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Commercial income and capital of hunting: an application to forest estates in Andalucía

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ABSTRACT

This paper presents and applies an experimental agroforestry accounting system (AAS) to measure the commercial income and capital of hunting activities in a large territorial area. This application goes beyond the conventional system of national agriculture and forestry accounts. The methodology developed allows the independent valuation of both environmental and manufactured capital which in turn allows the disaggregation of hunting income and other economic indicators by type of capital. The spatial distribution of these economic indicators can also be provided. Results show positive current total capital income but residual manufactured capital income current losses. An underlying economic rationale explaining this phenomenon is offered.

1. Introduction

Traditionally, the Mediterranean forest had been grazing land for livestock and, marginally, until the 1960s, for big game animals (Fernández-Ales et al., 1992; Herruzo and Martínez-Jauregui, 2013). Since then, the process of abandoning livestock activities due to its low commercial profitability has led to a drastic reduction of income derived from pastures in marginal areas (Oviedo et al., 2013). In these circumstances, recreational hunting, based on leisure and dependent on relative costs of labor that are lower than those in livestock production (Kreuter and Workman, 1997), has become a real commercial option for using the spaces that have been abandoned by livestock. This substitution of cattle for wild and/or controlled herbivores (Mysterud, 2010), which are hunting targets, tends to satisfy the demand of landowners self-consumption present in the recreational hunting (MacMillan et al., 2010; Olaussen and Mysterud, 2012). Also, through selling hunting services to third-party hunters, game species provides one of the few alternatives for the landowner to recover income from grazing resources that are no longer remunerated by livestock.

The phenomenon of expanding game species currently affects large swathes of rural areas in various countries (Gill, 1990; Apollonio et al., 2010; Milner et al., 2006; Acevedo et al., 2011; Herruzo and Martínez Jauregui, 2013), and this situation makes recreational hunting a subject of increased attention from the perspective of economics. In addition, possible environmental problems that may be caused by this activity and its intensification is requiring more research attention (McShea et al., 1997; Côté et al., 2004; Mysterud, 2010).

Game species are in effect free (*res nullius*), although their capture in most countries is only allowed by the owner of the land. This regulation transforms hunting activities into private enterprises in which game animals can be the object of private market valuation. There is a broad and extensive literature on the study of market and non-market values in hunting demand. These studies include revealed preference methods – travel costs (Miller and Hay, 1981; Sandry et al., 1983; Knoche and Lupi, 2007) and hedonic prices (Livengood, 1983; Hussain et al., 2007; Martínez-Jauregui et al., 2015) – and methods of declared preferences – contingent valuation (Brookshire et al., 1983; Boyle and Bishop, 1987; Loomis et al., 1989; Boman et al., 2011) and discrete choice models (Bullock et al., 1998; Delibes-Mateos et al., 2014). There is also a wide range of studies on the economic aspects of hunting activities based on the optimization of the production side. These works address the optimal management of hunting resources, generally of one or various species, and are usually based on bioeconomic models that may consider various management structures and thus include the interactions between the private benefits and external costs of game breeding (see, e.g., Cooper, 1993; Keith and Lyon, 1985; Milner-Gulland and Beddington, 1993; Smart et al., 2008; Olaussen and Skonhoft, 2011).

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Table 1
Production account with indication of the type of quantities (q) and prices (p) of animals' variables used.*

	Sub-activity of game breeding (b)	Sub-activity of recreational hunting (r)
1. Total output (TO)		
1.1 Intermediate output (IO)	q: total recreational harvest p: PRHn	
1.2 Final output (FO)		
1.2.1 Sales (S)	q: culled animals p: PM	q: recreational harvest marketed p: PRH
1.2.2 Game gross fixed capital formation (GFCF)		
1.2.2.1 New Construction (NC)		
1.2.2.2 New equipment (NE)		
1.2.2.3 Births reproductive females (BF)	q: births of reproductive females p: EPB	
1.2.3 Game gross work in progress formation (GWPF)		
1.2.3.1 Births of male animals and of females with non-reproducing main function (BM)	q: births of reproductive males p: EPB	
1.2.3.2 Growth of male animals and of females with non-reproducing main function (GM)	q: game species inventory p: EGR	
1.2.4 Self-consumption (SC)	q: culled animals self-consumed p: PM	q: recreational harvest self-consumed p: PRH
1.2.5 Other	q: animals poached p: PM	q: recreational harvest donated p: PRH
2. Total cost (TC)		
2.1. Intermediate consumption (IC)		
2.1.1 Raw Materials (RM)		
2.1.1.1 Bought (RMbo)		
2.1.1.2 Own (RMo)		
2.1.1.2.1 Intermediate own raw materials (IRMo)		q: total recreational harvest p: PRHn
2.1.1.2.2 Stored own materials (SRMo)		
2.1.2 Services (SS)		
2.1.3 Work in progress used (WPu)	q: recreational harvest p: EPH; PAA	
2.1.4 Other Inter.Cons. (otherIC)		
2.2 Labor cost (L)		
2.2.1 Employee labor costs (LE)		
2.2.2 Self-employed labor costs(LSE)		
2.3. Consumption of fixed capital(CFC)		
2.3.2 Construction (CFCC)		
2.3.3 Equipment (CFCE)		

* Males = Male animals and females with a non-reproductive main economic role; Females = Female animals with a reproductive main economic role; PRHn = market price of animals in recreational hunting net of harvest costs; PM = meat market price; PRH = market price of animals in recreational hunting; EPB = environmental price of births; EGR = Environmental growth revaluation; EPH = Environmental price of animal harvest; PAA = Market price of animal alive.

By contrast, there are fewer studies that adopt a sectorial approach to study the current hunting activity. Within this approach we find regional and national surveys of hunting and wildlife-related recreation activities (U.S. Department of the Interior et al., 2011).

Finally, there are also estimations of the production value (Goio et al., 2008) and of income and capital of hunting activities (e.g., Campos, 2000; Campos et al., 2008; Oviedo et al., 2013) in a way that is compatible with their inclusion into the system of national accounts. These studies analyze hunting activities together with other forest production in case studies or limited locations. However, no paper of this type has exclusively focused on hunting activities in a large scale and neither was able to disaggregate hunting income and other economic indicators by type of capital (environmental and manufactured). This is important because, valuation of environmental income (ecosystems services) is a priority government political agenda (i.e. Convention on Biological Diversity at Nagoya, 2010). In addition, differentiation of environmental and manufactured capital is an important issue as it contributes to our understanding of economic rationality in game managing as it will be shown later in the paper.

Currently, estimating private income and capital from the main agroforestry products (agriculture, livestock, forestry) is fairly developed within the national account systems. However, estimating private hunting income and capital has been hampered by both inadequate national economic statistics and the shortcomings of the national accounts systems government application conventions. The official hunting statistics in developed countries are relevant typically on the number of captures and the number of hunters, but the practice of registering the costs and products that would make it possible to calculate total hunting income is non-existent (see Martínez-Jauregui et al., 2011 for the case of Spain). For its part, the conventional system of Economic Accounts for Agriculture and Forestry (EEA/EAF) (European Commission, 2000) derived from the European System of Accounts (European Commission, 2013) is limited to registering the transactions of extracting game animals but commercial manufactured costs derived from hunting activities are aggregated with other related minor products. This practice does not allow for the explicit valuation of the current total income from hunting activities in most of the countries.

In this context, this paper intends to overcome the limitations of the conventional EEA/EAF by incorporating in the analysis the consideration of natural growth, the cost of work in progress used and the explicit valuation of the environmental assets. Thus, it makes progress in the valuation of hunting commercial income (including meat products and recreational services) and capital in a way that is consistent with the exchange value criterion of the European System of Accounts (ESA) normative framework (European Commission, 2013). To do so, the experimental agroforestry accounting systems (AAS) context, which already have introduced innovations to the EEA/EAF in private agroforestry estates case studies (Oviedo et al., 2013) is used. We improve the methodology and allow the independent valuation of both environmental