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# Bamboos of Odisha: Socio-Medico-Economic Food wealth

**Santwana Samilita Dash, Rajkumari Supriya Devi & Sanjeet Kumar***

Biodiversity & Conservation Lab, Ambika Prasad Research Foundation, Odisha, India
*Email-Id: sanjeet.biotech@gmail.com

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## ABSTRACT

Bamboos are the important socio-economic plant wealth. It gives materials for household stuffs as well as food. Bamboos are the source of economic credentials for many communities as well as regions. Keeping the importance of Bamboo, an attempt has been done to gather the information on bamboos for finding gaps and future work. The results revealed that about 13 species of Bamboos are reported from Odisha state. It was observed that, it is used as food and a source of economic values. It has also socio-cultural potentials and used to carry out many rituals and folks in the state. The present short communication brings attention towards its importance.

## INTRODUCTION

Bamboos are the tallest grasses of the world. Bamboos belong to family Poaceae (Yeasmin et al. 2015). They are also among world's fastest growing species. The stems are known as culms and the bush to which culms are confined in a unit, is known as clump. The culms can grow 7.5cm/day (Fang et al. 2019). Flowering is seen usually once in the life time, and after flowering, the bamboos usually die, having reached an over matured stage (Yuan 2017). The strength of the culms increases from 6 month to 3 to 4 days. Hardness is more in outer layers than in inner layers (Wang et al. 2016). Fungal and insect attack can deteriorate the strength (Jhanusz et al. 2017). Out of

approximately 1250 species of bamboos, about 130 found in India. In Odisha, the number of bamboo species are limited to 13, among which 3 to 4 are common (Zhao et al. 2017). *Dendrocalamus stricus* (Salia) and *Bambusa bamboos* (Kanta, daba or Balia) are found in wild, as well as cultivated in Odisha. *B. nutans* (Sundar kani), *B. vulgaris* (Badi baunsa or Golden bamboo, Plate 1a) and *B.tulda* (Balangi), are less common in the state, but mostly encountered in villege areas (Nongdam and Tikendra 2014). The introduced species are *B. baloca, B. ventricosa B. gigantius* and *B. longispathus* (Amom et al. 2018). *Dendrocalamus stricus* is known as the male bamboo and the hardiest of all Indian bamboos. It can grow almost all types of soil provided. On dry poor quality soil the culms are solid where as on fertile and moist soils they are rather hollow. The height varies from 20ft to 50 ft, and diameter from 1 to 3 inches .This species is also known as " HILL BAMBOO" (Goyal et al. 2015). *Bambusa bambos* are known as female bamboo, rather prefers moist and rich soil, hence it is more abundant on stream banks, but as an exception it has been found in abundance on hills along khurdha- Barbara belt (Canavan 2016). Culms may be 20 to 30 meters in length and 15 to 17cm in diameter. Thorns make up the clump virtually impenetrable (Soumya et al. 2016). *Bambusa nutans*, is much preferred by growers because it has longest and wider culms. It may be noted that *Bambusa nutans* is scarily distinguishable from *Bambusa tulda*. Young bamboos are known as Karadi or Karida. They have a nutritional value, which is indicated by presence of vitamin B and vitamin C, phosphorous, calcium, iron, glucose and carbohydrates etc. in the young shoots. *Dendrocalamus stricus* is comparatively soft to work, less prone to insect attack if properly dried. *Bambusa arundinacea* is very tough to work with because it is having thrones. *Bambusa nutans* is comparatively thicker than *Dendrocalamus stricus* are more prone to insect attack.In *Bambusa tulda* nodes are virtually absent; very tough to work, and are used for jhudi making. Stems and leaves of *Bambusa arundinacea* are said to be used as cooling agent, laxative; useful in burning sensations, blood related diseases, wounds, piles, gonorrhea and fever. The shoot is tonic and is applied to bleeding gums and joint pains, seeds are useful in urinary discharges. On other hand the genus *Dendrocalamus* is supposed to be therapeutically inert and leaves are given to animals during parturition. *Bansalochana*, a deposit organic silica found inside bamboo sometimes, has many uses in ayurveda (Rath 2005).

**Bamboo as a food**

Bamboo shoots are considered as one of the useful health foods because of rich contents of proteins, carbohydrates, vitamins, fibers, minerals and very low fat. Though bamboo shoots provide a lots of health benefits, their consumption is confined mostly to Southeast Asian and East Asian countries. The acceptability of bamboo shoots as popular vegetable crop is very less due to their high pungent smell and bitter acidic taste. The use of bamboo as a food in India is mainly restricted to Northeastern part of country where they form an indispensable part of several traditional special dishes. The different ethnic communities take fresh or fermented bamboo shoot as one of most preferred traditional food items. Some

important bamboo based traditional foods are *ushoi, soibum, rep, mesu, eup, ekhung, hirring,* and so forth. Bamboo shoots should be properly processed before they are consumed as freshly harvested shoots have high content of toxic cyanogenic glycosides which may pose serious health problems (Nongdam and Tikendra 2014). Bamboo shoots have immense potential of being used as important health food as they contain high proteins, amino acids, carbohydrates, many important minerals and vitamins. Freshly collected bamboo shoots have good amount of thiamine, niacin, vitamin A, vitamin $B_6$, vitamin E. Also bamboo shoot based diets are rich source of dietary fibers and phytosterols, and less cholesterol contents which make them one of popular natural health foods (Nongdam and Tikendra 2014). The good amount of protein content was reported from young shoots of bamboo (Choudhry et al. 2017). Bamboo seeds are locally known as Baunsa dhana or Baunsa paddy are collected by poor people as the inferior substitute of rice, to cook and consume like over-boiled rice (Jau). The seeds of *Bambusa bambos* are completely thicker than seeds of *Dendrocalamus stricus*. Chemical analysis of seeds of *Bambusa-bambos* has found crude protein, true protein, starch, calcium and phosphorous. The starch as well as protein content were comparable with that of rice variety IR8 (Soumya et al. 2016).Three cooking methods, namely, boiling, streaming, and stir-frying for 5 to 10 minutes, were reportedly used to evaluate the effect of nutrient components, free amino acids, L-ascorbic acid, total phenolic contents. After three conventional cooking treatments, the boiled bamboo shoots had serious losses of crude protein, soluble sugars, ash, free amino acids, and L-ascorbic acid. Studies showed that in steamed bamboo shoots, the L-ascorbic acid content was considerably reduced by stir-frying and the crude content was increased with the addition of peanut oil. From the perspective of nutrition and health, stir-frying seems to be the best method of cooking bamboo shoots (Zhang et al. 2011). Bamboos have a huge uses in food and beverage industries, such as Bamboo bear, Bamboo vinegar etc. Bamboo leaf tea is considered as a delicious healthy drinks in Asian countries and has found its way into European market (Horn and Haser 2016).

**Bamboo as a medicinal plant**

Bamboo plants play a significant role in traditional Asian medicine, especially in China and Japan. Bamboo shoot has an anti-thyroid potential without extra iodide. Chronic bamboo shoot consumption gradually a state of hypothyroidism (Chandra et al. 2004). Biomedical investigations on the health benefitting effects as well as toxicity of different parts and species of bamboo have been carried out worldwide since 1960s, and documented a wide range of protective effect of bamboo derived products, such as protection against oxidative stress, inflammation, lipotoxicity, cancer and cardio-vascular diseases. Some of these products may interfere with male and female reproductive function, thyroid hormone metabolism, and hepatic xenobiotransfermation of enzymes (Panee 2015). *Bambusa vulgaris* is a plant with potential anti-osteoporotic effects, due to its phytoestrogenic, anti-oxidative and anti-inflammatory properties (Watcho et al. 2019). *Bambusa vulgaris leaves* have wound healing effect (Davane , Nagoba

2016). Bamboo shoot has a number of healing properties. Bamboo leaves correct irregular menstruation, expectorant to relieve nasal congestion, used as antibiotic and anti inflammatory, induces labor, meant for acid digestion, anti-venomous, diuretic for stool elimination, anti diabetic, treat aphrodisiac etc. Black bamboo leaves control bacterial infections, helps in urination, reduce fever, treat chest cold and heat colds, treat pharyngitis. Stem sap of black bamboo treat bronchial and cerebral infections, lung infections with control phlegms. Stem bark is helpful in stopping vomiting. Leaves and stem shavings treat nasal bleeds. Roots and leaves reduce fever in babies. Roots of black bamboo are used to stop bleeding and also used as astringent, fever reducer, treat anxiety , cures sleeping problems and general restlessness. Stems of White dwarf bamboo treat irritability, urinary tract infection and positive effect on heart, stomach and bladder when taken as general tonic. Moso bamboo effective in arthritis, stem seaths are used to cure nausea and sour stomach. Timber bamboo are used as fever reducer, stems of new shoots are used for long time remedy for treating urine. Bamboo mana are used in chyawanprash, used to cure asthma, cough (Chandra et al. 2004). Finely milled Bamboo powder used as cleanser and scrub. Bamboo silica extract is great for damaged and dry hair. Bamboo silica extracts also helps to repair and rebuild collagen and used as moisturizer, that reducing wrinkles and smoothen skins. Bamboo sheet cleansing cloth and Bamboo charcoal are used to treat acne. Bamboo gels give cooling and soothing effect. Bamboo extracts are also used as facemasks (Nasri et al. 2015).

**Bamboo as ecological values**

Bamboo plants, in a year make an Indian carbon neutral, because each of them absorbs about 400kg $CO_2$ per year. Dense planting of bamboo on banks of Yamuna, will not only absorb $CO_2$ but also bring down a particulate matter. The plant is an excellent scavenger; its roots do not go below two feet, so it can absorb rich nutrients in raw sewage that flow untreated into Yamuna and raise its biological oxygen demand. During monsoon, the clumps will slow the flow and reduce chances of flooding downstream. People often plant bamboo as a staring way to restore land (Choudhury 2011). The products made from bamboo are fresh and eco-friendly, so many customers are willing to pay premium 15% to buy it. Bamboos are the home of many faunal species. The *B. arundinaceae* is the shelter of different types of Munia and Dove. They are the home of many reptiles like Bamboo pit viper. The most known associate species of bamboos is Giant Pandas (*Ailuropoda melanoleuca)*. Giant pandas are provisioned with three species of bamboo: *Phyllostachys bissetii*, consume the culm; *Bashania fargesii*, consume leaves; *Qiongzhuea opienesis*, consume the shoots. Other Asian animals who consume bamboo as heavy diets, are Red-panda *(Ailurus fulgens)*, and the widespread bamboo rats. Asian elephants (*Elephas maximus*), the largest mammals on the continent often find shelter in bamboo forests. In Africa, mountain gorillas (*Gorilla beringei)*, in the Viruna mountain, prefer bamboo shoots as their food. Other inhabitants of mountain bamboo forests in Africa include Giant forest hogs (*Hylochoerus meinertzhageni*), and a host of birds and reptiles. Bamboo

lemurs, a primitive primate, mainly specialized for bamboo as diets (Shaw 2018). There are many forest birds associated with bamboo in Atlantic forests. They include Purple winged ground dove (*Clavaris godefrida)*, Rufous capped spine-tail (*Synallaxis ruficapilla)*, White collared foliage gleaner (*Anabazenops fuscus)*, White browed foliage gleaner (*Anabacerthia amaurotis)*, White eyed foliage gleaner (*Automolous leucophthalmus)*, Canebrake groundcreeper (*Clibanoris dendrocolaptoids)*, Giant Anthshrike (*Batara cinerea)*, Dusky tailed antbird (*Myiothera malura)* (Hassan 2018). Bamboo trees play an important role in soil and water conservation. The economic assessment revealed that bamboo plantation, harvesting and processing have both positive and negative economic effects in the geographical areas of growth

**Bamboo as socio-cultural values**

Bamboo is a special plant having strength, straightness, lightness and within a short period, they attain maturity, so they are suitable for variety of uses (Canavan et al. 2017). In ancient, African countries like Ethiopia, Bamboo has been integral element to religion ceremonies, art, music and daily life. Bamboo culm used for building material, handicraft products exported. Bamboo root is used as a fuel (Huang et al. 2014). Bamboos are also used in making household furniture such as stools, baskets, mats, windows, doors, utensils. They are scratch proof and make the finest cookware with strong, light and flexible. Bamboos are used in kitchen hold items such as spatula, spoon, chopsticks, bowls, bottles, straw, Bamboo floors etc (Sharma et al. 2018). In ancient countries, Bamboo trees were source of paintings and poems. Bamboo cultures are mainly established in Asian civilization. People use Bamboo stems also for food and weapons for hunting (Basumatary et al. 2017). Works of Bamboo painting, usually in ink are famous in East Asia. Golden bamboos are soft, sunny yellow and a perfect paint color for a main wall in any space. Lucky bamboo is used for home decoration. Wind chime, toys, jewellery design, wall decors, tray designing can be made from Bamboos (Hazzar 2011).Generally musical instruments are made from Bamboos. Two types instruments such as string instruments and blowing instruments. Bamboo pipe walls are complex and composed of layered structure of fibers. The instruments such as drum, flute, xylophone, piano, guitar, whistles, cornet etc. are made from Bamboos (Cottingham 2014).

**Bamboo as an Economic Plant**

Bamboo industry panels have increased in the secondary structural sector such as building application, flooring and sport device, because it is one of the cheapest raw materials. At industry level, the panels are manufactured with only inner and intermediate region of the bamboo culm. Thin strips of bamboo are usually machined and arranged with the desired lay-up and shape to obtain laminates with specific properties better than those of conventional E-glass laminates in terms of both strength and stiffness. The strips of bamboo were bonded together by a natural thermoplastic polylactic acid matrix to meet biodegradability requirements (Morels et al. 2017). Bamboo can be more profitable than sugar and rice. *Dendrocalamus hamiltonii*, is a

commercially important bamboo species of India, experiencing exploitation due to heavy extraction from natural forests (Meena et al. 2019). Bamboo is a part of rural livelihood in many countries like India. Due to its versatile nature and multiple uses, it is also called as poor man's timber. Bamboo can be used as wood substitutes. Papers can be evolved from bamboo processing. Bamboo cultivation creates an opportunity for income generation activities for rural dwellers and serves as job creation for those who engage in its activities as well as employment to small and medium scale enterprises. The most important economic benefits that most rural dwellers get is when they engage in a commercial transaction in their bamboo produce. Commercial bamboo farmers employ worker from the locality to work on their farms. Findings show that most communities that bamboo is grown commercially benefit from infrastructures such as houses, roads, electricity, schools, hospitals and pipe-borne water. The local community has benefited from community development projects from these industries. However, most farmlands and production forest areas have been negatively affected as bamboo farming has become lucrative and most farmers are now turning their crop growing farmland tends into bamboo farms though they do inter farming between the bamboos when they are young. These have caused the migration and destruction of some species of birds, animals, flies, insects and plants that help in the provision of food and medicine to the local dwellers within the community. The spillage of chemicals herbicides from the plantation has contaminated the land which causes the land to become infertile. Most people have to travel a long distance to search for limited lands for crops cultivation and if care is not taken food security will become tenuous in the future. In all, the economic benefits outweigh the adverse effects from the assessment made so far in the communities where they are propagated. Rural communities and dwellers have experienced a significant impact on their economic lives, infrastructure and their livelihood. Income generated from farm produces declined in areas where commercial bamboo farming is increasing while other income generating activities, such as trade and wage labour has increased in the bamboo enterprises (Akwada 2016). Despite rustic material, the delicate rattan products are still worth thousands of dollars. Bamboo needs only 3-5 years to mature. After harvesting, bamboo will re-grow itself without planting a new tree. Just like this, bamboo brings economic values almost year around. The Government in China, India, and Indonesia are encouraging the farmers to develop bamboos to replace timber trees (Darabant 2016). Being different from timber trees planting bamboo has low initial cost, so it reduces investment burden for farmers. Planting bamboo is easy to payback because every part of bamboo has economic values. In farming industries uses of bamboo is common. Green house, fishing traps, water wheels, water pipes, beehives, animal food container, matches, vegetable stacks, bean poles, trellis poles, fence etc. are made up of bamboos (Darabant et al. 2016). Fresh bamboo leaves are used for wrapping material , dried bamboo leaves used for organic fertilizer. Bamboo products are used to reduce plastic use. In sports industry Bamboos are used to make bicycles, snowballs, polo balls, basket

balls, golf tees, skate boards etc. and in electronic industry Bamboos are used to make I- phone cases, mouse, keyboards, headphones, speakers etc. In automobile industry steering wheels are made from Bamboos (Dixon and Gibson. 2014). Papers are produced from Bamboos. Bamboo fiber is the best fiber materials for paper and cloth making after soft wood fiber. Bamboo pulp is a viscous solution of bamboo fibers, water and chemicals used to produce paper and fibers. Fabrics are generally made up of Meso BamBboos. Bamboo fabric are commonly known as Bamboo rayons. Toilet papers and towels are generally produced from bamboos (Fazita et al. 2016).

## DISCUSSION AND CONCLUSION

Considering the versatile uses of Bamboo in every aspect of human survival from ecological values to food and uncountable economic values, it would be right decision to uplift this plant as for research and development, its plantation and encourage the use of its products. More research need to be done to understand the ecology, habitat of the various species of Bamboos. This would help to propagate and introduce in areas of frequent soil erosion or places with less bamboo species. The nutritive and medicinal values also revealed that it can be widely used as a nutraceutical. This adds to the possibility to grow more and be used as foods during famine. It can also be a beneficial way to start business by growing bamboo as its time for maturity takes a less period of time. Apart from all the uses it can be a great way to conserve biodiversity and many faunal species rely on the bamboo as their habitat.

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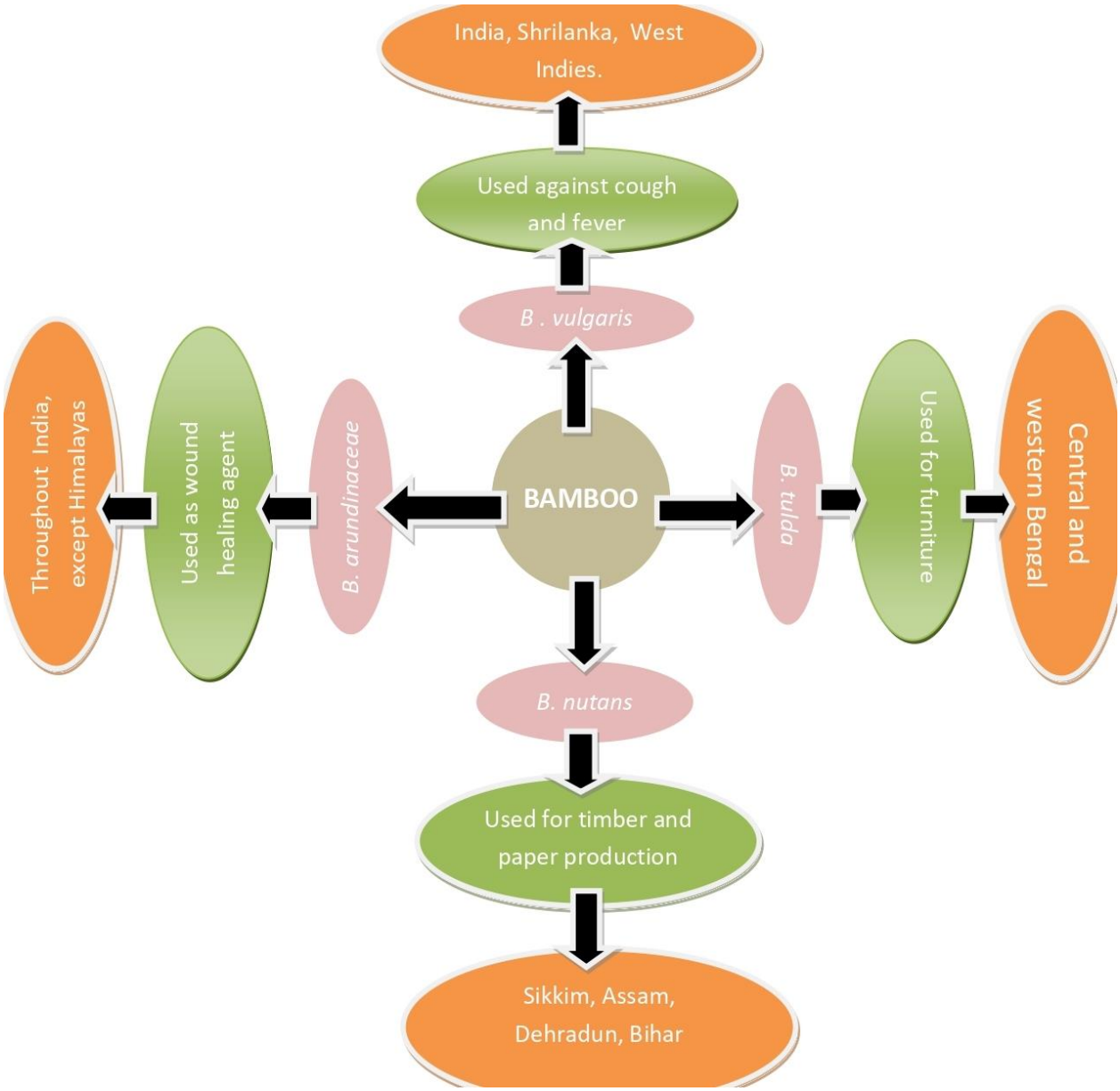


**Figure 1: Some common Bambusa species and their uses**


**Plate 1: Field work for demonstration,**

**A:*Bambusa vulgaris,*** **B:*Bambusa ventricosa***

**C-D: Field survey**