

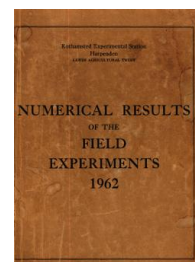
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62/W/B/4 Ley and Arable Rotations

Rothamsted Research

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62/B/4.1

LEY AND ARABLE ROTATIONS

Woburn Stackyard 1962 - the 25th year.

For history, treatments etc., see "Details of the Classical and Long Term Experiments" 1956.

Corrective K dressings (in cwt K_2O per acre, applied to sugar beet as muriate of potash half in autumn before ploughing and half broadcast on the plough furrow in February - commencing autumn 1961):-

Continuous rotations

<u>Rotation</u>	Fertiliser plots	Dung plots
Arable	3.6	3.2
Arable with hay	3.6	3.2
Lucerne	3.6	3.2
Grazed ley	1.3	0.0

Alternating rotations

<u>Last two rotations in order</u>	Fertiliser plots	Dung plots
Arable with hay/Ley	2.9	2.3
Ley/Arable with hay	3.6	3.2
Lucerne/Arable	3.6	3.2
Arable/Lucerne	3.6	3.2

Revised PK basal dressings (in cwt P_2O_5 and K_2O per acre, for all crops, commencing 1962):-

Treatment crops:

	Fertilisers* and time of application	P_2O_5	K_2O
Potatoes.	Superphosphate and muriate of potash, before ridging.	0.9	1.8
Rye.	0/14/28, combine drilled.	0.3	0.6
Carrots.	Superphosphate and muriate of potash, in seedbed.	0.6	1.8
Hay.	0/14/28, in spring, plus muriate of potash, after first cut.	0.6	1.2
Lucerne.			
1st year	Superphosphate and muriate of potash, in seedbed.	1.5	1.0
2nd year	Muriate of potash, in spring.	-	1.5
3rd year	Muriate of potash, in spring.	-	1.5
Grazed ley.			
1st year	Superphosphate and muriate of potash, in seedbed	1.5	1.0
2nd year	16/0/16, $\frac{1}{3}$ in spring, $\frac{1}{3}$ in early summer, $\frac{1}{3}$ in late summer	-	0.55
3rd year	as second year	-	0.55

*Granular compound fertilisers are described thus - 0/14/28 etc. to show percentages of N, P_2O_5 and K_2O in order.

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Test crops:-

	Fertilisers and time of application	P ₂ O ₅	K ₂ O
Sugar beet			
Fertiliser plots	Muriate of potash ploughed in, superphosphate on plough furrow	0.9	3.0 ⁺
Dung plots	superphosphate and muriate of potash on plough furrow	0.3	0.9
Barley	Superphosphate in winter	0.3	-

⁺Basal K₂O to sugar beet fertiliser plots to be equivalent to K₂O applied in dung in future.

Sub-plot fertiliser tests (in addition to basals) in cwt per acre:-

Sugar beet

All combinations of:-

'Nitro-Chalk': None; 0.72 N Magnesium sulphate: None;

Muriate of potash: None; 0.9 K₂O 500 lb per acre

Muriate of potash at 0.9 K₂O is applied in winter for barley to the sub-plots which did not receive the "test" potash for sugar beet.

Barley variety: This is now Proctor, and not Herta as hitherto.

Cultivations, etc.,

Treatment crops

Ley rotations

Ley 1st year. Ploughed twice: Aug 15 and Dec 22, 1961. Seedbed fertilisers applied: Mar 28, 1962. Seed sown at 40 lb per acre: Apr 10. Sprayed with MCPB/MCPA at 4 pints in 40 gallons per acre: May 30. 'Nitro-Chalk' applied: July 19 and Aug 16. Grazed 4 circuits: July 17 - Oct 8.

Ley 2nd year. Compound fertiliser applied: Mar 29, June 18, Aug 16, 1962. Grazed 5 circuits: May 15 - Sept 22.

Ley 3rd year. Compound fertiliser applied: Mar 29, June 20, Aug 16, 1962. Grazed 5 circuits: May 23 - Sept 30.

Lucerne 1st year. Ploughed: Aug 15, 1961. Treated for control of stem eelworm by injection of "D.D" soil fumigant at 800 lb per acre: Oct 31. Ploughed: Dec 22. Fertilisers applied: Mar 28, 1962. Seed drilled at 15 lb per acre: Apr 13. Cut twice: Aug 14 and Oct 1.

Lucerne 2nd year. Muriate of potash applied: Mar 29, 1962. Cut 3 times: June 27, Aug 14, Oct 1.

Lucerne 3rd year. Muriate of potash applied: Mar 29, 1962. Cut 3 times: June 27, Aug 14, Oct 1.

Arable rotations

Potatoes. Ploughed twice: Aug 15 and Dec 22, 1961. Fertilisers applied, potatoes machine planted: Mar 16, 1962. Earthed up: June 15. Sprayed twice with copper oxychloride fungicide at 2.3 lb Cu in 40 gallons per acre: July 23 and Aug 9. Haulm burnt off with diquat at 3 pints in 40 gallons per acre: Sept 22. Lifted: Oct 3.

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Rye. Ploughed: Sept 23, 1961. Seed combine drilled at $2\frac{1}{2}$ bushels per acre with PK compound: Oct 10. 'Nitro-Chalk' applied: Mar 30, 1962. Seeds hay mixture undersown on 4 plots: Apr 10. Combine harvested: Aug 31.

Seeds hay. Seeds undersown at 30 lb per acre in rye: Apr 11, 1961. PK compound and 'Nitro-Chalk' applied: Mar 29, 1962. Cut once: June 13. Muriate of potash and 'Nitro-Chalk' applied: June 14.

Carrots. Ploughed twice: Sept 4 and Dec 22, 1961. Fertilisers applied: Apr 24, 1962. Seed drilled at $4\frac{1}{2}$ lb per acre: Apr 27. Sprayed twice with demeton methyl at 12 fluid oz in 40 gallons per acre: May 29 and June 23. Thinned: June 29 - July 6. Lifted: Sept 19.

Test crops

Sugar beet. Dung equivalent K and half corrective K applied: Oct 23, 1961. Dung applied, all plots ploughed: Oct 25. Half corrective K, basal superphosphate and muriate of potash applied: Feb 22, 1962. 'Nitro-Chalk', "test" muriate of potash and magnesium sulphate applied, seed drilled at 7 lb per acre: Mar 21. Singled: May 30. Lifted: Sept 24.

Barley. Ground chalk applied at 40 cwt per acre: Nov 3, 1961. Ploughed: Nov 4. "Balancing" muriate of potash and basal superphosphate applied: Feb 19, 1962. Seed drilled at $2\frac{1}{2}$ bushels per acre: Feb 20. 'Nitro-Chalk' applied: Feb 23. Plots re-drilled at 1 bushel per acre (because of bird damage): Mar 21. Combine harvested: Aug 25.

Standard errors per plot. Test crops.

Sugar beet. Roots (washed)	Whole plot:	1.112 tons per acre or 7.7% (4 d.f.)
	$\frac{1}{2}$ plot:	0.590 tons per acre or 4.1% (4 d.f.)
	$\frac{1}{8}$ plot:	0.987 tons per acre or 6.9% (24 d.f.)
	$\frac{1}{16}$ plot:	0.900 tons per acre or 6.3% (32 d.f.)
Total sugar	Whole plot:	4.27 cwt per acre or 9.2% (4 d.f.)
	$\frac{1}{2}$ plot:	1.81 cwt per acre or 3.9% (4 d.f.)
	$\frac{1}{8}$ plot:	3.39 cwt per acre or 7.3% (24 d.f.)
	$\frac{1}{16}$ plot:	3.06 cwt per acre or 6.6% (32 d.f.)
Tops	Whole plot:	0.615 tons per acre or 2.7% (4 d.f.)
	$\frac{1}{2}$ plot:	1.484 tons per acre or 6.4% (4 d.f.)
	$\frac{1}{8}$ plot:	1.290 tons per acre or 5.6% (24 d.f.)
	$\frac{1}{16}$ plot:	2.225 tons per acre or 9.6% (32 d.f.)

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Standard errors per plot. Test crops.
Barley. Grain (at 85% dry matter) Whole plot: 1.10 cwt per acre or
2.6% (4 d.f.)
 $\frac{1}{2}$ plot: 1.58 cwt per acre or
3.7% (4 d.f.)

62/B/4.5

Summary of Results

Treatment crops

Ley, sheep days of grazing per acre

1st year	2nd year	3rd year
1265	1211	1397

Lucerne, dry matter: cwt per acre

	1st cut	2nd cut	3rd cut	Total
<u>1st year</u>				
Dung in 1960: tons per acre				
None	9.0	10.0		19.0
15	12.8	13.0		25.8
Difference	+3.8	+3.0		+6.8
Previous rotation				
Lucerne	8.4	9.0		17.4
Arable with hay	13.2	14.0		27.2
Mean	10.8	11.5		22.3
<u>2nd year</u>				
Dung in 1959: tons per acre				
None	17.3	16.3	14.7	48.3
15	26.8	18.3	16.4	61.5
Difference	+9.5	+2.0	+1.7	+13.2
Previous rotation				
Lucerne	19.8	18.9	14.7	53.4
Arable with roots	24.2	15.7	16.4	56.3
Mean	22.0	17.3	15.6	54.8
<u>3rd year</u>				
Dung in 1958: tons per acre				
None	13.6	10.6	7.3	31.5
15	22.4	12.2	5.8	40.4
Difference	+8.8	+1.6	-1.5	+8.9
Previous rotation				
Lucerne	15.2	10.6	5.9	31.7
Arable with hay	20.8	12.2	7.2	40.2
Mean	18.0	11.4	6.6	36.0

62/B/4.6

	<u>Treatment crops</u>		Rye	
	Potatoes		Grain:	Straw:
	Total tubers: tons per acre	Percentage ware ($1\frac{5}{8}$ " riddle)	(at 85% D.M.) cwt per acre	(at 85% D.M.) cwt per acre
Dung: tons per acre				
None	9.45	94.8	36.7	44.2
15*	11.86	94.8	34.8	45.3
Difference	+2.41	0.0	-1.9	+1.1
Previous rotation				
Ley	12.84	95.2	35.3	45.0
Lucerne	10.84	95.2	40.0	52.5
Arable with hay	10.64	94.7	31.1	36.3
Arable with roots	8.32	94.0	36.4	45.2
Mean	10.66	94.8	35.7	44.7

Hay

Yield, dry matter: cwt per acre

	1st and only cut
Dung in 1958: tons per acre	
None	52.5
15	55.5
Difference	+3.0
Previous rotation	
Lucerne	54.6
Arable with hay	53.4
Mean	54.0

Carrots

	Roots washed: tons per acre	Tops: tons per acre
Dung in 1958: tons per acre		
None	14.58	7.67
15	15.86	8.36
Difference	1.28	0.69
Previous rotation		
Ley	16.37	8.10
Arable with roots	14.07	7.94
Mean	15.22	8.02

*Dung applied: Potatoes for test crop sugar beet in 1960.
Rye for test crop sugar beet in 1959.

Mean dry matter % as harvested: Rye, Grain: 82.0
Straw: 76.8

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		1st Test crop				Mean
		Sugar beet				
		Previous rotation				
		Ley	Lucerne	Arable with hay	Arable with roots	
		<u>Roots (washed): tons per acre</u>				
Mean	(±1.112)	14.45	14.54	14.09	14.45	14.39
Dung: tons per acre						
None	(±1.188)*	13.68	13.73	13.32	13.45	13.55
15		15.22	15.35	14.87	15.45	15.22
Difference	(±0.834)	+1.54	+1.62	+1.55	+2.00	+1.67
Response to additional 0.72 cwt N per acre						
			(±0.987)			(±0.494)
No dung		-0.54	-0.78	+1.36	+0.15	+0.05
Dung 15 tons per acre		-0.03	+0.29	+0.30	+0.22	+0.19
Response to additional 0.9 cwt K ₂ O per acre						
			(±0.987)			(±0.494)
No dung		+0.18	+1.32	+0.58	-0.38	+0.43
Dung 15 tons per acre		+1.47	-0.01	-0.38	-0.16	+0.23
		<u>Sugar Percentage</u>				
Mean		15.7	15.8	16.6	16.3	16.1
Dung: tons per acre						
None		15.9	15.9	17.0	16.8	16.4
15		15.5	15.7	16.2	15.8	15.8
Difference		-0.4	-0.2	-0.8	-1.0	-0.6
Response to additional 0.72 cwt N per acre						
No dung		-1.1	-0.2	-0.8	-0.7	-0.7
Dung 15 tons per acre		-0.7	-0.7	-1.0	-0.7	-0.8
Response to additional 0.9 cwt K ₂ O per acre						
No dung		0.0	+0.6	-0.4	-0.2	0.0
Dung 15 tons per acre		-0.2	+0.1	+0.1	-0.1	0.0

*For use in horizontal and diagonal comparisons only.

62/B/4.8

		1st Test Crop				Mean
		Sugar beet				
		Previous rotation				
		Ley	Lucerne	Arable with hay	Arable with roots	
		<u>Total sugar: cwt per acre</u>				
Mean	(±4.27)	45.4	45.8	46.7	46.9	46.2
Dung: tons per acre						
None	(±4.46)*	43.6	43.6	45.2	45.2	44.4
15		47.2	48.0	48.2	48.7	48.0
Difference	(±2.56)	+3.6	+4.4	+3.0	+3.5	+3.6
Response to additional 0.72 cwt N per acre			(±3.39)			(±1.70)
No dung		-4.7	-2.9	+2.5	-1.4	-1.7
Dung 15 tons per acre		-2.1	-1.2	-1.9	-1.6	-1.7
Response to additional 0.9 cwt K ₂ O per acre			(±3.39)			(±1.70)
No dung		+0.5	+5.9	+1.0	-2.0	+1.4
Dung 15 tons per acre		+4.1	+0.2	-1.0	-0.7	+0.7
		<u>Tops: tons per acre</u>				
Mean	(±0.615)	23.96	23.82	22.16	22.64	23.15
Dung: tons per acre						
None	(±1.216)*	22.60	22.40	19.30	21.14	21.36
15		25.33	25.24	25.02	24.14	24.93
Difference	(±2.098)	+2.73	+2.84	+5.99	+3.00	+3.57
Response to additional 0.72 cwt N per acre			(±1.290)			(±0.645)
No dung		+4.20	+1.61	+5.46	+5.22	+4.12
Dung 15 tons per acre		+0.55	+3.42	+2.44	+3.02	+2.36
Response to additional 0.9 cwt K ₂ O per acre			(±1.290)			(±0.645)
No dung		+2.50	+1.29	-0.05	+0.32	+1.02
Dung 15 tons per acre		+3.10	+1.33	-0.32	+0.41	+1.13

*For use in horizontal and diagonal comparisons only.

62/B/4.9

1st Test Crop

Sugar beet

Plots receiving no additional N or K

Dung: tons per acre		Previous rotation			Mean	
		Ley	Lucerne	Arable with hay		Arable with roots
<u>Roots (washed): tons per acre</u>						
Mean	(±1.035)	14.29	14.38	14.14	14.52	14.33
None	(±1.380)*	14.26	13.94	12.75	13.50	13.61
15		14.33	14.82	15.53	15.54	15.05
Difference	(±1.469)	+0.07	+0.88	+2.78	+2.04	+1.44
<u>Sugar percentage</u>						
Mean		16.2	15.8	17.0	16.7	16.4
None		16.7	15.6	17.7	17.1	16.8
15		15.7	16.0	16.2	16.3	16.1
Difference		-1.0	+0.4	-1.5	-0.8	-0.7
<u>Total sugar: cwt per acre</u>						
Mean	(±3.78)	46.4	45.4	47.7	48.4	47.0
None	(±5.03)*	47.8	43.5	45.1	46.1	45.6
15		45.1	47.3	50.3	50.6	48.3
Difference	(±4.88)	-2.7	+3.8	+5.2	+4.5	+2.7
<u>Tops: tons per acre</u>						
Mean	(±1.167)	21.40	21.78	20.93	20.20	21.08
None	(±1.557)*	18.94	21.11	17.17	18.62	18.96
15		23.86	22.46	24.69	21.78	23.20
Difference	(±2.626)	+4.92	+1.35	+7.52	+3.16	+4.24

*For use in horizontal and diagonal comparisons only.

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1st Test Crop

Sugar beet

Previous rotation

Magnesium sulphate: lb per acre	Previous rotation				Mean
	Ley	Lucerne	Arable with hay	Arable with roots	
<u>Roots (washed): tons per acre</u>					
(±0.840)*					
None	14.28	14.47	14.01	14.44	14.30
500	14.63	14.61	14.18	14.46	14.47
Difference (±0.318)	+0.35	+0.14	+0.17	+0.02	+0.17 (±0.159)
<u>Sugar percentage</u>					
None	15.7	15.8	16.6	16.4	16.1
500	15.6	15.7	16.6	16.2	16.1
Difference	-0.1	-0.1	0.0	-0.2	0.0
<u>Total sugar: cwt per acre</u>					
(±3.14)*					
None	45.1	45.6	46.4	47.1	46.0
500	45.8	46.0	47.0	46.8	46.4
Difference (±1.08)	+0.7	+0.4	+0.6	-0.3	+0.4 (±0.54)
<u>Tops: tons per acre</u>					
(±0.860)*					
None	24.16	23.93	22.55	22.54	23.29
500	23.77	23.72	21.77	22.74	23.00
Difference (±0.787)	-0.39	-0.21	-0.78	+0.20	-0.29 (±0.393)

* for use in horizontal and diagonal comparisons only.

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2nd Test Crop

Barley

Previous rotation

Dung in 1961: tons per acre		Previous rotation				Mean
		Ley	Lucerne	Arable with hay	Arable with roots	
<u>Grain (at 85% dry matter): cwt per acre</u>						
None	(±1.11)*	43.5	41.2	40.0	40.0	41.2
15		42.7	43.4	44.9	43.9	43.7
Mean	(±0.77)	43.1	42.3	42.4	42.0	42.4
Difference	(±1.58)	-0.8	+2.2	+4.9	+3.9	+2.5 (±0.79)

Straw (at 85% dry matter): cwt per acre

None		31.8	28.9	23.7	29.2	28.4
15		35.6	36.2	32.0	32.3	34.0
Mean		33.7	32.5	27.8	30.7	31.1
Difference		+3.8	+7.3	+8.3	+3.1	+5.6

* For use in horizontal and diagonal comparisons only.

Mean dry matter % as harvested: Grain 80.0
Straw 85.0