THE ROLE OF LONG-TERM EXPERIMENTS IN VALIDATING TRAIT-BASED APPROACHES TO ACHIEVING MULTIFUNCTIONALITY IN GRASSLANDS

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SUPPLEMENTARY MATERIALS

Table S1 PGE species list with functional traits

Forbs	Life span	SLA (mm^2 mg^{-1})	LDMC (mg g^{-1})	seed mass (mg)	Height (cm)	Start of flowering (month)	Duration of flowering (months)	Lateral spread	Allocation
Achillea millefolium	0.333	19.3	184.1	0.2	45	6	3	5	0.32
Agrimonia eupatoria	0.333	18.82	339.5	15	60	6	3	2	0.40
Ajuga reptans	0.333	35.54	153	1.4	30	5	3	4	0.45
Anthriscus sylvestris	0.333	31.19	207	4.16	100	4	3	2	0.40
Bellis perennis	0.333	27.08	113.5	0.13	12	1	12	3	0.47
Cardamine pratensis	0.667	20.85	199.5	0.6	60	4	4	2	0.40
Centaurea nigra	0.333	23.69	154.3	2.4	60	6	4	2	0.24
Cerastium fontanum	0.667	27.39	130.3	0.14	45	4	6	2	0.40
Conopodium majus	0.333	22.5	189.3	2.58	45	5	2	2	0.40
Crepis capillaris	0	28.07	125.7	0.24	90	6	4	1	0.17
Filipendula ulmaria	0.667	24.33	391	0.8	120	6	4	4	0.40
Fritillaria meleagris	0.333	22.16	130.3	1.7	50	4	2	2	0.40
Galium verum	0.333	21.37	226.5	0.58	100	7	2	4	0.45
Heracleum sphondylium	0.333	22.17	220	7.5	200	6	4	2	0.40
Hypochoeris radicata	0.333	22.22	116	0.8	60	6	4	2	0.56
Knautia arvensis	0.333	20.05	183.7	4.24	100	7	3	2	0.40
Leontodon autumnalis	0.333	26.35	155.8	0.7	60	6	5	2	0.17

Leontodon hispidus	0.333	26.06	139.1	1.1	60	6	4	3	0.19
Linum catharticum	0	31.17	210	0.15	25	6	4	1	0.40
Ophioglossum vulgatum	0.667	24.75	110	No data	8	6	3	2	0.40
Pilosella officinarum	0.667	18.49	188	0.19	30	5	4	4	0.40
Pimpinella saxifraga	0.333	16.06	285.5	1.26	100	7	2	2	0.40
Plantago lanceolata	0.667	18.56	166.6	1.3	40	4	7	2	0.49
Potentilla reptans	0.333	25.51	241.5	0.29	100	6	4	5	0.53
Potentilla sterilis	0.333	24.6	250	0.53	15	2	4	3	0.53
Primula veris	0.667	18.67	214.7	0.83	30	4	3	2	0.40
Prunella vulgaris	0.667	29.85	162.8	1	30	6	4	3	0.25
Ranunculus acris	0.667	23.27	193.1	1.5	60	5	6	2	0.22
Ranunculus auricomus	0.333	31.9	152.5	2.99	40	4	2	2	0.46
Ranunculus bulbosus	0.333	18.18	188.3	2.566	40	3	7	2	0.51
Ranunculus ficaria	0.333	31.79	117.5	4	30	3	3	2	0.38
Rumex acetosa	0.333	29.44	101.9	0.8	100	5	2	2	0.42
Sanguisorba minor	0.333	20.5	311.1	7.3	40	5	4	2	0.62
Senecio jacobaea	0.333	25.5	125.3	0.25	150	6	5	1	0.63
Stachys officinalis	0.667	19.63	241.8	11.4	60	6	4	2	0.22
Stellaria graminea	0.333	29.27	174.7	0.27	90	5	4	4	0.77
Stellaria media	0	47.06	84	0.4	40	1	12	1	0.65
Taraxacum officinale	0.333	32.37	143.3	0.7	30	1	12	2	0.34
Tragopogon pratensis	0.333	19.1	188.5	3.5	70	6	2	2	0.18
Veronica chamaedrys	0.333	31.56	274.7	0.21	40	3	5	3	0.47
Vicia cracca	0.667	25.58	222	14.7	200	6	3	4	0.38
Vicia sativa nigra	0	22.86	217.5	38.6	120	5	5	1	0.38
Grasses									
Agrostis capillaris	0.667	27.61	258.7	0.07	70	6	3	4	0.35
Alopecurus pratensis	0.333	25.01	308.5	0.8	110	4	3	3	0.52
Anthoxanthum odoratum	0.333	29.91	273.2	0.53	50	4	3	2	0.31

Arrhenatherum elatius	0.667	28.29	292.3	2.8	150	6	6	4	0.35
Briza media	0.333	28.29	293.94	0.4	60	6	2	3	0.41
Bromus hordeaceus	0	27.25	289.3	1.48	80	5	3	1	0.53
Carex caryophyllea	0.333	20.68	310	1.13	15	4	5	3	0.27
Carex flacca	0.667	*15.34*	330	0.87	40	5	2	4	0.11
Cynosurus cristatus	0.333	24.1	248.3	0.5	75	3	9	2	0.95
Dactylis glomerata	0.333	24.56	262.5	0.9	100	5	4	3	0.28
Deschampsia cespitosa	0.667	17.62	328.4	0.56	40	6	2	4	0.45
Elytrigia repens	0.667	23.78	270.7	4.27	120	6	4	5	0.48
Festuca pratensis	0.333	25.02	262.8	2.2	120	6	1	2	0.47
Festuca rubra	0.667	20.03	267	1.1	100	6	2	4	0.56
Helictotrichon pubescens	0.667	20.7	264	2.14	100	5	3	2	0.29
Holcus lanatus	0.333	34.25	231.9	0.3	100	6	4	3	0.63
Lolium perenne	0.333	25.74	215.9	2	90	5	4	3	0.46
Luzula campestris	0.333	23.41	245.49	0.6	15	3	4	3	0.28
Poa pratensis	0.667	21.04	308.3	0.3	50	5	3	3	0.32
Poa trivialis	0.333	30.98	252.4	0.2	60	6	3	2	0.56
Trisetum flavescens	0.333	21.2	307.7	0.4	80	5	2	3	0.49
Legumes									
Lathyrus pratensis	0.667	25.32	273.7	12	120	5	4	3	0.40
Lotus corniculatus	0.667	23.61	186	1.16	35	5	6	2	0.13
Ononis repens	0.667	23.18	229.77	6	60	6	4	4	0.38
Trifolium pratense	0.333	23.58	218.2	1.5	100	5	5	3	0.40
Trifolium repens	0.333	31.34	186.1	0.6	50	6	4	4	0.36

Note: Life span: annuals = 0, herbaceous perennials= 0.333, rhizomatous perennials = 0.667, and woody perennials = 1; SLA, specific leaf area; LDMC, leaf dry matter content; Lateral spread: 1= therophytes (lateral spread of limited extent and duration), 2 = perennials with compact, unbranched rhizomes or forming small tussocks < 100 mm in diameter, 3 = perennials with rhizomatous systems or tussocks attaining 100–250 mm, 4 = perennials attaining diameter of 251–1000 mm, 5 = perennials attaining a diameter of >1000 mm[1]; Allocation = above ground dry matter/below ground dry matter (where data were missing for this trait, average values were used for species for same genus or where this was not possible, averages for monocots or dicots).

Table S2 Correlation matrix of plant functional traits

Allocation	1	–								
Flowering	2	–0.22	–							
Height	3	0.15	**0.47*****	–						
LDMC	4	0.02	**0.26***	0.19	–					
Life_span	5	–0.23	0.16	0.04	**0.26***	–				
Ln_seed_mass	6	–0.16	0.17	**0.36****	0.13	0.07	–			
SLA	7	0.23	**–0.33****	–0.06	**–0.39****	**–0.40*****	**–0.25***	–		
Duration	8	0.20	**–0.65*****	–0.22	**–0.36****	–0.11	–0.18	**0.35****	–	
Lateral spread	9	0.00	0.24	0.09	**0.34****	**0.46*****	–0.16	–0.14	–0.20	–
		1	2	3	4	5	6	7	8	9

Note: significant correlations indicated in bold. *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$.

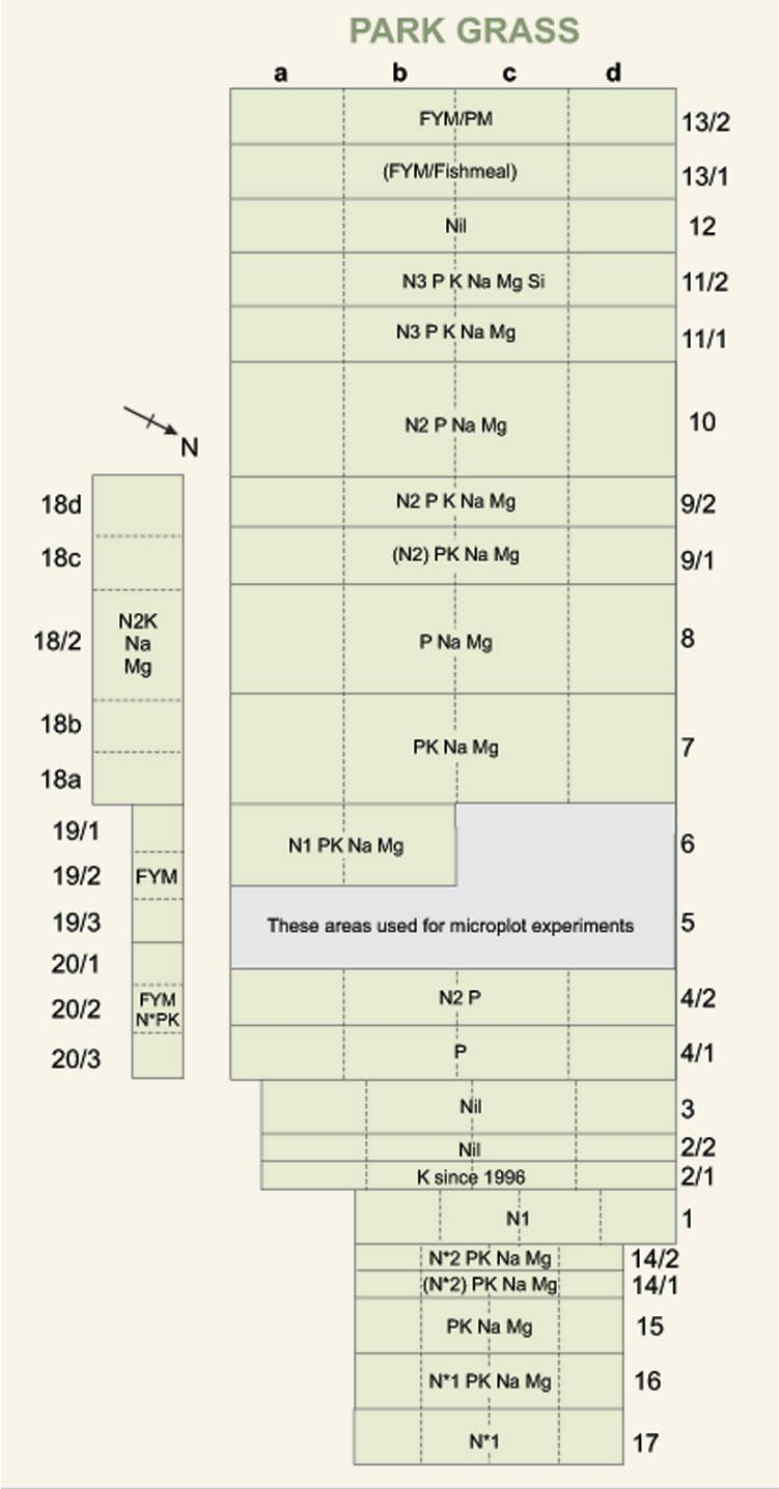

Fig. S1 Design of the Park Grass Experiment over the time period of study. The main plots (1–20) receive fertiliser treatments with different combinations of N, P, K, Na, Si and Mg; some receive farmyard manure (FYM), poultry manure (PM) or fishmeal. Nitrogen is applied at three rates (N1, N2 and N3; 48, 96 and 144 kg ha^{-1} N, respectively) and in two forms, ammonium sulphate or sodium nitrate (N^{*}). Subplots a, b and c have different amounts of lime added every 3 years, when necessary, to achieve a target pH of 7, 6 and 5, respectively. The subplot d is unlimed. Treatment shown on the plan in parenthesis has been withheld since the 1980s or 1990s.

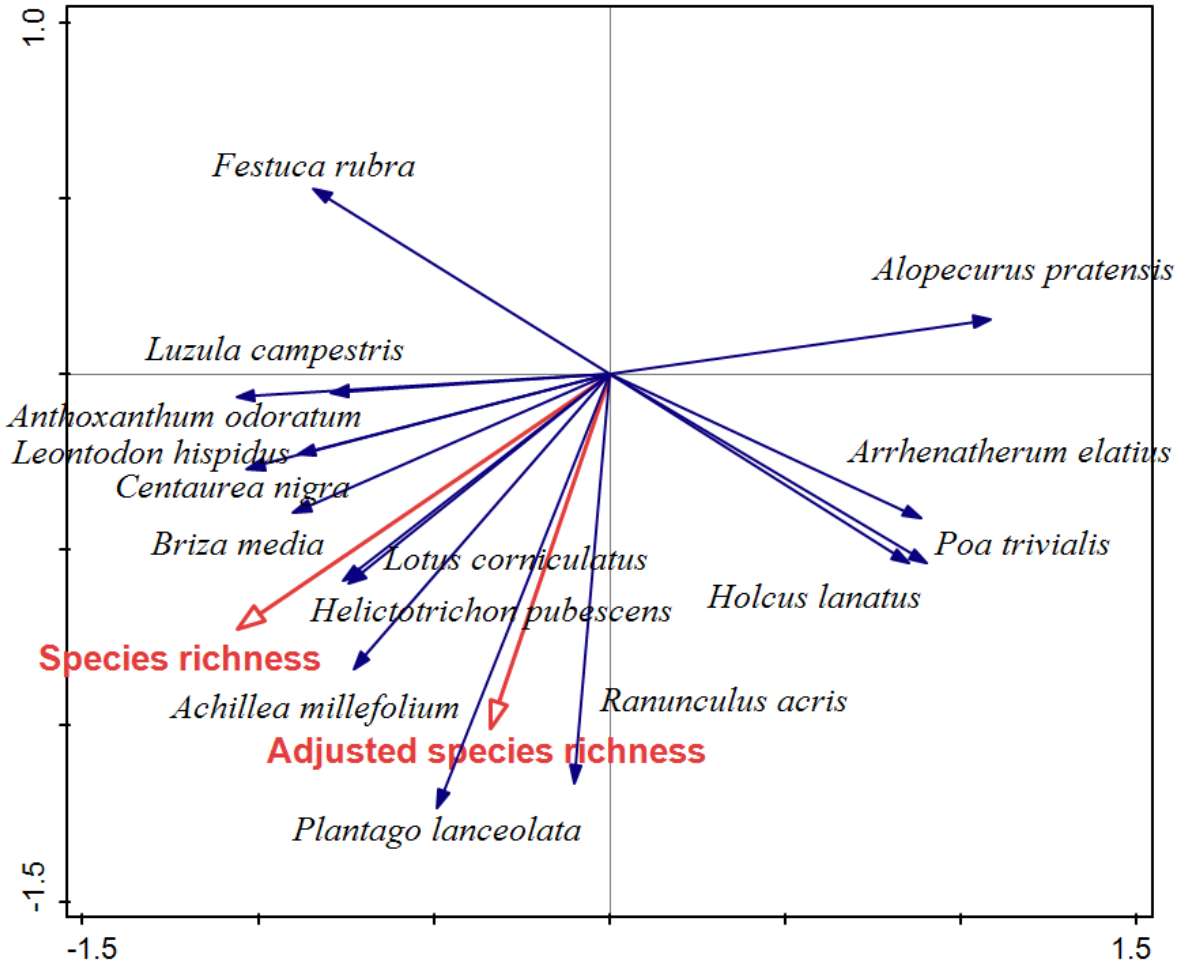

Fig. S2 RDA of relative biomass of species explained by species richness and species richness adjusted for biomass.

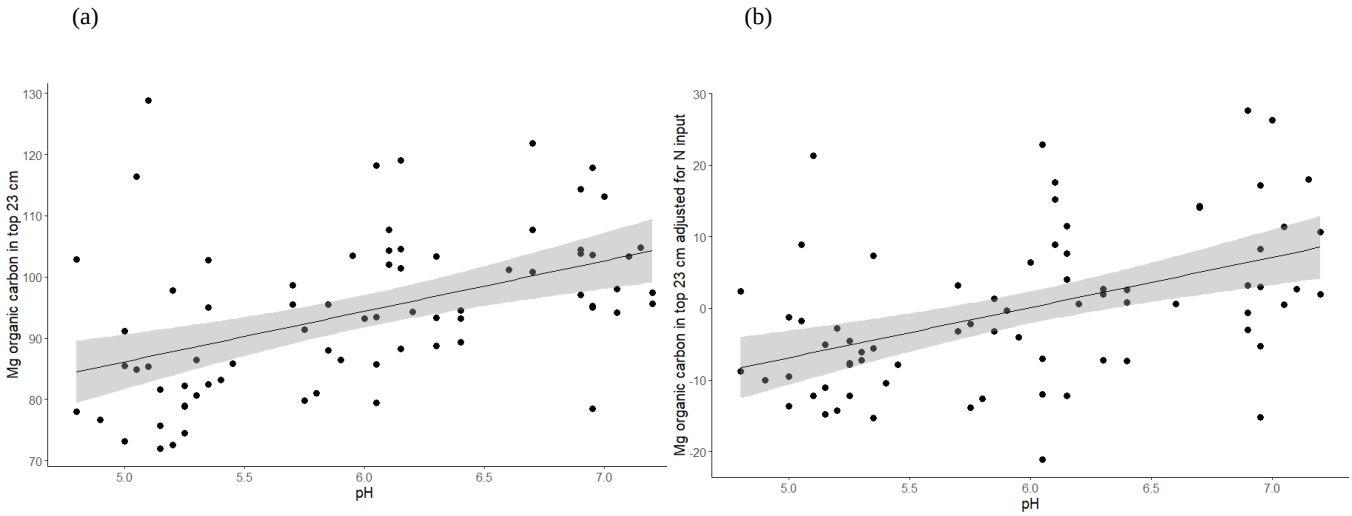

Fig. S3 Relationship between (a) SOC and soil pH (SOC = 44.9 + 8.25 × pH, % var=20.7. F.pr. < 0.001) and (b) SOC adjusted for N inputs (Adj.SOC = –42.4 + 7.09 × pH, % var = 21.2, F.pr < 0.001).

REFERENCE

1 Grime J P, Hodgson J G, Hunt R. Comparative plant ecology: a functional approach to common British species (2nd ed.). *Springer*, 2014