Assessing the benefit of the agroecosystem services: Lithuanian preferences using a latent class approach

Anastasija Novikova[a], Lucia Rocchi[b,*], Vlada Vitunskienė[a]

[a] Aleksandras Stulginskis University, Institute of Economics, Accounting and Finance, Universiteto str. 10, LT − 53361, Akademija, Kaunas distr, Lithuania
[b] University of Perugia, Department of Agricultural, Food and Environmental Sciences, Borgo XX Giugno, 74 − 06121, Perugia, Italy

ARTICLE INFO

ABSTRACT

This study represents a first analysis of citizens' willingness to pay (WTP) for agroecosystem services in a Baltic country (Lithuania). Since it is part of the European Union, Lithuania applied environmental agriculture schemes to support the production of agroecosystem services by farmers. Therefore, understanding the demand of such services may help policy makers to allocate funds. This study revealed that Lithuanian residents are concerned about environmental problems that may be caused by agriculture. Moreover, while the provision of agroecosystem services is demanded, citizens show very different tastes concerning these services. The application of a latent class model highlights three groups of citizens with different tastes and levels of WTP. Among the ecosystem services tested, the landscape provisions show the highest level of heterogeneity across the class. This study's findings provide quantitative information concerning the demand for improvements in agroecosystem services through agri-environmental protection programmes. The obtained data supports the conclusion that choice experiments are a reliable tool to analyse consumers' preferences related to environmental protection in Lithuania.

1. Introduction

Agricultural ecosystems cover nearly 40% of the world's surface land, and agriculture represents the most common form of land management in the world (Power, 2010). Food, fibre, and fuel production are the overwhelmingly dominant goals of agriculture (Karlsson and Ryden, 2012; Vivithkeyoonvong and Jourdain, 2017). As a managed ecosystem, agriculture plays unique roles in both supply and demand for other ecosystem services (Swinton et al., 2007; Dale and Polasky, 2007; Power, 2010; Huang et al., 2015), revealing the dependence of human well-being on these services (Matzdorf and Meyer, 2014). As Fig. 1 shows, agricultural ecosystems need and provide several ecosystem services, but they also provide disservices (Zhang et al., 2007).

The ecosystem services (ES) framework has recently been highlighted in the literature, proposing a need for better management of the integration of public and private dimensions (Ranganathan et al., 2008; Turner and Daily, 2008; Matzdorf and Meyer, 2014; Rodríguez-Ortega et al., 2014; Bernués et al., 2015; Scholte et al., 2015; Bull et al., 2016; Vivithkeyoonvong and Jourdain, 2017). Such an approach allows for providing economic valuation of ES and also for integrating multiple value domains (Bull et al., 2016). When applied to agriculture, the ES framework focuses on all the direct and indirect benefits that

agroecosystems provide to people (Zhang et al., 2007; de Groot et al., 2010; Huang et al., 2015; Rocchi et al., 2017).

According to the Millennium Ecosystem Assessment (2003), ES can be classified into the following four groups:

- Provisioning ES (material or energy outputs),
- regulating ES (biophysical processes providing benefits),
- Supporting ES (processes essential to provide other ecosystem services), and
- Cultural ES (recreational, aesthetic, spiritual benefits).

The last three groups can also be denominated as non-provisioning ES (Millennium Ecosystem Assessment, 2003). Traditionally, agroecosystems have been considered only as a source of provisioning services (Power, 2010). However, agroecosystems also provide a wide range of non-provisioning ES (Millennium Ecosystem Assessment, 2003; Power, 2010; Huang et al., 2015), such as agricultural landscapes (Sayadi et al., 2009; Colombo et al., 2009; Howley et al., 2012), preservation of biodiversity (Zhan et al., 2007), climate regulation (Smith et al., 2008) and flood control (Dominati et al., 2014). All these benefits from agriculture are very important in the context of European Union Common Agricultural Policy (CAP). For example, the second pillar of CAP (Rural

---

* Corresponding author.
E-mail addresses: anastasija.novikova@asu.lt (A. Novikova), lucia.rocchi@unipg.it (L. Rocchi), vlada.vitunskiene@asu.lt (V. Vitunskienė).
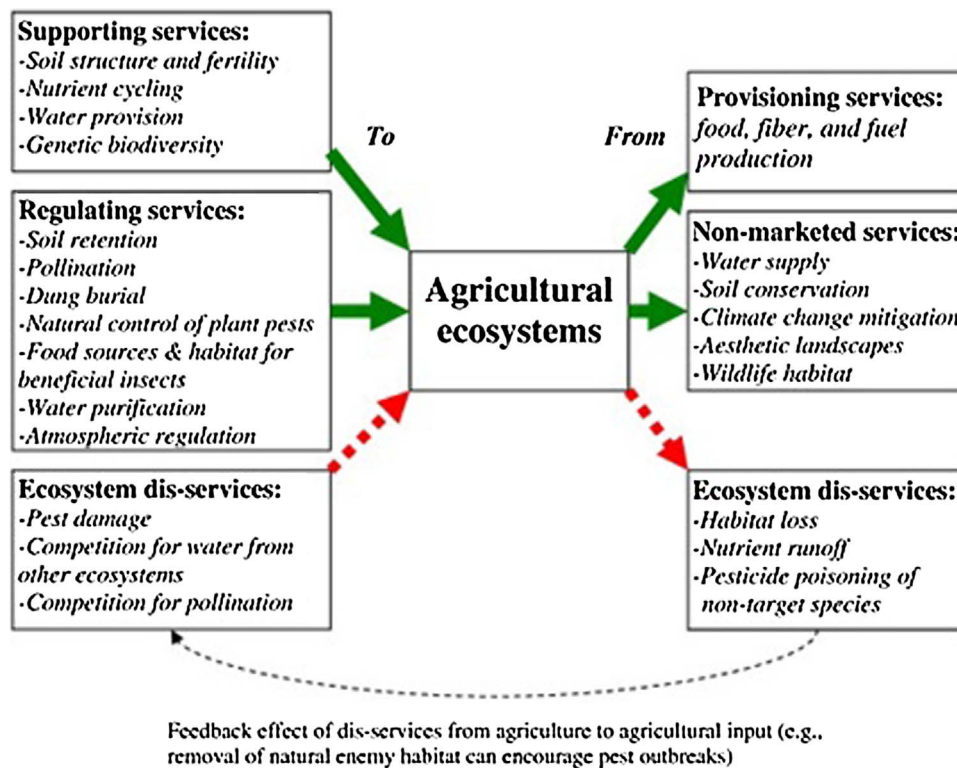
Development Policy) is fully connected with the preservation of these agroecosystem services, and agri-environmental schemes (AES), as Villanueva et al. (2015) stated, are a paradigmatic case of European tools. AES are multiannual and voluntary incentive-based payments to farmers for preserving and enhancing agroecosystem services, which are considered as environmental public goods (Villanueva et al., 2015). They usually consist of per-hectare payments implemented regionally and co-financed by the EU and each of its Member States (Espinosa-Goded et al., 2010; Uthes and Matzdorf, 2013). AES stands out as one of the most significant CAP tools as it has assigned an aggregated expenditure of 22.2 billion EUR (that is, 22% of the budget of the European Rural Development Policy 2007–2013), according to the ECA European Court of Auditors (2011). These agri-environmental programmes are implemented by receiving monetary support from EU citizens who are also the consumers of such services. Because the market for environmental public goods obtained from agroecosystems does not exist, the benefits gained by consumers cannot be feasibly measured employing traditional valuation techniques. The main objective of evaluation of ecosystem services is to address policies and incentives for better management of agriculture (Power, 2010).

In the absence of market values, stated preference methods, such as contingent valuation method (CVM) and choice experiments (CE) in particular, are recommended for measuring the benefits associated with the implementation of multidimensional policies with an impact on the provision of environmental public goods (Adamowicz et al., 1998; Bateman et al., 2002; Bennett and Blamey, 2001). In such an evaluation, hypothetical markets are created to analyse non-marketable goods. Consistently, they are based on the observation of consumer preferences and behaviour concerning these goods.

An overview of scientific literature (Adamowicz et al., 1994; Champ et al., 2012) reveals that the CVM is the most widely used stated preference technique for non-market valuation. Earlier studies of agricultural non-market valuation used CVM to estimate the willingness to pay (WTP) for the amenity values and for environmental benefits from agri-environmental protection (Tsai, 1993; Krumalova, 2003; Kubičkova, 2004; Boody et al., 2005; Yong-Kwang and Chang-Gil,

2006). In some situations, the outputs of the research should be considered as a "complex public good", as in the case of agri-environmental protection programmes (Campbell et al., 2005; Szabó, 2010). Baskaran et al. (2009b) notes that the analysis of different attributes could be important for policy makers to implement the right programmes. The use of CVM in situations where multiple options and several attributes are used is generally considered to be problematic (Jianjun et al., 2013). Literature on this topic states that AES can be considered as a "complex environmental public good", and therefore CE is the best technique to value both the overall good and each of its components (Bennett and Blamey, 2001; Hanley et al., 2001).

Several researchers have analysed consumer preferences for agroecosystem services or multiple functions of agriculture in European Union countries (Koùmalová, 2002; Arriaza et al., 2008; Domínguez-Torreiro and Soliño, 2011; Rodríguez-Entrena et al., 2012) and other developed countries such as Norway (Bernués et al., 2015), US, and New Zealand (Takatsuka et al., 2006; Baskaran et al., 2009a, b). However, there is limited attention in the literature in the case of Baltic countries. Moreover, no research has been carried out in Lithuania so far about consumer preferences for agroecosystem services. In this context, the main objectives of this paper are as follows: 1) to explore the applicability of CE to evaluation of agroecosystem services in Lithuania; 2) to estimate the non-market values of improvements in agroecosystem services within the study area, based on consumers' preferences; and 3) to understand how to use such information about consumer preference for better targeting the national expenditure for AES. The paper is structured as follows: Section 2 describes the main characteristics of Lithuanian agriculture, Section 3 explains the methodology applied in the research, the results of the empirical application are discussed in Section 4, and Section 5 ends the paper by presenting its main conclusions.

2. Case study: the Lithuanian agroecosystem services

Lithuania is a rural nation. Rural areas cover 97% of Lithuania, and approximately one-third of Lithuania's inhabitants live in them. Fig. 2