Forest Policy and Economics 73 (2016) 239–250

Contents lists available at ScienceDirect

Forest Policy and Economics

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

A local knowledge-based approach to predict anthropic harvesting pressure zones of wild edible mushrooms as a tool for forest conservation in Central Mexico

Sergio Franco-Maass [a], Cristina Burrola-Aguilar [b,*], Yolanda Arana-Gabriel [b], Luis Antonio García-Almaraz [a]

[a] Instituto de Ciencias Agropecuarias y Rurales, Universidad Autónoma del Estado de México, Instituto Literario 100, col. Centro, C.P. 50000 Toluca, Estado de México, Mexico
[b] Centro de Investigación en Recursos Bióticos, Facultad de Ciencias, Universidad Autónoma del Estado de México, Km 14.5, carretera Toluca-Atlacomulco, C.P. 50200 Toluca, Estado de México, Mexico

ARTICLE INFO

Article history:
Received 18 May 2016
Received in revised form 21 September 2016
Accepted 27 September 2016
Available online xxxx

Keywords:
Ethnomycology
GIS
Abies religiosa
Multi-Criteria Evaluation
Policy

ABSTRACT

The aim of this study was to develop a model to estimate human pressure exercised through the process of harvesting mushrooms on the high mountain forest ecosystems of Central Mexico. To predict human pressure, we applied a local knowledge-based model to a Geographic Information Systems and Multi-Criteria Evaluation (GIS-MCE) approach. The study area was Nevado de Toluca, which is located in a mountainous forest ecosystem of the Trans-Mexican Volcanic Belt. To construct the model, we used cartography data (land cover map, digital elevation model [DEM], distribution of villages, roads and sidewalks) and local knowledge regarding mushroom harvesting (questionnaires, semi-structured interviews, field trips with mushroom harvesters). The level of pressure model was based on the application of the Weighted Linear Combination (WLC). Thus, harvesters were queried regarding the importance of the main criteria cited in the literature and whether they considered looking for the best harvesting sites. With the information generated, a multi-criteria image was obtained that expressed the potential harvesting pressure. The model was validated with real data from field trips. The location of harvesting sites was then compared with the level of pressure obtained with the GIS analysis model. The model demonstrated that proximity to fir (*Abies religiosa*) forests exerted a greater influence on the value of the obtained pressure level; moreover, this type of vegetation is preferred by the local people for harvesting mushrooms. The final human pressure map confirmed that the model closely reflected the behavior of the mushroom harvesters in the studied region, and it was applied considering the 23 villages within the protected region of Nevado de Toluca. The information obtained can be used to locate areas with increased harvesting pressure, to establish potential sites for mushroom production, to propose a special program that includes management policies with successive harvesting schemes, or to define priority areas for monitoring and conserving this type of non-wood forest products (NWFPs).

1. Introduction

Worldwide, the consumption of mushrooms has increased, of which marketing is a popular activity for rural communities to promote new revenue (Boa, 2004; Cai et al., 2011). After China, Mexico ranks second in the number of wild mushrooms traditionally consumed. There are 371 mushroom species which are considered as NWFPs (Garibay-Orijel and Ruan-Soto, 2014). They serve as food and have a high economic importance for rural communities who live near forests (Mariaca et al., 2001; Pérez-Moreno et al., 2008; Garibay-Orijel et al., 2009). The harvest of mushrooms is a social activity (Montoya et al., 2008) that is part of the bio-cultural heritage of the rural population and involves a strong sense of family and community bonding (Rodríguez-Muñoz et al., 2012). This activity represents a real alternative for sustainable forest management and generates significant environmental, economic and social benefits (Benítez-Badillo et al., 2013).

Some factors related to the harvest of mushrooms are the type of vegetation, abundance, distribution, accessibility, cultural importance, consumer preferences, assigned prices (Jarvis et al., 2004; Ruan-Soto et al., 2009), distance between forests and the town where they are marketed, demand, and income from sales (Montoya-Esquivel et al., 2002, 2003; Garibay-Orijel et al., 2007; Burrola-Aguilar et al., 2012). Local knowledge plays an important role in the selection of the harvest sites and collection route. The collection process starts with knowledge of the habitat of the fungi and their morphological characteristics. People use information transmitted by the elderly as well as their own experience, the phenology of species, environmental conditions (climate, soil and micro-topographical conditions), and tree species that are associated with the elevation of each gathering area, which influence the presence of fungi (Mariaca et al., 2001; Montoya et al., 2014).

* Corresponding author.
E-mail addresses: sfrancom@uaemex.mx (S. Franco-Maass), cba@uaemex.mx (C. Burrola-Aguilar), agyarana@hotmail.com (Y. Arana-Gabriel).

http://dx.doi.org/10.1016/j.forpol.2016.09.020
1389-9341/