

CIRCULAR ECONOMY E SUSTAINABLE FOOD (SYSTEM)

**Come tutta la catena agroalimentare può
contribuire alla sostenibilità**

ENRICO BASSI

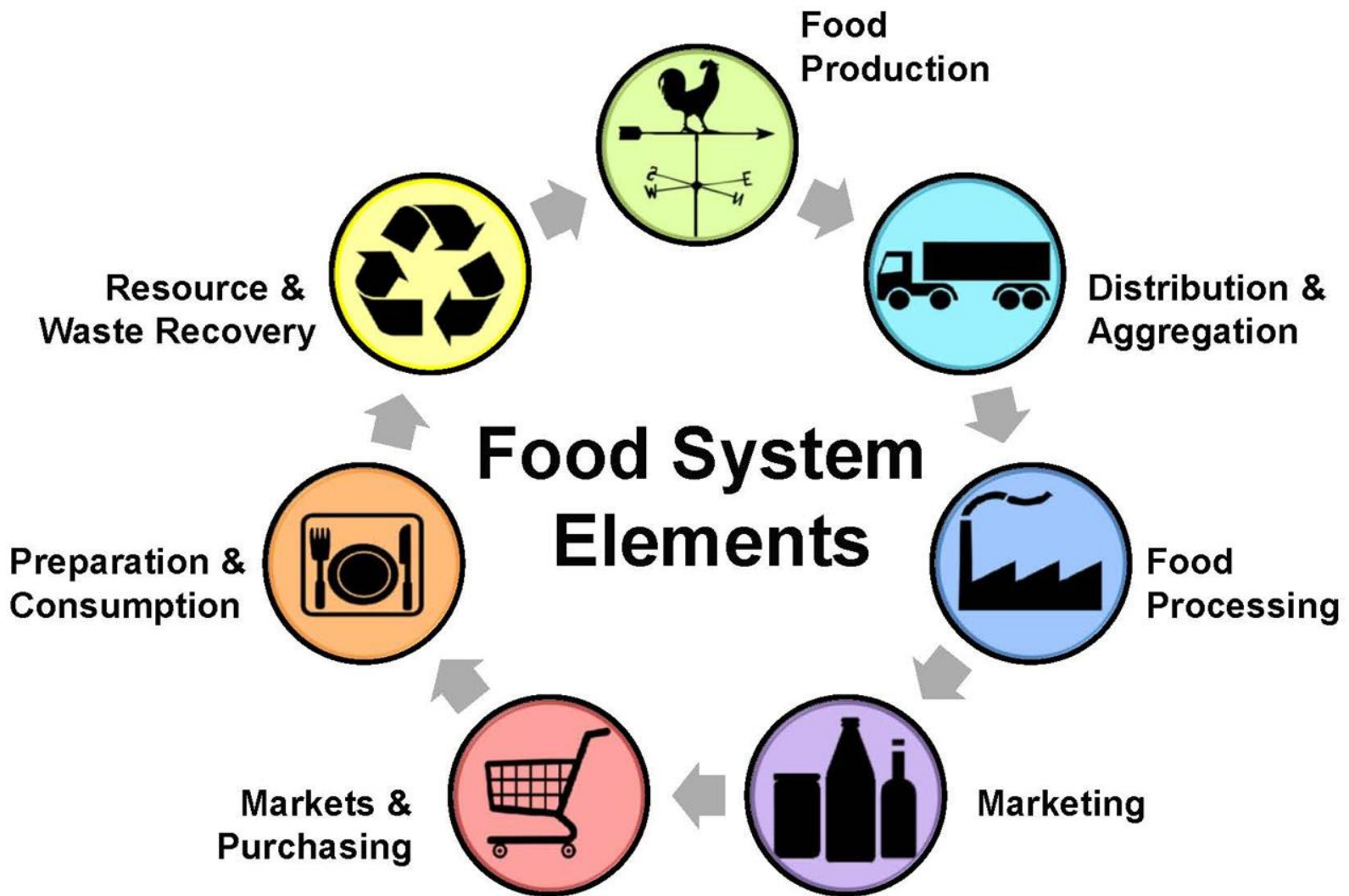
Ricercatore, Designer e Consulente per l'innovazione



IL TUO DOCENTE

- Ricercatore nell'ambito della sostenibilità
- Consulente aziendale sull'innovazione
- Docente di fabbricazione digitale
- Coordinatore del primo Fab Lab italiano (Fab Lab Italia), di Fab Lab Torino e Fab Lab OpenDot

IL SISTEMA ALIMENTARE



Adapted by Christy Shi, Center for Environmental Farming Systems.

From: Wilkins, J. and Eames-Sheavly, M. Discovering the Food System; An experiential learning program for young and inquiring minds. Cornell University, Departments of Nutritional Science and Horticulture. <http://www.discoverfoodsys.cornell.edu/>

GLI ATTORI

AZIENDE

CHIUNQUE FORNISCA UN PRODOTTO O UN SERVIZIO LUNGO LA CATENA

l'attore che può implementare i cambiamenti e accelerarli

PUBBLICA AMMINISTRAZIONE

CHIUNQUE NORMI CIÒ CHE ACCADE LUNGO LA CATENA

chi formalizza gli obiettivi e setta gli obiettivi

UTENTI

CHIUNQUE INTERAGISCA CON I PRODOTTI, I SERVIZI O LE NORME LUNGO LA CATENA

chi interviene attivamente e supporta (o si oppone) al cambiamento

PERCHÉ È COSÌ IMPORTANTE

GOOD

Alimentazione:

- sana
- preventiva
- curativa

NO WASTE

nessuno spreco dalla
vendita in poi

NO LOSS

nessuno spreco
nella produzione

FAIR

Che generi un beneficio accessibile a tutti, indipendentemente da reddito, cultura, istruzione, età e provenienza.

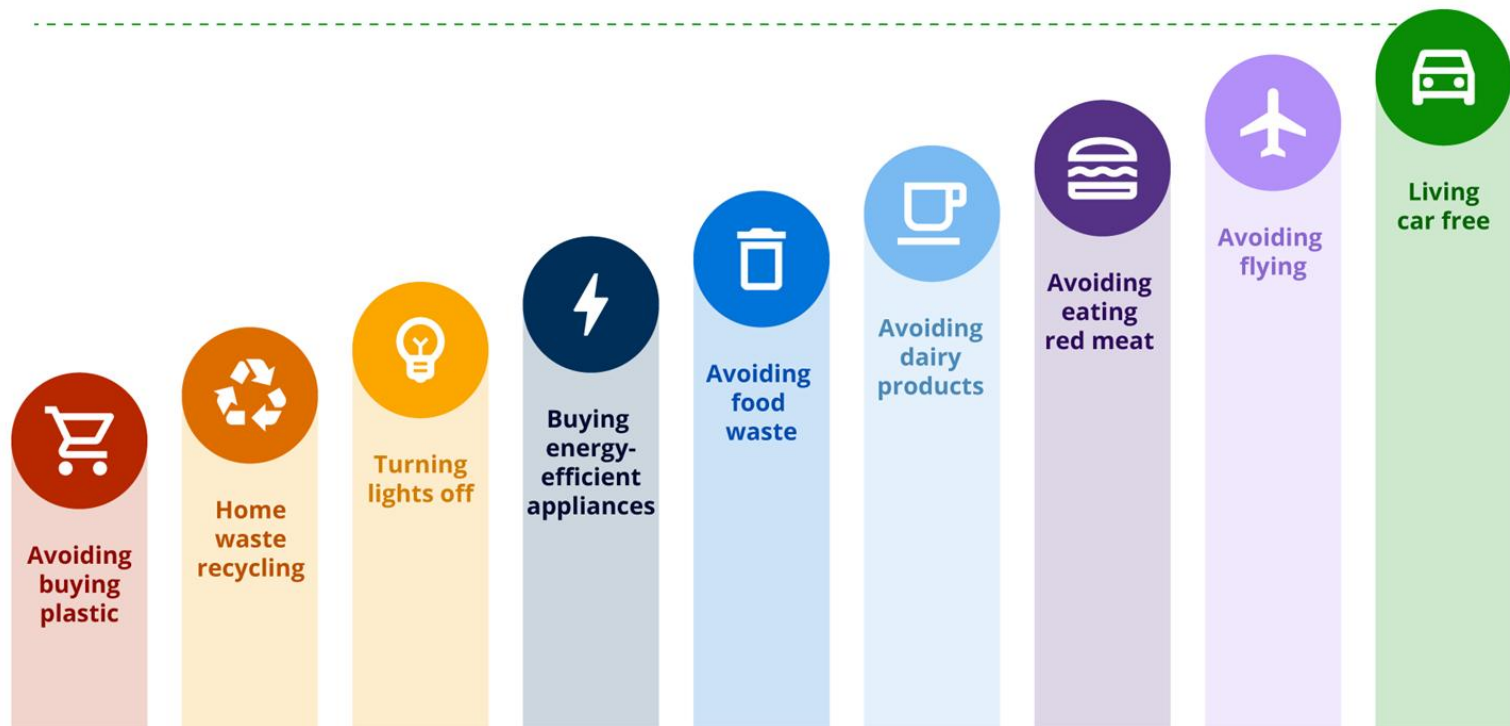
FOOD LOSS VS. FOOD WASTE



PERCHÉ UNA
TRASFORMAZIONE
SOSTENIBILE È
NECESSARIA

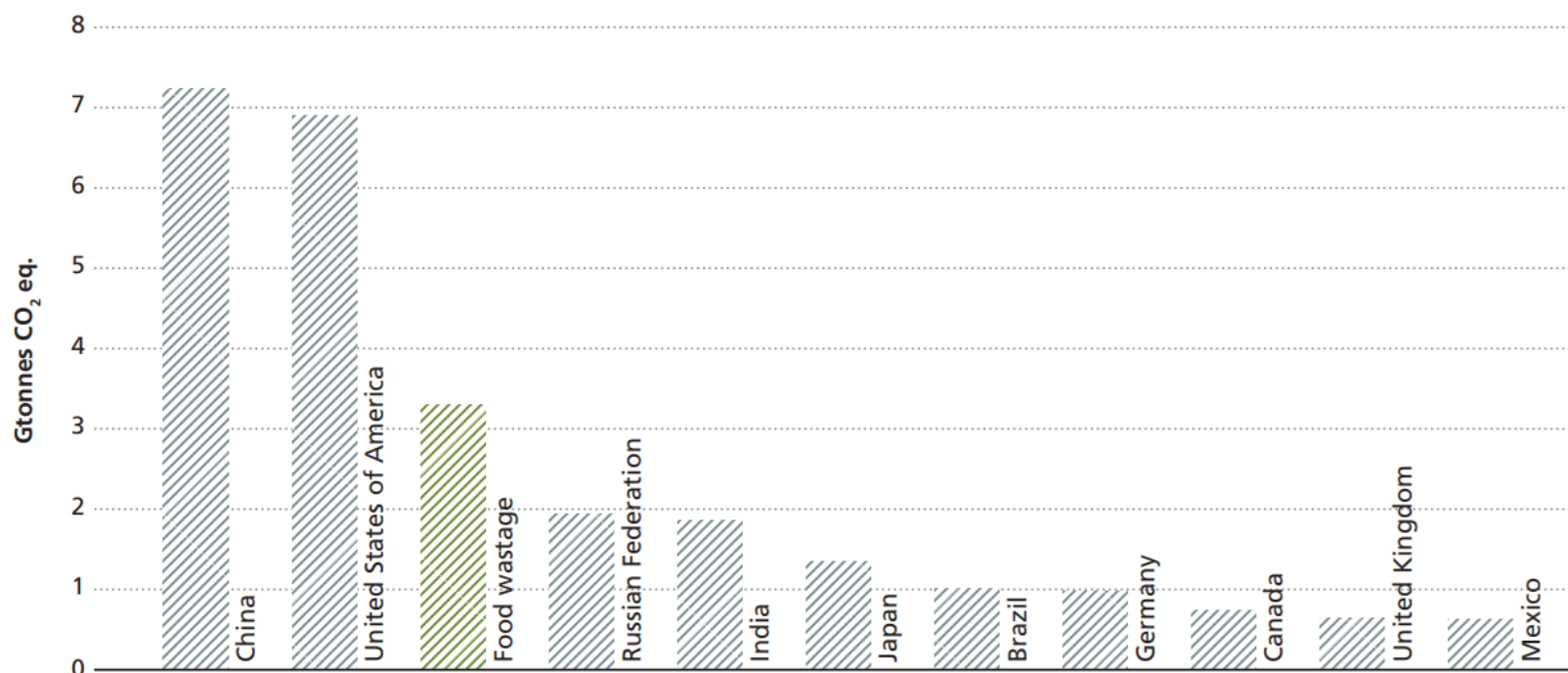
L'IMPATTO SULL'AMBIENTE

What lifestyle choices make a bigger impact to carbon output?



<https://blogs.bath.ac.uk/climate-action/2022/04/13/climate-change-can-one-person-really-make-a-difference/>

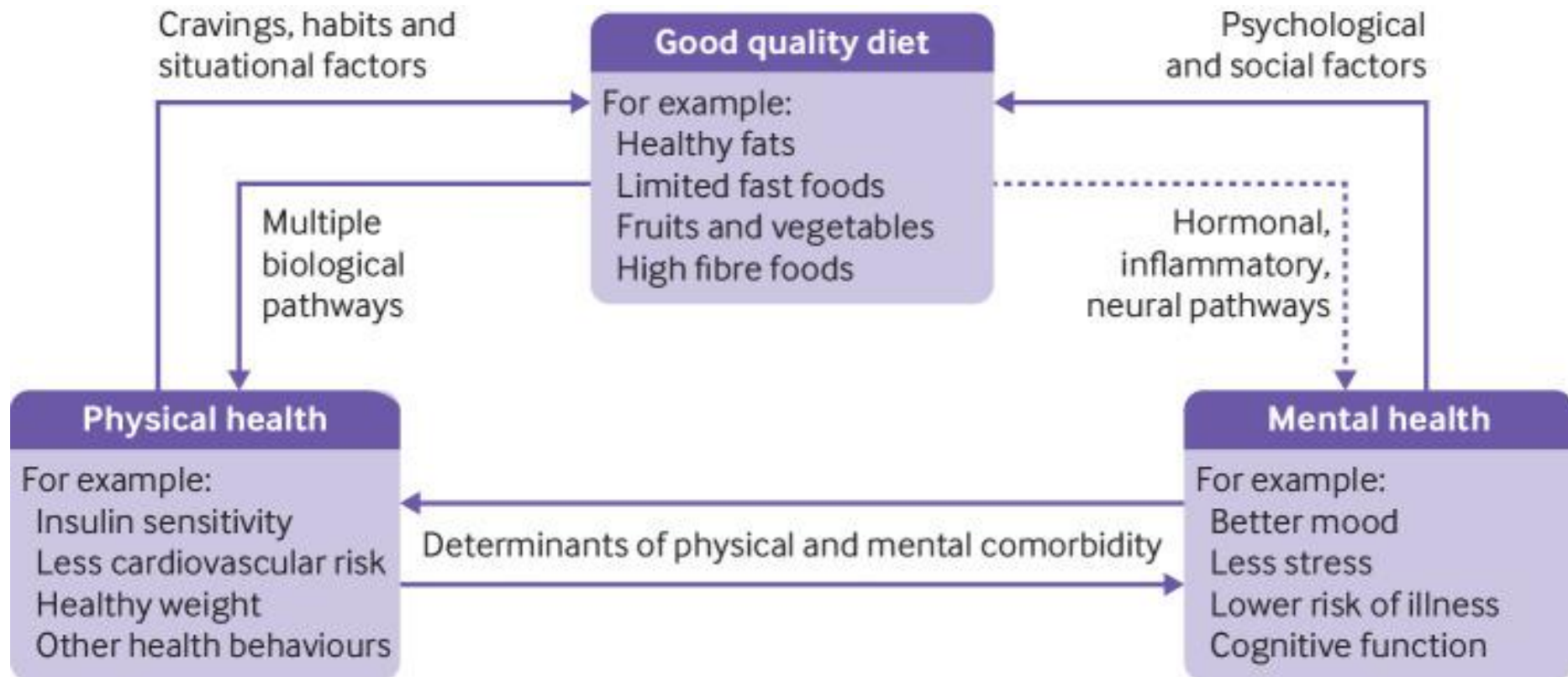
TOP TEN GLOBAL GREENHOUSE GAS-EMITTING COUNTRIES VERSUS FOOD LOSS AND WASTE, 2005



Source: WRI. 2012. Climate Analysis Indicators Tool. Available at: <http://cait.wri.org>

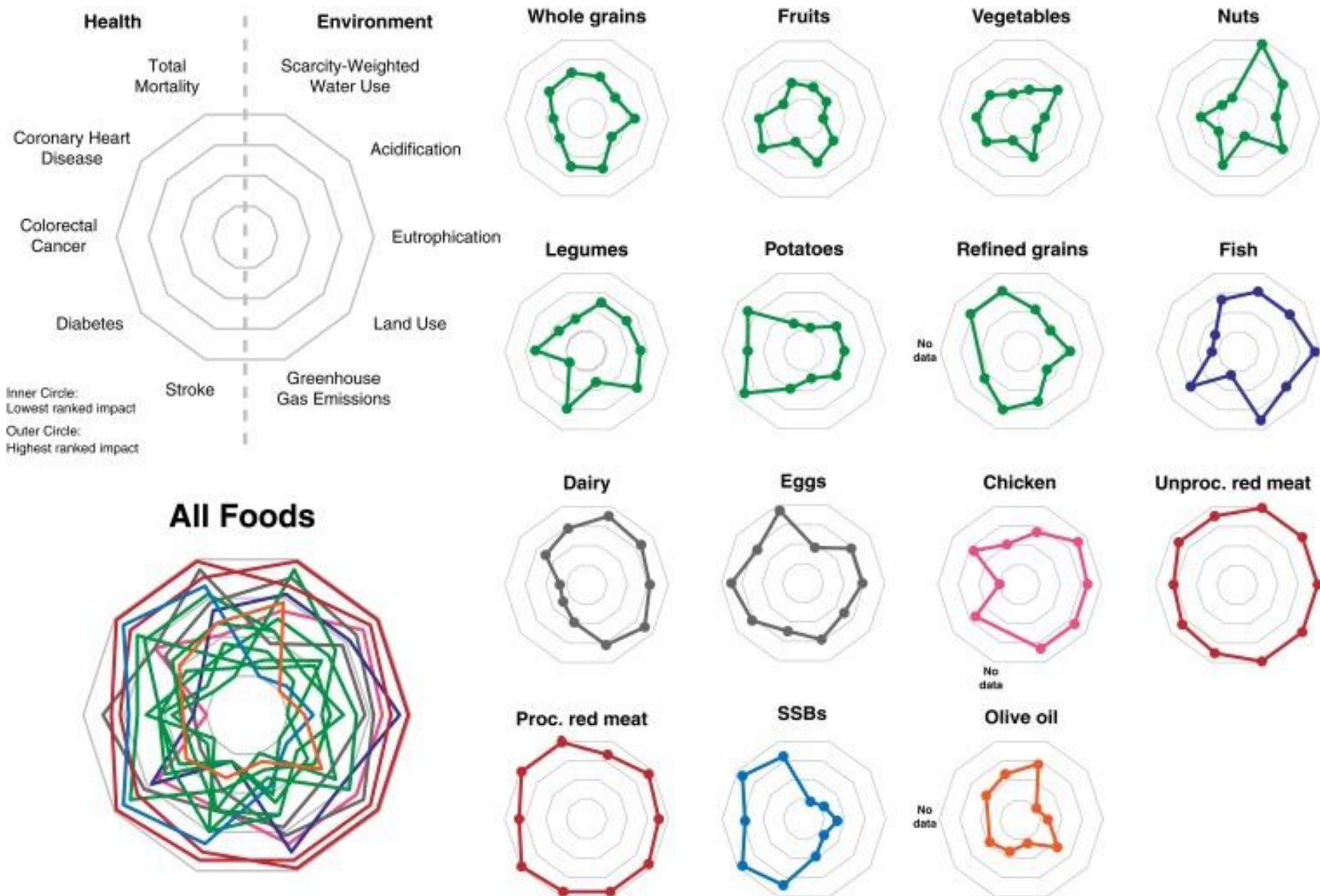
<https://openknowledge.fao.org/server/api/core/bitstreams/57f76ed9-6f19-4872-98b4-6e1c3e796213/content>

L'IMPATTO SULLE PERSONE



"Food and mood: how do diet and nutrition affect mental wellbeing?"

<https://pmc.ncbi.nlm.nih.gov/articles/PMC7322666/>



STRATEGIE



COS'È LA CIRCULAR ECONOMY

L'economia circolare è un modello di produzione e consumo che implica condivisione, prestito, riutilizzo, riparazione, ricondizionamento e riciclo dei materiali e prodotti esistenti il più a lungo possibile.

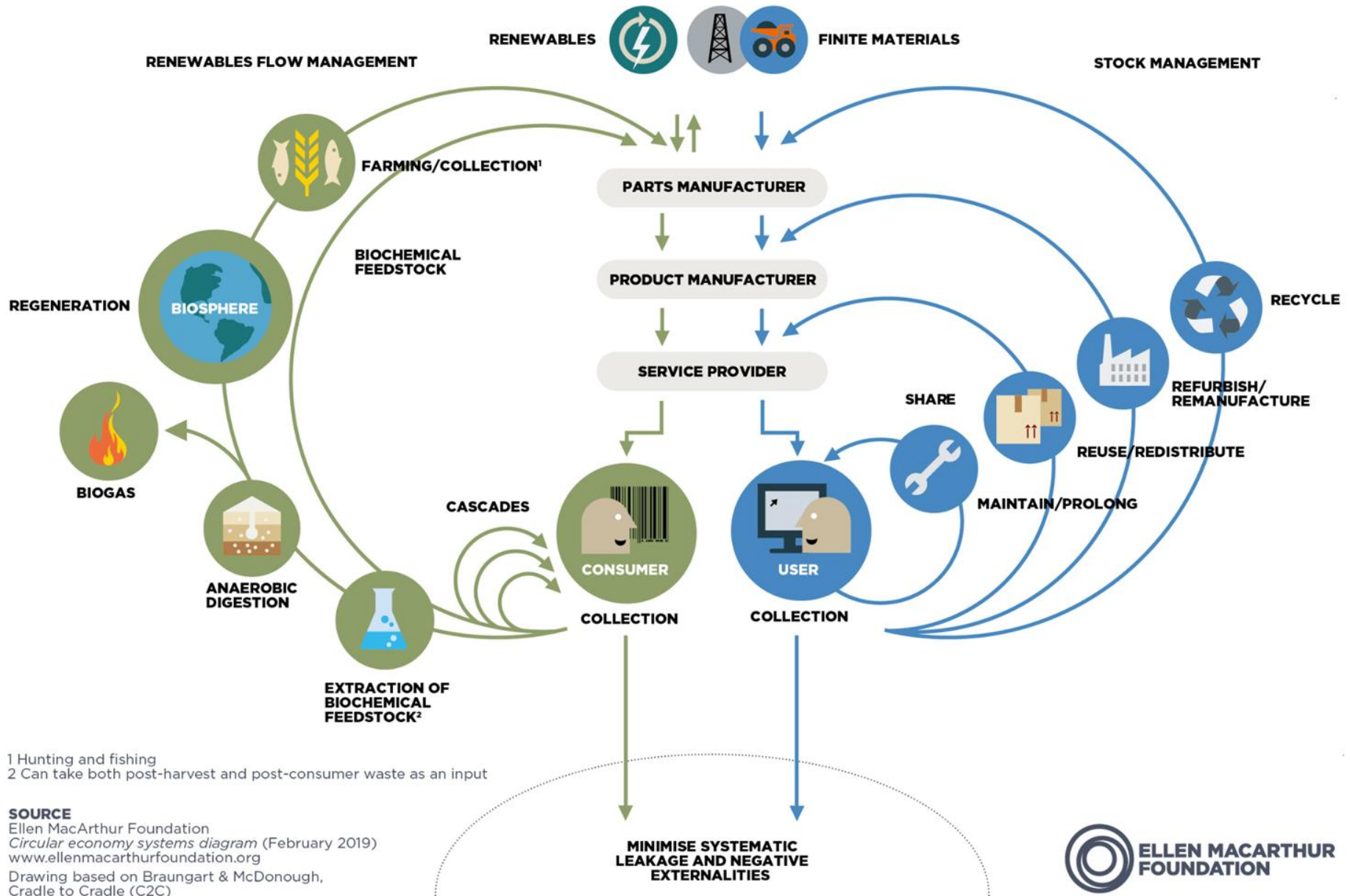
I CONCETTI CHIAVE

CHIUDERE I CERCHI - ogni flusso di materiale deve essere chiuso (confluire in un altro)

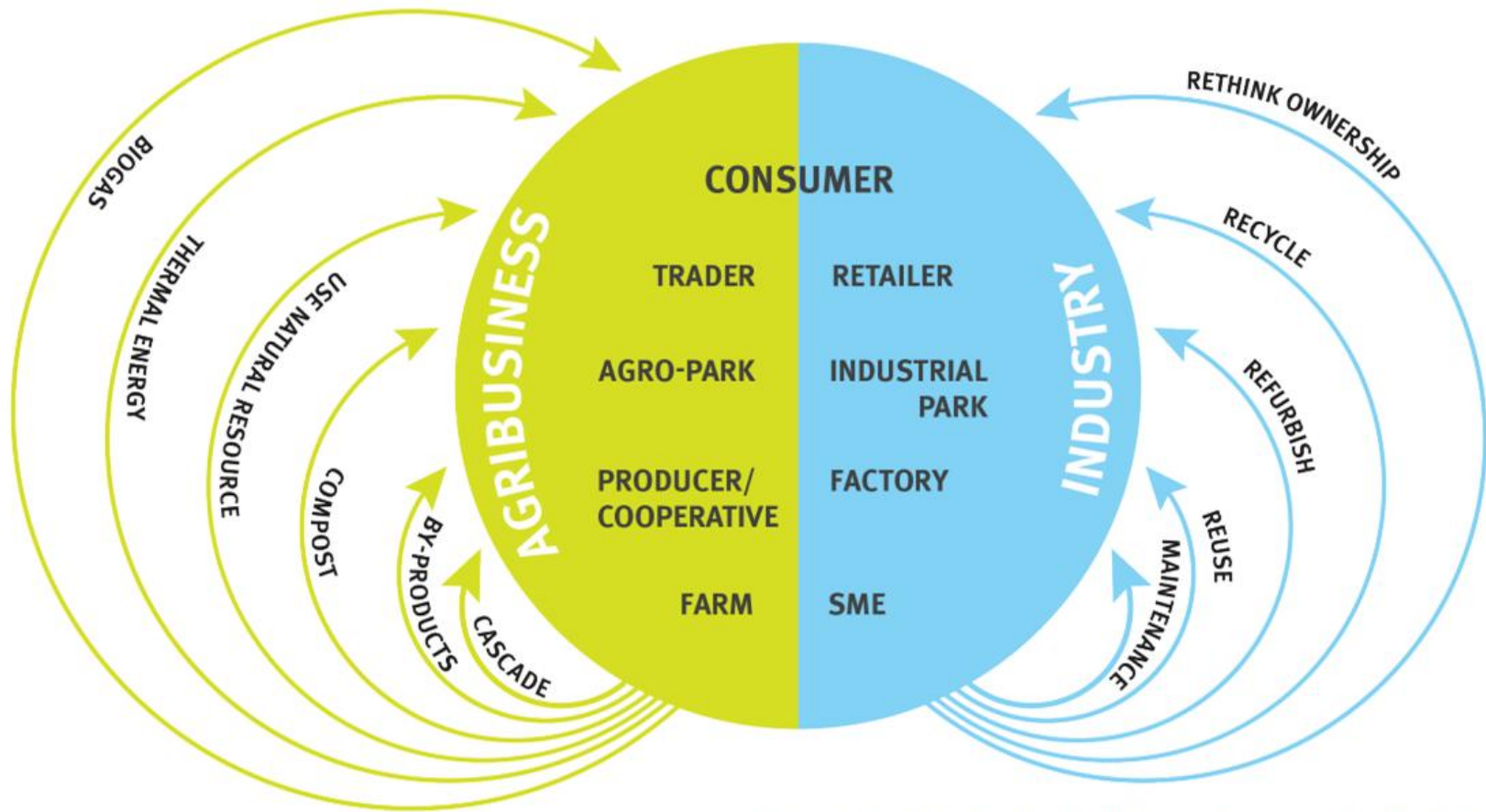
STRATEGIE - Ogni modello propone delle strategie che rendono il sistema circolare

GERARCHIA - le strategie hanno un ordine di priorità, in base a quanto impattanti sono.

CIRCULAR ECONOMY

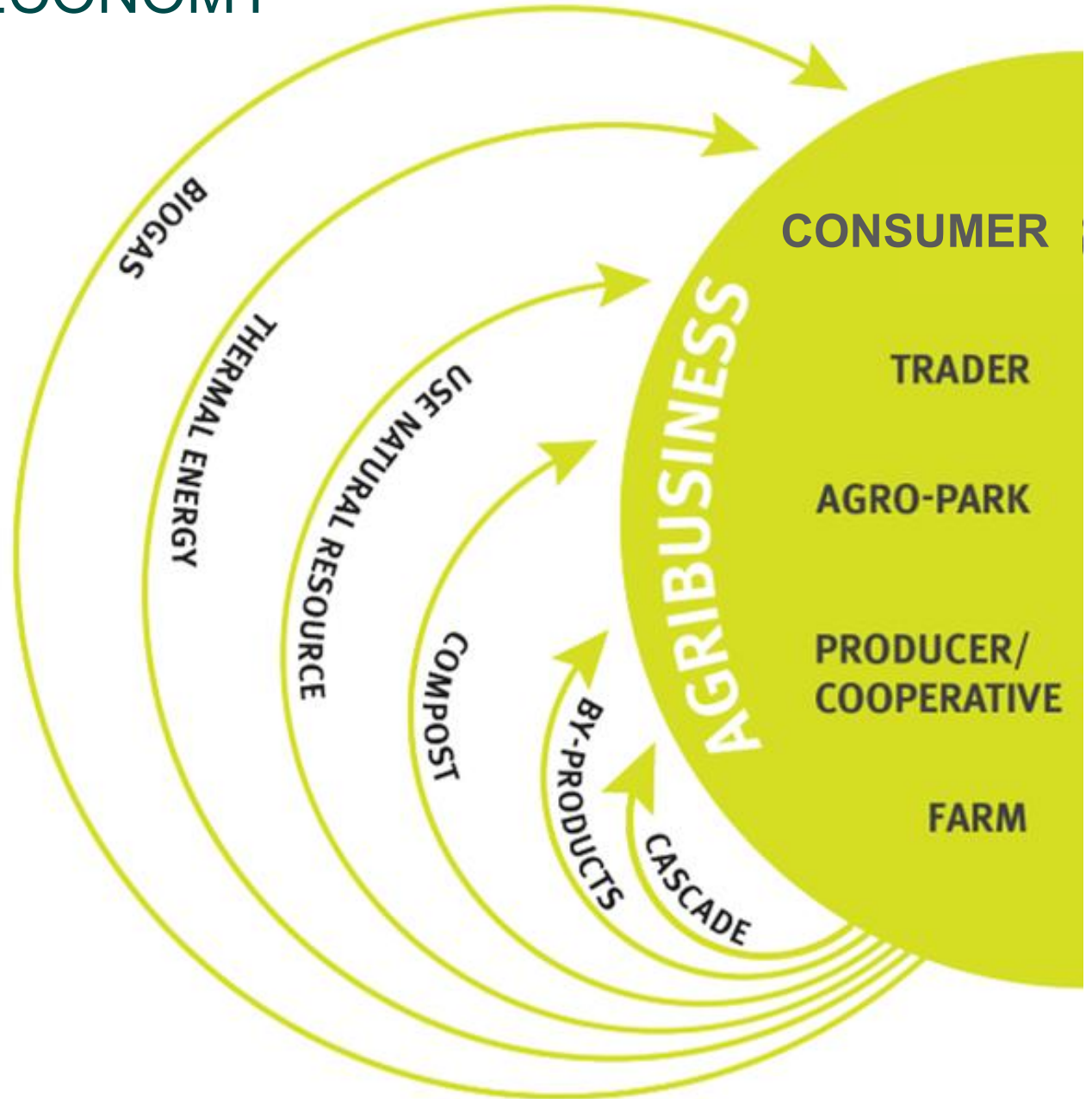


CIRCULAR ECONOMY



Source: Ellen MacArthur Foundation concept, redesigned by UNIDO

CIRCULAR ECONOMY



Food Recovery Hierarchy

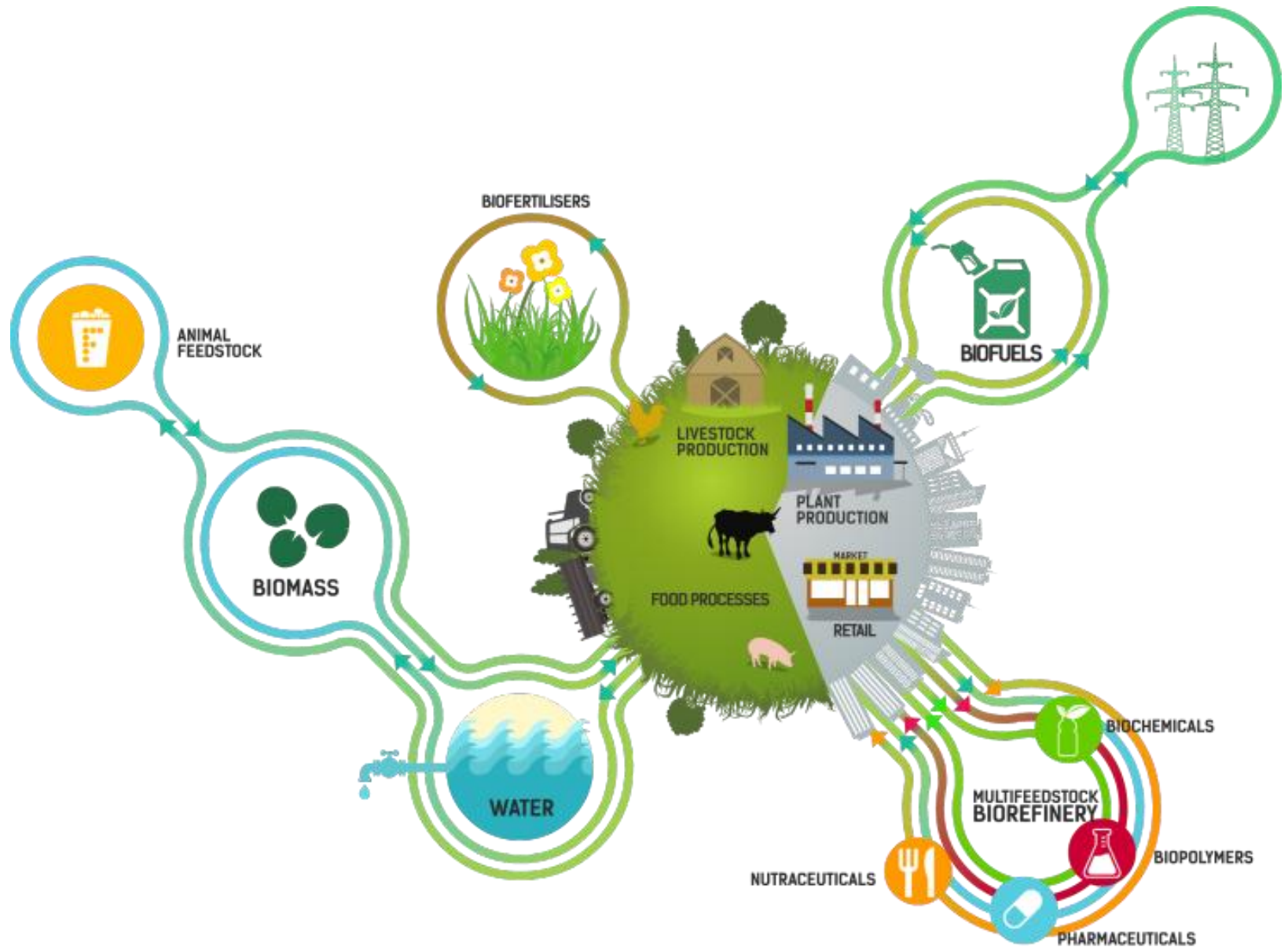


LE GERARCHIE

Imparare un framework di strategie e capire come applicarle.

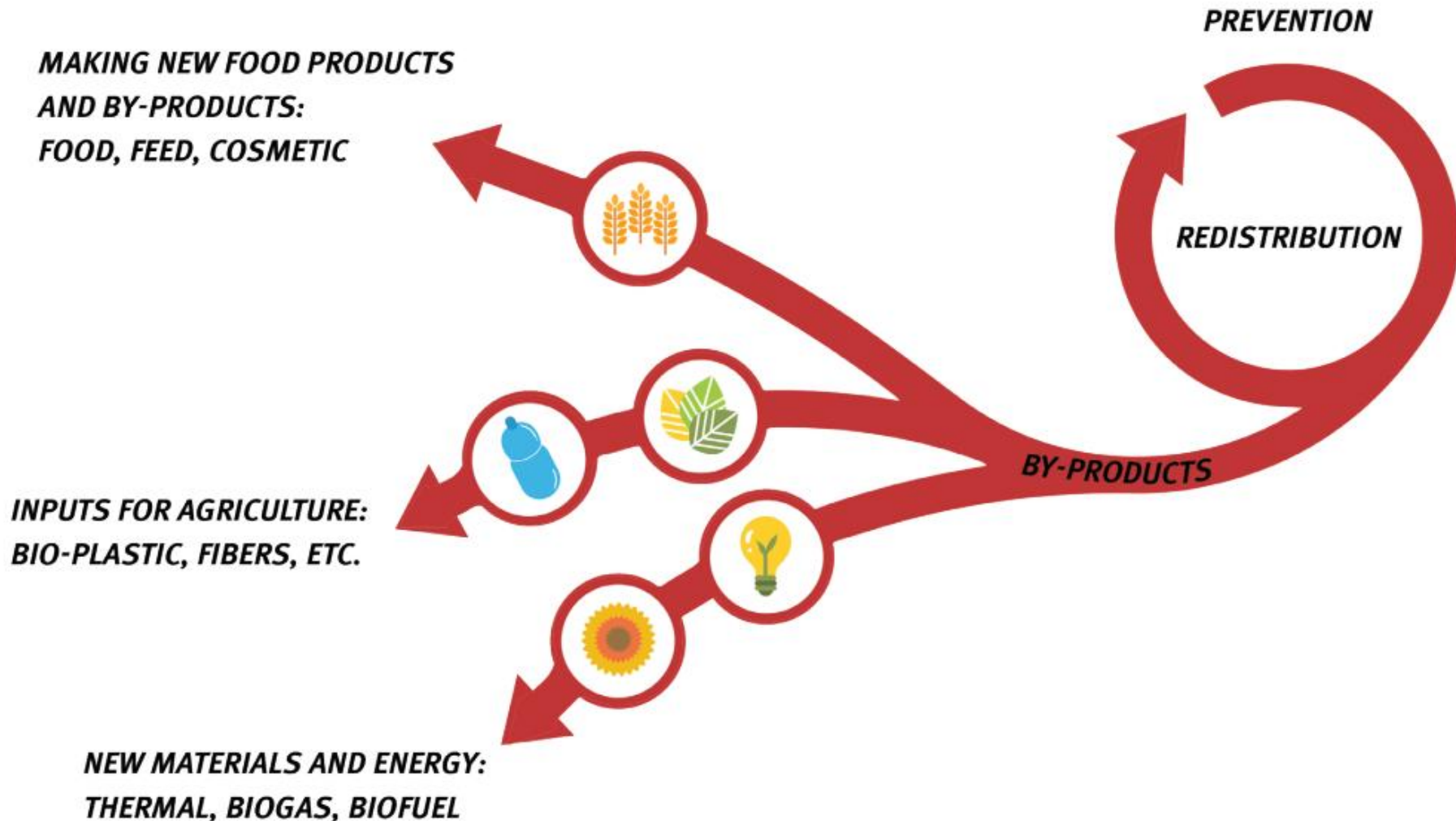
Scegliere qual'è la migliore e con che ordine cercare di integrarle.

BIO SYSTEM



L'USO A CASCATA

Practically recapturing value from food waste takes the following alternatives:



L'USO DELLE RISORSE A CASCATA

IL CASO DELL'OLIO
D'OLIVA

<https://www.food-hub.it/media/2021/01/08/s-ansa-di-oliva/>

Alimentazione umana

- Evitare gli sprechi
 - non danneggiare l'oliva
 - sistema di raccolta avanzati
- riuso di prodotti secondari
 - estratti polifenolici

Alimentazione animale

- Sansa come ingrediente per i mangimi

Cosmesi

- olio di minore qualità per sapone

Compostaggio Aerobico

- riuso di noccioli e acqua di vegetazione

Biomateriali

- bioplastica per packaging

Biocombustibile

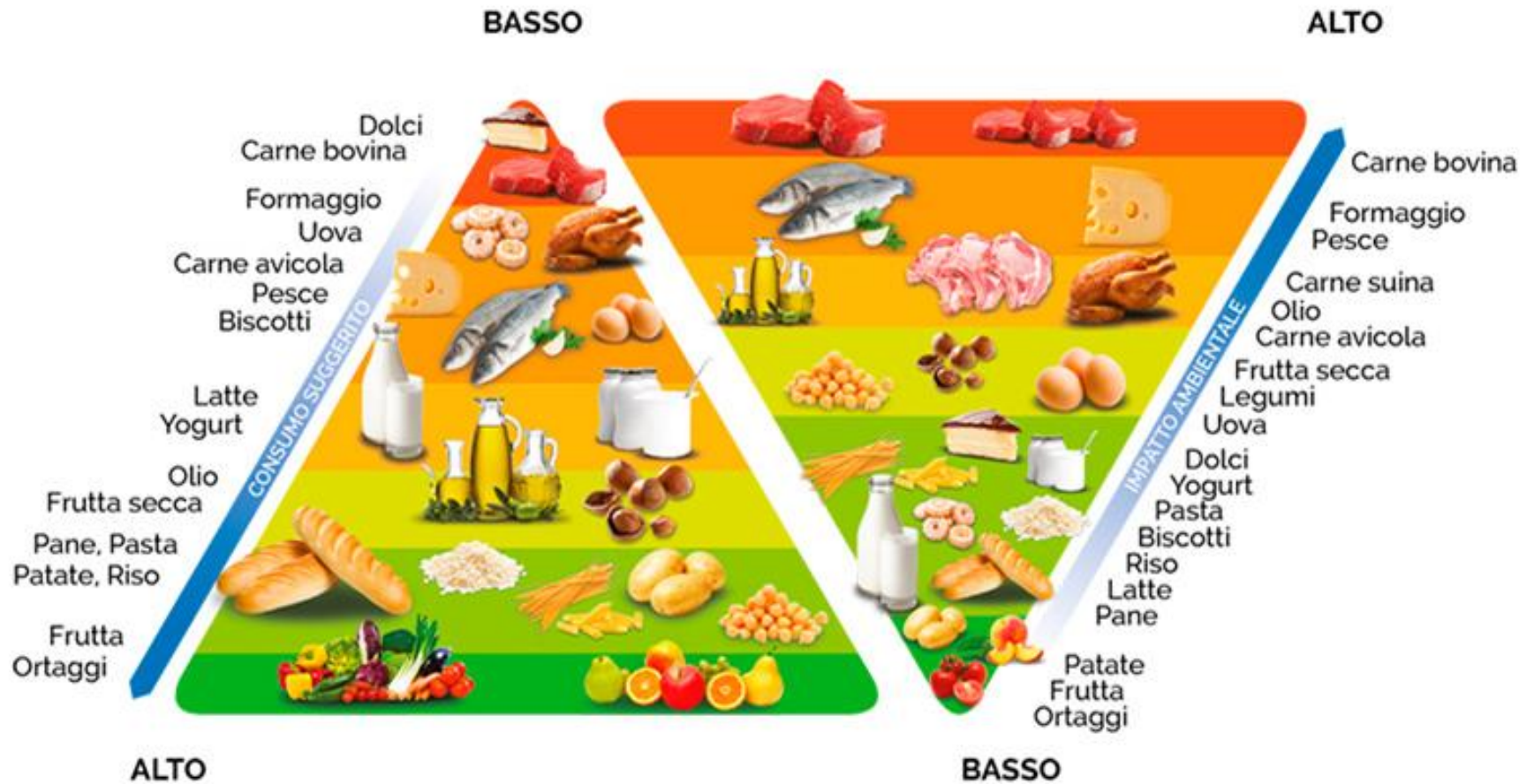
- riuso dei noccioli

Fermentazione anaerobica

- biogas

OLTRE LA SOSTENIBILITÀ AMBIENTALE

PIRAMIDE AMBIENTALE



PIRAMIDE ALIMENTARE

LA PRODUZIONE

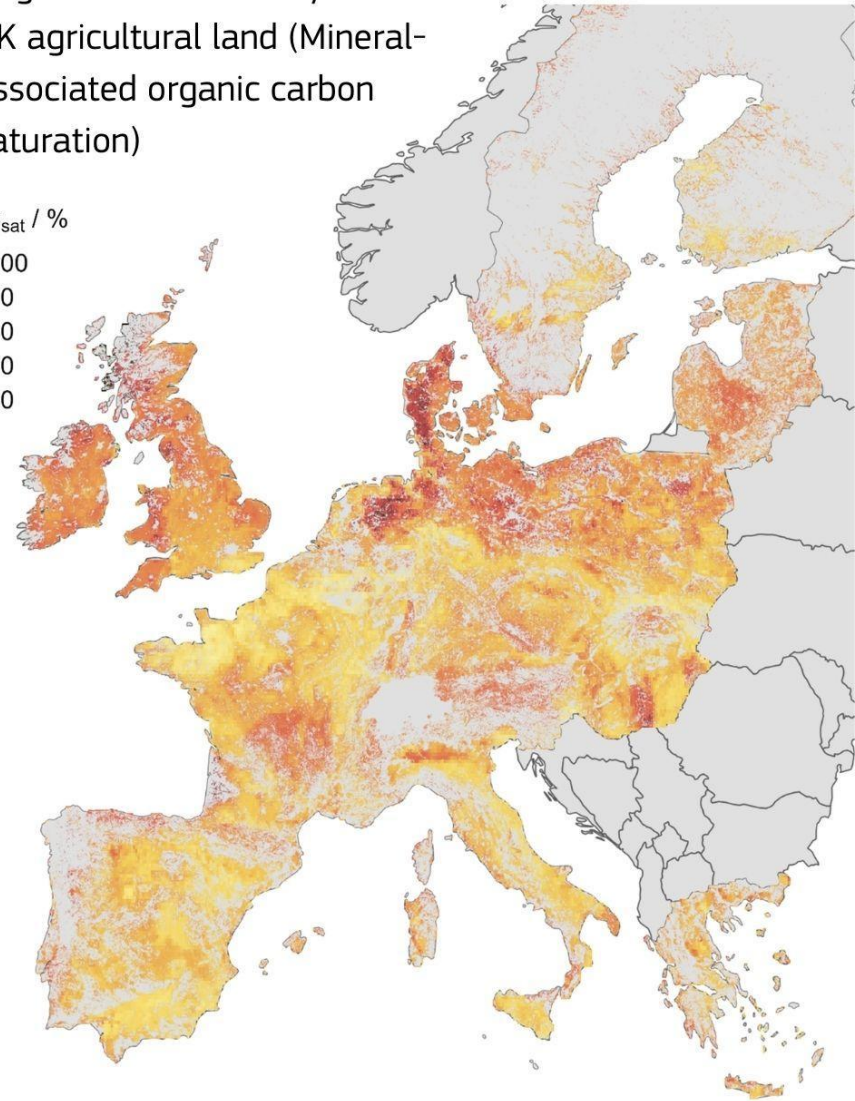
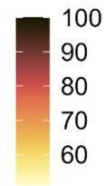
IL SUOLO

[...] Soil organic carbon also supports the productivity of soils, by improving their structural condition, water holding capacity and nutrient supply, rendering them more resilient to disturbances related to land use and climate conditions.

The climate crisis has increased the loss of soil organic carbon [...]

Degree of vulnerability of EU and UK agricultural land (Mineral-associated organic carbon saturation)

MAOC_{sat} / %



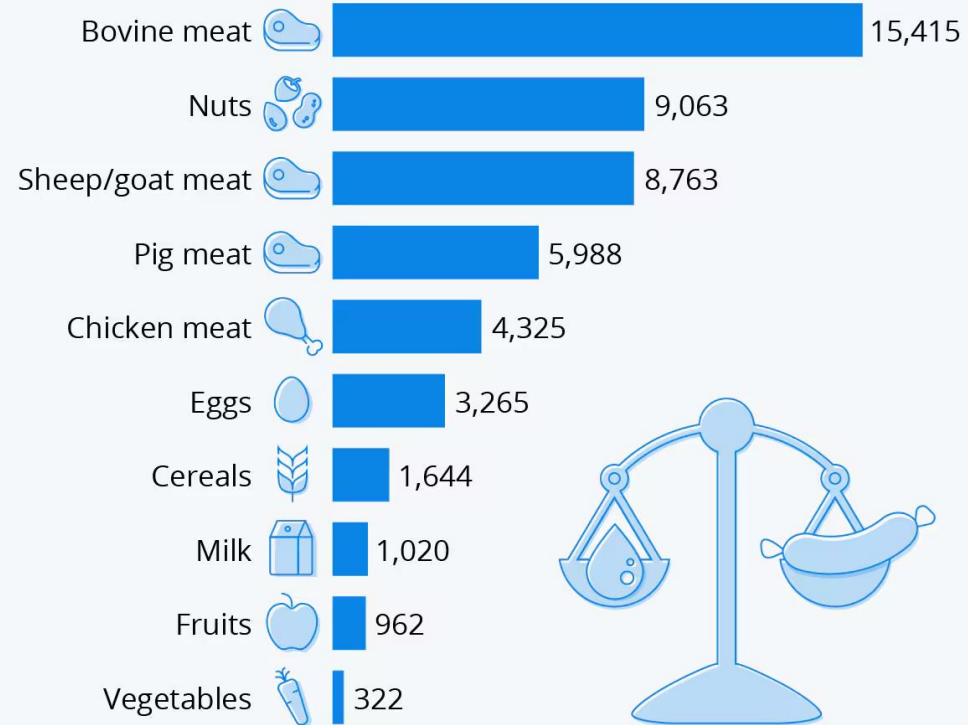
https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/soil-organic-carbon-risk-large-part-european-agricultural-land-2025-03-18_en

L'ACQUA

[...] Agriculture accounts for 70 percent of freshwater withdrawals worldwide, and pressure on water supplies for industrial, domestic and agricultural sectors is growing. That is why sustainable water resource management to increase water productivity in food and agriculture remains critical. [...]

How Thirsty is Our Food?

Liters of water required to produce one kilogram of the following food products*



* Global averages
Source: Water Footprint Network



statista

BIODIVERSITÀ

[...] A growing number of pollinator species worldwide are being driven toward extinction by diverse pressures, many of them human-made, threatening millions of livelihoods and hundreds of billions of dollars worth of food supplies, according to the first global assessment of pollinators. [...]

https://files.ipbes.net/ipbes-web-prod-public-files/Pollination_Ministerial_media_round%20table_IPBES.pdf

By the numbers

20,000 – Number of species of wild bees. There are also some species of butterflies, moths, wasps, beetles, birds, bats and other vertebrates that contribute to pollination.

75% – Percentage of the world's food crops that depend at least in part on pollination.

US\$235 billion–US\$577 billion – Annual value of global crops directly affected by pollinators.

300% -- Increase in volume of agricultural production dependent on animal pollination in the past 50 years.

Almost 90% -- Percentage of wild flowering plants that depend to some extent on animal pollination.

1.6 million tonnes – Annual honey production from the western honeybee.

16.5% -- Percentage of vertebrate pollinators threatened with extinction globally.

+40% – Percentage of invertebrate pollinator species – particularly bees and butterflies – facing extinction.

L'INQUINAMENTO

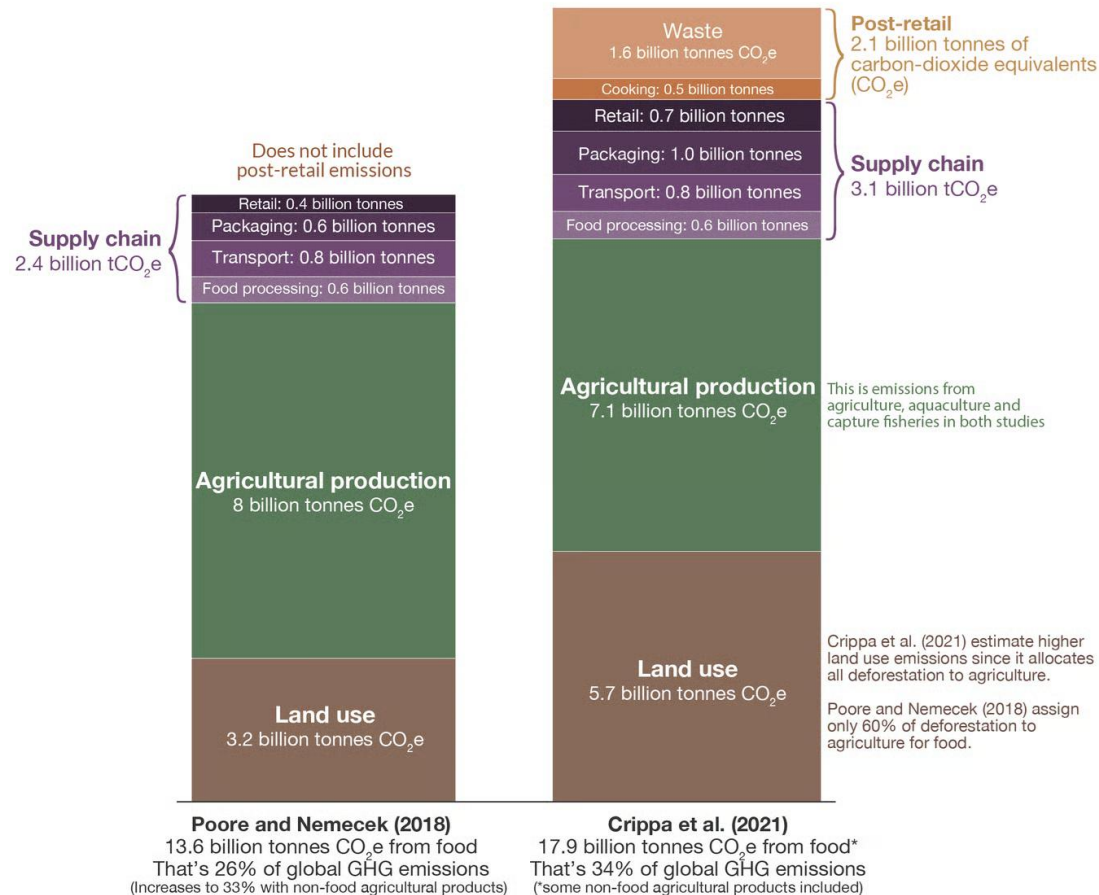
How much of global greenhouse gas emissions come from the food system?

Our World
in Data

Shown is the comparison of two leading estimates of global greenhouse gas emissions from the food system. Most studies estimate that food and agriculture is responsible for 25% to 35% of global greenhouse gas emissions.

[...] The study my article was based on was published by Joseph Poore and Thomas Nemecek, estimated that the food system was responsible for one-quarter (26%) of global emissions. A new study, published by Monica Crippa and colleagues in Nature Food estimates a higher share: one-third (34%) of emissions. [...]

<https://ourworldindata.org/greenhouse-gas-emissions-food>



*Crippa et al. (2021) include emissions from a number of non-food agricultural products, including wool, leather, rubber, textiles and some biofuels. Poore and Nemecek (2018) do not include non-food products in their estimate of 13.6 billion tonnes CO₂e. This may explain some of the difference.

Data sources: Joseph Poore & Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. Crippa, M., et al. (2021) Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*.

OurWorldInData.org – Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

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Choose your ideal beehive
We equip it with our Hive-Tech technology
You receive honey and valuable data for environmental biomonitoring.

Contact Us

60k

Monitored bees

+250

Involved companies

Choose a beehive remotely or at your company, with monitoring and honey included

Monitor with sensors in the beehive; they will listen to the bees to understand how they are doing and intervene if necessary.

Raise awareness among collaborators with our app by communicating your commitment and delivering the honey from your beehive.

<https://www.3bee.com/>



OBSERVE

OPI monitors the micro-climate of plants and soil with sensors specifically designed for agriculture. You can now check the status of your crops **everywhere you are**.

PREDICT

OPI growth models are calibrated on your crops by artificial intelligence, providing you key information on **weather, plant growth and diseases**.

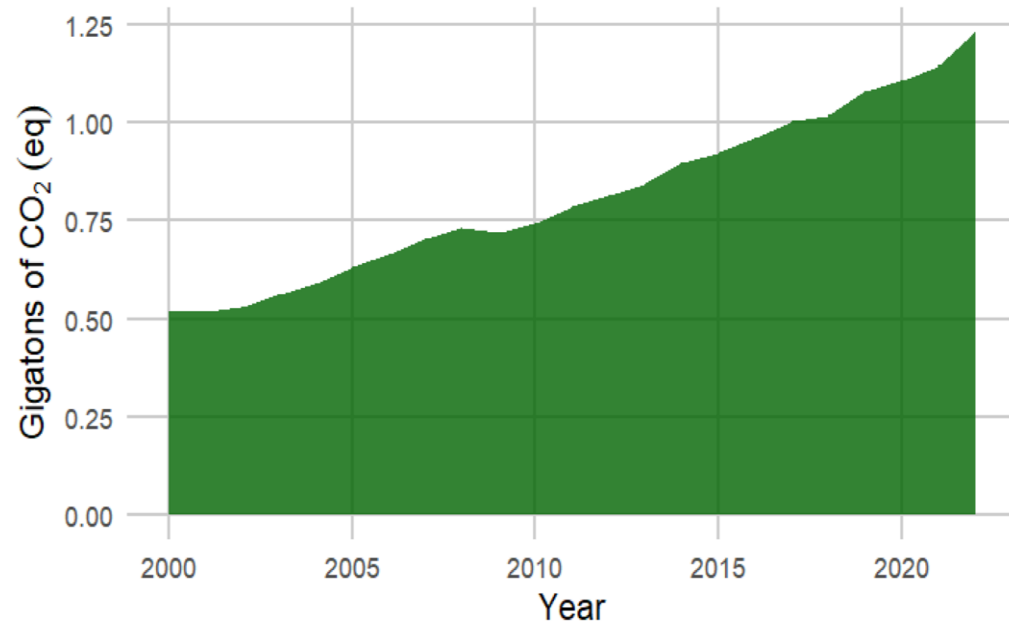
IMPROVE

OPI collects and analyzes agro-climatic data of your crops, so you can focus on the information that matters the most to You and optimize **your crop management**.

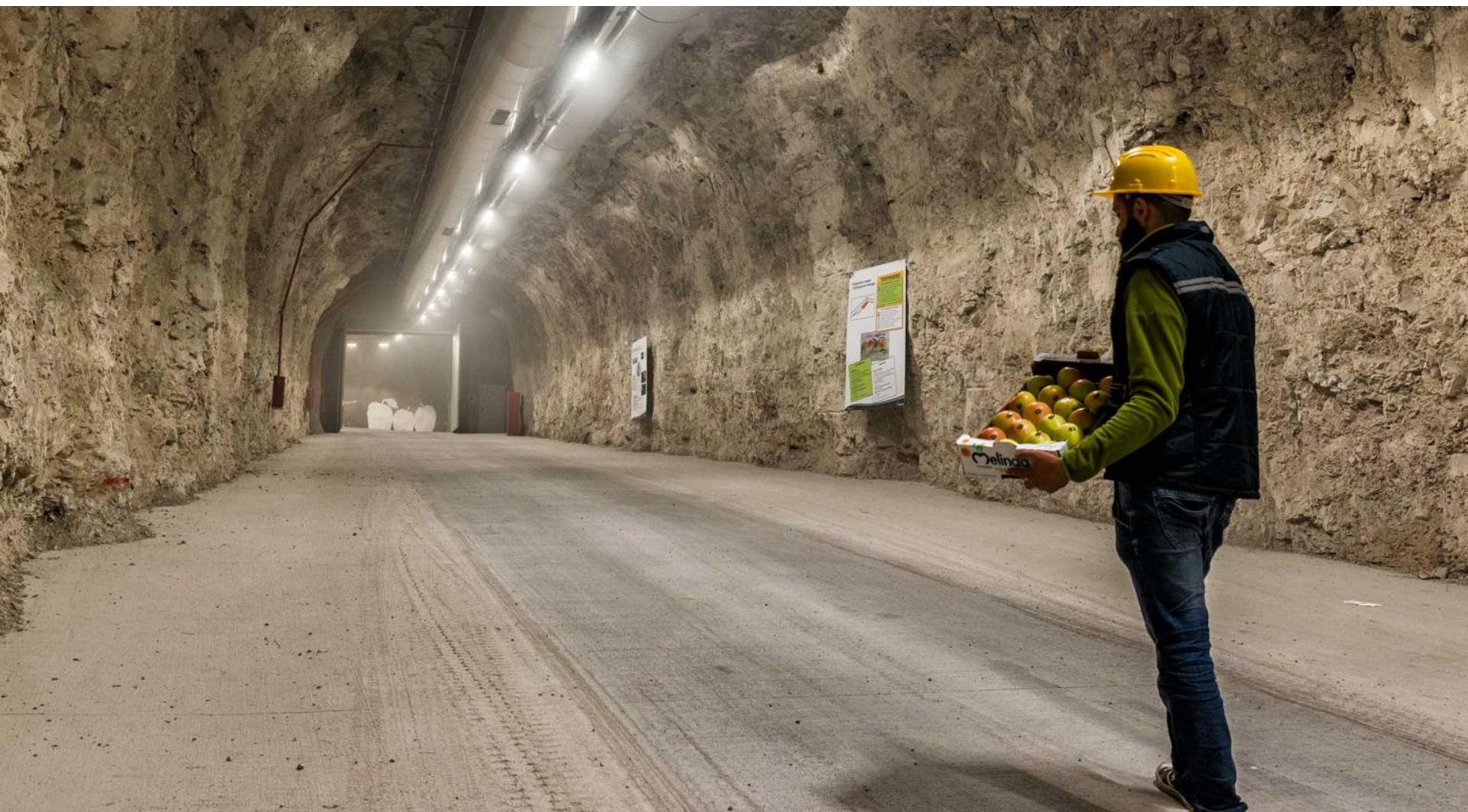
LA CONSERVAZIONE E LO STOCCAGGIO

LA CATENA DEL FREDDO

[...] We found that in 2022, world-total indirect emissions from energy use in cold chains were more than twice the direct component from refrigerants. This resulted in a new estimate of world-total GHG emissions from agrifood system cold chains of 1.32 Gt CO₂eq in 2022, with significant growth over the past two decades (0.52 Gt CO₂eq in 2000). [...]



REFRIGERAZIONE ALTERNATIVA —



<https://melinda.it/le-celle-ipogee-di-melinda/>

Without RYPEN

With RYPEN



Slowing down the ripening process, **without compromising taste.**

Fresh produce is global. Ensuring what's picked arrives in great condition for the consumer to enjoy is challenging. The control of ethylene is an important factor in this, with the industry's legacy solutions all having their own shortcomings. Enter RYPEN, the naturally balanced approach to extend peak ripeness windows, maintain condition, reduce food losses – all without negatively impacting taste.

[Find out more](#) →

PACKAGING INNOVATIVI E BIOMATERIALI

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Coating the Impossible

Sufresca®'s natural edible coatings extend the impact of lasting freshness by offering a simple solution for a growing variety of fresh fruits and vegetables, including those that are challenging to coat, thanks to our innovative technology and fresh outlook.



Fresh Thinking
For Fresher Produce



Natural

Made of plant-based additives and naturally occurring organic compounds, our coatings are essentially food.



Easy

We offer one coating for many varieties, which can be easily applied using simple techniques commonly used today.



Long-lasting

Our coatings provide natural-looking produce that stays fresh for much longer at ambient, cold and changing conditions.



<https://sufresca.com/>

TRATTAMENTI DI CONSERVAZIONE

SOLAR FOOD DEHYDRATOR

PRESERVE YOUR HARVEST WITHOUT ELECTRICITY

3 MODELS YOU CAN BUILD FROM SCRATCH!

SECURE YOUR FOOD SUPPLY AND STOCK UP YOUR PANTRY



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– The Power Is In Your Hands!

BUY NOW

LEARN MORE

<https://solar-food-dehydrator.com/>

LA TRASFORMAZIONE

INGREDIENTI NON SOSTENIBILI

© SCOTT PETERSON/GALLERY STOCK



58 MILLION POUNDS



Amount of chocolate that Americans consume during the week of Valentine's Day, from milk chocolate hearts to boutique truffles.

● = 1 MILLION LBS

70%



Estimated percentage of the world's cocoa beans grown in West Africa, where climate change is expected to boost temperatures and prolong dry spells in coming decades. That's not good news for local cocoa farmers: cocoa trees are sensitive to heat and drought.

SWEET SORROW



Cocoa is a critical cash crop for West African farmers, many of whom own just a few acres of land and can't afford chocolate themselves. But the plant's production is also fueling deep problems there. In particular:

DEFORESTATION

Cocoa farmers usually clear tropical forests to plant new cocoa trees rather than reusing the same land. That practice has spurred massive deforestation in West Africa, particularly in Ivory Coast. Experts estimate that 70% of the country's illegal deforestation is related to cocoa farming.

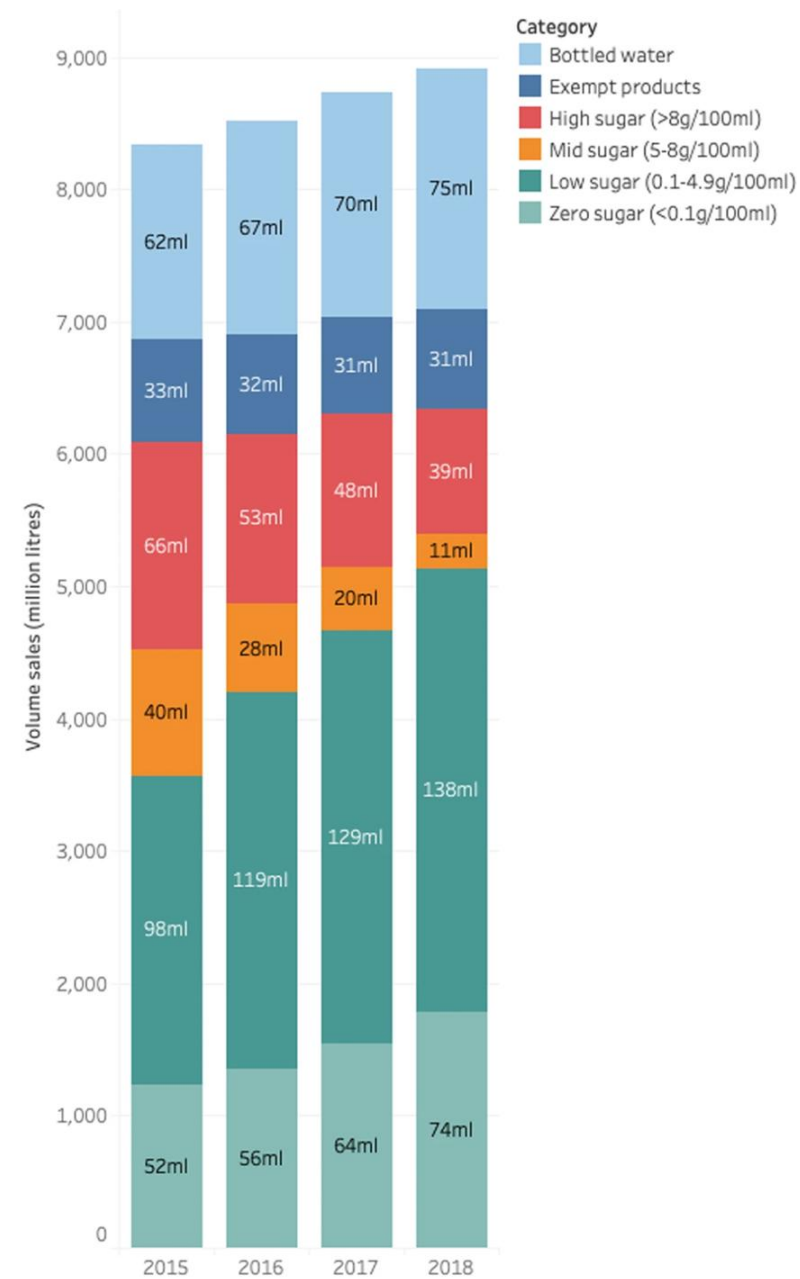
CHILD LABOR

West Africa's cocoa farmers frequently use child labor to help with growing, harvesting, and transporting cocoa beans. During the 2013-14 growing season, an estimated 2 million children were used for hazardous labor throughout Ghana and Ivory Coast.

<https://www.worldwildlife.org/magazine/issues/spring-2017/articles/bittersweet-chocolate-s-impact-on-the-environment>

RICETTE NON SOSTENIBILI

[...] The consumption of free sugars in the UK is more than double the guideline intake for adults and close to triple for children, with soft drinks representing a significant proportion. The aim of this study was to assess how individual soft drink companies and consumers have responded to calls to reduce sugar consumption, including the soft drink industry levy (SDIL), <https://bmcmmedicine.biomedcentral.com/article/10.1186/s12916-019-1177-1> between 2015 and 2018. [...]



Labels marked in bars refer to the volume adjusted for population changes and are expressed in ml per capita per day

SOLO BISTECCHIE, NIENTE ANIMALI —



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<https://www.redefinemeat.com/>

GRASSI “SOSTENIBILI”

New Age Ingredients for

#food

#cosmetics

#household

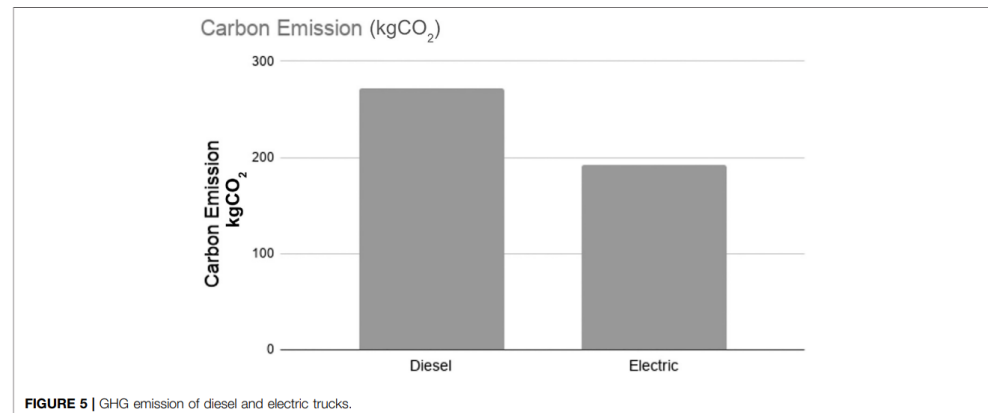
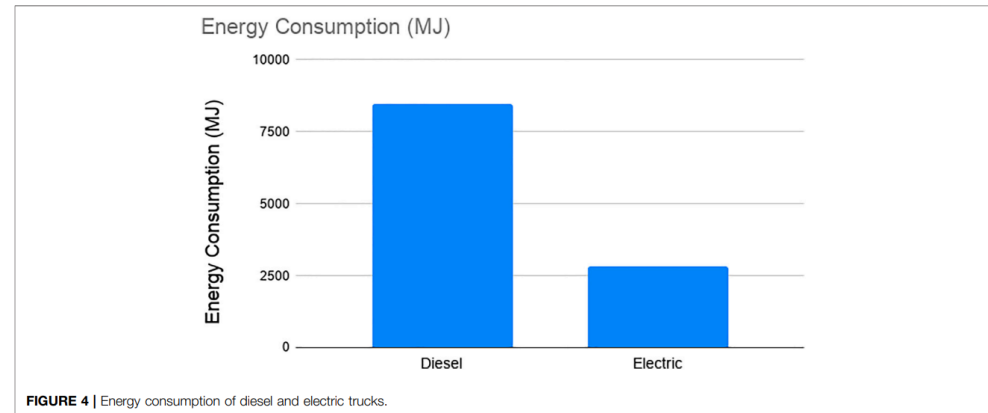
Fats and oils are critical components when it comes to creating good taste, texture, and mouthfeel. With the help of biotechnology, **ÄIO** is introducing new ways to produce tastier and healthier alternative microbial oils that have the potential to substitute unsustainable ingredients in our food chains.

<https://aio.bio/#ourproducts>

LA LOGISTICA E IL RETAIL

LOGISTICA E DELIVERY

*[...] Our case study shows that diesel trucks consume 300% more energy than electric trucks and generate 40% more greenhouse gases than diesel trucks for food distribution in the Gowanus district.
[...]*



<https://www.frontiersin.org/journals/big-data/articles/10.3389/fdata.2021.693820/full>

AI PER ORDINI, MAGAZZINO, LOGISTICA

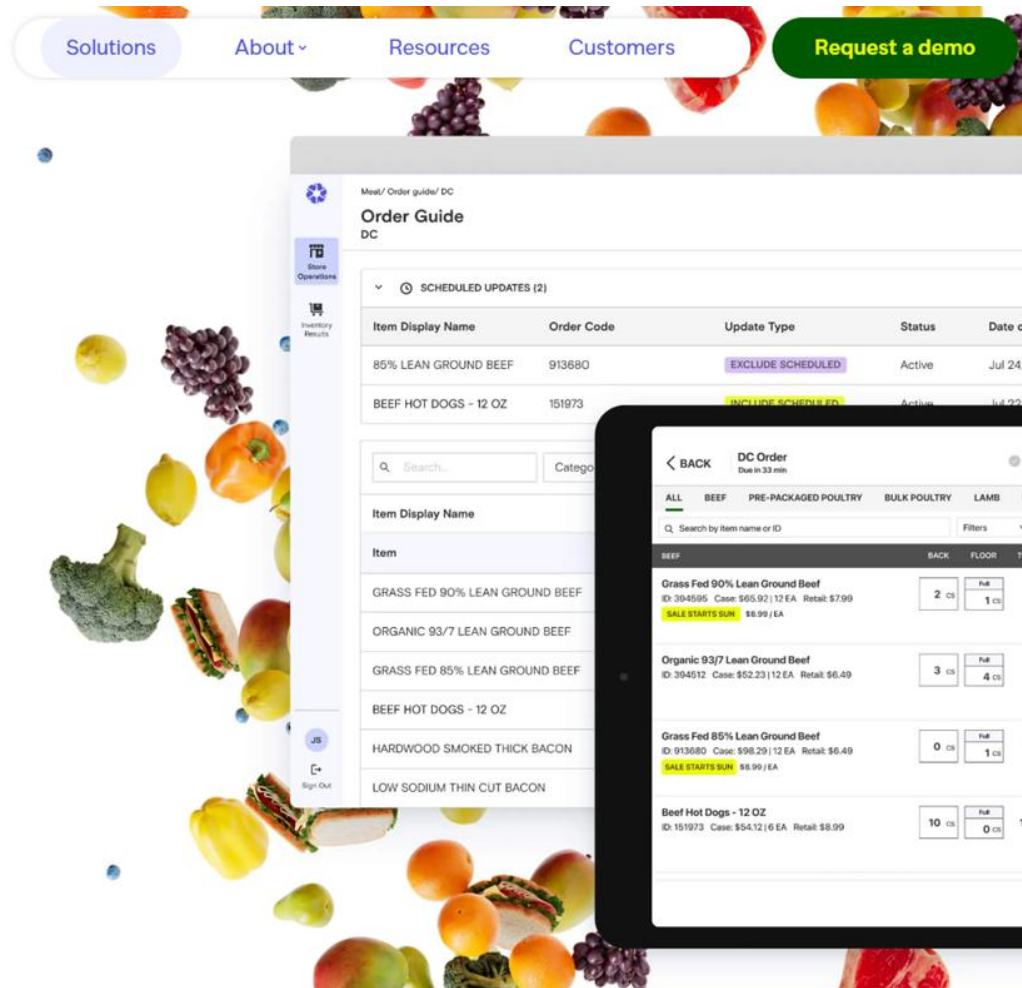


SOLUTIONS

Tailored technology to win in fresh

All-in-one inventory solutions don't cut it in fresh. Achieve more with purpose-built grocery technology, designed to uplevel decision making and drive results across your fresh business.

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<https://www.afresh.com/solutions>

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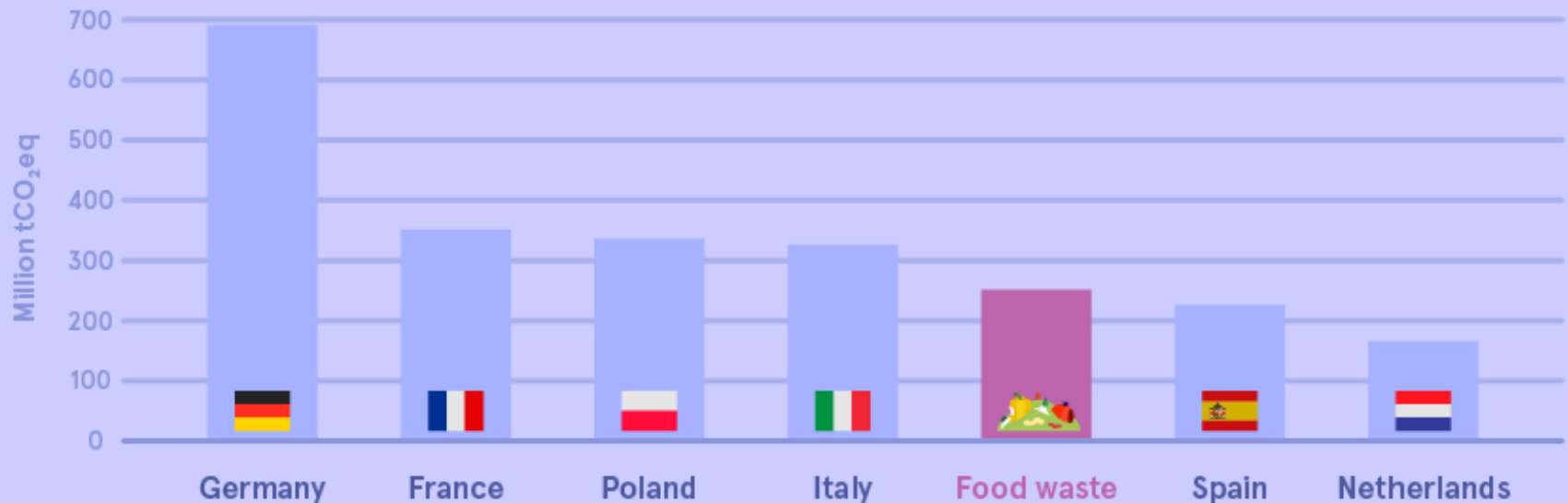


<https://www.deliverzero.com/>

LO SCARTO E IL FINE VITA

FOOD WASTE

If food waste were a Member State, it would be the EU's 5th largest emitter of greenhouse gas emissions.



Source: Sala et al., 2023.



<https://www.eufic.org/en/food-safety/article/food-waste-in-europe-statistics-and-facts-about-the-problem>

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WASTE-FREE
WORLD

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AREA OF IMPACT: ITALY

NOMINATED BY: C40 CITIES



<http://www.foodpolicymilano.org/>

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<https://www.winnowsolutions.com/>

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BIOVA PROJECT

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**FOOD INNOVATION
AGAINST WASTE**

<https://www.biovaproject.com/>

PRIMA LA BIRRA, POI LO SNACK

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TO

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LO SNACK

RI-SN
LO SNACK DA ECO

RI-SNACK™
LO SNACK DA ECONOMIA CIRCOLARE

TRIANGOLINI DA MALTO D'ORZO
RIGENERATO

zenzero
& cipolla

FATTO DALLE TREBBIE DI BIRRA BIOVA

ACK™
MIA CIRCOLARE

MALTO D'ORZO
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zenzero
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BIE DI BIRRA BIOVA

CK™
IRCOLARE

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BIRRA BIOVA



PRIMA LA BIRRA, POI LO SNACK

Ri-Snack™ di Biova Project è un croccantissimo spuntino a base di malto d'orzo che è già servito per fare la nostra Birra Biova.

Dopo aver dato questo fantastico servizio, il malto d'orzo che rimane viene chiamato “trebbia” ed è ancora meravigliosamente pieno di proteine, fibre e Sali minerali, ma molto più povero di zuccheri. In questo modo Ri-snack vince su tutti i fronti: è più sostenibile (visto che usa il 30% in meno di materie prime vergini), è più sano, non è MAI fritto, ed è buonissimo! Una strategia win win in piena regola!

Provali

PRIMA LA BIRRA, POI LO SNACK



NON SOLO CIBO PER LE PERSONE —

HiMEAT

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Pet Grade ingredient.

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<https://www.proteinitaly.com/en/products/himeat/>

NON SOLO CIBO, ANCHE ENERGIA

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Clean energy
is the future.
Organic food waste
is the fuel.

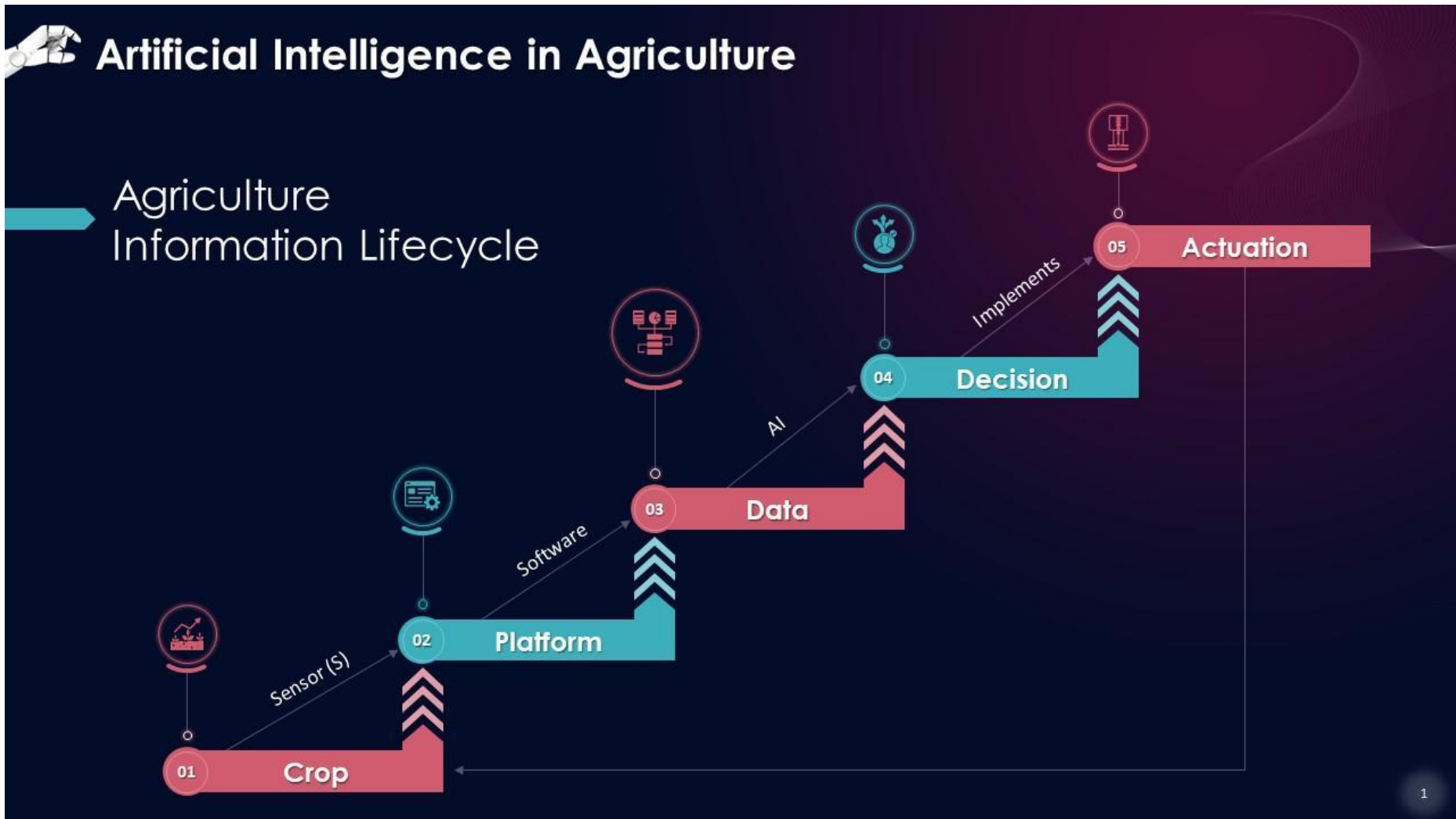
A more sustainable planet starts with what you do in your own backyard. At HomeBiogas, we've created advanced systems to help. From a bio-digester that transforms food scraps, to bio-toilets that are friendlier to the planet – the various benefits to your household are clear.

[Shop Now](#)

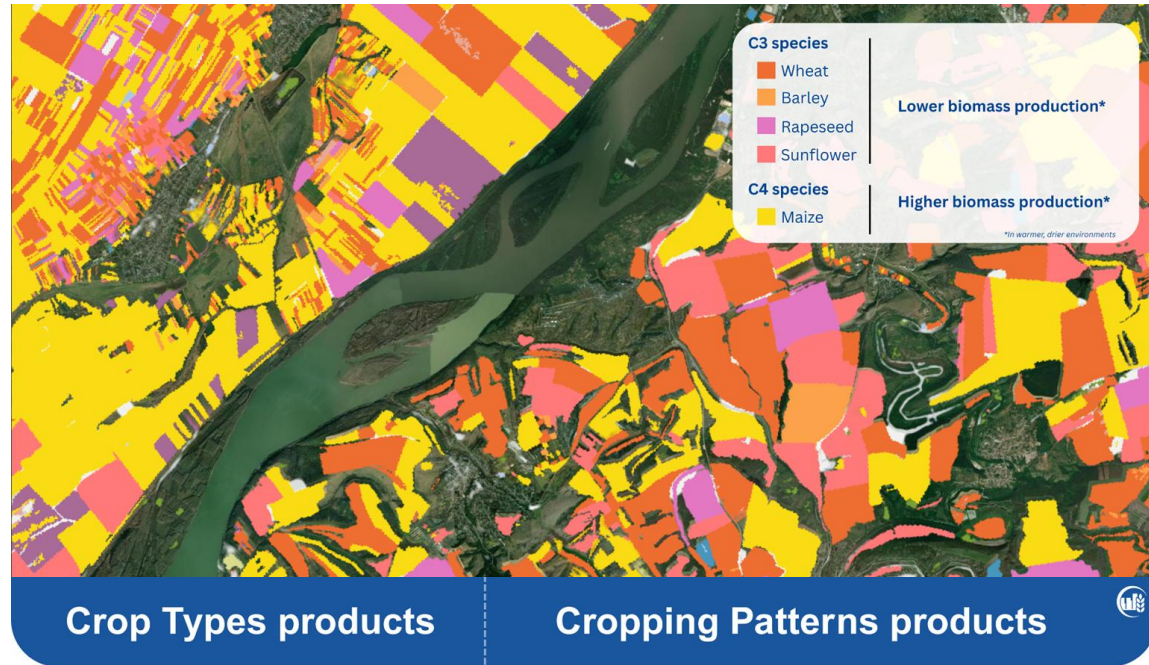
<https://www.homebiogas.com/>

LE PRINCIPALI DIREZIONI DEL CAMBIAMENTO

AI & PREDICTIVE STRATEGIES



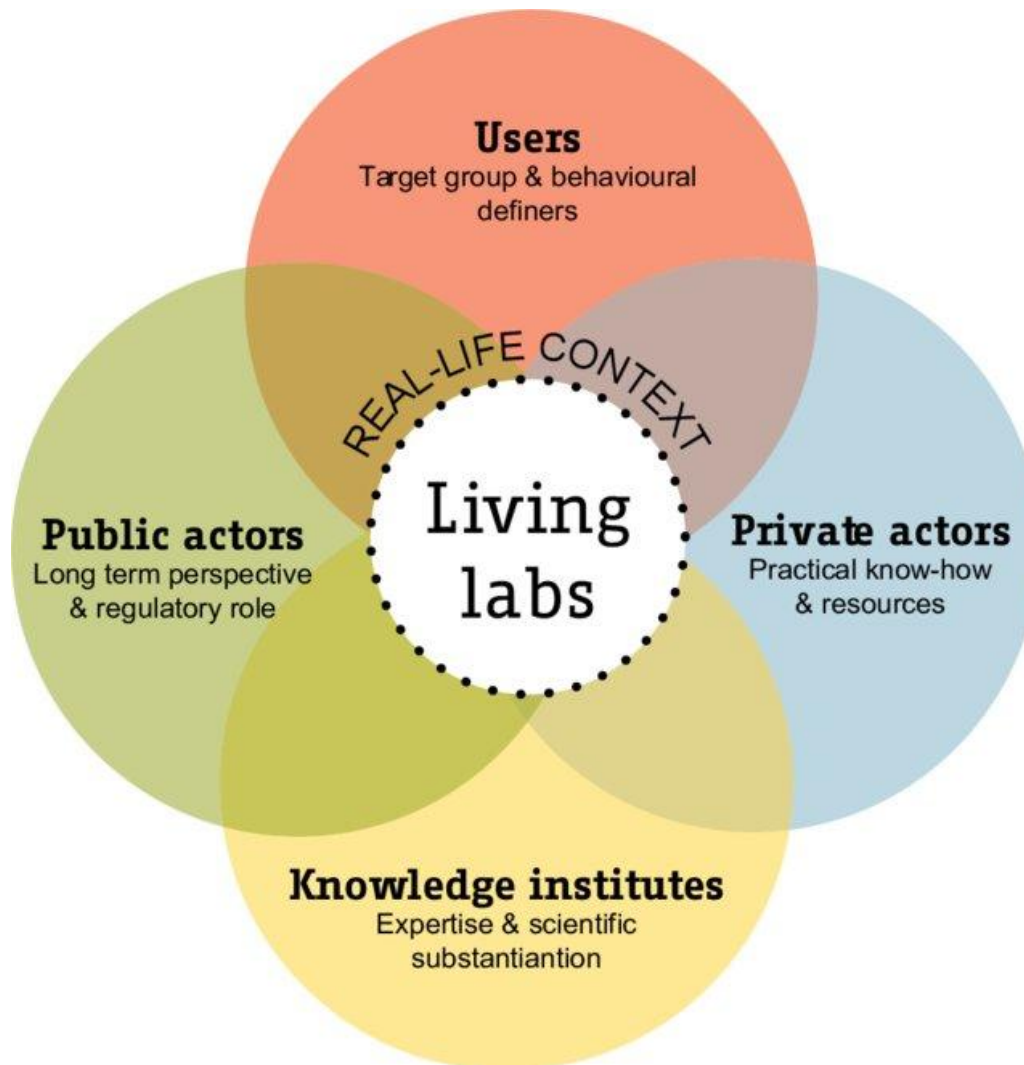
DATA DRIVEN E OPENSOURCE



ASSESSMENT



LIVING LABS



DIGITALIZZAZIONE E FORMAZIONE



RICAPITOLANDO...

- Serve intervenire profondamente sul sistema del cibo, in ogni aspetto della catena del valore
- Diversi attori hanno diversi ruoli, ma ognuno può contribuire
- L'impatto non è solo sull'ambiente, ma anche sulle persone e sulla società
- Esistono già svariate soluzioni sviluppate da start-up innovative e centri di ricerca
- Ogni fase della catena del valore ha soluzioni che potrebbero essere utili per limitare l'impatto ambientale e sociale
- Le innovazioni sono spesso basate su nuove tecnologie, quindi è fondamentale la formazione continua
- Ogni realtà deve decidere autonomamente che piano di sostenibilità sviluppare e seguire
- Per questo è fondamentale un lavoro di personalizzazione degli interventi

GRAZIE!

Enrico Bassi

enrico@enricobassi.com

<https://www.linkedin.com/in/enricobassi/>