

Eco-Friendly and Biodegradable Utensils Made from Areca Leaf by Tribal Communities of Madarihat-Birpara block, Alipurduar District, West Bengal: A Case Study Report

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ABSTRACT

Rapid industrialization as well as urbanization have resulted production of enormous solid wastes especially plastic pollutants throughout the world since last few decades. Disposal and management of solid wastes impose a serious threat in the present-day context. With continuous efforts of eco-activists towards minimizing impacts of plastic wastes on human health and environment, many entrepreneurs, NGOs and small-scale industries are trying their best to bring alternative solutions of plastic disposable cutlery by introducing eco-friendly utensils manufactured from biodegradable plant wastes. Towards sustainable livelihood development, role of ethnic societies throughout the world as well as the country is mentionworthy. The tribal people settled at Madarihat - Birpara block areas in the Alipurduar District of West Bengal have undertaken a remarkable initiative to manufacture eco-friendly tableware from betel nut (*Areca catechu* L.) leaves at rural level. This project not only provides a sustainable alternative to plastic utensils but also empowers the local tribal community through economic and skill development. This communication emphasizes on the process, benefits, and challenges associated with this initiative along with showcasing how traditional ecological knowledge can be contributed towards sustainable development.

KEYWORDS

- Plastic Pollution • Ecofriendly And Biodegradable Utensils • Areca Leaves
- Tribal Community • Alipurduar District

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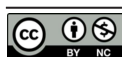
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INTRODUCTION

Plastic pollution, one of the major issues of today's world, is growing exponentially due to increase in consumerism and manifold uses of disposable items in various sectors including food industry as well as in daily life [Kora, 2019; Boro & al., 2020]. The plastic made single-use cutleries i.e. plates, bowls, spoons, forks, tumblers, ladders, glasses, trays etc., not only cause microplastic pollution, but emits toxic carcinogenic substances viz. bisphenol A, vinyl chloride, phthalates, melamine, epoxy resin etc. in the food particles resulting serious health damages to human including cancer, heart diseases, kidney failure, brain stroke etc. and also affects ecological balances [Campanale & al., 2020].

In recent years, increasing awareness of global ecological issues has prompted naturalists, professionals, academicians and researchers to seek sustainable and eco-friendly substitutes that can replace synthetic non-biodegradable polymers in various industries and applications. The impact of using disposable plastic platters in domestic as well as different industries has led to a search for alternate renewable resources, i.e., use of plant leaves, fibers, pulp etc. in making dining ware and food wraps which was a traditional practice in India far back as 2000 BC [Hegde & al., 2018]. In Indian culinary history, leaf made plates for serving foods are long standing tradition and custom of serving meal on such leaves and leaf plates is considered as pure, divine and of good practices, has its own cultural, religious, medicinal and socio-economic importance especially used during wedding, thread, birth, shraddha etc. [Tanwar & al., 2018; Kora, 2019]. In recent years, manufacturing biodegradable cutlery products and their uses has increased in ascending order resulting gradual pushing of the plastic utensil market to utilization of disposable renewable tableware made from plant leaf and fibers [Kora, 2019]. In India, the leaves are one of the major non-timber forest products (NTFP) and collected primarily from the forests by different local tribal communities. Leaves of various plant species such as Saal (*Shorea robusta* C.F. Gaertn.), Plantain (*Musa x paradisiaca* L.), Addaku [*Phanera vahlii* (Wight & Arn.) Benth.], Palas [*Butea monosperma* (Lam.) Kuntze], Supari (*Areca catechu* L.), Lotus (*Nelumbo nucifera* Gaertn.), Teak (*Tectona*

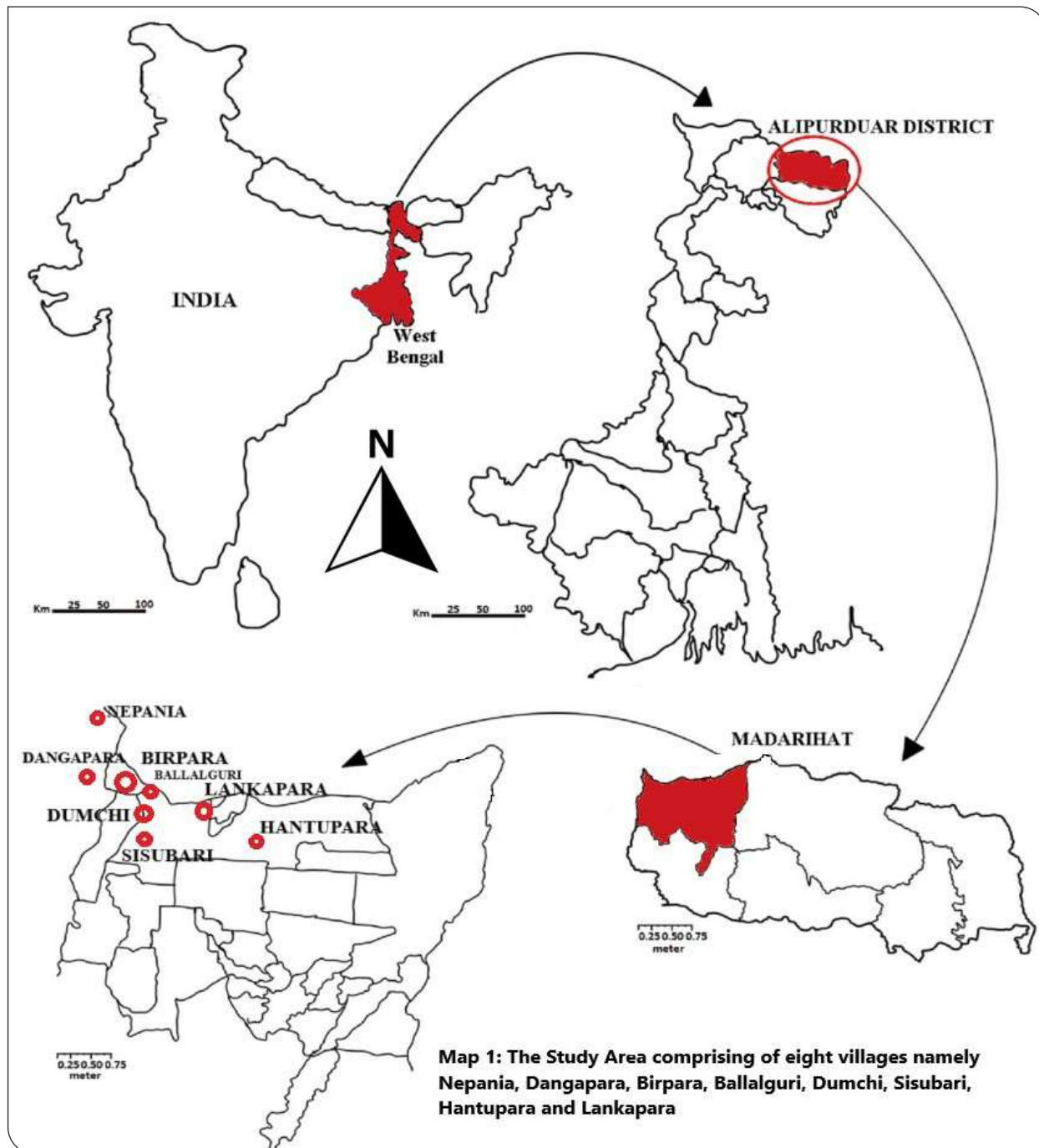
grandis L.f.), Kath-badam (*Terminalia catappa* L.), Pilkhan (*Ficus virens* Aiton), Elephant ear fig (*Ficus auriculata* Lour.), Pipal (*Ficus religiosa* L.), Bargad (*Ficus benghalensis* L.), Kanak champa [*Pterospermum acerifolium* (L.) Willd.], Toddy (*Borassus flabellifer* L.), Jackfruit (*Artocarpus heterophyllus* Lam.), Turmeric (*Curcuma longa* L.), Taro [*Colocasia esculenta* (L.) Schott] and Sugarcane pulp (*Saccharum officinarum* L.) etc. are utilized in making eco-friendly and bio-degradable cutleries in different states of India of which Areca leaves platters are most advantageous in terms of organic waste management as well as monetary benefits. The uses of Areca leaf plates dates back to centuries in various cultures and Hindu mythology [Ahuja & Ahuja, 2011]. Traditionally, these plates were used in rural areas for serving foods during local festivals and social gatherings. Over time, their popularity has increased due to their environmental benefits and natural appeal. The present case study report focuses on the technique of manufacture of domestic cutleries from fallen Areca leaves, environmental and socio-economic impacts of these ecofriendly products as well as challenges and prospects facing by the tribal community of Madarihat-Birpara block of Alipurduar District, engaged in this small-scale industry for livelihood development.

METHODS

The Madarihat - Birpara block, one of the six community development blocks of Alipurduar District, West Bengal, lies between 26.700001 N latitude and 89.282997 E longitude, situated in the north-western part of the district, is surrounded by and Banarhat CD block and Dadua river along the western boundary of the district, Samtse district of Bhutan on the north, Kalchini CD block on east and Falakata CD block on south (Map 1). The study area, comprising eight villages namely Ballalguri, Birpara, Dumchi, Sisubari, Lankapara, Hantapara, Dangapara and Nepania, are mostly rural, with over 80% of the population belonging to Scheduled Castes (SC) and Scheduled Tribes (ST). The area is dominated especially by Rabha, Dukpa, Toto, Mech, Santhal, Madasia, Bodo and Rajbanshi communities. As part of approved research project of Botanical Survey of India, during ethnobotanical survey in the tribal populated

villages of Madarihat - Birpara block in 2023-24, the senior author visited several villages and observed commendable sustainable initiatives, taken by the local communities in manufacturing biodegradable utensils

from Areca leaves. Most of the tribal people in this area are dependent on forest-based livelihoods, skilled in crafting materials from natural resources and the tradition is passed down generation after generation.



RESULT AND DISCUSSION

Manufacturing Process of Areca Leaf cutleries

Areca leaf platters are an innovative and sustainable option for eco-friendly dining. These plates are crafted from fallen leaves

of the Areca tree, ensuring no trees are harmed in the manufacture process. Areca leaf disposable products are one of the best alternatives for plastic cutlery that can be used at domestic as well as corporate level. As per the field study and statement of the labors,

The manufacturing of Areca leaf made platter involves seven (07) steps: 1. collection of raw materials i.e. naturally fallen Areca leaves; 2. cleaning the leaf sheaths in running water followed by dipping in 2-3% CuSo₄ soln. kept in a shallow tank for 10-15 days; 3. shade drying of the leaf sheaths in bundles and storage; 4. setting plate manufacturing machine with suitable temperature; 5. Molding i.e. heat pressing and forming of various utensils; 6. Waste sheath management; 7. Grading the Areca leaf cutleries. The workers clean the sheaths in freshwater followed by scrubbing using a soft brush to remove dirt and debris. After cleaning and draining of water, the leaf sheaths are shade dried for 15-20 days prior to placement in pressing machine. The plate-making machine has two pressing heads - upper and lower one. The upper one is fixed to an upper channel while the lower one is movable i.e. moves up and down and helps in pressing the treated sheaths. Both the pressing heads consist of a coil in it. The heat of these heads is controlled by a thermostat [Singh, 2024]. The pressing heads, screwed with cutting blades in the edges, cut the edges

from the leaf sheath. No chemicals or synthetic binders are used in this technique confirm purely natural and organic technique. The cut platters are then dried at 45° C temperature for two hours. As per interview record of the local labors belonging to Rabha and Mech communities, single semi-skilled operator usually prepares around 250-300 cups or 125-150 standard quality leaf plates per hour but the production is hampered during monsoon. The leaf cups or plates, subjected 1200° C to 1500° C heat for about 5 to 10 seconds, is sufficient to sterilize the finished product without the need of any additional chemical disinfectants. To avoid any contamination and growth of any micro-organisms, the leaf plates undergo sterilization which is done at multiple stages [Revathi & al., 2021]. The waste collected after the pressing and cutting of the sheaths is not thrown away, instead, all the waste products are shredded to consider as agro-wastes as well as animal fodder [https://kknexports.com/blog/manufacturing-process-areca-leaf-plates/]. The final step of this method includes stickering and sealing of the products for transport to market (Plate 1).





Plate I: Photographs showing procedure of Areca leaf plate manufacture: A: Areca leaf sheaths cleaned and tied into bundles; B: Bundles are taken to Areca Leaf Plate Manufacturing Unit; C: Retting of leaf sheaths in CuSO_4 solution; D: Shade drying of leaf sheaths; E: Heat pressing, moulding and cutting them into variously shaped plates and cutleries; F: Packing the finished goods for sale in markets.

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF ARECA LEAF UTENSILS:

Socio-economic Impact

The present initiative at rural level has created job opportunities for tribal backward people especially women component of tribal community of Madarihat-Birpara block area. The entire process, from collection to final production, engage significant numbers of labors, providing steady income sources throughout the year. The rising demand for sustainable products has opened new avenues for local artisans. It is a concurrent process where there exists a high need for employment and self-employment opportunities especially in rural areas which helps in addressing the regional economic growth. Areca leaf tableware has praised gradually in both national and international markets. Training programs have been organized to improve the craftsmanship and productivity at the community level, enabling them to produce high-quality products consistently. The initiative fosters mass participation and strengthens the social fabric by encouraging collaboration at Government level and shared goals.

Environmental Impacts

The naturally fallen Areca leaves, ensuring that no trees are cut and harmed in the process, often abandoned and treated as waste products, are turned into valuable as well as marketable products which in turn produces an eco-friendly alternative to single-use plastics.

As per the prediction of ecological researches, by the year 2050, the percentage of plastics by weight would be much higher than the fishes in the rivers, oceans and seas [Boro & al., 2020]. Areca leaf plates are 100% biodegradable and compostable. Unlike plastic plates, these are broken down naturally and return to the earth without leaving any toxic residues. This makes them a great choice for present generation looking forward to reduce their environmental footprint.

CHALLENGES AND ISSUES

Despite of several positive outlooks, this industry facing some challenges that need to be addressed with utmost care. Among the major challenges, limited infrastructure, lack of budget, unskilled labor, less distribution networks, limited investment interest in logistics and marketing, less popularity of the products due to comparatively higher price than plastic platters and unstable sourcing of raw material supply affects the production continuity which in turn retard quality of the products. However, establishing fair trade practices and supporting local farmers can tackle these issues.

Policy and Recommendations for future growth

In spite of existing challenges of less budget, implementation of modern techniques and advance equipment such as SFSA-FM-X1 semi-automatic molding machine, highly skilled and trained labors, supply of bulk of raw materials

throughout the year, opportunity of these utensils is gradually improving in India [Rane & Thakker, 2023]. The GOI has imposed several orders on replacing plastic tea cups/cutlery/water bottles with ecofriendly products in all Government sectors. Government as well as non-governmental organizations and small-scale industries play a crucial role in raising this initiative in national and international level by providing financial assistance for modern automatic machinery, capacity building training programs, awareness campaign and stakeholders' meetings to facilitate connections between rural manufacturers and national or international buyers. Infrastructure development such as establishing better production facilities and storage units; technological integration as introducing advanced appliances to improve efficiency and production quality; branding and strong global marketing; certification and collaboration with eco-friendly product retailers and online platforms to reach broader range of consumers are highly emphasized.

CONCLUSION

India accounts for 53.07% of world's Areca production [Murthy, 2022]. The eco-friendly tableware manufacturing initiative taken by the tribal community of Madarihat - Birpara rural areas exemplifies how traditional knowledge combined with innovative practices can address environmental challenges while promoting sustainable development. This model not only contributes to environmental conservation but also offers a pathway for economic empowerment and social upliftment of marginalized communities of rural Bengal. Scaling such initiatives globally can play a significant role in transitioning towards a greener and sustainable future.

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