Are traditional bamboo products green?

Bamboo is an important wood substitute and agroforestry plant[1] occupying about 37 million hectares of total forest area of the world[2]. There are about 1250–1500 species of bamboo worldwide[3]. It is estimated that almost 11.4 million hectares of land in India is under bamboos and India is a major bamboo-producing country in Asia[4]. It is one of the most environmentally and economically sustainable resources[5] and has a major contribution to the diverse economic needs of the rural community of the country[5]. North-east India occupies about 28% of the total bamboo area of the country and sustains about 70% of rural work force in the region[6]. Therefore, bamboo forms an important component of rural economy of north-east India[5]. There are many potential uses of bamboo including food, medicine, fencing, roofing, construction material, furniture, shelter, traditional crafts which plays a significant role as an income generator for the rural poor[5]. It has been observed that bamboo has a high potential to sequester large amount of carbon and has a crucial role in the climate change mitigation by carbon balance in the ecosystem[1,3–5]. The high standing carbon stock of bamboo thus makes it a vital sink of the terrestrial ecosystem[7].

Numerous studies have addressed the potential role of vegetation and soil of bamboo ecosystems in carbon storage and sequestration potential. However, a detailed study on the role of bamboo products which are in use since millennia has not been explored in the context of carbon storage and sink management. Therefore, the specific objective of this study is to evaluate the role of bamboo products in carbon storage.

A preliminary study was carried out by visiting the local markets of Cachar district of Assam, north-east India to explore the villages where the craft are being prepared. Accordingly, a list of villages was prepared and the number of villages to be studied was selected from that primary list. Selection criterion for villages to be studied was the community of the people involved in the craft making. The use of different community as a criterion for study area selection is based on the logic that such strategy will enable to represent diverse people preparing the products in the region. A total of four villages, namely (i) Irongmara (24°41′20″N 92°44′22″E) dominated by fisher community, (ii) Nagathal (24°35′24.4″N 92°45′21.6″E) dominated by Hmar tribal community, (iii) Rosekandy (24°42′03.1″N 92°41′54.4″E) dominated by tea tribes, and (iv) Sildubi (24°43′01.8″N 92°49′05.5″E) dominated by Bengali community were selected for the present study. From each village, 25 craft families were interacted to obtain the data set for the present study. Information regarding bamboo species used, local name of the products, average life span of the products, cost of bamboo products, total number of items prepared per day, number of working days per year were gathered through field visits and interaction with villagers through detailed and structured questionnaire in the respective villages.

Fresh weight of the bamboo products was taken in the field using an electronic weighing machine. Some sample bamboo products were brought to the laboratory and oven dried at 70°C up to constant weight. Sample bamboo products were powdered and analysed for determination of carbon content. A total of 50% of the ash free mass was calculated as the carbon content. The ash content was determined by igniting 1 g of powdered bamboo sample at 550°C for 6 h in a muffle furnace. The carbon storage in the different bamboo products was determined by multiplying the biomass with the carbon concentration. Biomass carbon stored in bamboo products per household was computed as follows.

Total number of bamboo products prepared annually per household (number/household) × total dry weight of the bamboo products (kg/household) × carbon content (%).

CO_2e was computed as follows: carbon stock × 3.67.

A total of 21 different agricultural, fishing and miscellaneous devices have been recorded from the study villages (Table 1). The agricultural and other products are prepared throughout the year whereas fishing-related products are mainly prepared in the rainy season. Four bamboo species namely *Bambusa cacharensis*, *Schizostachyum dullooa*, *Melocanna baccifera* and *Giganthocloa albociliata* are used by the craftsmen in the study villages. It was found that the maximum longevity of any bamboo product in the study area is five years. During the process of interaction with the villagers, it was found that they do not apply any post-harvest treatment to prevent any insect attack for their products. Non-application of post-harvest treatment deteriorates the bamboo products fast and therefore reduces their longevity[8].

The significant aspects of the 'greenness' of any product mainly resolve around: (i) whether the product is derived in sustainable and renewable way, (ii) sink capacity of the products, and

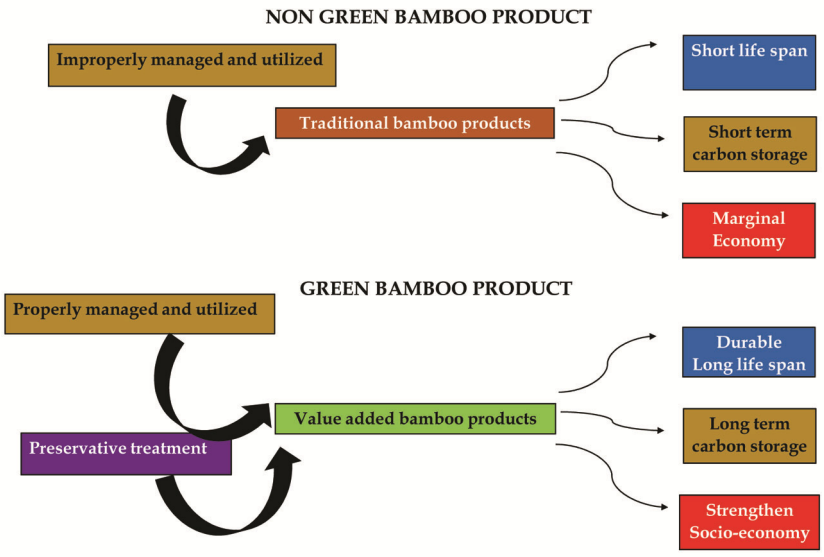
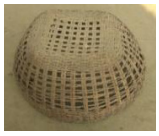
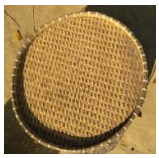


Figure 1. Conceptual diagram of green and non-green bamboo products.

Table 1. Different bamboo products, their life span and uses

Product description	Local name and life span (years) of the products	Image	Species used	Local uses
Porous basket	Khara 3–5		*Bambusa cacharensis*	To store fodder/cover small livestock
Open basket	Tukri 2–3		*B. cacharensis*, *Schizostachyum dullooa*, *Melocanna baccifera*	To store paddy/vegetables/rice/ fruits to carry soil during digging
Small basket	Potangi 4–5		*B. cacharensis*, *S. dullooa*, *M. baccifera*	To weigh rice/to wash rice
Small carrying basket	Dusoin 2–4		*B. cacharensis*	To store small items
Flat container	Dala 4–5		*B. cacharensis*, *S. dullooa*, *Giganthocloa albociliata*	To dry fish/keep fish while selling
Broom	Jharu 1–2		*M. baccifera*	For cleaning purposes
Carrying basket	Chenga 2–3		*B. cacharensis*	To keep fish/carry fish for selling
Small conical fish container	Kholoi 2–3		*B. cacharensis*	To store fish after catching
Box shaped fishing device	Gui 3–5		*B. cacharensis*, *S. dullooa*	To catch bigger sized fish
Conical Fishing device	Paron 2–4		*B. cacharensis*	To catch fishes from standing water

(*Contd*)

Table 1. (*Contd*)

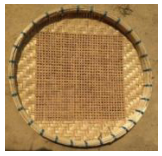
Product description	Local name and life span (years) of the products	Image	Species used	Local uses
Box shaped fishing device	Dori 2–4		*B. cacharensis*	To catch fish
Hand fan	Pakha 3–5		*B. cacharensis*	For the purpose of aeration
Large open basket	Chang 3–4		*S. dullooa*, *G. albociliata*	To keep utensil
Small basket	Kathi 4–5		*S. dullooa*, *G. albociliata*	To weigh rice
Large carrying basket	Kho 4–5		*S. dullooa*, *G. albociliata*	To collect firewood
Mat	Chatai 2–4		*S. dullooa*	To dry paddy
Winnowing tray	Kula 2–5		*B. cacharensis*	To clean rice
Porous tray	Chalni 2–5		*B. cacharensis*	To remove husk from rice
Fishing device	Chepa 3–5		*S. dullooa*	To catch fishes from running water
Cylindrical fishing device	Runga 3–4		*S. dullooa*	To catch fishes from running water
Hat	Chopi 3–4		*B. cacharensis*, *S. dullooa*, *M. baccifera*	Used during working in the field

Table 2. Biomass and carbon stock managed through bamboo products among the different communities in Barak Valley

Community	Total number of products prepared per household per annum (number/year)	Biomass stored in bamboo products per household (kg/household)	Carbon stock in bamboo products per household (kg/household)	CO_2e stock in bamboo products per household (kg/household)
Fishing	1016 (180)	508 (55)	239 (70)	876 (75)
Khasi and Hmar	1135 (150)	578 (35)	272 (55)	998 (80)
Bengali Hindu	2447 (290)	1100 (30)	517 (75)	1899 (110)
Tea tribes	800 (120)	416 (25)	196 (60)	718 (60)

Values are mean and within parenthesis indicate standard error of mean.

(iii) longevity of the carbon stored in the product[7]. Therefore, long-term sinks (~50 years) may be considered as greener in comparison to short-term sink (3–5 years) (Figure 1).

Given the importance of CO_2 management in vegetation and soil pool, consideration of carbon stock in products may add additional information on the role of a particular ecosystem in carbon stock management. The biomass and carbon stock managed through the bamboo products among the different communities are presented in Table 2. The present study revealed that each household in study villages can stock 718–1899 kg CO_2e through the bamboo products annually. Although a substantial amount of CO_2 is being stored in traditional bamboo products, the short life span of such products has relatively little contribution in long-term carbon sink management. Therefore in broader sense the traditional bamboo products are not green under the long-term carbon sink management concept. However opportunities exist to use traditional bamboo products for long-term sink through enhancing the longevity of such products. Therefore there is a need to enhance the durability of the bamboo products through efficient post-preservative treatment. Thus if efficient preservative treatment is introduced it will increase the durability of the products and carbon stored in it can be retained over a long period of time. The traditional bamboo products recorded are used for both commercial and household purposes, and further commercialization through value addition and local marketing can uplift the rural livelihood. This may also give an opportunity to eliminate the rural poverty and enhance women empowerment for major participation of female in this product making in the studied villages.

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Received 25 July 2018; revised accepted 28 February 2020

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