

## HM353 Assessing the sustainability of coffee production in Cusuco buffer zone communities

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Land management in buffer zones of protected areas is a complex task in which the needs of local communities must be met, while at the same time conserving the natural habitat as much as possible to ensure continued ecological function (de Fries et al., 2007). This issue is particularly problematic when trying to meet economic needs of communities in buffer zones of protected areas of forest as most forms of agriculture involve clear felling of forest. An increasingly popular solution to this problem is shade-grown coffee. Although shade-grown coffee plantations do not sustain the same levels of biodiversity as primary forest, studies of plant biodiversity across different farming and forest systems has found suggested that the diversity of plants found in shade-grown coffee plantations is considerably higher than other forms of agriculture and was similar to late secondary forest (Gillison et al., 2004). Shade-grown coffee plantations can also provide “safe-havens” for large mammals such as howler monkeys (McCann et al., 2003). However, investigation of faunal biodiversity in shade-grown coffee plantations in comparison to forest is lacking (Tejeda-Cruz et al., 2010).

Consumer demand for sustainably branded coffee (e.g. Fairtrade, Rainforest Alliance) continues to rise causing increasingly more land to be allocated to coffee farming. Consequently coffee farming has made a major impact on land use in tropical montane forest because even though coffee should be grown under the forest canopy (and therefore should not lead to deforestation), definition and regulations of what is considered “shade-grown” coffee is unclear leading to considerable variation in tree diversity and canopy cover in coffee plantations (Martinez et al., 2009). Thus, the concept of shade-grown coffee as a means of preserving biodiversity may only work in certain cases (Tejeda-Cruz et al., 2010).

Coffee is the major cash crop grown in the buffer zone of Cusuco National Park in Honduras and at least one community produces Rainforest Alliance certified shade-grown coffee. However, the degree of canopy cover, diversity of trees used for shade, and proportion of trees on the plot that have been planted following forest clearance as apposed to old growth trees from the original forest vary considerably across coffee plantations. The first aim of the Operation Wallacea project is therefore to investigate the variation in planting patterns of coffee farms and how this variation relates to biodiversity sustained within the farm. These data may then be used to determine the most suitable farming practices to maximize profitability of the coffee farms and biodiversity.

Investment in local communities is vital to the protection of the forest as a means of reducing community reliance on forest resources and preventing further forest encroachment to make way for agricultural land. In 2011, Operation Wallacea funded the construction of a solar powered coffee drying polytunnel in the buffer zone community of Buenos Aires to enable farmers to sell partially processed coffee for a significantly higher price than the unprocessed coffee they were selling previously. The aim for 2012 is to provide technical assistance to coffee farmers to improve the sustainability of coffee farms, while at the same time making the farms more cost-effective and improving the quality of the crop. Coffee farmers in buffer zone

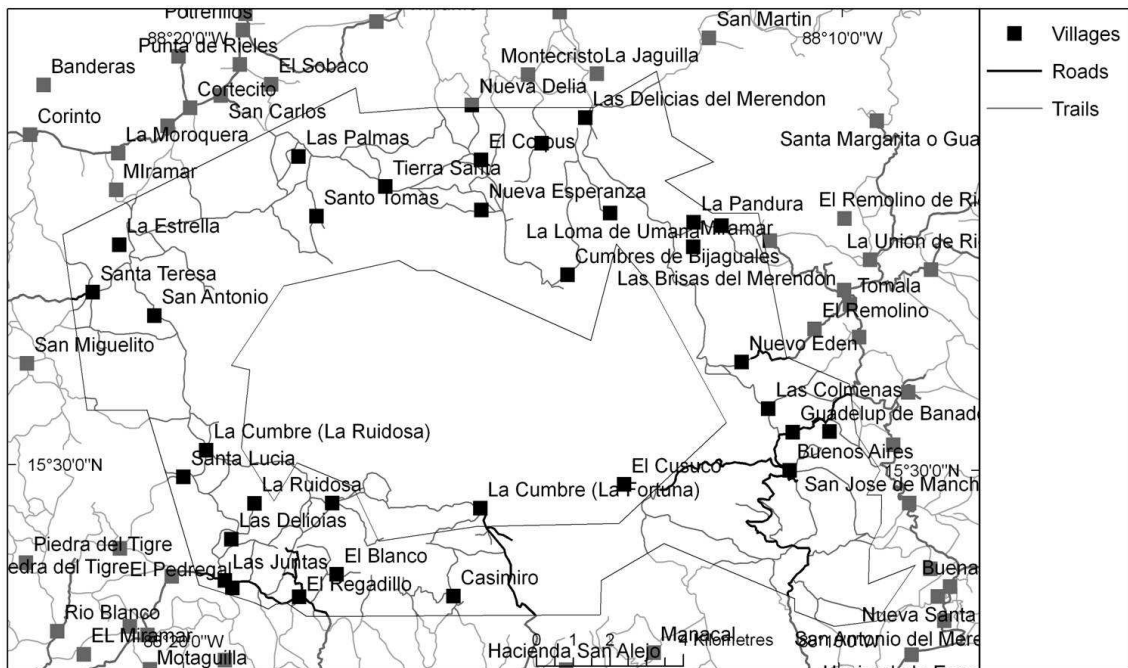
communities of Cusuco National Park reported that they would welcome agricultural assistance in the form of training, farm equipment and seeds. These coffee producers use over 50% of their gross income to purchase fertilizers, but confess that they have no idea which fertilizers they should be using or when they should apply them to the farm. In addition, many farmers reported that they now understood that their farms needed more shade cover, but were unsure of which trees were most suitable or the quantity that was needed and all farmers reported that they would welcome agricultural advice in general. Operation Wallacea, in conjunction with the Honduran Institute for Coffee (IHCAFE) will therefore be providing agricultural classes and farm-specific technical assistance to a selection of farmers from Buenos Aires. Students focusing on this aspect of the project could investigate farmer knowledge and perspectives before and after receiving agricultural training and use the farm-specific technical advice and existing economic and agricultural data to create a series of sustainable business plans for the coffee farms.

## **Methods**

### ***Subjects and Study Site***

Parque Nacional Cusuco (PNC) is located in the Merendon Mountain range in North West Honduras and consists of 23,440 acres including a buffer zone (15,650 hectares) and a central core area (7,790 hectares). There are three main forest types within the park: broadleaf, pine and dwarf forests with zones of transition, agriculture, shade coffee plantations and recently logged areas. The park was created in 1987 and has been managed by Corporacion Hondurena de Desarrollo Forestal (CODEFOR) until CODEFOR changed to Instituto Conservacion Forestal (ICF) in 2008. There are 38 villages in the buffer zone of the Cusuco National Park, the largest of which are shown in Figure 1. All 38 buffer zone communities in Cusuco generate income from agriculture. The major cash crop for these communities is coffee. Standardized collection of economic and agricultural data has been collected in 5 of these communities since 2008: Buenos Aires, Bañaderos and Las Juntas on the eastern side of the park and Santo Tomas and Tierra Santa on the western side of the park. Over 95% of all the coffee farms in the 5 target communities can be classified as small holder size by IHCAFE (2008) classification (<10.5 ha).

The village of Buenos Aires (location of this current research) is one of the largest of these buffer zone communities and consists of 102 houses, and 594 people. Since 2008, economic and agricultural data has been collected in Buenos Aires using structured interviews with the farmers at their house followed by an accompanied visit to their farm where the boundaries of the farm were mapped using a handheld GPS unit, and an additional structured interview was conducted followed by a visual farm survey. The economic status of each household, size of coffee farm, gross and net income from coffee farming, farming techniques and visual quality of coffee farms are known for all the major coffee producers in this community. These data indicate significant variation in all variables across coffee producers.



*Figure 1: Major villages in the buffer zone of Cusuco National Park. Note that El Cusuco in the core zone of the park is now the Operation Wallacea main research station and is no longer a community. La Fortuna is located in the core zone of the park, but its geographical location predates the formation of the park in 1987. Small communities that are not officially registered with the Honduran government are not present on this figure.*

### **Data Collection**

To investigate variation in habitat structure and tree diversity across coffee farms, a number of 20m x 20m survey plots will be created in each farm, in which canopy cover, number of trees species, tree DBH, height of undergrowth (measured using touch poles), and depth of leaf litter will be recorded. The results of these surveys may then be related to existing data from these farms regarding farming practices (e.g. application of fertilizers), crop yields and gross income to ascertain which habitat characteristics are preferably for the coffee. Using the same methods, habitat plots in areas of undisturbed forest at similar elevation may be used as a baseline for expected habitat structure and tree diversity. Measuring faunal diversity in these plots as a means of comparison with the core zone of the park may be possible by comparing the abundance and diversity of dung beetles (and excellent indicator group) across the habitat plots in coffee farms and undisturbed forest.

To investigate changes to farmer knowledge and perspectives towards sustainability as a result of agricultural classes, structured interviews can be conducted with farmers before and after these classes. Technical recommendations from IHCAFE and existing economic and agricultural data may then be used to create a business plan for each farm, citing the recommended changes, costs associated with each change and proposed economic and environmental benefit.

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