Good grief! Should I choose an artificial tree instead?

Three years ago, Dan posted about the Great Environmental Christmas Tree Debate: Which has greater environmental impacts, a real or artificial holiday tree? As of his 2009 post, Dan was unable to find a life-cycle analysis (LCA) comparing the "cradle-to-grave" (pinecone-to-mulch? petroleum-based plastic polymers-to-photo-degraded plastic gyre particles?) impacts of holiday tree alternatives.

Fortunately, we now have an answer. The American Christmas Tree Association, an artificial tree industry group, has since commissioned a *Comparative Life Cycle Assessment of an Artificial Christmas Tree and a Natural Christmas Tree* from the independent, Boston-based consulting firm PE Americas. The LCA compares the "the most commonly sold artificial and the most commonly sold natural Christmas tree in the United States."

Here's the profile of the most common artificial tree:

> The most commonly purchased artificial tree is manufactured at a large facility in China. . . . After manufacturing, the tree is shipped to the US and is distributed by a major big box retailer. The artificial tree including the tree stand is made of metal and plastic parts, is 6.5 ft tall, and weighs 5.1 kg (11.2 lb) out of the box. According USA TRADE 2009, over 10 million artificial trees have been imported to the United States each year . . . .

And here's the most common natural tree:

> The most commonly purchased natural tree is a Fraser fir. . . a 6.5 ft Christmas tree cultivated on wholesale natural tree farms, and distributed to the consumer through large retailers. . . . The accompanying tree stand is 10% metal and 90% plastic. . . . [The] American-grown Fraser fir [is] the most common natural tree grown in the United States.

The LCA examines five environmental impact parameters:

1. **Primary energy demand**: the total amount (MJ) of non-renewable energy extracted

from the earth;
2. **Global warming potential**: a measure of greenhouse gas emissions, like carbon dioxide or methane emissions (kg CO2 equivalent);
3. **Eutrophication**: a measure of eutrophying effects in terrestrial and aquatic ecosystems (kg Nitrogen equivalent);
4. **Acidification**: emissions that may have acidifying effects (mol H+ equivalent); and
5. **Smog**: emissions that contribute to low-level smog (kg NOx equivalent).

The parameters were analyzed over three use scenarios depicting how long a consumer uses an artificial tree prior to disposal: **1 year**, **5 years**, or **10 years**. The LCA also examined three disposal scenarios for the natural tree: **landfilling**, **incineration**, and **composting**.

Note that the LCA included tree stands, packaging, fertilizers, pesticides, and transportation both to the retailer and to the consumer's home—but not human labor, overhead costs, or decorations in its analysis.

The LCA's results show unsurprisingly that "that the overall impact of one artificial tree used for only one year is always greater than the overall impact of one natural tree used for one year, irrespective of the End-of-Life scenario." That's pretty much a no-brainer; but as an artificial tree is kept longer and used year after year, its relative environmental impacts decrease. **The LCA concludes that the "break-even" point, i.e., the number of years one must continue to use an artificial tree in order to produce less environmental impact than annually purchasing natural trees, is dependent on how the natural tree is disposed**. Across all disposal scenarios, the break-even length of time to keep an artificial tree is **about 8 years** for all parameters except global warming potential (landfilled natural trees are still better here) and eutrophication (composted or incinerated natural trees are always the best choice here).

The global warming potential break-even point is **3.6 years for a composted natural tree** or **4.0 years for an incinerated natural tree**. In other words, if you keep an artificial tree for more than 4 years, the global warming potential associated with your artificial tree will be less than purchasing and composting a new natural tree each year.

The study also found that, under all scenarios, **the impact of a holiday tree is <0.1% of the average American's annual carbon footprint**—put another way, if you're concerned about your environmental footprint, you should really worry more about plane flights, using

a clothes dryer, or eating a cheeseburger.

Here are the overall take-away lessons from the LCA:

- **If you choose to purchase an artificial tree**, keep your artificial tree for several years—ideally 8 years—before throwing it away. The most environmentally impacting aspect of artificial trees is the manufacturing process, accounting for ½ to ¾ of the artificial tree's footprint.
- **If you choose to purchase a natural tree,** try to reuse the tree material as mulch or in other ways before the tree meets its ultimate end. Also, consider what type of tree stand you purchase, as the tree stand can account for up to 41% of a natural tree's footprint (depending on how the natural tree is disposed of).
- **In either case, minimize car travel.** The LCA scenarios were very sensitive to transportation. In other words, environmentally-conscious consumers probably should worry more about car travel than tree choice. For example, a discerning consumer can opt to have a tree shipped to her home to capitalize on more efficient truck or rail transportation. Alternatively, strap a tree to the top of your electric vehicle! The study also recommends carpooling when driving to pick up your tree, but it's hard to imagine tying two trees on top of one car.
- **In general, don't obsess about your holiday tree choice** because "the overall environmental impacts of both natural and artificial trees are extremely small when compared to other daily activities such as driving a car." In fact, even if you throw out your artificial tree after only one year, the tree's impact will still be less than 40% of the average American's daily greenhouse gas emissions.

Furthermore, remember that you don't have to limit yourself to the binary "artificial vs. natural tree" choice. In my house, for instance, we opted this year for a small potted rosemary bush (available from Whole Foods) that will double as a fresh herb source when the holiday season is over. (Full disclosure: a bush is also a sensible option for those with tiny urban apartments). Here is a sampling of some other non-tree alternatives. You could also opt to rent a natural tree, thus avoiding the disposal impacts of a natural tree altogether.

Finally, let's not forget about tree lights. According to the LCA, the life-cycle energy demand of a natural tree amounts to **1 to 3 times less than the energy used by the incandescent lights that decorate that tree for one holiday season**. In the case of an artificial tree, **incandescent lights account for more than half of the tree's primary energy demand**. Luckily, you can instead opt for LED holiday lights, which use a small fraction of the energy sucked down by incandescent lights.

Happy holiday decorating!