

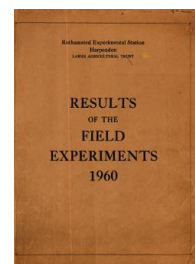
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60/W/B/7 Irrigation

Rothamsted Research

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50/B/7.1

IRRIGATION EXPERIMENT

Revised 1960 (the 10th year)

The effects of irrigation and nitrogen - Woburn Butt Close 1960.

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

The 3 course rotation is now as follows:-

- 1st year: early potatoes (following 1959 sugar beet).
- 2nd year: barley (following 1959 spring beans).
- 3rd year: winter beans (following 1959 spring wheat).

The fourth series carries a long term ryegrass ley for cutting.

Area of each whole plot (acres): Winter beans: 0.0555.

Sub plots (acres): Grass: 0.0264; remainder: 0.0277.

Area harvested (acres): Early potatoes: 0.0075; barley: 0.0110;
winter beans: 0.0177; grass: 0.0165.

Design: 4 series (1 in each crop) each containing 12 whole plots.
The bean plots are no longer split for the application of dung.

Treatments.

Early potatoes: all combinations of:-

Whole plots: Irrigation: None (0); full (C).

Weed control: normal cultivations after planting (no spray);
simazine spray at 2 lb in 40 gallons per acre (used as
pre-emergence weedkiller) without cultivations.

Sub plots: Nitrogen: None, 0.6 cwt N per acre as sulphate of
ammonia.

Note: After the early potatoes are lifted certain plots are sown
with trefoil as a green manure for barley. Provision is made
for a comparison of none v. irrigation applied to the trefoil.
No irrigation was applied in 1960.

Barley: All combinations of:-

Whole plots: Irrigation: None (0), full (C).

Sub plots: Nitrogen*: None, 0.2 cwt N per acre as 'Nitro-Chalk'.

Winter beans:

Whole plots: Irrigation: None (0), three systems (A, B, C -
see below).

Grass: all combinations of:-

Whole plots: Irrigation: None (0), full (C).

Potash: None, 0.6 cwt K_2O per acre as muriate of potash
applied after the 1st cut and once again in mid-season.

Sub plots: Nitrogen*: None, 0.3 cwt N per acre as 'Nitro-Chalk'
in spring and after each cut except the last.

*Note: In addition to basal dressing.

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Rainfall and Irrigation: inches

Week ending	Rain-fall	Grass	Barley	Potatoes	Beans		
		C	C	C	A	B	C
May 2	0.13	0.50	0.50	0.50	-	0.50	0.50
9	0.02	0.50	-	-	-	0.50	0.50
16	0.89	0.62	-	-	-	0.50	0.50
23	0.23	-	0.50	-	-	0.50	0.50
30	0.01	0.50	0.50	0.50	-	0.67	0.67
June 6	-	0.67	0.50	0.50	0.67	0.67	0.67
13	1.26	-	-	-	-	-	-
20	0.68	-	-	-	0.20	-	0.20
27	1.68	0.50	-	0.75	-	-	-
July 4	0.01	-	-	-	-	-	-
11	1.23	-	-	-	-	-	-
18	1.19	-	-	-	-	-	-
25	0.37	-	-	-	-	-	-
Aug 1	0.38	-	-	-	-	-	-
8	0.23	-	-	-	-	-	-
15	0.88	-	-	-	-	-	-
22	0.16	-	-	-	-	-	-
29	0.87	0.50	-	-	-	-	-
Sept 5	1.60	-	-	-	-	-	-
12	0.16	-	-	-	-	-	-
19	1.52	-	-	-	-	-	-
26	(0.63)	-	-	-	-	-	-
Oct 3	(0.64)	-	-	-	-	-	-
Total	14.77	3.79	2.00	2.25	0.87	3.34	3.54

Basal dressings (per acre):

Early potatoes: 0.60 cwt N as sulphate of ammonia; 0.75 cwt P_2O_5 and 1.50 cwt K_2O as compound fertiliser (14% P_2O_5 , 28% K_2O).
 Barley: 0.2 cwt N, 0.2 cwt P_2O_5 and 0.3 cwt K_2O as compound fertiliser (12% N, 12% P_2O_5 , 18% K_2O).
 Winter beans: 0.3 cwt P_2O_5 , 0.6 cwt K_2O placement drilled as compound fertiliser (10% P_2O_5 , 20% K_2O).
 Grass: 0.3 cwt N as 'Nitro-Chalk' in spring and again after each cut except the last, and 0.6 cwt P_2O_5 and 1.2 cwt K_2O as compound fertiliser (14% P_2O_5 , 28% K_2O).

Cultivations, etc.:

Early potatoes: Ploughed: Nov 20, 1959. PK compound applied: Apr 4, 1960. Sulphate of ammonia applied: Apr 6. Machine planted: Apr 7. Appropriate plots sprayed with simazine: Apr 15. Earthed up (except simazine plots): June 4. Haulm destroyed mechanically: July 13. Lifted: July 15. Trefoil sown at 30 lb per acre: July 21. Variety: Arran Pilot.

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Barley: Ground chalk applied at 3 tons per acre: Sept 8, 1959.
Ploughed: Sept 9 and Nov 21. Seed drilled at $2\frac{1}{4}$ bushels per acre: Mar 19, 1960. Fertilisers applied: Mar 21. Sprayed with DMBP at 10 pints in 80 gallons per acre: May 16. Combine harvested: Aug 13. Variety: Proctor.

Winter beans: Ploughed: Sept 7, 1959. Seed placement drilled at 275 lb per acre with PK compound: Nov 5. Harvested: Aug 10 and Aug 26, 1960. Variety: Rothamsted S.Q.

Grass: Ground chalk applied at 18 cwt per acre: Sept 23, 1959. Seed sown at 30 lb per acre: Oct 20. 'Nitro-Chalk' and PK compound applied: Apr 1, 1960. Cut 8 times (all plots): May 10, May 31, June 22, July 18, Aug 8, Aug 30, Sept 23, Nov 8. 'Nitro-Chalk' applied after each cut except the last. Muriate of potash applied to appropriate plots after 1st and 4th cuts. Variety: S22 Italian ryegrass.

Standard errors per plot.

Early potatoes. Total tubers

Whole plot: 0.708 tons per acre or 7.2% (4 d.f.)

Sub plot: 0.630 tons per acre or 6.4% (8 d.f.)

Barley, (grain at 85% dry matter)

Whole plot: 2.51 cwt per acre or 10.2% (8 d.f.)

Sub plot: 2.25 cwt per acre or 9.1% (10 d.f.)

Winter bean, (grain at 85% dry matter)

Whole plot: 2.80 cwt per acre or 9.5% (6 d.f.)

Cut grass, dry matter

1st cut:

Whole plot: 0.58 cwt per acre or 7.3% (6 d.f.)

Sub plot: 1.44 cwt per acre or 18.2% (8 d.f.)

Total of cuts 2-4

Whole plot: 2.03 cwt per acre or 4.2% (6 d.f.)

Sub plot: 1.98 cwt per acre or 4.1% (8 d.f.)

Total of cuts 5-8

Whole plot: 1.48 cwt per acre or 3.7% (6 d.f.)

Sub plot: 2.59 cwt per acre or 6.6% (8 d.f.)

Total of all 8 cuts

Whole plot: 2.55 cwt per acre or 2.7% (6 d.f.)

Sub plot: 3.96 cwt per acre or 4.1% (8 d.f.)

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Summary of Results

Early potatoes, Total tubers: tons per acre

Weed control	Irrigation		Weed control		Mean
	0	C	Normal cultivation	Simazine spray	
Normal cultivation	9.73	11.97			
Simazine spray	7.88	9.56			
N: cwt per acre including basal					
	$(\pm 0.483)^{**}$		$(\pm 0.257)^*$		
0.6	8.12	9.65	9.98	7.79	8.89
1.2	9.50	11.88	11.71	9.66	10.69
Mean	8.81	10.76	10.85	8.72	9.79
	(± 0.289)				
Difference (± 0.364)	1.38	2.23	1.73	1.87	1.80 (± 0.257)

Barley, (Grain at 85% dry matter): cwt per acre

N: cwt per acre including basal	Irrigation		Mean
	0	C	
	(± 1.21)		
0.2	19.2	23.3	21.3
0.4	26.8	29.4	28.1
Mean (± 1.03)	23.0	26.4	24.7
Difference (± 1.30)	7.6	6.1	6.8 (± 0.92)

Winter beans, (Grain at 85% dry matter): cwt per acre

Irrigation				
0	A	B	C	Mean
22.6	26.3	34.5	34.2	29.4
	(± 1.61)			

* For use in vertical and interaction comparisons only.

** For use in horizontal and diagonal comparisons only.

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Cut grass, Dry matter: cwt per acre

		1st cut				
K ₂ O: cwt per acre (including basal) in 1959	Irrigation				K ₂ O: cwt per acre including basal	Mean
	0	C				
	(±0.33)					
1.2	7.4	7.5				
2.4	4.8	11.8				
N: cwt per acre			1.2	2.4		
	(±0.48)*		(±0.48)*			
0.3	5.8	9.5	8.0	7.3	7.7	
0.6	6.4	9.7	6.9	9.2	8.0	
Mean (±0.24)	6.1	9.6	7.4	8.3	7.9	
Difference (±0.83)	+0.6	+0.2	-1.1	+1.9	+0.3 (±0.59)	

Total of cuts 2 - 4

		Irrigation				
K ₂ O: cwt per acre including basal	Irrigation				K ₂ O: cwt per acre including basal	Mean
	0	C				
	(±1.17)					
1.2	41.4	51.5				
1.8	44.5	55.7				
N: cwt per acre			1.2	1.8		
	(±1.01)*		(±1.01)*			
0.3	41.7	48.7	44.2	46.3	45.2	
0.6	44.1	58.4	48.6	53.9	51.3	
Mean (±0.83)	42.9	53.6	46.4	50.1	48.3	
Difference (±1.14)	2.4	9.7	4.4	7.6	6.1 (±0.81)	

*For use in horizontal and diagonal comparisons only.

Mean dry matter \bar{x} as cut:

1st cut: 20.9

Total of cuts 2 - 4: 19.0

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Cut grass, Dry matter: cwt per acre

Total of cuts 5 - 8

K ₂ O: cwt per acre including basal	Irrigation		K ₂ O: cwt per acre including basal		Mean
	0	C			
	(±0.85)				
1.2	38.9	35.4			
2.4	40.8	43.1			
N: cwt per acre	(±0.96)*		(±0.96)*		
			1.2	2.4	
0.3	36.7	36.9	35.0	38.7	36.8
0.6	43.0	41.5	39.3	45.2	42.3
Mean (±0.60)	39.9	39.2	37.2	41.9	39.5
Difference (±1.50)	+6.3	+4.6	+4.3	+6.5	+5.5 (±1.06)

Total of cuts 1 - 8

K ₂ O: cwt per acre including basal	Irrigation		K ₂ O: cwt per acre including basal		Mean
	0	C			
	(±1.47)				
1.2	87.7	94.3			
2.4	90.1	110.6			
N: cwt per acre	(±1.55)*		(±1.55)*		
			1.2	2.4	
0.3	84.2	95.2	87.1	92.3	89.7
0.6	93.5	109.7	94.9	108.3	101.6
Mean (±1.04)	88.9	102.5	91.0	100.3	95.7
Difference (±2.29)	9.3	14.5	7.8	16.0	11.9 (±1.62)

*For use in horizontal and diagonal comparisons only.

Mean dry matter % as cut:
 Total of cuts 5 - 8: 15.0
 Total of cuts 1 - 8: 17.3