Building Resilience in Food Distribution Systems

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CORE Group Concurrent Session:
Building Resilient Food Systems in an Age of Climate Change
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JOHNS HOPKINS
BLOOMBERG SCHOOL
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Why focus on food distribution?

Magnitude of global food loss/waste

By weight: **32%** of all food produced is wasted[1]

By calories: **24%** of all calories are wasted[1]

By 2050, the estimated global calorie gap will be 6,000 trillion calories/year.

If we halved the amount of wasted food, we would close 22% of that gap (1,314 trillion calories)[2]

1. *FAO, 2011: Global Food Losses and Food Waste – Extent, Causes, and Prevention.*
2. *World Resources Institute, 2013. Reducing Food Loss and Waste (Working Paper).*

Food loss also represents:

- **Inefficient use of resources** used to produce food: agricultural land, water, inputs, labor

- **Lost opportunity for income generation & trade**
  - In sub-Saharan Africa, postharvest losses valued at $4 billion USD per year[1]

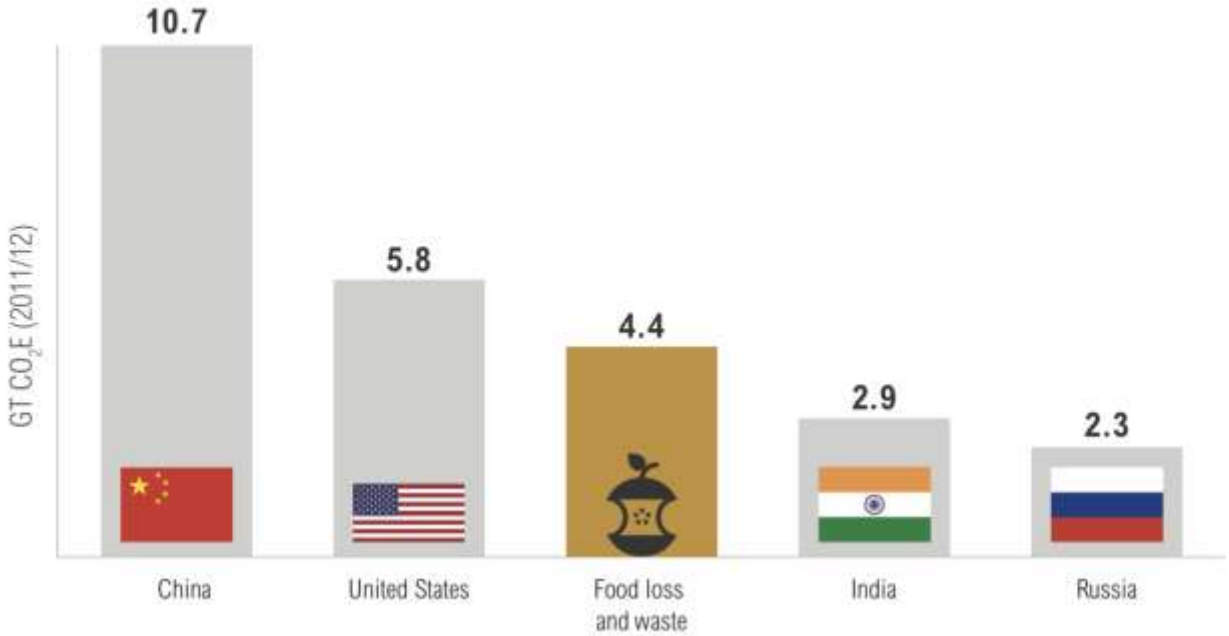
- **Loss of nutrients**
  - In the US: daily retail & consumer losses equivalent to recommended intakes for:
    - Iron: 66% of the US adult population
    - Vitamin A: 54% of the US adult population
    - Fiber: 27% of the US adult population[2]

1. *World Resources Institute, 2013. Reducing Food Loss and Waste (Working Paper).*
2. *Spiker, Marie L., et al. "Wasted food, wasted nutrients: Nutrient loss from wasted food in the United States and comparison to gaps in dietary intake." Journal of the Academy of Nutrition and Dietetics 117.7 (2017): 1031-1040.*

Connection to climate change

1. When we discard food, we discard GHG emissions embodied in its production
2. Food decomposing in landfills generates methane

FIGURE 2. **If food loss and waste were its own country, it would be the third-largest greenhouse gas emitter**



Champions 12.3. SDG Target 12.3 on Food Loss and Waste: 2016 Progress Report. Based on data from CAIT 2015, FAO 2015: Food Wastage Footprint & Climate Change

Summary of Solutions by Overall Rank

This table provides the detailed results of the Plausible Scenario, which models the growth solutions on the Drawdown list based on a reasonable, but vigorous rate from 2020-2050. Results depicted represent a comparison to a reference case that assumes 2014 levels of adoption continue in proportion to the growth in global markets.

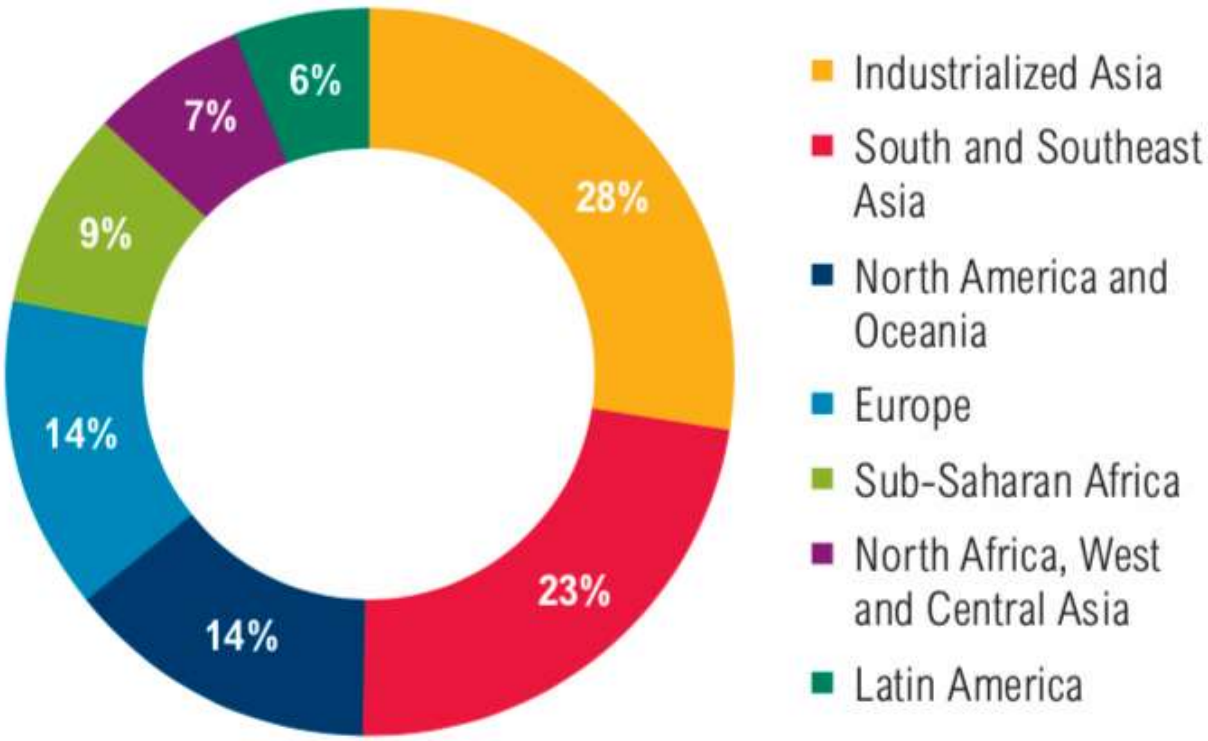
NOTE: Energy Storage (utility-scale & distributed), Grid Flexibility, Microgrids, Net Zero Buildings, and Retrofitting were not modeled independently to avoid double counting impacts from other solutions.

Rank	Solution	Sector	TOTAL ATMOSPHERIC CO2-EQ REDUCTION (GT)	NET COST (BILLIONS US $)	SAVINGS (BILLIONS US $)
1	Refrigerant Management	Materials	89.74	N/A	$-902.77
2	Wind Turbines (Onshore)	Electricity Generation	84.60	$1,225.37	$7,425.00
3	Reduced Food Waste	Food	70.53	N/A	N/A
4	Plant-Rich Diet	Food	66.11	N/A	N/A
5	Tropical Forests	Land Use	61.23	N/A	N/A
6	Educating Girls	Women and Girls	59.60	N/A	N/A
7	Family Planning	Women and Girls	59.60	N/A	N/A
8	Solar Farms	Electricity Generation	36.90	$-80.60	$5,023.84
9	Silvopasture	Food	31.19	$41.59	$699.37
10	Rooftop Solar	Electricity Generation	24.60	$453.14	$3,457.63
11	Regenerative Agriculture	Food	23.15	$57.22	$1,928.10
12	Temperate Forests	Land Use	22.61	N/A	N/A

Which regions of the world?

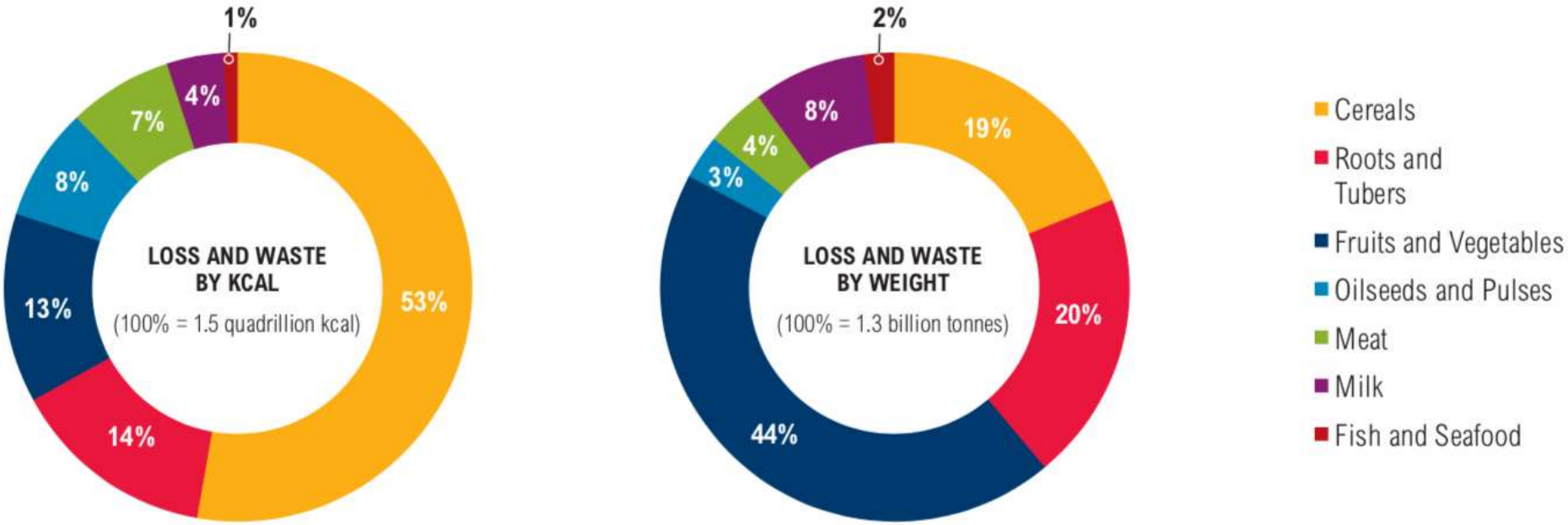
44% of total food loss and waste occurs in LMICs

Per-capita waste is disproportionately high in North America & Oceania (1500 kcal/day)



Source: World Resources Institute, 2013. Reducing Food Loss and Waste (Working Paper). Based on UN FAO, 2011. Global Food Losses and Food Waste – extent, causes, and prevention.

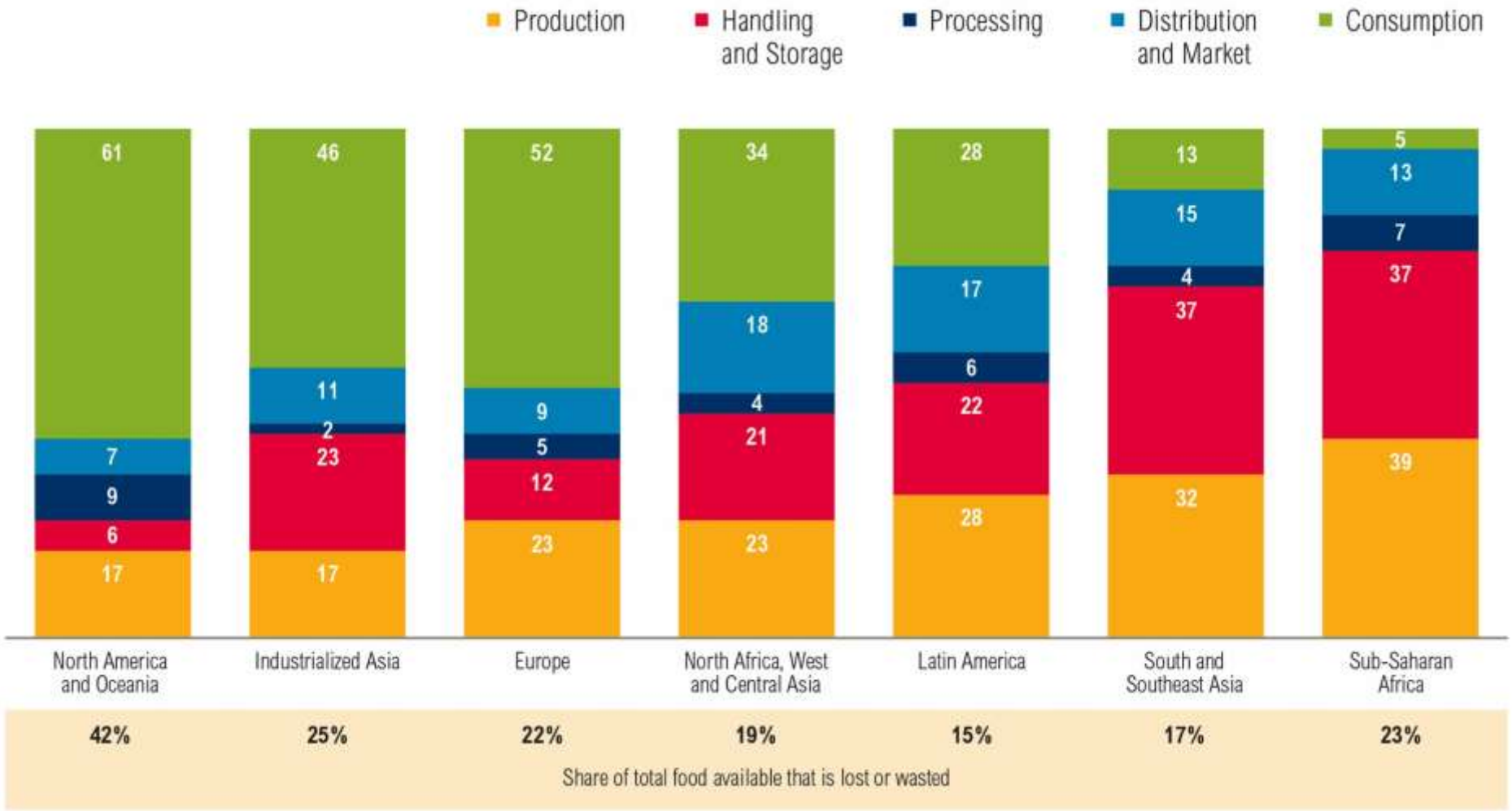
Which commodities?



Note that some commodities – meat, dairy – are especially resource-intensive to produce (land use, water, inputs)

Source: World Resources Institute, 2013. Reducing Food Loss and Waste (Working Paper). Based on UN FAO, 2011. Global Food Losses and Food Waste – extent, causes, and prevention.

Which stages of the supply chain?



Source: World Resources Institute, 2013. Reducing Food Loss and Waste (Working Paper). Based on UN FAO, 2011. Global Food Losses and Food Waste – extent, causes, and prevention


GARDEN FRESH TEA

How do we build resilience in food systems?

What is resilience?

- **Resilience:** the capacity of a system to withstand and adapt to disturbances over time.

- Disturbances include long- and short-term shocks
  - Political conflict
  - Natural disasters
  - Drought, flood, unexpected climate variability → crop failure
  - Unexpected surplus or glut of crops

- What makes for a resilient system of food distribution?
  - Mitigating ecological risks
  - Efficient infrastructure
  - Good governance

August 2017

Baltimore Food System Resilience Advisory Report

JOHNS HOPKINS
CENTER *for* A LIVABLE FUTURE

Baltimore Office of Sustainability
People·Planet·Prosperity

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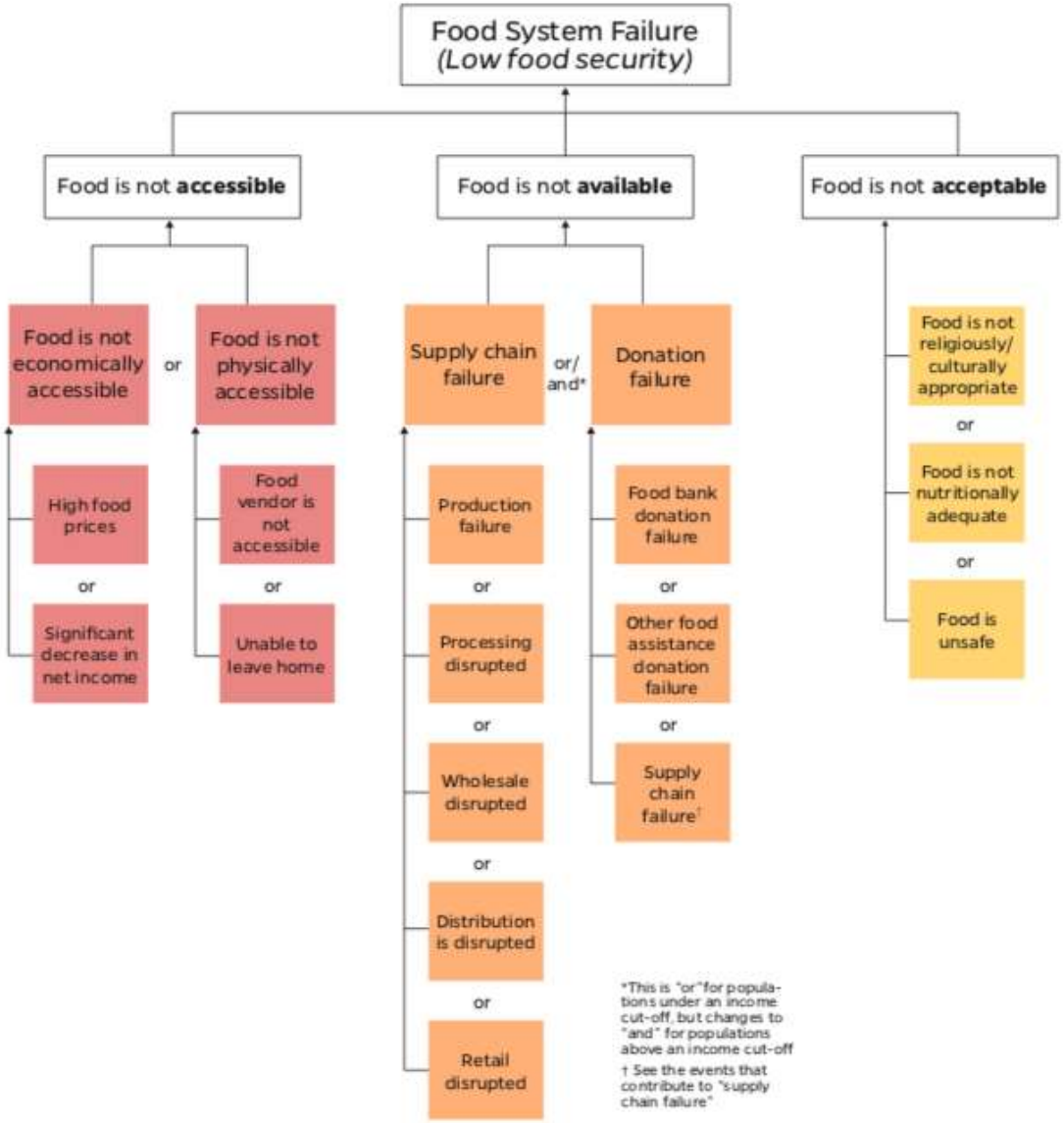


The fault tree above depicts possible points of vulnerability in the food system. A failure of a lower-level system component has the potential to lead to system failure further up the tree. Strategies recommended in this chapter aim to reduce the vulnerability and likelihood of failure at various points in the system, so as to strengthen the food system overall and enhance its ability to return to normal functioning after a disruptive event. Strategies recommended in this report are color-coded to match their corresponding component in the fault tree.

Building resilience

Through research:

- Best ways to measure magnitude of loss?
- How to track progress towards goals of reducing loss?
- How to test effectiveness of different options before implementation?

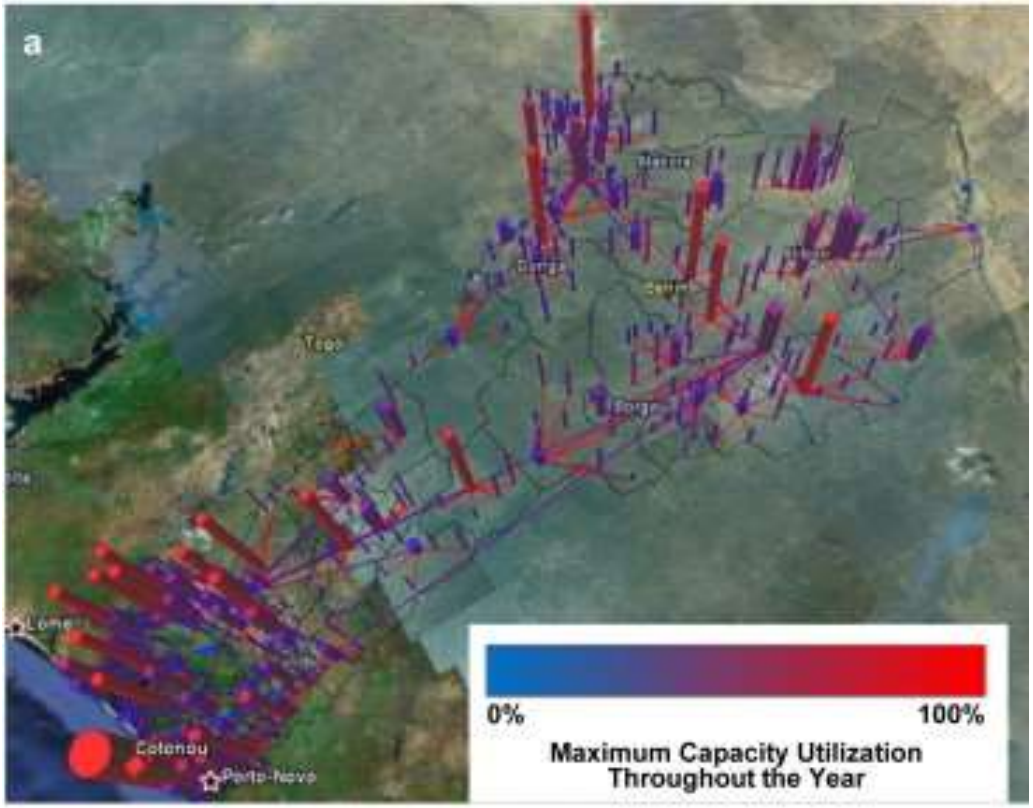
SUSTAINABLE DEVELOPMENT GOAL 12

Ensure sustainable consumption and production patterns

12.3	By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	**12.3.1**	Global food loss index

Building resilience

HERMES Agrifood: a computational modeling framework for food supply chains in LMICs. Being developed to test effectiveness of interventions to reduce postharvest loss.



HERMES agri-food

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Building resilience

Through structural improvements, new technologies:

- Improved infrastructure for roads, cold storage
- Improved farmer access to markets
  - Information & communications technology, e.g., SMS-based platforms to access market prices for crops
- Development of new technologies
  - Refrigeration with a low carbon-footprint
  - Technologies for food storage - ethylene & microbial management
- Scaling up low-cost technologies for handling & storage

Building resilience

Scaling up of low-cost handling and storage technologies:

- Plastic crates instead of bags for crops
- Small metal silos
- Evaporative cool chambers
- Hermetically sealed plastic storage bags for crops (PICS)

Transforming food supply chains involves trade-offs

	Potential benefits	Potential drawbacks
Improved infrastructure for food packaging, storage, cooling transport	Less postharvest loss, especially for perishables • Retain nutrients in food supply for consumption • Reduced use of cropland, water, inputs	Larger environmental footprint: • More energy use • Increased GHG emissions from transport, refrigerant leakage
More food processing	• More opportunities for micronutrient fortification • Improved food safety • Longer shelf life	Greater prevalence of ultra-processed foods: • Less fiber • More sodium, added sugars, saturated fat
Proliferation of modern retail	• Leverage economies of scale • Some foods become more affordable • Fewer seasonal gaps	• Non-staple foods may remain relatively expensive • Creates a preference for abundance

Viewpoint: The rejected vegetables that aren't even wonky

28 October 2015

Share

Tonnes of perfectly good food are thrown away in the UK every year. Why, asks Hugh Fearnley-Whittingstall.

In today's Magazine


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What can we do?

Important to work simultaneously:

- Minimize losses in LMICs
  - If you work with food producers, be aware of “leaky points”
  - Recognize multiple uses of mobile technology, for both global health + agriculture
  - Share findings in behavioral interventions
- Minimize losses here:
  - Leverage institutional policies to reduce waste → cafeterias, workplaces, conferences
  - Reduce waste in our own households

Contact

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