Sustainable *Nipa Lambanog* Enterprise Amidst of Environmental and Structural Constraints

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Abstract – *Lambanog is liquor. The most popular variety is produced from the distilled coconut sap, while the less popular one comes from the distilled sap of Nypa fruticans Wurmb, or "sasa lambanog" as it is called in Infanta, Quezon, Philippines. This study focuses on the lambanog actors in the mangrove areas, a place not merely spaces for nipa palm trees grow but also spaces that take care of them, steadily allowing them to make lambanog and earn a good livelihood. However, instances occur when lambanog production declines as a result of environmental and structural constraints. How the working groupresponds to these impediments, and how the Enterprise sustains are the topics of interest in this research. Site visit, participant observation and key informants interview guided by semi-structured questionnaire checklists were conducted to gather the data. Findings revealed that lambanog actors have encountered natural constraints like climate change, flooding, and the nipa palmtrees are getting older. It is also found that government and organization leaders promoted the shift in distillery technology from traditional firewood to a modern rice hull. This shift eliminated the need to cut trees in the upland and lowland forests for use as fuel. Rational to this strategy was in the environmental sense, however, this campaign to shift technology from conventional to modern also brought new problems, what we call "structural constraints."*

Keywords:*Constraints, Cultural heritage, Lambanog, Technology-sharing, Technology-shifting.*

INTRODUCTION

Local enterprises, like the small-scale and rural-based *lambanog* industry in Infanta, Quezon, continue to natural calamities, environmental hazards, and unstable economic returns. Relegated to the margins and regarded as informal economies, these industries have also experienced difficulties in gaining access to material and human resources, thwarting efforts to become responsive to the demands of the current market place. Moreover, recent attempts by outside enterprises and government agencies to encourage local distillery workers to adopt modern technology has met with general resistance.

Further, *lambanog* production process significantly vary among distilleries and quality is not maintained and or set beyond the standard level in other countries. As well, producers experience various constraints in keeping *lambanog* enterprises profitable. These constraints include the lack of training for *lambanog* processors, the lack of facilities for distillation process, and the non-implementation of quality standards in *lambanog* production. Since most of the distillers inherited the business from their families, the only training they have acquired comes from their informal, day-to-day exposure to the production and management of the industry, not from formal study of business practices. Likewise, there is no standard package and label for *lambanog* products as the wine is commonly stored in a plastic container. Customers need to bring their own containers where the drink can be transferred to when bought [1].

Surprisingly, despite these dilemmas, the *sasa lambanog* enterprise in Infanta manages to survive. Threats posed by environmental constraints (weather conditions, shortage of raw materials), technology (the shift from conventional to modern), and structure (the government policies on the multiple use zone for livelihood) have not dampened local *lambanog* production. In fact, over the years, the number of distilleries has increased, a few of them diversifying

the product line by switching from *lambanog* making to the production of honey or vinegar from the same source material, the nipa sap. What keeps distillery workers undaunted in the face of many challenges?

Some forces keep the industry intact, and one such force, taking a cue from the sociologist Mark Granovetter [2], points to the quality of relations found among social actors in *lambanog* production. We can thus also hypothesize that *lambanog* production has survived because of an adaptive strategies performed by local industry owners or producers as well as by individual workers.

This paper focuses on how the *sasa lambanog* actors respond to the environmental and structural challenges.

The results of the study provides an account of the current state of the nipa *lambanog* industry in Infanta, Quezon and sheds light on the socio-economic practices that have received Little attention from the government agencies and social science researchers. Further, the underlying experiences of the *lambanog* actors relative to the indigenous wine production offers an interesting opportunityfor cultural heritage research.

OBJECTIVES OF THE STUDY

This study primarily aimed to determine the environmental and structural constraints faced by the actors in the nipa *lambanog* industry in Infanta, Quezon. More specifically, it aimed to determine the adaptive strategies constructed by the *lambanog* actors to sustain the local wine production.

MATERIALS AND METHODS

This study used an overall qualitative design using case study and field research. Within that mode, the researcher explores, describes and explains why the local industry has persisted despite environmental and structural constraints. This study was conducted into two barangays in Infanta, Quezon. The first site was in Barangay Tongohin.The researcher chose it because it was her birthplace, a resident for seventeen years, and has ready access to key informants (KIs). Most of her key informants are community residents and farmers, thus enabling the study to obtain first-hand documentation on nipa *lambanog* making and establishing good rapport with them.The second site was in Barangay Binonoan, approximately 3 kilometers away from the first village. It is well known for making *lambanog*, and for having conventional and modern equipment. It has also a registered cooperative and a formal or registered *lambanog* enterprise. Further, it is one of the declared mangrove barangays following the guidelines set by the Multiple Use Zone (MUZ) program by the Department of Environment and Natural Resources (DENR) in 2012. This barrio is also recommended by the Municipal Environmental Natural Resource Officer (MENRO) for research on the *lambanog* industry.

The key informants for this study were the *lambanog* actors who worked and made themselves available during fieldwork. Permissions were sought to obtain photographs and video recordings. A few names were changed in direct quotes to insure anonymity as some key informants preferred to remain unidentified. There were no existing documents in the barangay office to trace the exact locations of the distilleries and to secure a list of distillery workers. Thus, to identify the location of the distilleries and the names of the workers involved in the nipa *lambanog*-making, snowball sampling was used. A key informant was asked to identify other key informants who, in turn, would identify another informant, and so on, until 41 available key informants in the 15 distilleries were located.

Thirty- five of the key informants were males and 6 were females. The 35 males were the 9 distillery and palm plantation owners, 1 plantation owners, 1 conventional distillery owner and 1 modern technology innovator, 10 cooks, 7 sap gatherers, 2 buyers and 4 consumers. The 6 females were 1 cook, 1 distillery owner, 1 former cook and a distillery and nipa palm plantation owner, and 3 buyers.

RESULTS AND DISCUSSION

The Environmental Constraints

"Throughout the human existence, weather and climate have played a decisive role in where and how cultures have developed. Climate's influence on agribusiness is as it is most evident with wine production where it is arguably the most critical aspect in ripening fruit to its optimum to produce a desired wine style" [3]. Similarly, environmental challenges, notably weather conditions, salinity, flooding, the aging of nipa palm trees, and the location of the distilleries, affect *lambanog* production. Table 1 lists these difficulties, disaggregated by the number of times each was mentioned by specific groups of actors involved in *lambanog* production. Chief of these are weather conditions and the salinity of the water.

Table 1. Environmental Constraints Reported by Group Involved in Nipa *Lambanog* Enterprise

Constaints	Frequency of Mention					Total	Percent
	Owner	Sap Gatherer	Cook	Buyer	Consumer		
Weather condition	9	7	6	0	0	22	30%
Salinity	4	8	6	0	0	18	24%
Flooding	3	7	3	0	0	13	18%
The Aging of Nipa Palm Trees	7	4	1	0	0	12	16%
Location of Distilleries	2	3	1	2	1	9	12%
Total Responses/Percent	**25**	**29**	**17**	**2**	**1**	**74**	**100%**

Changing Weather Conditions or Climate Change

Table 1 shows that, 30 percent (22 out of 74) of the *lambanog*actors cited weather condition or climate change such as prolonged dry or rain seasons, to have an adverse effect on *lambanog* production. Most of these responses came from owners and sap gatherers. One of the sap gatherers say:

> "*Nipa fruits produce a higher sap yield during the wet season but yield only little alcohol content. When the dry season comes, there is only little amount of sap gathered, but has more alcohol content, therefore producing morelambanog."*

The highest level of maturity of nipa fruits comes from October to November when rainfall is also more intense. Rainwater merges with the nipa sap inside the bamboo tube during sap extraction, diluting the sap, and thus produces a small amount of *lambanog*. Ascan and others [4] note that in a study of coconut *lambanog*processing in Liliw, Laguna, "the lack of supply of tuba during rainy season has been the major problem of all the coconut *lambanog* processors. The quality of tuba is affected when it is mixed with water and therefore the quality of coconut *lambanog* also suffers."

Similarly, in a study of grape wine industry, Mozell and Thach [5] observes that "any shift in climate and weather patterns may potentially affect the wine industry, especially, the change in grape chemistry and the quality of wine. As such, "minor shifts in seasonal temperature can make the difference between a poor, good, or excellent vintage, colder - than normal temperatures lead to incomplete ripening with high acid, low sugar, and unripe flavors." Grapevine prefers to grow in a temperate climate. It evolves with warm, dry summers and mild winters. Nipa palm, by contrast, is a tropical plant. The average minimum temperature in its growing area is 20°C and the maximum 32-35°C. Its optimum climate is sub-humid to humid with more than 100 mm rainfall per month throughout the year [6]. The grapes and nipa fruits are both sources of wine, grow in different regions of the world, and both are affected by climate change. Indeed, "wine's future is tied inextricably to a vital Earth and a vital population. Grape growers and winemakers must understand both the condition of the planet and the small, but significant, role their industry holds in the human matrix. They must seek, therefore, in a responsible manner, their proper and effective role in the adaptation to and the mitigation of global climate change" [5].

Salinity

According to Noor, Batool, Mazhar and Ilyas [7] "salinity is one of the major environmental problems affecting plants of different regions of the world." High siltation disturbs the life cycle of mangrove trees which leads to a rapid decline of the forests and stunts the growth of plants. In contrast, salinity produces a positive effect on the roots of the nipa palm trees. As another sap gatherer elaborates:

> *"The nipa fruit produces more sap when the roots of the nipa palm trees are accessed by fresh water from Agos River. If the roots of the nipa palm trees reached by saltwater, only a small amount of nipa sap can be obtained, but one with a higher more alcohol content, so, a better lambanog can be produced."*

The effect of salinity in the alcohol content of the nipa fruits ranked the second most frequently mentioned environmental constraint, attested by 24 percent (18 out of 74) of the informants, most of whom were owners, sap gatherers and cooks. One of the conventional distillery an owners explain:

> *"If a nipa palm tree is reached by salt water, we can have one and a half containers of lambanog; if not, we can only have one or three fourths of acontainer of lambanog, that's the difference."*

Scientific evidence supports the foregoing observation. Hossain and Islam [8] for example, state that "*Nypafruticans*is a species best adapted to grow in mangrove coastal areas with moderate salt load." Further, "*Nypafruticans* can grow well if a low salt

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concentration exists in the soil solution [9].” Science thus matches local knowledge

Flooding

Flooding can lead to plant death at the seaward mangrove margins. It also shifts species composition, ultimately leading to a reduction in productivity and ecosystem services. Thus, a five - meter rise in sea level will inundate some of the planet’s greatest vineyards and wine producing regions. A flood this size can include portions of Bordeaux, Portugal, New Zealand, Australia’s Swan district, and California’s Appellation [10]. Added to the coastal flooding, heightening levels of salinity in ground water will also damage vine growth in more inland waters [7]. In Infanta, 18 percent (13 out of 74) of the key informants cited that flooding as another environmental constraint to the production of *lambanog*. As one of the conventional distillery owners describe it:

> *“Sometime typhoons come during the extracting season of nipa fruits. There are chances that only a little amount of tuba will be collected because the nipa plantation has been severely affected by flooding.”*

In a situation like this,*lambanog*workers will have to wait for the level of water subsides to be able to collect pure *tuba.* The distillery owner adds:

> *“The seawater and rainwater will reduce the alcohol content of the tuba. The standard 70 to 75 proof will not be reached with seawater contamination. Lower than 70 proof makes the lambanog taste sweet. However, at more than 80 proof, the lambanog will be strong, which is not good for the health of the drinkers. The alcohol content then must not exceed 75 proof, because it is on this measure approximates the taste we are known.”*

A study of Matsui, Okimori, Takahashi, Matsumura and Bamroongrugsa[11] on nipa sap collection, production and farm management in Thailand confirms this. The authors state that “the sugar production from nipa sap was low during rainy season (December) owing to water inundation and in May owing to the decrease in the number of fruit clusters caused by damage to flower buds during the rainy season.” They conclude that “inundation affects the growth of fruit stalks and decrease sugar production during rainy season. This indicates that the growth of fruit stalks is regulated by water, suggesting that, it is vital to find adequate water condition for fruit stalk growth and for a higher sap/sugar production.” While this study deals with the effects of flooding on sugar production, a similar experience occurs in *lambanog* production.

The Aging of Nipa Palm Trees

Matsui and others [11] found that nipa farming in Thailand started over 100 years ago, during which sap has been continuously collected without replanting and fertilizer use. Thus, the length and diameter of fruit stalks were correlated with sap production. Higher sap production was found in the thicker and longer fruit stalks of the younger trees. In Vinzons, Camarines Norte, Rasco[12] similarly noted that for 100 years, the nipa palm trees in the area were never nurtured systematically. Moreover, the date of planting was never recorded because nipa palm trees grow naturally in the coastal areas. Clearly, however, the age of the palm trees reduced the amount of sap that can be extracted from the palm fruits.

In Infanta, 16 percent (12 out of 74) of the actors reported that nipa palms are getting older, yielding less sap. One of the modern distillery owners share his experience:

> *“In the past, I was able to get 40 containers of sap every day, but at present I only get 12 containers. That’s a big problem as other nipa palms are now getting older, lowering its fruit bearing ability. If we cut too much stalk to extract sap, the nipa palm trees die.”*

In the same situation, study of tea production in Brazil found out that “the age of tea is one of the factors associated with its declining productivity and reducing quality.” What is true for tea applies to the experiences of key informants in the gathering of nipa sap [13].

The Location of the *“Lutuan”* or Distillery.

Twelve percent (9 out of 74) of the*lambanog* actors said that location, *layo*or *lapit*, or the distance or proximity of the distillery from the house of the owners to the mangrove, is another problem, though a minor one, for *lambanog* workers. According to the sap gatherer in the modern distillery:

> *“It’s painful on back and neck when lifting containers of sap from the nipa palm plantation to the distillery (modern), back and forth…It would less of a problem if the*

distillery is located in the mangrove area, then it would be easy to collect sap."

However, a cook in the conventional distillery, takes another view:

"Using a boat, the river serves as an alternate route, aside from the path in the rice fields, to bring the lambanogshare to the house of the distillery owners, sap gatherers and buyers. But if the distillery is far from the house of the owner, sometimes our equipment's get stolen, so, we have to stay here and watch while cooking."

Comparing the location of the conventional and modern distilleries, the owner of modern distillery cites several conveniences:

"The modern distillery is beside the road and near the owner's house, so the owner can guard his cooking equipment. It also closely located near the water supply, so a water tank powered by electricity can be put up. As well electric light can be installed, if needed especially when distilling liquor at night."

Since the modern distillery is along the road, the transportation of rice hull is also made easy. From the rice mill, the rice hull can be transported via tricycle to the owners' house or directly to the distillery. A conventional distillery, situated along the river, also has an advantage, a woman conventional distillery owner, contends:

"Many would like to cook in our traditional distillery compared to the new one. Because we are near the brackish swamp, so cooks don't need to fetch water to be brought in the distillery. Water is also free; fuel is also available within the area."

In the distillery site, water coming from the swamp is directly used to facilitate the conventional distillation process. Although the distillery chamber is covered, it is highly possible that swamp water will mix with the *tuba*, and result in a bacterial contamination of the *lambanog*. Some key informants relayed to the researcher stories about the times they suffered from nausea and diarrhea after drinking *lambanog* that has been accidentally diluted with swamp water. The lack of clean water supply used for the distillation process in the conventional equipment makes the area unhealthy and the product unappealing to many buyers,

Moreover, building a conventional distillery in the mangrove area may lead to an exploitation of the environment. For instance, the cook uses wood as fuel which can easily be obtained in the mangrove. Because local authorities may not strictly monitor the *lambanog*actors' daily activities, these officials have no way to know if the cook only use discarded pieces of wood or plant a replacement tree if a mangrove plant was used for fuel. This environmental hazard can only be determined accurately through base satellite images consolidated by the National Mapping and Resource Information Authority (NAMRIA), and also through actual site inspection visits. Ironically, *lambanog* actors have learned to appreciate one advantage of a natural calamity. Heavy rain and floods, to take a specific example, brought measures to lessen the cutting of trees. As one key informant reports:

"In November 29, 2004, when flash floods swept Infanta, the mangrove areas littered with drifted logs, uprooted trees, and mud. Our entire livelihood perished and most locals were left with no means to regenerate income for several days. And because nipa palm trees lost their leaves, no raw material was available to make shingles as roof for our houses."

This tragic experience, however, prodded local government officials to conceptualize and adopt a forest land use plan (FLUP) in Infanta. As well, government and organization leaders promoted the shift in distillery technology from traditional firewood to a modern rice hull. This shift eliminated the need to cut trees in the upland and lowland forests for use as fuel. Rational to this strategy was in the environmental sense, however, this campaign to shift technology from conventional to modern also brought new problems, what we call "structural constraints."

The Structural Constraints

In general, the evolution of wine industry can be understood through the interplay of geography, climate and natural conditions, changes in demand and supply markets, state policies, technological improvements and social relations [14]. On a specific context, however, the origin of *lambanog*production can be traced from the availability of raw materials and the close interactions of people with nature. The *lambanog* actors formed a set of rules in the production process from the extraction to distillation, up to the distribution and selling of *lambanog*. Yet, the ability to compete with the larger market is limited

because of many constraints faced by the actors (see Table 2).

Absence of Organizations Exclusive for*lambanog*-makers

Twenty-two percent (31 out of 132) of the key informants cited that the absence of any organization exclusive for *lambanog*-makers. The opening of Binonoan Producers Cooperative (BIPCO) membership for all residents in Infanta created a division among workers in the distillery because a group wanted to have an organization exclusive for them. One of the *lambanog* cooks say: *"It is good if the organization is for lambanog-makers only since we know each other, we can also ask assistance to construct our own modern distillery as this will also augment our income."*

A modern distillery owner also asserts:

> *"If the outsiders will become members, these people do not know what we are doing here inside the distillery."*

Some of the *lambanog* makers expressed willingness to cooperate in any endeavor that would improve *lambanog* production, but only in an organization exclusive for them. Some also believed that *lambanog* production will prosper in this exclusive association because they know and trust each other.

As scholars have repeatedly cited, trust is "the major force behind the success (or failure)" of any social group [15]. Trust to each other guarantees social order in the distillery provided that production is supported by family, friends and neighbors within the village.

Their repeated interaction leads them to predict the behavior of others and ensures trust. It also "helps to reduce uncertainty" and motivate *lambanog* actors to work together [16].

No Formal Training for*Lambanog*-makers

Twenty-two percent (30 out of 132) of the key informants stated that they only had limited or little training and exposure in the production process with their families, friends and neighbors. This is similar in Velasco's [1] observation in Laguna that on the processing and production, there has been a "lack of formal training of *lambanog* processors, poor packaging and labeling, lack of facilities/equipment for distillation of *lambanog* and non-implementation of quality standards in *lambanog* production. There was also no standard packaging and labelling for *lambanog* products." Only the JVE Enterprise, manufacture the bottled and labeled *lambanog* in the study site.

Prohibition to cut trees for used as wood.

As shown in Table 2, there is 18 percent (24 out of 132) of key informants mentioned that "cutting down trees to get wood is now prohibited by law." However, some actors still cut *tabigi* (*Xylocarpusgranatum*), a kind of mangrove species, for wood. One of the *lambanog* cooks opine:

> *"Only piyapican be cut down, because it grows easily in the pakatan, unlike other mangrove trees). "*

Table 2. Structural Constraints Reported by Groups Involved in Nipa*Lambanog*Industry

Constaints	Frequency of Mention					Total	Percent
	Owner	Sap Gatherer	Cook	Buyer	Consumer		
Absence of Organization Exclusive for *lambanog-makers*	5	6	13	3	4	31	24%
No formal training for *lambanog-makers*	10	9	11	0	0	30	22%
Prohibition to cut trees for use as wood	7	8	9	0	0	24	18%
No stable income	0	7	8	0	0	15	11%
No fixed price of *sasalambanog*	2	3	3	3	2	13	10%
Expensive price of modern equipment	6	2	4	0	0	12	9%
Shortage of *bualaw* or rice hull for fuel	3	0	4	0	0	7	5%
Total Responses/Percent	**33**	**35**	**52**	**6**	**6**	**132**	**100%**

But there are limitations, as one of the local authorities pointed out:

"Piyapi is good as firewood, but they can only get the trunks or branches that are touching the river as these can obstruct the paths of a boat."

Further, the MENRO stresses:

"DENR says that any form of cutting in the timberland is prohibited, pawid or shingle will do, but according to Presidential Decree No. 105 they should have a transport permit. So, all forms of cutting are prohibited and that is also supported by the Executive Order No. 23, which intensifies the prohibition on the cutting of trees."

Although *lambanog* producers and workers are aware of the regulations concerning the prohibition on the use of mangrove for*lambanog* making, but, there are still existing conventional distilleries still use fire woods as fuel. Thus, according to the report of the committee on FLUP "timber poaching is still happening within the upland and mangrove part of the municipality, some are used for domestic consumption while other poachers use timber for livelihood" [17].

No Stable Income

Eleven percent (15 out of 132) of the informants revealed that "no stable income" can be expected in*lambanog*-making. One of the sap gatherers who earned below Php 5,000 a month says:

"Our income like weather is not stable."

When *lambanog*-making is not in season, farming and fishing are the alternative sources of income. But this shift in occupation is not always secure since the monetary returns on farming and fishing, like *lambanog*-making, vary by climate and weather fluctuations, not to mention population increase [17].

It is a great challenge for *lambanog* actors and local officials to find socially, ecologically, and financially sustainable solutions to deal with their unstable source of income. Effective planning and implementation in such a setting depends on inclusion of community resources; local knowledge, skills, and the integration of collective action for local adaptation, as well as, social capital – communities' cohesiveness and capacity for collective action – as a critical factor for climate change adaptation [18].

No Fixed Price of Sasa*Lambanog*

Ten percent (13 out of 132) of the key informants believed that no fixed price has been set for *sasalambanog* – and this fact has been a constraint to expand their business. The price, they say, rises when the supply of nipa sap used to distill *lambanog* is plentiful, but fluctuates when the available supply is low. This fluctuation occurs because nipa sap is extracted on a seasonal basis and distilled at the most appropriate moment. *Lambanog* enters the market at the same time of distillation with the price being determined by the market, not by the *lambanog* workers and producers.

Only the*sasalambanog* bottled by JVE Enterprises has a fixed price in Infanta. The bottle has a label, has a Department of Trade Indusrty (DTI) business permit, and is recognized by the Department of Science and Technology (DOST) as a qualityproduced *lambanog.* Velasco [1] finds a similar situation in Laguna where the "prices of *lambanog* vary depending on competition," and adds that "the wide range of selling prices as imposed by the wholesalers make it impossible for high-priced *lambanog* products to sustain the production. This is due to the increasing number of distributors compounding pure *lambanog* with water or other chemicals to lower the cost." The absence of a fixed price for *sasalambanog (*except the one manufactured by JVE Enterprise*),* reflectsthe inability of most local producers to commercially bottle the product, making it difficult for these producers to introduce to bigger markets. But the low price and the good taste of their *lambanog* keep local producers in business, and for this reason, this factor was not perceived as a major constraint. As one of the *lambanog* retailers say, "aside from *lambanog's*cheaper price as compared to other liquors, some customers still look for our product because it tastes good."

Expensive Price of Modern Equipment

Nine percent (12 out of 132) of the study's informants cited that modern equipment is expensive. In conventional equipment, surplus materials like lumber and tire can be used, however, in modern equipment, stainless, ply board and other parts can be purchased in the hardware. The conventional distillery maker remarks:

"The modern distillery is better, but the big problem is money, the price of new equipment is expensive, the materials are costly, more than one hundred thousand pesos!"

Another *lambanog* actors shared the same views:

"Similar to those who have a small area of sasahan, it's difficult to recover the huge investment if we are asked to build a new distillery" - sasahan owner

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"They said that the stainless distillery is expensive, anyway the process is almost the same, both the old and new (distillery), so there is no problem with us" - cook in a conventional distillery.

Some *lambanog* actors wanted to enhance their production process by using modern equipment, but they are constrained by lack of financial resources. In contrast, those who own nipa palm plantations, farmlands and have more financial capital can afford to build a modern distillery. Others who lack these resources still resort to the conventional practice of producing *lambanog*.

Shortage of *Bualaw* or Rice Hull for Fuel

In addition to the above constraints, a similar 5 percent (7 out of 132) of the key informants reckoned that the supply of rice hull, made available only during harvest of *palay*, is another important impediment to*lambanog production.* One of the modern distillery owners confirm this point:

"Poultry farm owners also use rice hull, that's why it's hard to look for a sack of rice hull. If there is no available rice hull, we follow the traditional distillery method where wood is used for fuel. Just as we did in this month of September when there is no rice to be milled, its supply is limited, but too expensive, fifteen pesos per bag. Its still additional cost as six bags of rice hull are consumed in one cooking. If we use the traditional distillery, we can only use piyapi, a kind of wood that easily grows and has many branches, so we could have a good supply in a year".

For the *lambanog*actors, regular using of rice hull will create shortage of supply within the area. Looking for another supply is far and socks of rice hull is also additional expenses. But, MENRO says:

"There are many sources of rice hull, like in Laguna, Rizal and other nearby towns."

The innovator of modern equipment also shared his views:

"Using rice hull sustains lambanog making. It provides more opportunities for relatives. Many are involved in the collection or buying of rice hull, tricycle drivers help out by naming the location of the rice mill…the use of rice hull will create labor, there are also canvassers who look for the rice hull to be sold."

Overall, some producers and workers refrain from the used of rice hull, but at the end, they adhered to the authorities. Thus, the findings show that *lambanog* production thrives through the collaboration of the *lambanog* actors, local officials and concerned individuals to enhance nipa *lambanog*-making.

Adaptive Strategies

Adaptive strategies seek to untangle the forces or constraints that *lambanog* actors face in their work. In Infanta, these strategies have been formed by actors through collaborations with local authorities and the BIPCO in order to preserve the environment and sustain *lambanog* production. These include the adoption of a proposed mangrove zone, technology-shifting, technology-sharing, and combined technologies.

The Proposed Multiple Use zone (MUZ)

Binonoan has been assigned a Community-Base Forest Management Area (CFBM) by the MENRO and the DENR managed by the BIPCO. CBFM was based on the map and other geographic features analysis made by the DENR, the MENRO, and the LGUs of Infanta. They define a MUZ for the management of protected areas where settlement, traditional and/or sustainable land-use including agriculture, agro-forestry, and other income generating or livelihood activities like *lambanog* production, may be allowed to operate consistently in accordance with the Infanta's Forest Land Use Plan (FLUP). The MUZ also included areas of high recreational tourism, educational or environmental awareness values, and areas with existing installations of national significance such as facilities or structures for renewable energy, telecommunication and hydro-electric power generation, among others. In determining the MUZ, special cases are considered. Timber extraction is prohibited, while the collection of non-timber products is regulated within MUZs. Land titles prior to the proclamation are duly recognized. Road easement of 60 meters as prescribed by the DPWH is considered within the scope of MUZ. Thus, agro-forestry shall be promoted in MUZ as a source for alternative livelihood [17].

Accordingly, in the proposed mangrove zone, the Fishpond Lease Agreements (FLAs), and privately owned nipa stands are considered to fall into MUZ. Production will be allowed in the area; however, while prescriptions are set to regulate activities within the areas. The showing of FLAs permit and the submission of reports to the Bureau of Fisheries and Aquatic Resources (BFAR) are strictly implemented.

Expansion of nipa plantation is also prohibited, as well as the construction of fishpond. As the MENRO says:

> *"It's fine to do clearing (cutting of trees), but they should have authorization from the DENR. No worries because the local government understands their livelihood, that is also why the Forest Land Use Plan answers them. At present, it has to be processed; DENR will declare first where the production area is, the MUZ and the protected zone—this is what the FLUP Committee is doing now. We will start from one of the barangays, we will gradually orient them to start the declaration that a particular area is declared a MUZ. FLUP identified them already; we just need to reconstitute the FLUP with the DENR. So, before we declare them (MUZ), we would have to restore first the denuded area. We started in a Barangay, it will be commenced by a resolution ordinance that will declare the production area of lambanog."*

The FLUP takes into account recent local and national developments, as well as the vision, plans and investment activities of the municipality. The rehabilitation and conservation of almost 3,000 hectares of mangrove forest is included in this plan. Mangrove is an alternative source of livelihood by the communities, it is use as fishpond for example, and most of all, the source of *lambanog* production. For this reason, a MUZ should be declared clearly by Local Government Unit (LGU) officials. As one of the local authorities in Binonoan says:

> *"All Barangay Councils of Binonoan, including the DA, DENR and MENRO were planting mangrove in the forest every month of July. There is a barangay ordinance prohibiting the use of firewood as fuel in cooking of wine."*

Currently, the exact location of the proposed MUZ and the Nipa *lambanog* buffer zone has not yet been clearly identified by the LGUs in the study area. But tree planting activities and mangrove rehabilitations are conducted. BIPCO members and JVE enterprises, in turn, support this local and national government environmental project. Technology-shifting and technology-sharing have also been promoted by the BIPCO, the innovator of the modern distillery, LGU officials and the MENRO. As well, altérnate distilleries (conventional and modern) were also applied by some distillery owners to solve problems in the shortage of fuel.

Technology-shifting from Conventional to Modern Improve the production process

The introduction of modern distillery in the village was generally accompanied by hesitation, resistance, and then, acceptance. The innovator of the distillery equipment tells:

> *"In the first two years, the lambanog workers reacted negatively to the construction of a modern distillery, for the reason that they do not know how to operate or use the new equipment, and thought that if the BIPCO alone will cook the lambanog, how about their livelihoods? But, it was gradually accepted by them. As of now, they already have seven modern distillery owners."*

Traditional technology like what is embedded in the village, but its use has shown to be problematic. As the innovator emphasizes:

> *"The use of the conventional technology is an enormous threat to the mangroves, because they are the source of firewood used in the traditional distillery, so, we develop an intervention or modern technology to solve the threat. Modern technology is also the way to improve lambanog production."*

The *lambanog* actors are willing to use modern equipment but are hindered by several excuses. A woman conventional distillery owner expresses some of them:

> "*We have plans of having a modern distillery because the use of firewood will not last a lifetime; it's just that we have used the allotted money for farming, and so failed to have one made. A barn will be build first, but a little taller than the previous one because it is a must for a rice husk fueled distillery."*

Local government officials also pushed for this shifting from a traditional *lambanog*to a modern distillery. The Secretary of Barrio Binonoan says:

> *"If everybody will use a rice hull, then the woodland will be beautiful and protected, likewise the cook will not be exposed to too much heat. Gathering of firewood is also a hard work!"*

The MENRO concurs:

> *"They should convert from the use of conventional equipment to modern stainless and the use of rice hull as fuel. Until now*

the law enforcement of the DENR, Municipal Office, LGUs, and community participation continues. There are no exemptions to the law like the use of piyapias fuel wood."

The BIPCO, LGUs and other local leaders continue to campaign for a prohibition on the cutting of *piyapi* and other mangrove trees through seminars and environmental awareness programs. They also promote the use of modern technology to improve *lambanog*production. Following this campaign, some conventional distillery owners that can afford new materials shift to modern technology. Since the distillation process is the same with the traditional method, *lambanog* cooks can easily cope with the new equipment. A former traditional *lambanog* cook says:

"It is better to cook in a stainless tuong. It's quick, you cannot get close to the fire, you just push a button and the water from the tank appears - no need to pour water on the tumbok. The lambanog-sharing arrangement is also the same, however, lambanog is better cooked on fuel wood."

It is clear that technology plays a vital role in people's livelihood. It also has a significant impact on the taste preference of the locals, and shapes the work habits of *lambanog*actors. For instance, locals embed on the taste and odor of *lambanog* distilled using conventional technology, but distillation on the modern technology makes actor works easier. Further, the same *lambanog* sharing arrangement of the *lambanog* actors prevail either in traditional and modern distilleries. Thus, shifting of technologies did not only improve the production process, but it also enabled social actors to support and provide services for one another.

Technology-Sharing BringsBenefit to Members

BIPCO also introduced technology-sharing strategies that helps to lessen the cutting of mangroves for fuel. The president of the BIPCO, elaborates:

"Members like sap gatherers can bring nipa sap here in the BIPCO distillery to cook. Same lambanog-sharing system, 2-2-1. The first 2 plastic containers of finished products are for the may-ari. The second 2 plastic containers of finished products are for the mangangarit. In the fifth distillation, half container of the finished product is for the magluluto, and half for the BIPCO. BIPCO's share are for the expenses, like electricity and rice hull. Members also have a share in the accumulated incomes of the cooperative."

Further, the president of the cooperative also observes:

"We will also worry that if all members from the other barrios bring their nipa sap in this distillery, the cooperative will not be able to accommodate them all. *We hope that whenthe cooperative will become bigger and acquire more modern equipment, it will be able to serve and assist all of its members."*

The BIPCO's encourages all *lambanog*actors to be members of the cooperative. Thus, by redistributing a part of its rent or share to its stakeholders, the cooperative will establish its reputation and encourage greater participation.

Combine Technologies; Other Ways to Sustain the *Lambanog*Production

Since a prohibition stands on the cutting of mangroves and timbers, and with this, a shortage in the rice hull as well, three of the distillery owners have used combine distilleries, traditional and modern, to sustain production. One of the combine distillery owners say:

"*It's better to be ready. The distillery fuelled by firewood might be totally banned, but we have already made a distillery fueled by rice hull. During harvest seasons and have rice mill and rice hull, the modern distillery is used. If there is no rice hull, then, the old one can be used."*

These alternate technologies cope temporarily with the problems of using fuel wood for *lambanog*production. Yet, the social actors are hoping that the local government officials can also help them find a more stable solution in using rice hull to replace wood for fuel. One of the conventional distillery owners makes this appeal:

"If the use of wood will be totally prohibited, we are hoping that authorities will help us to solve the shortage of rice hull, otherwise, nipa sap will be wasted, they cannot totally ban lambanog-making, it is the source of our livelihood and heritage."

Thus, MENRO shares this concern:

"An alternate distillery is good but they must try first to change all conventional distilleries into modern, and then we will take action or find solution on the problems regarding the use

of rice hull. We all know that we cannot stop residents from making lambanog, because it's the primary and secondary sources of their income. However, they must also continue to cooperate with us to sustain their livelihood without damaging the environment."

By being mutually responsive to each other's needs and expectations, local authorities and *lambanog*actors, have managed to build a level of trust among themselves. This sense of trust has also facilitated the exchange of information and a measure of solidarity among them. Trusting relationships, thus, act as a unique impetus to collective action. Moreover, cooperation between local authorities and *lambanog* actors create value for the environment and sustain livelihoods. Social capital has thus enabled *lambanog*actors within enterprises to act together more efficiently "to pursue shared objectives" (Waite and Williams 2009:502) with the support of local authorities. Over time, habits of trust and cooperation embed social capital in *lambanog* production, enabling the enterprise to sustain itself despite the environmental and structural constraints.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it is concluded that despite of environmental constraints, *lambanog* production thrives because nipa palmtrees grow abundantly in the mangroveareas. Nipa has also high adaptability to floods, various environmental conditions, and effects of climate change.

Moreover, faced with structural constraints, the *lambanog* actors, BIPCO and local government officials have formed adaptive strategies such as the technology-shifting from conventional to modern, and the technology-sharing arrangement to sustain the *lambanog* enterprise.

In the light of the significant findings, five recommendations derived from this study:

1. Establish an organization exclusive for *lambanog* working groups through community organizing with local policy making bodies and sponsoring agencies.

Exclusive organization is important for the *lambanog* actors as a major step in building the trust with authorities and sponsoring agencies. Beckert [19] also suggest that "trust and network ororganizations closure help store solve various constraints" in the industry. As well, participatory planning which incorporates the working groups into policymaking bodies and stakeholders will help provide capacity-building skills that will strengthen the self-help efforts of the *lambanog* workers. More importantly, livelihood opportunities should also be crafted by the new organization so that there is an alternative income if in case the *lambanog* production was not in seasoned. In addition, being a legitimate formal organization, *lambanog* actors may have useful contacts and networks which may lead them to acquire modern equipment. Also, tapping a larger network, as Granovetter [2] suggests, also helps the *lambanog* industry thrive in a competitive economic environment.

2. Strict implementation and monitoring of multiple use zone (MUZ). Local entities could tap people's organization and barrio enforcement team to intensify the monitoring of livelihood activities in the MUZ. As well, strict enforcement of regulatory policies and laws and clear sanctions are needed to protect the mangrove forest while continuing *lambanog* production. The local authorities should direct and be mindful on the rules stipulated in the FLUP to identify the exact location of *lambanog* production sites. Moreover, reviewing and updating several laws and policies in relation to the mangrove conservation may also shape the *lambanog* industry—that is by converting traditional technology into a modern one to avoid the cutting of woods in the area.

3. Lectures on climate change adaptation and mitigation, and disaster risk management.

Following on the local government mandates, this study also recommends information dissemination or follow-up lectures on climate change adaptation and mitigation, as well as on disaster risk management to *lambanog* actors. These sessions will help enlighten them on the forces that create the environmental or structural constraints they have experienced or may experienced in the future. Building their capacity to adjust to climate-sensitive activities will reduce their vulnerability to climate changes that occur, and make them more aware of the importance of using modern technology where they can protect nature and at the same time sustain the industry.

4. Include *lambanog* in the promotion of cultural heritage.

Heritage promotion might be conducted through making brochures, flyers and/or videos promoting the local culture and indigenous knowledge of *lambanog*-making process. There is a need to document these embedded traditional norms and practices to inform others and the future generations. This study also suggests to include in the flyers or brochure the

ingenuity of *lambanog*-making process. This information might recreate and transfer people's memory across generations and make it available for both local visitors and international tourists.

5. Further research in other *sasa* or nipa lambanog distilleries, as well in coconut *lambanog* distilleries found in other parts of Quezon. Equally helpful are studies on other small-scale local industries, particularly those that preserve facets of cultural heritage. Knowing what embeds these industries will help craft strategies for maintaining these enterprises and sustaining cultural assets.

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