

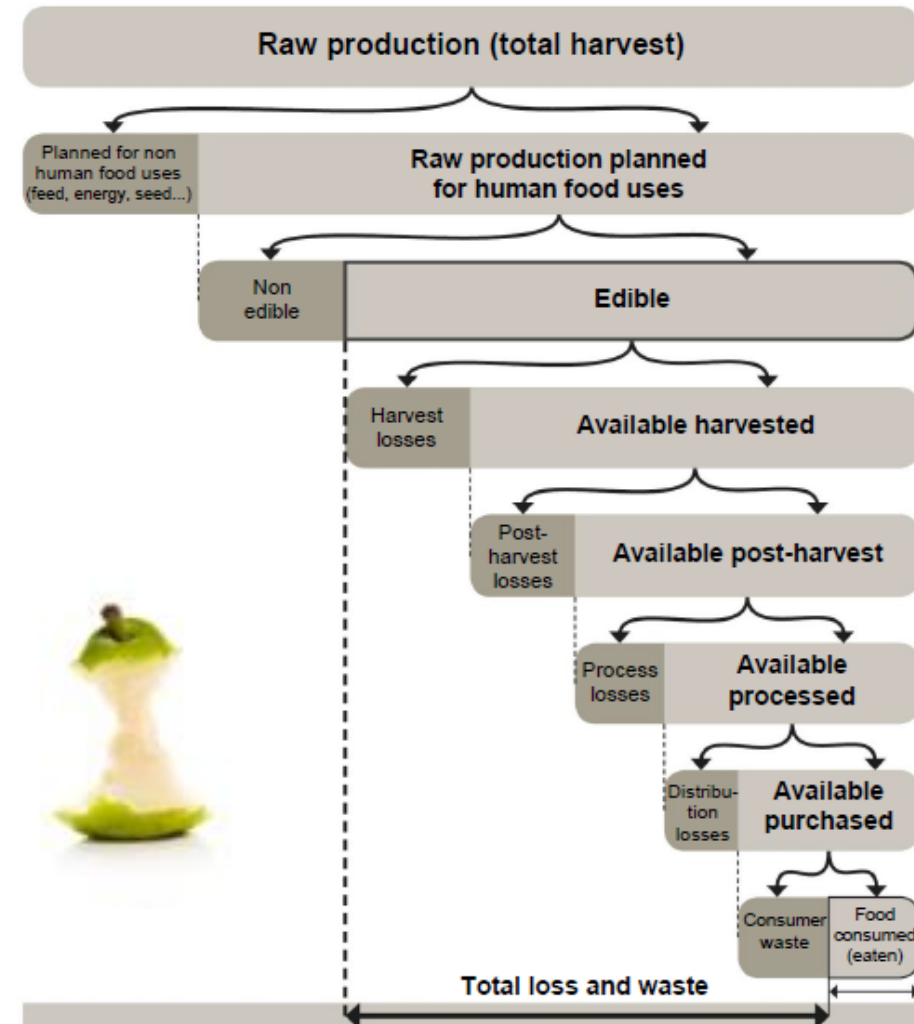


An analysis of food loss and waste along fresh food supply chains

Outline

- What is Food Loss and Waste?
- Why Does It Matter?
- Magnitude of the Problem
- Main Causes of Food Loss and Waste
- Main Destinations of Food Loss and Waste
- Food Waste Hierarchy
- My PhD's Contribution

What is Food Waste?



What is Food Waste?



Source: FAO, 2017.

FAO (2013) defines:

Food Loss – a decrease in mass or nutritional value of food originally intended for human consumption, usually caused by inefficiencies in the Food Supply Chain.

Food Waste – food appropriate for human consumption being discarded for being kept beyond its expiry date or left to spoil.

Why Does It Matter?



The 2030 Agenda for Sustainable Development was established in 2015 by UN and adopted by all Member States.

The aim of SDG 12 is to “ensure sustainable consumption and production patterns” and goal 12.3 specifically calls for “halving per capita global food waste at retail and consumer levels and reducing food loss along production and supply chains, including post-harvest loss, by 2030” (UN General Assembly, 2015).

Why Does It Matter? – Twitter Feed



Why Does It Matter? – Twitter Feed

**FEBA**
@EuroFoodBanks

Seguir

Portugal is taking food waste seriously!



Portugal creates commission to tackle food waste
Portugal has launched a national commission to combat food waste that will take what the government called "an integrated and multidisciplinary approach" to promoting activities aimed at just-food.com

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**REFRESH Food Waste**
@EUrefresh

Seguir

REFRESH pilot project "Gastrofira" in Spain quantifies food waste as first activity eu-refresh.org/first-activity ... [#foodwaste](#) [@CREDA_UPC_IRTA](#)

RETWEETS 3 CURTIDA 1



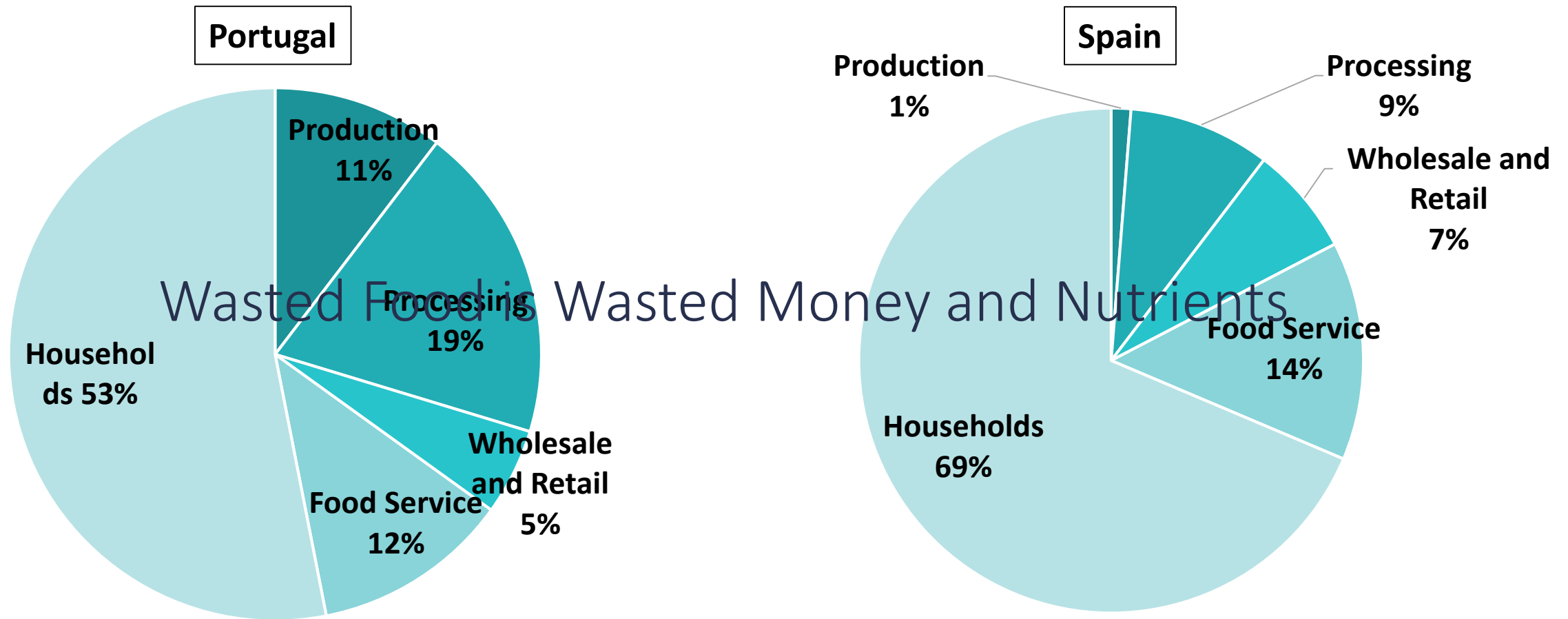
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Why Does It Matter? – Twitter Feed



Food Loss and Waste in Europe

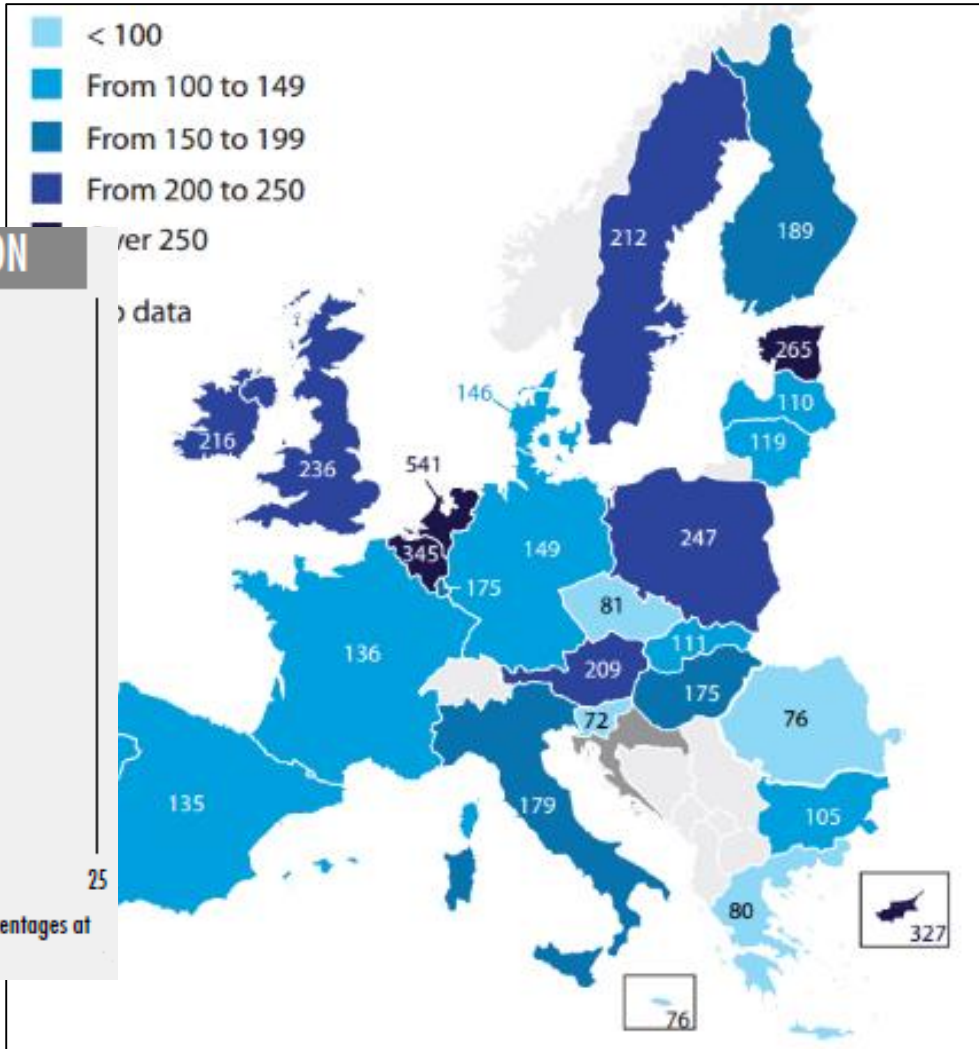


Source: FUSIONS, 2016.

Food Loss and Waste in Europe

Total food loss and waste in the EU (kg *per capita*)

Source: Technology options for feeding 10 billion people, STOA, 2013



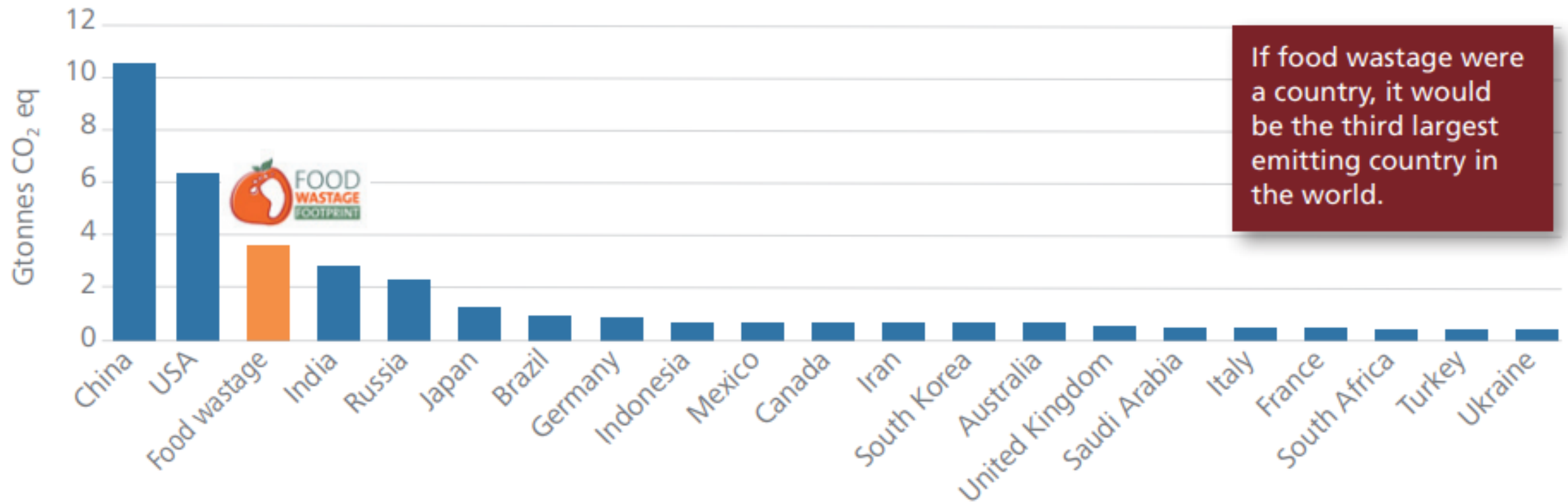
FOOD LOSS FROM POST-HARVEST TO DISTRIBUTION IN 2016, PERCENTAGES GLOBALLY AND BY REGION



Source: FAO, 2019

Environmental Impact of Food Loss and Waste

Total GHGs emissions excluding LULUCF
Top 20 of countries (year 2011) vs. Food wastage



If food wastage were a country, it would be the third largest emitting country in the world.

Food Loss and Waste in Portugal

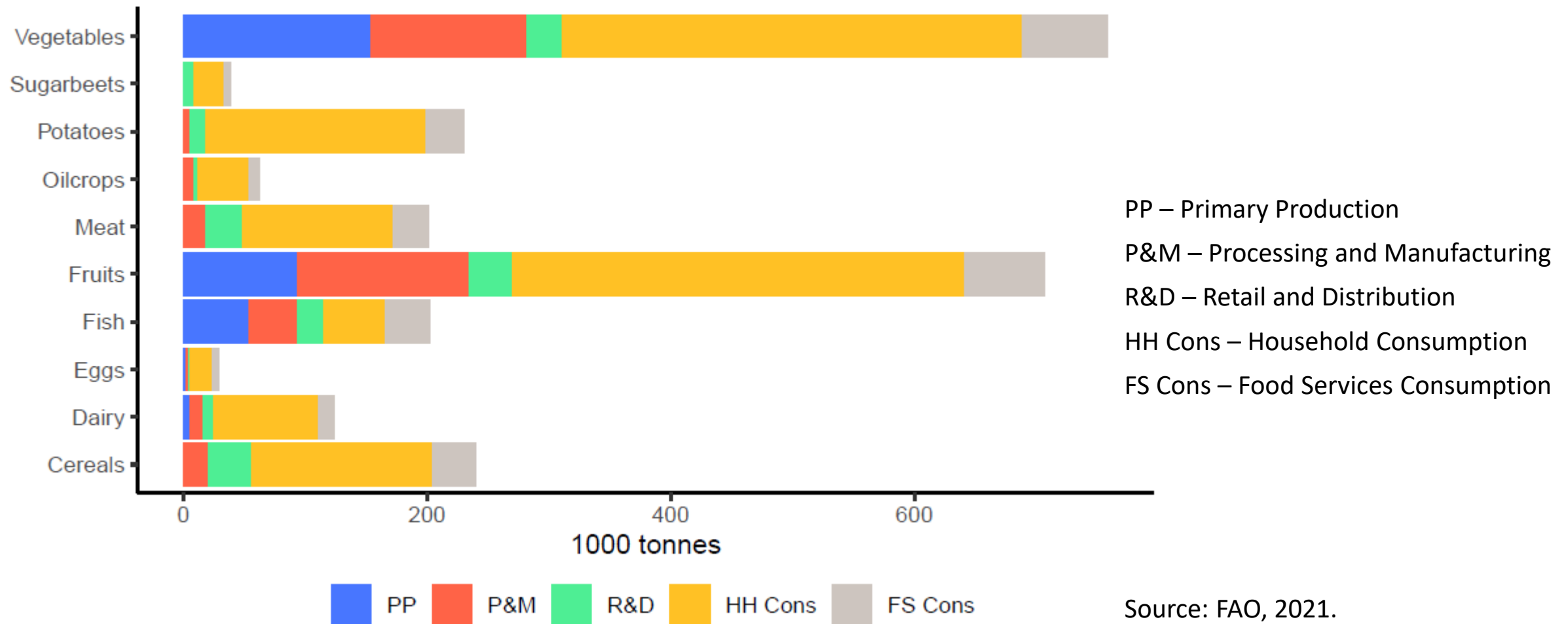
Cerca de **17%** das partes comestíveis dos alimentos produzidos para consumo humano, são perdidas ou desperdiçadas em Portugal



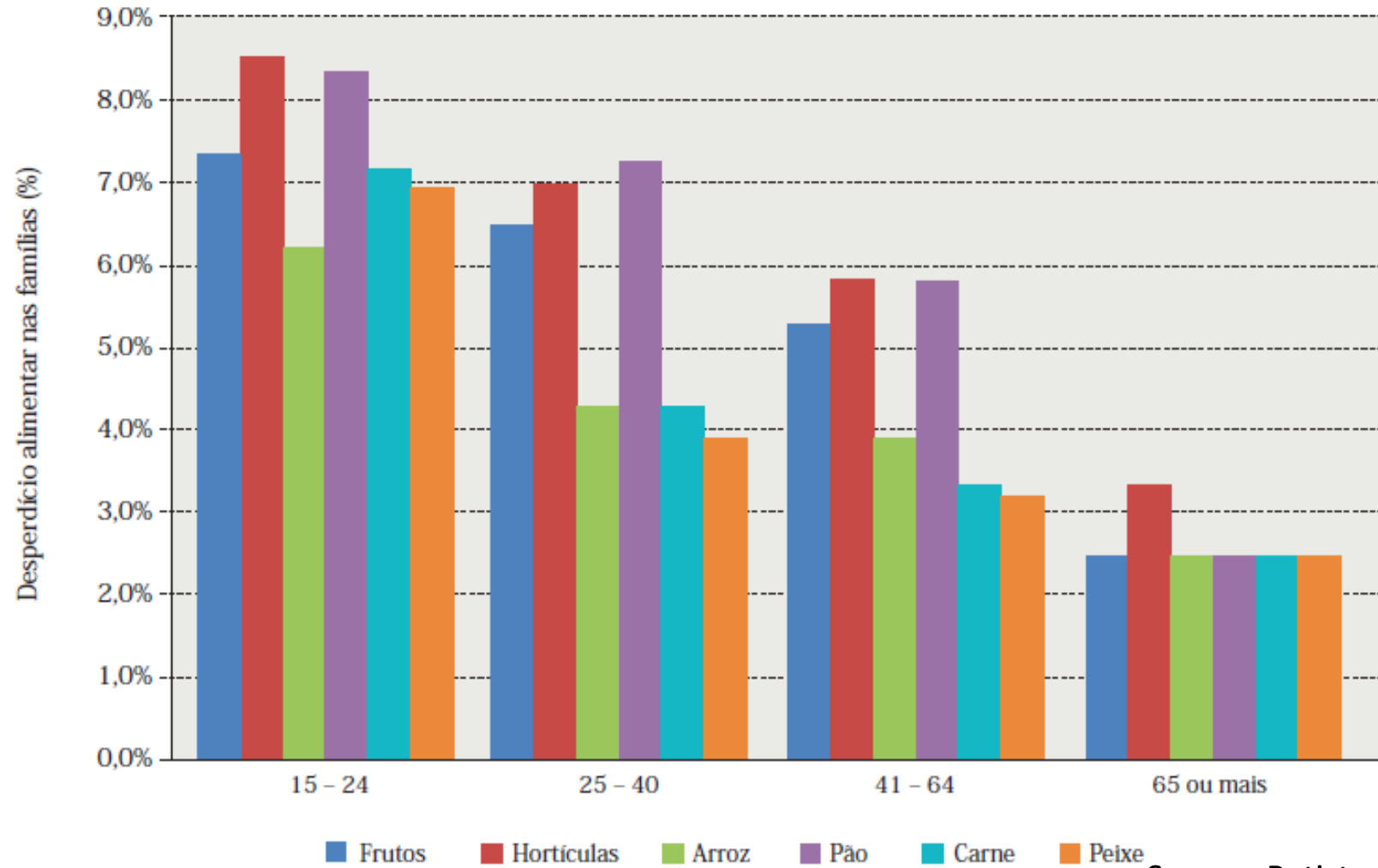
Source: Batista et al., 2012.

Food Loss and Waste in Portugal

Food Waste generation, Portugal, 2016



Food Loss and Waste in Portugal

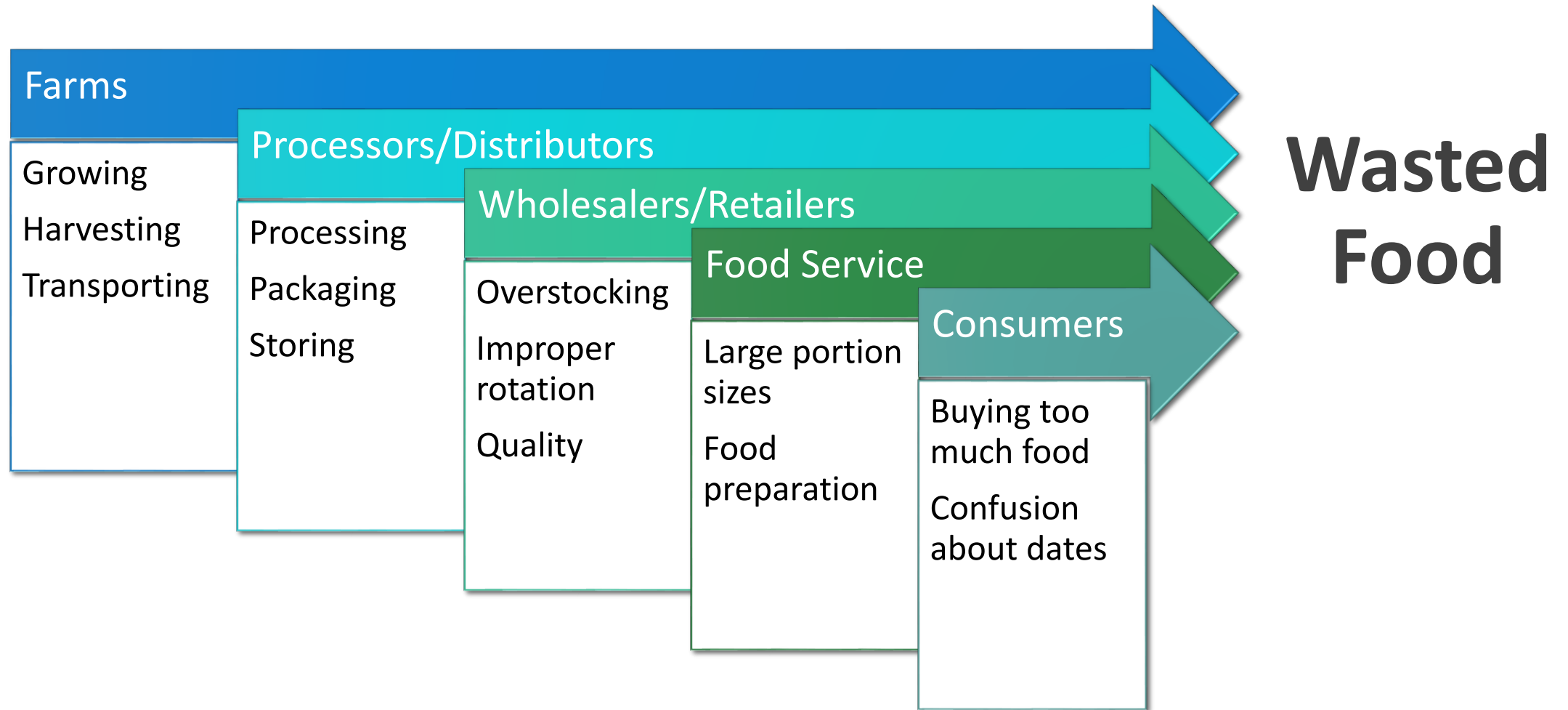


Source: Batista et al., 2012.

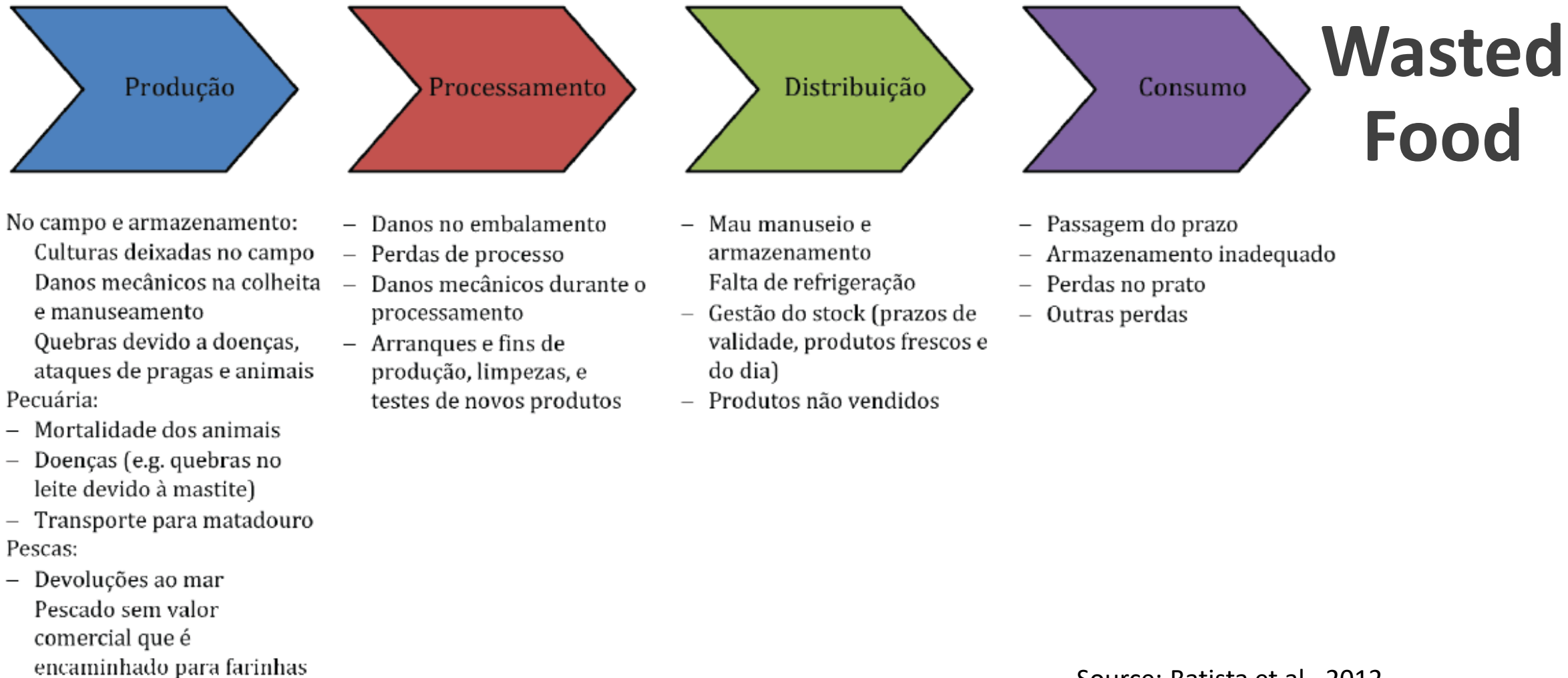
Funded Projects and Initiatives



Main Causes of Food Loss and Waste



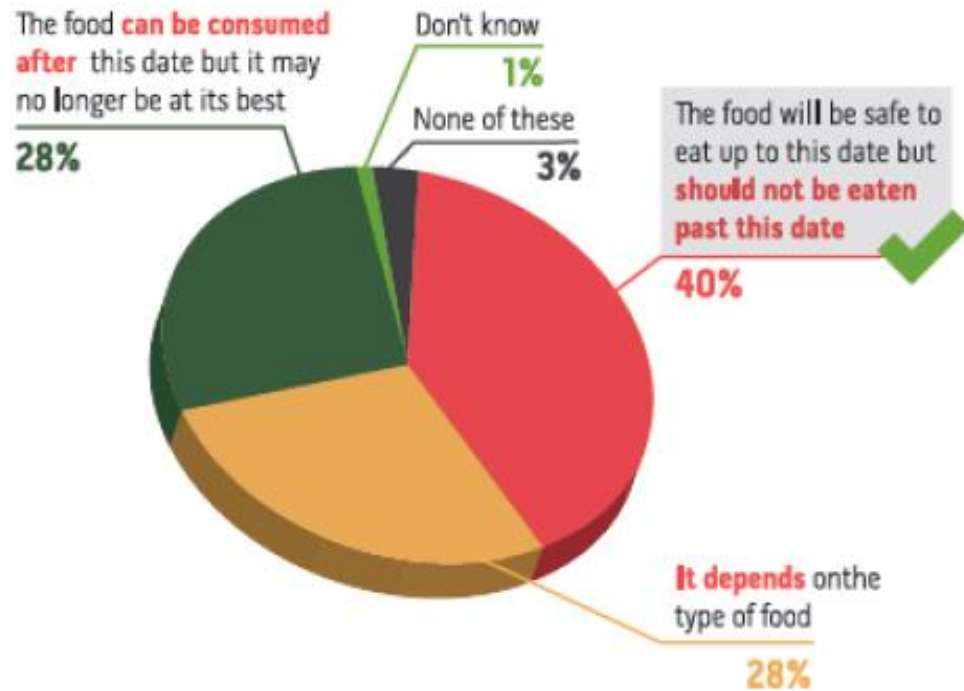
Main Causes of Food Loss and Waste



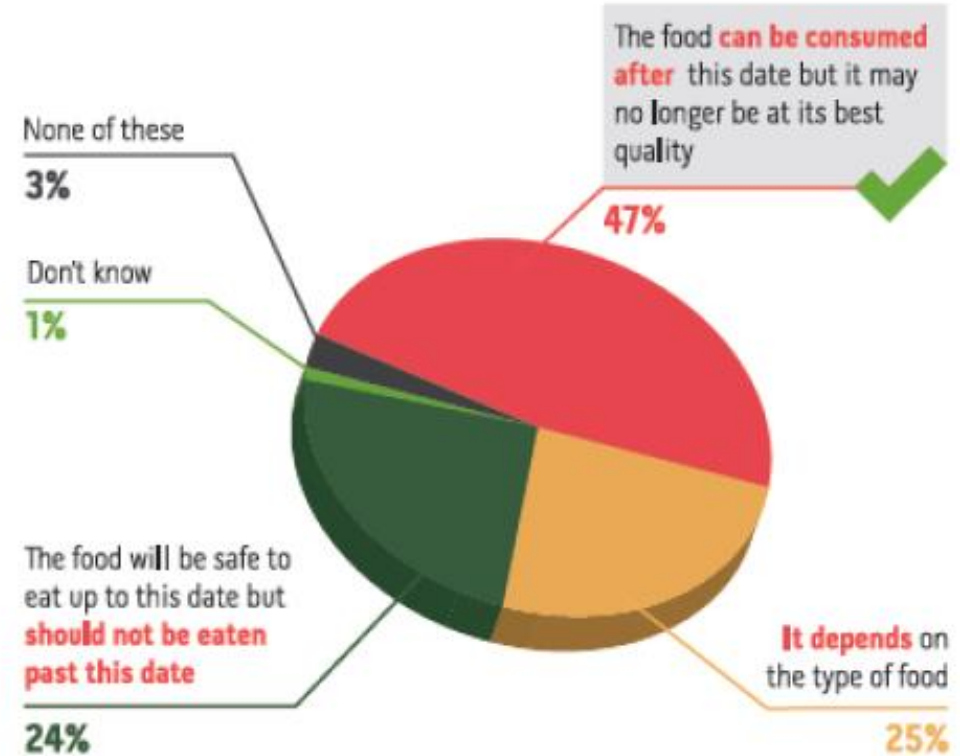
Source: Batista et al., 2012.

Main Causes of Food Loss and Waste

Europeans think that "use by" means:

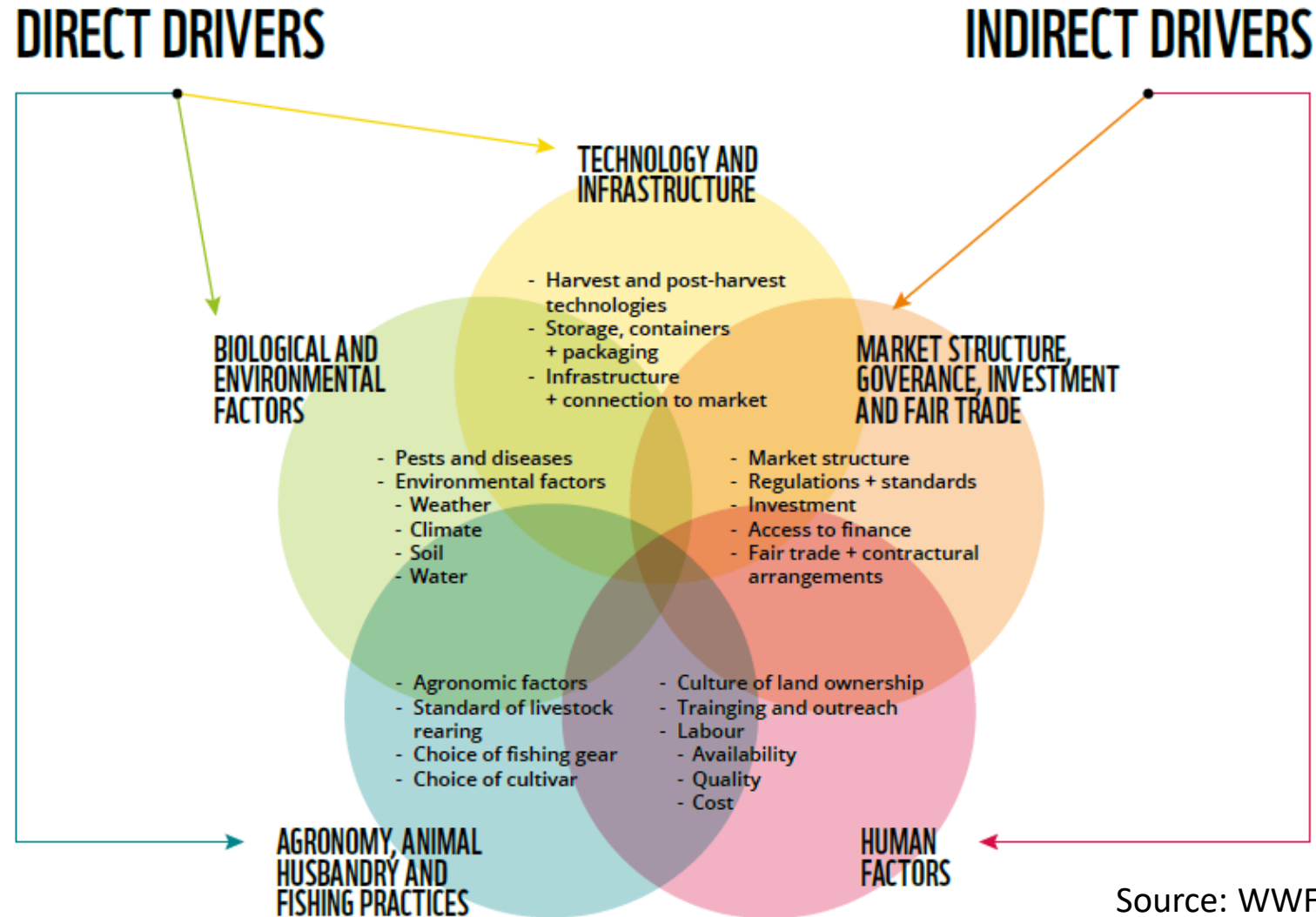


Europeans think that "best before" means:

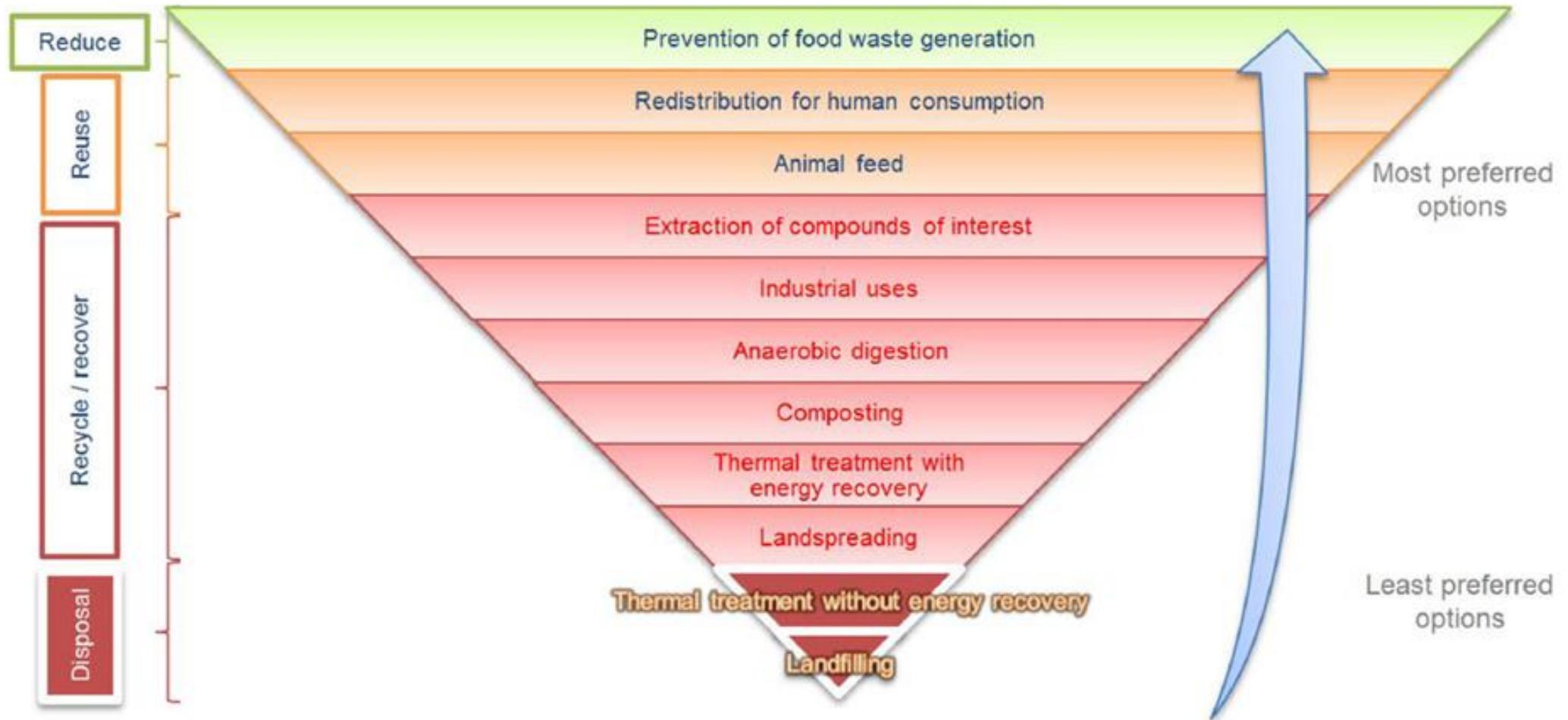


"USE BY" ≠ "BEST BEFORE"

Main Causes of Food Loss and Waste



Food Waste Hierarchy



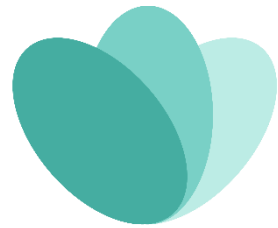
Source: Garcia-Garcia et al., 2017.

Final Destinations of Food Loss and Waste

Produtores	Indústria	Distribuição	Consumidores
• Consumo animal • Venda para produtos secundários • Doação para instituições de solidariedade • Incorporação no próprio terreno	• Transformação em subprodutos (geralmente para consumo animal) • Encaminhamento para os serviços de gestão de resíduos	• Venda a preços mais baixos dos produtos a aproximarem-se do prazo de validade • Encaminhamento para compostagem e serviços de gestão de resíduos • Doação para consumo animal • Doação para instituições de solidariedade	• Encaminhamento para os serviços de gestão de resíduos • Alimentação de animais domésticos • Compostagem doméstica

Source: Batista et al., 2012.

Apps Against Food Loss and Waste



Too Good To Go

“Mais do que uma simples app, somos um movimento de milhões de *Waste Warriors* e evitamos, todos os dias, que comida de qualidade acabe no lixo. Faz download da *app* gratuitamente e salva comida de estabelecimentos ao pé de ti: restaurantes, hotéis, pastelarias, supermercados... tudo a preços reduzidos.”



SHARE MORE • WASTE LESS

“Let’s not waste our wonderful world. Join millions of neighbours all over the world who are using OLIO to share more, care more and waste less. Get free stuff, borrow things, and shop homemade directly from your neighbours.”



“Easily track, organize and manage the food in your home. With lists for your freezer, fridge and pantry, you can easily check what food you have left, see what food you need to use first, create a shopping list, plan your meals, avoid unnecessary purchases, reduce food waste and save a bunch of money.”

Other Projects Against Food Loss and Waste



A Zero Desperdício fomenta a sustentabilidade e a passagem para uma economia circular e colaborativa como forma de combater o desperdício. A recuperação de excedentes alimentares e outros não só permite minimizar as carências alimentares e outras, como permite poupar o investimento financeiro necessário para apoiar as pessoas em situação de carência.



Este projeto visa procurar mercados alternativos para a fruta e hortaliças “feias” que consiga alterar padrões de consumo. Um mercado que gere valor para os agricultores e consumidores e combata tanto o desperdício alimentar como o gasto desnecessário dos recursos utilizados na sua produção.

Other Projects Against Food Loss and Waste

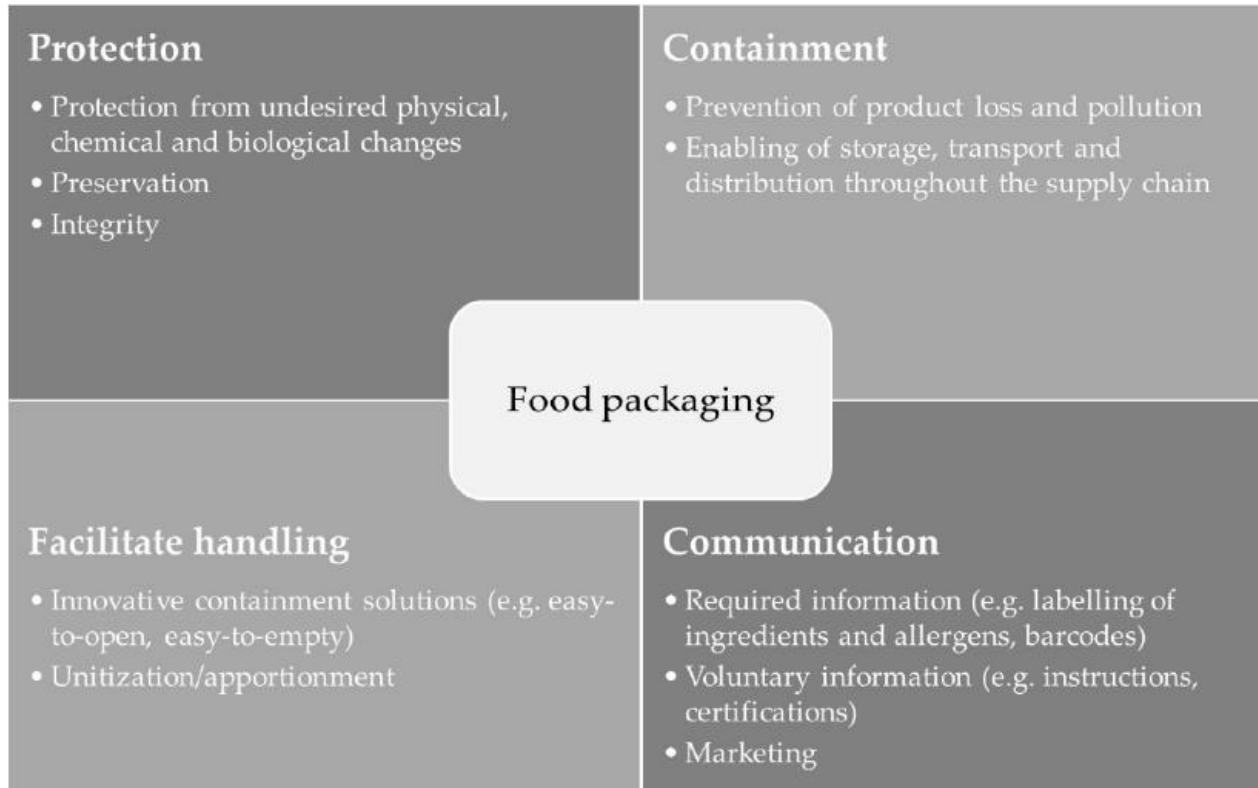


O Movimento REFOOD é independente, sustentável, 100% voluntário, democrático, orientado por cidadãos e organizado em comunidades locais. Dedicar-se à recuperação de comida em boas condições e à alimentação de pessoas necessitadas através da inclusão da comunidade local.



A GoodAfter.com é um supermercado online dedicado à venda de produtos que se encontram perto do fim do prazo de consumo preferencial, ou mesmo ultrapassado esse prazo.

Packaging Improvements



Packaging improves:

- product protection
- ventilation
- temperature control.

Polymer-based multilayer packaging extends the shelf life of food while reducing packaging weight.

Suitable for modified atmosphere packaging (MAP). Can contain a modified gas composition, mainly nitrogen, carbon dioxide, or oxygen, which aims to reduce microbial growth and chemical deterioration of the packaged food and therefore increase its shelf life.

Downside: it is usually landfilled or incinerated due to poor recyclability.

Packaging Improvements

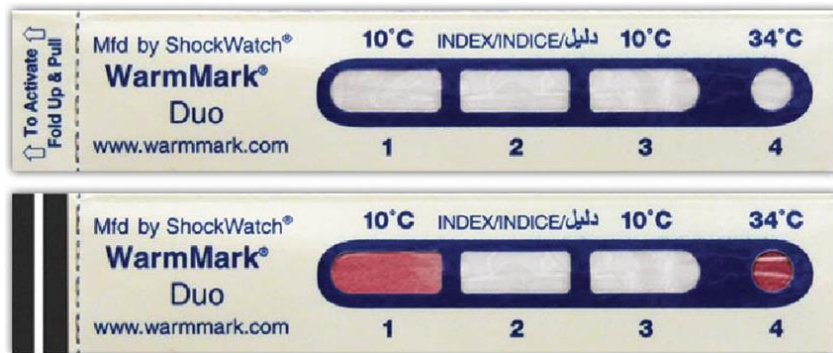


Active, Smart and Intelligent Packaging Market

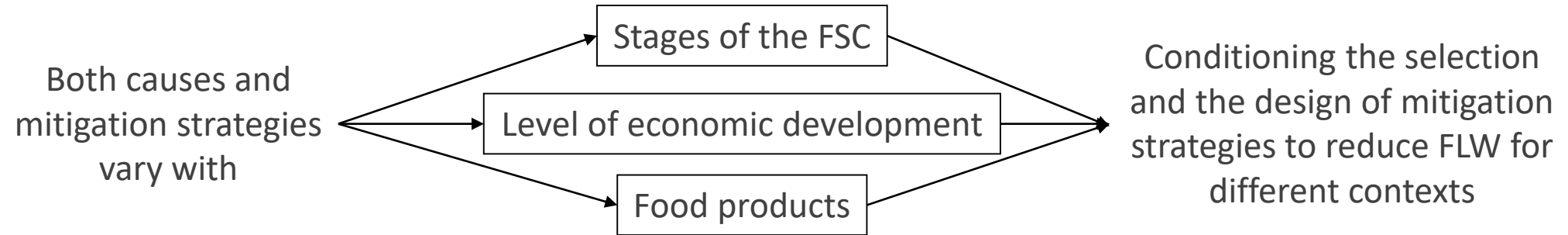
The smart packaging market was valued at USD 38.16 billion in 2020, and is expected to reach USD 48.72 billion by 2026, registering a CAGR of 4.15% over the forecast period of 2021-2026.

Active and intelligent packaging contains deliberately incorporated components intended to release or absorb substances into or from the packaged food or from the environment surrounding the food.

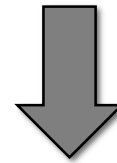
It extends the shelf life of food, since it comprises materials and articles that monitor the condition of packaged food or the environment surrounding the food, being able to reduce FLW by abandoning the system of a fixed best before data, by providing dynamic information about the actual condition of the food.



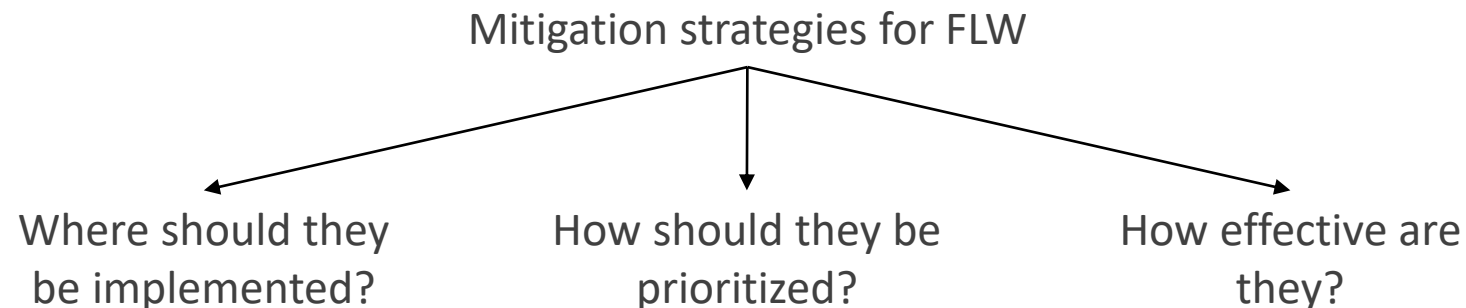
Focus of my PhD



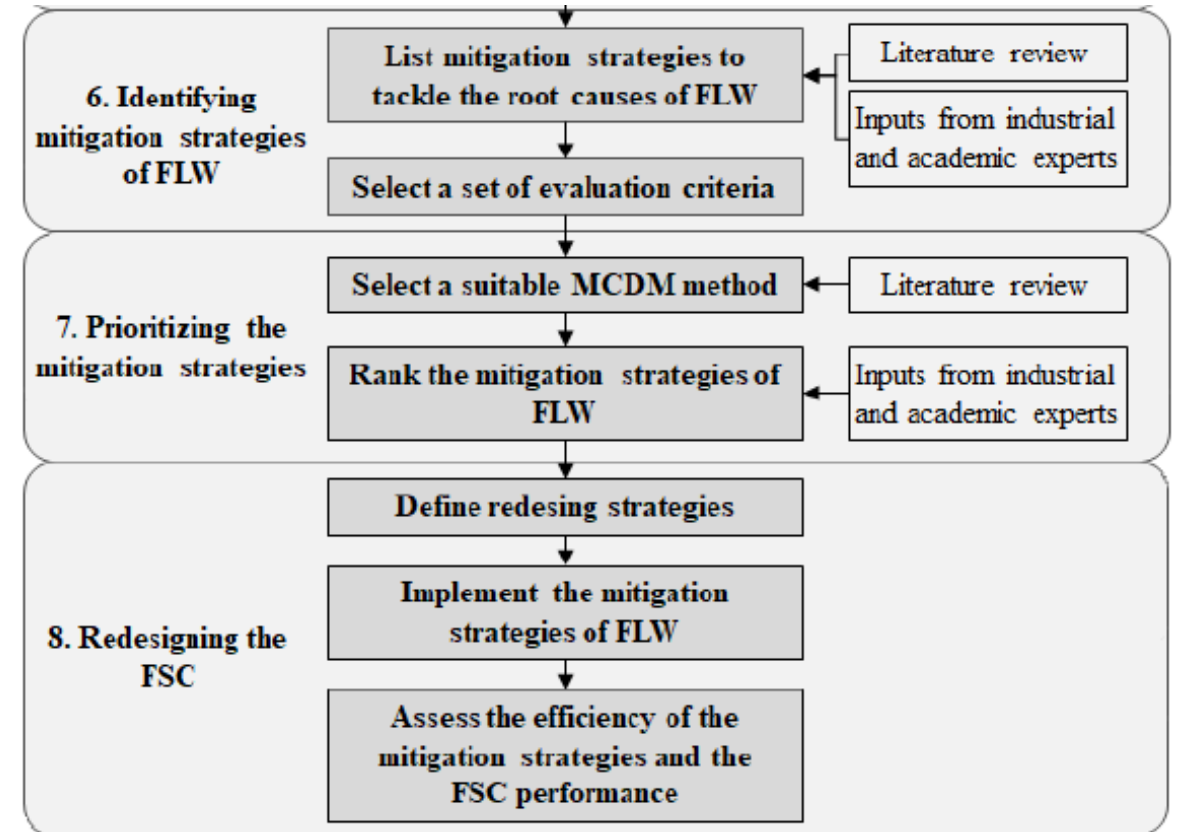
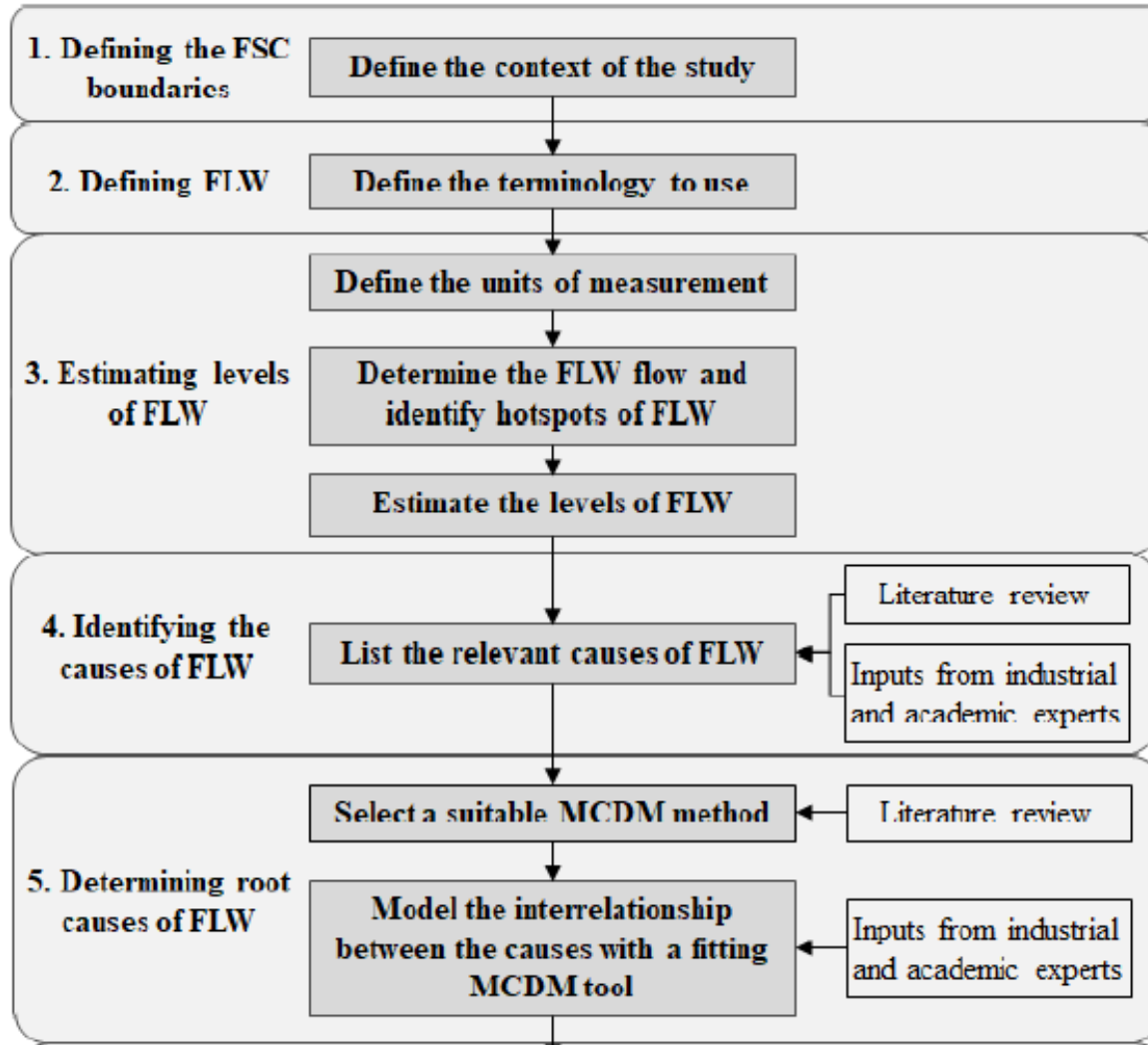
Identifying the causes of FLW is not enough

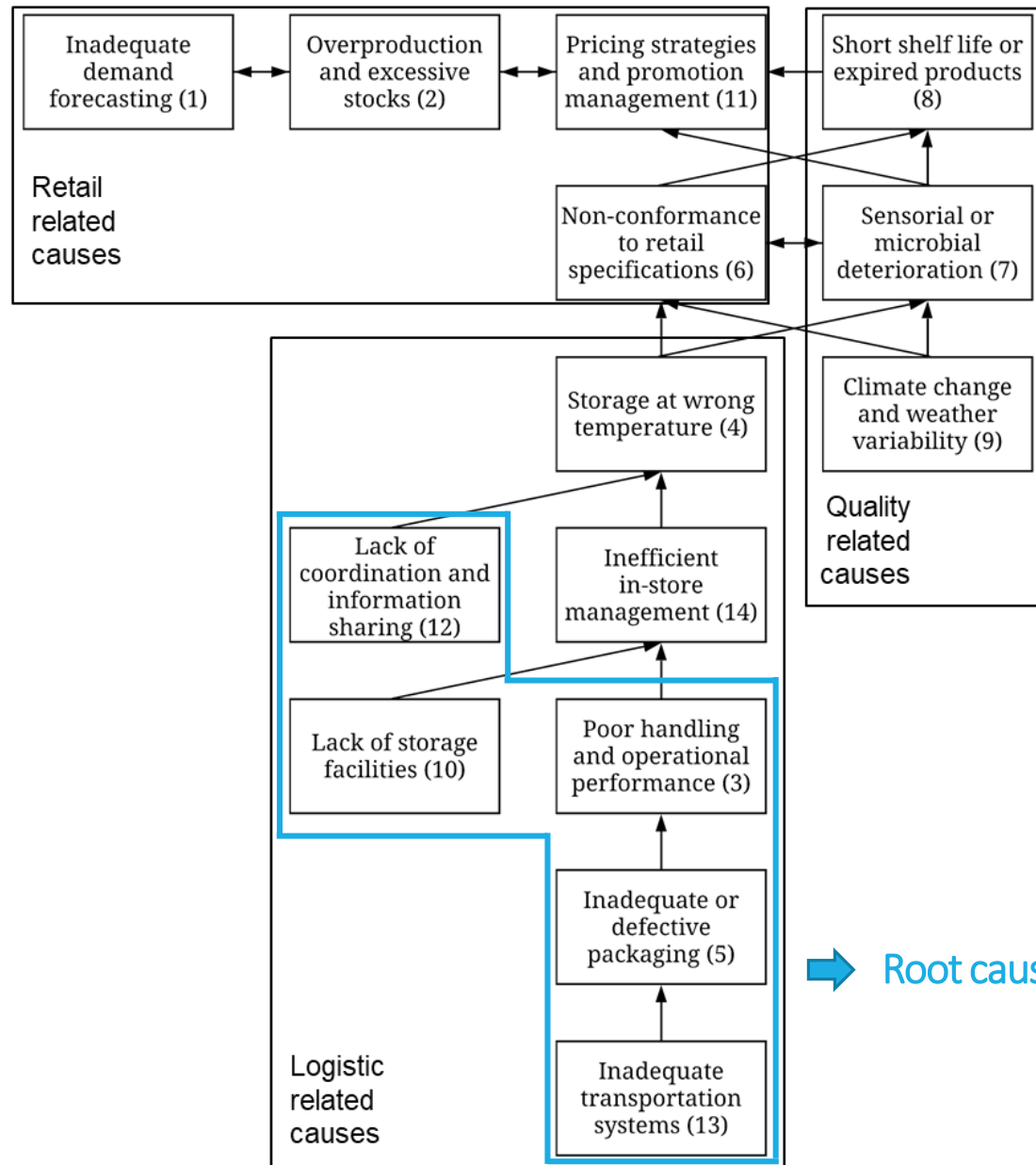


It is crucial to study which causes are the most influential of FLW



Holistic Framework to Reduce Food Loss and Waste





Interrelationships between the causes of FLW in the Portuguese Fruit and Vegetable Supply Chain

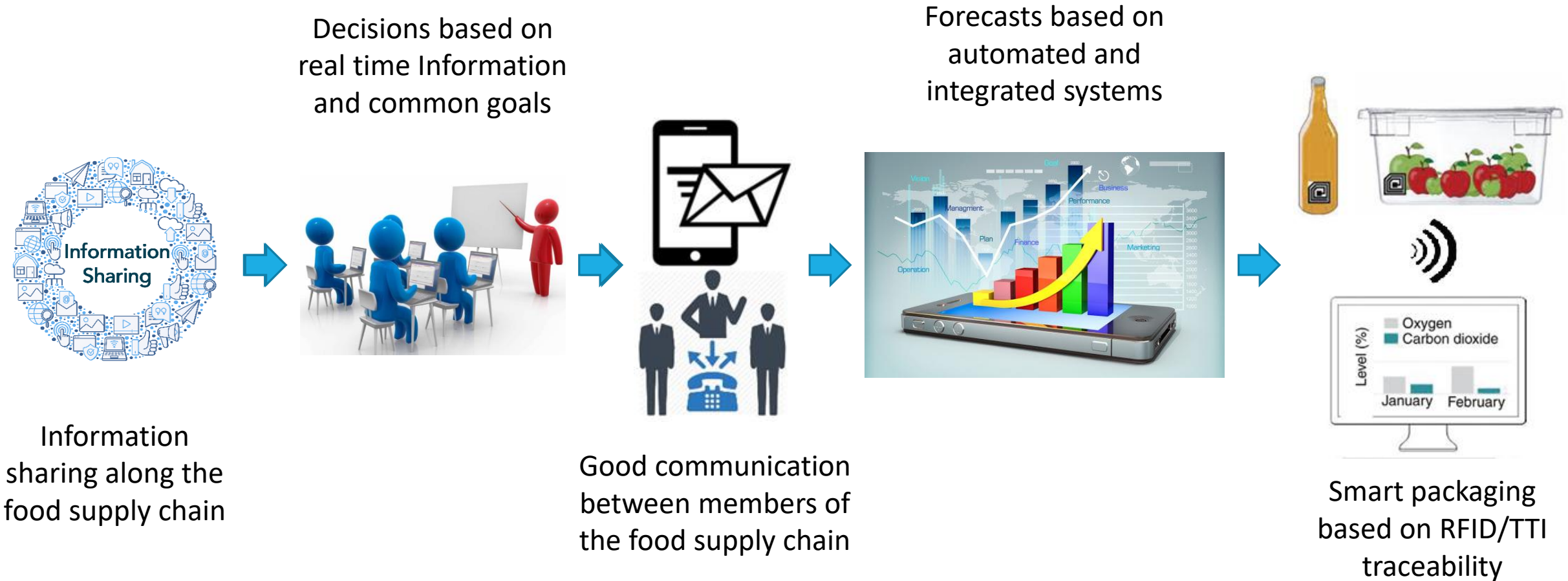
➡ Root causes of FLW

Ranking of Mitigation Strategies of Food Loss and Waste

Share and maintain information regarding the remaining shelf life	1	9	Invest in more and regularly maintain storage facilities
Training staff on handling practices	2	10	Develop new packaging and preservation techniques to enhance the product's shelf life
Ensure communication among FSC stages	3	11	Implement integrated IT systems through the FSC
Implement automated demand forecasting systems	4	12	Improve cooling methods
Develop and use intelligent packaging to monitor products' safety and quality	5	13	Ensure adherence to standard procedures
Improve visibility along the FSC through traceability systems	6	14	Improve transport infrastructures
Correct date marking to avoid confusion	7	15	Improve the means of transportation
Find new markets for overproduction or products sorted out due to industry's quality standards	8	16	Adjust packaging size

Information related	Technology related
Quality related	Transport and Infrastructures related

Main Recommendations



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Q&A

Thank you!