



Contents lists available at ScienceDirect

## Rangeland Ecology &amp; Management

journal homepage: <http://www.elsevier.com/locate/rama>

## Exploring the Role of Management in the Coproduction of Ecosystem Services from Spanish Wooded Rangelands<sup>☆</sup>

Mario Torralba<sup>a,\*</sup>, Elisa Oteros-Rozas<sup>a,b</sup>, Gerardo Moreno<sup>c</sup>, Tobias Plieninger<sup>a</sup>

<sup>a</sup> Department of Geosciences and Natural Resource Management, University of Copenhagen, Copenhagen, Denmark

<sup>b</sup> Social and Participatory Action Research Group, Department of Social Anthropology, Basic Psychology and Public Health, Universidad Pablo de Olavide, Seville, Spain

<sup>c</sup> Forestry School, INDEHESA, University of Extremadura, Plasencia 10600, Spain

## ARTICLE INFO

## Article history:

Received 3 March 2017

Received in revised form 24 August 2017

Accepted 5 September 2017

Available online xxx

## Key Words:

bundles  
multifunctionality  
social-ecological system  
synergies  
tradeoffs

## ABSTRACT

The wood pastures or hardwood rangelands of the southwestern Iberian Peninsula are complex social-ecological systems created from the long-term interaction of society and the landscape. *Dehesa*, oak woodlands managed for grazing, cropping, and other forms of production, is the most common rangeland system and one of the most distinctive landscapes. Traditionally characterized by multifunctional low-intensity management that enhances a wide range of ecosystem services, current management has shifted from the traditional toward more intensified models. This paper assesses the coproduction of ecosystem services on *dehesa* properties by exploring the relationship between biophysical and sociocultural factors and *dehesa* management practices. Based on 42 surveys we analyze 16 quantitative indicators using multivariate techniques. The results indicate that there are four main *dehesa* types as defined by their characteristics and management: large heterogeneous operations with diverse products; small and homogeneous operations focused on a reduced number of products; medium-large properties focused on crop production; and mid-sized properties with easy public access. Management is the result of the dynamics of interacting biophysical and sociocultural factors that influence manager priorities and investments. Management decisions group around the degree of multifunctionality of the operation, the relative importance of crop production, the degree of grazing pressure in the system, and how restrictive public access policy is. We find that in the study area, interactions between all the previously mentioned elements covary consistently, generating bundles of ecosystem services associated with each of three management models based on the intensity of management.

© 2017 The Society for Range Management. Published by Elsevier Inc. All rights reserved.

## Introduction

In Europe, wood pasture is a historical land management system in which open woodland provides shelter and forage for grazing animals, as well as providing for the production of a variety of woodland products. These rangelands, with their scattered trees and shrubs (Bergmeier et al., 2010), have an important role in European rural landscapes (Jørgensen and Quelch, 2014). Wood pastures are especially abundant in Mediterranean countries and Eastern Europe, and in total they cover an area of 203,000 km<sup>2</sup>, approximately 4.7% of the 27 countries of the European Union (EU) (Plieninger et al., 2015). In the southwestern Iberian Peninsula, wood pastures are most often oak

woodlands, hardwood rangelands managed for diverse products including livestock and game, generally referred to as *dehesa* (Huntsinger and Oviedo, 2014).

The long-term interaction between these wooded rangelands and the people living among them is an archetype of coupled social-ecological systems (SEs), where ecosystems and society have shaped one another (Huntsinger and Oviedo, 2014). As such, they are an important part of European cultural heritage and host rich local ecological knowledge (Plieninger et al., 2015). The traditional management of wood pastures, typically characterized by low-intensity management practices (Halada et al., 2011) and multifunctionality (understood as the ability to generate multiple products and diverse activities in the same management unit), in combination with high temporal and spatial heterogeneity, enhances biodiversity and ecosystem service provision (Díaz et al., 2013; Torralba et al., 2016). Therefore, *dehesa* and other wooded rangelands are considered prime examples of high nature value farming systems by European policy makers and scholars (Oppermann et al., 2012), as they enhance biodiversity through low-intensity management (Mountford and Peterken, 2003; Fischer et al., 2010) and habitat diversity (Moreno et al., 2016).

<sup>☆</sup> We acknowledge funding through Grant 613520 from the European Commission (Project AGFORWARD, 7th Framework Program). Elisa Oteros-Rozas has been partially funded by Andalusia Talent Hub program (Andalusian Knowledge Agency and Marie Curie IF from the European Commission).

\* Correspondence: Mario Torralba, Dept of Geosciences and Natural Resource Management, University of Copenhagen, Rolighedsvej 23, 1958 Fredriksberg C, Denmark. Tel.: +45 35333628.

E-mail address: [mtv@ign.ku.dk](mailto:mtv@ign.ku.dk) (M. Torralba).

<https://doi.org/10.1016/j.rama.2017.09.001>

1550-7424/© 2017 The Society for Range Management. Published by Elsevier Inc. All rights reserved.

Please cite this article as: Torralba, M., et al., Exploring the Role of Management in the Coproduction of Ecosystem Services from Spanish Wooded Rangelands, Rangeland Ecology & Management (2017), <https://doi.org/10.1016/j.rama.2017.09.001>

In Spain, holm oak (*Quercus ilex*) dehesas are the main rangeland type. Livestock graze the abundant understory grasses, and the oaks are a supplementary source of feed, providing acorns and tree fodder to a range of livestock including beef cattle, Iberian pigs, sheep, and goats and supporting a secondary industry in firewood and charcoal. Tree density is managed to create a microclimate that allows pasture vegetation, mostly annual grasses, to survive for a longer period into the hot summer drought (Moreno et al., 2013; López-Sánchez et al., 2016) and provide shelter for livestock (Ruiz and Gonzalez-Bernaldez, 1983). Dehesas traditionally incorporate crop production (mainly cereals for fodder production) and game habitat management within rangelands dominated by livestock grazing, creating an integrated and diverse agroecosystem.

Many dehesas have been affected by processes common to other European wood pastures, as a consequence of two antagonistic trends: land abandonment and agricultural intensification (Stoate et al., 2009; Roellig et al., in revision). Both processes reduce the multifunctional character of management and the heterogeneity of the landscape and typically lead to a loss of biodiversity (Bugalho et al., 2011; Plieninger et al., 2014; Queiroz et al., 2015). The drivers behind these processes are complex, but the consequences are that the land is abandoned to the dense shrubs that take over unmanaged dehesas, or under intensification, management tends to become more monofunctional, focused on meat production. As the secondary products of wood pastures (such as charcoal or cork) have low profitability (Bugalho et al., 2011), production tends to become less diverse. In particular, there is an increasing tendency to import animal fodder instead of relying on local resources, further exacerbating the disappearance of traditional practices such as transhumance (Oteros-Rozas et al., 2014) or the use of trees as for fodder (Moreno and Pulido, 2009).

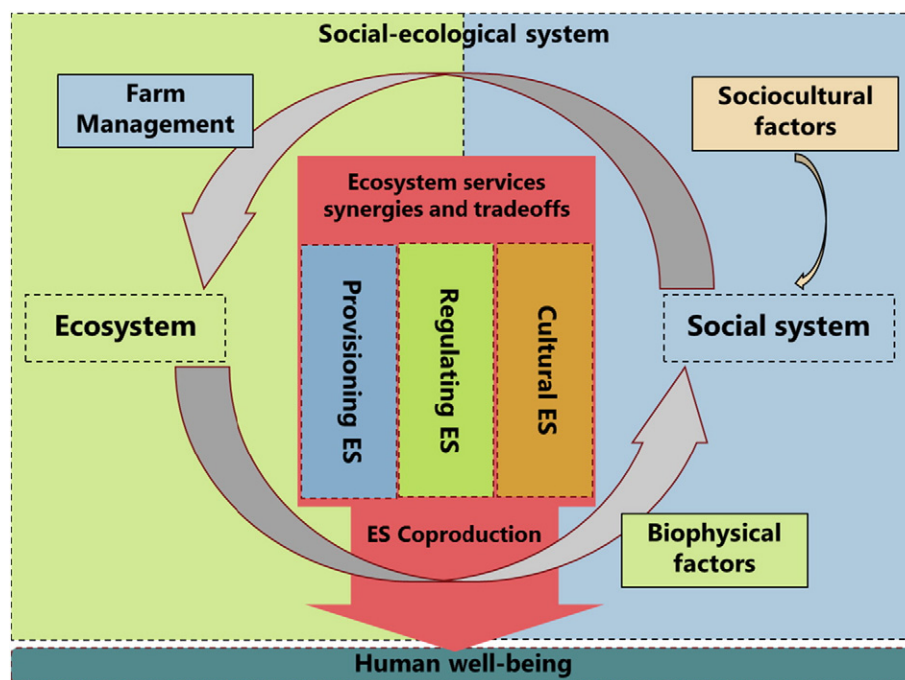
The challenges that wood pastures currently face may be threatening their capacity to provide ecosystem services (ESs). The ES framework has proved to be a useful tool for understanding the functioning of social-ecological systems in general (Reyers et al., 2013) and of the multifunctional role of wood pastures in enhancing biodiversity and ES provision in particular (Huntsinger and Oviedo, 2014; Torralba et al., 2016). However, as it has been pointed out in different literature reviews of ES provision

in agroecosystems, biophysical and monetary valuation of ES is to date the main area of research, which means that the sociocultural dimension of ES provision is often neglected (Nieto-Romero et al., 2014; Fagerholm et al., 2016b). In addition, there is a need for a more thorough understanding of the complex relationships between ES, particularly their interactions in term of tradeoffs, synergies, and bundles (Mouchet et al., 2014), and the relation between management practices and ES provision (Andersson et al., 2015).

Current understanding of the linkages between the biophysical and sociocultural components involved in ES provision is limited (Bennett et al., 2015). Recently, Palomo et al. (2016) and Fischer and Eastwood (2016) offered theoretical frameworks explaining how ESs are coproduced in social-ecological systems through the interaction between an ecosystem component and a social component. Here, we propose that the coproduction of ES is based on feedback processes in which a social system actively shapes and modifies an ecosystem through farm management (Fig. 1). At the same time, the ecosystem provides the physical framework and limits or increases the range of management options based on the ecosystem structure and the ecological processes underlying it.

On the one hand, management decisions are based on the natural resources involved in coproduction, and their potential and limitations, while, on the other hand, they are also shaped by sociocultural factors, often external to the individual operation, such as the governance context or markets. Typically, the perception and appreciation of ES vary across stakeholder groups (Oteros-Rozas et al., 2014; Villamor et al., 2014; Fagerholm et al., 2016a; Garrido et al., 2017). Sociocultural and biophysical factors, such as land tenure and property size, influence management decisions, perceptions, and perspectives (Huntsinger and Oviedo, 2014; Hausner et al., 2015; Malinga et al., 2016).

The main objective of this paper is to explore how management influences the coproduction of ES. In particular, we identify and characterize dehesas in relation to their management. We explore the synergies and tradeoffs associated with management, analyzing how biophysical and sociocultural factors influence the range of management models. Finally, we identify how different management styles foster and promote different management outcomes that result in the provision of different bundles of ES.



**Figure 1.** The two sides of the social-ecological system feed back into each other in the coproduction of ES. The social system shapes the ecosystem through management, while the ecosystem sets the boundaries and limits the management through biophysical factors. Sociocultural factors also influence the management model. The interaction between all these elements generates tradeoffs and synergies in ES that define the dehesa management model and result in the provision of management-associated bundles of ES.

Download English Version:

<https://daneshyari.com/en/article/8849546>

Download Persian Version:

<https://daneshyari.com/article/8849546>

[Daneshyari.com](https://daneshyari.com)