Forest Policy and Economics 69 (2016) 83–89

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Shedding light on the self-consumption value of recreational hunting in European Mediterranean forests

María Martínez-Jauregui [a,b], A. Casimiro Herruzo [c], Pablo Campos [d], Mario Soliño [a,b,*]

[a] National Institute for Agriculture and Food Research and Technology (INIA), Forest Research Centre (CIFOR), Ctra. de La Coruña km. 7.5, 28040 Madrid, Spain
[b] Sustainable Forest Management Research Institute, University of Valladolid & INIA, Avda. de Madrid 57, 34004 Palencia, Spain
[c] Technical University of Madrid (UPM), Department of Forestry Economics and Management, Madrid, Spain
[d] Institute for Public Goods and Policies (IPP), Spanish National Research Council (CSIC), C/Albasanz 26-28, 28037 Madrid, Spain

ARTICLE INFO

Article history:
Received 28 October 2015
Received in revised form 5 May 2016
Accepted 7 May 2016
Available online 18 May 2016

Keywords:
Big game
Discrete choice experiment
Hedonic price
Forestry
National accounting
WTP in space

ABSTRACT

This paper proposes a novel approach for simulating the price of hunting self-consumption by owners in the experimental Agroforestry Accounting System (AAS). The "enlightenment approach" allows allocating a competitive price or, alternatively, a price that matches the recreational hunting cost for driven hunts associated with self-consumption. The starting point is information gathered from two surveys of 740 owners of hunting estates (supply side) and 557 hunters (demand side) in Andalusian forests. The results show that 76% of the total driven hunt spots for big game were self-consumed by owners in the 2009–2010 hunting season. Regarding the traditional AAS framework, self-consumption is nearly one million euros less when the enlightenment approach is considered. This lower bound, compared to the upper bound imputed through market prices in the AAS, allows simulating a range of values for hunting self-consumption and expanding policy recommendations for hunting management.

1. Introduction

Andalusia plays an important role in European hunting activity in terms of species hunted (40 species), number of hunters (over 300,000 hunting licenses), and managed hunting area (over 7 million hectares). Regarding the main big game species in Spain, the estimated number of red deer harvested in Andalusia is ten times more than in Portugal, and it represents half the number of red deer harvested in France (MARM, 2009; Apollonio et al., 2010). There are strong recreational and cultural heritage components associated with hunting in Andalusia, as in other European areas. Hunters are mainly people from the region who usually pay for their hunting activities, in addition to estate owners and their family and friends who hunt for self-consumption. Non-regional recreational hunters have been rapidly increasing in the European Union, although there are still few who utilize Spanish estates.

There has been a shift towards commercial hunting (Skonhoft et al., 2013), although currently hunter-owners[1] do not sell a large portion of their hunting capacity due to not only market conditions and private decisions but also due to the associated property rights and the legal framework of recreational hunting activities. Self-consumed recreational hunting is considered to be a marketable final output enjoyed by hunter-owners, their family, and/or their friends. It is assessed according to the implicit market price, i.e., the AAS shows the self-consumed hunting price to be equivalent to its competitively traded one.

There is a large body of published literature that attempts to explain the hunting transactions market through hedonic analysis (Livengood, 1983; Pope and Stoll, 1985; Messonnier and Luzar, 1990; Munn et al., 2005; Shrestha and Alavalapati, 2004; Zhang et al., 2006; Hussain et al., 2007; Little and Berrens, 2008; Rhyne et al., 2009; Martínez-Jauregui et al., 2015). The results from these studies could be used to estimate the competitive market price of hunting self-consumption.

However, this paper questions whether or not all self-consumption should be imputed at marginal exchange prices in national accounting, particularly in those cases when some of non-marketed driven hunting spots cannot be matched with hunters' demands. Non-market valuation techniques, such as discrete choice experiments (Carson and Louviere, 2011), allow analyzing the expected demand for such non-marketed spots according to their characteristics (Boxall et al., 1996; Bullock et al., 1998; Haener et al., 2001; Horne and Petäjistö, 2003; Hussain et al., 2010; Cornicelli et al., 2011; Moro et al., 2013; Nielsen et al., 2014; Delibes-Mateos et al., 2014; Kerr and Abell, 2016; among others).

* Corresponding author at: National Institute for Agriculture and Food Research and Technology (INIA), Forest Research Centre (CIFOR), Ctra. de La Coruña km. 7.5, 28040 Madrid, Spain.
E-mail address: solino.mario@gmail.com (M. Soliño).

[1] We refer to hunter-owners as private landowners, public administrations, hunter associations/clubs, and others who have the right to harvest animals from a public or private estate.

http://dx.doi.org/10.1016/j.forpol.2016.05.002
1389-9341/

Recently, Herruzo et al. (2016) applied the conventional Economic Accounts for Agriculture and Forestry (EEA/EAF) and made progress in the valuation of hunting income and capital, thereby making it consistent with the exchange value criterion of the European System of Accounts (ESA). However, neither conventional national accounts nor Herruzo et al. (2016) touch upon the appropriateness of only using competitive market prices for all private self-consumption. In this paper we try to explain this topic using two independent samples (owners and hunters) and two different but complementary valuation methods (hedonic pricing methods and a discrete choice experiment). This joint analysis of supply/demand at a regional hunting scale has been, to the best of our knowledge, an overlooked issue in previous literature. This paper fills in the gap and allows adjusting the value of hunting income, plus it provides an improved picture of hunting management in an entire territory (Andalusia, southern Spain). In summary, we propose a complementary procedure for arriving at an estimate of the lower bound of hunting self-consumption.

The paper is organized as follows: the Materials and methods section presents the study area, the data, and the theoretical basis of the methods. In Section 3, the results from the surveys of the supply side (owners) and the demand side (hunters) are presented, and a new approach for simulating the imputed prices of self-consumption is proposed. Section 4 discusses the implications for national accounts, and Section 5 presents the conclusions.

2. Materials and methods

2.1. Data and study area

The data used in this study were collected from two face-to-face surveys: (i) an owners survey conducted of 740 random hunter-owners of Andalusian forest estates and (ii) a consumer survey conducted of 557 hunters of Andalusian forest estates. The study focuses on forest estates of Andalusia (the southern-most region of Spain, see Fig. 1), since it adequately reflects the various types of forest ecosystems that exist in southern Europe, in addition to the fact that hunting estates represent approximately 75% of the territory. Andalusia is divided into 8 provinces, and its area covers nearly 9 million ha (i.e., a surface similar to Austria or Portugal). The main big game hunting species in Andalusian forests are red deer (*Cervus elaphus* L.) and wild boar (*Sus scrofa* L.), and driven hunts are the most representative form of big game hunting (Martínez-Jauregui et al., 2015).

The surveys were used to gather information about the hunting estates, their marketed hunting transactions (hunting leases, harvests, services), and the activities of hunters (harvests, expenses, etc.). Specifically, information was collected about 444 big game driven hunts on 201 estates (representing 18,372 hunting spots) during the 2009–2010 hunting season. Other types of recreational hunting and hunting for management (culling) were excluded from the analysis. A discrete choice experiment of 557 hunters' preferences for driven hunts of big game was also conducted.

2.2. Market price modeling

The price of a driven hunt depends on the characteristics. By estimating a hedonic price function of the varying characteristics, it is possible to statistically explain the price and also isolate the implicit price for changes in each attribute (Taylor, 2003). The general hedonic price function is

$$P_{ij} = \alpha + \delta X_{ij} + \varepsilon_{ij} \quad (1)$$

where P_{ij} is the price of driven hunt i on estate j, and X_{ij} is a vector of characteristics associated with the driven hunt. Particularly, we describe how the market price per hunting trip (y_{ij}) changes as a function of: (i) male red deer hunted per trip, (ii) wild boar harvested per trip, (iii) other big game harvests, (iv) red deer trophy hunted per trip, (v) wild boar trophy harvested per trip, and (vi) service level. The estates were considered as random factors on the intercept to avoid spatial pseudo-replication. Thus, the price per spot in a driven hunt can be specified as:

$$y_{ij} = \beta^0{}_{ij} + \beta^1 x^1{}_{ij} + \ldots + \beta^n x^n{}_{ij} + \varepsilon_{ij}, \quad \beta^0{}_{ij} = \beta^0 + u^0{}_j \quad (2)$$

where y_{ij} is the price of a marketed hunting trip, $\beta 1$ through βn are the fixed effect coefficients, and $x^1{}_{ij}$ through $x^n{}_{ij}$ are the fixed effect variables (hunt-related services and organization and the hunting bag per trip, i.e., species, amount, and quality of harvests) for observation i (marketed driven hunt) and estate j. $\beta^0{}_{ij}$ explains that every driven hunt i within an estate j has its own intercept, but all the hunting transactions share a common slope. ε_{ij} is assumed to be multivariate, normally distributed by $u^0{}_j \sim N(0, \sigma^2_{u0j})$ and $\varepsilon_{ij} \sim N(0, \sigma^2_{\varepsilon ij})$.

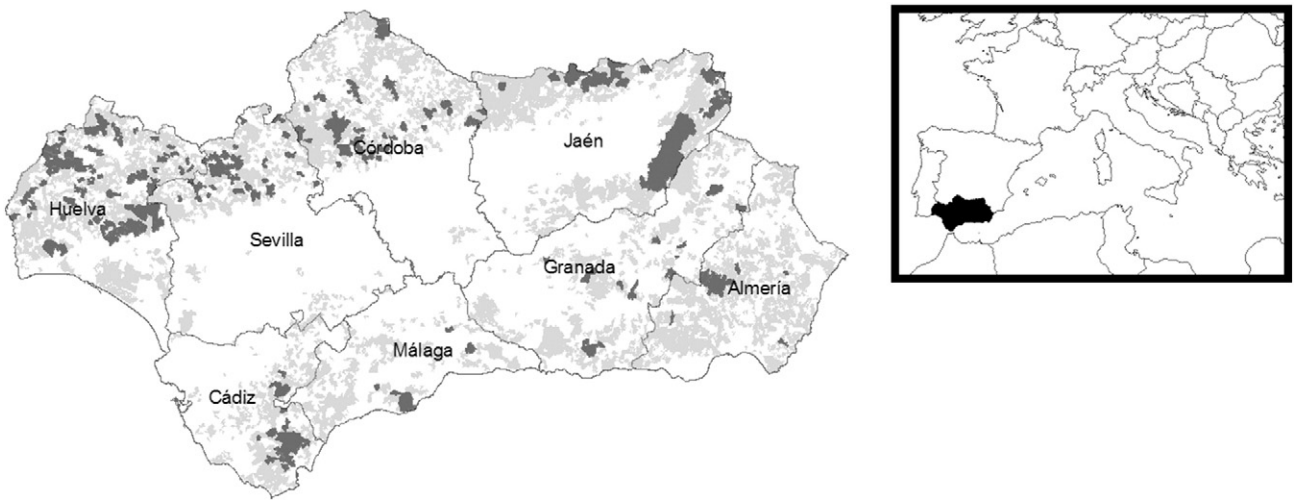

Fig. 1. Study area (grey: forest estates; black: sampled estates).