

A photograph showing a traditional drying rack for handmade bamboo paper. The structure is built with bamboo poles and has a thatched roof. Numerous long, narrow strips of yellowish-brown paper are hanging from the rack, drying in the sun. The background shows lush green foliage.

TRANSFER OF TECHNOLOGY MODEL

HANDMADE BAMBOO PAPER

INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN

Why bamboo?

- **Bamboos** grow more rapidly than trees and start to **yield within three or four years** of planting.
- **Plantation** establishment requires **minimal capital investment** and builds upon the inherent plant-cultivation skills of local farmers and foresters.
- **Bamboos** can be **harvested annually** and non-destructively.
- **Bamboos** are excellent for **rejuvenating degraded lands** and protecting against soil erosion.
- **Bamboos** may easily be **intercropped** with shallow-rooted crops.
- As well as the culms, **all other parts** of the bamboo plant **can be used in rural livelihoods** - shoots for food, leaves for fodder, and branches for items such as brooms and for firewood.

Why make paper from bamboo wood?



- **Bamboo wood** has a high fibre content (40-60%) and the fibres are strong, long (1.5 - 2.0mm, occasionally up to 5 mm long), have a high length to width ratio and thick walls, which are beneficial for papermaking.
- **Bamboo fibres** also have a high hemi-cellulose content that contributes to the specific characteristics of bamboo paper, such as it's fine texture, water resistance, absence of fluff and good ink absorbing abilities.
- **Bamboo paper** has a distinct brush-pen effect that makes it popular amongst calligraphers. Bamboo is also often used to produce joss papers and toilet papers. Bamboo pulp (up to 80%) is regularly used in conjunction with timber pulp to produce newsprint and other standard paper types.

How is bamboo paper produced?



1. Bamboos sections are soaked for 1-3 months



2. Sections are boiled to liberate the fibres, then bleached



3. The bleached fibres are pounded to separate them from other material



4. Fibres are placed in water to form pulp from which paper is produced



5. Pulp is picked up using a bamboo screen to produce a web - a crude, wet, paper sheet



6. Wet paper is pressed, baked on drying walls, trimmed and

Main development attributes of a handmade bamboo paper unit

- **Reduces** dependence on timber resources and thereby increases environmental protection and conservation.
- **Permits** rehabilitation of degraded lands through increased areas of bamboo plantations.
- **Creates** income-generating opportunities for bamboo growers who will supply the unit, and employment for unskilled and semi-skilled staff at the unit. Producing handmade paper is labour intensive.
- **Requires** minimal capital investment and involves a long cycle of production.
- **The work** is gender sensitive - women can be employed in all stages of paper production.

Some salient facts

- **Bamboo papermaking** has been practiced for 1500 years in China.
- The wide **variety** of paper products that bamboo can be used to produce provides a measure of flexibility to small scale producers, who can adjust their production of different types to meet changing demand.
- Many countries have national or regional **restrictions** on tree felling and are consequently short of raw materials for papermaking. For example a four fold increase in the shortage of timber for pulp in India over the years 1990 - 2015 is predicted. Bamboo pulp is an excellent substitute.
- Handmade papers fetch **higher prices** and the environmentally friendly nature of the bamboo raw materials can increase selling price further.
- Bamboo pulp can also be used to produce **rayon**.



Photo: Pressing wet paper before drying

Requirements for success

- Sustained **supply** of bamboos suitable for papermaking.
- Some **technically-trained personnel** to manage and maintain the unit.
- **Market information** and marketing links
- Start up **capital**.



Left: Bleaching in the bleaching pond.



Right: Taking stock for pounding

Financial aspects of a handmade bamboo paper unit

(based on information from two units in China)

START UP COSTS (US Dollars)

- Cauldron \$600
- Bleaching pond \$250
- Stone pounder \$1200
- Tanks \$1800
- Wall oven \$3700
- Paper cutting machine \$3700
- Other tools \$1800

TOTAL **\$13,050**

FINANCIAL DATA

- Internal Rate of Return **17.75 %**
- Benefit Cost Ratio **31.77 %**
- Breakeven Period **4.78 years**

For further information

See

TOTEMs

Handmade bamboo paper TOTEM

Websites

INBAR: www.inbar.int

RISF: www.forestry.ac.cn

Contact

- **INBAR**, Beijing 100101-80, China
- **Bamboo Research Division, RISF**, Chinese Academy of Forestry, 73 Daqiao Road, Fuyang, Zhejiang, China



Left: Wet paper ready for pressing.



Right: Checking paper quality.