COMPOST & CLIMATE CHANGE

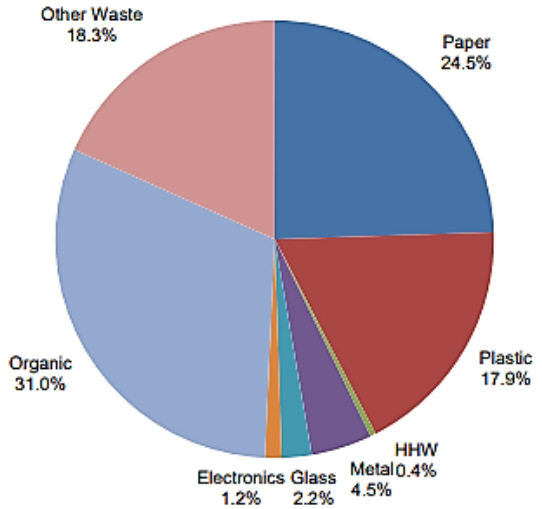
MN Composting Council
STATE CHAPTER OF THE U.S. COMPOSTING COUNCIL

CLIMATE CHANGE IN MN * LANDFILLED ORGANICS * ADAPTATION * USING FINISHED COMPOST

CLIMATE CHANGE IN MINNESOTA

Over the past few decades, Minnesota's climate has become warmer and wetter, with more extreme and damaging rains and warming winters. Between 1895 and 2017, Minnesota warmed by 2.9°F and annual precipitation increased by an average of 3.4 inches from 1895 levels. Extreme precipitation events in Minnesota are now more frequent and intense than ever before (1).

Climate impacts will only increase in the coming decades. It is anticipated that cold weather warming will continue, extreme rains will increase in frequency, and heat waves and droughts will increase in severity and duration (1). Removing organics from the waste stream and utilizing them as compost has many benefits, which can slow climate change and mitigate the impacts of extreme weather.



2013 Statewide Characterization Results (mean by weight) (3)

ORGANICS IN LANDFILLS

In 2013, wasted food, food scraps, and yard trimmings made up 31% of all municipal solid waste in Minnesota and was the largest component of the waste stream (2). Most organic material ends up in landfills, where it decomposes anaerobically (without oxygen). This decomposition produces methane, a greenhouse gas that is 23 to 71 times more effective at trapping heat than CO2.

The methane-producing decomposition of food in landfills produces at least 2.6% of all U.S. greenhouse gas emissions. In 2018, wasted food, food scraps, and yard trimmings in U.S. landfills produced 111 metric tons of CO2 equivalent, equal to the annual emissions of 37 million cars (3). Landfills are the largest direct human-made source of methane emissions in the U.S, primarily due to organic waste.

Composting utilizes aerobic decomposition (with oxygen), which produces minimal quantities of methane when compared to emissions from wasted organic material in landfills.

ADAPTATION MEASURES

There are many solutions to the climate impacts of organics in landfills. In 2019, Minnesota recycled about 34% of all wasted food through food-to-people, food-to-livestock, or composting (4). These are some of the most common methods used to reduce greenhouse gas emissions (GHGs) associated with organics material.

PREVENTION OF WASTED FOOD

Forty percent of all food produced in the U.S. is wasted (5). In 2019, Minnesota generated 843,885 tons of wasted food, and only 285,471 tons of that material was recycled or reused, leaving 558,414 tons of food to be thrown away (4). When food is wasted, so are the water, land, and energy resources that make that food. Food production is so resource-intensive that if global wasted food were a country, it would be the third highest GHG emitter in the world. So, preventing wasted food through planning, proper food storage, and understanding date labels can greatly impact emissions reduction and energy and resource use (6).

FOOD-TO-PEOPLE

In 2017, about 10% of Minnesota households were food insecure (7). Food rescue and donation can help to combat food insecurity while also combating climate change. In 2019, only 28,895 tons of wasted food in Minnesota was donated for human consumption (4). Food bank partnerships with local restaurants, catering companies, schools, and grocery stores can help to routinely divert food from landfills.

FOOD-TO-LIVESTOCK

Some food that is unfit for human consumption can feed livestock. In 2019, 195,495 tons of wasted food in Minnesota went to livestock (4). Local restaurants, caterers, grocery stores, schools, and even food banks, can partner with local farms to divert food that is inedible for humans from the landfill.

COMPOSTING

Composting wasted organic material reduces greenhouse gas emissions. In 2019, only 61,080 tons of wasted food, food scraps, and compostable products (source-separated organics) were composted in Minnesota, while 370,583 tons of yard trimmings were composted (4).

Composting is the naturally-controlled aerobic, biological decomposition process that recycles organic matter into a beneficial soil amendment. This process reduces greenhouse gas emissions by maintaining aerobic conditions for decomposition and avoiding the high methane production from anaerobic decomposition in landfills. Even better, the use of finished compost itself has additional climate change combating benefits.

Composting methods have different benefits. For example, if you have space, backyard composting of vegetable scraps can be convenient. When your compost is ready, you can top-dress it around existing plants, make a potting mix, or apply it to your yard for free! Meat, dairy, animal manure, and some compostable products are not appropriate for backyard composting.

Both curbside organics collection and drop-off sites often accept materials that can only be broken down properly in a large-scale commercial compost facility, along with vegetable scraps. However, curbside organics collection emits 38 times fewer greenhouse gases than compost drop-off sites because many personal vehicles are not traveling to drop-offs in a curbside collection system (8). Even when using organics drop-off sites, emissions reductions from composting still far outweigh emissions from transporting the organic waste to a composting facility.

There are many ways to promote composting at a large scale, whether through providing a curbside program, drop-off locations, or making backyard composting easily accessible within your community. All of these options help to reduce greenhouse gas emissions!

USING FINISHED COMPOST

Using finished compost is another effective way to reduce greenhouse gases associated with organic waste. Using compost both supports the composting industry, expands the demand for finished compost, and offers many climate change mitigation benefits.

Compost can be beneficial in many different types of projects. It can be used as a soil amendment to increase soil organic matter in agriculture or turf establishment following construction and remediation projects. Compost can also be top-dressed on established grasses to promote healthy plant growth and add efficient organic nutrients to gardens, tree plantings, rain gardens, and native landscapes. The use of compost can reduce the need for synthetic fertilizers, which do not support microbial life in soils.

Using compost to replace synthetic fertilizers, which are energy and resource-intensive, saves energy and resources, emits fewer greenhouse gases, and minimizes the need for chemical applications to soils.

SOURCES

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CLIMATE CHANGE COMBATING PROPERTIES

Water Absorption and Retention: Compost amended soils absorb much more water than untreated soils. This helps to reduce runoff and store water for plants and microbes to utilize in times of drought. With more extreme and lengthy heat and drought events expected in the future, improving the drought resistance of soils will be imperative to both growing food and keeping grass green.

Water Infiltration: Compost amended soils absorb more water to reduce runoff and move water more efficiently from the earth's surface into soils during heavy rain events. Compost improves total soil health, which benefits plants and microbes that build soil structure and enlarge soil pores. As extreme precipitation events become more intense and frequent due to climate change, compost is a useful tool to mitigate harmful impacts from flooding.

Carbon Sequestration: Compost is made up of simple and complex compounds including glucose, fats, and proteins. Through the composting process, microbes break down the simpler carbon compounds. This provides the microbes with energy to break down more complex compounds. In compost, slowly degrading, complex compounds store carbon microbes break them down. As microbes in the compost degrade complex compounds and continue to eat simpler compounds, they form more complex carbon molecules, which become permanently stored in the soil.

Plant Growth: Compost promotes healthy plant growth by promoting total soil health. Compost contains nutrients that plants need to grow, adds organic matter to the soil, and helps to reduce compaction. This promotes the formation of soil pores and root networks, which move nutrients and water to plants in need (9). Plants also remove carbon dioxide from the atmosphere.

Erosion and Sediment Control: Compost can also combat soil erosion. Increased water holding capacity helps to keep soils from drying out, improves infiltration reducing erosion-causing runoff, and increases soil organic matter, binding round soil particles together. These benefits make strong wind and precipitation events less detrimental to soils and plant life (10). Compost can be used for soil cover to prevent erosion or can be placed in compost socks and berms for sediment control on construction projects.