

The organic alternative

By Paul Miles

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If I told you there's a building material that is up to 50 times stronger than oak but lighter than steel or concrete, that is flexible, aesthetically pleasing and highly rated for its green credentials, you might say it sounds too good to be true.

If I went on to explain that the material can be used not only to build bridges and cathedrals but also to create floors, walls, clothing, paper, vinegar, cosmetics, animal feed and as a vegetable for human consumption, you would probably dismiss it as some Utopian pipe dream.

But the product exists. It's bamboo.

Today, there is a worldwide movement of architects, interior designers, aid workers and environmentalists championing this hollow-stemmed member of the grass family. Giant bamboos, which grow at rates of more than a metre a day, reaching heights of 30 metres or more and diameters of up to 25cm, are being cultivated and harvested for modern architect-designed structures. And interest in the projects is growing as fast as the grasses.

In Colombia, which is at the forefront of modern bamboo architecture, talents such as Oscar Hidalgo López, Marcelo Villegas and Simón Vélez build expensive homes and public buildings from bamboo. In the US, California architect Darrel DeBoer, who specialises in building with sustainable materials, has created university buildings from bamboo and written a manual about its use. Hawaii-based Bamboo Technologies has attained government building code certification for one species of structural bamboo and built more than 50 bamboo homes in the islands and California, the most expensive one costing \$250,000. The company hopes to build homes in other temperate areas of the US and Europe this year and its latest annual bamboo house design competition has attracted more than 300 entrants from 63 countries.

One happy customer is Shep Gordon, who bought a Bamboo Technologies kit last year for use as his home office in Maui. "It's fantastic. I've never felt so good being inside something. It really is magical," he says. "It's like being in a bamboo forest. It's really calming."

The 1,000 sq ft office "with lots of bells and whistles" took less than three weeks to erect. Speed of assembly is a "fantastic attraction, especially [in Hawaii] where there's a shortage in the labour market". It cost \$170 per sq ft compared with \$500 per sq ft for a traditional building and "I like this much more", Gordon says. He's now about to have a two-storey bamboo guesthouse built.

Stephan Reeve, who lives in a bamboo house in Kipahulu, Hawaii, and built another for her mother, says: "I love the look and feel of the bamboo culms [stalks]. We recently had a substantial earthquake which damaged local bridges and closed our highway for over a month. I was very safe in my strong and flexible bamboo home. I find it tremendously satisfying that my house is contributing to new, more sustainable construction processes. [And] it is a nice house for kids as it has all natural safe materials."

DeBoer praises bamboo for its "strength, longevity and beauty", characteristics that have also made it a new favourite among interior designers. In a pressed and laminated form, bamboo can be used as flooring and wall panelling and for kitchen cabinets and furniture and it comes in a range of natural colourings. US-based Smith &

Fong, established in 1989, says it has seen a “phenomenal growth” in sales of its Plyboo, which is manufactured in China. “With an increasing interest in green building, people are looking for products that are sustainable. It’s also durable and very versatile,” says Sven Eberlein, director of marketing. “I recently saw a bicycle made from bamboo.”

London-based Urbane Living is one of about six UK suppliers of bamboo flooring and sells “a huge amount”, according to director Adam Robertson. “It’s fantastic value for money, being comparable in strength to oak but at a fraction of the cost,” he says. Indeed, bamboo flooring starts at £16.49 a sq metre compared with about £40 for certified sustainable timber.

Bali-based Linda Garland, dubbed “the queen of bamboo”, makes beds, sofas and other furniture from some of the 200 species of bamboo (of the 1,500 or so worldwide) on her Panchoran Estate, near Ubud. Her pieces have been installed in the homes of clients such as David Bowie and Richard Branson and she’s currently building an enormous holiday home with black bamboo walls and roofs around a lake in eastern Bali for Hollywood film director Rob Cohen.

Garland, who also runs the non-profit Environmental Bamboo Foundation, which promotes the use of the material worldwide, says she’s “enchanted by [its] aesthetics” and hopes that luxurious homes such as the one for Cohen will help address its “association with poverty”, which is still a “problem with its status”.

That said, she remains committed to encouraging the use of bamboo for rebuilding low-income housing after natural disasters, since bamboo houses fare better than many other structures in hurricanes and earthquakes (up to magnitude five on the Richter scale, according to a 2004 test by Britain’s Timber Research and Development Association). After fashion designer Donna Karan stayed at Panchoran last year, she donated funds for five bamboo houses to be built for survivors of the Javanese earthquake.

Garland also emphasises the environmentally friendly aspects of bamboo. Its yield (weight per acre per year) is up to 25 times that of timber. One hectare of bamboo can yield 22 to 44 tonnes a year and it is ready to harvest within three to five years. Because it is botanically a grass, more shoots simply appear from where it is cut, so it doesn’t need to be replanted. Bamboo prevents soil erosion, sequesters at least four times more carbon than a forest of young trees and releases 35 per cent more oxygen.

Although humans have sheltered under bamboo structures for millennia, its modern renaissance dates to 2000 when Simón Vélez built a 1,830 sq metre pavilion from 4,000 giant stalks of *Guadua angustifolia* at the Hanover Expo. The organisation that commissioned him was Zero Emissions Research and Initiatives (Zeri), a “global network” that seeks to create a society without unwanted waste. The *Guadua* species used for the pavilion proved strong enough to meet strict European building codes. Loads weighing 10 tonnes placed at the edge of the 7.5m cantilevered roof caused a movement of just 5cm, most of which reversed when the load was removed.

DeBoer cites Vélez’s mortar-filled bolt joinery, which he pioneered some 20 years before, as “making all the difference” to bamboo architecture. In traditional housing, such as that used in the south Pacific, bamboo culms (stalks) are joined together by lashing with vines or other natural fibres, producing a joint that weakens over time as climate and age affects the fibres. Vélez’s method fills part of the hollow stalk, between nodes, with mortar and uses bolts to join pieces together. Several stalks can be joined together to form cathedral-like vertical columns and horizontal spans of more than 50 metres are now possible. Vélez’s most recent project was a 130-room bamboo eco-lodge in China but in Colombia he has built more muscular structures: bridges across gorges, enormous factory roofs, sports stadia and market places. “Bamboo is steel from nature,” he says. “Whatever an engineer can build from steel, I can build from bamboo. Steel and bamboo have the same strength.”

It is with roofs that bamboo comes into its own. The structures of architects such as Villegas and Vélez are at their most inspiring when you look up. Architect Shoji Yoh has designed public buildings in Japan with roofs inspired by bamboo basketware. A woven bamboo frame, supported with temporary posts, is covered with a thin layer of cement. It becomes a beautiful roof with a flowing, fabric feel, as if a lily flower has landed gently on the ground. Richard Rogers's award-winning Barajas airport in Madrid has 210,000 sq metres of laminated bamboo planking adorning its waving roof. "It gives the building a lovely 'soft' feel and is great at absorbing sound," an airport spokesman says. In Leipzig, the zoo's new multi-storey car park is clad in bamboo, changing what could be just another concrete monstrosity into a thing of Zen beauty.

As timber forests continue to be over-exploited, there's no doubt that bamboo will become an increasingly important crop. "It's such a multi-purpose plant," says Francesca Ambrosini, European representative for the International Network for Bamboo and Rattan (Inbar), a non-profit organisation funded by the United Nations and the European Union. The group promotes products such as paper, fabric (including super-soft, fast-wicking, anti-bacterial fibre) and cosmetics all made from bamboo using new technologies developed in the past few years. Construction – an area where, Barajas notwithstanding, Europe still lags – will be the next push. Moving on from demonstration buildings Vélez built for Germany's Vitra Design Museum, Inbar is working on modular housing made from bamboo panels suitable for European climates that are expected to cost in the region of just \$70 per sq metre to construct. It hopes to have built examples by the end of this year. "Use of bamboo directly contributes to the community or people of the developing or poor countries where it grows," says Shyam Paudel of Inbar.

There are some downsides to bamboo. Certain species can get out of control, spreading rapidly across vast areas. Infestation by the "powder post beetle" is a threat (although most bamboo is pre-treated to prevent insect damage). The process of laminating to produce flooring and panels adds environmental cost, especially if the bamboo is bleached.

More worryingly from a sustainability perspective, there are currently no commercial plantations producing structural bamboo in Europe or the mainland US (although there are some in Hawaii). Most comes from China, India, Vietnam and Latin America. According to the UN's Food and Agriculture Organization, in 2005, China had 5.4m hectares of bamboo plantation, some 2.7 per cent of its forestry area, and all the houses sold by Bamboo Technologies arrive in kit-form from Vietnam. Shipping bamboo and bamboo products round the world makes it much less eco-friendly. "Transport is an issue, as it is with many materials," says Sally Hall of the Association for Environment Conscious Building, which has about 1,400 members in the UK and is developing a "gold standard" for a "nearly zero" emissions house.

Still, enthusiasts think the benefits of bamboo easily outweigh its flaws. And they spread their message with religious zeal. Take architect Gale Goldberg, author of *Bamboo Style*. Her plea to readers? "Bring bamboo into your life".

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