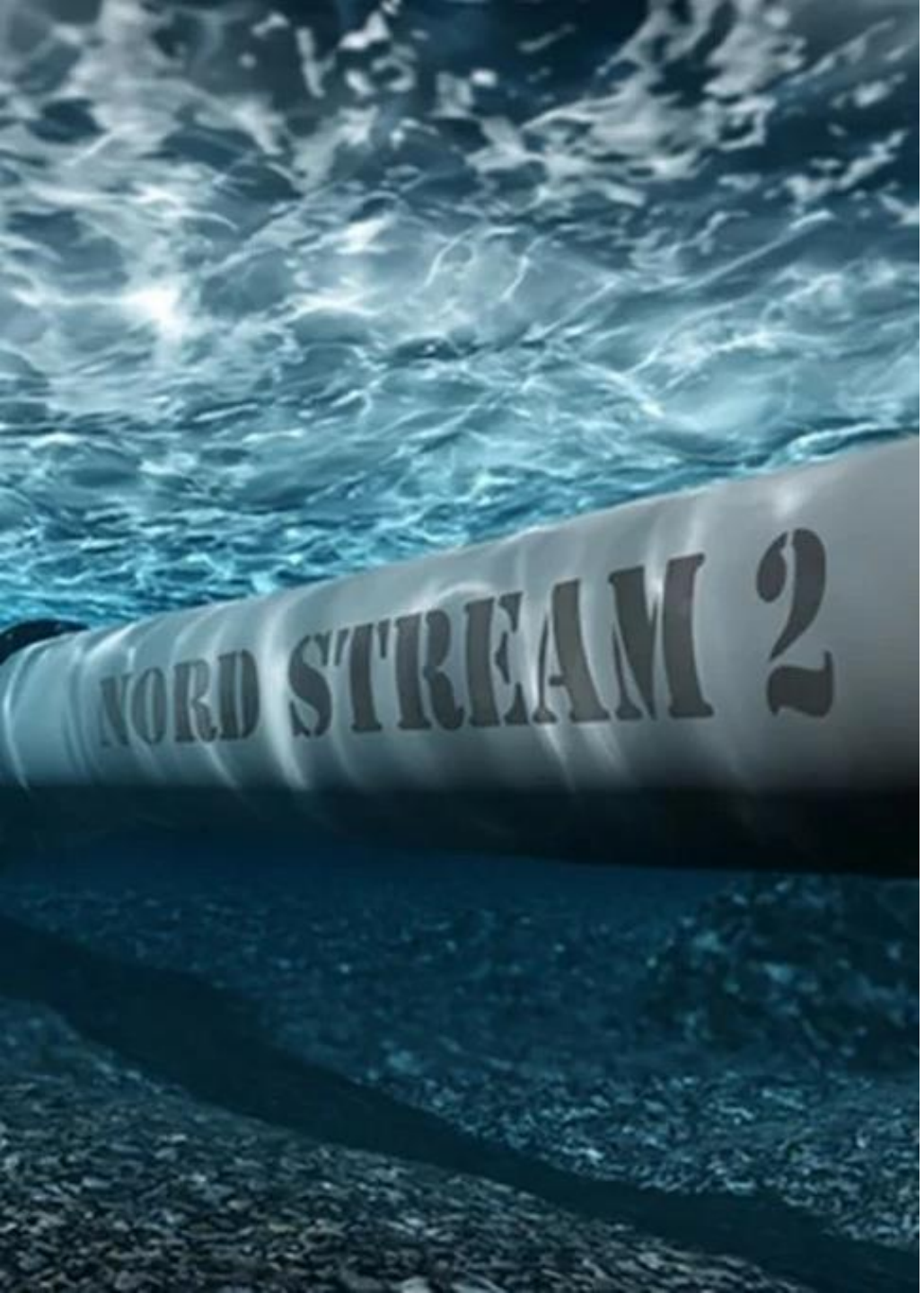
35 BCM BIOMETHANE TARGET:

AN ANALISIS OF FEEDSTOCK PROJECTIONS

FEEDBACKEU

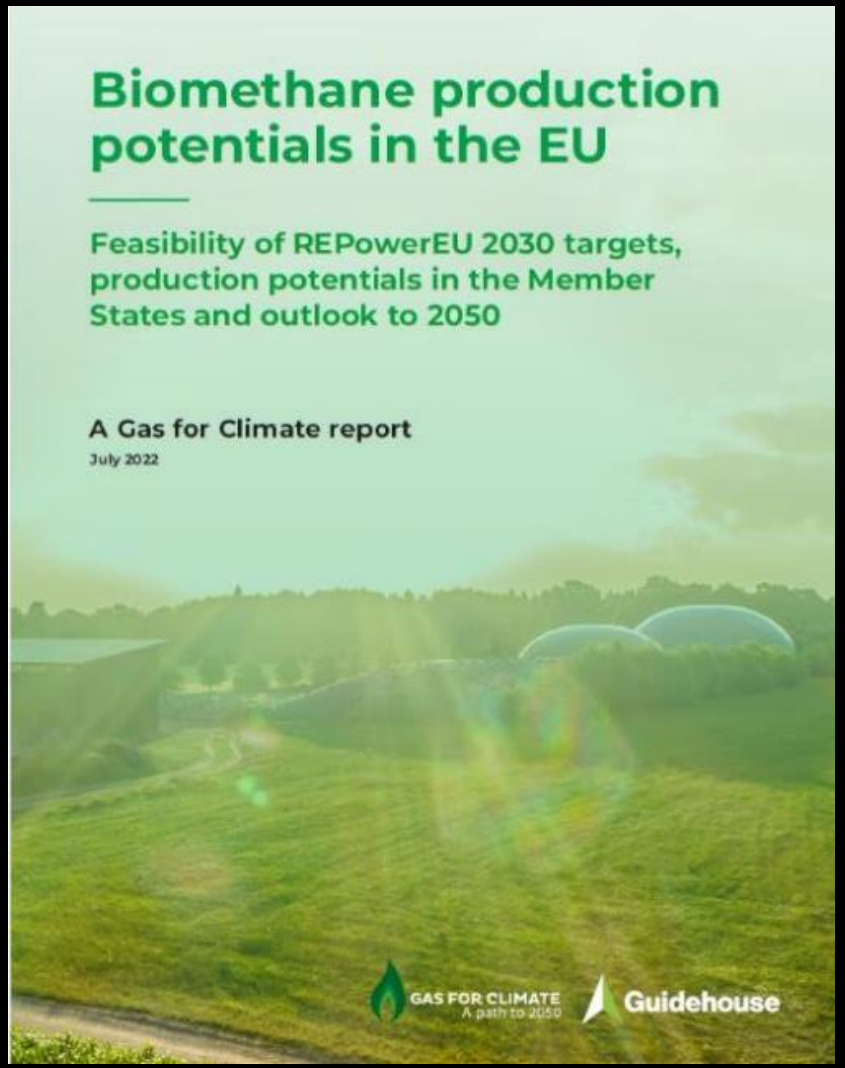


REPOWER EU:

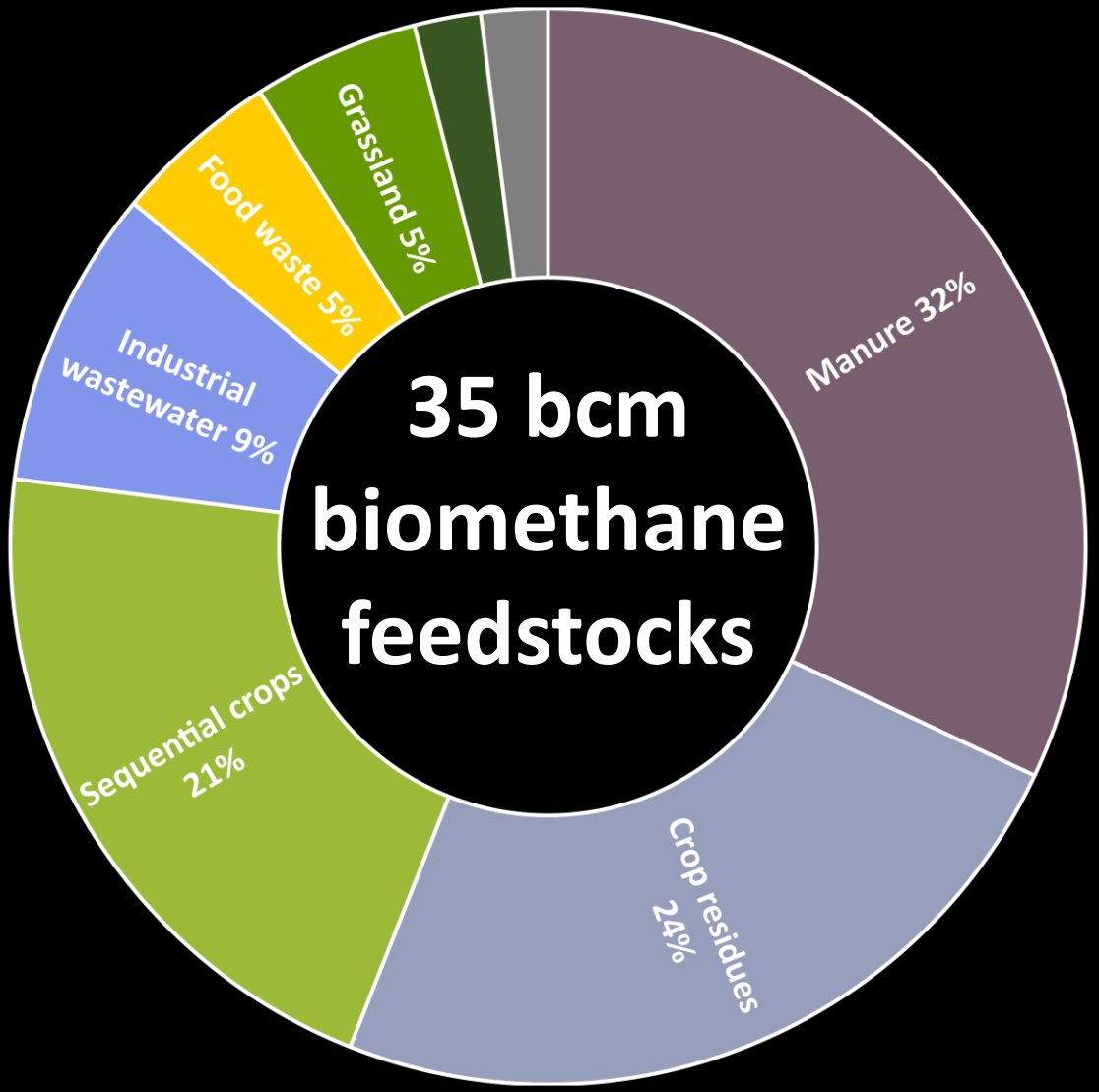
- “rapidly reduce dependence on Russian fossil fuels by fast forwarding the clean energy transition”
- Increase biomethane production from 3.5 to 35 bcm by 2030
- **“waste-based, avoiding the use of food and feed feedstocks that would lead to land use change problems” or “hamper food security”**


European Commission
Assistance to assessing options improving market conditions for bio-methane and gas market rules
Final report
Artelys
Trinomics
Fraunhofer IEE
Joint Research Centre
December 2021

24 bcm


Biomethane production potentials in the EU
Feasibility of REPowerEU 2030 targets, production potentials in the Member States and outlook to 2050
A Gas for Climate report
July 2022
GAS FOR CLIMATE
A path to 2050
Guidehouse

35 bcm



Alberici et al. “Biomethane Production Potentials in the EU: Feasibility of REPowerEU 2030 Targets, Production Potentials in the Member States and Outlook to 2050. A Gas for Climate Report.” (Guidehouse, 2022)

EBA European Biogas Association

Breaking Free of the Energy Dependency Trap
DELIVERING 35 BCM OF BIOMETHANE BY 2030

WHY BIOMETHANE?

BY 2030 WE NEED:
€48 bn to build
4,000 medium-size units
€35 bn to build
1,000 large-scale plants

Using **waste, agricultural residues and sequential crops.**

DIGESTATE USE
Digestate offers an **alternative** to the energy intensive, environmentally damaging production of **chemical fertilisers.** This reduces EU dependence on fertiliser imports and helps farmers bring down production costs, limiting food price volatility.

Digestate offers proven advantages in soil restoration and carbon retention.

STORAGE CAPACITY AND GRID BALANCING
Biomethane can be **easily** stored and produced at a constant pace, helping **balance energy supply** from variable renewable energy sources.

NOW IS THE TIME TO SCALE UP!

AFFORDABILITY AND COST EFFICIENCY

REDUCED EXPOSURE TO FOOD PRICE VOLATILITY

SUSTAINABILITY OF FEEDSTOCKS

FLEXIBILITY IN THE EU ENERGY SYSTEM

HIGH RETURN ON INVESTMENT

BIOMETHANE AND NATURAL GAS COSTS
Cost biomethane production: from **€55/MWh**
Typical production costs in Europe range between 55 and 100 €/MWh (depending on location, feedstock, size and setup of the plant)
Cost natural gas: approx. €100/MWh

INFRASTRUCTURE
Biomethane deployment does not require large **infrastructure** investments.

ENOUGH SUSTAINABLE FEEDSTOCK TO SCALE UP
By 2030, we expect to see: Increased supply of **food waste.** Expanded use of **industrial and urban wastewater** and improved mobilisation of **agricultural residues.**

SOLID EU VALUE CHAIN
Investment in biomethane has a direct impact on EU **economic growth** and the creation of **green jobs.**

https://www.europeanbiogas.eu/wp-content/uploads/2022/04/REPowerEU-with-biomethane-EBA.pdf

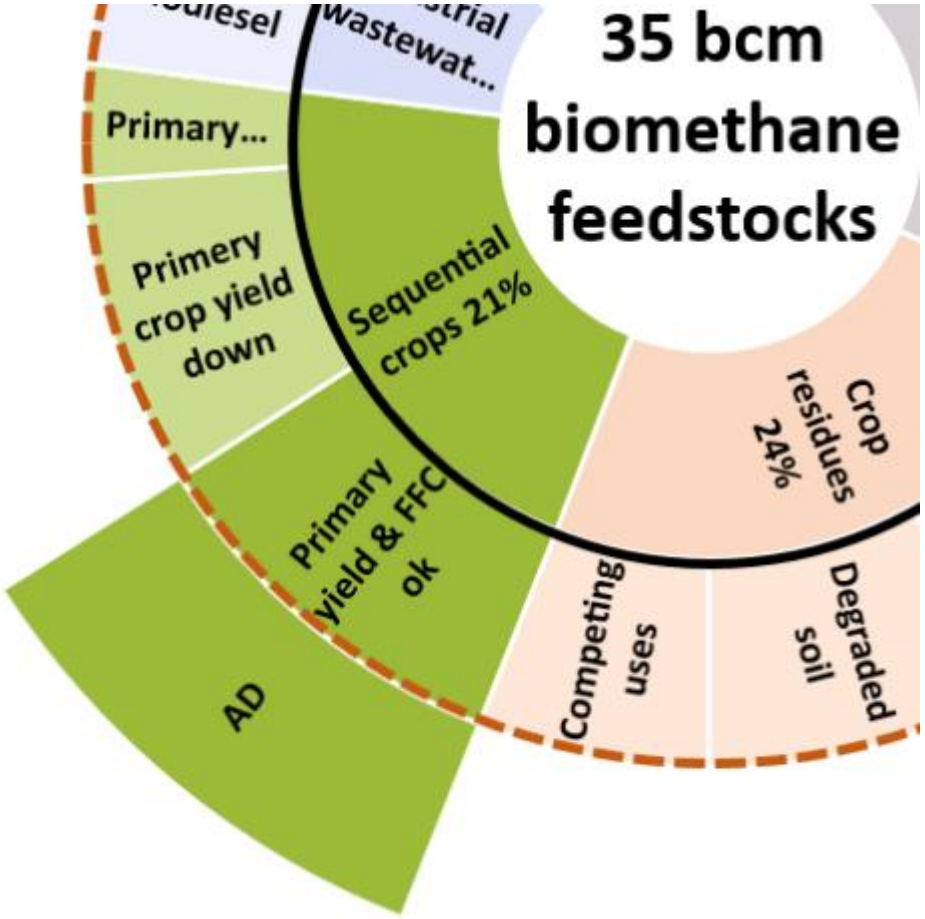
SUSTAINABILITY OF FEEDSTOCKS

ENOUGH SUSTAINABLE FEEDSTOCK TO SCALE UP

By 2030, we expect to see: Increased supply of **food waste.** Expanded use of **industrial and urban wastewater**

Sequential crops

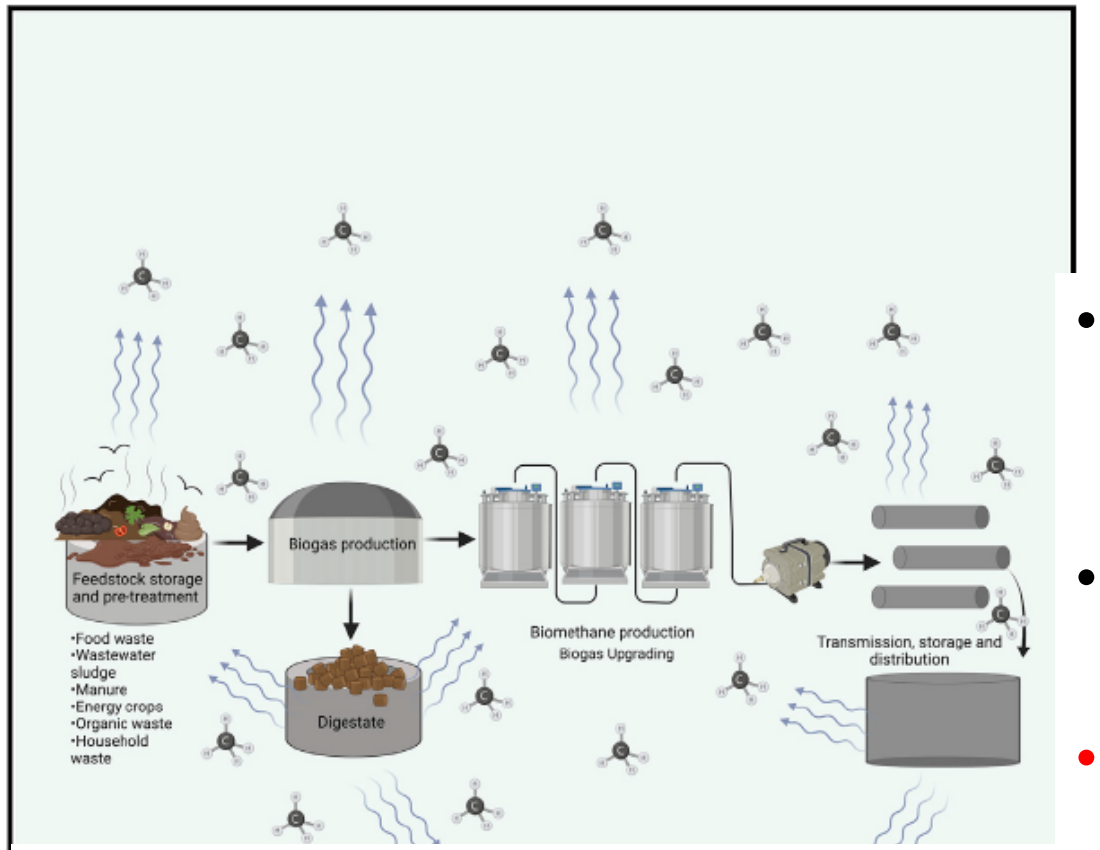
- double cropping, harvestable cover crop, energy cover crop or CIVE
- primary crop yield: food-feed-fuel competition?



Magnolo et al., “The Role of Sequential Cropping and Biogasdoneright™ in Enhancing the Sustainability of Agricultural Systems in Europe,” *Agronomy* 11, no. 11 (2021): 2102.

Methane emissions along biomethane and biogas supply chains are underestimated

Graphical abstract



Authors

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- Statistical analysis of 51 previous studies with mobile methane measurement and site data
- CH4 emissions 2 times greater tan estimated by IEA in 2021
- **One unit of biomethane emits more methane than one unit of fossil gas, under current average leakage rates**

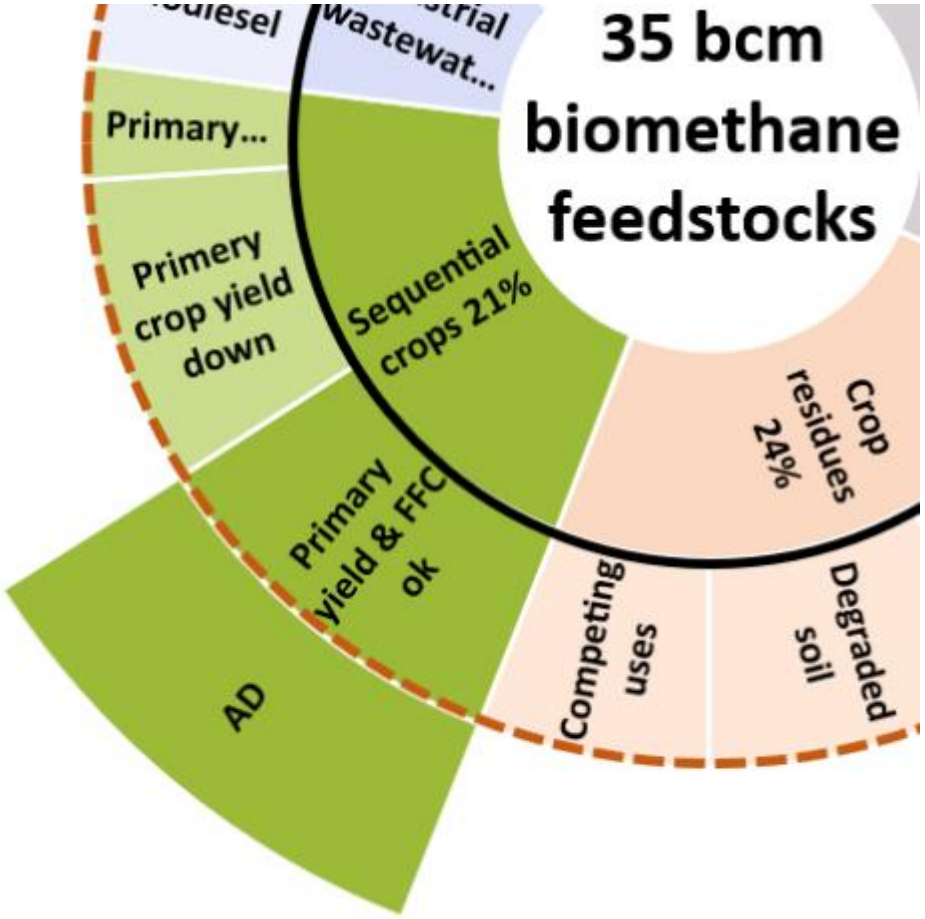
Bakkaloglu et al., 2022, One Earth 5, 724–736
June 17, 2022

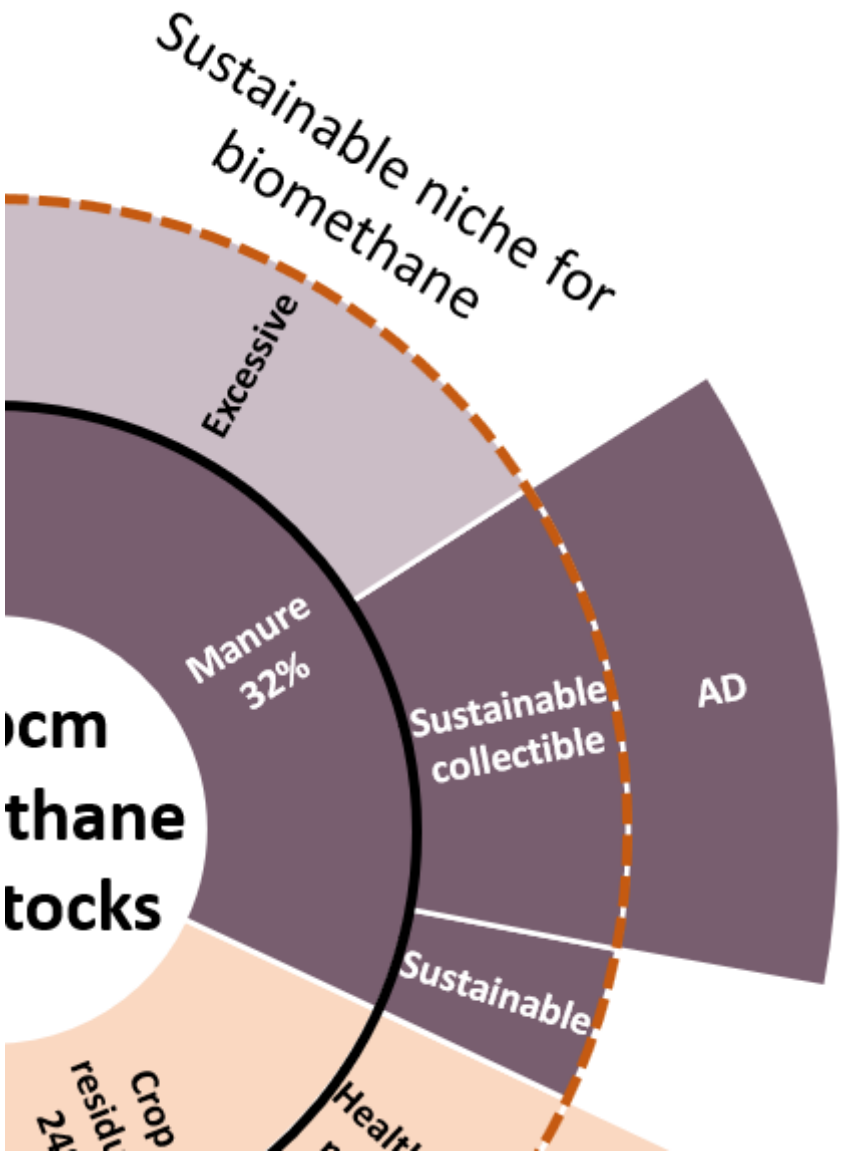
https://doi.org/10.1016/j.oneear.2022.05.012

Sequential crops

- double cropping, harvestable cover crop, energy cover crop or CIVE
- primary crop yield: food-feed-fuel competition?
- methane leakage: 70% reduction against REDII fossil fuel comparator?

(cf. International Energy Agency study on maize and methane leakage)





Manure

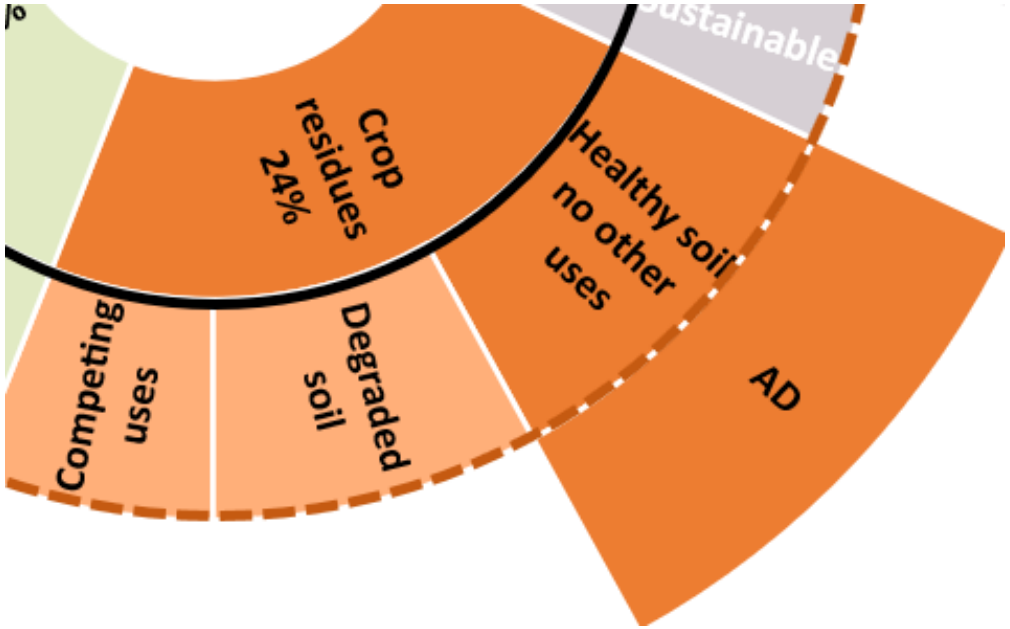
Based on current livestock production volumes calculated by JRC [1]

"*Reduction of excess meat consumption is amongst the most effective measures to mitigate greenhouse gas emissions, with a high potential for environment, health, food security, biodiversity and animal welfare co-benefits*"
Group of Chief Scientific Advisors to EC. [2]

EC Assessment: spatial and logistical challenges: manure to biogas, no upgrading to biomethane

Nitrates directive: JRC – FAO study: better manure management not enough, dietary change is a pre-condition for achieving reduction of nitrogen needed in EU agriculture [3]

1. Scarlat et al., "A Spatial Analysis of Biogas Potential from Manure in Europe," *Renewable and Sustainable Energy Reviews* 94 (2018): 915–30
2. European Comission, "Towards Sustainable Food Consumption – Promoting Healthy, Affordable and Sustainable Food Consumption Choices. Group of Chief Scientific Advisors," 2023
3. Leip et al., "Halving Nitrogen Waste in the European Union Food Systems Requires Both Dietary Shifts and Farm Level Actions," *Global Food Security* 35 (2022): 100648



Agricultural residues

Based on JRC study [1] twice as much as EC assessment

Sustainable removal rates uncertain and very location dependent

Competing uses (in addition to animal bedding)

1, Scarlat et al., “Integrated and Spatially Explicit Assessment of Sustainable Crop Residues Potential in Europe,” *Biomass and Bioenergy* 122 (2019): 257–69.

CO-DIGESTION VS MONO-DIGESTION

- mono-digestion: performance and technical challenges
- no spatial analysis of co-digestion feedstock availability

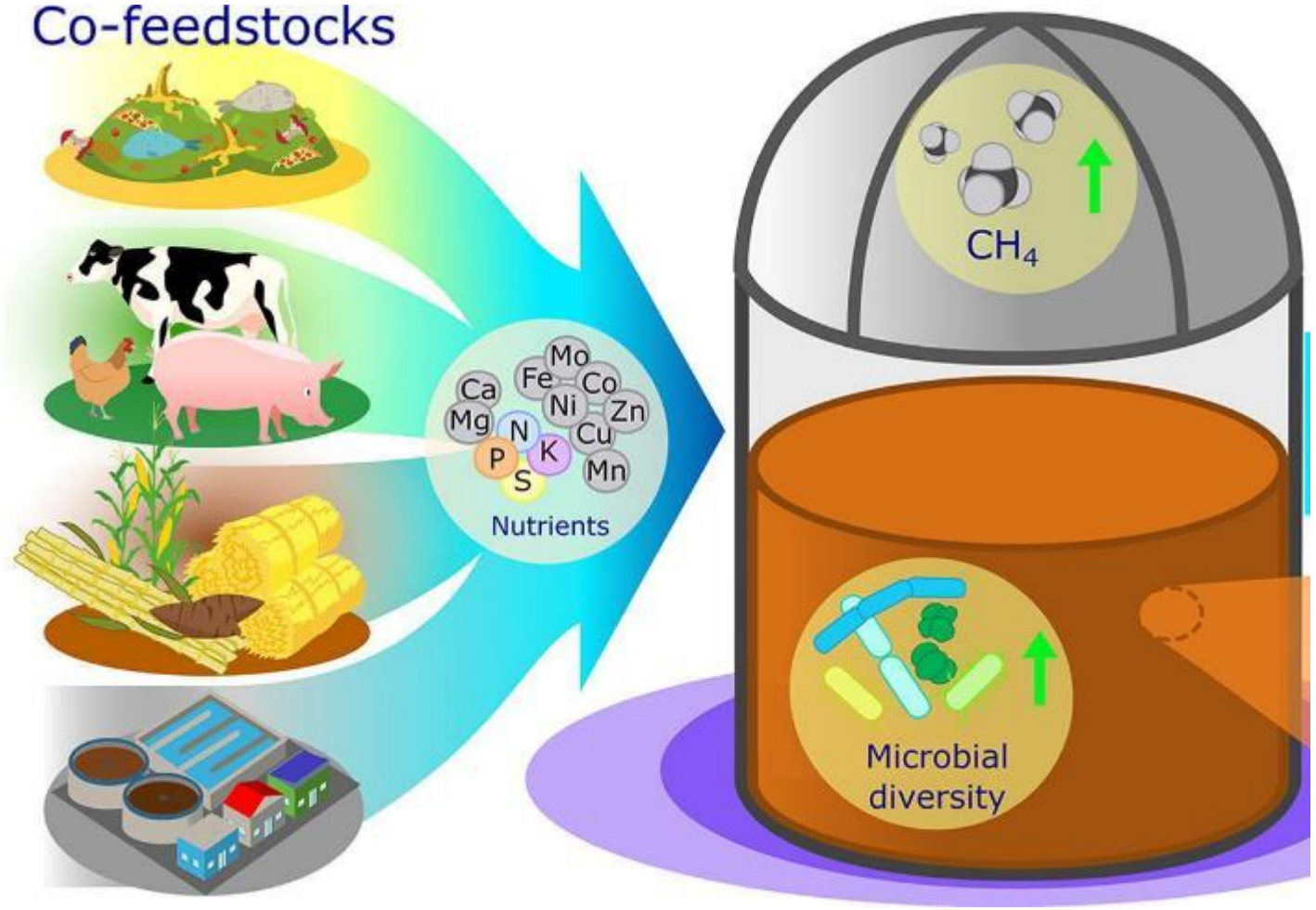
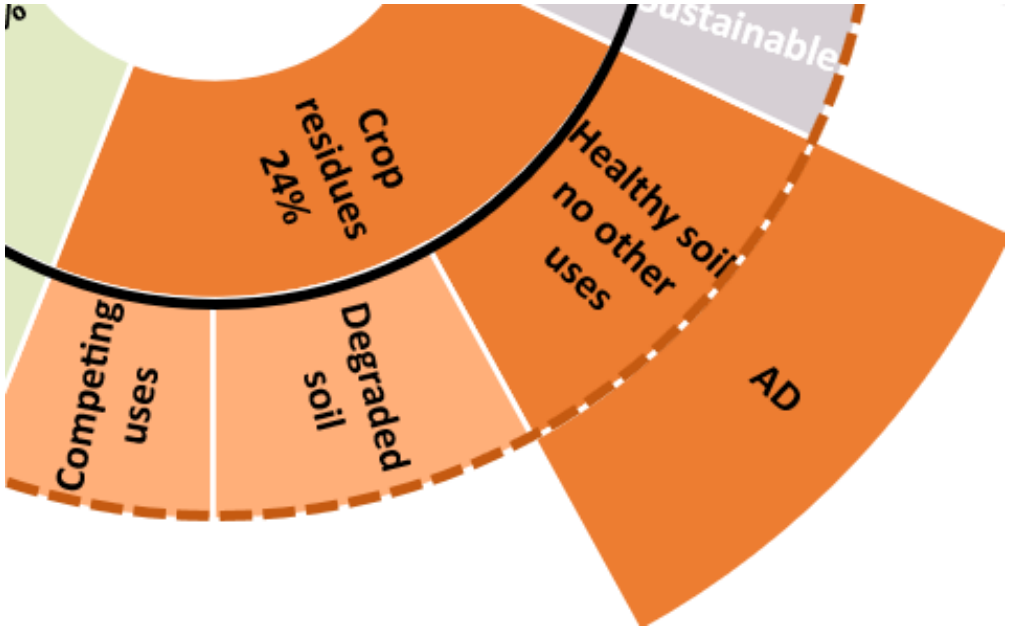


Image: Karki, R, et al. "Anaerobic co-digestion: Current status and perspectives." *Bioresource Technology* 330 (2021).



Agricultural residues

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Competing uses (in addition to animal bedding)

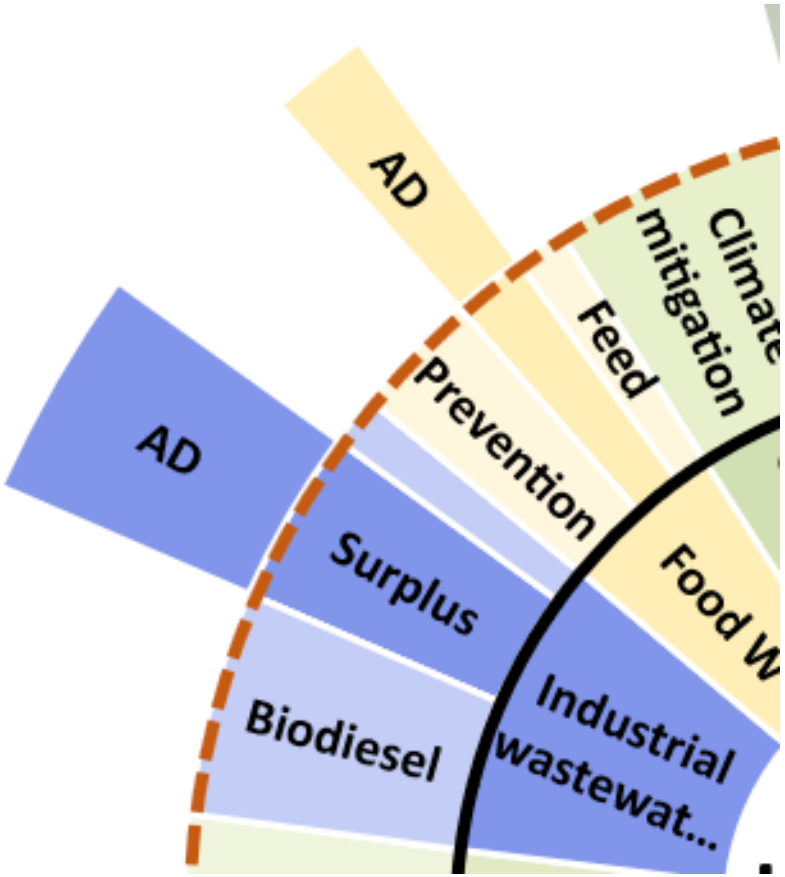
Spatial analysis of co-availability of sustainable feedstocks:
France agriculture AD by 2050

- Gas industry: 152.4 TWh
- ADEME & INRAE: 108.7 TWh [2]

1, Scarlat et al., “Integrated and Spatially Explicit Assessment of Sustainable Crop Residues Potential in Europe,” *Biomass and Bioenergy* 122 (2019): 257–69.
2. N. Malet, S. Pellerin, and T. Nesme, “Agricultural Biomethane Production in France: A Spatially-Explicit Estimate,” *Renewable and Sustainable Energy Reviews* 185 (2023): 113603

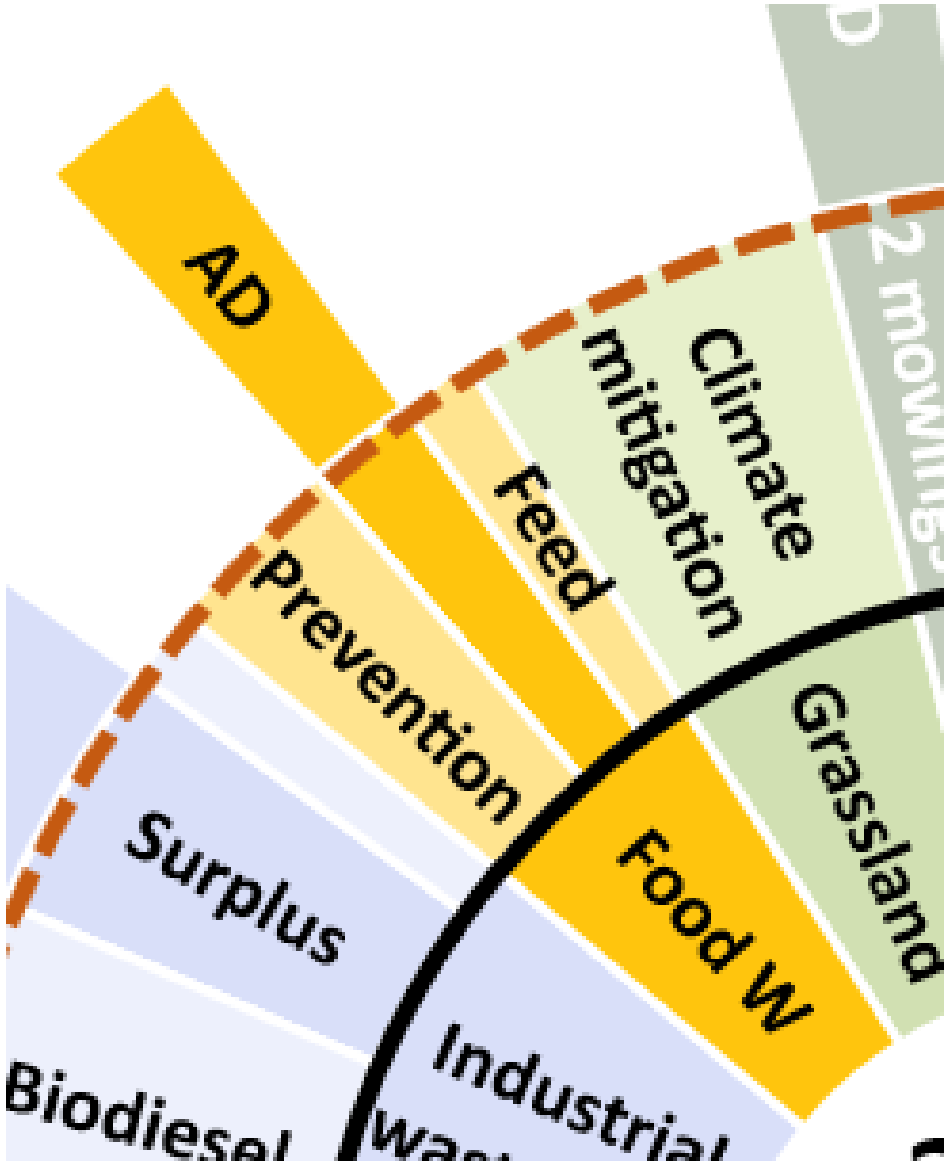
Industrial wastewaters (9%)

- 48% from biodiesel (feedstock crunch, 19 million bottles cooking oil / day)
- Competing uses for dairy, drink & food industry wastewaters?



Food Waste (5%)

- General mention of overall recycling and all waste prevention ambition, but no mention of specific FW reduction targets
- No consideration of competing uses of FW currently going to incineration or landfill
- Based on data prior to EC food waste data



Food Waste and Biowaste estimates

Assumptions on biowaste in ICL biomass study			
		Recycled	Collected for bioenergy
Scenario 1 - Low	2030	60%	40%
	2050	65%	35%
Scenario 2 - Medium	2030	50%	50%
	2050	55%	45%
Scenario 3 - High	2030	40%	60%
	2050	45%	55%

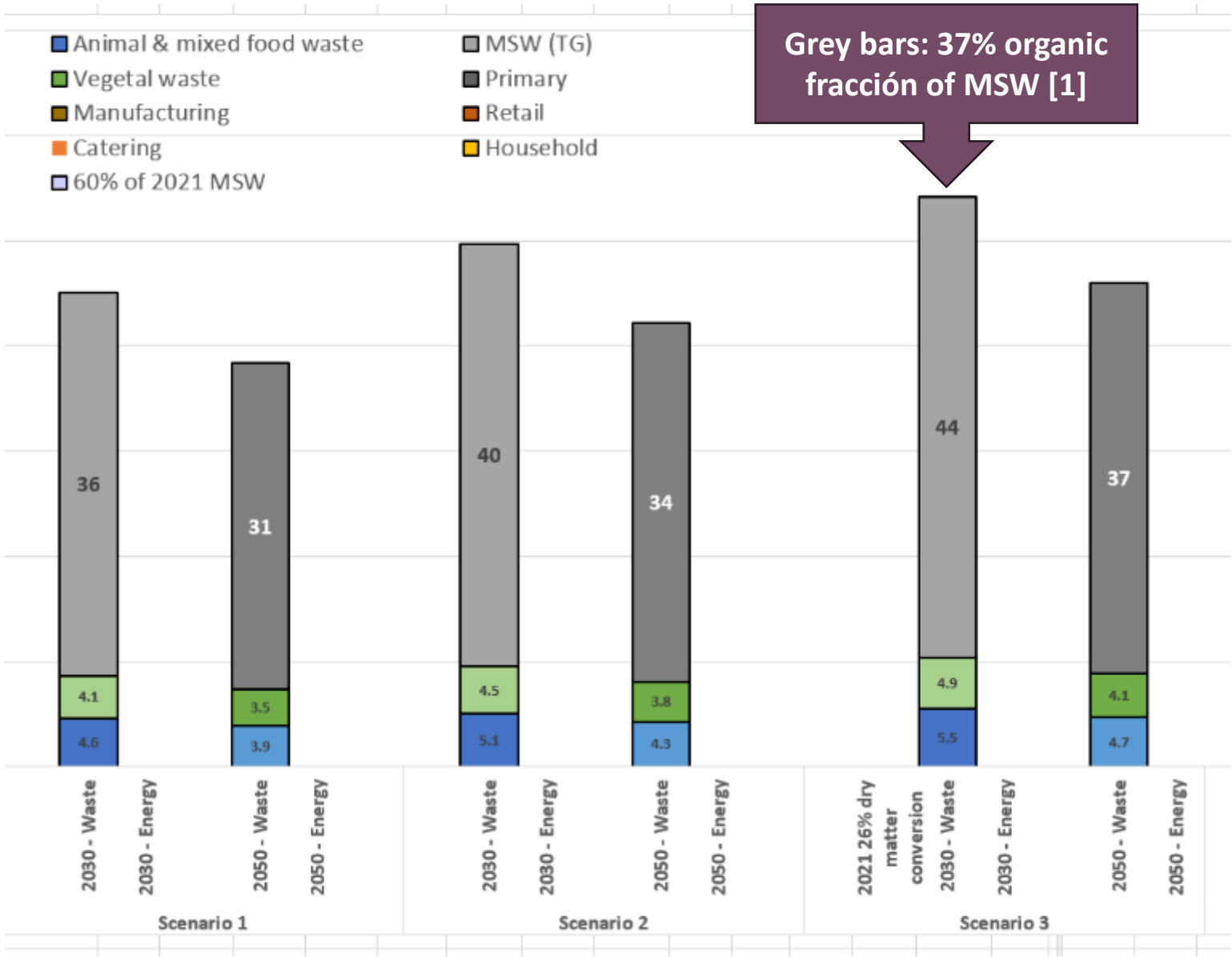
- Mixed food waste and vegetal waste to AD
- Municipal Waste to Thermal Gasification
- CirEc municipal recycling rates applied to MSW in low scenario;
  - 60% re-used and recycled by 2030
  - 65% re-used and recycled by 2030

- Rising awareness for reduction, reduced availability at source
- More is recycled and separately collected in 2050
- More is separated for bioenergy in the high scenario
- Gas industry study took Scenario 3 for AD feedstock estimates

Calliope Panoutsou and Kyriakos Maniatis, “Sustainable Biomass Availability in the EU” (Imperial College London, 2021), commissioned by Concawe

Food Waste and Biowaste estimates

- Overall waste reduction to 2050 within scenarios but scenario 3 has more available
- Assume this is as result of reduction in landfill and incineration

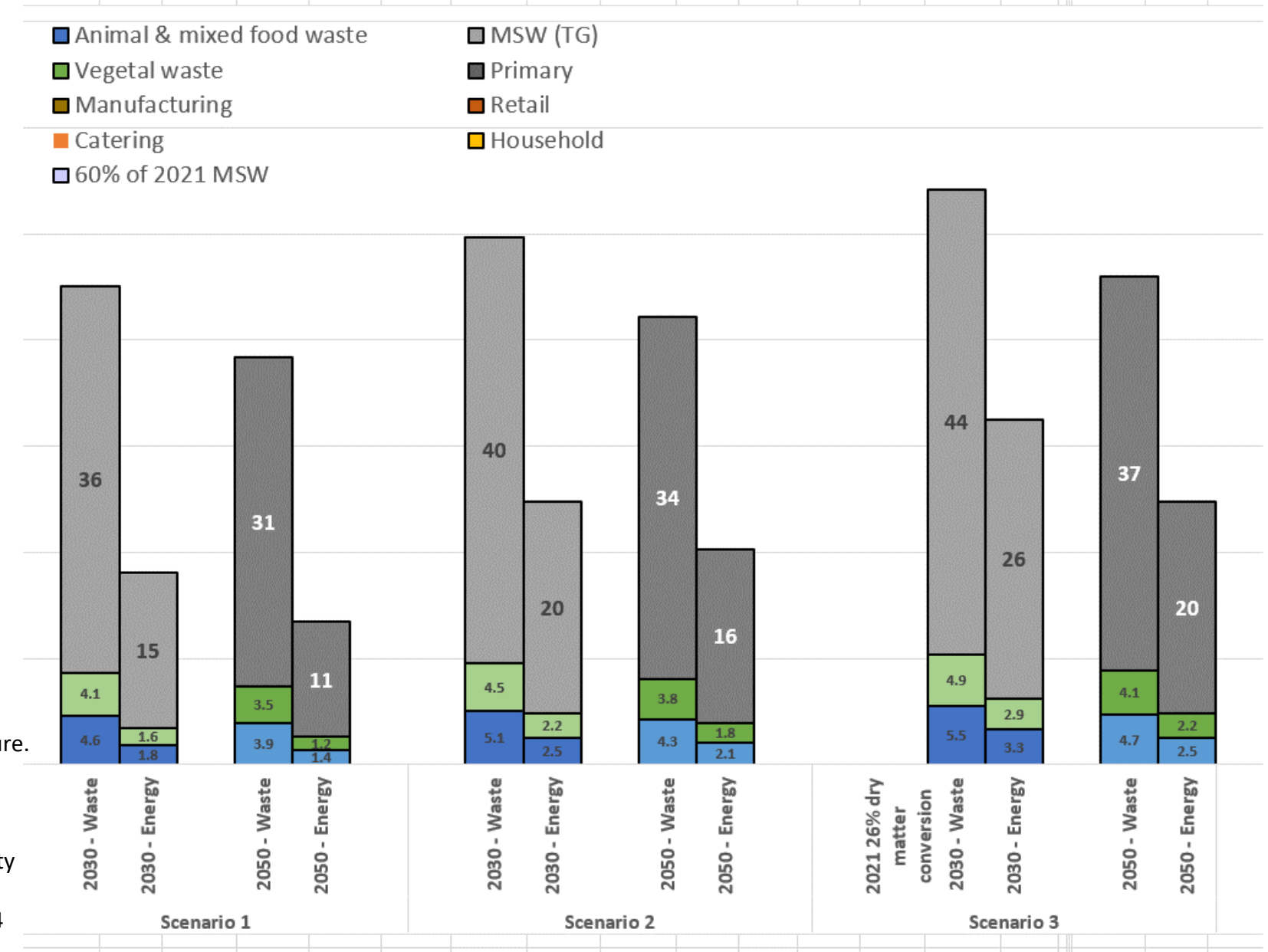


Data in graph from Calliope Panoutsou and Kyriakos Maniatis, "Sustainable Biomass Availability in the EU" (Imperial College London, 2021), commissioned by Concawe. Feedback applied 37% fraction to MSW figure.

Organic fraction from: 1.Bräutigam K-R, Jörissen J, Priefer C. The extent of food waste generation across EU-27: Different calculation methods and the reliability of their results. Waste Management & Research. 2014;32(8):683-694. doi:10.1177/0734242X14545374

Food Waste and Biowaste estimates

- Existing competing uses accounted for
- Waste currently going to incineration or landfill: potential feedstock



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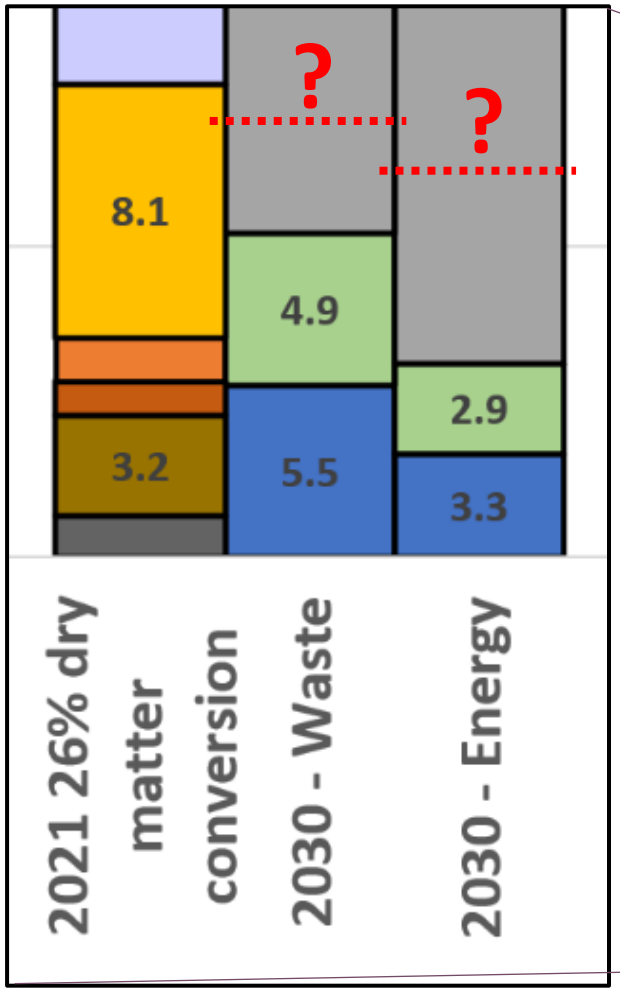
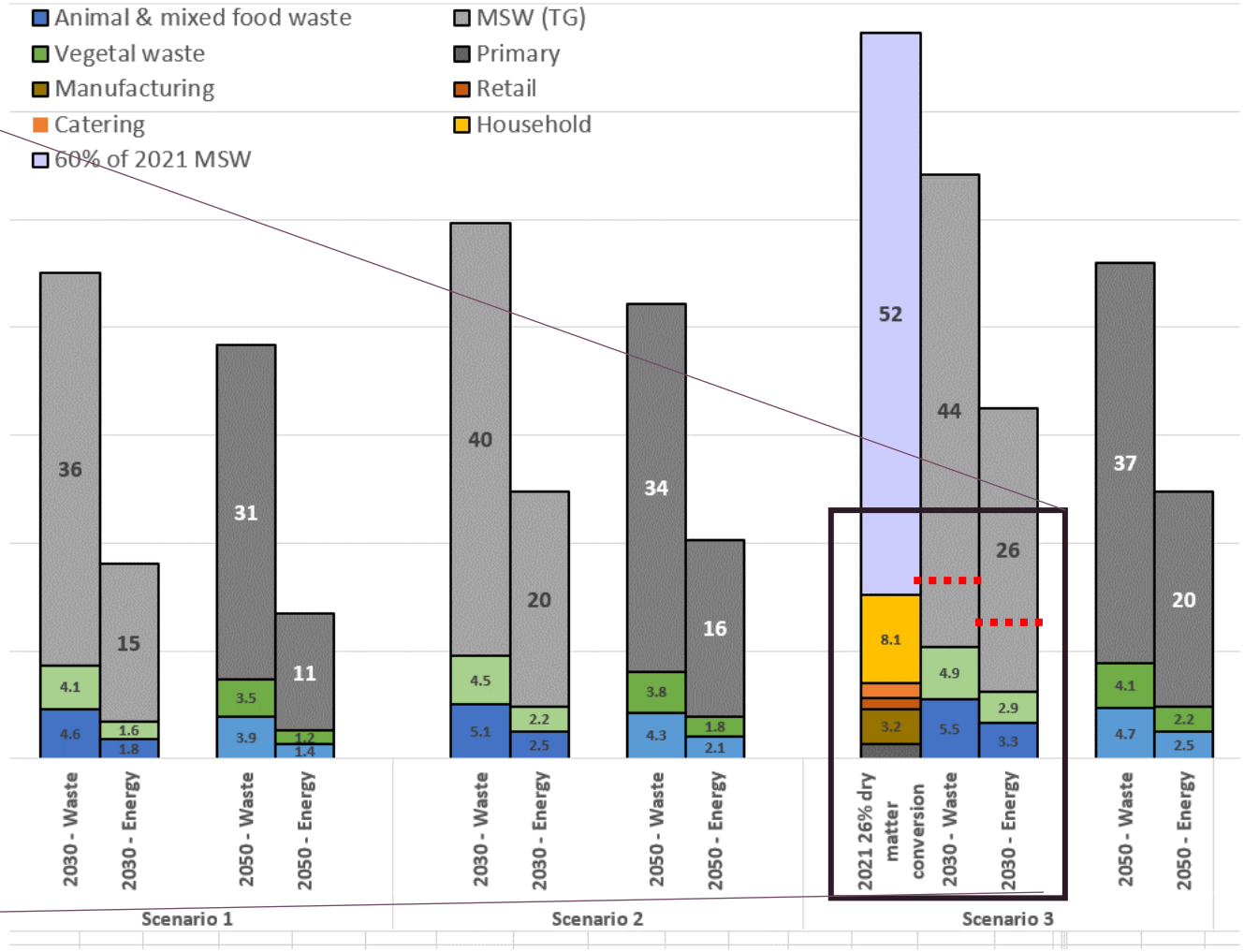
Gas industry Food Waste data comparison with EU Food Waste data

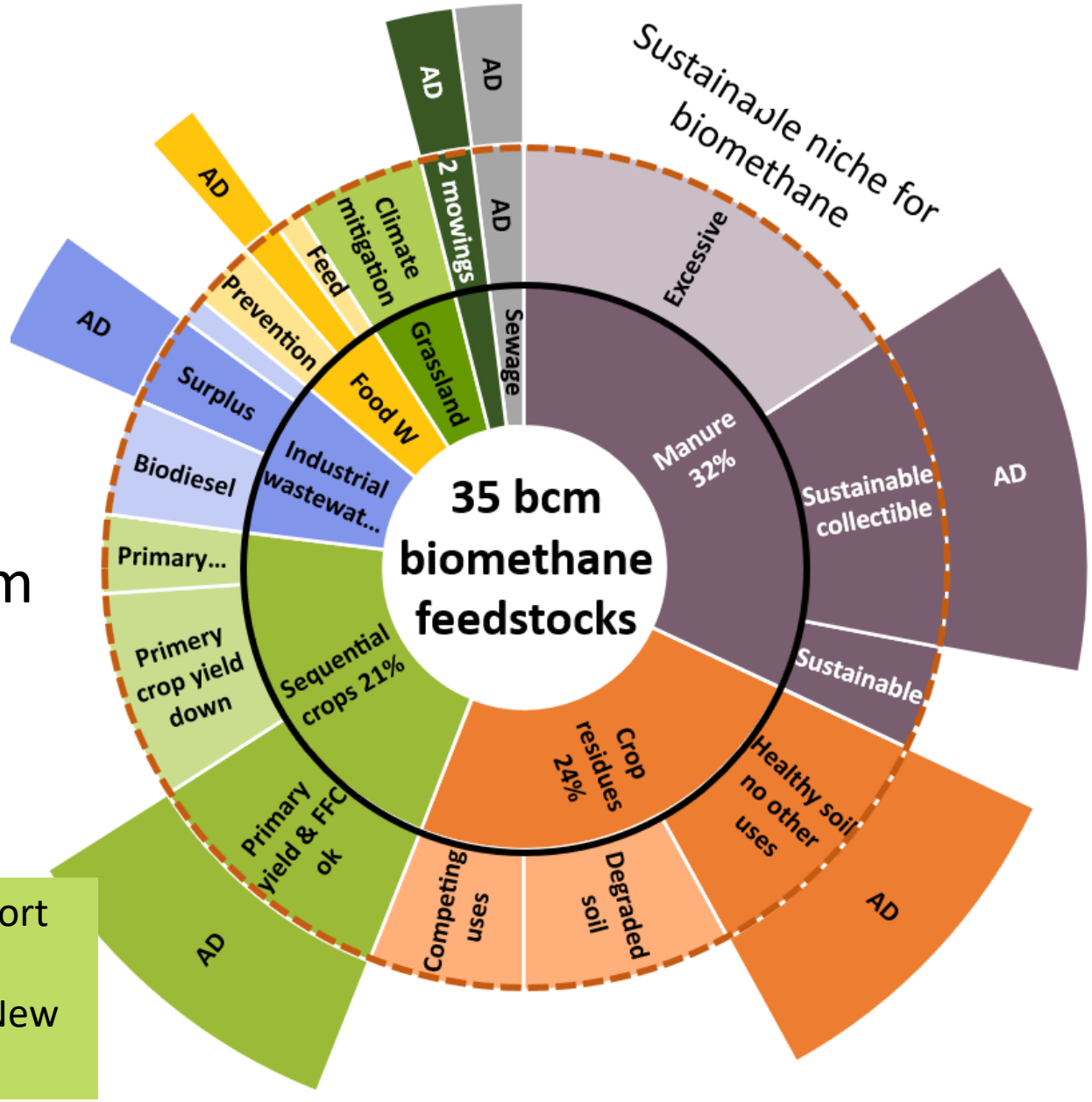




Dry matter fraction of food waste figures assumed to be 26% based on
Zu Ermgassen, Erasmus KHJ, et al. "Reducing the land use of EU pork production: where there's swill, there'sa way." Food policy 58 (2016): 35-48.

Risks resulting from upscaling biomethane target

- feedstock scramble for FW, wastewaters, crop residues, manure
- fall back on energy crops
- lock-in of livestock agri-system driving CC
- sequential crops increasing methane emissions



For an alternative strategy to reduce fossil gas import dependence with 20bcm biomethane see: Agora Energiewende, “Breaking Free from Fossil Gas. A New Path to a Climate-Neutral Europe.,” 2023.

Thank you

Full analysis to be published in November on https://feedbackeurope.org/campaigns/badenergy/

For further information, please contact
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