

S3. Supplementary material to results – result tables

Table S3.1. Service crop establishment [plants m⁻²] for the different treatments in the four experiments. Abbreviations: SK and OG stands for the two experimental regions, 1 = starting 2017, 2 = starting 2018, S = frost sensitive annuals, P = perennials, T = frost tolerant annuals. S = frost sensitive annual service crops (SCs), P = perennial SCs, T = frost tolerant annual SCs. Early Intra = early sowing of SCs in crop rows and Late Inter = late sowing of SCs in inter row centres. See Materials and method for detailed treatment explanations and table 1 for treatment overview. Means are back-transformed from square-root model estimates, CI denotes the 95% confidence interval and significance letters indicate the significances between treatments within experiments

System strategy	Service crop	SK1			OG1		
		Mean	CI	Sign	Mean	CI	Sign
<i>Early Intra</i>	<i>S</i>	139	102-182	b	65	33-107	ab
	<i>P</i>	160	114-215	ab	31	11-59	b
	<i>T</i>				49	22-86	b
<i>Late Inter</i>	<i>S</i>	216	154-287	a	127	83-182	a
	<i>P</i>	190	147-237	ab	31	5-79	b
	<i>T</i>				75	34-132	ab
		SK2			OG2		
		Mean	CI	Sign	Mean	CI	Sign
<i>Early Intra</i>	<i>S</i>	14	5-28	b	83	48-129	a
	<i>P</i>	37	20-59	a	16	3-39	bc
	<i>T</i>				89	50-138	a
<i>Late Inter</i>	<i>S</i>	0*	0*	c	5	0-20	c
	<i>P</i>	0*	0*	c	6	0-22	bc
	<i>T</i>				31	10-62	b

*In 2018 the emergence of frost sensitive annuals and perennials was delayed in both experiments due to the dry summer. At the time of the last plant counting very few plants had emerged. However, in august after rain had come the SC plants emerged also in these treatments.

Table S3.2. Stand development (number of plants, tillers and heads) and harvest components (heads plant⁻¹, kernels head⁻¹ and thousand kernel weight), mean and 95% confidence interval (CI), in oats in the four experiments. Abbreviations: SK and OG stands for the two experimental regions, 1 = starting 2017, 2 = starting 2018, S = frost sensitive annuals, P = perennials, T = frost tolerant annuals. S = frost sensitive annual service crops (SCs), P = perennial SCs, T = frost tolerant annual SCs. Early Intra = early sowing of SCs in crop rows, Late Inter = late sowing of SCs in inter row centres and Late Adjacent = late sowing of SCs close to crop row. See materials and methods and table 1 for information on treatments

System strategy	Service crop	Plants								Tillers								Heads							
		SK1		SK2		OG1		OG2		SK1		SK2		OG1		OG2		SK1		SK2		OG1		OG2	
		Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Early Intra	None	274	±32	163	±32	229	±28	218	±25	402	±44	294	±25			290	±47	325	±36	111	±35	305	±41	281	±37
	S	268	±30	166	±30	222	±28	228	±25	383	±42	275	±24			284	±47	296	±34	143	±33	300	±41	313	±37
	P	258	±32	164	±30	227	±28	221	±25	386	±43	288	±24			301	±47	308	±36	138	±33	320	±41	298	±37
	T					237	±28	261	±25							278	±47					295	±41	289	±37
Late Inter	None	317	±31	172	±30	237	±28	209	±25	427	±42	293	±24			283	±47	335	±35	141	±33	305	±41	296	±37
	S	269	±31	163	±30	230	±28	224	±25	399	±42	282	±24			283	±47	338	±35	131	±33	297	±41	291	±37
	P	260	±30	167	±30	233	±28	216	±25	369	±41	271	±24			270	±47	315	±33	137	±33	262	±41	295	±37
	T					238	±28	243	±25							299	±47					298	±41	320	±37
Late Adjacent	None					228	±28	214	±25							287	±47					313	±41	308	±37
	S					219	±28	231	±25							280	±47					284	±41	285	±37
	P					251	±28	220	±25							289	±47					291	±41	297	±37
	T					231	±28	219	±25							285	±47					317	±46	290	±37
		Heads plant ⁻¹								Kernels head ⁻¹								Thousand kernel weight							
		SK1		SK2		OG1		OG2		SK1		SK2		OG1		OG2		SK1		SK2		OG1		OG2	
		Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Early Intra	None	1,2	±0,193	0,707	±0,19	1,34	±0,2	1,33	±0,18	46,4	±8,7	33,1	±8,5	47	±7,9	46	±7,1	32	±1,5	26,9	±1,5	34,2	±2	28,5	±1,8
	S	1,11	±0,183	0,859	±0,18	1,35	±0,2	1,39	±0,18	45,4	±8,2	29,9	±8,1	50,1	±7,9	44,5	±7,1	31,1	±1,4	26,9	±1,4	34	±2	28,6	±1,8
	P	1,209	±0,192	0,851	±0,18	1,42	±0,2	1,35	±0,18	45,5	±8,7	30,5	±8,1	43,2	±7,9	44,3	±7,1	31,7	±1,4	26,6	±1,4	35,9	±2	28,2	±1,8
	T					1,25	±0,2	1,1	±0,18					40,3	±7,9	40,1	±7,1					34,4	±2	27,2	±1,8
Late Inter	None	1,075	±0,187	0,816	±0,18	1,29	±0,2	1,43	±0,18	47,4	±8,5	31,5	±8,1	47,7	±7,9	42,8	±7,1	31,9	±1,4	26,7	±1,4	36	±2	28,7	±1,8
	S	1,279	±0,187	0,795	±0,18	1,29	±0,2	1,36	±0,18	42,7	±8,4	28,8	±8,1	49,3	±7,9	45,3	±7,1	32,1	±1,4	27,3	±1,4	34,5	±2	28,5	±1,8
	P	1,235	±0,181	0,82	±0,18	1,15	±0,2	1,38	±0,18	47,7	±8,1	22,3	±8,1	54,8	±7,9	46,8	±7,1	32,3	±1,4	26,6	±1,4	34,9	±2	28,7	±1,8
	T					1,26	±0,2	1,31	±0,18					47,5	±7,9	39,2	±7,1					34,4	±2	29,3	±1,8
Late Adjacent	None					1,37	±0,2	1,44	±0,18					44,4	±7,9	46,1	±7,1					35,5	±2	28,5	±1,8
	S					1,3	±0,2	1,24	±0,18					49,8	±7,9	45,9	±7,9					35,6	±2	29,1	±1,8
	P					1,16	±0,2	1,37	±0,18					48,4	±7,9	44,6	±7,1					34,6	±2	28,4	±1,8
	T					1,4	±0,2	1,34	±0,18					45,5	±9,1	45,9	±7,1					35,4	±2	28,7	±1,8

Table S3.3. Stand development (number of plants, tillers and heads) and harvest components (heads plant⁻¹, kernels head⁻¹ and thousand kernel weight), mean and 95% confidence interval (CI), in oats in the four experiments. Abbreviations: SK and OG stands for the two experimental regions, 1 = starting 2017, 2 = starting 2018, S = frost sensitive annuals, P = perennials, T = frost tolerant annuals. S = frost sensitive annual service crops (SCs), P = perennial SCs, T = frost tolerant annual SCs. Early Intra = early sowing of SCs in crop rows, Late Inter = late sowing of SCs in inter row centres and Late Adjacent = late sowing of SCs close to crop row. See materials and methods and table 1 for information on treatments

System strategy	Service crop	Plants						Tillers						Heads					
		SK1		SK2		OG2		SK1		SK2		OG2		SK1		SK2		OG2	
		Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Early Intra	None	217	±25	179	±25	151	±17	132	±46	182	±46	270	±34	268	±45	166	±45	270	±35
	S	233	±25	178	±26	152	±17	134	±46	182	±46	255	±35	314	±45	154	±45	286	±35
	P	211	±25	168	±26	163	±17	125	±46	160	±46	292	±35	184	±45	131	±45	301	±35
	T					122	±17					231	±35					285	±35
Late Inter	None	223	±25	176	±26	148	±17	138	±46	180	±46	279	±35	277	±45	144	±45	282	±35
	S	245	±25	166	±26	150	±17	147	±46	160	±46	244	±34	305	±45	152	±45	266	±35
	P	196	±25	189	±26	138	±17	116	±46	186	±46	269	±35	213	±45	123	±45	261	±35
	T					154	±17					246	±35					307	±35
Late Adjacent	None					161	±17					266	±35					262	±35
	S					165	±17					294	±34					290	±35
	P					168	±17					267	±35					278	±35
	T					139	±17					235	±35					309	±35
		Heads plant ⁻¹						Kernels head ⁻¹						Thousand kernel weight					
		SK1		SK2		OG2		SK1		SK2		OG2		SK1		SK2		OG2	
		Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Early Intra	None	1,281	±325	0,928	±325	1,8	±34	17,1	±10,1	44,8	±10,1	31	±4,8	30,9	±1,6	35	±1,6	40,2	±0,9
	S	1,338	±325	0,882	±325	2	±34	22,4	±10,1	49,6	±10,1	27,8	±4,8	31,2	±1,6	35,1	±1,6	38,9	±0,9
	P	0,857	±325	0,813	±325	1,88	±34	36,4	±10,1	35,7	±10,1	28,7	±4,8	32,2	±1,7	35	±1,6	40,1	±0,9
	T					2,4	±34					31,8	±4,8					41	±0,9
Late Inter	None	1,243	±325	0,821	±325	1,92	±34	17,3	±10,1	49,4	±10,1	29,2	±4,8	31,2	±1,6	33,4	±1,6	40,5	±0,9
	S	1,246	±325	0,924	±325	1,78	±34	18	±10,1	43,5	±10,1	28,8	±4,8	32,4	±1,6	35,9	±1,6	39	±0,9
	P	1,123	±325	0,672	±325	1,9	±34	33,5	±10,1	46,7	±10,1	29,9	±4,8	30,2	±1,6	34	±1,6	40,3	±0,9
	T					1,99	±34					22,2	±4,8					39,6	±0,9
Late Adjacent	None					1,67	±34					29,6	±4,8					39,7	±0,9
	S					1,77	±34					29,4	±4,8					39,8	±0,9
	P					1,65	±34					28,8	±4,8					39,5	±0,9
	T					2,24	±34					26,5	±4,8					40,6	±0,9

Table S3.4. Weed biomass [g m⁻²] in oats and winter wheat before cash crop harvest in each experiment. Abbreviations: SK and OG stands for the two experimental locations, SC = service crop, S = summer annuals = P perennials, W = winter annuals. No data is presented for winter wheat in OG 2018 since spring wheat was grown here this year. See Materials and method for detailed treatment explanations and table 1 for treatment overview. Variation is given by the 95% confidence interval (CI)

In oats		SK1			SK2			OG1			OG2		
System strategy	Service crop	Mean	CI	Sign	Mean	CI	Sign	Mean	CI	Sign	Mean	CI	Sign
<i>Early Intra</i>	<i>No SC</i>	3.1	0.49-19	a	2.2	0.54-8.6	a	2.6	0.23-30	a	3.7	0.44-32	a
	<i>S</i>	3.3	0.60-18	a	0.93	0.24-3.7	a	1.9	0.22-16	a	10	1.4-74	a
	<i>P</i>	5.1	0.84-31	a	0.84	0.21-3.4	a	7.3	0.96-55	a	33	4.2-260	a
	<i>W</i>						a	1.0	0.12-9.2	a	6.9	0.84-56	a
<i>Late Inter</i>	<i>No SC</i>	4.5	0.84-24	a	0.35	0.086-1.4	a	2.0	0.22-18	a	21	2.6-170	a
	<i>S</i>	3.6	0.42-32	a	1.1	0.28-4.6	a	5.2	0.66-41	a	17	2.4-120	a
	<i>P</i>	3.2	0.78-13	b	1.4	0.36-5.8	a	3.6	1.6-80	a	31	4.4-220	a
	<i>W</i>							1.6	1.2-22	a	3.6	0.43-29	a
In winter wheat		SK1			SK2			OG1			OG2		
System strategy	Service crop	Mean	CI	Sign	Mean	CI	Sign				Mean	CI	Sign
<i>Early Intra</i>	<i>No SC</i>	0.029	0.0013-0.62	a	130	6.1-290	a				88	46-140	a
	<i>S</i>	1.7	0.080-37	a	150	6.8-320	a				150	91-220	a
	<i>P</i>	0.031	0.0014-0.67	a	31	1.4-67	a				79	40-130	a
	<i>W</i>						a				66	31-120	a
<i>Late Inter</i>	<i>No SC</i>	8.4	0.39-180	a	120	5.7-260	a				59	26-110	a
	<i>S</i>	4.2	0.20-91	a	78	3.6-170	a				110	62-170	a
	<i>P</i>	0.000040	0-0.00090	a	120	5.4-250	a				76	37-130	a
	<i>W</i>										54	22-99	a