Mastrangelo et al. (2015) showed that the diversity of services studied and the analysis of trade-offs between them were often low in most studies using the ecosystem services framework in the Pampas region, and that the majority of evaluations focused in provision and regulation services, with little or no attention to cultural services.

Cultural services may be provide directly by the ecosystem, but also by the productive and social activities undertaken there, such as the traditional knowledge transmission or identity associated with agricultural landscapes (Nahuelhual et al., 2014). For example, the country people identity (*gauchezca* culture) in the Pampas region of Argentina is closely related to farming activities, mainly livestock, which have promoted values and traditions that have been transmitted for generations (Litre et al., 2007). Landscape values can be understand as the qualities attributed by people to the whole landscape or to some of its components; as it is a social construct, it could vary between individuals and over time (Ruiz and Domon, 2012). Therefore, if landscape and activities change, it is probable that these changes affect CES supply. Although one main characteristic of CES is intangibility, they nevertheless create robust ties between humans and their natural environment, representing one of the strongest incentives for people to engage in natural capital conservation (Daniel et al., 2012; Milcu et al., 2013; Schaich et al., 2010). CES are important in a wide range of situations and industrialized societies frequently value them ahead of other services (Palomo et al., 2011; Quétier et al., 2010). In this context, the goal of the present study was to address how the agriculturisation process, characteristic of the Pampas Region, has affected the supply of CES, namely identity, sense of place and cultural heritage, and consequently, the well-being of local inhabitants, in a typical rural county of the southeast of the humid pampas. Related research questions were: Which are the main landscapes features sustaining CES? Are there perceived trade-offs arising from agriculturisation? To what extent CES loss has affected wellbeing and rural livelihoods? Relationships between ecosystem services and wellbeing are, to a large extent, context dependent, and therefore local case studies are well suited to deepen our understanding of such relations; yet, generalizations are generally limited.

2. Methods and data

2.1. Study area

This study was conducted in Balcarce district (surface of 4115.3 km^2) located in the southeast of Buenos Aires province (Argentina), where 70 per cent of land is planted surface (33 per cent with crops; 36 per cent with forage) while near 30 per cent are natural o seminatural grasslands, concentrated in lowlands and hills (Barral and Maceira, 2012). Its productive characteristics are similar to the rest of the Humid Pampa Region, being the agriculture and livestock the most common activities, but its natural landscape differs from the surrounding plains due to the presence of its hills or *sierras* (low mountains) (Fig. 1). Historically Balcarce was a potato-producing district; however within the last 20 years this crop has decreased and has been partially replaced by soybean (Urcola et al., 2015). Simultaneously, the total cultivated area increased by 58 per cent. In 2013, 57 per cent of cultivated land was covered by soybean at the expense of grazing lands (cattle decreased by 52 per cent in the same period) and other crops (e.g. wheat decreased by 69 per cent) (MAGyP, 2017). Agriculture expansion, associated with an increase in the use of input technologies over other production factors, negatively affected small farmers, who tended to rent their lands to large farmers, leading to the decline of traditional small-scale farms (Urcola et al., 2015). Therefore, Balcarce County did not escape from the agriculturisation process registered in the whole Pampa Region, with its effects of simplification and homogenization of the landscape and loss of natural and semi-natural environments and native biodiversity (Herrera et al., 2013), thus affecting the provision of different ecosystem services (Barral and Maceira, 2012). Traditional agricultural practices, which means the type of agriculture that relies on traditional practices such as people working their land considering the local knowledge, cultivating typical crops of the region (as potato or garlic), doing crop and animal rotations, and taking into account the social practices around the productive activities, changed drastically.

The *sierras* are usually part of private farms and their management depends on landowners; this fact hinders the *sierras* conservation, even if they could be considered as a common good that benefits the whole community. Traditional use of the *sierras* include