



Hardwood Review express

Bamboo Revisited

Industry Expansion Comes with Rising Environmental Costs

An updated report from Dr. Jim Bowyer et al at Dovetail Partners, Inc., provides significant new evidence from multiple studies that serious environmental issues associated with bamboo production remain—or are worse than originally thought—and that many of bamboo’s most oft-repeated environmental claims are unsubstantiated and untrue. We’ve excerpted and reprinted sections of Dovetail’s new report here with permission; download the full report at www.dovetailinc.org.

In 2005, Dovetail Partners, Inc. investigated the environmental attributes of bamboo, a material that had been firmly embraced by the green movement in the absence of any serious attempt to determine what impacts actually result from its production and use. At that time, our investigation revealed many environmental concerns associated with growing, harvesting and converting bamboo to useful products. Problems reported

included clearing of natural forests for establishment of bamboo plantations; creation of monoculture plantations; loss of biodiversity; substantial use of fertilizers and pesticides (despite claims that bamboo crops required neither of these treatments); and unsustainable harvesting of natural stands of bamboo. We concluded that the unquestioned green status accorded bamboo products needed serious re-evaluation and that, at a minimum, third-party certification should be required before awarding any kind of green status to bamboo products. In this report, we revisit the environmental impacts associated with the production and use of bamboo products.

Brief Background

China is reported to have both the largest and fastest growing bamboo sector, involving more than 10 million bamboo farmers, providing 35 million

jobs, and generating a market value of \$10.5 billion. Vietnam, Indonesia, Thailand and the Philippines also have significant bamboo resources and bamboo exports. India has about 30% of the global bamboo resource—but only contributed about 4% of the global supply in 2008. Because China dominates the production and ex-

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Hardwood Lumber Price Indexes



Indexes represent the average published prices of 7 key hardwood items. The margin is the difference in dollars between the kiln-dried and green indexes, as read from the right hand axis.



port of bamboo, the remainder of this report focuses on China.

China's 2009 forest inventory indicated a total bamboo forest area of 13.3 million acres, up 28% from 10.4 million acres in 1998. Despite the diversity of bamboo species, just one—Moso bamboo—is dominant in cultivated plantations and enrichment plantings within natural stands. By 2007, some 12.4 million acres of land were devoted to Moso bamboo, more than 80% of China's total bamboo area. The extent of bamboo in China has grown substantially since about 1970 in response to a combination of administrative orders and applied "afforestation" subsidies directly aimed at increasing bamboo resources.

Building a Green Mythology for Bamboo Flooring

Although produced in limited volume in China beginning around 1990, more than a decade would pass before bamboo flooring began to make inroads into world floor covering markets. A significant turning point occurred in November 2002 with the U.S. Green Building Council's (USGBC) designation of "rapidly renewable materials," including bamboo, as *environmentally preferable materials* in its Leadership in Energy and Environmental Design (LEED) v. 2.1 Standard. Within three years, bamboo flooring production had increased significantly in China, foreshadowing a much larger production expansion. The "green" bamboo genie was out of the bottle.

About two-thirds of bamboo flooring in 2005 went to the export market, with the vast majority to the U.S. and the European Union. In the U.S., the number of suppliers rose from less than 10 in the late-1990s to about 200 by 2005, with imports in 2005 of approximately 45 million ft². Similar growth in bamboo flooring consumption occurred in the EU, though volumes were 1/5 to 1/6 that of the U.S.

[Editor's Note: Bamboo flooring enters the U.S. legally under at least five different tariff codes: two for solid wood flooring (which technically isn't possible with bamboo) and three for engineered/assembled flooring and panels. Based on USITC data, we estimate that U.S. imports of bamboo flooring reached 66.4 million ft² in 2012. Volumes were slightly lower in 2013, but imports in December 2013 and January 2014 were the highest in at least 3 years.]

The anointment of bamboo as a green material was based on broad and unquestioned acceptance of the idea that rapidly renewable materials (i.e. those that renew in 10 years or less) are somehow inherently environmentally superior to those that renew in 11 years or more. It was (and remains) an idea that made little sense, but one that was nonetheless embraced by LEED, as well as a number of other green building programs patterned after LEED.

In 2005, as now, the websites and promotional literature of bamboo promoters were rife with glowing claims about the environmental attributes of bamboo. Currently,

those environmental claims are a bit more restrained than in 2005, but misinformation continues to be disseminated via a number of sources. For example, a 2008 article in *Scientific American* that continues to be cited, states:

"Bamboo's environmental benefits arise largely out of its ability to grow quickly—in some cases three to four feet per day—without the need for fertilizers, pesticides, or much water. ...Bamboo is so fast growing that it can yield 20x more timber than trees on the same area."

These same claims—word for word—can still be found on dozens of websites, though they are misleading or completely false. Another site references the "vast supply" of bamboo, stating "there are reportedly more than 1.6 million square miles of bamboo growing in China alone, with most of these native forests owned and managed by the Chinese government." With regards to this latter statement, China's bamboo resource in 2010 was reported by the UN Food and Agriculture Organization to be a little over 22,000 square miles, the vast majority of which is *in plantations* that are managed *by farmers* [i.e. this web report was wrong on all accounts.]

Meanwhile, the USGBC has at long last discontinued the availability of credits for use of rapidly renewable materials in its 2014 LEED v.4 Standard. Under the new standard, in order to qualify for green credits, bamboo products originating from farmed plantations must comply with the Sustainable Agriculture Standard of the Sustainable Agriculture Network, or if otherwise obtained, must have been legally harvested. Under these new guidelines, promotion of bamboo products as environmentally preferable materials will be much more difficult. However, the "rapidly renewable" mindset is firmly entrenched in many green building programs across the U.S. And although LEED v.4 has dropped rapidly renewable credits, the federal government specifically recognizes LEED 2009 for federal projects, which includes those credits.

Environmental Impacts of Bamboo Industry Expansion

From a social perspective, expansion of bamboo resources and industrial production has been quite successful. Numerous studies have documented expansion of household incomes and poverty reduction through increased bamboo production. And, planting bamboo on steep slopes previously terraced for agriculture has helped to stabilize these slopes and reduced runoff and erosion in many areas. The bamboo phenomenon, however, has been accompanied by substantial environmental costs. Outlined below are selected observations from a number of investigators and research teams (more are included, and all are cited, in the Dovetail report):



Impacts on Biodiversity

- “During the past 15-20 years, a vast area of natural bamboo forests in many counties in the Sichuan province has been turned into monoculture forests.”
- “Widespread over-harvesting and intensive monoculture plantations in many parts of southwest China have had serious negative effects on local ecosystems.”
- “Although intensive management practices have led to higher yields in the short run, in the long run, these forest ecosystems are experiencing a reduction in resilience to pests, disease and weather events, and a reduced capacity to provide important ecosystem services. They are also leading to lower productivity of bamboo forests in the long run.”
- “Moso bamboo has been expanding rapidly into other types of forests, gradually replacing previous pioneer species, [which has] greatly decreased the biodiversity and threatened the existence of other species in some areas, especially for some rare and endangered species.”

Impacts on Forests

- “Some farmers have begun returning farmland to bamboo forest in pursuit of higher profits, which may be a potential threat to China’s food security. In mountainous areas, some other types of forest have been clearcut to plant bamboo.”
- “Under intensive management, the natural soil fertility and site quality have gradually declined in some Moso bamboo forests, accompanied by damage to the soil’s physical structure and a consequent decrease in its water-retention capacity.”
- “About 23% of forests in Anji county (Zhejiang province) shifted to bamboo plantations between 1984 and 1995, and another 30% were converted to plantations between 1995 and 1999.”

Use of Fertilizer, Herbicides and Pesticides

- “The principal means of increasing yields is to increase the density of bamboo culms per unit of land, effectively creating monocultures. This is achieved primarily through active clearance of other vegetative species, including trees. This is typically done by performing two brush cuttings per year. In addition, topsoil tillage is performed every one or two years and chemical fertilizers and pesticides are applied in varying quantities.”
- “As a fast-growing plant, bamboo consumes substantial quantities of nutrients. It is estimated that, on average, farmers annually apply 203 pounds of fertilizer per acre to bamboo plantations.”
- “About 150 pounds of nitrogen (N) per acre is applied in July or August for Moso bamboo during the first 1-2 years after planting. More than 350 pounds per acre of N are needed in the third year, plus 6-12 tons of organic fertilizer, applied in winter.”

Water Use

There is no evidence that water requirements for bamboo plantation maintenance are low. In fact, most references suggest bamboo does best with an abundance of rainfall:

- “[Moso bamboo prefers] sites with a warm, moist climate and annual precipitation over 47 inches.”
- “Bamboos are not suitable for very dry areas unless irrigation is provided.”

Comparative Yields and Impacts

When rates of hardwood production *in natural stands within temperate forests* (managed to 80 to 100-year harvest cycles) are compared with “timber” production in *intensively managed bamboo plantations in subtropical regions* (with 4 to 6-year harvest cycles), bamboo can be shown to have yields 7 to 10 times those of wood. Bamboo yields can be as much as 20 times greater if temperate wood yields are compared to record (atypical) bamboo plantation yields. However, when wood yields from intensively managed plantations of eucalyptus are compared with yields from intensively managed bamboo plantations, the yields are similar or often higher for eucalyptus. Clearly, statements that “bamboo can yield 20x more timber than trees growing on the same area” are true *only* if the comparison is between very dissimilar resources and based on exceptional growth rates for bamboo.

Bamboo’s Bottom Line

Bamboo is a marvelous resource that provides myriad benefits for billions of people. Development of bamboo resources is economically assisting impoverished people while stabilizing erodible slopes and flood-prone watersheds. The benefits, however, come at a high environmental cost—including degradation of natural forests, tremendous biodiversity loss, widespread use of fertilizers and pesticides, loss of resilience of the resource, and increased social and environmental risks linked to large-scale monoculture.

The rapid renewal capacity of bamboo is a reality. But reality is replaced by fantasy when rapid growth is equated to environmental superiority without serious consideration of practices employed to achieve the rapid growth. Fantasy becomes even more fantastic when completely unfounded claims are accepted without question. As we concluded in 2005, bamboo products should never be designated as environmentally preferable materials without, at the very least, requiring careful consideration of environmental impacts throughout the entire supply chain.

Dan Meyer
Editor