Early Recovery and Livelihood Cluster and ShelterCluster

Coconut Lumber Technical Working Group

Yolanda Response, Philippines, 2013-2014

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1. INTRODUCTION

The impact of Typhoon Yolanda (Haiyan, international name) on the coconut farmers of the Central and Eastern Visayas was particularly severe, many losing not only their houses and livelihoods, but also the prospect of a livelihood sometime into the future. Initial reports from the Philippine Coconut Authority indicated that more than 33 million coconut trees in the seven provinces along the main path of Typhoon Yolanda (Quezon, Guimaras, Iloilo, Negros Occidental, Cebu, Eastern Samar and Leyte) were damaged to varying degrees. Approximately 15 million trees were totally destroyed.[1]

With losses of bearing coconut trees as high as 90%, the farms are cluttered with downed palms, fronds, stumps of trees, plus several months of undergrowth. The return of farms to productivity will be a long process, but its acknowledged starting point is the processing of the debris. And it is the processing of this debris that could give rise to several opportunities.

There are a number of ways in which the coconut lumber can be utilised (Figure 1)

- The sawing of the lower parts of the trunks into construction timber.
- The use of the lower grade timber for pallets, crates, scaffolding etc.
- The use of the best timbers (including the stumps) for furniture, joinery and flooring.
- The chipping and composting of the palm crowns, bark offcuts and fronds.
- Turning waste timber into charcoal.

Currently both the relief effort and the farmers' resources have solely concentrated on the processing of coconut lumber for construction. This focussing of effort has a compelling rationale: it provides much needed cash flow for farmers from the sale of their logs, plus it provides the community and agencies with construction materials for the rebuilding effort. But it does little to clear the farms of the bulk of the debris, and while providing a welcome resource and income, the benefits are confined to the short term. Essentially the response so far has been to harvest the low hanging fruit: to pick the rest (and the bulk) of the harvest will require the acquisition of more resources and skills. And it is in the pursuit of these skills and resources that lasting gains can be made for the communities affected by the typhoon.

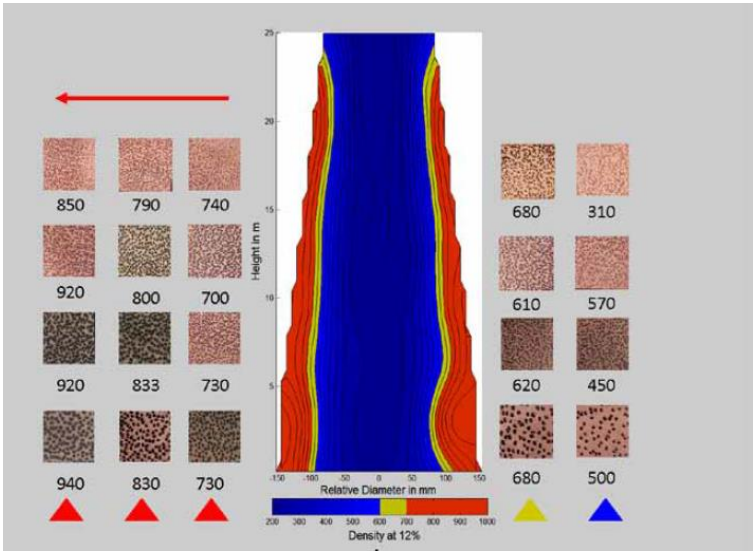
The long term processes that would extend the opportunities coming from the debris are

- Treating, storing and seasoning the timber
- Processing dried timber for high value- added products such as furniture, joinery and flooring
- Charcoal making
- Composting the left-over debris

None of the above processes are ground-breaking or novel per se; but within the context of a disaster, with multiple short term emergencies, multi-phase or delayed benefit responses are second choice to more expedient solutions. It is the well documented difference between emergency and developmental thinking within humanitarian agencies that can result in the loss of demonstrable opportunities for the affected communities.

[1] "Interim Technical Guidance on Salvage and Use of Downed Coconuts and Trees – Typhoon Haiyan/Yolanda" FAO 2013

THE ANATOMY OF COCONUT PALM



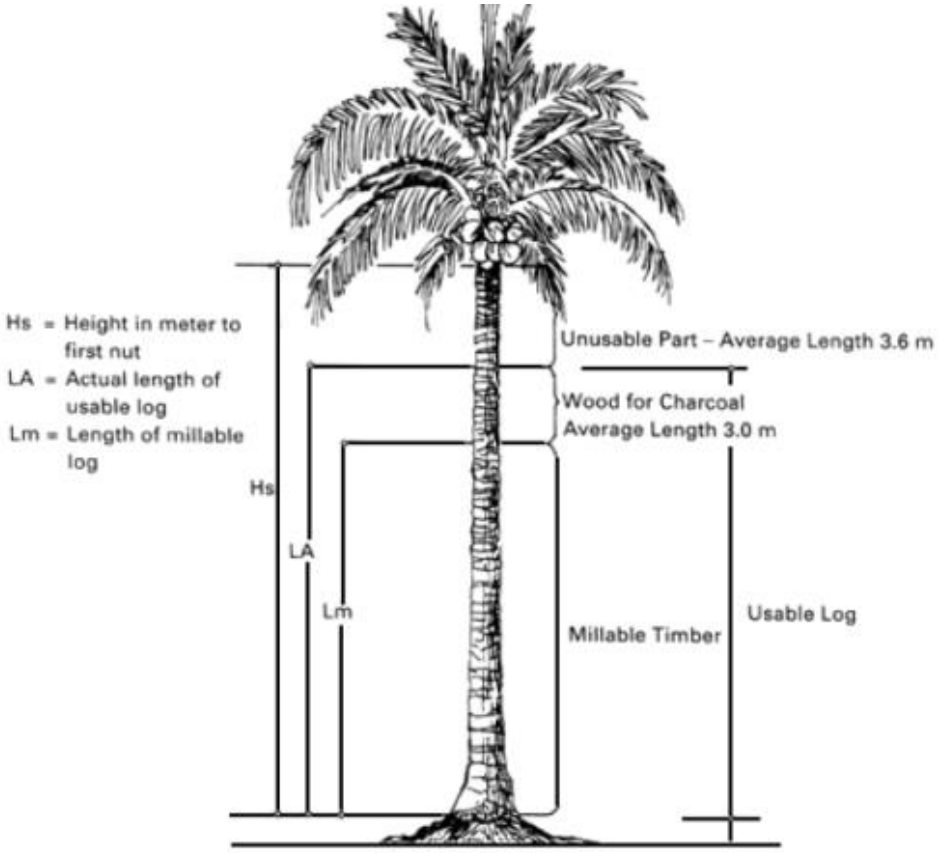


Figure 1: Anatomy of coconut palm. [2]

[2] Source of the photos: Bailleres H, Hopewell G, House S, Redman A, Francis L, and Ferhrmann, J (2010). Cocowood processing manual. From coconut wood to quality flooring. Department of Employment, Economic Development and

2. ISSUES AROUND THE COCONUT LUMBER

a. RETRIEVAL OF LOGS FROM FARMS

The removal of sawn logs to the nearest road is proving to be one of the major bottlenecks in reclaiming coconut lumber. The number of downed logs, the undergrowth, the rain and steep terrain all add to the time and cost of lumber retrieval. Added to this is the deadline to remove the logs before rot and insects take their toll. It would be ideal if trunks could be cut to length, the bark removed by squaring the four sides, and then the uncut log removed to the road. This, however, is unlikely to be done by hand labour, as the weight of the logs will necessitate mechanical lifting.

However, the practice of chainsaws making as few cuts as necessary to enable lumber to be carted to the nearest road is a sound principle if the maximum number of logs is to be retrieved. It is more efficient if the breakdown of logs to their final size is done by sawmills[3].

Given that rain does not make off-road movement impossible, consideration should be given to clearing or shifting unmillable logs to allow the access of trucks to the chainsaw sites. These can then be loaded by work crews and taken to the sawmills. The dragging of cut sections by carabayo can result in dirt embedded in the lumber, resulting in more rapidly blunted saw blades.

b. THE GRADING OF COCOLUMBER

Not all the trunk of a coconut tree is suitable for construction timber. The top, say one third, is not milled at all, it being the growing tip and hence quite soft. Furthermore, young trees (which normally means less than 40 years) are considered to have produced little timber of commercial value. A mature tree will normally produce 3 logs of, say, 10 to 12 feet (3 to 3.6 m) long, starting from the bottom of the trunk. These are referred to as the butt, middle and top log. Of these, the outside cuts of the bottom two logs could be considered grade 1, suitable for construction and, if seasoned, joinery and furniture. The remainder of the centre of the log is divided into second and third grade timber as per the diagram below. Grades 1 and 2 are considered to be off sufficient structural strength for single storey frame housing, with grade 1 preferred for major structural components such as posts (Figure 3).

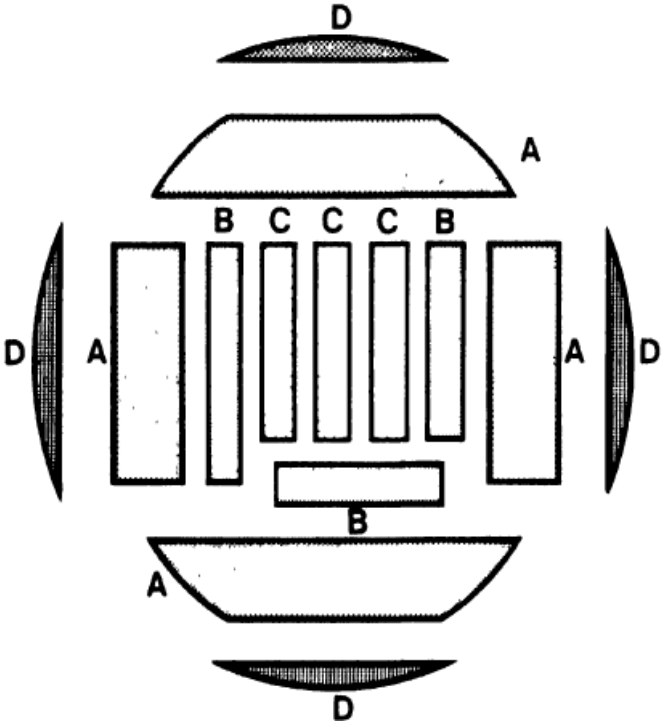
A search of the literature reveals no on-site tests that can reliably differentiate the various grades of lumber other than a visual inspection. By comparing the density of the vascular bundles, together with the darkness of the wood, it is possible to separate grade 1 from grade 3, but to differentiate grade 2 from either of these is problematic. The most reliable grading system is performed during the milling of the log. Here density is graded visually, using the vascular bundles as a cue, as well as the position of the board within the log. This also supports the practice of minimum chainsaw milling in the field, where the mixing of grades can easily occur during transportation.

Figure 2: Operating sawmill. Photo: Chris Howe.

Innovation, Brisbane. And Coconut Palm Stem Processing: Technical Handbook Wulf Killmand and Dieter Fink, ProTrade 1996, German Federal Ministry for Economic Cooperation and Development

[3] "An Economic Analysis of Coconut Timber Industry" M.C.C. Matibag, Laguna College 1985

The grade of the lumber is also a direct relationship to its density and weight. Hence grade 1 timber is distinguished from grade 3 by being heavier, darker in colour and having a higher density of vascular bundles.



CROSS-SECTION SHOWING GRADES OF TIMBER FROM A MILLED LOG

A= Grade 1: the hardest, strongest and darkest timber.

B= Grade 2: suitable for construction purposes, but not as durable as A.

C= Grade 3: suitable for interior linings, crates, pallets etc.

D= Bark offcuts

Figure 3. Cross-section showing grades of timber from a milled log[4]

c. THE SEASONING & TREATING OF COCOLUMBER

Figure 4: Storing coconut lumber. Photo: Chris Howe.

Given that it is estimated to be perhaps 8 million millable logs, at 80-100 board feet per log, this means that if all were processed there would be up to 800 million board feet. This is undoubtedly more than the needs of the immediate, local market. To act as safeguard to flooding the market, amongst other reasons, consideration should be given to storing and air drying a percentage of the sawn lumber.

When storing coconut lumber, consideration should be given to grading the cuts, so that the four outside cuts of the bottom log (and the outside of the 2nd log) are the ones that are stored. These are the high density timbers that once air dried, can be used for more exposed positions in construction, as well as in joinery and furniture manufacture.

[4] Source of the photo: Coconut Palm Stem Processing: Technical Handbook Wulf Killmand and Dieter Fink, ProTrade 1996, German Federal Ministry for Economic Cooperation and Development

Prior to stacking, the timbers should be dipped in a fungicide.[5] The stack should be covered with CGI and weighted down with heavy objects to resist any bowing or buckling of the drying timbers. They may also need to be protected on the sides by a mesh such as shade cloth, which allows air circulation while protecting from driving rain.

While not a high priority in the emergency phase, consideration should be given to the harvesting of the stumps that have a metre or more of recoverable timber. This is the best timber in the log, and once seasoned can be used for furniture, parquetry and inlays.

Figure 5: Coconut stump. Photo: Chris Howe.

d. DURABILITY OF COCOLUMBER

As mentioned earlier, there is a wide variation in the durability of the various grades of coconut lumber. In general, Grade 3 timbers from the central part of the log are more susceptible to insect and fungal attack, and also more likely to shrink and even collapse during the drying process.

As a general rule, only grade 1 timber should be used in exposed situations, and even here its performance can be improved if the timber is treated. There can be no doubt that contact with the ground shortens the life of any grade of coconut lumber. Similarly, continual wet/dry cycles for the exposed ends of rafters or purlins can lead to the collapse of that portion of the timber. Painting or oiling these exposed sections can lessen water penetration, but it would be best to use designs that eliminate this exposure.

The other factor affecting durability is the resistance to insect attack. It is well documented that coconut lumber is prone to attack by termites of both the ground dwelling and dry wood varieties. To provide protection against these would require extensive treatment processes. There are many anecdotal examples of resistance gained from the soaking of sawn timber in seawater, and I have no reason to doubt that it may be effective. How it could be carried out on a large scale I am not sure of, but it is an option open to beneficiaries once they receive their coconut lumber. Ground based termites can be controlled by the provision of sufficient under floor space to inspect for the presence of termite tunnels, which can then be treated by arsenic dust.

3. CASE STUDIES

INGOs are keen to facilitate the processing of the coconut lumber for both, their own and the community's needs. Some agencies are milling solely for their own use (Samaritan's Purse) while some are working with the coconut cooperatives (OXFAM). Government agencies (such as the Philippine Coconut Authority) and individual municipalities are also setting up various enterprise models, often market oriented, but with a strong community component. Many are using labour from the pool of 4Ps, or the coconut farmers themselves. UNDP is one agency that will be utilising Cash for Work schemes, with the objective of supplying other agency's timber requirements for reconstruction programs.

Cash for Work and piece-rate labour in all phases of the retrieval of coconut lumber is injecting considerable amounts of cash at the grassroots level. Future coconut lumber programs should

[5] Commercial fungicides can prevent fungal staining. Active ingredients include chlorothalonil (450gm/litre) & carbendazim (100gm/litre)

ensure as high a component of labour in the retrieval process as is commensurate with an acceptably efficient system.

a. **OXFAM**[6]

Oxfam, through lessons learned from the Bopha/Pablo responses, immediately rolled out an initiative to take advantage of these fallen trees to support affected communities. Through the establishment of community based sawmill enterprises, Oxfam aims to clear land of downed coconut trees, as well as produce shelter materials for the reconstruction effort, with the beneficial side effect of creating job opportunities and income in the communities.

Oxfam has engaged registered farmers and irrigation cooperatives and associations as beneficiaries of the initiative. These organisations have been selected for their vulnerability, presence of coconut farmers who were severely affected, legal status, and capacity to manage the sawmill business. Each organisation received 3 chainsaws and 1 portable table saw, together with protection materials, spare parts and maintenance material, and will employ around 15 people to operate the sawmill, along with skilled workers and labourers for land clearing.

Figure 6: Table saw at Oxfam sawmill in Palo. Photo: Chris Howe.

All of the mechanical equipment requires registration with the relevant authorities: the sawmills and the chainsaws have been registered with the Philippine Coconut Authority. All workers have been registered, and Oxfam has facilitated health and accident insurance for one year through a private insurance company, as a mandatory requirement to operate the equipment. Each saw mill is able to process 15-17 logs per day, and produce around 1,500.00 board feet in a day, when operating at full capacity.

b. **SAMARITAN'S PURSE**

Figure 7: Samaritan's Purse's yard. Photo: Chris Howe.

With a large shelter program to implement, Samaritan's Purse moved quickly to setup sawmills to utilize the coconut lumber. Operating in and around, the Palo area and hinterland, the agency has been able to develop an efficient system of processing logs.

On the coconut farms they have a team that assesses and buys logs from coconut farmers. The farmer's details, the GPS location and transaction details are recorded. They are followed by chainsaw crews who process the logs into slabs, which can then be carried manually to the road. Loaded onto trucks, the slabs are carried to a nearby mill site, where they are temporarily stacked until they can be sawn into their finished sizes.

[6] "Typhoon Yolanda Response: Fact sheet on Sawmill Enterprises" Oxfam 2014.

Currently they have no plans to supply beyond their own needs, but with their developing capacity and skilled teams they have the potential to process large quantities of coconut lumber.

4. LIVELIHOODS

a. Furniture

Coconut wood can be a promising material for the manufacture of furniture and with effective product promotion, quality furniture and other high value coconut wood products, like decorative interior walls, parquet floors, various novelties and curio items, can have a potential share not only in the domestic but also in the world markets.

Figure 7: Coconut lumber furniture. Photo source: http://www.id.all.biz/coconut-wood-furniture-g216

However, like many other conventional wood species untreated freshly-cut lumber can be easily attacked by mould and staining fungi especially if the material is not properly stacked and is exposed to humid environment during the air drying process. Hence, treatment is necessary if it is used for the production of high value products for export. [7]

b. Charcoal

Charcoal making offers potential income and livelihood opportunities for rural residents. Simple, low-cost charcoal kilns have been developed by the Forest Products Research and Development Institute (FRRDI), Department of Science and Technology (DOST) for efficient conversion of woody biomass into high-quality charcoal and briquettes. It is possible to make charcoal from downed coconuts, but the high moisture content and low density results in relatively poor-quality charcoal with little commercial value. [8]

c. The chipping and composting of the palm crowns, bark offcuts and fronds

People may also consider making compost from coconut fronds, which may be used to supplement chemical fertilizer in coconut replanting and intercropping. Donor organizations and Government agencies may wish to consider making simple mechanical chippers available to reduce palm fronds to small pieces to facilitate composting. Compost would be particularly useful for intercropping short-maturing crops during the 6-8 years until new coconut plantations become productive.[9]

d. Joinery

One of primary uses of coconut timber is for building construction. Coconut timber is suitable for housing components like joists, doors, window frames and jalousies. Low density coconut wood materials should be used only in non-load structures like walls and panels while high density coconut wood can be used for load-bearing structures like trusses and joints. [10]

[7] "Focus on Coconut Wood. Working Paper No: APFSOS/WP/23" FAO 1997. Asia-Pacific Forestry Sector Outlook Study.
[8] "Interim Technical Guidance on Salvage and Use of Downed Coconuts and Trees – Typhoon Haiyan/Yolanda" FAO 2013
[9] "Interim Technical Guidance on Salvage and Use of Downed Coconuts and Trees – Typhoon Haiyan/Yolanda" FAO 2013
[10] "Focus on Coconut Wood. Working Paper No: APFSOS/WP/23" FAO 1997. Asia-Pacific Forestry Sector Outlook Study.

5. REMARKS

OPPORTUNITIES

- The processing of such vast amounts of coconut lumber is truly a windfall benefit from the disaster, albeit at considerable cost to the present and future income of the coconut farmers. This benefit will only exist if the market forces are such that the lumber retains its approximate current market value. Wide variations on price will lead to it becoming unprofitable to process (falling price) or unaffordable to purchase (rising prices).
- Given the vast quantities that could be recovered, air drying and seasoning of grade 1 timber would seem to provide for the extension of the windfall benefits into the future. Its use for furniture and joinery, given market demand, would seem to provide long term livelihood opportunities.
- Half the coconut logs are not suitable for timber. Given the government ban on burning, the only feasible solutions would be to process them into chips, either for mulch or composting, with the more solid wood sections used for charcoal. Both these solutions, if developed with market responsive models, could supplement the livelihoods of thousands of families.

CONCERNS

- The cluster system provides a forum for the dissemination of information to all stakeholders in an emergency and recovery process. This system will necessarily awaken stakeholders to each other's programs, but the rigidity of agendas of the participating agencies considerably lessens the likelihood of cooperation. Planning needs to be more versatile in order to respond to disaster situations, where almost by definition ensuing circumstances will be unknown. Flexibility needs to be there for both opportunities and threats.
- Unless a similar effort is made to clear the unmillable logs, as is currently being done with coconut lumber logs, there will be the realisation of the predicted insect plague. Following on from these already serious consequences, coconut farmers will also be denied the ability to farm their land because of obstructing debris.
- Coconut lumber needs to be graded. There is a gradient of strength and durability from grade 1 to 3 that is of significance for the durability and safety of construction projects.

References:

Bailleres H, Hopewell G, House S, Redman A, Francis L, and Ferhrmann, J (2010). Cocowood processing manual. From coconut wood to quality flooring. Department of Employment, Economic Development and Innovation, Brisbane.

FAO 1985. Coconut wood processing and use.

FAO 1997. Asia-Pacific Forestry Sector Outlook Study. Focus on Coconut Wood. Working Paper No: APFSOS/WP/23.

FAO 2013. Interim Technical Guidance on Salvage and Use of Downed Coconuts and Trees – Typhoon Haiyan/Yolanda

Killmand W, and Fink, D. ProTrade 1996, German Federal Ministry for Economic Cooperation and Development Coconut Palm Stem Processing: Technical Handbook

Oxfam 2014. Typhoon Yolanda Response: Fact sheet on Sawmill Enterprises.