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Farm households' preferences for collective and individual actions to improve water-related ecosystem services: The Lake Naivasha basin, Kenya

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ABSTRACT

Interventions in payment for ecosystem services (PES) programs can involve both collective and individual actions. This study explores the potential for the development of payment for water related ecosystem services (PWES) program in the Lake Naivasha basin, Kenya. Using a choice experiment approach, the willingness to accept compensation is estimated for three water-related ecosystem services (WES) attributes: one collective attribute (reforestation) and two individual attributes (environment-friendly agricultural practices and restoration of riparian land). Moreover, the preferences of upstream farm households are analysed with regard to sub-basins where a PWES program has already been implemented and sub-basins where it has not been implemented so far. For sub-basins where PWES has already been implemented, environment-friendly agricultural practices is the only significant attribute for local farmers' choice to improve WES. Reforestation and environment friendly agricultural practices are significant attributes for sub-basins where PWES has not been implemented so far. Farm households are willing to accept compensation but there appears to be heterogeneity in preferences for WES attributes. We find differences in farm households' preferences and values for collective and individual actions. Therefore, contrary to the current norm in PES interventions with a uniform compensation scheme, we recommend conservation payments to vary among ecosystem service providers.

1. Introduction

A considerable number of studies have contributed to improve the understanding of classification and economic valuation of ecosystem services (Costanza et al., 1997, Costanza and Farber, 2002; de Groot et al., 2002; Boyd and Banzhaf, 2007; Fisher and Kerry Turner, 2008; Ojea et al., 2012). The concept of ecosystem services is already shaping environmental policies and actions (Costanza and Farber, 2002; MA, 2005). Payment for Ecosystem Services (PES) is a recent policy instrument for conserving ecosystem services which is applied in both developed and developing countries (Schomers and Matzdorf, 2013). The major objective of PES programs designed in developing countries is both to diversify existing livelihood strategies and to improve ecosystem services at the same time (Bulte et al., 2008; Milder et al., 2010). However, only few attempts have been made for implementing PES programs in developing countries. Particularly in Africa, market-based approaches to conserve ecosystems remain inadequately tested (Jones, 2006; Frost and Bond, 2008; Turpie et al., 2008; Jack, 2009; Fisher et al., 2010).

PES schemes are designed to create economic incentives to align collective and individual actions for protecting, ensuring or augmenting the delivery of benefits from natural systems to humans (Fisher et al., 2010; Muradian et al., 2010). Interventions in PES programs can involve both collective (communal) and individual (private) actions. Common property regimes are managed through collective actions while private property regimes are typically tied to individual actions (Dietz et al., 2002). Collective action occurs when more than one individual is required to contribute to an effort in order to achieve a desired outcome (Ostrom, 2004) or when voluntary action is taken by individuals within a group to achieve a common goal (Meinzen-Dick et al., 2002; Ostrom, 2008). Effort to influence strategies for managing water and other natural resources in rural areas should take into account factors that increase the likelihood that individuals will engage in collective action to manage local resources

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(Ostrom, 2008). Considering preferences for collective and individual interventions using a stated preference approach to quantify environmental values could strengthen valuation studies in PES programs (Farber et al., 2002; Gómez-Baggethun et al., 2010).

Understanding of preferences and values for alternative interventions in PES programs is also vital to implement PES programs that are allowing conservation payments to vary among ecosystem service providers. Compensation/reward payments are inducements provided to ecosystem service providers to enhance or maintain ecosystem services (Swallow et al., 2009). The current norm in PES programs is a scheme to receive a uniform compensation/reward (Jones, 2006; Munoz-Pina et al., 2008; Pagiola, 2008; Wunder and Alban, 2008). However, the economic case of uniform compensation to ecosystem service providers is weak because sources of income, livelihood strategies and demands for compensation vary (Southgate et al., 2010). As a result, preferred payments could vary among PES participants who adopt the same practices.

Water is widely regarded as the most essential of natural resources and many freshwater systems are directly threatened by human activities (Vorosmarty et al., 2010). According to the Millennium Ecosystem Assessment (MA, 2005), water-related ecosystem services (WES) related to flood control, water regulation, soil erosion control and water purification considered as "regulating services", water supply as "provisioning services" and habitat function as a "supporting service" (Lele, 2009). In response to growing concerns to improve WES in developing countries, payment for water-related ecosystem services (PWES) schemes were introduced as a market-based approach (Johnson et al., 2001; Milder et al., 2010). In PWES programs, members of upstream communities are considered resource managers who receive a payment for improving WES. It is understood that upstream communities will face some uncertainty in assessing the values of improving WES which may lead to higher estimates for willingness to accept compensation/reward (Muradian et al., 2010; Pascual et al., 2010). However, their willingness to accept compensation still reflects the level of payment needed to enter into voluntary agreements. This is supported by one of the principles of PES which states that PES is a voluntary transaction (Wunder, 2005). In our study, we analyse upstream farm households' preferences for collective and individual actions to estimate the willingness to accept compensation to improve WES in the Lake Naivasha basin, Kenya.

Lake Naivasha is a wetland of international importance for socio-economic and ecological functions (Ramsar, 2011). However, the resources in Lake Naivasha and its catchment face various threats. A decline in water quality and water availability are among the main challenges (Becht et al., 2005). To address these problems, an experimental PWES program has already been implemented since 2007 (Jones, 2006). However, this small-scale experimental program implements a uniform compensation scheme. Moreover, it is directed at influencing individual interventions of the local farmers. We aim at considering upstream farm households' preferences for both collective and individual interventions. Using a choice experiment (CE) approach, the marginal willingness to accept (MWTA) compensation is estimated for three WES attributes: one collective attribute (reforestation) and two individual attributes (environment-friendly agricultural practices and restoration of riparian land). Farmers in the upper parts of the basin can only reach for reforestation by collaborating through community-based resource management. The novelty in our paper is the introduction of the collective intervention of reforestation in valuing a PWES scheme. Finally, we test for implementing a non-uniform compensation scheme. We add to the limited literature on valuation studies on PES programs by discussing a particular experiment embodied in an East Africa context.

2. Study area

Lake Naivasha is approximately 140 km^2 to 160 km^2 and is mainly fed by the Malewa and the Gilgil rivers which contribute 80% and 20% of the total inflow to the lake, respectively. Malewa and Gilgil rivers currently discharge approximately 7 million tons of sediment into the Lake each year (WWF, 2011). For water management purposes the Lake Naivasha basin (~3400 km^2) has been divided into twelve sub-basins governed by twelve Water Resource Users Associations (WRUAs). The Malewa sub-basin (~1700 km^2) has an average flow of 20 $m^3 s^{-1}$ (WWF, 2011). The Lake Naivasha pilot PWES schemes have been implemented at selected sites on Malewa river since 2007. These schemes

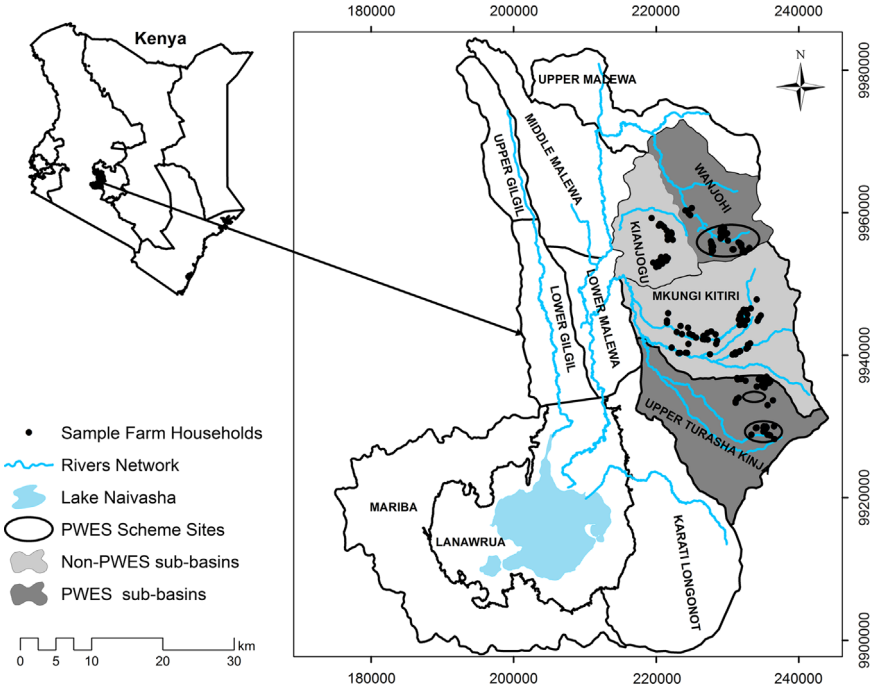

Fig. 1. The Lake Naivasha basin, Kenya showing sample respondents within PWES and Non-PWES implemented WRUA sub-basins.