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Municipality socioeconomic characteristics and the probability of occurrence of Wildlife Management Units in Mexico

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ABSTRACT

Wildlife use is a strategy for livelihood diversification, and markets depend on the characteristics of consumers and providers as well as on regional socioeconomic variables, such as the accommodation infrastructure, population density, land use, and economic activities, which are all aspects considered in this study. In Mexico wildlife subsidy is applied with general criteria and economic information related to wildlife uses is scarce. Assessing a municipality's socioeconomic characteristics and the probability of the occurrence of Wildlife Management Units (UMAs) in Mexico provides useful information for identifying the present conditions that have an influence on the location and development of UMAs providing useful information for decision making. Geographical and socioeconomic approaches for describing the distribution of UMAs can lead to better decisions related to focalization and therefore to the improvement of wildlife and environmental policies that have an influence on livelihood quality.

1. Introduction

Wildlife use is a rural livelihood strategy for income diversification. In this context, non-timber forest resources (Shone and Caviglia-Harris, 2006; Arnold and Pérez, 2001; Mutenje et al., 2011), wildlife ranching (Kreuter and Workman, 1994), bush meat consumption (Timah et al., 2008; Morra et al., 2009), sport hunting (Frost and Bond, 2007), wildlife watching, and payment for environmental services are among the most studied topics (Kosoy et al., 2008). In particular, hunting is an important source of revenue in rural areas for many countries, such as Zimbabwe (the Campfire program) (Frost and Bond, 2007), the United States (Wynveen et al., 2005; Munn et al., 2010), and Mexico (Avila-Foucat et al., 2008). In consequence, environmental policies have been built to address wild species conservation for ecological purposes but also for rural livelihoods. However, wildlife policies have been focused on conservation and management strategies, and socioeconomic aspects have been less explored.

1.1. *Problem statement*

The diversity of wildlife uses and socioeconomic aspects associated are one of the challenges to face for building sustainable wildlife markets and policies. Socio-economic information needed is at a micro level, for assessing for example, demand, cost-benefits, and satisfaction, as well as

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regional variables such as population, infrastructure, or international markets.

In that sense, this paper aims to address socioeconomic regional aspects and wildlife use, in order to provide some elements for wildlife policy in Mexico. In the country, there is very limited information on the economics of wildlife use at a micro or regional level. Thus, markets are not sufficiently studied generating limited livelihood income and policy gaps. Moreover, wildlife uses are diverse and depend on many political, social, economic, and biological factors. This heterogeneity makes difficult to generalize wildlife policies. Thus, encouragement Wildlife Management Units (UMAs) policy is not sufficiently focused.

Therefore, this papers aims to analyze pre-existing conditions in terms of socioeconomic and land use characteristics and the probability of the occurrence of UMAs in Mexico. Using a logit model we addressed the importance of some factors in the localization of UMAs in Mexico.

The former is in order to provide useful information for identifying the present conditions that have an influence on the location and development of UMAs. The study is done at a municipality level in order to catch the high Mexican diversity which is important for local or regional policies. In this sense, infrastructure, population density, marginality, land use and economic activities are proxy variables to address the municipality's socioeconomic description.

1.2. *Wildlife economics: brief review*

Human interaction with wildlife can be divided into consumptive and non-consumptive uses. Consumptive implies the extraction of species from the wild for consumption for commercial or subsistence purposes, such as recreation (hunting, fishing), industrial, or food. Meanwhile, non-consumptive uses are mainly for recreation (wildlife watching) or cultural purposes. Most of the literature on economics has been oriented to hunting tourism and fishing especially in developed countries but in the last three decades wildlife tourism demand has also been studied due to the increasing revenues coming from this activity (Duffus and Dearden, 1990; Reynolds and Braithwaite, 2001).

The determinants of hunting demand include microeconomic variables such as: income, price, leisure activities associated (Poudyal et al., 2008), the socioeconomic profile of tourists, and access to the site (Floyd and Gramann, 1997) as well as, non-guided and guided tours (Scrogin and Berrens, 1999). Regional variables associated to hunting demand have also been studied showing that accommodation infrastructure, the proximity of urban areas and roads (Little and Berrens, 2008), and population growth (Poudyal et al., 2008) are significant variables. In developed countries were hunting is an important leisure activity not only specific data on demand has been proved to be important but also the regional infrastructure that provides facilities for hunters and their families to spend time on the region.

For wildlife commerce, such as that of reptiles, the main aspects mentioned in the literature are prices, intermediaries, market access, and international fluctuations (Brooks et al., 2010). These last variables also apply to bush meat markets, in addition to the population density as a proxy for the proximity of urban areas and markets (Dupain et al., 2012). Wildlife international commerce has been documented in terms of the amount of species extracted but economic aspects have been less studied. However, it is recognized that market access and inadequate prices are one of the main issues. In developed countries, information on local bush meat markets and wildlife manufacture is very limited.

On the other hand, the demand for wildlife watching depends on variables such as, price, income, education, previous experience, and environmental knowledge as well on, tour expectations, satisfaction, and the equilibrium between the wilderness, infrastructure and security (Curtin, 2013). In that sense, the determinants of non-consumptive wildlife use is similar to hunting or fishing since both are leisure activities. Users are looking for equilibrium between economics aspects, the wilderness, and satisfaction.

It is also important to mention that wildlife use depends on the household decision regarding the option to supply to the market their wildlife for having an income diversification. That is, when wildlife is located in private lands, wildlife markets are generally a complementary source of income, similar to many other rural activities. Therefore, some literature has been oriented to assess the importance of nature exploitation for rural incomes, which should be part of wildlife and rural policies considerations (Kosoy et al., 2008; Lopez-Feldman et al., 2007).

The literature cited above shows that wildlife markets depend on the characteristics of consumers and providers and also on regional socioeconomic variables such as the accommodation infrastructure, population density, land use, economic activities, and poverty which are aspects considered in this study.

1.3. *Wildlife use and management in Mexico*

Wildlife use and management in Mexico take place in Management Units for Conservation and Sustainable Use of Wildlife (UMAs), which were implemented in 1997 by the Ministry of Environment and Natural Resources (SEMARNAT) in accordance with the Program of Wildlife Conservation and Rural Diversification (Avila-Foucat et al., 2008). The policy aims to generate income for farmers in community and private lands derived from the conservation of species and their habitat. According to Mexican law, UMAs are operated under a management plan approved by SEMARNAT for monitoring species and their habitats as well as for determining harvest rates. Income generation in UMAs is due to both extractive (e.g., sport hunting individuals for ornaments or pets) and non-extractive uses (such as ecotourism), and wildlife management can be carried out in captivity or in the natural habitat, which are also referred to as intensive and extensive management, respectively. The purpose of intensive management is the reproduction and re-introduction of species.

The number of UMAs registered up to 2013 was 12,000, and these units have been increasing at a rate of 5% per year (DGVS, 2014). The integration of UMAs is conducted through the Unit System for the Conservation, Management and Sustainable Use of Wildlife (SUMA). Registration of UMAs can be carried out in the federal or state SEMARNAT offices.