

# **Carbon Sequestration And Energy Efficient Potentials Of Bamboo Mat Composites**



**By**

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# Basic Need of Human Being

Food



Shelter



Cloth



Energy Need : Heat, Electricity



# BAMBOO AND ITS USES

Bamboo has more than 1,500 documented uses, ranging from fuelwood to light bulbs, medicine, poison and toys to aircraft manufacturing.



## Categories of bamboo products

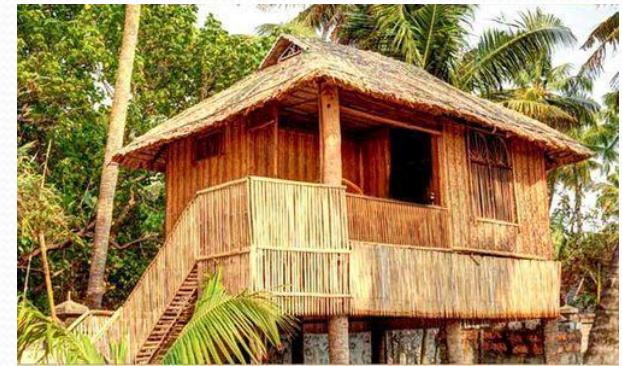
- Industrial Use and Products, (paper and pulp, bamboo charcoal for fuel, bamboo based gasifier for electricity)
- Food Products (consumption of bamboo shoots, wine etc., )
- Construction and Structural Applications (Bamboo housing)
- Wood Substitutes and Composites
- Cottage and Handicraft Industry



# BAMBOO AND ITS USES : TRADITIONAL USES



LAMP SHADES



Bamboo house,



LADDER

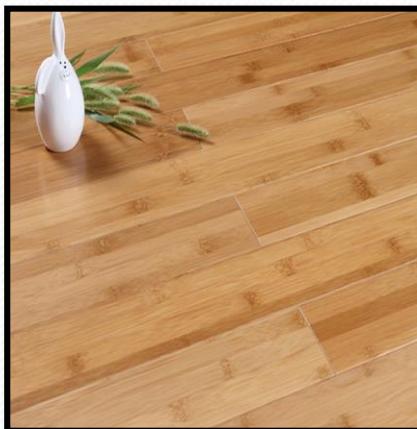


FENCING



SCAFFOLDING

# BAMBOO AND ITS USES : MODERN USES



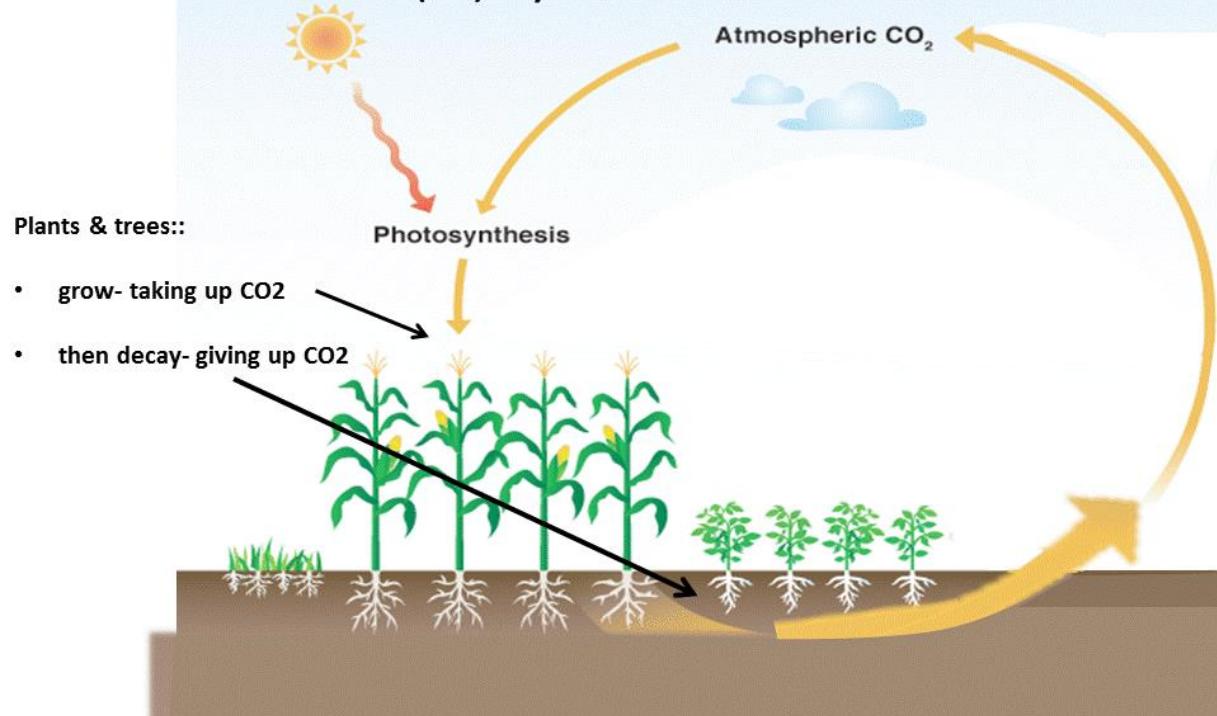
# Green House effect of CO<sub>2</sub>

- About 55 – 70% additional green house effect is caused by CO<sub>2</sub>.
- Addition of CO<sub>2</sub> to the atmosphere is 7.9 billion tons per year of which 3.3 billion tons are retained in the atmosphere.



# How to reduce CO<sub>2</sub> in atmosphere

## Terrestrial carbon (re)-cycle



- Removing CO<sub>2</sub> from air and storing it.
- Growing trees – absorbs CO<sub>2</sub> and release O<sub>2</sub>.
- A typical tree absorbs through photosynthesis an equivalent of 1 ton of CO<sub>2</sub> produces 0.7 ton of O<sub>2</sub>.

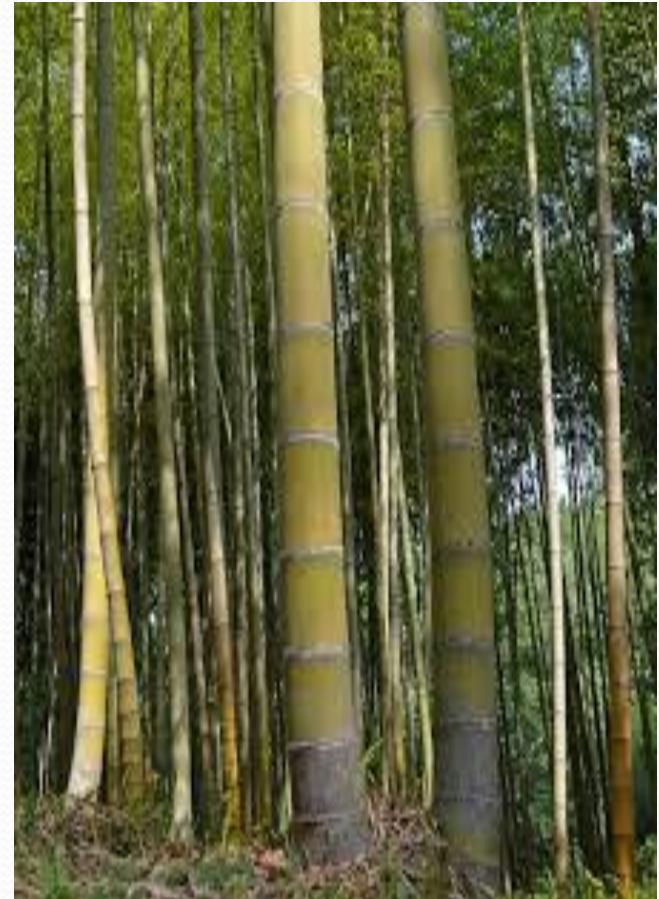
→ **Bamboo sequesters carbon dioxide from the atmosphere and converts the carbon into plant fiber.**



**Bamboo houses**

**Carbon capture and storage system.**

**Carbon is effectively stored for long years**



**large-scale bamboo**

**Effective carbon sinks.**

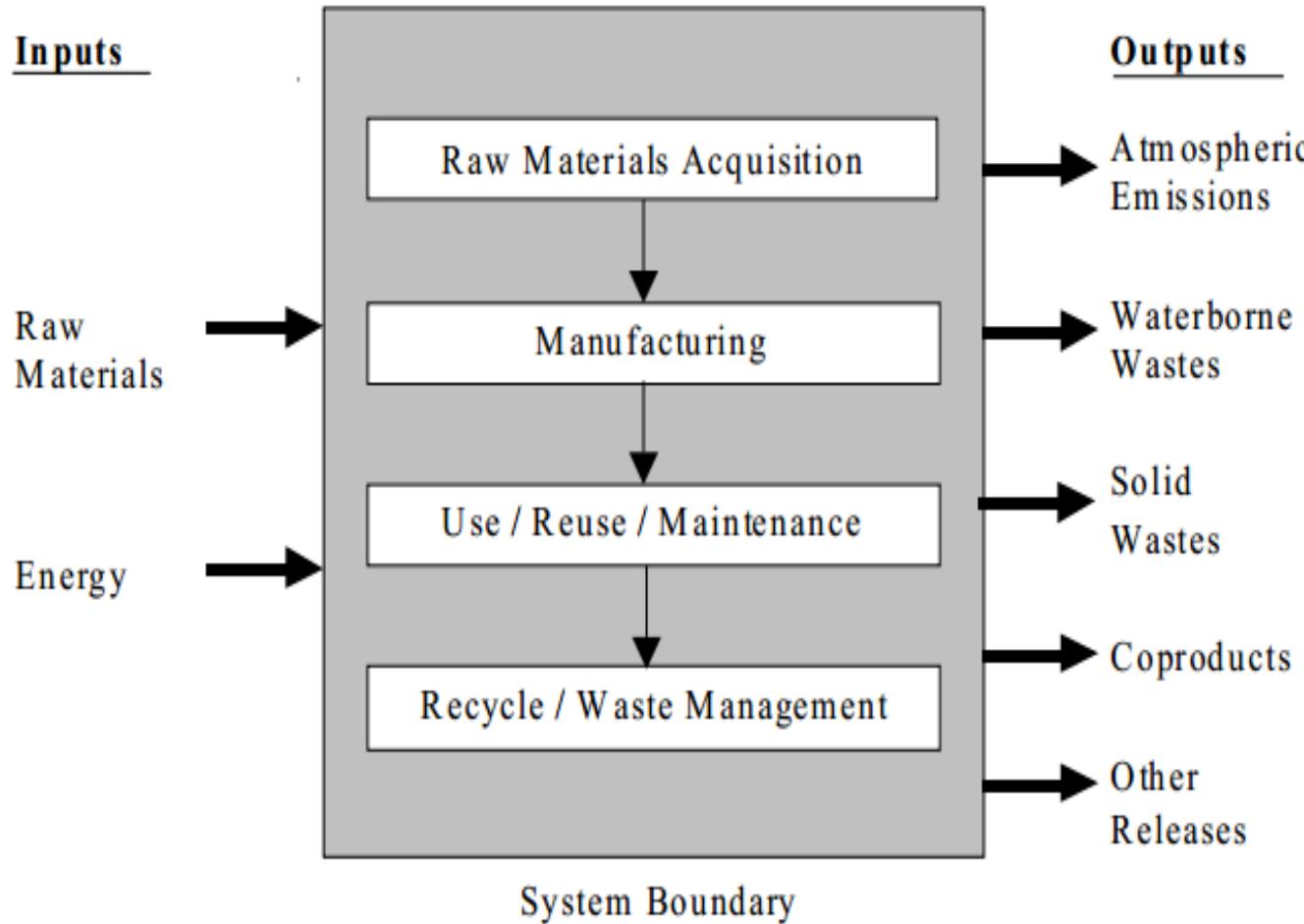
**Bamboo**

- Carbon sequestration & rapid expansion of raw material supply to support future growth in value-added products market.

- The concept of *green buildings* is derived from renewable materials which consume less energy, are less polluting, cost effective and are environmentally sustainable in life cycle analysis.
- Bamboo Mat Corrugated Sheets (BMCS) and Bamboo Mat Ridge Cap (BMRC) are such products which satisfy all the requirements.
- IPIRTI explored to study energy inventory on processing of BMCS and BMRC and their environmental impacts on carbon footprint during their manufacture
- While auditing the energy input during processing and study on carbon footing, the main characteristics of bamboo that is being taken into consideration are carbon content and moisture content in the material.

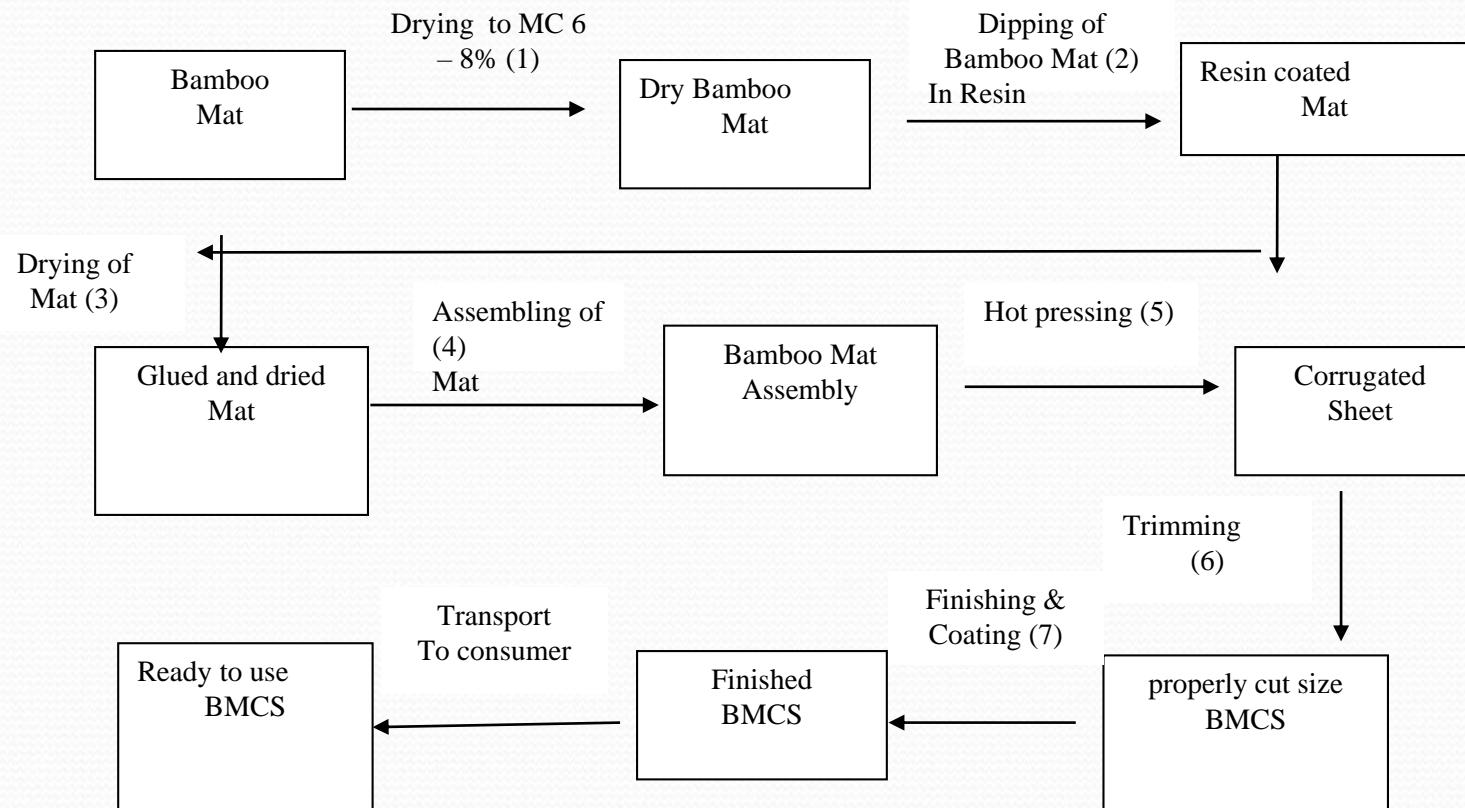


# Factors considered for study of carbon footing for BMCS and BMRC,



**LIFE CYCLE STAGES**

# Flowchart for manufacture of Bamboo Mat Corrugated Sheet and Bamboo Mat Ridge Cap



## Conversion loss and recovery of bamboo in making of bamboo mats

Felling & Trimming of branches -	Loss in Weight
Cross cutting	7%
Splitting +	5%
Knot removal and	36%
Width sizing	
Slivering	13%
Drying	3.5%
Mat weaving	1%
Total Loss	65.5 %
Recovery	34.5 % (MC 18%)



## Carbon balance :

Starting with green bamboo with bio mass of 42.00% the final products (BMCS & BMRC) contains 25.48%.

With 51.5% of C in solid biomass of bamboo, the carbon content in bamboo mat is 14.58%.

Thus converting green bamboo with average MC of 58% into bamboo mat a product with average carbon content 14.58% is obtained.

### **The carbon balance in the whole process**

Green bamboo	:Bio mass content	-	42.00
(100%)	Moisture Content	-	58.00
	Carbon content	=	21.63
CO <sub>2</sub> removed from air in the process growth		=	79.31
BMCS/BMRC	: Biomass content	=	25.4
	Carbon content	=	13.08
	<b>Equivalent CO<sub>2</sub></b>	<b>=</b>	<b>47.95</b>

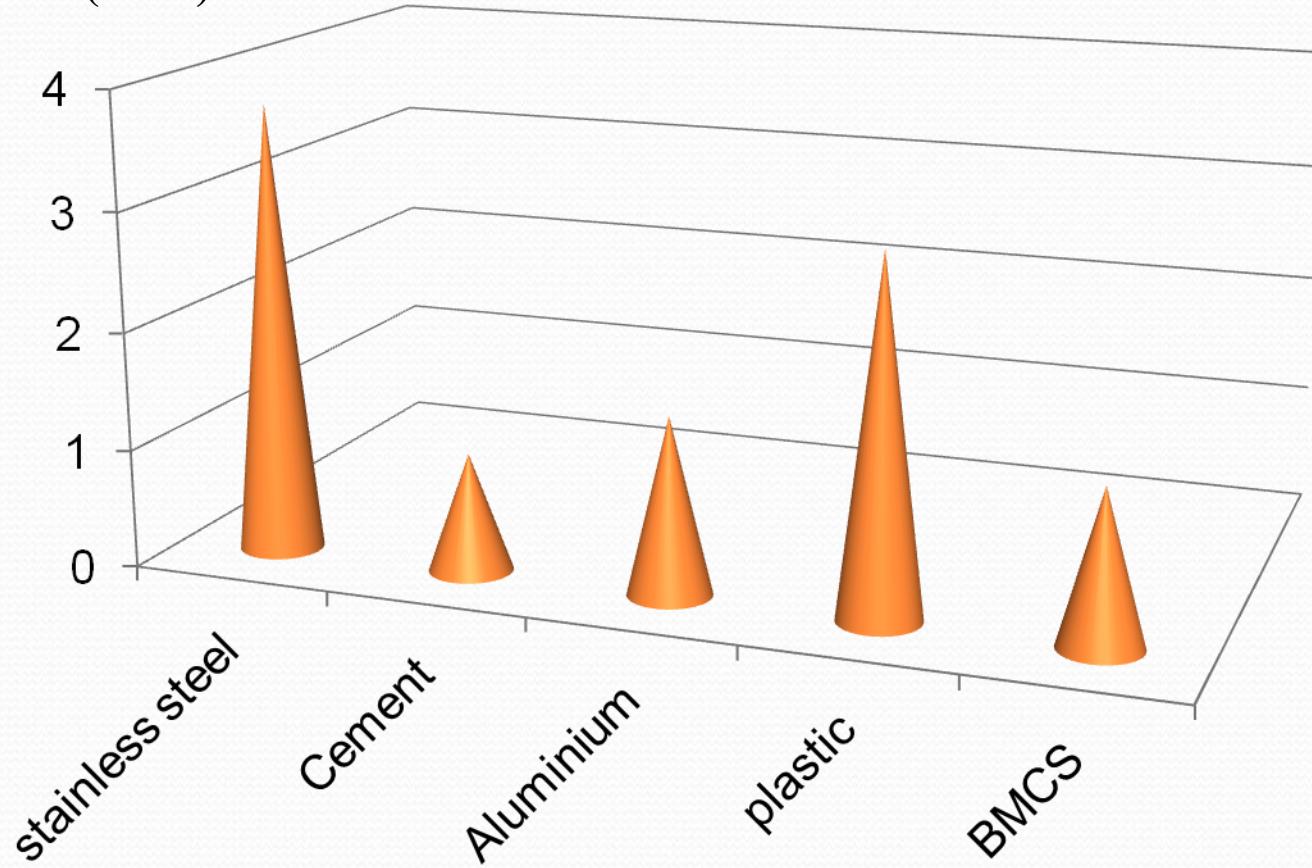
## Carbon balance... cont

**100 parts of green bamboo into BMCS/BMRC 13.08 parts of carbon is stored in the products which is equivalent to 47.96 parts of CO<sub>2</sub>**

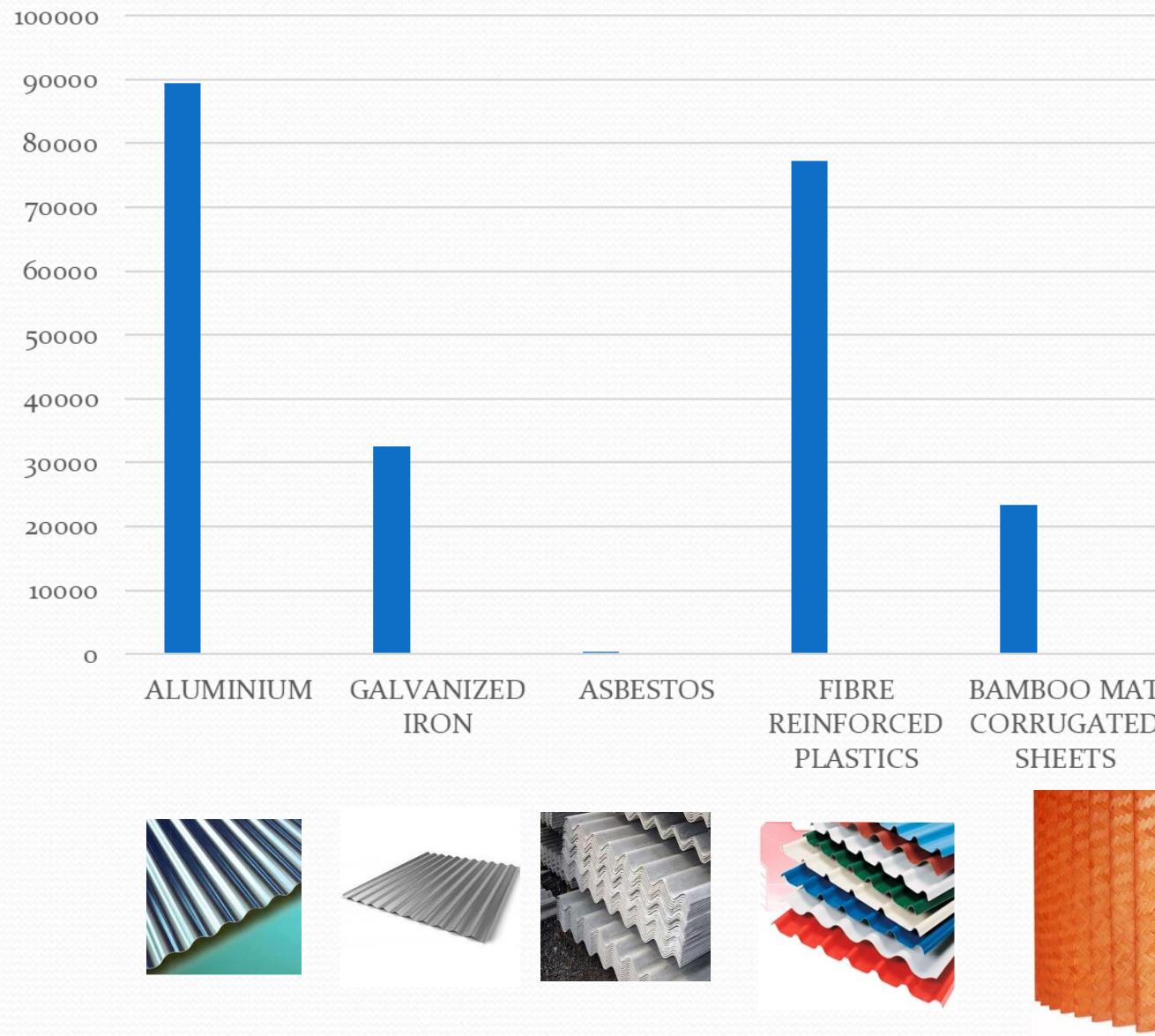
Total CO<sub>2</sub> emitted due to burning of fuel = (2.82+25.61) kgs = 28.43 kgs  
Carbon stored in 1 (one) BMCS = 4.01 kgs. Equivalent CO<sub>2</sub> = 14.70 kgs.  
Net release of CO<sub>2</sub> due to manufacture of one BMCS = (28.43 - 14.70) = 13.73 kgs

# Net $\text{CO}_2$ released during production of 1 Ton of different products

$\text{CO}_2$  released (Tons)



# Energy required for manufacture of ROOFING/CORRUGATED SHEETS (MJ per tons)



# CONCLUSION

- The use of biodegradable bamboo as raw material for manufacture of durable roofing sheet is unique by itself.
- The present study has conclusively shown that it is low energy consuming compared to conventional roofing sheet like GI, plastic, aluminium etc.
- Although the energy consumption in the manufacture of BMCS is higher than ACC sheet, BMCS is eco-friendly while ACC sheet is unhygienic in nature.
- A substantial amount of  $\text{CO}_2$  is removed from air and stored in BMCS as lignocellulose material.
- Pollution is minimized during manufacture of BMCS

# CONCLUSION

- The energy audits determined that the combined total energy consumption was 22784 MJ
- Measurement of cumulative carbon footprint of BMCS and BMRC from procurement of raw material to finished products indicates that there is a net gain of carbon in the process - resulting in substantial locking of carbon in the interest of posterity.

The manufacture of BMCS is thus has an edge over the other competitive roofing material with respect to energy efficiency, greenhouse effect, storage of carbon and effect on environment.



# THANK YOU

websites

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