

# Utilization of Bamboo and Wooden Resources for Development of Contemporary Products: An Approach for Climate Change Mitigation and Revenue Generation

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## ABSTRACT

Globally, there is a rising demand for plant based contemporary products in urban & peri-urban areas. Additionally, the Government of India (GoI) & Indian Council of Agricultural Research, New Delhi has also emphasized skill development among students and farmers through Hands-on-Trainings (HoTs) for growth of bamboo & wooden entrepreneurship in the country. The Navsari Agricultural University, Navsari, Gujarat was awarded with an innovative project on Secondary Agriculture through NAHEP-CAAST (Center for Advanced Agricultural Science & Technology). Utilization & value addition of plant resources (*viz.*, waste branches, roots, stumps, bamboo, seeds, cones, inflorescences) sustainably is one of the unique concepts of this project. This activity also finds place in the Vocal for Local concept of GoI, wherein local products are promoted at the global level through various government interventions. Preparation of contemporary products by wood & bamboo resources is one such activity of the project which has yielded excellent outcomes through design development & providing HoTs to farmers & students. There is ample scope for entrepreneurship in the field of contemporary products development using bamboo & wooden raw materials including their waste. This entrepreneurship is characterized by novelty & to flourish in a demand based environment to produce novel products. Over and above 60 innovative as well as contemporary bamboo & wooden products have been prepared, six pamphlets of success stories as well as one training manual on wooden decorates were published at NAU, Navsari under the aegis of NAHEP-CAAST sub-project. Therefore, rural farming communities & youngsters can involve themselves in preparing contemporary wood & bamboo products which may fetch premium rates in the market. Preparation of contemporary products using wood and bamboo can provide not only meaningful revenue generation & employment opportunities to the needy by making best use of locally available plant resources but also locks carbon for a long time hence development of contemporary products using bamboo & wooden resources an approach for climate change mitigation and revenue generation.

## HIGHLIGHTS

- ① Utilization and value addition of plant resources (*viz.*, waste branches, roots, stumps, bamboo, seeds, cones, inflorescences) sustainably is one of the unique concepts of this project.
- ② Six pamphlets of success stories as well as one training manual on wooden decorates were published at NAU, Navsari.

**Keywords:** Contemporary products, climate change, wealth from waste, carbon sink

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Secondary Agriculture is regarded as the sunrise sector of the Indian economy owing to its immense untapped potential. The Secondary Agriculture sector has a major role to play in employment generation, poverty alleviation and product diversification including utilization of woody/bamboo biomass. Among secondary agricultural products, Non-timber forest resources and woody/bamboo biomass also play a vital role in the forestry sector (Anonymous 1972). There is a growing demand for contemporary products development in urban & peri-urban areas (Sankanur *et al.* 2022a). Additionally, the Government of India (GoI) & Indian Council of Agricultural Research (ICAR), New Delhi has also accentuated skill development among students and farmers through Hands-on Trainings (HoTs) for growth of bamboo & wooden entrepreneurship through craftsmanship in the country. ICAR-NAHEP, New Delhi has granted a Center for Advanced Agricultural Science & Technology (CAAST) on Secondary Agriculture to the Navsari Agricultural

University (NAU), Navsari, Gujarat. Utilization & value addition of plant resources sustainably is one of the unique concepts of this project (Sankanur *et al.* 2020). This activity also finds place in the Vocal for Local concept of GoI, wherein local products are promoted at the global level through various government interventions. Preparation of contemporary products is solitary of the ways to get better income and uplift living standards (Sankanur *et al.* 2022b). The forest fringe villagers/ farmers who adopt agroforestry systems may take this benefit, especially women farmers or house wives for preparation of contemporary products from wood/bamboo and other resources by single or SHGs (Self-Help-Groups). This particular manuscript provides a platform to address the utilization and value addition from both bamboo and wooden resources utilizing tools, equipment & machineries.

By looking into these production potentials of contemporary products from bamboo & wooden resources use of each of these tools, equipment & machineries are elaborated as given in Table 1.

**Table 1:** List of tools and machineries used for production of sculptures from wood/bamboo

Sl. No.	Name of the equipments	Uses of equipments
1	Seasoning cum preservation vacuum pressure equipment	For preservation treatment and seasoning of wood / wooden log / bamboo / canes
2	Wood chipper	Machine converts larger samples of wood and wood products into smaller wood chips
3	Wood grinder (Fine grinding machine/ Hammer Mill)	Machine converts wood chips into fine powder for particle board or fibre board making
4	Circular saw (different size)	Demonstration of cross cutting of wood/stem
5	Power chain saw (different size)	Demonstration of cross-cutting of wood/stem
6	Agarbatti Making Machine	Preparation of Agarbatti of 80-90 kilo grams weight production per 8 Hour (depends on feeder).
7	Charcoal making machine	To convert biomass (agriculture wastes or forestry wastes that are rich in lignin, cellulose, hemicellulose, such as straw, sawdust, rice husk, fruit hush, coconut shell, palm shell, tree bark, small branches, logs, <i>etc</i> ) into charcoal.
8	Briquette making machine	To convert forest waste (Saw dust, sander dust, wood chips & shavings, tree bark & twigs, pine needles, wild grass, shrubs, bamboo leaves, veneer waste, wood peeling waste) into biomass briquette without any need of binder or adhesive.
9	Rotary sander	Wood polishing or removing rust. The rotating pad enables to quickly prepare large surface for more advanced prepping.
10	Hot press	Mainly used to fabricate hard boards.
11	Turning lathe machine	To rotate a work/wood piece about an axis of rotation to perform various operations such as cutting, sanding, knurling, drilling, deformation, facing and turning, with help of tools that are applied to the workpiece to create an object with symmetry about that axis.
12	Boring machine	Used for producing smooth and accurate holes in a workpiece by enlarging existing holes with a bore, which may bear a single cutting tip of steel, cemented carbide or diamond or maybe a small grinding wheel

13	Tenoning machine	Used for making tenon for furniture, wood door, easy operation
14	Surface planer cum Thickness planer (Combi-planner)	This machine used for an active role in applications like used for grooving, sawing, planning and designing to prepare contemporary products from Bamboo and Wood
15	Band Saw	Used principally in woodworking, metalworking, and lumbering, but may cut a variety of materials for R & D to prepare novel products from Bamboo and Wood
16	Bamboo toothpick machines	Bamboo Toothpick Processing Machine is mainly used to process bamboo into small toothpicks. Final product with diameter 2.2 mm and the length 65mm with two sharpened ends. The capacity is 600000 pcs/8 hours. Used for R & D on bamboo-based products preparation.
17	Bamboo bending machine	Useful for <i>bamboo</i> furniture, construction, fencing, artisan works, Used for Research & Development to bamboo based modern products preparation
18	Kulfi stick making machine	Used for is mainly used to process bamboo into small Kulfi sticks and R & D for preparation of innovative products

**Table 2:** List of tools/ equipment's/materials required for preparation of contemporary products

Hammers	Gas torch burners
Pliers	Wood Carving tools
Drills	Acrylic paint for wood
Sand papers (60-180 grit)	Thin metal plates
Nails	Eye wears
Adhesive	Small Hand saws
Rotary sanders	Varnishes
Smoother	Wooden glues
Paint brushes	Clay Powder
J type hooks	

All these tools / materials are having its potential scope for production contemporary products from wood/bamboo raw material including their wastes and other resources like branches, harvested tree roots, *etc.*

## METHODOLOGY

These contemporary products are prepared by hand and/ or machine using wood/bamboo as well as wastes from wooden samples/blocks, inflorescences, branches, flowers, twisted stems, roots and it requires an art and skill for preparation of attractive/fancy contemporary products. In the rural areas, contemporary products and other household utensils may be carved out of wood in different shapes and styles.

## RESULTS

**Outcome, output & impact of activity:** Earlier tribal artisans and local farmers of Ambapada village used to prepare only limited range of traditional products and now after two hands on trainings

in the project, they are able to prepare new range of contemporary products on their own *viz.*, table lamp, bamboo candle, bamboo lamp, climber sculpture, tree sculpture, garden tree sculpture, hanging tree sculpture, rakhi's, bamboo candle stands, contemporary wall clocks, contemporary chairs, contemporary garden chairs, *etc.* (Sankanur *et al.* 2022c; Sankanur *et al.* 2022d; Sankanur *et al.* 2022e; Sankanur *et al.* 2022f; Sankanur *et al.* 2022g). It is only due to interventions of the NAHEP-CAAST sub-project. Moreover, about 73 *Kotawali* tribal artisans of Waghai, Dangs, Gujarat were also trained which yielded change in their livelihood by earning 20 to 40K additional income per annum. In our unit, four local peoples were trained by providing skills for preparation of wooden based articles and now they are acting as master trainers for trainees. They have already prepared more than 60 bamboo & wooden contemporary products with the help of forestry faculty. We also prepared six pamphlets of success stories and published one training manual on wooden contemporary products at NAU, Navsari. In addition to this, contemporary products developed under NAHEP-CAAST sub-project also includes various designs of climber flowering plants, key chain hangers, stump contemporary products, corner contemporary products, table contemporary products, room lamps, table lamps, tea coasters, bamboo waterfall, tree machanas, farm houses, multi-stage flowering pot plants, peacocks, ducks, wall hangings, wooden desk organizers, wide range of pen stands, tea trays, boats, carts, aircrafts, pot stands, eco-friendly rakhi's, bamboo candle stands, Bamboo acoustic mobile speaker, Small bird play gyms, contemporary wall clocks, contemporary wall



racks, contemporary chairs, contemporary garden chairs *etc.* (Sankanur *et al.* 2019a; Sankanur *et al.* 2019b & Sankanur *et al.* 2022h).

## CONCLUSION

It is found that wood/bamboo resources such as branches, roots & stumps left out from the forests, plantations, agroforestry landuse systems &/or saw mills are considered as waste materials & these may be utilized for development of value-added attractive products *i.e.* wealth from waste. India has the second largest in bamboo resources in the world and many peoples are dependent on them for their livelihood. Now there is a need to promote the utilization of bamboo & wooden waste to the best possible extent. The potential of bamboo and wood resources is very high but it remains largely unrealized in India. By making different contemporary products and its marketing forest/plantation/agroforestry waste can be better utilized. A large number of employment opportunities can be tapped by preparation & marketing of contemporary products. Preparation of contemporary products is solitary of the ways to get better the income and uplift living standards of people involved in it. The tribes / artisans /forest fringe villagers/ farmers adopt agroforestry systems may take this benefit, especially women farmers or house wives/youth for preparation of contemporary products from wood/bamboo and other resources by single or SHGs (Self-Help-Groups).

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