

BY SIMONE ESTEVÃO



There are more than 1,200 species of bamboo around the world

Bamboo: a fiber to be discovered by the industry

Having over 1,200 species all over the world, the bamboo has some characteristics indicating a high potential for pulp and paper production. The range of possibilities, however, has not been duly taken advantage of by the Brazilian industry, for reasons ranging from disinterest in the raw material to the lack of development of proper technologies

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What comes to your mind when bamboo is referred to? Workmanship? Decoration? Contrary to what many people think, bamboo has an infinity of other ways of utilization, ranging from civil engineering to gastronomy and medicine. But its promising use in the pulp and paper area is what we are most interested in.

Combining softwood and hardwood characteristics for paper manufacturing, bamboo has a huge potential, since its strength allows typical long fiber applications, such as multilayer bags, corrugated board boxes, duplex cartons, besides a variety of other packaging paper grades. And by mixing the bamboo fibers with hardwood fibers, it is possible to manufacture any paper grade.

However, the bamboo pulp is not internationally commercialized on a large

scale, having been kept strictly connected to the local markets of the Asian continent. "This product has no commodity status. The great western producers, such as Canada, United States and Europe, are little interested in the bamboo fiber, since they have no suitable climate for its culture, as well as because Asia does not produce enough to export, so that it does not represent any threat or mean any opportunity for the Westerners", stresses Hans Kleine, Executive Secretary of the

Bamboo Association of Santa Catarina.

But what about Brazil? The bamboo fiber would not be an interesting raw material for pulp production in our country? The answer is yes, but the progress toward transforming this possibility into something concrete is minimum. "There is want of knowledge and a lack of interest in the subject, as well on the part of the companies of the area, as on that of researchers in general", declares Antonio Salgado, Technical Consultant of Grupo João Santos and scientific researcher retired by the Agronomic Institute of Campinas (IAC).

According to Hans Kleine, the key to understand this paradox is to be found in the way of development of the eucalyptus pulp industry itself. "The enormous success in producing and exporting bleached eucalyptus hardwood with technology developed in Brazil imparts a feeling that we did far more than it was our obligation", he points out. For him, the bamboo pulp might fill the gap left at present by the softwood pulp, which we have even to import, in order to manage the great existing demand. "It is exactly this market share that the bamboo would get into as a potential alternative. Initially to replace these imports and afterwards to become, maybe, the new star both of the national and international softwood market", conjectures Kleine.

Then what must still happen in order that the bamboo actually gains this space? According to Professor Antônio Ludovico Beraldo, associate of the Faculty of Agricultural Engineering of Unicamp, the answer is simple: investment. "If there were an allotment of just 1% of the resources reserved for the eucalyptus genome, the bamboo culture might experience a great leap of quality", he defends. Antonio Salgado agrees: "It is necessary to develop agricultural technologies specially for the country industry and equipment, mainly that associated with the plant cutting mechanization. Thus the range of products resulting from bamboo might be even enlarged".

PARTICULARITIES THAT MAY MAKE THE DIFFERENCE

A peculiar aspect of the bamboo fibers is that in spite of having characteristics similar to those of pinus softwood, as e.g. size, width and productivity, they are 1.16 to 6.16 mm long i.e. they do not fit solely

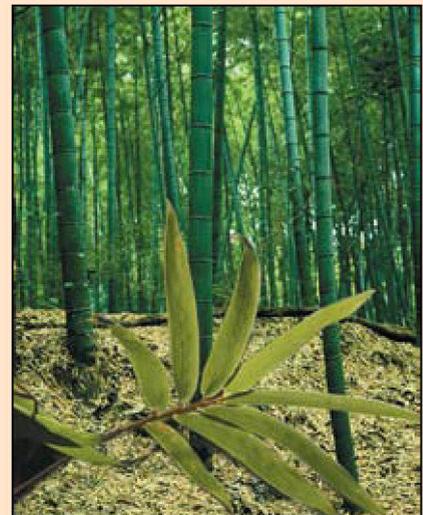
as softwood, nor as hardwood. But perhaps the main bamboo property is really its cutting time.

To be ready for the first cut, bamboo takes nearly three years. Thereafter the harvest can be carried out every 2 years. As far as eucalyptus is concerned, this time increases to 7 years, while for pinus it is not shorter than 15 years. "Within 13 years, bamboo allows being exploited up to six times, while the pinus did not yet make possible any cutting", points out Osmarino Borges Filho, agricultural engineer acting in the large plantation areas in Pernambuco.

The bamboo sprouts emerge from the soil in spring or in early summer and experience a very quick growth, reaching their final height within 4 to 6 months, when the branches and leaves are formed. During this period, the most common species in Brazilian territory, the *Bambusa vulgaris*, may grow up to 20 cm per day. When the growing phase is over, the culms endure a ripening period, in which their mechanical strength increases, until turning three years. The culms ranging from 3 to 6 years old are considered to be ripe and can be used in civil engineering, furniture, laminates, floors and other applications requiring their maximum physical strength. From the sixth year on, the culm strength begins to decrease, so that using very old culms is not recommended.

Another advantage presented by the bamboo and which counts for much in the pulp manufacturing process is the fact that its replanting can be dispensed with for over 100 years. The new sprouts shoot spontaneously every year. The eucalyptus sprouts again after cutting, which is done when it is 7 years old, but it should be replanted after 4 cycles, i.e. in the 28th year, whereas the pinus is replanted after each cutting, which is done in the period ranging from 15 to 20 years.

The bamboo has also high tear strength and low porosity, caused by the morphological structure of its fibers, long and narrow, with little lumen and thick cell walls. Its caloric power is similar to that of ligneous trees and its chemical composition distinguishes itself by the high proportions of ashes and pentosans, the low proportion of lignin and the high solubility in hot water, alcohol, benzene and soda.



BY FMAIS

The harvest of bamboo can be carried out every 2 years

But as nothing is perfect, bamboo has also its disadvantages for the area! The main one is to contain silica and starch in its composition. Silica makes difficult the black liquor recovery, while the starch speeds up the bamboo degradation during storage. "The culm starch also attracts insects and also many kinds of fungi. The attack only happens after culm cutting and may be avoided by treatment with tannin or other fungicides used to treat wood in general", comments Kleine. Both silica and starch must be removed from the pulp manufacturing process, which is easily done with simple technology, fully developed to deal with this raw material.

GEOGRAPHIC DISTRIBUTION

The different species of bamboo are divided in two big groups: the thicket forming ones, which form almost impenetrable groups of culms of rounded shape, with free spaces between the thickets, and the spreading ones, which form homogeneous forests, with culms more spaced among each other, allowing access to each individual culm.

As far as temperature is concerned, the spreading ones develop in colder subtropical climates, while the thicket forming ones prefer warmer tropical climates and generally are little tolerant to frosts. "The bamboo seldom flourishes, which makes the exact identification of a given species extremely difficult. INBAR (Bamboo and Rattan Institute) recommends the commercial plantation of only about 20 species", explains Beraldo.

COMPARATIVE TABLE: BAMBOO, PINUS AND EUCALYPTUS

	Bamboo	Pinus	Eucalyptus
Fiber length	1.16 to 6.16 mm	1.55 to 4.68 mm	0.7 to 1.2 mm
Width	7.5 to 29.2 μ m	21.5 to 42.8 μ m	20 μ m (average)
Average productivity	25 t/ha/year	23.2 t/ha/year	45 m ³ /ha/year
Density	Area 7x3.5m- 408 plants/ha	2 x 2.5 around 2,000 plants/ha	1,100 to 1,500 plants/ha
% Pulp	49.2%	55.5%	From 52% to 55%
% Lignin	14.6 %	26.6%	From 27% to 32%
Trade balance	Potential exporter	Strongly dependent on imports	Important world exporter

Sources: UFV / Osmarino Borges / Antonio Saigado / Cláudio Angeli Sansígolo (UNESP-FCA). Important: the data presented are average ones, so that there may be some divergence as a function of wood quality, researched region and existing technology

Bamboos are little demanding with regard to the type of soil, but certainly produce more in light and fertile soils, responding well to the use of fertilizers. In general they prefer well-drained soils and do not tolerate swamps, pure sand or too clayish soils.

Except for Europe, where at present it is grown in arboretums and parks, bamboo grows naturally in all continents. Its development is better in very rainy regions, with rains distributed along all months of the year, but this does not prevent it from growing, though with lower productivity, in less rainy regions, or where the rains are only concentrated in certain seasons of the year.

The countries of Asian southeast, such as China, India, Thailand, Philippines, Indonesia, Vietnam, Japan and Sri Lanka represent the largest bamboo-producing region in the world. Traditionally, up to the middle of the last century they only used natural forests, going then over to planting and industrializing the use of bamboo, enlarging the production scale.

In Latin America there are also large natural reserves, specially one of 180 thousand square kilometers of *Guadua* species, covering a part of Acre, a part of Bolivia and Peru, besides other natural forests in Ecuador, in Colombia, in Paraguay and in the Caribbean countries.

HINDRANCES AND CHALLENGES

In spite of the various favorable characteristics of bamboo and of the existing market prospects for pulp and paper manufacturing, only one company is active in this segment in Brazil.

It is Grupo João Santos, situated in the northeast region, with two manufacturing units: Itapagé, in Maranhão, and Cepasa, in Pernambuco.

Itapagé possesses a plantation of about 40 thousand hectares of bamboo, considered to be the largest commercial plantation area in the world. It also exploits forest areas of third parties in the neighboring states of the north and northeast regions, promoting small undertakers and providing jobs throughout the year, especially for operators in plant cutting – carried out almost completely by hand.

At present Itapagé is inactive and undergoing a rebuild process, which is focused on replacing the recovery boiler. It is expected that from the first semester of 2009 the company will go over to producing yearly 144 thousand tons of paper - 100% manufactured from bamboo pulp. At Cepasa they produce 70 thousand tons of paper per year.

While Brazil has stayed behind because it does not succeed in creating a collectivity spirit and in building a strong national association, with well-defined goals and plans, other countries, such as India and China, succeed in raising the number of investments in bamboo production by means of specialized associations and of an established commercial network.

In an attempt to change such a scenario, the Brazilian government organized, by means of the Ministry of Environment, a seminar at the VIII World Congress of Bamboo, with the purpose of structuring a national bamboo network, so as to consolidate this basis in the country. During the event, which took place in September 2006 in Brasilia, an agreement was signed for creating the first Center of Research and Application of Bamboo and Natural Fibers at the University of Brasilia. It is already a first step, although timid, toward a promising future!

Curiosities about bamboo

- On Taiwan Island some peoples believed in the legend that the first man and the first woman came from different "knots" of a same bamboo culm.
- It is the plant presenting the quickest growth on the planet. Some species can grow up to one meter per day.
- It has both softwood and hardwood fibers characteristics. From softwood it provides the strength and from hardwood a better paper sheet surface.
- There are about 1,200 species of bamboo all over the world.
- 73% of the houses existing in Bangladesh are made of bamboo.
- Bamboo is the basic source of nourishment for the panda bears in China;
- It was the first plant to normally develop in the region of Hiroshima and Nagasaki, in Japan, after the destruction caused by the atom bomb during the 2nd World War.