



CCm Technologies[®]

DELIVERING
CARBON EMISSIONS
REDUCTIONS

JANUARY 2024



- Carbon Capture and Utilisation
- Capture of Biogenically produced CO₂
- Use of recovered energy and physical resources
- Production of low Carbon premium products

THE CCM PROCESS



CAPTURE



Ammoniacal
Capture agent

+



Calcium
Salt



STABILISATION



PREMIUM PRODUCT



Sustainable,
low carbon,
pelletised,
drop-in
Plant Nutrients



Organic Fibre
Material

9 years of independent field trials validate agronomic efficacy & Carbon Trust certification of Carbon Footprint

Key Features



- The process uses directly captured CO₂ to stabilise the matrix with chalk
- The process uses directly captured CO₂ to stabilise ammonia
- The stabilisation process increases the dry matter content of the material and allows the inclusion of additional dry nutrient materials into a formulation
- The process creates a stable matrix which can influence that rate of nutrient release and/or breakdown

Key Features



- The level of capture is proportional to the N content of the end product
- So high capture rates deliver High N product – 15N
- CO₂ retained in product as Calcium Carbonate
- Use of biogenically source CO₂ and recovered/renewable power result in low Carbon footprint
- Cradle to Gate footprint certified by Carbon Trust as **minus 0.9kg CO₂e/kg of product** (12 4 4 plant nutrient material)



Potential Impact



➤ Will this approach actually make a difference ?

nature



UNIVERSITY OF
CAMBRIDGE

The analysis found that manure and synthetic fertilisers emit the equivalent of 2.6 gigatonnes of carbon per year

more than global aviation and shipping combined.

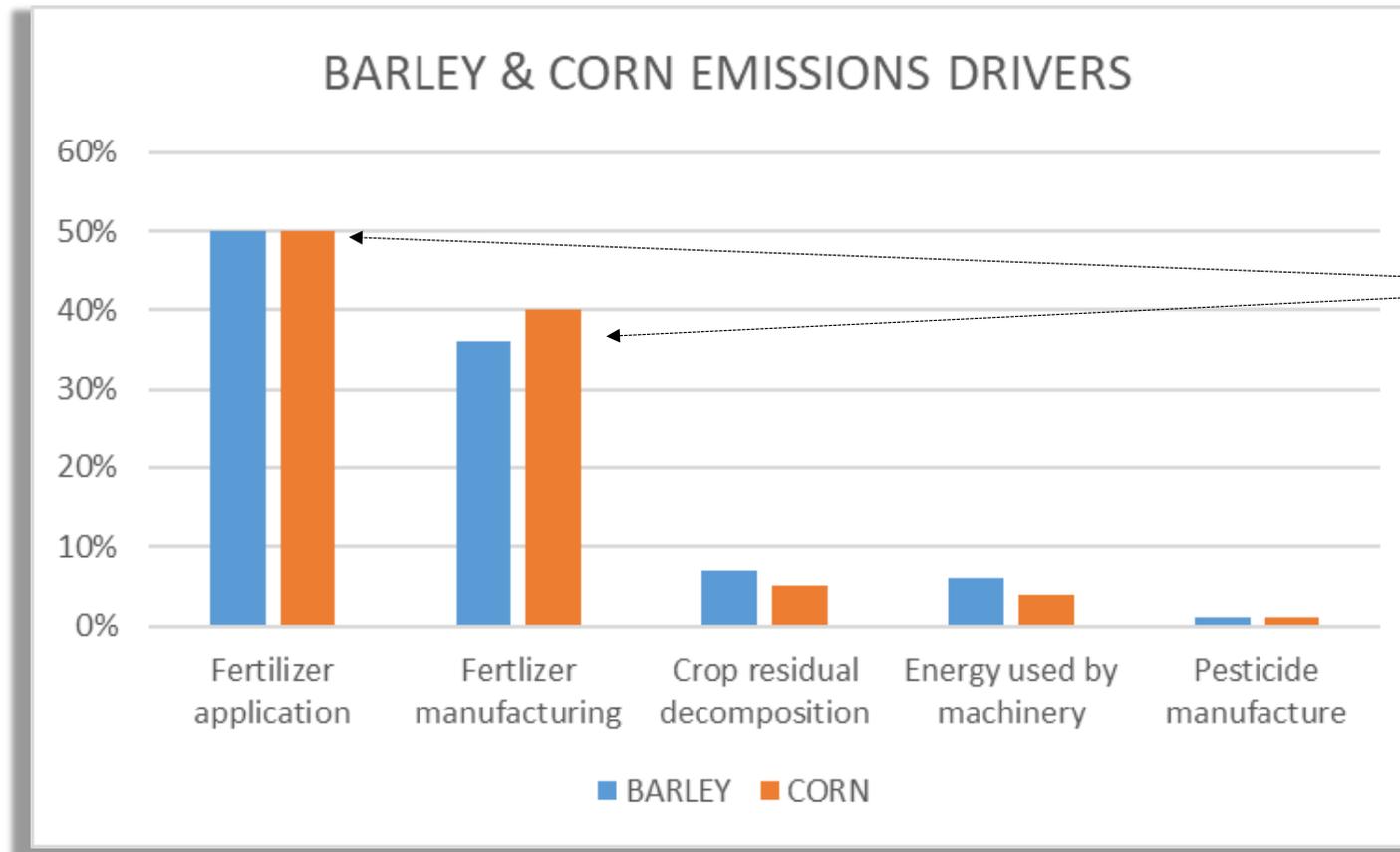
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Sources: [U Cambridge](#); [Nature.com](#); [Financial Times](#)

THE SINGLE LARGEST CONTRIBUTOR



TO AGRICULTURAL CO₂ EMISSIONS ARE SYNTHETIC MINERAL FERTILISERS



More than 80% of the carbon footprint come from fertilisers

Source: PepsiCo

CCm's technology targets both emissions from:

- Manufacturing &
- In-Field Use

2014 - 2017	RAU CIRENCESTER AND HARPER ADAMS (GRASS AND CEREALS)
2017 – 2022	VELCOURT AGRONOMY
2017- 2018	UNIVERSITY OF SHEFFIELD
2020 - 2021	NIAB/WWF
2020 – PRESENT	CRANFIELD UNIVERSITY
2022 – PRESENT	FRONTIER AGRICULTURE

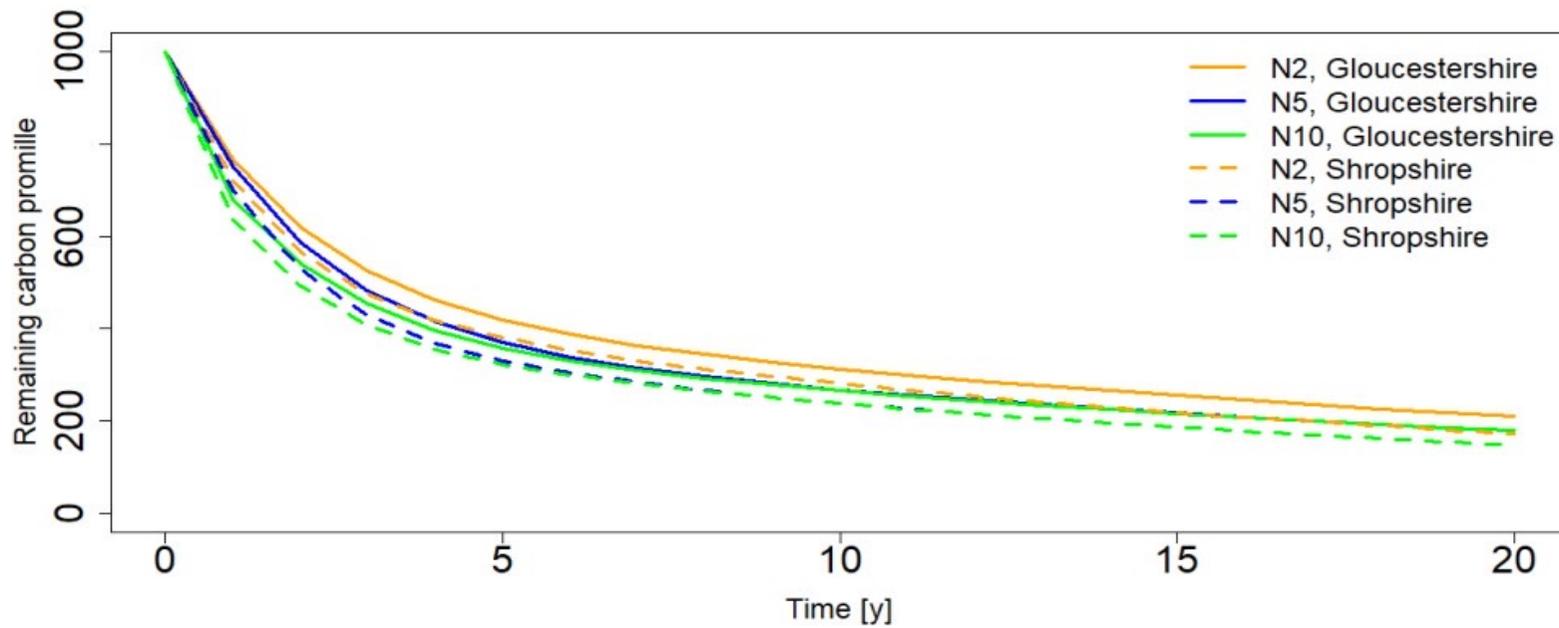
- INDEPENDENT FARMERS FROM 2015 ONWARDS (9 YEARS)
- CUMULATIVELY TRIALLED AT MORE THAN 100 SEPARATE LOCATIONS COVERING CEREALS, OIL SEEDS AND POTATOES
- ADDITIONALLY TRIALLED WITH INDEPENDENT AGRIBUSINESSES, INCLUDING PEPSICO, SAINSBURY'S, TESCO, BRANSTON, FRONTIER AG., YARA AND ORIGIN/AGRII SINCE 2018

Additional Benefits

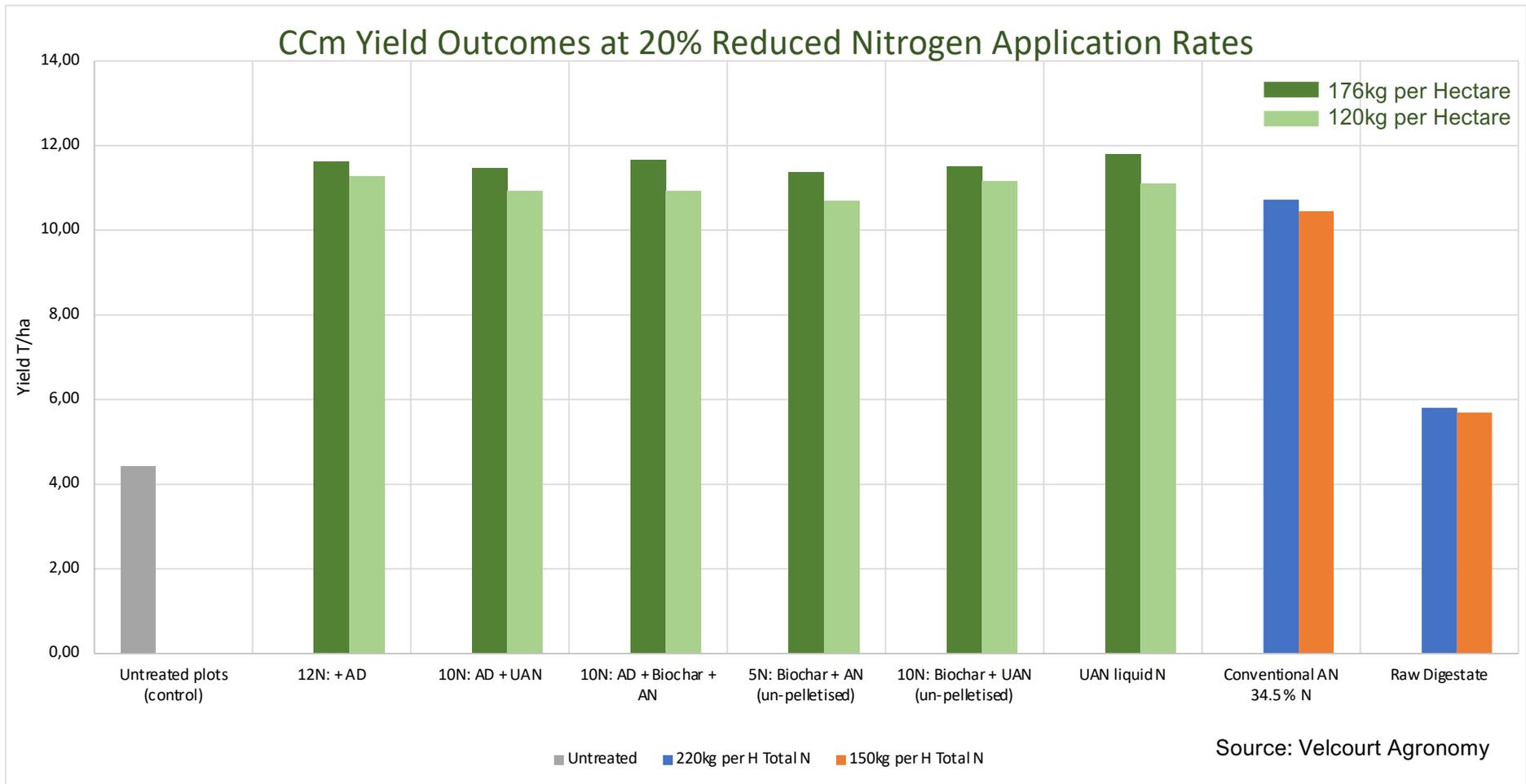


- Reduced run off and leaching
- Slowed release profile
- Return of Carbon to the soil
- Promotion of soil health
- Reduction in ammoniacal beak-down rates

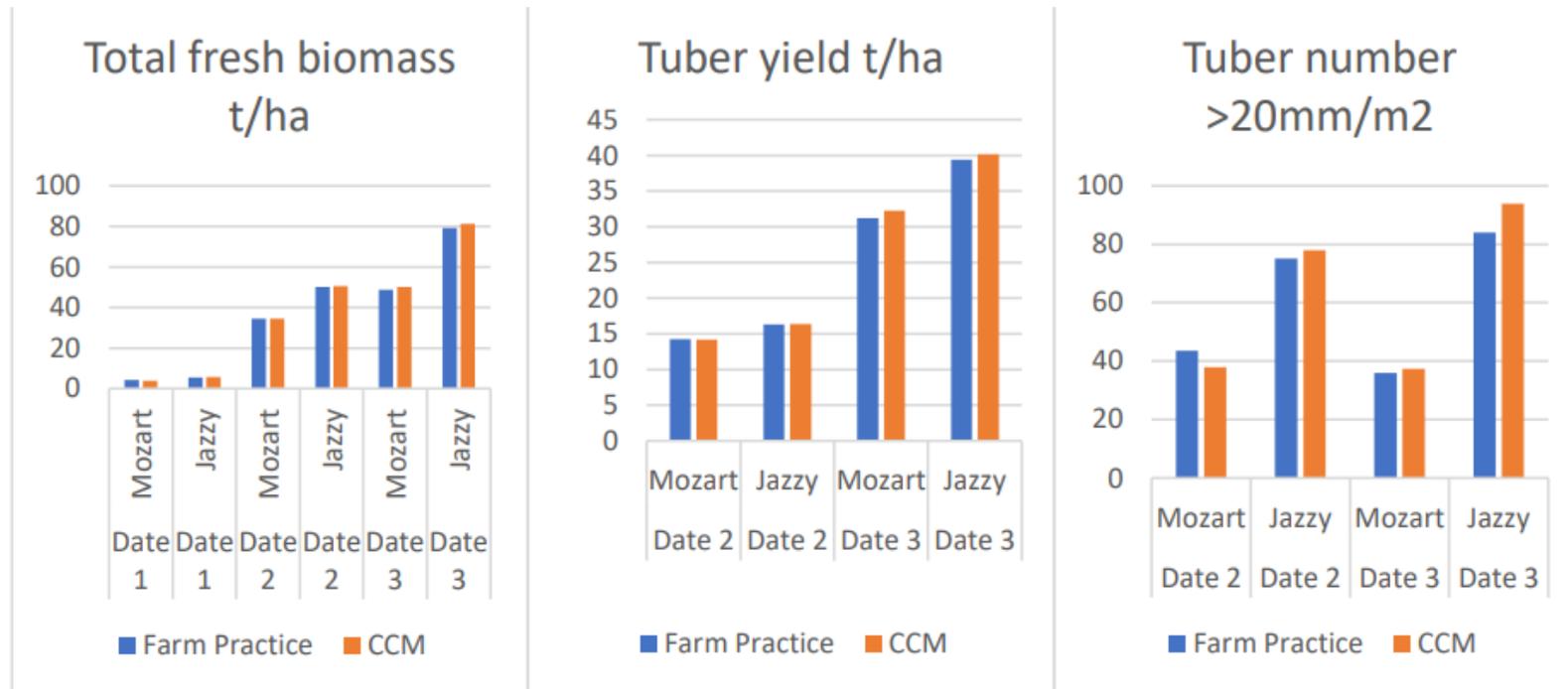
Figure 2: The decomposition of the soil enrichment materials at Gloucestershire and Shropshire over 20 years



Sustainable Fertilisers – 2021 Trial Summary

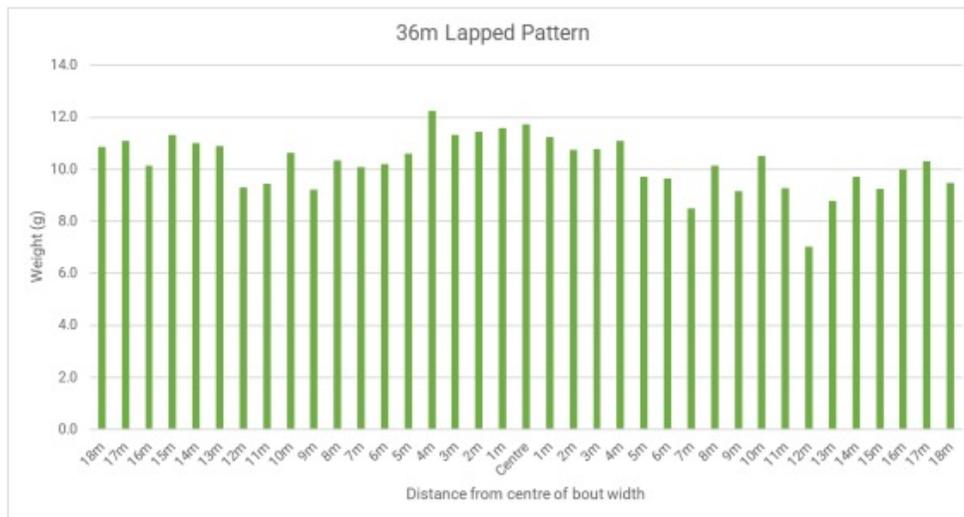


2021 Trial Summary – Potatoes NIAB WWF



CCm Fertilisers were applied at an N rate 15% less than AN

Pellet Spread Kvernland Exacta 1t/Ha



Lapped pattern

The weight of material that would be collected across the full bout width, using a to and fro driving pattern.

For the desired spread width of 36m a CV of 10.1% was attained.

Comments: Final spread pattern successful.



18m

0m

18m

Coefficient of Variation measures the accuracy of the spread pattern. For fertilisers a CV of 15% (as recommended in EB13739-2) should be attained in field conditions. <10% Excellent, 10%-15% Good, 15%-20% Poor, >20% Unacceptable.

There is no CV Pass/Fail for NSTS requirements.

CURRENT PRODUCTION CAPACITY



Farm-based AD - Bagley Biogas

Product Development Plant - Swindon



Wastewater-based AD - Severn Trent (Minworth)

Benefits



CCmGrowth[®] products are:

- Low Carbon manufacturing route
- In field reduced emissions to air
- In field reduced leaching losses
- In field reduced N application rate

CCmGrowth[®] products contain:

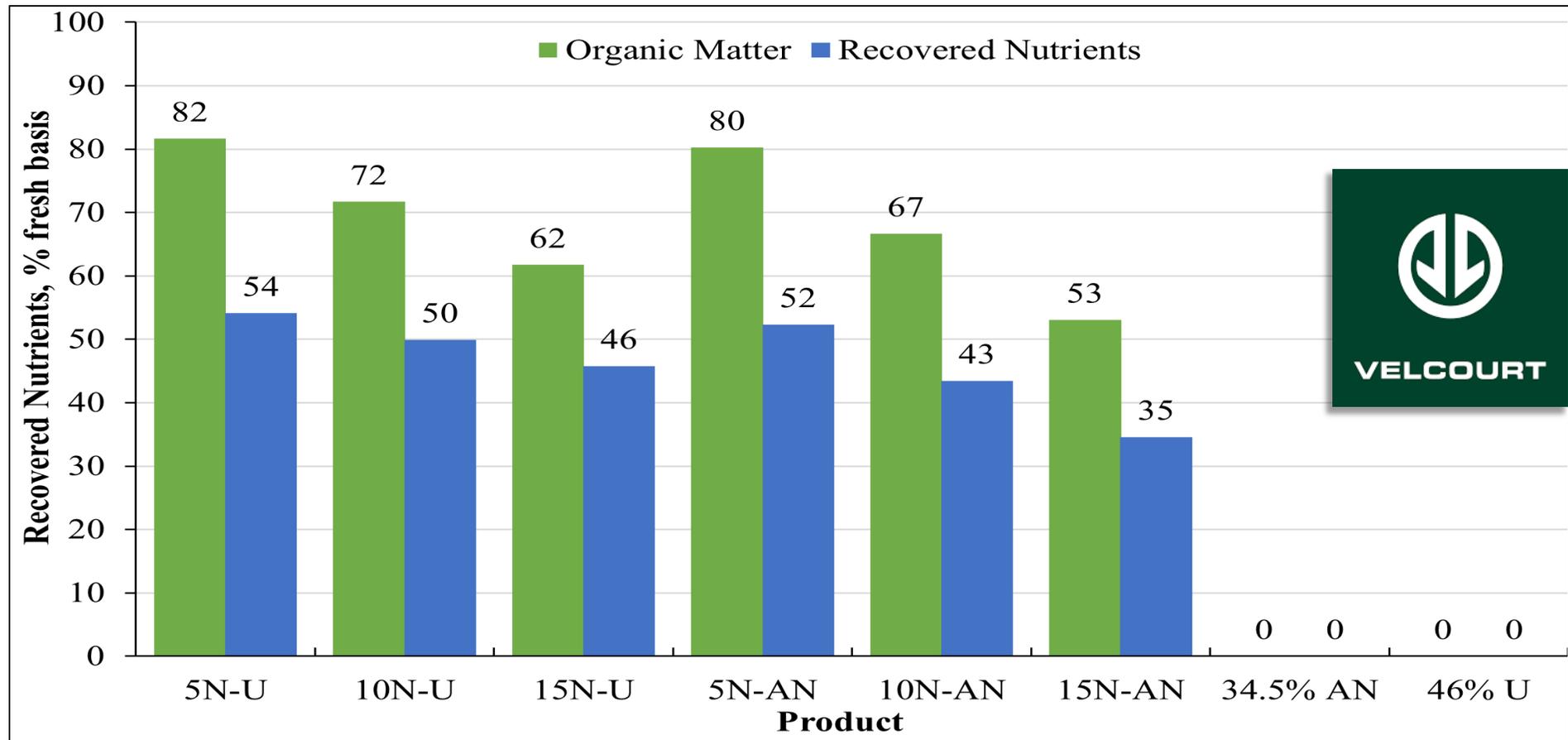
- A wide range of macronutrients N, P, K, S,
- A wide range of micronutrients and organic materials
- The additional organic components that improve soil health and reduce nutrient run-off and volatilisation

Sources: ¹[WWF "Climate Positive"](#); ²[United Nations/IKEA](#); ³[Fast Company](#);

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POTENTIAL IMPROVEMENTS

CURRENT LEVELS OF RECOVERED MATERIALS

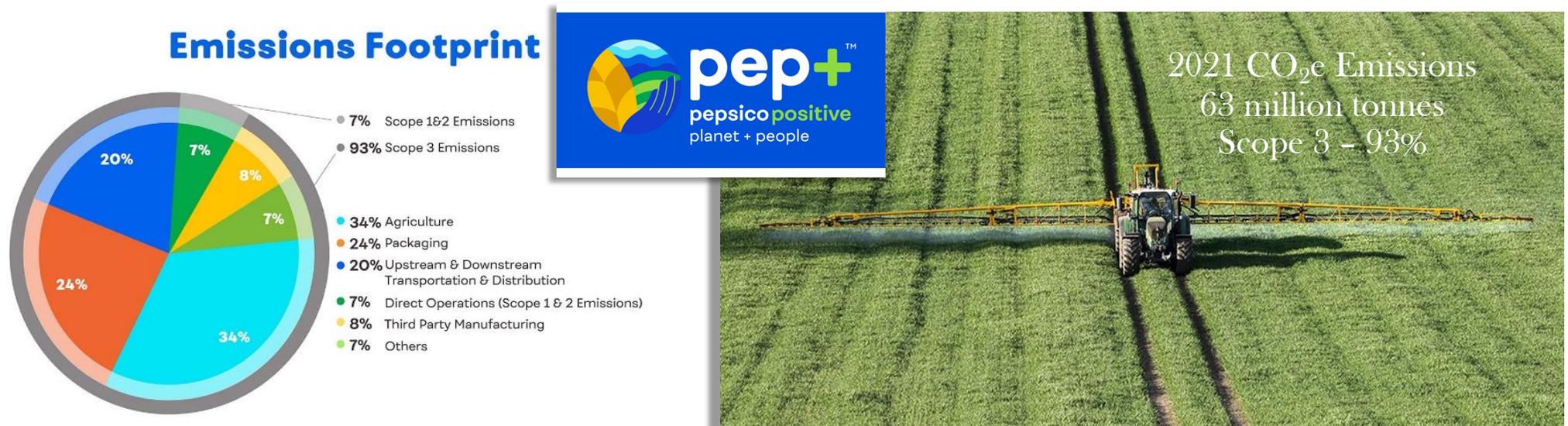


SCOPE 3 REDUCTION



CORPORATE IMPACT – PEPSICO CASE STUDY

- Scope 3 Carbon emissions (2021) – PepsiCo 93% of total emission (62 million tons).
- PepsiCo’s retained consultants have validated CCm’s GHG reduction capability as between 69% and 85% when compared to conventional fossil-fuel derived fertilisers.
- Impact: Within a decade, >10m ton CO₂ annual reduction in PepsiCo International’s Carbon emissions.
- More than 20% of their group-wide Scope 3 GHG emissions.



Thank You



First Low Carbon Harvest
using CCm Plant Nutrients
August 2015