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**INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN  
(INBAR)**

**TRANSFER OF TECHNOLOGY MODEL  
(TOTEM)**

**TOOTHPICK MANUFACTURING UNIT**

by

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## TRANSFER OF TECHNOLOGY MODELS (TOTEMS)

Transfer of Technology Models (TOTEMS) are focussed educational tools providing relevant information and distance training on one specific area of bamboo/rattan management, processing or utilization. They are a means of technology transfer between similar regions throughout the world, with the emphasis on South-South transfer for livelihood development. They enable those involved in the management and use of bamboo and rattan resources to more efficiently and effectively develop and use skills relating to these resources.

TOTEMS are primarily intended as practical information resources and teaching aids for those at the local extension level in their communities, who can utilize them to assist local community development. Each TOTEM consists of a detailed written report of the technology, a PowerPoint presentation, a film, and, where relevant, a set of technical photographs. They also include information on target users, financial analyses of sample set-ups from the partner country preparing the report, and information on where to source particular technologies (such as equipment). The TOTEM thus provides all the information required for establishing similar technologies within interested countries and regions.

- The **report** contains all the technical details of the particular processes involved, as well as other relevant information for establishing the technology such as costs of business establishment, running costs and cash flows.
- The **PowerPoint** presentation contains details of the relevant technologies and their applications, and is intended to provide an overview of the potential of the technology for development.
- The **film** provides a visual guide to the processes involved and helps to bring them alive in the minds of the learners.

The different parts of the TOTEM are targeted at slightly different audiences, via the local extension workers. The report and film are intended to be the main means of extension to the individuals and communities who will implement the technology and who will directly benefit from it. The PowerPoint presentation is primarily intended as a tool for the extension worker to sell the technology and its role in development to those who provide the infrastructural, policy and financial support for its implementation, such as government departments, donors and NGOs. There is considerable flexibility, however. Local extension workers will be able to incorporate the TOTEMS in their own work as they wish and adapt and develop them to suit their particular requirements and conditions.

This TOTEM on the **bamboo toothpick manufacturing unit** has been produced by Zhang QiSheng and Guan MingJie of the Bamboo Engineering and Research Centre at Nanjing Forestry University (NFU), Nanjing, China. The report section of this TOTEM describes the technology for producing and establishing a bamboo toothpick manufacturing enterprise for rural development in regions where bamboo is available as a raw material. It is intended to be used in conjunction with the illustrative film included in this TOTEM package



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The first part of the report introduces the technology, discusses its history, its development attributes, its benefits and its applicability. The second part of the report provides detailed information on the technical aspects of producing toothpicks from bamboos. **Appendix I** provides information on the specifications of the machinery required.

This TOTEM is one of the first to be produced by INBAR/ NFU and your feedback is most welcome - kindly contact INBAR or NFU with your comments or suggestions.

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**Note:** This TOTEM has been edited at INBAR and differs slightly from the form in which it was received from the authors.

## **BAMBOO TOOTHPICKS AT-A-GLANCE**

### **Why bamboo toothpicks?**

Bamboo wood is relatively soft, not particularly dense, and is ideal for the production of toothpicks. Bamboo is a renewable resource that can be harvested annually and if cultivated well produces a known yield per unit area. This makes it ideal for supplying the relatively low but regular inputs of raw materials required by the toothpick unit.

### **How are they produced?**

Toothpicks are produced by splitting bamboo culms into thin splits that are then split further into circular rods 2mm in diameter. These are then cut to length, polished and the ends are sharpened.

### **What is the market for bamboo toothpicks?**

The market for bamboo toothpicks is very large although figures are not available. Toothpicks are very widely used throughout Asia and in other regions of the world. In order to develop the market still further the environmentally friendly nature of using bamboos to produce toothpicks could be stressed.

### **What is the role of a bamboo toothpick-manufacturing unit in rural development?**

A bamboo toothpick-manufacturing unit can provide employment opportunities to a range of people. The unit itself will employ a minimum of 20 people and more employment will be generated in its forward and backward linkages, such as cultivation and harvesting of bamboo, marketing and retailing. The need for substantial quantities of raw bamboo will encourage the sustainable management of bamboo plantations, which can easily be intercropped with food crops and thus increase the food security of the rural poor that grow them.

### **How do I establish a bamboo toothpick unit?**

The establishment of a toothpick unit requires a regular supply of bamboos, electricity, labour and access to markets. The equipment required can be purchased for as little as USD \$13, 000 and with other start-up costs included the total initial investment required would be about USD \$25, 000 - 30, 000.



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## **PART ONE**

### **INTRODUCTION**

#### **DEVELOPMENT ATTRIBUTES, TARGET GROUPS and BENEFITS of a**

#### **BAMBOO TOOTHPICKS MANUFACTURING UNIT**

## **1. Bamboo toothpicks**

Bamboo toothpicks are widely used in many Asian countries, especially in China where there are a large number of small-scale toothpick production units. Bamboos are renewable, can be harvested annually and are an ideal source of softwood for light uses such as toothpicks. The productivity of sympodial bamboos (clump-forming types) is much higher than monopodial bamboos (running bamboos) and for this reason, only toothpicks made from sympodial bamboos are considered in this TOTEM.

Bamboos have been used to produce toothpicks in China since the Qing dynasty. Longmen county in Guangdong province in southern China is a major toothpick production centre and toothpicks have been produced by hand here for generations.. In Vietnam bamboo toothpick production methods have been developed specifically for the blind. The toothpicks produced by the blind association involved have captured a considerable portion of the domestic market and have created jobs and stable incomes.

In China there are now a range of modern machines available that permit the efficient medium-scale production of toothpicks in community or village level enterprises. They permit greater production rates, increased uniformity and higher quality than hand production.

## **2. General development attributes and advantages**

The main development attributes of the technology are as follows:

- Reduction in the use of tree timber through its substitution by bamboo timber, leading to increased environmental protection.
- Rehabilitation of degraded and waste lands
- Creation of employment opportunities especially among the rural poor
- Improvement of rural peoples skills and their empowerment through development of their potential
- Increasing social and community welfare

## **3. Suitable agro-ecological regions**

A bamboo toothpick unit is very suitable for most sub-tropical and tropical regions in which sympodial bamboos grow. Regions of natural bamboo forest are suitable, but the unit could be established where bamboos are grown on any scale, from homesteads to large plantations. The technology is especially suitable for areas where soil erosion is a problem, as the planting of bamboos to supply the unit can greatly reduce erosion.



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Planting bamboos can also restore degraded lands, such as abandoned shifting cultivation plots, and bring them back into productivity.

#### **4. Target groups**

There are three main target groups of the technology. The first group are those who will be employed directly by the unit. Unskilled, semi-skilled and some technically trained personnel will be required to establish and run the unit and all jobs can be done by both men and women. The second group are those who will cultivate and harvest the bamboos that are the raw material for the unit. This group includes workers on bamboo plantations, and owners of their own homesteads. Finally, if the unit is established as a cooperative venture within the community and is part-owned by or held in trust for, the community, then the community as a whole will also benefit from the money generated.

#### **5. Benefits**

The environmental benefits of a toothpick-manufacturing unit are considerable. The use of large quantities of bamboo as the raw materials will necessitate the effective and sustainable management of bamboo plantations and stands, and will encourage the planting of more bamboo. The cultivation of bamboo is beneficial for soil conservation and afforestation activities and plantations are encouraged as part of social forestry programmes. The use of bamboo to produce toothpicks will reduce pressure on timber wood, and contribute to forest conservation.

As noted in section four (above), establishing the unit will generate considerable employment opportunities for rural people. The unit would increase economic activity in the region, bringing greater prosperity to the communities involved and permitting knock-on investment in new bamboo-based projects.

#### **6. Scope for small enterprise development**

Bamboo toothpicks are a low input - low output product for the factory but are required in enormous numbers. All sectors of society in a huge range of countries use toothpicks, and with a little careful marketing, perhaps stressing the eco-friendly nature of the product, the vast majority could be using bamboo toothpicks. The very short rotational cycle of bamboo makes it very attractive in terms of cash flow compared to timber trees and this means it is attractive for those with limited capital. As a small-scale enterprise a toothpick-manufacturing unit may be eligible for development grants or other incentives from the government - check with your local government office or business advisory centre for details.

## **7. Requirements for success**

The essential requirements for a successful bamboo toothpick-manufacturing unit are:

- Initial capital investment
- A regular supply of bamboos as raw material
- Secured, trained workforce
- Sufficient markets

## **Concluding remarks**

The production of bamboo toothpicks on the small and medium scale is an effective way of utilising renewable bamboo resources, providing income generating opportunities for rural people, empowering individuals and communities with knowledge and experience, and sustainably developing the economies of poor rural communities. The technology has strong forward and backward linkages and its implementation will benefit a wide range of people involved in all stages of toothpick production. In a new location it is preferable to implement the technology with the support of state agencies, NGO's or private enterprises to ensure the linkages are properly in place. The establishment of a local or regional marketing agency for toothpicks may be also beneficial in developing the markets and guaranteeing the continued development of the unit.



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## **PART TWO**

# **THE BAMBOO TOOTHPICK MANUFACTURING UNIT**

## 1. Introduction

Bamboo toothpicks are produced by the following basic steps

- Cutting of culms into shorter sections
- Splitting culms and sectioning into thin, round rods 2 mm in diameter
- Drying rods
- Rolling rods to smooth the surface
- Sectioning rods to toothpick length (usually 65-70 mm)
- Polishing
- End-sharpening
- Sorting
- Checking
- Packing

## 2. Production of bamboo toothpicks

### 2.1 Raw materials

Bamboo culms 3-4 years old are selected. Species with very long internodes and relatively thin culm walls such as *B. chungii* and *B. cerosissima* from South China are ideal materials as their long internodes maximise the amount of useable wood available from each culm. Species with shorter internodes would also be suitable but those with very short internodes would only be useable as a last resort.

### 2.2 Minimum equipment requirements

- Cross cutting machine
- Splitting machine
- Rod-making machine
- Toothpick cutting machine
- Polishing machine
- End-sharpening machine
- Grinder

Details of these machines are given in **Appendix I**.

### 2.3 Culm sectioning, splitting and rodmaking

- Culms may be sectioned by hand or by using a cross-cutting machine. It is necessary to remove nodes at or very close to either end of a section as they hinder proper splitting.

- The sections are then split longitudinally into splits of approximately equal width in the splitting machine.
- Each split is then passed through a rod making machine that produces fine round threads of bamboo the same thickness as the eventual toothpick (usually 2mm). The machine also removes the outer green layer of the culm that is still attached to the split. However, the use of just one machine to produce rods from splits is relatively wasteful of bamboo wood. Productivity per culm is higher if the splits are passed through a series of machines, each of which produces splits of successively smaller diameter. However, the capital investment and running costs would increase.
- The bamboo rods are then left in the sunshine to dry.
- The rods may be bleached in open tanks to ensure uniformity of colour and increase acceptance amongst consumers. The rods are soaked in the bleaching agent (such as hydrogen peroxide, H<sub>2</sub>O<sub>2</sub>) for 15 minutes and then piled together to allow further penetration of the bleaching agent. They should be covered with plastic sheet to protect them from rain.

#### **2.4 Toothpick production**

- After drying the rods are cut to toothpick length. The cutting machine has an exposed blade and appropriate care should be taken to avoid injury.
- The toothpicks are then placed in the polishing machine.
- The ends of the toothpicks are then sharpened in the end-sharpening machine. In the case of single-ended toothpicks, other machines are available that engrave patterns or rings in the blunt end for decoration.
- Finally the toothpicks are placed in the grinding machine to finish them off.

#### **2.5 Checking and Packing**

The toothpicks are finally sorted into batches and substandard ones removed. They are packed at the unit into packages of up to 200 toothpicks, using the unit's own packaging style. This ensures greater brand recognition and offers greater opportunities for market penetration.

## APPENDIX



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## Appendix I

### Minimum machine requirements

<b>Machine</b>	<b>Number required</b>	<b>Specifications</b>	<b>Approximate cost per machine (USD)</b>
Cross-cutting machine	1		230
Splitting machine	1		2290
Rod-making machine	1		1820
Toothpick cutting machine	3		290
Polishing machine	2		725
End-sharpening machine	4		1490
Grinder	1		175
<b>TOTAL</b>	<b>13</b>		<b>12, 895</b>