Research Application Summary

Comparison of the perceived and "unseen" value of trees in Kamuli district in Eastern Uganda

Atugumya, A. B.* & Isabirye, M.
Faculty of Natural Resources and Environmental Sciences, Busitema University,
P. O. Box 236, Tororo, Uganda
*Corresponding author: armstrongbarcelona@gmail.com

Abstract

Farmers' knowledge on agro ecosystems is essential in sustainable tree-crop integration and management. Understanding the various ways farmers attach value to agrarian trees and a scientific evaluation on the contribution of trees in terms of their influence towards crop performance can enable farmers and all interested bodies make sound management decisions for improved livelihood. The study examined the farmer's perception of agrarian trees in Namasagali parish located in Kamuli district, eastern Uganda. This was based on the influence of trees on Below Ground Biodiversity (BGBD) and crop performance under the tree canopies. Purposive sampling was considered in determining the sampling population, Willingness to Accept (WTA) valuation method to capture farmer's perception and the market price method for capturing crop performance. For BGBD, a soil sample of (20cm x 20cm) stretched and 15 cm deep was excavated under and outside the tree canopies, placed on a white cloth and organisms within counted. Focus was on the 11 dominant macro soil organisms. The most dominant trees were *Ficus natalensis* (72%)*, Ficus sycomorus* (6%), *Persea americana* (4%), *Ficus ovata* (6%), *Markhamia lutea* (2%), *Mangifera indica* (2%)*, Artocarpus heterophyllus* (2%)*, Albizia coriaria* (4%) and *Milicia excelsa* (2%). The total composition of soil organisms was greater under the tree canopies than outside the tree canopies (13089 > 7461). The farmer's perceived value was less than the calculated and "unseen" value. Soil organisms were found explaining 99% of the variations in the crop amount ($P < 0.05$). Enhancing the farmer's knowledge will increase their willingness to adopt sustainable scientific options for cropping systems thus improving livelihoods.

Key words: Agrarian trees, eastern Uganda, perceived value, tree canopy

Résumé

Les connaissances des agriculteurs sur les écosystèmes agricoles sont essentielles à la durabilité de l'intégration et de la gestion du système arbres-cultures. Comprendre les différentes façons dont les agriculteurs attachent de la valeur aux arbres agraires et une évaluation scientifique de la contribution des arbres en termes d'influence sur la performance des cultures peuvent permettre aux agriculteurs et à tous les organismes intéressés de prendre des décisions de gestion profondes pour améliorer leurs moyens de subsistance. L'étude a examiné la perception de l'agriculteur sur les arbres agraires dans l'arrondissement de Namasagali située dans le district de Kamuli, à l'est de l'Ouganda.

Ceci est basé sur l'influence des arbres sur la Biodiversité du Sous-Sol (BGBD) et sur la performance des cultures sous couvert forestier. L'échantillonnage dirigé a été pris en compte dans la détermination de la population à échantillonner, la méthode d'évaluation de la volonté d'accepter (WTA) pour saisir la perception des agriculteurs et la méthode du prix du marché pour mesurer la performance des cultures. Pour le BGBD, un échantillon de sol (20cm x 20cm) a été étiré et 15 cm de profondeur ont été creusés sous et en dehors du couvert forestier, placés sur un tissu blanc et les organismes présents sont comptés. L'accent a été mis sur les 11 macro-organismes dominants du sol. Les arbres les plus dominants sont Ficus natalensis (72%), Ficus sycomorus (6%), Persea americana (4%), Ficus ovata (6%), Markhamia lutea (2%), Mangifera indica (2%), Artocarpus heterophyllus (2%), Albizia coriaria (4%) et Milicia excelsa (2%). La composition totale des organismes du sol était plus grande sous le couvert forestier qu'à l'extérieur de ce dernier (13089> 7461). La valeur perçue par l'agriculteur était inférieure à la valeur calculée et "invisible". Les organismes du sol expliquaient 99% des variations en quantité de culture (P <0,05). L'amélioration des connaissances des agriculteurs augmentera leur volonté d'adopter des options scientifiques durables pour les systèmes de culture, améliorant ainsi les moyens de subsistance.

Mots clés: Arbres agraires, Est de l'Ouganda, valeur perçue, canopée des arbres

Background

The majority of people are unaware of the ecosystem services that trees provide especially to enhance crop performance and improvement of people's livelihood. Biological resource management and people's livelihoods are complex and interconnected. While everyone is affected by ecosystem degradation, the poor households who have no access to land which is the most essential pillar of human livelihood and households national development in Uganda are disproportionately affected (MLHUD, 2009). Questions have been left unanswered as to what value trees are to the community. There are also questions regarding the environmental and economic values of ecosystem services offered by various trees (Raudsepp-Hearne *et al.,* 2010) . Most people are unaware of the environment in general and humanity's interrelatedness with the natural environment, which is causing misconceptions. The integration of trees and agricultural crops in gardens has the potential to enhance soil fertility, reduce erosion, improve water quality, enhance biodiversity, and increase aesthetics and sequester carbon (Garrett and McGraw, 2000; Garrity, 2004; Williams-Guillén *et al.,* 2008 and Nair *et al*., 2009). The objectives of this study was to find out how local farmers attach value to trees within their gardens and to evaluate the contribution of trees in terms of their influence towards crop performance.

Study description

In this study the **Perceived value:** is the value attached to the trees by the farmers and in this case was expressed by their Willingness to accept (WTA). **Calculated value:** This

was the tree value arrived at after assessing the market value of the crops under the trees and the tree carbon value and is the summation of the two. The **Unseen value:** This was the magnitude of the difference between the perceived value and the calculated value. It captured what the farmer missed out by taking a decision to have the tree cut.

The study was conducted in Namasagali parish located in the north western part of Kamuli district along the eastern bank of the Victoria Nile approximately 25 km from Kamuli town in eastern Uganda. The area experiences a bi - modal type of rainfall with an annual average rainfall of 1,350 mm while the mean monthly is 75 mm - 100 mm (Kamuli District State of Environmental Report, 2010).

Purposive sampling and semi-structured interviews were conducted focusing on the farming households who owned the trees that had cropping systems under their canopies to gain a deeper understanding on their perception towards these trees. A total of 50 trees within individual cropping systems were considered from which plots around the agrarian trees (within the tree canopy) and outside the canopy were demarcated depending on the tree canopy size. The crops and soil organisms within these plots were studied while considering: Crop performance in terms of the market price attached to the estimated yield and the availability of the soil organisms (diversity and integrity) that enhances crop performance under tree canopies.

The soil organisms under the tree canopy were studied clockwise from the major diagonal; eight transects each with four replicates. In total 32 plots were sampled for BGBD (soil organisms), where 16 sample points were under the tree canopy (within the yellow ring) and the other 16 sample points were outside the canopy. The distance between these sample points were at equal intervals and based on the tree canopy crown diameter. Each BGBD sample plots measured (20cm x 20cm) and 15cm deep.

Results and discussion

The composition of soil organisms was greater under the tree canopy than outside the tree canopy (Fig. 1). The most dominant organisms were earth worms, black ants, termites and red ants. Similarly Grayston *et al.* (2001), Kourtev *et al.* (2002) and Garbeva *et al.* (2006) explained that plant species increased the composition of underlying soil microbial communities compared to where there were no plants. Trees offer shade and litter (Wall, 2004) which attracts more species like termites, red ants, among others, for food which includes plant-decaying materials, dead foliage, woody materials, roots, seeds and the faeces of higher animals. The moist conditions of the soil under the trees promote decomposition of plant materials , which reduce soil microganism growth (Lavelle and Spain, 2001).
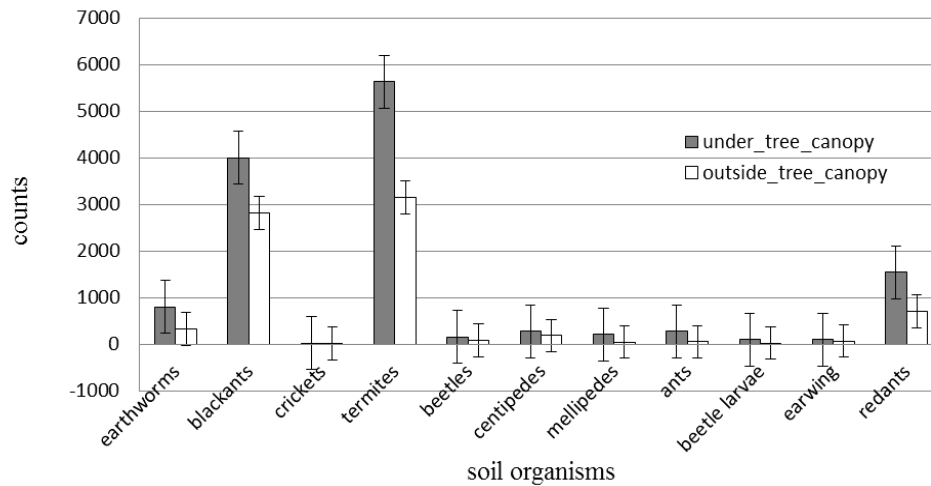
Figure 1: Comparison of the Species' composition under and outside tree canopy

As expected, presence of the soil microganisms had generally beneficial effect on crop yields, except for loss due to termites.

The farmers' perception of the value of agrarian trees was found to be lower than expected basing on the ecosystems services offered by these trees. This low perceived value directly affects the management of these farming systems. This also affects yields and hence explaining the poor livelihood and food security problems in Namasagali Sub County. However, in the course of the survey, interactions with the farmers indicated that with an increased access to principal natural resources such as land and the various scientific information and knowledge, they were willing to adopt friendly and sustainable management options for boosting their incomes and environmental benefits .

Acknowledgement

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