



# Food Waste

Food & Agriculture Deep Dive Series

*Wednesday, January 8<sup>th</sup>, 2020*

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# Executive Summary

In the world of agricultural technology (“agtech”), increasing agricultural yields are treasured as the holy grail to feed a hungry and growing population. However, it is well documented and more and more understood that there is in fact enough food to feed the world produced today. The challenge is food waste.

Food waste occurs throughout the supply chain, from farm to fork, and impacts fresh and perishable goods disproportionately. The reasons for food waste vary widely, including over production, supply chain management, cold chain management, and consumer education.

The problem of food waste is one that impacts and requires involvement from multiple stakeholders, including government, non-profit and for-profit sectors, making it a complex issue to solve, but one that is core to improving the food system going forward. In today’s deep dive, we will explore the means by which startups and for-profit companies are both creating value while helping solve this major issue.

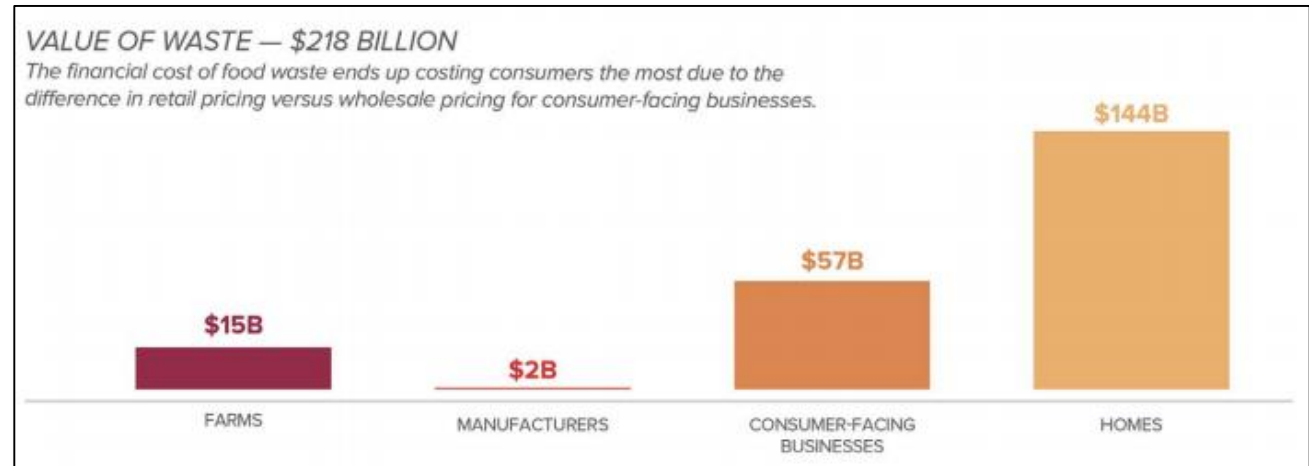
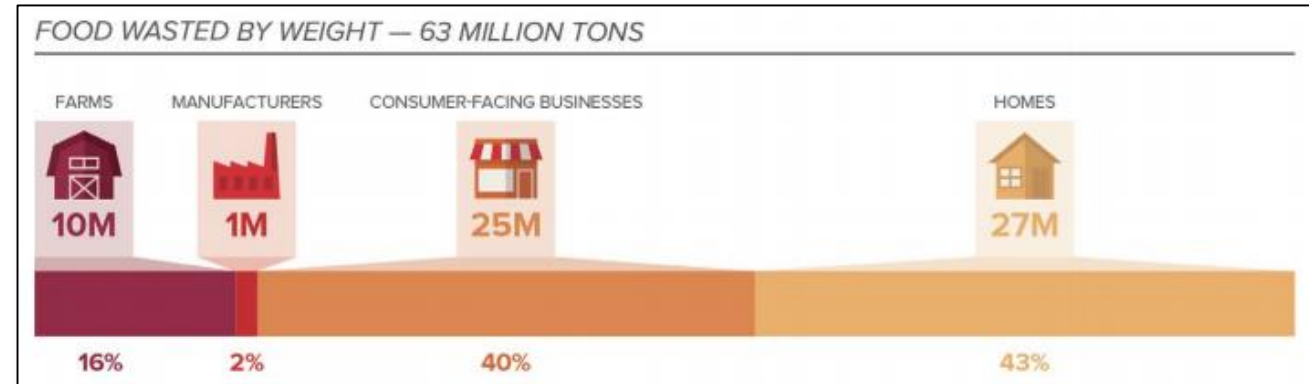


## **Food Waste**

*Definitions & Trends*

# Food Waste: A Problem of Enormous Scale

- Magnitude: In US, 40% of all food grown is wasted, adding up to 63 million tons of food sent to the landfill
- Cost: Each year, the US spends \$218 billion on growing, processing and transporting food that is never eaten
- Stakeholders: Food waste occurs throughout the supply chain and requires stakeholder involvement at the for-profit, non-profit and governmental sectors.



Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)

# Food Waste: Why So Much?

## Examples of why food waste occurs:



- Farm Gate: increased labor costs / lack of labor, cosmetic demands for produce, overproduction in good years when potentially unnecessary



- Manufacturers: product trimming / alteration, rapidly changing consumer demands, manufacturing process changes



- Consumer-Facing Businesses: consumer demand for menu variety, lack of data into supply / demand



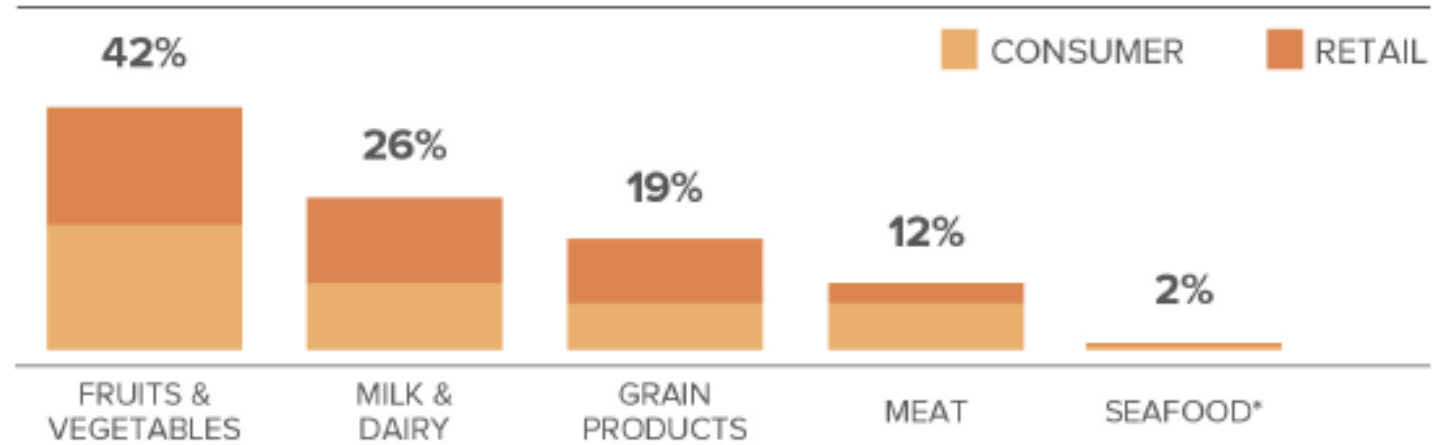
- Homes: as much as 55% of food purchases are unplanned, desire to purchase in bulk for discounts, confusion over expiration dates, barriers to at home compost

Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)

# Food Waste Breakdown: What Gets Wasted?

- Fresh / Perishable: Nearly 80% of food waste comes from perishable foods (deli items, meats, fruits, vegetables, seafood, milk & dairy, some grain, etc.)
- Solutions going forward have included shelf-life extenders, cold chain management, standardized labeling practices, demand forecasting

FOOD WASTE BREAKDOWN (BY WEIGHT AND BY TYPE)



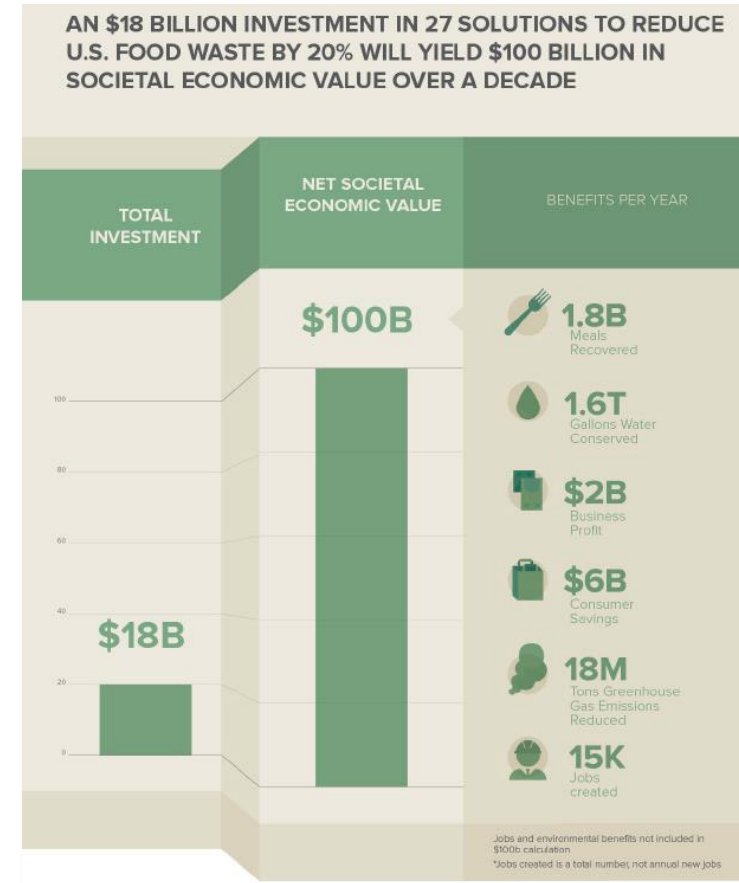
*\* While there is limited seafood wasted at the consumer level, large amounts of seafood are wasted during the production phase, with some estimates of up to 50% wasted as a result of seafood bycatch.*

Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)

# Why Does It Matter?

## Major Pillars of Food Waste Impact:

- Economic: Improved business profitability and increased job opportunities
- Social: Increase food availability at a lower cost, particularly for “ugly” produce
- Environmental: Substantial reductions in water usage and reductions in CO2 emissions, from both excess agricultural production & agricultural waste emissions



Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)





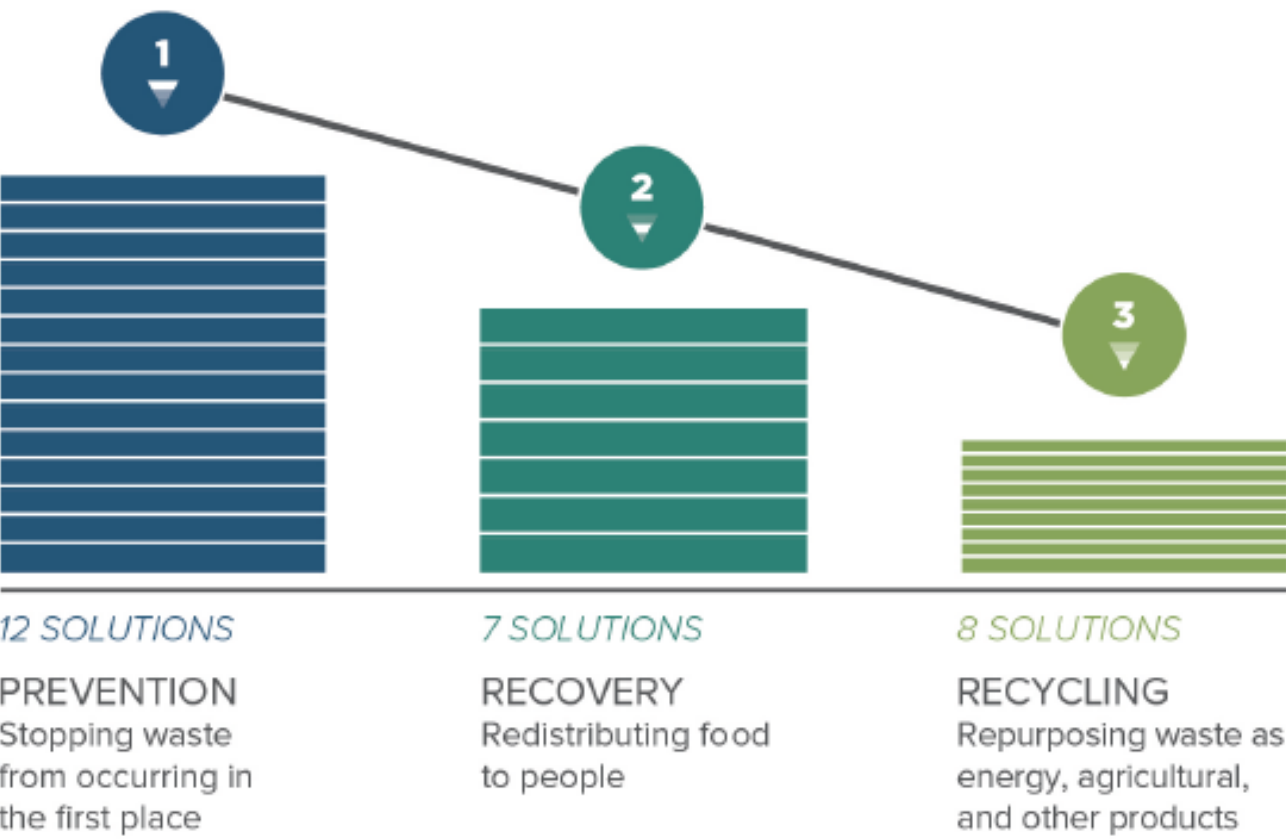
## **Technology Innovators**

*Opportunities & Challenges*

# Food Waste Reduction Methods & Their Impacts

- **Food Waste Prevention**
  - 2.6M Tons of Diversion Potential
  - \$7.7B in Annual Economic Value
  - \$6.2B in Investment Needed (10 Years)
  - \$1.9B in Business Profit Potential
  - 9.7M Tons CO2 Reduced
  - 1.2T Gallons Water Conserved
- **Food Waste Recovery**
  - 1.1M Tons of Diversion Potential
  - \$2.4B in Annual Economic Value
  - \$8.7B in Investment Needed (10 Years)
  - 1.8B in Annual Meals Recovered
  - 4000 Annual Jobs Created
- **Food Waste Recycling**
  - 9.5M Tons of Diversion Potential
  - \$121M in Annual Economic Value
  - \$2.9B in Investment Needed (10 Years)
  - 4.8M Tons CO2 Reduced
  - 11,000 Annual Jobs Created

## FOOD RECOVERY HIERARCHY



Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)

# Innovators by Category

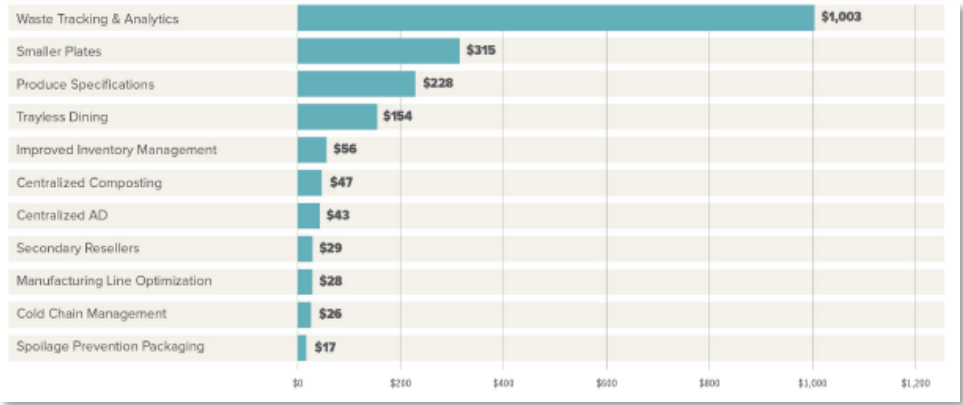
## Top Areas for “For Profit” Innovators

- Supply Chain & Operational Efficiency
- Shelf-Life Extension
- Secondary Marketplaces
- Renewable Energy
- Composting
- Animal Feed
- On-Site Processing Solutions
- Specialty Recycled Products

Food Waste Tools in “For Profit” and “Non Profit” Sectors



Annual Business Profit Potential (\$M)



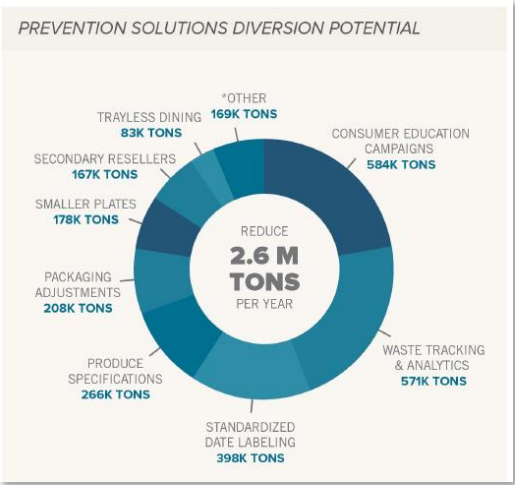
Source: [https://www.refed.com/tools/innovator-database/innovators#active\\_tab=innovatorAnalysis](https://www.refed.com/tools/innovator-database/innovators#active_tab=innovatorAnalysis)



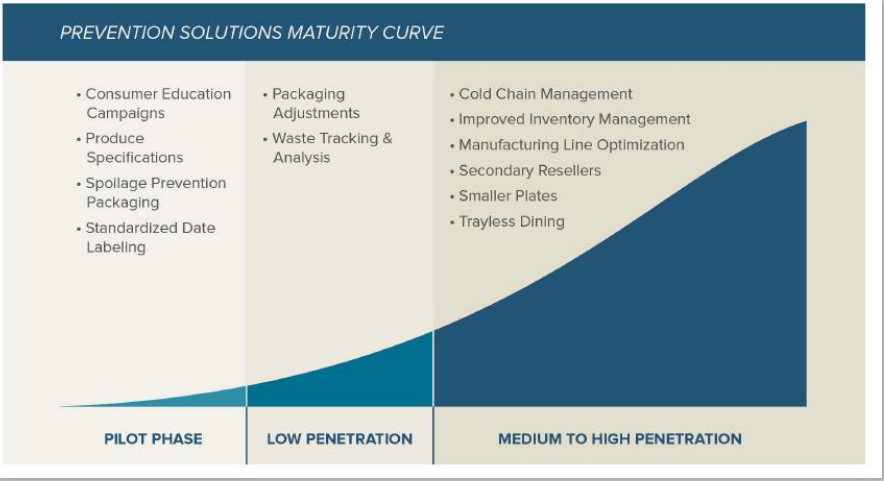
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# Prevention Solutions

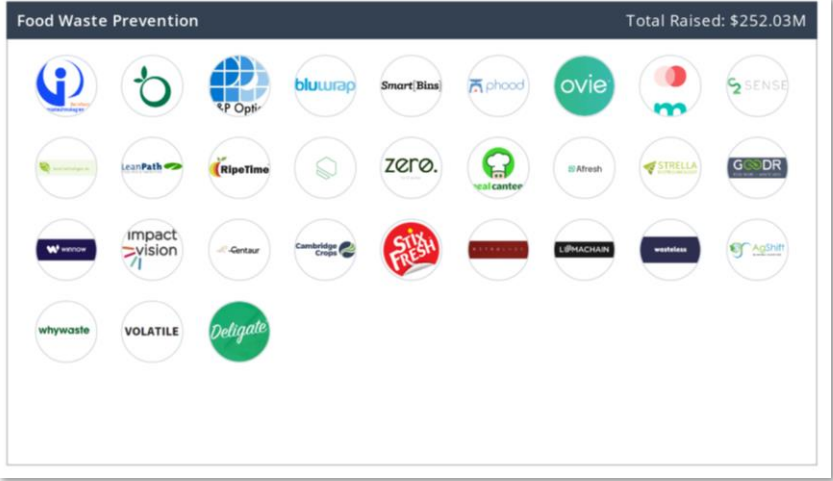
## Potential Tools



## Adoption Status



## Startup Landscape



### Takeaways

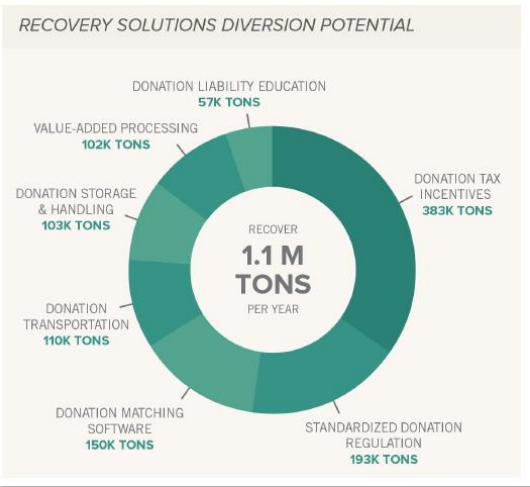
- Largest value creation & capture opportunity is in food waste prevention, but also deals with systemic food system challenges
- Waste tracking & analytics, shelf-life preservation / identification tools, supply management tools, and packaging have captured the most investment in food waste prevention
- Most solution / tech diversity across three solution categories

### Startup Highlight:

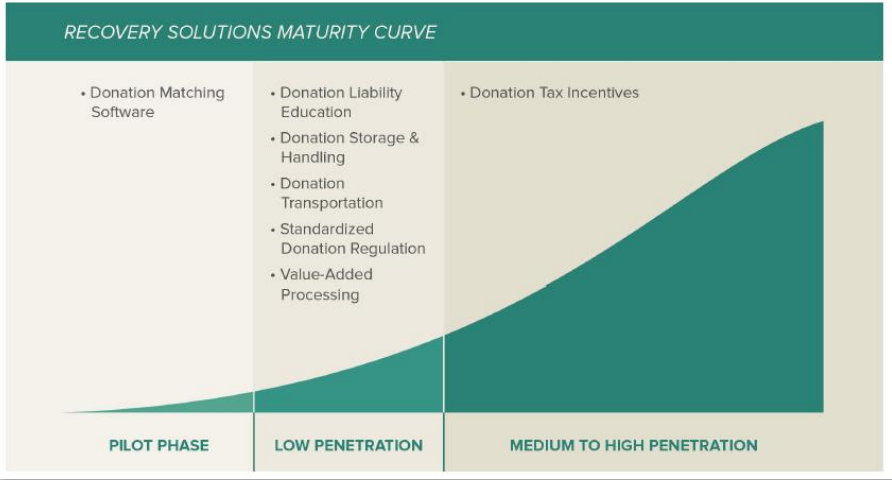


# Recovery Solutions

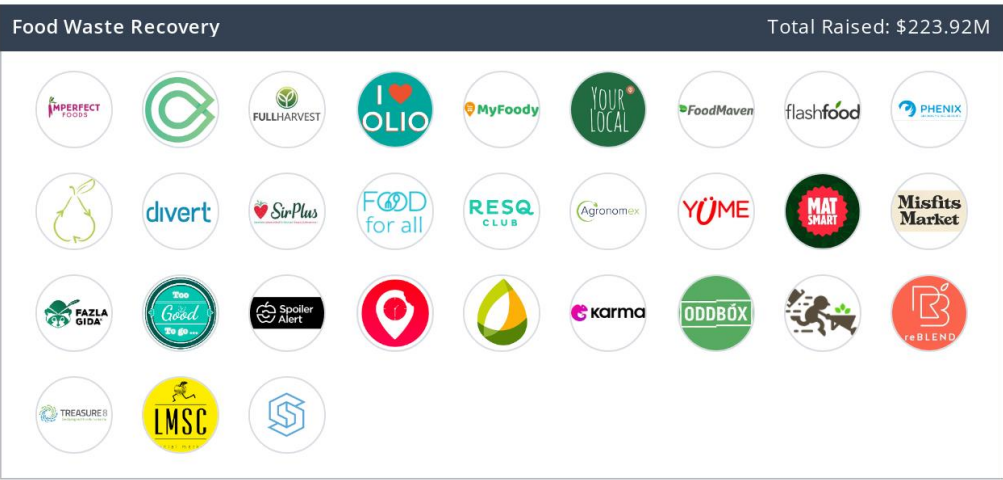
## Potential Tools



## Adoption Status



## Startup Landscape



## Takeaways

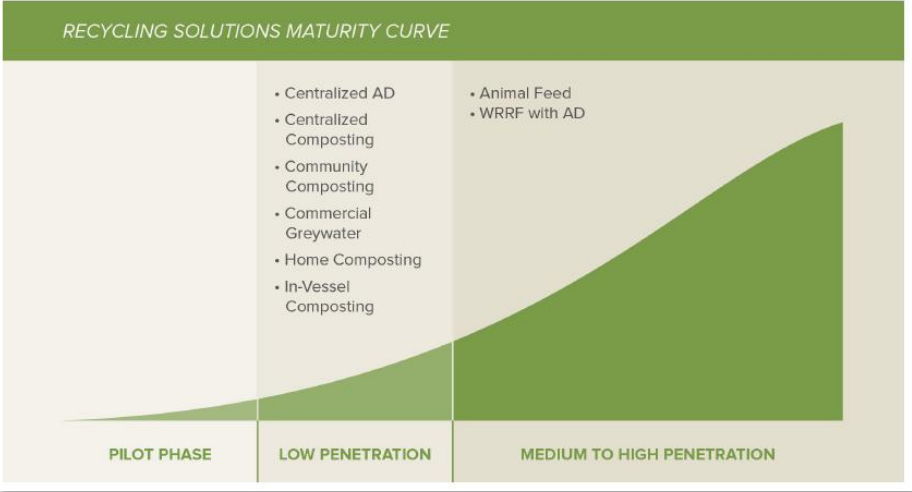
- “Low-hanging fruit”: not an easy business by any means, but somewhat easier to find new markets for soon to spoil produce or ugly produce than fixing food supply chain
- Least diversity of solutions across the three segments; largely focused on finding markets for “ugly produce” or finding donation opportunities that may or may not compete with non-profits
- Given size of the food waste problem, still very much so a viable business opportunity; hard to see the food system becoming completely lean.

# Recycling Solutions

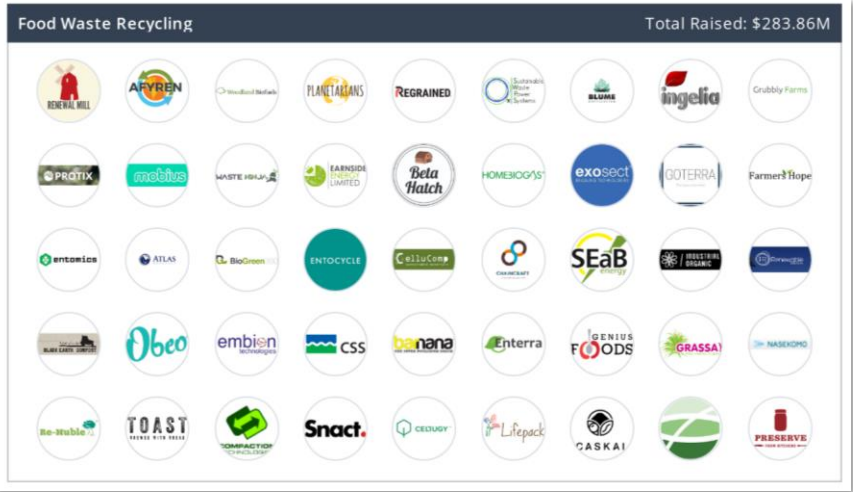
## Potential Tools



## Adoption Status



## Startup Landscape



## Takeaways

- Second largest diversity of solution types in startups, included energy harvest (anaerobic digestion), organic ag inputs, animal feed, consumer products, sustainable packaging solutions
- Potential challenges with “bad in, bad out”; certain degree to which for certain applications the waste needs to be higher quality

# Solution Implementation Challenges

## Prevention

- Misalignment of costs and benefits
- Consumer expectations
- Information gaps
- Organizational silos

## Recovery

- Liability concerns surrounding food safety
- Fragmented regulatory codes & incentives
- Handling, transportation & storage
- Financial viability

## Recycling

- Cost of disposal
- Transportation & logistical costs
- Material supply assurance
- Packaging & contamination
- Access to financing for capital intensive projects
- End market development

Source: [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)



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# Early Market Leaders in Areas of Interest



*Shelf-Life Extension*

- Technology: Natural coatings for avocados and other highly perishable goods
- Investment: \$70M Series C @ \$350M Pre-money | \$110M raised to date
- Status: Major commercial rollout | Kroger, Nature's Pride



*Secondary Produce Markets*

- Technology: Leading online marketplace for ugly produce
- Investment: \$30M Series B @ \$150M Pre-money | \$40M raised to date
- Status: Hired former Walmart Exec for CEO, distribution expansion



*Upcycling to Insects (Feed)*

- Technology: Insect rearing technology utilizing low cost food waste inputs
- Investment: At least \$50M raised | Valuation unknown
- Status: Opened 14,000 square foot processing plant in June 2019



*Supply / Demand Forecasting*

- Technology: AI supported supply chain analytics platform for grocery chains
- Investment: \$6.1M Series A @ \$23.50M Pre-money with Innovation Endeavors
- Status: Commercial rollout with Fresh Thyme

*Other Promising Players*



*Other Promising Players*



*Other Promising Players*



*Other Promising Players*



Source: Pitchbook & iSelect Fund Data



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# Policy Collaborations & Research Leaders



## October 2019

- USDA, FDA & USEPA partner with Food Waste Reduction Alliance to form “Winning on Food Waste Initiative”
- Set goal to reduce national US food waste by 50% by 2030 alongside leading grocery stores

<https://www.thepacker.com/article/government-agencies-partner-alliance-fight-food-waste>



- Market research & trends
- Innovator database
- Food Waste Summit



- Accounting method and tool for measuring food waste



- Market research, trends and initiatives at global scale



# Thank You For Joining!

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