
Bamboo Slat Chair

Location	Old Tamenglog, Tamenglong district, Manipur, India
Suitability	Households, Self-help groups
Benefits	Significant value addition – cash income generation – poverty alleviation – gender-neutral
Level	Household
Capacity	240 units per year
Keywords	Bamboo – Slat – Chair

Introduction

Tamenglong district is located in the west of Manipur state at an altitude of 1,290 m above sea level and covers a total area of 4,391 sq. km. The population of Tamenglong in the 2001 census was 111,493, predominantly the Zeliangrong Naga tribes and a number of sub-tribes. Population density is very low at 22.6 people per square km (compared to 273 average over the whole of India) and is distributed relatively evenly over the district. A substantial number of them live in poverty, chiefly because their main economic activity of slash-and-burn cultivation has become non-remunerative. Industrial development has passed Tamenglong by, largely because of the lack of infrastructure, and its remoteness and difficult terrain.

The total afforested land spreads over 3,884 sq. km, with 1.5 billion standing bamboo culms occupying 563 sq. km (*Melocanna baccifera* is the predominant species) and rattan contained in patches over 1,033 sq. km. Bamboo is one of the major natural resources in Tamenglong. It is highly renewable resource, allows annual harvesting and is a good source of timber. Bamboo is widely used by the tribal communities for a variety of purposes. Despite this, however, bamboo is not looked upon as a material of value owing to its perishability: biological deterioration is a major deterrent to the use of bamboo in longer duration applications. Preservative treatment of culms is therefore the primary value-adding step.

The Enterprise

The enterprise is household-based, and training for making bamboo slat-based low chairs was provided by TAMBAC. In a month the enterprise makes 20 chairs, a number dictated by the market, adding up to 240 units annually. Products are sold in Tamenglong HQ during festivals, and in the capital city of Imphal.



The enterprise required a capital investment of about INR 15,000. Specialized jigs were prepared by four artisans who received training from TAMBAC.

The bamboo used is a variety of *Bambusa balcooa*, locally called Kapui.

The Process

The process basically involves bending bamboo slats into two sets of loops of two different shape and dimensions, and assembling them into form the seat and back rest of the chair. A blowtorch is used for heating, and rattan slivers are used for tying.

Beneficiaries

The key beneficiaries of the enterprise are self-help groups and micro-scale entrepreneurs.

Key Financial Data

Cost price per chair	: INR 408
Sale price per chair	: INR 500
NPV of the enterprise	: INR 121,087
IRR	: 413.23%
Benefit-cost ratio	: 1.29

Cost of land is not taken into the calculations, as the enterprise is household-based. Renting/leasing would escalate operating costs.

Costs for the enterprise include as fixed capital INR 15,500, comprising one-time cost of tools (tool life is taken as 5 years). The annual operating cost is INR 94,793.00, mostly towards labour charges and cost of raw materials (procured locally at market prices). In a household enterprise, labour charges would be notional.

Marketing or transportation costs are taken as 10% of sale price.

Annual sales turnover is INR 120,000, earning a net profit of about INR 25,207 per year.

Key Benefits

- A significant value addition step.
- A viable business enterprise that can cater to local and export markets.
- Cash income generation.
- Livelihood opportunity and poverty alleviation.

Key Requirements

- Availability of bamboo and cane at reasonable prices.
- Rent-free working space.
- Market for the product.

The Environment

Manipur, one of the eight states in North-East India, covers a total geographical area of 22,327 sq. km. Of the total area, about nine-tenths constitute the hills, which surrounds the remaining one-tenth valley. Manipur is bounded by the states of Nagaland on the north, Assam on the west and Mizoram on the south. Along the east, it shares a 352 km long international boundary with Myanmar. The state lies between 94° 31' to 94° 78' E and 23° 83' to 25° 68' N and lies from 550 to 3,600 m above sea level. It has mainly hilly terrain (92%), surrounding a saucer-shaped valley of 1,856 sq. km, called Imphal Valley. The area has prevailing monsoon rainfall with an average annual rainfall of 2,100 mm and temperatures ranging from -1°C to 38°C.

The 2001 Census puts Manipur population at 2.39 million, with a density of 107 people per sq. km and annual growth rate of 3%. Meitei, which constitutes around 57% of the total population of the state, is the major ethnic community. There are altogether 29 ethnic tribal communities dominated by Nagas and Kukis (about 30% of the population). The Meitei lives in the plains, while the Nagas and Kukis prefer the hills.

The forests of Manipur belong to five ecological types: tropical wet evergreen forests; tropical moist deciduous forests; subtropical broad-leaved hill forests; sub-tropical pine forests; and mountainous wet temperate forests. Teak, Pine, Oak, bamboo and rattan are among the key forest species. Most bamboo species found in north-eastern India are present in Manipur state. Pure bamboo brakes constitute 3,268 sq. km area (18.6% of the total forest cover). More than 700 000 bamboo culms are extracted every year in Manipur. It also has more than 13 species of rattan under three genera. Both bamboo and rattan (cane) are well known to the people of Manipur because of their multipurpose economic uses.

Agriculture is the mainstay of the Manipur's economy. It engages 76% of the workers. The size of the cultivated area is, however, only 9.41% of the total geographical area of the State. Of this total cultivated area, 52% is confined to the valley. In the hills, jhum (slash-and-burn) cultivation is widely practiced but the returns are uneconomical and unsustainable.

A high rate of unemployment exists in Manipur, particularly among the educated youth. There are more than 400,000 unemployed persons as per the live register of the Employment Exchanges. Manipur has more than 650,000 people below poverty line.

The per capita net income of the State based on an estimate at current prices is INR 11,370 for 1999-2000 compared with the all-India average of INR 16,047. The average annual growth rate of the State Domestic Product (SDP) is 10.52% in 1999-2000 as against 8.03% of the manufacturing sector.

Tamenglong district is located in the west of Manipur state at an altitude of 1,290 m above sea level and covers a total area of 4,391 sq. km. The total afforested land spreads over 3,884 sq. km, with 1.5 billion standing bamboo culms occupying 563 sq. km (*Melocanna baccifera* is the predominant species).

The population of Tamenglong in the 2001 census was 111,493. The Zeliangrong Naga tribes are the predominant inhabitants and there are a number of sub-tribes. Population density is very low at 22.6 people per square km (compared to 273 average over the whole of India) and is distributed relatively evenly over the district. There are 171 villages in the district. Slightly more than one third of these have fewer than 200 people, one third have between 200-499 people and slightly less than one third have between 500-1999 people. There are only two villages with more than 2,000 inhabitants. The female: male sex ratio is 0.923. Literacy is 67% among men and 50% among women.

Each Naga village is a "village republic" – an independent democratic unit. The sense of community and cooperation is very strong. Each village has a village authority. The village authority, established under the Village Authority Act, is equivalent to the village panchayat (council) elsewhere in India. It has administrative, development, judicial and defence functions and is empowered to settle civil and criminal cases.

Land ownership in Tamenglong is mostly with important families in each individual village. These families decide who uses the land and for what purpose it is used, and collect a small fee from the users in the form of a small quantity of produce (usually one or two tins of rice per year). Each year, the village authority decides the location for swidden cultivation.



Land for terrace paddy, horticulture and housing is negotiated between the inhabitants and the land-owners, subject to approval by the village authority. There are no controls on farming or harvesting other than that agreed by the village committees.

The road network is highly underdeveloped. The Imphal-Tamenglong road (state highway) and the Tamenglong-Khongsang road (part of National Highway 53) are the only roads that are motorable throughout the year. There are no railways and the nearest airport is at Imphal, 153 km away. Only 48% of the villages have an electricity supply but most do not receive it regularly. Currently, there is only one working commercial bank in the district which is in Tamenglong.

The office of the Deputy Commissioner is in charge of all government activities in Tamenglong district as well as law and order and administration. It is the representative of the state government and acts as the focal point for vital areas of government interventions such as elections, census, disaster relief, and district planning, development and land revenue. The government has a number of local institutions aimed at helping development in Tamenglong.

Bamboo Preservation Enterprise

Bamboo is an inalienable part of a Manipuri's life, as it finds use in many ways and for many purposes. House construction is one area where it finds major use. Bamboo, with starch-rich culm, is very susceptible to biological degradation. This is a factor that curtails the value and wider application of bamboo, despite its strength and beauty. Rural bamboo houses have a life of 3-5 years, after which they have to be reconstructed.

While this has been an accepted norm in rural areas, the easy perishability of bamboo needs to be addressed to elevate the status of bamboo as a standard, modern structural material. In seismic zones

such as the north-east of India, bamboo would naturally be a construction material of choice for its lightness, flexibility and strength. However, it does not feature in housing programs because of its tendency for rapid degradation. Bamboo culms, therefore, need preservative treatment before it can be regarded as a material at par with wood and used in value-added longer-term applications.

Over the years, several preservation methods have been formulated and perfected. These are seldom used widely because of lack of know-how, non-demonstration of techno-economic advantages and absence of treatment facilities. The 2003 gregarious flowering of *Dendrocalamus hamiltonii* bamboo in the forest provided the impetus needed to set up treatment facilities. An enterprise catering basically to community needs was set up, as a model unit, by TAMBAC.

Inputs

- Bamboo (*B. balcooa* var.) pole
- Cane
- Thickness sizer
- Width sizer
- Saw
- Scraper
- Drill
- Blowtorch
- C-clamps
- Hammer
- Large knife
- Sandpaper
- Adhesive
- Varnish

Process Details

The chair manufacturing process involves the following steps:

1. Cross-cutting bamboo pole (85 mm diameter) into two pieces of 1,800 mm length.
2. Removal of outer node and scraping off the skin.
3. Splitting each piece into 8 splits
4. Removal of inner nodes and inner skin.
5. Preparing slats (about 27 mm width).
6. Width sizing to prepare slats of the required width (25 mm).
7. Thickness sizing to reduce slat thickness to 8 mm.
8. Straightening of slats using a blowtorch.
9. Bending slats into loops on a jig (one loop requires three bends) using blowtorch.
10. Drilling holes on the loops and fixing them using adhesive and bamboo nails (made from bamboo waste from earlier processing).
11. Scraping and cleaning the parts darkened by the use of blowtorch.

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12. Rough and fine sanding of the loops.
 13. Applying a coat of clear lacquer.
 14. Preparation of cane slivers.
 15. Splitting 9-ft long cane into 4 pieces.

16. Preparing slivers of 8 mm width.
17. Arranging the required number of loops side by side and tying the base, seat and backrest using the cane slivers.



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BAMBOO SLAT CHAIR : ON-FARM MODEL

A. PARAMETERS

Local currency unit:	INR
Interest rate	
- working capital (without project)	6% per year
- working capital (with project)	15% per year
- fixed capital (without project)	6% per year
- fixed capital (with project)	15% per year
Loan period (months)	
- working capital (without project)	12 months
- working capital (with project)	60 months
- fixed capital (without project)	12 months
- fixed capital (with project)	60 months

B. FIXED CAPITAL

Item	Without project				With project							
	Y1-Y5				Y2		Y3		Y4		Y5	
	Unit	Quantity	Rate	Total	Quantity	Rate	Quantity	Rate	Quantity	Rate	Total	
Tools & Equipment (Saw, Dau, Knife, Scraper, Thickness sizer, Width sizer, Drill machine, Hammer, Blowtorch, C-clamp)	Lump sum	1 Set	0	0	1 Set	Lump sum	15,500	0	0	0	0	0
Total							15,500					15,500

Notes:

1. All figures in INR.
2. Average operating life of tools is 5 years.

C. OPERATING COSTS

Item	Unit	Without project			With project			Y4			Y5						
		Y1-Y5			Y3			Y2			Y4			Y5			
		Quantity	Rate	Total	Quantity	Rate	Total	Quantity	Rate	Total	Quantity	Rate	Total	Quantity	Rate	Total	
Raw Materials																	
Bamboo (B.balcooa) culm for slat loops	12 ft culm	0	0	0	360	20	7200	360	20	7200	360	20	7200	360	20	7200	
Adhesive (Fevicol)	kg	0	0	0	9.6	160	1536	9.6	160	1536	9.6	160	1536	9.6	160	1536	
Sandpaper Grade-2	No.	0	0	0	864	6	5184	864	6	5184	864	6	5184	864	6	5184	
Sandpaper Grade-1	No.	0	0	0	240	22	5280	240	22	5280	240	22	5280	240	22	5280	
Clear lacquer (Touchwood)	ml	0	0	0	48000	0.22	10560	48000	0.22	10560	48000	0.22	10560	48000	0.22	10560	
Rattan cane	9ft pole	0	0	0	1200	5	6000	1200	5	6000	1200	5	6000	1200	5	6000	
Labour																	
Making slat loops																	
- Unskilled	workday	0	0	0	178.42	70	12489	178.42	70	12489	178.42	70	12489	178.42	70	12489	
- Skilled	workday	0	0	0	234.86	100	23486	234.86	100	23486	234.86	100	23486	234.86	100	23486	
Assembling																	
- Skilled	workday	0	0	0	110.57	100	11057	110.57	100	11057	110.57	100	11057	110.57	100	11057	
Marketing & other costs	percent sale	0	0	0			12000			12000			12000			12000	
Total							94793			94793			94793			94793	
D. REVENUE																	
Chairs sales/year	No	0	0	0	240	500	120000	240	500	120000	240	500	120000	240	500	120000	
Total					0		120000	240		120000	240		120000	240		120000	

Item	Y1-Y5	Y1	Y2	Y3	Y4	Y5
E. CASH FLOW PROJECTIONS						
INFLOW						
Sale revenues	0	120000	120000	120000	120000	120000
Enterprise contribution						
- Fixed capital		15500	0	0	0	0
- Working capital (2 month operating cost)		15799	0	0	0	0
Total inflow	0	151299	120000	120000	120000	120000
OUTFLOW						
Fixed capital	0	15500	0	0	0	0
Operating costs	0	94793	94793	94793	94793	94793
Total outflow	0	110293	94793	94793	94793	94793
Cash Flow	0	41006	25207	25207	25207	25207
F. FINANCIAL ANALYSIS						
Return on total capital employed						
- Income from sales	0	120000	120000	120000	120000	120000
- Cash outflow	0	110293	94793	94793	94793	94793
- Net cash flow	0	-6091	25207	25207	25207	25207
Internal rate of return – IRR (%)		413.23				
Discounted cash inflow		535011				
Discounted cash outflow		413923				
Net present value – NPV		121087				
Benefit/Cost ratio		1.29				
Contribution (Sales - variable cost)		25207	25207	25207	25207	25207
Profit before interest, tax & depreciation		25207	25207	25207	25207	25207
Fixed Cost		Nil				
Depreciation		3100	3100	3100	3100	3100
Profit before Tax – PBT		25207	25207	25207	25207	25207
Present value ratio – PVR		21	21	21	21	21
Tax (tax exempted)		Nil				
Profit after tax – PAT		25207	25207	25207	25207	25207
Break even point (in value)		14758				
Break even point (in unit)		30				