Graduated Sanctions Model in Swidden Agriculture

F. A. Correa, S. S. Downey, 2020-03-20

# Purpose of the model and the research

The purpose of this research is to explore the limits of land and user engagement in market-oriented production. By exploring these limits, we advance understanding of the emergence of sustainable use of the forest commons.

The landscape of southern Belize is a mosaic of land uses that includes rice plantations, cacao, cattle, oil, timber, and other market-oriented uses; it also includes the crops and fallows of swidden agriculture (Downey, 2015; Moritz et al., 2018, pp. 12859 & Suppl.). Swidden features labor exchanges, which are an informal mechanism to regulate land use (Downey, 2010).

We propose that an integrative model of emergence of sustainable use of the forest commons must differentiate subsistence land use from market-oriented land uses, and it must include any known mechanisms that help regulate land use. In this iteration of the model we make a first approach to the subsistence land use, by modeling a group of swidden farmers who exchange labor to produce food. This model explores the limits of graduated sanctioning to facilitate the emergence of sustainable use and the scenarios of collapse. In the following sections, we follow the ODD protocol to describe this approach with as much detail as possible (Grimm et al., 2006, 2010).

# Entities, state variables, and scales

Table 1 summarizes the entities, the state variables, and the scales of the model. The model features two types of entities: landscape and users. The landscape is a square grid of cells

Table 1

Summary of entities, state variables, and scales of the graduated sanctions model

|  |  |  |
| --- | --- | --- |
| Element | Number of entities | Units |
| Landscape |  |  |
| Size | 100x100 | Cells |
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