

Table S4a. AICc values for each of the mixed effects models fitted between protein concentration (log transformed) in wheat grains and different measures of weed community structure (WCM): Biovolume, biovolume of the whole weed community; S, weed species richness; J, Pielou index; PCA axes: PCA1, PCA3 and PCA 5 axes from a principal component analysis on weed community composition; CWM community weighted mean of eight traits: height, specific leaf area (SLA), seed mass, growth form, functional type, life form, month of flowering onset and flowering duration. AICc values in bold show the model selected in each case for parameter estimation. Models compared have different complexity ranging from a pure abiotic model (only management and climatic variables) to models including a weed community structure measure and their interactions with abiotic factors.

		df	Biovolume	S	J	CWM height	CWM SLA	CWM seed mass	CWM growth form	CWM funct. type	CWM life form	CWM flw. onset	CWM flw. durat.
Models													
M0: Abiotic factors		7	-831.9	-838.9	-838.9	-832.0	-834.8	-832.0	-838.9	-838.9	-838.9	-838.9	-838.9
M1: Abiotic factors + PCA axes		10	-846.9	-852.7	-852.7	-846.9	-848.3	-846.9	-852.7	-852.7	-852.7	-852.7	-852.7
M2: Abiotic factors + PCA axes + weed community metric (WCM)		11	-844.8	-852.9	-852.5	-850.7	-846.4	-845.7	-853.8	-853.3	-850.5	-851.4	-850.6
One interaction models	M3: M2 + WCM x fertilization	12	-842.8	-850.8	-850.5	-849.0	-848.4	-849.7	-851.6	-852.0	-848.5	-849.5	-853.5
	M4: M2 + WCM x precipitation	12	-843.4	-851.0	-851.9	-851.6	-844.4	-847.7	-853.5	-851.9	-848.4	-849.5	-848.5
	M5: M2 + WCM x preceding crop	12	-844.5	-850.8	-850.8	-848.5	-844.2	-843.6	-852.6	-853.2	-848.3	-850.5	-848.5
Two interaction models	M6: M2 + WCM x fertilization + WCM x precipitation	13	-841.1	-848.8	-850.4	-849.8	-849.8	-850.4	-851.3	-850.4	-846.3	-847.5	-851.5
	M7: M2 + WCM x fertilization + WCM x preceding crop	13	-843.1	-848.7	-848.5	-846.8	-848.4	-849.2	-850.4	-852.7	-846.3	-848.4	-851.7
	M8: M2 + WCM x precipitation + WCM x preceding crop	13	-844.5	-848.8	-850.5	-849.8	-842.2	-845.6	-852.3	-852.4	-846.4	-848.3	-846.4
Three interactions model	M9: M2 + WCM x fert. + WCM x precip. + WCM x prec.crop	14	-842.4	-846.6	-848.5	-848.1	-849.0	-849.8	-850.0	-851.6	-844.3	-846.2	-849.7

Table S4b. AICc values for each of the mixed effects models fitted between protein concentration in grains and different measures of weed community structure (WCM): PCA axes: PCA1, PCA3 and PCA 5 axes from a principal component analysis on weed community composition; FDis functional dispersion of eight traits: height, specific leaf area (SLA), seed mass, growth form, functional type, life form, month of flowering onset and flowering duration. AICc values in bold show the model selected in each case for parameter estimation. Models compared have different complexity ranging from a pure abiotic model (only management and climatic variables) to models including a weed community structure measure and their interactions with abiotic factors.

			df	FDis height	FDis SLA	FDis seed mass	FDis growth form	FDis funct. type	FDis life form	FDis flw. onset	FDis flw. durat.
Models											
M0: abiotic factors			7	-838.9	-834.8	-838.9	-838.9	-838.9	-838.9	-838.9	-838.9
M1: Abiotic factors + PCA axes			10	-846.9	-852.7	-846.9	-852.7	-852.7	-852.7	-852.7	-852.7
M2: Abiotic factors + PCA axes + weed community metric (WCM)			11	-845.0	-851.0	-844.9	-855.4	-850.7	-850.6	-853.7	-851.0
One interaction models	M3:	M2 + WCM x fertilization	12	-844.6	-851.0	-846.2	-853.3	-849.3	-848.4	-851.5	-849.2
	M4:	M2 + WCM x precipitation	12	-850.0	-848.9	-843.1	-856.9	-848.9	-849.0	-856.5	-848.9
	M5:	M2 + WCM x preceding crop	12	-845.6	-851.0	-842.9	-856.1	-849.6	-848.7	-852.7	-849.0
Two interaction models	M6:	M2 + WCM x fertilization + WCM x precipitation	13	-849.2	-849.4	-846.2	-854.7	-847.8	-846.8	-855.0	-847.1
	M7:	M2 + WCM x fertilization + WCM x preceding crop	13	-844.1	-849.4	-844.6	-853.9	-848.6	-846.5	-850.6	-847.9
	M8:	M2 + WCM x precipitation + WCM x preceding crop	13	-848.2	-850.0	-841.0	-859.7	-847.6	-846.8	-854.3	-846.8
Three interactions model	M9:	M2 + WCM x fert. + WCM x precip. + WCM x prec.crop	14	-847.1	-848.5	-846.4	-857.5	-846.8	-844.5	-852.8	-845.7