

## **Appendix 1**

Supplementary information on methods used.

### *Participatory methods*

The project objectives were conceived in collaboration with the village chief and the local three co-authors (MC, RBC and MBC). Each step of the research process entailed dialogue and consultation with these collaborators and key informants, and brainstorming sessions were held together prior to all data collection to decide upon culturally appropriate methods. At least one of these co-authors was present during each stage of data collection.

### *Participatory mapping*

In 2013, a digitized version of the map was presented to interviewees and annotated for corrections. We held a focus group meeting with four key informants chosen by a traditional authority in which any further errors were addressed, and the map was re-digitized. Short fallow is cleared land (1-4 years old) used for agriculture, while tall fallow is fallow that is  $\geq 5$  years old. After 2-3 years of cultivation, landowners clear a new hectare of land and leave the previous patch in fallow to regenerate. Secondary forest is considered land that has been un-cleared since settlement, but selective logging still occurs in both tall fallow and secondary forest. Parcels of land are rectangular and perpendicular to the highway, unlike the traditional land structure (Herlihy 1986), due to the nature of allotment at the time of settlement. A government engineer assigned each two-hundred metre stretch of land along the highway, from the highway to the northern border, to a single landowner.

### *Participatory wealth ranking*

To quantify if there is a relationship between household wealth and land cover at the level of the individual parcel, we ranked each household in the community according to perceived wealth. To do this we held a focus group meeting in 2013 with two village authorities and three key informants to create a participatory wealth map of the community (following methods outlined in Geilfus 2002). A leading traditional authority chose these key informants based on their knowledge of the community's household level socio-economics. Focus group members decided to choose four levels of wealth from 1 (poorest) to 4 (wealthiest). Each household was colour-coded according to its perceived wealth, using whether the household owns land, livestock and household electronics; its relative income; and whether the house has walls, floors and a tin roof as proxies for wealth, as used by Tschakert et al. (2007) in neighbouring Ipetí-Emberá.

### *Focus group discussion*

The leading traditional authority personally selected several of the female participants for the gender focus group based on their knowledge and participation in community congresses. The

focus group was held in the communal house and was also open to any women who wished to join. Discussion centred on gendered divisions of labor and changes in divisions over time.

### *Interviews*

We recorded all interviews for which consent to record was given (32 of 35). Ethics approval was obtained from the Instituto Nacional de Cultura (INAC) in Panama and the McGill Research Ethics Board. We used a purposive sampling strategy, selecting interviewees who were available and who fit into our target interview groups with the help of a leading traditional authority. Interviewees were categorized to ensure a range of generations and stakeholders in a future land use management plan was interviewed. We ensured that each wealth ranking was represented. Youth were characterised as  $\leq 26$  years of age, unmarried and non-landowners. Landowners are those who were given their land to manage at the time of settlement, whereas land inheritors are the sons of these original settlers, who now own and manage their parental lands. While women can be landowners when the male household head has passed away and land has not been allotted to male inheritors, they are not generally the ones who manage the land in Piriati (similar to traditional modes of inheritance, see Herlihy 1986, Kane 1986, 1994). Eight women were interviewed, to maintain roughly equal numbers of interviewees in each category. There was a geographical division between two parts of the community, drawn due to the asserted difference in worldviews between community members; the community leaders claim that those in “Site 1” are generally those who participate less in communal activities than those in “Site 2”, who tend to have concrete houses (*i.e.* more wealth) and pasture, and who settled in the community after the first wave in the early 1970s. Thus we stratified the interviewees of the community *a priori* according to their location: 16 interviewees in “Site 1” and 15 in “Site 2”. Four interviewees (3 landowners (one female) and 1 woman) live in Catrigandí. We chose to interview people in Catrigandí in order to capture any variation in perceived influences on land uses between community and non-community members. Approximately one third of all households in the village were surveyed (28 out of 88). We terminated sampling when novel information from interviews was saturated. These interviews were held in Spanish and Emberá and lasted from 30 minutes to 2 hours. The lead author (DS) led all interviews with the assistance and translation, as necessary, of the local co-authors (MC, RBC or MBC). All three local co-authors were present during the first interview, after which we held a discussion of appropriate questions and addressed any ambiguities, in order to refine the interviews (Table A1.1).

**Table A1.1.** Examples of questions asked during semi-structured interviews.

| Subject          | Questions   |
|------------------|---|
| Origin           | Where are your parents from?<br>When did you come to Piriati? Why?<br>How many people are in your family?<br>How many children are there in your family?<br>How old is the eldest person in your house?   |
| Tenure history   | When did you obtain your land?<br>From whom did you obtain your land?<br>When did the previous owner receive the land?<br>How was the land when you obtained it?  |
| Land uses        | When did you cut your forest?<br>When did you establish pasture?<br>How many cows do you have?<br>What type of pasture do you have?<br>Do you have a small-scale plantation?<br>Was there a government programme or NGO that encouraged you to plant a particular crop?<br>How much money did they give you? Did you like the project?<br>Do you share cows with another landowner?<br>Can we reconstruct the history of the forest in your plot? How, when and why has it changed?   |
| Land management  | Why did you establish pasture?<br>Can you explain how you manage your land? Do you burn your land?<br>How many times per year?<br>For how long do you leave burned land in fallow?<br>Can you explain to me the burning cycle?<br>Can you explain the rotation between fallow and cultivated land? Why do you burn?<br>Do you produce for sale or self-consumption or both?<br>What do you plant?<br>Do you fell wood?<br>Do you rent out a part of your land?<br>Have you sold part of your land?<br>Do you have any problems with neighbours or colonist farmers? |
| Subsistence      | What do members of your family do? What do you do?<br>How many people in your family help with cultivation?<br>Do you receive social benefits?  |
| Future land uses | How do you want your lands to be in the future?<br>Do you want to see more pasture, more forest, more cultivated land? Why?<br>Where would you like to see more of this? Why?<br>Would you like to reforest your lands? Why?  |

*Literature Cited*

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