# Testing the greenhouse gas abatement of bio-based production from agricultural residues

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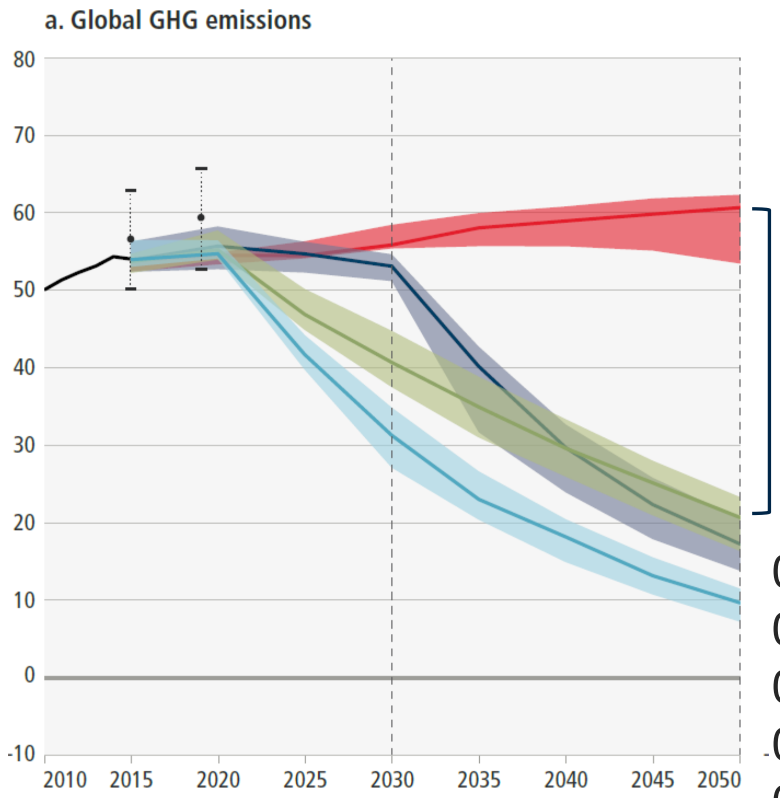
# Role of bio-based production in GHG mitigation

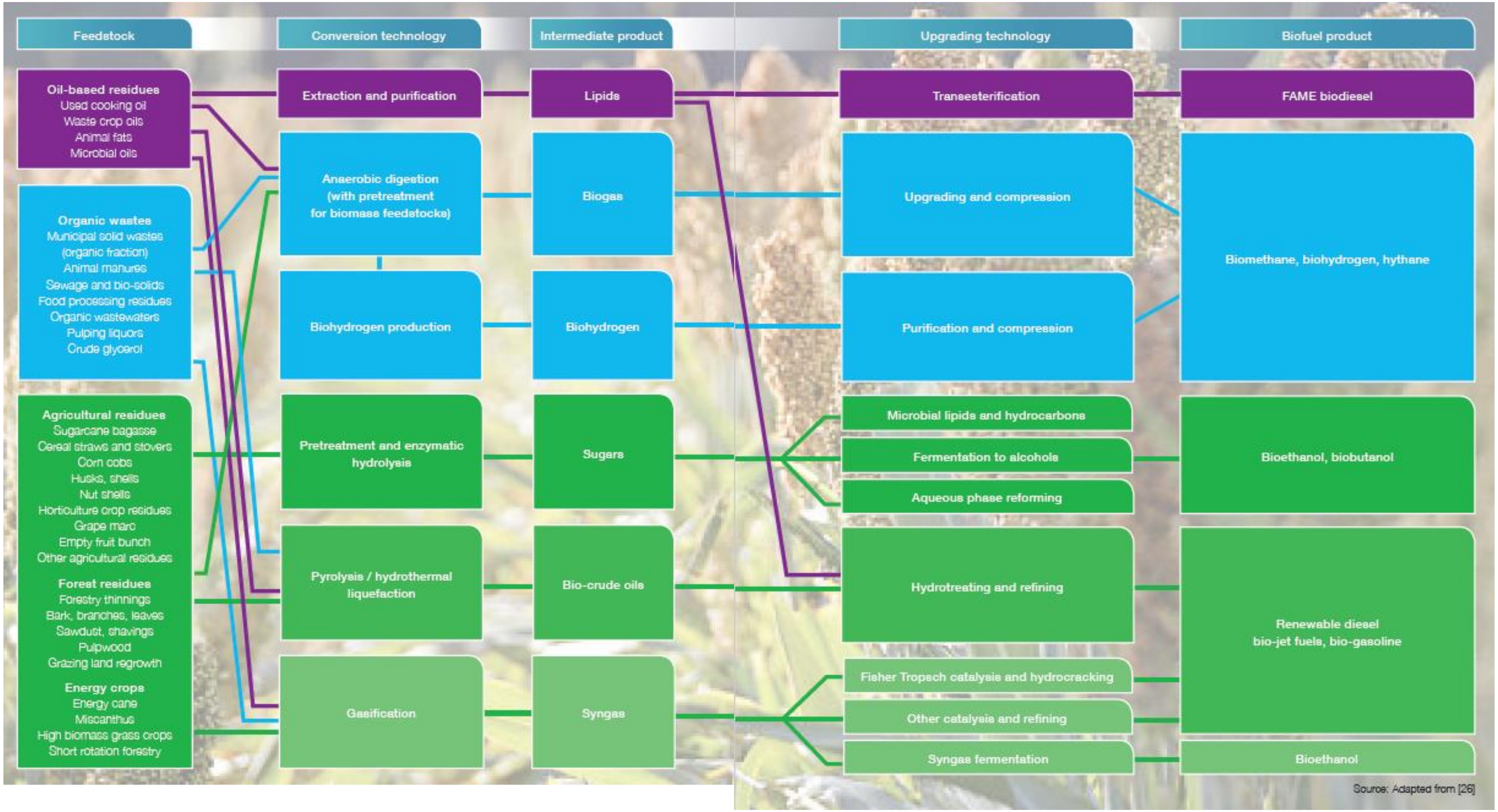

**40 Gt $CO_{2e}$/yr**

0.8 - bioelectricity (BE)
0.2 – BECC
0.6 – biofuels
0.6~ fuel switching
0.4 – feedstock decarbonisation
**2.6 – bio-based total**

3.6 – ag C sequestration

Source: IPCC 2022. Climate change 2022. Mitigation of Climate Change. Summary for Policymakers. Sixth Assessment Report (6AR). Fig SPM.7

# Bioproduction pathways




Source: O'Hara et al 2018. Biofuels to bioproducts: a growth industry for Australia | Discussion Paper

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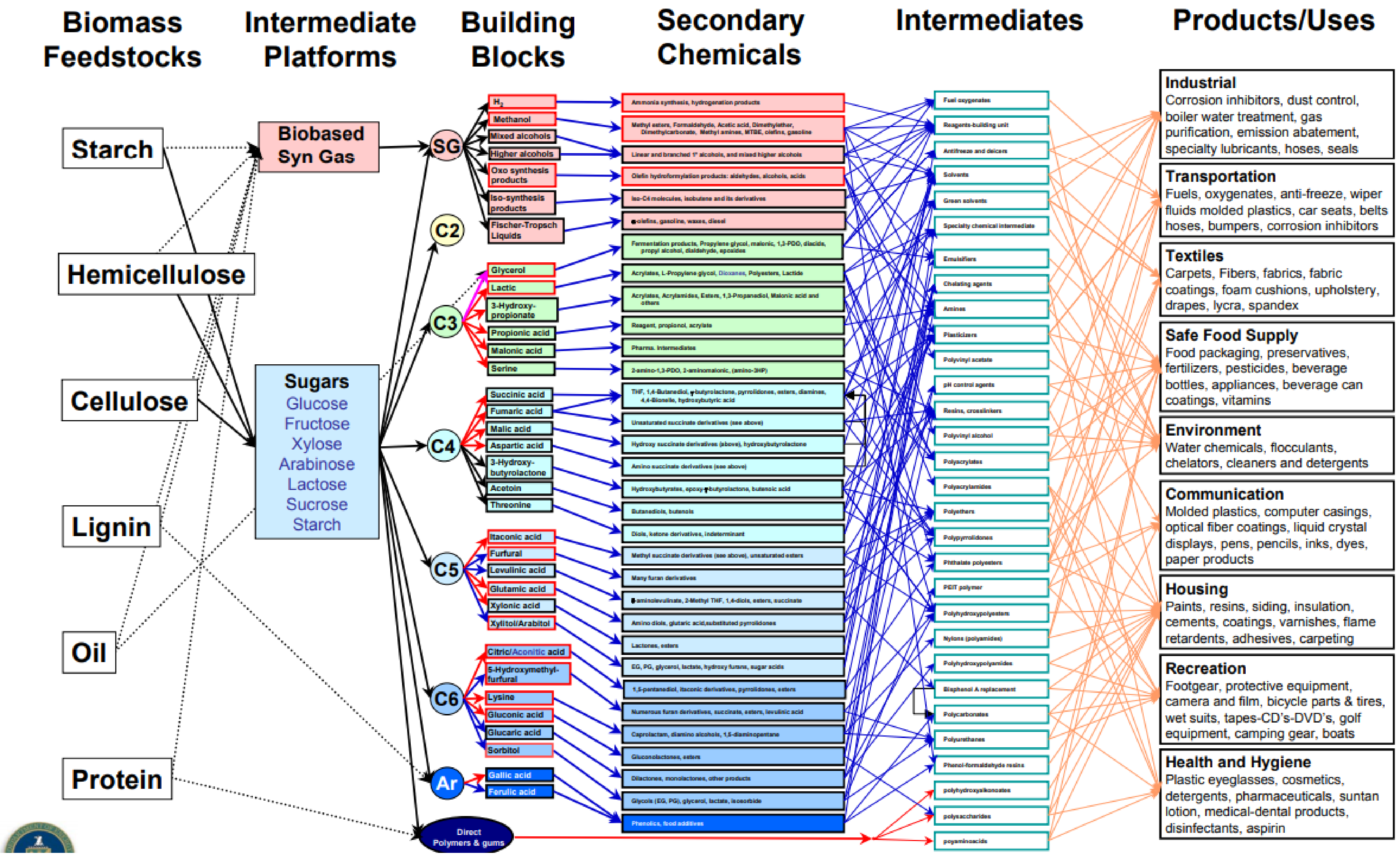
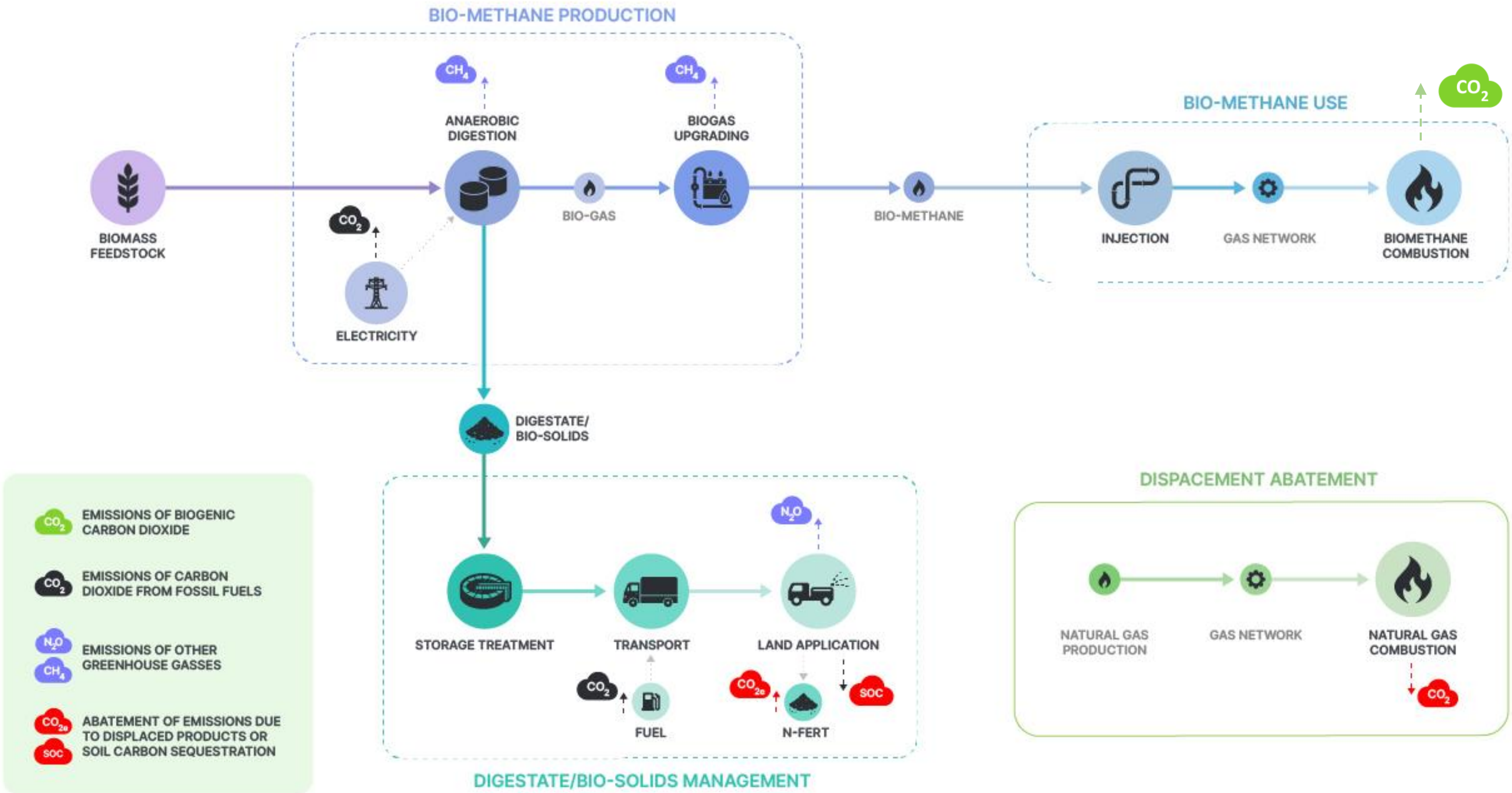
# Bioproduction pathways



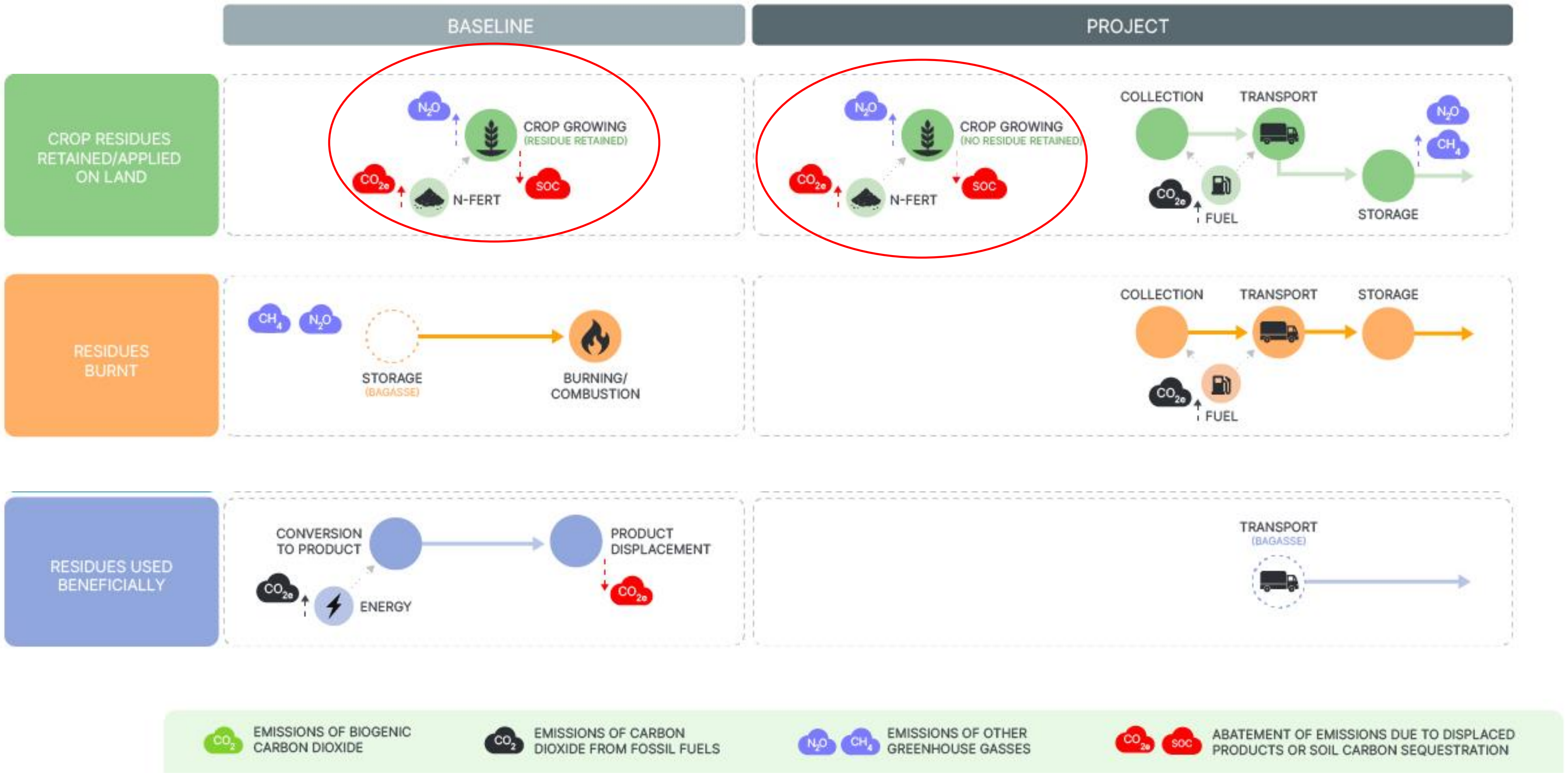

Source: Biddy et al 2016. Chemicals from Biomass: A market assessment bioproducts with near-term potential, NREL

# GHG emissions and abatement

## Biomethane example



# Diverting agricultural residues from existing uses



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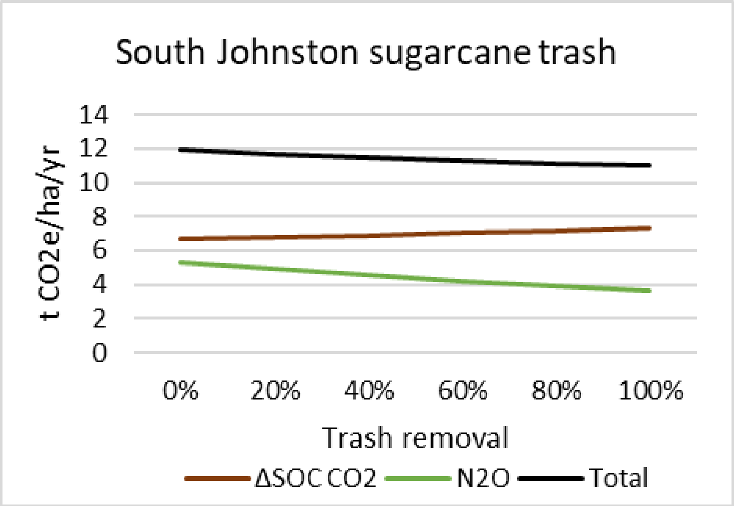
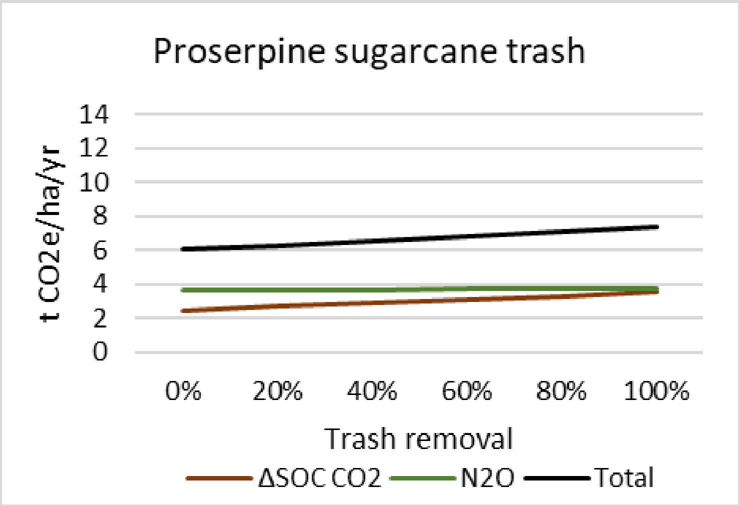
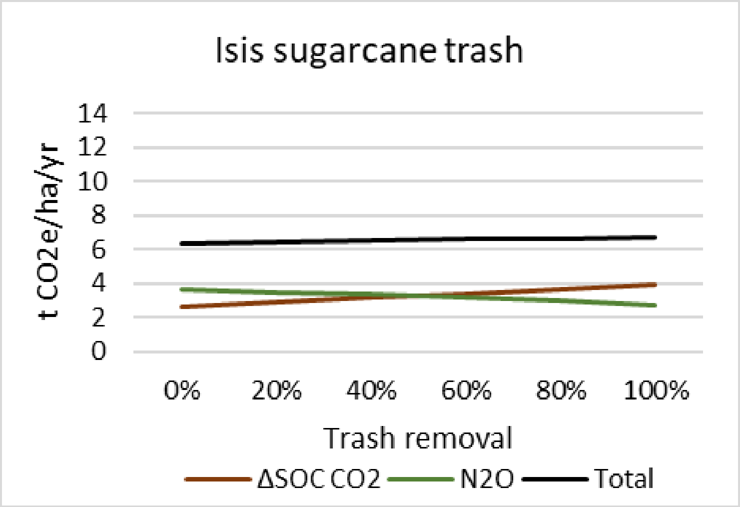
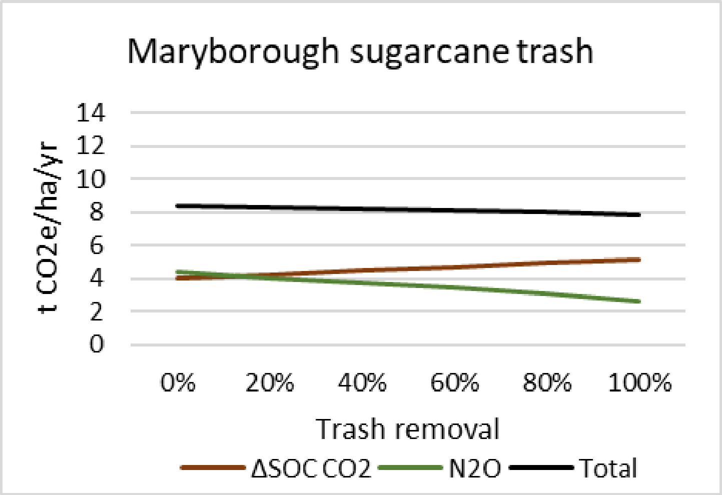
# APSIM modelling of residue removal

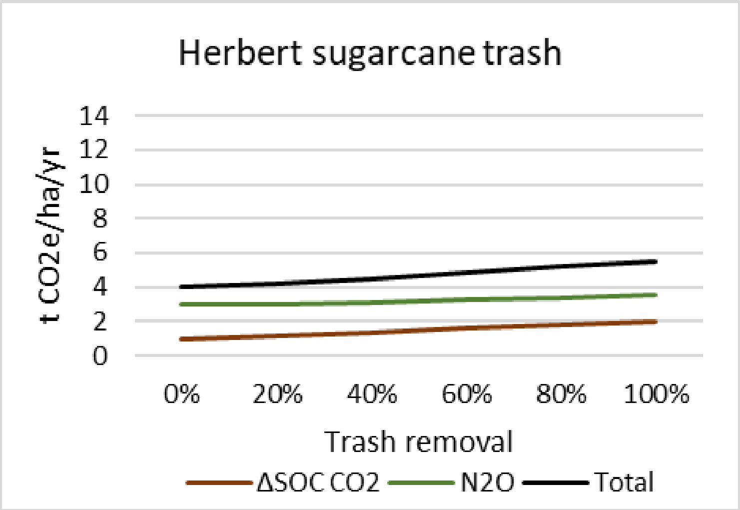
## How residue removal influence on-farm GHG flux

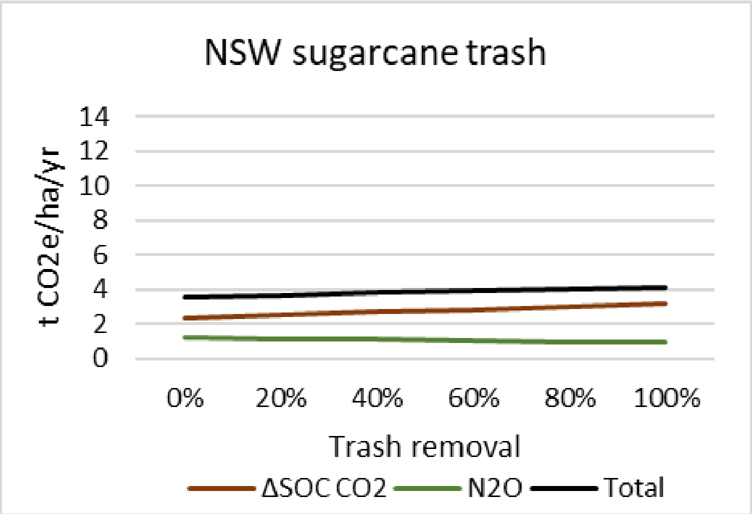


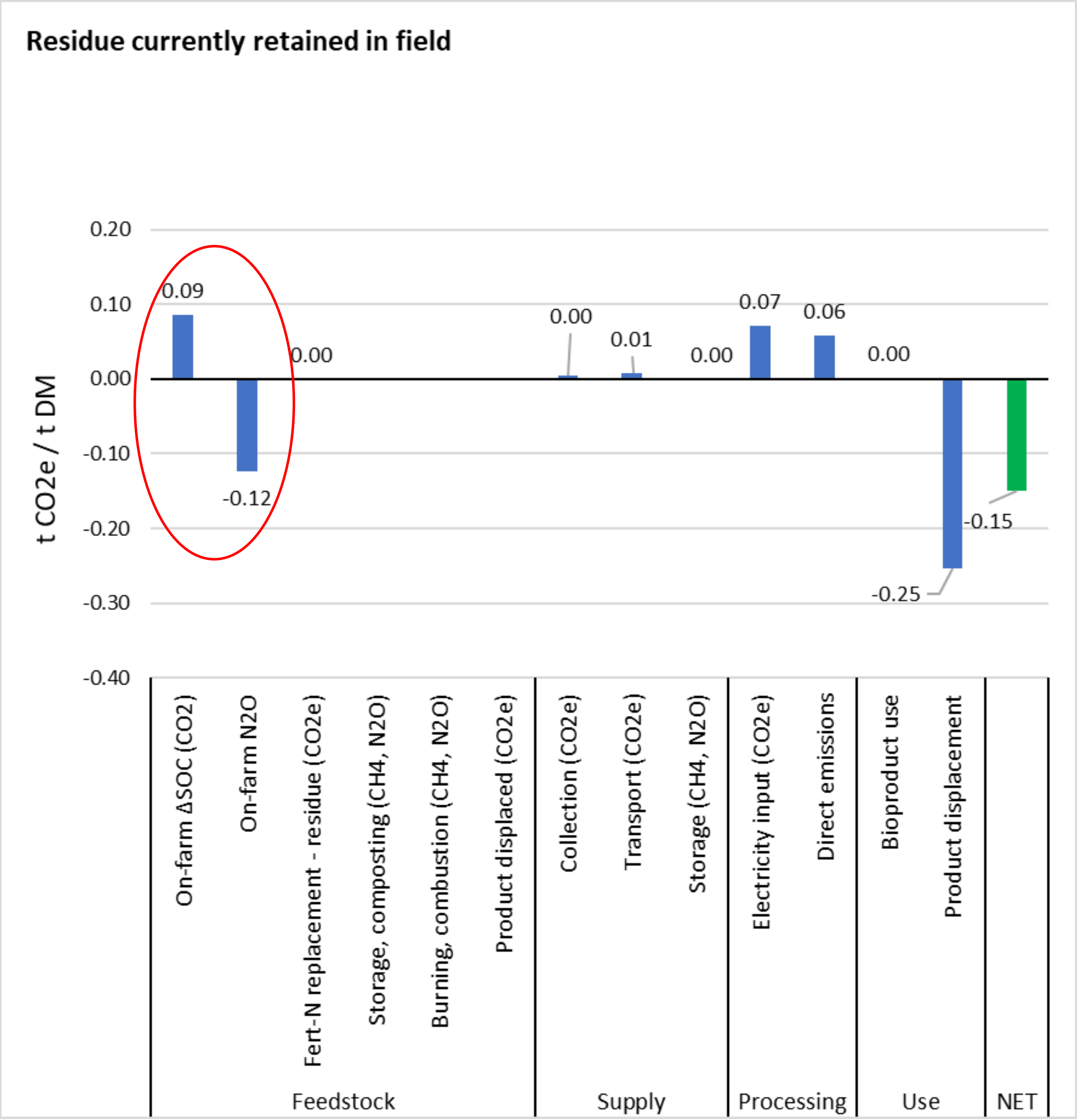



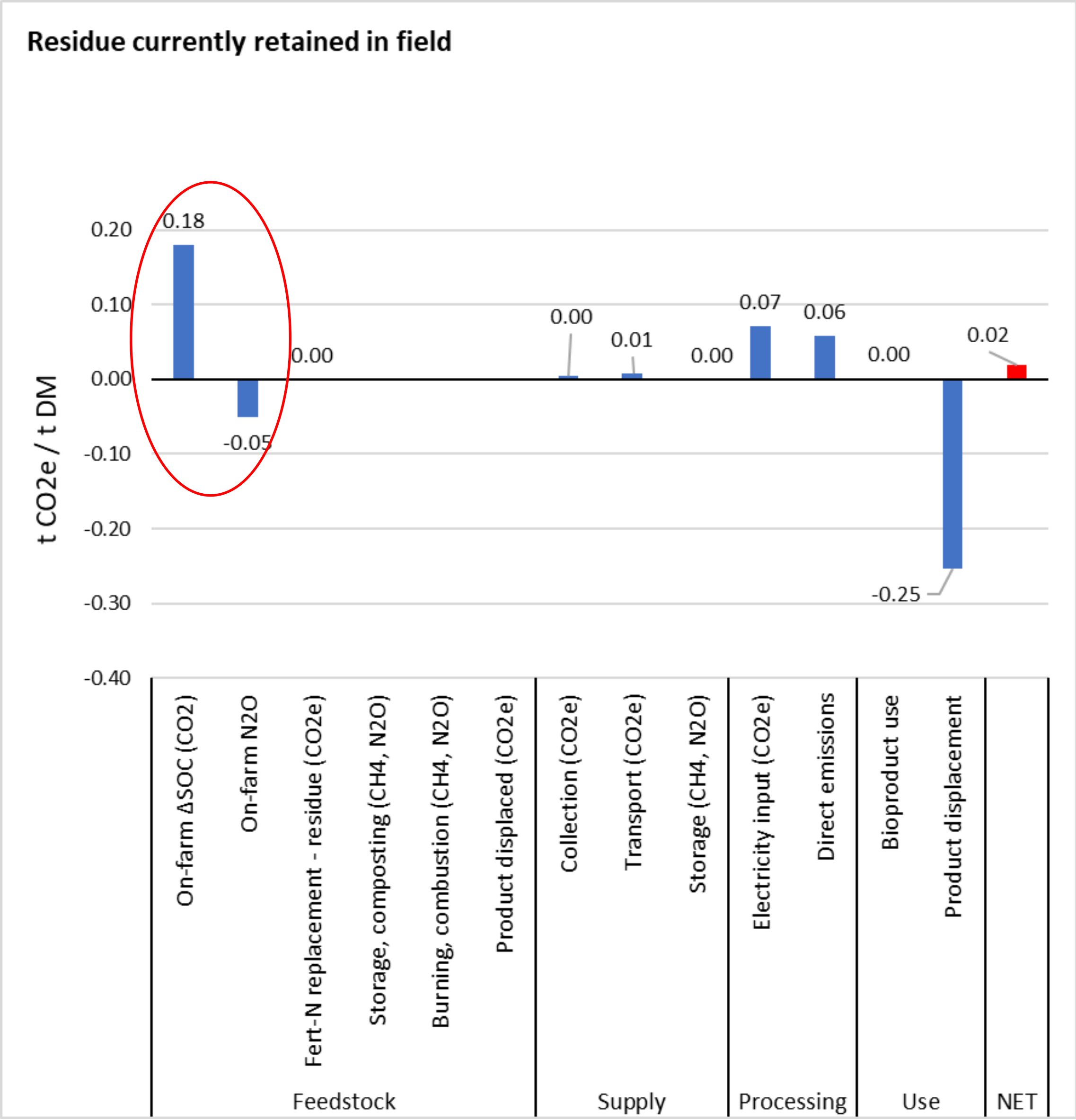



# How GHG mitigation is achieved from bio-production



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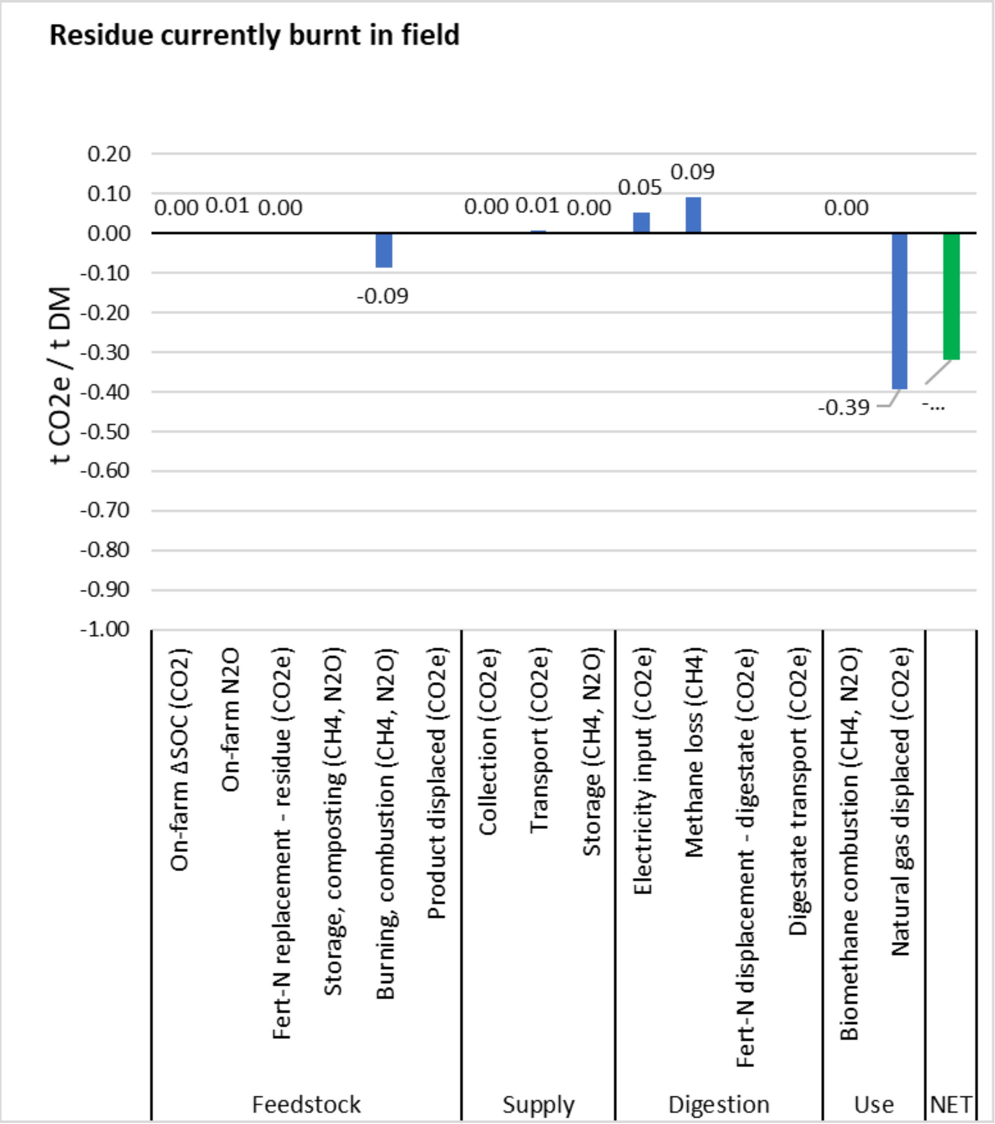


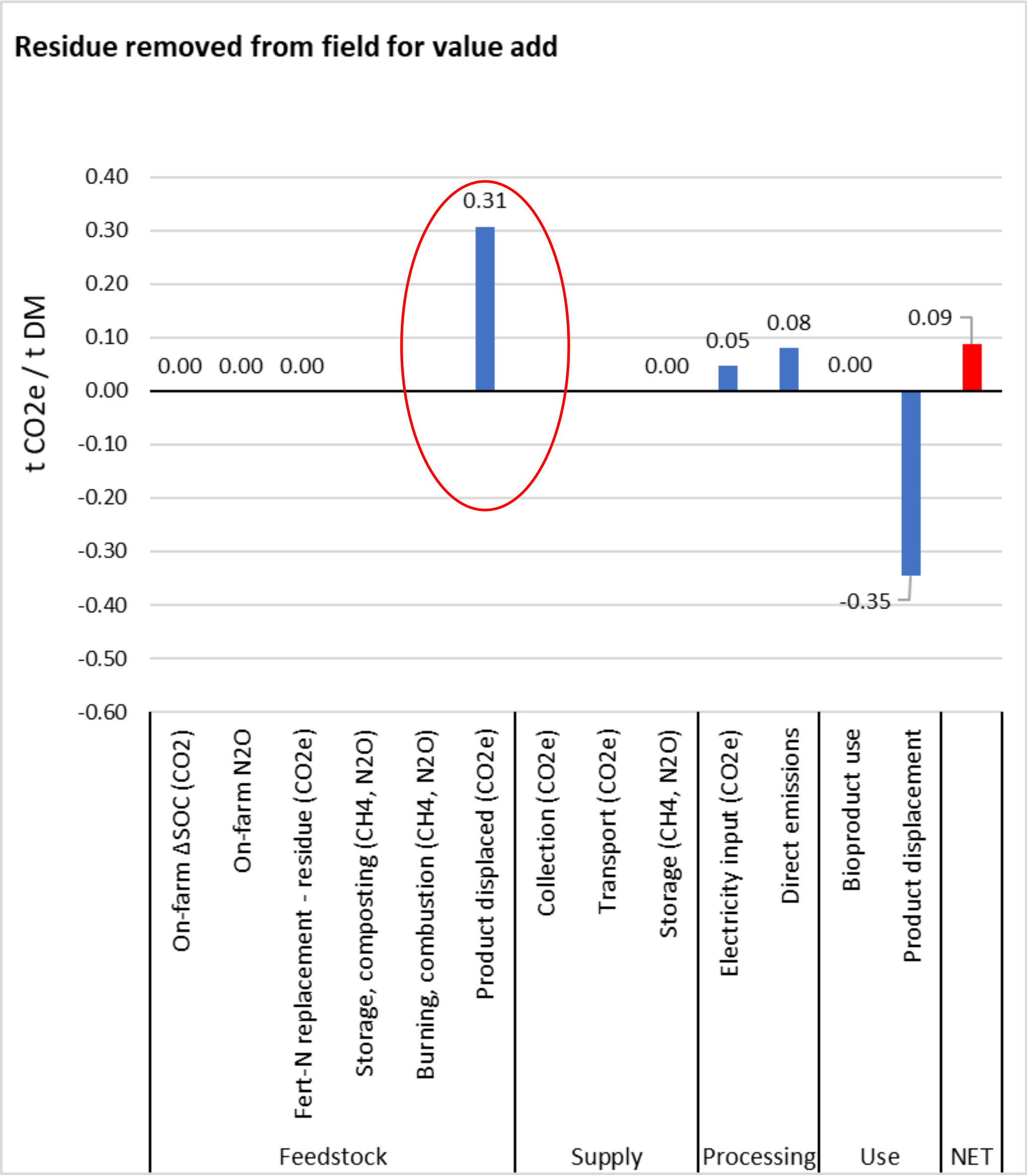

# Areas of potential leakages

- For residues removed from land in some regions, increased $CO_2$ emissions from SOC loss can be greater than reduced $N_2O$ emissions, resulting in an overall increase in on-farm GHG emissions.
- For residues that are already value-added into products, the lost displacement abatement when they are diverted away from these uses can also be a leakage.
- For residues with valuable nitrogen (N) content, urea-N replacement when they are removed also increases on-farm emissions.

This challenges the assumption that agricultural residues, often considered to be ‘wastes’, come free of embodied or consequential impacts when used as inputs to production processes.