Table S1. Field sites and soil properties of the six experiments

Variant	2019			2020		
	Site 1	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**
Location	49.26491, -0.87763	49.512660, 0.409829	48.851115, 0.023732	49.249615, -0.612199	48.829081, 1.230917	48.865838, 0.021099
Previous crop	*Beta vulgaris*	*Linum usitatissimum*	*Medicago sativa*	*Beta vulgaris*	*Brassica napus*	*Brassica napus*
Wheat cultivar	Sacramento	Libravo	Chevignon	Adoration	Boregar	Extase
Sowing date	17-11-2018	16-10-2018	16-10-2018	28-12-2019	10-10-2019	25-10-2019
Organic matter input	Yes	No	No	No	No	No
Soil type	Clay loams / Frank loams	Deep silt	Superficial clay limestone	Deep silt	Deep silt	Medium limestone clay
pH (water)	6.2	7.3	8.4	6.9	7.4	8.1
CEC (mol kg^{-1})	9.5	8.5	10.8	8.1	13.6	13.2
Organic matter (%)	2.4	2.1	3.4	1.6	2.4	4.1
C/N Ratio	Not determined	8.1	7.6	10.4	13.9	8.8
Total N (%)	Not determined	0.15	0.26	0.09	0.10	0.27
Organic C (%)	1.42	1.22	1.98	0.94	1.39	2.38
Assimilable P (ppm)	132	101	62	88	50	89
Exchangeable K (ppm)	168	238	254	215	130	337
Exchangeable Mg (ppm)	104	99	216	72	100	151

CaO (‰)	2.1	3.6	12.3	1.6	3.6	13.8

Table S2. Management of N fertilizer inputs for the six field experiments

Variant	2019			2020		
	Site 1	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**
Humus effect	65	50	30	40	35	25
Previous crop effect	20	0	40	20	20	20
Organic matter supply effect	12	0	0	0	0	0
N uptake	10	29	26	0	15	20
N residue (NO_3^-/NH_4^+)	33 (25/8)	35 (33/2)	42 (34/8)	30 (26/4)	39 (28/11)	24 (21/3)
Total N soil supply (kg N ha^{-1})	140	114	138	90	109	89
Crop needs	272	304	270	285	234	288
N remaining	20	20	20	20	15	20
Total needs	292	324	290	305	249	308
N fertilizer input	152	210	152	215 - 40 = 175	132 - 40 = 92	219 - 40 = 179
Supply 1	61	100	62	40 + 77	60	106
Supply 2	31	50	30	18	0	13
Supply 3	60	60	60	40	40	60

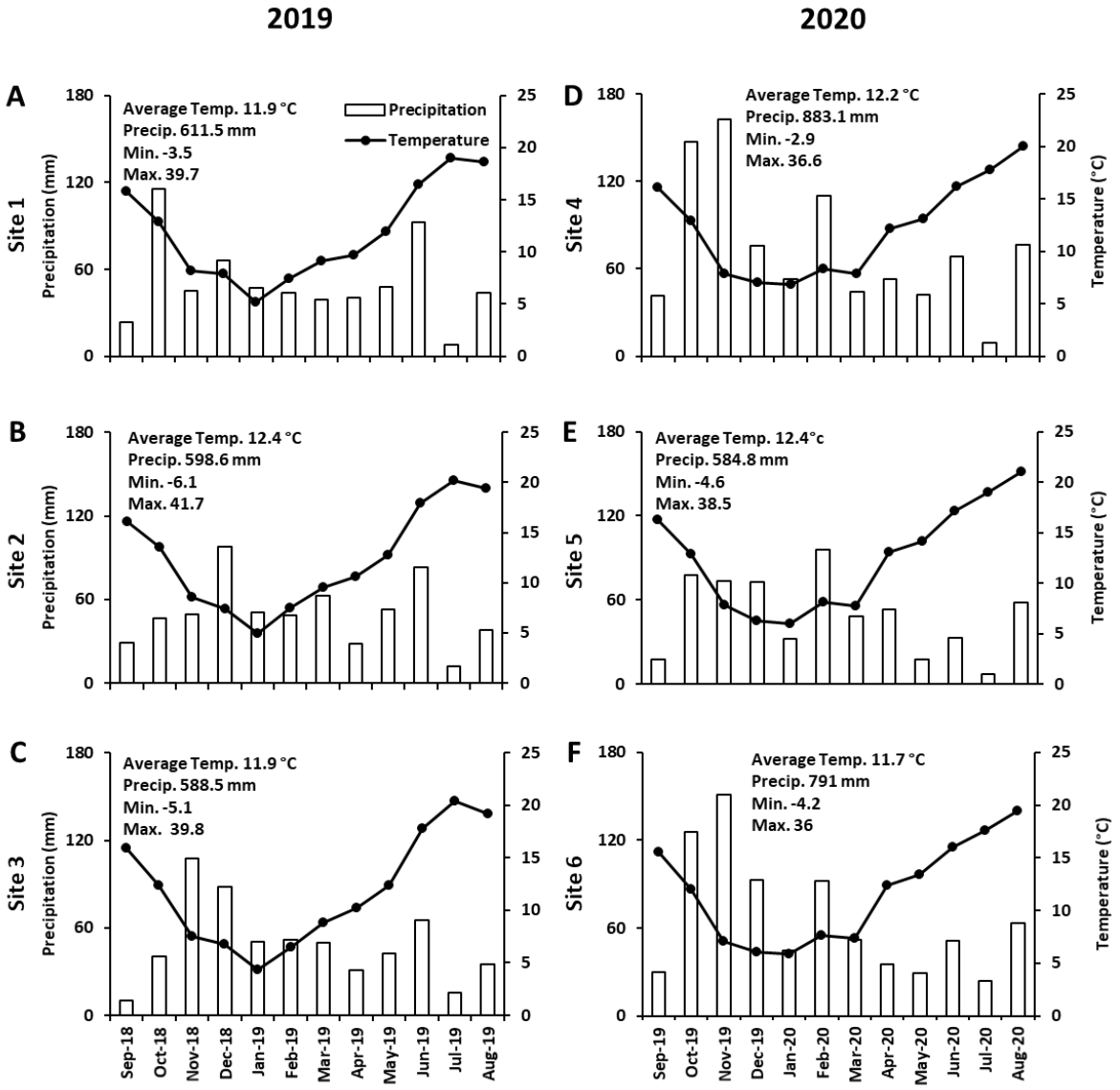

Figure S1. Weather conditions for each site during the growing period. (A) Site 1, (B) Site 2, (C) Site 3, (D) Site 4, (E) Site 5 and (F) Site 6.

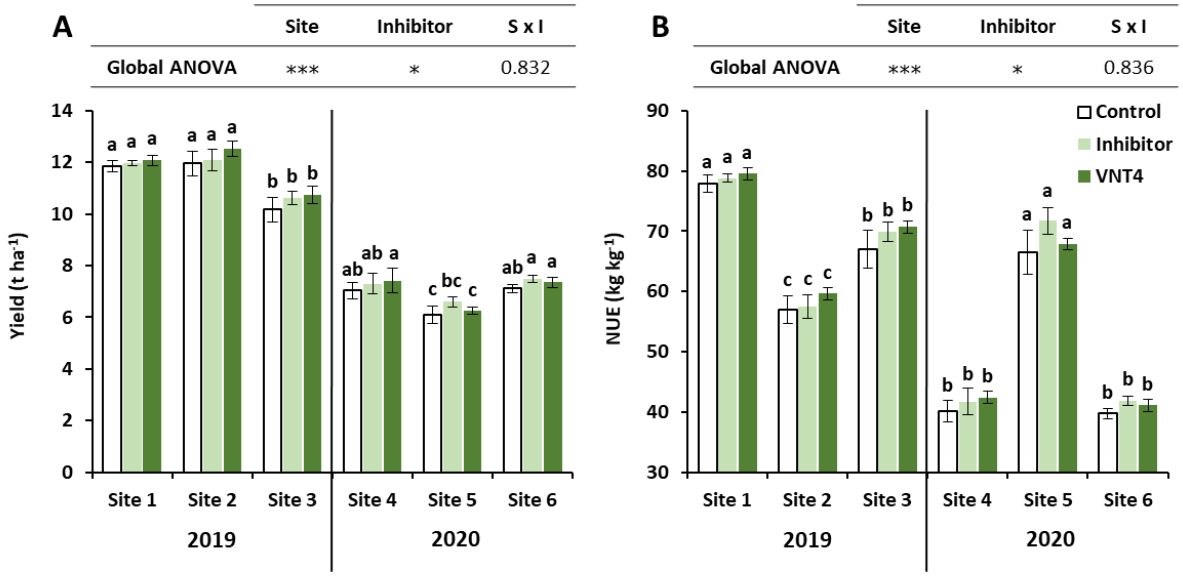

Figure S2. Influence of a urease inhibitor (NBPT) and VNT4 on (A) yield and (B) N use efficiency (NUE) in winter wheat under different site and year conditions. Plant culture was carried out under six different field conditions in France, Normandy. N was provided at the tillering, stem elongation and flag leaf stages. NBPT was mixed at a concentration of 0.2% in UAN at each N application (2 mL NBPT for 1 L of UAN). The VNT4 formulation (5 L ha^{-1}, see Table 1 for more details) was mixed with UAN before each N application, leading to a global application of 15 L ha^{-1}. Bars indicate means ± SE. Different letters denote significant differences in 2019 or 2020 according to Fisher's test ($p < 0.05$; n = 3 in 2019, n = 4 in 2020).