Defining agri-environmental schemes in the buffer areas of a natural regional park: An application of choice experiment using the latent class approach

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ABSTRACT

Buffer areas can be created for improving the sustainable management of Protected Areas (PAs). These areas differ in their governance both from the park and from the rest of the territory.

In the present study, we used choice experiments for identifying a set of political environmental measures to be applied in the buffer areas of the Trasimeno Regional Park (Region of Umbria). Particularly, we focused our attention on the role played by the farmers in those areas. We used choice experiments in a planning context, highlighting their ability to elicit the preferences of a group of producers and to identify several classes with different orientations, through the Latent Class Approach. We individuated classes of farmers with very different preferences about the possible measures to be applied in the contiguous areas. Our work provides two interesting indications for park management: the interest of some farmers in creating contiguous areas for the Trasimeno Park and the opportunity for policy makers to propose very different measures because farmers' interests are not uniform.

1. Introduction

Protected areas (PAs) are still considered vital for the conservation of biodiversity and maintenance of ecosystems services (Ament and Cumming, 2016; Chape et al., 2005; Palomo et al., 2013; Weisse and Naughton-Treves, 2016). However, sometimes they are not able to achieve these goals due to improper land development inside and outside the protected areas (Leroux and Kerr, 2013; Weisse and Naughton-Treves, 2016).

The creation of buffer areas can contribute to maintaining and preserving Protected Areas (Martino, 2001), because these zones alleviate pressure on PAs (Weisse and Naughton-Treves, 2016; Martín-López et al., 2011; DeFries et al., 2010). Some authors considered buffer areas to be the best ecological boundaries between PAs and other lands, due to the presence of anthropic forces in surrounding areas which affect ecological processes inside the PAs (DeFries et al., 2010; Martín-López et al., 2011) and may heavily influence their biological integrity (Hjortsø et al., 2006; Stræde and Treue, 2006). The environment is very complex, and its management implies taking into account many different aspects and parameters simultaneously (Cortina and Boggia, 2014). According to Laurance et al. (2012), environmental changes immediately outside of protected areas can be

as important for their ecological health as change within them.

For DeFries et al. (2010) and Martino (2001) buffer areas are the territories where most of the protection management is carried out (DeFries et al., 2010; Martino, 2001). Thus, the awareness that PAs alone may not achieve all their aims shifts the focus toward the importance of proper management in surrounding areas (DeFries et al., 2010; Leroux and Kerr, 2013). Specific environmental measures can be established in these areas to ensure the continuity of environmental and biodiversity protection (DeFries et al., 2010; Martino, 2001; Thorell and Götmark, 2005). For instance, specific funding for local and sustainable development can be allocated to buffer areas, and their presence makes it possible to incorporate the needs of the local population into the management process (Hjortsø et al., 2006; Smith, 2003). This has positive effects on the sustainable development of the local population (Ament and Cumming, 2016; Nepal and Weber, 1995; Shafer, 1999) and also on PAs (Laurance et al., 2012). Thus it is possible to achieve a balance between environmental protection and conservation, thanks to measures aimed at improving nature-based tourism, sustainable agriculture and typical artisan activities. The way such activities are managed determines the health of both the buffer areas and the PAs.

As Troupin and Carmel (2014) reported for Mediterrean regions,

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agriculture in protected and buffer areas is so important that we can speak about land sharing between farms and wild nature. For instance, intensive agriculture is mainly responsible for losses of nitrogen and phosphorus nutrients from the soil into the water (Buckley et al., 2012). Policy must act deliberately to reduce the negative consequences of such activities. At the same time, it has to avoid the development of a 'culture of assistance,' which legitimates claims to compensation for renouncing intensive agriculture (Martín-López et al., 2011).

Many species and ecosystems of conservation concern in Europe depend on agricultural management and are showing ongoing declines (Batary et al., 2015). As Martín-López et al. (2011) pointed out, agri-environmental incentives and payments for ecosystem services should be applied inside and outside PAs, in case of protected areas in agricultural area, for achieving a good conservation strategy. Agri-environment schemes (AES)[1] are partly designed to address this, since they are a major source of nature conservation funding within the European Union (EU) and in total the highest conservation expenditure in Europe (Batary et al., 2015). Thus, AES are an already used tool which can be specifically addressed for managing buffer areas of PAs.

Understanding the farmers' preferences to be involved in potential agri-environment schemes can be useful for managing their roles in buffer areas. Emery and Franks (2012), for instance, examined farmers' receptivity to the idea of collaborative agri-environment schemes (cAES) in England, finding encouraging results. Ruto and Garrod (2009) investigated the role of schemes designed in ten EU regions, pointing out the inverse relation between level of payments and contract flexibility, while Spanish farmers showed a strong preference for maintaining their current management strategies, as reported in Espinosa-Goded et al. (2010). Christensen et al. (2011) obtained similar results in Denmark. The heterogeneity of AES preferences in forest management was investigated by Broch and Vedel (2012) in Denmark. Regarding the new Common Agricultural Policy, farmers' preferences concerning land use restrictions in Belgium were investigated by Lizin et al. (2015), while Schulz et al. (2014) assessed farmers' willingness to accept Greening in Germany. Greiner (2015) and Kaczan et al. (2013) presented an analysis of motivations and design schemes for Australia and Tanzania. Martín-López et al. (2011) and Palomo et al. (2011) focused specifically on the case of PAs located within an agricultural background, such as the one presented in this paper. The methods most applied in the literature cited were choice experiments.

This work aims to consider an example of a buffer zone of an Italian PA, in order to highlight how the development of an agri-environment scheme addressed to farmers can support the management of PAs. In comparison to the international scenario, in Italy buffer areas are a novelty (Rocchi, 2012), therefore there are no previous studies concerning the application of AES in such areas.

The paper focuses its attention on the role of agriculture because it is widespread and is one of the main economic activities in the study area. In comparison to the literature analyzed, we propose a bunch of AES that farmers have to consider for addressing different impacts of agriculture in buffer areas on the protected area studied (Trasimeno Regional Park). We exploited the capability of choice experiments to elicit the preferences of a group of farmers about similar agri-environmental actions, to be applied in the buffer areas, and to divide them into several classes on the basis of distinct orientations through the latent class approach (LCA). In addition, we tried to understand how to use this information for improving farmer participation in agri-environmental schemes as recommended by Broch and Vedel (2012) and Bremer et al. (2014), since the voluntary nature of the AES is fundamental for achieving policy objectives (Espinosa-Goded et al., 2010).

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[1] Agri-environment schemes provide payments to farmers who subscribe, on a voluntary basis, to environmental commitments related to the preservation of the environment and maintaining the countryside (https://ec.europa.eu/agriculture/envir/measures_en).

2. Case study: Lake Trasimeno Regional Park

The Lake Trasimeno Regional Park is located in the Region of Umbria, central Italy (Fig. 1). It was established in 1995 (Regional Law of March 3, no. 9) and is the largest of the six existing regional parks in Umbria. The park has an area of about 129 km², including a lake, and it is located in the northwestern part of the region. The lake has a surface area of 120.73 km² (Burzigotti et al., 2003), with a water volume of 590 km³. The area surrounding the lake hosts important agricultural activities; 35.7% of the territory consists of plains, while the remaining part is covered by hills, the majority having slopes between 10% and 30%. These characteristics and the presence of water favored the development of the agricultural sector (Ciani et al., 2013).

Although the protected areas were recognized by the regional government with the establishment of the park, management and socioeconomic programs for Lake Trasimeno Regional Park have not yet been enacted; the planning process, however, is underway. Regional law, as well as national law, provides the opportunity to establish buffer areas. Therefore, the future plan for the park will include a buffer area (Rocchi, 2012), to make it possible to regulate a larger area and to enable the social and economic development of the territory. The buffer area identified for the park is shown in Fig. 2; it covers about 309 km² and corresponds to the entire catchment basin area. Considering land use (Fig. 2), it is clear that agriculture is of great importance within the area. Seven municipalities, including their entire administrative area, fall within the buffer area. The main agricultural crops are cereals, grapes and olives. There are not many large farms in the area; thus the majority of farms are small, less than 5 hectares (78% of the total number of farms). However, farms larger than 20 hectares (i.e. the remaining 22%) occupy the majority of the land (63% of the utilized agricultural area).

Because of its tendency to concentrate organic substance, Lake Trasimeno is characterized by quite a high level of eutrophication, and it is also quite muddy. Although these two characteristics are partially natural (Bresciani et al., 2011), intensive agriculture can increase the eutrophication and muddiness (Bresciani et al., 2010). The lake has no natural outflow, and for this reason its water tends to store chemical nutrients, such as nitrogen and phosphorus (Bresciani et al., 2011). More specifically, due to the conformation of the catchment basin, phosphorus used in farming can easily run into the lake, increasing its natural turbidity (Bresciani et al., 2010). The creation of a buffer area can be useful for having an additional limitation of such substances and improving water quality. To benefit from the Common Agricultural Policy (CAP), farmers are normally required to observe various *good agricultural practices* (Defrancesco et al., 2007). Good agricultural practices represent a minimum level of environmental protection, which all farmers must respect (Bergschmidt et al., 2003). However, sometimes these levels are not sufficient for protecting water quality (Worrall et al., 2009). Moreover, in the study area (which is a Nitrate Vulnerable Zone – NVZ) farmers must observe some additional restrictions for nitrogen use thanks to the Nitrate Directive, whereas for phosphorus there are none (Worrall et al., 2009). In buffer areas, additional limitations can be imposed, or it is possible to promote more sustainable types of agriculture, such as organic farming (Rocchi, 2012). Higher water quality in the lake is also expected to improve fish welfare. Because of the great importance of agriculture in the designated buffer area and its strategic role in landscape and regional management, the majority of the measures to be included in future management and socioeconomic plans should involve farmers.

The measures presented in the Rural Development Plan (RDP), the second pillar of the CAP, can prevent from some of the negative consequences for the Park, due to the agricultural activities in the surrounding areas. With the RDP, the European Commission tries to sustain agriculture as part of a specific cultural heritage and for its role in land management, rather than sustaining traditional intensive production. In particular, some measures proposed in the RDP try to