



Supplement of

Cutting peatland CO₂ emissions with water management practices

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Supplementary information

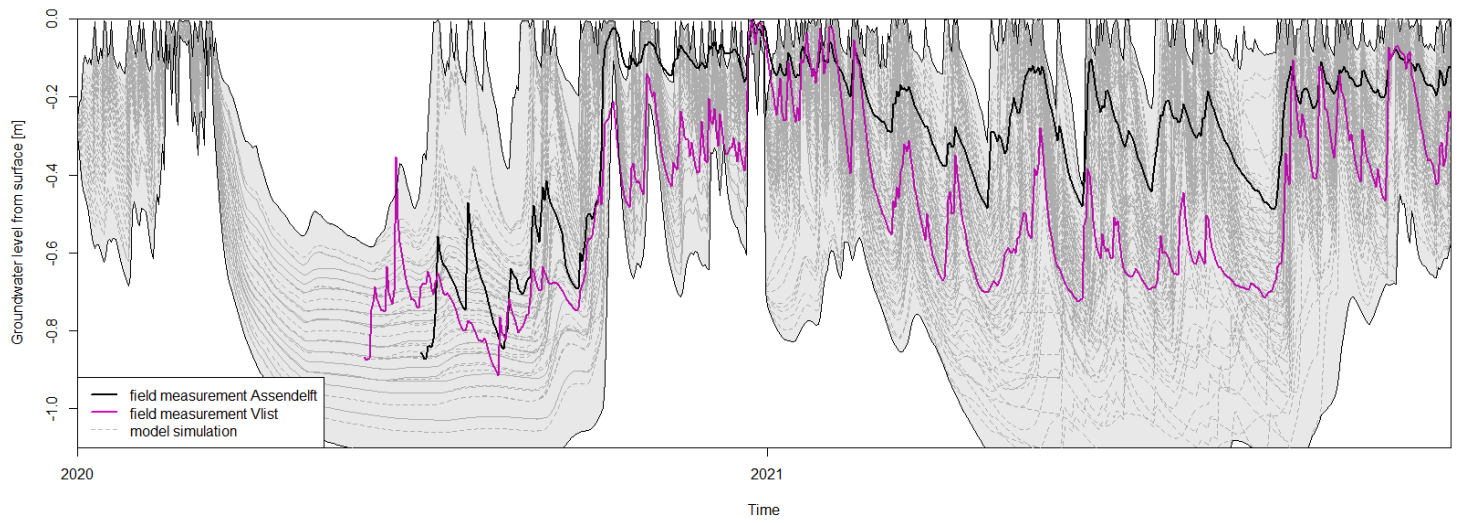


Figure S1 – Groundwater table height [m from surface] for control parcel simulations and field measurements of 2020 and 2021.

The correlations of the measured R_{eco} and the simulated respiration rate for the ensemble WFPS respiration rate curves in Fig. 4 and for each meadow are presented in Table S1.

10 **Table S1 – Correlations between R_{eco} and estimated potential respiration rate for research sites, using WFPS optimum curves presented in Fig. 4. WFPS curves with correlations > 0.60 are underlined.**

Curve	Assendelft		Vlist		Mean
	Control	SSI	Control	SSI	
<u>1</u>	<u>0.67</u>	<u>0.57</u>	<u>0.71</u>	<u>0.64</u>	<u>0.65</u>
<u>2</u>	<u>0.63</u>	<u>0.56</u>	<u>0.66</u>	<u>0.56</u>	<u>0.60</u>
3	0.32	0.33	0.39	0.33	0.34
4	0.62	0.45	0.65	0.60	0.58
5	0.52	0.39	0.56	0.47	0.48
<u>6</u>	<u>0.65</u>	<u>0.50</u>	<u>0.67</u>	<u>0.64</u>	<u>0.61</u>
<u>7</u>	<u>0.68</u>	<u>0.57</u>	<u>0.71</u>	<u>0.65</u>	<u>0.65</u>
<u>8</u>	<u>0.64</u>	<u>0.50</u>	<u>0.64</u>	<u>0.61</u>	<u>0.60</u>
9	0.56	0.34	0.55	0.47	0.48
10	0.58	0.42	0.59	0.56	0.53
11	0.48	0.08	0.47	0.33	0.34
<u>12</u>	<u>0.68</u>	<u>0.57</u>	<u>0.70</u>	<u>0.66</u>	<u>0.65</u>
13	0.61	0.45	0.62	0.57	0.56
14	0.50	0.14	0.51	0.41	0.39
<u>15</u>	<u>0.67</u>	<u>0.57</u>	<u>0.70</u>	<u>0.66</u>	<u>0.65</u>
<u>16</u>	<u>0.70</u>	<u>0.55</u>	<u>0.70</u>	<u>0.66</u>	<u>0.65</u>
17	0.63	0.44	0.64	0.61	0.58
18	0.25	0.28	0.31	0.28	0.28

Table S2 – Sensitivity analysis of the WFPS curve and temperature for the effectivity in reducing potential respiration rate [-] when implementing SSI in Assendelft and Vlist in 2020. The effectivities that are in accordance with the mean effectivities are underlined, outliers are shown in *italic*. *WFPS curve 2 was treated as an outlier.

2020 WFPS curve	Assendelft			Vlist		
	-1.5 °C	0 °C	+1.5 °C	-1.5 °C	0 °C	+1.5 °C
1	0.72	0.71	0.71	0.21	0.2	0.2
*2	<i>0.21</i>	<i>0.2</i>	<i>0.2</i>	<i>0.06</i>	<i>0.06</i>	<i>0.06</i>
6	0.86	0.86	0.86	0.34	0.34	0.34
7	0.72	0.72	0.72	0.22	0.22	0.22
8	0.89	0.89	0.89	0.45	0.44	0.44
12	0.75	0.75	0.74	0.26	0.26	0.26
15	0.76	0.75	0.75	0.26	0.26	0.26
<u>16</u>	<u>0.81</u>	<u>0.8</u>	<u>0.8</u>	<u>0.32</u>	<u>0.32</u>	<u>0.32</u>
mean effectivity	<u>0.79</u>	<u>0.78</u>	<u>0.78</u>	<u>0.29</u>	<u>0.29</u>	<u>0.29</u>
min effectivity	0.72	0.71	0.71	0.21	0.20	0.20
max effectivity	0.89	0.89	0.89	0.45	0.44	0.44
standard deviation	0.06	0.06	0.07	0.08	0.08	0.08

Table S3 – Sensitivity analysis of the WFPS curve and temperature for the effectivity in reducing potential respiration rate [-] when implementing SSI in Assendelft and Vlist in 2021. The effectivities that are in accordance with the mean effectivities are underlined, outliers are shown in *italic*. *WFPS curve 2 was treated as an outlier.

2021 WFPS curve	Assendelft			Vlist		
	-1.5 °C	0 °C	1.5 °C	-1.5 °C	0 °C	1.5 °C
1	0.12	0.11	0.11	-0.07	-0.07	-0.08
*2	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>	<i>-0.02</i>	<i>-0.02</i>	<i>-0.02</i>
6	0.24	0.24	0.23	-0.02	-0.02	-0.03
7	0.12	0.11	0.11	-0.07	-0.07	-0.08
8	0.25	0.25	0.24	-0.02	-0.02	-0.02
12	0.13	0.12	0.12	-0.06	-0.07	-0.07
15	0.14	0.13	0.13	-0.06	-0.07	-0.07
16	<u>0.17</u>	<u>0.17</u>	<u>0.16</u>	<u>-0.05</u>	<u>-0.05</u>	<u>-0.06</u>
<i>mean effectivity</i>	<u>0.17</u>	<u>0.16</u>	<u>0.16</u>	<u>-0.05</u>	<u>-0.05</u>	<u>-0.06</u>
<i>min effectivity</i>	0.12	0.11	0.11	-0.07	-0.07	-0.08
<i>max effectivity</i>	0.25	0.25	0.24	-0.02	-0.02	-0.02
<i>standard deviation</i>	0.05	0.06	0.05	0.02	0.02	0.02

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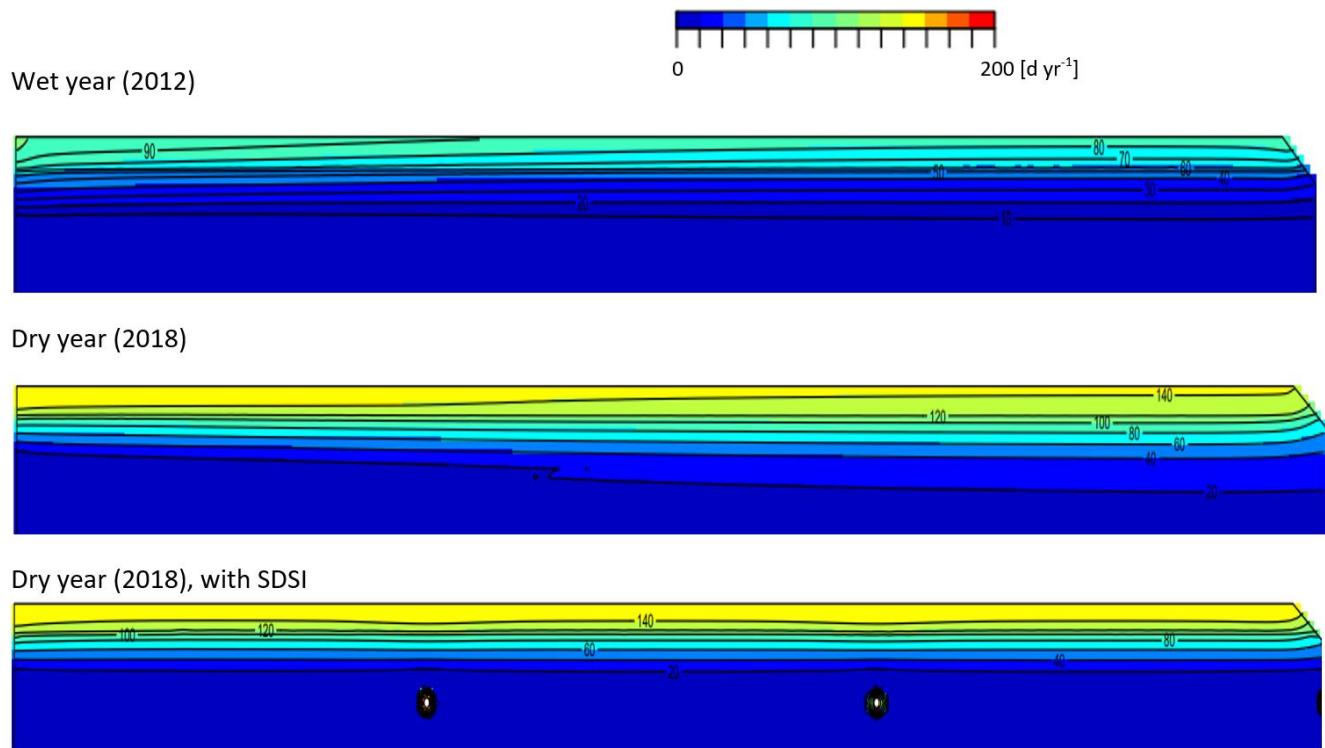
25 Table S4 – Average yield estimations for each harvesting event in 2020.

Assendelft			Vlist		
	Control	SSI		Control	SSI
Date	[g c m ⁻²]	[g c m ⁻²]	Date	[g c m ⁻²]	[g c m ⁻²]
12-5-2020	219.7	159.5	08-05-2020	167.7	154.4
8-6-2020	92.9	95.5	05-06-2020	123.7	86.4
7-7-2020	170.1	140.8	03-07-2020	86.1	84.4
17-8-2020	87.7	124.1	29-07-2020	96.5	119.8
29-9-2020	101.1	74.5	08-09-2020	90.1	88.8
			04-11-2020	69.1	52.0
Extra yield in chambers [factor]	1.41	1.14		1.26	1.31
Total after correction	946.05	679.30		800.89	764.40
Total [kg CO ₂ m ⁻² yr ⁻¹]	3.47	2.49		2.94	2.80

30 Table S5 – Average yield estimations for each harvesting event in 2021.

Assendelft			Vlist		
	Control	SSI		Control	SSI
Date	[g c m ⁻²]	[g c m ⁻²]	Date	[g c m ⁻²]	[g c m ⁻²]
11-5-2021	221.1	130.4	20-5-2021	218.6	267.9
11-6-2021	205.9	155.5	16-6-2021	152.2	128.6
6-7-2021	60.7	66.5	15-7-2021	117.6	100.8
9-8-2021	70.5	71.3	19-8-2021	65.7	47.4
15-9-2021	97.3	91.8	23-9-2021	116.3	101.2
25-10-2021	38.5	30.0			
Extra yield in chambers [factor]	1.09	1.36		1.12	1.27*
Total after correction	754.96	741.01		750.45	820.30
Total [kg CO ₂ m ⁻² yr ⁻¹]	2.77	2.72		2.46	2.37

*Chamber correction estimated using the average chamber corrections from SSI plots.



35 **Figure S2 - Cross-sections from ditch (left) to trench (right) of estimation of yearly respiration rate [d yr⁻¹] in the upper meter of the model domain in the modelled wet year (above), dry year (middle) and in a dry year with SSI (bottom).**

Table S6 - Results of potential respiration rate simulations (scenarios with normal settings for hydraulic conductivity of intact sedge peat layers). Positive seepage numbers refer to upward seepage.

Potential respiration rate		[d m yr ⁻¹]										
Climate Seepage [mm d ⁻¹]	Ditch water level [cm from surface] v	wet	wet	wet	wet	wet	dry	dry	dry	dry	dry	dry
		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	
control	-20	4	8	13	21	31	25	32	39	46	54	
	-30	9	12	15	21	27	31	36	43	50	58	
	-40	13	16	20	26	32	37	42	48	56	64	
	-50	17	21	26	32	39	43	48	55	64	73	
	-60	22	27	33	40	48	50	56	64	74	85	
SSI	-20	8	8	8	9	9	11	12	12	13	14	
	-30	14	15	15	16	16	23	23	24	25	26	
	-40	22	22	22	23	23	34	35	36	36	37	
	-50	29	29	30	30	31	45	45	46	46	47	
	-60	37	38	38	38	39	55	55	56	57	57	

Absolute differences [d m yr⁻¹] when comparing with a base scenario consisting of a ditch water level of -50 cm

control	-20	-13	-13	-13	-12	-8	-18	-16	-16	-17	-19
	-30	-8	-9	-11	-12	-12	-12	-12	-12	-13	-15
	-40	-4	-5	-6	-7	-7	-6	-7	-8	-8	-9
	-50	0	0	0	0	0	0	0	0	0	0
	-60	5	7	7	8	9	7	8	9	10	12
SSI	-20	-9	-13	-18	-24	-30	-32	-37	-43	-50	-60
	-30	-3	-6	-11	-17	-23	-20	-25	-31	-39	-48
	-40	5	1	-4	-9	-16	-9	-13	-20	-27	-37
	-50	12	9	4	-2	-8	2	-3	-10	-17	-26
	-60	20	17	12	6	0	12	7	1	-7	-16

Percentual differences [%]

control	-20	-77	-62	-50	-36	-20	-41	-34	-30	-27	-26
	-30	-49	-42	-42	-36	-30	-28	-25	-22	-21	-20
	-40	-24	-23	-25	-21	-18	-14	-14	-14	-13	-13
	-50	0	0	0	0	0	0	0	0	0	0
	-60	29	32	28	24	24	16	16	16	16	16
SSI	-20	-55	-61	-68	-73	-76	-74	-76	-78	-79	-81
	-30	-15	-28	-41	-51	-59	-47	-51	-56	-61	-65
	-40	28	7	-14	-29	-40	-20	-28	-36	-43	-50
	-50	71	43	15	-6	-21	4	-6	-17	-27	-36
	-60	117	83	45	19	0	27	15	1	-11	-22

45 Table S7 - Difference [d m yr^{-1}] between absolute effectivity of SSI when comparing results for the highest (0.46 m d^{-1}) and lowest (0.11 m d^{-1}) saturated hydraulic conductivity. Positive results indicate lower respiration rate with the low saturated hydraulic conductivity. Positive seepage numbers refer to upward seepage.

	<i>Climate</i>	wet	wet	wet	wet	wet	dry	dry	dry	dry	dry
	<i>Seepage [mm d^{-1}]</i>	1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1
	<i>Ditch water level</i>										
	<i>[cm from surface]v</i>										
control	-20	0	-1	-3	-7	-13	-3	-4	-7	-8	-8
	-30	0	0	-1	-2	-4	-1	-2	-3	-4	-4
	-40	1	0	0	-1	-1	0	0	-1	-1	-2
	-50	2	1	0	0	0	0	0	-1	-1	-2
	-60	3	3	1	0	-1	0	0	-1	-1	-2
SSI	-20	0	0	0	0	0	0	0	0	0	0
	-30	0	0	0	0	0	0	0	0	0	0
	-40	0	0	0	0	0	0	0	0	0	0
	-50	0	0	0	0	0	0	0	0	0	0
	-60	0	0	0	0	0	0	0	0	0	0

Table S8 - Absolute differences [d m yr⁻¹] when comparing control with SSI results. Positive seepage numbers refer to upward seepage.

<i>Climate</i>		wet	wet	wet	wet	wet	dry	dry	dry	dry	dry	
<i>Seepage [mm d⁻¹]</i>		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	
<i>Ditch water level [cm from surface] v</i>												
control	-20	0	0	0	0	0	0	0	0	0	0	
	-30	0	0	0	0	0	0	0	0	0	0	
	-40	0	0	0	0	0	0	0	0	0	0	
	-50	0	0	0	0	0	0	0	0	0	0	
	-60	0	0	0	0	0	0	0	0	0	0	
SSI	-20	4	0	-5	-12	-22	-14	-20	-27	-33	-40	
	-30	6	3	0	-5	-11	-8	-13	-19	-25	-33	
	-40	9	6	3	-3	-9	-2	-7	-12	-19	-27	
	-50	12	9	4	-2	-8	2	-3	-10	-17	-26	
	-60	15	11	4	-2	-9	5	-1	-8	-17	-27	

Percentual differences [%]

control	-20	0	0	0	0	0	0	0	0	0	0
	-30	0	0	0	0	0	0	0	0	0	0
	-40	0	0	0	0	0	0	0	0	0	0
	-50	0	0	0	0	0	0	0	0	0	0
	-60	0	0	0	0	0	0	0	0	0	0
SSI	-20	91	2	-36	-57	-71	-56	-63	-68	-72	-75
	-30	68	24	1	-24	-41	-27	-35	-44	-50	-56
	-40	68	40	15	-10	-27	-7	-16	-26	-35	-43
	-50	71	43	15	-6	-21	4	-6	-17	-27	-36
	-60	68	39	13	-4	-19	10	-1	-13	-23	-32

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Table S9 - Difference [factor] between absolute effectivity of SSI when comparing results for the full width and results for the middle of the parcel (positive factors indicate higher effectivity in the middle of the parcel). Positive seepage numbers refer to upward seepage.

<i>climate</i>		wet	wet	wet	wet	wet	dry	dry	dry	dry	dry	
<i>Seepage [mm d⁻¹]</i>		1	0.5	0	-0.5	-1	1	0.5	0	-0.5	-1	
<i>Ditch water level [cm from surface]</i>												
	-20	0.9	-11.4	1.8	1.6	1.6	1.5	1.5	1.5	1.5	1.5	
	-30	1.1	0.9	-7.7	1.8	1.6	1.5	1.5	1.5	1.5	1.5	
	-40	1.2	1.2	0.9	2.0	1.7	2.1	1.6	1.6	1.6	1.6	
	-50	1.3	1.2	1.1	2.3	1.7	0.2	2.1	1.7	1.6	1.6	
	-60	1.3	1.3	1.1	2.5	1.7	0.9	6.0	1.8	1.7	1.6	