
Bamboo Plantation (*Bambusa tulda*)

Rhizome Cutting Method

Location	Awankhul, Tamenglong district, Manipur State, India
Suitability	Self-help groups, community enterprises
Benefits	Part-time occupation – Generates cash income – Gender neutral
Level	Community, micro enterprise
Capacity	800 culms per year (average)
Keywords	Bamboo – <i>Bambusa tulda</i> – Plantation – Rhizome

Introduction

Tamenglong district – in the west of Manipur state in India – is located at an altitude of 1,290 m above sea level and covers a total area of 4,391 sq. km, more than 88% of which is forested. The 1.5 billion standing bamboo culms occupy 563 sq. km (with *Melocanna baccifera* being the predominant species).

The population of 111,493 is mostly the Zeliangrong Naga tribes. About 86% of the workers are engaged in agriculture, predominantly swidden, a backbreaking and non-remunerative enterprise that keeps 70% of the people in the district below poverty line. The road network is highly underdeveloped, with only two round-the-year motorable roads. There are no railways and the nearest airport is at 153 km away. Only 48% of the villages have electricity supply but most do not receive it regularly. This acute lack of infrastructure has kept remunerative industries away.

The tribal communities have great traditional skills in working with bamboo and rattan. Bamboo handicrafts have good market, and provide livelihood and cash income to thousands of families in rural areas. The over-dependence on one species of bamboo, particularly in the absence of adequate resource regeneration operations, is a threat to bamboo-based economic activities. Planned and systematic development of diverse bamboo species through plantations is therefore a strategic necessity.

The Enterprise

Community-run bamboo plantations were initiated in Tamenglong by the Tamenglong Bamboo and Cane Development Centre (TAMBAC) with active support from local communities. The enterprise described here is a small sized venture, with low levels of capital requirements. The land for the enterprise



was made available free of cost from the community land. The enterprise is suitable for village communities and small self-help groups, where part-time labour for plantation management will be available. The nursery has the capacity to supply 800 bamboo culms per year.

The Process

The plantation is raised using rhizome cuttings (offsets) of *Bambusa tulda*, which is a fast-growing species that is preferred for plantations in the Indian subcontinent. The offsets are obtained from the forest, and community labour is employed for plantation establishment and maintenance on the understanding that the benefits from sale/use of mature culms will accrue to the community.

Beneficiaries

The key beneficiaries are community groups and self-help groups who could run the enterprise as a supplementary activity. The enterprise is a part-time exercise that would leave the practitioners free to pursue their main livelihood activity.

Key Financial Data

Cost price per culm	: INR 20.00
Sale price per culm	: INR 40.00
NPV of the enterprise	: INR 133,985
Internal rate of return	: 32%
Benefit-cost ratio	: 2.1

Land cost is taken as nil, as it is available free of cost for community-based plantation activities. Costs



A culm cutting

for the enterprise include fixed capital of INR 850.00, a one-time cost of purchasing the tools, and 10-year operating costs of INR 175,937.00, which include costs of labour, materials and transportation.

Returns on the investment will start from the fifth year onwards. The enterprise is projected to yield an average income of INR 35,200 per annum over the

10-year period, beginning from the fifth year.

Key Benefits

- The opportunity to generate cash income in otherwise economically isolated areas
- Part-time work and flexible hours (after planting, the work involved is very less)
- The opportunity for the whole community (including women and the aged) to be involved in an income-generating activity
- A viable business enterprise that can cater to local markets

Key Requirements

- Land being available free of cost for plantation
- Rhizome cuttings being available within a reasonable distance
- A per hectare minimum yield of 400 culms per year from the fifth year
- Each bamboo culm commanding a minimum price of INR 40
- The village community contributing to the operating costs through labour

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 surround 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.

The 2001 Census puts Manipur population at 2.39 million, with a density of 107 people per sq. km and



A community group with culm cuttings

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 Kukis and Nagas 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.

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 landowners, 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 Plantation Enterprise

The plantation was established using rhizome cuttings of *Bambusa tulda*, a very useful species with green culms that grow up to 23 m high and 10 cm in diameter. The species finds use as scaffolding, food (shoots), and as a raw material for paper pulp, craft items, etc. It is one of the five quick-growing species in India and as such, is a preferred plantation species.

The rhizomes were obtained from the Barak valley, some 15 km away from the plantation site. The 800-



New shoot emerging from a planted cutting

plant plantation was set up as a community venture, with all families in the village contributing to the effort. Land is freely available for the community for plantation purposes and the location of plantation was finalized by joint consultations held with the community, the VLOs of Awankhul village, the village development council chairman and members of the local church.

Inputs

- Land
- Rhizome cuttings (offsets) of *B. tulda*
- Pickaxes
- Spades
- Hand saws

Process Details

- The land is surveyed and plantation site of 2 hectares is marked.
- The marked site is cleared of vegetation and stones.
- Layout of the plantation is prepared, identifying the pattern for planting. The propagules are planted at 5 m × 5 m distance from each other to provide enough space for clump establishment.
- Planting pits – 800 pits of size 50 cm × 50 cm × 50 cm – are dug as per the pattern.

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- Rhizomes cuttings (800 cuttings, each with culm section of 1 m height with at least two nodes + rhizome + roots) are prepared from 1-2 years old culms, and transported to the plantation site.
 - The cuttings are planted in the pits, the pits are refilled and earth heaped around the planted cutting.
 - In the first two years, any cutting that has died is replaced with a new cutting.
 - Weeding is done twice each in the first two years, along with mounting earth around the planted cuttings.
 - From the third year onwards, thinning of the clump is carried out as part of the maintenance work.
 - Harvesting of culms for sale is done from the fifth year onwards.



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BAMBOO PLANTATION : ON-FARM MODEL

A. PARAMETERS

Local currency unit: INR (US\$1 = INR 46)

Interest rate

- working capital (with project) 12% per year
- fixed capital (with project) 12% per year

Loan period (months)

- working capital (with project) 120 months
- fixed capital (with project) 120 months

B. FIXED CAPITAL

Item	Unit	With project											
		Y1		Y2		Y3		Y4		Y5-Y10			
		Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate		
Land	Ha (Forestland, free of cost)	2	0	0	0	0	0	0	0	0	0	0	0
Tools & Equipment (Pickaxe, spade, saw, knife)	INR	1 set	850	850	0	0	0	0	0	0	0	0	0
Total			850	0	0	0	0	0	0	0	0	0	0

Notes:

1. All figures in INR.
2. Average operating life of tools and equipment is taken as 10 years.
3. Last column indicates Y6 to Y10, where there are no expenses.

Item	Unit	With project									
		Y1		Y2		Y3		Y4		Y5	
		Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate
C. OPERATING COSTS											
Raw Materials											
- Rhizome cuttings	INR, per ha	2	8800	17600	0	0	0	0	0	0	0
- Transportation	INR, per ha	2	750	1500	0	0	0	0	0	0	0
Labour											
- Site survey, land clearing, pit digging, planting, refilling	INR, per ha	2	2721	5442	0	0	0	0	0	0	0
- Weeding, vacancy filling, earth work	INR, per ha	2	1383	2766	2	931	1863	2	1714	3429	0
- General maintenance	INR, per ha			0			0			0	2
Sub-total				27307			1863			3429	12500
											12500
											12500
C. OPERATING COSTS (Contd...)											
Raw Materials											
- Rhizome cuttings	INR, per ha			0			0			0	0
- Transportation	INR, per ha			0			0			0	0
Labour											
- Site survey, land clearing, pit digging, planting, refilling	INR, per ha			0			0			0	0
- Weeding, vacancy filling, earth work	INR, per ha			0			0			0	0
- General maintenance	INR, per ha	2	8,960	17920	2	10800	21600	2	12560	25120	33280
Sub-total				17920			21600			25120	33280
											33280
											33280

Item	Unit	With project																											
		Y1		Y2		Y3		Y4		Y5																			
		Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate	Quantity	Rate																		
D. REVENUE																													
Sale of culms	INR		0		0		0		0		0		800		40	32000													
TOTAL			0		0		0		0		0					32000													
D. REVENUE (Contd...)																													
Sale of culms	INR		1060		40		42400		1334		40		53360		1600		40	64000		1880		40	75200		2134		40	85360	
TOTAL					42400		42400						53360					64000						75200					85360

E. CASH FLOW PROJECTIONS

Item	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
INFLOW										
Sale revenues	0	0	0	0	32000	42400	53360	64000	75200	85360
Enterprise contribution										
- Fixed capital	850	0	0	0	0	0	0	0	0	0
- Working capital	27307	1863	3429	3429	0	0	0	0	0	0
Total inflow	28157	1863	3429	3429	32000	42400	53360	64000	75200	85360
OUTFLOW										
Fixed capital	850	0	0	0	0	0	0	0	0	0
Operating costs	27307	1863	3429	3429	12500	17920	21600	25120	28640	33280
Total outflow	28157	1863	3429	3429	12500	17920	21600	25120	28640	33280
Cash Flow before debt service	0	0	0	0	19500	24480	31760	38880	46560	52080
F. FINANCIAL ANALYSIS										
Income from sales	0	0	0	0	32000	42400	53360	64000	75200	85360
Cash outflow	28157	1863	3429	3429	12500	17920	21600	25120	28640	33280
Net cash flow	-28157	-1863	-3429	-3429	19500	24480	31760	38880	46560	52080
Internal rate of return		32%								
Discounted cash inflow		255436								
Discounted cash outflow		121451								
Net Present Value		133985								
Benefit/Cost ratio		2.10								