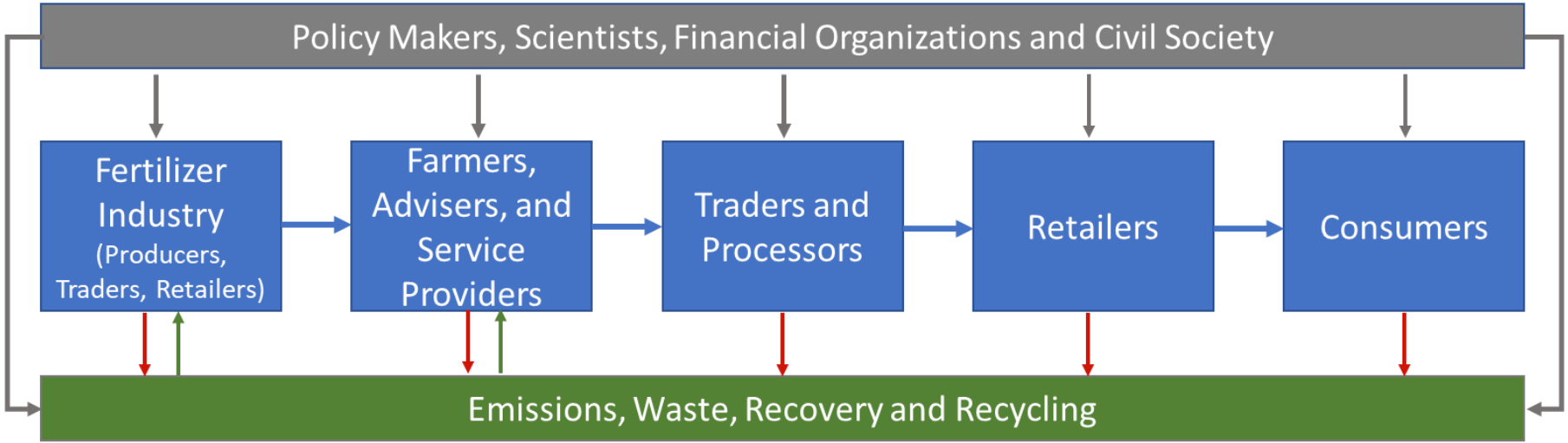
Innovation in crop nutrition – an industry perspective

FAO Science and Innovations Days, 19-21 October 2022, Rome

Achim Dobermann

adobermann@fertilizer.org

The agri-food chain from a nutrient perspective



Food systems & circular economy thinking

Disruptive technologies

New players, new partnerships

Progressive policies

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Innovation-driven transformations

Fertilizer production
Fertilizer use
Nutrient recycling
Business models

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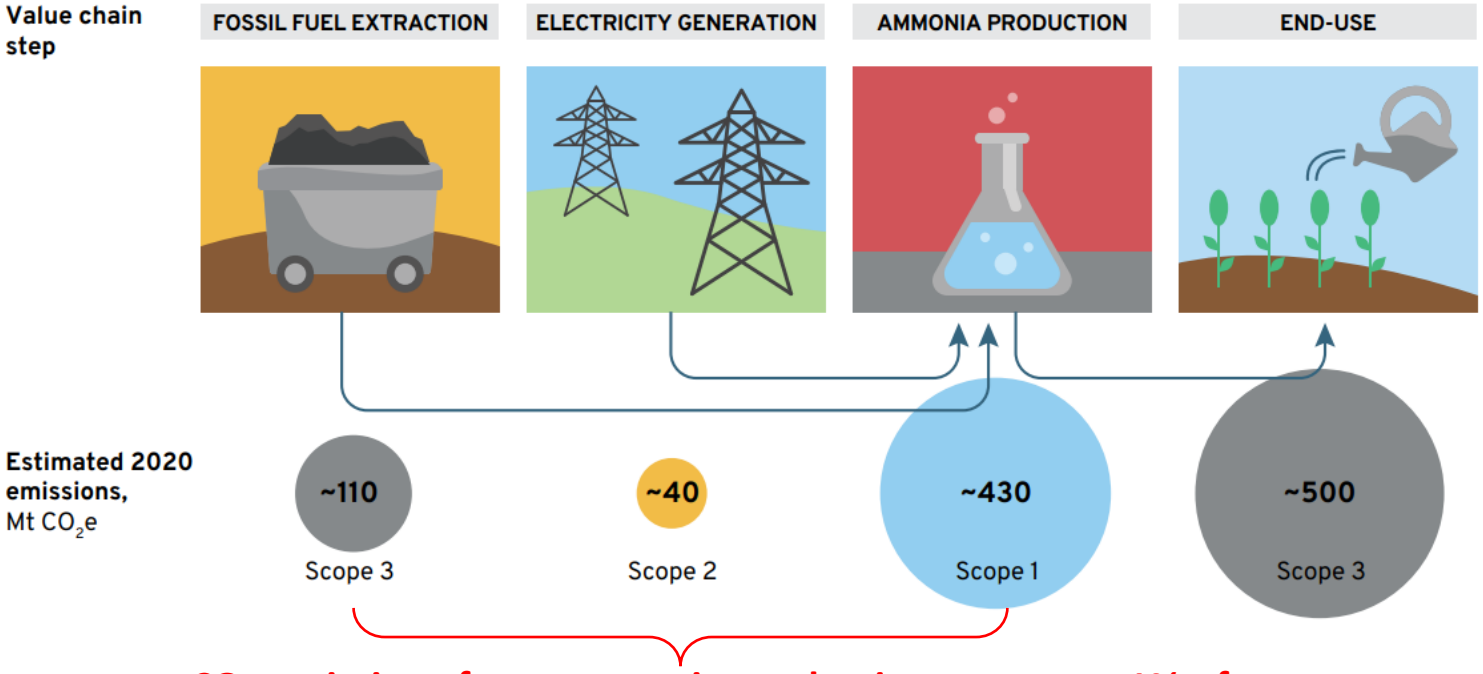
GHG emissions along the ammonia supply chain



CO_2 emissions from ammonia production represent 1% of all global emissions. Could they be eliminated by 2050?

https://missionpossiblepartnership.org/wp-content/uploads/2022/09/Making-1.5-Aligned-Ammonia-possible.pdf

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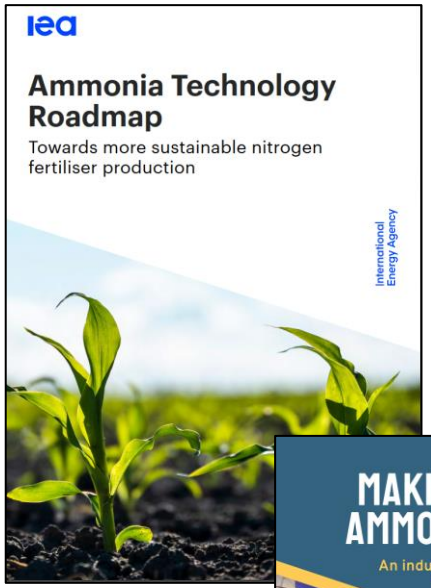
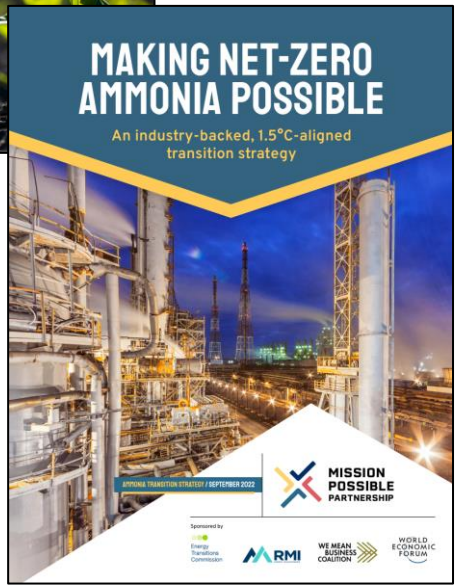
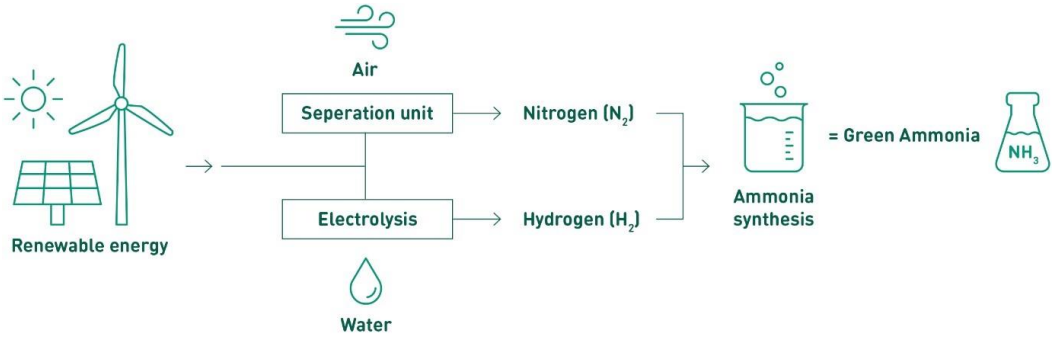




Green ammonia



https://www.stamicarbon.com

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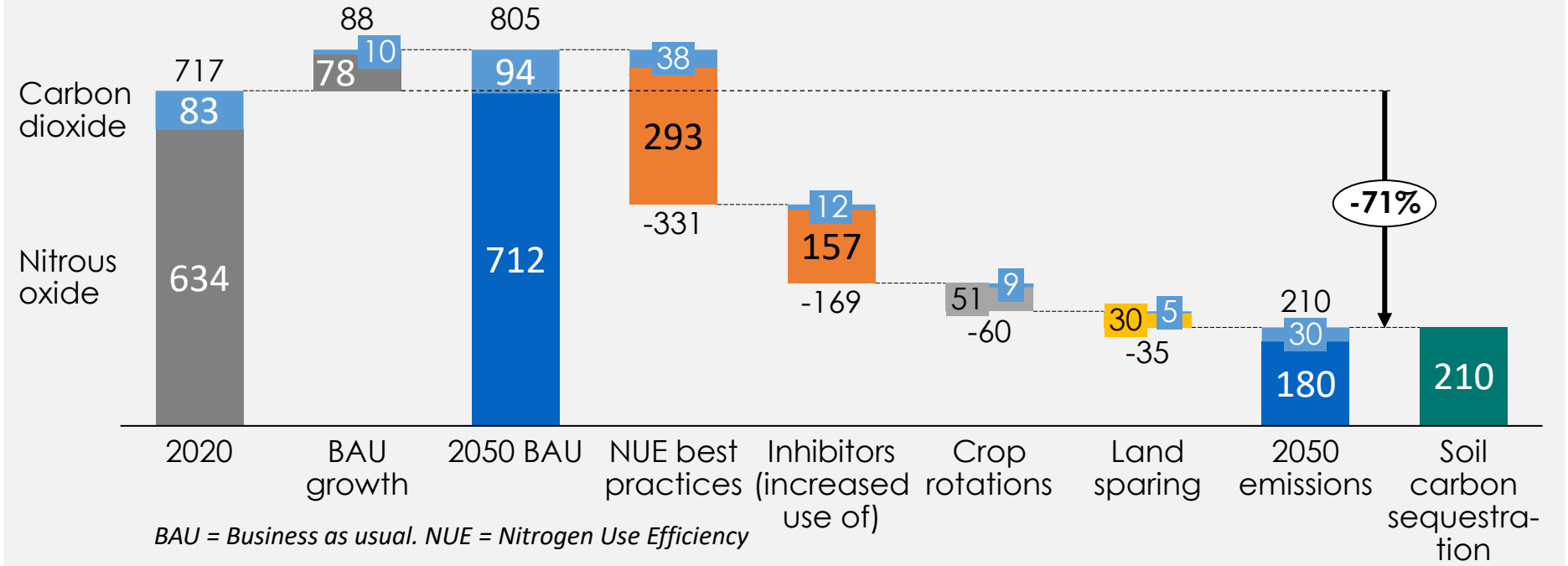
Scope 3 Emissions from the use of fertilizer can be more than halved by 2050 through increasing N use efficiency



https://www.fertilizer.org/Reducing-Emissions

Measures to reduce greenhouse gas emissions vary by countries and cropping systems

India – Rice-Wheat

- **Improving NUE and N overuse through digitised extension services** and support, opportunity to redirect subsidies
- **Improving crop rotations in Punjab & Haryana with addition of legumes**, but challenges on making profitable for farmers at current prices

China – Rice

- **Fertilizer-as-a-service delivering best practices** could reduce mineral nitrogen application by 25%.
- **Urease inhibitors** can address ammonia **volatization from urea and** controlled release fertilizer can improve efficiency

China – Maize-Wheat

- **Improving adoption of precision ag in North China Plain**, with annual investment of € 2-5bn required to address transition risks
- **Diversifying crop rotation** with legumes in North China Plain, with required break-even yield of 3t/ha

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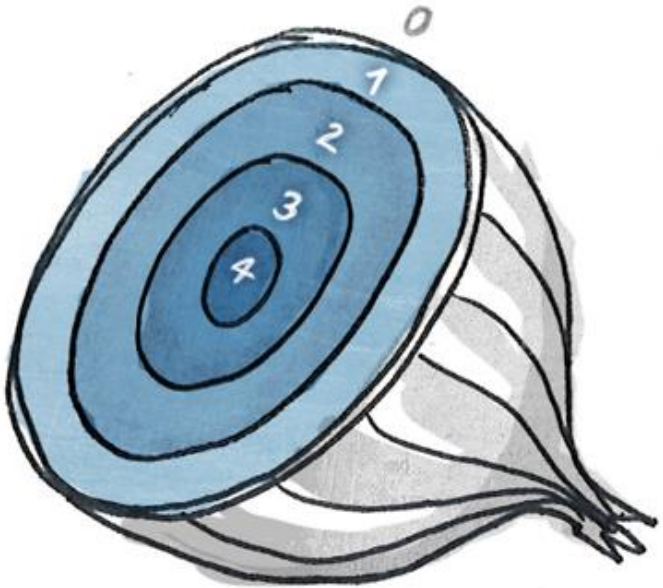
SYSTEMIQ

https://www.fertilizer.org/Reducing-Emissions

Novel fertilizers

- Tailored, including micronutrients
- Bio-active: gradually accessible to microbes and/or nutrient release triggered by the plant
- Bio-based, fully degradable
- Economical in production and performance
- Safe



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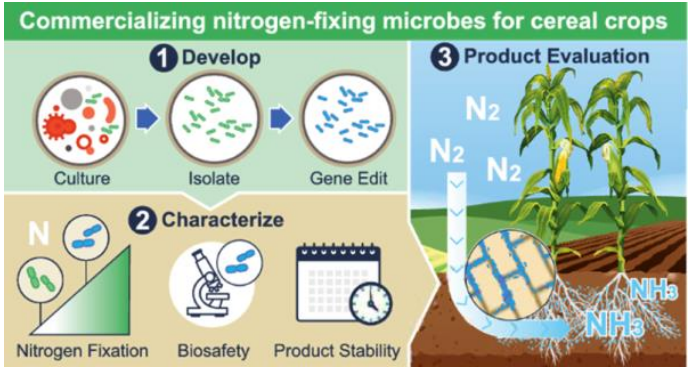
How well do such innovations work in reality, and why?

https://lp.icl-sf.com/uk-en/eqox/

https://www.iffco.in/en/nano-urea-liquid-fertilizer



https://www.pivotbio.com

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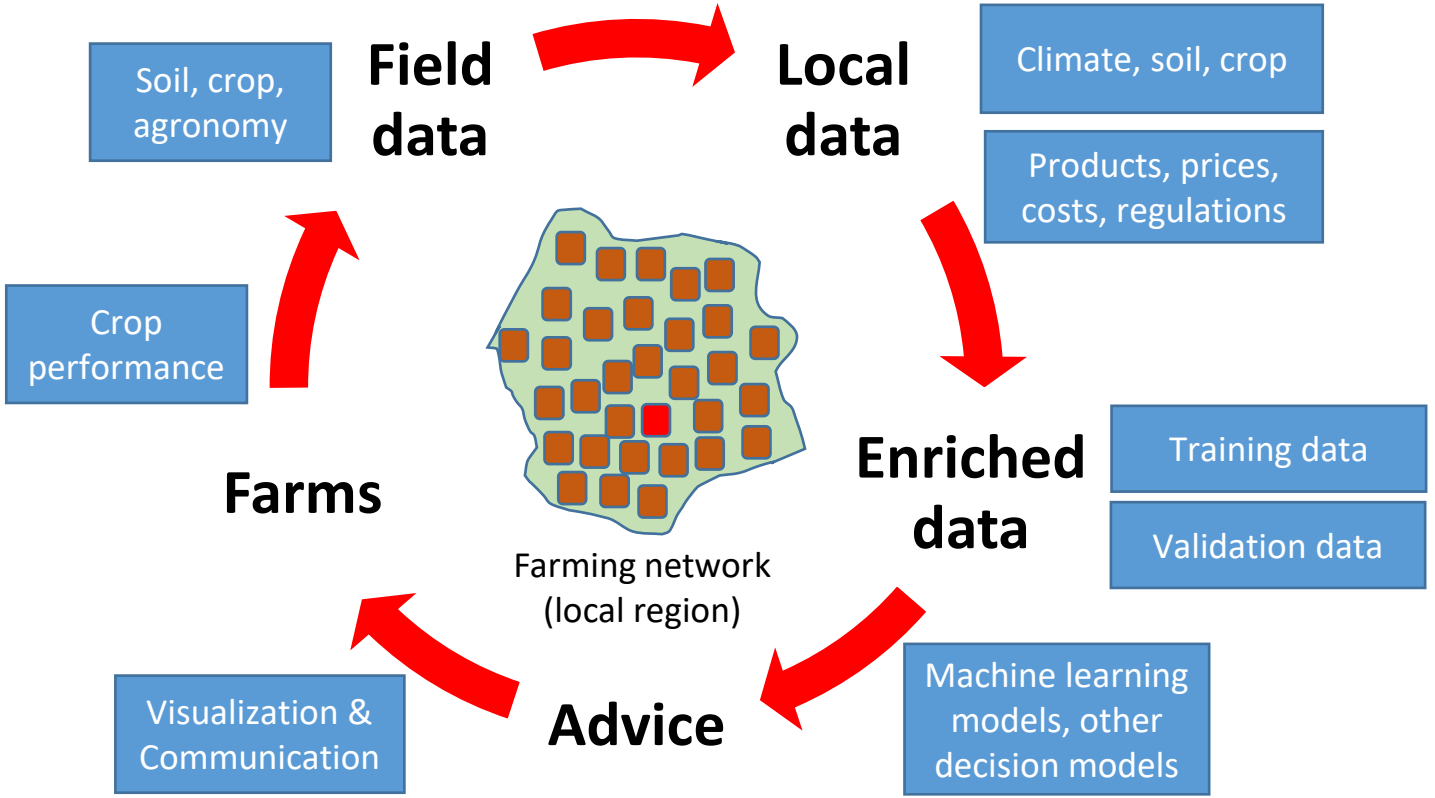
Data-driven, precise crop nutrition advisory



Key requirement: continuous collection, processing and sharing of field data

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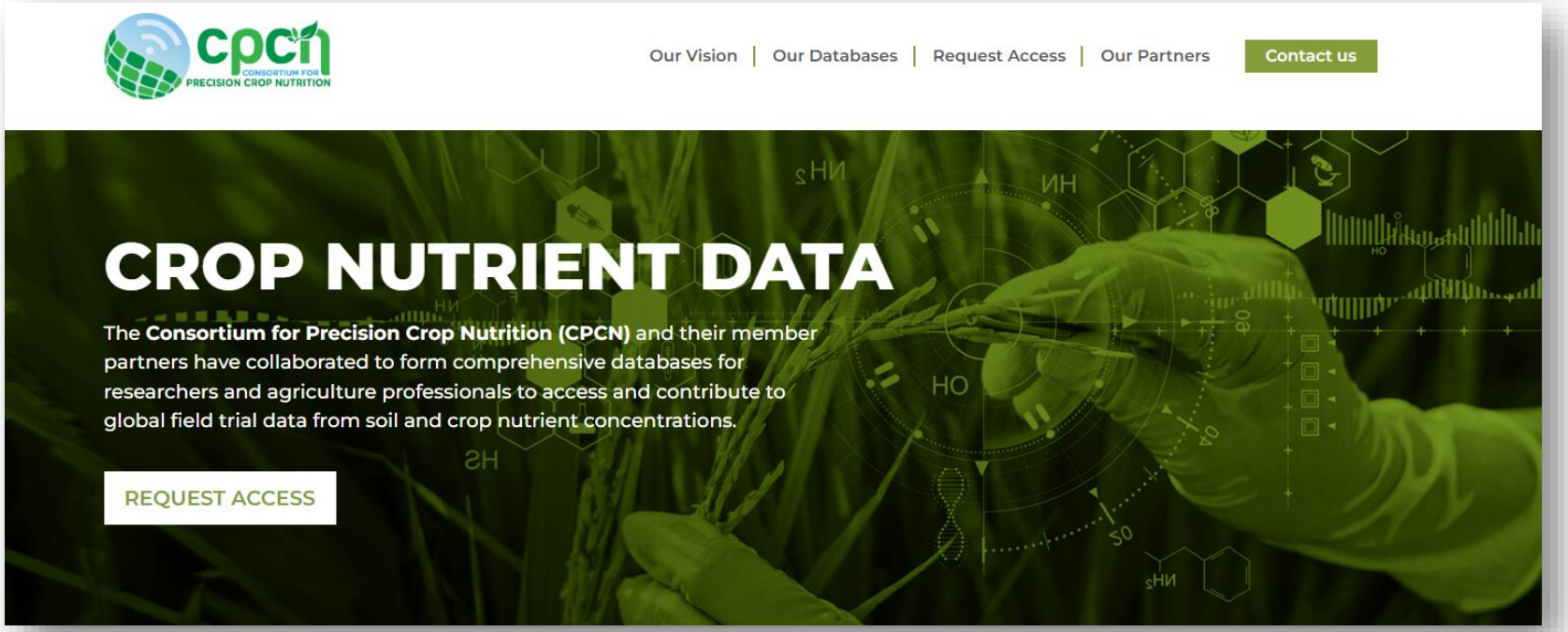
WWW.CROPNUTRIENTDATA.NET



Many researchers worldwide have already shared their data sets

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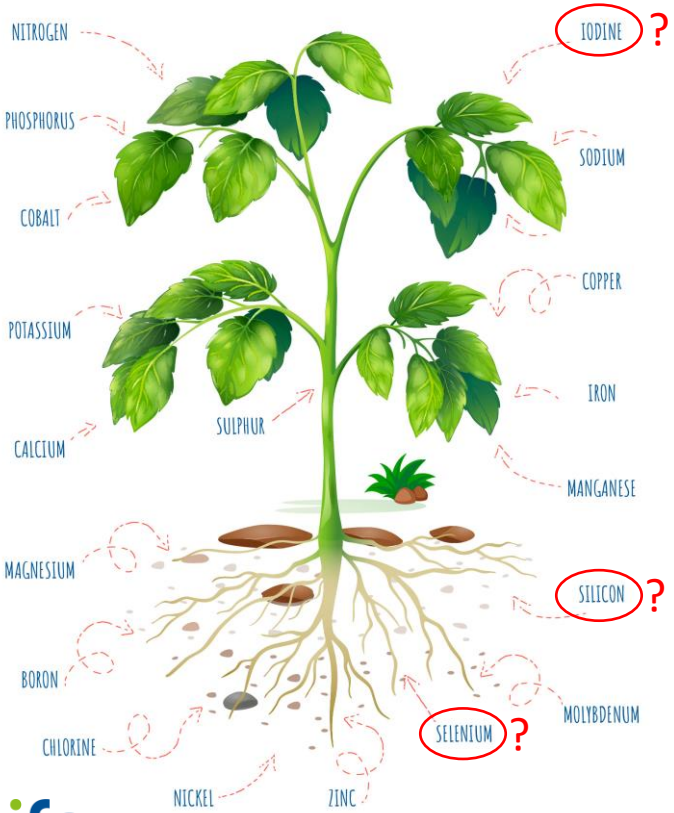
cpcn CONSORTIUM FOR PRECISION CROP NUTRITION
apni AFRICAN PLANT NUTRITION INSTITUTE
iSDA AFRICA
WAGENINGEN UNIVERSITY & RESEARCH
agmatix

Rethinking plant nutrients



A mineral plant nutrient is an element which is essential or beneficial for plant growth, development or the quality attributes of the harvested product.

Plant Soil
https://doi.org/10.1007/s11104-021-05171-w

SPECIAL ISSUE S97 - 30 YEARS

Check for updates

What is a plant nutrient? Changing definitions to advance science and innovation in plant nutrition

Patrick H. Brown · Fang-Jie Zhao · Achim Dobermann

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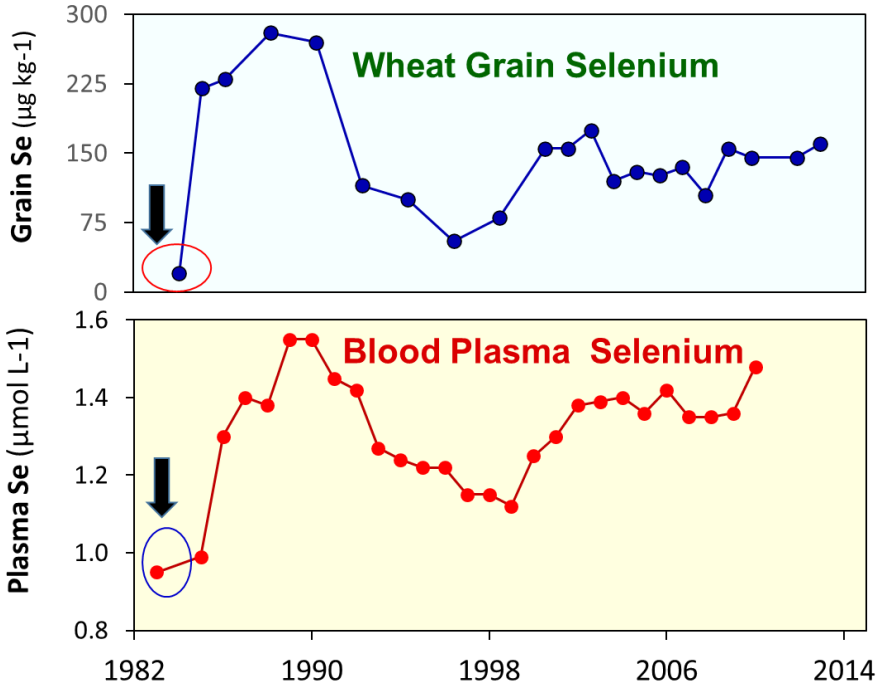
More nutritious crops

Nutrition- and health-sensitive agriculture includes the targeted enrichment and application of fertilizers to deliver micronutrients of importance to crop, animal and human health (e.g. Zn, Se, I).



Changes in grain and blood selenium since 1985 in Finland after Se-enrichment of NPK fertilizers

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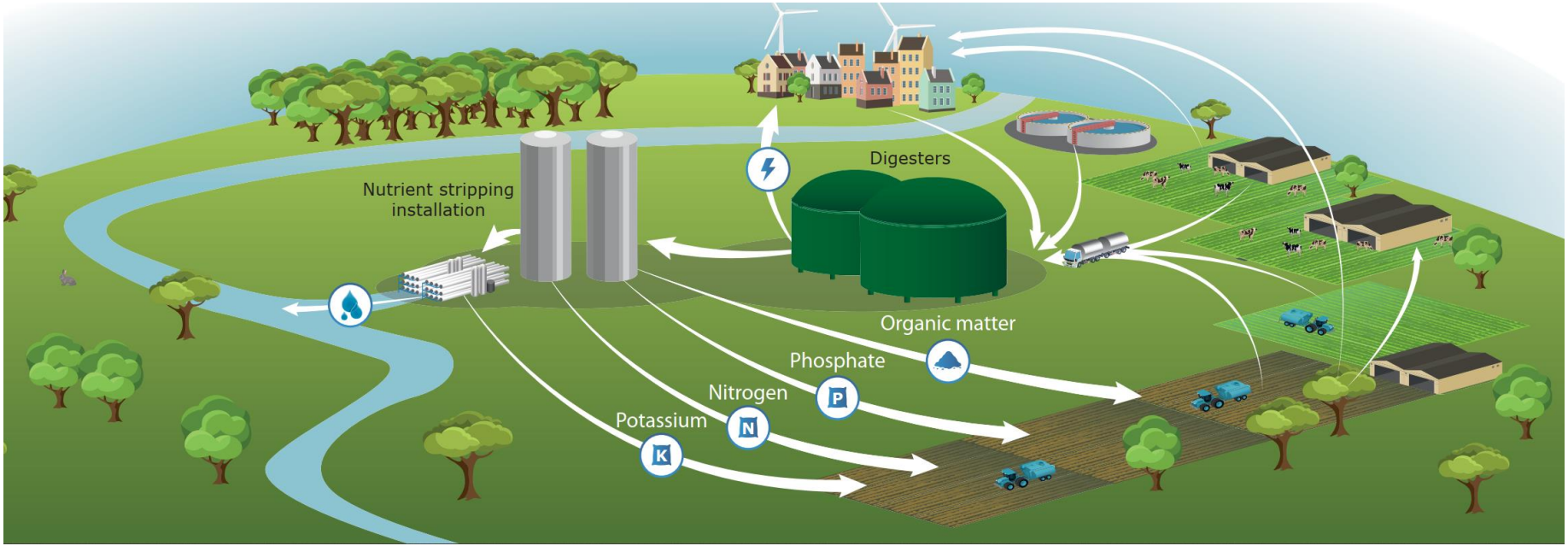
Recover and recycle nutrients from all major waste streams



https://systemicproject.eu/

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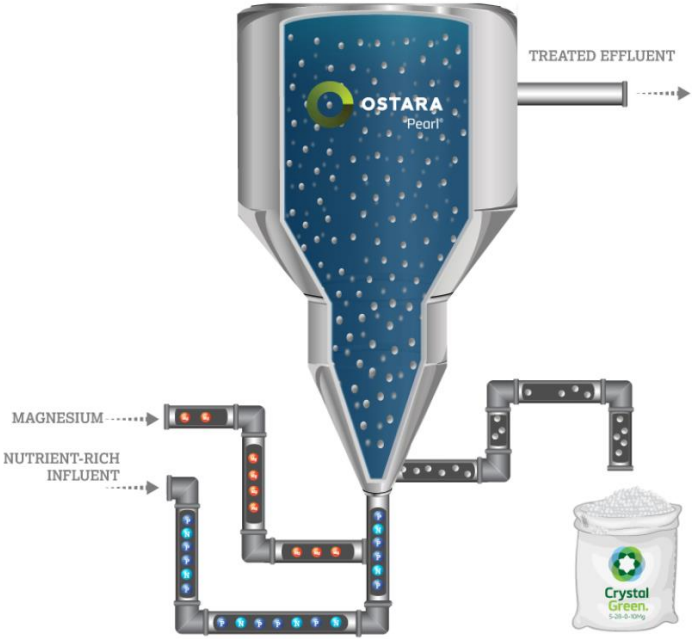
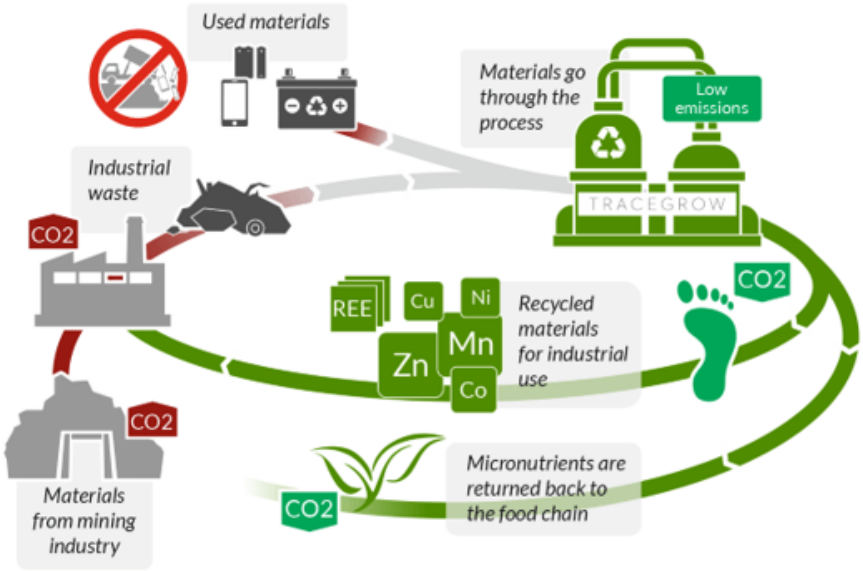
Use recycled nutrient forms where feasible



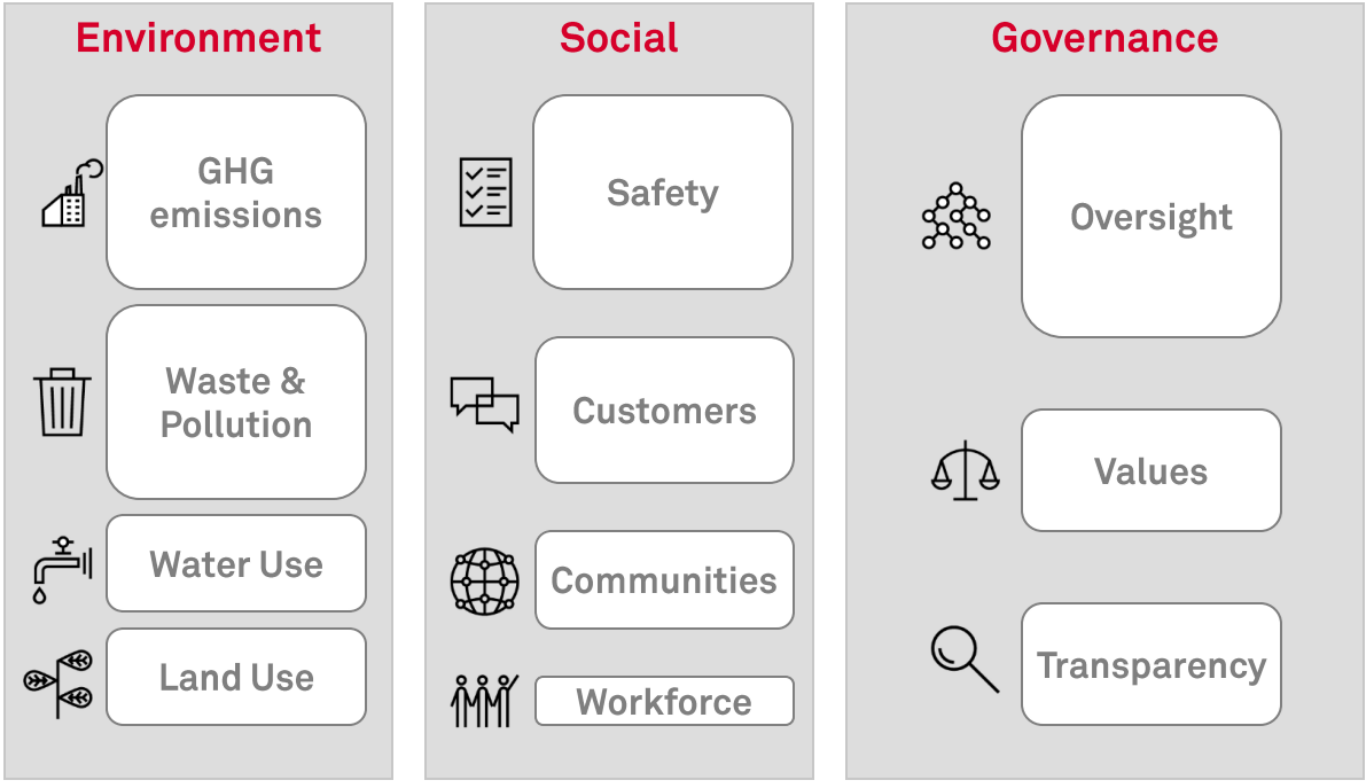
$MgNH_4PO_4*6H_2O$

P recovered from waste streams (e.g. municipal wastewater), https://ostara.com/



Micronutrients from spent alkaline batteries, https://www.tracegrow.com/

Sustainability-driven business



Source: https://www.spglobal.com/_assets/documents/ratings/research/100272730.pdf

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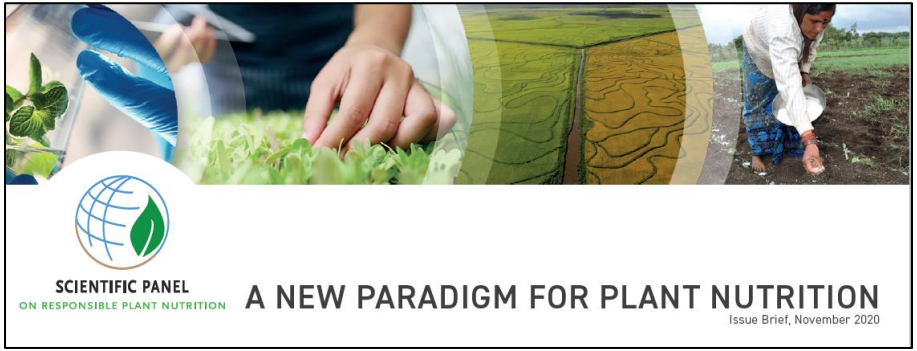
Responsible Plant Nutrition



SCIENTIFIC PANEL
ON RESPONSIBLE PLANT NUTRITION

A NEW PARADIGM FOR PLANT NUTRITION

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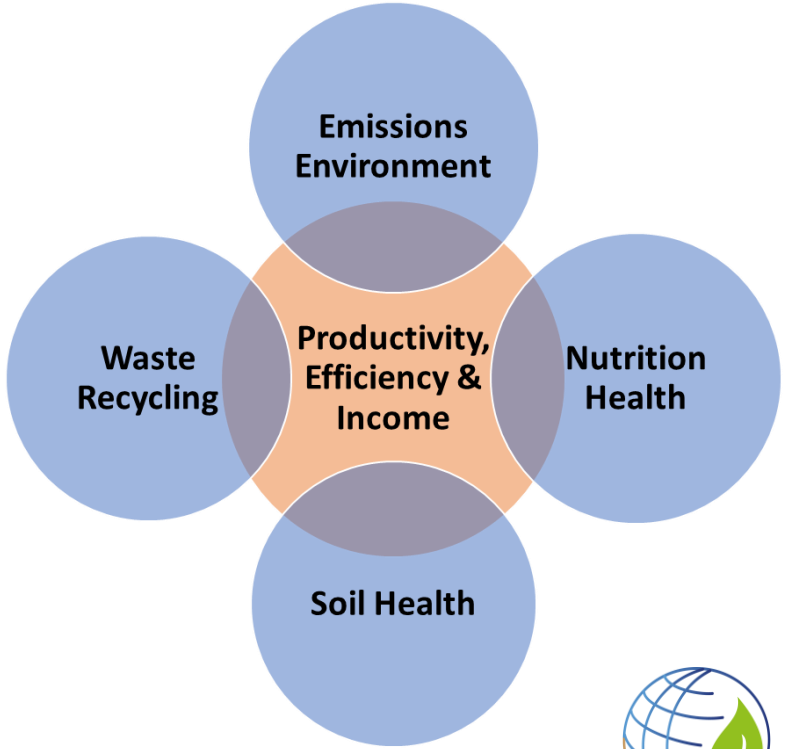
Responsible plant nutrition: A new paradigm to support food system transformation

Achim Dobermann [a,*], Tom Bruulsema [b], Ismail Cakmak [c], Bruno Gerard [d], Kaushik Majumdar [e], Michael McLaughlin [f], Pytrik Reidsma [g], Bernard Vanlauwe [h], Lini Wollenberg [i], Fusuo Zhang [j], Xin Zhang [k]

https://doi.org/10.1016/j.gfs.2022.100636



https://www.sprpn.org

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