

Supplementary material

Table SI. Observed systems and crops within the different arable rotations, soil properties of the experimental sites, selected agronomic practices and sowing date during the experimental years (1st year: September 2012 – August 2013, 2nd year: September 2013 – August 2014).

Rotation element	Crop	Experimental year	pH*	P ₂ O ₅ [mg/100g]*	K ₂ O [mg/100g]*	Mg [mg/100g]*	C/N*	Stubble cultivation	Primary soil tillage	Sowing date
Organic-low-BNF	Grass-clover	1 st	5.9 (0.4)	9.0 (0.8)	6.25 (0.8)	10.8 (0.7)	11	1 ×	Plough	18-Aug-2012
		2 nd	5.9 (0.3)	-	-	-	10	1 ×	Plough	06-Sep-2013
	Winter wheat	1 st	6.1 (0.2)	12.7 (0.6)	4.7 (0.5)	4.6 (0.1)	11	3 ×	Plough	02-Oct-2012
		2 nd	6.0 (0.3)	-	-	-	10	1 ×	Plough	02-Oct-2013
	Winter rye	1 st	6.0 (0.2)	18.0 (1.4)	6.8 (0.4)	9.1 (1.4)	11	3 ×	Plough	19-Sep-2012
		2 nd	6.1 (0.1)	-	-	-	11	3 ×	Plough	25-Sep-2013
	Oats	1 st	5.9 (0.2)	9.0 (0.0)	6.5 (0.9)	10.0 (0.5)	10	3 ×	Plough	09-Apr-2013
		2 nd	6.0 (0.1)	-	-	-	11	3 ×	Plough	04-Mar-2014
Organic-semi-BNF	Grass-clover	1 st	6.4 (0.2)	19.0 (0.8)	8.0 (0.7)	9.4 (0.8)	10	1 ×	Plough	18-Aug-2012
		2 nd	6.0 (0.2)	-	-	-	10	1 ×	Plough	04-Sep-2013
	Winter wheat	1 st	5.8 (0.1)	11.8 (0.9)	8.9 (1.8)	5.2 (0.7)	11	3 ×	Plough	01-Oct-2012
		2 nd	6.4 (0.1)	-	-	-	10	1 ×	Plough	01-Oct-2013
	Winter rye	1 st	6.0 (0.1)	13.3 (3.3)	6.8 (1.3)	9.1 (0.3)	11	3 ×	Plough	19-Sep-2012
		2 nd	5.8 (0.2)	-	-	-	11	3 ×	Plough	23-Sep-2013
	Peas	1 st	6.8 (0.1)	17.25 (2.1)	7.8 (1.3)	14.4 (1.2)	11	3 ×	Plough	20-Apr-2013
		2 nd	6.0 (0.0)	-	-	-	10	2 ×	Plough	02-Apr-2014
Conventional	Oilseed rape	1 st	6.7 (0.1)	18.8 (3.3)	13.3 (0.8)	10.9 (0.8)	10	1 ×	Cultivator	24-Aug-2012
		2 nd	6.6 (0.2)	-	-	-	10	1 ×	Plough	30-Aug-2013
	Winter wheat	1 st	6.8 (0.1)	13.3 (1.3)	13.3 (2.3)	14.3 (0.7)	11	2 ×	Cultivator	19-Sep-2012
		2 nd	6.7 (0.2)	-	-	-	10	2 ×	Cultivator	23-Sep-2013
	Winter wheat	1 st	6.4 (0.1)	24.0 (0.8)	13.8 (1.5)	13.6 (0.9)	10	2 ×	Plough	29-Sep-2012
		2 nd	6.6 (0.0)	-	-	-	11	2 ×	Plough	02-Oct-2013
	Sugar beet	1 st	6.5 (0.1)	16.3 (1.0)	11.5 (1.7)	8.9 (1.4)	11	-	Cultivator	09-Apr-2013
		2 nd	6.6 (0.2)	-	-	-	11	-	Cultivator	14-Mar-2014
Permanent grassland	Grassland	1 st	6.6 (0.1)	11.5 (0.6)	11.5 (1.6)	14.0 (0.6)	11	-	Direct seed	30-Oct-2012
		2 nd	6.5 (0.1)	-	-	-	10	-	Plough	06-Oct-2013
Beech-forest	Woodland	1 st	5.9 (0.2)	15.5 (1.3)	6.8 (2.6)	9.7 (1.6)	11	-	-	Aug-2004
		2 nd	5.9 (0.1)	-	-	-	11	-	-	-
Beech-forest	Woodland	1 st	3.6 (0.0)	4.0 (0.8)	13.8 (0.5)	12.5 (0.5)	15	-	-	-
		2 nd	3.6 (0.0)	-	-	-	15	-	-	-

*values are for 0-30 cm soil depth. C/N: mean value from biannual samplings during period I (n=8) and II (n=8); Major nutrients (n=4); Stubble cultivation was conducted by disc harrow or cultivator. Values in brackets show the standard deviation.

Figure S1. Daily N_2O - (black line and dots) and CH_4 -fluxes (grey line and dots) of the reference systems (grassland and beech forest) during the study period (Oct 2012 - Oct 2014). Grey background represents periods with mean daily temperatures below 0°C . Mean values are shown (n=4).

