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Food Waste Prevention, Rescue and Recovery as a Climate Change Solution

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MD Food Recovery Summit 2021

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Multiscale RECIPES
for Sustainable Food Systems

RECIPES: Resilient, Equitable, and Circular Innovations with Partnership and Education Synergies

Public health research, education, and practice for a healthier, more sustainable food system

Food waste research network

- > 40 researchers, 14 institutions
- Launched October 1, 2021, 5 year, $15M (National Science Foundation)
- Goal to address key research questions needed to address wasted food & advance sustainable food systems; includes focus on regions, rural-urban interconnections, partnerships

https://clf.jhsph.edu/

https://Wastedfood.American.edu

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Wasted food is a climate priority

Climate change is an existential threat

Business

How climate change and extreme weather are crimping America's pie supply

Impacts already here

- Heat, drought, floods, wildfires
- Impacts on food production, food supplies, food prices, nutritional quality of food

Wheat, honey, fruit fillings, dairy, vanilla…….

"Mother Nature bats last."

-Janice Ebbingsole, King Arthur flour

Washington Post, 11/17/21

Zack Wittman for The Washington Post

Global Estimates: Intergovernmental Panel on Climate Change 2021

- 21–37% of global GHG emissions attributable to food system.
- 2010–2016, global food loss and waste = 8–10% of total anthropogenic GHG emissions

Environmental Impacts of U.S. Food Waste:

What resources go into a year of food loss and waste in the U.S.?

EPA

*excluding impacts of waste management, such as landfill methane emissions

Greenhouse gas emissions of more than 42 coal-fired power plants

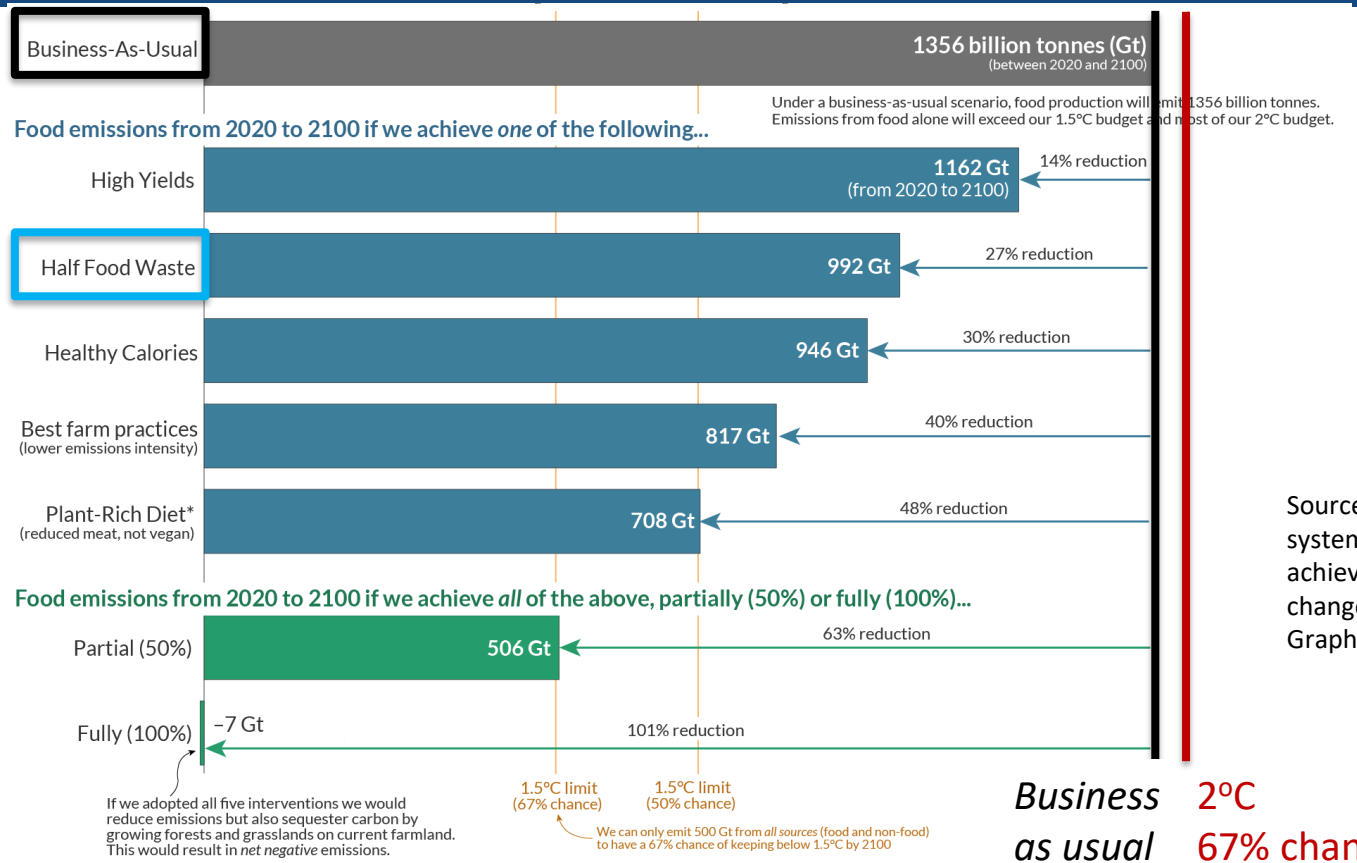
Enough water and energy to supply more than 50 million homes

The **amount of fertilizer** used in the U.S. to grow all plant-based foods for U.S. human consumption

An **area of agricultural land** equal to California and New York

Learn more: www.epa.gov/land-research/farm-kitchen-environmental-impacts-us-food-waste

By 2100, food consumes nearly entire global GHG “budget”



Source: Clark et al 2020. Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science.*
Graphic: OurWorldinData.org

Business as usual 2°C 67% chance

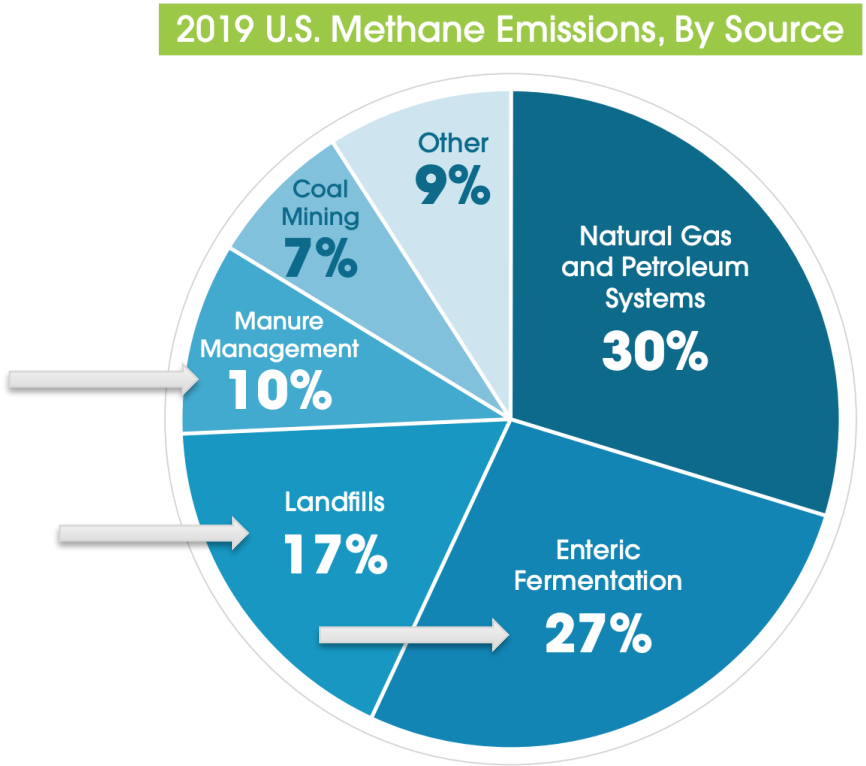
50% reduction food loss & waste = #1 ranked climate change solution, Project Drawdown (based on 2°C scenario)

* Gigatons CO2 Equivalent Reduced / Sequestered (2020–2050)

SOLUTION	SECTOR(S)	SCENARIO 1 *	SCENARIO 2 *
Reduced Food Waste	Food, Agriculture, and Land Use / Land Sinks	87.45	94.56
Health and Education	Health and Education	85.42	85.42
Plant-Rich Diets	Food, Agriculture, and Land Use / Land Sinks	65.01	91.72
Refrigerant Management	Industry / Buildings	57.75	57.75
Tropical Forest Restoration	Land Sinks	54.45	85.14
Onshore Wind Turbines	Electricity	47.21	147.72
Alternative Refrigerants	Industry / Buildings	43.53	50.53
Utility-Scale Solar Photovoltaics	Electricity	42.32	119.13
Improved Clean Cookstoves	Buildings	31.34	72.65
Distributed Solar Photovoltaics	Electricity	27.98	68.64
Silvopasture	Land Sinks	26.58	42.31
Peatland Protection and Rewetting	Food, Agriculture, and Land Use / Land Sinks	26.03	41.93
Tree Plantations (on Degraded Land)	Land Sinks	22.24	35.94
Temperate Forest Restoration	Land Sinks	19.42	27.85
Concentrated Solar Power	Electricity	18.60	23.96
Insulation	Electricity / Buildings	16.97	19.01
Managed Grazing	Land Sinks	16.42	26.01
LED Lighting	Electricity	16.07	17.53

https://drawdown.org/solutions/table-of-solutions

“Cutting methane is the strongest lever we have to slow climate change over the next 25 years” Inger Andersen, Executive Director of UNEP.



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

Food Loss & Waste GHG: 3 Components

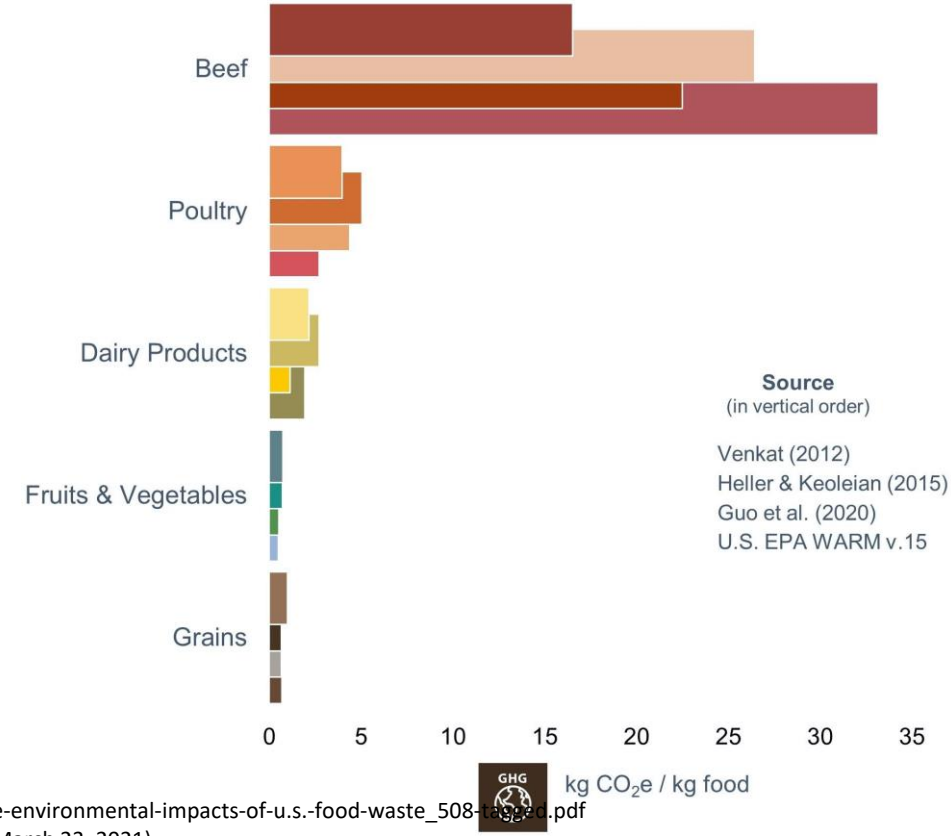
1. Food production

2. Supply chain, post-production activities

3. Disposition, food recovery hierarchy

Food production: GHG emissions vary by item (among other things)

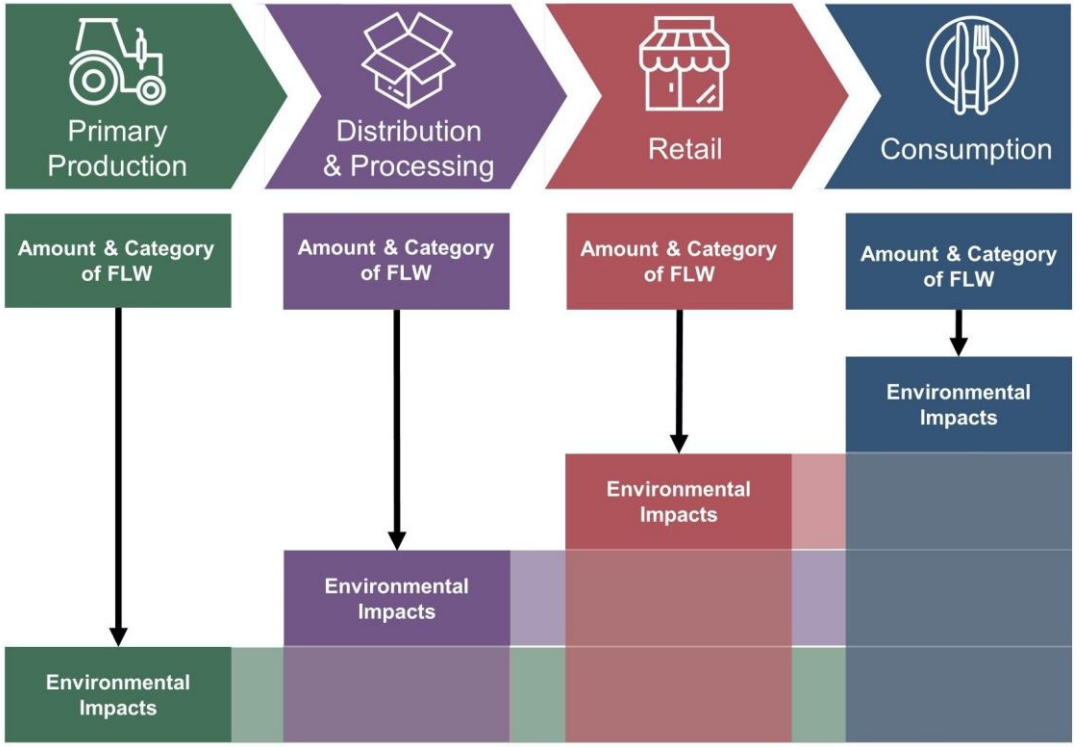
- Why is beef so high?: enteric fermentation (cattle belching), manure, feed production
- Reducing beef waste > impact per lb vs vegetable waste…
- BUT we waste much higher % of vegs than beef



https://www.epa.gov/system/files/documents/2021-11/from-farm-to-kitchen-the-environmental-impacts-of-u.s.-food-waste_508-tagged.pdf
Data from Guo et al. (2020) obtained from personal communication with X. Guo (March 23, 2021).

Supply chain: Food accumulates ”embodied” GHG emissions

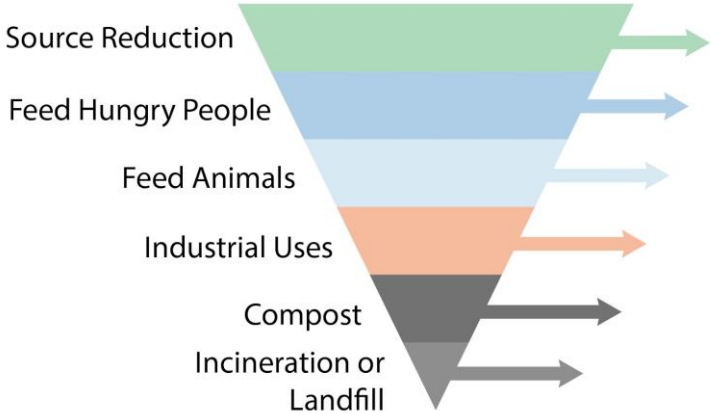
- → Waste later in food chain has greater GHG impact
- → Most waste among consumers

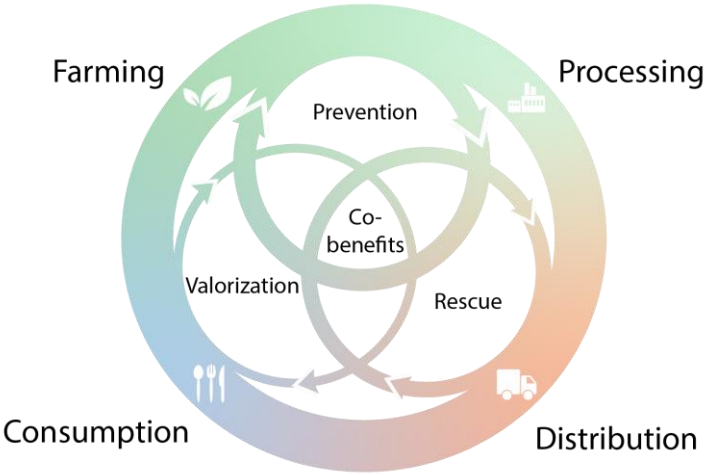


https://www.epa.gov/system/files/documents/2021-11/from-farm-to-kitchen-the-environmental-impacts-of-u.s.-food-waste_508-tagged.pdf

Solutions toward top of hierarchy have most GHG impact

Goal of circularity, obtaining resources shouldn't detract from goal of source reduction





Source: Multiscale RECIPES

Food Loss & Waste GHG: 3 Components

1. Food production
   - Nuance in “which foods"
   - Key message: Biggest GHG benefit = avoided production

2. Supply chain, post-production activities
   - Embodied emissions: processing packaging transport cold storage cooking, etc.
   - 85% GHG from landfilled FW is from pre-disposal (EPA)
   - Key message: Biggest GHG benefit = consumer level

3. Disposition – decay, transport emissions across food recovery hierarchy
   - Some landfill alternatives also avoid production emissions
   - Key message: Biggest GHG benefit=prevention

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Food waste solutions and climate impact:
GHG benefits often greatest at bottom of food supply chain, top of food recovery hierarchy

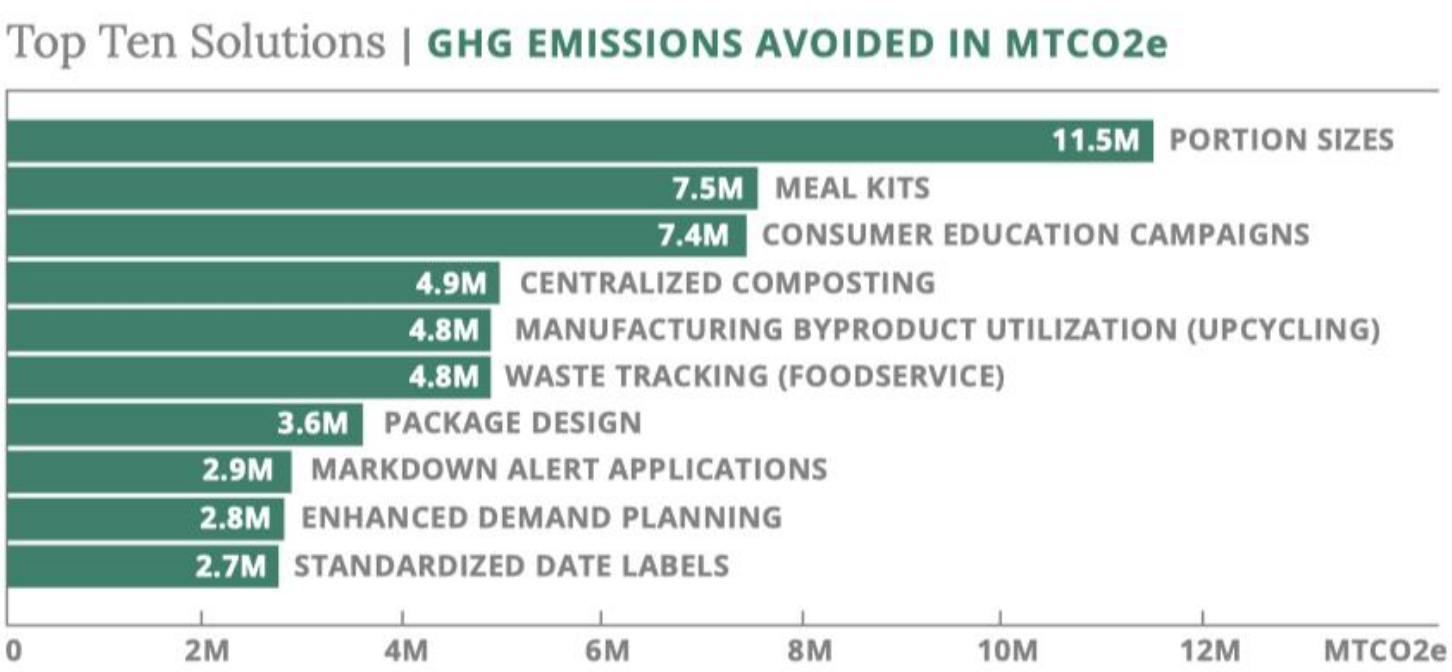
“Savings” from Halving U.S. Food Loss and Waste

(excluding impacts of waste management, such as landfill methane emissions)

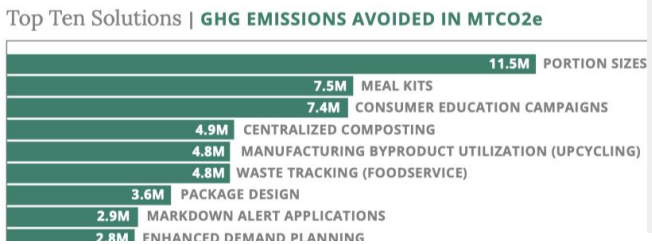
GHG emissions equal to **23 coal-fired power plants**

Graphic: EPA Kitchen to Table report 2021

ReFED Insights Engine – Top Ten Solutions for GHG Avoided

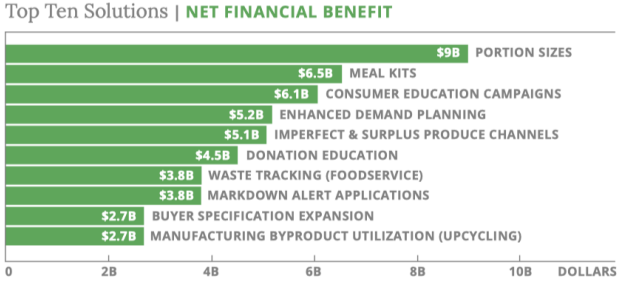


REFED: Top 10 solutions vary with goal



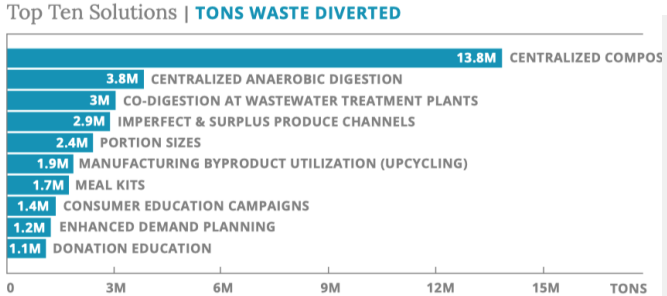
GHG avoided:

1. Portion size
2. Meal kits
3. Consumer education campaigns



Net financial benefit:

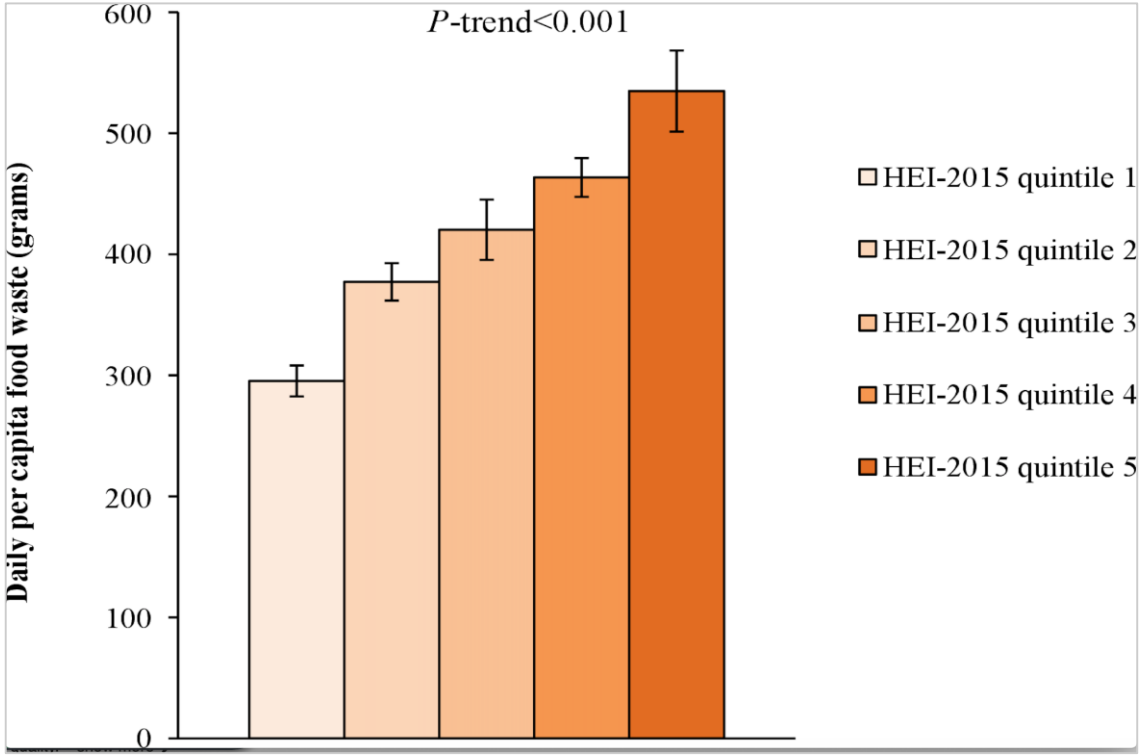
1. Portion size
2. Meal kits
3. Consumer education campaigns



Tons waste diverted:

1. Centralized composting
2. Centralized AD
3. Co-digestion at wastewater treatment plants

Be aware of solution tradeoffs; Ex: Waste rises with healthy eating



(FW by HEI quintile)

Conrad Z, Niles MT, Neher DA, Roy ED, Tichenor NE, Jahns L. 2018, Relationship between food waste, diet quality, and environmental sustainability. PLoS ONE 13(4): e0195405. https:// doi.org/10.1371/journal.pone.0195405

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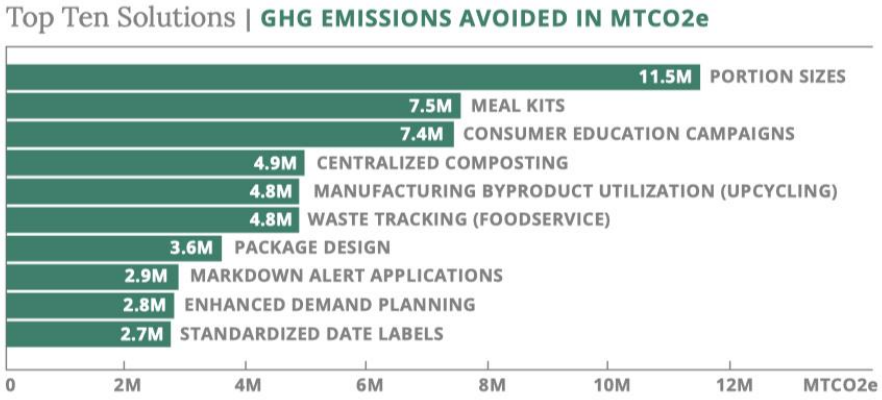
Maryland, Conclusions

HB 264 Organics Recycling Legislation

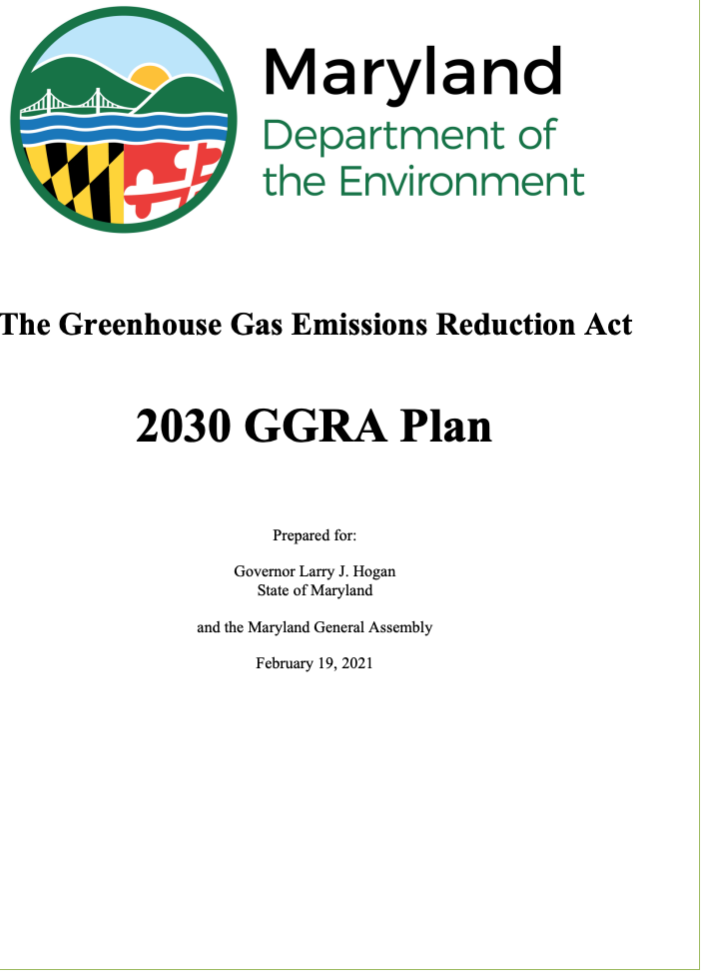
- Requires covered entities generating at least two tons of organic waste per week to arrange for disposal alternatives – such as **reduction, donation,** animal feed, composting or anaerobic digestion – by January 2023.

- From GHG perspective, greatest benefit from increasing source reduction, donation



- Requires state to achieve minimum 40% reduction in statewide GHG emissions from 2006 levels by 2030
  - Stretch goal: 50%

- “Food scraps reduction activities should be prioritized in the checklist. They should be given the same status as yard trimmings reduction activities in terms of providing credit.”



Conclusions

- Good news story here: Wasted food has been highlighted as one of most important opportunities for addressing climate change
  - It's complex, many tradeoffs
  - Need much more data, evaluation of intervention impacts

- Climate change crisis creates impetus to focus efforts, shift stronger incentives toward where GHG benefits greatest:
  - Top of food recovery hierarchy [source reduction]
  - Bottom of food supply chain [consumers]

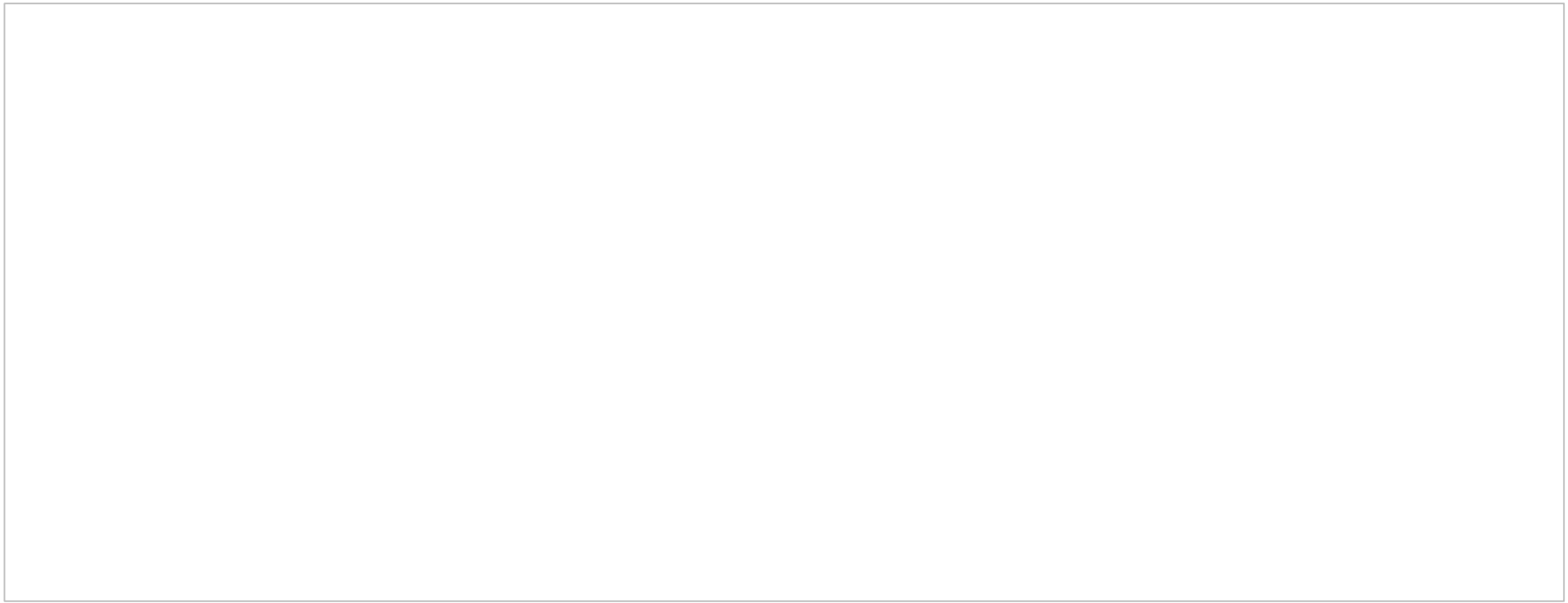
- It's not either/or! Need to pie-le on strong, coordinated efforts at *every* stage of hierarchy and supply chain, from every sector, business, organization, consumer

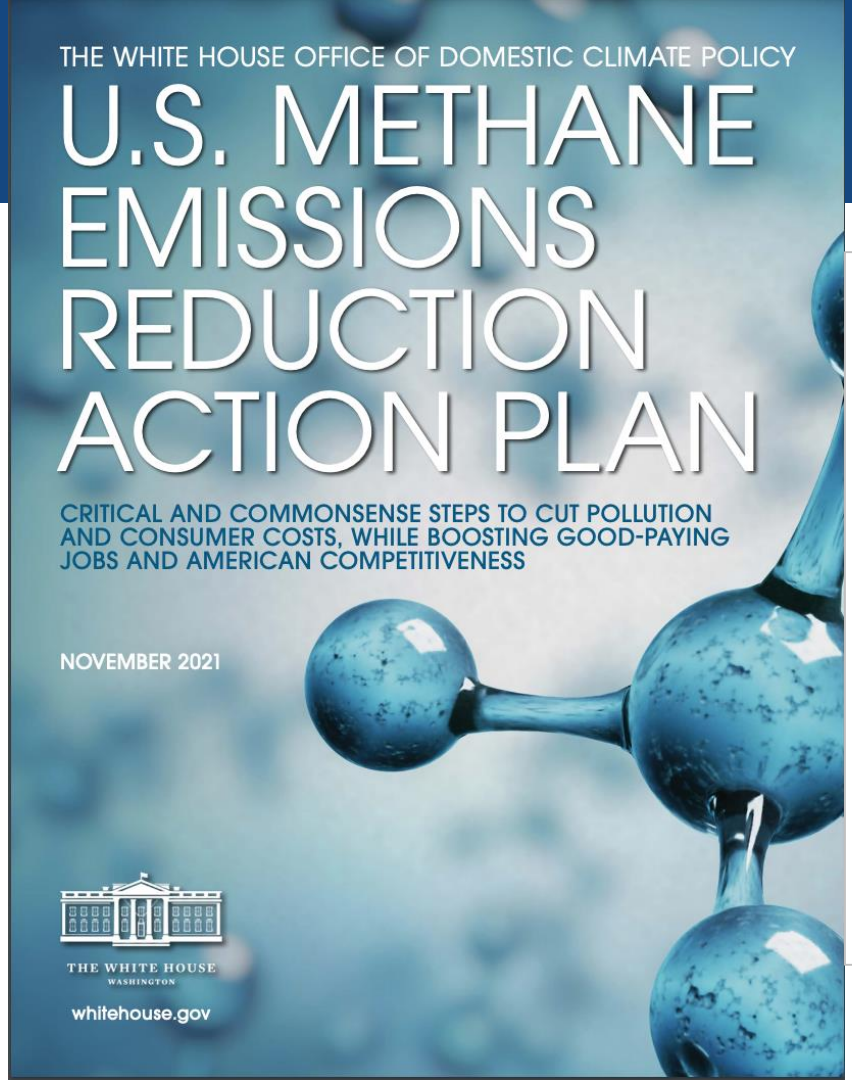
https://commons.wikimedia.org/wiki/File:Pumpkin-Pie-Slice.jpg

Thank You!

- Contact: Roni Neff Rneff1@jhu.edu
- RECIPES Food Waste Research Network https://wastedfood.American.edu

- Johns Hopkins Center for a Livable Future https://clf.jhsph.edu





- COP 26: global agreement to cut methane emissions 30% by 2030
- US plan includes section on reducing food waste in landfills, discusses national food waste 50% reduction target, but not very specific.