Ecological Indicators 93 (2018) 424–433

Contents lists available at ScienceDirect

Ecological Indicators

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

A perception based estimation of the ecological impacts of livelihood activities: The case of rural Ghana

Gideon Baffoe[a,*], Hirotaka Matsuda[b]

[a] Graduate Program in Sustainability Science – Global Leadership Initiative (GPSS – GLI), Graduate School of Frontier Sciences, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8567, Japan
[b] Graduate Program in Sustainability Science – Global Leadership Initiative (GPSS – GLI), Graduate School of Frontier Sciences, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8567, Japan

ARTICLE INFO

Keywords:
Ecological impact
Livelihood
Perception
Rural

ABSTRACT

Rural livelihoods are known to be heavily dependent on the natural resource base. Over reliance, over the years, has resulted in the decline of rural ecological quality. Meanwhile, natural resource abundance is key to the survival of rural poor households', as their livelihoods largely depend on them. To formulate appropriate tailored conservation policies, an empirical understanding of how rural people perceive the impacts of their livelihood activities on the environment would be critical. This understanding, however, is limited especially in African context. Using Ghana as a case, this study had two aims; the first was to estimate the relative impacts of livelihood activities on the natural environment, and the second was to estimate the willingness of rural household heads in natural resource conservation. Data were collected from 25 community development stakeholders, and two hundred household heads. The Multi-Attribute Decision Making (MADM) technique of Linear Additive Weighting and Logistic regression were employed. The overall study results showed a moderate (0.497) ecological impact of livelihood activities. On one hand, farming was found to be the activity with the most detrimental ecological impact (0.891), followed by gari processing (0.549), and other activities (0.447). Labour work and petty trading, recorded the least ecological impacts, with scores of 0.338 and 0.344, respectively. On the other hand, the level of household heads income, medicinal values of certain natural resources and access to extension services, were the significant factors that influence household heads willingness to conserve natural resources. Another significant but negatively correlated variable is the gender status of the household heads. The study results have implication on the incorporation of local ecological perceptions in rural conservation policies.

1. Introduction

Over the last few decades, evidences have shown decline in natural resources as a result of habitat degradation (Ndoye and Sindayigaya, 2009; Rapport and Hildén, 2013). Decline in ecological resources, it is established, has resulted in massive economic losses with land degradation, for instance, accounting for about 3% loss of annual agriculture GDP in sub-Sahara Africa (Moore and Thiongane, 2000; Adegoke, 2011). Many of these environmental problems are known to be in rural developing environments such as in Africa, where natural resources are the source of existing livelihoods for millions of poor households (NRI, 2000; Koziell and Saunders, 2001; Shackleton and Shackleton, 2000, 2004; Hunter et al., 2010). It is asserted that ecological assessment, especially in rural regions, needs to be given special attention, given the current wake of quality decline.

Defined as the general state of the immediate natural environment (Johnson et al., 1996), comprising a set of mutually penetrating and dependent properties and features of the environment influencing human wellbeing (Sowinska-Swierkosz, 2017), ecological quality is regarded a key attribute of multifunctional and resilient rural community (Wilson, 2010) as well as a core driver of sustainable development (Park et al., 2009). Abundant ecological resources are considered a measure of ecological quality and sustainability (McMichael et al., 2003).

A major attribute that has characterized previous studies on ecological quality assessment is the reliance on human perception (e.g. Moore and Thiongane, 2000; Park et al., 2009; Hunter et al., 2010; McManus et al., 2012). Lee (2011) argued that there is enhancement in sustainable use of ecological resources when users have positive attitudes about its conservation. Sirivongs and Tsuchiya (2012) are of the view that attitudes and perceptions influences stakeholders' willingness to engage in environmental conservation. Similarly, Vaske and Kobrin

* Corresponding author.
E-mail address: gideonbaffoe@s.k.u-tokyo.ac.jp (G. Baffoe).

https://doi.org/10.1016/j.ecolind.2018.04.074
Received 20 November 2017; Received in revised form 24 February 2018; Accepted 27 April 2018

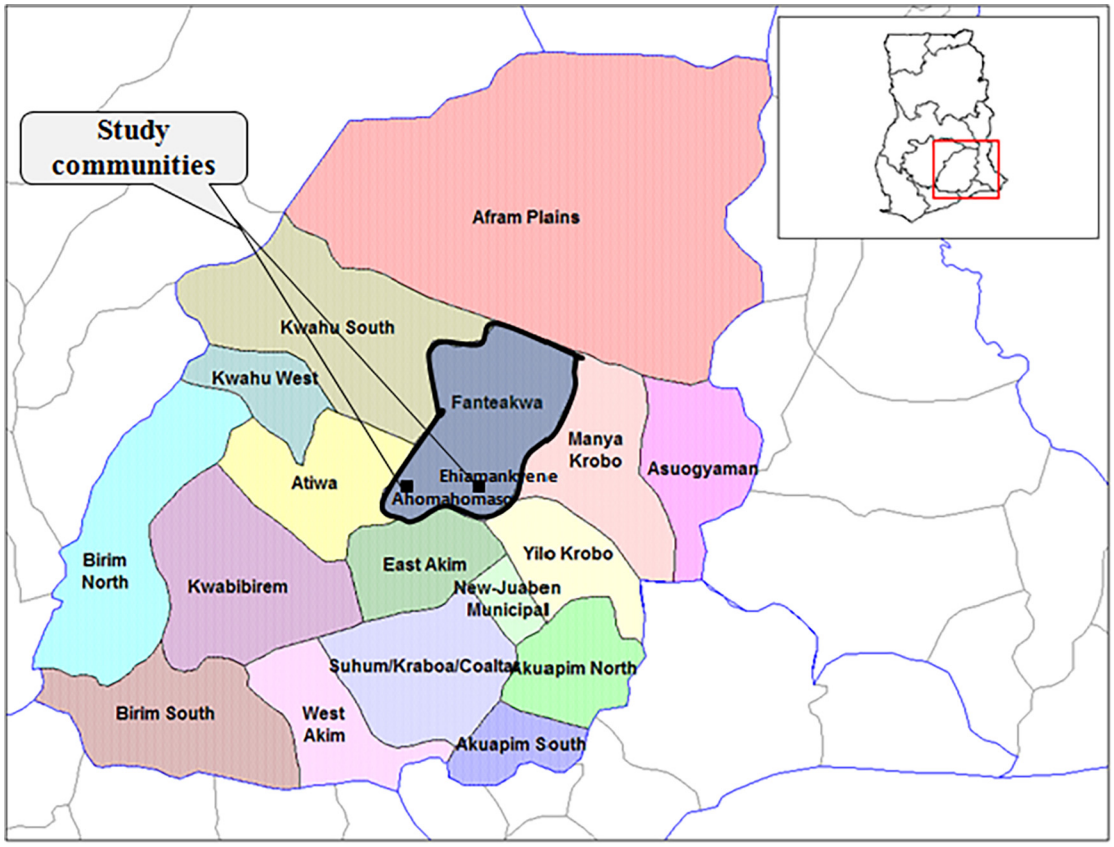

Fig. 1. Map of Ghana, Eastern Region and Fanteakwa district showing study communities. Adopted and modified from Ahanta, 2006.

(2001), asserts that peoples' perception on attachment to environmental resources has the propensity to influence pro-environmental behaviour in individuals. Perceptions are known to be critical in human-environment relations and governance (Maloney and Ward, 1973; Halpenny, 2010; Milfont and Duckitt, 2010; Gray, et al., 2010). The seemingly consensus is that ecological perception allows people to assess their wellbeing in relation to the natural environment (McManus et al., 2012).

Over the years, perception based ecological assessment studies across the globe have relied on the application of composite environmental quality indices (e.g. Esty et al., 2005; Lobdell et al., 2011; Zhang et al., 2013; Hong et al., 2013; Roboredo et al., 2016). The use of such indicators has become prominent as they provide information about the general conditions of resources (Heink and Kowarik, 2010). Thus indicators are used to measure the attributes of the structure, composition or function of ecological systems (Niemi and McDonald, 2004) as well as evaluating emergent properties such as ecosystem resilience (Jørgensen et al., 2013). But despite the significant efforts in various parts of the world, little is known about how the rural poor households' in Africa conceptualize, live with and respond to pressing ecological challenges (Adeola, 1996; Aerni, 2005; Allsopp et al., 2007; Ogunbode, 2013; Lombard and Ferreira, 2014). More specifically, how rural households' perceive the relative impacts of their livelihood activities on the environment is not understood. Also, though many scholars have shown that knowledge and utilization of natural resources as well perception of environmental changes may vary due to factors, including gender, age and time of exposure to the environment (Quinn et al., 2003; Albuquerque et al., 2011; Hanazaki et al., 2013; Martins et al., 2014; Campos J. et al., 2015; Campos L. et al., 2015), empirical knowledge on determinants of natural resource conservation among rural households' in Africa is limited. The few existing studies (e.g. Anderson et al., 2007; Hunter et al., 2010; Dude et al., 2015) do not allow us to understand such issues.

Dwelling on peoples' perception, and using Ghana as a case, the present study aims to fill the research gaps by (1) estimating the relative ecological impacts of rural livelihood activities on the environment and (2) identifying the determinants of natural resource conservation among rural household heads. The study aims to uniquely achieve the objectives by employing two techniques; the Multi-Attribute Decision Making (MADM) technique of Linear Additive Weighting (first of its kind in ecological quality assessment) and logistic regression.

Following Moore and Thiongane (2000), the ecological quality estimation is limited to those natural resources that rural people consciously use in their livelihood pursuit. In the work of Moore and Thiongane (2000), environment and natural resources were reported to be distinct, as community members perceive natural resources to be that part of the environment which man has dominion over. For instance, air was not considered a natural resource, since people do not consciously use air to make a living. In view of this, however, the current assessment is limited to those resources that rural households interact with on daily basis in the course of their livelihood activities. Resources such as soil and vegetation are considered since they are central to rural livelihoods (Uuemaa et al., 2009). In addition, and based on field experiences in the study communities, the study also considers how households' activities impact on the general sanitation (sanitary conditions) as well as on erosion and bush burning incidence. Indicators such as soil, water and vegetation are considered critical when assessing the impacts of human activities on the environment (Jørgensen et al., 2013; Sobral et al., 2017). An assessment of rural ecological quality in relation to livelihood activities in rural Ghana, we believe, will bring to the fore, the livelihood-ecology linkages, that can form the bases for informing appropriate tailored local conservation policies for betterment of rural communities.

The structure of the study is as follows; section two presents the methodology. Section three presents the empirical estimation results, while section four discusses the results. The last section, which is