Peat Moss Composting:

Problems and Solutions

February 1, 2023

Preface:

Two main contributors to the development and maintenance of the composting process, specifically in relation to the United States, can be summarized as the private and public sectors, i.e. the individual/market and the government. Both have similar motivations, which are important to understand. Facing anthropogenic climate change means adapting to an increase in global temperatures. North America will experience a decrease in snowpack and water resources with increases in heatwaves and their intensity/duration, and heavy precipitation (United States Geological Survey, 2023). On an individual level, this has led to an increased interest in personal responsibility and stewardship, with data trends to be explored in the next section.

In terms of government interest, the Midwestern U.S. has lost an average of two millimeters of soil per year since Euro-American colonization around 160 years ago due to agricultural practices (University of Massachusetts Amherst [UMA], 2022). This totals to about 57.6 trillion metric tons of soil (UMA, 2022). Considering topsoil contains the highest concentration of organic material and microorganisms, in addition to being the location where most of Earth's biological soil activity occurs, it makes sense to replace this loss of nutrition via organic compost fertilizer.

Using compost helps reduce the generation of methane in landfills, reduces the need for chemical fertilizers, promotes crop yields, promotes restoration and revitalization, remediates soil contamination, enhances water retention, promotes carbon sequestration, and is cost saving (United States Environmental Protection Agency [EPA], 2022). This in turn also benefits the private sector.

Compost and Peat Moss Data Trends:

With the increased demand for composting, the total Municipal Solid Waste (MSW) was most recently reported in 2018 as 42.6 million tons of organic waste (EPA, 2022). As documented in Figure 1 (See Appendix A), this was ~14,000,000 tons more than 2017 (EPA, 2022). Projections state that the at-home, residential composting market is likely to expand at a compound annual growth rate (CAGR) of 8.6% from 2022 to 2030 (U.S. Residential Compost Market Size Report, 2021).

The correlation between the increased implementation of composting and peat moss lies in the fundamentals of what makes a usable compost. There are 4 necessary components: water, air, “browns,” and “greens.” Green material is rich in nitrogen, like food scraps or grass clippings. Brown material is carbon rich, like dry leaves, or in some cases peat moss (EPA, 2022). The peat market is expected to experience a 12.4% CAGR from 2017 to 2025, with horticulture/permaculture being one of the primary contributors, (North America Peat Market Report [NAPMR], 2023).

Peat Moss Composting Risks:

Peat moss is made of partially decayed plant material submerged in a wet environment free of oxygen with acidic conditions, which is why it is found in bogs (Robin Sweetser [RS], 2022). Most peat moss in existence today is made from plants at least 12,000 years old (Fertile Fibre [FF], 2023). This means peat moss has a slow growth and decay rate which is 1/32 inch per year. It takes about 1,000 years for a 36 inch layer to grow, with some peat bogs being 40 feet deep (Piedmont Master Gardeners [PMG], 2023). It is because of this criteria that peat bogs can be considered non-renewable (RS, 2022).

In order to harvest peat, it has to be mined. The bogs are drained and the peat is scraped off or vacuumed up. (RS, 2022). Once mined, a peat bog will be gone for several generations,

and repair will never return it to its natural self. Revegetation, replanting while mining, takes at least 20 years to see results, (PMG, 2023). Harvesting of peat releases CO2 into the atmosphere because peat bogs are “carbon sinks” (RS, 2022). In fact, one of the most important purposes of a peat bog is carbon sequestration. The cold, wet, and anaerobic (oxygen-restricted) conditions of peatlands promotes rapid carbon uptake. By growing moss, little CO2 is released into the atmosphere as moss decomposes, unless harvested/mined (PMG, 2023). According to the UN, peatlands are the largest holders of organic soil carbon, holding at least 100 times more than a tropical forest, (Jordan Ardoin [JA], 2022). Even though peat bogs cover only 3% of the Earth, they capture 15-30% of all terrestrial carbon (PMG, 2023).

Not only does carbon sequestration aid the climate crisis for humans, carbon-storing wetlands protect and improve water quality, provide fish and wildlife habitats, store floodwaters, and maintain surface water flow during dry periods (PMG, 2023). Some rare species of flora and fauna only exist in these unique environments. Additionally, when properly managed, peatlands can retain 25% more water (FF, 2023).

There are other issues with peat moss composting as well. In the U.S. peat moss is not locally sourced. It comes from Canada, making it more expensive and more resource dependent (JA, 2022). The peat moss itself is low in nutrients, meaning fertilizer has to be added. It is often too acidic for plants, especially those that need alkaline or neutral soil pH, (JA, 2022). It dries out quickly and is easily blown away (FF, 2023). Peat moss also takes a long time to break down “green,” nitrogen rich, compost material, which may not be ideal depending on compost purpose. Additionally, most multi-purpose compost found in stores contains at least 70% peat moss, (FF, 2023).

Recommendations:

On a market, or individual level, it is gardeners over commercial growers that use the most peat moss (GdnsIllustrated, 2022). It is recommended to use some of the alternatives below. Residential yard trimmings, which have been regulated via state legislation in the U.S. since 1990, make a great "brown," carbon-rich compost alternative (EPA, 2022). Other at home alternatives include leaves, leaf mold, grass, pine needles, even manure. Manure can be sourced locally if not at home, as can wood based materials, another alternative. This includes sawdust, bark, wood fiber, and wood chips. (Natalie LaVolpe [NV], 2021).

Coconut coir is growing in popularity as a peat moss alternative. It is a byproduct made from coconut shell fibers. As a waste product from coconut production, it does help mitigate commercial waste, however, it is not local and the coconut industry is also not sustainable. Similarly, rice hulls are another possible, but potentially unsustainable, waste product. It is made by removing the skin from the grain before it is packaged and sold. Unlike coconut coir, it is mainly discarded, but can be preserved, sold, and used for compost (NV, 2021). Other similar waste product alternatives include hemp (RS, 2022) brewing waste, and paper, especially from sludge and pulp (Trees, 2022). However, it is recommended to refer to local/at home, low impact, alternatives such as previously stated, before purchasing from the consumer market.

The threat to peatlands is not only because of peat moss composting, though the data trends in the previous section do predict growth. Other threats include its use as fuel and its destruction due to agriculture and construction. Therefore, peatlands should be protected even if the private and public sectors no longer rely on peat moss for composting. Fortunately, there's an estimated 80% left of peatlands in pristine condition globally. The current loss of peatlands is more reversible than the decline of sea ice and the meltdown of glaciers. On a public level, there has been progress among many countries in terms of how to approach peatlands overall. The

process of “re-wetting,” or revegetation, uses donor seeds. Russia has been doing this most notably in Siberia with the aid of Germany since 2010. Re-wetting was successful in China on the Zoigê Plateau, the most extensive mountain peatland in the world. The U.S. Fish and Wildlife Service is attempting the process of re-wetting at the Great Dismal Swamp in Virginia and North Carolina. However, as mentioned in the previous section, revegetation is a slow process and will never fully recolonize to its original state. Additionally, revegetation is a complicated process, especially with the risks of drying to be expected from the increasing global temperature associated with climate change. It is recommended to re-wet peatlands as a way to restore already degraded peat bogs, especially in Canada, the U.S. supplier of peat moss, but beyond restoring depleted peatlands, it is important to preserve the remaining lands left.

Many peatlands fall on traditionally indigenous land and are yet another reason to be protected. The Mushkegowuk Council of Cree Indians in Northern Canada did sign a memorandum with Parks Canada to designate 34,749 square miles of Hudson and James bay sea and shoreline. However it has yet to be fully realized. If it is, it will be the first federally protected conservation of peatlands in all of North America. (Ed Struzik, 2021). There is an absolute need for legislation to protect the remaining peatlands and to see it come to fruition. In fact, Ireland banned sales of peat moss in 2018. England and Wales will be banning peat moss sales to gardeners by 2024 and banning commercial use for growers by 2030 (Contributor S, 2022). This should be a guide to the U.S. and Canada.

Bibliography:

Ardoin, J. (2022, June 16). *What are the pros and cons of Peat Moss? - lawn care blog: Lawn love*. Lawn Care Blog | Lawn Love. Retrieved February 13, 2023, from https://lawnlove.com/blog/peat-moss-pros-and-cons/#:~:text=Peat%20moss%20can%20make%20the,might%20end%20up%20killing%20them.

Contributor, S. (2022, October 19). *Sphagnum and peat moss sales to be banned in England and Wales, Ireland since 2018*. Cool Davis. Retrieved February 14, 2023, from https://www.cooldavis.org/2022/09/28/sphagnum-and-peat-moss-will-be-banned-to-gardeners/#:~:text=England%20and%20Wales%20will%20be,peat%20moss%20starting%20in%202018.

Environmental Protection Agency. (n.d.). EPA. Retrieved February 11, 2023, from https://www.epa.gov/recycle/composting-home

Environmental Protection Agency. (n.d.). EPA. Retrieved February 11, 2023, from https://www.epa.gov/sustainable-management-food/reducing-impact-wasted-food-feeding-soil-and-composting

Environmental Protection Agency. (n.d.). EPA. Retrieved February 13, 2023, from https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials

GdnsIllustrated. (2022, August 27). *Why a peat compost ban is a good thing*. Gardens Illustrated. Retrieved February 14, 2023, from https://www.gardensillustrated.com/feature/peat-compost-ban-alternative-gardens/

A growing controversy: Should we stop using peat? Piedmont Master Gardeners. (2022, February 2). Retrieved February 13, 2023, from https://piedmontmastergardeners.org/a-growing-controversy-should-we-stop-using-peat/#:~:text=Perhaps%20most%20important%2C%20peat%20extraction,that%20takes%20centuries%20to%20grow!

How bad is peat compost for the environment? Fertile Fibre. (n.d.). Retrieved February 14, 2023, from https://www.fertilefibre.com/blogs/blog/peat-compost-alternatives#:~:text=Many%20gardeners%20trust%20peat%20as,and%20is%20easily%20blown%20away.

LaVolpe, N., & Natalie LaVolpe #molongui-disabled-link. (2021, July 19). *7 peat moss alternatives that are better for the planet*. Farmers' Almanac - Plan Your Day. Grow Your Life. Retrieved February 14, 2023, from https://www.farmersalmanac.com/peat-moss-alternatives

North America peat market - size, outlook, trends & forecasts (2019 – 2025). Envision Intelligence. (n.d.). Retrieved February 13, 2023, from https://www.envisioninteligence.com/industry-report/north-america-peat-market/

ScienceDaily. (2022, March 16). *Midwestern us has lost 57. 6 trillion metric tons of soil due to agricultural practices*. ScienceDaily. Retrieved February 11, 2023, from https://www.sciencedaily.com/releases/2022/03/220316114958.htm

Staff, T. (2022, December 22). *What is Peat Moss? what is it used for?* Trees.com. Retrieved February 14, 2023, from https://www.trees.com/gardening-and-landscaping/peat-moss#downsides-of-peatmoss

Struzik, E. (2021, December 20). *Peatlands cover just 3% of Earth but could help stabilize the climate*. Canada's National Observer. Retrieved February 14, 2023, from https://www.nationalobserver.com/2021/09/17/news/peatlands-could-help-stabilize-climate#:~:text=Canada%20is%20the%20world's%20largest,targets%20and%20to%20restore%20biodiversity.

U.S. residential organic compost market size report, 2030. U.S. Residential Organic Compost Market Size Report, 2030. (n.d.). Retrieved February 13, 2023, from https://www.grandviewresearch.com/industry-analysis/us-residential-organic-compost-market-report-verified), U. S. G. A. R. D. E. N. E. R. (not, verified), S. B. (not, verified), B. A. P. (not, Robin Sweetser 9 months 2 weeks ago In reply to Hi, Sweetser, R., & verified), M. C. C. (not. (2022, May 1). *The great peat debate: What is Peat Moss?* Almanac.com. Retrieved February 13, 2023, from https://www.almanac.com/peat-moss-alternatives#:~:text=Peat%20moss%20or%20%E2%80%9Cpeat%E2%80%9D%20is,36%2Dinch%20layer%20of%20it!

What are the long-term effects of climate change? What are the long-term effects of climate change? | U.S. Geological Survey. (n.d.). Retrieved February 11, 2023, from https://www.usgs.gov/faqs/what-are-long-term-effects-climate-change

Appendix A:

Figure 1: