

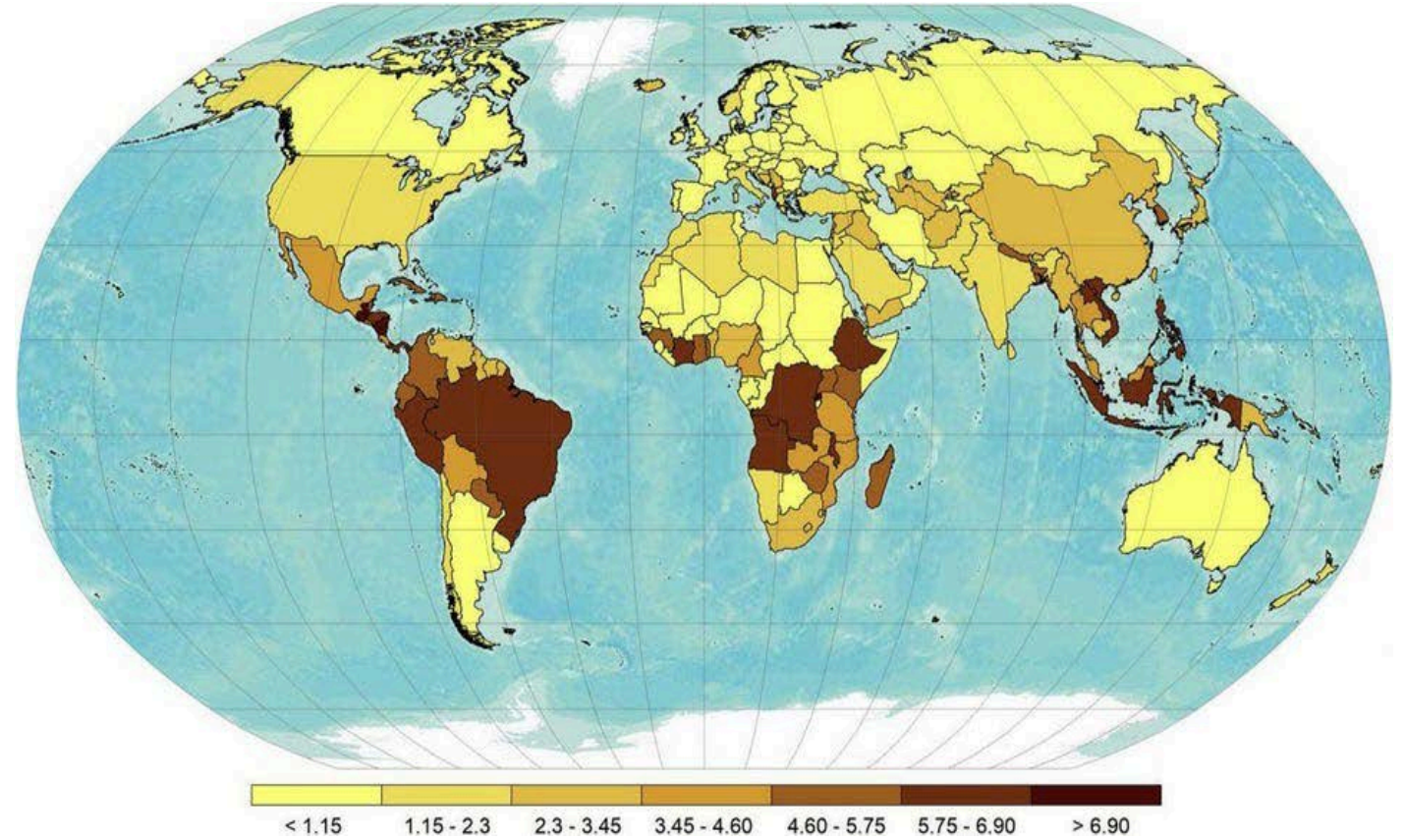
# Agricultural land lacks resistance to the wettest winters over the past decade



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Louise Olde, Hadewij Sint

# Soil erosion – an unintended consequence globally



% losses in land productivity due to soil erosion

# Soil erosion – an unintended consequence – the UK

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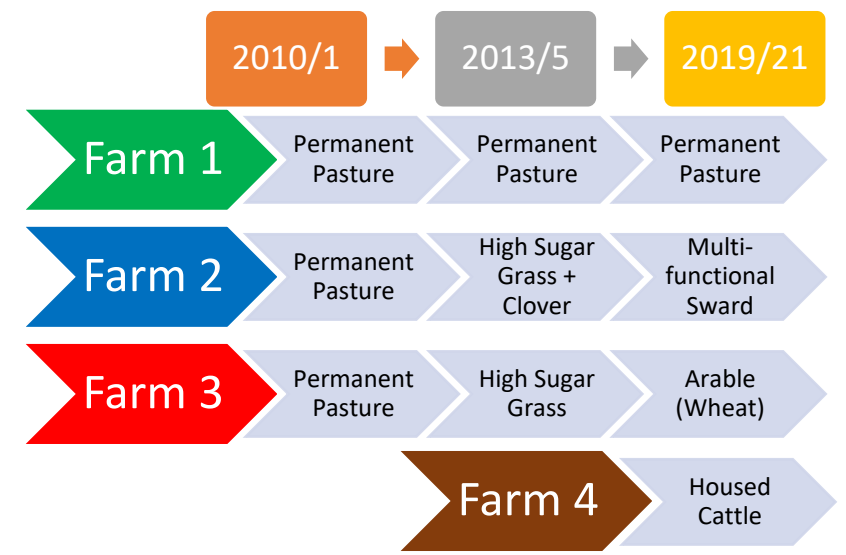
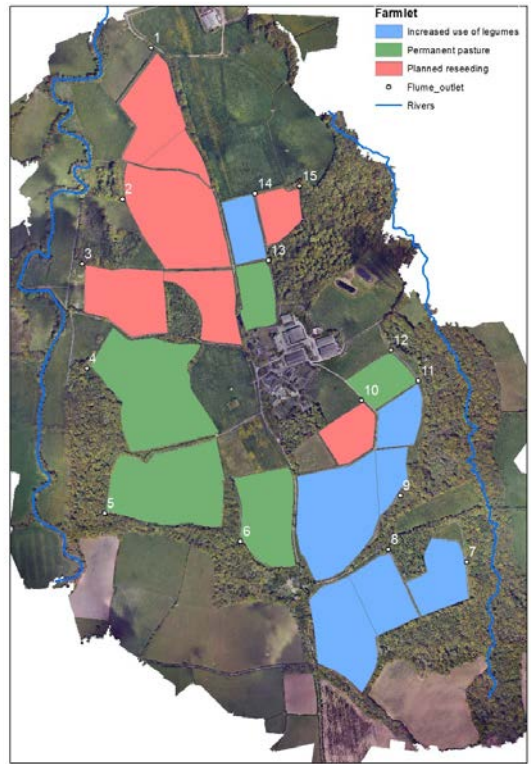
# The North Wyke Farm Platform

Soil	Atmosphere	Farm Management
% Moisture	Rainfall	Field inputs/outputs
Temperature	CO <sub>2</sub> and N <sub>2</sub> O	Liveweight gain
pH		Farm activities
Bulk density		Labour hours
N, P & C status		Machine hours

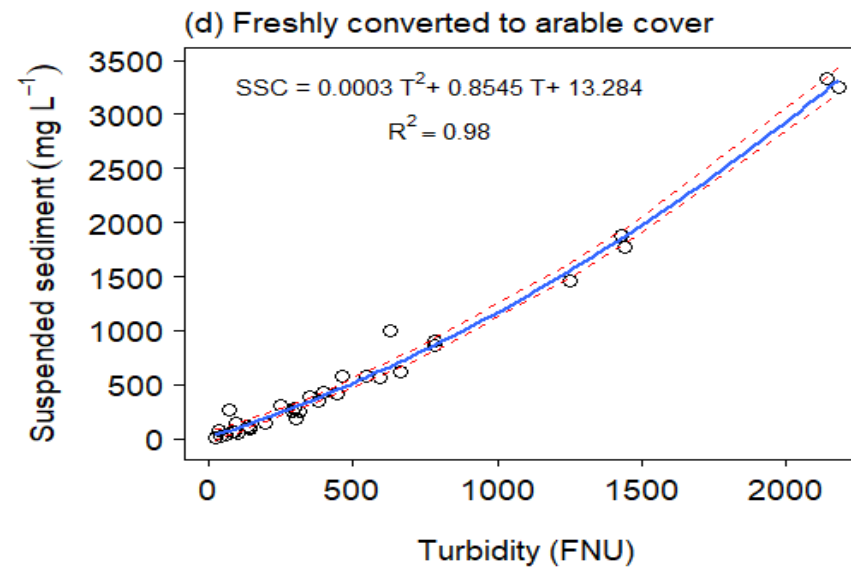
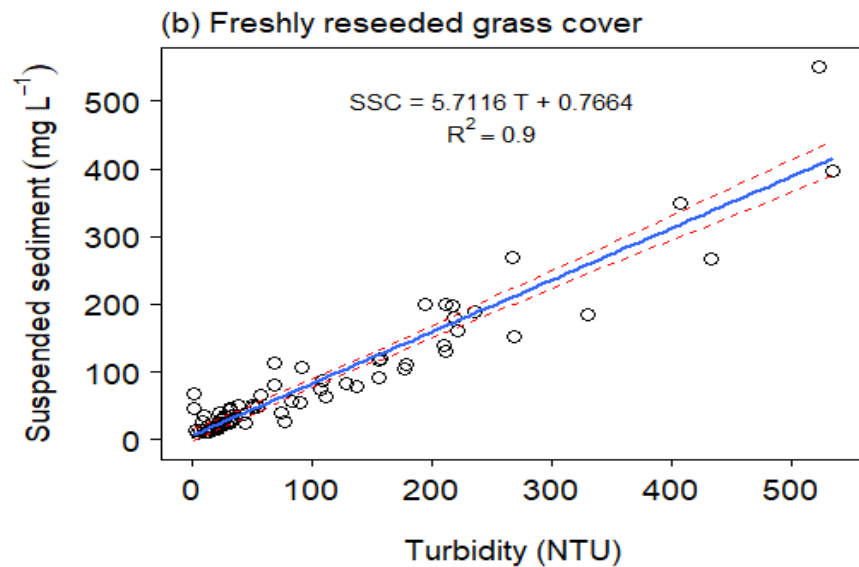
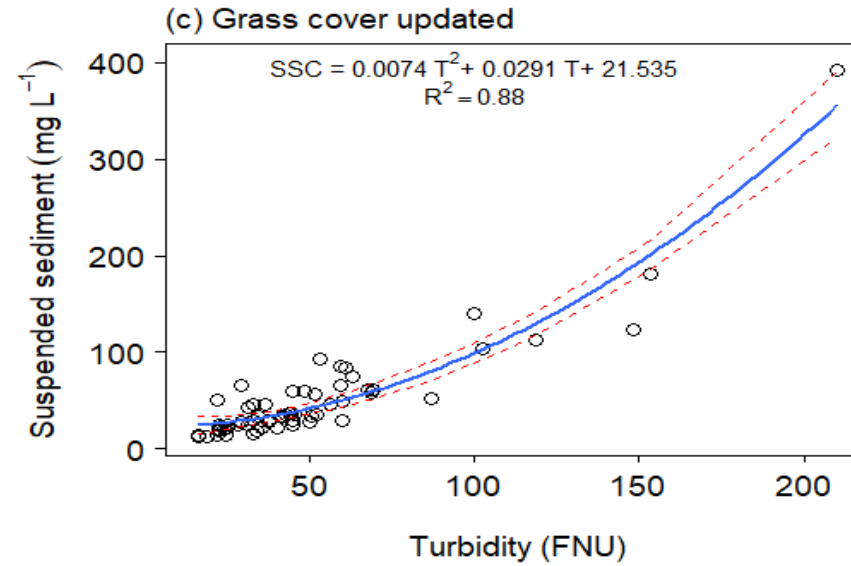
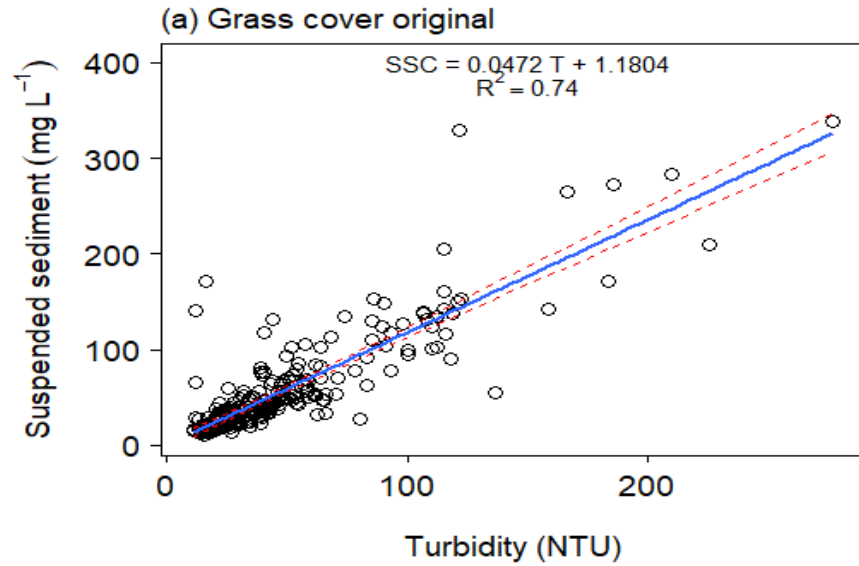


15 flume laboratories

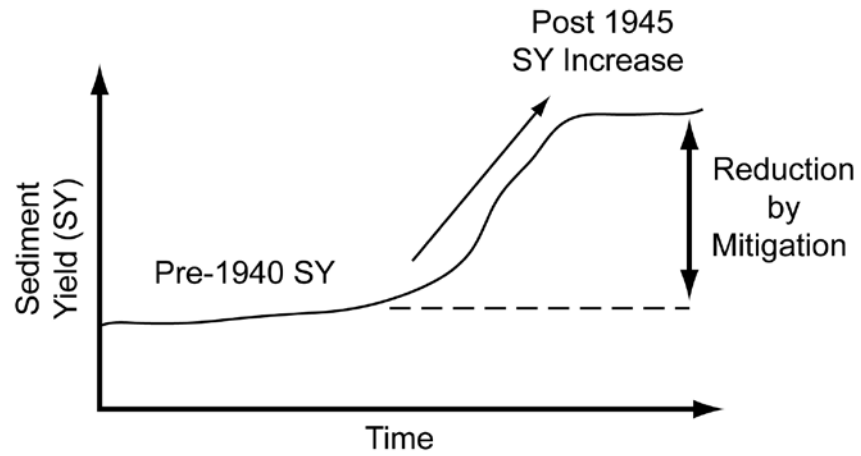
Water
Temperature
Conductivity
Turbidity
pH
Dissolved O <sub>2</sub>
Ammonium
Nitrate
Dissolved organic C



# SSC-turbidity conversions

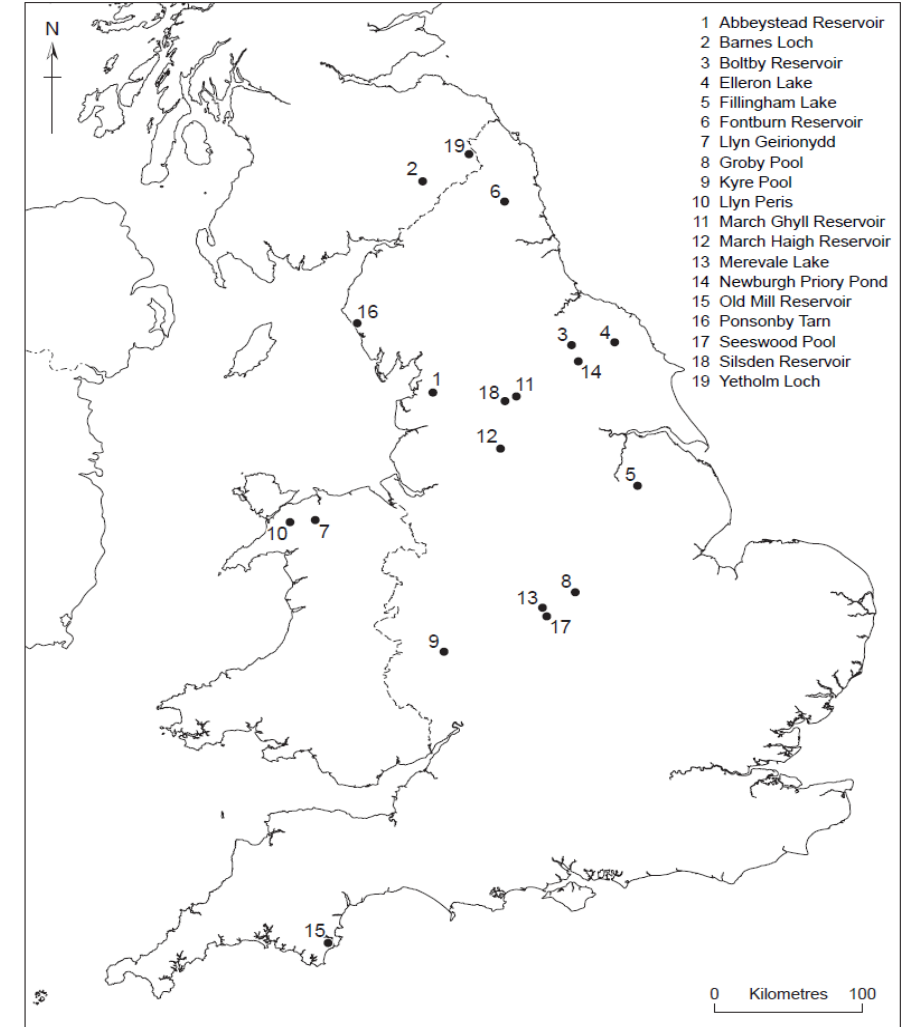


# Modern background net soil loss

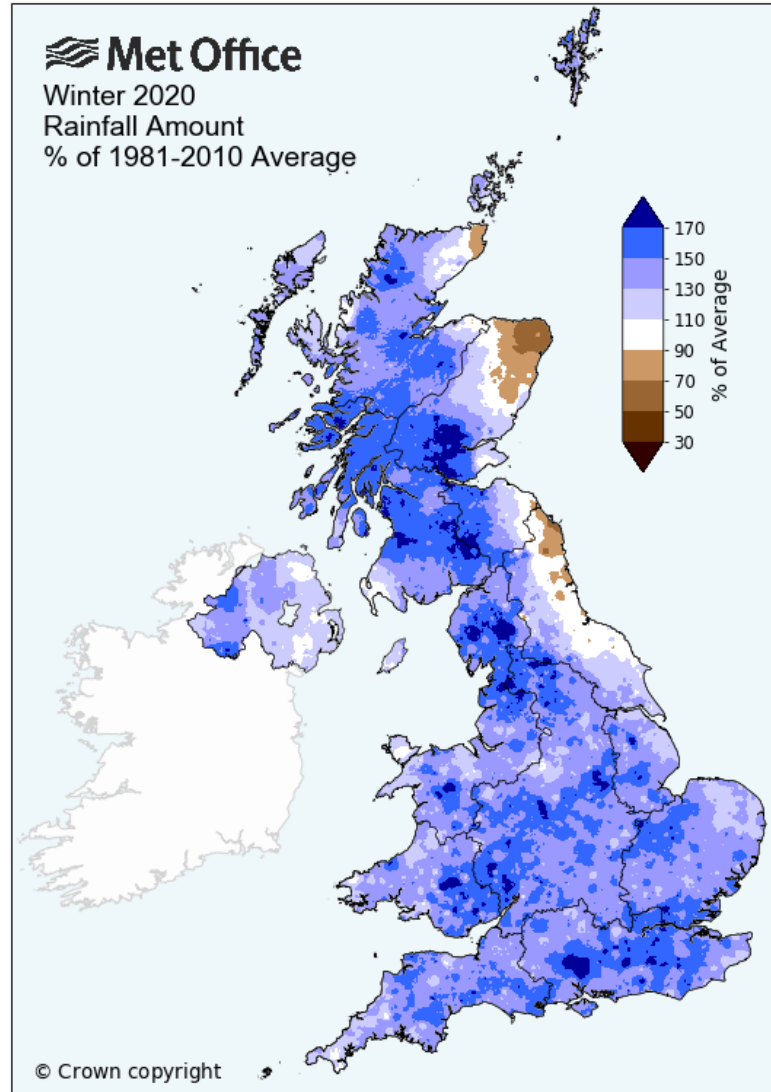


**Estimated modern background (t/ ha)**  
**Exceedance**  
**Breakdown in resilience**

	Lower limit	Upper limit
Estimated modern background (t/ ha)	0.15	0.35
Exceedance	Y	Y
Breakdown in resilience	partial	full



# The extreme wet winter of 2019-2020



# Exceedance of modern background soil loss: lower and upper estimates on permanent grass catchments

Catchment	Winter	Ex	Winter	Ex	Winter	Ex	Winter	Ex	Winter	Ex
	2012-2013		2013-2014		2015-2016		2019-2020		2023-2024	
4	0.08	n.a.	0.24	<b>1.63</b>	0.10	n.a.	0.10	n.a.	0.05	n.a.
	0.11	n.a.	0.30	n.a.	0.12	n.a.	0.17	n.a.	0.13	n.a.
5	0.11	n.a.	0.16	<b>1.08</b>	0.25	<b>1.65</b>	0.25	<b>1.66</b>	0.05	n.a.
	0.13	n.a.	0.20	n.a.	0.29	n.a.	0.35	n.a.	0.11	n.a.
6	0.04	n.a.	0.04	n.a.	0.29	<b>1.94</b>	0.14	n.a.	0.02	n.a.
	0.06	n.a.	0.07	n.a.	0.33	n.a.	0.21	n.a.	0.07	n.a.
12	0.07	n.a.	0.05	n.a.	0.19	<b>1.23</b>	0.11	n.a.	0.01	n.a.
	0.08	n.a.	0.06	n.a.	0.21	n.a.	0.15	n.a.	0.03	n.a.
13	0.08	n.a.	0.12	n.a.	0.11	n.a.	0.13	n.a.	0.02	n.a.
	0.09	n.a.	0.14	n.a.	0.13	n.a.	0.19	n.a.	0.05	n.a.



# Exceedance of modern background soil loss: lower and upper estimates on transitional catchments



No.	Winter 2012- 2013	Ex	Winter 2013- 2014	Ex	Winter 2015- 2016	Ex	Winter 2019- 2020	Ex	Winter 2023- 2024	Ex
1	0.05	n.a.	0.07	n.a.	0.27	<b>1.80</b>	0.96	<b>6.38</b>	0.01	n.a.
	0.07	n.a.	0.12	n.a.	0.32	n.a.	1.27	<b>3.62</b>	0.08	n.a.
2	0.08	n.a.	0.29	<b>1.95</b>	0.19	<b>1.24</b>	3.26	<b>21.74</b>	1.12	<b>7.48</b>
	0.10	n.a.	0.37	<b>1.05</b>	0.21	n.a.	3.76	<b>10.74</b>	1.36	<b>3.79</b>
3	0.12	n.a.	0.24	<b>1.60</b>	0.35	<b>2.31</b>	2.65	<b>17.65</b>	1.83	<b>12.22</b>
	0.15	n.a.	0.29	n.a.	0.39	<b>1.13</b>	3.11	<b>8.87</b>	2.19	<b>6.26</b>
10	0.07	n.a.	0.04	n.a.	0.19	<b>1.30</b>	0.67	<b>4.49</b>	0.01	n.a.
	0.08	n.a.	0.06	n.a.	0.23	n.a.	0.92	<b>2.63</b>	0.20	n.a.
15	0.15	n.a.	0.36	<b>2.43</b>	0.32	<b>2.15</b>	1.65	<b>11.03</b>	0.67	<b>4.45</b>
	0.18	n.a.	0.45	<b>1.30</b>	0.37	<b>1.05</b>	2.10	<b>6.01</b>	0.97	<b>2.76</b>

# Concluding remarks

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- Permanent grass, especially post scheduled plough and reseeded demonstrated a partial breakdown in the resilience of soil loss regulation to the wettest winters over the past ~decade – demonstrated by exceedance of only the lower uncertainty range for modern background soil loss
- Conversion of grass to arable resulted in a complete breakdown in resilience of soil loss regulation – demonstrated by exceedance of both the lower and upper uncertainty ranges for modern background soil loss
- *Collins, A.L., Upadhyay, H.R., Zhang, Y., Olde, L. and Sint, H. (2025). Agricultural land lacks resistance to water erosion during the wettest winters of the past decade. Agriculture Ecosystems and Environment 389, 109713.*

# Resilient Farming Futures strategic programme

