



THE ALA PROGRAMME: PHASE II

Community Forest Resource Use Report

July 2023

1. Introduction

Ranking 173/191 on the Human Development Index, *Madagascar remains one of the poorest and least developed countries in the world*.¹ Of the country's population, 50.9% live on less than US\$2.15 per day.¹ This is more pronounced in the Anosy region of southeast Madagascar where 83% of people live in poverty.²

Simultaneously, Madagascar is one of the world's highest conservation priorities.³ As a megadiverse country,⁴ Madagascar supports around 5% of global biodiversity⁵ and has some of the highest levels of endemism worldwide.⁶ Forest loss however, continues to threaten Madagascar's unique flora and fauna, with 4.62 million hectares of forest cover lost through deforestation between 2001 and 2021.⁷ In particular, Madagascar's littoral forests face a variety of threats, including unsustainable logging, increasing community reliance on natural resources, and climate change. The Sainte Luce littoral forest (SLLF) in the Anosy region is no exception.

The SLLF is one of three larger littoral forests left in Anosy, comprising of 17 fragments. The SLLF supports a large variety of plant species, 83% of which are endemic to Madagascar.⁸ Additionally, it is home to populations of various Threatened species, such as four Endangered lemur species, the Red-collared brown lemur (*Eulemur collaris*),⁹ the Southern woolly lemur (*Avahi meridionalis*),¹⁰ the Anosy mouse lemur (*Microcebus tanosi*),¹¹ the Thomas' dwarf lemur (*Cheirogaleus thomasi*), as well as numerous amphibian, reptilian, and invertebrate species.

Furthermore, the SLLF supports a growing community who are highly dependent on the forests for natural resources and livelihood activities.¹² Irregular rainfall and frequent droughts have depleted groundwater sources,¹³ compounding edge effects^A and increasing vulnerability to fire.¹⁴ The SLLF fragments are especially vulnerable to fire, due to a frequently practised traditional land management technique called *tavy*, a swidden agricultural practice which involves clearing land with fire for agriculture. In addition, proposed mining operations by QIT Madagascar Minerals (QMM) threaten to remove 661.8ha of the SLLF, exacerbating the risk of extinction of locally endemic species.^{12 15 16}

1.1 Sainte Luce

The *fokontany* (Malagasy village) of Sainte Luce comprises three hamlets, Ambandrika, Ampanasatomboky, and Manafiafy. In 2022, Sainte Luce had a population of 2,727, which is more than double the population of 1,238 in 2006.¹⁷ Local livelihoods and income generating activities are heavily dependent on natural resources, with 93.7% of households reliant on lobster fishing as a source income, and 70% reliant on *Mahampy* reed weaving. Resources required for fishing are typically derived from the SLLF, for example, *Amboza* is used to produce lobster pots and *Harandrato* is used to produce *pirogues* (Malagasy dugout canoe). Resources for weaving are derived from *Mahampy* wetlands, located between and around the SLLF fragments.

There are five SLLF fragments within relative proximity of Sainte Luce (S6, S7, S8, S9, and S17), Figure 1. The fragments S6 and S7 are designated as Community Resource Zones (CRZ), from which, natural resource use is permitted. The fragments S8 and S9 are part of Madagascar's National Protected Areas network, classified as conservation zones under IUCN Category V Protected Areas regime. S8 is comprised of two fragments, S8 North (S8N) and S8 South (S8S) which are divided by the road, and four remnants (S8 R1-R4). A small area of S8S falls outside the Protected Area. Similarly, the southern part of S9 falls outside the Protected Area. Much of S17 is designated as part of Madagascar's National Protected Areas network, with an area designated as a CRZ and an area that is privately owned. Protected Areas are managed by local organisations, such as FIMPIA (Forestry Police Association) and are enforced by a *dina*. A *dina* is a local environmental law, which, in this case, prohibits resource collection within the Protected Areas.

^A Edge effect involves microclimatic variations (light, temperature, and humidity) in the forest edge that become unsuitable for organisms adapted to forest interior conditions (Aragón et al., 2015).

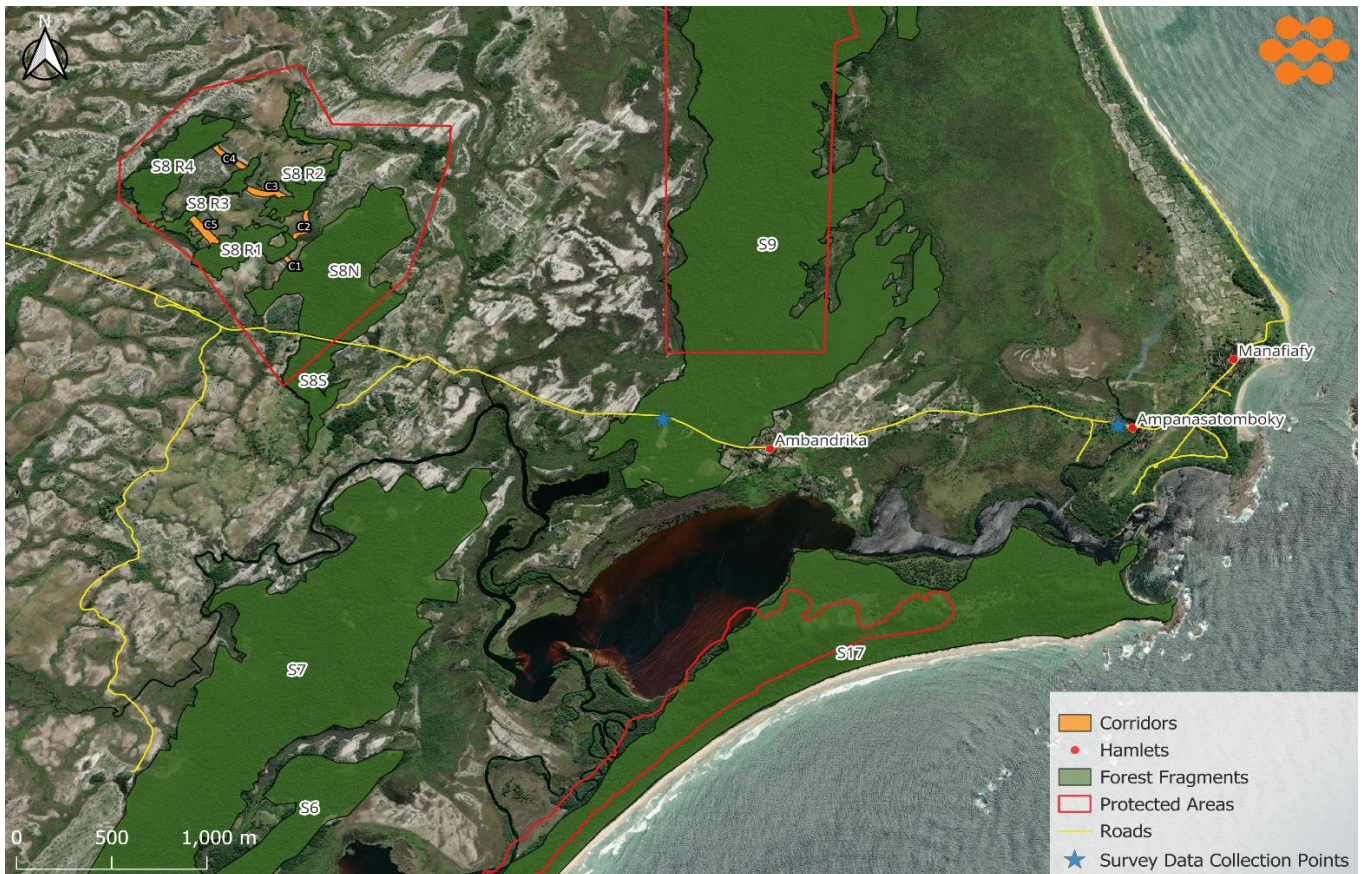


Figure 1: Map of the Sainte Luce littoral forest. Protected Area boundaries can be seen marked in red. The Ala Programme Corridors can be seen marked in orange in the top left. Blue stars indicate roadside survey data collection sites.

1.2 The Ala Programme

As a response to the threats facing the SLLF, SEED Madagascar (SEED) initiated the Ala Programme (*ala* meaning forest in Malagasy), a ten-year littoral forest conservation strategy. The Programme aims to improve habitat connectivity and species dispersal between SLLF fragment S8 and nearby forest remnants (R1-R4) through the creation of five forest corridors (C1-C5), Figure 1. The long-term objective is to conserve three Endangered nocturnal species of lemur (*Avahi meridionalis*, *Cheirogaleus thomasi*, and *Microcebus tanosi*) which cannot traverse the open land created by fragmentation. The Programme will also conserve and study an additional diurnal lemur species (*Eulemur collaris*), and many herpetofauna and invertebrate species in the SLLF, including a Critically Endangered frog (*Guibemantis diphonus*)¹⁸ and a Critically Endangered gecko (*Phelsuma antanosy*).¹⁹

In Phase I (2019-2021), SEED planted four forest corridors with *Acacia mangium* (*Acacia*) and native seedlings, totalling 1.64ha. In Phase II (2021-2024), available habitat was increased by expanding the original corridors and establishing a fifth forest corridor, creating a total corridor area of 3.81ha and connecting 88ha of littoral forest. Further, Phase II aimed to understand and meet community forest resource needs, build sustainable, locally led forest management structures, and contribute to the body of international conservation knowledge regarding forest corridors as a conservation strategy. This report discusses the Ala Programme's findings regarding community forest resource needs in Sainte Luce through Phase II.

1.3 Report Summary

To meet the resource needs of the community of Sainte Luce, SEED established a planting site, where trees would be available for community use. As such, the Ala Programme undertook several modes of data collection to assess community resource use within Sainte Luce. Plans to establish a planting site were indefinitely postponed in March 2024 due to uncertainties surrounding the proposed mining path of QMM. Additionally, QMM have proposed plans to plant trees for community use, meaning that SEED's limited resources would likely be better utilised elsewhere.

This report details the findings from 13 months of community resource use surveys, 90 household surveys, nine logger surveys, and six focus groups. The report then discusses findings in comparison to the 2013 Sainte Luce Community Assessment.²⁰

The findings of this report will be utilised to advocate for community needs in decisions taken by other actors working in Sainte Luce, such as QMM.

2. Methodology

For all data collection methods, the questions were carefully prepared and translated, with terminology changes, cultural norms, and predicted community perceptions of the question, considered throughout the process.

2.1 Community Resource Use Roadside Survey

Between the 13th of September 2021 and 28th of October 2022, the Ala Programme collected data to establish an understanding of forest resource use patterns in Sainte Luce. The Community Resource Use Roadside survey was conducted by two data collectors on the side of the main road into Sainte Luce. For the remainder of the report, this survey and resulting data set will be referred to as the 'roadside survey' or 'roadside data'. Surveys were conducted on 62 days of the 410-day period between September 2021 and October 2022. Surveys were conducted daily, however, due to staffing constraints, there was a momentary pause to data collection. From the 5th of November 2021, weekly surveys restarted, with four surveys per month conducted for the remainder of the time period. The survey was extended until October 2022 to ensure data was collected during all twelve months of the year. Surveys were conducted by two male data collectors who recorded responses on paper. Although deemed minimal, it is possible the gender of data collectors influenced the survey responses.

The survey collected information on the age (young/adult), sex (male/female), and number of persons collecting forest resources. The survey also documented information on the collected resources including, forest area, species name, quantity, frequency of collection, and the intended use of the resource. Malagasy and English language copies of the data collection sheet can be found in Annex 1. The survey was conducted in two locations on the main road running through Sainte Luce (see *Figure 1* above), one in SLLF fragment S9, around 0.5k east of the hamlet of Ambandrika, and one in Ampanasatomboky. All forest users that passed the data collection point, who were willing to participate, were surveyed.

The survey refusal rate was not noted. This would have been an interesting figure, as people may have been hesitant to respond if they were collecting wood from the Protected Areas, or without the relevant permit. Subsequently, the results may have a bias towards resources collected in non-protected areas.

Roadside data were inputted into Microsoft Excel and cleaned, with species and locations standardised.^B Extra care was taken with standardisation due to the similarity of many species' names, such as *Ambora* and *Amboza*, and *Roatry* and *Rotry*. Subsequently, all species within this report are referred to using local vernacular names.

Once the data was cleaned, a basic quantitative analysis was conducted to reveal frequency trends in species collected. Analysis was primarily based on the frequency of resources collected (defined as: the number of occasions the species was collected). The quantity of resources collected was omitted from analysis to avoid bias, due to the way quantity-based data represented results. For example, small twigs collected 20 times had a more significant impact on results than a large tree harvested once.

2.2 Community Focus Groups

Six focus groups were carried out between the 20th and the 22nd of February 2022, with two held in each of the three Sainte Luce hamlets, one for women, and one for men. Each focus group was composed of 15 participants. Participants were from a variety of backgrounds, including fishers, elders, homemakers, farmers, and members of local committees. Eight discussion topics were covered and centred around community resource use of native

^B Species and location names were confirmed following discussions with local experts.

and non-native species, with responses recorded on paper by two SEED staff (one male and one female).

2.3 Household Surveys

Household surveys were conducted between the 25th to the 28th of April 2022. Household surveys were conducted to gain an insight into household resource collection and usage habits. Ninety surveys were conducted, with 30 households from each of the three hamlets that comprise Sainte Luce. Based on a 2021 estimate,²¹ this equates to approximately a fifth of all Sainte Luce households ($x=19.4\%$). Surveys were conducted throughout the middle of the day and the afternoon to reduce bias, as fishing, the primary income generating activity in Sainte Luce, is performed during the morning. Survey responses were recorded on a phone using ODK, an open-source mobile data collection platform, by one male data collector.

The average age of respondents was 36, with the male occupant predominantly answering questions ($x=82.2\%$, $n=74$).

2.4 Logger Surveys

Logger surveys were conducted between the 28th and the 30th of March 2022 to gain an insight into logging in Sainte Luce. Surveys were conducted by two data collectors (one male and one female), with responses recorded on a phone using ODK.

Prior to the survey, participants were identified following a community discussion wherein individuals stated 'logging' or 'collecting wood' as their main occupation/livelihood within Sainte Luce. A total of nine individuals were identified, three from Ambandrika, one from Ampanasatomboky, and five from Manafiafy. All loggers were male, aged between 31 and 65 ($\bar{x}=51$), and had considered logging their primary livelihood activity for between six and 36 years ($\bar{x}=20$).

3. Findings

This section discusses forest resources harvested in terms of location-specific findings, species-specific findings, followed by the use of the resource. Finally, resource collectors will be discussed, with a focus on logger-specific findings. The terms collected and harvested are used interchangeably in this report.

3.1 Location

Twenty areas were named as locations people collect forest resources from during the roadside survey (*Figure 2*). The ten locations forest resources were most frequently collected from can be seen in *Table 1*. More than 80% of all resource collections were made from 11 locations situated inside forest fragments ($n=2,331$), which are either designated as community resource use zones, designated as Protected Areas, or have no designated status. Within the forest fragments, the majority of collection locations were at the forest edge, or close to the road. This is likely due to the easier accessibility.

When translated from Malagasy to English, a few of the specific location names were the same as the name of forest fragment itself,^c as such, specific locations within the fragment were determined by local experts during data analysis. All observations about the collection locations were made by local experts.

^c Location names that translate to the name of forest fragments are as follows: S7 is S7, Analavinaky South is S8 South, Ambava'n'ala is S9 north of the road, and Ambava'n'ala South is S9 south of the road. All four points were plotted on the map where the locations were likely to be following discussions with local experts who stated that despite these names referring to the whole areas, if people harvested resources, it is highly likely they would come from the area marked.

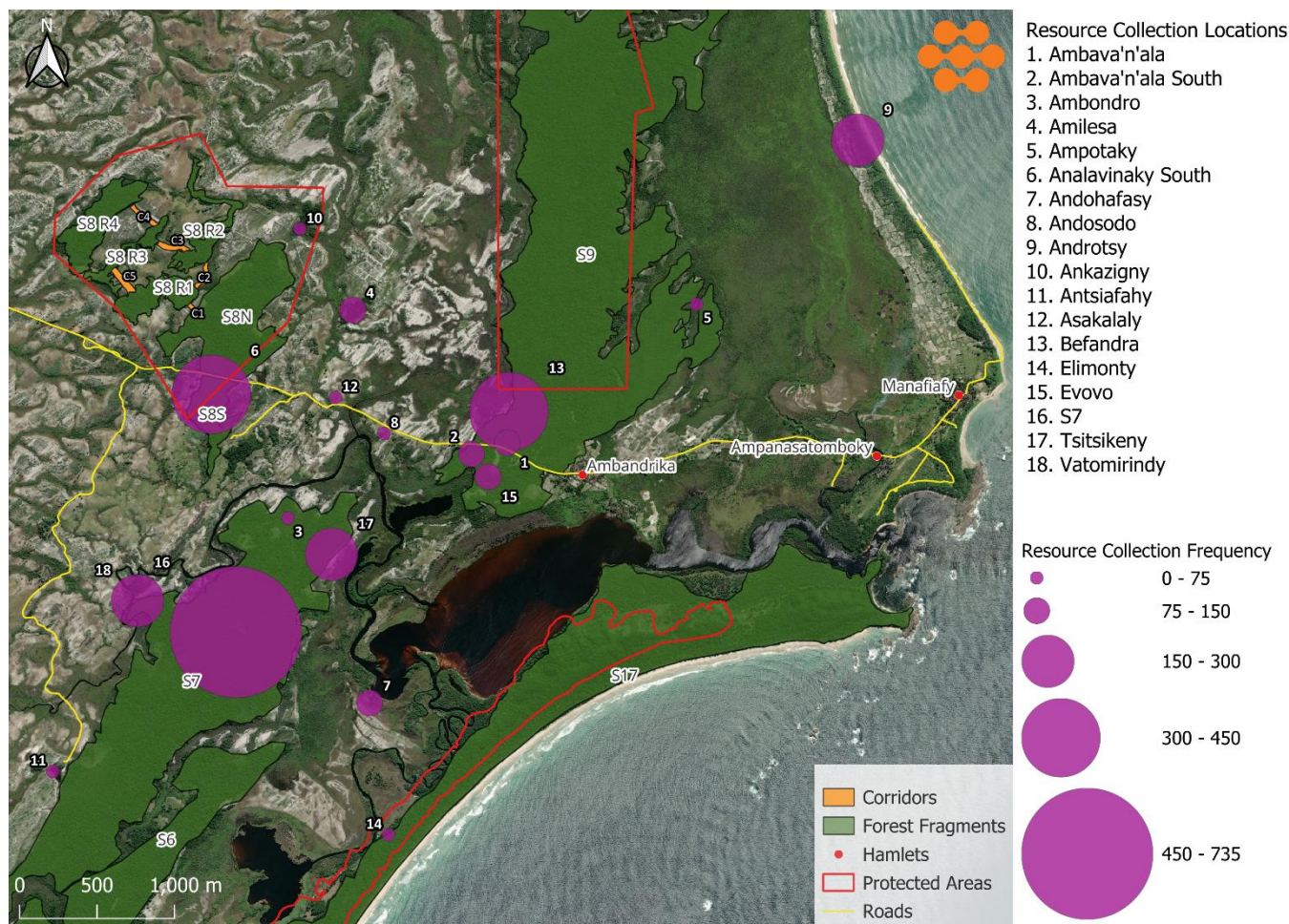


Figure 2 – Forest resource collection locations proportional to resource collection frequency.

Table 1 – Table showing the top ten location by frequency of resource collection.

Location	Resource Collection Frequency	% of Resources Collected (n=2,811)
S7	735	26.1
Analavinaky South	412	14.6
Befandra	318	11.3
Androtsy	232	8.2
Vatomirindy	232	8.2
Tsitsikeny	227	8.0
Evovo	135	4.8
Ambava'n'ala South	99	3.5
Ambava'n'ala	87	3.0
Amilesa	81	2.9

3.1.1 Community Resource Use Zones

The S7 fragment had the highest number of resources collected from it ($x=43\%$, $n=1,209$), from four named locations, which is to be expected due to S7's designation as a CRZ. Additionally, S7 was the most frequently visited resource collection location ($x=26.2\%$, $n=735$). The fragment had the greatest diversity of resources collected, with 80 different named resources collected.

3.1.2 Protected Forest Fragments

Four named locations are situated within the IUCN Protected Areas, Ambava'n'ala, Analavinaky South, Ankazigny, and Elimonty, accounting for 17.6% of resources collected ($n=495$). Analavinaky South was the second most frequently visited forest resource collection location ($x=14.7\%$, $n=412$). It is important to note that Ambava'n'ala refers to the whole of the S9 fragment north of the road, so it is likely that some resources will have come from the Protected Area. Similarly, Analavinaky South refers to the whole of S8S, only half of which is protected, so it is

likely that a lot of the resources collected will not have come from the Protected Area. Analavinaky South was the location with the highest total of exotic resources collected ($n=30$), with 29 collections of *Grevillea* and one of *Acacia*. In fact, *Grevillea* accounted for the joint-second most resource collections from Analavinaky South, making it the most frequently named location for *Grevillea* ($x=64.4\%$, $n=29$), which is interesting as *Grevillea* is an exotic species so would not naturally be found in the littoral forest fragments. Nevertheless, *Grevillea* is found in abundance along the edges of Analavinaky South, in areas that have likely been deforested of native species.

Secondly, despite falling within the Protected Area in principle, Ankazigny is not in practice covered by the *dina* which forbids resource collection from the Protected Area of S8, as it is not part of the forest fragment or its neighbouring remnants. Elimonty is the only other location that falls within the Protected Area and should be fully protected by the *dina*.

3.1.3 Unprotected Forest Fragments

The highest proportion of collection locations were situated in the S9 fragment ($n=5$), with all five named locations falling outside of the Protected Area. The S9 fragment had the second largest number of resource collections ($x=23.9\%$, $n=671$), and the second greatest diversity of species harvested, with 73 named species collected.

Evovo ($x=4.8\%$, $n=135$) refers to the majority of S9 south of the road and is a major planting site for community members in Sainte Luce. Evovo's high community importance can be in part attributed to its proximity to the hamlet of Ambandrika, however, the land is not community-owned. Ampotaky ($n=32$, 1.1%) is the only named collection location in S9 on the west side of the fragment, this area also includes the neighbouring wetland.

3.1.4 Outside Forest Fragments

A large number of resources were collected from outside the forest fragments, with 479 ($x=17.1\%$) resources collected across eight non-forest fragment locations. The named collection locations that were outside forest fragments all vary in location and character. Amilesa, Ankazigny, and Andohafasy all refer to areas that cover small pockets of trees and wetland, with the first two located between the S8 and S9 forest fragments, and the latter located between the S7 and S17 fragments. Asakalaly ($x=0.7\%$, $n=20$) refers to the area surrounding the river and contains an old community planting site for exotic trees. As such, Asakalaly was the location with the highest proportion of exotic species resources collected from it ($x=70\%$, $n=14$).

Androtsy, the narrow strip of trees bordering the sea north of Manafiafy, was the non-fragment location with the highest resource collection ($n=232$, $x=8.3\%$) greatest species diversity ($n=53$) and accounted for 48.4% of collections outside of fragments. Androtsy's high collection frequency is possibly due to it being the second closest location to both Ampanasatomboky and Manafiafy. Androtsy was also the location with the highest number of species collected per collection, 3.1, compared with an average of 1.8 across all sites.

Two locations were only mentioned once during the survey, Andopitaly (this translates as "from the hospital", meaning it was harvested from the local public health centre), and Ambovara, which was the only location unable to be identified by the local experts. Ambovara may have been a spelling error by the data collector, and as such was omitted from the location-based analysis.

3.1.5 Species Collection Location Diversity

Fanola was the most collected species from the S7 ($x=14.6\%$, $n=177$), S8S ($x=14.3\%$, $n=59$), and S9 ($x=17.7\%$, $n=73$) forest fragments. *Ramirisa* was the most collected species from the S17 forest fragment ($x=28.2\%$, $n=11$), with *Lalo* ($x=12.1\%$, $n=58$) the most frequently collected species from outside of the forest fragments. A full breakdown of the top three most frequently collected species from each forest fragment can be seen in *Table 2*.

Table 2 – Table showing the top three most frequently collected species from each forest fragment, as recorded in the roadside survey.

Ranking	S7 (n=1,209)	S8S (n=481)	S9 (n=671)	S17 (n=39)	Outside (n=479)
1.	<i>Fanola</i> (4.6%)	<i>Fanola</i> (12.3%)	<i>Fanola</i> (10.9%)	<i>Ramirisa</i> (28.2%)	<i>Lalo</i> (12.1%)
2.	<i>Zora</i> (3.9%)	<i>Grevillea</i> (7.0%) <i>Vondroza</i>	<i>Vondroza</i> (8.8%)	<i>Zora</i> (12.8%)	<i>Fanola</i> (10.2%)
3.	<i>Nato</i> (3.8%)	<i>Harandrato</i> (5.6%)	<i>Rotry</i> (6.7%)	<i>Fanola</i> (10.2%)	<i>Voapaky</i> (5.4%)

Fanola was not only the most frequently collected species overall in S7, S8S, and S9, but it also had the greatest diversity of harvesting locations, being collected from 18 named locations. Approximately half of the *Fanola* was collected from the S7 forest fragment (x=48.9%, n=177), as seen in Figure 3. *Voapaky* had the second greatest collection location diversity at 15 locations, with the highest proportion being harvested from the S7 fragment (x=37.5%, n=45).

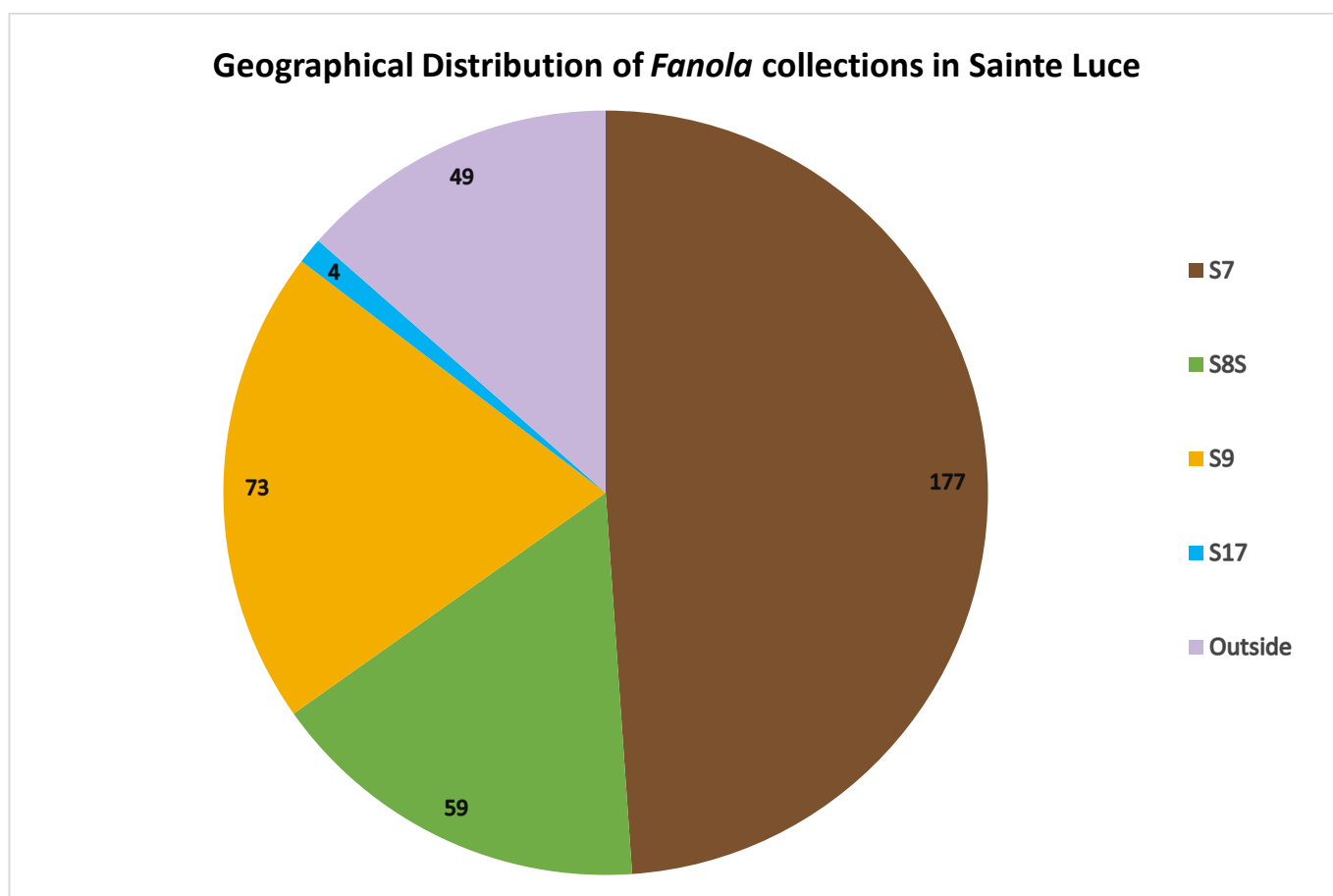


Figure 3 - Pie chart showing the geographical distribution of *Fanola* collections in Sainte Luce from the roadside data.

3.2 Species

Findings from the roadside data reveal that a total of 2,811 forest resources were harvested, across 1,544 collections, from 105 named species. Of these 105, 102 were native species, and three were exotic. On 12 occasions, a resource was harvested, but the species could not be identified or was not identified sufficiently accurately to be named within this report. For example, *vahy*, which translates as vine, was recorded on nine occasions, unknown recorded on two occasions, and *teza*, meaning part of a tree, was recorded once. On average, 45 resource collections were made per surveyed day. Using a simple extrapolation, this would give a value of 16,425 resources collected per year within the Sainte Luce community. Only one species was collected on

the majority of occasions ($x=60\%$), with three or more species accounting for around a quarter of collections ($n=356$, $x=23\%$). No more than six named species were collected at one time, and this frequency was rare ($n=23$, $x=1.5\%$).

Table 3 – Table showing the top eleven most frequently collected species from the roadside survey data.

Ranking	Species	Collection Frequency	Percentage (n=2,811)
1.	<i>Fanola</i>	362	12.9
2.	<i>Vondroza</i>	140	5.0
3.	<i>Lalo</i>	126	4.5
4.	<i>Rotry</i>	120	4.3
=	<i>Voapaky</i>	120	4.3
5.	<i>Zora</i>	96	3.4
6.	<i>Nato</i>	89	3.2
7.	<i>Harandrato</i>	88	3.1
8.	<i>Fantsikahitry</i>	85	3.0
9.	<i>Haramboanjo</i>	78	2.8
10.	<i>Makaragna</i>	77	2.7

In total, 105 named species were identified in the roadside survey. Species harvested were predominantly trees, such as *Harandrato*, alongside palms, such as *Amboza*, *Ravinala* (Traveller's Palm)^D shrubs, and bushes, including *Belataka*, vines, *Vahipiky*, grasses such as *Anjavidy*, and pandanus (*Fandra*).

Of the 105 named species recorded, the 11 named species, seen in Table 3, accounted for half ($x=49.1\%$) of the total resources harvested.

3.2.1 Native Species

Fanola was the most frequently harvested species, accounting for 12.9% ($n=362$) of total resources harvested, considerably more than the second (*Vondroza*, $n=140$, $x=5.0$) and third (*Lalo*, $n=126$, $x=4.5\%$) most frequently harvested species.

When the six focus groups were asked about the five most important tree species in their community, 14 species were named, with *Harandrato* and *Sotro* mentioned by five groups ($x=83\%$). *Fanola* was stated the second most frequently ($n=4$), with no other species mentioned by more than two focus groups. In the roadside data, *Fanola* accounted for the greatest proportion of harvestings where firewood was given as the sole intended use ($x=15.1\%$, $n=266$), this accounted for 73.5% of the *Fanola* harvested ($n=362$). The greater importance placed on *Fanola* as a resource by women may be because of the gendered nature of its use, with it frequently collected for firewood. Firewood is predominantly used for cooking, which, in Sainte Luce, is typically a gendered household activity conducted by women. This explanation is given more weight by the fact that *Fanola* was mentioned by all three female focus groups, but only one male group.

There were also slight differences in the most important tree species identified by each hamlet, with *Tapinandro* only mentioned by both focus groups in Ambandrika, *Nato* only mentioned by both focus groups in Ampanasatomboky, and *Zahambe* only mentioned by focus groups in Manafiafy. A reason for hamlet-specific preferences may be due to the availability of certain species close to their hamlet. Despite this, there is no evidence to suggest that is the case from the roadside data, with all three species most commonly harvested in S7.

During focus group discussions, 22 species were listed for use by participants if the five most important species were not available to them, 14 of those species were not mentioned by participants previously. When considering both the five most important species to the community of Sainte Luce, and their alternatives, *Harandrato* was mentioned by all six focus groups, with *Tapinandro* and *Vondroza* joining *Sotro* on five mentions, and

^D Despite its name, Traveller's Palm is not a true palm.

Fantsikahitry joining *Fanola* on four mentions. Thus, these six species may be the most important to the community of Sainte Luce. Four of these species were also in the top ten most frequently collected resources in the roadside survey data and accounted for at least 3.0% of total resources collected. Although not within the top ten most frequently collected species, *Tapinandro* also ranked relatively highly as the 16th most frequently collected species, accounting for 1.7% of total collections. *Sotro* is the outlier, with a large difference between its collection frequency and the relative importance placed on it by the community. *Sotro* ranked as the 45th most frequently collected species in the roadside survey. This could suggest although the species is important to the community of Sainte Luce, its availability in the SLLF is low or in decline.

It is also worth noting that the male focus group in Ambandrika mentioned *Ravinala* as one of their five most important species and stated that there are no replacements for it.

Dypsis scottiana, a Vulnerable palm species, conserved by Project Palms, was the joint-11th most frequently harvested species (2.7%, n=75). Interestingly, *D. scottiana* is differentiated amongst the local community by size, which varies by age category of the palm. For example, smaller or juvenile *D. scottiana* have the vernacular name *Amboza* (n=57), and larger or adult *D. scottiana* have the vernacular name *Raotry* (n=18). *D. scottiana* is the only named species recorded on the survey that is differentiated by size/age in this way.

Half (n=52) of the species collected were harvested on fewer than ten occasions, with 21% of species harvested only once (n=22). Two notable examples of infrequently harvested species were *Telopoloambilany* (*Chrysalidocarpus saintelupei*) (n=3), an Endangered species of palm which is one of six species conserved by SEED's Project Palms, and Eucalyptus, an exotic, but abundant tree species in Sainte Luce (n=1).

3.2.1.1 Native Species Threats

During focus groups, participants were asked what issues they face in regard to natural resource use. Five of the groups stated that the main issue was overexploitation, mainly due to forest destruction or that resources and more specifically hardwoods are declining due to overexploitation. *Harandrato*, *Rotry*, and *Sotro* were all identified by household surveys and focus groups as hardwood species in decline. Despite their noted decline, *Harandrato* and *Rotry* were both among the top ten most collected species from the roadside data. Four of the focus groups stated that *tavy* (the clearance of land with fire for agricultural purposes) was a threat to natural resources. 'People outside of the community coming to take hardwoods' and 'people taking hardwoods without permits' were both stated as resource threats by two different focus groups.

3.2.2 Exotic Species

Three exotic tree species were recorded in the roadside survey, *Acacia*, *Eucalyptus*, *Grevillea* (*Acacia mangium*, *Eucalyptus* spp., *Grevillea robusta* respectively), representing 2.0% of total harvestings, with *Grevillea* harvested most frequently (n=45, x=1.6%). This low collection frequency is explained by focus group data, with all six focus groups highlighting a community-wide consensus that people would rather collect native trees under all circumstances. One group in Ambandrika, stated that they would only use exotic species if they had no choice, due to native forest resources declining. Four groups also stated that exotic species were bad for agricultural crop growth, with one focus group highlighting that exotic species compete with other species for water, and they are bad for the soil.

Despite their low community usage, all six focus groups highlighted that exotic species are faster growing than native species. Two groups recognised that harvesting exotic species, as opposed to native species, can reduce deforestation in the SLLF. When focus groups were asked if they would be willing to use exotic species, all six groups mentioned *Grevillea* and at least one *Eucalyptus* species.

3.3 Usage

This section will discuss general resource usage, before focusing on the three primary resource uses of firewood, house construction, and fishing. The usage sub-sections will start with a discussion of the roadside survey results, followed by contextualising findings from the other three data sets.

Intended Resource Use by Resource Collection

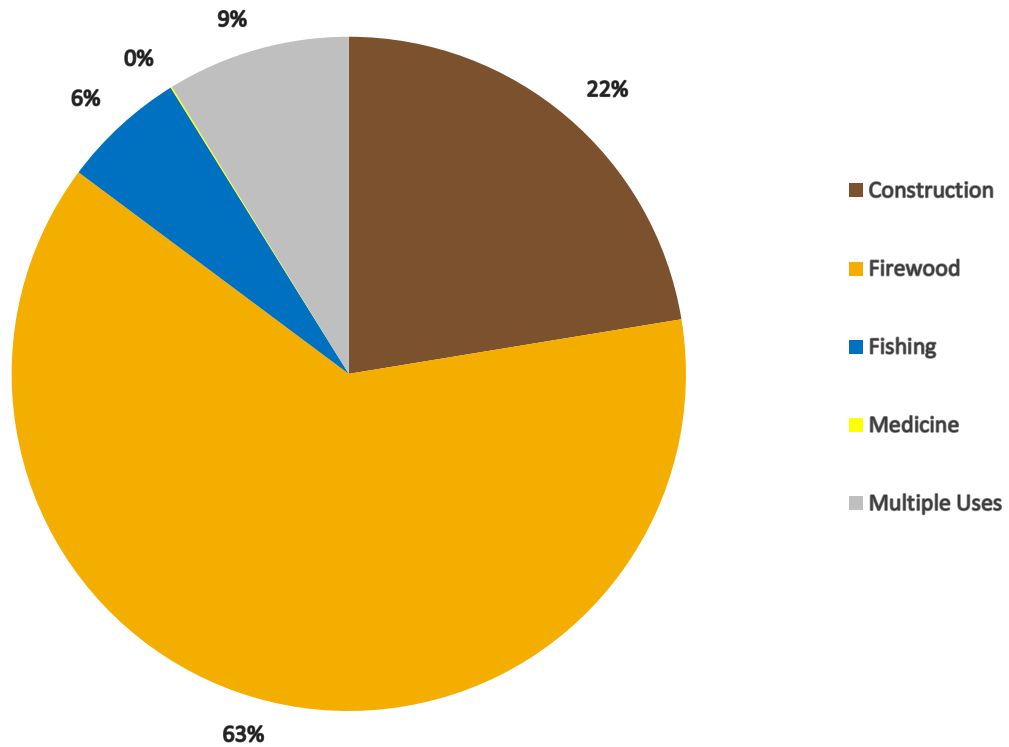


Figure 4 – Graph showing the intended resource use for the 2,811 resources recorded as collected during the roadside survey.

From 1,544 collections, 1,622 intended uses of forest resources were recorded, with all respondents except one detailing an intended use for the resource they had collected. The maximum number of intended uses stated after a collection was three. Uses stated in the roadside survey can be split into three primary categories: firewood, construction, and fishing (Figure 4). Firewood includes any resources that were intended to be burnt for fuel or for charcoal creation. Construction refers to house construction including house walls, planks, roofs, beams, fences, and furniture. Fishing primarily refers to resources used to produce lobster pots, but also includes *pirogue* repairs, paddles, and fishing rods. Medicine was also stated by two collectors as the intended resource use.

Only one use was given for the majority of the 2,811 resources collected in the majority of collections ($x=91.2\%$, $n=1,765$), with nearly two-thirds of resource collections made solely for firewood ($x=62.8\%$, $n=1,765$), a fifth of collections made solely for construction ($x=22.4\%$), and 5.9% made solely for fishing.

Sixteen named species were used for all three primary uses, 50 named species were used for two primary uses, and 36 named species were used for one.

Table 4 – Table comparing the top ten most frequently collected species recorded in the roadside data for the three primary uses.

Ranking	Firewood		Construction		Fishing	
	Species	% Collections (n=1,765)	Species	% Collections (n=630)	Species	% Collections (n=166)
1	<i>Fanola</i>	15.1	<i>Fanola</i>	9.5	<i>Amboza</i>	24.0
2	<i>Lalo</i>	6.5	<i>Voapaky</i>	7.6	<i>Voliandroky</i>	22.2
3	<i>Vondroza</i>	5.8	<i>Fantsikahitry</i>	6.8	<i>Ravinala</i>	19.2
4	<i>Rotry</i>	5.2	<i>Harandrato</i>	5.9	<i>Harandrato</i>	13.2
5	<i>Zora</i>	4.2	<i>Ravinala</i>	4.6	<i>Fanola</i>	3.0
6	<i>Haramboanjo</i>	3.5	<i>Bamby</i>	4.4	<i>Vondroza</i>	2.4
7	<i>Voapaky</i>	3.5	<i>Vondroza</i>	4.1	<i>Bamby</i> <i>Fotsivavo</i>	1.8
8	<i>Nato</i>	3.4	<i>Fontondahy</i>	3.3	Three species	1.2
9	<i>Makaragna</i> <i>Mantsa</i>	3.2	<i>Hazomainty</i>	3.2	Nine species	0.6
10	<i>Mampay</i>	2.5	<i>Nato</i> <i>Raotry</i>	2.9	N/A	N/A

3.3.1 Firewood

Firewood was the primary use of nearly two thirds of all resources collected (n=1,765). A total of 87 named species were collected for use as firewood, with the ten species most frequently collected for firewood seen in Table 4. *Fanola*, the most frequently collected species overall, was also the resource collected most frequently to be used as firewood, accounting for 15.1% of firewood collections (n=266). The second and third species most frequently collected for firewood were *Lalo* (x=6.5%, n=115) and *Vondroza* (x=5.8%, n=103). Of the 87 species in total, 23 named species were used as firewood, including *Acacia* (n=11).

Interestingly, despite firewood being the primary purpose for forest resource collection in Sainte Luce, less than half of the 90 households interviewed for the household survey collect firewood (n=41). The majority of households were more likely to get firewood from a vendor (street stall). This figure varied between the three hamlets, with Manafiafy households most likely to collect firewood (x=73%), and Ampanasatomboky (x=27%) the least likely. It is noteworthy that 76% of households preferred to collect deadwood for firewood and 19% preferred to cut branches, rather than cut the whole tree (5%). Deadwood is often preferred as it is already dry so can be used almost immediately after collection.

3.3.1.1 Species Collected

Overall, 20 preferred species for firewood use were listed by the 41 households that were more likely to collect than buy firewood, with 23 further species listed as alternatives if the preferred species was not available. *Fanola* (n=6) and *Vondroza* (n=3) ranked first and third respectively amongst priority firewood species listed by households, these two species also ranked first and third for species collected for firewood in the roadside data. Half of the 41 households chose 'flammability' (x=49%) as the main reason for collecting a species, followed by 24% stating 'easier to cut' as the primary reason. As easy to cut is a primary reason for the choice of firewood collected, it may be that opportunism leads to a diversity of resources being collected for firewood.

Whilst both the roadside and household surveys show a clear preference for *Fanola*, the diversity of species mentioned demonstrate that firewood, and subsequently household activities in Sainte Luce, such as cooking, are not dependent on specific resources.

It is noteworthy that firewood was the intended use of 98.2% of exotic species harvested in the roadside survey. Despite this, a small number of exotic species were harvested comparative to their proliferation in the Sainte Luce area. Reasons for the low usage of exotic species in Sainte Luce were given by two households as 'burning time is too quick', and 'there is no dry wood (to collect)'. Focus groups findings aligned with the household surveys, with

half of the focus groups (x=3) noting that exotic species burn too quickly compared to native species. One focus group also highlighted that burning exotic species creates a lot of ash.

3.3.1.2 Collection Locations

Firewood was collected from all 20 locations named within the roadside survey, with collections made relatively equally from fragments S7 (x=28.5%), S8S (x=26.6%), and S9 (x=24.5%). A total of 19.2% of collections came from outside of the forest fragments, primarily from Amilesa (x=6.2%) and Androtsy (x=5.4%). The 41 households that collect firewood (in comparison to purchasing it), reported that they were more likely to collect firewood from S9 (31.7%) and S8 (19.5%), than S7 (14.6%). The household survey figures are similar to the roadside data findings for S9 and S8, however, only half the proportion of households reported that they collect firewood from S7 compared with the roadside data. A potential explanation for this may be that the vendors, rather than the households themselves, more frequently collect firewood from S7. Another significant difference between the roadside and household findings is that Evovo accounted for 5.3% of firewood collection in the roadside data but was named by 29.2% of households (n=12) as the primary location from which they collect firewood. Two households outlined their reasons for collecting firewood from the Protected Areas of S8 and S9 as 'it is closer' and there is a 'broken bridge to S7'.^E

3.3.1.3 Livelihood Implications

Two-thirds of firewood-collecting households stated that they previously collected firewood from a different area to now. The majority of households changed location more than one year ago (x=54%), with 14 households stating this was due to the designation of S8, S9, and S17 as Protected Areas. Species availability was another factor influencing collection location for 27% of households, with four households stating they could no longer find certain species in specific locations. Households named 16 species they could no longer find, with *Ampoly* (n=11), *Nato* (n=6), and *Sotro* (n=5) stated most frequently. Both *Ampoly* (x=0.8%, n=22) and *Sotro* (x=0.5%, n=14) were rarely mentioned in the roadside data but were collected from nine and six different locations respectively, with 45.5% of *Ampoly* and 71.4% of *Sotro* collections made from the S7 fragment. *Nato*, however, was the sixth most frequently collected species in the roadside survey (x=3.2%, n=89), yet was only found in eight named locations. This suggests that *Ampoly*, *Sotro*, and *Nato* are still present across Sainte Luce, but their populations in the areas frequented by households may have declined significantly. A reduction in species availability is concerning for livelihoods in Sainte Luce, as well as the biodiversity of the SLLF.

Two-thirds of households collected firewood every day, with the time per day spent collecting firewood^F varying by *fokontany*. On average, Ambandrika residents spent an hour per day harvesting firewood, compared with three hours for Ampanasatomboky and Manafiafy residents. Nearly a fifth of Manafiafy residents (x=17.5%) spent four or more hours per day collecting firewood. The likely explanation for this is that Ambandrika is closest to the forest fragments, and Manafiafy the furthest. Focus groups suggested that the time spent per day collecting firewood has increased, with three groups of participants stating that they were concerned about how far women must go to find firewood (x=50%). This concern was mentioned by a focus group in each of the three hamlets, showing that despite proximity to the SLLF, Ambandrika residents are still having to travel far to collect firewood. This suggests that forest resources have been depleting in areas closest to the hamlet.

3.3.2 Construction

Construction was the primary use of nearly a quarter of resources harvested (n=630), with a total of 71 named species harvested for this purpose. *Fanola* was again the most frequently collected species used for construction (x=9.5%, n=60), followed by *Voapaky* (x=7.6%, n=48) and *Fantsikahitry* (x=6.8%, n=43). Of the 71 named species, seven were used exclusively for construction, including *Falafa* (n=4). No exotic species were harvested with construction as the intended use.

^E At the time of writing, this bridge is still broken. However, S7 is accessible by a *piroque* ferry.

^F This includes the time spent harvesting the resource, as well as the walking time to and from the location.

The term construction encompasses nine different uses, as seen in *Table X*. A quarter of resources harvested for construction were for fencing ($x=25.2\%$, $n=159$), and 13.8% were used for square posts ($n=87$). A total of 38 named species were harvested for fencing, with *Fantsikahitry* ($x=16.4\%$) accounting for the highest proportion of those. *Voapaky* was the most frequently harvested species for use as a square post, accounting for 9.2% of collections ($n=8$). The most common material harvested for each construction subcategory can be seen in *Table 5*.

Table 5 – Table showing the most frequently collected species per construction subcategory, as per the roadside data.

Use	Most Frequently Collected Species
Fencing (n=159)	<i>Fantsikahitry</i> (n=26)
Furniture (n=2)	<i>Lendemo</i> , <i>Makaragna</i> (n=1)
House Construction: beam (n=11)	Eleven Species (n=1)
House Construction: floor (n=1)	<i>Raotry</i> (n=1)
House Construction: plank (n=58)	<i>Voapaky</i> (n=16)
House Construction: post (n=87)	<i>Voapaky</i> (n=8)
House Construction: roof (n=8)	<i>Fanola</i> , <i>Fantsikahitry</i> (n=2)
House Construction: triangle ⁶ (n=12)	<i>Bamby</i> (n=9)
House Construction: walls (n=10)	<i>Ravinala</i> (n=4)

3.3.2.1 Species Collected

Household survey respondents in Manafiafy, who more frequently collect construction materials than buy them ($n=8$), highlighted five target species for construction, *Nato* for making planks ($n=6$), *Fantsikahitry* ($n=4$), *Menahihy* ($n=2$) for roofs, *Harandrato* ($n=3$), and *Fontondahy* ($n=2$) for making posts and beams. Despite being the preferred species for plank making amongst households, *Nato* ranked joint-tenth in the roadside survey data for species harvested for construction ($n=18$). As seen in *Table 4*, *Fantsikahitry*, *Harandrato*, and *Fontondahy* also fall within the roadside data top ten for construction. In the roadside data collected however, 23 species were collected more frequently than *Menahihy* for construction. A further ten species were also mentioned by households as secondary target species for construction, including *Zora*. *Sotro* was identified as a species participants could no longer find by four households. These four households were different from the five who stated they could no longer find *Sotro* for use as firewood, taking the total to 10% of the surveyed households who noted they could no longer find *Sotro*. This suggests *Sotro* may be a species in significant local decline.

No exotic species were recorded in the roadside data as collected for use in construction. Focus groups shed light on this, with all six outlining that exotic species are not strong or durable, meaning that they break easily. Three focus groups highlighted that exotic species deteriorate quickly and do not last more than one year as timber of furniture. Finally, one focus group highlighted that timber made from exotic species easily gets termites. Despite this, five focus groups explained that exotic species can be used to make furniture, and two groups stated that they can be used to build fences.

3.3.2.2 Collection Locations

Nearly half of all collections for construction resources were made in S7 ($x=49.1\%$), with resources collected from 15 of the 20 named locations. Relatively few collections for construction purposes were made from S8S (8.7%), compared with S9 (26.1%) and locations outside of the fragments (15.0%).

3.3.2.3 Livelihood Implications

The majority of households surveyed in Sainte Luce stated that they buy construction materials from a logger ($x=75\%$) or vendor (11%). Only 13% of households typically collected wood for construction themselves. In Manafiafy the picture is more varied, with 40% of households using loggers, 27% vendors, and 33% collecting construction materials themselves ($n=10$).

⁶ Triangle may be called triangle in Sainte Luce, but instead it refers to a horizontal wall support used to pierce *Ravinala* stems to keep them in place.

Of the ten households that collect construction materials themselves, six stated that they harvest construction materials from the CRZ's of S6 and S7. Two households stated that they had changed where they harvested construction material from more than one year prior, because the target species could no longer be found in those forest areas. All eight households stated that a permit was required for harvesting construction materials, with five households stating the permit is too expensive, and two stating it is too time consuming to acquire a permit.

3.3.3 Fishing

3.3.3.1 Species Collected

Forest resources collected solely for fishing comprised 5.9% of total resources collected (n=166), with 18 named species harvested for this purpose. No species were exclusively harvested for fishing use, but 80% of fishing resources came from four species. *D. scottiana* (Amboza) was the most frequently collected resource for fishing, accounting for roughly a quarter of resources collected for this purpose (x=24.1%, n=40), with one adult *D. scottiana* (Raotry) also harvested for fishing. Fishing, therefore, accounts for more than half of the collections of the Vulnerable palm species *D. scottiana* (x=53.3%). *Voliandroky* (x=22.3%), *Ravinala* (x=19.3%), and *Harandrato* (x=13.9%) rank as the second to fourth species most frequently collected for fishing.

As per the roadside data, exotic species were collected once for fishing (*Grevillea*). Despite this low number of collections, two focus groups highlighted that exotic species can be used to make the brim of a *pirogue*, and a further group highlighted that they can be used to produce paddles.

3.3.3.2 Collection Locations

Fishing resources were harvested from 15 of the 20 named locations, yet a disproportionate number were collected from S7 (x=60.7%), with 14.6% of collections coming from both S8S and S9. A total of 9.6% of collections for fishing resources came from outside of the forest fragment.

3.3.3.3 Livelihood Implications

With the lowest species diversity of any usage category, and a significant portion of fishing resources coming from four species, it is clear that the specialised nature of fishing equipment, such as lobster pots, makes their production reliant on a few specific species concentrated in a number of locations. Thus, threats to these few species threaten the livelihoods of the majority of the Sainte Luce population. In fact, two focus groups outlined how livelihoods are already being threatened by a resource scarcity, stating that *D. scottiana* (Amboza) and *Vahipiky* which are both used to produce lobster pots are difficult to access. This is evident for *Vahipiky* in the roadside data, wherein it was only collected on two occasions. Despite this, *D. scottiana* ranked 11th for resource collections in the roadside data.

3.4 Collector

A total of 2,159 people were interviewed during the roadside survey, from 1,544 collections. The average collection group size was 1.4 persons, with two or more people collecting resources on 30% of occasions (n=464). The maximum collection group size was six (n=2). On average, 35 people were collecting resources per day, which equates to 1.3% of the population of Sainte Luce. The greatest number of people harvesting resources was 92 on the 25th of September 2021, this equates to roughly 3.4% of the population of Sainte Luce.

In the roadside survey, adult males comprised the majority of collectors (x=60.5%, n=1,307),^H with adult females comprising 10.5% of collectors (n=226). Nearly a quarter of resource collectors were children (reported age = <18) (x=23.7%), with 503 young males and eight young females. Around 5% of collectors were loggers (n=115), meaning that their primary livelihood was logging. Including men, young males, and loggers, nearly all collectors were male (x=89.2%, n=1,925) (Figure 5).

^H Loggers, despite all being men, were recorded as their own demographic, so they are not included in this category.

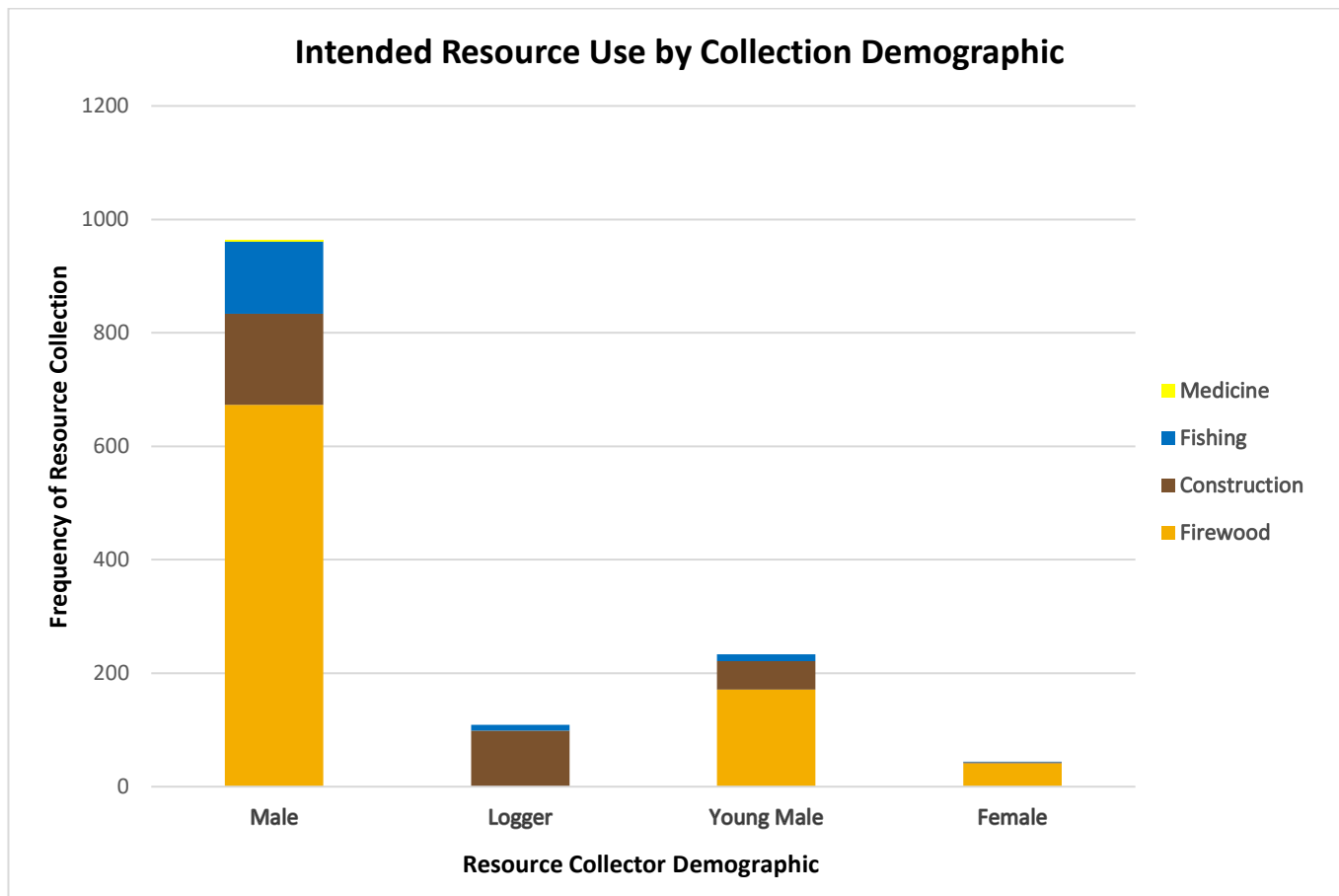


Figure 5 – Graph showing the intended resource use by collection demographic when a collection comprised only one demographic with one intended use. Subsequently collection groups comprised of more than one demographic, and multiple use collections made by single demographic collection groups were excluded from this graph. Young females were also excluded from this graph as their number of collections was negligible.

3.4.1 Adults Males

Adult males were involved in 68.2% of collections and were the sole demographic collecting resources on 963 occasions (x=62.5%). Of these 963 occasions, adult males most frequently collected resources for firewood (x=69.9%), as seen in *Figure 2*. Adult males disproportionately harvested resources for fishing, being present for 86.4% of fishing resource collections and being the sole demographic for 71.4% of fishing resource collections. As fishing is the primary livelihood in Sainte Luce, and it is heavily gendered, it could be implied that adult males are collecting their own fishing resources, rather than relying on someone else to do so.

3.4.2 Adult Females

Adult females were involved in 10.4% of collections (n=160) and were the sole demographic collecting resources on 44 occasions. On these 44 occasions, nearly all were for firewood (x=93.2%), as seen in *Figure 2*. This suggests that adult females were collecting resources for use in their own households, as household activities, such as cooking, are typically gendered in Sainte Luce.

3.4.3 Children

Young males were present at a quarter of collections (x=25.2%) and were the only demographic present on 229 occasions (x=14.2%). These 229 young males, like adult females, were also most likely to be collecting resources for firewood (x=73.4%), followed by house construction (x=21.5%).

Despite more than twice the number of children collecting wood than women as part of the roadside survey, women were twice as likely as children to be the primary household collector of firewood. From the household survey, adult females were the primary collector in 17.1% of households that collect firewood, with children the primary collector in 9.7% of households.

It can be seen that resource collection in the roadside survey was slightly gendered by use, with young males and women disproportionately collecting firewood, likely for use in their households, and adult males disproportionately collecting fishing resources, likely for use in their livelihood.

3.4.1 Loggers

Collections involving loggers accounted for 8.2% of all resources collected (n=230). Collections involving loggers on average harvested 2.1 species, slightly higher than the overall average of 1.8.

3.3.4.1 Resource Collection Use

Collection groups containing only loggers (n=93) overwhelmingly harvested resources for use in house construction (89.2%), followed by multiple uses (n=7),¹ and fishing (n=3). Nearly all households surveyed in Ambandrika and Ampanasatomboky (x=87%) typically buy construction materials from loggers, which likely influenced the fact that logger harvesting of construction materials was disproportionate in the roadside data, with loggers present for 23.7% of resource collections for this purpose, despite only being present for 7.0% of collections. The most frequent construction sub-categories reported by loggers were plank (n=33), square post (n=27), and triangle (n=15), showing that loggers are often hired to harvest resources for specific purposes.

No collections were made for firewood by collection groups solely comprised of loggers, this is likely because most collections for firewood (x=95%), as per the household surveys, were for deadwood or branches that will not require a logger to cut down a tree. Despite this, seven (x=78%) of the loggers interviewed in the logger survey stated that they collect firewood, albeit secondly,⁷ after construction materials.

All nine loggers interviewed as part of the logger survey stated that they collect wood primarily for use in house construction, with 100% specifying both for poles and beams, and eight loggers specifying they collected material for flooring (89%), and four for house walls (x=44%). Two loggers also stated that harvest species to construct *pirogues* and another two stated they harvest species to build furniture (x=22%).

3.3.4.2 Species Collected

Bamby accounted for nearly a fifth of logger-only resource collections (x=19.2%, n=34), and *Voapaky* an eighth (x=12.4%, n=22). Seven species accounted for more than half of logger-only collections (x=56.5%), with only two of those species also included in the seven most targeted species for harvesting mentioned during the logger survey, as seen in *Table 6*.

Table 6 – Table comparing the seven most frequently harvested species by loggers, as per the roadside data, versus the seven most frequently mentioned species targeted by loggers, as per the logger survey. The frequency for the roadside data is the number of collections of different species made when the only demographic interviewed was a logger.

Ranking	Roadside Survey Species	% of Roadside Logger Collections (n=177)	Logger Survey Species	% Mentioned by Loggers (n=9)
1.	<i>Bamby</i>	19	<i>Fontondahy</i>	89
2.	<i>Voapaky</i>	12	<i>Harandrato</i>	78
3.	<i>Fanola</i>	6	<i>Lampivahitry</i>	67
4.	<i>Haramboanjo</i>	6	<i>Rotry</i>	56
5.	<i>Nato</i>	5	<i>Voapaky</i>	56
6.	<i>Hazomainty</i>	5	<i>Fanola</i>	44
7.	<i>Fontondahy</i>	4	<i>Vondroza</i>	44

When asked about which exotic species they would use for construction materials, eight surveyed loggers stated *Acacia* (x=89%), seven stated *Eucalyptus* (x=78%), and two stated *Grevillea* (x=22%). Although when asked if they would harvest exotic species, three loggers said they would use exotic species for both construction and

¹ All seven times 'multiple uses' was reported, uses were for both house construction and fishing.

firewood, three said they would only use these species for firewood, one said they would only harvest *Acacia*, and two stated they would not harvest these species as they are 'not strong'.

3.4.2.3 Collection Locations

Loggers collected resources from less than half of the named locations (n=9), collecting primarily from S7 (n=69), followed by S9 (n=23), and Androtsy (n=13). No logger collections were made from S8S. Including Androtsy, resources were only collected from three locations found outside of the forest fragment. Despite this, all nine loggers surveyed stated that they only collect wood from the S7 fragments. It is unclear why there is a discrepancy between the roadside data and the logger survey as to the locations frequented by loggers. A potential explanation would be that some of the loggers in the survey were not from Sainte Luce and thus, were not included in the logger survey. Either way, loggers harvest from a smaller number of locations than other collectors, for two likely reasons. Firstly, loggers tend to harvest larger trees, which are predominantly found in the forest fragments, and secondly that loggers concentrate on harvesting a smaller number of species, likely due to the specific intended usage of said species, which are, in turn, found in a smaller number of locations.

3.3.4.3 Livelihood Implications

The majority of household survey respondents that buy construction materials from loggers (n=78) stated that they pay 20,000Ar and above (x=56%, n=44), 26% stated that they pay between 10,000-15,000 Malagasy Ariary (MGA), and 10.2% paid less than 10,000MGA.^J Residents of Ambandrika most frequently paid between 10,000-15,000MGA, whereas in Ampanasatomboky and Manafiafy, the average price paid was between 20,000MGA and above. A potential reason for this may be that the latter two hamlets are farther from the forest fragments and the logger may charge a higher fee. Nearly all households stated that the cost of using a logger has increased within the last year (x=99%).

All nine surveyed loggers only sold their wood in Sainte Luce, with seven working based on customer demand, one working independent of demand, and one logger not working at all during the surveyed year (2022) due to a lack of demand. A reduction in demand was attributed to two factors, a rise in the cost of living, and an increase in the price of wood due to loggers having to walk longer distances to harvest resources. Subsequently, it can be seen that deforestation is directly leading to an increase in wood prices, thus impacting the livelihoods of loggers in Sainte Luce. All nine loggers were concerned about the availability of wood impacting their livelihoods, with six stating they would change their livelihood to fishing if resources ran out, and three stating they would move community to carry on logging as a livelihood.

Six of the interviewed loggers (x=67%) harvested more than ten trees per week, with two harvesting eight trees, and one harvesting six trees. This means that loggers harvest a minimum of 82 trees per week in Sainte Luce, which gives a minimum of 4,264 trees per year. Loggers most commonly stated that they could produce four planks from one tree (n=7), and can sell 2m planks for between 2,000-3,000MGA, and 3m planks for between 3,000-4,000MGA. If loggers most commonly harvest at least ten trees per week, they can make four planks per tree, and can sell planks for between 2,000 and 4,000. A typical logger can, therefore, bring in at least 80,000-160,000MGA per week through logging.^K Four surveyed loggers explained that permit prices in the CRZ are typically 2,000MGA, but it depends on the number and type of species being harvested.

4. Discussion

This section will cohesively discuss the findings from the roadside survey, focus groups, household survey, and logger survey as well as compare findings, where relevant, to the 2013 Sainte Luce Community Assessment.²¹

Nearly half of all forest resources in the roadside data were collected from the S7 fragment (x=43%). This is to be expected as S7 is in the CRZ. To be less expected is that approximately a fifth of resources may have been

^J There was no indication of the quantity or quality of wood that households receive for this price in the survey responses.

^K At current exchange rates (June 2024), £1 is equal to 5,660MGA. Meaning loggers can earn between £14-£28 per week from logging.

harvested from the Protected Areas, which raises questions regarding the strength of *dina*. Nevertheless, it is entirely understandable that community members may want to break the *dina* in order to collect key livelihood resources they cannot easily find elsewhere. Nearly a fifth of all resources were collected outside of the SLLF fragments ($x=17\%$), notably Androtsy, showing that smaller patches of forest also play a significant role in providing resources for community usage. Despite the 2013 Assessment mentioning that key species such as *Harandrato*, *Fanola*, and *Raotry*, were harvested from S6, no resource collections from S6 were noted during the roadside or household surveys. This could be due to the fact that S6 is now managed by COBA (*Communautés de Base*– Forest Management Association) Tsiharoa, as such, it is difficult for the community of Sainte Luce to acquire permits for resource collection. In addition, a reduction in resource availability is causing households that collect firewood, and loggers that collect construction materials, to change harvesting locations. It can be assumed that all resource collection locations reported during the roadside survey either fall within the Protected Areas, or in the proposed mining path of QMM, leaving significant questions about the future of natural resource availability in Sainte Luce.

A wide variety of forest resources are harvested in Sainte Luce for three primary uses, firewood, construction, and fishing, with 105 named species collected and recorded within one year of data collection. Despite this large number of species, 11 accounted for nearly half of all resource collections, indicating that the community of Sainte Luce rely heavily on a small number of species. Focus groups highlighted 28 species that are important to the community of Sainte Luce, with *Harandrato*, followed by *Sotro*, *Tapinandro*, and *Vondroza* identified as important by the most groups. Importance placed on species varied slightly by hamlet and demographic, with women's focus groups having a greater preference for *Fanola* than men's, and residents of Manafiafy having a greater preference for *Zahambe* than residents of other hamlets.

Species identified by focus groups were broadly similar to the ten most important species identified in the 2013 Community Assessment. The 2013 Assessment, the 2022 focus groups, household surveys, and logger surveys, all identified that species availability is declining across Sainte Luce. Forest resource availability has thus been a prominent community issue for at least a decade. For example, *Sotro* is a particularly threatened species, with 10% of households naming it as a species they can no longer find. Furthermore, *Sotro* had a very low number of collections ($n=14$, $x=0.5\%$) in the roadside data, relative to its importance, which suggests it may be a species in short supply across the SLLF.

As a usage category, firewood encompassed the greatest diversity of species, with 87 named species recorded in the roadside survey for this purpose. Despite this, 54% of households surveyed, stated that they prefer to buy firewood than collect it. Household surveys identified 43 important species used for firewood, with the primary reason for this being flammability. Firewood was most often collected by households daily, with men being the primary firewood collectors according to both the roadside data and the household surveys. Nevertheless, women and children disproportionately collected firewood relative to forest resources required for other uses. The impact of firewood collection on the SLLF and the Sainte Luce community is being felt, with two-thirds of households having to change where they are collecting firewood from due to a reduction in species availability.

Deadwood was collected by 76% of households, indicating that despite the large number of firewood collections, the impact on the SLLF is lessened. Firewood collection takes a household an average of three hours per day. Any further reduction in species availability may cause a subsequent change in harvesting location. As a result, households may have to spend more time collecting firewood per day, as opposed to conducting income-generating activities such as weaving and fishing. It can be argued that *Fanola* is the most important species in Sainte Luce for firewood, with it being the most collected species in the roadside data and highlighted as the target firewood species by the highest number of households that collect firewood.

Construction had the second greatest diversity of species usage in Sainte Luce, with 71 named species recorded in the roadside survey for this purpose. Loggers disproportionately collected construction materials, which reflects that 78% of households buy construction wood from loggers, rather than collecting resources themselves. Surveyed loggers identified 40 species which they target for house construction materials, which is an increase

from the 27 key species identified by loggers in the 2013 Community Assessment. Only one species, *Ditsaky*, was identified by loggers in 2013 but was not in 2022. A widening in the number of target species over the last ten years suggests that populations of the species mentioned in 2013 have dwindled, leading to more alternatives being collected. Further evidence of this is that loggers surveyed in 2022 stated that they have to walk further to collect construction materials due to a reduction in species availability. Overall, it appears that fewer species are suitable for construction than for firewood, although collections for this purpose are less frequent than for firewood, with many of the most important species for construction declining in population.

Fishing had the lowest diversity of species collected for one use, with 18 named species recorded in the roadside data, and only four of those accounting for 78% of total collections. The 2013 Community Assessment identified seven species specifically used to produce lobster pots, three of which were also in the top four collected species from the roadside data: *D. scottiana (Amboza)*, *Voliandroky*, and *Ravinala*.¹ However, the other four species identified, were either not mentioned at all in roadside data, *Fandrikatany* and *Boakamainty (Beccariophoenix madagascariensis)*, or on a small number of occasions, *Telopoloambilany (C. saintelupei)* (n=3) and *Vahipiky* (n=2). This suggests that these four species are in significant decline locally, with their usage for fishing having significantly decreased in the last ten years. *Boakamainty* and *Telopoloambilany* are both target species of Project Palms, with a paper identifying that populations of these two species declined rapidly between 2012 and 2020.²² Further, *Vahipiky* was identified by focus groups as declining in population and was found in a 2023 SEED report to be mostly gone from the Sainte Luce area.²³ In the roadside data, fishing resources were disproportionately collected by adult males, suggesting that men are collecting resources for use in their primary livelihood. A livelihood that appears significantly threatened due to its reliance on a small number of palm and vine species used for specific purposes, with populations of said species in decline. With fishing the primary income generating activity in Sainte Luce, a reduction in forest resource availability, but particularly *D. scottiana (Amboza)*, *Voliandroky*, and *Harandrato*, threatens the whole community.

Exotic species had a low level of community usage, almost exclusively used for firewood, despite their proliferation in Sainte Luce. The quick burning time of exotic species was stated as a reason for their low levels of use by focus groups. Despite focus groups recognising that harvesting exotic species can protect the SLLF, they outlined that due to the poor durability of exotic species wood they would prefer to use native species under all circumstances. This community-wide consensus, opposing the use of exotic species, should inform any future plans to plant resources for community use.

Logging in Sainte Luce has reduced in the past ten years. In the 2013 Community Assessment no loggers harvested less than 20 trees per week, yet in 2022, three loggers harvested less than eight trees per week. A reduction in demand, due to cost of living increases, and lower species availability, has resulted in loggers travelling farther to find key species, thus increasing their price, has caused the reduction in logging. Ironically, this suggests that deforestation has contributed to reduced logging. Finally, loggers in both 2013 and 2022 were concerned about the decreasing availability of wood, showing that the SLLF has been heavily exploited for a number of years.

It can be seen that between the 2013 Community Assessment and the 2022 surveys, deforestation of the SLLF has continued, with a number of key species used for firewood, construction, and fishing experiencing significant population declines. This deforestation threatens community livelihoods and the viability of the SLLF as a habitat for faunal and floral biodiversity.

5. Conclusion

The findings from the roadside survey, focus groups, household surveys, and logger surveys reveal significant insights into forest resource use in Sainte Luce. The roadside survey highlighted that a substantial portion of forest resources are collected from S7, which is to be expected given its designation as a CRZ. Surprisingly, around

¹ *Harandrato* is the exception. As this species is typically used for paddles, it would not be included in the 2013 data.

a fifth of resources may have been collected from the Protected Area, and a further fifth from outside of the forest fragments. Changes in resource collection location suggests shifting patterns in resource use over time, likely reflecting changes in the availability of resources. These shifting patterns are causing community members to walk further and spend more time collecting, which comes at a cost to household and economic activities.

In total, 105 named species were mentioned in the roadside data, with the highest proportion used for firewood, reflecting its critical role in daily life in Sainte Luce. Loggers collect a significant amount of construction materials and target more species than ten years ago, indicative of dwindling populations of key species. Finally, fishing, the primary income-generating activity for 93.7% of Sainte Luce households, can be seen to be reliant on four main species, one of which is an Endangered palm species (*Amboza, D. scottiana*). The number of species relied upon for fishing materials has decreased over the last decade. Reliance on such a small number of species highlights the vulnerability of this already volatile livelihood. Further, the community has noticed a number of other important species that are in significant decline, such as *Sotro*. Exotic species, despite their proliferation, are seen as not durable and are subsequently rarely used in Sainte Luce.

Overall, the numerous types of data discussed here demonstrate that the community of Sainte Luce relies heavily on one CRZ, among other resource collection locations, to provide a wide diversity of forest resources for household and livelihood use. This report underscores a long-standing issue of declining species availability due to overexploitation, which in turn is negatively impacting natural resource derived livelihoods. Findings highlight the urgent need for sustainable resource management strategies, to mitigate further environmental degradation and ensure long-term resilience for the SLLF and the Sainte Luce community. Subsequently, the Ala Programme: Phase III, will use this report to advocate for the community of Sainte Luce's natural resource needs to key stakeholders in the face of proposed industrial mining.

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