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Fourteen Years of Sustainable Charcoal: The Case of Ankitsakalaninaomby

Dan Raudonis
SIT Study Abroad

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Fourteen Years of Sustainable Charcoal: The Case of Ankitsakalaninaomby

Dan Raudonis

Skidmore College/SIT Study Abroad

Spring 2012

Advisor: McGordon Ranaivo Arivelo

Program Director: Jim Hansen

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Introduction

Domestic Energy in Madagascar

All over the world, different sources of energy are harnessed by populations looking to fulfill their needs, be it electricity, heating, or cooking. In Madagascar, fuel wood and wood charcoal provide the bulk of daily energy needs – for over 85% of the population they are the only available sources of domestic energy (GREEN-Mad 6). These two sources provide a cheap alternative to other fuels such as natural gas, which can be more than three times as expensive as charcoal (GREEN-Mad 51). In an impoverished country such as Madagascar, where 90% of the population live on less than two US dollars per day (PPP), inexpensive sources of energy are indispensable (World Bank).

Madagascar's population is growing rapidly, however, at a rate of nearly 3% annually (CIA World Factbook). This rapid growth has caused an increased burden on the island's natural resources, particularly forests. Between 1990 and 2010, Madagascar experienced an average rate of deforestation of 0.42%, leading to a loss of 8.3% of its remaining forest cover (Mongabay). Traditionally, the majority of charcoal production has been carried out illegally in natural forests, contributing to these high rates of deforestation (GREEN-Mad 6).

In 1994, the German Agency for International Cooperation (GTZ, now GIZ) in collaboration with the government of Madagascar, launched the project Gestion Rationnelle de l'Energie et de l'Environnement à Madagascar (GREEN-Mad), aimed at finding solutions to the problems of energy in Madagascar (GREEN-Mad 6). One of the first areas of focus for the project was the northern province of Antsiranana (now the region of Diana), centered on the urban center of Antsiranana (Diego Suarez) (GREEN-Mad 6). One of the early goals of the

project was to find a way to reduce the domestic demand for charcoal in the province – an estimated 9,000 tons per year in 1992 (GREEN-Mad 6).

Beginning in 1995, the project began to develop a strategy for creating sustainable charcoal plantations in rural areas, a process they termed “Reboisement villageois individuel” – individual village reforestry (GREEN-Mad 6). The core concept behind the initiative was the creation of a sustainable means of producing charcoal, thereby reducing the pressure on natural forests, satisfying urban demand for energy, and providing economic development to rural areas (GREEN-Mad 6). The project, in conjunction with local populations, established plantations of *Eucalyptus camaldulensis*, a fast-growing exotic species of tree with dense wood capable of producing high quality charcoal (GREEN-Mad 42). These plantations are managed and owned by the villagers, with each participant working and reaping the benefits of their own designated parcel of land.

Location and Objectives of Study

One of the first areas in which this concept was put into practice was the *fokontany* of Ankitsaka, located 36 km south of Diego Suarez along RN6, a national route (Appendix A). Ankitsaka was chosen by the project due to its close proximity to the city as well as the availability of land for plantations– 146 ha in total (Andriamanantseho 4/23).

This study seeks to determine what economic impact the implementation of the project has had on the *fokontany* of Ankitsaka and, more specifically, its largest village, Ankitsakalaninaomby. The study location was chosen due to its long-standing involvement with the project – more than 14 years. As a result, Ankitsakalaninaomby represents an example of the project in a state of relative maturity, well-established within its community. The study takes a

broad look at the economic changes in the community that emerged as a result of its participation in the project. The purpose of this study is to determine how the degree to which the project has impacted the community of Ankitsakalaninaomby, as well as identifying any challenges to the project that may exist. The findings of the study are split across four categories: livelihood change, domestic impact, land security, and creation of new economic organizations, with additional background information on the village and the project included to provide context. Villagers were reluctant to talk about household economics directly, so these categories were intended to serve as a less-direct way of assessing economic impact.

Methods

The bulk of the research for this paper was conducted over a two week period from April 6-20, 2012, in the village of Ankitsakalaninaomby. For the purposes of gathering information, all questions during this two-week phase were posed in Malagasy and answers were translated into French by an interpreter. A number of different qualitative and quantitative research techniques were employed to gather information during this phase. Much of the research was conducted through stakeholder interviews and focus groups with key members of the community. Additional research was conducted using RRA and PRA techniques, as outlined in Freudenberger's (1999) manual, including transect walks, historical profiles, historical matrices, and time trend lines. For the latter two techniques, villagers were asked to use beans to quantify livelihood importance (for the historical matrix) and relative harvest quality (for the time trend line), as a function of time.

Further information was gathered using a questionnaire about household structure and economic activities. Due to the busy harvest season, many men were working in the fields for a

significant portion of the day and were unable to respond to questions. As a result, many of the respondents (82%) were female, and steps were taken to ensure that the topics addressed on the questionnaire were ones they would be familiar with. Roughly 20% of adult households (17) were surveyed using this technique. With the help of a local guide, adult households were identified, and every fifth household was surveyed. Of these households, one out of three was asked to identify livelihood importance using historical matrices.

Supplemental information was gained before and after the field work in the village through interviews in Diego Suarez with ECO-Consult (the technical firm currently implementing the project) staff, a member of the forest ministry, *Ministère de l'Environnement et des Forêts*, and a member of the land titling office, *Direction des Domaines et des Services Fonciers*. These interviews were conducted in French, without the aid of a translator.

Findings and Analysis

The Village of Ankitsakalaninaomby

History

Prior to being a village, Ankitsakalaninaomby was little more than agricultural fields for the nearby village of Sankazo Ambony. The village is located right on the border of RN6, a highway first constructed by the French colonial administration in 1938 (CDF 4/20). The first occupant of the area was a man named Tsimandrana, who lived near the road and sold tea to passersby (Elder #1 4/9). Shortly thereafter, the farmers of Sankazo Ambony began to experience issues with loose zebu (cattle) trampling and destroying their crops. As a result, they began to move closer to their fields, and established the village of Ankitsakalaninaomby, a name that means “trampled by zebu” in Malagasy. The move allowed them to both watch over their

fields and expand their economic horizons by selling crops and animals to travelers on the route. The first residents of the village arrived around 1942, and by 1946 it had begun to grow into a sizeable town.

Over time, the town began to expand and develop. The chief of Sankazo Ambony settled in Ankitsakalaninaomby and established himself as the head of the village (Elder #1 4/9). As the population grew, and new families moved onto unoccupied land, they split off from Ankitsakalaninaomby to found the villages of Madera and Andranomena. Later, in 1976, Ankitsakalaninaomby was established as the seat of a new *fokontany*, (the smallest formal political unit in Madagascar) named Ankitsaka (CDF 4/13). The new *fokontany* united the towns of Ankitsakalaninaomby; Madera, located 1 km to the north; Andranomena, located 1 km to the south; and Abavato, located 5 km to the south. Currently, the *fokontany* of Ankitsaka is composed of 710 people, 600 of whom live in Ankitsakalaninaomby. There is, however, a large fluctuation in population as workers come and go in search of work (CDF 4/7). As a result, census data in the *fokontany* is very limited.

Social Organization

The *fokontany* is lead by a president (*chef de fokontany*), popularly elected, who serves as the intermediary between the villages and the larger political division of the commune, Andrafiabe. He is in charge of local development, and plays a limited role in conflict resolution (CDF 4/7). Each village in the *fokontany* is led by a village chief (*chef de secteur*), also popularly elected, who works with the *chef de fokontany* and plays an important role as the main arbiter of village disputes (CDS 4/17). The *chef de secteur* is charged with resolving certain issues within the village before they need to be passed to the *fokontany*. Issues such as conjugal conflicts,

quarrels between young people, and land disputes are all settled by the village. On the other hand, more severe cases such as murders, wildfires, and cattle stealing are all referred directly to state law enforcement (CDS 4/17).

The village of Ankitsakalaninaomby is composed of roughly 220 houses. Many of these houses are owned by the same family and are clustered close to one another. The average size of households, based on the survey, is 4.1, though family ties often extend far beyond the immediate household. In all, there are approximately eight large families that exist in Ankitsaka, thus many of the residents are closely related (CDF 4/18). There is a limited degree of resource sharing that occurs between family members; during times of need families will share labor, tools, and agricultural stores.

Many residents have been living in Ankitsakalaninaomby for the majority, if not the entirety of their lives. On average, survey respondents indicated that they had been living in the village for 66% of their lives. About 35% of villagers responded that they had been living in the village for their entire lives. Thus, while the village experiences some fluctuation in population due to migration, a large portion of villagers remain in the village for a long period of time.

Infrastructure

One of the principal features of the village is its proximity to RN6, a national route that runs north to Diego Suarez and southwest through the towns of Ambilobe and Abanja. In 1973 it was destroyed by a flood and had to be rebuilt, though the newer road was considered by older villagers to be of lower quality (Elder #2 4/9). During the 1960s, Ankitsakalaninaomby was home to a pumping station that sold gasoline and oil to passing cars. In 1975, however, President Ratsiraka mandated the removal of these stations, leaving Diego Suarez and Ambilobe as the

only places to get gasoline along that portion of the route (Elder #3 4/9). Today, the road serves as an important outlet for transporting goods and people to and from the urban center of Diego Suarez.

The market at Daraina, located 1 km away from the town along the route to Diego Suarez, is also an important area for the village. Villagers can buy products such as oil, gasoline and buckets far more affordably in the market than in the village (WFG 4/10). Some villagers will also sell their harvests and livestock there, though the preference of most was to sell within the village or to Diego Suarez.

Ankitsakalaninaomby is bisected by a river that bears its name. Formerly, the river served as an important source of water for drinking and washing clothes, but recent development has begun to change that. In 1998 GTZ, in conjunction with the village, constructed a new well by the side of the road. Two years later, in 2000, there was an epidemic of cholera in the region, but the village was relatively unscathed because of this well (CDF 4/13). More recently, in December 2011, an EU-funded project created five water fountains throughout the *fokontany*. These fountains serve as an important water source for drinking, washing clothes, and bathing, though one can still observe villagers engaging in the latter two activities in the river.

Ankitsakalaninaomby is also home to a schoolhouse. Originally built in Sankazo Ambony by Adventist missionaries, it was later moved to Ankitsakalaninaomby due to its proximity to the road. Frustrated by a lack of progress, the Adventists abandoned the school after several years, leaving behind construction blueprints with the *chef de fokontany*. With the aid of these plans, the *fokontany* was able to reconstruct a new school in 2000. This school was under the direction of the military as a civil service school, before becoming a school for primary education (Elder #3 4/9).

There are, however, significant gaps in the town's infrastructure. For one, the town lacks electricity, though some of the richer members of the town will occasionally use gasoline-powered generators. Furthermore, there are no medical services of any sort in the village, and villagers must travel some distance to receive even the most basic medical care. Similarly, the village lacks latrines and a proper means of disposing of waste. The *chef de fokontany* is currently in the process of working with an external development agency to solve the latter problem, but all three of these issues remain barriers to development (CDF 4/7).

“Reboisement Villageois Individuel” in Ankitsakalaninaomby

The sustainable charcoal project began in the *fokontany* of Ankitsaka in 1998. Prior to the establishment of the project, GREEN-Mad conducted extensive educational campaigns in the area to raise awareness about the potential benefits of participation. Following that, they waited for interested communities to take the initiative to rally support for the project and present a proposal for an area in which to implement it (GREEN-Mad 11). In the case of Ankitsaka, the *chef du fokontany*, in consultation with the local population and the heads of the village, identified land that would be ideal for the plantations. The land on which the eucalyptus plantations were established was very arid and unsuitable for agriculture. The area had suffered from frequent brush fires and fields were often destroyed by cattle, and as a result the land was abandoned when the project arrived (CDF 4/18). GREEN-Mad intentionally places plantations on land that is otherwise unsuitable for agriculture to reduce the potential for future conflicts (GREEN-Mad 10). For this reason, the project was seen as a way of adding value to otherwise abandoned land. Following identification, the *fokontany* made a request to the commune to grant

them land for reforestation. Preliminary feasibility studies were conducted by GREEN-Mad and the site was surveyed for suitability before the project was green-lit (CFG2 4/12).

When the project was first being established, interested members of the community registered their names with the *fokontany*. Twice weekly meetings were held on Tuesdays and Thursdays to train interested villagers about the basics of managing a eucalyptus plantation, including how to prepare the plants and manage the fully-grown trees. Beginning in October, villagers cleared plots for planting, and started to sow seeds. In December, when shoots began to sprout, the saplings were transferred to pots to be given more time to grow before being planted in the plantations in the months of January and February (CFG3 4/15). One key element of the training is proper tree cutting. If eucalyptus trees are cut at the proper height, about 0.1m above the ground, they will sprout new shoots, allowing new trees to grow without further planting (GREEN-Mad 41).

During the establishment of the project, participants were not given compensation. Instead, they were given their plots of land free of charge and taught how to manage them. There were, however, costs incurred in this process, mainly in terms of expended energy and time spent planting, watering, transporting saplings, and managing the plots. GREEN-Mad estimates that for a single hectare of land, the costs for of labor, materials, and training amount to 560,168 Ar¹ (GREEN-Mad 65). Of this cost, GREEN-Mad pays for about 65% (367,718 Ar), leaving the remainder (192,450 Ar) to be borne by the participants in the project (GREEN-Mad 65). As a result, these labor costs present somewhat of a barrier to entry for poorer villagers. The process, particularly potting the plants, is considered very labor intensive, and richer villagers would

often hire help to aid in ¹establishing their plantations (CDF 4/18). Some poorer villagers, however, do not have this luxury, and have a difficult time participating in the project.

Initially, each participant in the project was given a two-hectare parcel of land. In order to enlarge one's parcel, villagers must first fill their parcel with trees and be in the process of actively managing their plantations. This serves as proof that they are competently able to manage their land. Those seeking to expand their parcels submit their names to the *fokontany* along with the desired size of expansion. GREEN-Mad then surveys the land to verify that it is being properly managed. If so, they plow the new land to enable the villager to plant new trees. There is no limit to the size of expansion, but one cannot expand into land occupied by another. It is, however, difficult to expand now because all of the available land is occupied (Guide 4/15).

Initially, some members of the village were distrustful of the project. In the past, the state convinced some villagers in other areas to engage in similar efforts of planting eucalyptus. These plantations were known as *Zone de l'Action en Faveur de l'Arbre* (ZODAFARB) areas (Théo 4/23). The villagers agreed to help, thinking that they would share in the profits, but the ZODAFARB land was ultimately controlled and owned by the state (Guide 4/8; Théo 4/23). As a result, some villagers were distrustful of the project, and sold their share when it was first established. (Guide 4/8)

Livelihoods in Ankitsakalaninaomby

Livelihoods and Economic Well-being

Livelihoods provide one of the best ways of understanding economic well-being in the context of rural life. Villagers struggled to identify concrete standards for what defined wealth

¹ Ar = Ariary, the currency of Madagascar. 2000 Ar is roughly equal to 1 USD at the time of this study

in their community. One thing that was agreed upon, though, was that livelihoods were a major source of wealth. Poverty was seen as the byproduct of a lack of means for working – lack of fields or tools (WFG 4/10). Accordingly, livelihoods such as agriculture, animal-raising and charcoal production were all seen as sources of wealth. These three livelihoods were by far the most widespread livelihoods in the village, and were thus the focus of study, though villagers practiced other professions as well. Other professions include gardening, basket-weaving, embroidery, commerce, alcohol distilling, and creating food products such as pepper sauces. It is typical for families to engage in a number of activities at once – few families had fewer than two household professions.

Agriculture

Agriculture is considered to be the single most important livelihood to the villagers of Ankitsakalaninaomby. When surveyed, more than 81% of respondents indicated that it was the livelihood that was the most important to their household. The majority of this agriculture is riziculture, though the town also produces a slew of other agricultural products, including cucumber, eggplant, peanut, corn, sugarcane, banana and coconut. Many of the fields are located on the border of the river than runs through town, which serves as a valuable source of irrigation. While some agricultural fields are located by the river, others are located as far as 3-5 km from town, near other sources of water. Charettes (ox drawn carts) are used to transport harvests into town from these further fields (GGI 4/7).

Agricultural work is largely linked to the yearly cycles of wet seasons and dry seasons. February and March are considered the busiest months for agriculture due to the heavy rains brought on by the rainy season. Occasionally, rains may also occur earlier or later in the season,

so January and April are also busy months. During this season, farmers plant as many crops as they can, including rice, manioc, and peanuts. After several months of growing, the crops are ready for harvest. In May and June, rice is harvested and other less rain-dependent crops are planted in time for the dry season (AFG 4/12).

The dependence of crops on water is one of the main issues facing agricultural production in Ankitsakalaninaomby. Lack of rain can disrupt growing and lead to poor harvests. In 2001, a severe lack of rain, believed by villagers to have been caused by a solar eclipse, led to farmers getting next to no harvest. In 2002, however, harvests were great due to additional rain from a cyclone (Farmer #1 4/15). Thus, there is a great yearly variation in harvest, based on precipitation.

Pests have also caused farmers in the area great trouble. In 2006, caterpillars ate the crops, destroying the harvest. More recently, at the time of this study, a different insect (known as Mavobe) were in the process of eating the crops. Richer farmers were able to purchase insecticides at a very steep price (30000 Ar/L), but even these have proven inadequate, as the bugs have begun to lay their eggs by the roots of the plants, out of reach of the insecticides. In order to attempt to stave off insects, some farmers have begun to keep stores of insecticides and apply it to their crops every two weeks (Farmer #1 4/15). Insecticides are too pricy for most villagers, so many have no way of fighting against this threat. The bugs are most abundant during the rainy season, and were repeatedly mentioned by villagers as one of the biggest threats to their crops.

Good harvests generally yield enough rice to plant during the next rainy season, and still have enough to eat until the next harvest. If the family has to buy rice during that period, it's considered an average harvest, while a bad yield means that one has to buy rice to plant in

addition to rice to feed the family. Surpluses will often be sold, either in the village if the surplus is small, or in Diego Suarez if the surplus is large enough. For the most part, though, agriculture's primary role in Ankitsakalaninaomby is one of subsistence.

Members of the community will generally support each other in different ways during times of need. Personal stocks of rice are shared between family members during times of shortage, though the amount is always repaid later when possible. In times of very good harvest, farmers will often pay others to aid them in their work. Help without payment will sometimes be sought the day after a villager has had to miss a day of harvests to make up for lost time. This is frequent after large village events such as marriages or funerals (Farmer #2 4/15). Many villagers also reported a shortage of agricultural tools such as plows. When necessary, farmers borrow these tools from one another, but this is not always possible, depending on how many other people need to use the tool.

Farmers will typically either work in their own fields, fields they share with their family, or the fields of another. Of those surveyed, 76.9% worked in their own fields or family fields, while the remainder worked in fields owned by another. For some, working in the fields of another is only necessary when personal harvests are insufficient, and thus is not a constant form of employment (Questionnaire #13 4/17). Farmers who work in the fields of another will generally gain a portion of whatever they harvest, with the rest going to the proprietor of the field.

Animal-raising

Animal-raising is another common village livelihood. Zebu (cattle) are considered to be the most important, but a number of different fowl, including chicken, turkeys, ducks and geese

are also raised in the village. Cattle pastures are located behind the village, away from the road, and many use the eucalyptus plantations as a grazing area. This is seen as communal land, open to everyone for grazing use. Cattle don't typically pose a problem to the plantations – they do not trample or eat the trees (Guide 4/8). Occasionally they will brush against the trees to rid themselves of flies, but this bends rather than destroys the trees, and poses no problem to their growth (Guide 4/8).

There are a number of issues facing cattle-raising. For one, cattle theft is common and difficult to control. It is nearly a daily occurrence, and villagers expressed frustration at being unable to prosecute the wrongdoers. Those caught in the act are sent to the gendarmes, but corruption often leads to them being released on the very same day, free to exact revenge on their accusers. Illness also poses problems to both cattle and other animals. Villagers recognized that there were several different types of disease, the names of which were unknown. There is a lack of financial means to fight against these diseases through vaccines, however, so many animals go untreated. There is also the risk of cattle accidentally trampling or otherwise damaging property. If zebu destroy the fields of another, the owner of the zebu must pay a debt to the owner of the field. Zebu are secured within the village at night to protect fields and to keep track of the herd (Cattle-Raiser #1 4/19).

Charcoal

Charcoal production, though not considered by any of the questionnaire participants to be the most important livelihood to their family, still plays an important role in village life. Of those surveyed, 37.5% of households were directly involved in the production of charcoal, while an additional 31% had a family member who was involved. This is significant because the resources

gained through charcoal production are often shared among the larger family unit. In total, there are 36 proprietors of eucalyptus plantations in the town of Ankitsakalaninaomby (CDF 4/18).

The charcoal plantations begin less than one kilometer from the center of the village along a dirt path, though some parcels are further away. Typically these paths are travelled by special charettes used to transport charcoal, but during dry seasons it is accessible by car as well (Guide 4/8).

Most of the work on the plantations is either done alone or within the family. Only 18% of plantation owners surveyed employed others on an infrequent basis, and none employed them on a permanent basis. Employing others on the plantation depends greatly on the amount of wood to be cut and processed. If there is little work to be done, employment can last 1-2 months, whereas greater workloads can entail a year-long employment (CFG3 4/15). Employees typically earn a share of the charcoal they create. Employers will often offer to buy this charcoal from them, or, occasionally, will ask them to sell the entire harvest and split the profits (CFG3 4/15).

The quantity of charcoal produced varies somewhat depending on the methods used. Villagers estimated that if one follows standard procedure, waiting 6 years after initial planting to cut, and five years for each subsequent cut, yields of 450 bags/ha and 800+ bags/ha can be achieved respectively. If one waits only four years after the initial planting, however, the yields are estimated to be a reduced 300 bags/ha (CFG1 4/10). The perceived rise in yield from the first cycle of cutting to the second appears somewhat optimistic. GREEN-Mad estimates that yields of 6 m³/ha/yr and 7.5 m³/ha/yr can be achieved during the first and second rotations respectively (GREEN-Mad 63). Thus, villager estimations of production nearly doubling from the first to second rotation may be overstated.

One of the largest expenses in the production of charcoal is transportation. To transport charcoal from the plantation into town, a special type of charette designed to handle heavy loads is required (CFG2 4/12). Few villagers own a charette themselves; so many producers are obligated to rent one from the town of Mandroso-miadana, located 7-8k from the village (CFG1 4/10). Charette transportation is secured in one of two ways: either by renting the charette and paying the driver, or driving it oneself (CFG3 4/15). Either way, rates can often be quite steep. Further costs are incurred from transportation from the village to Diego Suarez. Another source of expense is the processing of charcoal. Urban buyers will often have different specifications as to the size of the charcoal, so much time is spent ensuring uniformity for sale and filtering out small flakes of charcoal (CFG1 4/10).

Fires are not typically a problem in the eucalyptus plantations, but occasionally they do break out. Last year, there was a fire caused by someone using traditional charcoal production methods – stacking logs to a certain height before covering the pile with dirt and letting it burn slowly. As a result of fires such as these, the forestry service created a rule mandating that charcoal producers must clear brush from the area 50m around the immediate area of burning (Guide 4/8). Despite this, I observed someone preparing a traditional charcoal pit without clearing. A forestry official admitted that the rule is difficult to police, as it is impossible to monitor all of the plantations (Théo 4/23).

Certain seasons are particularly bad for traditional charcoal production. From May to June, unpredictable wind patterns make production by traditional means hazardous, as there is an increased chance of unexpected gusts accidentally causing a forest fire. Similarly, from July to September, the ground is clumpy due to the dry season and there is an increased risk of air pockets forming by the charcoal pit, leading to an explosion (CFG1 4/10).

Regardless, charcoal producers expressed a preference for traditional charcoal production methods. There are two ovens for producing charcoal, spaced relatively far apart across the plantation. The charcoal ovens are believed to be poorly adapted to charcoal production, as they are not highly tolerant of heat (CFG1 4/10). At the time of the study, one of the ovens was broken down due to the concrete being overexposed to heat, and was in the process of being rehabilitated, a process paid for by GREEN-Mad (Guide 4/8).

Traditional charcoal production has not been the only source of fire in the plantations. In the early days of the project, there was a problem with some villagers setting fire to the eucalyptus, which they believed was negatively affecting water sources. In response, the community created a rule that all members of the village must respond to alarms calling the village to fight forest fires. Names of participants are taken down, and any villagers absent are fined (CFG3 4/15)

Fire is not the only problem that affects charcoal production as a livelihood. Tree theft has been a minor problem on the plantations. When the project was first beginning, someone was caught cutting the trees of another well before the 6 years had passed. He was caught, and the *fokontany* gave him a warning. On occasion 1-2 trees will be stolen from plantations, but it is never a very large number. These cases are difficult to stop and can prove to be an annoyance because the culprits rarely follow proper cutting protocol (Guide 4/19). Insects can also occasionally pose a problem. They are not typically an issue for living eucalyptus trees, but felled trees can occasionally run into problems with them. As a result, the preferred season to cut trees is June through August, when insects are few (CFG2 4/15). Finally, although the villagers are well supplied with axes, there is a desire to purchase a chainsaw to facilitate tree cutting. Axes are seen as wasteful, both in terms of wood and energy. Cutting trees down by hand is both

slow and physically taxing, and a chainsaw is seen as a means to improve this process (Guide 4/19).

Livelihood Comparison and Analysis

The information gained from villagers, in conjunction with survey data, indicates that charcoal production has not served as a replacement for agriculture and cattle-raising as a village livelihood, but rather as a supplemental form of income. Of those involved in charcoal production, 89% are also involved in agriculture, indicating that charcoal production is often accompanied by another livelihood.

Agriculture is still widely considered as the most important livelihood, but a historical look at livelihoods shows that charcoal is rising in importance among participants. Appendix B, a composite chart of five households' perceptions of livelihood importance, demonstrates the change that has occurred over the past 14 years. The chart shows that charcoal, considered negligible as a source of income at the time of the project's inception in 1998, has grown in importance over time. By 2004, the year in which charcoal first began to be produced, it had risen sharply in importance as a livelihood. This trend continued into 2009, the beginning of the second cycle of cutting, but dropped somewhat in 2012, with some villagers mentioning that they had yet to begin producing charcoal for that year.

This change was largely explained by villagers as a consequence of agricultural struggles. The agricultural harvest of 2009 in particular was singled out because it suffered due to a lack of water. Indeed, as indicated in Appendix C, harvests have experienced a great deal of variance over the past 10 years, largely attributed to problems with insects and drought. One of the benefits of eucalyptus as a source of wood is that it is largely resistant to the problems that

plague agriculture. Eucalyptus trees are both drought and pest-resistant, so they are able to grow even as harvests are stagnating (NRI 3). As a result, charcoal production represents a more reliable source of income than agriculture.

Domestic Wood Use in Ankitsakalaninaomby

Prior to the establishment of the project, the villagers of Ankitsakalaninaomby got their wood from two sources: natural forests and government-run plantations. Natural sources were generally considered more accessible, and many villagers got their wood from a nearby mountain, slightly over 2 km away. Villagers would harvest wood from these mountains for construction and fuel use. Richer villagers could also visit government-run reserves set up to serve as source of wood. These reserves are costly, however, as villagers must purchase a permit in order to harvest wood and must secure a means of transport (CFG3 4/15). With the project's inception, however, these methods of procurement have faded in favor of charcoal from the plantations.

Currently, 76.5% of households purchase charcoal from other villagers, at least some of the time. This charcoal was universally cited as coming from the eucalyptus plantations. Households that produce charcoal would often purchase charcoal from other villagers during months in which they had not yet begun to produce their own supply. The remainder used dry wood as their sole source of cooking fuel, but of this 23.5%, three-quarters harvested it from their own plantations. The remaining household would either purchase its fuel wood, or harvest it from the mountain (Questionnaire #14 4/17).

Beyond charcoal, the plantations are also useful for the wood they provide. Wood from eucalyptus plantations is useful in the construction of houses and other projects. Of the

households surveyed, 41.1% either purchased eucalyptus wood or got it from their families for purposes of construction. Outside buyers have also made use of the eucalyptus wood for purposes other than charcoal. JIRAMA, a private utilities firm has purchased trees from the plantations for use in their electrical poles (Guide 4/8).

Land Security in Ankitsakalaninaomby

Land Tenure in Madagascar

In Madagascar, the vast majority of land is secured informally, through customary, unwritten land rights (Rapairison 20). These rights, while protecting land from conflict in a local context, are not an adequate form of protection against outside claims (Teyssier 1). Formal land titling, considered the most secure validation of land rights, is expensive and complicated. To gain a formal title, one must pay anywhere from 300-900 USD over the course of a complex legal process that can last as long as seven years (Teyssier et al. 19). In the context of rural Madagascar, very few can afford this process, so much of the land remains untitled.

GREEN-Mad attempted to address this issue by incorporating an element of land security into the sustainable charcoal plantations. When the project was introduced in Ankitsakalaninaomby in 1998, Madagascar's was using a colonial system of land tenure known as the Torrens System. Under this system all land belonged to the government of Madagascar, which could then issue land titles to individuals (Teyssier et al. 2). The government could also issue collective land titles for community development projects, a process known as cadastre (Arivelo 4/25). This process is considered far cheaper than individual land titling, and though it does not grant the same individual land rights as an individual title, such as the ability to sell land, it provides a level of land security to the community (Teyssier et al. 19).

In order to secure land for charcoal plantations, GREEN-Mad worked with state authorities to arrange a transfer of land through the cadastral system, in what is known as “dotation foncière” (Arivelo 4/25). Under this system, the commune was able to grant up to 300 ha of land for improvement purposes. For greater sizes of land the commune must consult with central state authorities in the capital of Antananarivo (Andriamanantseheno 4/5). This process of granting land for reforestation was formalized in 2000 as its own system known as “Réserve Foncier pour le Reboisement” (RFR) (Arivelo 4/25).

In 2005, Madagascar’s land tenure system underwent a period of reform. The new policy had two key provisions: the removal of the presumption of state control of land and the establishment of decentralized land offices, known as “guichets fonciers,” capable of granting land certificates (Evers 3). These certificates grant recognition to “non registered private property,” namely lands secured by customary recognition (Teyssier et al. 19). The certificates accord many of the same rights as a formal land title, but are far cheaper and less time consuming.

Current Land Security

The tenure system currently at work in the plantations of Ankitsakalaninaomby is a mix between collective cadastral titling and scattered certificate titling. The project was established before the inception of the certificate system, so its initial legal basis was under the cadastre (McGordon 4/25). Since the reforms of 2005, some villagers have taken it upon themselves to further secure their land through the certificate system. Recently, however, the certificates have been more difficult to acquire. The “guichets” issuing the certificates were largely funding by outside donors, which have suspended their aid in the wake of the 2009 political crisis

(Andriamanantseheno 4/23). As a result, the process of certifying the lands individually has grinded to a halt.

Much of the agricultural land in Ankitsakalaninaomby is located on land registered to a defunct colonial title. The title, “Daraina 1101 BK 1938,” is still technically in force, though it is currently undergoing a process known as “prescription acquisitive.” Under this process, colonial lands no longer managed by their original owners, and since occupied by villagers, can undergo a transfer of ownership. To gain title, villagers must first have been actively working the land for 20 years. Then, they compile a dossier from the various land titling offices including a copy of the original title and a map of the area, and bring it to the courthouse. After a long and expensive court process, villagers can gain formal title to the land (Receveur 4/26). There are three years left until this process can be initiated by villagers, but it is unlikely that it will be within the reach of many.

Currently, most agricultural lands are secured by customary land tenure, on land passed down from past generations of family. Of the farmers that work their own agricultural fields, 87.5% do so on land inherited from their family, secured on the basis of customary rights. These lands are occasionally the subject of competing claims, but these are typically settled outside of the realm of formal judicial structures, in the *fokonolona* (the informal village political body). To resolve a land dispute, each side must have 4-5 witnesses for their testimony. An elder who is well versed in village affairs serves as an expert, while the *chef de secteur* serves as the chief arbiter. This group meets and attempts to settle the issue amicably, and is usually able to do so successfully. If no solution is forthcoming, the matter is passed along to the courts to settle. Land disputes occur frequently with ricefields, but rarely with eucalyptus plantations (CDS 4/17).

As most agricultural fields are secured on the basis of customary rights, the charcoal plantations represent the only secured land for many proprietors. Of those surveyed, 87.5% either had agricultural land that was held on a customary basis, or worked in the agricultural fields of another. Thus, participation in the project presents a rather unique opportunity to gain some degree of security over land essential to livelihoods.

There are, however, two potential complications with this system. For one, the plantations must be worked on a semi-routine basis in order for the proprietor to maintain ownership. The land secured under the cadastral system is granted to participants on the basis of improvement. For this reason, if plantations are not worked for 5 years, the state reclaims the land (CDS 4/17). Secondly, plantation owners are not legally allowed to sell their parcels of land, but some sale still occurs in an informal, unregistered manner (CFG2 4/12). This could potentially lead to complications in the future as land ownership becomes confused after a series of unregistered, unauthorized sales.

Charcoal Organizations in Ankitsakalaninaomby

AMH

The introduction of the project has led to the creation of two new organizations, the first of which is AMH – Ankitsaka Mamboly Hazo. AMH is an organization with two branches, one concerning the planting of trees and the other concerning the process of creating charcoal. Founded in 2003, it is made up of 24 members who elect a panel of officers – 12 in all – president, manager, treasurer and a panel of councilors. Membership is voluntary, though members must attend the meetings in order to be considered participants. Meetings are generally held every three months, though they are also called in the event of a forest fire. Occasionally the

group will also send members to Diego Suarez to engage in meetings organized by GREEN-MAD (CDF 4/13).

One of the core functions of AMH is to serve as an educational source for teaching others how manage the eucalyptus plantations. Trained members will travel to other locales to train other villagers on how to manage plantations and how to produce charcoal. In the past, members have travelled as far as the cities of Tulear and Mahajanga (on the south-west and north-west coasts of Madagascar, respectively) though current efforts are focused on the much nearer cities of Anbanja and Ambilobe (CDF 4/13).

The *chef de fokontany* at the time of this study was one such trainer, and it had become his primary form of employment, though he did still engage in a limited amount of agriculture. He served as the head of AMH as well as its lead trainer. He would often delegate training projects to his fellow trainers, and engage in the follow up to double check their work (CDF 4/7).

ADAM

In December 2010, the charcoal producers of several *fokontany* created a collective market to manage the sale of charcoal to the urban market of Diego Suarez (ADAM1 4/11). This market is named ADAM, an acronym derived from the names of the different *fokontany* involved: Ankitsaka, Ankairayna, Daraina, Mandreso-miadana, and Antsoha. Prior to its creation, each *fokontany* had its own individual market. In the case of Ankitsaka, ADAM was predated by a market called Ankitsaka Tsara Charbon (CDF 4/20).

ADAM functions by purchasing bags of charcoal directly from its members at their current price on the rural market. After the purchase, ADAM bags the charcoal, processes it, and transports it a storehouse located next to the route in the village of Ankitsakalaninaomby. The

charcoal is then transported to Diego Suarez for sale in the urban market (ADAM1 4/11). The selling price depends on the price in the urban market, but the organization generally tries to gain a profit of 300-400 Ar/bag (CFG1 4/10). At the end of the year, the profits from this sale are redistributed to the membership in amounts proportionate to each member's contribution (ADAM1 4/11). To pay for the expenses incurred during this process, ADAM will purchase charcoal from its suppliers in 12 kg bags and resell it in 10 kg bags. The 2 kg difference is used to cover the aforementioned costs, as well as the fee for transportation to Diego Suarez and the salaries of ADAM's officers (CDF 4/20).

Currently, ADAM has roughly 70 members, 10 of whom are from Ankitsakalaninaomby, and a panel of four officers, two of whom are women. The officers are elected by the membership and include a president, a secretary, a treasurer and a sales manager. The organization meets four times a year in Ankitsakalaninaomby to discuss finances, sales and ways to improve the functioning of the organization. Representatives from each village will also journey to Diego Suarez on occasion to participate in large conferences organized by GTZ, involving representatives from other communes (ADAM1 4/11).

Members are required to contribute an initial six sacks of charcoal to join, and there is no specific quota for continued contribution. Members are, however, expected to contribute on a regular basis. If a member contributes only the initial six bags to the store and does not participate further, they are given a warning. If another year passes without contribution, they are kicked out of the organization (ADAM1 4/11).

According to its officers, ADAM was created with the intent of uniting the charcoal producers of the area and creating a common cause. Prior to its creation, sellers would often not be paid immediately by their buyers and would often have to wait a month or more to see any

money from the sale of their charcoal. Under the system created by ADAM, sellers receive immediate compensation, with further benefits coming later. The officers also stressed that ADAM has caused an overall raise in selling prices. Before the creation of the collective markets, different sellers would undercut each other in order to sell their charcoal, thereby lowering the price for everyone (ADAM2 4/12).

ADAM has, however, encountered some difficulties and challenges. For one, villagers have been reluctant to join ADAM. As it stands currently, 28% of Ankitsakalaninaomby's charcoal producers are members of ADAM. Fears about possible corruption among the officers have caused many to doubt the effectiveness of the market (ADAM2 4/12). Others believe that they stand to profit more from selling independently than by joining the organization, while some are simply reluctant to change their habits. Middlemen and other independent sellers pose a problem for ADAM as they will often undercut their prices, forcing ADAM to lower their selling prices (CDF 4/19).

Changes in urban prices will also occasionally cause ADAM to take a loss on the bags it sells. Urban charcoal prices are often tied to the seasons; during the rainy season, few people are producing charcoal, preferring instead to spend time working on agricultural fields which are very rain-dependent. Furthermore, transportation can also be an issue during the rainy season, due to muddy roads. As a result, prices for charcoal tend to drop significantly during the dry season as more producers begin to create charcoal (CDF 4/19).

The bags used for the charcoal are also a source of concern. They are special bags with a "Green Charcoal" emblem, issued by the government of Madagascar. They are intended to facilitate transport past police checkpoints, where they might otherwise encounter delays for examination and taxation. The bags are expensive, however, costing 1000 Ar/bag – roughly three

times the cost of a standard bag. Producers complain that they also tear easily, causing a loss of charcoal (CFG1 4/10).

Finally, ADAM has encountered difficulties with producers demanding an advance to cover expenses before cutting their trees, with the promise to contribute bags of charcoal afterwards. In reality, many producers will contribute only enough bags to cover the debt, and will sell the rest outside of the organization (ADAM2 4/12).

Conclusions and Recommendations for Further Study

It is difficult to determine how much direct economic impact the project has had on household economics. Villagers were uncomfortable discussing how money gained from the project was spent, with one group answering simply that it was spend on “family needs” (CFG3 4/15). Judging by the metrics used in this study, however, the introduction of the eucalyptus plantations has had a multi-faceted impact on village life.

In terms of individual households, the plantations have given a supplemental livelihood that can be worked in tandem with agriculture, providing additional economic stability. The introduction of sustainable charcoal production has also changed the means of procuring household fuel, transitioning from natural sources to a largely sustainable charcoal and fuel wood based system. A byproduct of this transition is the creation of a rural market for sustainable fuel, which is bought and sold between villagers. The project has also presented many villagers with their only source of secure land, further protecting their economic well-being, though the unsanctioned sale of land presents a source of concern.

On the *fokontany*-level and beyond, the existence of AMH and ADAM presents potential for further amelioration of charcoal production and commerce. ADAM, in particular, can

potentially lower the expenses of processing and transporting charcoal, as well as raising the eventual selling price. Both of these organizations, however, are suffering from low membership numbers and lack of interest among villagers. The officers of these organizations should look to demonstrate the value of membership in order to raise community participation. One possible way of doing so is finding a way to address the largest problems faced by charcoal producers. The purchase of a charette, for use in transporting charcoal, would greatly reduce the cost of one of the largest expenses of producing charcoal. If one of the organizations were to acquire a charette, it would serve as a clear example of a membership benefit. GREEN-Mad has stated that they do not engage in direct financial aid, such as purchasing a charette, due to difficulties in the past (Andriamanantseho 4/23). They should instead look to improve financial education in the village, and aid the villagers in the creation of a collective fund for purchasing items such as a charette.

This study presents a general look at many of the economic factors at work in the production of charcoal in Ankitsakalaninaomby. In many areas, however, much more specificity is needed to better understand the factors underlying these general trends. A study looking at the cutting habits of charcoal producers, whether they cut all of their trees at once to gain a one-time large benefit, or space out their production to acquire a constant stream of revenue, and whether these habits are tied to other economic factors, would aid in further understanding charcoal production as a livelihood. An assessment of the profitability of ADAM versus independent sale versus unsanctioned production would also help to characterize these three forms of transaction. These studies could help to further understanding of how the charcoal project has impacted Ankitsakalainomby and how it can be improved.

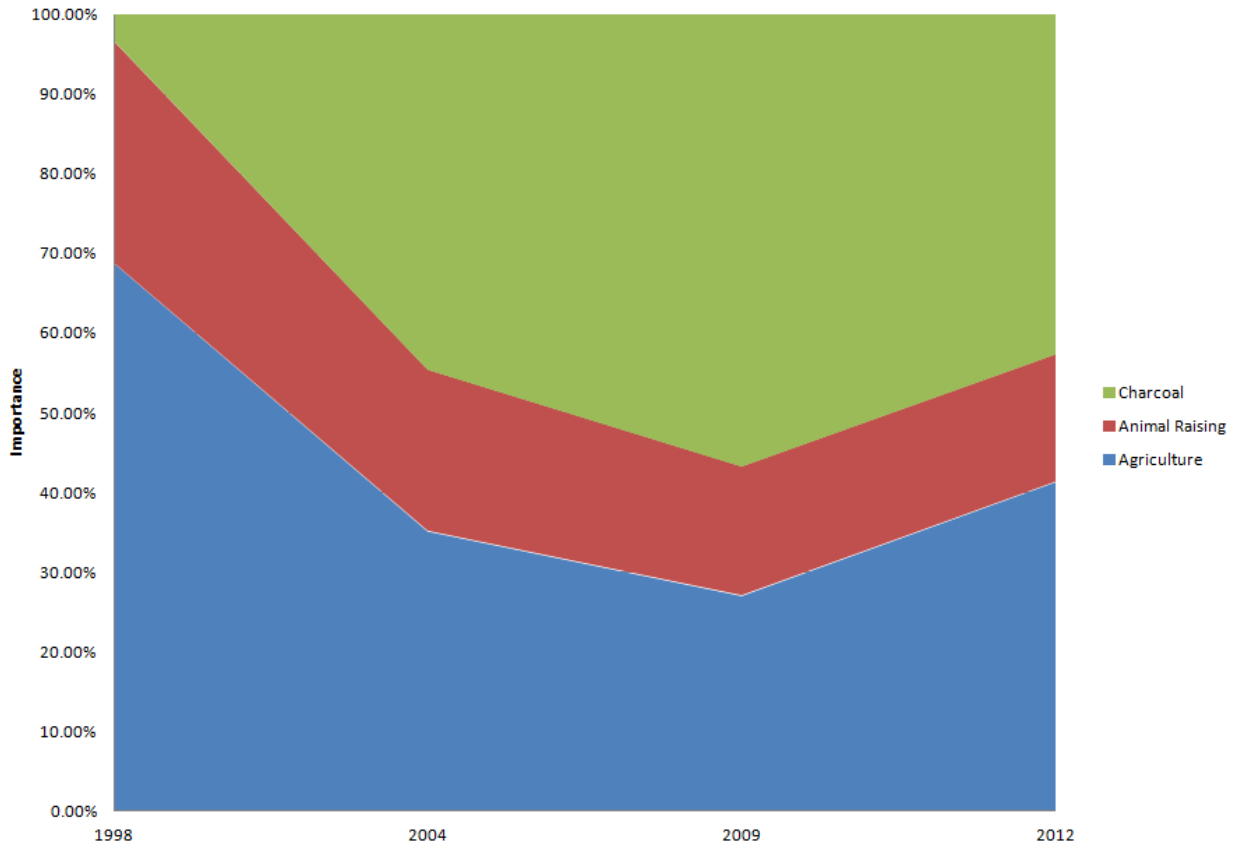
Appendix

A. Map showing location of study

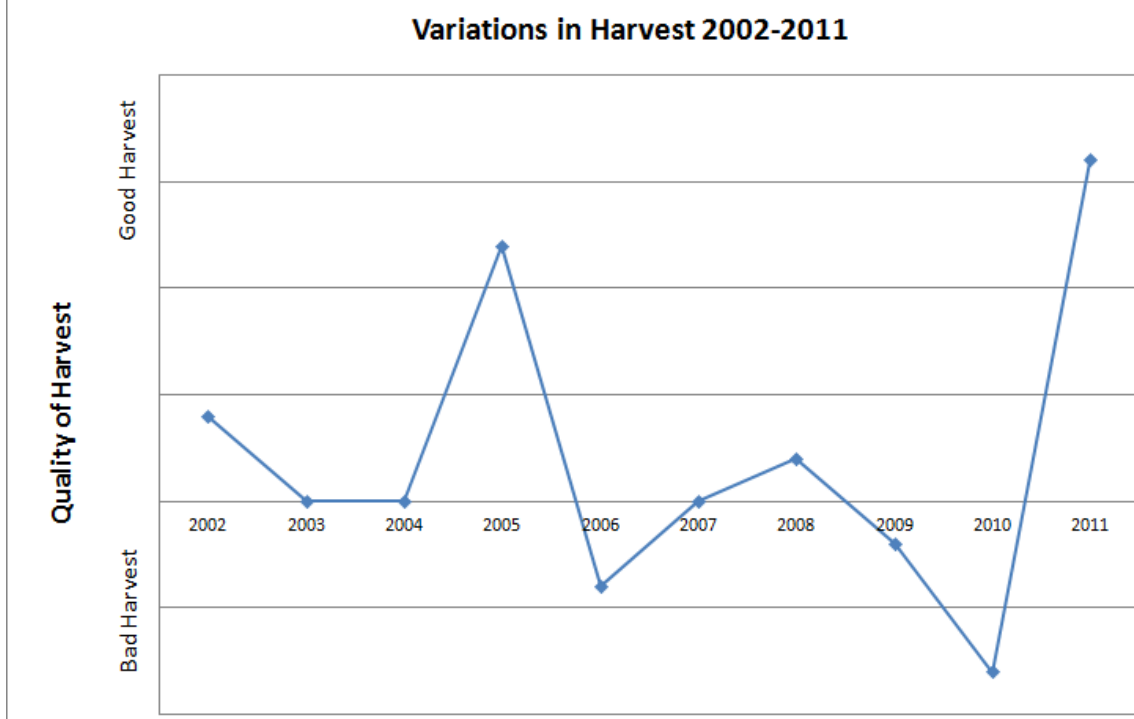


Source: <http://www.knietzsch.com/travel/ma-map.gif>

B. Perceived importance of livelihoods as a function of time



C. Relative Harvest Strength 2002-2011



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