

## **Session 3**

*[Wednesday 3<sup>rd</sup> period 1.5 hours - Hall A]*

The use of wood in different cultures

# Speakers



**Speaker:**  
**Eric Appau Asante**

**Topic:**  
**The Effect of Culture and Traditions on the Use of Wood in Ghana**



**Speaker:**  
**Michael Grabner**

**Topic:**  
**Understanding Historical Wood Utilization - Ideas for the Future?**



**Speaker:**  
**T K Kunhamu**

**Topic:**  
**The Wood Legacy of Kallai: Lessons for the Future**



**Speaker:**  
**T P Subramony**

**Topic:**  
**Bamboo as a Modern Construction Material**

# The Effect of Wood Culture and Traditions on the Use of Wood in Ghana

Eric Appau Asante<sup>1</sup>

## Abstract

*This research sought to raise awareness of some aspects of Ghanaian tradition and culture which have a direct or indirect effect on wood usage in Ghana. A multiple case study approach was adopted. Questionnaire, interviews and observation were the main instruments used to collect data.*

*The study revealed that in Ghana it is believed that the forest is a living territory managed by a population of venerated spirits and that man is part of the living realm. It also came to light that the forest and other natural reserves are well preserved due to the people's strong adherence to certain traditions within Ghanaian culture. Again the use of wood and the aesthetics of wooden products have several interesting cultural and traditional connotations which could be utilized to strengthen the forest products sector.*

**Keywords:** Ghanaian Culture, traditions, aesthetics, wood usage, preservation

---

<sup>1</sup> Department of General Art Studies, Kwame Nkrumah University of Science and Technology, Kumasi (eaasante.cass@knust.edu.gh)

## **1. INTRODUCTION**

The effect of culture and traditions on the use of wood in Ghana cannot be overemphasized. This study deals exclusively with selected Ghanaian traditional and cultural concepts and practices observed in some of the societies which have not been associated with Christianity or Islam. Discussions featured in this paper have commonly made use of the present tense, suggesting that the practices are still carried out and the ideas still held to this day. Undoubtedly, there are rapid developmental changes taking place in Africa and Ghana in particular and these changes have largely influenced some traditions and beliefs which hitherto helped to preserve the natural environment. It would be wide of the mark to assume that everything traditional has been changed or forgotten to such an extent that no traces of it are still to be found. The traditional concepts still form the essential background of many Ghanaians, depending on the individual ethnic group.

## **2. THE FOREST IN THE CONTEXT OF GHANAIAN TRADITIONAL BELIEFS**

Mbiti (1990) asserts that Africans generally believe that the spiritual universe is united with the physical, and that the spiritual and the physical intermingle and dovetail into each other, making it difficult, or even unnecessary, to draw the distinction or separate them at times. Confirming the above assertion, Yeboah and other key respondents (personal interview) stated that the Akans of Ghana believe that man is not the only creature that is endowed with an immortal soul, but also animals and trees. The three commonly used trees whose wood the Ashantis use for their carvings (Tweneboa or Kodua, Nyamedua and Sese), are said to possess very vindictive spirits. The root of Tweneboa can turn into a venomous serpent to protect itself against any ‘aggressors’ (people who may fell the tree indiscriminately). The three are believed to be capable of moving themselves from one place to another. It is said that such trees can make themselves invisible to man upon realizing that they are in danger of being pestered by him.

Aside from the above, the field research generally revealed that trees, and moreover wood, possess other human abilities such as being able to talk, feeling pain, bleeding and being indisposed. This stems out of a belief in animism; that is the belief that God has given special abilities to both animate and inanimate objects.

### **2.1 Venerating and sacrificing to the spirits of the tree**

Due to the people’s strong adherence to the cosmological beliefs discussed above, it is necessary for artists to appease the spirit of the tree before he fells it. In most cases, fowls, sheep or eggs are sacrificed by the artist to the spirit of the tree. This is done amidst incantations and the performance of libation which are believed to be means of communicating to the tree. He may say: “here is a chicken for you. I am going to fell you and make a product out of you; receive an offering and eat. Please guard me against injury. Do not let me suffer your wrath afterwards; and let me have a good price and patronage for the product”. After this prayers and incantations have been performed, the artist believes that he can fell the tree and make good use of its wood without any casualty. However, traditionally the sacrifice to the spirit of the wood does not end here. It is expected that the spirit who has been deprived of his home will return again into the wood in which it lived before the tree was cut down. The wooden product can also be inhabited by external spirits. It is therefore important that similar sacrifices be performed to the product itself. So the traditional wood

worker in Akan lives continuously in a religious atmosphere. Sarpong (1971) affirms that formerly, a woman observing her menstrual periods could not approach her husband who is producing a wooden product while he is at work. If she kept her state as a secret to her husband who is a traditional wood artist, it is believed that the man would sustain wounds from his tools.

Again, certain religious rites are also performed on the carver or traditional wood workers tools. Wine is poured on them and the blood of a fowl sprinkled upon the tools with incantations, this practice is a means of venerating the spirits inhabited in the tree.

In an earlier study, Underwood (1952), found that a priest must be consulted who may in turn consult the spirits of the trees, ask their forgiveness for what is explained as a necessary act of destruction. It is interesting to note that such a practice is currently observed by traditional wood carvers before an art work is done.

## **2.2 Some Instances**

‘The Big tree’: this site is currently one of the popular tourist attractions in Ghana. It is located at Aprozumasi in the Birim South District of the Eastern Region. Legend had it that the ‘Big Tree’ was discovered by a hunter called Yaw Andor who hailed from Akyem Asanteman. It is said that, on one of his expeditions to the forest, he overheard some people speaking at the site. When he moved close to the place from where the sound was coming, he fainted up on what he saw. On gaining consciousness, he ran to Asanteman and reported to the chief about what he had heard and seen. Following this the chief sent armed men into the forest thinking that they were being attacked by their enemies. The men who were sent into the forest kept their food under the tree, when they returned the following day they realized that, it was the doing of some dwarfs in the area. The elders of the town therefore decided to fell the tree. The first person who attempted to cut the tree died instantly and that scared the rest of the people. An attempt was made again to use a chain-saw to fell the tree. But this also proved futile as the tree rejoined and repaired itself when they had almost cut through. The mark of the chain saw can still be seen on the trunk of the tree today. (Ghana Tourist Division).

Apart from the above instance, there have been several other cases where trees have been felled from forest reserves and strategic locations and by the next morning, the same trees have been found unharmed. Such trees are believed to be habitats of powerful spirits.

## **3. EFFECTS OF BELIEFS ON WOOD**

According to Dauda (2009), “the country's total forest cover which stood at 8.2 million hectares at the turn of the 20th century has decreased to about 1.6 million and it is estimated that the nation's forest depletes by 65,000 hectares every year”. Dauda explained that the country's natural resources were declining both in quality and quantity due to its over-exploitation, poor timber processing methods coupled with illegal logging and chainsaw lumbering. However, part of the problem could be attributed to the neglect of some of the cultural beliefs and traditions which have been discussed above.

It could be said that up until now, the forest and other natural reserves were well preserved due to the people’s strong adherence to Ghanaian cultural traditions. Ghana could boast of

almost 240 forest reserves which have close links with sacred groves and socio-cultural beliefs.

Again, wooden products such as stools, drums, combs, plates and mortars are considered to be sacred. They are therefore kept well during and after its usage. For example, an empty stool is placed on its side or against the wall. The reason for this is to prevent any wandering spirit from sitting on it. Scientifically, this also helps to preserve the wooden product. Wooden sculptures such as the Akuaba doll are also believed be abodes for benevolent spirits therefore they are kept maintained, knowing that they can promote female fertility.

## **CONCLUSION**

The forest can be well preserved if Ghanaians adhere to the relevant cultural practices and traditions that promote it. The use of wooden products such as combs, stools and combs must be encouraged since it portrays the aesthetics of nature and the metaphysical.

## **REFERENCES**

Dauda C, 2009, Ghana's Forest Reserves Threatened. Accra, Daily Guide.

Sarpong P, 1971, The sacred stools of the Akan. Accra-Tema Ghana Publishing Corporation. Pp7-15

Mbiti J.S, 1969, African religions & philosophy. Great Britain, Biddles Ltd, Guildford and King's Lynn.

Rattray R.S, 1927, Religion and art in Ashanti. Vol.2 Hinterland, Oxford. Underwood L. (1952). Masks of West Africa. London, Alec Trinity Ltd.

# Understanding Historical Wood Utilization- Ideas for the Future?

Michael Grabner<sup>2</sup> and Andrea Klein<sup>3</sup>

## Abstract

*Much of the knowledge of the utilization and the properties of wood as raw material began to get lost with the onset of the industrialization. As a result, old traditions of handicraft-men – important intangible cultural properties – are disappearing. This loss of knowledge was described for the first time at the beginning of the 20th century by a folklorist (Blau 1917) working in Bohemia. He mentioned that this knowledge starts to retreat to higher altitudes of forest lands, where the forests are the main focus of life.*

*Blau (1917) described, that within a single farming house 12 different wood species were found in Carinthia and even 27 in Bohemia. These findings underline the high diversity of wood utilization in former times.*

*By studying old books, the description of properties and applications of various wood species can be found. The reasons for the selection of a species are usually not given. To bridge this gap of knowledge, we started to study historical wood utilization at collections of wooden artefacts like buildings, tools, machines, household appliances, furniture and so on. The aim is to set up a database of wooden goods where a description of the artifact itself, its geographic region, age and the wood species are linked. Groups of related applications mainly defined by different requirements are formed. These requirements can be directly linked to wood properties.*

*First results show, that within the small region of the mountain Schneeberg, 32 different wood species including nine shrubs (mainly for highly specialized products as the rungs of a ladder) were in use. Understanding historical wood utilization will help to use our forests more efficiently – primarily in times of shortage of wood as raw material.*

**Keywords:** Historical wood utilization, wood quality, wood identification

---

<sup>2</sup> University of Natural Resources and Life Sciences, BOKU Vienna, Peter Jordan Strasse 82, A-1190 Vienna, Austria (michael.grabner@boku.ac.at)

<sup>3</sup> University of Natural Resources and Life Sciences, BOKU Vienna, Peter Jordan Strasse 82, A-1190 Vienna, Austria (andrea.klein@boku.ac.at)

## 1. INTRODUCTION

Woody plants are enormously important for and beneficial to mankind, and among them trees have the distinction of being the largest and oldest living organisms on earth. Trees are sources of essential products including lumber, fuel, pulp, food for humans and wildlife, medicines, waxes, oils, gums, resins and tannins (Hinckley and Lassoie 1981, Zobel and Buijtenen 1989, Kozłowski and Pallardy 1997).

Wood was and still is one of the most important multi-purpose and sustainable natural raw materials. It surrounds us from the cradle to the grave. The products vary from toys, tools, housing and fuel to works of art and religious objects (Begemann 1977, Ziethen 2000, Radkau 2007, Wegener 2007). However, the cultural history of wood utilization is not completely written yet, but it is evident that the cultural activity of human beings has always been linked to wood.

As wood was used throughout each epoch (e.g. Stone Age, Bronze Age, Iron Age), we should talk about the Wood Age, which spans the history of human cultural activity (Vorlauf 2007, Radkau 2007).

In the past, due to the rapid degradation of wood, it was not possible to verify the Wood Age (Begemann 1977). Because of improvements in dendrochronology and radiocarbon dating, wooden artifacts are an increasing source of important findings in archaeology. From the medieval period onwards to the present, buildings are an important source of wooden artifacts – buildings, roof constructions, beams and so on (Grabner and Wimmer 1998, Grabner et al. 2004). Just a few findings exist (up to now) from the early medieval period (Grabner 2002). In Central Europe, wooden artefacts from the roman period are mainly wooden well chambers (Grabner 2005), barrels (Hebert and Grabner 2007) or pathways (Pöll et al. 1998).

Forests are the main wood suppliers. Looking at the past, a trade-off between wood utilization and the size of forested area is easily visible. The ancient Mediterranean cultures destroyed almost their whole forest lands due to the high harvesting activities for setting up ships and buildings (Meiggs 1982) - with consequences up to now. A similar demolition of forests also happened in medieval times and later. Wood was necessary for various pre-industrial processes (mainly as charcoal): iron, glass and salt production. Only because of strict forest regulations it was possible to preserve the forests in Central Europe (Johann 1968 and 1998, Wegener 1999, Meiners 2007, Radkau 2007).

Nowadays, sustainable forestry and wood supply are still very important goals for policy makers and society (Limacher et al. 2005, Anonymous 2006). Though, Mantau (2007) stated that within the European Union almost the sustainable amount of wood per year is harvested at the moment, Teischinger (2007) discussed the shortage of wood resources and possible solutions by adapting technologies. Hetsch (2007) concluded to increase the use of wood assortments, which are not in use at the moment, to satisfy the increasing demand of raw material.

A lot can be learned about sustainable forestry and wood utilization from the past – for example the use of currently rarely used species or the use of crooked and bended assortments (Blau 1917).



The EU Forest Action Plan (Anonymous 2006) attempts to enhance the social and cultural dimensions of forests. Within our project, material and immaterial cultural heritage will be analyzed and preserved. Material goods are represented by all preserved wooden artifacts. The immaterial goods are the knowledge of how to use wood (especially which species for which purpose) and how to prepare or machine it (Anonymous 2003). Only fragments of these immaterial goods are available nowadays. Blau (1917) described for his time period (beginning of the 20th century), that knowledge about wood utilization is beginning to get lost. He mentioned that this knowledge starts to retreat to higher altitudes of forest lands, where the forests are the main focus of life.

At the moment, we still have the possibility to save most of these immaterial goods for the future. But it is getting harder and harder, due to extinction of handicraft and especially of experienced craft-men.

As traditions are local (Anonymous 2003), the utilization of wood species for a special purpose will be dependent on the geographic region. The growing area of woody species is limited by climate and site factors. Wood quality is highly variable (Zobel and Bujtenen 1989) and dependent on site factors, too.

## **2. HISTORICAL RESOURCES**

### **2.1 Old Literature**

In literature, figures of the most important wood properties (like wood density) and the common uses are described (for example Bechstein 1812, Wagenführ 2007). A prominent example is the usage of Yew to produce bows and crossbows – due to the excellent elastic performance.

Looking at the old wood-science-literature which is describing the utilization of wood (for example: Andrea 1790, Bechstein 1812, Nördlinger 1860, Möller 1883, Nördlinger 1890, Heß 1895, Thenius 1896, Graef 1905, Laris 1910, Hunziker 1916, Hufnagl 1920, Gayer 1939, Knuchel 1954, König 1956, Schafflützel 1974), no description of geographic regions are given. In ethnographic literature the description of wood utilization is directly linked to the geographic region (for example: Schönwiese 1911, Blau 1917). But information on wood species is rare. Generally, descriptions of wooden goods can hardly be found in ethnology literature.

The data base of the old literature (for example Bechstein 1812) is not known. So we do not know if these descriptions were done just for excellent handicraft-men, or if the same species and techniques were used by farmers to produce comparable goods. So, the results will be important for ethnology, too – to proof, how strong commercial handicraft was linked with handicraft techniques of the farmers.

### **2.2 Wooden collections**

It is possible to study historical wood utilization at collections of wooden artefacts, like buildings, tools, machines, household appliances, furniture and so on. Therefore the collections of museums in Austria were started to be analysed:

1) The Austrian open air museum (“Österreichisches Freilichtmuseum Stübing”), Stübing; Styria. Many different buildings from all Austrian provinces were dismantled and brought to the Museum. So the collections of wooden artefacts, tools and machinery can be allocated to the particular buildings (Pöttler 1992).

2) The museum of Forest Farmers in Gutenstein, Lower Austria (“Waldbauernmuseum”). This museum presents an enormous collection of wooden artefacts of the region of the mountain Schneeberg (Lower Austria). The collection is dominated by artefacts of small forest farmers utilizing wood to produce charcoal, for the calcination of limestone, the utilization of resin and some other specialized handicrafts.

### **3. METHODS**

#### **3.1 Wood identification**

Wood species was identified by anatomical features using reflected light microscopy as well as micro sectioning and transmitted light microscopy. Various publications dealing with wood identification are available; for example: Grosser 1977, Bosshard 1982, Sachsse 1984, Wagenführ and Scheiber 1985, Schweingruber 1990, Wagenführ 1999. Due to missing unique anatomical features, in some cases it is just possible to determine the genus – not the species (for example: *Tilia*, *Betula*, *Acer*).

#### **3.2 Dendrochronology**

It is well known that the age of a temperate forest tree can be determined by counting the growth rings formed in the lower part of the stem. However, it is less known that the pattern of wide and narrow rings can be compared among trees to establish the exact year in which a given ring was formed (Fritts 1976). The same type of comparison can be made among wood fragments of unknown age and the rings in living trees, in order to establish the date when a wooden piece was part of a living, growing tree (Fritts 1976, Schweingruber 1988). The procedure of matching ring patterns among trees and wood fragments in a given area is referred to as cross dating (Stokes and Smiley 1996). It is used to identify the year in which each ring was formed and to assign exact calendar dates to the rings.

Various reference chronologies are available at the Tree-Ring-Lab of the University of Natural Resources and Life Sciences, Vienna. These chronologies are reaching back to the 12th century and are established for the main tree species (spruce, fir, larch, pine and oak) separated into the main forest growth districts (Alps, alpine forelands and Eastern Austria; Geihofer et al. 2005).

In principle, all wooden goods were checked on the chance of dendrochronological dating (mainly for softwood and oak). Grabner et al. (2006) showed, that dendrochronological dating of small samples can be done – if the exhibit enough tree rings. Samples from wooden houses and big constructions were taken with a dry wood borer.

At furniture or big household tools, ring width was measured directly at the surface with the help of digital photos. A clean and not painted surface is necessary to do so. Usually, the ring width was measured at a cross section of the boards (for example at the top of cupboards) after sanding.

On special goods (like big wooden cups) or art objects no measurements can be done at sanded cross section (like described above). These examples will be measured by the help of x-ray computer tomography (CT) (Grabner et al. 2006b, 2009).

### **3.3 Description of wooden parts – the data base**

The description of the wooden parts is mainly given by the museums. Sometimes folkloristic descriptions are also given in literature describing the collections of the museums. The functionality of wooden parts (tools, machines, parts of buildings) were analyzed together with handicraft-men of the museums. The main interest is describing the requirements on the wooden goods – split into mechanical stress and natural durability. Mechanical stress (static, dynamic, damping-characteristics) is very often the reason to choose a special species. The same is true for natural durability in combination with exterior utilization or in contact with water.

In the data base, the whole description of the objects as well as the requirements is held; completed by information of origin, inventory number, date due to archive information, due to ethnology and dendrochronological date (if possible), special growth characteristics and wood species.

Nemestothy and Beischlager (2009) analysed old literature dealing with the description of wood species as well as with the utilization of these species back to the 18th century. The problem appearing with this old literature is, that in some cases measured figures, but in most of the cases only descriptive texts are available (for example for wood density). Seven key-parameters were defined: density, strength, elasticity, cleavability, swelling, durability and fibrousness.

Niklasová (2009) tested various so called “rarely used wood species” according to the recent standard methods. There is now a possibility to compare figures from old literature and descriptive text from literature to modern testing results.

We are currently working on the set up of a database of wooden goods where a description of the artifact itself, geographic region, age and wood species are linked. Groups of related applications will be formed – for example tool handles or furniture. These groups are mainly defined by different – mainly mechanical – requirements (strength, stiffness and the absorbability of crushes are important for tool handles for example) and can be directly linked to wood properties. The cooperation between handicraft-men of the museums and wood scientists is very important to understand the functionality and the mechanical requirements of different wooden parts (tools, gearwheels, handles, construction timbers and so on).

Wood properties will be described by the detected applications. These results will be compared to the available literature of the same time. Geographical or chronological differences in the selection of wood species for defined applications can be analyzed with the help of the data base. The data base is the scientific background of various questions, like ethnological dating, monument conservation and so on.

#### 4. FIRST RESULTS FROM THE “SCHNEEBERG-REGION”

At the collection of the Museum of Forest Farmers in Gutenstein, located in the “Schneeberg-region” in Lower Austria, 1357 artifacts were analysed (see Fig. 1). Within this small region, 32 different wood species were used. 83.8% were made of hardwood species; just 16.2% of softwood. Ten species belonging to the group of shrubs were detected with an amount of 9.5%.

These species were mainly used as tool handles and specialized parts like teeth of rakes, spindles or transportation tools.

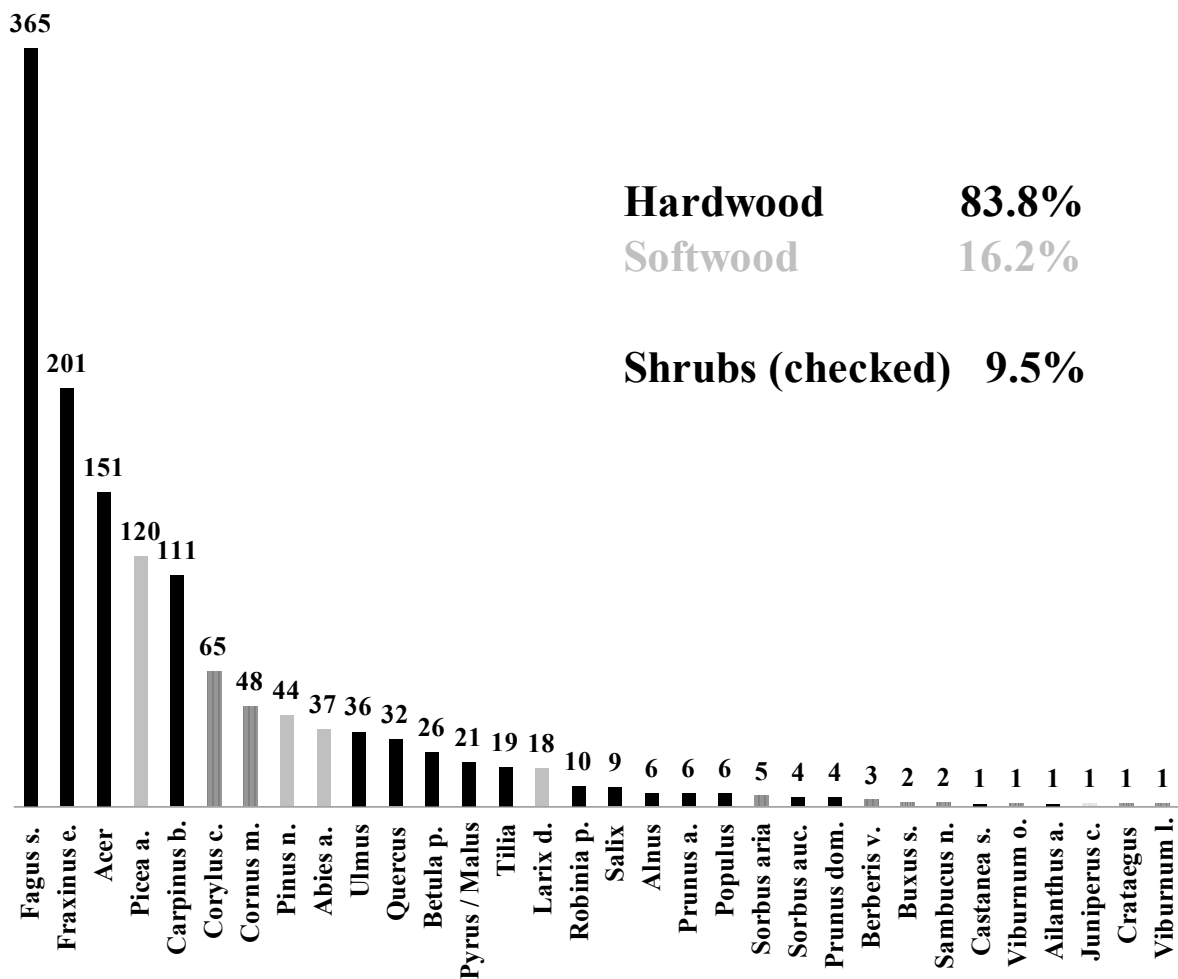


Fig. 1: Wood species found at the Museum of Forest Farmers (numbers)

It was clearly visible, that the different species were used according to the mechanical stress appearing in use. About one third was made out of beech wood. But, these were usually not specialized parts. Looking more in detail to different crafts, the specialized utilization of different species is evident. The amount of Hazelnut-wood was 33% at frameworks for transportation and 50% in basketry. The not bended barrels were made of softwood (Norway spruce and Silver fir); the bended ones were made of oak wood. 50% of the planers were made out of hornbeam.

Especially the wainwright crafts used the more elastic, but mechanically strong species: ash, elm and partially maple.

Sorting the wooden artefacts to a group of objects where “high density is required”, beech – with a high wood density – was hardly found. This group was dominated by shrubs like cornel cherry, hazelnut or barberry.

## **5. IDEAS FOR THE FUTURE?**

The UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (Anonymous 2003) was ratified by the Austrian government in the year 2009. Article 1 defines: “The “intangible cultural heritage means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage.” Article 2 presents the domains – amongst others: “knowledge and practices concerning nature and universe (d)”; “traditional craftsmanship (e)”.

The wooden goods analyzed for the present study are stored within an un-endangered environment. However, problems due to degradation or suboptimal storage are obvious. Measures to protect and conserve these wooden goods have to be set up. Therefore the results achieved at the museums will be of high importance to safeguard wooden goods outside the museums (farming, wooden buildings, roof constructions and so on). Due to the dendrochronological dating of the goods within the museums, a better knowledge of the age of comparable wooden goods will be given. That is also an important basis of monument conservation and for the declaration of historic monuments.

The knowledge of special uses of seldom used wood species is rare. Mantau (2007) stated that within the European Union almost the sustainable amount of wood per year is harvested at the moment. Hetsch (2007) concluded to increase the use of wood assortments, which are not in use at the moment, to satisfy the increasing demand for raw material.

The reprise of knowledge of wood species selection is important for the future of wood utilization. The utilization of nowadays not used species for specialized wooden products can be of technological and economic interest. To develop new products using rarely used wood species, the knowledge of their properties is necessary. This knowledge can be obtained by the analyses of historical applications. The improved knowledge of historical wood utilization will help to create new niche-products; for example the use of Laburnum in gardening.

To give another example: It was started to banish plastic bags made of mineral-oil based composites. So the bag of the future might be the basket – made of wood, as used for centuries.

## **6. ACKNOWLEDGEMENTS**

This project is funded by the Austrian Science Foundation (FWF TRP 21-B16).

## 7. REFERENCES

- Andrea, JH, 1790, Charakteristik innländischer Forstbäume und Sträucher in Tabellen kurz dargestellt nebst einem alphabetischen Verzeichnis der vornehmsten Schriftsteller über das Forstwesen. Andreaische Buchhandlung, Frankfurt am Main. 30p
- Anonymous, 2003, Convention of the safeguarding of the intangible cultural heritage. United Nations Educational, Scientific and Cultural Organization. Paris
- Anonymous, 2006, The EU Forest Action Plan, adopted June, 15th 2006.  
[http://ec.europa.eu/agriculture/fore/action\\_plan/index\\_en.htm](http://ec.europa.eu/agriculture/fore/action_plan/index_en.htm)
- Bechstein, JM, 1812, Forstbotanik oder vollständige Naturgeschichte der deutschen Holzpflanzen und einiger fremden: Erster Teil. 802p.
- Begemann, H.F. 1977. Was ist Holz. Eine Einführung in die Holzkunde. Deutscher Betriebswirte-Verlag GmbH. 206 pp
- Blau, J, 1917, Böhmerwälder Hausindustrie und Volkskunst. Band 1: Wald- und Holzarbeit. Calve, Prag. 419p.
- Bosshard, H, 1982, Holzkunde. Band 1: Mikroskopie und Makroskopie des Holzes. . Lehrbücher und Monographien aus dem Gebiete der exakten Wissenschaften : Reihe der experimentellen Biologie; 18. 224p.
- Fritts HC, 1976, Tree Rings and Climate. Academic Press, New York, 567 pp.
- Gayer, S, 1939, Die Holzarten und ihre Verwendung in der Technik. Jänecke, Leipzig. 282p.
- Geihofer, D, Grabner, M, Gelhart, J, Wimmer, R, Fuchsberger, H, 2005, New master chronologies from historical and archaeological timber in Eastern Austria. Proceedings of the EuroDendro 2005. September 29th – October 1st 2005. Viterbo, Italy. 50-51
- Grabner, M, Wimmer, R, 1998, Dendrochronologische Hausdatierungen in Krems. Fundberichte aus Österreich 37. 63-64
- Grabner, M, 2002, Dendrochronologische Datierung der Holzfunde aus der Wehranlage Sand. Arbeitsberichte des Kultur- und Museumsvereines Thaya. (2,3,4) 2002. 975-976
- Grabner, M, Wimmer, R, Weichenberger, J, 2004, Reconstructing the history of log-drifting in the Reichraminger Hintergebirge, Austria. Dendrochronologia 21 (3): 131-137
- Grabner, M, 2005, Dendrochronologie und Holzartenbestimmung. In: Zeitschienen. Vom Tullnerfeld ins Traisental. Archäologische Funde aus 20.000 Jahren. Fundberichte aus Österreich. Materialhefte. BDA Wien, Österreich; Reihe A, Sonderheft 2: 38-39
- Grabner, M, Reschreiter, H, Barth, FE, Klein, A, Geihofer, D, Wimmer, R, 2006, Die Dendrochronologie in Hallstatt – Ein Statusbericht. Archäologie Österreichs 17/1. 40-49

Grabner, M, Kastner, J, Reschreiter, H, Salaberger, D, 2006b, Dendrochronologische Datierung von Holzfunden aus Hallstatt mit Hilfe der Computertomographie. In Karl, R., Leskovar J. (Eds): Interpretierte Eisenzeiten. Fallstudien, Methoden, Theorien. Studien zur Kulturgeschichte von Oberösterreich 19, 99-108.

Grabner, M, Okochi, T, Salaberger, D, 2009, The Need of High Resolution  $\mu$ -X-ray CT in Dendrochronology and in Wood Identification. 6th International Symposium on Image and Signal Processing and Analysis ISPA 2009. September 16-18, 2009, Salzburg, Austria

Graef, M, 1905, Moderne Bautischlerei. Voigt, Leipzig.

Grosser, D, 1977, Die Hölzer Mitteleuropas. Springer, Berlin. 208p.

Hebert, B, Grabner, M, 2007, Noch ein römisches Fass aus der Lafnitz und die ersten Dendrodaten vom österreichischen Südostalpenrand. Archäologie Österreichs 18 (1): 21

Heß, R, 1895, Eigenschaften und forstliches Verhalten der wichtigeren in Deutschland einheimischen und eingeführten Holzarten. Parey, Berlin. 238p.

Hetsch, S, 2007, Geneva Timber and Forest Discussion Paper 48: Mobilizing wood Resources: Can Europe's forest satisfy the increasing demand for raw material and energy under sustainable forest management? United Nations Publications: ISSN10207228

Hinckley, TM, Lassoie, JP, 1981, Radial growth in conifers and deciduous trees. A comparison. Mitteilungen der Forstlichen Bundesversuchsanstalt, Wien 142. 17-56

Hufnagl, L, 1920, Handbuch der kaufmännischen Holzverwertung und des Holzhandels für Waldbesitzer, Forstwirte, Holzindustrielle und Holzhändler. Parey, Berlin. 400p.

Hunziker, von W, 1916, Unsere Holzarten. H.R. Sauerländer & Co, Aarau. 82p.

Johann, E, 1968, Geschichte der Waldnutzung in Kärnten unter dem Einfluss der Berg-, Hütten- und Hammerwerke. Archiv für Vaterländische Geschichte und Topographie. Band 63. Verlag des Geschichtsvereines für Kärnten.

Johann, E, 1998, The Impact of Industry on Mountain Forests in the History of the Eastern Alps before World War I: In: Gorski Gozd (Mountain Forest). Zbornik Referatov IXI Gozdarski Studenski Dnevi, Univerza v Ljubljani. Juri Diaci (Hg.), March 1998, 81-94.

Knuchel, H, 1954, Das Holz. Entstehung und Bau, Physikalische und gewerbliche Eigenschaften, Verwendung. Verlag H.R. Sauerländer & Co, Aarau. 472p.

König, E, 1956, Heimische und eingebürgerte Nutzhölzer. Holz-Zentralblatt-Verlag, Stuttgart. 243p.

Kozlowski, TT, Pallardy, SG, 1997, Physiology of woody plants. Academic Press, San Diego, London, Boston, New York. pp 411

Laris, E, 1910, Nutzholz liefernde Holzarten, ihre Herkunft und Gebrauchsfähigkeit für Gewerbe und Industrie. A.Hartleben's Verlag Wien, Band 329. 232p.

Limacher, S, Walker, D, Kammerhofer, A, 2005, Wald und Holz in Europa. Ein Blick in die Zukunft. Wald und Holz 11/05:37-39

Mantau, U, 2007, The legend of the woody biomass reserve in Europe. In: Hetsch, S. (Ed): Geneva Timber and Forest Discussion Paper 48: Mobilizing wood Resources: Can Europe's forest satisfy the increasing demand for raw material and energy under sustainable forest management? United Nations Publications: ISSN10207228

Meiggs, R, 1982, Trees and timber in the ancient mediterranean world. Oxford University Press.

Meiners, U, 2007, Holzkultur – Sachkultur. Gedanken zu einer Beziehung aus volkskundlicher Perspektive. In: Fansa, M., Vorlauf, D. (eds): Holz-Kultur. Von der Urzeit bis in die Zukunft. Schriftenreihe des Landesmuseums für Natur und Mensch, Heft 47. Zabern, Mainz am Rhein. 288p.

Möller, J, 1883, Die Rohstoffe des Tischler- und Drechslergewerbes. Das Holz. Fischer Verlag, Kassel. 222p.

Nemestothy, S, Beischlager, M, 2009, Utilization of different wood species – Analyses of old literature. Bakkalareatsarbeit an der Universität für Bodenkultur Wien. Institut für Holzforschung.

Niklasová, S, 2009, Characteristics of rarely used wood species. Diploma thesis at the Czech University of Life Sciences Prague and the University of Natural Resources and Applied Life Sciences Vienna – BOKU.

Nördlinger, H, 1860, Die technischen Eigenschaften der Hölzer für Forst- und Baubeamte, Technologen und Gewerbetreibende. J.G. Cotta'scher Verlag, Stuttgart. 550p.

Nördlinger, H, 1890, Die gewerblichen Eigenschaften der Hölzer. J.G. Cotta'scher Verlag, Stuttgart. 92p.

Pöll, J, Nicolussi K, Oegg, K, 1998, Die römische Reichsstraße Via Claudia Augusta bei Lermoos (Tirol). Ergebnisse der archäologischen, dendrochronologischen und palynologischen Untersuchungen. - Archäologie Österreichs 9/1: 55-70.

Pöttler, VH, 1992, Erlebte Baukultur. Schriften und Führer des Österreichischen Freilichtmuseums Stübing bei Graz. Selbstverlag des Österreichischen Freilichtmuseums, Stübing bei Graz. 356p.

Radkau, J, 2007, Holz - wie ein Naturstoff Geschichte schreibt. Oekom Verlag. 342p.

Sachsse, H, 1984, Einheimische Nutzhölzer und ihre Bestimmung nach makroskopischen Merkmalen. Parey, Hamburg. 160p.

Schafflützel, H, 1974, Nutzhölzer. Herkunft, Merkmale, Eigenschaften, Verwendung. Verlag Verband schweizerischer Schreinermeister und Möbelfabrikanten, Zürich. 157p.



Schönwiese, H, 1911, Die Holz- und Spielwarenhausindustrie der Viechtau bei Gmunden. Sonderabdruck aus Heft 1 des fünfzigsten Bandes (Jahrgang 1911) der Berichte des Forstvereines für Oberösterreich und Salzburg, Gmunden. 32p.

Schweingruber, FH, 1988, Tree rings. Basics and applications of dendrochronology. Reidel, Dordrecht. 276p.

Schweingruber, FH, 1990, Mikroskopische Holzanatomie. Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft, Birmensdorf, Switzerland. 226p.

Stokes, MA, Smiley, TL, 1996, An introduction to tree ring dating. The University of Arizona Press, Tucson, 73pp.

Teischinger, A, 2007, Ressourcenverknappung in der Holzwirtschaft als Herausforderung für Technologie und Innovation. Lignovisionen 15. Universität für Bodenkultur Wien

Thenius, G, 1896, Das Holz und seine Destillationsprodukte. Hartleben, Wien. 336p.

Vorlauf, D, 2007, Holz – unentbehrliche Grundlage technischer und kultureller Menschheitsentwicklung. In: Fansa, M., Vorlauf, D. (eds): Holz-Kultur. Von der Urzeit bis in die Zukunft. Schriftenreihe des Landesmuseums für Natur und Mensch, Heft 47. Zabern, Mainz am Rhein. 288p.

Wagenführ, R, Scheiber, C, 1985, Holzatlas. Fachbuchverlag, Leipzig. 720p.

Wagenführ, R, 1999, Anatomie des Holzes. DRW Verlag, Leipzig. 188p.

Wagenführ, R, 2007, Holzatlas. Fachbuchverlag, Leipzig. 816p.

Wegener, G, 1999, Holz – Rohstoff mit Tradition und Zukunft: Wald und Holz tragen zur Lösung ökologischer Herausforderungen bei – neue Techniken und Produkte. Holz-Zentralblatt 125(142):9-10

Wegener, G, 2007, Holz – Multitalent zwischen Natur und Technik. In: Fansa, M., Vorlauf, D. (eds): Holz-Kultur. Von der Urzeit bis in die Zukunft. Schriftenreihe des Landesmuseums für Natur und Mensch, Heft 47. Zabern, Mainz am Rhein. 288p.

Wimmer, R, Grabner, M, 1998, Standardchronologien in Österreich für die dendrochronologische Datierung. Archäologie Österreich 9/2: 79-85

Ziethen, G, 2000, „Und ewig rauschen die Wälder“ (?) – von den Holzvorkommen der Antike zum Raubbau an der Natur. In: Xylem und Phloem. Natur und Kulturgeschichte des Holzes. Palmengarten der Stadt Frankfurt am Main. Sonderheft 33.

Zobel, BJ, Buijtenen, JP van, 1989, Wood variation. Its causes and control. Springer Verlag. Berlin Heidelberg. pp.363



## UNDERSTANDING HISTORICAL WOOD UTILIZATION – IDEAS FOR THE FUTURE?

Michael Grabner & Andrea Klein

University of Natural Resources  
and Life Sciences - BOKU Vienna, Austria





### Introduction



***“Old principles of economics and operation,  
old inherited skills, knowledge and experiences  
together with necessary knowledge  
of language and culture  
retreat to higher mountains in forest areas”***



Josef Blau (1917)




**Introduction**



**What is meant by “historical wood utilization”?**




**Introduction**


**What is meant by “historical wood utilization”?**

- wood species selection
- wood quality
- dendrochronological dating
- conservation
- rarely used wood species
- crooked assortments
- forestry rules
- the culture of wood and forest utilization
- arts
- crafts
- material and intangible cultural heritage
- the history of wood utilization
- social effects of wood utilization
- economy of wood utilization







## Resources to study historical wood utilization



### What resources do we have?

#### Archaeological excavations



## Resources to study historical wood utilization



### What resources do we have?

#### Collections in museums:





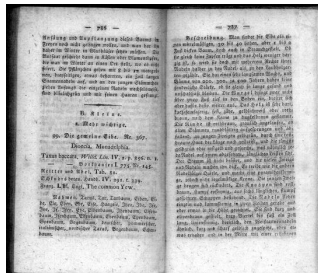
## Resources to study historical wood utilization



### What resources do we have?

#### Old literature:

- Andrea 1790,
- Bechstein 1812,
- Nördlinger 1860,
- Möller 1883,
- Nördlinger 1890,
- Heß 1895,
- Thenius 1896,
- Graef 1905,
- Laris 1910,
- Hunziker 1916,
- Hufnagl 1920,
- Gayer 1939,
- Knuchel 1954,
- König 1956,
- Schafflützel 1974



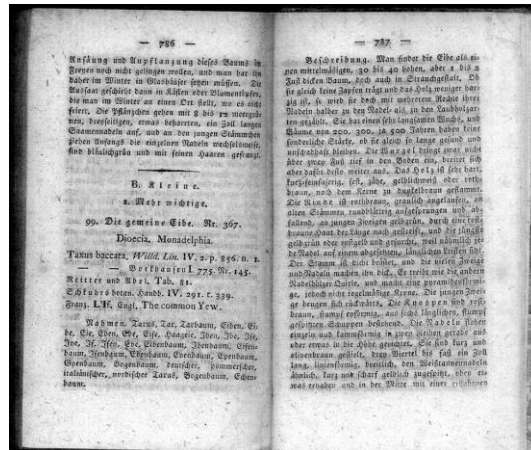
## Resources to study historical wood utilization



### What resources do we have?

#### Archives:

- like forestry rules,
- invoices of amounts of wood
- used for buildings or fire-wood
- Custom rules (Mautbüchl)







## Resources to study historical wood utilization

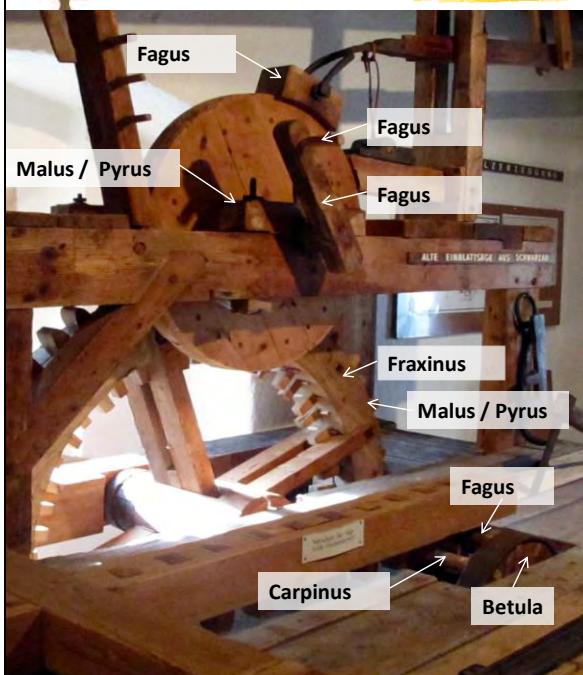


### What resources do we have?

Oral history and crafts-men knowledge:



## What we have started ...



### Wood identification

Which species was used for which purposes?

### Description of load and stress

Which kind of stress is influencing the wooden part?

Mechanical stress  
Durability  
Friction  
Damping  
...



What we have started ...



## Dendrochronological Dating

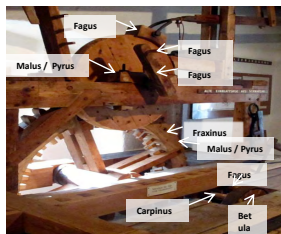
Date of harvesting the trees.



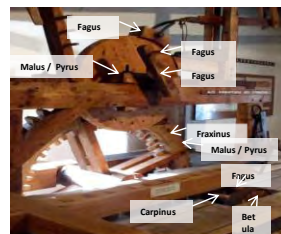
What we have started ...



## Putting the information together in a database:



Wood species



Load / Stress



Date

object	part	stress	species	date
wheel	spoke	mechanical, dynamic	ash	1883

→ Describing a species and its properties by the utilization

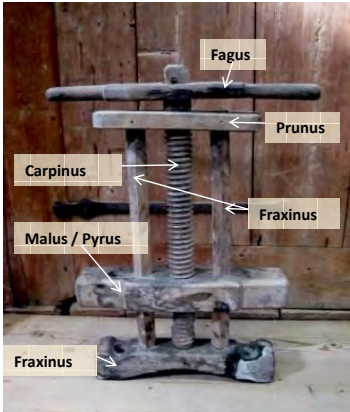
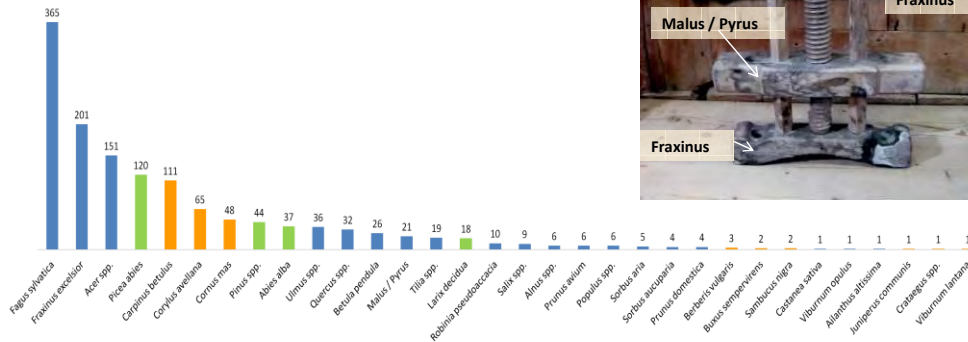


## First results ...



### Museum of forest farmers (Gutenstein):

32 different wood species  
 83.8% hardwood  
 16.2% softwood  
 9.5% shrubs



## Ideas for the future?



### Safeguarding material and intangible cultural heritage:

**Material heritage:**

**Intangible cultural heritage:**

“The “intangible cultural heritage” means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage.”

Article 2 presents the domains – amongst others:

“knowledge and practises concerning nature and universe (d);

“traditional craftsmanship (e)”

**in Austria:** charcoal production (Köhlerei)  
 utilization of resin (pitch pine) (Pecherei)





## Ideas for the future?



### Reprise of knowledge:

baskets in stead of plastic-bags



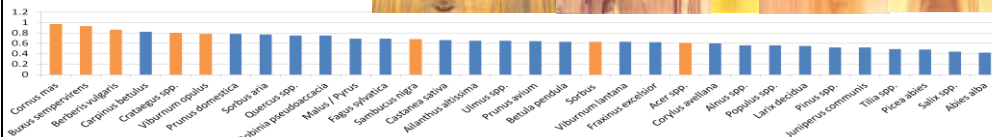
### New (old) assortments:

crooked trees for structural timber



### Sustainability (?):

utilization of rarely used wood species



## A scientific community – Historical Wood Utilization



Workshop in Stuebing, Austria: 23<sup>rd</sup> to 25<sup>th</sup> of September 2011



45 participants; 12 European countries; 8 different scientific fields

# The Wood legacy of Kallai: Lessons for the Future

Kunhamu, T.K.<sup>4</sup>, Gopakumar, S. Anoop, E.V. and Gosh, A

## Abstract

*The Malabar region of Kerala state, India, has enjoyed a prominent place in international wood trade from time immemorial. The fertile river deltas and floristic richness of the Western Ghats make this region a land of innumerable tree species of economic and ecological significance. Among the timber trade centers in Malabar region, Kallai, in Calicut, stood out as one of the pioneer and premier centers of wood trade that dates back beyond the era of the Zamorins. Kallai, once the 'hub of timber market' in south Asia, dictated international timber prices for several decades. The period 1950-70 was the golden period of Kallai. Bountiful supply of good quality structural timbers such as teak, rose wood, and karimaruthu (*Terminalia tomentosa*) from private and government forests and cheaper transport through the Chaliyar river and heavy wood demand in the national and international market led to the proliferation of saw mills during this time. It is reported that almost 150 large and small saw mills operated along the banks of Kallai river during this period.*

*Many factors contributed to the legacy of Kallai as an acclaimed wood trade centre. The demand for specific wood products such as long teakwood planks of specific sizes for the manufacture and repair of large country boats (used by the Royal British navy) was a major international influence. The teak wood from the nearby Nilambur had high demand in the international market owing to its golden brown colour, strength and durability. In addition, the wood for making railway sleepers in southern India was delivered through Kallai. Kallai was supplying wood raw materials for the packing case industry that flourished in Tamil Nadu and Andhrapradesh during the eighties. The glory of Kallai faded in the late 70's primarily on account of the acute dearth for wood raw materials. Enactment of Land Ceiling Act, vesting and assignment of private forests and increased governmental control on the felling of trees were some of the factors that lead to the shortage of quality timber trees. The scarcity of high quality timber species led to a shift towards the use of second quality timber species such as *Terminalia bellerica* (Thanni)- for small timber use in Tamil Nadu, mango- for plywood and packing case, ben teak (*Lagerstroemia lanceolata*) for lorry body building, *Artocarpus hirsutus* (Anjili) for country boat construction etc.*

*The wood trade history of Calicut is best known for its royal and elegant country boats known as 'Uru' constructed at Beypore, a small coastal town near Calicut. "Uru" built by the traditional shipbuilders known as Khalasis has a centuries old tradition. The uru made from Beypore had high demand in the Middle East and Europe for its exceptional design and stability. However, the Uru trade has faced serious setbacks since the mid eighties. The acute scarcity of quality timbers such as teak, karimaruthu, rose wood (*Dalbergia latifolia*), and pali (*Palaquium elipticum*) was the major factor for this. Yet another reason was the non-availability of wooden spares for the repair and maintenance of urus at the traded countries, primarily due to the stringent government policy on the export and import of wood. Despite this, there is now resurgence in uru manufacture primarily on account of its utility in*

---

<sup>4</sup> College of Forestry, Kerala Agricultural University (PO), Thrissur – 680 656, Kerala, India (kunhamutk@yahoo.com)

*the tourism sector. This article critically analyses the reasons for the rise and fall of Kallai as a premier wood trade centre and tries to draw lessons on diversification of wood products as well as enhancing the wood availability from areas outside conventional forests areas etc.*

**Key words:** wood trade- structural timbers- *uru* (country boat)- Beypore- Kerala

## 1. INTRODUCTION

The tropical climate of Kerala in southern India, characterized by high humidity, and rainfall, permits the growth of a wide array of tree species that are of high economic and ecological significance. The fertile river deltas and other areas of the state falling within the western ghats region with congenial edaphic conditions is home to several economically valuable tree species such as the teak (*Tectona grandis*), rose wood (*Dalbergia latifolia*) and sandal (*Santalum album*) etc. The evergreen and moist deciduous forests of Kerala which are rich in tree species that are suitable as structural timbers as well as softwood species suitable for plywood, pulp and other smallwood purposes (Bhat et al, 20 ). The wood resources from Kerala were a major attraction for the British colonial forces who ruled the country for centuries, primarily on account of their superior qualities and vast export potential (Tucker, 1988). Historically, Malabar region was a leading trading centre of spices on the west coast of India during the medieval period (Logan, 1887). The Malabar region of Kerala enjoyed a prominent place in international wood trade from time immemorial. Kozhikode (formerly Calicut), the most important city of Malabar enjoyed a prominent place in the international trade in the subcontinent. The most historical event that later changed the socio-political equations of the country was the discovery of sea route to India by the Portuguese navigator Vasco Da Gama who landed at Kappad, a place near to Kozhikode in 1498 (Madan, 1998).

Among the timber trade centers in Malabar, Kallai, a suburban place near Kozhikode, bagged attention as one of the pioneer and premier centers of wood trade that dates back beyond the era of the Zamorins. Kallayi (or Kallai) is a small village on the banks of Kallayi river which links with the Chaliyar river on the south by a man-made canal. The Kallayi wood trade belt spreads over around 35 km on both sides of the Kallayi river. It remained under the Madras Presidency of British India government till 1947 and under Madras state till the formation of the state of Kerala in 1956. The key factors that enabled Kallai the glory as a premier wood trade centre is the plentiful availability of wood raw materials and accessibility to the sea port. The period 1950-70 was the golden period of Kallai. Bountiful supply of good quality structural timbers such as teak, rose wood, and karimaruthu (*Terminalia tomentosa*) from private and government forests and cheaper transport through the Chaliyar river and heavy wood demand in the national and international market led to the proliferation of saw mills during this time. It is reported that more than 150 large and small saw mills operated along the banks of Kallai river during this period (personal communication, wood traders, Kallai, August 13, 2011).

## 2. HISTORICAL BACKGROUND

Malabar, particularly Kozhikode, was known to world as a trade centre from time immemorial. The landing of Vasco Da Gama at Kappad, paved the way for many foreign aggressors that include English, Dutch, Arabs etc. Prior to the European colonization there

had been healthy trade with Arabs for a long period. The then ruling dynasty of Malabar, the Zamorins, maintained very strong relation with Arab traders, the chief commodities of transaction being spices and wood (Logan, 1887). Kozhikkode became a mighty seaport, where the Arabs and the Chinese met to exchange the products of the west with the east and vice versa. Religious tolerance, good administration, and the friendly attitude of Zamorin to all traders, made Calicut the chief centre of trade in Malabar region. Zamorin gave special concession to Arabs (the Moors) to carry out trade (Ayyar, 1938).

Kallai once the 'hub of timber market' in south Asia dictated the international timber prices for several decades. The first organized wood processing (sawmilling) unit in Kerala was set up at Kallai in 1893 by A. Brown (Muraleedharan and Bhat, 1989). The golden era of Kallai as one of the premier timber market in the world dates back to prehistoric periods which continued till the Second World War. Domestic as well as international trade in wood flourished during the British period. Reports suggest that the teak wood from Kallai was used for the construction of Buckingham palace.

The forests in the southern Kerala were under the princely possession long back. The entire forest lands were under the Thiru-Kochi devaswam. This posed restrictions on the felling and extraction of timber from these forests. However, this was not true with Malabar where private forests flourished till the early 70's. During their reign, the British brought Malabar under the Madras presidency. Large stretches of forest lands in Malabar were under the ownership of land lords and local rulers. Prominent among such private forest owners in Malabar were Maruveetil Nair, Koipathodi, Kuppathodi nayar, P.I Kunhammed kutty, Kunhimayin haji, Kakkodans, M.C. Pothan, Nilambur- Kovilakam, etc. There was no control on the felling and extraction of trees. Trees belonging to quality timber species like teak and rosewood were available in plenty from these private forests. The river Chaliyar enjoys a prominent role in upholding the glory of Kallai as the Mecca of wood trade. Most of the pristine moist deciduous forests were along the banks of Chaliyar river and the round wood were transported as rafts even during summer.

International wood trade was mainly focused on quality saw logs for ship building and for furniture making. The demand for specific wood products such as long teakwood planks of size 30'x2"x2" for the manufacture and repair of large country boats (used in royal navy) was a major international wood trade sector. Lengthy teak wood planks of size 35 to 40" were easily transported from the Nilambur forests in huge rafts through the Chaliyar river. Also, the major source of wood for railway sleeper making in southern India was delivered through Kallai. Yet another wood trade area was the packing case industry which also flourished in Kallai for many decades. The major tree species used for this purpose include Matti (*Ailanthus triphysa*), Bombax (*Bombax ceiba*), Macaranga (*Macaranga peltata*) etc. The demand for packing case was chiefly from Tamil Nadu (Imperial Tobacco company) and Hyderabad.

Kallai was reported to have almost 150 saw mills during the early 60's. M/s Pary & Co, M/s B.S.T Saw mills, M/s P.I. Kunhamed Kutty haji mills, M/s Imbichi Koyaji saw mills, M/s Bichu saw mills, M/s V.K, Sankaran Nair & O. Gopalan saw mills, M/s Standard furniture Co etc. were prominent among them (Personal communication, wood traders, Kallai, August 13, 2011).

## 2.1 Nilambur teak forests

Nilambur in the eastern part of Malabar is yet another internationally acclaimed centre often christened as the 'Mecca of teak' that helped Kallai in carving its own wood legacy. The teak wood from Nilambur had high demand in the international market owing to its golden brown colour, strength and durability. Plenty of timber trees in the Nilambur forests were subjected to massive felling for quality saw logs during the British regime. Despite this, teak and other timber trees were available in plenty from this region even during the early 1800s. However, the dearth of quality saw logs was felt during the mid 1800s and the authorities started thinking of alternate strategies to make quality teak timber available for continuous supply. These efforts lead to the establishment of the first ever planted teak forests in the history in Nilambur which dates back to mid 1800s. The continuous strenuous efforts of the then Collector of Malabar, Mr. H.V. Connolly along with his staff finally turned successful in planting teak in Nilambur along the banks of Chaliyar river during 1841-46. The contribution by Mr. Chathumenon, Sub Conservator of forests in establishing this first ever teak plantation in Nilambur was immense. To commemorate these two leaders who paved the basis for modern plantation forestry in Kerala, part of their plantations were declared Permanent Preservation plots (PPPs) by the state govt and are named as Connolly's plot and Chathumenon's plot respectively. Since their efforts, teak planting continued, however systematic plantation development initiated only after 1920s.

The plantation forestry programme initiated at Nilambur was later adopted throughout the Malabar and Travancore forests that helped to partly ensure the continuous supply of timber. The bulk of the auctioned trees from the Govt. depot reached Kallai through cheaper mode of river transport in massive rafts called Therappan and Kallai turned out to be the bustling nerve point of Calicut's timber trade.

## 3. TIMBER INDUSTRY

Kallai shares century old traditions in the transactions involving timbers trees especially teak and rosewood. There was high demand in the national and international market for finished wood products from Kallai. The single most important tree species that was converted to saw logs was teak. The quality of the timber from Kallai is attributable to the high level of salinity in the Kallai river area where wood got *seasoned* in the saline slush for extended periods of time. International wood trade was mainly focused on quality saw logs for ship building and for furniture making. The demand for specific wood products such as long teakwood planks of size 30'x 2"x 2" for the manufacture and repair of large country boats (used in royal navy) was a major international wood trade sector. Lengthy teak wood planks of size 35 to 40" were easily transported from the Nilambur forests in huge rafts through the Chaliyar river. Similarly high quality teak planks of size 30'x 1.5'x 1" were exported to Middle East countries mainly for repair of *Urus* (wooden country boats). This finished wood trade flourished during the early part of the century and continued till the 1970s. It is reported that separate contingent of expert workers were involved exclusively in this activity on a round the clock basis at Kallai. Also there was high demand for 'V' shaped wooden frames to reinforce the basement of boats and *urus*. Wood was also exported to many European countries including Germany, England, Italy and Japan. Also, the major source of wood for railway sleeper making in southern India was delivered through Kallai. In the early 90s it was reported that 25-30 truckloads of sawn timber were transported daily to Mumbai and Pune, which were the major domestic destinations of wood from Kallai.

#### 4. DOWN FALL OF KALLAI

The timber trade in the Kallai belt of Kerala, once the largest trading area in Asia and the second largest in the world, is now facing extinction with timber dealers attributing the crisis to a variety of factors. The Kallayi wood trade belt is now a poor shadow of what it once was. From the flourishing period of 1950s and 60s, when there were more than 150 saw mills engaged in wood trade, the decline started in the 1970s, when only 50 sawmills were active at Kallai, several were about to close and others were about to become storage hangars for processed wood.

A dearth of quality timber was felt in Malabar during the early 50s that triggered the down fall of glory of Kallai. With the introduction of the Kerala Private Forests (Vesting and Assignment) Act, 1971, a large portion of these private forests were nationalized and declared as reserved forests. This led to significant control over the felling and movement of trees. This was the major factor that affected the wood industry in the Malabar region. The Supreme Court ban on clear felling also curtailed the wood flow to Kallai. Adding to this, the stagnation in the construction industry in Mumbai and Pune and a shift to concrete houses caused a steep fall in transport of timber to these centers. Later trade unions strengthened in the timber sector which is believed to have lead to the decentralization of the saw mills to the interior country side.

Timber exports through Beypore port have witnessed a steep fall over the years. For instance, exports, which stood at 7,878 tonnes in 1991-92, fell to 3,784 tonnes in 1992-93 and further to 3,553 in 1993-94. Though it recorded a three-fold increase to 11,774 tonnes in 1994-95, exports dropped to 11,237 tonnes the following year. The worst performance was in 1996-97 when it touched a low of 603 tonnes.

Along with the stagnation in the construction industry came the Supreme Court of India ruling on December 12, 1996, which said that the running of saw mills of any kind, including veneer or plywood mills, was *prima facie* violation of the provisions of the Forest Conservation Act, 1980, and "every state government must promptly ensure total cessation of all such activities forthwith." The court also ordered that there should be a blanket ban on the movement of cut trees and timber from any of the seven north-eastern states to any other state of the country either by rail, road or waterways. This has resulted in a virtual stoppage of timber coming from Nagaland, Arunachal Pradesh and Assam to the state. Moreover, considerable shift in preference among local consumers to the construction of concrete houses has also contributed to the decline of wood industry in Kallai. The major reason cited is the enormous hike in the wood price. After timber arrivals from the other states stopped, traders had to depend more on state government depots the where the price of timber escalated manifold.

In the wake of the recession in local wood supply, the industry is also sourcing timber from countries like Malaysia, Nigeria and Myanmar. The open market policy of Late Prime Minister of India, Mr. Rajeev Gandhi paved the way for the import of large number of tree species to Kerala market. They include Burmese irul or Pyinkado (*Xylia dolabriformis*), red sanders (*Pterocarpus santalinus*), Andaman pedauk (*Pterocarpus dalbergiodes*), African pedauk (*Pterocarpus soyauxii*). Despite their cheaper price, the demand for these timbers are less, primarily due to lack of oil content and colour. However, it creates a greater turnover for the traders. The sawn turnover proportion of foreign timber is 85% as compared to 60% in the case of indigenous timber. However, traders experience considerable difficulty in the

procurement of foreign timber as it is imported by big traders at ports like Tuticorin and Mangalore and has to pass through many hands.

Traders feel that the industry, which employs nearly 10,000 people in 50 big mills and 120 small mills in the Kallai belt alone, can be saved if the government slashes sales tax on timber and firewood. The state government has fixed the tax at Rs 12.5 per cent in the last budget.

## 5. URU TRADE AT BAYPORE

The wood trade history of Malabar is best known for its royal and elegant country boats known as 'Uru' constructed at Beypore, a small coastal town near Kallai, Calicut. "Uru" built by the traditional shipbuilders known as *Khalasis* has centuries old tradition. The *uru* made from Beypore had high demand in the Middle East and Europe for its exceptional design and stability. These have been used by the Arabs and Greeks since ancient times as trading vessels, and even now, *urus* are being manufactured and exported to Arab nations from Beypore. It is built of several types of wood, the main one being teak. The teak was taken from Nilambur forests in earlier times, but now imported Malaysian teak is used.

The name *uru* is associated with the traditional ship building culture of Kerala. And the art and science of making these ships came from the Arab world, some several centuries ago. The Arabs called them *dhow*s and they eventually became the traditional Arabian trading vessels (<http://historicalalleys.blogspot.com/2009/02/dhow-s-of-beypore.html>). Centuries ago, Arab traders traced their way to the spice-scented shores of Kerala. And after coming to know about the availability of good timber in the forests of Kerala and also the presence of skilled crafts persons in ship building, the Arab merchants began to place orders for constructing dhows to the crafts persons of Malabar in north Kerala. Beypore has a 1500 years old tradition of shipbuilding. It once experienced great demand from Western Asia for ships, because of its fame as the home to excellent crafts persons. The *Baraami*'s were the ship builders in Beypore. These *Baramis* can be traced to the Al Mukalla tribe in Egypt and struggle to continue the ship building in Beypore. The carpenter breed called *Khalasis* crafted these wonderful ships. The Beypore area is today home to the *Mappila khalasis*, famous for their expertise in lifting heavy weights.

The *urus* made in Beypore ships were usually around 300 tonnes. The 'keel' is the first part of a Uru to be made. Traditionally it is made with teak wood. Iron and copper nails are used to hold the wood together and the gaps were filled using fine quality cotton. 'Chukkan' is the another important part of Uru construction. Usually 'Chukkan' starts from the keel and height would be the actual height of the Uru. 'Chukkan' provides the total control of the vessel. Then the inside part of the dhow 'deck' and, finally 'aruthi' is made. The manufacturing process is completed with the tying up of the sail 'mat' (*paya*) to the mast (*chamaram*). The interesting aspect of Uru making is that no plan, sketch or technical documents are followed during any time of its construction. The construction details are assigned on a day to day basis to the assistants and carpenters by the master carpenter. No electrical tools or heavy machines are used. The basic tools are the indigenous carpentry tools. All heavy lifting is done using elaborate pulley systems. Various types of ships were built in Beypore. Some of them include *Boom*, *Padavu*, *Bireek*, *Kottiya*, *Sambook*, *Bahala* and *Pathemar*. An exciting fact about the shipbuilding industry in Beypore is the way in which the craft are built and the variety which can be found. The flat bottomed *zambuk*, the majestic *bireek* (both Indian and Arabian designs), the boom which boasts of an enormous cargo carrying capacity, and the

*bahala* with its beautiful and intricate carvings and arches, are all made using traditional tools and techniques ([http://en.wikipedia.org/wiki/Uru\\_\(boat\)](http://en.wikipedia.org/wiki/Uru_(boat)) accessed on 13/9/2011).

Special methods used from historic times were the use of wooden dowels instead of nails, use of coir rope and tar to seal joints etc. Duarte Barbosa first recorded (around 1500 AD) the manufacture of keeled ships boats carrying 1200 bahares burden (approximately 400 tonnes) in Beypore (Dames, 1989). He also noted that they had no decks. They were classic sewn boats of teak wood (both of which were at that time only available in Malabar – in this context). The caulking was done with shavings off the palm trees and the ships were coated with shark oil or castor oil for waterproofing.

### **5.1 Launching of Uru**

The launching of an *uru* is a festive ceremony, attended by a large number of people. First, a prayer is said by the Qazi. When a dhow was ready for launch wooden planks were kept up to appropriate height. The logs of the Puvathi (*Schleichera oleosa*) tree serve as rollers and are placed on either side. Over these, roller beams (Balus) strong enough to support the ship are kept. The gap between the beams and ship are filled tight with ropes. Then the ship is allowed to slowly move over the rollers with the help of rope and pulleys. In water they are submerged exactly up to the water mark earlier drawn by the Baramy. After the successful launch, a feast is laid out for all who have contributed to the ship building effort.

However, the Uru trade faced serious setbacks since the mid eighties. The primary reason is the transition to steel and fiber boats. Beypore town today is dotted with dozens of shops that sell model ships and one can notice iron anchors lying on either side of the road, which are tell tale signs of this flourishing industry. The acute scarcity of quality timbers such as teak, karimaruthu, rose wood (*Dalbergia latifolia*), and pali (*Palaquium ellipticum*) was the major factor for this. Yet another reason was the non-availability of wooden spares for the repair and maintenance of *urus* at the traded countries, primarily due to the stringent government policy on the export and import of wood. Despite this, there is now resurgence in *uru* manufacture primarily on account of its utility in the tourism sector.



## 6. WINDS OF CHANGE

As earlier discussed, the cardinal factor for the down fall of Kallai as a wood trade centre was the non-availability of quality timber of teak and rosewood. With the ban on the green felling and the land ceiling act and associated nationalization of private lands, supply of teak and rosewood declined substantially in the Kallai market. However, the industry adjusted with the changing trends by switching over to other second order timber trees such as such as *Terminalia bellerica* (Thanni) and Venga (*Pterocarpus marsupium*) which opened up renewed demand in the small timber sector especially from Tamil Nadu and Andhra Pradesh. Yet another change was the demand for mango for plywood and packing case, ben teak (*Lagerstroemia lanceolata*) for lorry body building, *Artocarpus hirsutus* (Anjili) for country boat construction etc.

When the ban on the green felling exist and the wood share from the govt forests narrows down there is need to improve the wood supply from the private lands and agro-forests. Reports suggest that 60-70% of the structural timber in Kerala is sourced from private homesteads (Krishnankutty, 1990). This stresses their enormous potential in meeting our wood demand. Tree farming initiatives in the non forested areas and agro-forestry practices involving integration of trees in agriculture fields can improve the wood raw material availability (Guillerme, et al. 2011).

## 8. CONCLUSION

This article analyses the reasons for the rise and fall of Kallai as a premier wood trade centre in Kerala and tries to draw lessons on the need for diversification of wood products. It recognizes raw material scarcity as the key factor for the downfall of wood industry in Kerala. Enhancing the wood availability from areas outside conventional forests is the lead action warranted in this context. Policy interventions that facilitate tree farming in the homesteads and agro-forests can bring forth substantial headway in improving wood supply and bring back the lost glory in wood trade.

## 8. REFERENCES

- Ayyar, K.K.V, 1938, The zamorins of Calicut: from the earliest times down to A.D. 1806. University of Calicut. Publication Division. 320p.
- Dames, M.L, 1989, The book of Duarte Barbosa: an account of the countries bordering on the Indian Ocean and their inhabitants. AES first reprint. Asian Educational Services. 31, Hanz Khyas Village, New Delhi- 110 016. pp74.
- Guillerme S, Kumar B.M., Menon, A, Hinnewinkel, C, Maire, E and Santhoshkumar AV, 2011, Impacts of public policies and farmer preferences on agroforestry practices in Kerala, India. Environ Manage. 48(2):351-364.
- Krishnankutty, 1990, Demand and supply of wood in Kerala and their future trends. KFRI research report 67. Kerala Forest Research Institute. Peechi- 680 653, India. 66pp.

Logan, W, 1887, Malabar Manual. J. Jetley. Asian Educational Services. 31, Hanz Khyas Village, New Delhi- 110 016. 751p.

Madan, K.D, 1998, Life and travels of Vasco Da Gama. J. Jetley. Asian Educational Services. 31, Hanz Khyas Village, New Delhi- 110 016. 140p

Muraleedharan, P.K. and Bhat, K.M, 1989, A techno-economic study of sawmilling industry in Kerala. KFRI. Res. Rep. 60.

Tucker, R.P. 1988. The depletion of India's forests under British Imperialism: Planters, Foresters and Peasants in Assam and Kerala. In. The Ends of the earth: perspectives on modern environmental history (Donald Worster Eds.) 341 p. Cambridge University Press.

# THE WOOD LEGACY OF KALLAI: LESSONS FOR THE FUTURE

Kunhamu T.K., Gopakumar, S. Anoop,  
E.V. and Ghosh, A

College of Forestry, Kerala Agricultural University

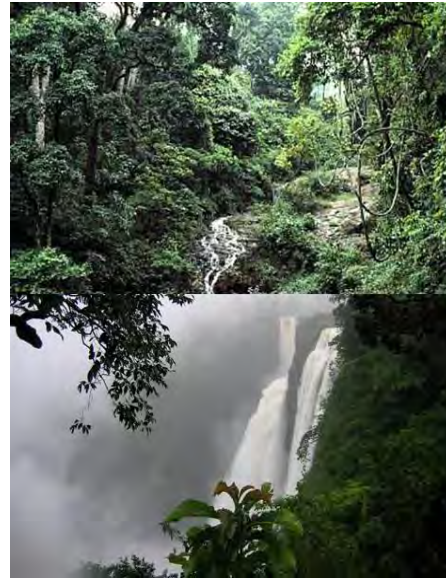
## Kerala– The God’s own country

- Lush greenery
- Unique biodiversity
- Warm humid climate
- Land of diverse crops
- Fertile soil



- Evergreen and moist deciduous forests
- Home to several valuable tree species
- Structural timbers, softwood species for plywood, pulp and other smallwood purposes

- Teak (*Tectona grandis*)
- Rose wood (*Dalbergia latifolia*)
- Xylia xylocarpa*
- Terminelia tomentosa*
- Sandal (*Santalum album*)



## Malabar

- North and central Kerala regions
- Prominent in the ancient trade map of Kerala.
- Leading trade centre of spices for centuries
- Kozhikode (Calicut)- trade capital of Malabar prominent place in the international trade in the subcontinent



# Glory of Kallai

- ▶ Kallai, a suburban village near Calicut city along the bank of Kallai river
- ▶ Internationally acclaimed premier centers of wood trade
- ▶ Kallai once the 'hub of timber market' in south Asia
- ▶ Dictated the international timber prices for several decades
- ▶ Dates back beyond the era of the *Zamorins*.
- ▶ Kallai wood trade belt–35km either side of river



- ▶ Export centre of timber– finished and raw wood products to middle east, Europe for several centuries
- ▶ 1950–70 was the golden period of Kallai
- ▶ Bountiful supply of good quality structural timbers such as teak, rose wood, and karimaruthu (*Terminalia tomentosa*) from private and government forests– accessibility to the sea port
- ▶ The river Chaliyar – prominent role in upholding the glory of Kallai
- ▶ Cheaper river transport– heavy wood demand in the national and international market
- ▶ Proliferation of saw mills more than 150 large and small saw mills



## History

- ▶ Carved unique wood niche- wood trade for centuries
- ▶ **Vasco Da Gama** at Kappad-1498- gate way
- ▶ Trade with Arabs and Europeans (Dutch and French)
- ▶ **Zamorins and Arab** traders
- ▶ Kozhikkode- mighty seaport- **Arabs and the Chinese** - exchanged the products of the west with the east and *vice versa*
- ▶ English east India company-1600
- ▶ Construction of Buckingham palace
- ▶ Battle of Waterloo-British fleet- wood from Kallai

- ▶ Restrictions on the felling and extraction of timber from Thiru-Kochi forests-**princely forests**
- ▶ **Malabar-private forests flourished** till early 70'
- ▶ The first organized wood processing (sawmilling) unit in Kerala was set up at Kallai in 1893 by A. Brown
- ▶ Private forest owners in Malabar were Maruveetil Nair, Koipathodi, Kuppathodi nayar, P.I Kunhammed kutty, Kunhimayin haji, Kakkodans, M.C. Pothan, Nilambur-Kovilakam, etc

## Demand for specific products

- ▶ Long teakwood planks of size 30'x2"x2"- manufacture and repair of large country boats (used in royal navy)
- ▶ Lengthy teak wood planks of size 35 to 40'- from the Nilambur forests in huge rafts through the Chaliyar river
- ▶ High quality teak planks of size 30'x 1.5'x 1" were exported to Middle East countries for repair of *Urus* (wooden country boats).
- ▶ High demand for 'V' shaped wooden frames to reinforce the basement of boats and *urus*



- ▶ Major source of wood for railway sleeper- in southern India
- ▶ Packing case industry which also flourished in Kallai for many decades
- ▶ High demand for lesser known trees- Matti (*Ailanthus triphysa*), Bombax (*Bombax ceiba*), Macaranga (*Macaranga peltata*)
- ▶ Wood was also exported to many European countries like Germany, England, Italy and to Japan.



## Prominent saw mills

- ▶ M/s Pary & Co
- ▶ M/s B.S.T Saw mills
- ▶ M/s P.I. Kunhamed Kutty haji mills
- ▶ M/s Imbichi Koyaji saw mills
- ▶ M/s Bichu saw mills
- ▶ M/s V.K, Sankaran Nair & Co
- ▶ M/s Gopalan saw mills
- ▶ M/s Standard furniture Co

## Nilambur teak forests

- ▶ **'Mecca of teak'** – helped Kallai in carving its own wood legacy.
- ▶ **High demand**– golden brown colour, strength and durability.
- ▶ Dearth for quality saw logs–felt during the mid 1800s
- ▶ **Conolly**–Collector of Malabar–Pioneering efforts– successful in planting teak in Nilambur along the banks of Chaliyar river during 1841–46.
- ▶ Mr. Chathumenon, Sub Conservator of forests





## DOWN FALL OF KALLAI

- ▶ Largest trading area in Asia and the second largest in the world
- ▶ 1950s and 60s- more than 150 saw mills- down 50 in the early 80's
- ▶ **Major reason: Dearth for quality timber**
- ▶ Kerala Private Forests (Vesting and Assignment) Act, 1971- **private forests-nationalized** as reserved forests
- ▶ Supreme Court **ban on clear felling**: curtailed the wood flow to Kallai
- ▶ Stagnation in the **construction industry in Mumbai** and Pune and a shift to concrete houses caused a steep fall in demand.
- ▶ **Trade unions** strengthened - decentralization of the saw mills to the interior country side.

Out flow of wood from Kallai

Sl No	Year	Annual exports* (Tones)
1.	1991-92	7878
2.	1992-93	3784
3.	1993-94	3553
4.	1995-96	11774
5.	1996-97	11237
6.	1997-98	603

\* Finished wood

- ▶ Supreme court ruling– blanket ban on the movement of cut trees and timber from seven north–eastern states to other state of the country
- ▶ Virtual stoppage of timber coming from Nagaland, Arunachal Pradesh and Assam to the state
- ▶ Shift in preference concrete houses– contributed to the decline of wood industry in Kallai.

- ▶ The open market policy of Late Prime Minister of India, Mr. Rajeev Gandhi– import of large number of tree species to Kerala market.
- ▶ Burmese irul or Pyinkado (*Xylia dolabriformis*),
- ▶ Red sanders (*Pterocarpus santalinus*)
- ▶ Andaman pedauk (*Pterocarpus dalbergiodes*)
- ▶ African pedauk (*Pterocarpus soyauxii*).

- ▶ Imported wood: Cheaper price– less demand– due to lack of oil content and colour– but more outturn
- ▶ The industry, which employs nearly 10,000 people in 50 big mills and 120 small mills in the Kallai belt alone
- ▶ Government to **slash sales tax** on timber and firewood
- ▶ Govt to revamp the **wood export policy**.

## URU trade at Baypore

- ▶ The wood trade history of Malabar– best known for its royal and elegant country boats– known as '*Uru*' constructed at **Beypore**, a small coastal town near Kallai, Calicut.
- ▶ High demand in the Middle East and Europe for its exceptional design and stability
- ▶ Arabs and Greeks used Uru since ancient times– as trading vessels
- ▶ Even now, *urus* are being manufactured and exported to Arab nations from Beypore.



- ▶ Grand maritime tradition
- ▶ The *Baraami's*– ship builders in Beypore.
- ▶ *Baramis* – *Al Mukalla* tribe in Egypt and struggle to continue the ship building in Beypore.
- ▶ The carpenter breed called *Khalasis* –crafted these wonderful ships.
- ▶ The Beypore area is today home to the *Mappila khalasis*, famous for their expertise in lifting heavy weights.



## URU making

- ▶ Usually around 300 tones. The '**keel**' is the first part of a Uru to be made. Traditionally made with teak wood.
- ▶ Usually '**Chukkan**' starts from the keel and height would be the actual height of the Uru –Chukkan' provides the total control of the vessel
- ▶ The manufacturing process is completed with the tying up of the sail 'mat' (**paya**) to the mast (**chamaram**)

- ▶ Various types of ships were built in Beypore. Some of them include
  - *Boom,*
  - *Padavu,*
  - *Bireek,*
  - *Kottiya,*
  - *Sambook,*
  - *Bahala*
  - *Pathemar.*
- ▶ The ships were coated with shark oil or castor oil for waterproofing.

## Launching of Uru

- ▶ A festive ceremony
- ▶ Logs of the Puvathi (*Schleichera oleosa*) tree serve as rollers
- ▶ Over these, roller beams (Balus) strong enough to support the ship are kept.
- ▶ Ship is allowed to slowly move over the rollers with the help of rope and pulleys



## Uru industry: set backs

- ▶ Uru trade faced serious setbacks since the mid eighties
- ▶ Proliferation of modern vessels
- ▶ The acute scarcity of quality timbers such as teak, karimaruthu, rose wood (*Dalbergia latifolia*), and pali (*Palaquium elipticum*)
- ▶ Non availability of wooden spares for the repair and maintenance of *urus* at the traded countries
- ▶ Primarily due to the stringent government policy on the export and import of wood.

## Winds of change

- ▶ Switching over to other **second order timber trees** such as *Terminalia bellerica* (Thanni) and Venga (*Pterocarpus marsupium*)
- ▶ Opened up renewed demand in the small timber sector especially from Tamil Nadu and Andhra Pradesh and other states.
- ▶ Uru building gaining momentum– demand from tourism sector from many countries
- ▶ Renewed demand:
  - Mango for plywood and packing case
  - Ben teak (*Lagerstroemia lanceolata*) for lorry body building
  - *Artocarpus hirsutus* (Anjili) for country boat construction
  - Ailanthus for matchwood industry

# Opportunities

Structural timber availability in Kerala

Source	Teak (%)	All Timbers
Homesteads	63	32%
Estates	0	41%
Forests	34	9 %
Imports	3	18%
Total	100 %	100%

Source: Krishnankutty, 2005

## Lessons for future

- ▶ Raw material scarcity as the potential reason for the down fall of Kallai
- ▶ Need for diversification of wood products
- ▶ Wood from natural forests– narrows down
- ▶ Enormous potential– availability from homesteads and agroforests
- ▶ Encourage tree farming– in non forested areas
- ▶ Tree farming– policy interventions

# **Bamboo as a Modern Construction Material**

**T P Subramony**





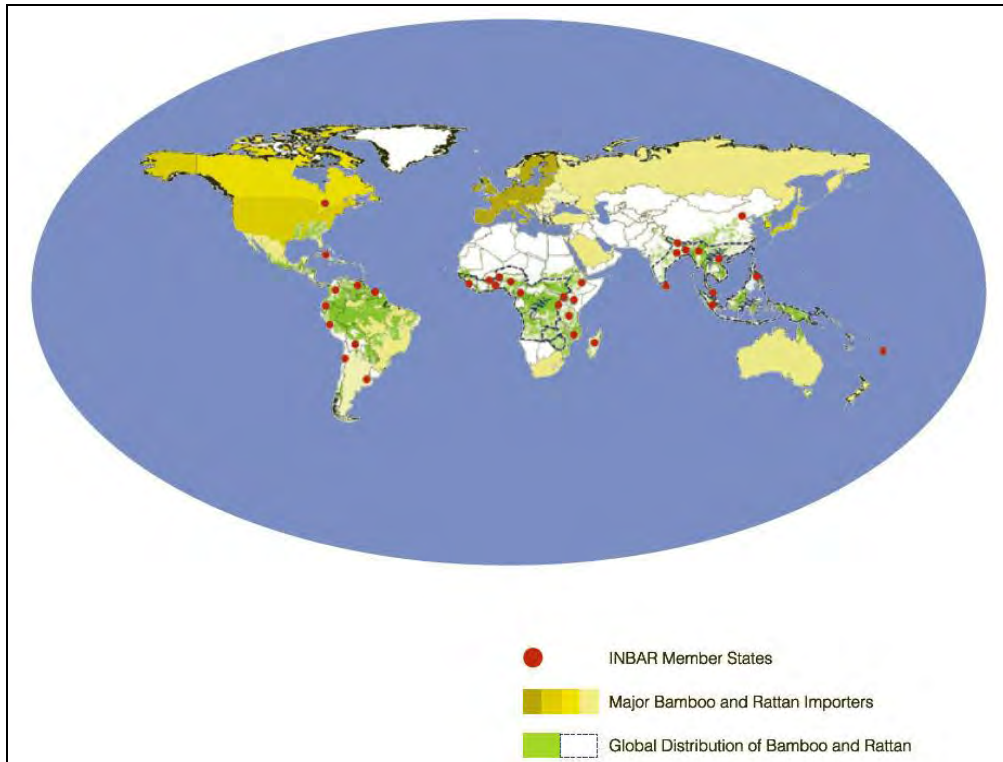
**Bamboo as a Modern Construction Material**  
 International Conference on the Art and Joy of Wood  
 (19-22 October 2011, Bangalore, India)

T. P. Subramony / Nripal Adhikary  
 International Network for Bamboo and Rattan (INBAR)  
 South Asia Regional Office



- **INBAR:** Inter-governmental international organization
- **Headquarters:** Beijing, China
- **Regional Offices:** India (for South Asia region); Ecuador; Ethiopia; Ghana; China
- **Countries (SARO):** - Bangladesh, Bhutan, India, Malaysia, Myanmar, Nepal, Sri Lanka (MCs)
- **Member countries:** 37





## INBAR's Strategy and the MDGs

- Millennium Development Goal 1:  
Eradicate extreme poverty and hunger
- Millennium Development Goal 7:  
Ensure environmental sustainability
- Millennium Development Goal 8:  
Develop a global partnership for development

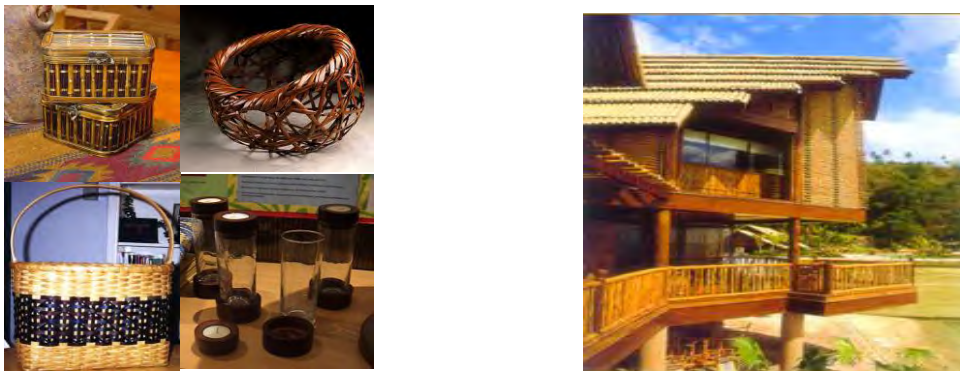


## INBAR Programmes

- Environmental Sustainability (ES)
- Livelihood and Economic Development (LED)
- Trade Development (TDP)
- Global Bamboo Housing Programme (GBHP)
- Non-Timber Forest Products (NTFP)



## Multiple applications from Handicraft to Housing





## Global Bamboo Housing Programme

- Research and Development
- Disseminate knowledge
- Technology Transfer
- Support the development of markets



## Why Bamboo?

Bamboo matures in 3-6 years.

It takes 60 days for bamboo to grow 60 feet.

Earthquake resistant properties  
e.g. Costa Rica (7.6 Richter Scale)

High insulating property.

Economical

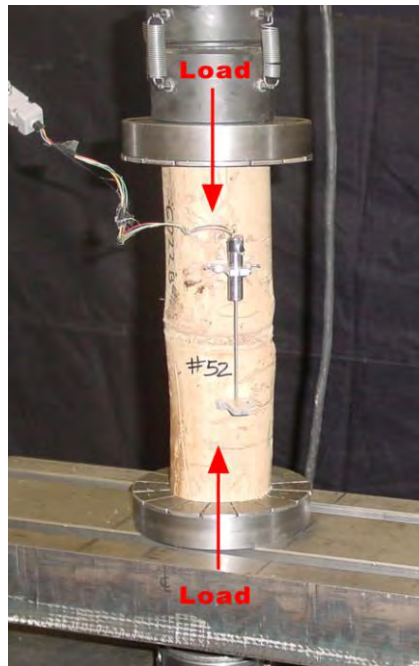


Building Materials	Density	Modulus of Elasticity		Yield Strength		Ultimate Strength		Strength Over Density
		p/cf	ksi	Mpa	psi	Mpa	psi	
Carbon Fiber	110	21,800	150,305	n/a	n/a	819,463	5,650	1,072,752
Structural Steel	490	29,000	200,000	36,260	250	58,000	400	17,045
Aluminum Alloy	170	10,000	68,947	26,106	180	29,000	200	24,565
Cast Iron	435	27,500	190,000	n/a	n/a	29,000	200	9,600
<b>Bamboo pole</b>	<b>25</b>	<b>2,694</b>	<b>18,575*</b>	<b>n/a</b>	<b>n/a</b>	<b>8,700</b>	<b>60*</b>	<b>50,112</b>
Timber	40	1,600	11,000	n/a	n/a	5,800	40	20,880
Concrete	150	3,000	20,684	n/a	n/a	435	3	418

\* Janssen, 1991

Bamboo Pole = 1.5 higher strength than Typical Timber

Structural Feasibility  
INBAR



INBAR



## Some Modern Examples



## A big question



- So what does it take for bamboo to become a mainstream modern material?



## Challenges to making bamboo



mainstream

- Supply Chain
- Proper Harvesting regime
- Appropriate Treatment
- Appropriate Joinery & Craftsmanship
- Supportive Policy



## Challenges to supply chain



# Appropriate Treatment



## Untreated bamboo

**Cheap, fast, effective:**  
*buy it today, use it today. Biodegrades:  
lasts for 1-3 years depending on  
exposure.*



## Treated bamboo

*Has a 20-30yrs life expectancy if  
correctly harvested, handled and  
treated, and sheltered from weather in  
use. Hence offers a greatly increased  
contribution to community resources.*

Source: Humanitarian Bamboo , 2009



# Appropriate Treatment



Source: abari.org





## Appropriate Joinery & Craftsmanship

- Joints often weakest part of bamboo structure
- Joints require specialized skill
- Very labour intensive process
- Few tools dedicated to bamboo

## Appropriate Joineries:



Source: Jorge Moran adaptation Simon Velez

# Appropriate Policies:



## Key Policy Issues

## Examples of Good Practice

Standards and Building Codes

2 ISO standards; National building codes approved in Peru & Columbia;

India recently declared it as grass.

Bamboo placed on



## Case Study : Post-Disaster Recovery Sichuan,China





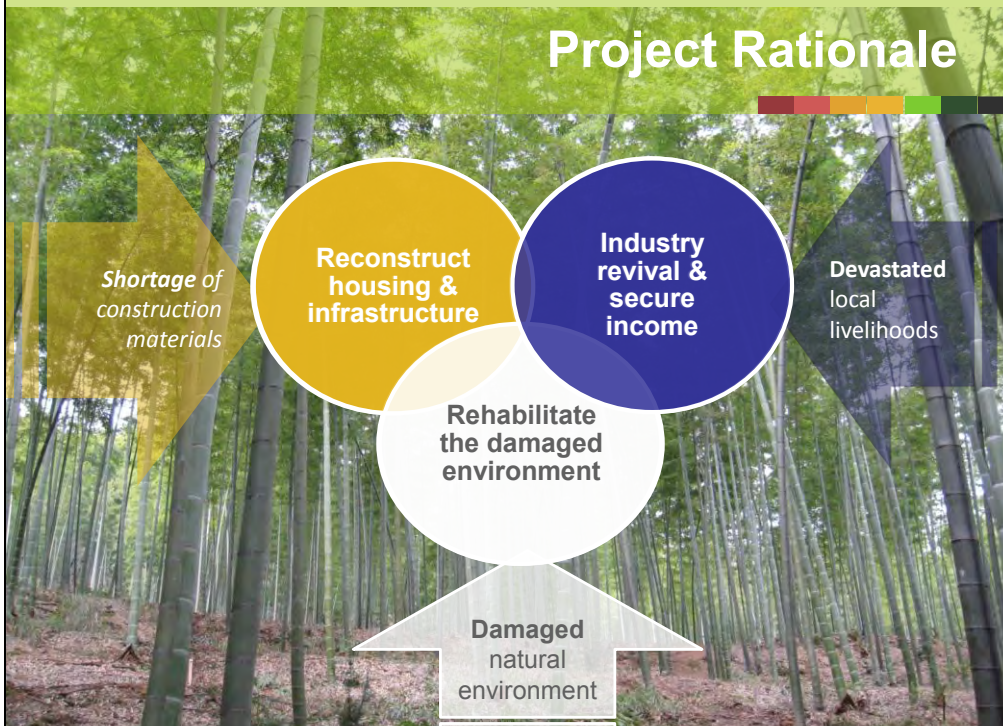
## Background



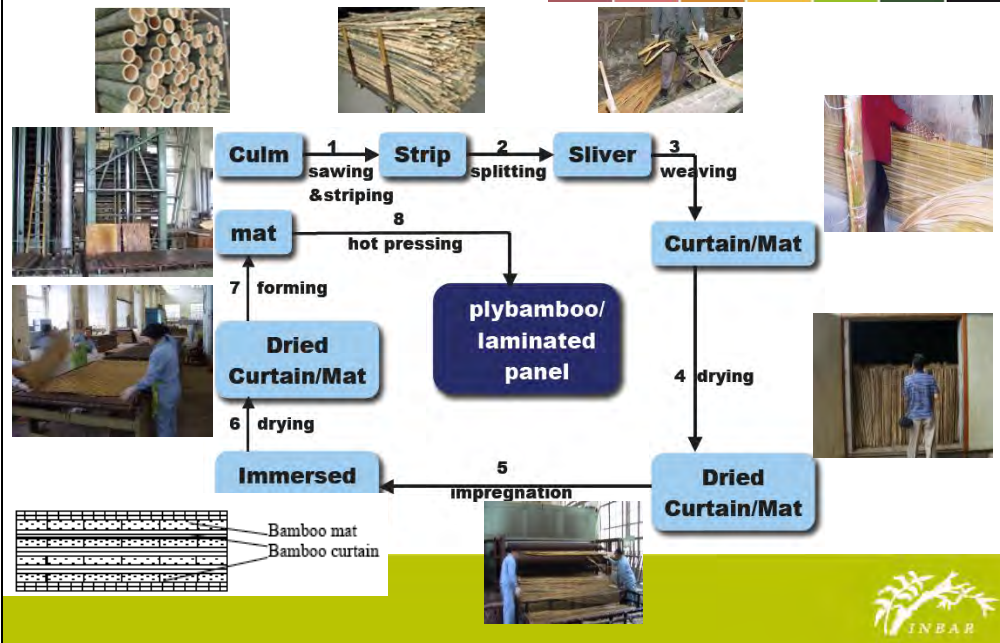
### 2008 Sichuan Province Earthquake

- 5.5 million people left homeless and displaced
- 370,000 unemployed & 1.15 million deprived of agricultural production
- €21 billion in damages - **huge demand for re-building materials**

## Project Rationale



# Processing for Bamboo Plywood







Zeri Pavilion, Colombia

Amiens Cathedral, France

Bamboo & Architecture  
INBAR



Cupola at Casa Alejano, Colombia

Abbey Church of St. Denis, France

Shelter, Colombia

Thorncrown Chapel by Fay Jones, AR

Bamboo & Architecture  
INBAR