

Design of Nipa Leaves Weaving Machine

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ABSTRACT: Nipa weaving is a traditional industry. However, modern roof products in the market could make the industry vanish. Thus, to improve its operation is necessary. This study was aimed to design a nipa weaving machine. The specific objectives are: to describe the economic contribution of the industry together with the problems it is facing in Southeast Asian country; to describe how the weaving operation is conducted; and make a design of the machine. The data were gathered through literature search. The design was presented through isometric drawing where operation of its parts was introduced and explained. Thatch making provides economic contributions to workers in different parts of Southeast Asia. However, problems are arising that if not be provided with appropriate actions could lead to a possible demise of the industry. Nipa thatching is using an old process which is done by hand with the position of the nipa weavers not in good condition. Hence, nipa leaves weaving machine was designed. Although hand weaving is still used, using the apparatus can speed up the preparation of the nipa leaves. Using the machine can place the nipa weavers in a healthy condition.

KEYWORDS: Nipa leaves, weaving machine, traditional industry, design, thatch making

I. INTRODUCTION

The use of building materials from plants are very beneficial to maintain the climatic conditions. One proper example is the roof made from palm leaves categorized as an environmentally friendly roofing material due to simple working tools, vegetative based material, man power use and preservation process through immersion in sea water [1]. Nypa fruticans (nipa palm) is one of the most widely distributed and useful palms in the mangrove forests of the South and Southeast Asia [2]. This palm is important for communities playing a central role for coastal and riverine people as part of maintaining a healthy coastal ecosystem, and for the goods that people make from the palm material [3],[4]. In Lagonoy, Camarines Sur, Nipa thatch is the common and ideal roof for rural impoverished and traditional Filipinos that being part of the Bahay Kubo, a national shelter of the Philippines, is considered as a cultural symbol describing a simple yet blissful Filipino family [5]. This humble thatch, locally known as tiklad, was extracted usually from common-pool resources of the community which is dominant among tropical countries, specifically, among communities alongside the river. Not only do individuals purchase shingles for their new homes or community buildings, but because the shingles last for only about 5-6 years [6], people are constantly patching existing roofs.

The main objective of this study is to make a design of nipa weaving machine. The specific objectives are the following: to describe the economic contributions in the industry together with the problems it is facing in the Southeast Asian

countries; to describe how nipa leaf weaving operation is conducted in the region; and make a design of nipa leaf weaving machine.

II. METHODOLOGY

The first two parts of this study used literature review. The economic contributions and the problems of nipa leaf weaving industry in different parts of southeast Asian regions were addressed as well as the process of nipa thatch making. Literature review was broadly described as a more or less systematic way of collecting and synthesizing previous research which is useful if the aim is to engage in theory development [7]. Literature reviews play an important role as a foundation for all types of research that can serve as a basis for knowledge development, create guidelines for policy and practice, provide evidence of an effect, and, if well conducted, have the capacity to engender new ideas and directions for a particular field serving as the grounds for future research and theory [8].

The information taken from the literature search strengthened the support if there is really a need to make a design of nipa weaving machine. The design was based from the principle of simple machine. Simple machine is a device with few moving parts used to modify motion or force to perform work [9]. The designed machine was made by providing an isometric drawing of the apparatus. Isometric drawing is considered to be a graphical representation of the product that does not usually used to give the important details needed in manufacturing process [10]. The different parts of the

apparatus and its functions was also described based from the presented parts of the isometric drawing.

III.RESULTS AND DISCUSSION

The economic contributions and problems encountered by the industry, mode of nipa thatch making and the design of the nipa leaves weaving machine are presented as follows:

A. Economic contributions and the problems

The scrutiny of the related studies and literature reflected that working with nipa leaves provide significant contributions to the economy of local workers in different parts of Southeast Asia. However, there are problems seen on the operation. This is shown in Table 1.

Table 1. Economic Contributions and Problems in Operation

Area of study	Economic contribution	Problems in the operation
Ayeyawardy, Myanmar	Profitable for small-scale farmers	seasonal business activity
Chaungzone, Myanmar	convenient source of livelihood	depletion of workers
Mon State, Myanmar	increase in the market prices of nipa thatch	impacted competitiveness against zinc sheets
Pak Phanang Basin, Thailand,	easy to sell as the demand was high	most of labor are aged 60 years with 21.33 years of experience
Bohol, Philippines	Very promising economic potential	production and utilization practices vary greatly from area to area
Kendari, Indonesia	Roofs that are suddenly sold to help the family economy	most people buy for the roof of a chicken coop
Panay, Capiz	nipa-related industries showed to have a great potential to develop.	low production relative to land area; traditional production processes; declining number of weavers and workers
Lagonoy, Camarines Sur, Philippines	Mostly are women in maintaining their tradition in thatch making	shift on market preference, political issues, environmental and societal concerns

In Ayeyawardy region in Myanmar, it was found that the average annual net income from trading nipa leaves, either as bundles or as sheets, was positive and profitable for small-scale farmers involved in the activity. It was found that

commercialization of nipa thatch is a seasonal business activity whose future may be undermined by customer preference for zinc iron roofing materials [11]. In Chaungzone township, Myanmar was found that Nipa palm thatch businesses is a convenient source of livelihood providing attractive income to locals. However, despite the fact that the demand is high, thatch businesses have observed a depletion of workers. The reason behind the scarcity of workers is related to a shift to other economic activities, mostly related to crop plantation [12]. This diminishing workforce for processing nipa thatch has pushed an increase in the market prices, impacting its competitiveness against zinc sheets [13].

According to a survey [14] related to nipa palm thatch production in Khanap Nak, in Thailand, there are four (4) farmers having nipa palm farms with thatch production at an average of 60 rows per day. Some of the farmers can produce as much as 100 rows per day with labor availability at an average of 1.5 workers, most of whom are aged 60 years with 21.33 years of experience. Regarding the choice of production, 50% of the farmers were found to use materials, such as nipa palm leaves. In dry season, the branches are trimmed and the trimmed leaves are used to produce thatch for sale and use in the community. The farmers also indicated that thatch is easy to sell as the demand was high. After the production, they sell the remaining trimmed leaves to the merchants in the community. More importantly, they can benefit from low production costs due to the availability of nipa palm leaves in the area.

In Bohol Island of the Philippines, It was found that its economic potential is very promising. However, production and utilization practices vary greatly from area to area that some producers over-cut while others have irregular harvests reflecting mismanagement of nipa production area [15].

In Kendari, Indonesia, the prices of palm leaves are economically comparable to how to get the leaves [1]. The cost of taking palm leaves was not calculated with the principle that the mother has a daily bustle. The roofs that have not been sold is like the act of saving while the roof that is suddenly sold help the family economy. The weakness of the palm leaves roofing is that most people buy for the roof of a chicken coop.

In Panay, Capiz, the status of the industry when benchmarked with other high earning nipa-related industries showed to have a great potential to be developed. It was found [16] that the future for the nipa industry may be considered not being at its brink but rather at its breaking through the boundaries of a traditional system and management towards a socio-economically and sustainable industry. It was also found that the problems in the industry are the low production of nipa shingles relative to land area; traditional production processes; declining number of weavers and nipa workers coupled with backward manpower skills. Markets had remained unchanged but challenged by the presence of new technologies and products; price mechanism dependent on

buyers and the declining demand for nipa shingles as roofing and walling materials.

Consequently, it was mentioned [5] that the significant role of women in maintaining their tradition in thatch making is struggling due to the shift on market preference, political issues, environmental and societal concerns, among others. It was further explained that thatch making as a livelihood may face a possible demise if the issues will not be addressed immediately. It was elaborated [5] that the community of Lagonoy, Camarines Sur, consisting of twelve (12) households are all engaged in thatch making with age ranging from 50 years old and above is quite threatening to their enterprise because commonly the children were no longer involved in thatch making. Most of their children preferred to migrate or work in other communities, in Metro Manila or even abroad, especially those who were able to finish schooling. The women thatch makers look for individuals outside the community who will do the harvesting. Conversely, the women are complaining about the cost of contracting an individual outside the community because aside from they are paying P250 (2.5 USD) per day by producing five (5) to six (6) bundles or locally known as “bugkos”, they are also giving packs of cigarettes, snacks, and lunch.”

Based from the gathered literature and studies, it can be deduced that by any means thatch making provides economic contributions to workers in Southeast Asian countries, however problems are arising that if not be provided with appropriate actions could result to a possible demise of the industry.

B. Mode of nipa thatch making

The mode of Nipa thatch making in the region is presented in table 2. The production process of Nipa thatch was as old as its history. In Palawan, Philippines, men harvest the palm materials by removing the oldest fronds, cutting the base a

Table 2. Mode of Nipa Thatch Making

Location	Mode of operation	Source
Palawan, Philippines	Men harvest and remove the oldest fronds by cutting the base few inches from the water. They also harvest the bamboo that serves as base for each shingle. Women do cut of leaflets and weaving or sewing.	Fadiman, 2008
Ayeyarwady Delta, Myanmar	Leaflet bunches of nipa palm are fixed in place by thin strips of bamboo that find the leaflets characteristics of being soft and easy to work. Its light weight creates less load on the house structure,	Ono & Suzuki, 2013

	and its morphology allows to drain water efficiently	
Bohol, Philippines	Nipa leaves are used as thatching materials for rural houses, green sheds, rest cottages and other small buildings	Carandang & Carandang, 1997
Burabod, Lagonoiy, Camarines Sur, Philippines	Males are in charge of harvesting nipa leaves that it includes cutting it to separate the leaves from the midribs while the female are in charge of of preparing the leaves, stick and string and weaving until it became a finished product.	Cerio, 2018
Kendari, Indonesia	the way of making is with the use of manpower, and preservation was through immersion in sea water.	Umar et al, 2017

few inches above the water while women will sometimes cut off the leaflets [17]. The men also harvest the bamboo that serves as the base for each shingle. While men do the harvesting, women do the weaving or sewing. After stripping a piece of bamboo to use as thread, the weaver folds the nipa leaflet over a stiff piece of bamboo, and sews it closed. Each nipa leaf is lined up next to one another, slightly overlapping and sewed onto the bamboo, which is then hung to dry. It takes about 65-70 leaflets for one shingle, which is about 2-3 fronds. After they make enough shingles, the family will lash them onto bamboo beams to make the roof. Where people live in nipa huts, a steady market exists. The main importance comes from the harvested nipa palm leaves which used for roof thatching and for walling [18]. Made of leaflet bunches of nipa palm are fixed in place by thin strips of bamboo that find nipa palm to be an optimum plant resource. Given the leaflets characteristics of being soft and easy to work, its light weight creating less load on the house structure, and its morphology allows it to drain water efficiently. Nipa leaves are used as thatching materials for rural houses, green sheds, rest cottages and other small buildings [19]. Males are in charge of harvesting a nipa leaves or locally known as pagsasagasa [5]. From the root word sagasá, it means the act of harvesting the leaves of nipa palm through cutting the leave’s midribs to separate it from the nipa trunk and cutting the leaves at its base to separate it from the midribs. The females, on the other hand, are in charge of preparing the leaves, stick and string and weaving until it became a finished product. After which, the females are commonly in charge of looking for customers and the males are in charge of transporting the product to the customer. However, this concept, somehow, changes as years goes. Since most of the males are busy with their livelihood such as farming, fishing,

employment from small and medium enterprises in town proper; most of them did not longer perform their function as mang-sasagasa (leaves harvester). Sewing process of palm leaves are as follows [1]:

“a) Bone roof placed on the abdomen side of the tailor. Directions sew in the roof of the bone is from front to back. When sewn from back to front, it is difficult to draw a leaf. All the sewing process roof of palm leaves is from front to back. Two leaves folded into leaves with half a leaf; b) The end of the bone is split as wide as the roof of palm leaves to clamp the first leaf. Gala rope in containers that aqueous should be at the sharp end has been made to be easily pierced leaf; c) Pinch the two pieces of palm leaves that have unfolded at the end of the bone roof. Leaves folded symmetrical; Gala rope stabbed from underneath. The leaves had been stabbed in the middle of the leaf sticks. Gala rope hand drawn high as tailors. Gala rope stabbed back at the first leaf. End of the rope in the middle of the rope inserted into a round. At the bottom end of the rope so that the gala was made knot tying a rope into a strong bond. Gala rope function in the first part was as the first leaf binder; e) Leaves both folded in the bones of the roof. The second leaf is folded over the first leaf. The layout of the first leaf and the second leaf placed each at a distance of half a leaf; f) Gala rope stabbed in the upper part. Gala rope from the top of the second leaf pierced from the edge. Gala translucent strap to the first leaf is in the middle of the leaf sticks. The position of the rope gala now is located at the bottom. Gala rope from the bottom stabbed from underneath the leaf till it reached the top. Gala rope plugged in while in the second leaf folding third leaf; g) Fold the third fastest in the bones of the roof. The second and third leaves each placed half leaves. The sewing process is the same as the process of sewing the first and second leaf. Gala ropes are depleted in the sewing process can be reconnected using the new gala ropes; and h) Gala rope at the last leaf folds directed to the back of the leaf. Gala rope then pierced from below. Gala rope from the bottom stabbed in the middle of the second leaf of the latter. The leaves are then pierced from the edge of the last leaf. Tie the leaf between the leaf to create strong ties knot of two belts so that the leaves that had been sewn not uncovered.”

The presented literature shows that the process of weaving nipa thatch is an old process and traditional. It was done by hand sewing going hand in hand while the nipa leaves are prepared for sewing. These actions were done with the position of nipa weavers not in good condition. With this situation it is necessary to design a weaving machine that if materialized could change the method of weaving nipa leaves.

C. The designed nipa leaves weaving machine

The design of nipa weaving machine is shown in figure 1. The apparatus may contain the following important parts: nipa leaves preparation area, nipa leaves weaving area, horizontal hole, push rods with bamboo stick handler, handle and hinges.

nipa leaves will be prepared for thatching while the nipa leaves weaving area will serve as the area that nipa leaves will be stitch or weaved. The horizontal hole is the part of the apparatus that the nipa leaves together with the bamboo stick will be positioned for stitching or weaving while the push rods with bamboo stick handler together with the hinges and

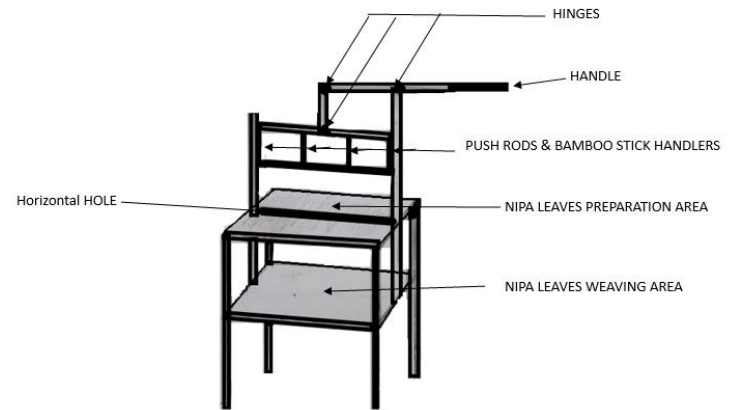


Figure 1. Design of nipa leaves weaving machine

handle will act as the simple machine that when they move will position the nipa leaves together with the bamboo stick ready for weaving. Although hand weaving cannot be removed with the designed machine, the highlight of the design is it can speed up the preparation of the nipa leaves and the hand weaving process. Using the machine can put the position of the nipa weavers in a thriving condition.

CONCLUSIONS

Based from the gathered literature and studies, it can be deduced that by any means thatch making provides economic contributions to workers in different parts of Southeast Asia. However, there are problems arising that if not provided with appropriate actions could lead to face a possible demise of the industry. In practice, nipa thatching is an old process and traditional which is done by hand sewing. The process is done hand in hand with the preparation of the nipa leaves for sewing with the positioning of the weavers not in proper condition. A nipa leaf weaving machine is designed on this study. Although hand weaving is still used with the designed machine, the highlight is it can speed up the process. Using the machine can help the position of the nipa weavers in good condition. The construction of the designed apparatus is recommended so that its usefulness in the operation be constructed, tried and tested.

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