



TITLE: Nitrogen yield advantage from grass-legume mixtures is robust over a wide range of legume proportions and environmental conditions

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Table S1

Details on the 16 sites with data on N concentration (N_{conc}) in total harvested stand biomass. Listed sites were part of a continental-scale field experiment that included more locations. For extended information to all sites see Kirwan *et al.* (2014)[¶].

Site #	Country	Site name	Altitude of experimental site (m a.s.l.)	Mixture type [‡]	N_{conc} data for years			N_{conc} data for co-dominant stands [§]	N fertilizer (kg ha ⁻¹ year ⁻¹)	Harvests per annum (year 1,2,3)
					1	2	3			
1	Belgium	Merelbeke	11	O	x			150	4,3,4	
10	Germany_a	Renningen	460	ME	x	x	x	150	4,5,5	
11	Germany_b	St. Johann	700	ME	x	x	x	150	4	
13	Iceland_a	Korpa	35	NE	x	x	x	40	2	
14	Iceland_b	Korpa	35	NE	x	x	x	80	2	
15	Ireland	Wexford	54	ME	x	x	x	150	5	
18	Lithuania_a	Dotnuva	71	ME	x	x	x	120	3	
20	Lithuania_c	Dotnuva	71	ME	x	x	x	120	3,3,2	
22	Norway_a	Saerheim	90	ME	x	x	x	0	3	
23	Norway_b	Tromsø	15	NE	x		x	60	2	
24	Norway_c	Ås	95	ME	x	x		135	3	
26	Poland_a	Brody	94	ME	x	x	x	120	4,4,3	
27	Poland_b	Brody	91	ME	x	x	x	90	4,3	
34	Switzerland	Zurich-Reckenholz	491	ME	x	x	x	150	5	
35	Wales_a	Aberystwyth	30	ME		x	x	90	4	
36	Wales_b	Bronydd Mawr	323	ME	x			93	4,3,4	

[‡] For the sown species in the three types of mixtures (ME: Mid European, NE: North European, O: Other) see Table 1, core text

[§] For the type of stands, i.e. the proportions of the sown species, see Table S2

[¶] Kirwan L, Connolly J, Brophy C *et al.* (2014) The Agrodiversity Experiment: three years of data from a multisite study in intensively managed grasslands. *Ecology*, **95**, 2680.

Table S2

Sowing proportions of the two grass and legume species in experimental stands at each site. The fifteen stands were repeated at two levels of seed density, the lower being 60% of the higher density, resulting in a total of 30 established plots per site. G1: fast establishing grass, G2: temporally persistent grass, L1: fast establishing legume, L2: temporally persistent legume. Species names are given in Table 1, core text.

Type of stand	G1	G2	L1	L2
Equi-proportional mixture	0.25	0.25	0.25	0.25
Dominant mixtures	0.70	0.10	0.10	0.10
	0.10	0.70	0.10	0.10
	0.10	0.10	0.70	0.10
	0.10	0.10	0.10	0.70
Co-dominant mixtures	0.40	0.40	0.10	0.10
	0.40	0.10	0.40	0.10
	0.40	0.10	0.10	0.40
	0.10	0.40	0.40	0.10
	0.10	0.40	0.10	0.40
	0.10	0.10	0.40	0.40
Monocultures	1	0	0	0
	0	1	0	0
	0	0	1	0
	0	0	0	1

Appendix A. Supporting text and information on the methods and analyses

Validation of the NIRS method

Mathematical evaluation of the NIRS spectra was performed using the Modified Partial Least Squares method (WinISI software version 3, Infrasoft International, USA). The NIRS calibration was based on 278 samples – selected to represent the whole spectral and chemical variability – for which nitrogen concentration (N_{conc}) was directly determined with an elemental analyzer applying the DUMAS combustion method (Vario Max CN, Elementar Analysensysteme, Hanau, Germany). The calibration covered a range of 0.51 - 4.56% N in dry matter with a mean of 2.30, a standard deviation of 0.814, and explained 99.0% of the variance in N_{conc} .

Assessment of the NIRS spectra of the full dataset revealed a very evenly distributed population. As generally expected, a few outliers were observed. These, however, were non-systematic regarding sites or mixture type, indicating that no particular types of samples have been determined as outliers due to the diverse growing conditions or due to high shares of local unsown species. Reasons for this are the strict common protocol for sample preparation and the systematic use of comparable grass-clover mixtures across all sites.

The NIRS method was back-validated by regressing 130 randomly selected, independent N_{conc} determinations against the values obtained by a direct measurement with the elemental analyzer. The slope of this relationship was estimated to be 0.992 (confidence interval: 0.974, 1.010), the linear relationship accounted for 98.9% of the variance in the data with N_{conc} covering the relevant range, and the standard error of estimation of independent validation samples was 0.079 (% N in dry matter), suggesting a 1:1 relation between NIRS and elemental analyzer data. There were no outliers in the validation dataset.

Confounding effects of total biomass

It must be assumed that N_{tot} is closely related to the total biomass produced by the swards, as N_{tot} is the product of N concentration and total harvested biomass. This would suggest including total stand biomass as a covariate in regression analyses of eqs. 1 (core text), S1 & S2 (below). However, total biomass production is also strongly affected by legume proportion (e.g. Nyfeler *et al.*, 2009; Finn *et al.*, 2013), used as the regression predictor of major interest in our analyses. Including total harvested biomass in regressions of eqs. 1, S1 & S2 would therefore have led to highly correlated predictors and the associated aberrations (Graham, 2003; Dormann *et al.*, 2013). To avoid this, sequential regression was applied: total biomass was first regressed on legume proportion (using the same model specification as eqs. 1/S1/S2), and residuals of this first model were used as the biomass predictor, termed *DeltaBiomass*, in eqs. 1, S1 & S2. It follows that the biomass effect as modelled in these equations is uncorrelated to legume proportion and explains variation in N_{tot} additional to the contribution it already has through its relationship with legume proportion.

Linear mixed model to equation 1: regressing N_{tot} on legume proportion

Equation 1, core text, was extended to a model where all coefficients were estimated for each of three years, and where random coefficients were added to estimate the general (population) stand performance while allowing for variation across sites for each of the three years:

$$N_{tot} = \sum_{t=1}^3 (\beta_{0t} + b_{0t}) * year_t + \sum_{t=1}^3 (\beta_{1t} + b_{1t}) P_{Leg.t} * year_t + (\beta_{2t} + b_{2t}) P_{Leg.t}^2 * year_t + (\beta_{3t} + b_{3t}) P_{Leg.t}^3 * year_t + \sum_{t=1}^3 (\alpha_t + a_t) D * year_t + \sum_{t=1}^3 (\gamma_t + g_t) DeltaBiomass * year_t + \varepsilon_t$$

eqn. S1

Here, β_{it} coefficients ($i = 1,2,3$) estimate the general linear and non-linear effects of stand legume proportion P_{Leg} on N_{tot} in each of three years t , β_{0t} estimates N_{tot} in grass monoculture ($P_{Leg.t} = 0$) including potential weeds, and α_t and γ_t give the general effects of seed density D and $DeltaBiomass$, respectively. Coefficients b_t , a_t , and g_t estimate the variance across sites with $b_t \sim N(0, \sigma_{bt}^2)$, $a_t \sim N(0, \sigma_{at}^2)$, and $g_t \sim N(0, \sigma_{gt}^2)$. The error term is $\varepsilon_t \sim N(0, \Sigma)$. An unstructured covariance matrix among random terms b_t , a_t , and g_t within each year was initially included. Moreover, an interaction between P_{Leg} and $DeltaBiomass$ was tested and included, while a term for unsown species proved to be non-significant and was omitted.

Restricted maximum likelihood was used for fixed parameter and variance estimation (Pinheiro & Bates, 2009). To stabilize convergence of the likelihood, P_{Leg} was centered around its mean of all predictor years, that is, the mean of sown legume proportion and realized legume proportions of years 1 and 2. Consequently, centered P_{Leg} was also implied for fixed parameter testing as displayed in Table 2, core text, using the full likelihood. Note that estimates of N_{tot} for varying legume proportions as provided in Table 3 and Fig. 4, core text, do not differ whether P_{Leg} is centered or not.

Regarding modeling strategy, the variance structure was held in accordance with the fixed effect terms. For example, it appeared that the interaction of the cubic legume term with year ($P_{Leg.t}^3 * year_t$) was non-significant and was therefore omitted to reduce model complexity, accordingly, a single random coefficient b_3 was retained in the model. The final model (Table 2, core text), from which estimates of N_{tot} and N_{gain} were derived (Table 3, core text), omitted non-significant density effects and interactions and included an unstructured covariance matrix of b_t terms within *and* among years. Random coefficients for the covariate $DeltaBiomass$ (g_t) had to be omitted due to convergence problems, but when fit on simpler models, g_t terms were of negligible size. Further, $DeltaBiomass$ was kept at zero for all predictions, i.e. at the mean of the residuals from the first stage model (see “Confounding effects of total biomass” above).

To receive average site values, a further model regressed the average N_{tot} across the first two experimental years on sown legume proportion. Only two years were considered, because the large majority of sites had data for this time-span. This resulted in the simplified equation:

$$N_{tot} = (\beta_0 + b_0) + (\beta_1 + b_1)P_{Leg} + (\beta_2 + b_2)P_{Leg}^2 + (\beta_3 + b_3)P_{Leg}^3 + (\gamma + g)DeltaBiomass + \varepsilon$$

eqn. S2

with fixed and random terms as specified for eqn. S1 and an unstructured covariance matrix among random b and g terms. An interaction term $P_{Leg} \times DeltaBiomass$ was included ($F_{1,312} = 9.4$, $P = 0.002$). Seed density D was tested initially, but was omitted due to non-significance.

Finally, we note that – convenient to all regression approaches – replicates of stand compositions are not essential for estimation of coefficients and their standard errors. Estimates and inference in such regressions are based on the residual variation around the model fitted, which derives from all stands in the design. It is noteworthy that predictions of N_{tot} based on eqs. S1 & S2 were highly reliable, indicated by high correlation between predicted and observed values ($r^2 \geq 0.95$), and by accurate model fits to individual sites (see Fig. S1, Supporting Information).

Justification for pooling individual species performance to functional groups

N_{tot} in bulk biomass of monocultures and mixtures was initially analysed using a regression-based approach following Kirwan *et al.* (2009). Here, an ecosystem response (e.g. N_{tot}) is modeled as a linear combination of i) identity effects of species as represented by their monoculture performance, ii) species net interactions (being positive, negative, or neutral) that are defined as the difference between the actual mixture performance and that expected from the relative contribution of the constituent monocultures, and iii) any further factors applied, such as seed density in our case. This approach allowed regressing N_{tot} in stand biomass on the proportional biomass contributions of the four sown species and the unsown species fraction (US), which led to the following formulation:

$$N_{tot} = \beta_1 P_{G1} + \beta_2 P_{G2} + \beta_3 P_{L1} + \beta_4 P_{L2} + \beta_5 P_{US} + \delta_1 P_{BGL} + \delta_2 P_{WGL} + \delta_3 P_{SUS} + \alpha D + \gamma DeltaBiomass + \varepsilon$$

eqn. S3

where P represents the proportional biomass of species functional types in a stand (harvested biomass proportions of previous year, sown proportions for year 1). The identity effect of each functional type and unsown species is thus estimated by β_1 to β_5 , i.e. the model estimate of N_{tot} of a species grown in monoculture. Pairwise interactions between species functional types were grouped together to reveal specifically effects between non-fixing grass and N_2 fixing legume species (BGL) on N_{tot} , within grasses and legumes (WGL) representing interactions between fast establishing and temporally persistent species, and between sown grass and legume species and the unsown species fraction (SUS). These interactions entered the model by the sum of pairwise products of proportions, denoted with:

$$P_{BGL} = P_{G1} * P_{L1} + P_{G1} * P_{L2} + P_{G2} * P_{L1} + P_{G2} * P_{L2}$$

$$P_{WGL} = P_{G1} * P_{G2} + P_{L1} * P_{L2}$$

$$P_{SUS} = P_{G1} * P_{US} + P_{G2} * P_{US} + P_{L1} * P_{US} + P_{L2} * P_{US} \quad \text{eqs. S4}$$

δ_1 to δ_3 estimate therefore the net interactions between and within functional types of grasses and legumes and their interactions with unsown species. The effect of seed density is estimated by α , with D denoting the level of seed density coded as -1 and +1 for low and high density, respectively, so all other terms are estimated at average density. A potential effect of *DeltaBiomass* on the response variable is estimated by the γ coefficient (see paragraph “Confounding effects of total biomass” for definition of *DeltaBiomass*).

The basic eqn. S3 was extended to a random coefficients approach, where a general (population) relation of N_{tot} to species’ biomass proportions was estimated for each of three years while allowing for variation across sites (Pinheiro & Bates, 2009). The identity and interaction effects were included in the model as both fixed and random terms, leading to:

$$N_{tot} = \sum_{t=1}^3 \sum_{i=1}^5 (\beta_{it} + b_{it}) P_{it} * year_t + \sum_{t=1}^3 \sum_{j=1}^3 (\delta_{jt} + d_{jt}) P_{jt} * year_t + \sum_{t=1}^3 (\alpha_t + a_t) D * year_t + \sum_{t=1}^3 (\gamma_t + g_t) DeltaBiomass * year_t + \varepsilon_t$$

eqn. S5

The coefficients β_{it} estimate the general identity effect of the four species (and unsown) i (G1, G2, L1, L2, US) in each of three years t ; likewise, coefficients δ_{jt} estimate the general effect of the three kind of interactions between functional types (BGL, WGL, SUS) in each year, and α_t and γ_t the general effects of seed density and fluctuations in total stand biomass, respectively. Coefficients b_{it} , d_{jt} , a_t , and g_t estimate the variance across sites with $b_{it} \sim N(0, \sigma_{bit}^2)$, $d_{jt} \sim N(0, \sigma_{djt}^2)$, $a_t \sim N(0, \sigma_{at}^2)$, and $g_t \sim N(0, \sigma_{gt}^2)$. The error term is $\varepsilon_t \sim N(0, \Sigma)$. Correlations among random terms within years were not included due to convergence problems, but fitting three independent models to each of three years’ data including such correlation revealed qualitatively the same results.

Within this framework, an additional model assessed the average interaction of all possible pairwise products of proportions with $P_{AVE} = P_{BGL} + P_{WGL} + P_{SUS}$, the effect being estimated by a single coefficient δ_{AVE} for each of three years t , leading to:

$$N_{tot} = \sum_{t=1}^3 \sum_{i=1}^5 (\beta_{it} + b_{it}) P_{it} * year_t + \sum_{t=1}^3 (\delta_{AVE,t} + d_{AVE,t}) P_{AVE,t} * year_t +$$

$$\sum_{t=1}^3 (\alpha_t + a_t) D * year_t + \sum_{t=1}^3 (\gamma_t + g_t) \Delta Biomass * year_t + \varepsilon_t$$

eqn. S6

with $d_{AVE.t} \sim N(0, \sigma_{d_{AVE.t}}^2)$, and remaining terms as for eqn. S5. Estimates of N_{tot} based on eqs. S5 & S6 are given in Table S3, Supporting Information.

In the regressions following eqs. S5 & S6, it became apparent that interactions affecting N_{tot} were mainly between non-fixing grasses and N_2 fixing legumes (BGL), but to a far lesser extent between fast establishing and temporally persistent species within grasses and legumes (WGL; compare Table S3, Supporting Information). Further, the identity effects (i.e. N_{tot} response in monocultures) for each of the two functional types within grasses and legumes were similar (Table S3, compare estimates and their standard errors of G1 vs. G2, and L1 vs. L2). It was therefore tested whether the identity effects of fast establishing and persistent species functional types within grasses and legumes could be collapsed to one effect, more formally, whether $\beta_1 P_{G1} + \beta_2 P_{G2} = \beta_{Grass}(P_{G1} + P_{G2}) = \beta_{Grass} * P_{Grass}$, and likewise for legumes. It appeared that this grouping was parsimonious for grasses in each of three experimental years ($P > 0.5$ each) and legumes ($P > 0.07$ in year 1; $P > 0.2$ in year 2, $P > 0.5$ in year 3). In conjunction with the predominant interaction effects *between* grasses and legumes (BGL effect, Table S3), it was concluded that this grouping was justifiable and that N_{tot} could be analysed in a more parsimonious way that directly would reveal the effect of legume proportion on N_{tot} , which lead to eqn. S1.

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Table S3

Predicted total nitrogen yield (N_{tot} ; $\text{kg ha}^{-1} \text{ year}^{-1}$) of monocultures, and predicted N_{tot} and mixing effects of the equi-proportional mixture across all sites. Given are the fixed effect means based on eqs. S5/S6, Appendix A, Supporting Information. Note that eqs. S5/S6 were part of a preliminary analysis described in Appendix A.

Year	Monocultures [‡]						Equal stand mixture				
	N_{tot}						N_{tot}	Mixing effects [§]			
	G1 (SE)	G2 (SE)	L1 (SE)	L2 (SE)	US (SE)	\bar{x}		AVE	BGL	WGL	SUS
1	176.2 (23.2)	186.8 (27.9)	334.0 (43.8)	237.6 (29.5)	- [¶]	233.6	305.5	71.8***	52.8***	19.0 [†]	-
2	160.4 (22.7)	174.4 (28.1)	256.2 (23.6)	217.8 (26.2)	156.0 (51.7)	193.0	263.7	70.8*	31.4*	6.6 [†]	-14.9 ^{ns}
3	115.8 (19.3)	133.9 (24.4)	189.3 (35.2)	213.8 (26.2)	115.4 (30.5)	153.6	188.6	34.9 ^{ns}	-6.4 ^{ns}	9.0 ^{ns}	-2.0 ^{ns}

[‡] G1: fast establishing grass, G2: temporally persistent grass, L1: fast establishing legume, L2: temporally persistent legume, US: unsown species, in parentheses: 1 standard error, \bar{x} : average (linear mean) of the four monocultures and US. Seed density was not significant and was omitted.

[§] Mixing effects are given for the equi-proportional mixture (i.e. equal proportion of the four sown species and the pooled unsown species) and are calculated as the difference of N_{tot} between the equal stand mixture and \bar{x} . Mixing effects were assessed following eqn. S5 by splitting the interaction terms into interactions between grasses and legumes (BGL), within grasses and legumes (WGL), and between the four sown species and pooled unsown species (SUS). A further model following eqn. S6 assessed the average interaction (AVE) representing all pairwise effects. Values of N_{tot} for monocultures, \bar{x} , and for the equal stand mixture refer to eqn. S6.

[¶] No estimation of N_{tot} for US and SUS in year 1 because unsown species were initially absent.

*** $P \leq 0.001$, ** $P \leq 0.01$, * $P \leq 0.05$, [†] $P \leq 0.1$, ns: not significant

Table S4

Summary of environmental variables, total nitrogen yield in pure grass stands (N_{totgrass}) and mixtures (N_{totmix}), and N gain in mixtures ($N_{\text{gainmix}} = N_{\text{totmix}}$ minus N_{totgrass}). Site means across the first two experimental years are provided; see Materials and Methods, core text, for details on computation. Values of N_{totmix} and N_{gainmix} are predicted for a mixture with one third proportion of legumes and two thirds of grasses.

Site #	Annual precipitation (mm year ⁻¹) [¶]	Mean annual temperature (°C) [¶]	Maximum temperature (°C)	Minimum temperature (°C)	Productivity (t ha ⁻¹ year ⁻¹)	N_{totgrass} (kg ha ⁻¹ year ⁻¹)	N_{totmix} (kg ha ⁻¹ year ⁻¹)	N_{gainmix} (kg ha ⁻¹ year ⁻¹)
1	616	10.9	32.3	-6.2	10.4	180	431	251
10	639	9.0	29.9	-13.4	13.0	260	398	138
11	1046	7.4	30.2	-15.8	12.0	291	384	93
13	1179	5.6	21.7	-13.5	3.9	61	93	32
14	1033	5.0	21.8	-13.5	2.3	39	54	15
15	932	10.5	22.5	-0.9	14.1	355	461	106
18	506	7.1	28.8	-18.0	8.0	145	173	28
20	492	7.1	28.2	16.5	7.8	113	155	42
22	1415	8.1	23.8	-5.7	4.3	106	317	211
23	1221	4.2	23.3	-11.3	6.4	92	217	125
24	800	6.4	27.3	-17.5	10.4	163	255	92
26	625	9.0	30.6	-11.9	9.4	189	201	12
27	607	9.3	32.3	-14.6	8.8	266	251	-15
34	863	9.9	32.5	-9.5	8.4	203	441	238
35	1101	10.5	24.7	-5.8	10.6	221	358	137
36	1556	- [‡]	24.6	-4.4	6.9	111	220	109

[‡] Missing data

[¶] Differences to Kirwan *et al.* (2014) are due to different time-spans for calculation.

Kirwan L, Connolly J, Brophy C *et al.* (2014) The Agrodiversity Experiment: three years of data from a multisite study in intensively managed grasslands. *Ecology*, **95**, 2680.

Table S5

Correlation matrix of the five environmental variables on which the response variables in Table S7 were regressed. Displayed is the Pearson correlation coefficient (R) and its significance. Prod: Site productivity; Precip: Annual precipitation; MAT: Mean annual temperature; Tmin: Minimum site temperature; Tmax: Maximum site temperature.

	Prod	Precip	MAT	Tmin
Precip	-0.413 ^{ns}			
MAT	0.635*	-0.311 ^{ns}		
Tmin	0.146 ^{ns}	0.503*	0.596*	
Tmax	0.461 [†]	-0.674**	0.495 [†]	-0.308 ^{ns}

** $P \leq 0.01$, * $P \leq 0.05$, [†] $P \leq 0.1$, ns: not significant

Table S6

Fixed parameter estimates and their standard errors for total N yield (N_{tot}) resulting from the linear mixed model (eqn. S1, Appendix A). Linear and non-linear legume terms were centered around the mean of all predictor years (i.e. the mean of sown legume proportion and realized legume proportions of year 1 and 2) to stabilize convergence of parameter estimation.

	N_{tot}	Standard error
Year 1	($\text{kg ha}^{-1} \text{ year}^{-1}$)	
Intercept [‡]	291.5	32.35
Legume linear [§]	122.2	22.31
Legume quadratic [§]	-377.8	85.43
Legume cubic [§]	320.8	108.95
DeltaBiomass [†]	24.8	1.00
Legume x DeltaBiomass [¶]	4.1	1.80
Year 2		
Intercept [‡]	254.8	32.94
Legume linear [§]	37.2	25.31
Legume quadratic [§]	-	-
Legume cubic [§]	-	-
DeltaBiomass [†]	19.3	1.02
Legume x DeltaBiomass [¶]	-	-
Year 3		
Intercept [‡]	196.3	24.78
Legume linear [§]	23.8	14.20
Legume quadratic [§]	-	-
Legume cubic [§]	-	-
DeltaBiomass [†]	20.2	1.65
Legume x DeltaBiomass [¶]	-	-

[‡] Intercepts represent N_{tot} of a mixture with 37% legume proportion, the mean legume proportion across all predictor years. Note that the “Year” effect in Table 2, core text, refers to differing intercepts among years.

[§] Linear and non-linear legume terms represent the effect on N_{tot} by changing legume proportion. The “Legume x Year” interaction (Table 2, core text) refers to differing linear effects of legume proportion on N_{tot} among years. Non-linear legume terms had no interactions with year; therefore, in years 2 and 3, these are similar to year 1.

[†] DeltaBiomass is uncorrelated to the other predictors and represents an effect of fluctuations in stand biomass (in $\text{t ha}^{-1} \text{ year}^{-1}$) on N_{tot} (see Appendix A, Supporting Information, for further explanation). The “DeltaBiomass x Year” interaction (Table 2, core text) refers to differing effects of DeltaBiomass on N_{tot} among years.

[¶] There was no further interaction of “Legume x DeltaBiomass” with year.

Table S7

Summary of regressions relating realized legume proportion, total nitrogen yield in mixture (N_{totmix}), and the relative N yield gain in mixture ($N_{\text{gainmix}}/N_{\text{totmix}}$) to site productivity and four climatic variables. Note that site 15 (Ireland) was omitted from these analyses because legumes were absent from the second year onward.

Predictor terms		Regression		
A) Realized legume proportion		<i>t</i> value	<i>P</i> value	Δ -2 log Likelihood
1	Productivity	0.18	0.858	< 0.1
2	Annual precipitation	1.70	0.113	3.0
3	Mean annual temperature [‡]	1.51	0.156	2.4
4	Minimum temperature	3.56	0.003	10.2
5	Maximum temperature	-0.16	0.879	< 0.1
B) N_{totmix}				
1	Productivity	3.56	0.003	10.2
2	Annual precipitation	-0.27	0.792	0.1
3	Mean annual temperature [‡]	3.76	0.003	10.9
4	Minimum temperature	1.53	0.150	2.5
5	Maximum temperature	2.71	0.018	6.7
C) $N_{\text{gainmix}}/N_{\text{totmix}}$				
1	Productivity	-0.69	0.500	0.5
2	Annual precipitation	2.48	0.027	5.8
3	Mean annual temperature [‡]	0.01	0.991	< 0.1
4	Minimum temperature	3.02	0.010	8.0
5	Maximum temperature	-1.23	0.241	1.6

[‡] Missing data for mean annual temperature at one site

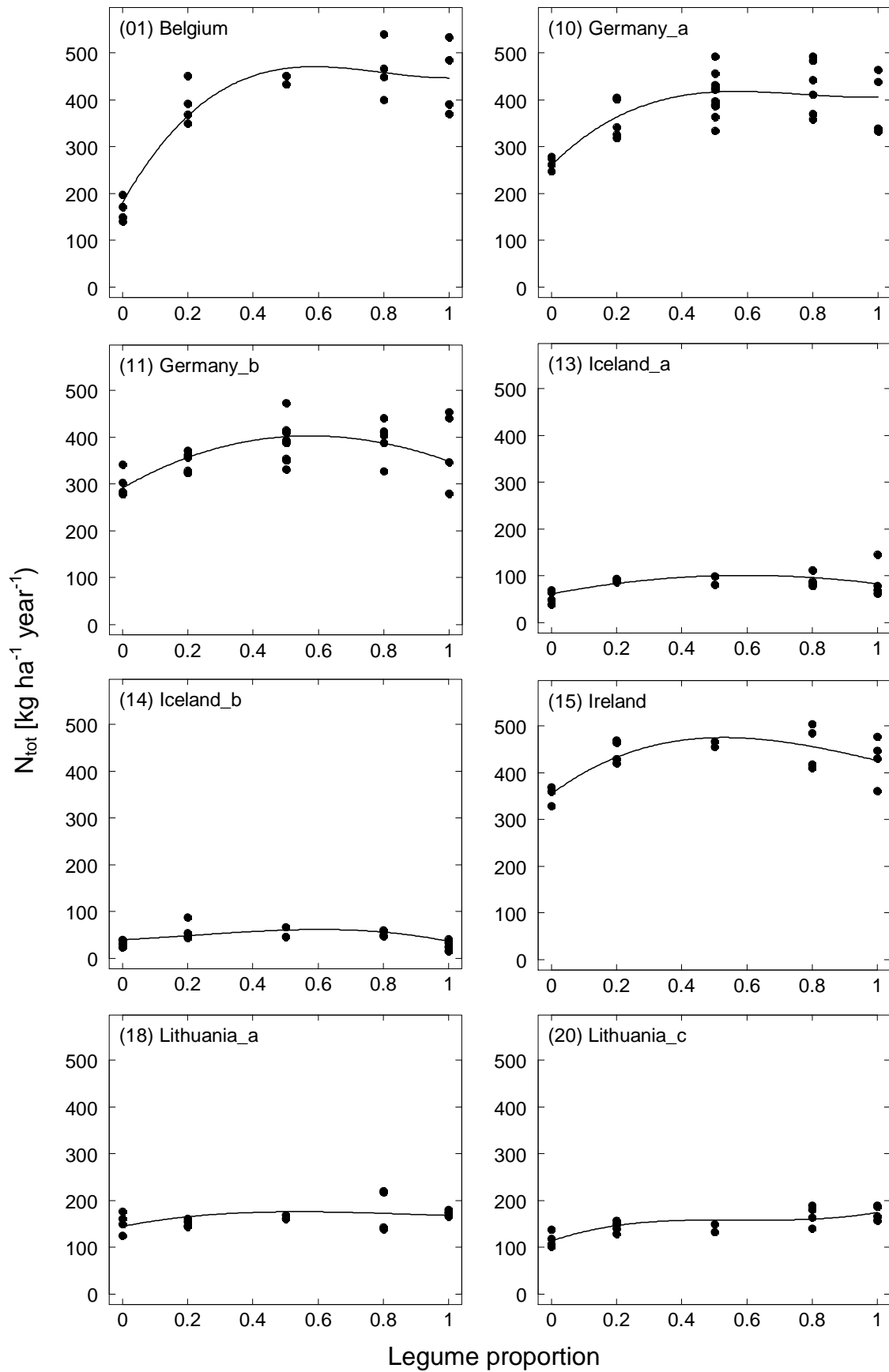


Fig. S1 Total N yield (N_{tot}) as affected by sown legume proportion at sixteen sites across Europe. Displayed N_{tot} is averaged across the first two experimental years and was analyzed according to eqn. S2, Appendix A, Supporting Information.

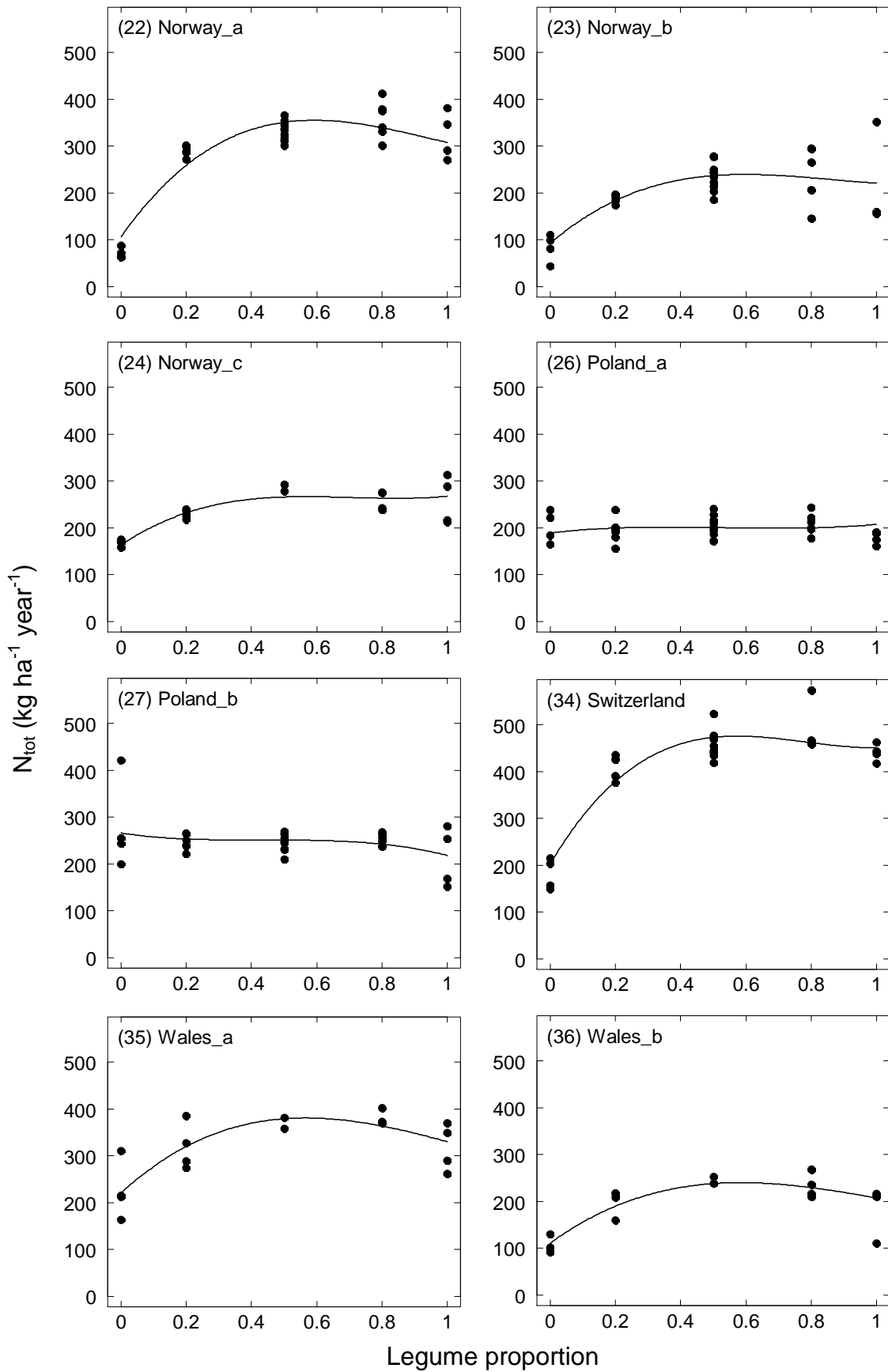


Fig. S1 continued The fitted lines to individual sites are derived from the random variation around the population mean. Note that the effect of stand biomass on N_{tot} (*DeltaBiomass*, eqn. S2, Appendix A, Supporting Information) is not considered in these panels. Including this effect would have resulted in a further reduction in lack of fit.