Nipa thatching

Nypa Fruticans, also known as nipa palm or mangrove palm, is a trunkless plant that grows in coastal areas, tidal flats and brackish swamps in the Philippines (figure 1) , and in many other parts of the Pacific and South-east Asia. The leaves, or fronds, of mature palms can grow up to 9m (30ft). This information paper outlines how nipa leaves are harvested for roof shingle production in the Philippines, the existing supply chain in Yolanda affected areas, and good practices for using nipa in construction.

Typical applications in humanitarian shelter projects

- Roofing shingles Non-structural (figure 2)
- Walling (non-structural)

Figure 1: Nipa habitat near Tacloban City, Leyte. (Photo: K. Balson, Building Research Establishment Ltd.)

Figure 2: A shelter with coco lumber framing and nipa roofing in Tanauan, Tacloban, Philippines by NGO Green Mindanao. (Photo: K. Balson, Building Research Establishment Ltd.)

Background information

Advantages

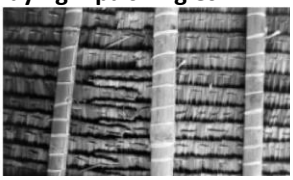
- Cost effective
- Easy to replace with minimum labour
- Locally available
- Purchasing nipa stimulates local economy and provides livelihood opportunities
- Good thermal insulation in hot, humid climates
- Lightweight, posing less risk to occupants during earthquake
- Good wind resistance; as it is permeable, nipa doesn't attract suction forces as high as corrugated galvanised iron (CGI) roofing
- Can be long-lasting if properly harvested, treated, stored and maintained and double-layered shingles are used (up to 10 years reported)

Challenges

- Requires regular annual maintenance
- Life span if not maintained (min. 1-3 years), but longer

Product size	**Common size:** 1200mm x 400mm (4ft x 1ft 3 in); Some regions also produce smaller / larger shingles. Generally sold in bundles of 25.
Types	- Ordinary (made from new leaves, more brittle) - Original (made from mature leaves, much stronger) *Prices vary accordingly from 4-10 pesos per shingle*
Availability	All year round, as nipa leaves are harvested at 2-3 month intervals. *Note: The frequency of delivery varies depending on the rate of harvest. Consider ordering additional sheets in advance for contingency during typhoon seasons.*
Suppliers	Mostly small scale shingle distributors: - Bohol Island, southern and northern Leyte, Samar, southern Cebu, Negros and Panay islands. - Distributors for Tacloban are from the towns of Sta.Rita, Samar Province, St. Bernard, Hinundayan and Hinunangan.
Alternatives to Nipa	Anahaw leaves (Livistonia roundifolia), cogon leaves, coco leaves for thatching, kaong (Arenga pinnate or sugar palm), rattan

• Increased fire risk • Often overlooked for lower maintenance materials such as CGI roofing		**Environmental considerations**	- Classified as a species of 'Least Concern' [1] - Ensure the supply is not sourced from sites listed under National Integrated Protected Areas System (NIPAS). - Wider issues to consider: Appropriate permits for harvesting, fair payment for shingle manufacturers and incidence of child labour.

Nipa roofing	
Nipa shingles	A shelter of 25m^2 roof area will require approximately 300 no, 4' shingles considering a 3" overlap. Ensure shingles are made with double layers of leaves; single layered shingles will last 1-2 years and will need to be replaced.
Roof frame	- In order for the water to effectively run off the roof (instead of soaking through the shingles and into the house), a minimum roof pitch of 40 degrees is recommended. ***It is mportant to note that this steep pitch may pose a typhoon risk if the nipa shingles are later changed for CGI or other non-permeable materials which attract high suction forces during strong winds.*** - In order to support the nipa shingles, good practice is to use bamboo splits in between rafters spaced 30-40cm apart. 3 classes of bamboo poles are available, the higher the class, the higher the number of splits. - To support the first layer of thatch fix a batten of ⏛60mm thickness along the length of the eave. Ensure rafters used can support 20-30kg/m^2
Fixings	- Shingles are tied to rafters using rattan (a type of climbing palm) ties; *Note: A tough black fibre locally known as "cabonegro" (gomuti) is produced from sugar palm to make rope and thatching for houses. Baling-uai is a vine with a slender stem, which can also be used to fasten shingles. Nylon fibre can also be used as a tie.* - Bamboo strips should be tied to purlins in order to increase their resistance to the uplift forces of strong winds.
Constructing nipa roof	
Laying nipa shingles  Figure 3 © The basics of biomass roofing	• Start at the low end of the roof and work upwards towards the ridge. • The closer the overlapping, the longer the life of the thatched roof; recommended maximum overlap is 7.5cm (3") end lapping tied to rafters and bamboo strips (figure 3); • Allow a maximum of 2-3" overlap at the roof ridges and hips.
Roof projection/overhang	Not more than 45cm (18") as recommended in the HSWG's *Build Back Safer Key Messages*
Joining roofing and walls	Prior to thatching ensure adequate tie-down (wire, rope or metal straps) is in place, tying rafters to vertical structural posts/roof beams following *Build Back Safer* design principles
Protecting the roof	**Termite treatment** – Solignum coating. Some organisations are experimenting with non-chemical preservative techniques by treating nipa with salt water (soaking in sea water) similar for coco lumber, for half a day; In some areas the shingles are smoked before installation. **Wind:** Metal ridge caps, barge caps and fish nets laid on top of the nipa shingles help to hold them down during strong winds.

[1] International Union for Conservation of Nature and Natural Resources, http://eol.org/pages/1137487/details

General tips
✓ Use only mature and dry nipa palm leaves to make the shingles
✓ Ensure nipa shingles are stored in dry location, as any exposure to moisture could lead to decaying of leaves
✓ The slope of the roof is a vital factor in its durability
✓ Soaking bamboo before nailing reduces brittleness when nailed

Some useful reference documents on nipa in the Philippines, Pacific and Southeast Asia	
Provides useful information from Bohol on roof shingle manufacturing practices in Philippines including planting guidelines, productivity and harvesting cycle.	Myrna G. Carandang , Leni D. Camacho , Antonio P. Carandang , Sofronio C. Camacho , Dixon T. Gevaa , Lucrecio L. Rebugio & Yeo-Chang Youn (2009): *Sustainable thatching materials production from nipa (nypa fruticans) in Bohol, Philippines,* Forest Science and Technology, 5:1, 17-22
Outlines basic principles of thatching using nipa, cogon, anhaw	Lubrica, Jose B. (1966): *Building Construction - House Wiring, House Plumbing and Estimating,* Quezon City, Philippines: Manlapaz Publishing Co.
These publications from the Ecosystems research and Development Bureau explain ways of sustainable land use management by integrating nipa shingle production with other livelihood activities by such as fishing.	http://erdb.denr.gov.ph/enr/t4t/agrinipa_0001.pdf http://erdb.denr.gov.ph/enr/t4t/aquasilvi_0002.pdf
P. 335, Table 11-14 provides an estimate on effective roof covering, no.of shingles and the amount of rattan required per m2 based on end laps for different shingle types.	Max B.Fajardo Jr (2000), *Simplified Construction Estimate*, Philippines: 5138 Merchandising Publisher
For further information on the National Integrated Protected Areas System (NIPAS) in the Philippines	Ecosystems Research and Development Bureau (2012), *Philippine Country Report on Forest Genetic Resources:* ERDB, College, Laguna. Ecosystems Research and Development Bureau and Food and Agriculture Organization of the United Nations http://erdb.denr.gov.ph/files/country_report.pdf
Outlines Nipa availability data for Mindanao region	Proceedings of the 1st ASEAN Congress on Mangrove Research and Development, December, 2012
A survey of Nipa Palm after Cyclone Nagris in Myanmar provides information on harvesting cycles in other parts of SE Asia.	http://sheltercentre.org/sites/default/files/Nipa%20palm%20Sourcing%20and%20Market%20Analysis.pdf
Published by Food and Agriculture Organisation, summarising the value of non-wood forest products (NWFPs) including bamboo, rattan to the economy	http://www.fao.org/docrep/x5334e/x5334e09.htm Regional Office for Asia and the Pacific, Food and Agricultural Organisation of the United Nations: (1994) *Non Wood Forest Products in Asia* http://www.fao.org/docrep/019/x5334e/x5334e.pdf
This study was implemented by Save the Children in Myanmar as part of their cyclone Nargis response. The EMMA pilot seeks to better understand critical market systems including Dhani (a palm-like thatching material), used in shelter construction.	Practical Action (2008): *Emergency Market Mapping and Analysis, Pilot Test 2, Myanmar July 15-31 2008, Key Findings and Recommendations* http://emma-toolkit.org/wp-content/uploads/EMMA-Myanmar-2008-Fish-Nets-and-Thatch.pdf
The Basics of Biomass Roofing	Hall, Nicolas (1997), *The Basics of Biomass Roofing,* SKAT, St. Gallen, Switzerland

Annexe: Additional Information on Nipa Shingle Production

The data given below is based on desk-based research, an interview with a local NGO Green Mindanao, references provided by the University of San Carlos and field interviews with 4 local builder's merchants/hardware stores and 3 carpenters in Tacloban City.

Nipa is readily available in coastal areas of the Philippines including southern Cebu, Negros and Panay islands. Bohol islands is one of the oldest producers of nipa and nipa shingles. Local NGO Green Mindanao stated that the Mindanao region has the potential to produce enough shingles for 500 shelters per week. This could be increased further by developing a region-wide supply chain for production, harvesting, drying, assembling and provision of suitable storage for contingency use. The data below from the Mindanao region highlights that there is an estimated 87.54 ha. plus about 4 km of nipa stands along the rivers in Jimenez municipality, Misamis occidental.[2]

Barangays	Nipa area (ha)
Oroquieta City	9.00
Aloran	35.54
Panaon	4.00
Sinacaban	29.00
Jimenez	4 km along the rivers
Tudela	10.00
Total	87.54

"A mature nipa plantation can have an average of 17,233 mature plants per ha. These mature palms are capable of producing an average of 51,148 shingles per year"[3]. Local sources in Tacloban are from the towns of St. Bernard, Hinundayan, Hinunangan, Sta.Rita and Samar provinces. Anecdotal references quote that these areas collectively can produce 20,000 pieces per week equivalent to 100 shelters (200 pieces per shelter). For Yolanda affected areas, healthy nipa swamps and farms are located mostly around Southern provinces of Leyte and Northern Leyte and Samar provinces. One NGO interviewed received enough shingles from Bohol to construct 100 shelters per week in the first 3 months immediately after typhoon Yolanda.

Nipa harvesting

In the Philippines the nipa shingle production season starts after the rainy season from December and continues regularly throughout the year at 2-3 month intervals. Using a bolo (sharp knife) all the branches are cut except one bud and a few young branches closer to the bud.

After the first harvest, nipa leaves take between 2-3 months to regrow to sufficient length for shingle production. The common practice in the Philippines is to harvest 2-3 times a year. Most regions do a second and sometimes a third harvest by cutting individual new leaves by knife as opposed to cutting whole branches.

The following table summarises the harvest cycle information gathered during an interview with a producer and a supplier of nipa in Tacloban and local NGO Green Mindanao:

December	First harvest	The lower branches have mature leaves which are sold as 'original' leaves (much harder in texture, size and less brittle compared to shingles made from new leaves) @10 pesos per shingle in Tacloban
Jan	Production & distribution of shingles	
Feb	Production & distribution of shingles	
Mar	Production & distribution of shingles	
Apr	Second Harvest (Cutting of leaves only)	Leaves take between 4 and 5 months to re-grow to sufficient length after it has
May	Production & distribution of shingles	

[2] Proceedings of the 1st ASEAN Congress on Mangrove Research and Development, December, 2012
[3] Sustainable Thatching Materials Production From Nipa (Nypa fruticans) In Bohol, Philippines, Forest Science and Technology Vol. 5, No. 1, pp. 17~22 (2009)

June	Production & distribution of shingles	been cut but not mature enough. This is the most common Shingle available in the market at about 8 pesos per shingle.
Jul	Production & distribution of shingles	
August	Third Harvest (cutting of leaves only) /No harvest (Typhoon season)	
September	No harvest (Typhoon season)	
October	No harvest (Typhoon season)	
November	No harvest (Typhoon season)	

Supply chain and livelihood

Nipa distributors generally distribute to building hardware merchants. Merchants in Tacloban city procure nipa directly from distributors based in and around Sta.Rita, Samar. Delivery frequency varies from weekly (in the peak harvest/production season) to monthly.

Nipa shingle production is an important livelihood, especially for women in the rural areas. For example, Villafranca Women's Association (ViWA), Gigaquit, Mindanao, supported by the Mindanao Rural Development Agency (MRDA), is a community driven membership organisation consisting of small women's groups. The organisation coordinates shingle production in the area and acts as a supplier for local traders.

Figure 4: Roof structure (coco lumber) and nipa roofing. The nipa shingles are overlapped by 3". Project: Temporary shelters by IOM, All Hands Volunteers & Operation Blessing, Tagpuro, Leyte, Philippines. (Photo R. Dodds, Humanitarian Shelter Working Group)

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