

# Participatory Mapping Process and Reflections for Papua New Guinea

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This document is supplementary to the Hoover et al (2017) research to further documents and discusses the participatory mapping efforts conducted in the village ( Figure 1). For more details on the livelihood summary see the associated readme file for the 2011 report.

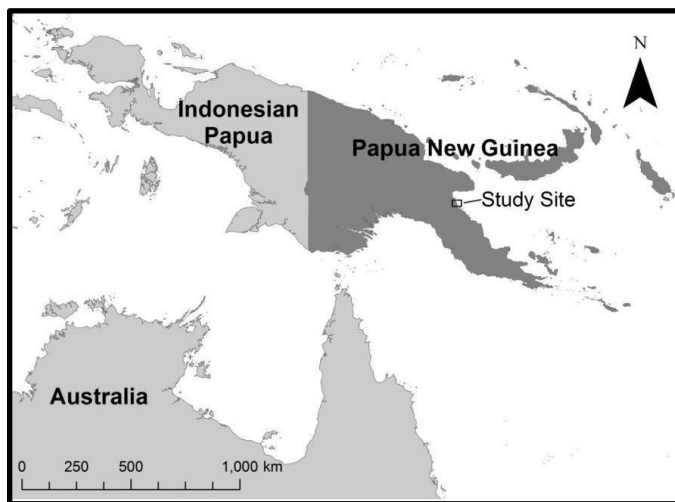


Fig. 1. Location of Papua New Guinea and the approximate location of the village.

## Background

In many locations across the globe, remote sensing imagery can be one of the only and most consistent datasets available to assess land cover over a long period of time. Although remote sensing analyses provide a wealth of information, land cover assessments and change detection are still challenging in swidden-fallow landscapes (Fox et al., 2003; Leisz & Rasmussen, 2012; Rindfuss et al., 2004; Schmidt-Vogt et al., 2009). Unlike plantations, mono-cropping, or industrial agriculture where growing seasons and field arrangements are rigidly structured, swidden-fallow systems (swidden) are often mosaicked and in such cases it is more difficult to detect and differentiate the variety of land-uses (Schmidt-Vogt et al. 2009). The swidden mosaic is created innately at the local scale from social and environmental conditions. For example, land use decisions can be influenced by soil conditions, solar input, land tenure or ownership, and crop-fallow rotation strategies and histories. The combination of these factors influence the size, shape, and orientation of the plots, which then reflects as and each of which has a unique land use and associated land cover.

In Papua New Guinea (PNG) identifying and classifying swidden LU and LC changes have received little attention. Such analyses are vital in a country where approximately 85% of the

population depends on swidden to fulfill subsistence and livelihood needs. At the national level between 1972 and 2000 one study of forest cover change found that swidden (46%) and logging (48%) accounted for a large proportion of forest degradation and loss (Shearman et al. 2009). Shearman et al. (2009) used aerial and satellite imagery but also relied on population data as a proxy to estimate past and extrapolate future swidden areas. However, in a repeat study for 2000-2012 the same authors (Bryan et al 2014) found the total amount of swidden that resulted in forest degradation and loss was 0%. This contradicts their previous proxy and predictions because the population growth trajectory was the same over the two time periods. There is a large body of literature that shows the links between population growth and land use is overly simplistic and more in depth analyses should be conducted (Filer et al. 2009; Bourke 2001b; Lambin et al. 2001; Schmidt-Vogt et al. 2009; Fox et al. 2000; Mather & Needle 2000).

Overall, swidden is multifaceted, complex, and driven by land use decisions made at different spatial scales. Without ancillary data to support swidden LULC, total swidden area can be misestimated. This could then influence land use regulations at the national level. There are a few reasons why swidden can be misestimated, first, forest succession is spectrally similar between swidden cleared land and logging, this is especially so when plots are left to fallow. Second, logging ventures are often adjacent to or encapsulate villages because the customary land managers (tribes) are the ones who, in most cases, permit commercial logging on their land for monetary compensation. In this case, without ancillary data forest changes can often be designated as swidden because a village settlement is present and assumptions are made about proximate land conversions. The needed ancillary data, such as commercial logging permits and spatial boundaries are not easy to acquire and companies do not always log within the designated boundaries of the permits. Thus, to understand how swidden and subsistence strategies have changed over time and how village level decisions influence LULC, it was important to work with a village where commercial logging has not occurred so that the satellite image time series was not confounded by logging.

Along the northeast coast, there are few villages that did not succumb to logging pressures in the 1970s (Bein et al., 2007) and because of this, scientists have been conducting biological research to better understand primary forest species in PNG and identify species new to science (check the Bishop Museum, HI and the University of PNG for specific reports and studies). While anthropogenic research has been conducted in Kamiali to document the local language and understand carrying capacity, few, if any research efforts have conducted participatory mapping where the community members were actively and equally represented in the assessments and discussions of resources and subsistence livelihood.

### **Participatory Process:**

The participatory mapping in the village consisted of numerous aspects and were broken down into two phases by years 2011 and 2014, which represent the two field visits. A flowchart of the research components and activities and the order therein are displayed in Figure 2, a narrative of these activities follow.

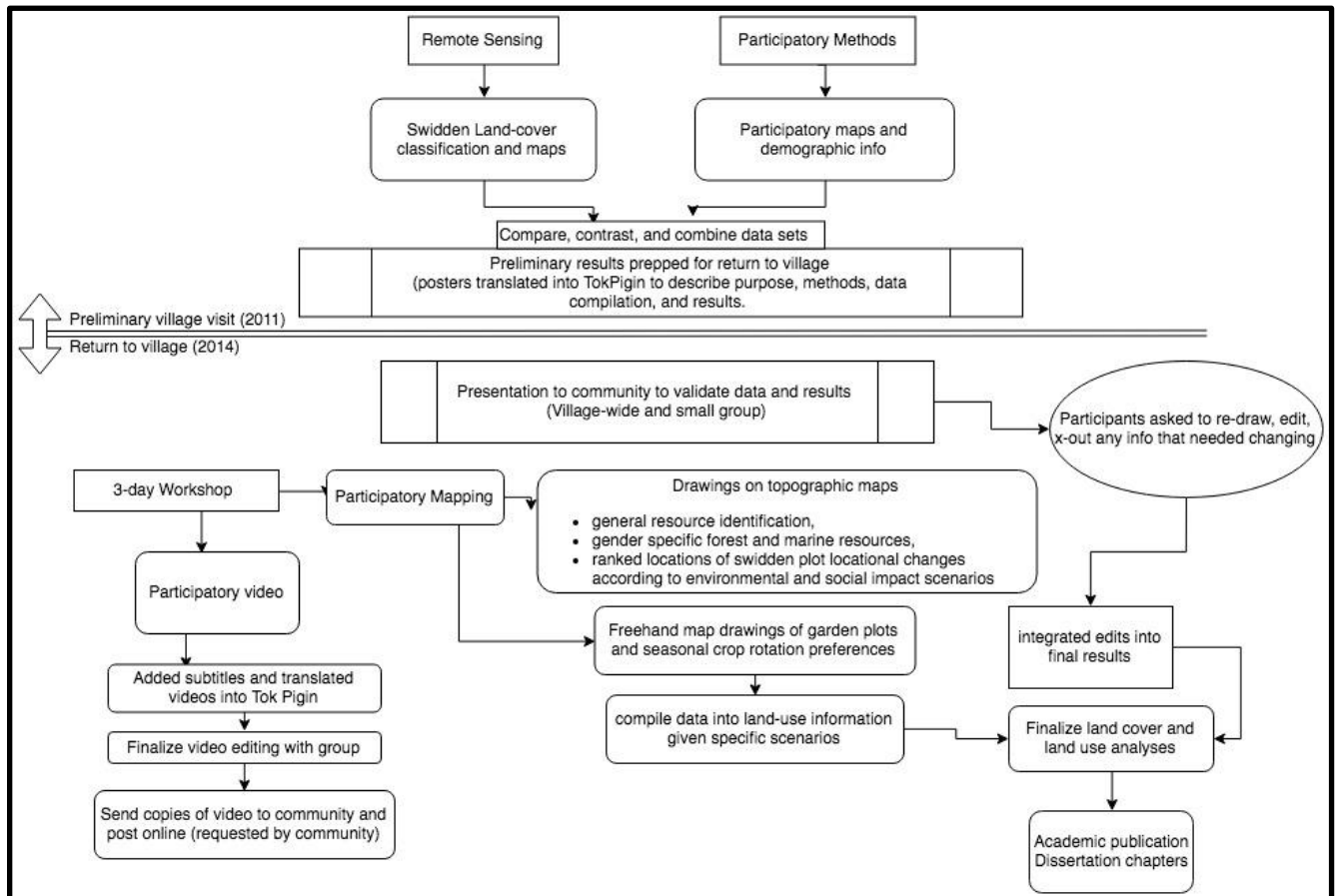


Figure 2. Remote sensing and participatory methods

### Identify participants and stakeholders

The first step in both village visits was to select participants. In 2011 participants for the interviews were semi-randomly selected by putting the family name into a bowl. Then one individual was selected from that family to represent their perspectives. Genders were balanced so that of the 32 households, half were female and half male. When the household interviews were conducted, occasionally the person selected went to work in the gardens or out to fish, so another resident of the household was selected in situ while still maintaining gender balance. For the other activities and mapping efforts, individuals or small groups were selected from the community. While a more random selection would likely have been more representative of community demographics, the guides/translators decided who we would talk to based on their relationships and knowledge of who would be willing and available.

In 2014, the entire community was invited to review previous data collection efforts and results. The smaller workshop group constituted 20 participants who were selected by the village chairman (chief). This group was asked to review results from the 2011 data analysis in more detail and then attended a workshop on resource mapping and participatory video. The workshop participants were provided a stipend, refreshments, and lunch for the 5-day workshop. This selection process was also slightly biased because many of the more vocal, active, and prominent community members were selected to participate.

Overall, it is a challenge to select participants randomly or select those who better represent the demographics of the community. For example, many of the poorer or less educated individuals were not selected for the groups but may have had insightful perspectives. This in part is likely due to being new to the community and not wanting to overstep any relationship boundaries with the chairman's decisions. A more diverse group could have been created to include those individuals with a more focused research question or explicit request. For example, please include 4-5 of the poorest families.

### **2011 participatory mapping efforts and activities**

The goal of the first phase (2011) was to understand swidden subsistence and livelihood strategies at the village level via household data. Mapping and participatory exercises were conducted with small groups to add to the household level data and include seasonal subsistence calendar, resource ranking and change, household interviews, open ended questions and discussions and participatory resource mapping exercises. Using these data we compared and combined the participatory information with remote sensing data to complement and improve the analyses. The Report Livelihood summary for a coastal village in Papua New Guinea (2011) contains the questions, format and summaries. A brief overview is supplied here.

- The interviews followed a list of questions that were consistent across informants and focused on swidden resources. Each informant described household swidden plots as the area currently cultivated.
  - Fallow land is not reported by the participants as part of their swidden area. This is due either to the phrasing of interview questions or to how land-managers perceive swidden land.
- Participatory maps of the village and swidden area were created using blank paper.
  - Ground-truthing of swidden plots was conducted with a GPS and tape measure to confirm plot location, size, orientation, and the swidden phase (newly cleared, cultivated, or fallow).
- The participatory maps were digitized and georeferenced to a 2011 Landsat image. Reference points were added to a GeoEye image captured in 2010, as the finer resolution assists in comparing land cover and the participatory map in greater detail (Figure 3).

- A study was conducted by Bein et al., (2007) to assess swidden land area in relation to population and potential carrying capacity. Some of these data (population, households, swidden area) were used for a temporal comparison.
- A Seasonal Subsistence Calendar:
  - Describes the cropping and fallow rotation based on season, village holiday and celebrations, and other community topics such as school schedule.
- Resource ranking:
  - There are three main resources in the community that include gardening (agriculture), marine (reef and ocean), and forest. Forest resources have changed little over time, but people describe going further for firewood and animals. There has been a major perceived decline in fish populations in both the reef and ocean regions of the WMA. The garden although has experienced increased soil moisture and pests remains as the most reliable form of subsistence. The agricultural area is not perceived to be overcrowded due to population growth. Many participants described that if all resources declined enough the community could live on Sago palm as their ancestors once did. Sago palms are intermixed in the forest and numerous. A more detailed description and change in ranking over time can be reviewed in (Citation).
- Open ended questions and discussions:
  - discussed general resource use, changes, and species collected or used (fish species, garden cultivars)

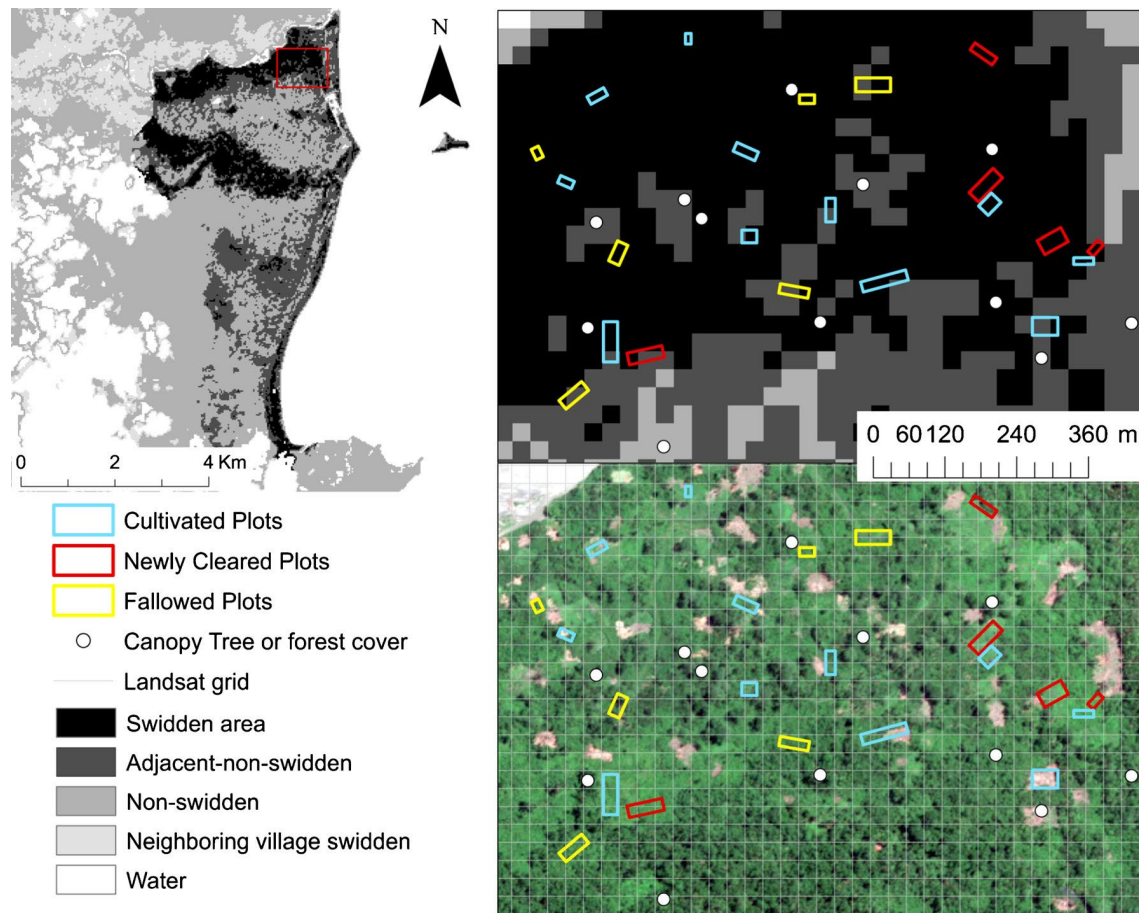


Figure. 3 The ground-truthed points and swidden plots shown are accurate area, location, orientation, and land-use and land-cover type (not all swidden plots are digitized). Some of the land-covers do not align with ground-truthed land-uses because there is a year separating the image capture and field data collection. A 30 m pixel grid is overlaid on the 2 m pixel resolution of the GeoEye image for resolution comparison. See Hoover et al., 2017 for more details.

### 2014 participatory mapping efforts and activities

The second phase (2014) of the research was conducted on a return trip to the village, the first phase of data, results, and maps were presented to the community for validation and discussion. Afterwards, we conducted a small workshop to discuss and map subsistence strategy responses to a variety of environmental and social pressures (e.g. climate variability, resource changes, population growth and declines (out migration)). One aspect of the workshop was to create a participatory video that captured topics most important to the village, which is their lifestyle. The workshop attendees (participants) wrote, directed, and edited the video and described in detail the aspects important to their subsistence livelihood.

To validate our initial results we returned to the village in 2014. The results of participatory mapping and remote sensing (PRS) analysis were presented to the community as a whole and a 20-person group. Here, we used large posters with methods and results that were translated into Tok Pigin and each poster was presented orally and layed out near the community center so that anyone could review and comment on the results. Everyone was encouraged to ask questions, discuss the results, and make edits to the posters (Figure. 4). In the smaller 20-person group specific questions were posed, detailed notes taken, and map edits made to assure the accuracy of LULC classifications and participatory information.

Edits and corrections to the analyses were recorded and incorporated into final products. The data validation process has been shown to facilitate additional discussions, information sharing, and collective learning among collaborators, and also improve resource and management negotiation and decision-making (Ruankaew et al. 2010; Laituri 2011).



Figure 4. Photo of the community reviewing the posters.

The resource mapping workshop was conducted with the 20-person group. Smaller groups of 4-5 people were formed based on the resources discussed, for example both single and mixed gender groups were formed as there are resources collected or managed by specific genders, e.g. women only fish for shells. We provided large format topographic maps for participatory mapping exercises because this allowed participants to focus more time on resource locations and discussions rather than blank paper sketching efforts. Likewise, nearly all of the resources used are within 5 km of the village center and customary land tenure boundaries are strictly followed and this worked well to a pre-formatted map. Numerous maps were created that show general resource identification, gender specific forest and marine resources, and ranked locations of

swidden plot locational changes with respect to different environmental and social impacts. Each group presented their map to the workshop and discussed similarities and differences among the maps. Participants were also encouraged to sketch and draw maps of their choosing and this resulted in 5 maps that showed unique aspects of swidden: i.e. seasonal rotation of specific crops to areas more favorable for growth (Kisi's map dry/wet season shifts). These maps could be directly related to other participatory exercises (seasonal calendar, resource ranking over time).

While pre-formatted maps aid in more rapid exchange of ideas and spatial identification, the open sketch maps were overall very useful and highly recommended for participants to draw their spatial perception of landscape, resources, or other topics because it isn't bound by a prefabricated map.

### **Observations and discussions:**

- Nearly all community members were aware of environmental conditions that impact subsistence strategies, for example unpredictable seasonal changes, increased number of ocean surges and delta flooding. They wanted solutions and assistance to combat these challenges.
- Actively discussed future cultural and environmental change scenarios with participants and how they would strategize adaptations.
- Many conversations about subsistence responses to (extreme) environmental impacts were the first of their kind (as in never discussed or vocalized), but responses/strategies were similar and widely agreed upon.
- Chromium mining is planned along the village southern boundary (river) and would result in environmental and social impacts. The neighboring village to the south of the river and Kamiali are split on whether or not to allow the mining. There are a lot of drawbacks and impacts to the community environmentally as the runoff from dredging would flow into valuable reef areas. Also, many sago palms located along the river would be impacted or destroyed. The immigration of miners would not be all 'good people' and participants described rape as a major concern. The benefits would be short-term financial gains.



**Figure 5:** General map key and women's forest resource locations

The main objective of participatory video, also known as videovoice or photovoice, is to enable community members to record and reflect on topics that are important without external researchers directing the observations and dialogue (Wang and Burris 1997). At the time of this research photovoice was more common but smaller, less expensive, and easy to operate video cameras made using video equipment quite easy. The video recordings provide rich context as the *in situ* locations and dialogue are captured.

The workshop group decided upon Lifestyle as the overarching topic of participatory video and was split into four subtopics: women's work, fishing, gardening, and river and forest. A storyboard was created for each topic (Figure 6). The storyboard assists in designing the content and frame of each portion of the video so that a detailed and formulated narrative could be filmed. [Kamiali Lifestyle Video \(English\)](#)



Figure 6: Description of how to create a storyboard for PAR video (top-left); Forest and river storyboard in TokPigin (top right). Video review and editing by the workshop participants (bottom-left).

The first half of the participatory video workshop discussed how to create a storyboard and how to convey information through interviews, acting, and creating a scene. The second half of the day everyone learned how to use video cameras and frame a good shot, this was not a challenge for most individuals who had experience with a cell phone or modern camera with a display screen.

A Flip camera (small hand held camera with a USB port) and a more traditional video camera were used. After everyone had a chance to practice a short video clip, we reviewed and critiqued each video. In general, participants were very aware of what was a good shot and what needed to be improved upon once reviewed on a larger screen. Likewise, with the natural setting of most of the videos, projecting one's voice and speaking clearly were important (crashing waves were a challenge with the recordings). During the first viewing of the practice videos everyone was very serious and provided constructive feedback to their peers on how to improve their portion of the video.

We used a Flip camera and a traditional camcorder because both have screens that you can view what is being filmed and the video can be reviewed immediately afterwards. Although a GoPro would have been better in some cases and is less sensitive to the elements, it did not allow for the video to be watched right after filming (current models may differ). We used a tablet to view the videos after filming to assure that the shot was adequate as well. The traditional video camera was more coveted because it was viewed as better technology and provided the 'real' cinematographer feel, as one participant described.

The video cameras were given out to the groups and each of the four traveled to the preferred locations for filming. The researchers joined two of the groups and two groups filmed independently. Most of the 'actors' in the videos were workshop participants and other villagers were occasionally included to play a role. Frequently the video was captured in 'one take', unless not actually recorded. Always check the recording afterwards.

Translations and subtitles for videos were not possible in the village due to the lack of electricity. The portable solar panels did not receive adequate sun to charge computer equipment quickly. Therefore, to translate the videos we traveled with three individuals back to Lae and stayed at a hotel to write subtitles from Tokpigin to English. There wasn't enough time to translate the videos to the local language and the local language of Kamiali doesn't have a written form (a written form is being developed by Canadian researchers).

A few suggests for the process:

- Researchers should make a point to stay distant from the film crew and not influence the content or conduct. We found that participants would ask if their content 'was good' after recording and we didn't want to influence the process or content.

- Always double check that the scene was recorded right after the scene was filmed.
- Select one person from each group to translate - gender specific translation is also VERY important. We found that when a man started to translate the women's work video, many aspects were deemed not important to go into detail about. Thus, we had to start that translation over and the man was not happy.

### **Participatory Mapping researcher observations:**

- Previous research in the community was beneficial as both researchers (academically) and community members (financially) were more trusting and welcoming. This was not the case in other villages, who were accustomed to resource extraction (logging, mining) ventures who are typically not transparent about their objectives.
- It seems that many research efforts collect data from this village but do not share information or results broadly with the community. It is likely that the individuals or small groups who assist with field work learn more about the purpose and objectives and they likely share it more broadly with the community.
- This participatory mapping project was the first time results were presented and discussed with the community. This spurred questions about why other researchers haven't done so as well.
- Community members were keen to conduct and discuss mapping exercises.
- Many participants wanted extra paper to take home to create maps that were important for the community and resources.
- All participants in the workshop were very keen on continued discussions and activities concerning swidden and subsistence.
- All resources were openly discussed and mapped, however sacred places of ancestors were withheld. The cemetery (near the two large swamps) was openly discussed as well.
- Swidden agriculture, fishing, and forest resources are of great interest and importance in this community. They have sought local groups to assist with agricultural pests (e.g. spraying the taro with a pesticide to kill a boring beetle) yet this was not an easy decision and many say the tubers taste bad due to the pesticide, but they continue to use it so they can eat the traditional foods of their people.
- Many topics were discussed, but at the end of the workshop participants seemed to feel like they 'learned' a lot from us, even though we prompted the discussion and did our best to ask rather than answer or interject in the discussion. It is uncertain if this was politeness or if the dichotomy of the participant-researcher relationship.

### **PAR Video researcher observations:**

- Community members extremely enjoyed designing and making the videos. They were very serious, professional, and thoughtful about the process.

- After practice and use of the video cameras participants excelled at capturing videos and could identify good footage once reviewed.
- Everyone enjoyed seeing themselves on screen.
- We did not have any specific objectives for the video content or desired outcomes, as we wanted to use the PAR video as a research tool where the researcher is nearly absent from the content and creation process. Here, the community has full control of the project and a larger sense of pride. Plus they have a product (video) to share and discuss.
- Participatory video and mapping resulted in a high degree of community engagement, discussions, and pride. Likewise, the larger community was involved in aspects of making the video and there was consensus among the participants and community that the video accurately portrayed village life.
- Reports from other visiting scientists is that the community watches the video frequently in large groups, as there was one TV with a Disc player and USB port for videos.

### **Reflection on the process:**

I felt I created meaningful relationships with the Kamiali community members. However, there were aspects of the research process that felt as though I was the only one to benefit from the relationship, such as the PhD and publications I would receive after conducting the research and field work. The 2011 mapping work went well, I established connections with numerous community members, but overall the research felt like cataloging someone's resources and this had been done before in the village. It felt like I was similar to one of the biologists making lists of new species, a one way relationship that uses the community and its resources for personal (academic) gains. It was not until my return trip in 2014 when I shared the results did I understand the community was never really part of the research process after the 'extraction' of information. The interest of the community in scientific research is high and they are curious about not only the preliminary field work but also the results and outcomes. This is their home. More guidance or a framework for research expectations and relationships needs to be established. For example, species distribution results shared with the community may lead to greater insight in species occurrences and improve the research. After I shared my mapping process and results with the community, many had constructive and valuable things to say about the data analysis and results, which proved yet again that swidden and land tenure is complex!

Per discussions with numerous individuals, there was great value in the climate extremes and agricultural impacts workshops. One of the primary reasons was that detailed and scientific information was directly relayed from a researcher and such information is not easily accessible via PNG sources (news, media). In addition, the workshop conversations concerning these impacts were the first of their kind and aligned with many observations the community had in recent years. While awareness is one aspect of addressing and mitigating the agricultural and climate impacts, I did not provide tangible resources to assist the community nor did I ask what types of resources or assistance they would want or need. This should be a vital step in

establishing what the community receives from researchers in return to make it worth their time and effort. This is in addition to monetary and refreshments provided to participants.

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