



Modeling the Agroecological Land Suitability for *Coffea arabica* L. in Central America

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Coffee production is an important income source for small farms in Central America, but climate change threatens the production. In order to develop efficient adaptation strategies, an assessment of local conditions and opportunities is essential. Lack or uncertainty of information are common challenges for such assessments. A tool to resolve these challenges is Bayesian network analysis. In this study, we developed ALECA, the first Bayesian network model to evaluate the agroecological land suitability for *Coffea arabica* L. A new set of suitability functions was created and subsequently used to populate the conditional probability tables of the variables. The variables include temperature, precipitation and dry season length for the climate, slope and aspect for the landform, and soil pH, cation exchange capacity and texture for the soil component. We validated ALECA by comparing a map of current coffee areas, and specific coffee areas with known suitability for coffee production in Central America to the suitability evaluations of the model; and proceeded to explore 1) the capabilities of the model to manage data uncertainty, and 2) the changes to suitability scores under climate change. The results showed that the area suitable for coffee production will decline in Central America under climate change, underlining the need for models like ALECA, which can be used to produce reliable land evaluations at local, national and regional scales under uncertainty.