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Saxmundham Rotation II experimental details, 1969-1986

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Description:

- **Page 1:** Cover Page
- **Pages 2-3:** Saxmundham Rotation II experimental plan, P treatments and crop sequence, 1969-1986
- **Pages 4-5:** Saxmundham Rotation II fertilizer N applications 1969-1986
- **Page 6:** Saxmundham Rotation II %SOC, pH and exchangeable K, 1968-1982

Site: Saxmundham Experimental Station, Suffolk, UK. Latitude 52.22 N, Longitude 1.47 W

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Saxmundham Rotation II Experimental plan, P treatments and cropping 1969-1986

For fertilizer N applications see separate sheet

The experiment receives basal K

Blocks	Micro-plots	Main strips							
		8	7	6	5	4	3	2	1
A	01	(1)(3) 1	(0)(0) 0	(1)(1+1+1) 1	(3)(1+1+1) 0	(3)(3) 0	(3)(1+1+1) 0	(2)(3) 1	(3)(3) 0
	02	(0)(0) 0	(0)(1+1+1) 0	(0)(0) 0	(2)(3) 1	(0)(1+1+1) 0	(1)(1+1+1) 1	(0)(0) 0	(2)(1+1+1) 1
	03	(2)(1+1+1) 1	(2)(1+1+1) 1	(2)(3) 1	(0)(0) 0	(0)(0) 0	(0)(0) 0	(3)(1+1+1) 0	(0)(1+1+1) 0
	04	(3)(3) 0	(1)(3) 1	(3)(1+1+1) 0	(1)(1+1+1) 1	(1)(3) 1	(2)(3) 1	(0)(3) 0	(1)(3) 1
	05	(0)(1+1+1) 0	(3)(3) 0	(0)(3) 0	(0)(3) 0	(2)(1+1+1) 1	(0)(3) 0	(1)(1+1+1) 1	(0)(0) 0
B	06	(3)(1+1+1) 0	(2)(3) 1	(0)(0) 0	(0)(1+1+1) 0	(0)(3) 0	(3)(3) 0	(3)(3) 0	(0)(3) 0
	07	(0)(0) 0	(1)(1+1+1) 1	(0)(1+1+1) 0	(2)(1+1+1) 1	(3)(1+1+1) 0	(1)(3) 1	(0)(0) 0	(0)(0) 0
	08	(2)(3) 1	(3)(1+1+1) 0	(1)(3) 1	(0)(0) 0	(2)(3) 1	(0)(1+1+1) 0	(2)(1+1+1) 1	(1)(1+1+1) 1
	09	(0)(3) 0	(0)(0) 0	(3)(3) 0	(1)(3) 1	(1)(1+1+1) 1	(0)(0) 0	(1)(3) 1	(3)(1+1+1) 0
	10	(1)(1+1+1) 1	(0)(3) 0	(2)(1+1+1) 1	(3)(3) 0	(0)(0) 0	(2)(1+1+1) 1	(0)(1+1+1) 0	(2)(3) 1
C	11	(0)(0) 0	(1)(1+1+1) 1	(0)(0) 0	(2)(1+1+1) 1	(3)(1+1+1) 0	(0)(1+1+1) 0	(2)(1+1+1) 1	(3)(1+1+1) 0
	12	(3)(1+1+1) 0	(0)(0) 0	(2)(1+1+1) 1	(3)(3) 0	(2)(3) 1	(2)(1+1+1) 1	(3)(3) 0	(1)(1+1+1) 1
	13	(1)(1+1+1) 1	(3)(1+1+1) 0	(0)(1+1+1) 0	(1)(3) 1	(0)(0) 0	(1)(3) 1	(0)(1+1+1) 0	(2)(3) 1
	14	(2)(3) 1	(2)(3) 1	(3)(3) 0	(0)(0) 0	(0)(3) 0	(0)(0) 0	(1)(3) 1	(0)(0) 0
	15	(0)(3) 0	(0)(3) 0	(1)(3) 1	(0)(1+1+1) 0	(1)(1+1+1) 1	(3)(3) 0	(0)(0) 0	(0)(3) 0
D	16	(3)(3) 0	(0)(0) 0	(2)(3) 1	(2)(3) 1	(0)(1+1+1) 0	(0)(3) 0	(0)(0) 0	(2)(1+1+1) 1
	17	(1)(3) 1	(3)(3) 0	(0)(0) 0	(1)(1+1+1) 1	(1)(3) 1	(3)(1+1+1) 0	(3)(1+1+1) 0	(0)(0) 0
	18	(0)(1+1+1) 0	(2)(1+1+1) 1	(1)(1+1+1) 1	(3)(1+1+1) 0	(3)(3) 0	(0)(0) 0	(0)(3) 0	(1)(3) 1
	19	(2)(1+1+1) 1	(1)(3) 1	(0)(3) 0	(0)(0) 0	(2)(1+1+1) 1	(1)(1+1+1) 1	(1)(1+1+1) 1	(0)(1+1+1) 0
	20	(0)(0) 0	(0)(1+1+1) 0	(3)(1+1+1) 0	(0)(3) 0	(0)(0) 0	(2)(3) 1	(2)(3) 1	(3)(3) 0

(a)(b) c

43.89m

P treatments	per hectare	per hectare	
Main plots/strips	every 4th year	total	
	1899-1964	1965-1968	
1	None	None	Because of the treatments up until 1968 the following strips are sometimes considered as pairs:- 1 & 2
2	25.1 t FYM	None	
3	25.1 t FYM + 410.8 kg I	None	
4	25.1 t FYM + 410.8 kg I	100.4 t FYM	
5	25.1 t FYM + 410.8 kg I	100.4 t FYM + 246.6 kg P	
6	25.1 t FYM + 410.8 kg I	246.6 kg P	
7	25.1 t FYM + 410.8 kg I	493.2 kg P	
8	25.1 t FYM + 821.5 kg I	None	

Treatments to microplots, 1969-1986 (1986 was the final year of the experiment in this form).

- (a) (b) c**
- (a)** 0, 0, 1, 2, 3: 0, 0, 27.4, 54.8, 82.2 kg P/ha
in 1969 & 1971 to Blocks A & B and in 1970 & 1972 to Blocks C & D
- (b)** 0, 3: 0, 82.2 kg P/ha applied between 1973 to 1975 to Blocks A & B
and between 1974 to 1976 to Blocks C & D (see *note below)
No P was applied to the crop harvested in 1977.
- c** 0, 1: 0, 52.4 kg P/ha applied every other year;
autumn 1977, 1979, 1981, 1983 & 1985 to Blocks A & B,
(ie to crops harvested in 1978, 1980, 1982, 1984 and 1986)
autumn 1978, 1980, 1982 & 1984 to Blocks C & D,
(ie to crops harvested in 1979, 1981, 1983 and 1985).

1973-1976

* Note: between 1973-75 on Blocks A & B (1974-76 on Blocks C & D) P was applied as either one dressing of 82.2 kg/ha (3) in 1973 (or 1974) or as three equal dressings of 27.4 kg/ha (1+1+1; total 82.2 kg/ha), applied annually in 1973-75 (or 1974-76). One microplot in each group of five remained as P0. Microplots in any one strip within pairs of Blocks (A & B, C & D) and within pairs of Main Strips (1 & 2, 3 & 8, 4 & 6, 5 & 7) were considered, so that, as far as possible, the revised treatments could be 'balanced', with regard to their previous treatment. Thus, if one of the previous P0 and the P2 treatment in microplots 01-05 of Strip 1 became (1+1+1) and the previous P1 and P3 treatments became (3) then the opposite was done on microplots 06-10 and on microplots 01-05 of Strip 2 etc

Block	Cropping sequence 1969-1986																	
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A	P	B	SB	B	P	B	B	B	WW	B	WW	Be	WW	WW	WW	Be	WW	WW
B	SB	B	P	B	SB	B	B	B	WW	B	WW	Be	WW	WW	WW	Be	WW	WW
C		P	B	SB	B	P	B	B	B	WW	B	WW	Be	WW	WW	WW	Be	WW
D		SB	B	P	B	SB	B	B	B	WW	B	WW	Be	WW	WW	WW	Be	WW

P = potatoes; B = spring barley; SB = sugar beet; WW = winter wheat; Be = beans

Saxmundham Rotation II Residual P microplots 1969-86. Amounts of N applied

No fresh P applied to A&B blocks, 1976-77 or to C&D blocks, 1977-78.

Note: see below for amounts of N applied
(N1 - N5 are not the same for each crop)

In plot order

P Treatment			Block	Plot No.	Basal N (See below)															
1969&71	1973-75	1978 > 1979			1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
3	3	0	A	101								2	2	0	3	3	3	0	4	4
2	3	1	A	102								2	2	0	3	3	3	0	4	4
0	3	0	A	103								1	1	0	2	2	2	0	3	3
1	3	1	A	104								3	3	0	4	4	4	0	5	5
0	0	0	A	105								4	4	0	5	5	5	0	6	6
0	3	0	B	106								2	2	0	3	3	3	0	4	4
0	0	0	B	107								3	3	0	4	4	4	0	5	5
1	3	1	B	108								1	1	0	2	2	2	0	3	3
3	3	0	B	109								4	4	0	5	5	5	0	6	6
2	3	1	B	110								4	4	0	5	5	5	0	6	6
3	3	0	C	111								1	1	1	0	2	2	2	0	3
1	3	1	C	112								4	4	4	0	5	5	5	0	6
2	3	1	C	113								1	1	1	0	2	2	2	0	3
0	0	0	C	114								2	2	2	0	3	3	3	0	4
0	3	0	C	115								3	3	3	0	4	4	4	0	5
2	3	1	D	116								3	3	3	0	4	4	4	0	5
0	0	0	D	117								1	1	1	0	2	2	2	0	3
1	3	1	D	118								2	2	2	0	3	3	3	0	4
0	3	0	D	119								4	4	4	0	5	5	5	0	6
3	3	0	D	120								3	3	3	0	4	4	4	0	5
2	3	1	A	201								1	1	0	2	2	2	0	3	3
0	0	0	A	202								2	2	0	3	3	3	0	4	4
3	3	0	A	203								1	1	0	2	2	2	0	3	3
0	3	0	A	204								3	3	0	4	4	4	0	5	5
1	3	1	A	205								4	4	0	5	5	5	0	6	6
3	3	0	B	206								3	3	0	4	4	4	0	5	5
0	0	0	B	207								1	1	0	2	2	2	0	3	3
2	3	1	B	208								3	3	0	4	4	4	0	5	5
1	3	1	B	209								2	2	0	3	3	3	0	4	4
0	3	0	B	210								4	4	0	5	5	5	0	6	6
2	3	1	C	211								2	2	2	0	3	3	3	0	4
3	3	0	C	212								2	2	2	0	3	3	3	0	4
0	3	0	C	213								1	1	1	0	2	2	2	0	3
1	3	1	C	214								3	3	3	0	4	4	4	0	5
0	0	0	C	215								4	4	4	0	5	5	5	0	6
0	0	0	D	216								3	3	3	0	4	4	4	0	5
3	3	0	D	217								4	4	4	0	5	5	5	0	6
0	3	0	D	218								2	2	2	0	3	3	3	0	4
1	3	1	D	219								1	1	1	0	2	2	2	0	3
2	3	1	D	220								4	4	4	0	5	5	5	0	6
3	3	0	A	301								2	2	0	3	3	3	0	4	4
1	3	1	A	302								3	3	0	4	4	4	0	5	5
0	0	0	A	303								4	4	0	5	5	5	0	6	6
2	3	1	A	304								2	2	0	3	3	3	0	4	4
0	3	0	A	305								1	1	0	2	2	2	0	3	3
3	3	0	B	306								4	4	0	5	5	5	0	6	6
1	3	1	B	307								1	1	0	2	2	2	0	3	3
0	3	0	B	308								2	2	0	3	3	3	0	4	4
0	0	0	B	309								3	3	0	4	4	4	0	5	5
2	3	1	B	310								4	4	0	5	5	5	0	6	6
0	3	0	C	311								3	3	3	0	4	4	4	0	5
2	3	1	C	312								1	1	1	0	2	2	2	0	3
1	3	1	C	313								4	4	4	0	5	5	5	0	6
0	0	0	C	314								2	2	2	0	3	3	3	0	4
3	3	0	C	315								1	1	1	0	2	2	2	0	3
0	3	0	D	316								4	4	4	0	5	5	5	0	6
3	3	0	D	317								3	3	3	0	4	4	4	0	5
0	0	0	D	318								1	1	1	0	2	2	2	0	3
1	3	1	D	319								2	2	2	0	3	3	3	0	4
2	3	1	D	320								3	3	3	0	4	4	4	0	5
3	3	0	A	401								4	4	0	n*	n*	n*	0	6	6
0	3	0	A	402								3	3	0	4	4	4	0	5	5
0	0	0	A	403								2	2	0	3	3	3	0	4	4
1	3	1	A	404								1	1	0	2	2	2	0	3	3
2	3	1	A	405								4	4	0	5	5	5	0	6	6
0	3	0	B	406								4	4	0	5	5	5	0	6	6
3	3	0	B	407								2	2	0	n*	n*	n*	0	4	4
2	3	1	B	408								2	2	0	3	3	3	0	4	4
1	3	1	B	409								3	3	0	4	4	4	0	5	5
0	0	0	B	410								1	1	0	2	2	2	0	3	3
3	3	0	C	411								3	3	3	0	n*	n*	n*	0	5
2	3	1	C	412								3	3	3	0	4	4	4	0	5
0	0	0	C	413								4	4	4	0	5	5	5	0	6
0	3	0	C	414								1	1	1	0	2	2	2	0	3
1	3	1	C	415								2	2	2	0	3	3	3	0	4
0	3	0	D	416								2	2	2	0	3	3	3	0	4
1	3	1	D	417								4	4	4	0	5	5	5	0	6
3	3	0	D	418								1	1	1	0	n*	n*	n*	0	3
2	3	1	D	419								1	1	1	0	2	2	2	0	3
0	0	0	D	420								3	3	3	0	4	4	4	0	5
3	3	0	A	501								2	2	0	n*	n*	n*	0	4	4
2	3	1	A	502								2	2	0	3	3	3	0	4	4
0	0	0	A	503								4	4	0	5	5	5	0	6	6
1	3	1	A	504								3	3	0	4	4	4	0	5	5
0	3	0	A	505								1	1	0	2	2	2	0	3	3
0	3	0	B	506								2	2	0	3	3	3	0	4	4
2	3	1	B	507								4	4	0	5	5	5	0	6	6
0	0	0	B	508								3	3	0	4	4	4	0	5	5
1	3	1	B	509								1	1	0	2	2	2	0	3	3
3	3	0	B	510								4	4	0	n*	n*	n*	0	6	6
2	3	1	C	511								1	1	1	0	2	2	2	0	3
3	3	0	C	512								1	1	1	0	n*	n*	n*	0	3
1	3	1	C	513								4	4	4	0	5	5	5	0	6
0	0	0	C	514								2	2	2	0	3	3	3	0	4

0	3	0	C	515	3	3	3	0	4	4	4	0	5
2	3	1	D	516	3	3	3	0	4	4	4	0	5
1	3	1	D	517	2	2	2	0	3	3	3	0	4
3	3	0	D	518	3	3	3	0	n*	n*	n*	0	5
0	0	0	D	519	1	1	1	0	2	2	2	0	3
0	3	0	D	520	4	4	4	0	5	5	5	0	6
1	3	1	A	601	2	2	0	3	3	3	0	4	4
0	0	0	A	602	4	4	0	5	5	5	0	6	6
2	3	1	A	603	3	3	0	4	4	4	0	5	5
3	3	0	A	604	3	3	0	n*	n*	n*	0	5	5
0	3	0	A	605	1	1	0	2	2	2	0	3	3
0	0	0	B	606	3	3	0	4	4	4	0	5	5
0	3	0	B	607	2	2	0	3	3	3	0	4	4
1	3	1	B	608	4	4	0	5	5	5	0	6	6
3	3	0	B	609	1	1	0	n*	n*	n*	0	3	3
2	3	1	B	610	1	1	0	2	2	2	0	3	3
0	0	0	C	611	2	2	2	0	3	3	3	0	4
2	3	1	C	612	4	4	4	0	5	5	5	0	6
0	3	0	C	613	3	3	3	0	4	4	4	0	5
3	3	0	C	614	4	4	4	0	n*	n*	n*	0	6
1	3	1	C	615	1	1	1	0	2	2	2	0	3
2	3	1	D	616	2	2	2	0	3	3	3	0	4
0	0	0	D	617	1	1	1	0	2	2	2	0	3
1	3	1	D	618	3	3	3	0	4	4	4	0	5
0	3	0	D	619	4	4	4	0	5	5	5	0	6
3	3	0	D	620	2	2	2	0	n*	n*	n*	0	4
0	0	0	A	701	2	2	0	3	3	3	0	4	4
0	3	0	A	702	3	3	0	4	4	4	0	5	5
2	3	1	A	703	1	1	0	2	2	2	0	3	3
1	3	1	A	704	4	4	0	5	5	5	0	6	6
3	3	0	A	705	1	1	0	n*	n*	n*	0	3	3
2	3	1	B	706	3	3	0	4	4	4	0	5	5
1	3	1	B	707	2	2	0	3	3	3	0	4	4
3	3	0	B	708	3	3	0	n*	n*	n*	0	5	5
0	0	0	B	709	1	1	0	2	2	2	0	3	3
0	3	0	B	710	4	4	0	5	5	5	0	6	6
1	3	1	C	711	3	3	3	0	4	4	4	0	5
0	0	0	C	712	4	4	4	0	5	5	5	0	6
3	3	0	C	713	2	2	2	0	n*	n*	n*	0	4
2	3	1	C	714	2	2	2	0	3	3	3	0	4
0	3	0	C	715	1	1	1	0	2	2	2	0	3
0	0	0	D	716	3	3	3	0	4	4	4	0	5
3	3	0	D	717	4	4	4	0	n*	n*	n*	0	6
2	3	1	D	718	4	4	4	0	5	5	5	0	6
1	3	1	D	719	1	1	1	0	2	2	2	0	3
0	3	0	D	720	2	2	2	0	3	3	3	0	4
1	3	1	A	801	4	4	0	5	5	5	0	6	6
0	0	0	A	802	2	2	0	3	3	3	0	4	4
2	3	1	A	803	1	1	0	2	2	2	0	3	3
3	3	0	A	804	1	1	0	2	2	2	0	3	3
0	3	0	A	805	3	3	0	4	4	4	0	5	5
3	3	0	B	806	3	3	0	4	4	4	0	5	5
0	0	0	B	807	1	1	0	2	2	2	0	3	3
2	3	1	B	808	3	3	0	4	4	4	0	5	5
0	3	0	B	809	4	4	0	5	5	5	0	6	6
1	3	1	B	810	2	2	0	3	3	3	0	4	4
0	0	0	C	811	4	4	4	0	5	5	5	0	6
3	3	0	C	812	2	2	2	0	3	3	3	0	4
1	3	1	C	813	3	3	3	0	4	4	4	0	5
2	3	1	C	814	2	2	2	0	3	3	3	0	4
0	3	0	C	815	1	1	1	0	2	2	2	0	3
3	3	0	D	816	4	4	4	0	5	5	5	0	6
1	3	1	D	817	1	1	1	0	2	2	2	0	3
0	3	0	D	818	2	2	2	0	3	3	3	0	4
2	3	1	D	819	4	4	4	0	5	5	5	0	6
0	0	0	D	820	3	3	3	0	4	4	4	0	5

Basal fertilizer N (ie applied to all plots, not a treatment)

From 1969 to 1977 crops received different amounts of basal N fertilizer as follows:-

Potatoes received 251 kg N/ha

Sugar beet received 188 kg N/ha

S. barley in 1970 received 126 kg N/ha; in 1971, 1972, 1973, 1975 (blocks A & B), 1976 (blocks C & D), 100 kg N/ha; in 1974 (blocks A & B) and 1975 (blocks C & D) 82 kg N/ha

S. barley in 1976 (block A) and in 1977 (block C) received 63 kg N/ha; in 1976 (block B) and 1977 (block D) received 94 kg N/ha

W. wheat in 1977 received 50 kg N/ha at drilling and 126 kg N/ha in spring

N fertilizer treatments:

Spring barley in 1978 and 1979 received N1, N2, N3, N4 = 30, 60, 90, 120 kgN/ha

Winter wheat in 1978, 1979 and 1980 received N1, N2, N3, N4 = 40, 80, 120, 160 kgN/ha plus 50kg/ha at drilling

Beans in 1980, 1981, 1984 and 1985 did not receive N fertilizer.

Winter wheat in 1981, 1982, 1983, 1984 received N2, N3, N4, N5 = 80, 120, 160, 200 kgN/ha plus 40 kg/ha at drilling (except 50 kg/ha for crop in 1984)

Winter wheat in 1985, 1986 received N3, N4, N5, N6 = 120, 160, 200, 240 kgN/ha plus 45 kg/ha at drilling

To 'balance' (as far as possible) the 4 levels of applied N across the previous P treatments and levels of Olsen P, the above scheme was devised.

For example, looking at Strips 1 and 2 (Blocks A and B; sub-plots 101-110 and 201-210) for 1978:- N1, N2, N3, N4 was superimposed on

subplots with least P (in blue above) and with maintenance P (in red). To achieve the 4 N rates on soils which had previously received P3, subplots on

pairs of strips were used i.e. Strips 1 & 2 (in green above). The other pairs of Strips were 3 & 8, 4 & 6, 5 & 7.

n* : From 1981 on Blocks A & B, and from 1982 on Blocks C & D, some plots (the P3, P0 treatment) on Strips 4, 6, 5, 7 are missing from the above scheme; these plots marked 'n*' were used for an ¹⁵N trial (Powlson et al, 1992, J. Ag. Sci. 118, 83-100; Hart et al, 1993, J. Ag. Sci. 121, 355-362)
Yields are not given for these plots.

Saxmundham Rotation II Residual P microplots.

0-23cm surface soils sampled in spring.

Soils sampled with 2.5cm diameter semi-cylindrical auger, bulking c. 12-15 cores per microplot

Air dried and ground

		Treatments until 1968		<u>% Organic C by Tinsley</u>		
		per hectare every 4th year	per hectare total			
Main strip	1899-1964		1965-1968	1969	1977/78	1981/82
1	None		None	1.14	1.04	1.04
2	25.1 t FYM		None	1.35	1.16	1.15
3	25.1 t FYM + 410.8 kg P		None	1.42	1.15	1.19
4	25.1 t FYM + 410.8 kg P		100.4 t FYM	1.59	1.30	1.27
5	25.1 t FYM + 410.8 kg P		100.4 t FYM + 246.6 kg P	1.64	1.30	1.32
6	25.1 t FYM + 410.8 kg P		246.6 kg P	1.54	1.29	1.28
7	25.1 t FYM + 410.8 kg P		493.2 kg P	1.55	1.28	1.30
8	25.1 t FYM + 821.5 kg P until 1952		None	1.46	1.27	1.29
				<u>pH in 0.01 M CaCl₂</u>		
				1968	1977/78	1981/82
1	None		None	7.45	7.25	7.04
2	25.1 t FYM		None	7.32	7.17	6.98
3	25.1 t FYM + 410.8 kg P		None	7.25	7.12	6.80
4	25.1 t FYM + 410.8 kg P		100.4 t FYM	7.16	7.05	6.82
5	25.1 t FYM + 410.8 kg P		100.4 t FYM + 246.6 kg P	7.19	7.12	6.90
6	25.1 t FYM + 410.8 kg P		246.6 kg P	7.24	7.10	6.92
7	25.1 t FYM + 410.8 kg P		493.2 kg P	7.28	7.18	7.02
8	25.1 t FYM + 821.5 kg P until 1952		None	7.33	7.19	7.00
				<u>Exchangeable K, mg/kg</u>		
				1970/71	1977/78	
1	None		None	172	198	
2	25.1 t FYM		None	184	199	
3	25.1 t FYM + 410.8 kg P		None	160	189	
4	25.1 t FYM + 410.8 kg P		100.4 t FYM	183	204	
5	25.1 t FYM + 410.8 kg P		100.4 t FYM + 246.6 kg P	178	202	
6	25.1 t FYM + 410.8 kg P		246.6 kg P	165	192	
7	25.1 t FYM + 410.8 kg P		493.2 kg P	164	188	
8	25.1 t FYM + 821.5 kg P until 1952		None	151	178	

The soil contained 0.3 - 0.6 % CaCO₃ in 1968; chalk was applied to some plots in autumn 1984.