Ecological Economics 93 (2013) 219–229

Contents lists available at SciVerse ScienceDirect

Ecological Economics

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

Surveys

Assessing the total economic value of threatened livestock breeds in Italy: Implications for conservation policy

Kerstin K. Zander [a,*], Giovanni Signorello [b], Maria De Salvo [b], Gustavo Gandini [c], Adam G. Drucker [d]

[a] The Northern Institute, Charles Darwin University, Darwin, NT 0909, Australia
[b] Department of Agrifood and Environmental Systems Management, University of Catania, Italy
[c] Department VSA, Faculty of Veterinary Medicine, University of Milan, Via Celoria 10, 20133, Milan, Italy
[d] Bioversity International, Via dei Tre Denari 472a, 00149 Maccarese, Rome, Italy

ARTICLE INFO

Article history:
Received 23 May 2012
Received in revised form 28 May 2013
Accepted 4 June 2013
Available online 24 June 2013

Keywords:
Agrobiodiversity
Animal genetic resources
Choice experiment
European traditional livestock breeds
Rural Development Plans

ABSTRACT

The total economic value (TEV) of two threatened Italian cattle breeds (Modicana and Maremmana) was investigated using a choice experiment survey. Most respondents (85%) support breed conservation, their stated willingness-to-pay easily justifying EU support. The high landscape maintenance, existence and future option values of both breeds (around 80% of their TEVs) suggest that incentives mechanisms are indeed needed in order to allow farmers to capture some of these public good values and hence motivate them to undertake conservation-related activities. The positive direct use values of both breeds (around 20% of their TEVs) imply that niche product markets aimed at enhancing the private good values associated with conservation could also form elements of a conservation and use strategy for these breeds.

1. Introduction

According to the most recent State of the World's Animal Genetic Resources report Europe is home to 277 local cattle breeds (FAO, 2007a; p. 34), which is about 30% of the world's FAO-registered local cattle breeds. Worldwide 16% of cattle breeds have become extinct (FAO, 2007a) and a further 16% are at risk (critical or endangered). Despite a comprehensive inventory of cattle breeds worldwide the status of 30% of cattle breeds is still unknown. For Europe the situation appears even worse, with 27% of the cattle breeds being at risk and another 9% having an uncertain status (FAO, 2007b).

The loss of and increasing threat to such breeds can largely be attributed to changes in production systems leading to changes in breed use and crossbreeding, as well as changes in consumer preferences associated with changes in socio-economic factors (Rege and Gibson, 2003). In particular, as production systems have evolved into more intensive and commercially-oriented systems high-yielding breeds have become increasingly preferred and largely kept for their production traits. As these high-yielding breeds have increasingly replaced multipurpose traditional breeds, the associated non-direct use values of the latter have also been progressively reduced. [1] These include important non-market and public good values related to their indirect use (e.g. traditions and culture, landscape maintenance) as well as non-use existence and future option values. The latter value is a type of insurance against unknown future change, such as climate change and disease outbreaks (Rege and Gibson, 2003).

In the presence of the significant non-market and public good values associated with agrobiodiversity, of which animal genetic resources (AnGRs) are one component, positive incentives as called for under the Convention on Biological Diversity's 2011–2020 Strategic Framework (CBD, 2011) are required in order to ensure that socially desirable levels of livestock diversity are maintained. However, as conservation funds are limited understanding the 'true' (i.e. total) economic value of different breeds and their contribution as a public good can be an important tool to support prioritisation and funding allocation (Fadlaoui et al., 2006). Understanding such values can help in the design of incentive mechanisms, including those that are based on the development of new markets to promote breed self-sustainability. Although incentive payment schemes exist under the European Union (EU) Council Regulation (EC) no. 1257/1999, Council Regulation no. 1698/2005 and Commission Regulation (EC) no. 817/2004 (European Union, 1999, 2004) for farmers rearing local traditional breeds at risk, these payments are often inadequate to cover the true financial opportunity costs of local breed farmers (Signorello and Pappalardo, 2003).

A number of studies related to the economic valuation of traditional cattle breeds have been carried out in developing countries where the livelihood functions (e.g. indirect use-values) of such breeds are particularly important. Such studies include, *inter alia*, the Borana (Zander and Drucker, 2008), the Fulani (Jabbar and Diedhiou, 2003) and Zebu breeds

* Corresponding author.
E-mail address: kerstin.zander@cdu.edu.au (K.K. Zander).

[1] Gibson and Pullin (2005) estimated that up to 90% of the value of traditional livestock breeds can be associated with their non-direct use values.

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http://dx.doi.org/10.1016/j.ecolecon.2013.06.002

(Ruto et al., 2008; Scarpa et al., 2003). Ouma et al. (2007) and Kassie et al. (2009) have valued particular traits of local cattle breeds for breeding purposes, such as trypanotolerance, fertility and milk yield. Developed country AnGR valuation studies are more limited in number but include two in Italy related to the costs and benefits of conserving the Pentro horse (Cicia et al., 2003) and Valdostana Cattle (Giacomelli et al., 2001). Both studies have employed the contingent valuation method.

The aim of this study was to assess the total economic value (TEV) of two Italian cattle breeds, the Modicana and the Maremmana. The study was carried out within the project 'Towards self-sustainable European regional cattle breeds' (EURECA) which aimed to assess cattle breeds in eight European countries (Hiemstra et al., 2010). Two hypotheses guided our approach. We firstly hypothesise that both breeds have significantly different use and non-use values, implying that different types of conservation intervention may be appropriate. We test this hypothesis by means of a choice experiment (CE), a non-market multi-attribute valuation method which enabled us to estimate the values of the different types of benefits to society associated with the conservation of these breeds. Given that most breed valuation studies using CEs have been carried out in developing countries, it is interesting to reveal how the TEV of local breeds in Europe are made up. The second hypothesis relates to the importance of 'localness' in valuation studies. Considering findings from other valuation studies (e.g. Garrod et al., 2012; Hanley et al., 2003; Pate and Loomis, 1997; Sutherland and Walsh, 1985), we hypothesis that respondents who live closer to where the breeds are kept are willing to pay more for their conservation. To address this hypothesis we administered the CE in locations close to and more distant from where the breeds are kept. Where it can be shown that respondents from the more distant locations reveal a willingness-to-pay (WTP) for the conservation of these breeds, it may be reasonable to extend these conservation values to a wider section of Italian society. A comparative analysis of the TEV components of the two breeds and an understanding of how society's WTP for conservation activities differs between respondents also permit us to elaborate conservation policy recommendations. To support recommendations we also estimate overall conservation costs, including those currently being incurred under the EU Rural Development Plans (RDPs).

The remainder of the paper is structured as follows: the next section (Section 2) provides an outline of the economic framework of the conservation of genetic resources for food and agriculture. Section 3 describes the underlying random utility theory and the applied logit model, followed by the presentation of the results (Section 4). Discussion is undertaken in Section 5 and conclusions are highlighted in Section 6.

2. Economic Framework

Narloch et al. (2011), drawing on Swanson (1997) and Drucker and Rodriguez (2009), note that the erosion of agrobiodiversity may be seen in terms of the replacement of the diverse existing pool of local plant and animal genetic resources (PAGR) with a smaller range of specialised improved ones. Local PAGR may be expected to perform better than improved PAGR in marginal production environments which have only slightly been modified by external inputs (Bellon, 2006; Cavatassi et al., 2011). With agricultural intensification, improved PAGR (developed for productive traits under modified environments) become more productive because of their higher responsiveness to external inputs, especially in areas which are favoured in terms of agronomic potential and market access (Bellon, 2006)—see Fig. 1. For AnGRs, such replacement occurs not only by breed substitution but also by crossbreeding, thereby gradually eliminating local breeds in the process of production system changes often associated with the overall development process (Drucker and Rodriguez, 2009).

However, there are a number of reasons which suggest that such replacement is resulting in less than socially desirable levels of PAGR being maintained, in particular as a result of the fact that significant non-market and/or public good values associated with conservation services have been ignored. At the landscape level, these non-market values relate to the public good role of agrobiodiversity use in, for instance, supporting agroecosystem resilience (e.g. Hajjar et al., 2008), evolutionary processes, gene flow and global option values, as well as maintaining traditions and culture (e.g. Bellon, 2009). Ignored values also include private good characteristics, unrelated to direct use values associated with production outputs but instead associated with the use of agrobiodiversity to minimise farm-level risks related to external shocks, such as climatic events and disease outbreaks (e.g. Di Falco and Chavas, 2009).[2]

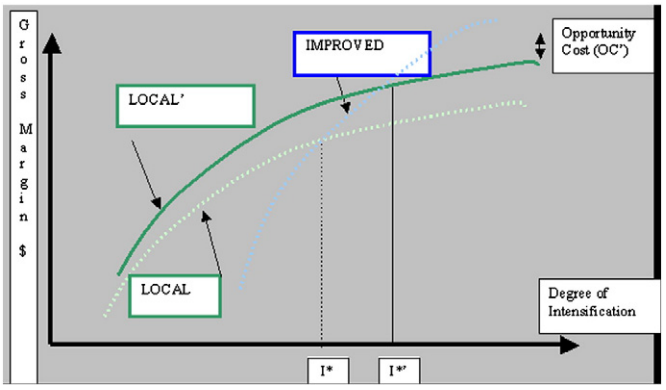

Fig. 1. Local PAGR (LOCAL curve) outperform improved PAGR (IMPROVED curve) up to a given level of production system intensity, I*—where the term 'intensity' is used in a broad sense and includes, inter alia, factors related to access to markets and extension services. According to the market profitability functions represented by the dotted lines, after I* is reached, farmers face increasing financial incentives to replace the local PAGR with improved ones. Accounting for ignored public good values would lead to an upward shift in the LOCAL PAGR curve (solid line), so that the socially optimal replacement point is in fact be to the right of I* (at I*') (adapted from Drucker and Rodriguez, 2009).

In general, Fig. 1 suggests that farmers will need to be compensated for their financial opportunity costs of continuing to maintain socially desirable levels of local PAGR (also see Krishna et al., 2013). Associated incentive mechanisms to permit the 'capture' of the total economic values arising from the maintenance of local PAGR would have the effect of shifting the dotted curve for local PAGR upwards to the left. Such mechanisms could include support payments such as those under the RDPs, as well as enhancing private values through niche market and value chain development for products and services associated with local PAGR.

Within this conceptual context it becomes apparent that an understanding of non-market and public good values is important from a conservation policy perspective. Accounting for such values within a TEV framework permits us to determine, *inter alia*, whether the benefits of intervention outweigh the costs, and what the appropriate intervention strategies are, including for cases where PAGR conservation priorities have little or no current market development potential. We consequently apply such a framework (Bateman et al., 2004; Pearce and Moran, 1994), classifying such values into use and non-use values. In the context of the multiple values that can be associated with European traditional cattle breeds, it is also possible to identify their relevance to different types of stakeholders and the stakeholder's willingness to pay for the different types of environmental service provided by these local cattle breeds. Direct use values can be linked with livestock production outputs, such as milk and meat production, and are of relevance to farmers and consumers of these products (see Table 1). These values

[2] Narloch et al. (2011) also go on to identify market failures (e.g. externalisation of environmental impacts) leading to an overestimation of the performance of improved PAGR, as well as important intervention failures (e.g. capital subsidies, support prices) that increase the financial profitability of improved PAGR.