
Joss Sticks (Agarbatti)

Part 1: Bamboo Sticks

Location	Nalchar, West Tripura district, Tripura State, India
Suitability	Self-help groups, individual entrepreneurs, households
Benefits	Poverty alleviation – Generates cash income – Gender neutral
Level	Household, micro enterprise
Capacity	36,000 kg per year
Keywords	Bamboo – Stick – Incense – Joss – Agarbatti

Introduction

Tripura, one of the eight states in Northeast India, is the smallest state of the region and the second most populous state after Assam, with a total population of about 3.19 million, as per 2001 Census. The state is divided into four districts – North Tripura, South Tripura, West Tripura and Dhalai. Nearly two-thirds of the area is hilly, leaving very little arable land to meet the requirement of burgeoning population of the state.

Tripura has close ties with the Indian incense sticks or joss sticks (*agarbatti*) industry, with annual market value of INR 18,000 billion (approximately US\$410 million). Bamboo stick forms the incense stick's core that carries the dried fragrant paste. Tripura supplies more than one-third of the bamboo sticks for the industry. It is estimated that about 60,000 households are engaged in splitting bamboo to make sticks for joss sticks. Most of these households are located in small handicraft-making clusters, and among them the Nalchar and Chorilam clusters, both in West Tripura district, are well known.

The Enterprise

Making sticks for agarbatti from bamboo slivers is one of the many traditional bamboo-based technologies that are being promoted by the Tripura Bamboo and Cane Development Centre (TRIBAC), a non-profit organization, as the means for ensuring sustainable alternative livelihood patterns in regions of Tripura that are rich in resources – both natural and human – but poor in terms of cash availability. TRIBAC was set up by the Centre for Indian Bamboo Resource and Technology (CIBART).



Finished bamboo sticks being loaded onto a van

Stick production in Nalchar and elsewhere in Tripura is traditionally a manual process that yields non-uniform, low-quality sticks and therefore adds little value. Manual operation also reduces productivity. TRIBAC semi-mechanized the process, using a machine to produce uniform sticks from bamboo slats cut to a specific size.

The production is carried out by a 10-member self-help group, which has a production capacity of 120 kg per day, at 3,600 super medium grade sticks per kg. Annual production is about 36,000 kg.

The Process

The process is fairly simple. Bamboo poles are first cross-cut to cylinders of required length using a saw. These cylinders are then split into slats and the outer and inner parts scraped off. The slats are reduced to slivers, which are then further split into sticks. The sticks are sun-dried and bundled.

TRIBAC has introduced power-operated machines for cutting into culms into cylinders, cylinders into slats and slats into sticks. CIBART has been working with machinery manufacturers to develop low-cost, pedal-operated machines for semi-mechanizing the process. The production process discussed here, however, focuses on the manual method.

Beneficiaries

The main beneficiaries are self-help groups (SHGs), most of which comprise women who otherwise have no opportunity to earn cash income. Such SHGs often operate in an informal set-up from

households, which provides flexibility of working hours to the women. This helps the SHG members, who have routine household chores. Income earned by the women often forms the difference between abject poverty and the means to feed the family, particularly in lean months when agriculture is not an option.

TRIBAC has initiated the formation of several such SHGs to form clusters in Nalchar and elsewhere.

Key Financial data (US\$1 = INR 44.29)

Cost price per 1 kg of stick	: INR 6.34
Sale price per 1 kg of stick	: INR 7.00
NPV of the enterprise	: INR 478,046.00
IRR	: 147%
Benefit-cost ratio	: 1.14

Cost of land is not taken into the calculations; it is assumed that the enterprise has the required land at its disposal. Cost of raw material (bamboo) works out to INR 1.56 per kg. There is no marketing or transportation costs involved, as the buyers pick up the sticks from the production site. The rest of the production cost is mostly labour charges, which accrues to the producers (SHGs). The actual earning, therefore, is much more than the INR 0.66/kg profit.

Costs for the enterprise include as fixed capital one-time cost of INR 2,500.00 towards tools, and annual operating cost of INR 227,664.00 towards costs of material (bamboo) and labour. Annual sales turnover is INR 252,000, earning a net profit of INR 24,336 per year.

Key Benefits

- Livelihood creation and poverty alleviation.
- Opportunity for women and the aged to contribute to cash income generation.
- Production can be carried out in households.
- Very low capital investment.

Key Requirements

- Adequate availability of bamboo at a reasonable cost.
- Rent-free premises to operate from.
- Regular demand for the sticks.
- Acceptability of the quality (non-uniform).

The Environment

Tripura, one of the eight states of Northeast India, is the smallest state of the region (geographical



area 10,491.49 sq. km) and the second most populous state after Assam, with a total population of about 3.19 million and a population density of 304 per sq. km (compared with 273 average over the whole of India), as per 2001 Census. While Assam and Mizoram share its eastern boundary, Bangladesh surrounds it on three sides through a boundary of 856 km (almost 85% of its perimeter). For this reason, Bangladesh plays a large role in the development of Tripura, as a consumptive market and even influencing the social fabric of the state.

Tripura is divided into four districts – North Tripura, South Tripura, West Tripura and Dhalai. Agartala is the capital of Tripura. There are 15 sub-divisions in the state 38 development blocks and one autonomous council. Nearly two-thirds of the area is hilly, leaving very little cultivable land to meet the requirement of burgeoning population of the state. Tripura's per capita net sown area of 0.214 acre is 1.5 times lower than the all-India level (0.343 acre), indicating the growing population pressure on limited cultivable land resource of the state.

Tripura has close ties with the Indian incense sticks or joss sticks (*agarbatti*) industry, with annual market value of INR 18,000 billion (approximately US\$410 million). Bamboo stick forms the incense stick's core that carries the dried fragrant paste. Tripura supplies more than one-third of the bamboo sticks for the industry. It is estimated that about 60,000 households are engaged in processing bamboo to make sticks for joss sticks. Most of these households are located in small handicrafts clusters. The Nalchar and Chorilam clusters, both in West Tripura district, are well known.

Tripura's share, however, is just about INR 200 billion owing to low value addition, mainly because the sticks are not uniform and do not have a good finish owing to the manual process used. Low productivity is another reason for the skewed share of Tripura in the industry.

At present, out of the INR 12.64/kg, which is the final value of the bamboo sticks to the joss sticks industry, only INR 7.00 (about 55%) accrues to the Tripura economy. The tribal households produce approximately 37.5 million tons of bamboo sticks annually. The labour cost is INR 1.50 per kg of bamboo sticks. The cost to the tribal workers is inclusive of gunny bag packing, purchase tax, forest royalty, raw material cost and labour charges.

The Enterprise

The production is carried out by a 10-member self-help group operating from Nalchar. It operates from a household, which obviates the need to rent a place. Buyers take delivery of the sticks from the production site; hence, no transportation or marketing costs are involved. The enterprise has a daily production capacity of 120 kg, of 3,600 "super medium grade" sticks per kg.

The enterprise documented here uses *Bambusa balcooa*, locally known as *Barak* bamboo, which

in Tripura grows to a height of about 30 ft and attains a diameter of about 8 cm. It is thick-walled (>11 mm) and has internodes that are about 30 cm long.

Inputs

- Bamboo poles
- Hacksaw
- Large knife (dao)
- Small knives and blades
- Rope
- Gunny bag

Process Details

1. The bamboo culm is cross-cut into 25 pieces (70 mm dia. × 228 mm length), leaving out the nodes.
2. Using a knife (dao), the pieces are split and re-split into slats.
3. The slats are slivered using small knives and then reduced to sticks of dimensions 1.1 mm (W) × 1 mm (T) × 228 mm (L). These are "Super Medium" Grade.
4. The sticks are sun-dried in the open.
5. Dried sticks are collected, bundled in 1-kg bundles and several bundles are packed in gunny bag.

Detailed financial data on page 6 onwards

Part 2: Rolling & Scenting

Location	Polonnaruwa district, Sri Lanka
Suitability	Self-help groups, individual entrepreneurs
Benefits	Poverty alleviation – Generates cash income – Gender neutral
Level	Micro enterprise
Capacity	450,000 packets per year (6 joss sticks per packet)
Keywords	Incense stick – Joss stick – Agarbatti



Rolling of joss sticks

Introduction

The island of Sri Lanka – which lies within the Indian Ocean, separated from the Indian subcontinent by the Gulf of Mannar and the Palk Strait – has a population of 19.3 million and a land area of 65,610 sq. km. More than two-thirds of the population live in rural areas. Roughly one-third of the population, predominantly in rural areas, is

classified as poor owing to low growth in agriculture and infrastructure sectors. The gross national income (GNI) per capita is US\$1,010 (2004).

Cultivable land extent of Sri Lanka is nearly 2.9 million ha, which is about 45% of the total land area of the country. The main agricultural land uses are paddy (27%) and plantation crops (tea, rubber

and coconut, 24%). Per capita land availability of the country is 0.3 ha.

Both bamboo and rattan resources in Sri Lanka are depleted owing to unscientific management practices. Rattan finds more use in the country than bamboo, although production is heavily dependent on imports, for housing (wattle-and-daub construction), furniture and handicrafts. Bamboo applications are in constriction and household utility items.

The Mahaweli Authority of Sri Lanka (MASL) is currently implementing the "Village Self-help Learning Initiative" (VSHLI) rural development project in 30 villages in Polonnaruwa district. This initiative uses participatory development options to empower village communities and improve their livelihood patterns. Each village formed a Village Organization (VO) set up as a company by a majority (>80%) of the village community, and formed the Federation of VOs for ensuring continuity and functional effectiveness. The Federation promotes and generates income and employment to the community using local resources. The success of this pilot project has spawned the Community Driven Development and Livelihood Improvement ("Gemidiriya") project, covering 4,000 communities in six districts in southern Sri Lanka.

As VSHLI is now making attempts to build mutually beneficial partnership programs with outside agencies, a team of officials from three organizations – National Dairy Development Board in India (NDDDB), SEWA (Self-Employed Women's Association of India) and International Network on Bamboo and Rattan (INBAR) – visited VSHLI and Gemidiriya projects sites in December 2004.

The organizations expressed interest in supporting the development of micro-level economic activities in VSHLI and Gemidiriya project areas through a collaborative program to add greater value to the products that are currently produced in some project villages by introducing new technologies and by cost sharing. The partnership program seeks to provide the communities access to sustainable and long-term livelihood security through their own resources and traditional skill-sets. The success of the program will pave the way for replication elsewhere in the country.

The Enterprise

The program proposes to use the skills, raw material and other resources available in various identified centres new applications through design di-

versification and training initiatives. One of the opportunity areas for these traditional skills is in the manufacture of joss sticks. The partnership program proposes to use the skills, raw material and other resources available in various identified centres new applications through design diversification and training initiatives. One of the opportunity areas for these traditional skills is in the manufacture of joss sticks.

Joss sticks making involves the following ingredients: bamboo sticks, charcoal powder, *bhoomi* (local name) powder (essentially adhesive wood bark dust) and perfume. This enterprise has the added advantage of setting up ancillary enterprises, such as stick making (bamboo splints), charcoal making and packaging units.

The Process

The process involves weighing the required quantities of *bhoomi* powder and charcoal powder, and mixing them with water to make a thick paste. Small quantities of this paste are then rolled on to bamboo sticks. The coated sticks are then sun-dried. Dried sticks are then scented using a combination of different perfumes – this is the most value-adding step in joss stick production, and the formula for blending perfumes and aromatic ingredients is a trade secret – and other ingredients such as aromatic oil. The scented joss sticks are then packed in packages of different shapes and volume.

Beneficiaries

Key beneficiaries of the enterprise would be village community groups, particularly women members of such groups, as joss stick enterprise does not involve hard labour and allows operational flexibility. A survey conducted in 2000 by the government and donor agencies found that roughly one-third of the Sri Lankan population is poor, earning less than US\$15 per month. The majority (87%) of these poor people live in villages. Low income levels have noticeable impact on access to nutrition, health, sanitation, water, etc. The labour force participation rate of women continues to be half that of men and, consequently, the unemployment rate among women is also double that among men.

Key Financial data (US\$1 = LKR 101.38)

Cost price per packet	: LKR 4.78
Sale price per packet	: LKR 6.00
NPV of the enterprise	: LKR 544,250.29

PV ratio (average for 5 years) : 49.40

Benefit-cost ratio : 1.08

Cost of land is not taken into the calculations; it is assumed that the enterprise has the required land at its disposal. Cost of raw materials works out to LKR 1.43 per packet (6 joss sticks). The largest component in the rest of the production cost is

labour charges, which accrues to the producers. The actual income to the production unit, therefore, is much more than the LKR 1.22/packet profit. Initial costs for the enterprise include as fixed capital one-time cost of LKR 15,000.00 towards tools and equipment, and 3 months working capital of LKR 330,863. Annual sales turnover is LKR 1,822,500 (production at 90% of capacity).

Detailed financial data on page 9 onwards



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BAMBOO STICK : ON-FARM MODEL

A. PARAMETERS

Local currency unit: INR (US1 = INR 44,29)

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		Y1		Y2		Y3		Y4		Y5		
	Unit	Quantity	Rate	Total	Quantity	Rate	Total	Quantity	Rate	Total	Quantity	Rate	Total
Tools & Equipment (Hacksaw, Dau, Knives)	Lump sum	1 Set	0	0	1 Set	Lump sum	2,500	0	0	0	0	0	0
Total							2,500						

Notes:

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

Item	Unit	Without project			With project			Y4	Y5			
		Y1-Y5		Y3		Y4						
		Quantity per unit	Rate	Total	Quantity	Rate	Total			Quantity	Rate	Total
C. OPERATING COSTS												
Raw Materials												
Bamboo (B. balcooa) culm	kg	0	0	36000	1.56	56160	36000	1.56	56160	36000	1.56	56160
Labour												
Making sticks	workday	0	0	2858	60	171504	2858	60	171504	2858	60	171504
Total						227664			227664			227664
D. REVENUE												
Sticks/year	kg	0	0	36000	7	252000	36000	7	252000	36000	7	252000
Total				0		252000			252000			252000

Item	Y1-Y5	Y1	Y2	Y3	Y4	Y5
E. CASH FLOW PROJECTIONS						
INFLOW						
Sale revenues	0	252000	252000	252000	252000	252000
Enterprise contribution						
- Fixed capital		2500	0	0	0	0
- Working capital (2 month operating cost)		37944	0	0	0	0
Total inflow	0	292444	252000	252000	252000	252000
OUTFLOW						
Fixed capital	0	2500	0	0	0	0
Operating costs	0	227664	227664	227664	227664	227664
Total outflow	0	230164	227664	227664	227664	227664
Cash Flow	0	62280	24336	24336	24336	24336

Item	Y1-Y5	Y1	Y2	Y3	Y4	Y5
F. FINANCIAL ANALYSIS						
Return on total capital employed						
- Income from sales	0	252000	252000	252000	252000	252000
- Cash outflow	0	230164	227664	227664	227664	227664
- Net cash flow	0	-16108	24336	24336	24336	24336
Internal rate of return – IRR (%)		147				
Discounted cash inflow		1099670				
Discounted cash outflow		961362				
Net present value – NPV		138308				
Benefit/Cost ratio		1.14				
Contribution (Sales - variable cost)		24336	24336	24336	24336	24336
Profit before Interest, tax & depreciation		24336	24336	24336	24336	24336
Fixed Cost		Nil				
Depreciation		500	500	500	500	500
Profit before Tax – PBT		24336	24336	24336	24336	24336
Present value ratio – PVR		10	10	10	10	10
Tax (tax exempted)		Nil				
Profit after tax – PAT		24336	24336	24336	24336	24336
Break even point (in value, INR)		5178				
Break even point (in kg)		740				

JOSS STICK : ON-FARM MODEL

Local currency unit:

LKR (US\$1 = 101.38)

A. FIXED CAPITAL

Item	Without project					With project						
	Y1-Y5		Y1		Y2		Y3		Y4		Y5	
	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate
Tools & Equipment (Average life - 5 yrs)	Lump sum	0	0	1 Set	Lump sum	15,000	0	0	0	0	0	0
Total						15,000						

Item	Unit	Without project		Y1		Y2		Y3		Y4		Y5	
		Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate
		per unit	Total	Total	(70% of capacity)	Total	(90% of capacity)	Total	(90% of capacity)	Total	(90% of capacity)	Total	(90% of capacity)

B. OPERATING COSTS

Raw Materials																
Bamboo sticks	kg	750/year	0	0	525	30	15750	675	30	20250	675	30	20250	675	30	20250
Charcoal powder	kg	750/year	0	0	525	15	7875	675	15	10125	675	15	10125	675	15	10125
Bhoomi powder	kg	600/year	0	0	420	75	31500	540	75	40500	540	75	40500	540	75	40500
DEP oil	l	225/year	0	0	158	750	118125	203	750	151875	203	750	151875	203	750	151875
Perfume	l	660/year	0	0	462	600	277200	594	600	356400	594	600	356400	594	600	356400
Packaging	pkt	450000	0	0	315000	0.6	189000	405000	0.6	243000	405000	0.6	243000	405000	0.6	243000
		per year														
Labour																
- Plant operators	No.		0	0	6	4500	324000	6	4500	324000	6	4500	324000	6	4500	324000
- Marketing	No.		0	0	1	8000	96000	1	8000	96000	1	8000	96000	1	8000	96000
- Scenting, R&D	No.		0	0	1	12000	144000	1	12000	144000	1	12000	144000	1	12000	144000
Marketing costs	LKR						120000			120000			120000			120000
Total	LKR						1323450			1506150			1506150			1506150

D. REVENUE

Packets/year	No	450000	0	0	315000	6	1890000	405000	6	2430000	405000	6	2430000	405000	6	2430000
		per year														
Marketing costs	LKR						472500			607500			607500			607500
Total					0		1417500			1822500			1822500			1822500

Item	Y1-Y5	Y1	Y2	Y3	Y4	Y5
E. CASH FLOW PROJECTIONS						
INFLOW						
Sale revenue	0	1417500.00	1822500.00	1822500.00	1822500	1822500
Loan						
- Fixed capital		15000.00	0	0	0	0
- Working capital (2 month operating cost)		330862.50	0	0	0	0
Total inflow	0	1763362.50	1913625.00	1913625.00	1913625.00	1913625.00
OUTFLOW						
Fixed capital	0	15000.00	0	0	0	0
Operating costs	0	1323450.00	1611580.50	1611580.50	1611580.50	1611580.50
Total outflow	0	1338450.00	1611580.50	1611580.50	1611580.50	1611580.50
Cash flow before loan	0	424912.50	302044.50	302044.50	302044.50	302044.50
DEBT SERVICE						
Principal - Fixed capital	15000.00	3000.00	3000.00	3000.00	3000.00	3000.00
Principal - Working capital	330862.50	0	82715.63	82715.63	82715.63	82715.63
Interest - Fixed capital	0	2400.00	1920.00	1440.00	960.00	480.00
Interest - Working capital	0	52938.00	61408.08	39703.50	26469.00	13234.50
Total	0	58338.00	149043.71	126859.13	113144.63	99430.13
F. FINANCIAL ANALYSIS						
Return on total capital employed						
- Income from sales	0	1417500.00	1913625.00	1913625.00	1913625.00	1913625.00
- Cash outflow	0	1396788.00	1760624.21	1738439.63	1724725.13	1711010.63
- Net cash flow	0	20712.00	153000.80	175185.38	188899.88	202614.38
Discounted cash inflow		1417500.00	1741398.75	158,309.00	1454355.00	1320401.00
Discounted cash outflow		1396788.00	1602168.03	1442905.00	1310791.00	1180597.00
Net present value – NPV		588714.41				
Benefit/Cost ratio		1.08				
Contribution (Sales - variable cost)						
Interest		658050.00	971475.00	971475.00	971475.00	971475.00
Depreciation		55338.00	63328.08	41143.50	27429.00	13714.5
Other fixed cost		3000.00	3000.00	3000.00	3000.00	3000.00
Profit before Tax – PBT		564000.00	564000.00	564000.00	564000.00	564000.00
Present value ratio – PVR		35712.00	341146.92	363331.50	377046.00	390760.50
Combined break even point (in value, LKR)		46	51	51	51	51
		1126026.00				

Item	Y1-Y5	Y1	Y2	Y3	Y4	Y5
F. FINANCIAL ANALYSIS						
Return on total capital employed						
- Income from sales	0	252000	252000	252000	252000	252000
- Cash outflow	0	230164	227664	227664	227664	227664
- Net cash flow	0	-16108	24336	24336	24336	24336
Internal rate of return – IRR (%)		147				
Discounted cash inflow		1099670				
Discounted cash outflow		961362				
Net present value – NPV		138308				
Benefit/Cost ratio		1.14				
Contribution (Sales - variable cost)		24336	24336	24336	24336	24336
Profit before Interest, tax & depreciation		24336	24336	24336	24336	24336
Fixed Cost		Nil				
Depreciation		500	500	500	500	500
Profit before Tax – PBT		24336	24336	24336	24336	24336
Present value ratio – PVR		10	10	10	10	10
Tax (tax exempted)		Nil				
Profit after tax – PAT		24336	24336	24336	24336	24336
Break even point (in value, INR)		5178				
Break even point (in kg)		740				