

Combining Non-Timber Forest Product Extraction and Selective Logging:

Can it Increase Profits on Programme for Belize's Lands?

By

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ABSTRACT

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By the end of the 20th century, the economic importance of Non-Timber Forest Products (NTFPs) and the possibilities they provide for conserving the tropical rainforest were in the forefront of many management plans and ecological studies. Bayleaf palm (*Sabal mauritiiformis*) is one such NTFP found in the Rio Bravo Conservation and Management Area (RBCMA) of northwestern Belize. Recent studies have found that there are ecologically sustainable ways to harvest bayleaf and that there are commercial markets for bayleaf in Belize. Programme for Belize (PfB), owner of the RBCMA, has zoned areas for NTFP extraction but has not begun harvest of bayleaf. This study considers whether bayleaf harvest would be more feasible if it were combined on the same land as selective logging.

The idea of combining selective timber harvesting with NTFP extraction in the same area is not new. Programme for Belize includes selective logging as a part of its management plan and could possibly extract bayleaf from selectively logged lands with little added disturbance of the surrounding forest, and with minimal added costs. PfB's access to market and the current and future profitability of bayleaf harvest are crucial in determining if its extraction would be feasible. This study was undertaken to determine if harvest of bayleaf from timber extraction zones could increase PfB's profits. The principal elements analyzed were added costs, demand, and market structure in order to (i) develop an estimate of the costs and revenues from bayleaf harvest by PfB, (ii) assess current and potential future trends in the demand for bayleaf, and (iii) determine the current structure of the bayleaf market and identify any obstacles to PfB's participation in the market. Costs such as stock surveys, labor and transportation, were determined through observations and informal interviews. Surveys were conducted to get opinions on bayleaf and its demand. The market structure was evaluated through open-ended interviews, observations, and survey results.

It was determined that a stock survey of bayleaf palm on the RBCMA could be added to the timber stock survey with minimal additional costs. Moreover, labor costs would be minimal. Depending on how PfB transports bayleaf from Hill Bank Field Station to the market, however, the transportation costs could be extremely high.

Surveys conducted of three different groups revealed that most people believe bayleaf is increasing in demand (especially in the tourism sector), but is becoming less abundant. The opinions expressed in the surveys showed people believe that the price of bayleaf has been increasing over the past five years and will continue to increase in the future. The majority of the people surveyed also believe that certification of bayleaf as harvested sustainably could be beneficial in protecting the species, yet most lodges surveyed would be unwilling to pay more for leaf that was certified sustainably.

A thorough review and assessment of the market structure of bayleaf for tourism operations indicated that there are two main markets within reach of PfB: the inland market and the island market. The inland market is composed of contractors, usually working with family members to harvest and transport the leaf, and has few players and points of exchange of leaf. The island market, on the other hand, has many players, many points of exchange, and more available options for transport and purchase.

With a rise in use in tourism for tourist facilities, bayleaf could become a valuable commodity on the Belizean market. Currently, its price does not fetch enough for PfB to make a generous profit. However, PfB could possibly foster healthy community ties by allowing locals to enter the RBCMA and

cut bayleaf for a small fee and still make a small profit. This would have to be carefully planned, as there could also be negative consequences (i.e. increased poaching on RBCMA). Furthermore, if the populations of bayleaf dwindle and the tourism sector continues to grow, attitudes of lodge owners might change making certification of bayleaf an option and increasing the price of the leaf as well as the profit margin for PfB.

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Introduction

By the end of the 20th century, the economic importance of non-timber forest products (NTFPs) and the possibilities they provide for conserving the tropical rainforest were in the forefront of many management plans and ecological studies. NTFPs are being promoted as a way to save rainforests by helping to put a higher value on the forest through teaching locals how to use and market products other than timber. In considering the extraction of NTFPs, however, many researchers have failed to realize that their extraction can be a non-sustainable activity. In order for the extraction of NTFPs to be sustainable, much needs to be known about the physiology and reproduction of the species in question, and its effects on the ecosystem as a whole. Bayleaf palm (*Sabal mauritiiiformis*) is one such NTFP that has been studied for management purposes in the Rio Bravo Conservation and Management Area (RBCMA) of northwestern Belize and for marketing purposes throughout the country (O'Hara, 1999; Poff, 1997). Those recent studies suggest that there are sustainable ways to harvest bayleaf and that there are commercial markets for bayleaf in Belize. Results from the case study of bayleaf palm for management purposes indicated that with a recovery period of at least five years after harvest, *S. mauritiiiformis* would be able to regain its original number of leaves¹. This study builds on the previous ones by addressing the question of profitability of a combination of NTFP extraction and selective logging in the same area of a managed natural forest.

What are NTFPs?

Though forest-dwellers have been extracting non-timber forest products (NTFPs) for millennia, just recently have we realized their importance and the possibilities they provide of conserving one of our most valuable resources – the tropical rainforest. A NTFP is any product that comes from a forest except

¹ O'Hara's study encompassed a series of studies which evaluated leaf productivity rates, leaf size, percent recovery of original leaf number, and several important trace elements (C, Al, Mn, Fe) in foliar tissues. These experiments provided the most sensitive early assessment of palm response to harvesting.

for timber². Various products are included in this definition such as nuts and wild game, biochemically active plants and eco-tourism. NTFPs are often referred to as “minor” or “petty” forest products, yet according to Panatyotou and Ashton (1992), they can be equal to or greater in value than timber. In fact, eco-tourism alone can bring in forest revenues that are quite hard to surpass, even given the highest tropical hardwood prices. In one study that took place in the Monteverde Cloud Forest of Cost Rica (Menkhaus and Lober, 1995) using the travel cost method (Clawson, 1959) (Burt and Brewer, 1971), foreign tourists placed a monetary value of US\$1150 per person per visit on eco-tourism. Eco-tourism is one example of a NTFP that can help preserve the rainforest.

Selective Logging

Unlike temperate regions, selective logging is the norm in natural forests in tropical America. Species diversity is so great that it is not feasible to use the clear-cut method as a silvicultural technique when logging a parcel of land. Selective logging is a time-consuming and presumably expensive way of logging forests which is often under fire for being just another term for “high-grading” (taking out the best individuals and leaving only poor parent material). Selective logging, however, when practiced correctly, has been shown to reduce harvesting costs and maintain a healthy forest that is consistent with preservation of many NTFPs (Dykstra, et al., 1992; Holmes, 1999).

Combining NTFP Extraction with Selective Logging

Why study the combination of NTFP extraction with selective logging? There are three main reasons which Panatyotou and Ashton (1992) speak of. The first is to increase profits without doing too much extra damage to the forest. The second is forest protection through valuation. The main idea behind this reason is that a forest that has a high value while standing will run a lower risk of being cut for another use. The last reason to combine the two activities is to preserve the richness of a tropical forest.

² There is an ongoing argument as to whether or not fuelwood is a NTFP and the term “Non Wood Forest Products” is sometimes used to differentiate.

In a management plan for land that is used commercially the benefits of combining NTFP extraction and selective logging could be enormous. First, the logging roads are already there and new ones would not have to be constructed to take out NTFPs, this can help prevent more disturbance of the forest than is necessary. Secondly, the available stock can be surveyed while the harvest planning for logging is taking place, eliminating extra time spent on separate cruises. And lastly, an area that might be entered for extraction of NTFPs would be left untouched, thus preserving more of the forest as a whole, untouched.

Programme for Belize

Programme for Belize (Pfb) is a non-profit Belizean conservation organization that owns and manages over 90,000 hectares (225000 acres) of land in what is known as the Rio Bravo Conservation and Management Area (RBCMA) in northwestern Belize. Pfb was established in 1988 and through land donations and purchases has become the largest private protected area in Belize comprising about 4% of the total land area (www.pfbelize.org, 2000). The objective of Pfb is to pay for the conservation of the entire area by wise use of its natural resources, and it does this by managing the RBCMA for four activities; tourism, timber, research and carbon sequestration. Programme for Belize, in its own words, is an opportunity for positive action. In the few years that Pfb has managed the RBCMA it has hosted researchers from ornithologists to archaeologists, welcomed educational groups of all ages, become a highly visited eco-tourism destination, and has established outreach activities in surrounding communities.

Although tourism accounts for the largest income at Pfb, selective logging is used primarily in managing for future timber harvests. Pfb's method of selective logging³ utilizes a pre-planned method of harvesting to extract specific individuals from a stand, and leave certain individuals as parent material. All trees of 30 cm diameter at breast height (DBH) are recorded and entered into a GIS database that is used to produce maps of the area to be logged. From each map staff members are able to plan which trees

³ sometimes referred to as Low Impact Logging – LIL , or Reduced Impact Logging – RIL

will be felled and which will remain standing. The maps are also used for planning directional felling and skidder trails.

Which NTFP?

Sabal mauritiiformis

According to Zona (cited in O'Hara, 1999, page 16) *S. mauritiiformis* is a tall, graceful palm that is found in disjunct populations from southern Mexico to northern South America and in a few Caribbean isles. It has been found growing in a number of forest types from undisturbed rainforests to secondary forests and pastures. It has a large range in elevation (from sea level to 1000m), but is most abundant below 500m (Henderson, 1995).

In a sub-tropical moist forest, such as the forests of northwest Belize, many palm species are found and used as thatching material. Cohune palm (*Attalea cohune*), for example, is also used for thatch, but does not last as long as bayleaf, which can last about 15 years without having to be repaired or replaced, and has been known to last as long as 25 (Tut, pers. comm.). Compared to cohune palm, which usually only lasts for no more than 7 years, bayleaf is the obvious choice for roofing material.

Historically, the use of bayleaf for thatch has been for residential dwellings, but recently this use is moving more toward tourism, and tin roofs are becoming more popular among locals. This change could be due to several factors; bayleaf is harder to find, tin is cheap and considered more "modern", and the government tax of BZ\$0.05⁴ per leaf on bayleaf cut from public lands (although this tax is rarely enforced and would probably not be a major cause of locals switching from bayleaf use).

Factors involved in bayleaf extraction

⁴ The exchange rate is fixed at BZ\$2 to US\$1.

To conduct research on the extraction of bayleaf from the RBCMA, three main factors were addressed: market, demand, and added costs. First, market structure and location were important in determining if PfB could successfully harvest and sell bayleaf in Belize. The structure can give clues as to whether or not an “outsider” (such as PfB) will be able to enter a certain market, and the market must be located close enough to the area of extraction. Secondly, if the market is accessible but there is no demand then harvesting and selling bayleaf would not be a profitable venture. For this reason I looked at the perceived abundance of bayleaf, the past and future price trends and also the question of certification of this specific NTFP and NTFPs in general. Lastly, if there is an accessible market and if the demand is there, added costs are another important factor involved in the harvest and marketing of this NTFP. Added costs that might be incurred would be those associated with the stock survey, labor, transportation, and monitoring of the harvest. These factors were addressed through interviews and observations, a literature review, and surveys.

Methodology

Interviews and observations

Although formal surveys were conducted for the three main groups (listed below), I also learned a lot about certain aspects of my project (especially market structure) from informal interviews with many different people including, but not limited to, Programme for Belize (PfB) Staff, Belize Forestry Department officials, tourists, lodge owners, and various scientists who were living in Belize conducting research of their own. I conducted these informal interviews during three trips to Belize: March 10-17, July 21-August 10, and December 6-12, 1999.

PfB Staff

Staff members were always eager to talk about PfB and not only how extracting NTFPs may or may not be good for it, but also any subject regarding the Rio Bravo Conservation and Management Area (RBCMA). Casual conversations with them were most helpful in formulating ideas, developing questions for others, and organizing my thoughts.

Observations and literature review

Another part of my research involved going to the field station at Hill Bank and speaking with the field crew there. I spent three days at Hill Bank investigating issues related to NTFP extraction. In addition to discussions with the field crew, I accompanied them on a stock survey so I could see the areas, look for bayleaf myself, and see exactly how the stock survey was carried out. This information was helpful in determining how long it might take to add a NTFP to the survey. And, before leaving for Belize a thorough literature review was performed to help refine my search questions.

Surveys

Before leaving for Belize in July 1999, I defined my basic research questions related to the profitability of bayleaf. I wanted to know:

- Can bayleaf be harvested from logged lands?
- Will it cost more money to add bayleaf to the stock survey?
- How much will it cost to harvest bayleaf?
- Who will do the harvesting?
- How much are the harvesters paid?
- Is the demand high enough?
- Is the supply of bayleaf decreasing or increasing?
- Who still uses bayleaf for roofing?
- How much money does one leaf fetch?
- How much will it cost to transport bayleaf to the point of sale?
- Could there be future sustainability problems with the harvest of bayleaf?

Survey Development

With input from my committee, I drafted a general survey to gather opinions on bayleaf harvest from everyone interviewed, and specific questions for three groups: staff, harvesters/contractors, and lodge owners. These surveys were reviewed by my adviser, by Dr. Vincent Palacio of PfB, and by the Human Subject Committee of North Carolina State University before implementation in the field. I conducted all interviews in person (except for one phone interview with a lodge owner) between July 22nd and August 9th 1999. Please see Appendix I for surveys.

Sampling Procedure

PfB Staff Survey

In this survey I was looking for ideas, thought, and any questions that staff members might have about the combination of NTFP extraction and selective logging. My sampling method was simple: I interviewed any staff member who would sit down for a few minutes to answer my questions. I tried to interview those who knew most about PfB's logging operations and those who would be most involved in NTFP extraction at the RBCMA. Ten staff members were interviewed.

Harvester/Contractors Survey

Harvesters/Contractors of bayleaf palm were all indigenous Mayan peoples, many of whom lived in villages relatively far from the larger towns. After getting their names and a general idea of where they lived from the lodge owners I interviewed, I drove to their villages to interview them. Most do not have telephones, so at times I would drive over an hour to the village, only to wait for a while and then leave because they were not at home. I was able to interview 5 harvesters/contractors.

Lodge Owners Survey

I identified all lodges in Belize in the phone book and the BETA (Belize Eco-Tourism Association) directory. The sampling frame included all lodges that advertised thatch roofs AND were within 75 miles of PfB lands. I wrote the names of these lodges on slips of paper and drew a random sample of 15. I then drew 5 more to use as back lodges in the event that one or more of the 15 drawn was not able to respond.

General Survey

I completed the general survey with everyone in the three groups, asking these general opinion questions before the group-specific survey.

Data Analysis

Answers from the General Survey and the Lodge Owners Survey were coded, entered in Excel, and analyzed in SAS. Answers from the PfB Staff Survey and the Harvesters/Contractors Survey were

summarized with simple descriptive statistics, since the sample sizes are quite small. I presented my initial results to PFB in December, gathering feedback and suggestions incorporated here.

Results

Market Structure and Location

The use of bayleaf palm can be broken down into two different types: the traditional use and the tourism use. Traditionally, the Mayans and their descendants have used palm fronds and grasses to thatch roofs for thousands of years (Abrams, 1994). With a little over 11% of Belize's population Maya (Belize Abstract of Statistics, 1998), tradition still plays a major role in many aspects of life. However, according to surveys most people state that bayleaf use is decreasing in traditional use and increasing only in its use in tourism facilities.

Due to the fact that it is incomplete, the market of bayleaf in tourist facilities does not easily fit into a particular structure. There is not enough competition to allow for a set price of bayleaf and because of the factors mentioned later in this section, the market for bayleaf is difficult to define, at best. The tourism sector, however, is the one in which bayleaf is used the most and appears to be increasing in use.

When bayleaf is used for tourist facilities the job is usually done on a contract basis where a contractor is responsible for getting the leaves and materials together and weaving himself or with helpers. It is usually done on the basis of square feet or by simple size of the structure ("small", "medium", "large"). There are two main markets – inland and island – with the market structure differing greatly between the two.

Inland market

The inland market is family oriented. There are few players and points of exchange with the leaf only going through the hands of the contractor and no middleman. In some instances, the lodge owns enough of the surrounding land that the employees harvest bayleaf on the grounds and weave the roofs

without having to go through a contractor. Most of the lodges, however, contract with one of only four or five frequently used contractors in the area.

If the job is contracted, the contractor usually has family members as helpers (cutting, hauling, and weaving the leaf). This means that there is usually no paid labor. When there are paid laborers, they are usually friends or neighbors and there is no fixed labor force for harvesting bayleaf. In this circumstance, the contractor never pays for the leaf. That is to say, he sometimes is forced to pay the government tax of \$0.05 per leaf, but he never buys leaves brought from another part of the country and harvested by someone else.

In this market, the contractors are all of Mayan heritage. They have worked with bayleaf for generations and they have all lived in the area their whole lives. Because of this traditional structure and the lack of market for just leaves, it would be difficult for others to enter this market.

Island market

In contrast, the island market has many players, many points of exchange, and could be more accessible to new players. There are several lodges on Ambergris Caye, in San Pedro in particular, who have thatch roofs and state that thatch roofs are very important to lodge ambience. All resorts reported using only one contractor on the island. When the contractor is used he usually covers the cost of shipping leaves, and if he does not cover the cost, he pays more per leaf for delivery to the island. The resorts do small repairs themselves using full time employees and purchasing small quantities of bayleaf.

Since the leaves for this market come from the mainland, they go through several hands before arriving on Ambergris Caye. Usually, a shipper in a coastal town will contact harvesters farther inland who cut the leaf and then truck it to the coast. The shipper then ships it to the island where it is purchased by the contractor (for more detail, please see Appendix II). Given this structure where leaves pass hands many times, this market would be the only viable option for marketing bayleaf for PFB.

Demand

In looking at demand I used the surveys to examine the perceived abundance, price trends, and the idea of certification. I found that most respondents (regardless of group) believe that bayleaf is becoming less abundant in Belize. In fact, 70% believe it is becoming less abundant, while only 20% believe it is the same and only one person questioned believed that it is growing in abundance (Fig. 1).

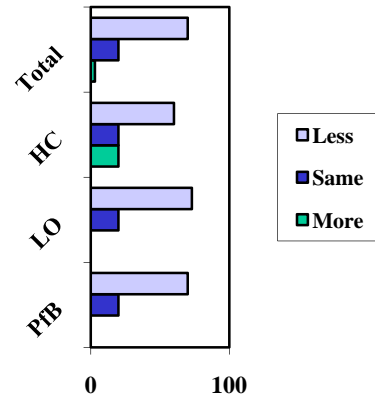


Fig. 1

Concurrently, respondents said they also believe that bayleaf use is becoming more popular in Belize (Fig. 2), but half of those who answered that it was more popular stated that it is so only in the tourism

Is bayleaf becoming more or less popular?

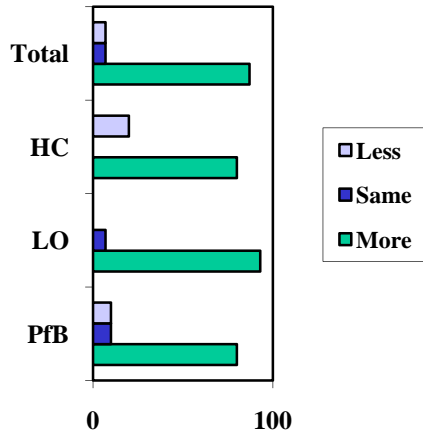


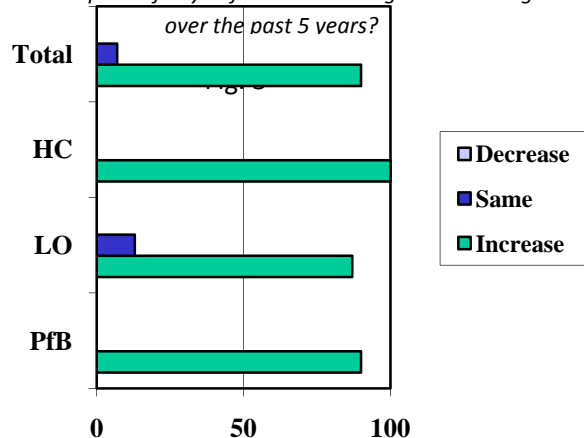
Fig. 2

sector. Of the reasons given for the rise in popularity of bayleaf only in the tourism sector, the most common ones were, "too hard for locals to find", and "tin is more popular among locals".

Furthermore, 90% of people surveyed stated that they believe the price of bayleaf has been increasing over the past five years (Fig. 3), with that figure rising to 100% when looking only at the Harvesters/Contractors. When questioned about price, however, about half of the respondents stated that they did not know the price. Of those who said they did know it, the descriptive

statistics are shown in Fig. 4. Another interesting question was the one regarding certification. I asked respondents if they believed it would be worthwhile to certify bayleaf palm as being sustainably harvested

Has the price of bayleaf been increasing or decreasing over the past 5 years?



(and explained the meaning of that term). As in other questions, results were the same across groups and overall 47% stated that it would be worthwhile, and only 7%

Is bayleaf becoming more or less abundant?

stated that it would not (30% responded "maybe"). The most common reason given for why it would not be worthwhile was the fact that it might cost so much to certify that it would not be profitable when sold. This was backed up by the fact that 55% of lodge owners surveyed stated that they would not be willing to pay more for certified leaf. All survey results can be found in Appendix III.

Added Costs

Stock Surveys

After speaking with the chief forester of PfB, Darrell Novelo, it was determined that PfB could combine the stock survey of bayleaf palm with the timber stock survey with minimal added costs. The bayleaf stock survey, however, would not be a complete one like the timber stock survey. In the NTFP stock survey the “eyeball” method could be used, with the recording person looking around the area and giving it a range from 0 - 5, with 5 being “very abundant” and 0 being “no bayleaf present”. This, in turn, would be entered into the GIS with the timber

Fig. 4	
<i>Of respondents who said they knew the price of bayleaf:</i>	
Mean	0.47
Standard Error	0.051928
Median	0.48
Mode	0.5
Standard Deviation	0.220311
Sample Variance	0.048537
Kurtosis	1.462298

information and possibly used in the future if PfB begins to extract bayleaf. This method is not as detailed as the one used for the timber survey, but would suffice for determining the abundance of bayleaf on the RBCMA. Furthermore, this survey could help PfB determine if, in fact, bayleaf is abundant on their lands.

Labor and Monitoring

The costs of labor and monitoring were tabulated given certain information. According to each harvester/contractor surveyed, harvesters in the inland market receive \$0.25 per leaf harvested. On the contrary, according to an intermediary, in the island market, harvesters receive between \$0.08 and \$0.12

per leaf harvested. The reason for the difference in payment is unknown. Monitoring costs for PfB would be \$25 per day for a day laborer (Novelo, pers. comm.).

Transportation

Transportation is the area in which PfB would incur most of its costs. There are no large, cargo trucks at Hill Bank Field Station and PfB would have to truck leaves to their destination in a small flat bed pickup, which would mean usually more than one trip to the port. The vehicles that are used at Hill Bank Field Station get between 5 and 10 MPG and have an average daily maintenance cost of \$10. PfB pays 65% of the market price for gas, which is currently \$5. Shipping to San Pedro Town on Ambergris Caye is \$25 per trip from Corozal Town. This is using a small sailing boat that can carry 800 leaves per trip. Shipping from Belize City on a cargo barge is \$2.50 per 100-leaf bundle. Appendix IV has several cost examples using the island market as a destination.

Conclusions

Based on the interviews, observations, and surveys mentioned above, it is apparent that the demand for bayleaf is increasing. Poff (1997) stated that the number of tourism facilities was rising by 10% from 1991 through 1997. Given that the tourism industry of Belize is trying to establish casinos and offshore docks for cruise ships (Anon, pers.comm.), it appears that Belize tourism will continue to increase.

The abundance of bayleaf on public lands, however, seems to be shrinking. Most respondents believe that bayleaf has been decreasing over the past five years (see Appendix III). This could be due to a number of reasons including unsustainable harvest methods, the cutting of entire trees to use the boles as pilings on docks and piers, and deforestation in general.

Most lodge owners who have thatch roofs stated that they are “very important” for lodge ambience. This suggests that if bayleaf is actually decreasing in abundance, lodge owners might be willing to pay more for the leaf in the future. There could also be a possibility of making a profit from having bayleaf certified sustainably harvested. As the inland market is made up of few players and points

of exchange of leaf, however, the island market seems to be the most available for Pfb if, in fact, the demand and supply work together in favor of extracting on the RBCMA. Currently, however, bayleaf does not fetch enough money for Pfb to make a generous profit from its harvest.

Summary

Due to factors such as transportation and monitoring costs, Programme for Belize would make a negligible profit, if making a profit at all, from the extraction and sale of bayleaf palm from the RBCMA. If they could lessen their costs, a slightly greater profit could be made, but with the possible difficulty involved in accessing the market, it would not be worthwhile at the present time.

However, since the supply of bayleaf appears to be decreasing and the use seems to be increasing, it would be my recommendations that Pfb go ahead with the stock survey of bayleaf palm. The added cost for the stock survey would be minimal and the benefits of knowing where bayleaf is on the Rio Bravo Conservation and Management Area (RBCMA) would be worthwhile. If the demand does, in fact, continue to increase and the abundance dwindles, the price of bayleaf could rise. Furthermore, lodge owners might be more willing to pay a premium for certified leaf and the idea of certifying bayleaf as being sustainably harvested could become more appealing to Pfb. Thus, knowing where the stocking is could facilitate future harvests and sales of the leaf.

Also, one aspect that most people failed to mention was hurricanes. The past two years alone have seen very destructive hurricanes (Georges, Mitch, etc.) in the Carribean. Belize was lucky in that it avoided the damage that was suffered by other Central American republics. Although it has been stated that bayleaf roofs can withstand winds of up to 75 or 80 MPH (Graniel, pers.comm.), many hurricanes can sustain winds much stronger. If Belize were unfortunate enough to suffer a storm as such, many roofs would be destroyed and the demand for bayleaf would skyrocket. This event would be another reason to begin including bayleaf in the stock survey of timber.

My second recommendation would be for Pfb to *consider* allowing locals from surrounding communities to harvest bayleaf for personal use or sale. If a cutter were to pay Pfb at least BZ\$0.15 per leaf⁵ Pfb could make a meager profit, but more than this, an activity such as this could help foster better community relationships. Pfb maintains good relationships with its surrounding communities, but Pfb is considered by some to be holding valuable resources hostage. Sharing with neighbors would be one way to help overcome this stigma. Anyone who entered the RBCMA to cut bayleaf would have to be monitored to assure Pfb of sustainable extraction practices. This must be accompanied by an outreach program designed to teach locals about the methods and importance of sustainable extraction of any natural resource. In sharing with neighbors, however, it must be considered that opening the land for local use could increase the amount of poaching that is done on the RBCMA. Some staff members already believe that poaching is occurring, and allowing locals to enter might increase this activity by showing them where the resources are and how to get there. To find out exactly how much poaching is going on, why, and by whom, Pfb could hire an outsider to do an independent study. Having this information would be helpful in deciding whether or not to let locals cut bayleaf.

Since NTFP extraction is involved in many management plans, it would be a welcome addition to the research being conducted worldwide, if bayleaf palm could be successfully and sustainably extracted and marketed by Pfb. By realizing this goal, Pfb could become a model example of sustainable extraction and marketing for other organizations and the surrounding communities, as well as for the whole country. Since the profit is negligible, it would not be in Pfb's best interest economically, but by setting an example for others, they could fulfill one of their goals: conservation of the area by wise use of its natural resources.

⁵ Assuming Pfb would incur monitoring and office costs (see Appendix IV) of \$175 total.

Appendix I -- Surveys

- i. General Survey
- ii. PfB Staff Survey
- iii. Lodge Owners Survey
- iv. Harvester/Contractor Survey

Note -- In these surveys sometimes the word "sabal" was used. It is another word for bayleaf and in some areas it is more common than the word "bayleaf".

i.

Sabal/Bayleaf Thatch Questionnaire

Ginger Deason, International Forestry Program, North Carolina State University

1. Have you worked with sabal in any capacity in the past 5 years? NO
Purchased Harvested Constructed Regulated Researched Other

2. Do you believe that harvesting sabal only from areas that have already been logged for timber could help promote forest conservation?
YES NO No Impact Depends on: _____

3. Do you know the current price of sabal? NO
Price per leaf:
Price per bundle: _____ (leave per bundle _____)
Point of sale:

4. Has the price of sabal been increasing or decreasing over the past 5 years?
Increasing Decreasing Same

5. Do you expect the price to increase or decrease over the next 5 years?
Increase Decrease Same

6. Is sabal becoming more or less abundant in Belize?
More Less Same

7. Is sabal use becoming more or less popular?
More Less Same

8. Several organizations are involved in the sale of certified timber. Certification means that an independent agent verifies that a product is harvested in a sustainable manner. Do you think that it would be worthwhile to certify sabal?
YES NO Maybe, if...

9. There could be various substitutes for native sabal, including other types of palm, sabal or other palms grown in plantations, or other materials. Do you think that these substitutes are replacing sabal as roofing material?
YES NO Some parts of Belize:

Which substitute is most important?

10. Where possible, do you believe it is a good idea to sustainably harvest sabal from protected areas to help fund conservation of those areas?

YES

NO

Maybe, if...

ii.

**Programme for Belize
Staff Survey**

NTFPs

1. Do you foresee PfB harvesting NTFPs commercially in the near future?
2. What benefits would you desire for PfB from NTFP extraction on its lands?
3. Would you personally recommend that PfB harvest NTFPs?
4. What are the barriers to PfB harvesting NTFPs?

Sabal

5. Do you think it would be practical to extract sabal from logged lands? Why/why not?

Combination

6. Have you considered the combination of NTFP extraction and selective logging before, or have you ever heard of anyone else trying it?
7. Do you think that NTFP extraction on logged lands can decrease ecological impacts on **PfB lands** as a whole?
8. What would be the advantages and disadvantages of collecting sabal from logged areas?

Certification

9. Do you think it would be **practical** to have sabal certified sustainable?

iii. **Lodge Owners' Survey about Sabal/Bayleaf Thatch Roofs**
Ginger Deason, International Forestry, North Carolina State University

1. How many structures in your facility have thatched roofs? _____ How many are sabal? _____
 2. When was the last time that you put up a new or repaired a sabal roof? (month/yr.) _____
 3. Was that a typical new roof or repair job? YES NO
If no, when was the most recent job that was fairly typical? (month/yr) _____
-
-

Considering that last job/last typical job:

4. Do you know where the leaves were harvested? YES NO If yes, where?
 5. Did you contract out the job? YES NO
-
-

If yes,

6. What did that include? (check all that apply)
Thatch _____ Other materials _____ Transportation to site _____ Construction _____
 7. What was the total cost for what size roof? (in square feet, sq. meters, or diameter)
 8. How did you decide on a contractor? (and skip to #12)
-
-

If no,

9. Where do you buy the leaves for thatching?
 10. How were the leaves transported to the construction site? Cost of transport per unit?
 11. How much did you pay for construction? For what size roof? Only labor or also other materials?
-
-

12. How important are thatch roofs for lodge ambience at your facility:
Very important Somewhat important Not important

13. Do you think tourists would be:
More likely less likely no change
to stay at your facility if you advertised and used certified thatch for your roofs?
(remind of explanation of certification from core survey)

14. Do you think that tourists would be willing to pay more per person to stay at your lodge if you offered facilities with certified sustainably harvested thatch?
YES NO

15. Would you be willing to pay more per leaf for certified thatch? YES NO

16. If yes, approximately how much more per leaf or what percentage more? _____

iv.

Bayleaf Harvester/Contractor Survey

Bayleaf harvester questions

1. Do you harvest in logged or natural forests? Why/why not?
2. Do you prefer one area to another? Why/why not?
3. Is bayleaf more abundant in a certain area?
4. Is it easier to extract from one or another?
5. How many bundles can you typically harvest in a day?
6. How many leaves are in a bundle?
7. Do you get paid per day, leaf, bundle, or another way? How much?
8. How much money do you typically make in a day harvesting bayleaf?
9. How much money did you make last year/month harvesting bayleaf? Was that typical?
10. Do you have another job? What is it?
11. How do your wages compare to that of something else (farming or work in the city)?
12. Who pays you?
13. Do you work for a contractor?
14. How much time is spent in transit (from home to work site, as well as from work site to point of sale)?
15. How much time is spent walking out to area to be harvested?
16. How much time is spent in the actual cutting of the bayleaf?
17. How much time is spent in hauling bundles back to road/trail?
18. How much time is spent in lunch and/or breaks?
19. How much time is spent in transit from home to work site and back?
20. How many leaves do you get from one tree?

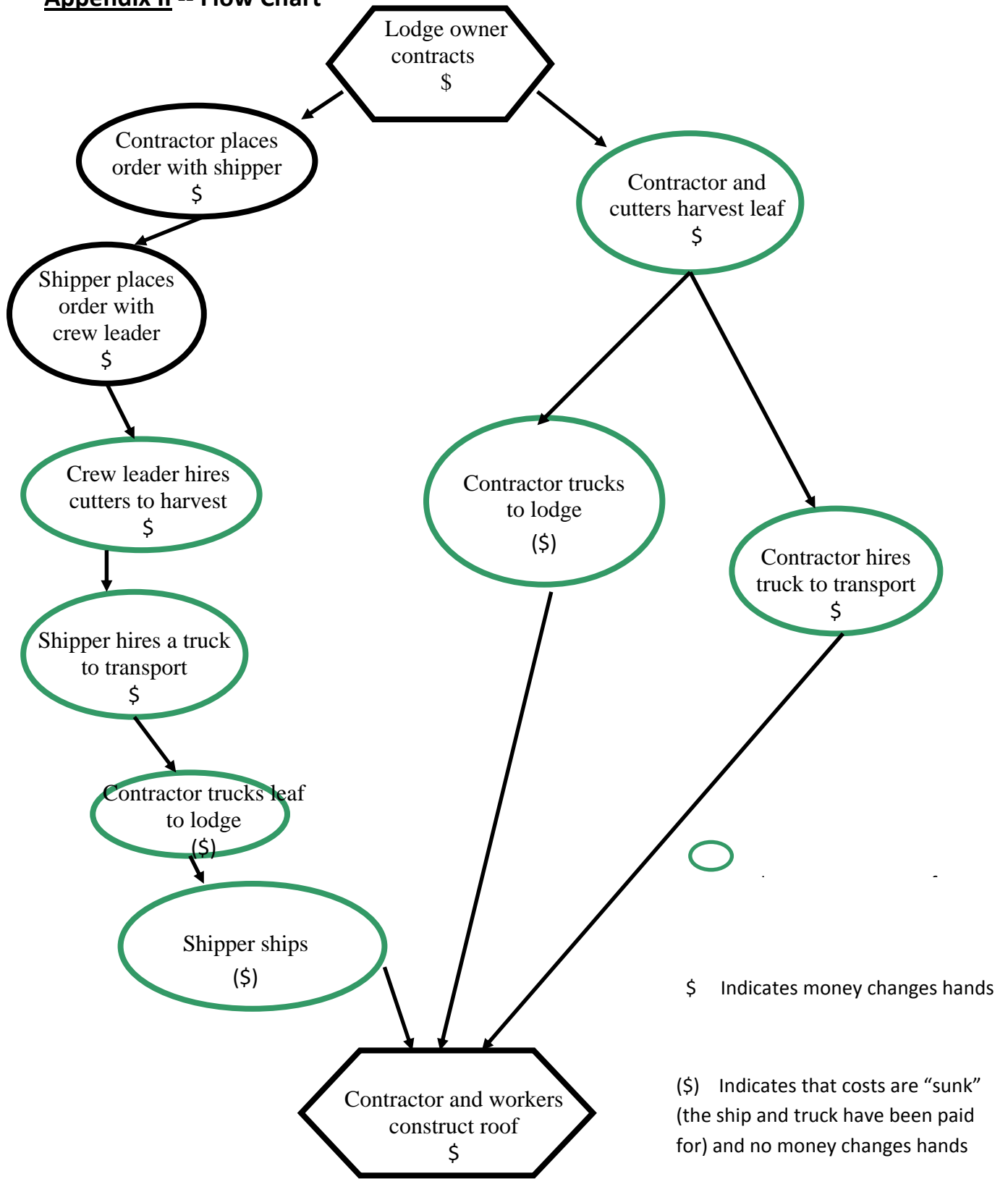
21. Do you worry about trees becoming scarcer?
22. When you cut the normal amount of leaves from a tree does that kill the tree or will you be able to come back and harvest again from that same tree?
23. How soon can you go back to that tree?
24. How do you determine which leaves to cut and which trees to cut from?
25. If you were told to leave at least two leaves per tree and not cut from the same tree in a five year period, how would that affect your production?
26. Have you noticed if sabal is getting harder to find?
27. How big does a tree/leaf need to be to be cut?
28. How many merchantable-sized leaves does a tree usually have?
29. How tall or short does a tree need to be to harvest from?
30. Exactly which moon phase do you harvest in? Why?
31. How many days do the bundles need to “season” before use?
32. How old are you?
33. Where are you from?

Bayleaf Contractor Questions

1. Have you noticed a certain part of the year that you get more contracts for bayleaf? If so, which part?
2. Do you charge more during certain parts of the year?
3. Do you just work in this area (**note area**) or do you travel around and work all over the country?

4. How much do you charge for a contract and for what size roof?
5. What are the delivery costs (fuel, vehicle, etc.)?
6. Are transportation costs per mile, hour, or previously decided on amount?
7. How much do you pay harvesters?
8. Are they supervised?
9. Do you do the thatching yourself?
10. If not, who does and how much is he paid? Is that usually part of the contract?
11. Are you paid up front or upon completion of contract?
12. How much money did you make last year/month selling bayleaf? Was that typical?

Appendix II -- Flow Chart



Appendix III -- survey summaries

The following pages contain the survey summaries from all surveys.

- i. General Survey
- ii. Programme for Belize Staff Survey
- iii. Lodge Owners Survey
- iv. Harvester/Contractor Survey

Respondents answering “don’t know” were dropped from tabulations, because of this some cells do not equal 100%.

i. General Survey

General Survey	PfB Staff	Lodge Owners	Harvesters/Cont.	Total
Have you worked with bayleaf in the past 5 years?	NO 40% Researched 40% Regulated 10% Other 10%	Purchased 47% Constructed 20% Har/Con 7% Pur/Con 13% Pur/Har/Con 13%	Purchased 20% Constructed 20% Har/Con 40% Pur/Har/Con 20%	NO 13% Purchased 30% Constructed 13% Researched 13% Har/Con 10% Pur/Con 7% Pur/Har/Con 10% Other 3%
Do you believe that harvesting bayleaf...could help promote forest conservation?	YES 50% NO 20% Depends 20%	YES 53% NO 33% Depends 7%	YES 40% NO 40%	YES 50% NO 30% Depends 13%
Has the price been increasing or decreasing over the past 5 years?	Increasing 90% Decreasing 0% Same 0%	Increasing 87% Decreasing 0% Same 13%	Increasing 100%	Increasing 90% Decreasing 0% Same 7%
Expect the price to increase or decrease over the next 5 years?	Increase 90% Decrease 0% Same 0%	Increase 87% Decrease 0% Same 13%	Increase 80% Same 20%	Increase 87% Same 10%
Becoming more or less abundant?	More 0% Less 70% Same 20%	More 0% Less 73%	More 20% Less	More 3% Less

		Same 20%	60% Same 20%	70% Same 20%
Use becoming more or less popular?	More 80% Less 10% Same 10%	More 93% Less 7% Same 0%	More 80% Less 0% Same 20%	More 87% Less 7% Same 7%
Worthwhile to certify bayleaf?	Yes 50% No 30% Maybe 20%	Yes 67% No 13% Maybe 20%	Yes 60% No 20% Maybe 20%	Yes 60% No 20% Maybe 20%
Are any materials that are replacing bayleaf for roofing?	Yes 20% No 40% Some places 30%	Yes 60% No 13% Some Places 20%	Yes 80% No 0% Some Places 20%	Yes 50% No 20% Some pl. 23%
Do you believe it is a good idea to sustainably harvest bayleaf from protected areas to help fund conservation of those areas?	Yes 60% No 0% Maybe 30%	Yes 40% No 7% Maybe 33%	Yes 40% No 20% Maybe 20%	Yes 47% No 7% Maybe 30%

ii. Programme for Belize Staff Survey

PfB harvesting in future?	Benefits	Would you recommend it?	What are the barriers?
Yes 30% No 30% Depends 40%	Econ/local oppor/serve as example 50%	Yes 70% No 10%	Marketing 30% Sustainability 20%

	Econ/local oppor 40%		Community tension 10% Control 40%
	* "local oppor" means employment opportunity for locals *	*all responding "yes" qualified it with "if it's sustainable"*	

Practical to extract from logged lands?	Considered combo before?	Can decrease impacts?	Advantages	Disadvantages
Yes, accessibility 80% No, destructive 10%	No 90% Yes 10% (had heard of it in Peten, Guat)	Yes 20% No 30% Depends 50%	Less overall environmental impacts Accessibility	Impacts all in one place
			some comments given -- not all respondents answered this question	*see previous comments*

Practical to certify?	
Yes	20%
No	50%
Maybe	30%

iii. Lodge Owners Survey

# of structure	Of bayleaf	Last new job	Contracted?	Contractor Decision
1-7 40%	63% of all are made of bayleaf	1999	Yes 64%	Used before 71% Recommended 29%
8-16 27%		43%	No 36%	
17 & over 33%		1998 50% before 7%		
		all were typical	*included all materials*	*of respondents who answered*

Ambience important	Tourists stay change	Tourists pay more	Would you pay more?
Very important 93%	More likely 47%	Yes 20%	Yes 33%
Not important 7%	Less likely 0% No change 53%	No 73% Maybe 7%	No 53% Maybe 13%
	one respondent answered "ecotourists more likely"		*no one could answer how much more*

*from the following questions, less than half respondents were able to answer:

- Total Costs
- Size of roof
- Number of Leaves
- Where do you buy leaves?
- Transportation to construction site

iv. Harvester/Contractor Surveys

Harvester Section

Harvest in logged or unlogged forests?	Prefer one area?	More abundant in a certain area?	How many leaves can you harvest in a day?	Payment
Logged 40%	Logged 40%	Lowland/wet 40%	600 60%	Per leaf 20%
Unlogged 0%	Natural 20%	Upland 20%	250 20%	Per leaf or per bundle 20%
Either 40%	No preference 20%		400 20%	
	*those who answered logged said it was because of accessibility *the one who answered natural said it was because there was more bayleaf			

Amount you typically make harvesting bayleaf	Wages compare?	Time spent in actual cutting of bayleaf?	How many leaves do you get from one tree?	Worry about scarcity?
At least BZ\$30-35 per day	Decent income	6am until night 7am until 1pm 8am until 3pm	10-15 4-7 10-11 10-12 7	Yes 40% No 20%
*one respondent	*one respondent			

Harvest from	When can you	How do you	Have you	How big does a
--------------	--------------	------------	----------	----------------

same tree?	come back?	determine which leaves to cut and trees to cut from?	noticed if bayleaf is getting harder to find?	tree need to be?
Yes 80%	5 years 20% 2 years 40% 1 year 20% 2 weeks 20%	Depends 20% Old ones 20% All but three 20%	Yes 20% No 20% Yes and No 20%	Depends 40% 7-8 years old 20%

How many merchantable-size leaves does a tree usually have?	Which moon phase do you harvest in?	Why?	How many days do the leaves need to season before use?
10-11 20%	New moon to 1 st qtr. 60% 1 week after full 40%	Bugs/ants 40% Water 20%	Over 1 week 40% 2-3 40% 1 day 20%

*no answers to the following questions:

- How much money did you make last year/month harvesting bayleaf?
- Do you have another job?
- Who pays you?
- Do you work for a contractor?
- How much time is spent in transit?
- How much time is spent walking out to area to be harvested?
- How much time is spent in hauling bundles back to road/trail?
- How much time is spent in lunch and/or breaks?
- How much time is spent in transit from home to work site and back?
- If you were told to leave at least two leaves per tree and not cut from the same tree in a five year period, how would that affect your production?
- How tall or short does a tree need to be to harvest from?
- How old are you?
- Where are you from?

Contractor section

Certain part of year you get more contracts?	Do you charge more in certain part of year?	Do you work in just this area?	How much do you charge for a contract and for what size roof? (individual answers)
Dry season 40%	Yes 0% No 20%	Yes 60% No 40%	\$4000-5000
Off-tourism 20%	Depends 20%		20'x30' \$8000 15'x20'
No 20%			\$3000 18'x26' \$22 per square foot

What are delivery costs?	How much do you pay harvesters?	Are they supervised?	Do you do the thatching yourself?	Who does and how much is he paid?
\$200 per trip 20%	25 cents/leaf 80%	Yes 60% No 20%	Yes 80% No 20%	\$35/day
*one respondent				*didn't say if it was part of contract or who does it

When are you paid?	How much money did you make last year?
Partial payments throughout 80%	Very little 40% \$8000 20%

*no answers to the following questions

- Are transportation costs per mile, hour, or previously decided on amount?

Appendix IV. -- Cost Examples for Island Business

To find a range of possibilities, I made two different calculations: (1) the most liberal estimate showing the most amount of money PFB could make; and (2) the most conservative estimate showing the least amount of money that PFB could make. Each cost example was worked out assuming the following:

- A. all prices are in Belize dollars (BZ\$2=US\$1)
- B. two harvesters working for three days cutting 500 leaves each per day
- C. using a vehicle that gets 5 MPG (conservative) or 10 MPG
- D. PFB pays only 65% of market price for gas
- E. gas costs \$5 per gallon
- F. PFB hires harvesters from Rancho Dolores (conservative) or Double Head Cabbage
- G. workers stay at Hill Bank Research Station the three days of working
- H. \$10 per day maintenance costs for each vehicle
- I. a day-laborer is hired to monitor bayleaf extraction at \$25 per day
- J. on average, a guest cabana uses 2675 leaves for the roof
- K. it takes three trips/three days to take 2675 leaves to Corozal Town
- L. it takes two trips/two days to take 2675 leaves to Belize City
- M. in conservative estimate a PFB staff person drives truck to Corozal Town or Belize City
- N. in liberal estimate a day worker drives truck
- O. shipping from Corozal Town is by small boat that charges \$25/trip and carries 800 leaves/trip
- P. shipping from Belize City is on barge that charges \$2.50/bundle

Two scenarios:

1. PFB ships through Corozal Town and sells on island		(1)	(2)
<i>2675 leaves to make a guest cabana</i>			
<u>pay harvesters</u>		214.00	321.00
<u>transportation of harvesters to Hill Bank</u>		3.25	13.00
<u>trips into forest to harvest</u>		33.90	37.80
<u>three days of monitoring costs</u>		75.00	75.00
<u>transport to Corozal Town from Hill Bank</u>		280.50	505.50
<u>shipping to island</u>		100.00	100.00
<u>office costs</u>	100.00	200.00	
TOTAL COSTS	(joint costs ⁶ excluded)	806.65	1252.30
GROSS PROFIT		1203.75	936.25
NET PROFIT		397.10	-316.05

2. PFB ships leaf through Belize City and sells on island			
<i>2675 leaves to make a guest cabana</i>			
<u>pay harvesters</u>		214.00	321.00
<u>transportation of harvesters to Hill Bank</u>		3.25	13.00
<u>trips into forest to harvest</u>		33.90	37.80
<u>three days of monitoring costs</u>		75.00	75.00
<u>transport of leaves to Belize City</u>		183.00	408.00
<u>shipping to island</u>		67.50	67.50
TOTAL COSTS	(joint costs excluded)	676.65	1122.30
GROSS PROFIT		1203.75	936.25
NET PROFIT		527.10	-186.05

⁶ “joint costs” are those costs that are shared by other activities (i.e. vehicles, GIS, logging trails) and cannot be allocated

3. PFB sells right to harvest bayleaf on RBCMA

2675 leaves to make a guest cabana

cutter's cost⁷

<u>transportation</u> ⁸	30.00
<u>pay harvesters</u> ⁹	267.50
<u>opportunity costs</u> ¹⁰	37.50
<u>trucking costs</u> (from Rancho Dolores to Corozal Town)	205.50
GROSS PROFIT (@ BZ\$0.40 per leaf) ¹¹	1070.00
NET PROFIT	529.50

PfB's costs

<u>monitoring</u>	75.00
<u>office costs</u>	100.00
<u>total costs</u>	175.00
<u>amount Pfb could possibly charge to harvest per leaf</u>	354.50/2675

⁷ this is an example using rough estimates of fuel consumption of vehicle and gross profits

⁸ a local will not receive the fuel discount -- cost is based on 3 days R/T from Rancho Dolores

⁹ payment based on BZ\$0.10 per leaf

¹⁰ based on per day truck is in use

¹¹ based on average price BZ\$0.35 - BZ\$0.45

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