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# Results of the Classical and Other Long-term Experiments 2004

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## 04/R/HB/2 - Hoos Barley

### Rothamsted Research

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04/R/HB/2

HOOS BARLEY

**Object:** To study the effects of organic manures and inorganic fertilisers on continuous s. barley. From 1968 to 1978 a rotation of potatoes, beans and s. barley was practised. The rotation was discontinued in 1979 and continued in s. barley. The experiment was modified for 2003. The Main plots continue as previously. The Silicate Test plots continue but are not split to test rates of N (basal N is applied). The remaining plots are to be used to study the effect on yield of P residues, (basal N applied).

The 153rd year, s. barley.

For previous years see 'Details' 1967 and 1973, Station Report for 1966 and 74-03/HB/2.

**Main plots**

**Treatments:**

Whole plots

1. **MANURE** Plot Fertilizers and organic manures:

		Form of N 1852-1966	Additional treatments 1852-2002	Treatments since 2003
---	11	None	-	-
-P-	21	None	P	(P)
--K	31	None	K(Na)Mg	K(Mg)
-PK	41	None	PK(Na)Mg	(P)K(Mg)
A--	12	A	-	-
AP-	22	A	P	(P)
A-K	32	A	K(Na)Mg	K(Mg)
APK	42	A	PK(Na)Mg	(P)K(Mg)
D1852	72	None	D	D
(D)	71	None	(D)	(D)
(A)	62	None	(Ashes)	(Ashes)
-	61	None	-	-
D2001 <sup>(a)</sup>	73 <sup>(a)</sup>	-	D	D
P2KMg <sup>(a)</sup>	63 <sup>(a)</sup>	-	P2KMg	P2KMg

<sup>(a)</sup> Plots 63 and 73 started in 2001

Form of N: A, sulphate of ammonia to supply 48kg N  
 P: 35 kg P as triple superphosphate in 1974 and from 1988 to 2002, single superphosphate in other years  
 (P): (none), P application to be reviewed for 2008  
 P2: 44 kg P as triple superphosphate since 2001.  
 K: 90 kg K as sulphate of potash  
 (Na): (none)16 kg Na as sulphate of soda until 1973  
 Mg: 35 kg Mg as kieserite every third year since 1974 (applied at 30 kg in 1992, 1995 and 1998) (sulphate of magnesia annually until 1973). Annually to new plot 63.  
 (Mg): (none), Mg application to be reviewed for 2008  
 D1852: Farmyard manure at 35 t since 1852.  
 D2001: Farmyard manure at 35 t since 2001  
 (D): Farmyard manure 1852 - 1871 only  
 (Ashes): Weed ash 1852-1916, furnace ash 1917-1932, none since

Sub-plots

2. **N** Nitrogen fertilizer (kg N), as 'Nitro-Chalk', since 1968 (cumulative N applications until 1973, on a cyclic system since 1974):

0

48  
96  
144

**Silicate Test plots**

**Treatments :**

Whole plots

**MANURE** Plot Fertilizers:

		Additional treatment 1852-1979	Changes since 1980	Treatments since 2003
N----	131	-	-	N3
NP---	231	P	-	N3 (P)
N-K--	331	K (Na)Mg	-	N3 K (Mg)
NPK--	431	PK (Na)Mg	-	N3 (P)K (Mg)
N--S-	134	Si	Si omitted	N3 (Si)
NP-S-	234	P Si	"	N3 (P) (Si)
N-KS-	334	K (Na)MgSi	"	N3 K (Mg) (Si)
NPKS-	434	PK (Na)MgSi	"	N3 (P)K (Mg) (Si)
N---S	132	-	Si added	N3 Si
NP--S	232	P	"	N3 (P) Si
N-K-S	332	K (Na)Mg	"	N3 K (Mg) Si
NPK-S	432	PK (Na)Mg	"	N3 (P)K (Mg) Si
N--SS	133	Si	-	N3 Si
NP-SS	233	P Si	-	N3 (P) Si
N-KSS	333	K (Na)MgSi	-	N3 K (Mg) Si
NPKSS	433	PK (Na)MgSi	-	N3 (P)K (Mg) Si

N: From 1852-1966 whole plots received 48kg N as nitrate of soda. Between 1968-2002 whole plots were split to test 4 rates of N as "Nitro-chalk" (cumulative applications until 1973, on a cyclic system from 1974).

N3: Basal N, 144kg as "Nitro-chalk" since 2003

Si: Silicate of soda at 450kg (Note: S also refers to silicate of soda)

(Si): Silicate of soda omitted since 1980

P, (P), K, Mg, (Mg), (Na): as above

**P Test plots**

**Treatments:**

Since 2003 the remaining plots [ex-Castor meal (plots 14, 24, 34 & 44) and those testing combinations of NPK with and without Mg (plots 55, 56, 57 & 58)] have been used to study the effect of P residues on yield. Previous treatments have resulted in different levels of available P in the soil. Large dressings of K were applied to some plots to increase levels of exchangeable K in the soil such that K should not limit yield; plots 141 and 241 were sacrificed and used as discard areas so that the K applications did not encroach on adjacent no K plots on the Silicate Test. Other plots received the normal rate of K. The level of exchangeable Mg in the soil is such that Mg should not limit yield; the need to apply Mg will be reviewed for 2008.

Whole plots

**Manure**

Plot	Treatment since 2003
142	N3K*
143	N3K*
144	N3K*
242	N3K*
243	N3K*
244	N3K*
341	N3K
342	N3K

343 N3K  
344 N3K  
441 N3K  
442 N3K  
443 N3K  
444 N3K  
551 N3K  
552 N3K  
561 N3K  
562 N3K  
571 N3K\*  
572 N3K\*  
581 N3K\*  
582 N3K\*

N3: Basal N, 144kg as "Nitro-chalk"  
K : 90kg K as sulphate of potash  
K\*: 450kg K as sulphate of potash

**Experimental diary:**

27-Nov-03 : T : : K, K\*, Si, Mg ( to plot 63) applied.  
28-Nov-03 : T : : P applied  
10-Dec-03 : T : : FYM, applied.  
          : B : : Ploughed 30 cm wide furrow.  
12-Feb-04 : B : : Combination drilled, Optic, tr. Raxil S, at 350  
                  seeds/m<sup>2</sup> with the Accord drill.  
21-Feb-04 : B : : Rolled.  
01-Mar-04 : B : : Avadex Excel 15G at 15 kg.  
14-Apr-04 : B : : tm) Ally at 30 g in 200 l.  
          : B : : tm) Oxytril CM at 0.5 l in 200 l.  
20-Apr-04 : T : : N (27% N).  
26-Apr-04 : B : : tm) Acanto at 0.4 l in 200 l.  
          : B : : tm) Unix at 0.4 kg in 200 l.  
06-Aug-04 : B : : Combine harvested plots for yield.  
          : B : : Combine harvested discards.  
          : B : : Sampled and weighed straw.  
01-Sep-04 : B : : Baled straw.

**NOTE:** Samples of grain and straw were taken for chemical analysis.  
Unground grain and straw samples from selected treatments were archived.

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MAIN PLOTS

GRAIN TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

N	0	48	96	144	Mean
<b>MANURE</b>					
---	0.75	0.85	0.75	1.12	0.87
-P-	1.37	2.16	2.68	2.96	2.29
--K	0.52	1.51	1.76	1.75	1.38
-PK	0.63	2.67	4.48	4.84	3.16
A--	0.55	0.85	0.75	1.36	0.88
AP-	1.56	2.13	2.12	2.16	1.99
A-K	0.64	1.02	1.51	1.43	1.15
APK	0.98	3.14	4.53	5.06	3.43
D1852	6.20	7.78	8.00	8.06	7.51
(D)	1.42	2.27	2.41	2.48	2.14
(A)	1.26	1.76	2.59	3.27	2.22
-	0.49	1.43	1.61	1.23	1.19
D2001	3.70	5.95	7.28	7.53	6.12
P2KMg	1.52	3.78	4.54	6.11	3.99
Mean	1.54	2.66	3.22	3.53	2.74

GRAIN MEAN DM% 87.3

STRAW TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

N	0	48	96	144	Mean
<b>MANURE</b>					
---	0.42	0.16	0.17	0.39	0.29
-P-	0.55	0.76	1.23	0.17	0.68
--K	0.91	0.41	0.71	0.46	0.62
-PK	0.17	0.90	1.99	1.75	1.20
A--	0.17	0.30	0.16	0.29	0.23
AP-	0.58	0.93	0.94	1.09	0.88
A-K	0.15	0.16	0.61	0.36	0.32
APK	0.16	1.17	2.05	2.06	1.36
D1852	2.87	3.17	4.05	4.04	3.53
(D)	0.22	0.83	0.72	0.85	0.65
(A)	0.21	0.71	0.89	1.41	0.81
-	0.22	0.22	0.52	0.44	0.35
D2001	1.30	2.60	3.38	4.14	2.86
P2KMg	0.33	1.66	1.95	2.48	1.60
Mean	0.59	1.00	1.38	1.42	1.10

STRAW MEAN DM% 80.9

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**SILICATE PLOTS**

**GRAIN TONNES/HECTARE**

\*\*\*\*\* Tables of means \*\*\*\*\*

	PK	N3--	N3P-	N3-K	N3PK	Mean
<b>Silicate</b>						
(-)-		1.85	2.44	1.62	5.38	2.82
(Si)-		2.04	3.91	3.42	6.43	3.95
(-)Si		2.29	3.74	2.85	5.75	3.66
(Si)Si		2.25	3.33	3.44	5.76	3.70
Mean		2.11	3.36	2.83	5.83	3.53

GRAIN MEAN DM% 82.6

**PHOSPHATE PLOTS**

**GRAIN TONNES/HECTARE**

\*\*\*\*\* Tables of means \*\*\*\*\*

<b>PLOTS</b>	
142	3.48
143	3.55
144	3.63
242	5.67
243	5.54
244	5.04
341	4.13
342	4.68
343	4.22
344	4.26
441	6.01
442	5.50
443	5.02
444	5.05
551	5.10
552	4.80
561	4.46
562	4.29
571	3.45
572	3.82
581	1.78
582	1.48
Mean	4.32

GRAIN MEAN DM% 83.6

PLOT AREA HARVESTED 0.00256