

BAMBOO IN KYEIK PE LAN AND PYA THAR CHAUNG, DAWEI DISTRICT , MYANMAR (VALUE CHAIN STUDY)

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I. Introduction

I.1. Terms of Reference

The objective of this study is to conduct a Value Chain and Market Analysis/Study of bamboo as a forest- based community product for the villages of Kyeik Pe Lan, Pya Thar Chaung, in Dawei District, Tanintharyi Region.

I.2. Rationale/Background of the Study

Myanmar is one of the most biologically diverse and ecologically productive nations on earth. However, its natural wealth is under unprecedented pressures affecting forest resources vital to human wellbeing. (WWF 2013). Thus, WWF is working with the government and other partners to help set priorities for conservation strategies, coordinate land-use planning and promote sustainable development not only for forest resources, its inhabitants but the wildlife thereat, as well.

Supportive to this endeavor, the WWF is planning to implement a natural resource-based livelihood project in three villages namely Kyeik Pe Lan, Pya Thar Chaung, and Kyeik Htu along the Banchaung Valley, Tanintharyi Region (Figure 1)

Figure 1 Map of the study area

WWF aims to promote sustainable production of non-timber forest products (NTFP) to improve the well-being of forest dependent communities by gaining access to natural resources and its economic benefits at the same time enabling sustainable forest management. These villages are inhabited by the Karen indigenous communities and are dependent on the forest's natural resource for their livelihood. Due to the limited time, only two villages were covered (Kyeik Pe Lan, and Pya Thar Chaung). The study was conducted from November 27 – to December 18, 2016).

I.3. Methodology

Output of this study is a result of the following activities that were undertaken

I.3.1. Information/ Data Collection and Validation

Primary data were collected through meetings with government regulatory agencies, development organizations, business groups and individuals engaged in the dynamics across the value chain. Discussions with officials and staff of the Ministry of Natural Resources and Environmental Conservation and in particular Forest Department on existing forest laws and policies and with the Forest Research Institute on researches undertaken on the properties of available bamboo species, and bamboo technology in general. Information gathered from interview with Trade Department was on assistance provided to micro enterprises and SMEs with regard to capacity building and market linkaging. Development projects undertaken in the past as well as current were discussed with local and international non-profit, non-government and development organizations. Some of these organizations met with were Ecosystem Conservation and Community Development Initiative (ECCDI), The Center for People and Forest (RECOFTC) and Tanintharyi Karen Peace Support Initiative (TKPSI). There was sharing of insights with the Business Innovation Facility, a market systems development programme funded by the United Kingdom's Department for International Development, on recent studies they had conducted on the bamboo sector in Myanmar. Further information on the key issues and constraints confronting the industry were gathered through interviews and consultations with industry associations like the Myanmar Rattan and Bamboo Entrepreneurs Association, Myanmar Bamboo Society, Bamboo Lovers Network, and business organizations like Sirboni, Yadana Tint Company Limited to name a few. These organizations grow bamboo, maintain plantations and manufacture bamboo products.

Interviews with raw material collectors, traders, and processors gave insights on the production, distribution and marketing systems of the value chain as well as issues in their respective sectors.

Secondary data from sources such as government publications, documents, literatures of researches, value chain reports and similar studies on the bamboo sector were reviewed. Statistical data and other information on prices, quantities are lacking due to difficulty of accessing from the concerned offices or individuals.

I.3.2. Focus Group Discussion (FGD)

Focus group discussion with the villagers was conducted on separate occasions in the two villages. There were 42 participants in Kyeik Pe Lan and 17 from Pya Thar Chaung. Discussions were based on their perception and opinions of the strengths, weaknesses, opportunities and threats (SWOT) on their resources of raw materials and manpower, infrastructure, technology, capital and government support.

Further, a third FGD workshop (Figure 2) was participated by 16 people composed of staff from the Forest Department in Dawei, development partners like Wildlife Conservation Society and Tanintharyi Karen Peace Support Initiative, traders from Dawei, and farmers from the villages. A SWOT analysis on the various aspects of the value chain was taken up, which validated results of the focus group discussions previously conducted in the villages and information gathered from interviews.



Figure 2 Focus group discussion in Dawei with stakeholders

I.3.3 On-site Environmental Scanning

Field visits in the two villages provided insights on resources in the field. Observations on the actual environmental situation of the forests in the nearby villages, available bamboo resources, status of the vegetation, farm practices, such as shifting cultivation (Figure 3) other crop vegetation, community activities and available infrastructures were documented.



Figure 3. Shifting cultivation in bamboo forests averaging 5 hectares

Field scanning likewise aimed to gather information and validate the claims of the traders, weavers, officers from the government sectors, bamboo plantation developers and furniture makers met previously during the early part of the study.

As part of the implementation plan and supportive to product /technology development, bamboo poles were harvested as samples for anatomical analysis specifically on its mechanical and physical properties. Further, observations were made on the existing uses of bamboo in the locality in order to assess the technical capability and skills of the villagers.

I.3.4 Skills Scanning

Primary processing of bamboo was demonstrated by one of the villagers, with time and motion data documented. It was observed that their method of measuring length and width was through the use of the hand, where distance from the elbow to the tip of the middle finger for 18 inches; a thumb for an inch.

The availability and prices of power tools (hand drill, sander, grinder, etc.) and finishing materials (wood glue, lacquer, varnish, etc.) needed in the production processes of bamboo were surveyed in hardware stores in Dawei. Generators are commonly sold, due to the high cost of electricity, at 300 kyats per kilowatt hour, compared to 25 kyats per kilowatt hour in Mandalay. Access to machine shops for machine and tool fabrication and repair services was also looked into.

1.3.5 Bamboo Awareness /Informal Training

The training cum field work demonstration conducted in the village aimed to develop the knowledge and skills of the villagers in terms of bamboo management. Its purpose was to create awareness of the bamboo as an economic driver for providing sustainable livelihood opportunities and significantly, the accountability of protecting the resources for wildlife and the environment, in general.

The three-day training aimed to determine the level of knowledge on how well the participants know their environment. It served as an opportunity to gather data on the various bamboo species present in the area and the plant's anatomical description specifically the abundant species for possible development.

1.3.6 Visits to Markets and Production Sites

Visits to local markets, tourist shops, trade centers, in Yangon, Dawei, and Mandalay gave a general idea of products being sold as well as the skills available in specific areas or regions. Bamboo pole landings and production sites are common in Dawei and areas around Mandalay. On-site low-end bamboo furniture makers, pole traders and mat weavers were also interviewed to discuss issues encountered in the trade as well as gather information on sources of raw materials and of the value addition along the value chain. An ocular visit was made to a hotel and beach resort in Manungmangan, one of the areas located 12 kilometers from the city of Dawei and being developed as a tourist attraction, to assess needs of a potential market.

II. Overview of Bamboo in Myanmar

II.1. Resources

According to FAO estimates in 2014, Myanmar's land area was estimated at 65.3 million hectares, of which 29.6 million hectares or 45.3 % is forest area. (FAO Country Profile 2017). In another report (GFRA 2010 Country Report Myanmar), FAO claimed that 2.7% (or 859,000 hectares) of the total forest area are bamboo resources. Myanmar ranks fifth in the world in terms of bamboo forest area, with China as the major producer, followed by India, Indonesia and Lao People's Democratic Republic.

As stated in the Book of Bamboo Species in Myanmar (2007), there are 118 identified bamboo species belonging to 18 Genera in Myanmar. In a related study conducted by Dransfield and Widjaja (1995) on the distribution of woody bamboo genera, there are two (2) genera of bamboo species found in Myanmar. These are Genus *Melocalamus* and *Pseudostachyum*. Related to this, a study conducted by the Business Innovation Facility Project entitled "Myanmar Bamboo Sector Competitiveness Study" (2015) indicated that Tanintharyi Region has some of the best bamboo natural forests. In the paper presented by the Myanmar Survey Research and Bamboo Products, Marketing and Extension Section in a forum jointly organized by ITTO and the Forest Department of Myanmar in 2006, the document showed that there are 48 identified major bamboo species habitat in Myanmar, and only three (3) bamboo species (*Bambusa arundinaceae*, *B. binghami* and *Dendrocloa distans*) are listed to be thriving in Tanintharyi Region. (Table 1).

Table 1. Major Habitat/Location of Bamboo Species in Myanmar

| No. | Myanmar Name | Scientific Name | Habitat /Location in Myanmar |
|-----|--------------|-----------------------------|---------------------------------------|
| 1 | Kya Khat Wa | <i>Bambusa arundinaceae</i> | Bago, Yoma and Tanintharyi Div. |
| 2 | Kyathaung-wa | <i>Bambusa polymorpha</i> | Bago Yoma |
| 3 | Kyar Wa | <i>Bambusa pallida</i> | Naga Mountain Region and Kachin State |
| 4 | Naga Chat | <i>Bambusa binghami</i> | Bago Yoma and Tanintharyi |

| | Wa(WaKyap) | | Division |
|----|----------------------------------|--------------------------------------|--|
| 5 | Pilaw Pinan Wa | <i>Bambusa nana</i> | Lower Myanmar |
| 6 | Sinthana Wa | <i>Bambusa sinthana</i> | — |
| 7 | Ta PinTine Net/ Thaik Wa Gyi | <i>Bambusa burmanica</i> | — |
| 8 | Ta Pin Tine Wa | <i>Bambusa longispiculata</i> | Mogoke and Thanwin Valley |
| 9 | Thaik-wa | <i>Bambusa tulda</i> | Bago, Sittaung and Dawei Region |
| 10 | Thaik-wagyi | <i>Bambusa burmanica</i> | — |
| 11 | Thaik Wabo | <i>Bambusa kingiana</i> | Kachin and Northern Shan State |
| 12 | Thar Law Wa | <i>Bambusa tharlawwa</i> | — |
| 13 | Wa Byet | <i>Bambusa offinis</i> | — |
| 14 | Wa Min | <i>Bambusa thalawwa</i> | — |
| 15 | Wa Myinn | <i>Bambusa griffithiana</i> | — |
| 16 | Wa Phyu Kalay | <i>Bambusa oliveriana</i> | Some Regions in Lower Myanmar |
| 17 | Tin-wa | <i>Cephalostachyum pergracile</i> | Bago Yoma and Upper Myanmar |
| 18 | Kyatwa | <i>Cephalostachyum burmanicum</i> | Various Parts of Myanmar |
| 19 | Hmyin Wa | <i>Dendrocalamus strictus</i> | Central and Lower Regions of Myanmar |
| 20 | Kyalo Wa (Wa Bo) | <i>Dendrocalamus brandissi</i> | Hilly Regions |
| 21 | Wa Gyi | <i>Dendrocalamus calostacyus</i> | Kachin, Shan State and Upper Chindwin Region |
| 22 | Wa Net | <i>Dendrocalamus longispathus</i> | Ayeyarwaddy and Yangon Region |
| 23 | Wa Phyu | <i>Dendrocalamus membrenaceus</i> | Various parts of Myanmar |
| 24 | Wa Pyaw | <i>Dendrocalamus longifimbriatus</i> | — |
| 25 | Wabo Aye | <i>Dendrocalamus hookeri</i> | Banmaw and Kathar Districts |
| 26 | Wabo Gyi | <i>Dendrocalamus giganteus</i> | Shan State, Upper Chindwin and Some Parts of Lower Myanmar |
| 27 | Wabo-Myet-San-Gye | <i>Dendrocalamus hamiltonii</i> | Upper Myanmar |
| 28 | Wani | <i>Dendrocalamus latiflorus</i> | Hilly Regions |
| 29 | Htamyin Wa | <i>Dendrochloa distans</i> | Myeik and Thanintharyi Regions |
| 30 | Kamyin Wa/Tamyin Wa | <i>Dendrochloa distans</i> | Thanintharyi Region |
| 31 | Sin Nin Wa/Wa New/ Wa Tha Put | <i>Dinochloa maclellandi</i> | — |
| 32 | Wanwe | <i>Dinochloa milellandi</i> | Some Regions in Lower Myanmar |
| 33 | Wa New Goat | <i>Dinochloa campactiflora</i> | Some Regions in Lower Myanmar |
| 34 | Wa Phyu Gyi | <i>Gigantochloa macrostachya</i> | — |
| 35 | Wa toe | <i>Gigantochloa apus</i> | — |
| 36 | Kayin Wa | <i>Melocana bambusoldestrin</i> | Rakhine Yoma and Upper Chindwin |
| 37 | Tha Put Wa | <i>Neohouseaua stricta</i> | Kachin and Northern Shan State |
| 38 | Wa Soon | <i>Neohouseaua dulloa</i> | Kachin and Northern Shan State |
| 39 | Wa Tha Put | <i>Neohouseaua helferi</i> | Nago Yoma and Lower Myanmar |
| 40 | Kyaung Wa Ame' | <i>Oxythenanthera thwaitesii</i> | — |
| 41 | Thaik Tu Myin Tu Wa | <i>Oxythenanthera parviflora</i> | — |
| 42 | Wa Pyaut | <i>Oxythenanthera nigrociliata</i> | Kachin State and Kathar District |
| 43 | Watoke | <i>Oxythenanthera albociliata</i> | — |
| 44 | Wa Ni Par | <i>Pseudosorghum polymorphum</i> | — |
| 45 | Wa Khar | <i>Pseudostachyum wakha</i> | — |
| 46 | Thanut Wa | <i>Thyrsostachys oliveri</i> | Kachin and Shan States |
| 47 | Htiyo wa/Htee Wa | <i>Thyrsostachys siamensis</i> | Various Parts of Myanmar |
| 48 | Wa Kauk | — | — |

Source: The Botanical Name and Genus of Main Plants in Myanmar Agricultural Services

II.2. Utilization

Bamboo is an important non-timber forest product material in rural communities as it has a wide range of uses. Among its major uses is for construction for almost all parts of the house, including fences and scaffolding. Bamboo is also used for agricultural implements such as bins, carry baskets, trays, sieves, crates, etc. for on-farm and off-farm use for arts and handicrafts, furniture, traditional toys, musical instruments and furniture chopsticks, charcoal and food.

Bamboo has the potential to create livelihood opportunities for the rural communities and generate income along the chain of various production activities from plantation to marketing of finished bamboo products. In the food sector, bamboo shoots are becoming popular, and sold in raw form and as preserved and being exported to different countries.

Bamboo has developed as a valuable substitute for wood over the past years. With new applications, industrial products have emerged as bamboo-based panels, parquet tiles, modern laminated furniture and floorboards.

II.3. Market

Based on the study conducted by BIF (Myanmar Bamboo Sector Competitiveness Study, December 2015) the total bamboo market amounted to US\$ 1.369 billion with a significant increase of 20% from 2013 to 2014. As shown in Figure 4, Global Bamboo Exports 2007-2014, the overall performance dipped in 2009 due to the global financial crisis in 2007-2008. The largest market were woven bamboo products, which consists of bamboo basketwork, bamboo mats and screens, plaits and plaiting materials. This is followed by bamboo flooring, bamboo shoots and furniture.

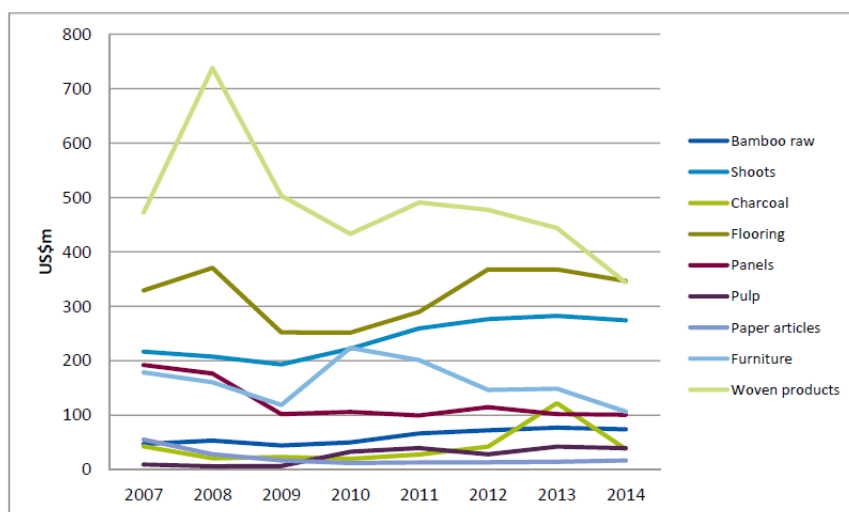
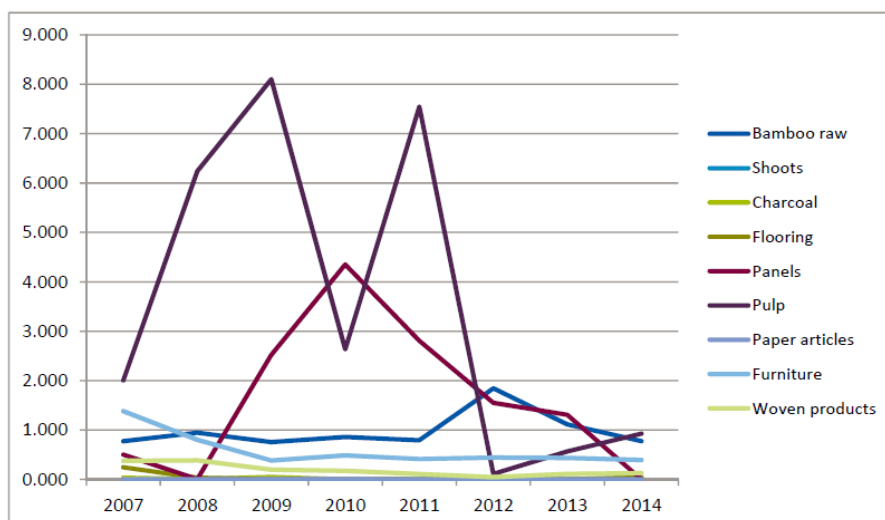


Figure 4. Global bamboo exports, 2007 – 2014
Source: INBAR dataset based on UN Comtrade

Figure 5 shows Myanmar had total exports of bamboo amounting to US\$2.2million in 2014. Its main exports were pulp, panels, raw bamboo and furniture. Exports declined by 37% from the previous year with significant decrease in raw bamboo and panels. However, there is no data available for cross border trading as such activities are not recorded nor reported by authorities in charge of border trade control. Among Myanmar's neighboring countries, Vietnam and Thailand exported flooring, edible shoots, veneer panels and poles on a small scale.



Source: INBAR based on UN COMTRADE data

Figure 5. Myanmar bamboo exports, 2007-2014

IV. RESULTS/FINDINGS

IV.1. Study Areas

The areas under study are the villages of Kyeik Pe Lan and Pya Thar Chaung located in Dawei District in the Tanintharyi Region. Both villages are remote with road infrastructure deficiencies. Kyeik Pe Lan is approximately two (2) hours from Dawei by land transportation while travel to Pya Thar Chaung takes three (3) hours from Dawei City during the dry season. These villages are difficult to reach in the rainy season particularly Pya Thar Chaung as it has a rugged and hilly landscape and crosses a shallow stream even during the dry season.

Kyeik Pe Lan has 85 households while Pya Thar Chaung has a total of 100 households, with 5 to 6 members per household. Kyeik Pe Lan is a relatively newly established village, as its residents moved in 2000 from the village of Phar Thar Yebu, a conflict area in the 1990s. It was observed that some members of families who were relocated from conflict areas have refugee status in Thailand and are studying in the refugee camp. They go home to their families during the school break and often take a sibling with them when they return to the camp, to study. The refugee camp is located near the border of Thailand and Myanmar, which is 4 to 5 hours' ride on a motorbike. Some of the refugees who studied and stayed in the camp for long period of time are eventually offered jobs. They would send money to their families back in the village.

There is no power supply in the villages however almost every household owns a solar panel that can produce between 40 to 300 watts. The solar panels were either purchased by the homeowners themselves or donated by non-government organizations. In Dawei, the cost of a set of solar panels, including battery and inverter ranges from 400,000 to 700,000 Kyats, depending on the power output and country of origin. Products that are made in Thailand are of better quality thus more expensive. The mode of transportation within the village is the motorcycle which most of the residents own. Mini buses ply only the main roads, with 2 to 3 trips a day. Bus fare, for example, from Kyeik Pe Lan to Dawei is 3,000 kyats* per way per person and a baggage is charges 1,000 kyats per piece. Villagers have access to education as there is a public-school building in the villages that were visited, although level is only up to grade four.

*(US Dollar 1 = 1,360 kyatts, during the study period)

IV. 2. Livelihood

Agriculture is a major income earner of the villagers but people also depend on other forest resources such as rubber and betel nut when the harvest season is over, to meet their socio-economic needs. There are plantations of rubber and betel nut in the villages so economic activities take place around these resources.

Bamboo is among the NTFPs selected by the villagers for community-based livelihood. Villagers claim that bamboo resources are “abundant” in their area but these are not being traded and used only for their own consumption.

IV.3. Bamboo

IV.3.1 Resources (Natural stands)

In terms of bamboo resources, two bamboo species found to be abundant in the villages are commonly used for domestic purposes such as construction of temporary dwellings, fence, container baskets, and agricultural implements. Woven bamboo mats used as walling for the villagers houses also collect Wanwe (*Dinochloa maclellandi*) for the said purpose. Both species are collected from bamboo natural forests without obtaining cutting permit from the Forestry Department as long as the poles cut are for domestic use only, meaning less than 100 poles. Pole harvesting is done anytime of the year or whenever the villagers need poles.

Despite the claims of the participants on the two (*Dinochloa maclellandii* and *Bambusa longispiculata*) species as “abundant” there is no scientific basis of this claim. Further, the other five (*Cephalostachyum pergracile*, *Dendrocalamus brandisii*, *Neohousezeaua dulloo*, *Dendrocalamus membranaceus* and *Oxythenanthera lacei*) species indicated in Table 2 said to be thriving in the area are not included in the list of species mentioned in the ITTO report (2005) on Major bamboo species habitat in Myanmar.

Table 2. Bamboo species found in Kyeik Pe Lan and Pya Thar Chaung Villages

| No. | Local Name | Scientific Name | Description |
|-----|---------------|---|-------------|
| 1 | Tin-wa | <i>Cephalostachyum pergracile</i> Munro | - |
| 2 | Wabo | <i>Dendrocalamus brandisii</i> (Munro) Kurz | - |
| 3 | Wanwe | <i>Dinochloa maclellandi</i> (Munro) Kurz | Abundant |
| 4 | Tabindaing wa | <i>Bambusa longispiculata</i> Gamble ex Brandis | Abundant |
| 5 | Wa Soon | <i>Neohousezeaua dulloo</i> (Gamble) A. Camus Syn. <i>Schyzostachyum dulloo</i> (Gamble) Majundar | - |
| 6 | Wa Phyu | <i>Dendrocalamus membranaceus</i> Munro Syn. <i>Oxythenanthera lacei</i> Gamble | - |
| 7 | Hmyin wa | <i>Dendrocalamus strictus</i> | - |

During the environmental scanning, it was observed that clumps of Wanwe (*Dinochloa maclellandi*) are flowering sporadically (Figure 6). The clumps are located between Pya Ta Chaung and Hi Ka Be, Tanintharyi Region. The average diameter of the flowering culms is 8.10 cm with an average height culm of 12 m. Number of culms ranges from 7 – 11 culms per clump. Specifically, the flowering clumps are located at 13.98 latitude and 98.55 longitude, with an elevation of 730 m asl.

Figure 6. Sporadic flowering within the study areas.

Relative to environmental scanning, a unique bamboo species was accidentally found in a nearby village. The species could be under the Genus *Dendrocalamus* due to its large diameter (7.3 cm) class and long internode of 103.4 cm. Villagers claim that it is ideal for basket weaving because of its long internode. Its culm thickness is 1.0 cm (base) and 0.75 cm (upper culm).

The bamboo awareness and hands on field work that was conducted in the village was attended by people from the two study areas and its neighboring villages. Topics covered nursery and plantation establishment, management and protection; harvesting techniques, preservation technologies, utilization, market opportunities and the impact of this forest resource on their livelihood. It was observed further that there were changes in vegetative structure of the land caused by shifting cultivation, a common practice in the area. The average area per clearing reaches 5 hectares. Continuous shifting cultivation practices in forest lands will eventually affect environmental stability affecting livelihood opportunities both the inhabitants in the uplands and in the lowlands. Hands-on demonstration/practicum in the field dealt on clump rehabilitation of Wanwe (*Dinochloa maclellandi*) (Figure 7). Inventory of bamboo clumps was undertaken within the natural forest with Tin wa (*Cephalostachyum pergracile*) as the sample species.

Figure 7. Before and after (respectively) bamboo clump rehabilitation

Actual pole inventory was also done as part of the training to create an awareness of the importance of quality and quantity of bamboo. During the inventory, the participants claimed that the pole size requirement is no longer met, therefore they have to go farther in the forest to gather poles.

Figure 6. Pole preparation for anatomical description by the participants

One activity during the informal training in Kyeik Pe Lan Village is the inventory of *Cephalostachyum* spp. bamboo, a species that is claimed as abundant by the villagers. Inventory of such bamboo is to generate data on the population of the species within a one-hectare in terms of number of culms, clumps, diameter and height growth of the bamboo and number of internodes, among others. (Table 3).

Table 3. Inventory of *Cephalostachyum* spp.(R. Parker & C.E. Parkinson) bamboo in Kyeik Pe Lan Village

| Number of clumps per hectare | Average number of culms per clump | Average clump circumference | Average culm diameter (cm.) | Average culm height (m.) | Average number of internodes per culm |
|------------------------------|-----------------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------------------|
| 561 | 1.5 | 192'' (16 ft.) | 3.50 | 8.5 | 34 |

The study area is flat dominated by the said species and interspersed with other grass species.

Data show that there are 561 clumps per hectare. The spacing between clumps therefore is approximately 4.25 m. x 4.25m. Considering the average diameter circumference of the clumps as well as the average number of culms per clump, the natural bamboo forest plantation can be considered abundant. It should be mentioned in this report that the collection of data regarding clump circumference is at 5% sampling while number of clumps is 100% inventory by sectioning the area and inventory was conducted per group. The presence of mature, over mature small size culms and dead culms is evident in the plantation.

Another activity during the training was the collection of data on the morphological characteristics of Wanwe (*Dinochloa maclellandi*) bamboo supportive to product development. The participants grouped into four were required to collect three- year old poles of the said species and guided to collect data on number and length of internodes and culm thickness, among others (Table 4). Five poles collected as samples were cut at 1.2 meters and measured of their culm thickness from the lower and upper end.

Table 4. Morphological characteristics of Wanwe (*Dinochloa maclellandi*) in Kyeik Pe Lan Village, Dawei District, Tanintharyi Region, Myanmar

| No. of pole samples | No. of internodes | Length of internode (cm.) | Culm diameter, cm (Upper-1.2m.cut) | Culm diameter (cm) (Lower -1.2 m cut) | Culm thickness (Upper)(cm) | Culm thickness (Lower)cm. |
|---------------------|-------------------|---------------------------|------------------------------------|---------------------------------------|----------------------------|---------------------------|
| | | | | | | |

| | | | | | | |
|-------|----|--------|-------|-------|------|------|
| 1 | 20 | 35.36 | 3.13 | 3.28 | 0.51 | 0.72 |
| 2 | 13 | 35.00 | 3.13 | 3.50 | 0.40 | 0.70 |
| 3 | 10 | 33.30 | 4.76 | 4.84 | 0.77 | 0.95 |
| 4 | 20 | 35.65 | 3.13 | 3.28 | 0.83 | 1.00 |
| 5 | 20 | 27.44 | 2.28 | 4.76 | 0.22 | 0.50 |
| Total | 83 | 166.75 | 16.43 | 19.66 | 2.73 | 3.87 |
| Mean | 17 | 33.35 | 3.29 | 3.93 | 0.55 | 0.77 |

From the data in Table 4, one Wan we pole has 17 internodes on the average with 33.35 cm internode length. It has a culm diameter taper of 0.64 at 1.2 m. cut while the mean culm thickness taper 0.22 cm.

IV.3.2. Plantation.

A few individuals and companies have established bamboo plantations (*Dendrocalamus asper* and *Bambusa linhispiculata*), on land that is owned by them. Some of these plantations are in areas measuring 250 to 350 acres located in Mandalay, Naypyidaw, Yangon and other areas, for bamboo shoot production, furniture and parquet manufacturing (*Dendrocalamus brandisii*). Along this line, the plantation developer decides on what bamboo species to plant and takes care of its management and protection, as well.

Similarly, some bamboo enthusiasts produce bamboo propagules of various species; however, these are not sold as planting materials but are collections. Observations also show that in Yangon and in Dawei, the presence of plant nurseries is not evident, though few ornamental (yellow striated bamboo - *Bambusa vulgaris* var. *striata*, Malaysian dwarf bamboo – *Bambusa multiplex* f. *variegata*) bamboos are used as landscape materials in some establishments. Further, it was mentioned that there is an existing *bambusetum* in Yangon. A *bambusetum* is an *in-situ* collection of endemic and exotic bamboo species collected from local and foreign sources and are introduced and grown for conservation and educational purposes. The number of species planted and the year of its establishment were not mentioned.

IV.3.3. Production/Processing

Bamboo in the villages is used mainly as construction material for their houses. The flooring in their houses are either split bamboo or flattened bamboo poles and walls are made of woven bamboo mats. Bamboo is also woven into winnowing trays, sieves for catching fish, basket containers for carrying agricultural crops, garbage bins, and storage for clothes and other household use. Harvesting and processing of poles are done by the men, while weaving is done by both men and women. Bamboo shoots are harvested from the forest and consumed as food.

When there is a need, poles are harvested from the forest which is about 1 to 3 miles away from the village. The poles are carried down on foot back to their homes. The villagers claim that one can carry up to 15 pcs. of poles of 5 to 6 meters' length in one trip. Simple hand tools like jungle knives are used in cutting, scraping, splitting, and flattening of bamboo and smaller knives for splicing. No electrical tools are used as there is no power supply in the village.

An actual demonstration of bamboo processing was done by one of the villagers with a trial time and motion study, to determine available technical skills and capabilities (Figure 8). Part of the process was taking measurements of upper and lower thickness of the culm, which will determine the component output of the raw material, for example quantity of slats for basket making. In the time and motion study material usage is determined (size and quantity of bamboo poles needed) processes are identified with the corresponding time taken (cutting, splitting, splicing, flattening, weaving, assembly, etc.) and labor and materials are computed. All inputs are recorded in a process sheet, which then becomes the basis for material requirements and production costs and capacity.

Figure 8. Time and motion study of production process

While there is no bamboo production in the villages where raw materials come from, a production facility for chopsticks is present in the city. The factory is owned and operated by a local businessman who was in the wood business for the past 10 years but stopped his operations due to the logging ban and decided to go into chopstick production. The factory has a dryer, five chopsticks-making machines which the owner purchased in Yangon, and a generator. The entire set-up cost him 300 million kyats. Marketing of the chopsticks is done by another trader. It was found out that supply of power in Dawei is distributed by a Thai holding company, hence the prohibitive price of electricity at 300 kyatts per kilowatt hour. In contrast, electricity in Mandalay costs only 25 kyatts per kilowatt hour. This explains the presence of generators in production areas in Dawei.

Tools and equipment, supplies and materials for production and processing of bamboo products are readily available at the hardware stores in Dawei. These are imported from China, India, Thailand, Japan, Germany and the United States.

IV.3.4. Market.

There is no market in both villages since the areas are abundant in bamboo and the villagers can gather poles from the forest themselves. However, piles of bamboo poles and sticks are found along the roadside outside these villages ready to be picked up by a collector. (Figure 9)

Figure 9. Bamboo poles along roadsides for pick-up

The market for bamboo in Dawei is mostly for domestic use and sold as poles and semi-processed bamboo as sticks, woven mats and slats.

Poles are sourced from the townships of Kaleinaung, Thayetchaung, Yay Phyu and Launglon, delivered by the materials traders who transport it on a barge to Dawei. They are given cash advance

by the trader to purchase the poles. End buyers are mostly locals who use the poles for house construction, such as fences and roof shingles, or by weavers to make into mats and baskets, or producers of souvenir items and chopsticks. Competition among traders is stiff. For example, buying price of the same type of bamboo pole vary from one trader to the other, whose yards are located near each other. The first trader quoted her buying price at 400-500 kyats per pole, a second one pays the collector 300 kyats, and third one 160 to 250 kyats.

Some of the products sold in the local market consists of hats, made from culm sheaths, containers for carrying farm products and storage purposes, winnowing trays among others, which are roughly made. (Figure 10)

Figure 10. Bamboo products sold in the local market.

Yangon and Mandalay are major trading centers that cater to both local and foreign residents and tourists, thus, there is a wider array of products being sold in better quality. Popular among the bamboo products are finely woven handbags, folio bags and purses, hats made from culm sheaths, woven flower baskets, food cover, parasols and bamboo-based lacquerware (Figure 11). Their selling prices have a margin of about 20% of the purchase price from the supplier. However, this was not validated as handicraft producing villages or production sites were not visited. Handicraft stores, in Naypyidaw which have their main stores in Mandalay or Sagaing sell the same items found in Yangon or Mandalay. According to shop owners, the products like woven baskets and lamp bases, among others are made in Bagan State and Sagain Region while some items are produced in Rakhine, Shan, Kayah, Mon and Kayin States sold by middlemen.





Figure 11. Bamboo products sold in tourist shops

The tourism industry in Myanmar is booming and this is a potential sector for the bamboo products offering more opportunities for value adding. A businessman and plantation owner who was visited in Mandalay was making samples of round pole furniture for beach resorts (Figure 12). At the same time, a training cum production for furniture making was being conducted to trainees coming from different villages.

Bamboo sticks is however in demand in the export market. These are being exported to Singapore and Holland and used for flower sticks and kites.



Figure 12. Round pole furniture being developed in Mandalay for resorts

In Yangon, high end restaurants and hotels, upscale residences of both local and foreign residents are niche market for high valued furniture. One company makes a sale of about 19,800,00 kyatts a year to this market segment. Demand is however declining due to stricter requirements of buyers and the high cost of transporting poles from the harvest area to the factory, which is located in the city.

According to some members of the Myanmar Rattan and Bamboo Entrepreneur Association, the country is not yet ready to export as the bamboo industry is not in place and it is only recently that the government is paying attention to this natural resource. In addition, the procedure for exporting is tedious and securing permits from the Forest Department takes at least two months. There are fees to be paid to the government, which according to the manufacturer/exporter increases cost of the product.

The association continues to promote its products through organization of local exhibitions and participation in international trade fairs in its private capacity.

The market for school furniture was being considered hence a brief meeting with the staff of Basic Education High School in Dawei was scheduled to inquire on the procurement procedure as well as on the school furniture requirement.

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IV.3.5 Bamboo Value Chain

The activities in the existing value chain in the study area are few. The actors and activities involved in the value chain are the following:

Raw Material Collectors/Harvesters are the people who live in the village and harvest the poles from the forest. Some of the poles are used for the household and some are for small scale sale to material traders. They bring the harvested poles to a designated area where it is consolidated with other poles from other harvesters. Pole length ranges from 6 to 7 meters and is delivered as is.

Material traders. Material traders are the small traders who buy the raw materials from the harvesters and stock the poles until it has reached a certain volume. The poles are then sold to interested individuals without any processing and act as the intermediary between the raw material collector/harvester and processor. They set the price according to the quality and size of the culm. Likewise, they are responsible for paying fees for commercial quantity to the Forest Department. Fee ranges from 100 kyatts per pole and more depending on the size. Transport is by means of a truck that hauls the poles from the village or through the river by a barge. Selling price of poles to the trader ranges from 160 to 300 kyatts per pole.

Processors on the other hand are involved in primary processing activities including preservation after the poles are delivered to them. Processors advance an amount of money to the material trader for purchasing raw materials. purchase the raw materials from different areas and traders and sell the poles as is or undertake primary processing to sell as poles of a specified length, as split or slats. Retailers deal with at least four collectors and advance the money to them to be paid to the harvesters. They lease an area of about 1000 square meters, usually by the roadside along the river, for warehouse and production purposes. To maximize the area, most of them undertake production of finished goods such woven mats for walling and flooring or assembled into fences and roofing. Retail price of pole ranges from 400 to 600 kyatts and can go as high as 1,000kyatts per pole during the rainy season. Weavers buy poles from them to be made into 8 x 6 feet mats, and then sold to the retailer at 8,300 kyatts. The retailer in turn sells this for 9,600 kyatts. There is stiff competition among the retailers as their bamboo yards are near each other and sell the same products, hence, price haggling is common practice.

Producers/Traders convert the raw material into finish product. Producers can be weavers of mats, or assembler of fence and roofs. In some cases, the processor buys the poles directly from the collector for his own production of a single item like chopsticks. Processors can be individuals who buy semi-processed bamboo and do small scale production of items such as baskets, trays and souvenir items and sell these to other traders or directly to the consumers for immediate use.

Table 4 is an illustration of a value addition for bamboo mats in the Dawei market with economic values created on each chain, based on data gathered from the actors.

Table 4. Value Addition

| FUNCTION | ACTOR | SELLING PRICE | VALUE ADDED |
|-----------------------------|---------------------------|---|--------------------------------------|
| Input Supply/ Plantation | Raw material collector | 100 kyats/pole x 2= 200 kyatts | 200 kyatts |
| Production | Materials Trader | 300 kyats/pole x 2= 600 kyatts Materials trader pays for fees collected by Forest Department at 100kyats per pole; and for transportation estimated at 2- kyats per pole | 400 less 204 kyats= 196 kyats |
| | Processor | 400 kyats/pole x 2= 800 | 200 kyats |
| | Weaver (Labor cost) | 100 kyatts/sqft. X 48 sqft= 4,800 kyats Weaver can finish 1 piece per day | 4,800 kyats |
| Marketing | Trader/Retailer | 160kyatts/sqft. X 48sqft. = 7,680 kyats Less cost of weaving and bamboo poles | 2,880 less 800 = 2,080 kyats |

In the above table, the level that adds the greatest value is the weaver, who can finish one 8 x 6' ft. mat in one day and weaves in her backyard. Costs of other inputs (like transportation, power, etc.), if any are minimal, as the raw materials are provided by the trader and no tools used that require the use of electricity.

Based on the information gathered from a trader, she pays an average price of 300 kyats per pole. She has around 10 material traders who deliver to her an aggregate quantity of 30,000 poles within a period of 20 to 50 days. Unfortunately, she does not keep record of her sales.

Below is a list of some of the expenses of the same trader.

| Item | Expense per month | Expense per year | |
|--|--|------------------|--|
| Lease on land (1,000 square meters) | 300,000 kyats | 3,600,000 kyats | Paid to the government |
| Municipal fees | | 70,000 kyats | Paid to the municipal government |
| Electricity | 7,000 kyats | 84,000 kyats | Electricity cost at 300 kyats per kilowatt hour |
| Salary of employees (5-6 persons) | Ranges from 3,000 to 5,000 kyats per person | | Employees are members of the family and have no standard salary |

It was noted that there is no standard rate, for example for lease on land and salary paid to employees or workers. Another trader who was interviewed not far from the first one claimed that she pays monthly lease on 1,500 square meter area at 100,000 kyats. Her workers are members of her family.

IV.3.6. Government and Private Sector Support

The forest law in Myanmar states that all forest land belongs to the state. Hence the responsibility for the management of forest resources rests with the Forest Department, and as such, regulates the activities within the forest. Any economic activity being undertaken in the forest required the approval of the department. Likewise, permits are required for the extraction/harvest of forest resources, and transportation to another township. The rules apply to bamboo as well.

Community forest enterprises can be a favorable alternative to contribute to poverty reduction and resource conservation if they are given rights to sustainable forest management. In the Management Plan prepared by the Forestry Office for Phaung Taw Gyi Group Villages and Kyeik Pi Lan Community in Myita Sub-township, Tanintharyi District, the Annual Work Plan states that production of poles can only be done in the year 2021 to 2045 in community forests for user's group who applies for permit to develop community forests. The user's group can harvest poles for their domestic use without tax only upon the approval of the chairman of the user's group based on the Management Plan prepared on September 2016.

The Forest Research Institute is tasked with providing technical information on all aspects of forestry, including bamboo. It has conducted researches and provided trainings on propagation, harvesting, preservation and skills training for weaving. In the 1990's, there were villages engaged in the production of bamboo parquet and matboard, however it was discontinued due to sustainability issue of the bamboo resource. According to a staff interviewed at FRI, research and development of bamboo was eventually halted as there was no bamboo industry and results were not put to use.

For the development and growth of enterprises, the Trade Department in collaboration with development NGOs, provide trainings on capacity building, microfinancing, skills development and assists them in marketing their products. The Trade department has expressed its willingness to assist the villagers by endorsing them or capacity building trainings.

There are organizations willing to provide the needed support for bamboo development in the villages. A few of them had agreed to provide free basic training on technical skills and entrepreneurship, such as the Myanmar Bamboo Society, the Tanintharyi Karen Peace Support Initiative, RECOFTC, Myanmar Bamboo Lovers Network.

Power tools, equipment, supplies and materials necessary in the production of bamboo are available in hardware stores in Dawei City. Likewise, solar panels, batteries and inverters as well as generators are sold in the stores. These are imported from China, India, Thailand, Japan, United States and Germany. Repair services for solar panel and machines are likewise available.

IV.3.7 Problems and Constraints in the Study Areas

Focus group discussions were held with the villagers and with other stakeholders to gather information on their views and opinion of the bamboo resources in their villages. Based on their SWOT analysis, the following are the problems and constraints:

1. Resources. Bamboo is abundant in the villages; however, they are natural stands and found in the forest. The distance from the village to the forest which is about 1 to 3 miles, makes harvesting difficult.

The villagers are not knowledgeable on the harvesting and management techniques such that for every pole that they need, they will have to cut three more poles for easy removal of the one pole causing damage to the clumps. Since the villagers also have no knowledge of managing bamboo stands, the growth performance of the culms is poor. The villagers would then have to go farther into the forest to gather more poles suited to their requirements, contributing to the decrease of resources.

The villagers have no tenurial rights over the land that they occupy. Land is owned by the state however the villagers are allowed to harvest forest products anywhere for their use. They do not find it encouraging to propagate on their land as they cannot claim ownership and have no motivation to clean the area of clumps.

2. Production/ Processing. The villagers are not aware of the bamboo for its economic value and its opportunities for income generation, hence they utilize the bamboo for household use, and in the case of bamboo shoots, for household consumption.

Villagers lack technical skills for the production of bamboo products. The lack of power supply hinders the introduction of new technology that will enable production of high quality products. There are also no facilities for storage of poles. The poles are piled up beside their houses which poses a fire hazard.

3. Market. Bamboo from the villages has no market. Traders and pole collectors do not find it attractive to invest in the business because of the remoteness of the villages and poor road infrastructure.

4. Institutional Support. Villagers lack the support of government in the management of bamboo resources, for instance regular monitoring is not being performed by the concerned government agency. Villagers are not able to access services such as capital financing and marketing services as they have no leverage as individual farmers. In general, traders and farmers are not able to loan for a start-up or additional capital from a financing institution without a collateral.

Annex 1a presents the summary of SWOT analysis in the villages of Kyeik Pe Lan with 42 participants and Pya Thar Chaung with 17 participants.

Annex 1b summarizes the SWOT analysis of 16 participants consisting of traders, conservationists, forestry officials, weavers and representatives from the villages, during the focus group discussion conducted in Dawei

IV.3.8. Recommendations:

Bamboo is one of the most important NTFP for rural economic development and environmental protection and conservation. Based on the findings of the study, capacity building is crucial in crafting a program of sustainable bamboo development. This may be done by raising awareness among the villagers of the opportunities and potentials for poverty reduction and by providing them trainings on technical skills enhancement and upgrade and basic entrepreneurship, thru training cum production gearing towards the establishment of a community bamboo enterprise. Simultaneously, support from the government for institutional and infrastructural developments is imperative for the sustainability of the enterprises. Following are the recommendations:

1. Based on available bamboo resources, basic skills, tools and infrastructure the adoption of institutional markets is recommended. It provides greater opportunities for bamboo producers for value adding as these markets have various requirements that will enable them to improve their basic skills and allow capital build-up for investment, while infrastructure in these areas is being improved. More significantly, it will involve government agencies and start the convergence and networking of government institutions, development organizations and industry associations. School furniture is recommended as the initial product for the institutional market.

2. Myanmar's tourism industry is growing, offering another potential market for value adding. Simultaneous to the adoption of school furniture, product and technology development must be undertaken to meet the needs of the tourism industry in particular resorts and hotels, with high value quality products. Products made of plastic is commonly used in the hotels because of its low price and easy maintenance. However, competition can be dealt with by producing good design quality products integrated with new bamboo technology.

3. Bamboo charcoal is an alternative energy source that will reduce dependence of villagers to fuel wood from trees. It can be another source of income for the villagers which will motivate them to better manage existing bamboo stands by removing all unwanted culms. Waste of bamboo production will also be utilized to the fullest. The bamboo charcoal can be processed further into briquettes for additional value.

4. Community bamboo enterprises would best benefit the community as a whole and not just a few individuals as profits from economic activities may be used for the improvement of livelihood in the community. All bamboo related activities e.g. production of school furniture, briquettes and plantation will be operationalized as a community bamboo enterprise that is self-managed and owned by all the stakeholders. This will be actualized through the adoption of the following:

a. The “Productivity Formula” as which allocates costs for tools, equipment and machinery, research and development, design and marketing, and capital build-up enabling the community to build the required capital necessary for reinvestment:

| | |
|------|--|
| 40% | Material & Labor |
| 10% | Overhead |
| 5% | Administration |
| 5% | Tools, Jigs & Equipment (this can be used to pay back for advance made on initial equipment) |
| 5% | R& D (For new designs and technology) |
| 5% | Marketing |
| 10% | Capital Build Up (for further investment or pay back of any loan) |
| 2% | Interest for Working Capital |
| 6% | Capital share (may include source of raw material) |
| 6% | Management share |
| 6% | Labor share |
| 100% | Sales |

b. The “training cum production” concept is hands-on training in manufacturing and management that is actualized in a real environment. Initially, efforts shall be undertaken to secure a purchase order for manufacturing. Skills training is then directed to the production processes of the order, including the repair and maintenance of tools, preparation of jigs, reengineering of processes and equipment. Training for the harvesting community is equally important to ensure the quantity and quality of bamboo poles to be delivered in time as required by the bamboo enterprise. Likewise, process and product costing are vital parts of the training, not only to determine the cost of the product but to evaluate later on processes that will lead to time savings and achieve levels of efficiency. The value of time and money as inputs in production is emphasized. The expected output of each participant contributes to the creation of a final product and the completion of an order. In like manner, basic business skills such as bookkeeping, accounting, production management, production scheduling, budget and control and materials control are practiced under actual work conditions. Hence there must be concerted effort of the participants involved in management to make the resources available, to enable those in manufacturing to produce the products in good quality, and on time for delivery to the buyer. This concept of learning by doing will enable the participants to develop skills in production and enterprise management.

c. The principle of “trade not aid” enables stakeholders to be responsible whereby there is no dependency on grants or aids. Grants awarded to the community enterprise do not require pay back however the members of the enterprise can agree to treat the grant as a loan that needs to be paid back to the enterprise. This will enable them to invest in capability and productivity training, invest in appropriate tools and equipment to increase productivity, and production technology for value adding, as well as provide capital for market and product development, and build capital from surplus for growth and expansion. Thus, the accumulated profits may be utilized to generate more income, set up other enterprises and provide jobs to more people.

On bamboo plantation and management, two concerns need to be addressed: the availability of the resources for utilization of community bamboo enterprise, and the conservation and protection of natural resources.

5. The availability of raw materials must be ensured, in terms of quantity, quality and price. Bamboo resource in the two study sites of Kyeik Pe Lan and Pya Thar Chaung) is abundant however no inventory of poles has been undertaken despite the value of the plant. Hence, there is no scientific basis as to the quantity and quality of the poles thriving in the natural forest. It is recommended therefore, that sample plots be established to gather information on “abundance” and quality of the poles for production planning and scheduling.

Another bamboo species with economic importance is found in area. It is a long pipe bamboo possibly under Genus *Dendrocalamus* species be given importance in terms of its propagation, anatomical description, as well as its physical and mechanical properties. Fifteen (15) varieties of bamboo were already tested of their physical and mechanical properties. Of the 15 bamboos studied, three (*Cephalostachyum pergracile*, *Dinochloa maclellandi* and *Dendrocalamus brandisii*) are found thriving in the two village. The bamboo species that are identified for the utilization of the proposed products can be propagated in spaces near the village, so that primary processing can be done in the harvest area. This will also prevent the villagers from going into the forest to harvest poles.

6. Rehabilitation strategies should be a part of Research and Development to enhance natural bamboo forests near the villages. Similarly, Information Education Campaign (IEC) on environmental protection should be the concern of all stakeholders using appropriate IEC materials. Information/education campaign should include information on available bamboo species, various propagation techniques, nursery and plantation establishment and management, establishment of plantations and management, protection; harvesting techniques, indigenous preservation technologies, utilization and market opportunities.

7. On Bamboo Research and Development, some studies have already been undertaken especially on the anatomical description as well as the physical, mechanical and chemical properties of economically important bamboo species. It is recommended that a compendium of such undertaking should be done by the committee concern at the Forestry Department to identify gaps related to bamboo policies, plantation and product development, and marketing. This undertaking is leading towards a Bamboo Road Map in Myanmar to create direction for the government and bamboo stakeholders and include short and long-term bamboo development goals.

8. On policies, the Myanmar Forest Policy prepared in 1995 by the Ministry of Forestry (Forest Law), Chapter 1 (g) in its meaning; a tree includes bamboo, cane, bush, creeper and orchids among others. This should be corrected to avoid confusion. Similarly, bamboo policy is not highlighted in this document. Considering the vast bamboo forest in the county and its utilization in the villages, policy review along this line is relevant.

9. Research undertaking should not only be on bamboo concerns but on other farming systems (i.e. Agroforestry) to minimize shifting cultivation practices which is detrimental to natural bamboo plantations due to fire occurrences. Agroforestry farming practices should be given attention to address issues on shifting cultivation that is also affecting bamboo natural forests.

ANNEX 1a

Summary of SWOT analysis of bamboo from the two villages (Kyeik Pe Lan and Pya Thar Chaung)

| Strengths (Resources, Manpower, Infra-structure, Technology, Capital, Government) | Weaknesses (Resources, Manpower, Infra-structure, Technology, Capital, Government) |
|---|---|
| <p>Vast natural forests</p> <p>Numerous species to choose from</p> <p>No cutting permit required</p> <p>Available manpower from the family members to harvest poles</p> <p>Available manpower for hire if labor within the family is not available</p> <p>Wide space to stock poles within their backyard</p> <p>Available river transport system during the rainy season</p> <p>Knowledgeable in indigenous /traditional and simple technologies (i.e. mat weaving, roof frame) using simple tools</p> <p>Available and interested manpower to learn new products and bamboo technologies/designs</p> <p>Available low capital for housing from family</p> <p>No tax from the government for 50 – 100 poles and if poles are collected for domestic use only</p> | <p>1 – 3 km. walk to gather poles</p> <p>Forest fires from shifting cultivation burns other pole collection sites nearer the villages</p> <p>No road network for transporting poles from natural forest to the village</p> <p>No electric power; only few families use solar panel (One panel)</p> <p>No traders/pole buyers because of poor road network</p> <p>No safe place to keep poles, poles piled near houses are fire hazard</p> <p>No available technology to produce quality products in bigger quantity, only charcoal is produce</p> <p>Villagers cannot borrow from banks because they do not have collaterals</p> <p>No market for products in the village; very minimal market even in the local areas (Dawei Township)</p> |

| Opportunities (Resources, Manpower, Infra-structure, Technology, Capital, Government) | Threats (Resources, Manpower, Infra-structure, Technology, Capital, Government) |
|--|---|
| <p>Bamboo poles as substitute of wood for housing is readily available</p> <p>No high technology required working on bamboo, simple tools can be used</p> <p>Women are also able to cut bamboo poles because it is a light material (4 - 5 cm dia., 16” long)</p> <p>Both men and women can weave bamboo baskets and make small farm implements</p> | <p>Clumps are damaged during cutting because for every pole harvested three are cut for easy removal from the clump</p> <p>Poles are easily attack by powder post beetle (2 – 3 year old culms are used)</p> <p>No support in terms of capital from the government to start even a small business</p> <p>No concrete tenurial rights of the villagers</p> |

ANNEX 1b

Summary of SWOT analysis of bamboo from traders, forestry officials, NGO representatives, and village representatives

| Strengths (Resources, Manpower, Infra-structure, Capital, Government) | Weaknesses (Resources, Manpower, Infra-structure, Capital, Government) |
|--|--|
| <p>Belief that bamboo can support people, wildlife and protect the environment</p> <p>Abundant bamboo resources and available species to choose from</p> <p>Available river system to transport poles from the village to market during the rainy season</p> <p>Available open space to store bamboo poles but</p> | <p>Long distance hauling from village to market especially for poles</p> <p>Difficulty in transporting poles because of poor road network</p> <p>No techniques/designs in producing better quality bamboo products especially baskets</p> <p>Traders cannot borrow from banks unless there is collateral</p> |

| | |
|---|--|
| not in warehouses Lots of manpower, hence labor cost is less | Power in the villages is difficult, cannot support production at the village level No support from the government in terms of marketing |
|---|--|

| Opportunities (Resources, Manpower, Infra-structure, Capital, Government) | Threats (Resources, Manpower, Infra-structure, Capital, Government) |
|--|--|
| <p>Traders consider bamboo as an opportunity for the villagers to earn income</p> <p>Available and willing to learn manpower of quality products as long as there are available new technologies to earn more including the entrepreneurs</p> <p>At present there is on-going road network development leading to the village, traders are optimistic this can encourage villagers produce products</p> <p>Traders can sell freely as long as they pay tax</p> | <p>Less supply of poles to traders during the rainy season due to difficulty in cutting and hauling poles from the cutting area to the village.</p> <p>Some villagers prefer to plant crops during the rainy season in fallow farms; hence there is less supply of poles</p> <p>Unstable pole price especially during the rainy season</p> <p>In some cases, advance payment from traders are not use for collecting poles, thus delivery of poles is uncertain</p> <p>Government does not provide support in the management of bamboo natural forests</p> |

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Disclaimer

The content of this study is based on information, data, views and opinions gathered in good faith from both primary and secondary sources.