

Harmonizing Sustainability Approaches in the Food Industry: Processing, Packaging, and Industry 4.0

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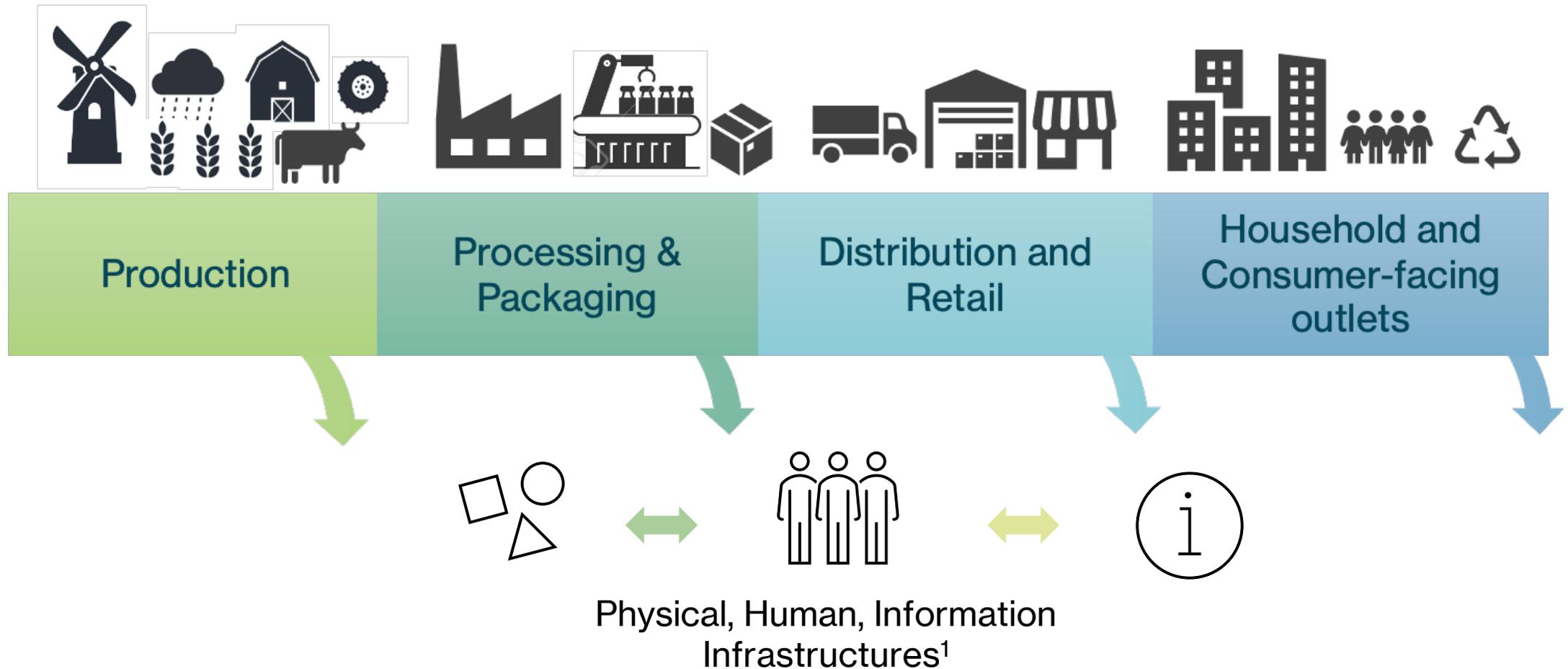


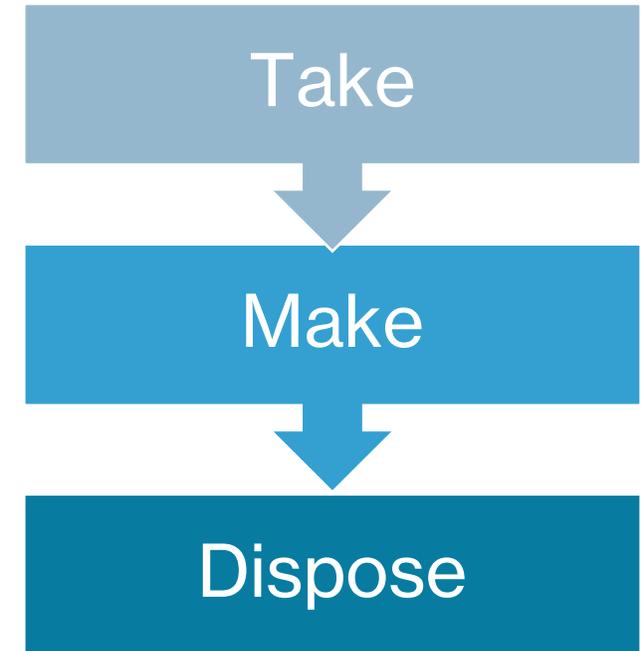
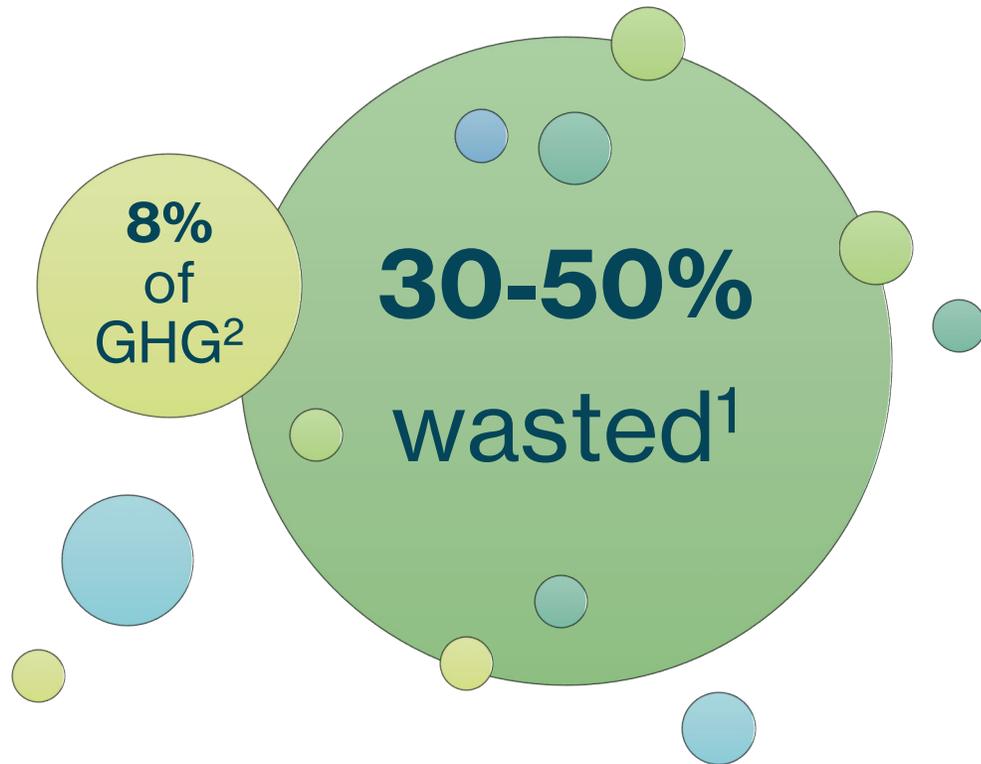
FUTURE OF FOOD FORUM
REDUCING THE CARBON FOOTPRINT OF FOOD SYSTEMS

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March 2, 2022

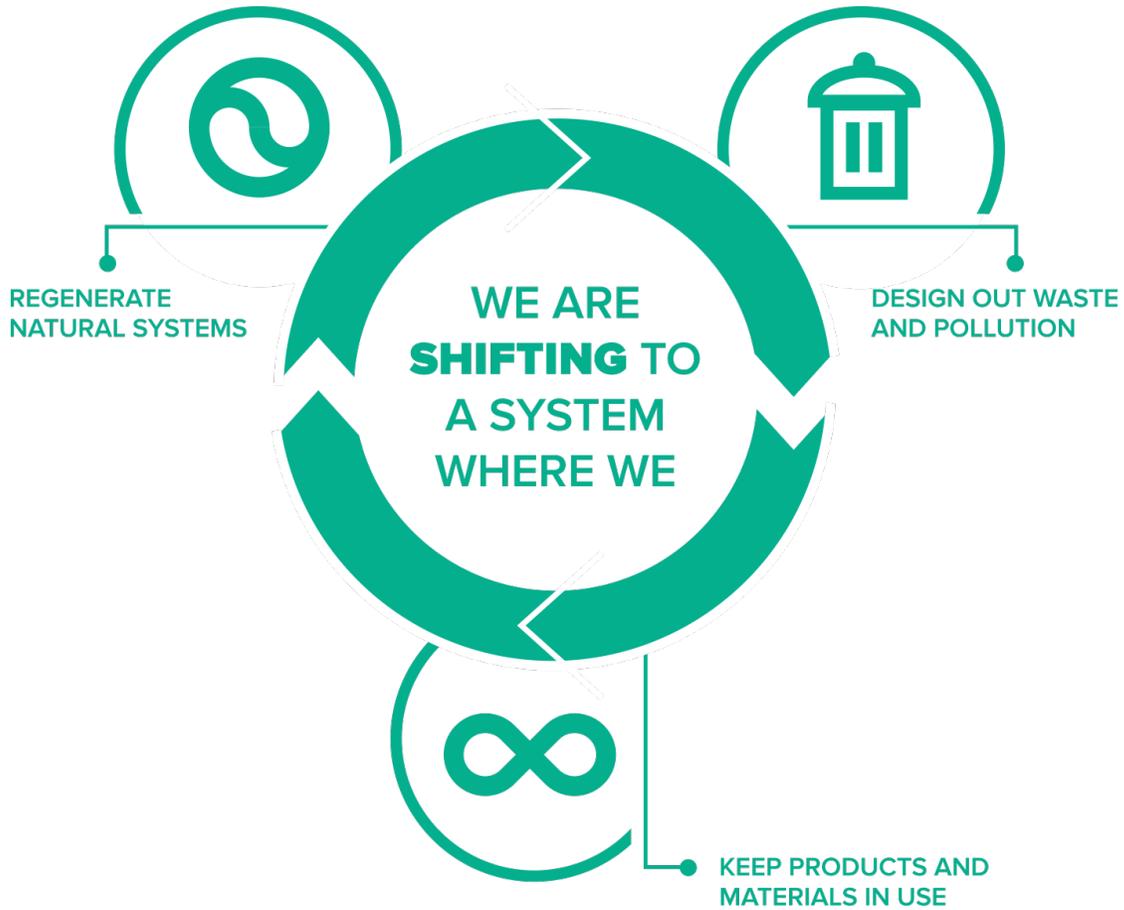
Sustainable Future of Food Systems



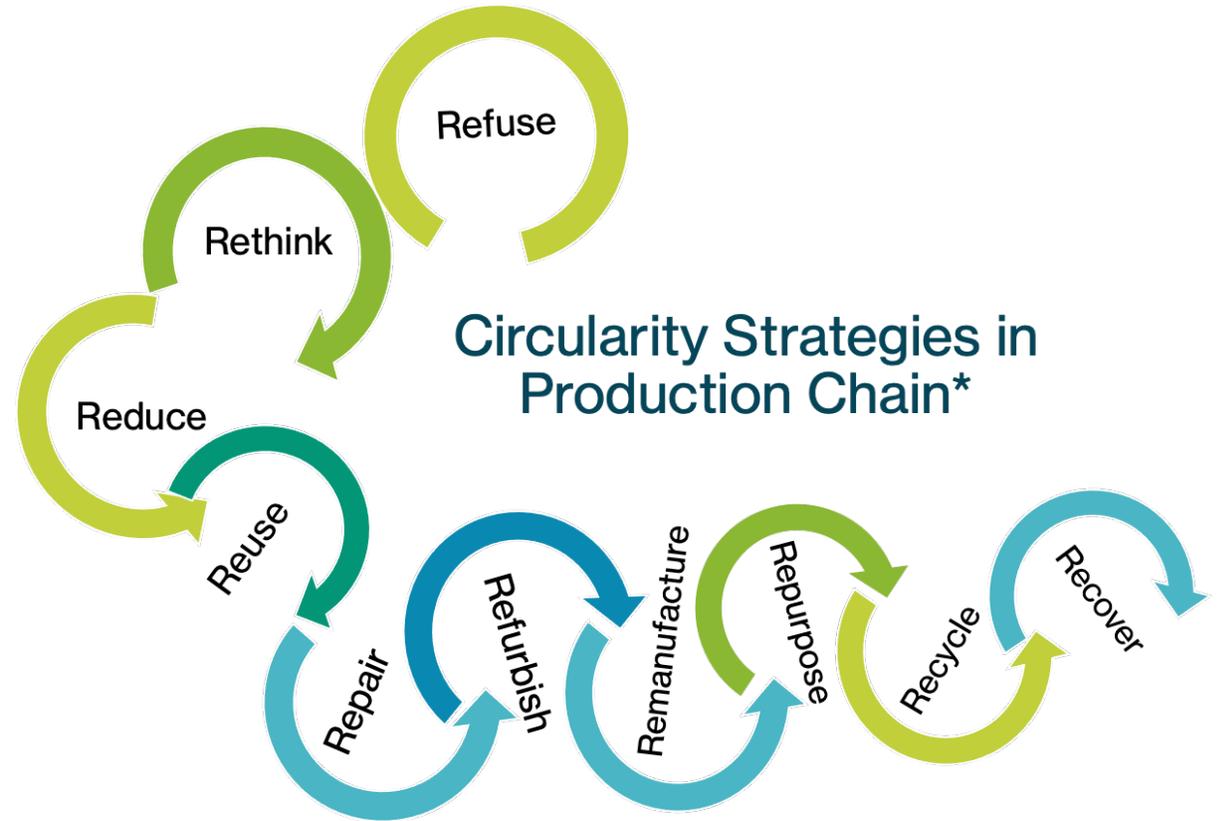


¹ Project Drawdown (2020)

² ReFED Roadmap to reduce US **food waste** by 20 percent

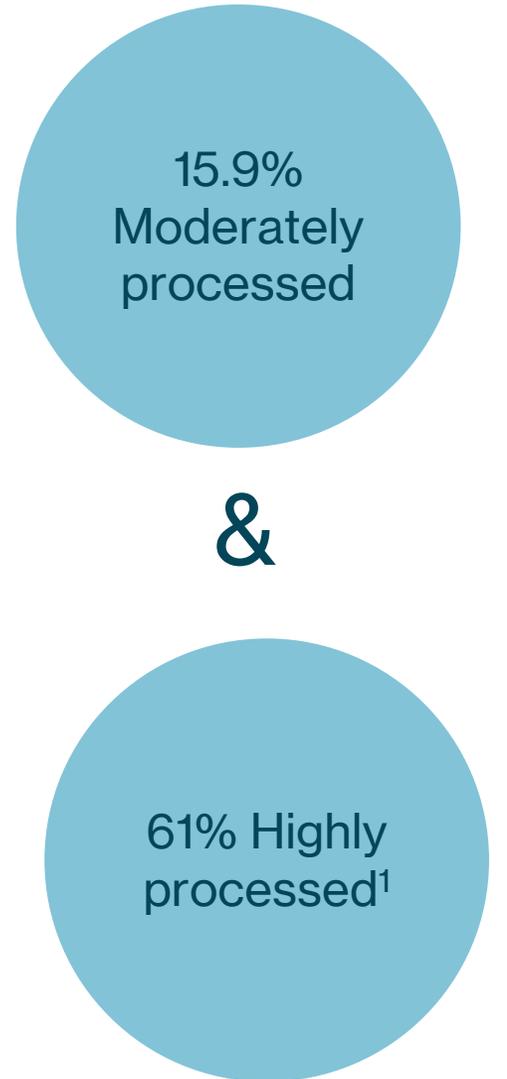


Source: Ellen MacArthur Foundation



*Potting, J., Hekkert, M. P., Worrell, E., & Hanemaaijer, A. (2017). *Circular economy: measuring innovation in the product chain*

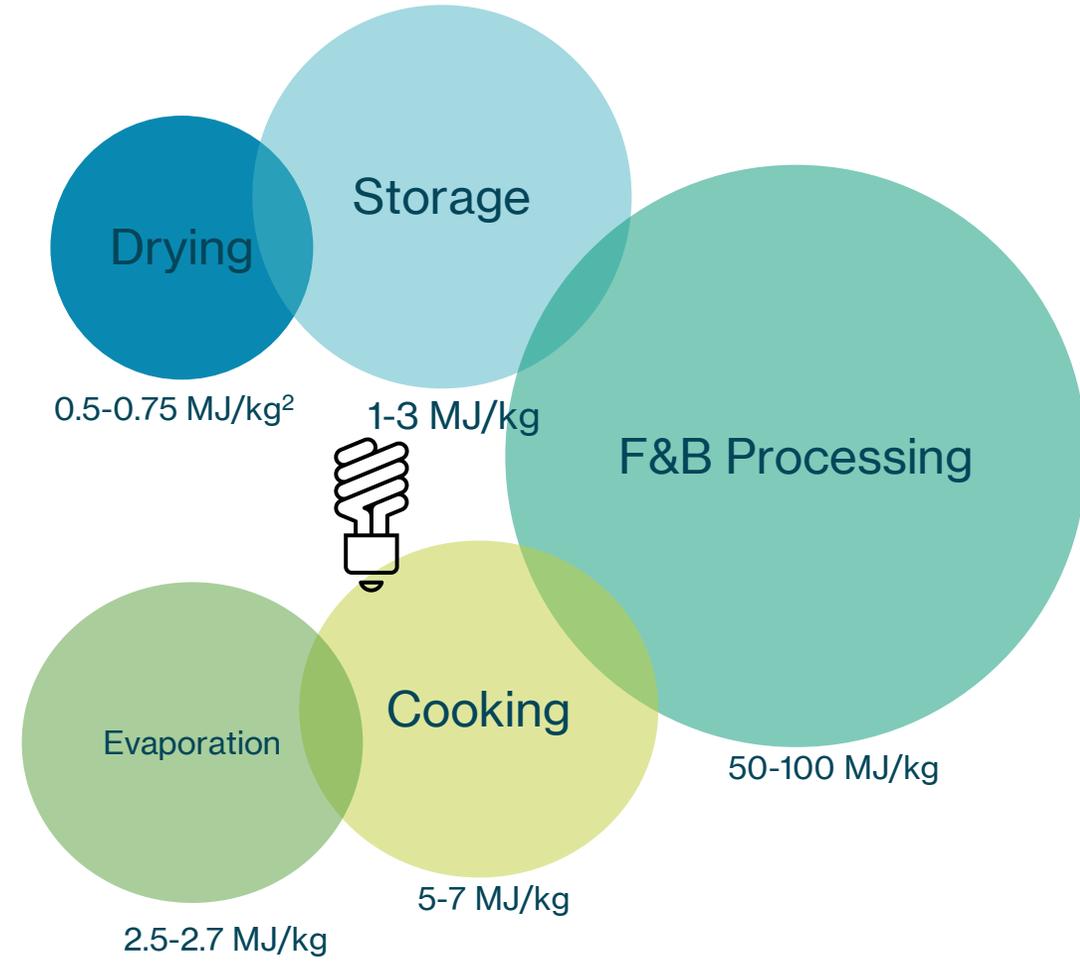
Processing



Energy embedded in consumption



10-15 Mt CO₂eq/year (FAO,2011)

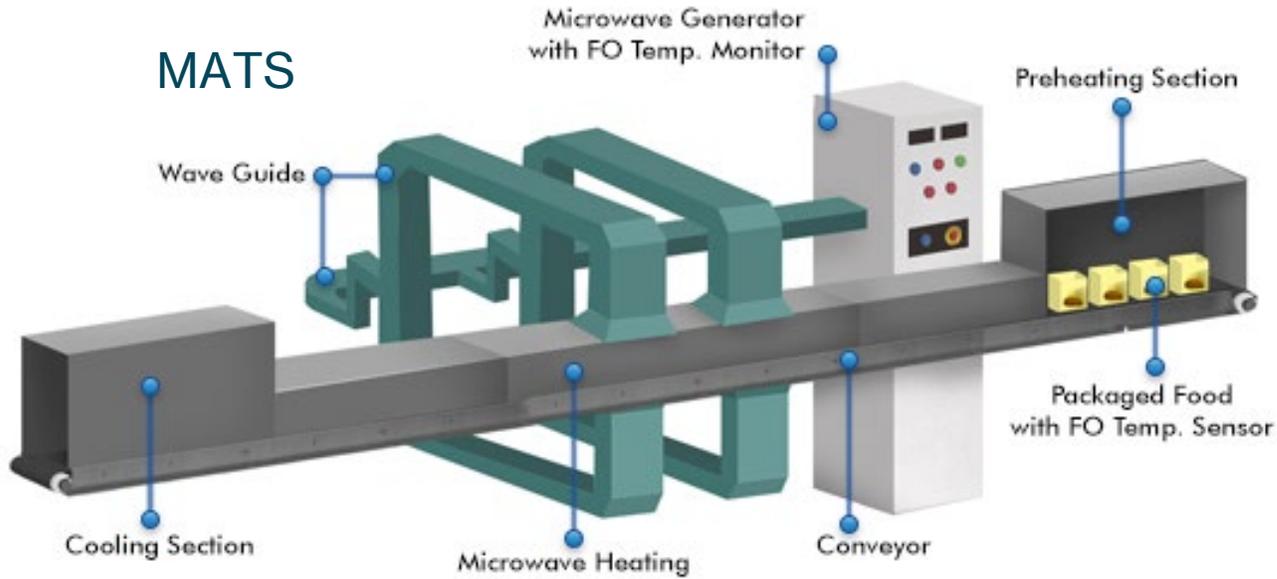


¹Poti et al. (2015)Journal of Clinical Nutrition, 101(6), 1251–1262

²Clairand, J. et al. (2020). “Review of energy efficiency technologies in the food industry...”. *IEEE Access*, 8, 48015-48029

Processing

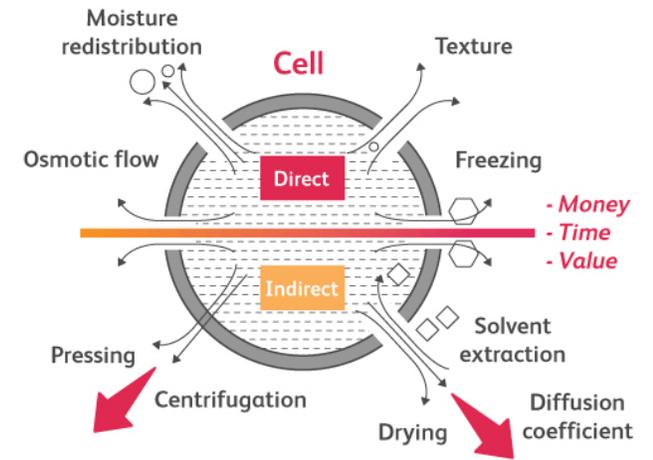
MATS



164 kt CO₂/year
40% waste heat recovery



Thermal



apfoodonline.com

Non-thermal

Packaging



Packaging \$180B industry in the US
 Packaged food \$3,407B (US) by 2030^{PRNewswire}

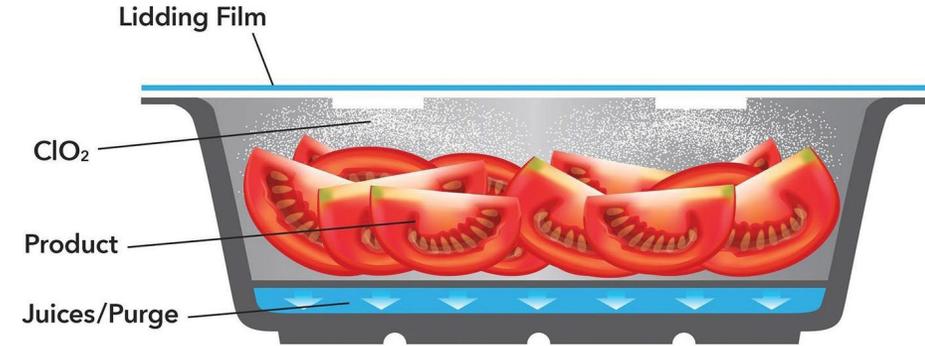
| Product | Packaging Relative Env. Impact (PREI)* Licciardello (2017) |
|---------|--|
| Beef | 1.2-6.5 |
| Cheese | 1.7 |
| Coffee | 10-15 |
| Milk | 3.3-13.9 |
| Pasta | 13-28 |
| Wine | 34-82 |
| Beer | 48-78 |

Expressed as GWP

Packaging

Smart use of packaging can mitigate Food Waste Issue

| Solution | Emissions Reduction ^{ReFED} (Tons CO2e) |
|------------------------|--|
| Package Design | 3.57 |
| Std. Date labels | 2.73 |
| Active/Intelligent Pkg | 2.43 |
| Portioning | 11.5 |



Digitalization as key enabler of sustainability



Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation

Figure 1: The 'Transformative Twelve' could deliver significant impacts to food systems by 2030

Changing the shape of demand

ALTERNATIVE PROTEINS



- Reduce GhG emissions by up to 950 megatonnes of CO₂ eq.
- Reduce freshwater withdrawals by up to 400 billion cubic metres
- Liberate up to 400 million hectares of land



FOOD SENSING TECHNOLOGIES FOR FOOD SAFETY, QUALITY, AND TRACEABILITY

- Reduce food waste by up to 20 million tonnes

NUTRIGENETICS FOR PERSONALIZED NUTRITION



- Reduce the number of overweight by up to 55 million

Promoting value-chain linkages



MOBILE SERVICE DELIVERY

- Generate up to \$200 billion of income for farmers
- Reduce GhG emissions by up to 100 megatonnes of CO₂ eq.
- Reduce freshwater withdrawals by up to 100 billion cubic metres

BIG DATA AND ADVANCED ANALYTICS FOR INSURANCE



- Generate up to \$70 billion of income for farmers
- Increase production by up to 150 million tonnes



IOT FOR REAL-TIME SUPPLY CHAIN TRANSPARENCY AND TRACEABILITY

- Reduce food loss by up to 35 million tonnes

BLOCKCHAIN-ENABLED TRACEABILITY



- Reduce food loss by up to 30 million tonnes

Future Workforce

- Future of the US agri-food industry workforce
- Introduction to sustainability and digitalization components
- Retiring generation
- Upcoming workforce differences
- Micro-credentials

A promotional poster for the USDA REEU Circular Economy & Digitalization program. The background features a close-up of a robotic hand holding a bundle of green wheat stalks against a blurred green field. The text is overlaid on the image. At the top, the title 'USDA REEU CIRCULAR ECONOMY & DIGITALIZATION' is written in large, bold, black letters. Below the title, in smaller green text, it says 'LEARN CIRCULAR ECONOMY & INDUSTRY 4.0 TOOLS' and '& JOIN RESEARCH IN A 10-WEEK SUMMER PROGRAM at the UNIVERSITY of FLORIDA'. Further down, in green text, it provides the application URL 'https://go.ufl.edu/cdskillsreeu' and the information website 'CDSkillsREEU.com'. At the bottom left, there are logos for 'USDA' and 'UF UNIVERSITY of FLORIDA'. At the bottom right, the text 'Deadline April 15' is written in green, followed by 'APPLY NOW!' in large, bold, green letters.

**USDA REEU
CIRCULAR
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APPLICATION:
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INFORMATION:
[CDSkillsREEU.com](https://cdskillsreeu.com)

Deadline April 15
APPLY NOW!

USDA
UF UNIVERSITY of FLORIDA

Thank you!



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AGRICULTURAL & BIOLOGICAL
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**FOOD SYSTEMS
INSTITUTE**