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SUPPLEMENTARY INFORMATION
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Nutrient availability as the key regulator of global forest carbon balance

Sources of data

We used data of mean annual carbon flux from a global forest database [9]. This data set contains complete measurements of carbon balance and uncertainties of gross primary production (GPP), ecosystem respiration (Re) and net ecosystem production (NEP) of forests around the world. Of these forests, we excluded those that had been disturbed less than one year before measurement and those for which we found no information on nutrient availability. The carbon balance of the remaining 129 forests was estimated by eddy covariance (N = 124) or by modelling with site-specific parameterization (N = 5). During the processing of eddy covariance data, any error in estimating Re from nighttime measurements would be translated into biased GPP, and a spurious correlation between Re and GPP would then be the consequence. However, problems related to the calculation of Re and GPP were previously shown important at shorter timescales, but irrelevant at annual time scale [13]. Carbon fluxes not captured by net ecosystem exchange (NEE), such as fluxes of volatile organic compounds, dissolved carbon or lateral fluxes (exportations), were assumed to be similar (and negligible) across forest sites.

The WorldClim database[10] (resolution ~ 1km at the equator) and MODIS evapotranspiration time series (MOD15A2 product) provided climatic data [mean annual temperature (MAT) and mean annual precipitation (MAP) from WorldClim and potential and actual evapotranspiration (PET, AET) from MODIS]. The reliability of the data from the WorldClim database was tested with the available observed climatic values from the forests. Results indicated a strong correlation between observed and WorldClim values for annual temperature and precipitation (R = 0.98, $P < 0.001$ and R = 0.91, $P < 0.001$ respectively).

All continents were represented in our analyses (Supplementary Fig. 1), although most of the forests studied were in Europe and North America. Boreal (N = 31) and especially temperate (N = 68) sites outnumbered Mediterranean (N = 14) and tropical (N = 16) sites, and 61 forests were coniferous, 57 were broadleaved and 11 were mixed.

Information on nutrient availability

For each forest, we compiled all available information from the published literature (carbon, nitrogen and phosphorus concentrations of soil and/or leaves, soil type, soil texture, soil C:N ratio, soil pH, measures of nutrients, see Supplementary Table 1) related to nutrient availability. Then we followed the criteria shown in Supplementary Table 3 to code these variables as three-level factors indicating high, medium or low nutrient availability. Next, we transformed these factors into dummy variables (e.g. 3 binary variables for pH indicating high, medium or low nutrient availability) and performed a factor analysis in which we only included those dummy variables indicating high and low nutrient availability. Those indicating medium nutrient availability were excluded from the factor analysis (as well as from all other analyses) to reduce the number of variables in the multivariate analysis and to ensure a clear separation into two groups. The first factor extracted explained 14.8% of the variance in the dataset and was related to nutrient-rich dummy variables whereas the second factor explained 8.7% of the variance and was related to nutrient-poor dummy variables (Supplementary Fig. 2A). Then, based on the aggregations across the two main factors extracted (Supplementary Fig. 2B) we classified the forests as having clearly high or clearly low nutrient availabilities. Those forests located near the threshold nutrient-rich/poor were further analyzed, checking in detail all the information available for classification. The remaining forests whose empirical evidence was not strong enough to be clearly classified into the high or the low nutrient availability groups (due to lack of data, contradictory information or simply presenting data indicating moderate nutrient availability) were classified as medium nutrient availability.

To maximize robustness, we included only the forests with clearly high (N = 23) and clearly low (N = 69) nutrient availabilities for the main analysis, discarding data from the 37 remaining forests of medium nutrient availability from the main analyses. In a second analysis, those forests whose nutrient status was not completely certain were assigned an alternative nutrient classification (the second most plausible nutrient availability level, e.g. if a nutrient-rich forest did not present very strong evidence of belonging to the high category, we assigned it to the medium category: the nutrient status changed in the direction that would go against our main finding; thus potentially offsetting the observed increase of CUEe with increasing nutrient availability), to perform a sensitivity analysis to test the robustness of our results to possible misclassifications (Supplementary Table 2). This sensitivity analysis supported the robustness of our results.

We further tested the objectiveness of our nutrient classification using logit models, in which the response variable was the nutrient status of the forests (high or low availability), and the predictor variables were those contained in Supplementary Table 1). Given the lack of data for all variables for all forests, we categorized the predictor variables into four-level factors (following the criteria shown in Supplementary Table 3), where na indicated that data was not available, and high, medium and low indicated values or indications that suggested high, medium or low nutrient availability.

From the saturated model (i.e. nutrient status [high or low] ~ all variables in Supplementary Table S1), we constructed the minimum adequate model selecting the predictor variables using stepwise backward selection and the Akaike information criterion (AIC). We then cross-validated the saturated and the minimum adequate models using the repeated random sub-sampling validation technique: 78 forests were randomly selected as the training set for our nutrient classification models and were tested by predicting the 14 remaining forests for which the models were not previously fitted. This procedure was repeated 1000 times. Both the saturated and stepwise-selected models performed well in the classification of the nutrient status with the available data (100% and 99% of the cases were correctly classified in the saturated and the stepwise model, respectively; see Supplementary Table 4). To further test our classification, we tested the reports on nutrient availability ("Report" column in Supplementary Table 1) available in the literature, considering them the most objective classification, with the other predictor variables, except for the assessments by the principal investigators because these assessments would mostly agree with those in the publications. We applied the same model selection and cross-validation procedures to these models predicting the reports from literature as to the models predicting our nutrient classification. With all the available data, the saturated and stepwise models correctly classified 95% and 93% of the forests, respectively (Supplementary Table 4).

Statistical analyses

We ran generalized linear models (GLM) to test for differences in CUEe, NEP, Re and GPP between forests of high and low nutrient availability, accounting for the possible effects of GPP, mean age of the stand (as a covariate), management (as a binary variable: managed or unmanaged) and climate [MAT, MAP and water deficit (WD) = 1 – (AET/PET)*100]. In addition, we tested for interactions up to the second order among GPP, nutrient availability, age and management. Thus, the saturated model (e.g. for NEP) was: NEP ~ (GPP + nutrient availability + Age + Management) + MAT + MAP + WD, where variables between brackets where those for which we tested for interactions up to the second order. The significant variables of the final model (minimum adequate model, al terms significant at the 0.05 level) were selected using stepwise backward variable selection and the AIC of the respective regression models. To evaluate the variance explained by each predictor variable, we used the *averaged over orderings* method (the *lmg* metric, similar to hierarchical partitioning [31]) to decompose R^2 from the *R* [29] package relaimpo [Relative Importance for Linear Regression [30]]. We further tested our results with model averaging [MuMIn R Package [32]]. Model averaging is a procedure based on multimodel inference techniques that computes an average model from the estimates of the best models predicting the data and weighting their relative importance according to the difference of the second-order AIC between each model and the best model [33]. Finally, we tested whether nutrient status, management, age and climatic variables could lead to changes in patterns of biomass allocation with stepwise forward regressions. Model residuals met the assumptions required in all analyses.

The robustness of our analyses was tested by five different methods: i) running weighted models using the inverse of the uncertainty of the estimates as a weighting factor, ii) using only data derived from eddy covariance towers, iii) restricting comparison of nutrient-rich and nutrient-poor forests to a common rank of GPP (GPP < 2500 gC m^{-2} $year^{-1}$, thus excluding most of the tropical forests), iv) using an alternative classification of nutrient availability (the second most plausible classification) as an analysis of sensitivity and v) using the factors extracted for the classification of nutrients as nutrient richness covariates instead of using the binary factor nutrient availability. We also present the analysis with all the data available (including the medium nutrient availability category) in Supplementary Fig. 8 and in the Supplementary Models. All analyses revealed very similar results.

Captions

Fig. S1. Global map of the forests used in this study. Forests have been coded according to their nutrient status: red indicates nutrient-rich forests whereas blue indicates nutrient-poor forests.

Fig. S2. Summary of the factor analysis performed to evaluate nutrient availability. Graph A shows the factor loadings of the variables used in the analysis following the criteria presented in Supplementary Table S3. A clear separation can be seen between those indicating high (correlated with Factor 1, F1) and low (correlated with Factor 2, F2) nutrient availability. Graph B shows the factor scores of the studied forests aggregated according to the nutrient status. Note that in graph A FP is missing because no forest presented high values of FP. Note also that in graph B some forests might present equal factor scores, resulting in fewer points than expected. Abbreviations: ASI (additional soil information), CEC (cation exchange capacity), CN (soil C:N ratio), FN (foliar nitrogen concentration), FP (foliar phosphorus concentration), H (history of the stand), NDM (nitrogen deposition or mineralization), ST (soil type), ON (other soil nutrients), PI (assessment by the principal investigator of the forest), R (report about nutrient availability), SN (soil nitrogen concentration).

Fig. S3. Influence of stand age and nutrient availability on NEP. Nutrient availability clearly influences NEP ($P < 0.0001$), but stand age has no significant effect ($P = 0.14$) when GPP is not considered. Neither interaction between nutrient availability and stand age is significant ($P = 0.50$).

Fig. S4. Relationships of NEP (A) and Re (B) with GPP in nutrient-rich and nutrient-poor forests indicating the age category of each stand. The age of the stand did not affect the relationships of NEP (graphs **A**, **C**, **E**) and Re (graphs **B**, **D**, **F**) with GPP. The bar charts inside the NEP graphs show the average CUEe of nutrient-rich and nutrient-poor forests. Graphs **C** and **D** show forests older than 50 years old and graphs **E** and **F** show forests younger than 50 years old. Red-like points indicate nutrient-rich forests and blue-like points represent the nutrient-poor ones.

Fig. S5. Relationships of NEP (A) and Re (B) with GPP in nutrient-rich and nutrient-poor forests weighted using the inverse of the uncertainty as a weighting factor. The uncertainty of the estimates did not change the results. Thus, as in Fig. 1, nutrient-poor forests do not increase NEP when rates of carbon uptake increase. The bar chart inside graph **A** shows the average CUEe of nutrient-rich and nutrient-poor forests. Error bars indicate the uncertainty of the estimate on both the x- and y-axes (SE). In forests with GPP < 2500, Nutrients*GPP (where Nutrients = nutrient availability) interactions are not significant at the 0.05 level.

Fig. S6. Relationships of NEP (A) and Re (B) with GPP in nutrient-rich and nutrient-poor managed forests. The general pattern for NEP and Re versus GPP shown for nutrient-rich forests was also evident here. Nutrients = nutrient availability.

Fig. S7. NEP to GPP ratio (CUEe) is influenced by nutrient availability but not by management. Different letters indicate significant differences between groups (Tukey's HSD). The numbers beside the letters indicate the number of forest sites in the data base.

Fig. S8. Relationships of NEP (A) and Re (B) with GPP showing also the medium nutrient availability category. The general pattern for NEP and Re versus GPP in medium nutrient availability forests fits between the patterns shown by the nutrient-rich and the nutrient-poor forests. Nutrients = nutrient availability.

Fig. S9. Nutrient-rich forests have a lower fine-root to total biomass ratio and a higher ratio of leaf area index (LAI) per unit of fine-root biomass. Error bars indicate standard errors. The numbers above the bars indicate the number of forest sites in the data base. Significance was tested with ANOVA.

Fig. S10. Relationships of NEP (A) and Re (B) with GPP showing only forests presenting 1000 < GPP < 2500. The results for this range of GPP indicate that the interaction between GPP*nutrient availability is not significant neither for NEP nor for Re. However, nutrient availability significantly increases the mean in NEP and reduces Re (P = 0.0026 and P = 0.0036 respectively). On the other hand, differences in CUEe between nutrient-rich and nutrient-poor forests remained significant at the < 0.001 level (CUEe nutrient-rich = 0.33, nutrient-poor = 0.17). Nutrients = nutrient availability.

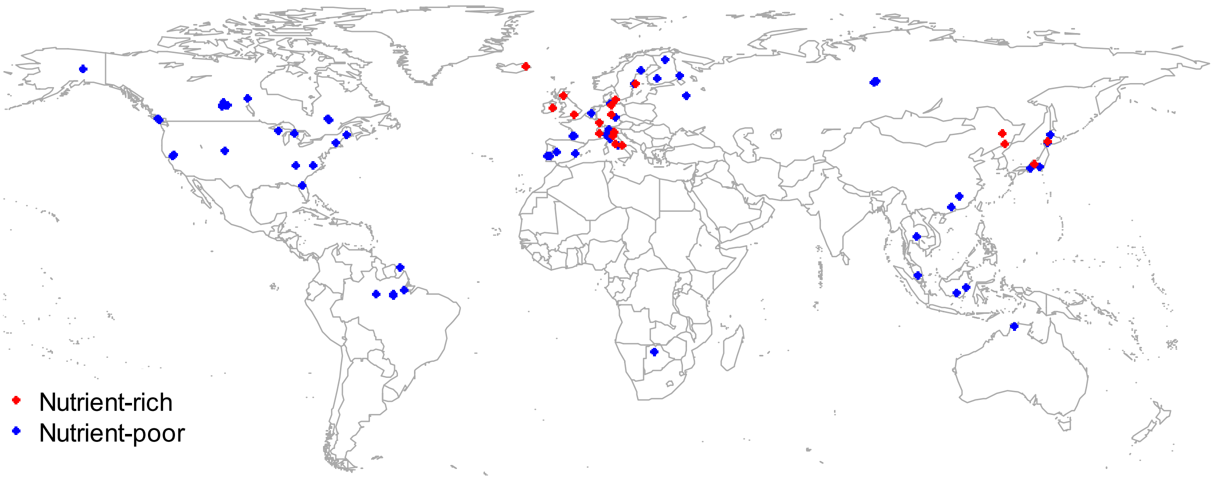
Table S1: Information on the nutrient availability of the forests studied. The term id indicates the number of the site, referenced at the bottom of the table. NA indicates our classification of nutrient status according to the provided information [high (H), medium (M) or low (L) nutrient availability]. PI indicates the nutrient status suggested by the principal investigators of the forests. The other columns provide information on nutrient availability as follows: soil type, additional soil information, soil pH, soil carbon content (kg m^{-2}) or concentration (per dry mass %), soil nitrogen content or concentration, carbon-to-nitrogen ratio (C:N), information on other soil nutrients, cation exchange capacity (CEC), nitrogen deposition (D) or mineralisation (M), foliar nutrient concentration (N: nitrogen, P: phosphorus), history of the forest and reports in the published literature on soil or forest nutrient availability. Units: Carbon (C) and nitrogen (N) in percentage of dry mass (when indicated by %) or in kg m^{-2}; CEC in meq 100 g^{-1}; nitrogen deposition and mineralization in kg ha^{-1} $year^{-1}$; foliar nutrient concentration in percentage of dry mass. Additional abbreviations: L (lower soil horizons), Lt (litterfall), U (upper soil horizons).

Table S2. Analysis of sensitivity to a possible misclassification of nutrient availability. The table contains those forests for which information assessing nutrient status could lead to a wrong classification. Each shows its values for CUEe, the uncertainty of this estimate (SE), the original and most plausible classification of nutrient status and an alternative nutrient classification. The *P*-values of the significant variables and the β weights of the covariates, using the original and the alternative nutrient classification with stepwise backward regressions, are shown at the bottom of the table. Possible predictors were GPP, nutrient availability, stand age and management, including their interactions up to the second order, MAT, MAP and WD. Significance levels: * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. H high, M medium and L low nutrient availability.

Table S3: Followed criteria for evaluating nutrient availability. The table shows the code assigned to the forests according to the values of the variables used for the nutrient availability assessment.

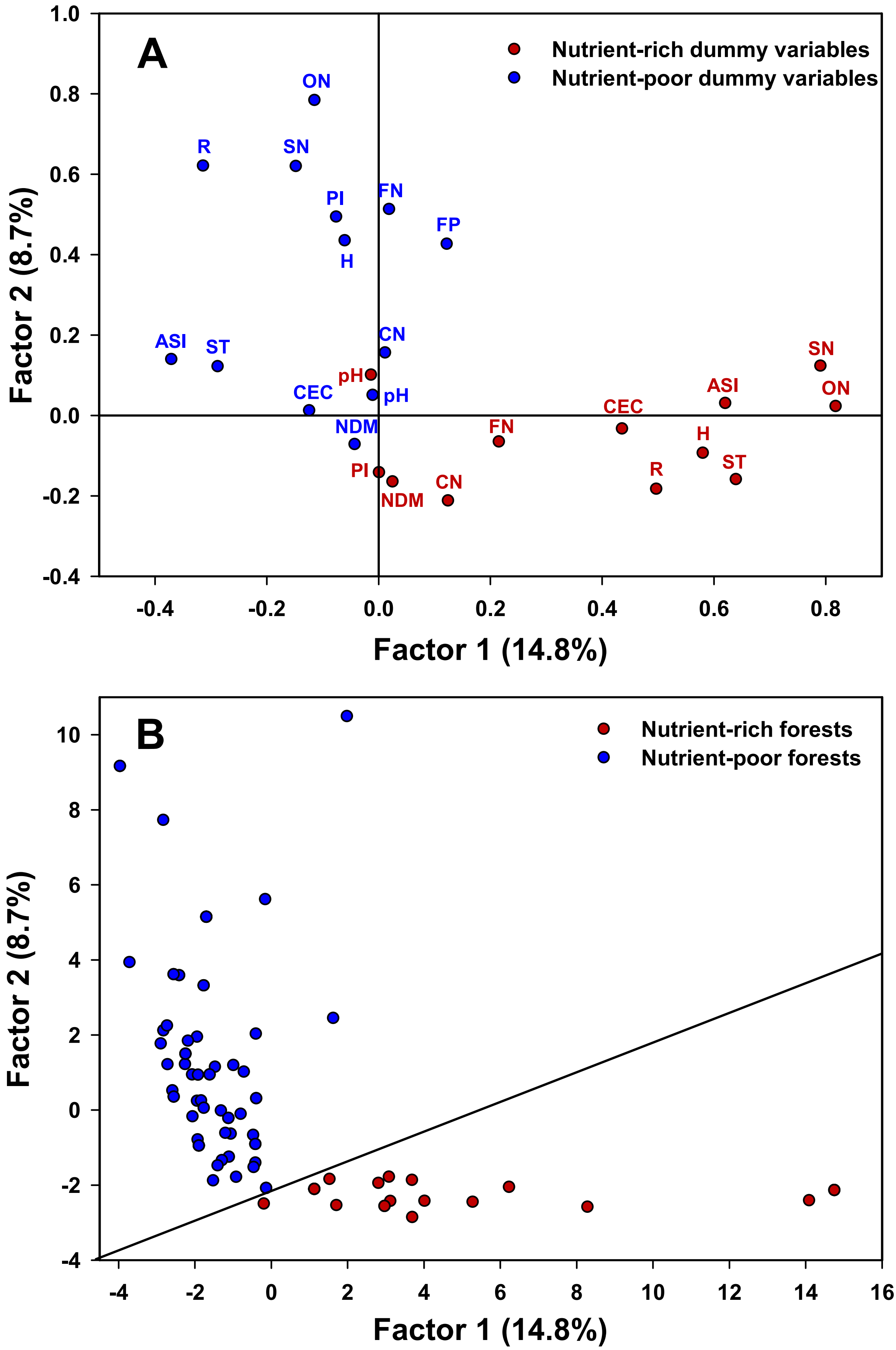
Table S4. Validation of the nutrient classification. Summary of the percentage of successfully classified forests of the different logit models used to validate the nutrient classification. In general terms, our nutrient classification was successfully predicted with the available data for nutrient status that, in turn, achieved a good percentage of successful predictions of the reports found in the literature on the nutrient status of the forests.

222 **Fig. S1.**

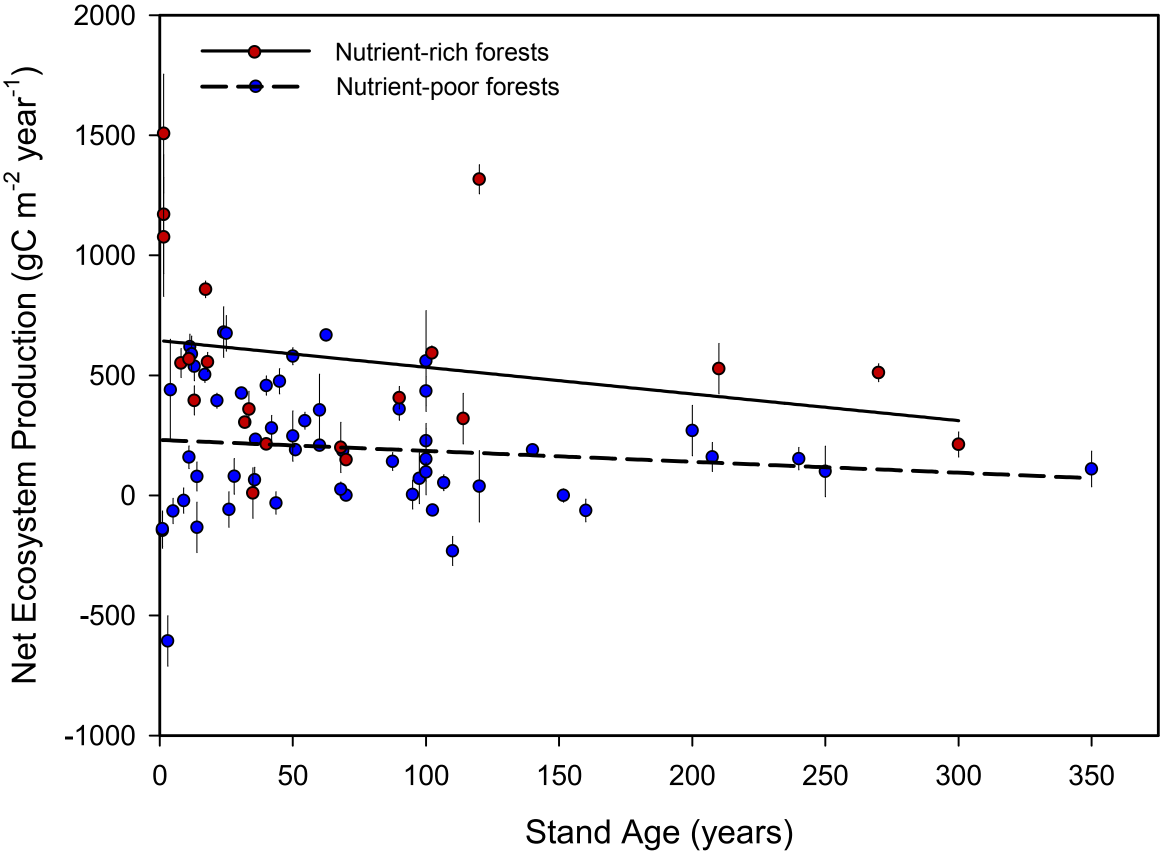


223

Fig. S2.


A
Nutrient-rich dummy variables
Nutrient-poor dummy variables
ON
R
SN
PI
FN
H
FP
ASI
ST
CN
pH
CEC
NDM
SN
ASI
ON
CEC
FN
H
R
ST
PI
CN
NDM
Factor 2 (8.7%)
Factor 1 (14.8%)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0.0
0.2
0.4
0.6
0.8
B
Nutrient-rich forests
Nutrient-poor forests
Factor 2 (8.7%)
Factor 1 (14.8%)
10
8
6
4
2
0
-2
-4
2
4
6
8
10
12
14
16

226 **Fig. S3.**



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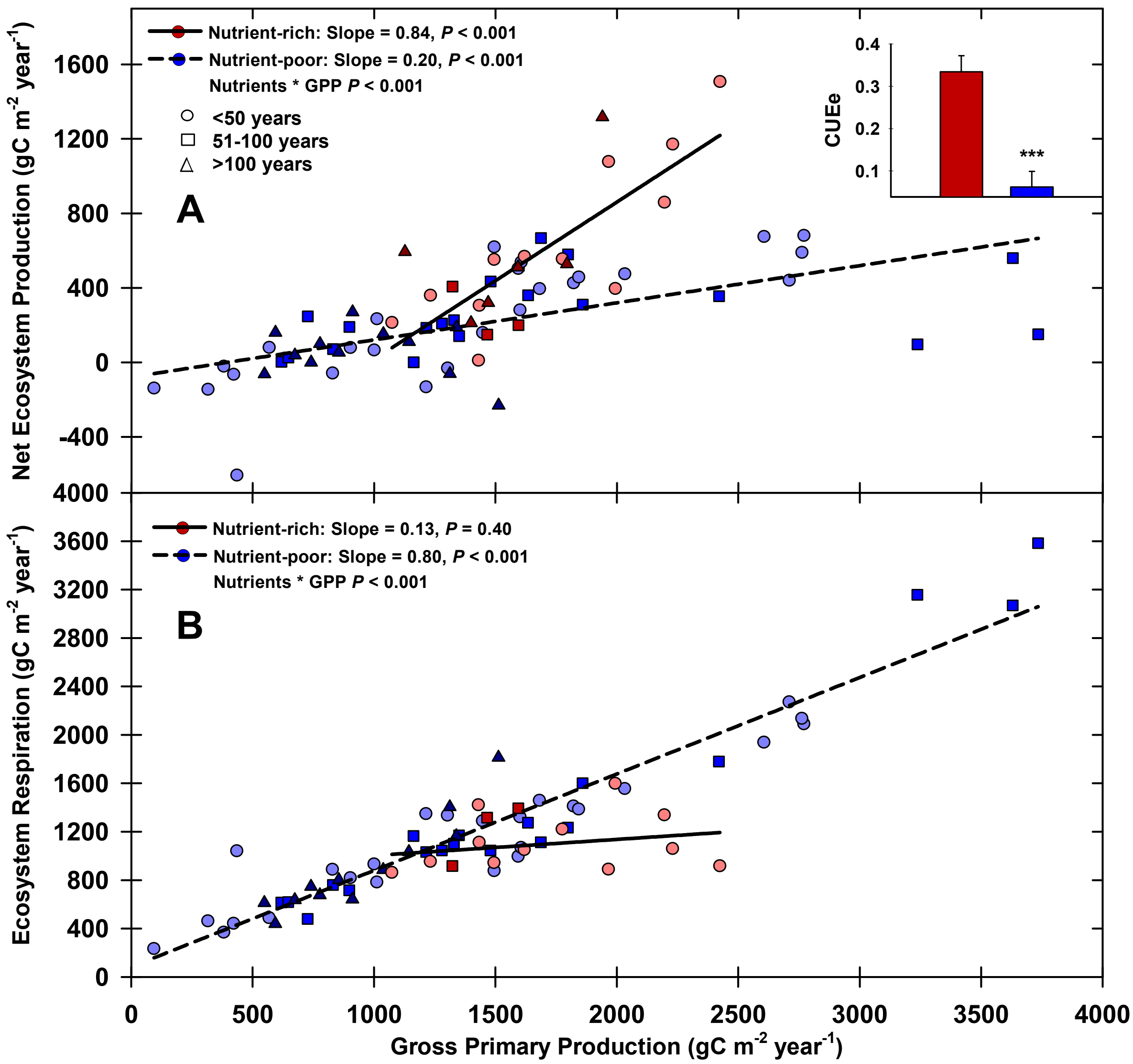
228 **Fig. S4.**



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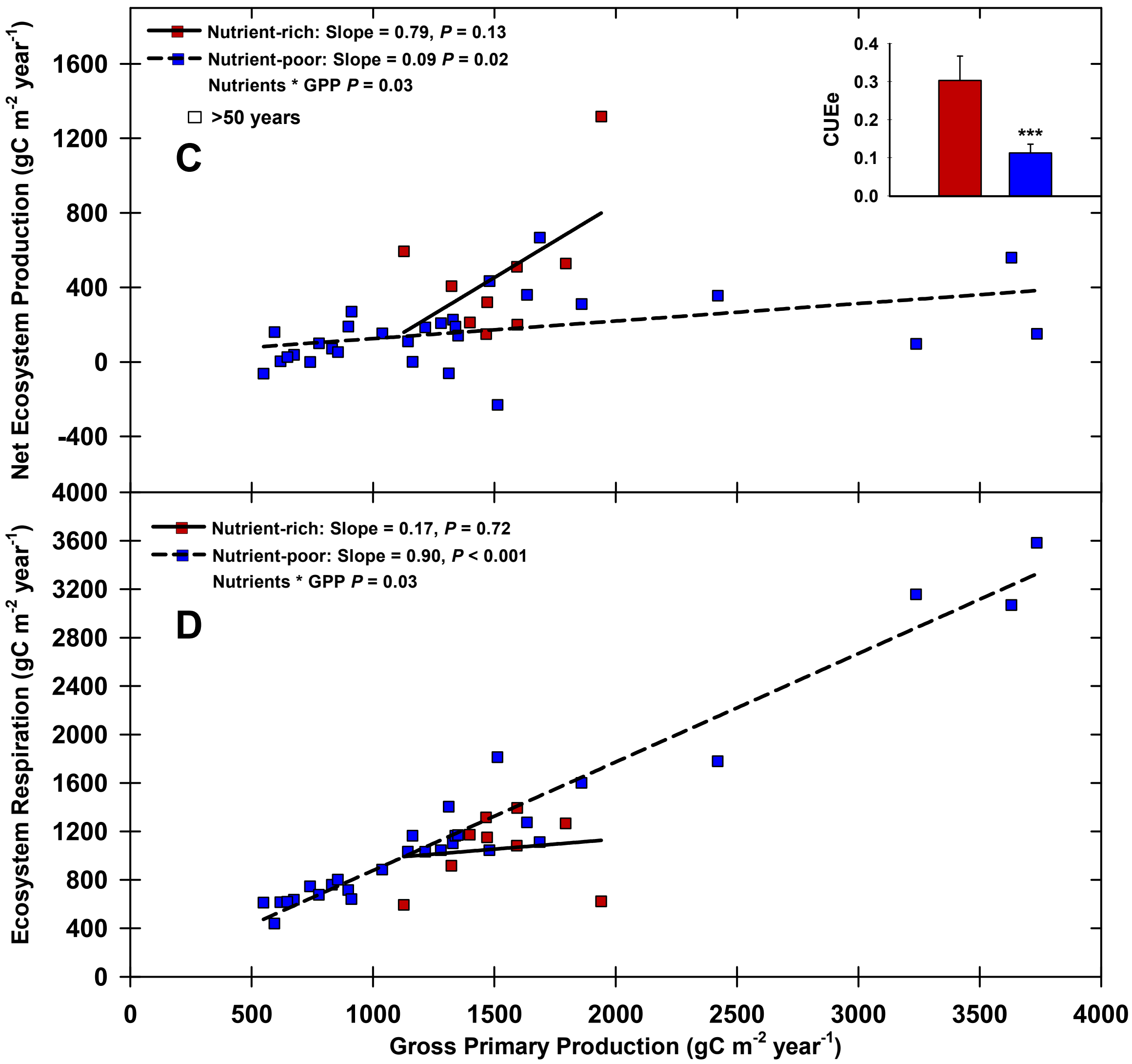


Nutrient-rich: Slope = 0.79, P = 0.13
Nutrient-poor: Slope = 0.09 P = 0.02
Nutrients * GPP P = 0.03
>50 years
C
CUEe
***
Net Ecosystem Production (gC m-2 year-1)
Nutrient-rich: Slope = 0.17, P = 0.72
Nutrient-poor: Slope = 0.90, P < 0.001
Nutrients * GPP P = 0.03
D
Ecosystem Respiration (gC m-2 year-1)
Gross Primary Production (gC m-2 year-1)

230

231

232

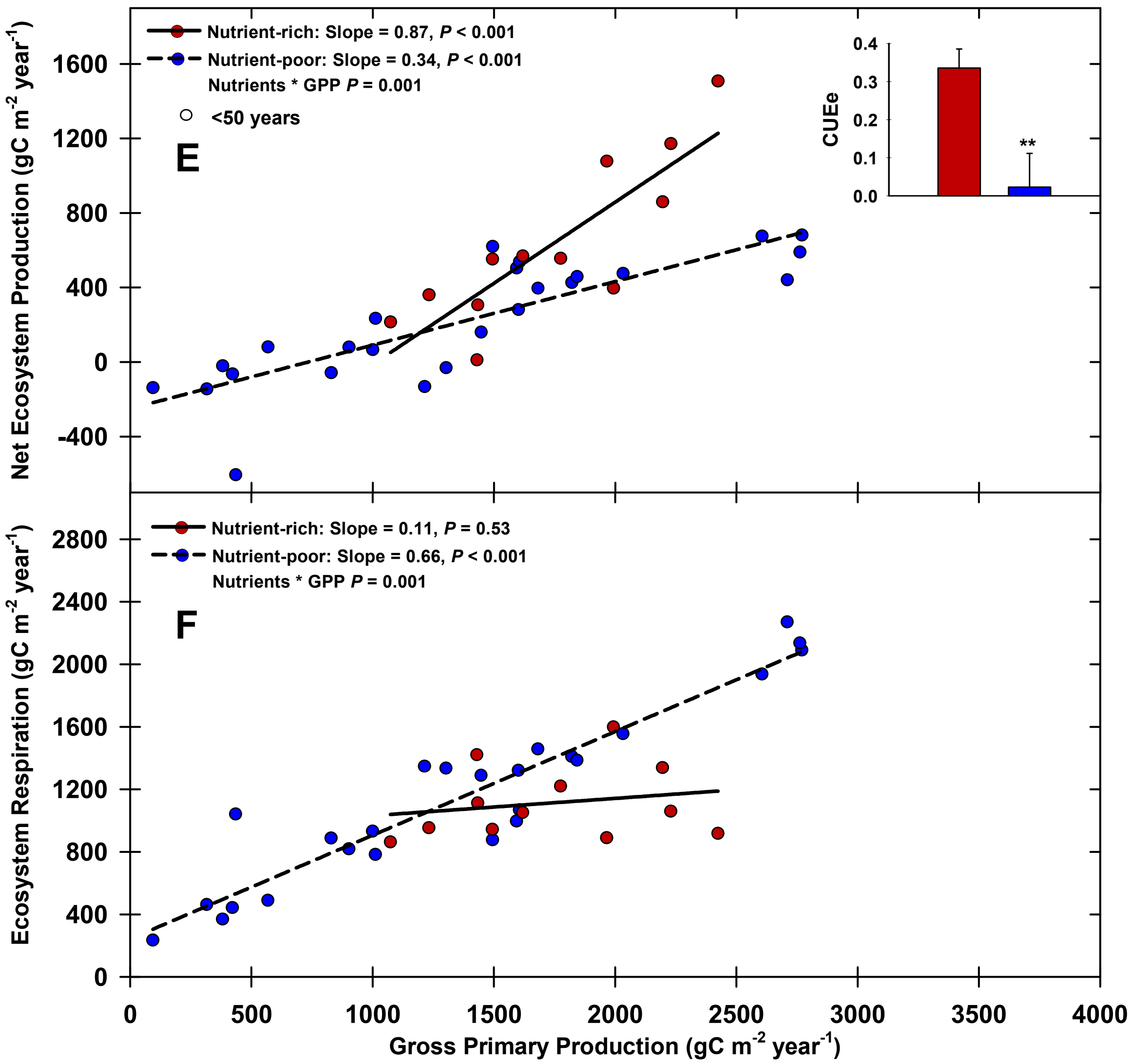
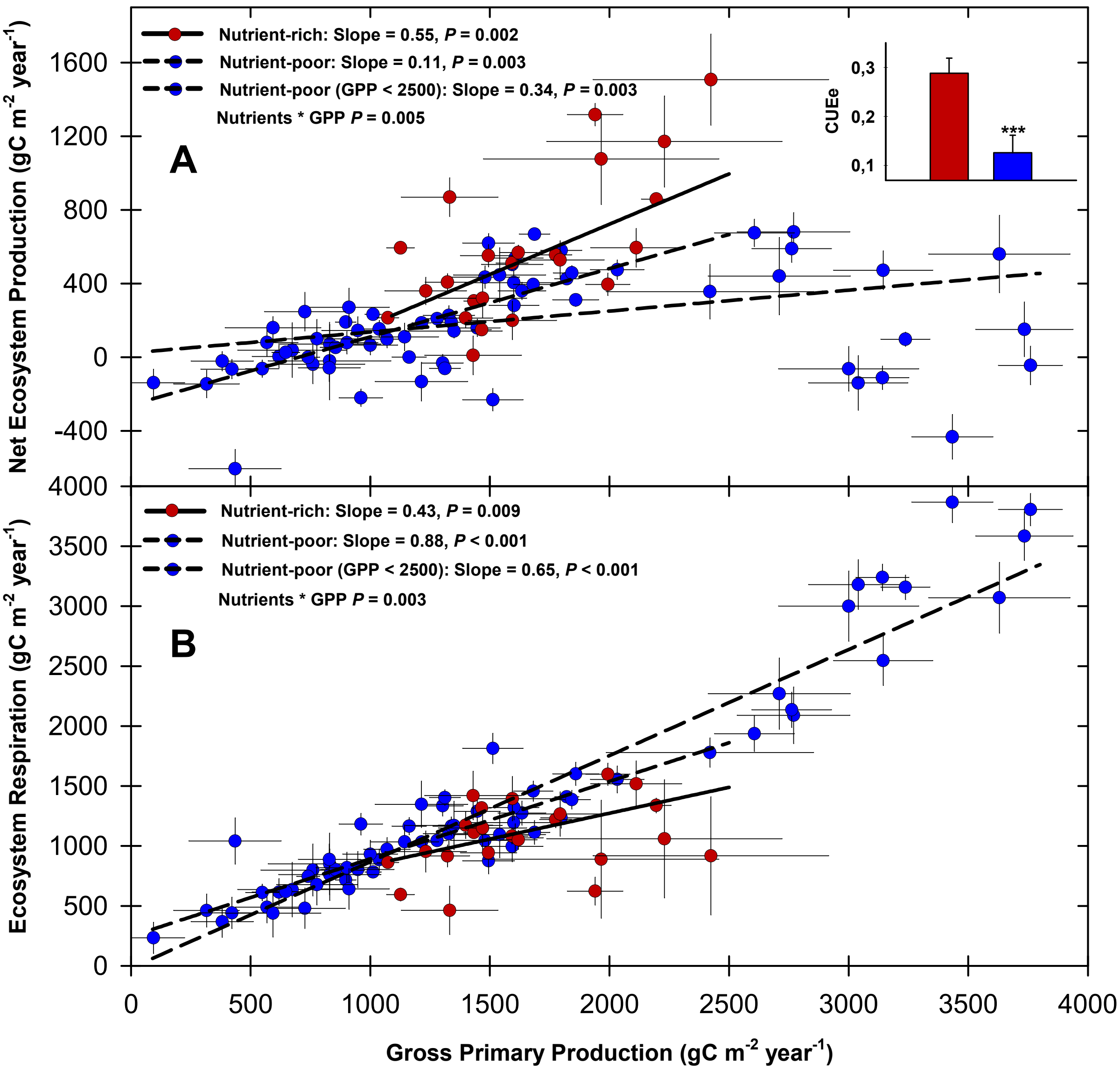
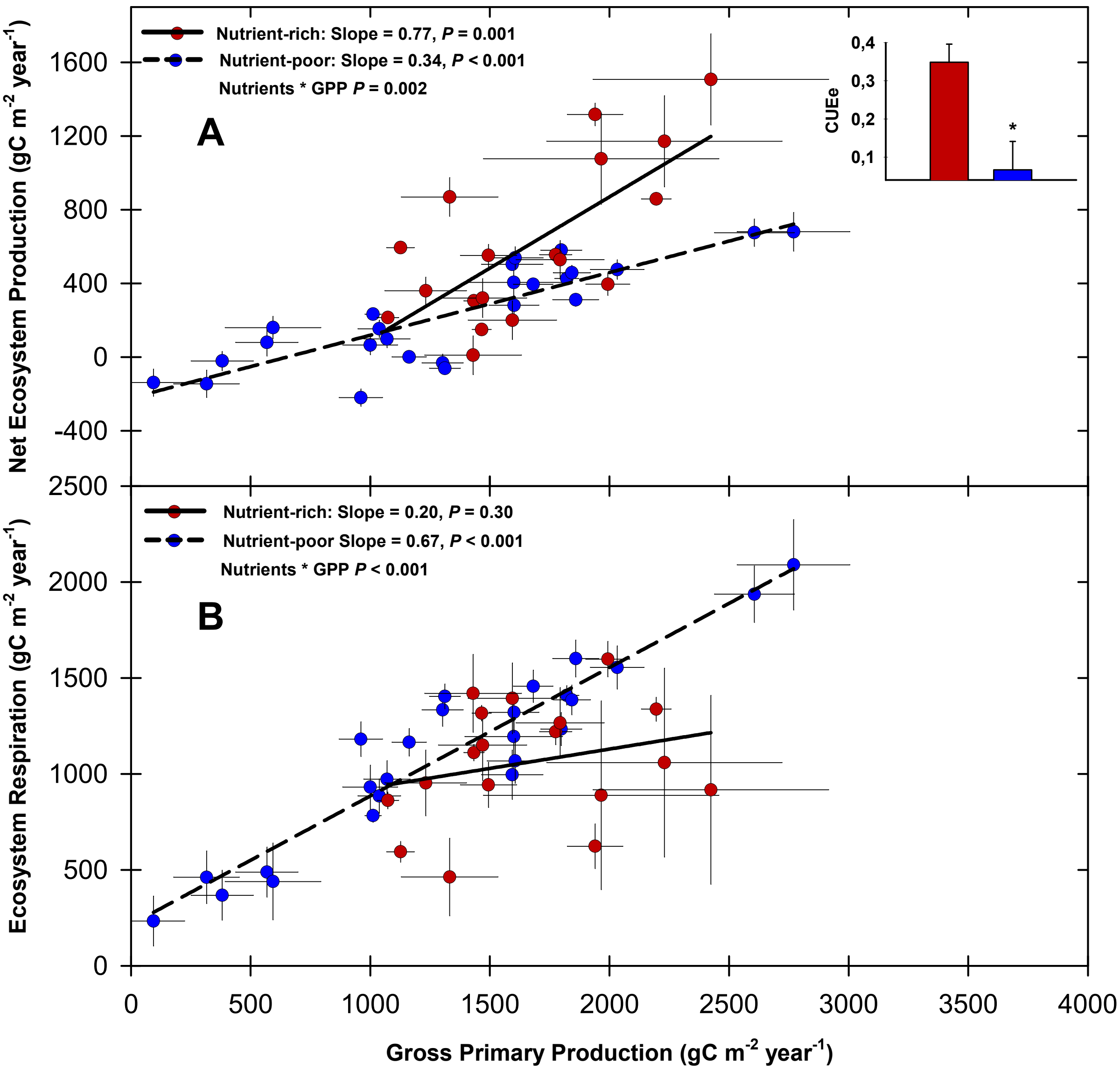

Nutrient-rich: Slope = 0.87, P < 0.001
Nutrient-poor: Slope = 0.34, P < 0.001
Nutrients * GPP P = 0.001
<50 years
E
CUEe
**
Net Ecosystem Production (gC m-2 year-1)
Nutrient-rich: Slope = 0.11, P = 0.53
Nutrient-poor: Slope = 0.66, P < 0.001
Nutrients * GPP P = 0.001
F
Ecosystem Respiration (gC m-2 year-1)
Gross Primary Production (gC m-2 year-1)

Fig. S5.


Nutrient-rich: Slope = 0.55, P = 0.002
Nutrient-poor: Slope = 0.11, P = 0.003
Nutrient-poor (GPP < 2500): Slope = 0.34, P = 0.003
Nutrients * GPP P = 0.005
A
CUEe
0,1
0,2
0,3
***
Net Ecosystem Production (gC m-2 year-1)
1600
1200
800
400
0
-400
Nutrient-rich: Slope = 0.43, P = 0.009
Nutrient-poor: Slope = 0.88, P < 0.001
Nutrient-poor (GPP < 2500): Slope = 0.65, P < 0.001
Nutrients * GPP P = 0.003
B
Ecosystem Respiration (gC m-2 year-1)
4000
3500
3000
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
3000
3500
4000
Gross Primary Production (gC m-2 year-1)

236 **Fig. S6.**



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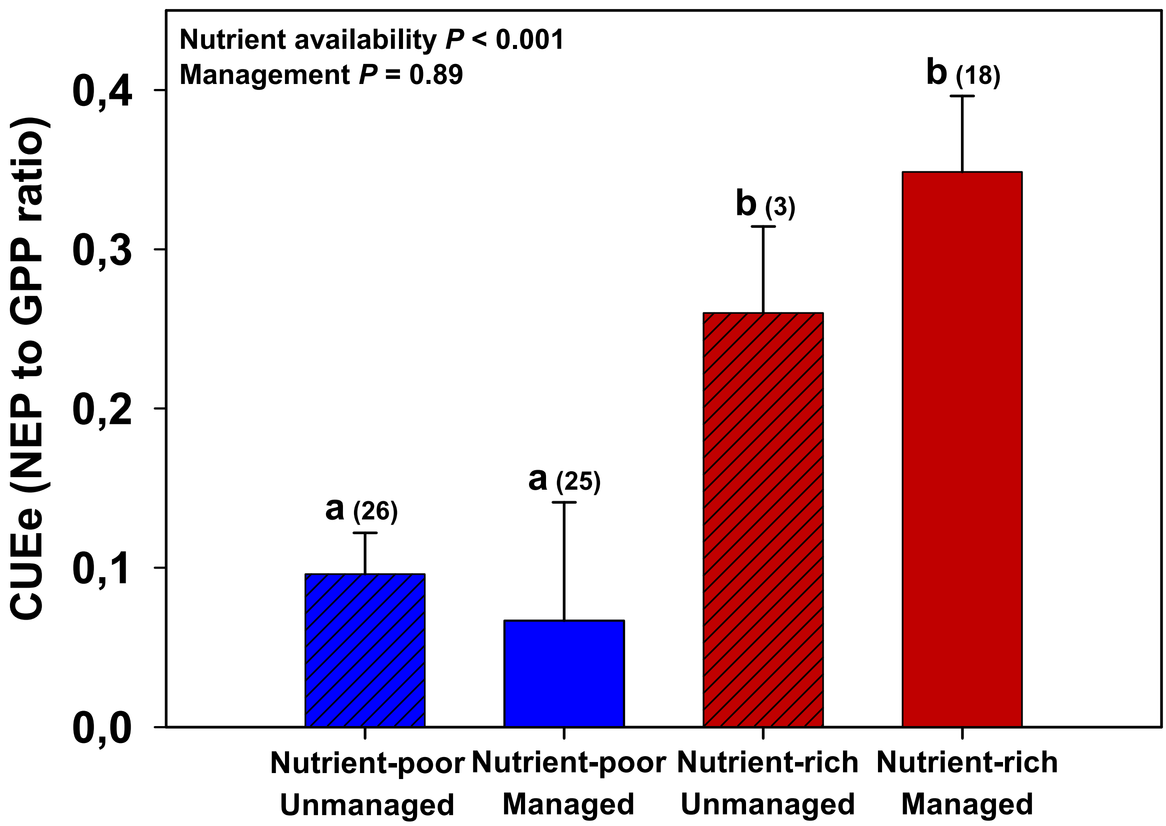
238

239 **Fig. S7.**



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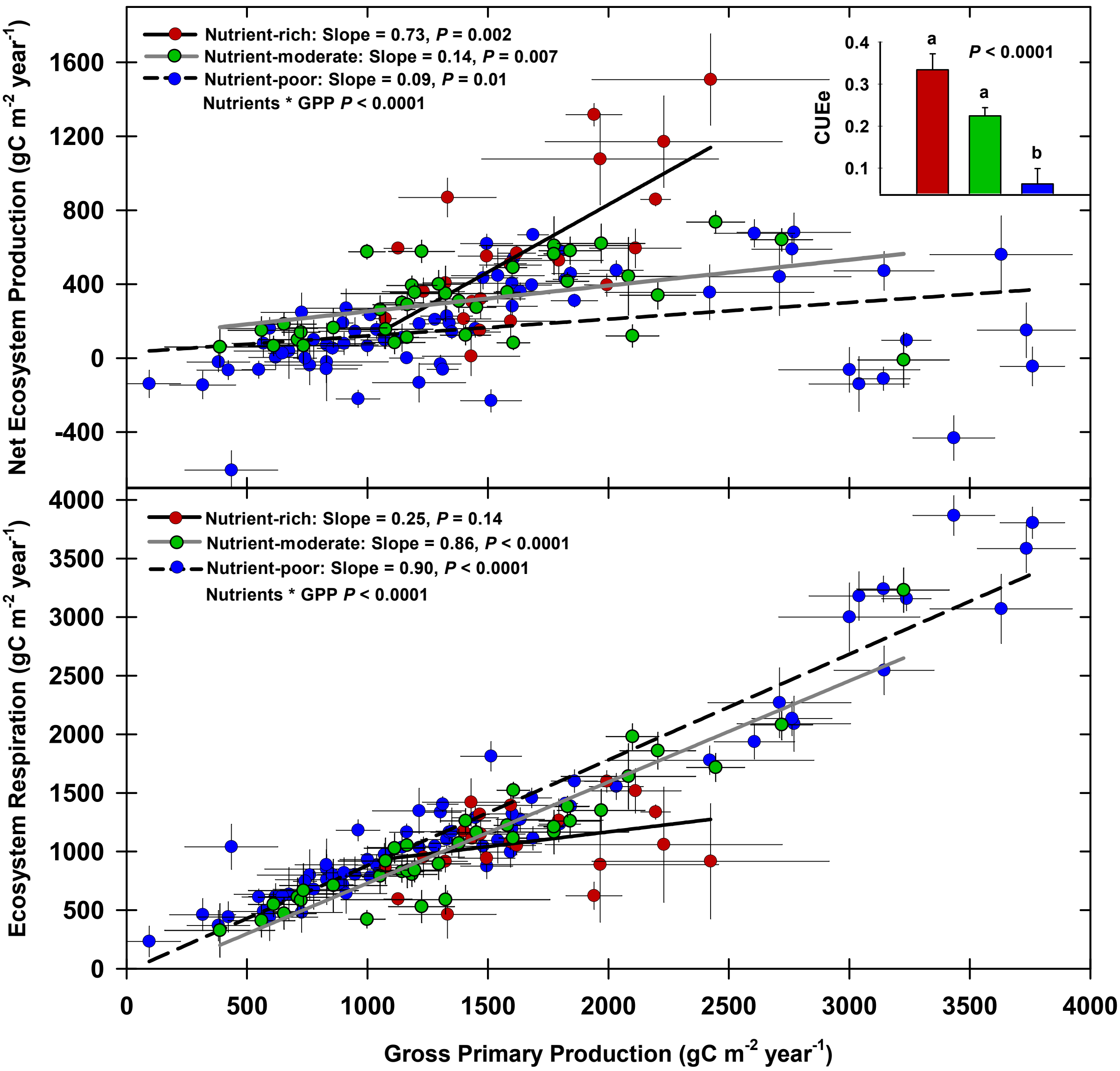
242

243 **Fig. S8**



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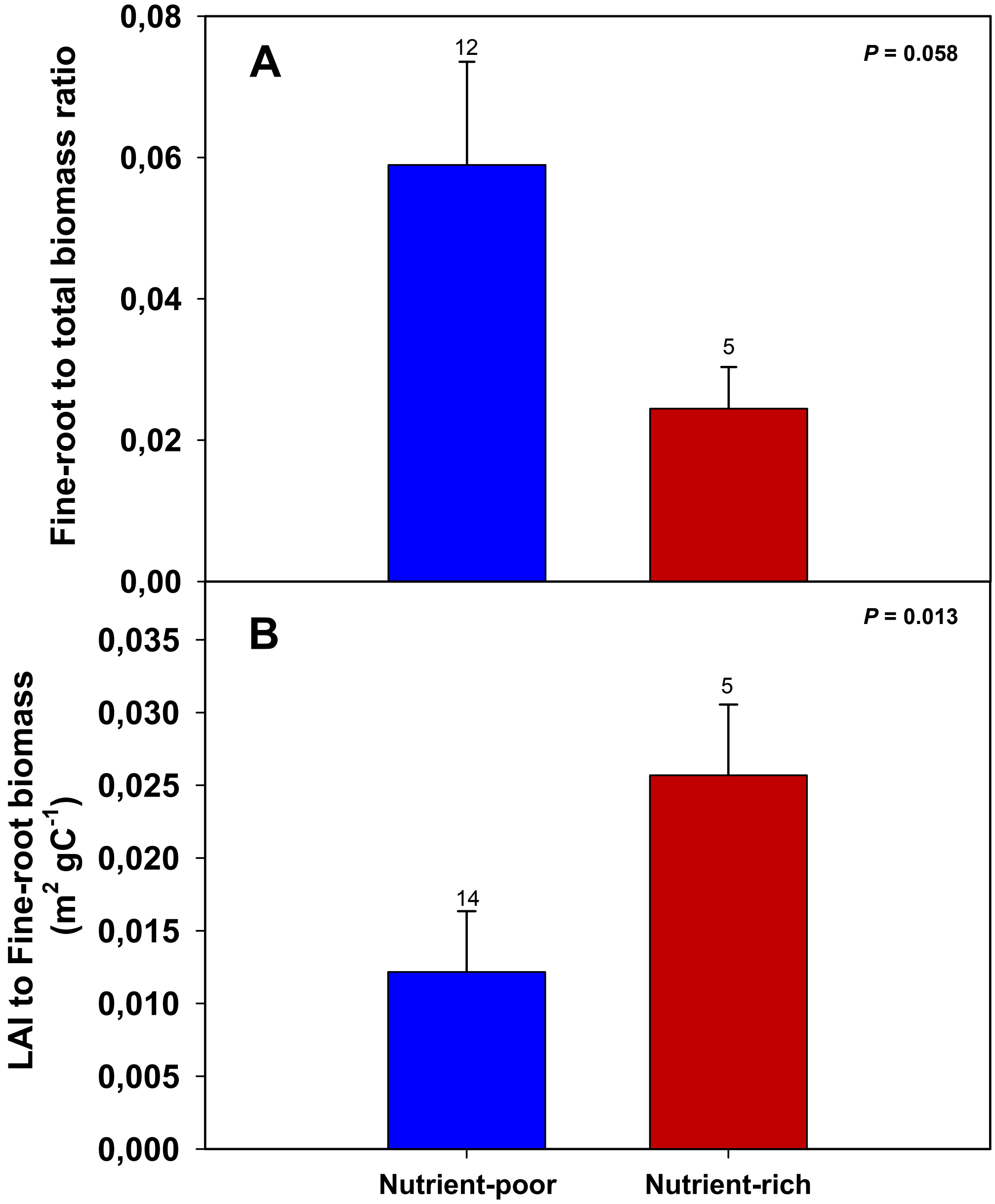
245

246 **Fig. S9.**



247

248 **Fig. S10**

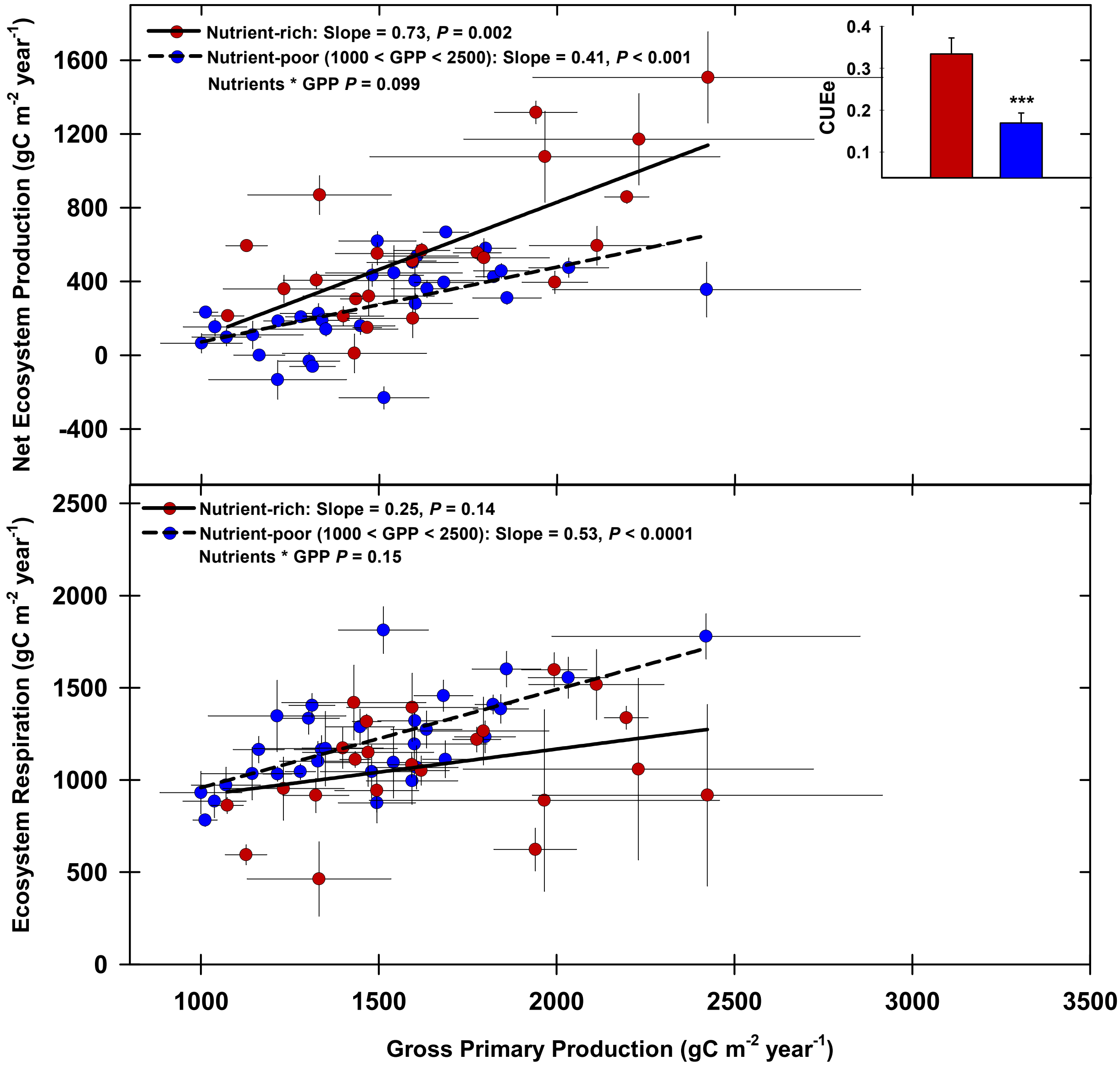


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Table S1.

Site id	NA	PI	Soil type	Additional soil info	pH	C	N	C:N	Other Nutrients	CEC	N D/M	Fol N	History	Report
1	H										D:10		Fertilized with 350 kg urea ha^{-1}, 46% N	
2	L	L	Spodosol (ultic alaquods)	Poorly drained, argilic horizon										Nutrient limited
3	M			Stony sandy loam										Adequate nutrient supply
4	M							24			M:65			
5	L		Dystric, podzolic brown soils or Gleysols	Sandy to loamy sandy texture, organic layer mod/moder	3 to 5					Low (Ca, Mg)	D: high			
6	L		Hydromorphic podzol	Sandy, surface water table in winter										
7	M	M	Haplic and Entic podzols				U: 1.53% L: 0.13%	U: 30 L: 21						
8	L		Mixed, mesic, ultic haploxeralf (Cohasset series)	Fine-loamy, clay-loam	5.5	U: 6.9%	U: 0.17%	U: 41						
9	L		Fibric Histosol	Very wet, waterlogged										Nutrient-poor
10	M		Dystri-cambic Arenosol, near id 10	Not waterlogged							D: high			
11	L		Haplic podzol	wet sandy soil with humus and/or iron B horizon (Al buffer region).	4					Low	D: 35			Poor in Mg and P foliar concentrations. Good N foliar concentration.
12	L		Ultisol											
13	M	M	Brown podzolic	well drained, stone free, fine sandy loam materials										Good potato production when fertilized.
14	L			Sandy, hummus rich in calcium carbonate	5.8	U: 1.9% L: 0.7%		U: 66 L: 100						
15	L								Low P	Low				Extremely nutrient limited
16	H		Brown forest earth	Deep and nutrient-rich soil layer										
17	L		Ferro-humic or humic podzols	Good drainage			0.01%	135				N:0.79%		
18	L													Similar to id 17

19	M		Histosol (Belhaven series)	Loamy mixed dysis thermic terric Haplosaprists (peat soils)	<4.5										Previously farmed; F at planting: 28–50 kg ha^{-1} (N and P); F mid-rotation: 140–195 kg ha^{-1} N and 28 kg ha^{-1}P	
20	H		Humic alfisol	Silty loam-silty clay	5.2		Very high					Very high	D: high			
21	L		Oxisol	80% clay, high porosity (50-80%), low water capacity, highly weathered	4.3											Low nutrient content
22	L		Rustic podsol, Chromic cambisol	Reddish soils	4			U: 29					D: 13			
23	L		Lateritic red or yellow soil	63% clay, 19% silt	3.8											
24	H														Former agricultural land regularly fertilized	Nutrient rich
25	L		Ultic alfisol	Mixed clay mineralogy, poorly drained from fall to spring	5.8											
26	L		Arenosol	Dune system												
27	L		Dystric cambisols		4.8	0.35%	0.03%			P: 9 ppm				N: 1.17% P: 0.07%		
28	L		Gelisol	Loamy sand to loam, thick organic horizon (30cm)		U: 40% L: 3%	U: 0.7% L: 0.17%	U: 50 L: 20						N: 0.84%		
29	L															Strongly nutrient limited
30	L						Low						D: 5.7			Immature and nutrient-rich lava soil (64% N deficit)
31	L			Peat soil	<4.7											Nutrient limited
32	M		Orthic Gleysol											N: 0.7 - 2.1%		
33	M		Andosol	Silty loam	5.8	U: 2.1%	Low					19				Nitrogen limited
34	L	L	Acrisol and ultisols	Sandy												Nutrient-poor
35	M		Brown alfisol	Sandy loam or loam												
36	H		Cambisol	4% sand, 56% lime, 44% clay												Nutrient-rich
37	H	H	Gleysol				U: 1.3%	U: 19 L: 30								
38	M		Gleysol	Peaty, seasonally waterlogged, black organic horizon											Fertilized 40 ago.	N increased after clear cutting

39	M		Gleysol	Peaty, seasonally waterlogged, black organic horizon									Fertilized 40 ago.	N increased after clear cutting
40	L			well drained, acidic sandy loam with some poorly drained peat soils							M: 34			Nutrient-poor
41	H		Luvisol or Stagnic luvisol											Typically very nutrient-rich soils
42	L	L		Well drained lateritic red and yellow earth soils with highly weathered sands	5.5		0.10%							Nutrient-poor
43	L	L			3.5			35				N: 1.06%		
44	L	M L	Haplic podzol				Low				M: low D: low			>99.9% soil N is unavailable for plants. Nitrogen limitation.
45	L			Sandy loam with limited water capacity	acid		Low		Low P					Bogs and peatland poor in N and very P limited
46	L	L	Lithic haploxerepts	Very rocky silt loam		1.1%	0.11%	10						
47	L			Heavily leached					Low P	Low				Nutrient-poor
48	H													Very nutrient-rich soil
49	H													Very nutrient-rich soil
50	H													Very nutrient-rich soil
51	M		Spodosol (or cryosol)	Coarse texture, highly leached, gray		2.2%	0.50%	4.4						
52	L		Entisol											
53	L		Dystric cambisol	90 cm depth, low water capacity, rocky and sandy (80%)	5.6	2.6%		14						
54	H	M	Typic Fragiudalf (Alfisol)	fine-silty	U: 3.7 L: 6.7	U: 6.2%	U: 0.5%	U: 12.6						
55	M		Haplic cambisol and rendzic leptosols (rendzina)	Very shallow	4 to 7.5	6.5	0.47	U: 15			D: 26			
56	H		Alfisol	Dark-brown										
57	H	H	Humic Umbrisol		6.1			15.8						
58	L		Hydromorphic podzol	Sandy, waterlogged in winter				26						
59	M			Sand dunes.							D: high			Nutrient-poor under natural conditions

60	M		Kandiustalfs		6.5									Relatively nutrient rich
61	L	L M	Kalahari sands	Presents a calcrete duricrust								N: 1 to 3%		Nutrient-poor
62	M			Sandy soils			Low							N-fixing shrubs increase N availability
63	M			Sandy soils			Low							N-fixing shrubs increase N availability
64	L	L		83% sand, 9% silt and 8% clay	5.6	1.6%	0.12%	133						
65	M		Typic Dystrochrept								M: 122			
66	M	M	Mollic Eutroboralf and Typic Argiboroll	Loam	5.3	2.5%	0.14	17.9	High P					Although N might be limiting, P is highly available
67	L	M L										N: 0.95%		
68	H		Eutric Vertisol	60% clay		5.6%	3.80%	8.5	P: 98ppm	27		N: 3%	Former fertilized agricultural land	
69	L		Podzolic glacial till	Sandy										Nutrient-poor
70	L	L	Ombrotrophic peat dome		<3	39%	1.30%	30	Low			P: very low N: low		Low availability of essential nutrients
71	L	L		58% sand, 32% silt, 10% clay	U: 6.4 L: 6.3	U: 1.2 L: 1.6	U: 0.08 L: 0.08	U: 15 L: 20				N: 0.71%		
72	L		Durian Series	Band of laterite, highly leached	3.5 to 4.8				Low P	Low				
73	H		Xeric Alfisol	Loam texture			High		High				Former agricultural land	Characterized by its high nutrient availability
74	H		Xeric Alfisol	Loam texture			High		High				Former agricultural land	Characterized by its high nutrient availability
75	H		Xeric Alfisol	Loam texture			High		High				Former agricultural land	Characterized by its high nutrient availability
76	L			Waterlogged										Nutrient availability restricted by slow decomposition rates
77	L			Waterlogged										Nutrient availability restricted by slow decomposition rates

78	L			Waterlogged									Nutrient availability restricted by slow decomposition rates
79	M	H		75% rocks, stone-free fraction is silty-clay loam (39% clay, 35% silt, 26% sand)		7.40%	0.48%	U: 15 L: 11			N: 1.26%		
80	L		Red earth				Low		Low				Very poor nutrient status
81	M				U: 3.9 L: 4.1	U: 27% L: 9%	U: 1.3% L: 0.4%	U: 20 L: 24	U: 0.08% L: 0.03%		N Lt: 1% P lt: 0.07%		
82	H		Luvisol	100 cm depth, 52% sand, 12% silt, 35% clay	5.7			12.6					
83	L		Utisol	Stony	5.1		Low		Low	Low			Nutrient-poor, especially P
84	L	L		93% sand, 3% silt, 4% clay	6.5 to >7.9	U: 0.9 L: 0.4	U: 0.03 L: 0.03	U: 30 L: 14	Low		N: 0.70%		Poor sandy soil
85	H			Loam, from volcanic ashes.							N: 2.30%		
86	M	M				U: 4.2%	U: 0.4%	10.5					
87	L			Sandy to sandy loam		3.1	0.14	22.0			N: 0.95%		
88	L			Sandy to sandy loam		2.3	0.19	12.1			N:1.07%		
89	L			Sandy to sandy loam		3.3	0.17	19.4			N:1.35%		
90	L			Sandy to sandy loam		1.7	0.08	21.3			N:1.36%		
91	L			Sandy		1.8	0.1	18.0			N:1.20%		HJP75 could be more nutrient limited due to higher tree competition
92	L			Sandy to sandy loam		1.4	0.1	14.0			N:1.55%		
93	M	M											
94	M	M											
95	H												Fertilized
96	L	L	Ultic alaquods	Sandy, siliceous, thermic		Low	Low		Low			Trees responded drastically to fertilization experiment	Low in available nutrients
97	L	L	Ultic alaquods	Sandy, siliceous, thermic		Low	Low		Low			Trees responded drastically to fertilization experiment	Low in available nutrients
98	L		Haplic podzol				Low		Low				Nutrient-poor soil

99	M				Low					Low			Nutrients are sufficiently available in this forest
100	H		Luvisol				High						Very nutrient rich
101	L	M		57% sand, 36% silt and 6% clay			0.18%				M: 4.4		
102	H		Brown soil										Very nutrient rich
103	M		Dystric Cambisol	Clay loam, from volcanic ash deposit									
104	L		Belterra clay Ferralsols				Low		Low				Nutrient-poor
105	L		Belterra clay Ferralsols				Low		Low				Nutrient-poor
106	L		Gleyic Cambisol								D: 5		Stream water chemistry revealed very low N concentrations
107	M		Dystric Cambisol										Less nutrient rich than a eutric Cambisol
108	L			Drained, peat-rich			Low		Low				Severely nutrient limited
109	L		Volcanogenous regosol	Well drained			Low		Low				Nutrient-poor
110	M	M	Brunicolic grey brown luvisol	Sandy to loamy sand soil, low-to-moderate water-holding capacity	6.3	0.56%	U: 0.06%	L: 11.4			D: 7.5	Planted on former agricultural land	Have higher amounts of soil macronutrients (i.e. P, K, Ca, Mg) than id 111 and 112
111	M	M	Gleyed brunisolic luvisol	Sandy to loamy sand soil, low-to-moderate water-holding capacity	4.1	0.61%	U: 0.05%	L: 15.4			D: 7.5	Planted on cleared oak-savannah land	
112	M	M	Brunicolic grey brown luvisol	Sandy to loamy sand soil, low-to-moderate water-holding capacity	3.7	0.60%	U: 0.06%	L: 19.4			D: 7.5	Planted on cleared oak-savannah land	
113	M	M	Gleyed brunisolic luvisol	Sandy to loamy sand soil, low-to-moderate water-holding capacity	4.3	0.51%	U: 0.07%	L: 14.2			D: 7.5	Planted on former agricultural land	Same as id 110
114	L		Entic Haplothod	Sandy, well drained			Low						Nitrogen limited
115	H		Brown Andosol			U: 8.1% L: 3.0%	U: 0.4% L: 0.2%.	U: 20 L: 15				Grazed heathland pasture prior to afforestation	
116	L	L M		Gravelly loamy sand, 19 cm depth		U: 39% L: 4.6%	U: 0.9% L: 0.3%	U: 43 L: 15					Presents low nitrogen availability

117	L	L M		Gravelly loamy sand to sand, 19 cm depth	U: 45% L: 6.9%	U: 1% L: 0.2%	U: 45 L: 35					
118	L	L M		Gravelly loamy sand, 19 cm depth	U: 46% L: 18%	U: 1% L: 0.8%	U: 46 L: 23					
119	M	M										Fertilization stimulated tree growth
120	L		Typic Paleudult	Highly weathered, acidic		Low		low P	Low			
121	M		Podzols and Cambisols									Moderately nutrient-rich soils
122	M		Enthic Haplorthod							M: > id 114		Nutrient-poor soil similar to id 114
123	M		Stagni-vertic Cambisol	Some areas of arenihaplic Luvisols and calcaric Cambisols								Vegetation is typical for relatively nutrient-rich soils
124	M		Rendzina	Above chalk and limestone			11					Poor soil conditions
125	M		Brown	Loam		Low		Low				Nutrient limitations
126	L		Cambisols	Sandy silt		Low		Low			see report	Nutrient limited: extremely low nutrient concentrations were reported in *Pinus* and *Larix* trees
127	L		Cambisols	Sandy silt		Low		Low			Idem id 126	Nutrient limited
128	L		Cambisols	Sandy silt		Low		Low			Idem id 126	Nutrient limited
129	L		Cambisols	Sandy silt		Low		Low			Idem id 126	Nutrient limited

Site id: 1. Aberfeldy/Griffins; **2.** Austin; 3. Balmoral; 4. Barlett; 5. Bayreuth/Weiden Brunnen; **6.** Bilos; **7.** Bily Kriz Forest; **8.** Blodgett Forest; **9.** Bornhoved Alder; **10.** Bornhoved Beech; **11.** Brasschaat; **12.** Bukit Soeharto; **13.** Camp Borden; **14.** Castelporziano; **15.** Caxiuana; **16.** Changbai Mountains; **17.** Chibougamau EOBS; **18.** Chibougamau HBS00; **19.** Coastal plain North Carolina; **20.** Collelongo; **21.** Cuieiras/C14; **22.** Davos; **23.** Dinghushan DHS; **24.** Dooary; **25.** Duke Forest; **26.** El Saler; **27.** Espirra; **28.** Fairbanks; **29.** Flakaliden C; **30.** Fujiyoshida; **31.** Fyedorovskoye; **32.** Groundhog; **33.** Gunnarsholt; **34.** Guyaflux; **35.** Gwangneung; **36.** Hainich; **37.** Hampshire; **38.** Hardwood; **39.** Hardwood_21; **40.** Harvard; **41.** Hesse; **42.** Howards spring; **43.** Howland; **44.** Hyytiala; **45.** Ilomantsi Mekrijärvi; **46.** Ione; **47.** Jacaranda/K34; **48.** Kannenbruch Alder/Ash; **49.** Kannenbruch Beech; **50.** Kannenbruch Oak; **51.** Khentei Taiga; **52.** Kiryu; **53.** La Majadas del Tietar; **54.** La Mandria; **55.** Lägeren; **56.** Laoshan;

57. Lavarone; **58.** Le Bray; **59.** Loobos; **60.** Mae Klong; **61.** Maun Mopane; **62.** Metolius; **63.** Metolius young; **64.** Mitra; **65.** Morgan Monroe; **66.** NAU Centennial; **67.** Niwot Ridge; **68.** Nonantola; **69.** Norunda; **70.** Palangkaraya; **71.** Parco Ticino; **72.** Pasoh; **73.** Popface alba; **74.** Popface euamericana; **75.** Popface nigra; **76.** Prince Albert SSA (SOAS); **77.** Prince Albert SSA (SOBS); **78.** Prince Albert SSA (SOJP); **79.** Puechabon; **80.** Qianyanzhou Ecological Station; **81.** Renon; **82.** Roccarespampami 2; **83.** Sakaerat; **84.** San Rossore; **85.** Sapporo; **86.** Sardinilla; **87.** Saskatchewan F77; **88.** Saskatchewan F89; **89.** Saskatchewan F98; **90.** Saskatchewan HJP02; **91.** Saskatchewan HJP75; **92.** Saskatchewan HJP94; **93.** Sky Oaks old; **94.** Sky Oaks young; **95.** Skyttorp2; **96.** Slash pine Florida Mid; **97.** Slash pine Florida old; **98.** Sodankylä; **99.** Solling; **100.** Soroe; **101.** Sylvania; **102.** Takayama; **103.** Takayama 2; **104.** Tapajos 67; **105.** Tapajos 83; **106.** Teshio CC-LaG; **107.** Tharandt; **108.** Thompson NSA (NOBS); **109.** Tomakomai; **110.** Turkey Point TP02; **111.** Turkey Point TP39; **112.** Turkey Point TP74; **113.** Turkey Point TP89; **114.** University of Michigan; **115.** Vallanes; **116.** Vancouver Island DF49; **117.** Vancouver Island HDF00; **118.** Vancouver Island HDF88; **119.** Vielsalm; **120.** Walker Branch; **121.** Wet-T-57; **122.** Willow Creek; **123.** Wytham Woods; **124.** Yatir; **125.** Yellow River Xiaolangdi; **126.** Yenisey Abies; **127.** Yenisey Betula; **128.** Yenisey Mixed; **129.** Yenisey/Zotino.

Table S2.

Forest name	CUEe	SE	Original Classification	Alternative Classification
Bayreuth/Weiden Brunnen	-0.02	0.04	L	M
Bilos	0.25	0.07	L	M
Blodgett Forest	0.11	0.03	L	M
Bornhoved Alder	0.15	0.07	L	M
Brasschaat	0.00	0.02	L	M
Camp Borden	0.12	0.05	M	L
Castelporziano	0.32	0.02	L	M
Guyaflux	0.04	0.04	L	M
Hampshire	0.28	0.06	H	M
Hardwood	0.32	0.05	M	H
Hardwood_21	0.31	0.06	M	H
Lägeren	0.23	0.03	M	H
Lavarone	0.68	0.05	H	M
Loobos	0.23	0.02	M	L
Maun Mopane	-0.03	0.25	L	M
Prince Albert SSA (SOAS)	0.15	0.02	L	M
Prince Albert SSA (SOBS)	0.06	0.06	L	M
Prince Albert SSA (SOJP)	0.05	0.08	L	M
Sylvania	0.10	0.07	L	M
Teshio CC-LaG	0.05	0.08	L	M
Vielsalm	0.31	0.02	M	L
Wet-T-57	-0.03	0.04	M	H
Willow Creek	0.25	0.06	M	H
Yatir	0.28	0.11	M	L
Yellow River Xiaolangdi	0.30	0.05	M	L

	Effect (β)	R^2	Effect (β)	R^2
Nutrient availability	H>L; -0.32**	0.12	H>L; -0.29**	0.07
GPP	0.91***	0.14	0.59**	0.12
Age	1.13***	<0.01	1.22***	0.01
GPP*Age	-1.17***	0.17	-1.18***	0.18
MAT	-	-	0.39*	0.06
Adjusted R^2	**0.40**		**0.39**	

NOTE: Depending on the classification, the number of replicates varies (because the number of forests of medium nutrient availability changes).

Table S3.

Variable	Code	Variable	Code
Soil Additional Info		**Soil type**	
Poorly drained, argilic horizon	Low	Acrisol and ultisols	Low
100 cm depth, 52% sand, 12% silt, 35% clay	Medium	Alfisol	High
4% sand, 56% lime, 44% clay	Medium	Andosol	Medium
57% sand, 36% silt and 6% clay	Low	Arenosol	Low
58% sand, 32% silt, 10% clay	Medium	Belterra clay Ferralsols	Low
60% clay	Medium	Brown Andosol	High
63% clay, 19% silt	Low	Brown podzolic	Low
75% rocks, stone free fraction is silty-clay loam (39% clay, 35% silt, 26% sand)	Medium	Brown soil	High
80% clay, high porosity (50-80%), low water capacity, highly weathered	Low	Brunicolic grey brown luvisol	High
83% sand, 9% silt and 8% clay	Low	Cambisol	Medium
90 cm depth, low water capacity, roky and sandy (80%)	Low	Dystric cambisol	Medium
93% sand, 3% silt, 4% clay	Low	Enthic Haplorthod	Low
Above chalk and limestone	Low	Entisol	Low
Band of laterite, highly leached	Low	Eutric Vertisol	Low
Clay loam, from volcanic ash deposit	Medium	Fibric Histosol	Low
Coarse texture, highly leached, gray	Low	Gleyed brunisolic luvisol	High
Dark-brown	High	Gleyic Cambisol	Medium
Deep and fertile soil layer	High	Gleysol	Medium
Drained, peat-rich	Low	Haplic cambisol and rendzic leptosols	Medium
Dune system	Low	Histosol	Low
Fine-loamy, clay-loam	Medium	Humic umbrisol	Medium
Fine-silty	Medium	Kalahari sands	Low
Good drainage	High	Kandiustalfs	Medium
Gravelly loamy sand to sand, 19 cm depth	Medium	Lateritic red or yellow soil	Low
Gravelly loamy sand, 19 cm depth	Medium	Lithic haploxerepts	Low
Heavily leached	Low	Luvisols	High
Highly weathered, acidic	Low	Mixed mesic ultic haploxeralf	Low
Loam	High	Mollic Eutroboralf and Typic Argiboroll	Medium
Loam, from volcanic ashes.	High	Ombrotrophic peat dome	Low
Loamy mixed dysis thermic terric Haplosaprists (peat soils)	Low	Orthic Gleysol	Medium
Loamy sand to loam, thick organiz horizon (30cm)	Medium	Oxisol	Low
Mixed clay mineralogy, poorly drained from fall to spring	Low	Podzol	Low
Not waterlogged	Medium	Red earths	Low
Peat soil	Low	Spodosol	Low
Peaty, seasonally waterlogged, black organic horizon	Low	Stagni-vertic Cambisol	Medium
Peaty, seasonally waterlogged, black organic horizon	Low	Typic Dystrochrept	Medium
Presents a calcrete duricrust	Low	Typic Paleudult	Low
Sand dunes	Low	Ultic alaquods	Low
Sandy	Low	Ultic alfisol	Low
Sandy loam or loam	Medium	Ultisol	Low
Sandy loam with limited water capacity	Low	Volcanogenous regosol	Medium
Sandy silt	Medium		

Sandy to loamy sand soil, low-to-moderate water holding capacity	Medium
Sandy to loamy sandy texture, organic layer mod/moder	Medium
Sandy to sandy loam	Medium
Sandy, hummus rich in calcium carbonate	Low
Sandy, siliceous, thermic	Low
Sandy, surface water table in winter	Low
Sandy, waterlogged in winter	Low
Sandy, well drained	Low
Silty loam	Medium
Silty loam-silty clay	Medium
Some areas of arenihaplic Luvisols and calcaric Cambisols	Medium
Stony	Low
Stony sandy loam	Medium
Very rocky silt loam	Low
Very shallow	Low
Very wet, waterlogged	Low
Waterlogged	Low
Well drained	Medium
Well drained lateritic red and yellow earth soils with highly weathered sands	Low
Well drained, acidic sandy loam with some poorly drained peat soils	Low
Well drained, stonefree, fine sandy loam materials	Medium
Wet sandy soil with humus and/or iron B horizon (Al buffer region).	Medium

Soil pH

0 - 5	Low
5.1 - 6	Medium
6.1 - 8	High

Soil N%

>0.8%	High
>0.1%	Medium
<0.1%	Low

Other Nutrients (soil P)

9 ppm	Low
98 ppm	High
0.08-0.03%	Medium

C:N ratio

> 30	Low
30 - 20	Medium
<20	High

CEC (meq L^{-1})

>20	High
>10	Medium
<10	Low

N deposition (kg ha^{-1} year^{-1})

>20	High
20 - 10	Medium
<10	Low

N mineralization (kg ha^{-1} year^{-1})

4.4	Low
34	Low
65	Medium
122	High

Foliar N%

>2%	High
2 - 1%	Medium
<1%	Low

Foliar P%

0.07%	Low

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Table S4.

Dependent variable	Model selection	AIC	Correct cases	Failed cases	Success (%)
Nutrient status	Saturated	110	92	0	100%
Nutrient status	Stepwise	37	91	1	99%
Report	Saturated	130	55	3	95%
Report	Stepwise	37	54	4	93%

List of Models

Here, we present the minimum adequate models exposed in Table 1 followed by its homologous final model achieved by the model averaging procedure. Predictor variables were: GPP, Nutrient availability (NA), Age, Management (MNG), and its interactions up to second order, MAT, MAP and WD. Forests whose category of management was not managed or unmanaged were excluded. In model averaging summaries, R imp indicates the relative importance of the variables in the final model.

General Model

NEP (Fig. 1)

	Estimate	Std.Err	t value	Pr(>|t|)	
Intercept	-1056	219.8	-4.803	0.0000124	***
gpp	0.8679	0.1235	7.029	3.38E-09	***
age	4.76	1.319	3.609	0.000664	***
nutrient.classLOW	934.9	229.4	4.076	0.000149	***
mat	20.67	6.186	3.342	0.001502	**
gpp:age	-0.00293	0.0007656	-3.828	0.000333	***
gpp:nutrient.classLOW	-0.6802	0.1318	-5.162	0.00000346	***
age:nutrient.classLOW	-1.862	0.7679	-2.425	0.018614	*

R^2= 0.7356 **adj R^2=** 0.702

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	809163	1	23.0691	0.00001244	***	
gpp	1732864	1	49.4036	3.384E-09	***	0.18
age	456867	1	13.0252	0.0006645	***	0.03
nutrient.class	582787	1	16.6151	0.0001486	***	0.19
mat	391717	1	11.1678	0.0015015	**	0.09
gpp:age	513890	1	14.6509	0.0003332	***	0.09
gpp:nutrient.class	934745	1	26.6494	3.465E-06	***	0.15
age:nutrient.class	206289	1	5.8813	0.0186138	*	0.01
Residuals	1929161	55				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-935.8	239.8	244.1	3.833	0.00013	***	(Intercept)	1.00
age	3.947	2.058	2.075	1.902	0.05715	.	gpp	1.00
gpp	0.7856	0.1379	0.1404	5.597	<0.00001	***	gpp:NA	1.00
mat	18.69	6.871	7.011	2.667	0.00766	**	NA	1.00
NA.LOW	731.9	287.5	291.9	2.507	0.01217	*	mat	0.97
age:gpp	-0.00284	0.00081	0.000824	3.445	0.00057	***	MNG	0.62
age:NA.LOW	-1.865	0.7762	0.7939	2.349	0.01881	*	gpp:MNG	0.55
gpp:NA.LOW	-0.5897	0.164	0.1668	3.536	0.00041	***	age	0.53
MNG.UM	280.4	156.1	158.2	1.773	0.07628	.	wd	0.50
wd	2.738	1.733	1.768	1.549	0.12146		age:gpp	0.45
gpp:MNG.UM	-0.2451	0.0736	0.07525	3.257	0.00112	**	age:NA	0.42
MNG.UM:NA.LOW	-72.39	136	139.1	0.52	0.60276		map	0.15
map	-0.0281	0.09175	0.0938	0.3	0.76454		MNG:NA	0.08
							age:MNG	0.00

16 models Δ < 4

285 Re (Fig. 2)

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	1097	228.8	4.794	0.0000129	***
gpp	0.09329	0.1285	0.726	0.471097	
age	-4.788	1.373	-3.487	0.000968	***
nutrient.classLOW	-955.6	238.8	-4.002	0.00019	***
mat	-17.02	6.44	-2.643	0.010676	*
gpp:age	0.00294	0.000797	3.688	0.000519	***
gpp:nutrient.classLOW	0.6805	0.1372	4.961	0.00000712	***
age:nutrient.classLOW	1.967	0.7995	2.46	0.017077	*

R^2= 0.9108 **adj R^2=** 0.8995

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	873556	1	22.9785	0.00001286	***	
gpp	20021	1	0.5266	0.4710968		0.64
age	462225	1	12.1587	0.0009684	***	0.01
nutrient.class	608864	1	16.0159	0.0001896	***	0.03
mat	265614	1	6.9869	0.0106758	*	0.16
gpp:age	517154	1	13.6035	0.0005186	***	0.03
gpp:nutrient.class	935495	1	24.6078	7.125E-06	***	0.05
age:nutrient.class	230005	1	6.0502	0.0170767	*	0.01
Residuals	2090888	55				

286 Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	1028	252.1	256.7	4.004	6.2E-05	***	(Intercept)	1.00
age	-4.61	1.463	1.492	3.089	0.00201	**	gpp	1.00
gpp	0.1505	0.1434	0.146	1.031	0.30247		NA	1.00
mat	-15.27	7.095	7.242	2.108	0.03502	*	gpp:NA	1.00
NA.LOW	-765.2	303.2	307.8	2.486	0.01293	*	mat	0.85
age:gpp	0.00283	0.00083	0.00085	3.332	0.00086	***	age	0.71
age:NA.LOW	1.971	0.8094	0.8277	2.382	0.01723	*	age:gpp	0.71
gpp:NA.LOW	0.5838	0.1719	0.1747	3.342	0.00083	***	age:NA	0.68
wd	-3.12	1.809	1.845	1.691	0.09077	.	wd	0.59
MNG.UM	-214.4	164.1	165.9	1.292	0.1963		MNG	0.39
gpp:MNG.UM	0.2253	0.07724	0.07896	2.853	0.00434	**	gpp:MNG	0.29
map	0.05755	0.09505	0.09721	0.592	0.55382		map	0.15
MNG.UM:NA.LOW	76.51	142	145.3	0.527	0.59841		MNG:NA	0.03
							age:MNG	0.00

13 models Δ < 4

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Models weighted by the uncertainty of the estimates (Supplementary Fig. 5)

NEP

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-848.4	226.4	-3.747	0.000431	***
gpp	0.7368	0.1328	5.548	8.53E-07	***
age	5.099	1.522	3.349	0.001468	**
nutrient.classLOW	719.1	240.9	2.985	0.004221	**
mat	17.79	6.842	2.6	0.011953	*
gpp:age	-0.00308	0.0009198	-3.346	0.001484	**
gpp:nutrient.classLOW	-0.515	0.1536	-3.352	0.001457	**
age:nutrient.classLOW	-2.288	0.8235	-2.778	0.007462	**

R^2= 0.614 **adj R^2=** 0.5648

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	15401	1	14.0377	0.0004313	***	
gpp	33773	1	30.783	8.532E-07	***	0.20
age	12308	1	11.2187	0.0014678	**	0.02
nutrient.class	9778	1	8.9126	0.0042208	**	0.14
mat	7416	1	6.7591	0.011953	*	0.08
gpp:age	12281	1	11.1935	0.0014844	**	0.06
gpp:nutrient.class	12327	1	11.2351	0.001457	**	0.08
age:nutrient.class	8469	1	7.7187	0.0074616	**	0.03
Residuals	60343	55				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	1028	252.1	256.7	4.004	6.2E-05	***	(Intercept)	1.00
age	-4.61	1.463	1.492	3.089	0.00201	**	gpp	1.00
gpp	0.1505	0.1434	0.146	1.031	0.30247		NA	1.00
mat	-15.27	7.095	7.242	2.108	0.03502	*	gpp:NA	1.00
NA.LOW	-765.2	303.2	307.8	2.486	0.01293	*	mat	0.85
age:gpp	0.002829	0.00083	0.000849	3.332	0.00086	***	age	0.71
age:NA.LOW	1.971	0.8094	0.8277	2.382	0.01723	*	age:gpp	0.71
gpp:NA.LOW	0.5838	0.1719	0.1747	3.342	0.00083	***	age:NA	0.68
wd	-3.12	1.809	1.845	1.691	0.09077	.	wd	0.59
MNG.UM	-214.4	164.1	165.9	1.292	0.1963		MNG	0.39
gpp:MNG.UM	0.2253	0.07724	0.07896	2.853	0.00434	**	gpp:MNG	0.29
map	0.05755	0.09505	0.09721	0.592	0.55382		map	0.15
MNG.UM:NA.LOW	76.51	142	145.3	0.527	0.59841		MNG:NA	0.03
							age:MNG	0.00

13 models Δ < 4

Re

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	843.6	226	3.733	0.000451	***
gpp	0.257	0.1309	1.963	0.054717	.
age	-4.752	1.544	-3.078	0.003249	**
nutrient.classLOW	-710.6	240.3	-2.957	0.004569	**
mat	-14.44	6.942	-2.08	0.042228	*
gpp:age	0.002832	0.0009312	3.041	0.003608	**
gpp:nutrient.classLOW	0.5055	0.1522	3.321	0.001596	**
age:nutrient.classLOW	2.252	0.8341	2.7	0.009199	**

R^2= 0.8781 **adj R^2=** 0.8626

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	10232	1	13.9334	0.0004507	***	
gpp	2830	1	3.8532	0.0547171	.	0.65
age	6956	1	9.4726	0.0032495	**	0.00
nutrient.class	6421	1	8.7445	0.0045687	**	0.02
mat	3176	1	4.3251	0.0422277	*	0.15
gpp:age	6791	1	9.2477	0.0036078	**	0.02
gpp:nutrient.class	8101	1	11.032	0.0015956	**	0.03
age:nutrient.class	5353	1	7.2893	0.009199	**	0.01
Residuals	40389	55				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	787.1	271	275.3	2.858	0.00426	**	(Intercept)	1.00
age	-4.66	1.566	1.602	2.91	0.00362	**	gpp	1.00
gpp	0.2976	0.1511	0.1536	1.937	0.05273	.	NA	1.00
mat	-13.85	7.181	7.34	1.887	0.05921	.	gpp:NA	0.97
NA.LOW	-557	302.8	307	1.814	0.06964	.	mat	0.73
age:gpp	0.00279	0.00094	0.00097	2.889	0.00387	**	age	0.70
age:NA.LOW	2.252	0.8484	0.8675	2.596	0.00942	**	age:gpp	0.70
gpp:NA.LOW	0.4508	0.1705	0.1735	2.598	0.00938	**	age:NA	0.70
wd	-2.856	1.872	1.913	1.493	0.1354		wd	0.51
MNG.UM	-185.5	162	163.9	1.132	0.25761		MNG	0.30
gpp:MNG.UM	0.2135	0.09021	0.09213	2.317	0.02049	*	gpp:MNG	0.22
map	-0.03157	0.08994	0.09188	0.344	0.73117		map	0.11
							age:MNG	0.00
							MNG:NA	0.00

15 models Δ < 4

Models forests Eddy Covariance data

NEP

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-575.607	257.70547	-2.234	0.029924	*
gpp	0.58016	0.1567	3.702	0.000525	***
nutrient.classLOW	468.7595	281.1306	1.667	0.101563	
managementUM	321.0978	119.82562	2.68	0.009896	**
mat	18.41545	7.09241	2.597	0.012274	*
gpp:nutrient.classLOW	-0.43306	0.18555	-2.334	0.02358	*
gpp:managementUM	-0.25613	0.07463	-3.432	0.001197	**

R^2= 0.58 **adj R^2=** 0.5306

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	181821	1	4.9889	0.029924	*	
gpp	499578	1	13.7077	0.000525	***	0.18
nutrient.class	101326	1	2.7803	0.101563		0.11
management	261706	1	7.1808	0.009896	**	0.04
mat	245706	1	6.7418	0.012274	*	0.09
gpp:nutrient.class	198516	1	5.447	0.02358	*	0.06
gpp:management	429267	1	11.7785	0.001197	**	0.11
Residuals	1858698	51				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-541.6	328.6	333.1	1.626	0.10396		(Intercept)	1.00
gpp	0.5573	0.1879	0.1907	2.922	0.00348	**	gpp	1.00
MNG.UM	328.7	130.2	133.2	2.467	0.01361	*	NA	1.00
mat	17.67	7.436	7.606	2.323	0.02018	*	MNG	0.91
NA.LOW	391.7	370.2	374.8	1.045	0.29596		gpp:MNG	0.91
gpp:MNG.UM	-0.2623	0.07625	0.07807	3.36	0.00078	***	mat	0.90
gpp:NA.LOW	-0.4468	0.1904	0.1948	2.293	0.02183	*	gpp:NA	0.83
wd	1.995	1.977	2.023	0.986	0.32403		age	0.18
MNG.UM:NA.LOW	-91.61	138.1	141.5	0.648	0.51729		wd	0.18
age	2.343	2.424	2.434	0.963	0.33564		MNG:NA	0.11
age:gpp	-0.00275	0.0008	0.000822	3.341	0.00083	***	age:gpp	0.09
age:NA.LOW	-1.928	0.799	0.8188	2.354	0.01855	*	age:NA	0.09
map	0.02251	0.09908	0.1015	0.222	0.82458		map	0.08
							age:MNG	0.00

9 models Δ < 4

Re

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	627.57583	260.16476	2.412	0.01949	*
gpp	0.38836	0.1582	2.455	0.01754	*
nutrient.classLOW	-522.60114	283.81343	-1.841	0.07139	.
managementUM	-314.55694	120.96911	-2.6	0.01215	*
mat	-17.83373	7.16009	-2.491	0.01605	*
gpp:nutrient.classLOW	0.46899	0.18732	2.504	0.01554	*
gpp:managementUM	0.2495	0.07534	3.311	0.00171	**

R^2= 0.9163 **adj R^2=** 0.9065

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	216134	1	5.8188	0.01949	*	
gpp	223853	1	6.0266	0.01754	*	0.67
nutrient.class	125940	1	3.3906	0.07139	.	0.01
management	251153	1	6.7616	0.01215	*	0.01
mat	230428	1	6.2036	0.01605	*	0.19
gpp:nutrient.class	232822	1	6.2681	0.01554	*	0.01
gpp:management	407320	1	10.966	0.00171	**	0.02
Residuals	1894342	51				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	643	310.3	315.7	2.037	0.04166	*	(Intercept)	1.00
gpp	0.3806	0.1769	0.1803	2.111	0.03475	*	gpp	1.00
MNG.UM	-321.6	134.1	137.2	2.344	0.01908	*	NA	1.00
mat	-17.6	7.308	7.486	2.351	0.01871	*	gpp:NA	0.95
NA.LOW	-509.2	338.6	344.3	1.479	0.1391		mat	0.90
gpp:MNG.UM	0.2514	0.07647	0.07833	3.21	0.00133	**	MNG	0.89
gpp:NA.LOW	0.4727	0.1973	0.2017	2.344	0.01908	*	gpp:MNG	0.89
wd	-1.792	1.933	1.981	0.905	0.36569		age	0.20
MNG.UM:NA.LOW	109.1	139.1	142.6	0.765	0.44426		wd	0.14
age	-2.459	2.41	2.421	1.016	0.3098		MNG:NA	0.12
age:gpp	0.00268	0.00081	0.00083	3.236	0.00121	**	age:gpp	0.11
age:NA.LOW	1.953	0.8048	0.8247	2.367	0.01791	*	age:NA	0.11
map	-0.01641	0.1001	0.1025	0.16	0.87287		map	0.09
							age:MNG	0.00

8 models Δ < 4

Models without nutrient status

NEP

	Estimate	Std.Err	t	Pr(>|t|)	
(Intercept)	-594.399	133.86874	-4.44	4.1E-05	***
gpp	0.511744	0.0616439	8.302	1.9E-11	***
managementUM	355.4655	131.84313	2.696	0.00917	**
wd	5.280222	1.6748899	3.153	0.00256	**
gpp:managementUM	-0.36777	0.0796442	-4.62	2.2E-05	***

R^2= 0.5974 **adj R^2=** 0.5697

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	998461	1	19.7151	4.09E-05	***	
gpp	3490265	1	68.9169	1.92E-11	***	0.31
management	368140	1	7.2691	0.009166	**	0.08
wd	503344	1	9.9388	0.002562	**	0.05
gpp:management	1079913	1	21.3234	2.20E-05	***	0.15
Residuals	2937383	58				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R
(Intercept)	-571.522	154.13	157.1015	3.638	0.00028	***	(Intercept)	1.00
gpp	0.51726	0.06999	0.07143	7.241	2.0E-16	***	gpp	1.00
MNG.UM	331.4987	138.953	141.85	2.337	0.01944	*	MNG	1.00
wd	5.23634	1.73593	1.7725	2.954	0.00314	**	gpp:MNG	1.00
gpp:MNG.UM	-0.3526	0.08492	0.08666	4.069	4.7E-05	***	wd	1.00
map	-0.11618	0.09751	0.09959	1.167	0.24337		map	0.38
age	0.3439	0.45327	0.46312	0.743	0.45774		age	0.22
mat	3.80219	7.9414	8.10027	0.469	0.63879		mat	0.19
							age:gpp	0.00
6 models Δ < 4							age:MNG	0.00

Re

	Estimate	Std.Err	t	Pr(>|t|)	
(Intercept)	608.429056	137.84864	4.414	0.0000448	***
gpp	0.4893964	0.0634765	7.71	1.88E-10	***
managementUM	-348.463312	135.7628	-2.567	0.01287	*
wd	-5.4720214	1.7246841	-3.173	0.00242	**
gpp:managementUM	0.3532584	0.082012	4.307	0.0000646	***

R^2= 0.8672 **adj R^2=** 0.858

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	1046150	1	19.481	4.48E-05	***	
gpp	3192086	1	59.442	1.88E-10	***	0.70
management	353779	1	6.588	0.01287	*	0.02
wd	540575	1	10.066	0.002415	**	0.11
gpp:management	996345	1	18.554	6.46E-05	***	0.04
Residuals	3114635	58				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R
(Intercept)	553.652	163.49	166.527	3.325	0.00089	***	(Intercept)	1.00
gpp	0.46987	0.07201	0.07349	6.393	2.0E-16	***	gpp	1.00
MNG.UM	-301.36	144.967	147.921	2.037	0.04162	*	MNG	1.00
map	0.16497	0.09806	0.10018	1.647	0.09961	.	gpp:MNG	1.00
wd	-5.33181	1.77344	1.811	2.944	0.00324	**	wd	1.00
gpp:MNG.UM	0.31923	0.0905	0.09226	3.46	0.00054	***	map	0.57
mat	-1.60924	8.40043	8.56236	0.188	0.85092		mat	0.18
age	-0.27027	0.46671	0.47681	0.567	0.57084		age	0.20
							age:gpp	0.00
6 models Δ < 4							age:MNG	0.00

Models excluding forests with GPP>2500

NEP (Fig. 1)

	Estimate	Std.Err	t value	Pr(>|t|)	
Intercept)	-862.685	196.8156	-4.383	0.0000557	***
gpp	0.7604	0.1203	6.32	5.59E-08	***
nutrient.classLOW	441.8157	226.904	1.947	0.05682	.
wd	4.2971	1.5516	2.77	0.00772	**
gpp:nutrient.classLOW	-0.4184	0.1396	-2.998	0.00413	**

R^2= 0.7179 **adj R^2=** 0.6966

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	706098	1	19.2125	0.00005568	***	
gpp	1467744	1	39.9365	5.592E-08	***	0.44
nutrient.class	139341	1	3.7914	0.056824	.	0.17
wd	281899	1	7.6703	0.007721	**	0.05
gpp:nutrient.class	330378	1	8.9894	0.004128	**	0.06
Residuals	1947852	53				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-869.3	197.7	202.4	4.295	1.7E-05	***	(Intercept)	1.00
gpp	0.7416	0.1187	0.1215	6.105	<0.00001	***	gpp	1.00
mat	17.13	6.702	6.847	2.502	0.01233	*	NA	1.00
NA.LOW	700.2	250.3	255.2	2.744	0.00607	**	gpp:NA	1.00
wd	2.96	1.667	1.705	1.737	0.08247	.	mat	0.95
gpp:NA.LOW	-0.5919	0.1571	0.1602	3.696	0.00022	***	wd	0.63
age	0.4008	0.6631	0.6738	0.595	0.55191		age	0.20
MNG.UM	28.78	57.71	59.08	0.487	0.6262		MNG	0.15
map	0.003563	0.09553	0.09778	0.036	0.97093		map	0.13
age:gpp	-0.00076	0.00076	0.000778	0.982	0.32601		age:gpp	0.04
							age:MNG	0.00
							age:NA	0.00
							gpp:MNG	0.00
10 models Δ < 4							MNG:NA	0.00

Re (Fig. 2)

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	904.8063	195.6001	4.626	0.0000244	***
gpp	0.2193	0.1196	1.834	0.07224	.
nutrient.classLOW	-460.8056	225.5027	-2.043	0.04599	*
wd	-4.3754	1.542	-2.838	0.00643	**
gpp:nutrient.classLOW	0.4221	0.1387	3.043	0.00364	**

R^2= 0.7411 **adj R^2=** 0.7215

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	776734	1	21.398	0.00002441	***	
gpp	122124	1	3.3644	0.072238	.	0.55
nutrient.class	151576	1	4.1757	0.045992	*	0.03
wd	292264	1	8.0515	0.006429	**	0.10
gpp:nutrient.class	336102	1	9.2592	0.003641	**	0.06
Residuals	1923867	53				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	911.146	200.906	205.649	4.431	9.4E-06	***	(Intercept)	1.00
gpp	0.22852	0.12099	0.12381	1.846	0.06494	.	gpp	1.00
mat	-12.4522	6.86698	7.01552	1.775	0.07591	.	NA	1.00
NA.LOW	-586.236	259.596	264.532	2.216	0.02668	*	gpp:NA	1.00
wd	-3.77785	1.69819	1.73473	2.178	0.02942	*	wd	0.86
gpp:NA.LOW	0.50671	0.16353	0.16657	3.042	0.00235	**	mat	0.63
age	-0.14644	0.34228	0.35019	0.418	0.67582		MNG	0.17
MNG.UM	-24.049	60.7591	62.0809	0.387	0.69847		age	0.14
map	-0.01268	0.09794	0.10008	0.127	0.89922		map	0.13
							age:gpp	0.00
							age:MNG	0.00
							age:NA	0.00
							gpp:MNG	0.00
10 models Δ < 4							MNG:NA	0.00

Weighted models excluding forests with GPP>2500

NEP

	Estimate	Std.Err	t value	Pr(>|t|)	
Intercept)	-567.832	201.3927	-2.82	0.00675	**
gpp	0.5898	0.1245	4.737	0.0000167	***
nutrient.classLOW	484.8521	235.3754	2.06	0.04433	*
mat	16.0388	6.577	2.439	0.01813	*
gpp:nutrient.classLOW	-0.4356	0.1585	-2.748	0.00818	**

R^2= 0.6143 **adj R^2=** 0.5852

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	8623	1	7.9497	0.00675	**	
gpp	24335	1	22.435	0.00001666	***	0.34
nutrient.class	4603	1	4.2432	0.044333	*	0.11
mat	6450	1	5.9468	0.018128	*	0.12
gpp:nutrient.class	8191	1	7.5515	0.008178	**	0.05
Residuals	57488	53				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-630.542	240.08	244.2723	2.581	0.00984	**	(Intercept)	1.00
gpp	0.58475	0.13469	0.13717	4.263	2E-05	***	gpp	1.00
mat	13.9113	7.15618	7.30633	1.904	0.05691	.	NA	1.00
NA.LOW	313.3486	302.626	306.4643	1.022	0.30656		gpp:NA	0.87
wd	3.69658	1.81166	1.85251	1.995	0.04599	*	wd	0.76
gpp:NA.LOW	-0.37807	0.17028	0.17373	2.176	0.02954	*	mat	0.75
map	0.07223	0.08776	0.08967	0.806	0.4205		map	0.19
MNG.UM	29.63878	54.6654	55.95706	0.53	0.59634		MNG	0.12
age	0.11882	0.35025	0.35868	0.331	0.74045		age	0.10
							age:gpp	0.00
							age:MNG	0.00
							age:NA	0.00
							gpp:MNG	0.00
12 models Δ < 4							MNG:NA	0.00

Re

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	330.71463	132.59705	2.494	0.01572	*
gpp	0.58081	0.05895	9.852	1.16E-13	***
nutrient.classLOW	170.1716	56.38605	3.018	0.00388	**
wd	-3.91987	1.78531	-2.196	0.03243	*

R^2= 0.7128 **adj R^2=** 0.6968

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	4639	1	6.2207	0.01572	*	
gpp	72381	1	97.0636	1.156E-13	***	0.58
nutrient.class	6792	1	9.1082	0.003878	**	0.03
wd	3595	1	4.8208	0.032435	*	0.11
Residuals	40268	54				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	614.725	234.124	238.326	2.579	0.0099	**	(Intercept)	1.00
gpp	0.40001	0.13299	0.13544	2.953	0.00314	**	gpp	1.00
mat	-11.4335	7.2117	7.36514	1.552	0.12057		NA	1.00
NA.LOW	-303.751	284.67	288.541	1.053	0.29247		gpp:NA	0.90
wd	-3.46331	1.80117	1.8424	1.88	0.06014	.	wd	0.72
gpp:NA.LOW	0.35391	0.16485	0.16807	2.106	0.03523	*	mat	0.56
map	-0.04307	0.08784	0.08976	0.48	0.63136		MNG	0.14
MNG.UM	-19.3384	58.1629	59.4065	0.326	0.74478		map	0.14
age	-0.05802	0.34906	0.35716	0.162	0.87094		age	0.12
							age:gpp	0.00
							age:MNG	0.00
							age:NA	0.00
							gpp:MNG	0.00
15 models Δ < 4							MNG:NA	0.00

Models using only managed forests

NEP

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-857.573	205.9132	-4.165	0.000201	***
gpp	0.7092	0.1253	5.661	0.00000237	***
nutrient.classLOW	257.9824	249.5965	1.034	0.308621	
wd	6.39	1.8149	3.521	0.001247	**
gpp:nutrient.classLOW	-0.2955	0.1474	-2.005	0.053009	.

R^2= 0.7857 **adj R^2=** 0.7605

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	619836	1	17.345	0.0002014	***	
gpp	1145367	1	32.0511	2.372E-06	***	0.52
nutrient.class	38177	1	1.0683	0.3086206		0.14
wd	443006	1	12.3967	0.0012471	**	0.09
gpp:nutrient.class	143617	1	4.0189	0.0530094	.	0.04
Residuals	1215014	34				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-872.4	254.7	261.1	3.341	0.00083	***	(Intercept)	1.00
gpp	0.6644	0.1388	0.1426	4.66	3.2E-06	***	gpp	1.00
mat	16.51	9.362	9.723	1.698	0.08957	.	NA.	1.00
NA.LOW	282.1	334.3	341	0.827	0.408		wd	1.00
wd	6.396	2.165	2.229	2.869	0.00412	**	gpp:NA	0.85
gpp:NA.LOW	-0.3741	0.172	0.1776	2.107	0.03516	*	mat	0.49
age	0.9862	0.8297	0.8554	1.153	0.24892		age	0.46
age:NA.LOW	-1.362	1.124	1.168	1.166	0.24349		map	0.13
map	-0.02869	0.118	0.1222	0.235	0.81435		age:NA	0.11
age:gpp	0.00027	0.00105	0.001097	0.246	0.80581		age:gpp	0.03

13 models Δ < 4

Re

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	909.3045	208.0546	4.371	0.000111	***
gpp	0.2617	0.1266	2.067	0.04639	*
nutrient.classLOW	-323.2086	252.1922	-1.282	0.208656	
wd	-6.2747	1.8337	-3.422	0.001636	**
gpp:nutrient.classLOW	0.3361	0.1489	2.257	0.03055	*

R^2= 0.8121 **adj R^2=** 0.79

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	696872	1	19.1014	0.0001107	***	
gpp	155911	1	4.2735	0.0463903	*	0.57
nutrient.class	59923	1	1.6425	0.2086559		0.03
wd	427173	1	11.7089	0.0016363	**	0.17
gpp:nutrient.class	185837	1	5.0938	0.0305504	*	0.05
Residuals	1240417	34				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	928.819	249.516	256.331	3.624	0.00029	***	(Intercept)	1.00
gpp	0.29454	0.14175	0.14572	2.021	0.04325	*	gpp	1.00
NA.LOW	-353.056	325.228	332.658	1.061	0.28855		NA	1.00
wd	-6.27146	2.166	2.23117	2.811	0.00494	**	wd	1.00
gpp:NA.LOW	0.3958	0.17112	0.17674	2.239	0.02513	*	gpp:NA	0.90
mat	-15.2377	9.50801	9.87347	1.543	0.12276		mat	0.44
age	-1.00995	0.8149	0.83836	1.205	0.22833		age	0.41
age:NA.LOW	1.42601	1.14127	1.18605	1.202	0.22924		age:NA	0.12
map	0.03553	0.11456	0.11897	0.299	0.76523		map	0.10
							age:gpp	0.00

10 models Δ < 4

Models using an alternative nutrient availability classification

NEP

	Estimate	Std.Err	t value	Pr(>|t|)	
Intercept)	-926.2	195.4	-4.74	0.0000165	***
gpp	0.7644	0.1093	6.994	4.6E-09	***
age	5.143	1.253	4.104	0.000141	***
alternutrLOW	769.5	203	3.79	0.000387	***
mat	20.21	5.225	3.869	0.000302	***
gpp:age	-0.00337	0.0007395	-4.557	0.0000309	***
gpp:alternutrLOW	-0.5263	0.1166	-4.515	0.0000357	***
age:alternutrLOW	-1.918	0.7773	-2.468	0.016854	*

R^2= 0.7553 **adj R^2=** 0.723

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
Intercept)	623153	1	22.4697	0.00001645	***	
gpp	1356752	1	48.9219	4.604E-09	***	0.25
age	467161	1	16.8449	0.0001407	***	0.04
alternutr	398366	1	14.3643	0.000387	***	0.12
mat	415043	1	14.9657	0.0003016	***	0.11
gpp:age	575924	1	20.7667	0.00003088	***	0.1
gpp:alternutr	565233	1	20.3812	0.0000357	***	0.11
age:alternutr	168904	1	6.0903	0.0168544	*	0.02
Residuals	1469850	53				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R
Intercept	-924.6	208.3	212.8	4.344	1.4E-05	***	(Intercept)	1.00
age	5	1.387	1.413	3.539	0.0004	***	age	1.00
alternutrLOW	761.1	213.8	218.6	3.482	0.0005	***	alternutr	1.00
gpp	0.7599	0.1127	0.1152	6.598	2E-16	***	gpp	1.00
mat	20.18	5.445	5.572	3.622	0.00029	***	mat	1.00
age:alternutrLOW	-1.943	0.7858	0.8042	2.416	0.01571	*	age:gpp	1.00
age:gpp	-0.00331	0.0008	0.000812	4.077	4.6E-05	***	alternutr:gpp	1.00
alternutrLOW:gpp	-0.5283	0.1217	0.1245	4.244	2.2E-05	***	age:alternutr	0.93
map	0.05238	0.08533	0.08736	0.6	0.54879		map	0.15
MNG.UM	25.84	60.62	62.06	0.416	0.67716		MNG	0.14
wd	0.508	1.615	1.653	0.307	0.7586		wd	0.13
							age:MNG	0.00
							alternutr:MNG	0.00
5 models Δ < 4							gpp:MNG	0.00

Re

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	977.7	198	4.939	0.00000824	***
gpp	0.2071	0.1107	1.87	0.067002	.
age	-5.106	1.27	-4.022	0.000184	***
alternutrLOW	-828.8	205.7	-4.029	0.00018	***
mat	-19.72	5.294	-3.725	0.000475	***
gpp:age	0.003305	0.0007492	4.41	0.0000508	***
gpp:alternutrLOW	0.5626	0.1181	4.763	0.0000152	***
age:alternutrLOW	1.975	0.7876	2.508	0.015246	*

R^2= 0.9122 **adj R^2=** 0.9006

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	694393	1	24.3888	8.243E-06	***	
gpp	99570	1	3.4971	0.0670024	.	0.67
age	460518	1	16.1745	0.0001841	***	0.01
alternutr	462143	1	16.2316	0.0001799	***	0.02
mat	395084	1	13.8763	0.0004749	***	0.13
gpp:age	553836	1	19.4521	0.0000508	***	0.04
gpp:alternutr	645866	1	22.6844	0.00001521	***	0.04
age:alternutr	179061	1	6.2891	0.0152462	*	0.01
Residuals	1509004	53				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	988.9	205.1	209.8	4.713	2.4E-06	***	(Intercept)	1.00
age	-5.131	1.284	1.314	3.905	9.4E-05	***	age	1.00
alternutrLOW	-830.8	212.8	217.7	3.815	0.00014	***	alternutr	1.00
gpp	0.2053	0.1117	0.1143	1.796	0.07251	.	gpp	1.00
mat	-19.53	5.501	5.63	3.469	0.00052	***	mat	1.00
age:alternutrLOW	1.996	0.7959	0.8146	2.451	0.01425	*	age:alternutr	1.00
age:gpp	0.00332	0.00076	0.00078	4.272	1.9E-05	***	age:gpp	1.00
alternutrLOW:gpp	0.5642	0.1231	0.126	4.479	7.5E-06	***	alternutr:gpp	1.00
map	-0.04651	**0.08653**	0.08859	**0.525**	0.59959		map	0.16
MNG.UM	-24.53	61.43	62.9	0.39	0.69654		MNG	0.15
wd	-0.5608	1.636	1.675	0.335	0.7377		wd	0.14
							age:MNG	0.00
							alternutr:MNG	0.00
4 models Δ < 4							gpp:MNG	0.00

Models with the factors extracted from the nutrient classification

NEP

	Estimate	Std.Err	β	β Std.Err	t value	Pr(>|t|)	
(Intercept)	-269.131	88.209304	0	0	-3.051	0.00346	**
f1	-27.8263	25.151078	-0.358	0.3235612	-1.106	0.27322	
gpp	0.414041	0.0556693	0.87959	0.1182636	7.438	<.0001	***
managementUM	269.0477	124.50198	0.38392	0.1776568	2.161	0.03491	*
f1:gpp	0.030442	0.0129536	0.7639	0.3250582	2.35	0.02226	*
gpp:managementUM	-0.2593	0.0770538	-0.6833	0.2030509	-3.365	0.00137	**
R2=	0.6811	**adj R2=**	0.6532				

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R2
(Intercept)	379989	1	9.3089	0.003459	**	
f1	49966	1	1.224	0.273216		0.23008
gpp	2258026	1	55.3167	5.93E-10	***	0.25579
management	190625	1	4.6699	0.034912	*	0.05029
f1:gpp	225437	1	5.5227	0.022257	*	0.05242
gpp:management	462245	1	11.324	0.001374	**	0.09254
Residuals	2326737	57				

NEP model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	-283.9	117.3	119.3	2.38	0.01733	*	(Intercept)	1.00
f1	-23.95	29.63	30.08	0.796	0.42587		F1	1.00
gpp	0.3949	0.0736	0.07487	5.274	1.00E-07	***	gpp	1.00
managementUM	287.8	129	131.8	2.184	0.02897	*	MNG	1.00
f1:gpp	0.03079	0.01348	0.01376	2.236	0.02532	*	F1:GPP	0.91
gpp:managementUM	-0.2697	0.07942	0.08109	3.326	0.00088	***	gpp:MNG	1.00
mat	8.61	6.457	6.599	1.305	0.19198		mat	0.40
wd	1.836	1.88	1.917	0.958	0.33831		wd	0.23
f1:managementUM	10.99	24.14	24.68	0.445	0.65613		age	0.14
age	0.1778	0.4022	0.411	0.433	0.66526		f1:MNG	0.11
map	-0.00703	0.09706	0.09907	0.071	0.94347		map	0.11

13 models Δ < 4

Re

	Estimate	Std.Err	β	β Std.Err	t value	Pr(>|t|)	
(Intercept)	262.962863	95.062739	0	0	2.766	0.007595	**
f1	-29.580566	6.7969963	-0.2122776	0.04877697	-4.352	5.54E-05	***
gpp	0.592046	0.0600396	0.7015992	0.0711494	9.861	5.20E-14	***
managementUM	-354.527459	127.54614	-0.2821977	0.10152452	-2.78	0.007325	**
gpp:managementUM	0.3044804	0.0785227	0.4475773	0.11542614	3.878	0.000272	***
R2=	0.8825	**adj R2=**	0.8744				

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R2
(Intercept)	363520	1	7.6519	0.0075953	**	
f1	899786	1	18.94	5.54E-05	***	0.04064662
gpp	4619512	1	97.2379	5.20E-14	***	0.79499854
management	367050	1	7.7262	0.0073248	**	0.01205423
gpp:management	714312	1	15.0358	0.0002716	***	0.03479453
Residuals	2755424	58				

Re model averaging

	Estimate	SE	Adj SE	z val	Pr(>|z|)		Variables	R Imp
(Intercept)	304.659	129.075	131.275	2.321	0.0203	*	(Intercept)	1.00
f1	23.8269	30.8621	31.3221	0.761	0.4468		F1	1.00
gpp	0.5864	0.06759	0.06894	8.506	<2e-16	***	gpp	1.00
managementUM	-269.56	134.21	137.027	1.967	0.0492	*	MNG	1.00
f1:gpp	-0.03089	0.01409	0.01439	2.146	0.0319	*	F1:GPP	0.89
gpp:managementUM	0.24987	0.08332	0.08504	2.938	0.0033	**	gpp:MNG	1.00
wd	-2.08056	1.89952	1.93923	1.073	0.2833		wd	0.30
mat	-5.51703	6.9059	7.05402	0.782	0.4341		mat	0.18
map	0.05393	0.09743	0.09953	0.542	0.5879		map	0.15
f1:managementUM	-10.2502	25.1642	25.7219	0.398	0.6903		f1:MNG	0.11
age	-0.10723	0.41819	0.42727	0.251	0.8018		age	0.11

13 models Δ < 4

Models using the "medium" nutrient availability category

NEP

	Estimate	Std.Err	β	β Std.Err	t value	Pr(>|t|)	
(Intercept)	-650.147	207.74185	0	0	-3.13	0.00221	**
gpp	0.689827	0.1239448	1.68764	0.30322786	5.566	1.66E-07	***
nutrient.classLOW	258.9967	227.36606	0.41185	0.36154805	1.139	0.25696	
nutrient.classMEDIUM	391.1855	238.17323	0.56405	0.34342186	1.642	0.10316	
managementOTHR	110.4697	116.18876	0.13705	0.14414666	0.951	0.34366	
managementUM	270.503	103.77753	0.38345	0.14710976	2.607	0.01032	*
wd	3.125687	1.1435189	0.20683	0.07566875	2.733	0.00723	**
gpp:nutrient.classLOW	-0.32062	0.1365047	-1.0328	0.43971008	-2.349	0.0205	*
gpp:nutrient.classMEDIUM	-0.37808	0.1422941	-0.8666	0.32615306	-2.657	0.00898	**
gpp:managementOTHR	-0.20223	0.0766118	-0.3909	0.14808735	-2.64	0.00942	**
gpp:managementUM	-0.3007	0.0626977	-0.8944	0.18649016	-4.796	4.77E-06	***

R2= 0.5834 **adj R2=** 0.548

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R2
(Intercept)	438923	1	9.7943	2.21E-03	**	
gpp	1388151	1	30.9759	1.66E-07	***	0.12
nutrient.class	149973	2	1.6733	0.192051		0.17
management	312383	2	3.4853	0.033835	*	0.10
wd	334825	1	7.4714	7.23E-03	**	0.03
gpp:nutrient.class	316390	2	3.53	0.032437	*	0.05
gpp:management	1030957	2	11.5026	2.73E-05	***	0.10
Residuals	5288049	118				

Re

	Estimate	Std.Err	β	β Std.Err	t	Pr(>|t|)	
(Intercept)	946.1472	225.7538	0	0	4.191	6.42E-05	***
gpp	0.1500605	0.1312338	0.17799832	0.15566652	1.143	0.255847	
nutrient.classLOW	-598.9845	238.7771	-	0.19726044	-2.509	0.013893	*
nutrient.classMEDIUM	-769.0284	254.6037	-	0.19182404	-3.02	0.003276	**
age	-2.345405	0.7963151	-	0.08718799	-2.945	0.004096	**
managementOTHR	112.3993	62.51324	0.06759027	0.03759176	1.798	0.075492	.
managementUM	171.6502	60.24119	0.12208751	0.04284699	2.849	0.005417	**
wd	-2.910387	1.324959	-	0.04379972	-2.197	0.030591	*
gpp:nutrient.classLOW	0.5007344	0.1411159	0.75653774	0.21320593	3.548	0.000615	***
gpp:nutrient.classMEDIUM	0.5897503	0.1492076	0.7248549	0.18338927	3.953	0.000153	***
gpp:age	0.00160319	0.0005973	0.24371494	0.09080813	2.684	0.008647	**

R2= 0.8971 **adj R2=** 0.8858

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R2
(Intercept)	741158	1	17.565	6.42E-05	***	
gpp	55170	1	1.3075	2.56E-01		0.71958764
nutrient.class	393809	2	4.6665	0.0117675	*	0.01904361
age	366040	1	8.6749	4.10E-03	**	0.00879914
management	397873	2	4.7147	1.13E-02	*	0.01802822
wd	203592	1	4.825	0.0305909	*	0.09880494
gpp:nutrient.class	659885	2	7.8194	0.0007349	***	0.02221301
gpp:age	303933	1	7.203	8.65E-03	**	0.01059682

CUEe

	Estimate	Std.Err	β	β Std.Err	t value	Pr(>|t|)	
(Intercept)	-0.05665285	0.0929213	0	0	-0.61	0.5435	
gpp	0.00030991	5.251E-05	0.79007388	0.1338564	5.902	5.51E-08	***
nutrient.classLOW	-0.173781	0.064971	-0.3085533	0.1153579	-2.675	0.0088	**
nutrient.classMEDIUM	-0.02722514	0.0697433	-0.04408481	0.1129332	-0.39	0.6971	
age	0.00290722	0.0008546	0.68411616	0.2010993	3.402	0.001	***
map	-0.00016161	6.121E-05	-0.29530044	0.1118445	-2.64	0.0097	**
gpp:age	-1.9465E-06	6.354E-07	-0.63595917	0.2076081	-3.063	0.0028	**

R2= 0.3763 **adj R2=** 0.3369

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R2
(Intercept)	0.0197	1	0.3717	0.5435249		
gpp	1.8473	1	34.8383	5.51E-08	***	0.1446
nutrient.class	0.5977	2	5.6359	0.0048644	**	0.1056
age	0.6137	1	11.5728	9.81E-04	***	0.0117
map	0.3696	1	6.9711	0.0096844	**	0.0468
gpp:age	0.4976	1	9.3836	0.0028486	**	0.0677
Residuals	5.0375	95				

GPP Models

General

		Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)		1306.23	137.051	9.531	1.28E-13	***	
mat		74.397	6.163	12.072	2E-16	***	0.65
wd		-8.874	2.581	-3.438	0.00107	**	0.1
	R^2=	0.7514	**adj R^2=**	0.7432			

Weighted

		Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)		1379.807	140.646	9.811	4.39E-14	***	
mat		63.475	6.473	9.805	4.47E-14	***	0.56
wd		-10.171	2.751	-3.697	0.000474	***	0.15
	R^2=	0.7056	**adj R^2=**	0.6958			

GPP < 2500

		Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)		1406.357	135.555	10.375	1.83E-14	***	
NA.LOW		-263.7	97.152	-2.714	0.0089	**	0.11
mat		56.63	7.272	7.787	2.18E-10	***	0.47
wd		-5.408	2.517	-2.149	0.0362	*	0.04
	R^2=	0.6223	**adj R^2=**	0.6013			

392 **GPP < 2500 Weighted**

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	1386.784	133.901	10.357	1.57E-14	***	
mat	51.652	7.161	7.213	1.69E-09	***	0.44
wd	-9.159	2.644	-3.464	0.00104	**	0.14
R^2=	0.5799	**adj R^2=**	0.5646			

393 **Only Managed forests**

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	1048.172	119.347	8.783	1.77E-10	***	
NA.LOW	-309.188	117.171	-2.639	0.0122	*	0.07
mat	74.979	9.498	7.894	2.29E-09	***	0.59
R^2=	0.6598	**adj R^2=**	0.6409			

394 **Only Eddy covariance data**

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
Intercept)	1223.0939	167.9484	7.283	1.43E-09	***	
mat	51.4191	8.761	5.869	2.76E-07	***	0.38
map	0.363	0.1423	2.551	0.0136	*	0.27
wd	-12.0537	2.6356	-4.573	0.0000284	***	0.16
R^2=	0.811	**adj R^2=**	0.8005			

395 **Alternative Classification**

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	1569.856	123.786	12.682	2E-16	***	
alternutrLOW	-216.12	90.99	-2.375	0.0209	*	0.04
mat	67.954	5.944	11.433	2E-16	***	0.58
wd	-11.626	2.252	-5.163	0.00000321	***	0.13
R^2=	0.7514	**adj R^2=**	0.7384			

397 General

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-0.2251	0.113	-1.993	0.050969	.
gpp	0.0003517	0.0000645	5.452	0.00000107	***
age	0.004071	0.0009644	4.221	0.0000866	***
NA.LOW	-0.1956	0.05992	-3.264	0.001843	**
gpp:age	-2.944E-06	7.065E-07	-4.168	0.000104	***
R^2=	0.4349	**adj R^2=**	0.3959		

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	0.1901	1	3.9722	0.050969	.	
gpp	1.42266	1	29.7273	1.068E-06	***	0.14
age	0.85283	1	17.8204	0.00008656	***	0.004
NA.	0.50995	1	10.6556	0.0018432	**	0.12
gpp:age	0.83122	1	17.3688	0.0001038	***	0.17
Residuals	2.7757	58				

398 Weighted

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-0.03192	0.1037	-0.308	0.75943	
gpp	0.0001887	0.0000578	3.265	0.00185	**
age	0.003124	0.001041	3.001	0.00398	**
NA.LOW	-0.03051	0.05347	-0.571	0.57044	
gpp:age	-1.967E-06	6.16E-07	-3.193	0.0023	**
age:NA.LOW	-0.001373	0.0005272	-2.604	0.01173	*
R^2=	0.3448	**adj R^2=**	0.2873		

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	0.043	1	0.0947	0.759431		
gpp	4.8367	1	10.6612	0.001854	**	0.01
age	4.087	1	9.0088	0.003982	**	0.03
NA.	0.1478	1	0.3257	0.570442		0.16
gpp:age	4.6239	1	10.1922	0.002296	**	0.09
age:NA.	3.0765	1	6.7813	0.011726	*	0.05
Residuals	25.8594	57				

399 GPP<2500

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-0.504	0.1096	-4.598	0.0000261	***
gpp	0.0004657	7.229E-05	6.442	3.31E-08	***
age	0.003238	0.001097	2.952	0.00466	**
gpp:age	-2.172E-06	8.525E-07	-2.548	0.01371	*
R^2=	0.4552	**adj R^2=**	0.4249		

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	1.03712	1	21.1416	0.00002612	***	
gpp	2.03587	1	41.5013	3.308E-08	***	0.38
age	0.42758	1	8.7162	0.00466	**	0.01
gpp:age	0.31848	1	6.4922	0.01371	*	0.07
Residuals	2.64901	54				

400

GPP<2500 weighted

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	0.187674	0.036618	5.125	0.00000396	***	
NA.LOW	-0.126927	0.035287	-3.597	0.00069	***	0.15
mat	0.012343	0.003086	4	0.000191	***	0.19

R^2= 0.3397 **adj R^2=** 0.3157

Only Managed

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	-0.3887	0.1444	-2.693	0.0109	*	
gpp	0.0004172	7.783E-05	5.36	0.00000585	***	0.37
age	0.00461	0.001737	2.655	0.012	*	0.03
NA.LOW	-0.171	0.08213	-2.082	0.0449	*	0.09
gpp:age	-2.712E-06	1.304E-06	-2.079	0.0452	*	0.05

R^2= 0.5477 **adj R^2=** 0.4945

Eddy covariance

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
(Intercept)	-0.2325	0.1195	-1.945	0.057055	.	
gpp	0.0003537	7.426E-05	4.763	0.0000152	***	0.12
age	0.004067	0.001055	3.857	0.000313	***	0.02
NA.LOW	-0.1892	0.06651	-2.845	0.006295	**	0.09
gpp:age	-2.933E-06	8.006E-07	-3.663	0.000576	***	0.15

R^2= 0.3728 **adj R^2=** 0.3255

Alternative Classification

	Estimate	Std.Err	t value	Pr(>|t|)		R^2
Intercept)	-0.2209	0.115	-1.921	0.05998	.	
gpp	0.0002462	7.852E-05	3.136	0.00275	**	0.12
age	0.004683	0.001057	4.43	0.0000453	***	0.01
alternutrLOW	-0.1627	0.06088	-2.672	0.0099	**	0.07
mat	0.01454	0.006533	2.225	0.03017	*	0.06
gpp:age	-3.202E-06	7.429E-07	-4.31	0.000068	***	0.18

R^2= 0.4426 **adj R^2=** 0.392

Using Factor 1 and 2 from the nutrient classification analysis

	Estimate	Std.Err	t value	Pr(>|t|)	
(Intercept)	-0.09955499	0.0714464	-1.393	0.17	
f1	0.01556442	0.0053638	2.902	0.01	**
f2	0.04844199	0.0200583	2.415	0.02	*
gpp	0.00020052	4.541E-05	4.416	<0.0001	***
managementUM	0.1584173	0.0931077	1.701	**0.09**	.
f2:gpp	-2.6022E-05	1.143E-05	-2.277	0.03	*
gpp:managementUM	-0.0001458	5.589E-05	-2.609	0.01	*
R2=	0.4812	**adj R2=**	0.4246		

ANOVA table (type III)

	SumSq	DF	F value	Pr(>F)		R^2
(Intercept)	0.03965	1	1.9416	0.169098		
f1	0.17194	1	8.4201	0.005328	**	0.18
f2	0.1191	1	5.8325	1.91E-02	*	0.02
gpp	0.39819	1	19.4996	4.76E-05	***	0.09
management	0.05912	1	2.8949	0.094507	.	0.04
f2:gpp	0.1059	1	5.186	0.02668	*	0.07
gpp:management	0.13899	1	6.8064	0.011675	*	0.09
Residuals	1.12313	55				