The Science Behind the Magic

RESEARCH CONDUCTED BY
Julia Singer, BSc (Hons) and Matthew Hoekstra, Ph.D.

Introducing: The Future of Food Waste™

This research delves into the critical issue of food waste and its significant contribution to global greenhouse gas emissions. With a focus on Canada, the study highlights that a substantial portion of methane emissions originates from household food waste. In response to this environmental challenge, Food Cycle Science presents an innovative solution—the FoodCycler™—an energy-efficient household machine that effectively converts food waste into a valuable soil amendment called Foodilizer™. By exploring the technology's environmental impact and potential benefits, this study aims to shed light on the importance of sustainable waste management practices for a more ecologically conscious future.

CANADA'S TOTAL GHG EMISSIONS 2020 IN MEGATONS (MT) (672 MT CO2E)

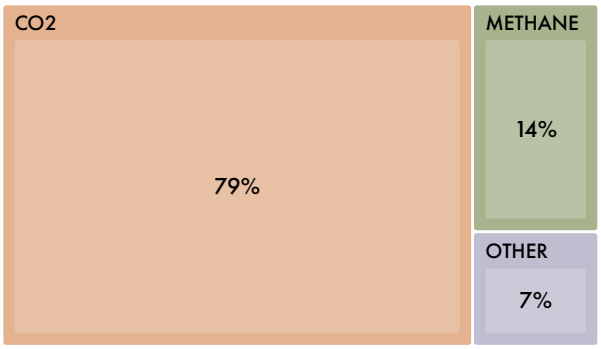

FIGURE 1.
Canada's Total Greenhouse Gas Emissions in 2020. Methane emissions accounted for 14% (94 Mt CO2) of the total GHG emissions of 672 Mt of CO^2e. Figure adapted from "Faster and Further: Canada's Methane Strategy".
CO2E (531 Mt CO^2e)
OTHER (47 Mt CO^2e)

Why Is Food Waste Such a Huge (and Smelly) Problem?

Food waste is responsible for up to 10% of global greenhouse gas emissions[1]. When disposed of in landfill, food waste decomposes and creates methane gas that is approximately 30 times more harmful than the CO^2 emissions from our vehicles.
Methane emissions represent 14% of Canada's total greenhouse gas emissions[3] (Figure 1).
Waste accounts for close to a third of those methane emissions (Figure 2), and the vast majority of that waste is from landfills[3] (Figure 3).
Approximately 16 billion kg (17.6 million tons) of biodegradable waste—including food waste—were landfilled in 2018[3]. All of this landfilled waste is currently producing methane and will continue to produce methane for many more decades[3]. Canadian households contribute significantly to food waste ending up in landfills: food waste represents 30% of the waste disposed of by Canadian households[3].
In 2016, Canadians disposed of just under 6 billion kg (6.6 million tons) of food waste from their residences[5]. This is the same weight as almost 1.1 million elephants[6]. Landfill methane emissions in 2020 were more or less the same as they were 20 years ago[3]. Methane's global warming potential is highest during the first 20 years it is in the atmosphere, meaning it warms the Earth the most during this time[7]. Because Canada's landfill methane emissions have not been decreasing during the time period when methane is the most harmful to our planet, we need to urgently address the problem at the source: household food waste.

CANADA'S TOTAL METHANE EMISSIONS 2020 (92 MT CO2E)

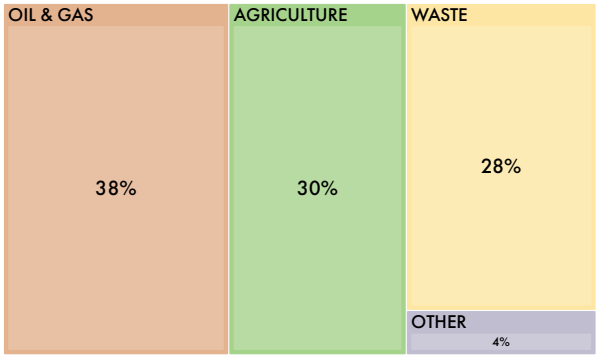

FIGURE 2.
Canada's Total Greenhouse Gas Emissions in 2020. The waste sector accounted for 28% (26 Mt CO^2) of the total methane emissions of 92 Mt of CO^2e. Figure adapted from "Faster and Further: Canada's Methane Strategy".

The Solution

Food Cycle Science has a solution to divert household food waste from landfill. With the push of a button, the FoodCycler enables consumers to reduce the global warming impact of food waste without dealing with the mess and smell of conventional disposal methods. The FoodCycler is a compact, low-energy household machine that uses our patented Vortech™ grinding system to reduce food volume by up to 90%. This innovative technology uses high heat to pulverize and dehydrate food waste, resulting in a by-product we call Foodilizer™.

FIGURE 3. The net carbon footprint of the FoodCycler™ over a seven year period is approximately -3,787 kg (3.79 tons) Co2e. This is equal to the annual emissions avoided/equivalent to:

0.84 gas-powered passenger vehicles

1,612L (426 gallons) of gasoline consumed

4.5 acres of forest in one year

Source: https://www.energy.gov/energysaver/appliance-energy-calculator.

ANNUAL CARBON EMISSIONS OF THE FOODCYCLER™ ECO 5

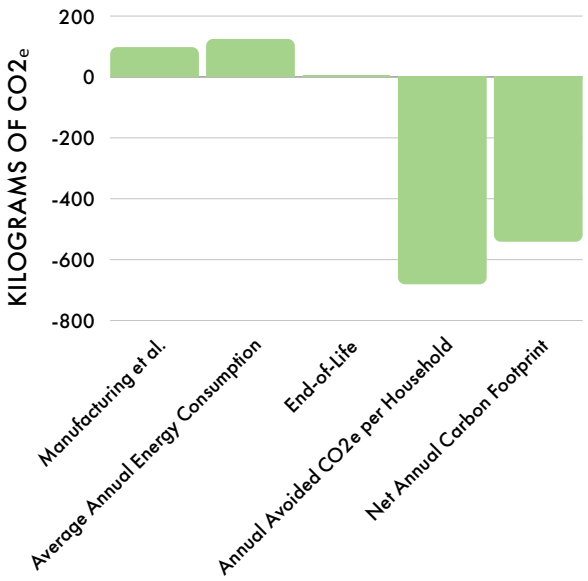

FIGURE 4.
Annual carbon emissions of the FoodCycler Eco 5™. Emissions from processing and shipping as well as end-of-life only occur once. End-of-life is defined as the removal and disposal of the product and degradation of its constituent materials. Energy consumption was converted to CO2e using the US EPA's eGRID emissions factors and average US electricity source emissions. Methane emissions were converted to CO2e using the100-year global warming potential of methane. Data was collected from a pilot program with over 4,410 residents from 47 Canadian municipalities and a lifecycle analysis performed by ClimatePartner.

Since the FoodCycler processes food waste in a closed-loop, aerobic environment, it emits zero methane gas and is odour-free thanks to our carbon filter system. Foodilizer is not compost, but it is a nutrient-rich soil amendment that can be added at appropriate ratios to soil as a fertilizer, composted in backyards, or processed in centralized composting facilities[8]. Regenerative Waste Labs[9], a leading research and consulting firm has provided recipes for incorporating Foodilizer of different compositions in home and municipal composting settings. When added to a compost pile and moderately rehydrated, Foodilizer has a significantly higher surface area for microbial activity, which accelerates the composting process[8]. When used as a fertilizer and integrated at appropriate ratios, Foodilizer also provides beneficial nutrients for optimal vegetation growth.

Once incorporated into the soil, Foodilizer is broken down by soil bacteria and releases these valuable nutrients while adding organic matter into the soil.

The Environmental Impacts of FoodCycler™ Technology

Food Cycle Science sees the technology as complementary to—not in competition with—existing food waste diversion strategies and infrastructure. With curbside organics collection systems, the collection and transportation of food waste creates greenhouse gas emissions from additional transportation vehicles on the road.

TOTAL CARBON EMISSIONS OF THE FOODCYCLER™ ECO 5 OVER A 7-YEAR PERIOD

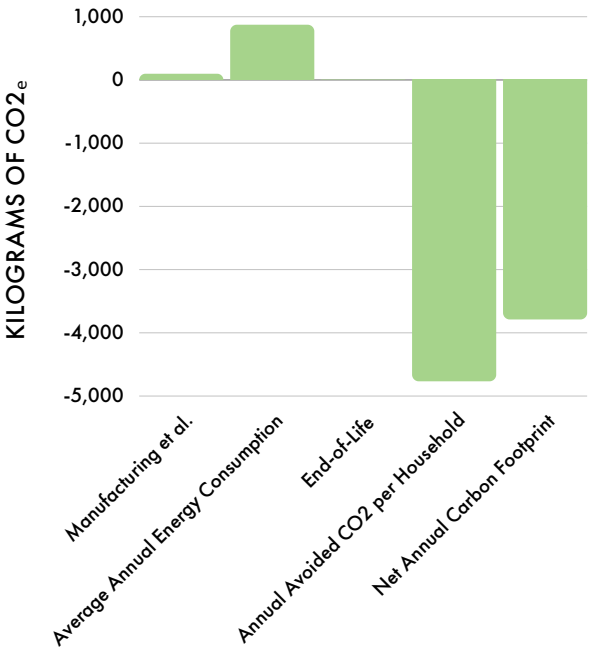

FIGURE 5.
Total carbon emissions of the FoodCycler™ Eco 5 over a seven-year period. Emissions from processing and shipping as well as end-of-life only occur once. End-of-life is defined as the removal and disposal of the product and degradation of its constituent materials. Energy consumption was converted to CO^2e using the US EPA's eGRID emissions factors and average US electricity source emissions. Methane emissions were converted to CO^2e using the 100-year global warming potential of methane. Data was collected from a pilot program with 4,410 residents from 47 Canadian municipalities and a lifecycle analysis performed by ClimatePartner.

AVERAGE ENERGY CONSUMPTION OF COMMON HOUSEHOLD APPLIANCES OVER AN 8-HOUR CYCLE (KWH)

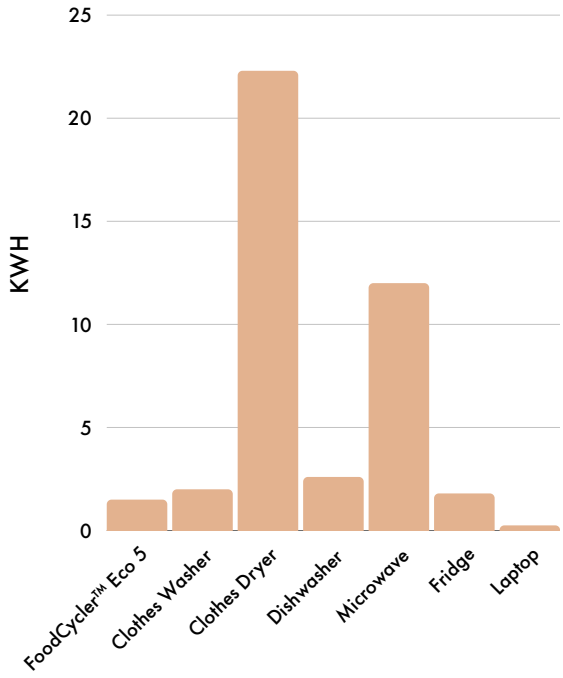

FIGURE 6.
Energy consumption of common household appliances over an 8-hour cycle compared to the FoodCycler™ Eco 5. Wattage values for appliances are samples only; actual values vary depending on appliance age and features. The lifespan for all appliances is 7-14 years, with the exception of the laptop, which has a lifespan of 3-5 years.

Source: https://www.energy.gov/energysaver/appliance-energy-calculator.

The key benefit of the FoodCycler is its ability to divert organic waste from landfills that would otherwise generate significant greenhouse gas emissions and reduce vehicle emissions from food waste transportation. Household food waste that is processed in the FoodCycler would, in most cases, otherwise end up in a landfill. Over a seven-year period (the conservative expected life of the unit), the FoodCycler diverts 2,450 kg (2.45 tons) of food waste. This quantity is based on the Municipal Pilot Program Resident Survey, aggregating data from 4,410 residents across 47 Canadian municipalities using the FoodCycler FC-30 (2.5 L unit) and Eco 5 (5.0 L unit) as of November 2022. Survey results were validated by third-party consultants through the Impact Canada Food Waste Reduction Challenge. The environmental impact of the FoodCycler is minimal in terms of both its carbon footprint and energy consumption. The

annual net carbon footprint of the FoodCycler is -541 kg CO^2e (0.54 tons), meaning it avoids more greenhouse gases than it emits (Figure 4).

In Conclusion

This study emphasizes the pressing need to address food waste's environmental impact. The FoodCycler offers a practical solution by diverting waste from landfills and producing a nutrient-rich soil amendment. This innovative technology shows promise in reducing greenhouse gas emissions, promoting responsible waste management, and contributing to a greener future.

To learn more about FoodCycler, please visit:
www.foodcycler.com

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www.foodcyclescience.com

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