

Food Waste Diversion at Hartsfield-Jackson Airport Restaurants

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Problem

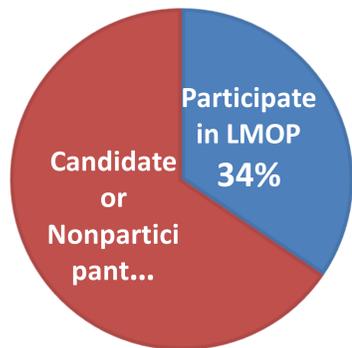
50-55% CH₄ 40-50% CO₂



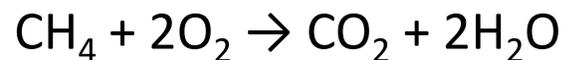
CH₄ is **28–36** times as potent as CO₂ (EPA, 2017).

Municipal landfill contributes to **14.1%** CH₄ emission and is the 3rd cause in the U.S. (EPA, 2019).

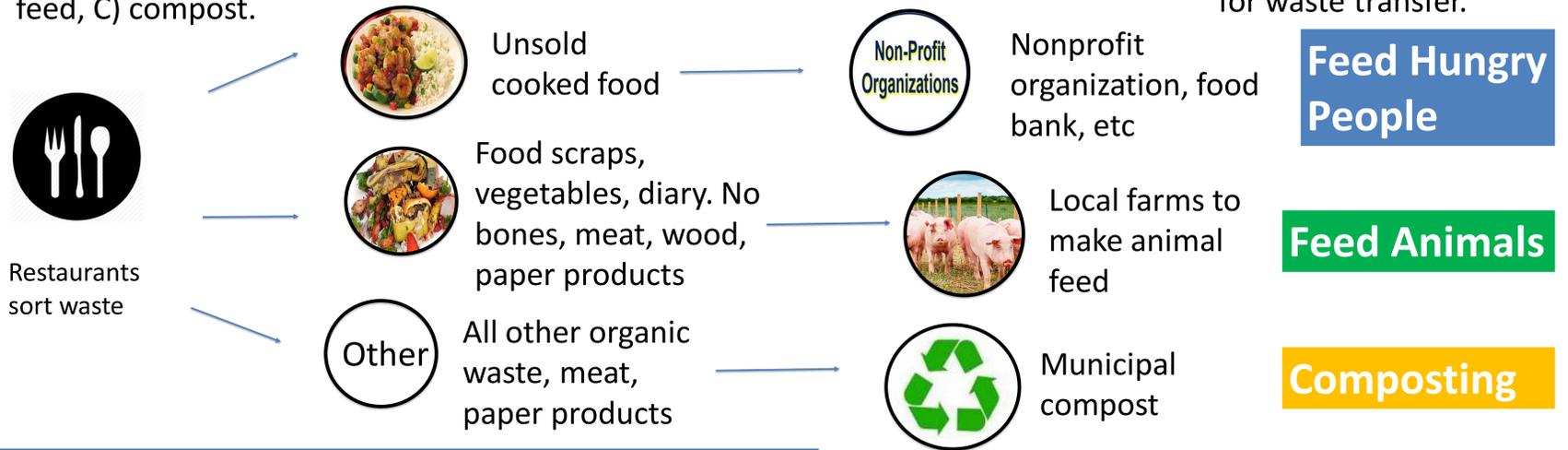
LANDFILLS IN GEORGIA



Flaring: burning methane to generate electricity



We plan to divert food waste from ATL international airport restaurants to A) food donation, B) making animal feed, C) compost.



Carbon Savings

“One million tons of municipal solid waste (MSW) produces roughly 300 cubic feet per minute (cfm) of landfill gas (LFG)” (EPA, 2019).

1. Convert cfm LFG to kg CH₄/min

$$\text{Convert to m}^3: 300 \text{ ft}^3 \times \left(\frac{0.3048 \text{ m}}{\text{ft}}\right)^3 = 8.50 \text{ m}^3 \text{ LFG/min}$$

Assuming 50% LFG is CH₄, 50% is CO₂:

$$8.50 \text{ m}^3 \text{ LFG/min} \times 50\% = 4.25 \text{ m}^3 \text{ CH}_4/\text{min}$$

$$\text{CH}_4 \text{ density: } \frac{16.034 \text{ g/mol}}{25.29 \text{ L/mol}} \times \frac{1000 \text{ L}}{\text{m}^3} = 634 \text{ g/m}^3 \text{ CH}_4/\text{min}$$

$$\text{Convert to kg CH}_4: 4.25 \text{ m}^3 \times 634 \text{ g/m}^3 \times 0.001 \text{ kg/g} = 2.69 \text{ kg CH}_4/\text{min}$$

2. 1 ton of MSW's CO₂ equivalent per year

$$\text{Per ton MSW: } \frac{2.69 \text{ kg CH}_4/\text{min}}{10^6 \text{ tons MSW}} = 2.69 \times 10^{-6} \text{ kg CH}_4/\text{min}$$

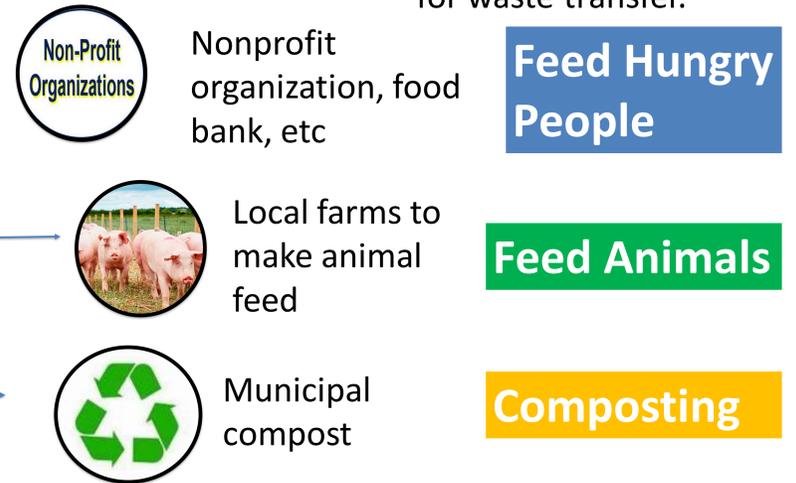
$$\text{Per year: } 2.69 \times 10^{-6} \text{ kg CH}_4/\text{min} \times 60 \frac{\text{min}}{\text{hr}} \times 24 \frac{\text{hr}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}} = 1.41 \text{ kg CH}_4/\text{ton MSW}$$

$$\text{CO}_2 \text{ equivalent: } 1.41 \text{ kg CH}_4 \times 25 = 35.35 \text{ kg CO}_2/\text{ton MSW}$$

$$\text{Total CO}_2 \text{ emission: } 35.35 \text{ kg CO}_2 + 1.41 \text{ kg CO}_2 = 49.84 \text{ kg CO}_2/\text{ton MSW}$$



RUBICON



Financial Savings

According to current food donation program, tax savings of Famiglia averages \$33164.79 per year.

Co-benefits

- An attempt at solving the social issue hunger.
- Save carbon emission of making animal feed.
- Pork tastes better (Chai & Kye, 2017).

References

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EPA. (2019, July 15). Landfill Gas Energy Basics. Retrieved August 3, 2019, from https://www.epa.gov/sites/production/files/2016-07/documents/pdh_chapter1.pdf

EPA. (2019, February 20). LMOP Database. Retrieved August 3, 2019, from <https://www.epa.gov/sites/production/files/2019-02/lmopdataga.xlsx>

Chai, A & Kye, N. (2017). Wasted! The Story of Food Waste. [DVD] United States: Zero Point Zero Production

Waste Diversion Program

Food Recovery Hierarchy

www.epa.gov/foodscraps

- Source Reduction: Reduce the volume of surplus food generated
- Feed Hungry People: Donate extra food to food banks, soup kitchens and shelters
- Feed Animals: Divert food scraps to animal feed
- Industrial Uses: Provide waste oils for rendering and fuel conversion and food scraps for digestion to recover energy
- Composting: Create a nutrient-rich soil amendment
- Landfill/Incineration: Last resort to disposal

Fig. 2 Our program focus on 2nd, 3rd and 4th tiers. They are food donation to feed the hungry, food scrap collection to make animal feed and diverting the rest of food waste to compost.

	Donation	Animal feed	Compost
MSW (ton/yr)	3.35		
CO ₂ saving (kg CO ₂ /yr)	167		