



# Social preference-based valuation of the links between home gardens, ecosystem services, and human well-being in Lefke Region of North Cyprus



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## ABSTRACT

The purpose of this study is to evaluate the relationship between ecosystem services (ESs) and human well-being (HWB) in the home gardens of Lefke Region located in North Cyprus. The objectives of the study include: to examine the plant composition; to evaluate the key ESs delivered by the home gardens; to assess the contribution of ESs to HWB; and to evaluate the relationship between ESs and HWB. The Millennium Ecosystem Assessment, a social preference method and relevant tools (e.g. questionnaire) were used to evaluate the importance of ESs and HWB, which were expressed on a five point Likert scale. The results revealed that approximately 183 plant species are cultivated in the home gardens, which deliver 21 ESs with a perceived average relative value ranging from moderate (e.g. 'sense of belonging' in the cultural ESs) to very low (e.g. provisioning ESs) degree. These services mostly influence the security (a secure environment) and at least the basic material component of HWB. The results of this study can contribute to improving our understanding of the social values of ESs, their influence on HWB, and developing relevant policy responses in terms of sustainable landscape development.

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## 1. Introduction

Home gardens are a traditional land use system that has evolved from prehistoric times (e.g. hunters and gatherers) through ancient civilizations to the modern era (Mohri et al., 2013). Home gardens, numerous small areas, represent a significant proportion of green spaces in cities (Vergnes et al., 2012). They are multi-storey combinations of various trees and crops around residences that provide the family with food and other services (e.g. ornaments and additional income) (Aguilar-Stoen and Moe, 2009; Mohri et al., 2013). According to Berkes et al. (2003), home gardens are the integrated concept of humans-in-nature. Reyes-García et al. (2014) highlighted that home gardens are pockets of social-ecological memory, in which the knowledge and experience of managing a local ecosystem and its services have been captured, stored, and transmitted through time. Home gardens create high agro-biodiversity and enhance the dietary diversity of the household (van der Stege et al., 2012) by producing a variety of fruits, vegetables, and non-timber forest products (Mohri et al., 2013). They are established to produce aesthetic, spiritual, and psychological benefits (Dunnnett and Qasim, 2000), and usually managed by family labour (Fernandes and Nair, 1986; Vogl et al., 2004;

Kumar and Nair, 2004). The composition of home gardens is intrinsically linked with past and present land use, surrounding ecosystems, and local culture (van der Stege et al., 2012), which are embedded in larger social-ecological landscape systems (Fernandes and Nair, 1986). Diversity in home gardens is an outcome of differences in geographic location, climatic condition, cultural factors, farming systems, and socio-economic conditions (Mohri et al., 2013). They are continuously adapted with the aim of satisfying the material, nutritional, and spiritual needs of the households (Esquivel and Hammer, 1992). A range of events (e.g. economic crises and changing policies) has an impact on household decision-making and, therefore, on the home garden composition and management. In such situations, home gardens create a buffer to overcome disturbances by accessing to food, medicinal and ritual plants, and the profit from selling plant materials. Biodiversity in home gardens contributes to maintaining and enhancing the resilience of householders (increasing their ability to find needed resources on their doorsteps) (van der Stege et al., 2012) and the entire landscape's system. Thus, home gardens are crucial sources of ecosystem services (ESs) which contribute to human well-being (HWB) (Camps-Calvet et al., 2016). Although there is a growing interest in literature regarding home gardens, in the relevant literature the contributions of home gardens regarding ESs and HWB remain relatively unexplored (Calvet-Mir et al., 2012;

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Dunnett and Qasim, 2000). Within this context, this study was carried out to solve this knowledge gap.

Several authors (e.g. Dunnett and Qasim, 2000) emphasized that home gardens provide various ESs for humans. ESs are the benefits people obtain from ecosystems (MA, 2003: p.3), which depend on biodiversity and sustain HWB in everyday life (Hausmann et al., 2015). The concept of ESs originated as a metaphor to illustrate the reliance of humans on the biosphere. It is now applied to understand how options for ecosystem conservation, use, and modification affect HWB in specific cases through landscape planning and policy development (Fisher and Turner, 2008). The concept is a potentially powerful approach to landscape scale conservation and management (Ciftcioglu, 2016). In recent decades, the concept of ESs has been a powerful guide for policy making and integrating ecosystem-related values in the decision-making process (Chan et al., 2012; Castro et al., 2011; Hausmann et al., 2015). However, ESs are still lacking in most policy tools (de Groot et al., 2010). Therefore, an interdisciplinary collaboration between ecologists and social researchers is needed to link ecosystem dynamics and human dimensions (Carpenter and Folke, 2006) and to develop conceptual frameworks for incorporating ESs into decision-making (Chan et al., 2006; Martín-López et al., 2009).

There are different ways of categorizing ESs. Much of the current literature follows the MA (2005), which classifies them into four groups (Wu, 2013): provisioning ESs (the products obtained from ecosystems e.g. food), regulating ESs (the benefits obtained from the regulation of ecosystem processes e.g. climate regulation), cultural ESs (the nonmaterial benefits people obtain from ecosystems e.g. aesthetic experiences), and supporting ESs (the benefits that are inevitable for the production of all other ESs e.g. primary production) (MA, 2005; Martín-López et al., 2009; Diaz et al., 2015a,b; Castro et al., 2011). All these services together contribute to the social-ecological resilience of landscapes (Folke et al., 2003, 2010) and HWB (e.g. food security and community development) (Taylor and Lovell, 2014).

Well-being is a broad term, interpreted in different ways, and there is no single agreed definition of wellbeing (Summers et al., 2012). Well-being is the state of people's life situation (McGillivray, 2007: p.3). HWB refers to the state of physical and mental health of individuals (Diaz et al., 2015a,b). HWB comprises several dimensions (e.g. economic, social and environmental), including objective and subjective wellbeing. Objective dimensions of HWB capture material and social attributes (e.g. basic human needs, the level of wealth and infrastructure) that contribute to individual or community wellbeing. Subjective dimensions of HWB capture an individual's assessment of their own circumstances – what they think and feel (Summers et al., 2012). Perhaps, the MA (2005) is the most comprehensive work to articulate wellbeing in a socio-ecological context (King et al., 2014). Therefore, the most cited classification of HWB comes from the MA (2005), including: basic material for a good life (e.g. food and drinking water), health (e.g. mental health), security (e.g. secure access to resources), good social relations (e.g. family cohesion), and freedom of choice and action (e.g. economic freedom). The significance of home gardens for HWB was emphasized by many scholars. For example, Dunnett and Qasim (2000) emphasized that people grow food in their gardens for a mixture of both practical and emotional reasons: for the taste, aroma and freshness of home-grown fruit and vegetables, and for the pleasure of growing a crop from start to finish. Mazumdar and Mazumdar (2012); and Dunnett and Qasim (2000) highlighted that ESs obtained from home gardens contribute to both physical and mental health (e.g. aiding in recovery, stress reduction, and cognitive functioning). The amount of physical exercise possible in home gardens (e.g. walking and watering) is valued from the point of physical health. Home gardens may constitute a restorative environment that fosters recovery from mental fatigue, social unrest, disease, and

crime (Kaplan and Kaplan, 1989; Bhatti and Church, 2004; Dunnett and Qasim, 2000; Maller et al., 2005). Home gardens provide a safer environment for children and protect householders from external threats such as motor traffic (Dunnett and Qasim, 2000). Home gardens provide an opportunity for contacting with the natural world that is carried out not only for the material (e.g. food and water) needs but also for psychological, emotional, and spiritual needs (Maller et al., 2005; Francis and Hester, 1990; Dunnett and Qasim, 2000; Kaplan, 1973; Cameron et al., 2012). Contact with the nature may be experienced via various means, including viewing natural scenes, being in natural settings, encountering plants and animals, participating in recreational activities, undertaking environmental conservation works, and participating in nature-based therapy programmes, amongst others (Maller et al., 2005). For example, exposure to nature has been shown to promote recovery from surgery, lower blood pressure, social integration, to relieve from stress, to reduce mental fatigue, to contribute to the integrity of a person and community, and to develop 'sense of place' (Hausmann et al., 2015; Cameron et al., 2012). Home gardens also provide opportunities for socializing with and learning from community members (Maller et al., 2005). As a result, home gardens and associated ESs positively contribute to the lives of people in terms of different aspects of wellbeing (MA, 2005; Carpenter et al., 2009; Daw et al., 2011). However, how ESs affect different components of HWB remains poorly understood (Wu, 2013).

ESs interact with social structures and processes as humans derive a portfolio of ESs from ecosystems. Therefore, humans can be considered as an integral part of the ecosystems (Levin, 1998). There is a large body of literature (Costanza et al., 1997; de Groot et al., 2002; MA, 2005) linking natural and social settings (Gross and Lane, 2007). Perhaps, the MA (2005) is the most comprehensive work that links ESs to HWB. The linkages between ESs and HWB can be evaluated at different scales. Understanding the dynamic relationship between ESs and HWB in the context of home gardens is the main research question of this study. Within this context, Lefke Region has been selected as a case study area.

The present home gardens in Lefke Region are the products of the past traditions, design solutions, and horticultural skills. This is especially important for the entire Mediterranean region where private outdoor spaces (e.g. patios, gardens, balconies, and terraces) are intensively used throughout the year due to favourable climate. Such Mediterranean lifestyle can be observed on the entire Cyprus Island. Within this context, Lefke Region has a special place for not being occupied by gigantic urban developments. Home gardens are attached to houses and they are indispensable parts of buildings. They are the products of a unified design approach. Practical tools, methods, or techniques for policy makers are needed to evaluate the links between home gardens, ESs and HWB. Accordingly, the purpose of this study is to evaluate the relationship between ESs and HWB in the home gardens of Lefke Region located in North Cyprus. To this end, the objectives of the study include: (i) to examine the plant composition in the home gardens, (ii) to evaluate the key ESs delivered by the home gardens, (iii) to assess the contribution of ESs to HWB, and (iv) to evaluate the relationship between ESs and HWB. The results of this study can contribute to improving our understanding of the social values of ESs, their importance for HWB, the mutual relationship between ESs and HWB, and developing relevant policy responses with a special attention to landscape sustainability.

## 2. Material and method

### 2.1. Study area: Lefke Region

Cyprus is the third largest island of the Mediterranean basin after Sicily and Sardinia. The island has a Mediterranean climate

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