

Long term C balance in Irish grasslands

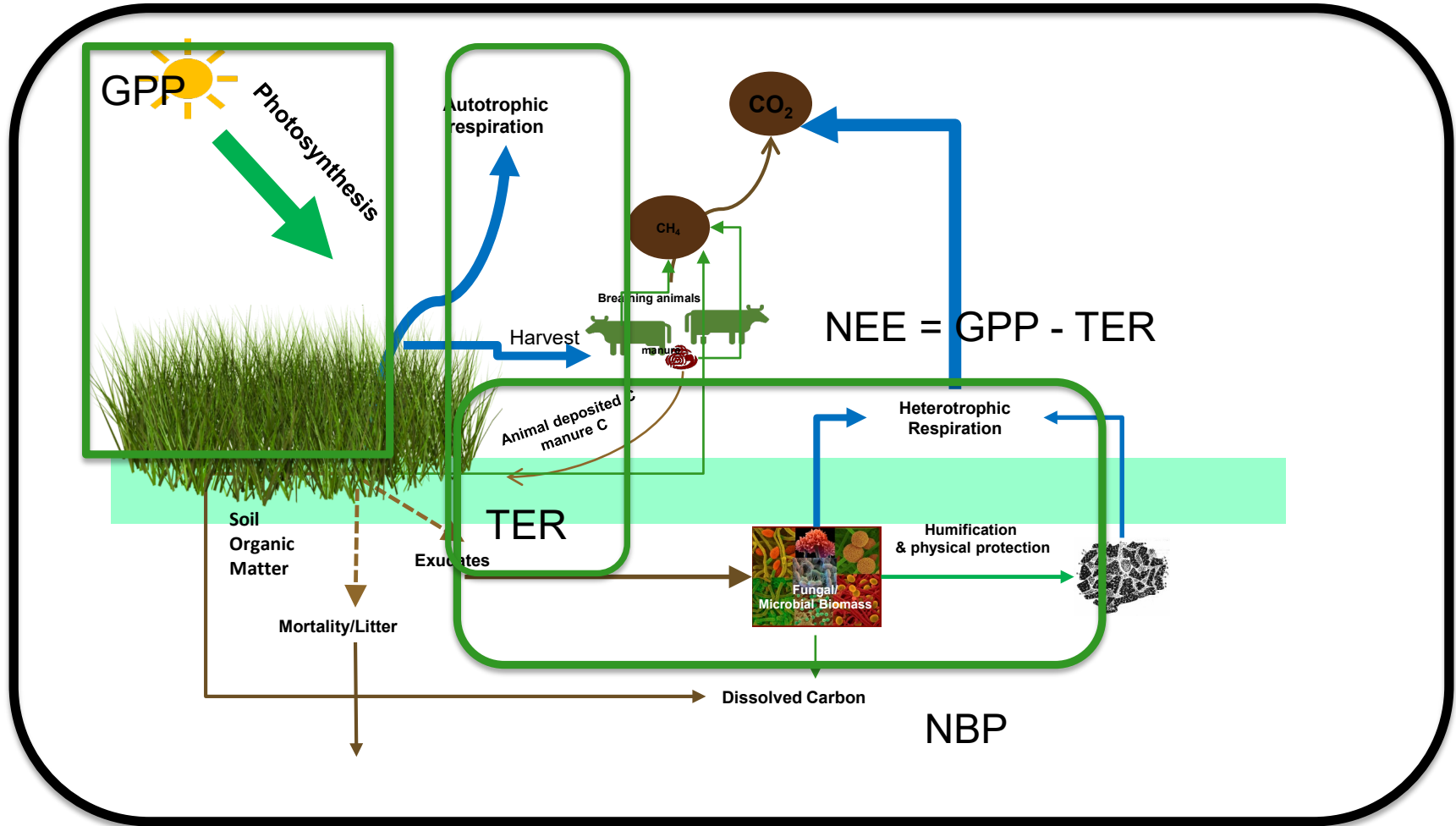
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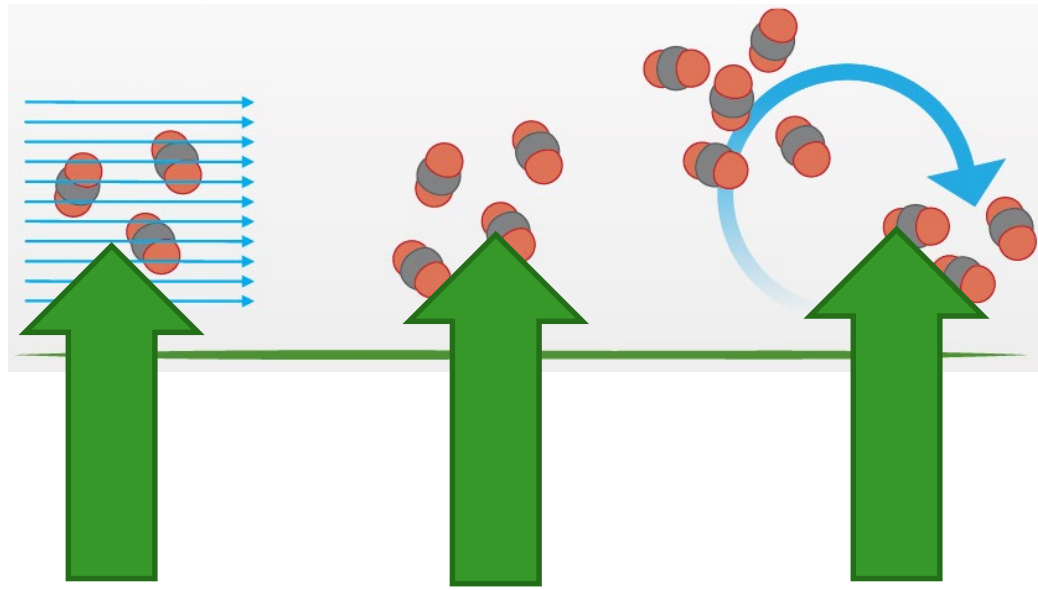
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The main processes in the Carbon cycle

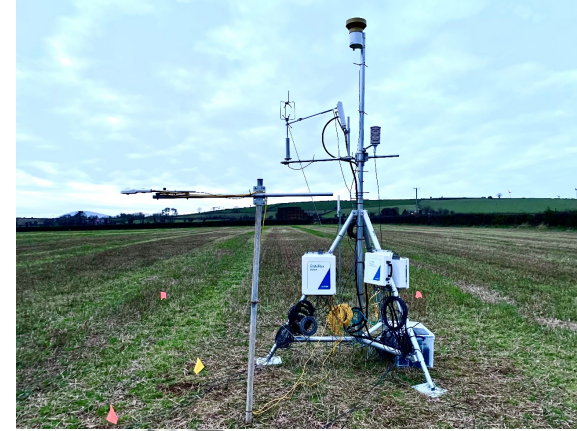




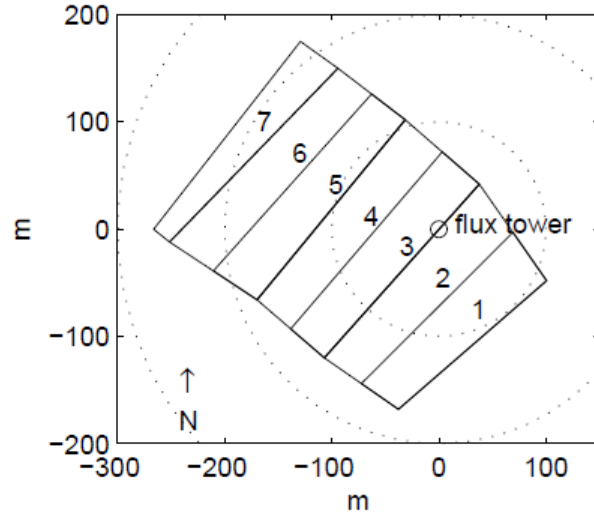
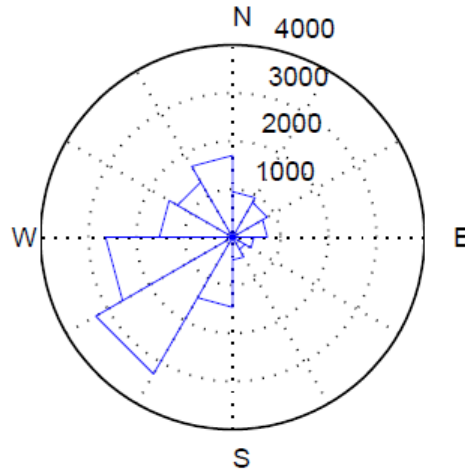
Mean windflow
carries CO_2 /
 H_2O / CH_4 etc
molecules over the
measurement area

Measured area adds
molecules into the
mean flow (= flux)

Upward eddy motions
carry more molecules
than downward motions



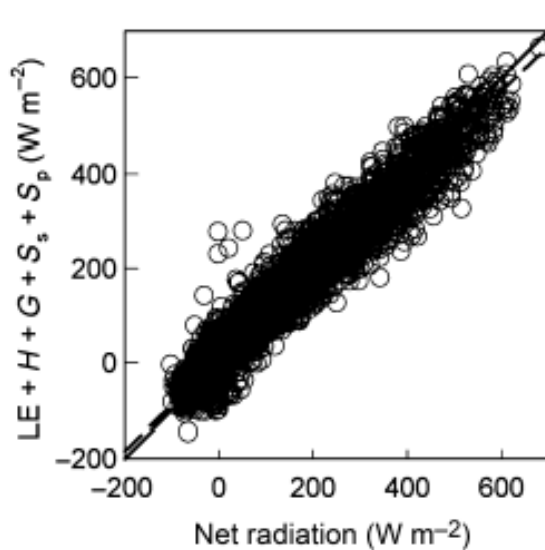
What you measure over depends on wind direction and windspeed



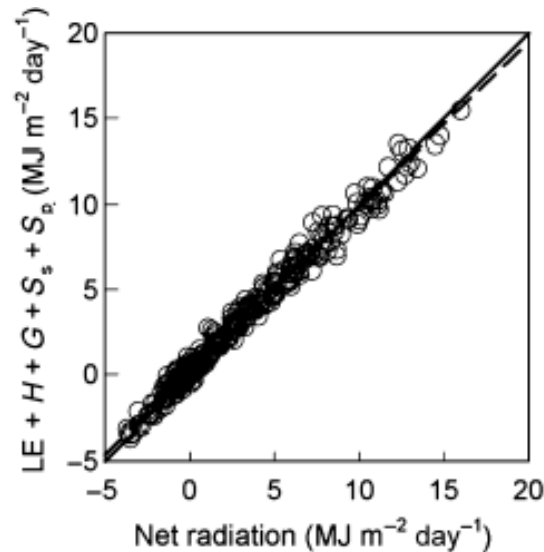
QaQc: Ensuring the integrity of the data

- Use energy balance closure to ensure that water fluxes are being calculated correctly -

Year	slope	intercept	R2
2004	0.96x	0.2	0.99
2005	0.95x	0.4	0.98
2006	0.91x	0.3	0.99
2007	0.93x	0.5	0.94
2008	0.92x	0.4	0.88
2009	0.93x	0.3	0.96
2010	0.88x	0.6	0.81
2012	0.90x	0.5	0.99
2013	0.91x	0.4	0.95
2014	0.89x	0.2	0.89
2015	0.93x	0.5	0.88
2018	0.91x	0.6	0.83
2019	0.92x	0.3	0.94
2020	0.91x	0.4	0.96
2021	0.94x	0.5	0.95



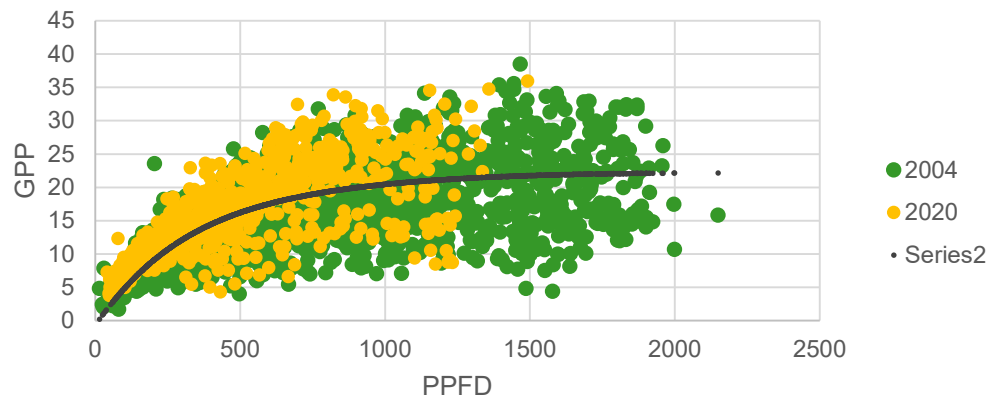
Half-hourly values



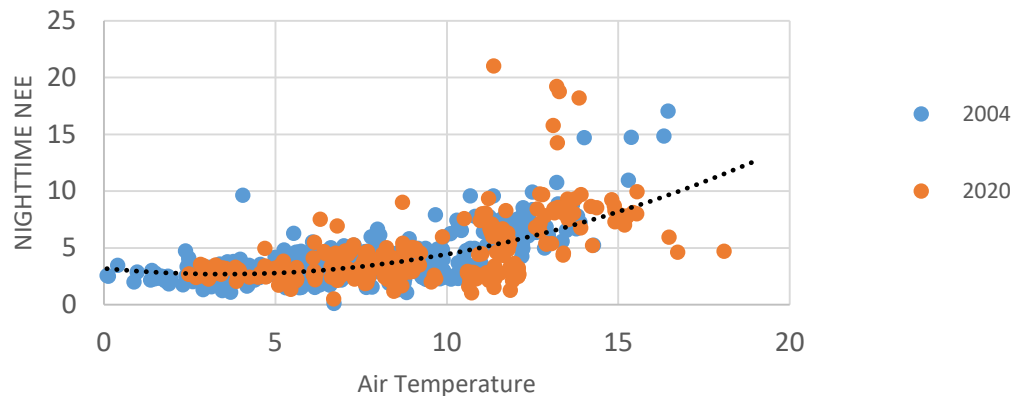
Daily values

PARTITIONING NEP into Gross Primary Production and Total Ecosystem Respiration

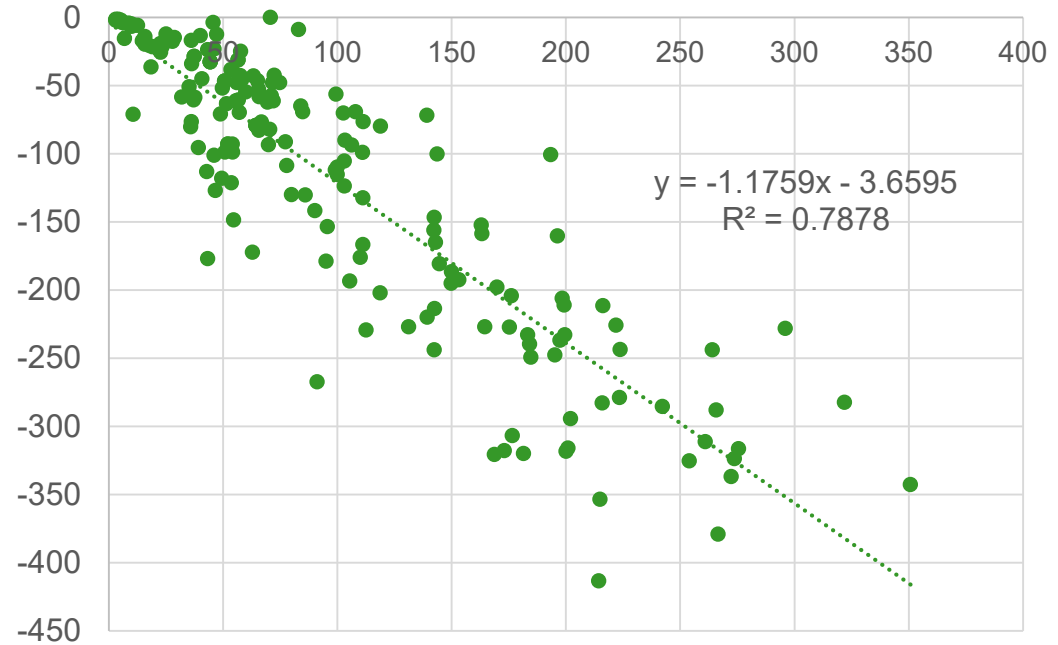
$$GPP = \frac{\alpha Q_{PPFD} A_{max}}{\alpha Q_{PPFD} + A_{max}}$$



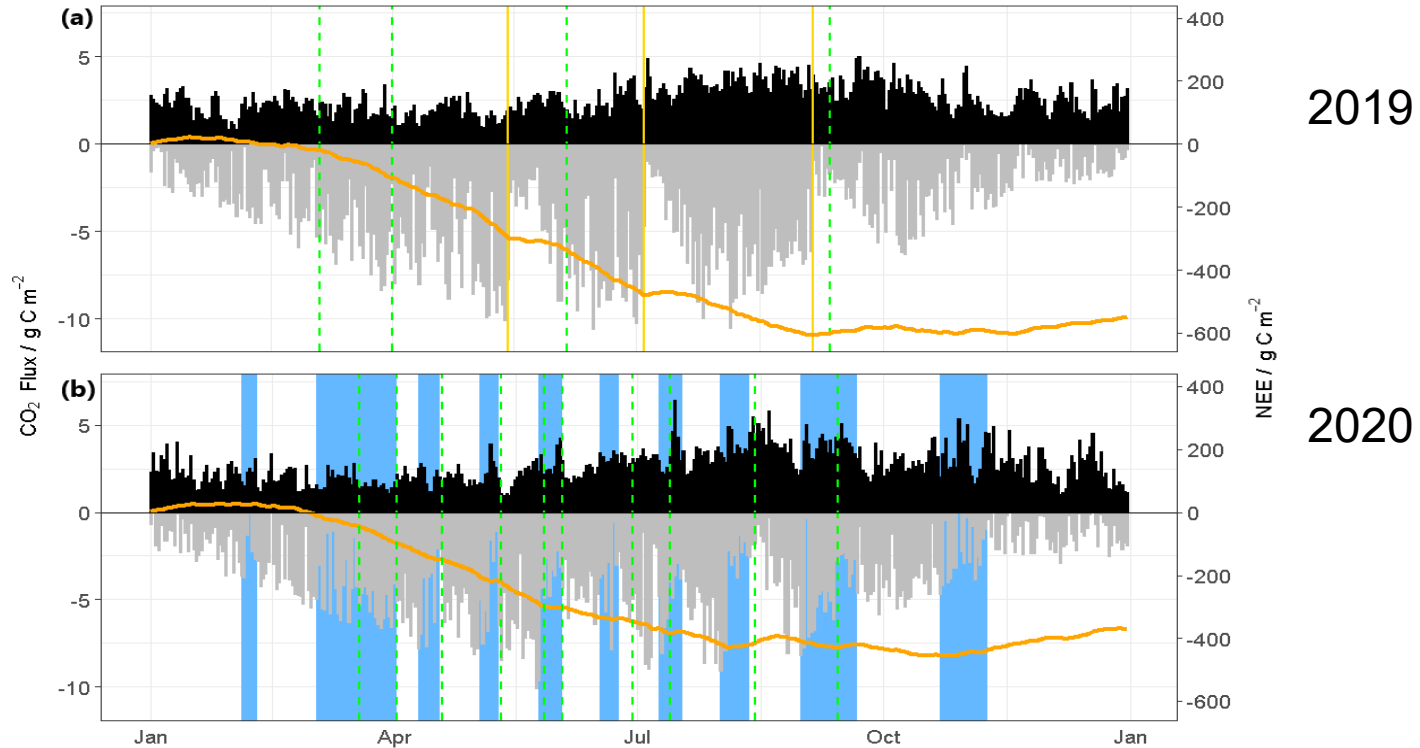
$$TER = R_{10} e^{E_0(1/(283.15-T_0) - 1/(T-T_0))}$$



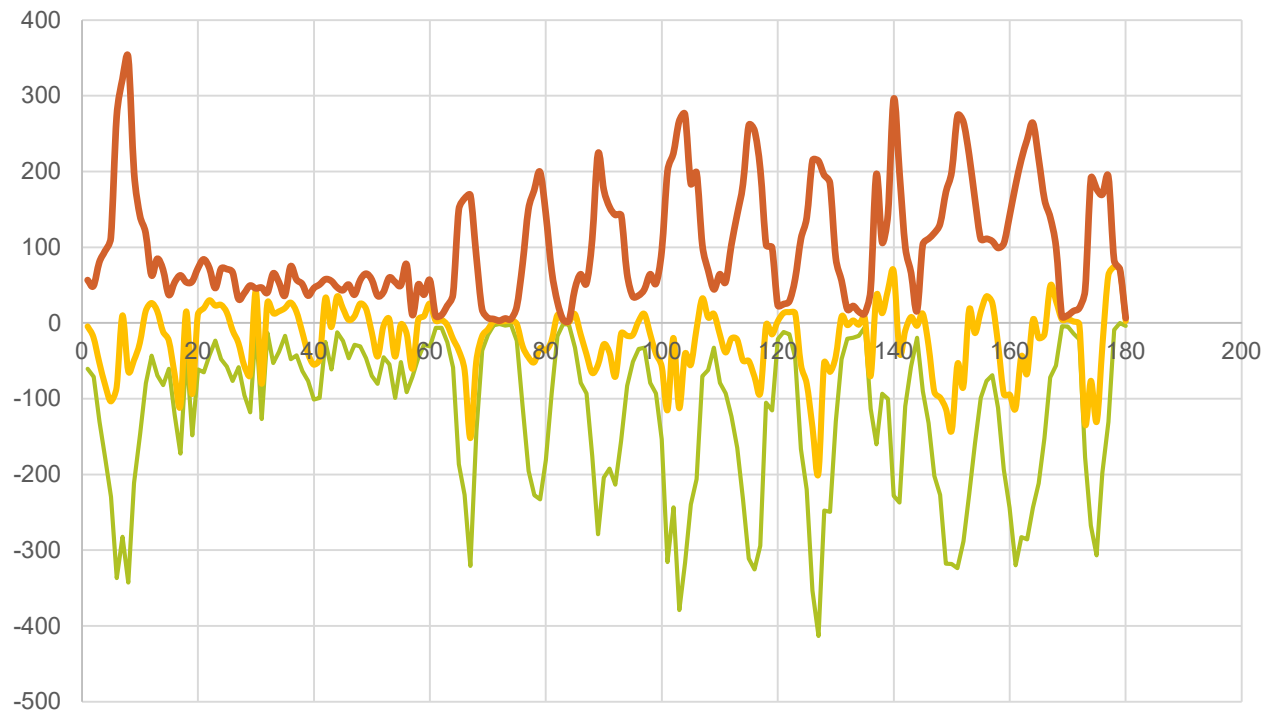
Correlation between GDP and Reco



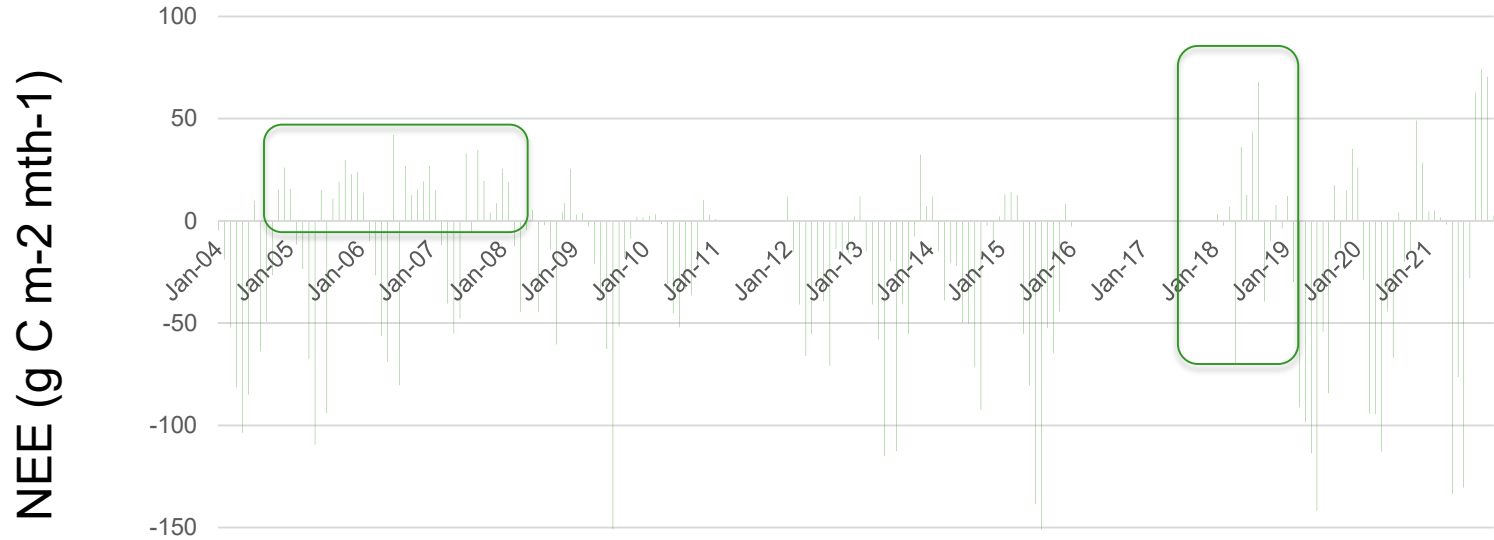
Half-hourly data gives good temporal indication of management impacts



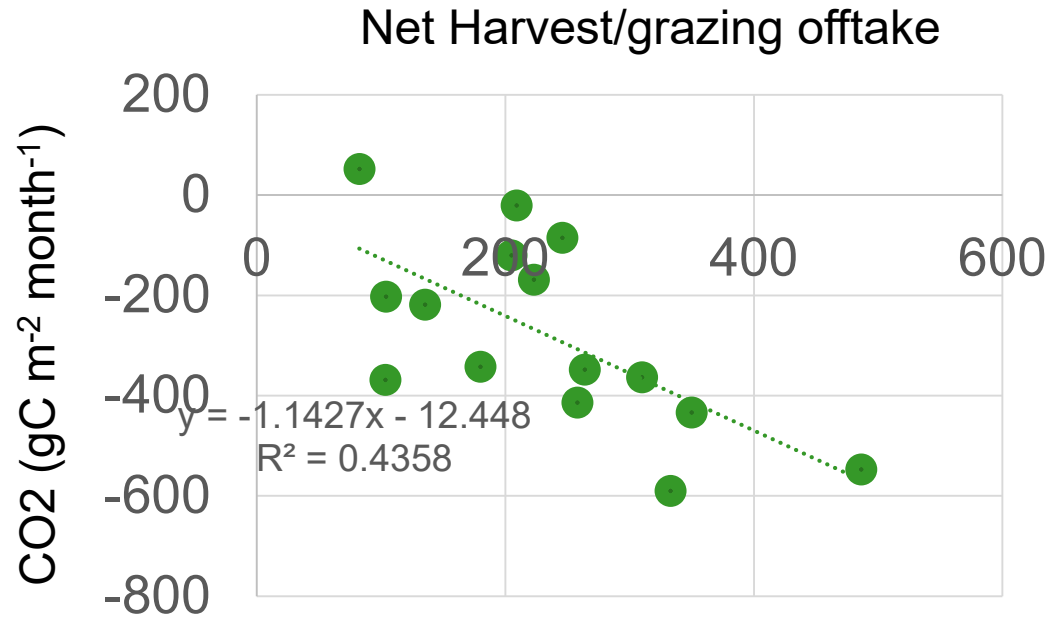
C Flux (g C m⁻² mth⁻¹)



Long term Carbon budget of grassland at Johnstown Castle

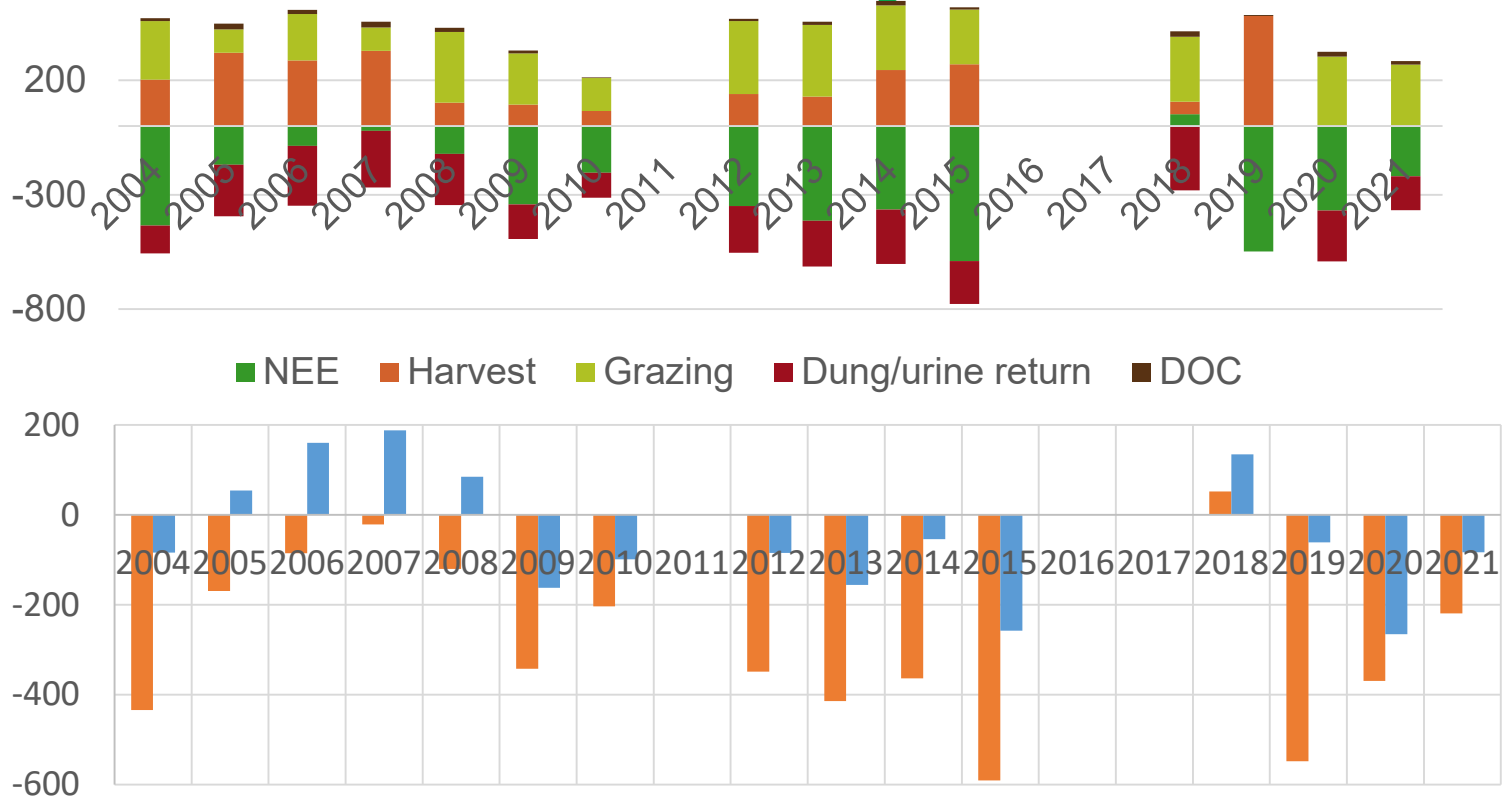


- Higher Net productivity – mean higher offtake
- Will not necessarily lead to higher NBP



Getting the final balance- Net Biome Productivity

C Balance (gC m⁻² yr⁻¹)



Net grassland balance

- In JC grassland – net C balance ranged from a source of 1.87 tC ha⁻¹ yr⁻¹ to a sink of 2.65 tC ha⁻¹ - driven mainly by land management decisions
- Net balance while in winter kale was +1.21 ±0.63 tC ha⁻¹ yr⁻¹ and -1.06 ±0.83 tC ha⁻¹ yr⁻¹ when in grass
- However in bad drought year – grassland was a source of 1.38 tC ha⁻¹ yr⁻¹

Acknowledgements

