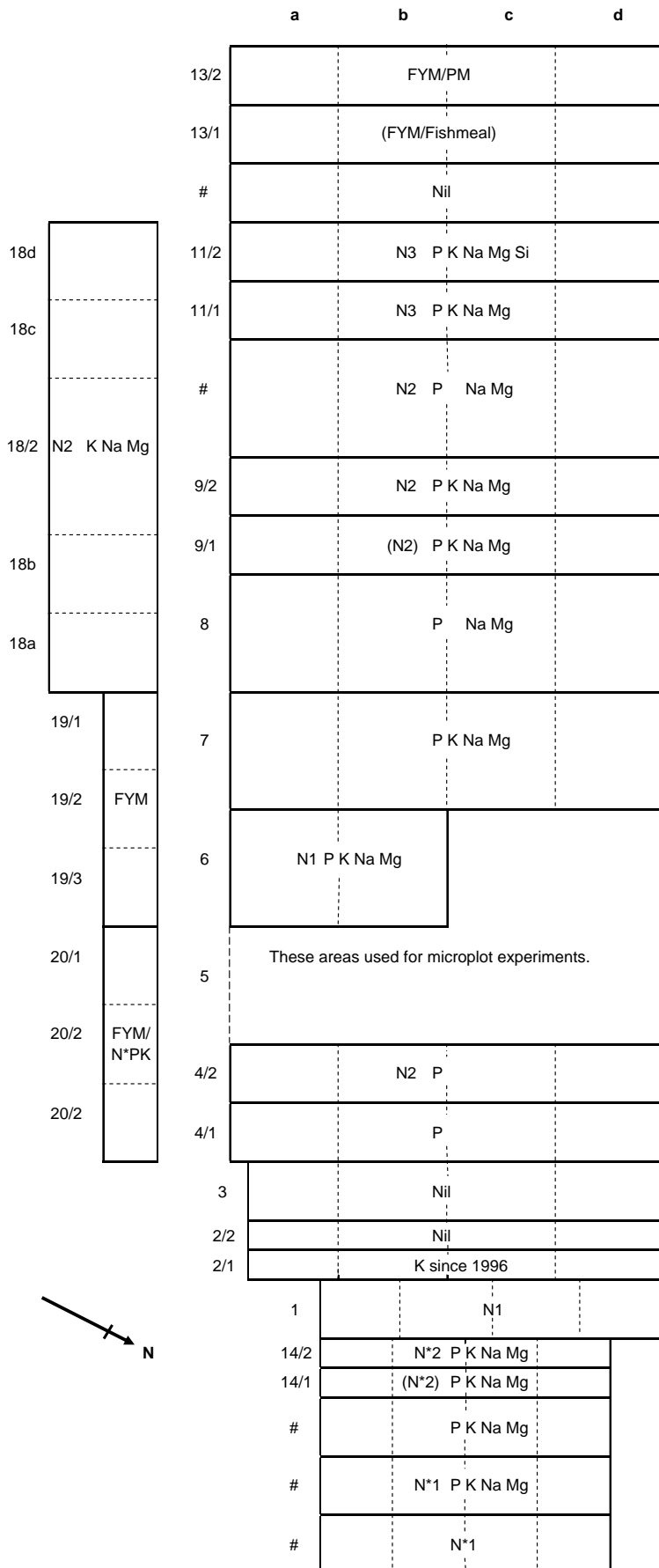


A celebration of 150 years of the Park Grass Experiment



Rothamsted Research

The Park Grass Experiment



Plot layout and current treatments

Plot treatments

(per hectare per year unless indicated)

Nitrogen (applied in spring)

N1, N2, N3: ammonium sulphate supplying 48, 96, 144 kg N and 55, 110, 165 kg S

N*1, N*2: sodium nitrate supplying 48, 96 kg N and 78, 157 kg Na

(N2), (N*2): last applied 1989

Minerals (applied in winter)

P: triple superphosphate supplying 35 kg P

K: potassium sulphate supplying 225 kg K and 99 kg S

Na: sodium sulphate supplying 15 kg Na and 10 kg S

Mg: magnesium sulphate (Epsom salts) supplying 10 kg Mg and 13 kg S

Si: water soluble sodium silicate supplying 135 kg Si and 63 kg Na

Plot 20: rates of fertilizer in years when FYM is not applied; 30 kg N*, 15 kg P, 45 kg K

Organics (applied every 4th year)

FYM: 35 t farmyard manure supplying c. 240 kg N, 45 kg P, 350 kg K, 25 kg Na, 25 kg Mg, 40 kg S, 135 kg Ca

PM: Pelleted poultry manure (replaced fishmeal in 2003) supplying c. 65 kg N

On plot 13/2 FYM and PM (previously fishmeal) are applied in a 4-year cycle *ie*:

FYM in 2005, 2001, 1997, 1993 *etc*

PM in 2003, fishmeal in 1999, 1995, 1991 *etc*

(FYM/Fishmeal): FYM and fishmeal last applied in 1993 and 1995 respectively.

Lime

Sub-plots a, b and c: differential amounts of chalk applied, *if needed*, every three years to maintain soil pH 7, 6 and 5, respectively

Sub-plot d receives no chalk

Plots 1-13 started in 1856, plots 14-17 in 1858, plot 18 in 1865 and plots 19 and 20 in 1872.

Sub-plots range in size from 75 - 634 m²

Species comprising 10% or more of biomass and total number of species; mean 1991-2000.

For species, see list opposite.

Treatment	Plot	Soil pH 1995-02	AC	AP	AO	AE	DG	FR	HP	HL	LoP	LaP	TP	AS	CN	HS	LH	PL	RaA	RuA	SM	Total no species
Nil	3a	7.2	10	-	-	-	-	20	-	-	-	-	-	-	10	-	15	-	-	-	10	39
	b	6.4	10	-	-	-	-	20	-	-	-	-	-	-	10	-	15	10	-	-	-	36
	c	5.3	30	-	-	-	-	30	-	-	-	-	-	-	-	-	15	-	-	-	-	37
	d	5.2	45	-	-	-	-	30	-	-	-	-	-	-	10	-	-	-	-	-	-	36
Nil	12a	7.0	15	-	-	-	-	10	-	-	-	-	10	-	-	-	20	-	-	-	-	44
	b	6.3	20	-	-	-	-	20	-	-	-	-	-	-	-	-	15	-	-	-	-	42
	c	5.2	25	-	-	-	-	40	-	-	-	-	-	-	-	-	10	-	-	-	-	37
	d	5.1	30	-	-	-	-	30	-	-	-	-	-	-	-	-	15	-	-	-	-	42
Nil	2/2a	7.1	15	-	-	-	-	15	-	-	-	-	-	-	10	-	20	-	-	-	-	42
	b	6.0	10	-	-	-	-	15	-	-	-	-	-	-	10	-	15	10	-	-	-	37
	c	5.2	30	-	-	-	-	35	-	-	-	-	-	-	10	-	-	-	-	-	-	33
	d	5.1	35	-	-	-	-	30	-	-	-	-	-	-	20	-	-	-	-	-	-	33
P	4/1a	6.9	-	-	-	-	-	20	-	-	-	-	10	-	-	-	15	10	-	-	-	34
	b	6.1	-	-	-	-	-	20	-	-	-	-	-	-	-	-	10	15	10	-	-	34
	c	5.2	30	-	-	-	-	25	-	-	-	-	-	-	-	-	10	-	-	-	-	29
	d	5.3	25	-	-	-	-	25	-	-	-	-	-	-	-	-	15	-	-	-	-	32
PNaMg	8a	7.0	10	-	-	-	-	20	-	-	-	-	10	-	10	-	-	-	-	-	-	36
	b	6.1	-	-	-	-	-	20	-	-	-	-	-	-	-	-	15	-	10	-	-	37
	c	5.3	30	-	-	-	-	20	-	-	-	-	-	-	-	-	15	-	-	-	-	32
	d	5.2	30	-	-	-	-	20	-	-	-	-	-	-	-	-	10	-	-	-	-	29
PKNaMg	7a	6.9	-	-	-	15	-	-	-	-	-	15	15	-	-	-	-	10	-	-	-	27
	b	5.9	-	15	-	20	-	-	-	-	-	-	10	-	-	-	-	10	-	-	-	29
	c	5.0	25	-	-	-	-	-	-	-	-	15	10	-	15	-	-	-	-	-	-	28
	d	4.9	40	-	-	-	-	10	-	-	-	-	15	-	10	-	-	-	-	-	-	28
PKNaMg	15a	6.7	-	-	-	10	-	10	-	-	-	20	10	-	-	-	-	-	-	-	-	28
	b	5.9	-	-	-	15	-	10	-	-	-	-	20	-	-	-	-	10	-	-	-	27
	c	5.0	20	-	-	-	-	10	-	-	-	-	20	-	15	-	-	-	-	-	-	26
	d	4.9	40	-	-	-	-	10	-	-	-	-	10	-	-	-	-	-	-	-	-	27
N*1	17a	7.1	10	-	-	-	-	15	-	-	-	-	-	-	-	-	25	10	-	-	-	32
	b	6.4	15	-	-	-	-	-	-	-	-	-	-	-	-	-	30	15	-	-	-	34
	c	5.8	25	-	-	-	-	10	-	-	-	-	-	-	-	-	25	10	-	-	-	34
	d	5.8	25	-	-	-	-	10	-	-	-	-	-	-	10	-	10	-	-	-	-	34
N*1PKNaMg	16a	6.7	-	10	-	25	-	15	-	-	-	10	10	-	-	-	-	-	-	-	-	25
	b	6.2	-	10	-	25	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	25
	c	5.5	25	10	-	15	-	10	-	-	-	-	-	-	-	-	-	10	-	-	-	23
	d	5.4	35	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27
N*2PKNaMg	14/2a	6.9	-	20	-	50	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	24
	b	6.4	-	20	-	40	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	24
	c	6.1	-	20	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21
	d	5.9	-	25	-	30	10	-	-	-	-	-	-	-	-	10	-	-	-	-	-	22
N1	1a	7.1	-	-	-	-	10	25	10	-	-	-	-	-	-	-	10	-	-	-	-	33
	b	6.2	20	-	-	-	10	25	-	-	-	-	-	-	-	10	-	-	-	-	-	31
	c	5.3	35	-	-	-	-	45	-	-	-	-	-	-	-	-	-	-	-	-	-	33
	d	4.1	65	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
N2KNaMg	18a	7.1	15	-	-	-	10	15	-	-	-	-	-	-	10	-	10	-	-	-	-	30
	b	6.3	30	-	-	-	-	15	-	-	-	-	-	-	25	-	-	-	-	-	-	29
	c	5.4	35	-	-	-	15	20	-	-	10	-	-	-	-	-	-	-	-	-	-	21
	d	3.8	80	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
N2P	4/2a	6.9	10	-	-	-	-	55	-	10	-	-	-	-	-	-	-	-	-	-	-	22
	b	6.2	15	10	-	-	-	55	-	10	-	-	-	-	-	-	-	-	-	-	-	14
	c	5.2	30	-	-	-	-	55	-	-	-	-	-	-	-	-	-	-	10	-	-	18
	d	3.7	30	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
N2PNaMg	10a	6.9	10	-	-	-	-	45	-	-	-	-	-	-	-	-	-	10	-	-	-	23
	b	5.9	20	15	10	-	-	40	-	-	-	-	-	-	-	-	-	-	10	-	-	15
	c	4.9	25	-	10	-	-	50	-	-	-	-	-	-	-	-	-	-	10	-	-	16
	d	3.7	-	-	85	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	4
N2PKNaMg	9/2a	6.9	-	15	-	25	10	-	-	15	-	-	-	-	-	10	-	-	-	-	-	22
	b	6.3	-	25	-	35	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	17
	c	5.0	30	10	10	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	18
	d	3.7	15	-	65	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	4
N3PKNaMg	11/1a	6.5	-	20	-	40	10	-	-	10	-	-	-	-	-	-	-	-	-	-	-	14
	b	6.2	-	20	-	35	20	-	-	10	-	-	-	-	-	-	-	-	-	-	-	15
	c	4.9	-	30	-	20	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	13
	d	3.6	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	3
N3PKNaMgSi	11/2a	6.7	-	25	-	45	10	-	-	-	-	-	-	-	-	10	-	-	-	-	-	14
	b	5.9	-	35	-	40	10	-	-	10	-	-	-	-	-	-	-	-	-	-	-	10
	c	5.0	10	40	-	35	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	13
	d	3.7	-	-	-	-	-	-	-	95	-	-	-	-	-	-	-	-	-	-	-	4
FYM/PM	13/2a	6.8	30	-	-	-	10	15	-	-	10	-	-	-	-	-	-	-	-	-	-	28
	b	6.1	-	15	-	20	10	-	-	-	-	-	-	-	-	10	-	-	-	-	-	30
	c	5.3	20	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10	-	-	-	32
	d	5.1	35	10	-	-	-	10	-	10	-	-	-	-	-	-	-	-	-	-	-	34
FYM	19/1	5.4	45	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31
	19/2	6.1	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	30
	19/3	5.7	25	-	-	15	-	-	-	-	-	-	-	-	-	-	-	10	10	-	-	27
FYM/N*PK	20/1	5.7	35	10	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27
	20/2	6.1	-	15	-	25	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	29
	20/3	5.9	15	10	-	15	10	-	-	10	-	-	-	-	-	-	-	-	-	-	-	26

Data are rounded to the nearest 5%; absence of a value does NOT necessarily imply absence of that species. Data for plots 2/1, 9/1, 13/1, 14/1, 18/2 and 6a & b not shown.

Species identified 1991-2000. (After Crawley *et al*, 2005, The American Naturalist, **165**, 179-192)

Grasses and sedges		Forbs	
<i>Agrostis capillaris</i>	Common Bent	<i>Achillea millefolium</i>	Yarrow
<i>Alopecurus pratensis</i>	Meadow Foxtail	<i>Agrimonia eupatoria</i>	Agrimony
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	<i>Ajuga reptans</i>	Bugle
<i>Arrhenatherum elatius</i>	False Oat Grass	<i>Anenome nemorosa</i>	Wood Anenome
<i>Briza media</i>	Quaking Grass	<i>Anthriscus sylvestris</i>	Cow Parsley
<i>Bromus hordeaceus</i>	Soft Brome	<i>Bellis perennis</i>	Daisy
<i>Carex caryophyllaea</i>	Spring Sedge	<i>Capsella bursa-pastoris</i>	Shepherd's-purse
<i>Carex flacca</i>	Glaucus Sedge	<i>Cardamine pratensis</i>	Lady's Smock
<i>Cynosorus cristatus</i>	Crested Dog's-tail	<i>Centaurea nigra</i>	Common Knapweed
<i>Dactylis glomerata</i>	Cocksfoot	<i>Cerastium fontanum</i>	Common Chickweed
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	<i>Conopodium majus</i>	Pignut
<i>Elytrigia repens</i>	Common Couch	<i>Crepis capillaris</i>	Rough Hawk's-beard
<i>Festuca pratensis</i>	Meadow Fescue	<i>Filipendula ulmaria</i>	Meadowsweet
<i>Festuca rubra</i>	Red Fescue	<i>Fritillaria meleagris</i>	Snake's-head Fritillary
<i>Helictotrichon pubescens</i>	Downy Oat-grass	<i>Galium verum</i>	Lady's Bedstraw
<i>Holcus lanatus</i>	Yorkshire Fog	<i>Heracleum sphondylium</i>	Hogweed
<i>Lolium perenne</i>	Perennial Ryegrass	<i>Hieracium pilosella</i>	Mouse-ear-hawkweed
<i>Luzula campestris</i>	Field Wood-rush	<i>Hypochaeris radicata</i>	Cat's-ear
<i>Phleum pratense</i>	Timothy	<i>Knautia arvensis</i>	Field Scabious
<i>Poa annua</i>	Annual Meadow-grass	<i>Leontodon autumnalis</i>	Autumn Hawkbit
<i>Poa pratensis</i>	Smooth Meadow-grass	<i>Leontodon hispidus</i>	Rough Hawkbit
<i>Poa trivialis</i>	Rough Meadow-grass	<i>Ophioglossum vulgatum</i>	Adder's-tongue
<i>Trisetum flavescens</i>	Yellow Oat-grass	<i>Ornithogalum angustifolium</i>	Star-of-Bethlehem
Legumes		<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Lathyrus pratensis</i>	Meadow Vetchling	<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	<i>Potentilla reptans</i>	Creeping Cinquefoil
<i>Ononis repens</i>	Common Restharrow	<i>Potentilla sterilis</i>	Barren Strawberry
<i>Trifolium pratense</i>	Red Clover	<i>Primula veris</i>	Cowslip
<i>Trifolium repens</i>	White Clover	<i>Prunella vulgaris</i>	Selfheal
<i>Vicia cracca</i>	Tufted Vetch	<i>Ranunculus acris</i>	Meadow Buttercup
<i>Vicia sepium</i>	Bush Vetch	<i>Ranunculus auricomus</i>	Goldilocks Buttercup
Shrubs and trees		<i>Ranunculus bulbosus</i>	Bulbous Buttercup
<i>Quercus robur</i>	Oak	<i>Ranunculus ficaria</i>	Lesser Celandine
<i>Rosa</i> sp.	-	<i>Rumex acetosa</i>	Common Sorrel
<i>Rubus fruticosus</i>	Blackberry	<i>Rumex obtusifolius</i>	Broad-leaved Dock
Species highlighted in bold are those comprising 10%, or more, of the above ground biomass on selected treatments; see table opposite.		<i>Sanguisorba minor</i>	Salad Burnet
		<i>Senecio jacobea</i>	Common Ragwort
		<i>Senecio vulgaris</i>	Groundsel
		<i>Stachys officinalis</i>	Betony
		<i>Stellaria graminea</i>	Lesser Stichwort
		<i>Stellaria media</i>	Common Chickweed
		<i>Taraxacum officinale</i>	Dandelion
		<i>Tragopogon pratensis</i>	Goat's-beard
		<i>Veronica chamaedrys</i>	Germander Speedwell

Archived soils
from 1876



Grass sorting 1930s



Harvesting 1941



Harvesting 2005



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