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# Valuation of environmental and social functions of the multifunctional Cypriot agriculture

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ABSTRACT

The multifunctional farming sector in Cyprus poses threats on the island's water resources, but highly contributes to the protection of the cultural identity and to the provision of incomes and employment in its rural areas. These services are externalities, as farmers are not remunerated in markets for the environmental and cultural services they provide, nor for the fact that they maintain vivid rural areas. This paper presents an application of the Choice Experiment method, in order to evaluate these non-traded outputs of Cypriot agriculture. The results of the empirical analysis demonstrate that the Cypriot public is in favor of a less intensive pattern of agriculture. Furthermore, Cypriots are willing to pay in order to mitigate adverse environmental effects of agriculture, to improve cultural heritage and to safeguard the continuation of farming trade on the island. The estimated benefits often exceed income losses from changes in the cropping pattern towards extensification, which verifies that EU rural development policies are regarded as beneficial by the public.

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## 1. Introduction

The agricultural sector is multifunctional, which is manifested through complex interactions with the environment and the provision of rural amenities. Agriculture's multifunctionality has been a central issue during trade liberalization negotiations within the World Trade Organization (WTO) and is steadily gaining attention in the agricultural policy reform agenda. Proponents of multifunctionality claim that the maintenance of rural landscapes, the viability of rural areas and food security are some of the non-traded outputs of agriculture, which are endowed with public good characteristics or are externalities (OECD, 2001). As such, these non-traded outputs provide additional arguments in favor of policy interventions and protectionism in the farming sector.

The debate over agriculture's multifunctionality mainly involves societal perceptions of goods and services that stem from agricultural activity. Farmers continue to maintain landscapes and vivid rural economies, but they are not rewarded by markets. A positive approach of multifunctionality recognizes multiple functions of agriculture, but favors policy measures to arrange their provision only as long as they are perceived and valued by society (Vermersch, 2001; Allaire and Dupeuble, 2002; OECD, 2003); if society is not affected by the non-traded outputs of agriculture, there is no room for public intervention. Therefore, central to the integration of multifunctionality in the agricultural policy reform agenda is to provide estimates of the values of non-traded outputs that society attributes to them, which sum up to the Total Economic Value (TEV) of agriculture (Hediger and Lehmann, 2003).

The multifunctional character of agriculture is also an emerging issue in academic circles. Many authors have examined the implications of joint production of traded and non-traded outputs (Paarlberg et al., 2002; Havlík et al., 2005) and the effects of price policies on the production of non-traded outputs (Randall, 2002; Peterson et al., 2002; Romstad, 2004a, 2004b). The effects of the spatial distribution of agricultural and environmental resources on production and development patterns and, consequently, on the manifestation of agriculture's multifunctionality have also been examined (Baumgartner, 2000; Freshwater, 2005; Polyzos and Arabatzis, 2008). The role of preferences and the valuation possibilities of agricultural externalities have also been of interest (Randall, 2002; Boody et al., 2005). More recently, Howley et al. (2014) found that the aspirations of farmers and of the general public do not differ substantially when it comes to the environment. This broader consensus between the "producers" and the "consumers" of environmental public goods from agriculture, however, needs to be

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closely examined, as it may conceal conflicts regarding particular issues *e.g.* the wild flora and fauna. Hence, the authors highlight the necessity of a segmented approach of farmers and the public in order to detect individual-specific characteristics shaping preferences for multifunctionality. Kvakkestad et al. (2015) undertook a sub-sample Q survey and a linked Likert scale survey to examine whether Norwegian farmers were aware of their numerous roles. It was verified that the farmers recognize their cultural role and their essential contribution to the provision of landscapes, nonetheless they prefer payments linked to agricultural activity rather than mere payments for public goods. Stated preference techniques, such as Contingent Valuation (CV) and Choice Experiments (CE), have been employed in order to attach monetary values to non-traded outputs of agriculture (Yrjola and Kola, 2004; Kallas et al., 2007). Villanueva et al. (2015) applied a CE in order to estimate the heterogeneity of farmers' preferences towards participation in an agri-environmental scheme for olive groves in Spain, providing high-quality information for the implementation of the new Rural Development Program (RDP) 2014–2020 in the country.

The purpose of this paper is to provide estimates of the value that society places on features of multifunctional agriculture. The CE method is employed in order to examine the factors that affect individual preferences regarding functions of agriculture and to estimate monetary values for these functions. The experimental design considers four attributes. The first two attributes concern the adverse environmental effects of agriculture, namely pollution of water resources by pesticide and fertilizer use and pressures on water reserves from irrigation. The third attribute is related to the protection of cultural heritage and rural landscapes, which shape the identity of rural regions of the island. The fourth attribute evaluated within this survey is the maintenance of the farming trade, which is multifunctional and, because of that, it is expected that the public is positively predisposed towards farmers. The CE data are analyzed by estimating Conditional Logit (CL) and Random Parameters Logit (RPL) models. The estimated coefficients reveal public preferences about multifunctional agriculture and focus on the effects of particular individual characteristics and attitudes on the acceptance of changes in the level of provision of agriculture's externalities. Furthermore, these coefficients are used in the estimation of the Marginal Willingness to Pay (MWTP) for the valued functions of agriculture. As a final step, income losses from potential changes in the cropping pattern of the Cypriot agriculture are compared to benefits from the provision of non-traded outputs. The analysis provides information of crucial importance for the implementation of the new Common Agricultural Policy (CAP) and RDP of Cyprus, implementing Reg. EC/1305/2013, as it links societal preferences directly with land uses and depicts the directions towards which the cropping pattern in Cyprus should shift under the new policy in force.

## 2. Agriculture's multifunctionality in the policy agenda

Multifunctionality reflects the fact that the agricultural sector produces food and fiber jointly with non-traded outputs. The former, referred to as "non-trade concerns" in the WTO agenda, are often externalities or are endowed with public good characteristics. Despite controversial, the concept of agriculture's multifunctionality has been central among countries' claims of widening the "green box" measures in order to protect unique farming systems that produce some of these externalities. It is worth noticing that the negative externalities of agriculture, such as pressures on water resources and air quality, have been recognized in literature (see Pretty et al., 2000), but the concept of multifunctionality in agricultural policy has focused on positive externalities (employment, income, cultural heritage, rural development).

The European Union (EU) farming sector has been long recognized as multifunctional, which is manifested through the small family farms that prevail in the continent (de Vries, 2000). This "European Model of Agriculture" plays a significant role in maintaining vivid rural areas and protecting the environment and cultural heritage (Casini et al., 2004). EU favors protectionism in the farming sector, because market competition could abolish this model of agriculture and cease the provision of relevant goods and services. In this context, the CAP provides economic incentives through its second pillar, many of which have affected land uses (Arabatzis and Polyzos, 2007), and, consequently, non-traded farm outputs, but have not achieved environmental and rural development goals. The new Regulations EC/1305/2013 and EC/1307/2013 verify that the EU is committed to safeguard its multifunctional agriculture, as new dimensions are added in rural development policies, strengthening the social role and the environmental sustainability of the European farming sector. In particular, the CAP actually in force envisages the socioeconomic development of mountainous, less-favored (LFA) and remote areas and the promotion of their cultural identity.

The relationships between agriculture and the environment are predominantly complex. The extent to which farming affects the environment, either positively or negatively, depends on input use and on the cropping pattern. Conventional EU farming systems produce negative environmental externalities which affect soil, air quality and surface and ground water resources. The main pressures of agriculture on water resources and aquatic ecosystems are due to poor management of irrigation and non-point sources of pollution, mainly agrochemical residuals (Pretty et al., 2000). Agro-environmental measures have emerged in order to minimize adverse environmental effects of agriculture (Dobbs and Pretty, 2004). The recent CAP reform (Reg. EC/1305/2013) still proposes payments to farmers who adopt integrated or organic farming (see for instance Pauloudi et al., 2009) and motives to expand fallow lands and forests, much like the previous periods. The latter were examined within the framework of past RDPs in Greece by Arabatzis et al. (2006) and Arabatzis (2008), who found that agroforestry measures were adopted by a rather heterogeneous cohort of farmers, whose decision, nonetheless, was influenced *inter alia* by prior participation in other relevant schemes, land ownership and gender. Payments for ecosystem services also constitute tools regulating the provision of environmental services (Villanueva et al., 2015) with benefits for rural and rural-urban societies alike. Such payments are viewed within a generalized framework of designated land use policies at the regional level (Caro-Borrero et al., 2015); at the country level, Lizin et al. (2015) estimated significant perceived costs for farmers if land use restrictions were to be implemented in agriculture in Belgium, including crop restrictions and less use of pesticides.

Another category of agriculture's externalities is the formulation of agricultural landscapes (Lindland, 1998; Peterson et al., 2002; Casini et al., 2004). These include natural and man-made elements which reflect structural changes in the farming sector as well as social, cultural and political changes that occurred during centuries. Rural landscapes characterize and differentiate the countryside and constitute important resources for the development of these areas. Arabatzis et al. (2010) demonstrated that relevant strategies were proven efficient in a study of the implementation of Leader+ in Greece, which was more successful when undertaken by agents aiming at the amelioration of the natural and man-made landscapes.

Agriculture's role in rural development is undeniably significant. Functions such as aversion of depopulation, protection of cultural heritage and maintenance of the farming trade are some of its non-traded outputs that affect rural amenities. Farm policies are considered necessary in regulating their provision, but it is ambigu-

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