FORESTRY COMMISSION
BULLETIN No. 37

Experiments on Nutrition Problems in Forest Nurseries

VOLUME II

SUPPORTING TABLES

By
BLANCHE BENZIAN, B.Sc.
ROTHAMSTED EXPERIMENTAL STATION

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(Volume I comprises Text and Main Tables)

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FOREWORD

This present volume is the second of a series of four, which are arranged as follows:

Nursery Experiments

First volume: text, summary tables, diagrams, photographs
Second volume: detailed supporting tables

Forest Experiments

Third volume: text, summary tables, diagrams
Fourth volume: detailed tables

The first and second volumes of this Bulletin No. 37, which deal with nursery experiments, form the major part of the work. This second volume (which was prepared first) contains a full and, at the same time, as concise a statement as possible of the detailed results for each individual experiment. Drawing on all available evidence, the first volume discusses those subjects which were regarded as the most important for an understanding of the nutritional problems investigated and the most useful for an improvement of nursery practice.

The third and fourth volumes (to be published later) will summarize results from the so-called 'forest extension' experiments, which test the performance, during the establishment period in the forest, of seedlings and transplants grown with different treatments in the nursery. Linked with these 'extension experiments' were tests on fertilizers applied in the forest—usually during the year of planting; these will also be described. The third volume containing text, and the fourth volume containing only tabular statements, will match in general presentation the first and second volumes respectively.

The **First Volume** is divided into: Part A—General, Part B—Seedbed experiments, Part C—Transplant experiments, Résumé and Appendix; it also contains four supplementary papers by other authors. Parts B and C deal mainly with the period 1945 to 1956, for which detailed results are shown in this present (second) volume. For most of the experiments, which were continued beyond that date, it has been possible to include more recent evidence.

The first volume is written in such a way that it can be read without reference to this second volume. The third and fourth volumes, to be issued later, need to be read in conjunction with the first and second volumes.

Second Volume

The detailed tabular statements of this second volume are also grouped into several parts: A. General, B. Seedbeds, C. Transplants, Appendix and Supplementary Tables; the latter accompany one of the supplementary papers.

Part A. This section contains tables giving descriptions of soils (by B. W. Avery)[1] and histories of each nursery site, weather data, and also particulars of fertilizers (inorganic and organic), bulky organic manures, partial sterilants and all other chemicals used as experimental treatments. Chemical analyses are given for composts and other bulky organic manures, as well as for the raw materials from which the composts were made.

Parts B and C. Results are presented for all nursery experiments on tree crops between 1945 and 1956; the only experiments omitted up to that date are those on poplars and a few small trials dealing with silvicultural rather than nutritional questions. To allow the working up and summarizing of the large mass of data, it was necessary to confine the detailed results shown in the tables of this second volume to the twelve-year period ending 1956; this constitutes nearly 85 per cent of the total number of 'experiment-years' for the period up to and including 1962.

The experiments are grouped into 'Series of experiments'—111 series for seedbeds and 52 for transplants; each series comprises experiments of similar design and treatments, usually started in the same year. Thus, the smallest series would be one consisting of an experiment conducted at a single site on a single crop and lasting only one year; on the other hand, one of the larger series may include as many as six sites, and five species, and may have lasted more than 10 years. A separate table is devoted to each series; in addition to the results stated in terms of height and plant number, it shows design and lay-out, details of treatment application and dates of sowing or lining out. For reasons discussed in Chapter 4 of Volume I, end-of-season height was chosen as the main index of performance; plant number (often in condensed form) is shown for most experiments. The appropriate standard errors are also listed. Results for many of the other attributes of the crop—such as dry weight and chemical analyses are being summarized, and it is intended to publish them later.

Appendix. This contains Nursery Cropping-Histories.

Supplementary Tables. These support the paper by Goodey in the first volume of this Bulletin.

[1] Compiled from data supplied by G. D. Ashley, B. W. Avery, P. Bullock, C. B. Crampton, D. C. Findlay and R. A. Jarvis.

Part A

GENERAL

Table 1

WAREHAM NURSERY

LOCATION AND SIZE OF NURSERY

County Dorset Grid reference SY/883928 Nursery area 4 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 100 ft. O.D. Gently undulating.

Slope, aspect and exposure

Even slopes of less than 2° to north-west, falling to a shallow depression in sections H and G. Sheltered by plantations.

Geology

Bagshot beds (varicoloured sands with seams of pipe-clay) overlaid by flinty drift of local origin.

Cultivated soil

Dark grey, strongly acid, humose sand with some flints, derived from the upper horizons of a sandy podzol; eroded by rain-wash on bare sloping ground.

Soil Profile characteristics

Apart from the shallow depression passing through sections H and G, where gley-podzols subject to subsoil waterlogging are encountered, the profile exhibits the characteristics of a well-developed humus-iron podzol. The bleached sand layer (A_2 horizon) is at least 6 inches thick over the greater part of the site and extends to below 24 inches at some points near the south end; the succeeding humus-enriched B_1 horizon, averaging 6 inches in thickness is compact and weakly cemented; the boundary between this layer and the underlying ochreous B_2 horizon, which is appreciably richer in clay, is marked by a nearly continuous thin pan or zone of maximum cementation, which appears to impede drainage where undisturbed by cultivation. The deep subsoil is variable in texture, often becoming sandier with depth and containing numerous angular flints of drift origin.

CLIMATE

mean values (1945-1957)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.6	2.5	1.7	2.4	1.9	2.1	2.7	3.7	3.2	4.0	3.8	33.7
Rain days	17	14	12	11	12	11	10	15	16	13	16	17	164
Temp (°F)	40	40	44	48	53	58	62	62	58	53	47	43	51
Sunshine (hours)	62	82	137	207	226	234	232	225	145	118	71	53	1792

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Calluna heath. The south-west half of the area (which subsequently became Sections 3,4,5 and 6 of the nursery) had been maintained as a fire ride for many years and was first ploughed following burning in 1936; in 1940 it was cultivated using a tractor-drawn agricultural cultivator. The north-east half was burned whenever the south-west half was ploughed. The nursery (comprising Sections 1 to 8) was opened in 1943; it was extended to the south-east in 1945, along the line of the fire ride. This extension provided the ground for the first experiments of this investigation.

Ground preparation for formation of nursery

In 1943 the whole of the south-west half and part of the north-east half was ploughed to a depth of 9 inches. In 1945, when the nursery was extended, the ground needed for seedbeds was harrowed and the remaining part of the north-east half was ploughed.

Cropping, manuring and liming in the years preceding experiments

None

Seedbed Cover used in the years immediately preceding experiments

None (see previous paragraph).

Experiments started 1945

Table 2

DEERLEAP NURSERY

LOCATION AND SIZE OF NURSERY

County Hampshire Grid reference SU/344085 Nursery area 6.8 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 70 ft. O.D. Plateau remnant.

Slope, aspect and exposure

<1° north-west. Exposure moderate.

Geology

Barton Sand (light brown or light yellowish brown fine sandy loam, frequently mottled), underlain by Bracklesham Beds clay, and modified at the surface in the central and southern parts of the nursery by flinty drift ('Plateau Gravel').

Cultivated soil

Very dark grey, strongly acid, loamy sand, flinty on the experimental site, resulting from admixture of the upper horizons of a humus-iron podzol.

Soil Profile characteristics

Below the cultivated layer on the experimental plot there is a compact B_1 horizon of very dark brown humose sand, followed by a brown fine sandy loam B_2 horizon about 3 in. thick. This overlies a layer of light brown fine sandy loam with strong brown mottling, merging below into a light olive-grey fine sandy clay loam with yellowish-brown mottling. Drainage is impeded to some extent by a clayey substratum (probably derived from the Bracklesham Beds) which at the centre of the nursery rises to within a foot of the surface.

CLIMATE

mean values (1947-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.6	1.9	2.4	1.9	2.0	2.8	3.2	3.3	4.0	3.4	32.8
Rain days	16	13	14	12	13	10	11	14	14	13	15	16	160
Temp (°F)	40	38	44	48	54	59	62	62	58	52	46	42	50
Sunshine (hours)	57	80	132	192	216	212	216	203	146	117	70	49	1690

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Young Scots pine plantation with ground vegetation dominated by *Calluna*, but containing some *Molinia*. Fires spreading from an adjacent railway had run through the area repeatedly, damaging the plantation but not burning much of the surface humus. The nursery was opened in 1946 and extended in 1947.

Ground preparation for formation of nursery

Deep-ploughed and cultivated; some levelling of site.

Cropping, manuring and liming in the years preceding experiments

The nursery was cropped with seedbeds annually for the first few years of its existence, without any fallowing or green cropping.

Seedbed Cover used in the years immediately preceding experiments

3/8 inch natural gravel (non-calcareous) from Ringwood, Hants.

Remarks

Yields in the first year of cropping were very much above the (then) average, both in numbers and size of plant produced. The nursery was closed down in 1956.

Experiments started in 1946 on a site which had not previously carried conifer seedbeds.

Table 3

RINGWOOD NURSERY

LOCATION AND SIZE OF NURSERY

County Hampshire | Grid reference SU/121097 | Nursery area 80 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 160 ft. O.D. Dissected low plateau.

Slope, aspect and exposure

Even slope of <2° to west. Sheltered by plantations on west and north. Slightly exposed to the east.

Geology

Bagshot Beds (varicoloured sands with seams of pipe-clay) overlaid by flinty drift ('Plateau Gravel').

Cultivated soil

Dark greyish-brown, moderately acid, loamy sand with some flints, becoming dark grey with conspicuous bleached sand grains along the western side, which appears to have been reclaimed from heath or woodland in comparatively recent times. As the soil has a weak, unstable structure, the clods formed by cultivation quickly break down under the impact of rain, and development of a compact, impervious layer below the normal depth of ploughing causes periodic waterlogging of the surface layer.

Soil Profile characteristics

A clear soil boundary, apparently corresponding with a former difference in land-use or vegetation, bisects the site from north to south.

To the east of this boundary, the sub-surface horizon consists of brown loamy sand, becoming increasingly gravelly below 18 inches, with weak gley effects indicating a tendency to seasonal wetness. Along the lower lying western side, there is little gravel in the subsoil, and the profile has the characters of a gley-podzol. The subsoil horizons are variable, and have been disturbed locally, but a sub-surface layer of bleached sand, followed by a more compact, humose B_1 horizon, can generally be identified. Below this, there are traces of a ferruginous B_2 horizon in places; elsewhere the material below the zone of humus accumulation is wet, mottled with grey and yellow, and is clearly subject to long-period waterlogging. In the adjoining plantation, the bleached sand layer extends to 30 inches in places.

CLIMATE

mean values (1947-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.6	1.9	2.4	1.9	2.0	2.8	3.2	3.3	4.0	3.4	32.8
Rain days	16	13	14	12	13	10	11	14	14	13	15	16	160
Temp (°F)	40	38	44	48	54	59	62	62	58	52	46	42	50
Sunshine (hours)	57	80	132	192	216	212	216	203	146	117	70	49	1690

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Eastern side - agricultural land used for corn or roots; western side - rough grazing, said to have been boggy and to have had a ground vegetation of *Molinia coerulea* and heather. The nursery was opened between 1926 and 1928, and extended in 1939.

Ground preparation for formation of nursery

Not known.

Cropping, manuring and liming in the years preceding experiments

Four-course rotation of greencrops, transplants (2 years) and seedbeds. For the first eight years very little was added to the soil except decomposed weeds; for the next nine years, rhododendron peat was added, at about 12 tons per acre, sometimes mixed with farmyard manure or dried blood. In the three years immediately preceding experiments, composts made from straw, leaf mould and pine litter (with dried blood as activator) were applied. Other materials used occasionally in composts included stable and poultry manure, hopwaste, potato haulms, straw, lupins and mustard. Part of the nursery was put down to grass ley which was dug in without cutting the grass.

Seedbed Cover used in the years immediately preceding experiments

3/8 inch gravel (non-calcareous) from Ringwood, Hampshire.

Remarks

The lower part of Section 7 and adjacent sections have occasionally been so wet and soft that men attempting to walk over them have sunk in and have had to be pulled out.

In 1946 - a good growing season - 2-year old Sitka spruce seedlings were observed to be yellow, stunted and embedded in a mass of weeds.

Experiments started 1947, Section 9 (renumbered Section 7 in July 1947).

Table 4

BRAMSHILL NURSERY
Elvetham Section

LOCATION AND SIZE OF NURSERY

County Hampshire Grid reference SU/796555 Nursery area 13.5 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 230 ft. O.D. Edge of low plateau.

Slope, aspect and exposure

c. 2° south-east. Exposure moderate.

Geology

Bracklesham Beds, modified at the surface by thin spread of flinty drift.

Cultivated soil

Dark grey, acid, humose sand, ashy grey and liable to blow when dry, resulting from admixture of the upper horizons of a humus-iron podzol.

Soil Profile characteristics

The bleached A_2 horizon most of which has generally been incorporated in the cultivated layer, is followed by a compact, black, humose B_1 horizon 2-5 inches thick. In the upper part of the experimental section this lower humose horizon is strongly expressed and clearly retains appreciable amounts of moisture. Below it is a B_2 horizon of strong brown loamy, sand, followed by light olive or greenish grey sand with pronounced yellow mottling at depth, indicative of drainage impedance.

CLIMATE

mean values (1950-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.0	4.9	2.5	2.7	2.0	1.3	2.8	4.4	3.2	0.7	6.1	1.9	34.5
Rain days	16	22	18	18	16	10	14	21	20	10	24	18	208
Temp (°F)	40	42	44	46	52	60	62	60	58	50	46	39	50
Sunshine (hours)	42	66	114	178	168	254	207	173	103	93	58	36	1493

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Calluna heath, with poor quality Scots pine. Area severely burned in July 1947. Nursery was opened in 1947 and extended in 1949. The area used for experiments was on the 1949 extension.

Ground preparation for formation of nursery

Soil broken up by giant rotovator. As much vegetation as possible was removed by cultivator. The area was then deep ploughed using Solo-trac plough; this was followed by more cultivation.

Cropping, manuring and liming in the years preceding experiments (Section 2)

The first crop was Scots pine, sown in 1949 and was given superphosphate (c. 5 g.P per sq.yd.) at the time of bed preparation, plus a topdressing of potassium chloride (8 g.K per sq.yd.) and hoof and horn (9 g.N per sq.yd.). Experiments were laid out on the site of the Scots pine seedbeds in the following year.

Seedbed Cover used in the years immediately preceding experiments

¼ inch crushed flint (non-calcareous) from Yateley pit, Hants.

Remarks

The area allocated for experiments (Section 2) was considered by the local staff to have been poorer than the remainder of the nursery. The first crop was a failure, seedlings being lost after germination. Heather beetle was thought to be partly responsible.

Experiments started 1950, Section 2.

Table 5

KENNINGTON NURSERIES
(Old Kennington and Kennington Extension)

LOCATION AND SIZE OF NURSERY

County Berkshire Grid reference SP/518029 Nursery area 7½ acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

220-240 ft. O.D. Gentle footslope, merging into Thames terrace.

Slope, aspect and exposure

Nearly level in Old Kennington (original nursery), gentle in Kennington Extension, with even slope of c. 1-2° to east. Exposure slight to east and north, sheltered by woods to west.

Geology

Corallian of variable lithology, including yellow sands with interbedded seams of grey clay and coarse-textured, flaggy, detrital limestone. The surface soil contains scattered flints and quartzose pebbles of drift origin, as well as limestone fragments.

Cultivated soil

Near-neutral to moderately acid sandy loam with occasional flints and quartzose pebbles of drift origin. Fragments of flaggy limestone are turned up by the plough in places, notably in Kennington Extension. The surface readily caps after heavy rain, and is eroded by rain-wash, leading to appreciable accumulation of sandy soil at the lower ends of sloping plots.

Soil Profile characteristics

The soil is predominantly of brown-earth type, with a sub-surface horizon of brown sandy loam to sandy clay loam. Below 18 inches the subsoil is variable in character, reflecting the complex lithology of the underlying rocks; over the greater part it consists of yellowish, calcareous sand, with more or less inter-mixed seams and lamellae of grey clay, but in Kennington Extension, and locally elsewhere, beds of limestone rock are encountered at 15-27 inches, overlain by several inches of stiff, dark brown sandy clay loam. Under-drainage is generally satisfactory, but is impeded locally by seams of clay, and on low ground in the east of the old nursery the profile is of a gley type, with dull yellowish and mottled sub-surface horizons. Under cultivation, a compact layer tends to form immediately below the normal depth of ploughing, and causes appreciable water-logging after heavy rain.

CLIMATE

mean values (1945-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	1.9	1.7	1.7	1.5	2.5	2.0	1.8	2.7	2.2	2.1	2.6	2.1	24.8
Rain days	15	13	11	12	13	12	11	13	14	12	15	17	158
Temp (°F)	38	39	43	48	54	58	63	62	58	51	45	42	50
Sunshine (hours)	54	77	125	184	192	183	193	178	129	103	63	53	1535

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nurseries

Old Kennington (Kennington I) established on old pasture; converted to nursery in 1925.

Kennington Extension (Kennington II), adjoining Old Kennington, was established in 1945 on ground which had been under oats for three years following old pasture.

Ground preparation for formation of nurseries

Ploughed and cultivated.

Cropping, manuring and liming in the years preceding experiments

Old Kennington. Each Section has been used both for experiments and for stock production.

Section 1 received 100-120 tons F.Y.M. during the period 1925-1947 and 2 cwt. steamed boneflour on two occasions.

Section 4 received up to 70 tons F.Y.M. and 40 tons of compost. The southern half of the Section was more regularly manured than the northern half. No phosphatic fertilizers were applied in this Section.

Section 5. Between 1926 and 1946 this section was cropped with seedlings or transplants and fallowed periodically up to 1933. In the fallow period mustard or lupins were grown. Bulky organic manures were applied in 1933, 1937, 1942 and 1944, using farmyard manure, horse-dung or hopwaste compost. In 1933, the second greencrop was given a topdressing of ammonium sulphate. In 1937 part of the area had a topdressing of lime, dried blood and broadleaf humus. Ashes from burnt refuse were spread in 1926. In 1947 and 1948 the Section was under a grass ley and in 1949 it carried Sitka spruce transplants.

Section 6. From the first ploughing until 1945, when nutrition experiments were laid out, this Section had only been given two dressings of manure and both these were applied only to parts of the Section. In 1937, part was given horse manure at 20 tons per acre, and in 1944 was greencropped with a 'Mashlum' mixture and was given hopwaste compost at 20 tons and bonemeal at 5 cwt. per acre. Ashes were spread in 1926. Most of the time the ground was cropped with transplants or left bare. There were seedbeds only from 1927-9.

Section 8. This area received nothing in the period 1925-1941 apart from some ashes (1926) and compost soil (1933). Since 1943 compost was applied in most years, so that during the period between then and 1953 the main parts of the Section received 180 tons of compost - as hopwaste compost in 1943-48 and bracken-hopwaste compost in 1949-53. In addition, either bonemeal, boneflour or superphosphate were applied at 5 to 8 cwt. per acre on five occasions during this period.

Kennington Extension. No cropping, manuring or liming between last oat crop and first seedbed experiments.

Seedbed Cover used in the years immediately preceding experiments

Old Kennington. Partly ¼ inch Thames river gravel (calcareous) and partly Leighton Buzzard sand (non-calcareous).

Experiments started 1945.

Table 6

BAGLEY NURSERY (Research)

LOCATION AND SIZE OF NURSERY

County Berkshire Grid reference SP/510022 Nursery area 1.1 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 340 ft. O.D. Dissected plateau.

Slope, aspect and exposure

Slight even slope to east of 1-2°. Sheltered by woodland on all sides.

Geology

Plateau Gravel drift thinning to east over Kimmeridge clay.

Cultivated soil

Very dark grey, strongly acid, pebbly loamy sand becoming finer in texture, less stony and more poorly drained towards the eastern side, where the surface may remain waterlogged for periods of several weeks.

Soil Profile characteristics

On the west side, in Section 4, the profile has the characters of a gley-podzol, the upper horizons of which have been disturbed by cultivation. Beneath the characteristic podzol B horizons, which are coarse textured, compact yellow and pale grey, mottled, stony, sandy clay is encountered at below 15 inches. Further east, in Section 1, the profile progressively assumes the characteristics of a strongly acid surface-water gley, having a pale coloured, rust-mottled, loamy sub-surface horizon overlying stiff mottled clay with sandy pockets.

CLIMATE

mean values (1945-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	1.9	1.7	1.7	1.5	2.5	2.0	1.8	2.7	2.2	2.1	2.6	2.1	24.8
Rain days	15	13	11	12	13	12	11	13	14	12	15	17	158
Temp (°F)	38	39	43	48	54	58	63	62	58	51	45	42	50
Sunshine (hours)	54	77	125	184	192	183	193	178	129	103	63	53	1535

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Old woodland; large oak and sycamore on part of the area (Sections 1 and 2) and a 40-year old European larch plantation on the other part (Sections 3 and 4). The nursery was opened in 1939 (Sections 1 and 2) and extended in 1945 (Sections 3 and 4).

Ground preparation for formation of nursery

Stumps of oak and sycamore were dug out by hand, and larch stumps carefully removed by hand winch. Some soil was brought in from outside the nursery to fill up the holes left by the stumps. The ground was ploughed and repeatedly harrowed to level.

Cropping, manuring and liming in the years preceding experiments

Compost, at 20 tons per acre, was regularly applied to seedbeds and to transplants; the compost was made of bracken, hops, etc. Those parts of sections not in use were bare fallowed, or green cropped with lupins. Section 1 received four applications of hopwaste compost during the period 1939-45. Section 4 was given no compost before being used for experiments.

Seedbed Cover used in the years immediately preceding experiments

Leighton Buzzard Sand (non-calcareous).

Experiments started 1945.

Table 7

WYTHAM NURSERY

LOCATION AND SIZE OF NURSERY

County Berkshire | Grid reference SP/460080 | Nursery area 0.75 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 450 ft. O.D. Hilly, ground sloping down to west and north.

Slope, aspect and exposure

4° south-west. Exposure slight to south-west.

Geology

Corallian (lower Calcareous Grit) sand with seams of clay, overlaid in places by slipped masses of Coral Rag limestone.

Cultivated soil

Mainly greyish brown to brown, acid, stoneless fine sandy loam, becoming finer in texture along the north-western side. At the southern corner there is a small patch of very calcareous soil, probably derived from a detached fragment of Coral Rag.

Soil Profile characteristics

Over the greater part of the site, the profile is of brown-earth type, but the subsoil horizons are variable in texture. In the commonest type of profile encountered there is a sub-surface horizon of yellowish-brown, fine sandy loam, which passes down into paler coloured, sandy material containing patches and seams of grey clay. Elsewhere the subsoil consists of yellow-brown fine sandy clay loam or sandy clay with grey mottlings indicating slight drainage impedance. In the patch at the southern corner, noted above, the soil is a greyish brown clay loam containing fragmentary limestone, resting below 18 inches on yellowish fine sandy loam.

CLIMATE

mean values (1945-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	1.9	1.7	1.7	1.5	2.5	2.0	1.8	2.7	2.2	2.1	2.6	2.1	24.8
Rain days	15	13	11	12	13	12	11	13	14	12	15	17	158
Temp (°F)	38	39	43	48	54	58	63	62	58	51	45	42	50
Sunshine (hours)	54	77	125	184	192	183	193	178	129	103	63	53	1535

SITE HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Open woodland with sparse sycamore, mostly coppice; ground vegetation consisting mainly of dense vigorous bracken. Nursery opened in December 1945.

Ground preparation for formation of nursery

Trees dug out by hand, dead bracken cleared by hand, and whole area ploughed. Uncropped ground cultivated frequently during the first summer to eradicate bracken.

Cropping, manuring and liming in the years preceding experiments

None.

Seedbed Cover used in the years immediately preceding experiments

None. (see previous paragraph)

Experiments started 1946

Table 8

AMPTHILL NURSERY

LOCATION AND SIZE OF NURSERY

County Bedfordshire Grid reference TL/069382 Nursery area 5.5 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 275 ft. O.D. Spur of plateau with steep slopes to south and west.

Slope, aspect and exposure

Section 4 nearly level; Section 1 includes a valley-head bounded by short slopes of up to 5°. Sheltered by forest on east, south and west sides; open to north.

Geology

Lower Greensand (varicoloured sand and sand-rock with concretionary ironstone) overlaid by sandy glacial drift.

Cultivated soil

Brown, slightly acid to near-neutral, loamy coarse sand with some flints, quartzite pebbles and fragments; more stony and brighter in colour on convex slopes where erosion has occurred, and correspondingly deeper in the neighbouring depression. The surface readily caps after heavy rain, and sets hard if dry weather follows.

Soil Profile characteristics

Uniformly of brown earth type, with a sub-surface horizon of reddish-brown loamy sand to sandy loam; much slabby iron-stone occurs at around 18-24 inches, below which coarse, yellowish sand (probably Lower Greensand *in situ*) is commonly encountered. Under cultivation, a compact layer tends to form below the normal depth of ploughing, and impedes drainage to some extent.

CLIMATE

mean values (1949-1956)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	1.8	1.9	1.6	1.5	2.3	1.7	2.3	2.7	1.9	2.1	2.9	1.7	24.3
Rain days	13	14	11	12	12	11	11	14	13	13	15	16	155
Temp (°F)	38	37	42	46	52	58	61	61	57	50	43	41	49
Sunshine (hours)	57	76	123	176	196	197	203	192	150	110	63	54	1596

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Agricultural land; carried allotments for a short period during 1914-18 war. Nursery opened in 1920.

Ground preparation for formation of nursery

Probably ploughed.

Cropping, manuring and liming in the years preceding experiments

Rotation of greencrop (rape and mustard), seedbeds and transplants. Seedbeds and transplant beds treated with composts (bracken, ride trimmings and dried blood), greencrops with NPK fertilizer. Lime applied over most of the nursery. Sections 1 and 4 were fallowed for two to three years starting in 1947, in order to clean the ground (which had become very weedy) and to eliminate cockchafer.

Seedbed Cover used in the years immediately preceding experiments

Sand from Leighton Buzzard (non-calcareous).

Remarks

In 1947 the nursery was considered suitable for hardwoods and conifer transplants but not for conifer seedbeds because of heavy weed infestation (*Poa annua*).

Experiments were confined to two Sections forming part of the original nursery opened in 1920.

Experiments started 1949, Sections 1 and 4.

Table 9

NAGSHEAD NURSERY

LOCATION AND SIZE OF NURSERY

County Gloucestershire Grid reference SO/608086 Nursery area 14½ acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

300-330 ft. O.D. Head of shallow valley.

Slope, aspect and exposure

c. 2° north. Sheltered by adjacent woodland.

Geology

Carboniferous (Coal Measures) sandstone. Hard, grey, flaggy, slightly micaceous sandstone with some red, ferruginous staining.

Cultivated soil

Dark brown, stony, fine sandy loam, with a near-neutral reaction. Local, darker-coloured patches indicate old charcoal heaths or places where charcoal was dumped before spreading, as was done in the early days of the nursery.

Soil Profile characteristics

The profile is characteristic of a well-drained, acid brown earth, with a subsoil of brown to strong brown, very stony loam. On the higher parts of the slope where the experimental plots were sited, the surface is moderately stony, and weathered sandstone becomes dominant at about 18 inches. Lower down the slope, the subsoil is thicker and more retentive of moisture. This may be due in part to the presence of shale bands at no great depth, but augering revealed little evidence of imperfect drainage.

CLIMATE

mean values (1947-1950)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	3.1	3.2	4.0	3.3	3.2	1.8	2.2	3.0	3.1	3.4	3.6	3.1	36.9
Rain days						no data							
Temp (°F)	40	38	43	47	52	59	61	61	58	51	44	40	49
Sunshine (hours)	46	65	126	158	194	201	191	185	131	91	56	51	1497

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Oak woodland, planted 1809-14. Nursery opened 1905 and extended during 1918 to 1920.

Ground preparation for formation of nursery

Trees felled and cleared, stumps blown out, ground double dug.

Cropping, manuring and liming in the years preceding experiments

Three-course rotation of green crops (mustard, lupins or potatoes), seedbeds and transplants. Greencrops received farmyard manure, ammonium sulphate, hoof and horn, phosphate, and bonemeal at different times. Lime was applied in early years. Leaf mould was sometimes applied prior to sowing and transplanting.

Seedbed Cover used in the years immediately preceding experiments

3/8 inch coarse sand (non-calcareous) from Trellech, Monmouthshire.

Remarks

There was no indication of any fall-off in productivity in the years immediately preceding these experiments.

Experiments started 1947 Section 18, 1948 Section 27.

Table 10

TAIR ONEN NURSERY

LOCATION AND SIZE OF NURSERY

County: Glamorganshire | Grid reference: ST/035743 | Nursery area: 78 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

300-425 ft. O.D. Plateau dissected by shallow valleys.

Slope, aspect and exposure

General slope of c. 1° to north-north-west, steepening along the margins of the valleys to 3-4°. Plateau dissected by shallow valleys. Moderately exposed.

Geology

Carboniferous limestone, overlain in the south-east corner by Rhaetic sandstone.

Cultivated soil

Mainly dark brown loam to silt loam (over limestone), with finer textured silty clay loams on some of the valley sides and lighter sandy loams over sandstone. Soil reaction ranges from about 4.8 to 7.3.

Soil Profile characteristics

The soils are well-drained brown earths. Most of them contain hard limestone fragments, but in the absence of added lime the fine earth is non-calcareous and slightly to moderately acid in reaction. In each of the experimental sections except 175, there is a sub-surface horizon of yellowish brown to yellowish red, friable loam, passing below 17 inches into a stiffer reddish brown silty clay loam to silty clay with blocky structure, which rests on limestone at variable depths, normally at least 24 inches. In section 175, the soil is derived partly from sandstone, and has a subsoil of reddish-yellow, friable, sandy loam to loam.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	4.2	3.4	3.9	3.2	3.4	1.8	3.4	5.8	4.4	4.9	5.7	4.4	48.3
Rain days	20	14	8	14	8	17	10	15	11	15	12	12	156
Temp (°F)	40	38	43	46	52	56	60	60	57	51	45	41	49
Sunshine (hours)	44	69	115	179	208	222	208	204	125	101	66	52	1593

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

30-40 acres were arable; the remainder was rough grazing, covered with rough grass, bramble, bracken, gorse and scrub. Oldest part of nursery opened in 1936.

Ground preparation for formation of nursery

Woody growth cut and burned; grass and bracken ploughed in. 5 cwt. lime said to have been applied to selected sections.

Cropping, manuring and liming in the years immediately preceding experiments

Three-year rotation of transplants, seedbeds and greencrops. Manures and fertilizers included farmyard manure (20 tons per acre), bracken-hopwaste compost (20 tons per acre), hoof, horn, ammonium sulphate, superphosphate and potassium chloride.

Seedbed Cover

3/16 inch calcareous grit from the sea shore at Porthcawl (11% $CaCO_3$). Also some hard Carboniferous Limestone chips (90% $CaCO_3$).

Remarks

A general fall-off in productivity has been observed during the life of the nursery. The 1947 experiments were sited on an acid part of the nursery where calcareous sand or limestone seedbed covers had not been used.

Experiments started

1947 Compartment 175 (recent extension)
1948 Compartments 7 and 24
1950 Compartments 193 and 194 (recent extension)

Table 11

WYKEHAM MOOR

LOCATION AND SIZE OF NURSERY

County Yorkshire Grid reference SE/943889 Nursery area 5 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 650 ft. O.D. Dipslope-plateau of Tabular Hills.

Slope, aspect and exposure

Nearly level - sheltered by plantation.

Geology

Corallian (Lower Calcareous Grit) sandstones, deeply weathered and disturbed by frost action, with inclusions of silty material containing far-travelled stones.

Cultivated soil

Very dark grey, moderately acid, loamy fine sand with numerous sandstone fragments and traces of *Calluna* derived from the upper horizons of a podzol.

Soil Profile characteristics

A section exposed nearby reveals a shallow gleyed podzol profile with a nearly continuous thin, iron-humus pan (disrupted by ploughing), at about 18 inches below the surface, overlying compact brownish-yellow, stony, loamy sand, with some yellow and grey mottling in the upper part, and containing brown silty inclusions as above.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.3	1.9	1.9	2.1	1.8	3.1	1.9	1.7	3.5	2.8	28.1
Rain days	16	16	15	13	13	12	12	13	12	11	16	17	164
Temp (°F)	37	37	40	45	49	56	59	58	56	50	43	39	47
Sunshine (hours)	31	67	107	151	181	195	178	167	112	90	54	35	1369

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Acquired for plantation in 1928 but left as fire ride. Deep ploughed using RLR plough in 1943 and levelled. Site colonized by *Erica spp.* and *Calluna vulgaris* which was bulldozed off in 1946 when the experimental seedbeds were laid down.

Ground preparation for formation of nursery

See above.

Cropping, manuring and liming in the years preceding experiments

None.

Seedbed Cover used in years immediately preceding experiments

None. (see previous paragraph)

Experiments started 1947

Table 12

HARWOOD DALE NURSERY

LOCATION AND SIZE OF NURSERY

County Yorkshire Grid reference SE/966985 Nursery area 8.6 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 640 ft. O.D. Undulating upland.

Slope, aspect and exposure

Nearly level. Exposure moderate to severe.

Geology

Estuarine Series (silty shales and fine grained sandstones) with thin locally-derived drift.

Cultivated soil

Very dark grey fine sandy loam 6 in. thick with occasional sandstone pebbles, derived from a shallow gley-podzol. When dry the soil becomes powdery and is liable to blow, but is waterlogged in wet seasons.

Soil Profile characteristics

The subsoil consists of yellowish brown loam to clay loam, more or less mottled and humus stained, overlying compact, weathering, fine-grained sandstone and shale at 18-24 inches.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.3	1.9	1.9	2.1	1.8	3.1	1.9	1.7	3.5	2.8	28.1
Rain days	16	16	15	13	13	12	12	13	12	11	16	17	164
Temp (°F)	37	37	40	45	49	56	59	58	56	50	43	39	47
Sunshine (hours)	31	67	107	151	181	195	178	167	112	90	54	35	1369

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Heathland; dominantly *Calluna vulgaris* and *Molinia coerulea* with patches of goat willow (*Salix caprea*). Nursery opened in 1941.

Ground preparation for formation of nursery

Surface bulldozed. The surface peat, which was removed in 1941, was returned to the eastern half of the nursery in 1942.

Cropping, manuring and liming in the years preceding experiments

Farmyard manure (10 tons per acre) was applied in 1941 and composted hops (20 tons per acre) in subsequent years. 5 cwt. of ground limestone was applied when the nursery was first opened and again in 1947. Green crops of lupins followed by mustard (manured with bonemeal) were grown.

Seedbed Cover used in the years immediately preceding experiments

3/16 inch washed oolite. Calcareous gravel (34% $CaCO_3$) from West Ayton, Scarborough, Yorks.

Remarks

Some loss in productivity was noted in 1944 and subsequent years.

Experiments started 1947 Section 7, 1948 Section 3.

Table 13

WYKEHAM NURSERY

LOCATION AND SIZE OF NURSERY

County Yorkshire Grid reference SE/950859 Nursery area 8 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 475 ft. O.D. Dipslope plateau of Tabular Hills, dissected by deep valleys.

Slope, aspect and exposure

c. 2° west. Moderately exposed. Some shelter from hedges and adjacent plantations.

Geology

Corallian ('Lower Calcareous Grit'), fine-grained, non-calcareous or decalcified sandstone. (The sub-surface weathered zone contains occasional quartzite pebbles and inclusions of silty material, suggesting the presence of glacial drift.)

Cultivated soil

Dark greyish brown, slightly to moderately acid, fine sandy loam with occasional quartzite pebbles and angular sandstone fragments.

Soil Profile characteristics

The soil is a deep, well-drained, acid brown earth, with some indications of superficial podzolization on the eastern side. Below the cultivated layer is a yellowish brown, friable sub-surface horizon varying in texture from sandy loam to sandy clay loam. Brashy weathering sandstone is encountered in places at 30 inches, but is generally below 36 inches and may be overlain by a layer of brown, silty material.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.3	1.9	1.9	2.1	1.8	3.1	1.9	1.7	3.5	2.8	28.1
Rain days	16	16	15	13	13	12	12	13	12	11	16	17	164
Temp (°F)	37	37	40	45	49	56	59	58	56	50	43	39	47
Sunshine (hours)	31	67	107	151	181	195	178	167	112	90	54	35	1369

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Probably low quality pasture. Much *Agrostis* adjacent to the nursery. Nursery opened in 1926.

Ground preparation for formation of nursery

The pasture was probably dug in.

Cropping, manuring and liming in the years preceding experiments

Three to four year rotation of transplants, seedbeds, greencrop (mustard). The greencrop was given farmyard manure at 40 tons per acre.

Seedbed Cover used in the years immediately preceding experiments

3/16 inch washed calcareous oolite gravel (34% $CaCO_3$) from West Ayton, Scarborough, Yorkshire.

Experiments started 1948 Section 1.

Table 14

REASTY TOP NURSERY

LOCATION AND SIZE OF NURSERY

County Yorkshire Grid reference SE/964945 Nursery area 21 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 670 ft. O.D. Dissected plateau; steep drops within ½-1 mile of nursery.

Slope, aspect and exposure

<1° south. Exposure severe.

Geology

Corallian (Lower Calcareous Grit) sandstones.

Cultivated soil

Very dark brown, acid, fine sandy loam containing numerous, bleached sandstone fragments.

Soil Profile characteristics

The original soil was a podzol with a peaty A_0 horizon up to 4 inches thick and a nearly continuous, thin iron pan at from 6 to 18 inches, which impeded drainage. In most places the pan has been disrupted by ploughing, and the horizons above it are incorporated in the cultivated layer. Below the pan the subsoil consists of strong brown to reddish yellow, friable, stony sandy loam passing down into more compact, paler-coloured sandy material which is hard and brittle when dry.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.3	1.9	1.9	2.1	1.8	3.1	1.9	1.7	3.5	2.8	28.1
Rain days	16	16	15	13	13	12	12	13	12	11	16	17	164
Temp (°F)	37	37	40	45	49	56	59	58	56	50	43	39	47
Sunshine (hours)	31	67	107	151	181	195	178	167	112	90	54	35	1369

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Heathland - ground vegetation of heather with small patches of birch scrub. Nursery opened in autumn 1947.

Ground preparation for formation of nursery

Ground vegetation removed in autumn 1947 by bulldozer, which also removed up to 2 inches of peat. In the following spring the area was subsoiled to a depth of 16 inches and ploughed to 9-11 inches. Tractor vaporising oil was used to kill vegetation in part of the nursery.

Cropping, manuring and liming in the years preceding experiments

Ground limestone was applied to the whole area at 5 cwt. per acre. Experiments were laid out in the first year of the nursery's existence.

Seedbed Cover used in the years immediately preceding experiments

None - see previous paragraph. (Quartzite chippings from Doncaster were used on seedbeds in 1948 and subsequently.)

Remarks

The nursery was closed in 1956 because it had become excessively weedy. Until this time, the area was highly productive.

Experiments started 1948, near north-east corner of Hackness Moor; 1950 Section 27.

Table 15

ROSEDALE (BANKS) NURSERY

LOCATION AND SIZE OF NURSERY

County Yorkshire | Grid reference SE/768934 | Nursery area 4.5 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 590 ft. O.D. Dissected plateau with steep slopes within ½-2 miles in most directions.

Slope, aspect and exposure

2 to 3° south. Exposed severely to east and west, sheltered from plantations to north and south.

Geology

Corallian (Lower Calcareous Grit), fine-grained, non-calcareous or decalcified sandstone.

Cultivated soil

Very dark brown, acid, fine sandy loam, containing abundant sandstone fragments.

Soil Profile characteristics

On the northern (upper) side of the nursery, the soil is very shallow, and brownish yellow weathering sandstone is encountered at 6-12 inches. Lower down, where the soil is deeper, remnants of a compact, very dark brown to reddish-brown, podzol B horizon are present below the ploughed layer, followed by friable, yellowish brown sandy loam. At the foot of the slope the soil is 24 inches or more thick, over weathering sandstone.

CLIMATE

mean values (1947-1951)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.9	2.3	2.3	1.9	1.9	2.1	1.8	3.1	1.9	1.7	3.5	2.8	28.1
Rain days	16	16	15	13	13	12	12	13	12	11	16	17	164
Temp (°F)	37	37	40	45	49	56	59	58	56	50	43	39	47
Sunshine (hours)	31	67	107	151	181	195	178	167	112	90	54	35	1369

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Arable land. Nursery opened in 1934.

Ground preparation for formation of nursery

Previous vegetation burned off.

Cropping, manuring and liming in the years preceding experiments

Four-course rotation consisting of 3 years transplants (or 2 years transplants and 1 year seedbeds), followed by 1 year with two crops of mustard - except in the first four years when lupins were sown. A small area was greencropped with oats and tares alongside the mustard.

Seedbed Cover used in the years immediately preceding experiments

3/16 inch washed calcareous oolite gravel (34% $CaCO_3$) from West Ayton, Scarborough, Yorkshire.

Remarks

Heavy weed growth was prevalent in the nursery.

Experiments started 1948 (Section not known).

Table 16

WIDEHAUGH NURSERY

LOCATION AND SIZE OF NURSERY

County Northumberland Grid reference NY/963642 Nursery area 67.4 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

130 ft. O.D. Old alluvial flood-plain of river Tyne.

Slope, aspect and exposure

Even, very gentle slop of <1° to north. Exposure moderate.

Geology

Light-textured, silty alluvium, current bedded, with occasional underlying pockets of gravel.

Cultivated soil

Dark greyish brown, slightly acid, fine sandy loam with few stones, about 10 inches thick. The structure is weak, and under fallow conditions the impact of rain causes the inorganic fractions to undergo superficial resorting, giving cappings of fine sand and silt, and deposition of clay in furrow bottoms.

Soil Profile characteristics

The subsoil consists of light greyish brown little-altered alluvium composed largely of silt and fine sand. A compact layer 2 inches or more thick tends to develop just below plough depth, and this may impede percolation and/or root penetration if not broken up. Otherwise the profile is well drained.

CLIMATE

mean values (1947-1950)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	2.7	2.8	1.7	2.2	1.1	2.2	2.9	2.8	1.8	1.2	2.6	1.7	28.6
Rain days	16	18	13	17	9	15	13	18	16	13	17	13	178
Temp (°F)	38	37	41	46	50	56	59	59	56	50	42	38	48
Sunshine (hours)	36	74	116	132	166	196	169	150	116	86	73	52	1366

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Part farmland used for grass or oats, part market-garden. Couch grass (Agropyron repline) and Poa annua present at outset. Nursery opened in 1935 and subsequently extended.

Ground preparation for formation of nursery

Ground was ploughed and hand-forked. Where turf had been removed, it was stacked and limed, and subsequently returned to the land.

Cropping, manuring and liming in the years preceding experiments

4-course rotation followed where possible. 1 year with two crops of mustard followed by 1 or 2 years under transplants and 1 or 2 years under seedbeds. Potatoes taken as extra crop during the 1939-45 war. Farmyard manure (10 tons per acre) applied to seedbeds and green crops; basic slag and hydrated lime to green crops only.

Seedbed Cover used in the years immediately preceding experiments

¼ inch Whinstone chippings 2% $CaCO_3$ from Haltwhistle, Northumberland. Some calcareous cover had been used prior to the use of the Whinstone chippings.

Remarks

A general fall-off in productivity has been observed during the life of the nursery. Mustard crops grew well. Failure of experimental sowings in 1949 was attributed to use of Whinstone chips which, being dark in colour heat up in sunny weather in spring.

Experiments started 1947 Section 62, 1948 Section 60.

Table 17

LONGTOWN NURSERY

LOCATION AND SIZE OF NURSERY

County Cumberland Grid reference NY/415685 Nursery area 14 acres

SITE AND SOIL CHARACTERISTICS

Elevation and topography

c. 150 ft. O.D. Gently undulating

Slope, aspect and exposure

Gentle, 1-2° to south. Exposure moderate.

Geology

Fine-textured glacial drift, mainly derived from Triassic 'red beds', with erratics of Ordovician and Silurian sandstones and granite.

Cultivated soil

Dark greyish brown, slightly to moderately acid, humose, fine sandy loam about 11 in. thick containing erratic stones as above, and broken tiles; this is an artificial A horizon, largely built up from top-waste, sewage sludge and peat since 1946, which overlies the subsoil clay unconformably. Drainage is impeded by the underlying clay, and the soil is subject to seasonal waterlogging.

Soil Profile characteristics

The original profile was a surface-water gley with poor drainage due to restricted percolation. The subsoil consists of light brown, slightly stony, sandy clay, prominently mottled with light grey and red, which merges at around 29 inches into dark reddish brown, clayey till with little mottling.

CLIMATE

mean values (1948-1950)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Rainfall (inches)	4.2	2.4	2.0	2.1	1.8	2.9	2.9	5.1	4.3	3.8	3.6	3.3	38.4
Rain days						no data							
Temp (°F)	40	40	43	46	51	57	59	58	56	50	43	39	49
Sunshine (hours)	28	66	118	118	193	184	153	108	98	67	53	40	1224

NURSERY HISTORY AND SILVICULTURAL OPERATIONS

Use of ground before formation of nursery

Soil bulldozed, levelled and sown with grass to form aerodrome in 1939. Nursery opened in 1946.

Ground preparation for formation of nursery

Not known.

Cropping, manuring and liming in the years preceding experiments

Area under unmanured transplants in 1947.

Seedbed Cover used in the years immediately preceding experiments

Not known.

Experiments started 1948, Section 7.

Table 18

TOTAL RAINFALL IN INCHES

Data obtained from nursery rain gauge or nearest official rain gauge. Location shown in brackets after name of nursery.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Wareham (1945-47 Wareham Trigon., 1948-57 Wareham nursery)													
1945	2.07	2.20	0.98	0.70	2.11	2.81	0.85	1.91	2.87	4.27	1.30	5.05	27.12
1946	3.56	2.88	1.25	2.58	3.71	3.22	0.93	3.86	5.59	1.52	6.01	4.71	39.82
1947	3.18	1.84	8.28	2.35	2.02	1.71	1.34	0.99	1.35	1.49	2.00	3.71	30.26
1948	6.17	1.23	1.42	1.99	2.33	2.40	1.28	3.99	2.94	2.67	2.30	5.64	34.36
1949	1.06	1.70	1.37	1.76	2.44	0.70	0.41	1.11	4.61	7.66	4.53	2.06	29.41
1950	0.75	5.86	1.74	2.59	1.47	1.05	5.11	3.76	4.21	1.47	6.36	2.43	36.80
1951	3.56	6.10	3.82	2.95	2.67	0.43	1.33	5.13	4.09	1.26	9.83	3.24	44.41
1952	2.41	0.58	2.62	1.80	2.55	0.76	0.91	2.33	4.75	4.63	3.85	3.23	30.42
1953	0.96	1.68	0.67	2.72	2.69	1.94	2.67	2.06	3.33	4.54	2.26	0.88	26.40
1954	1.95	3.18	4.40	0.11	2.08	2.91	2.91	3.02	3.60	3.04	7.01	3.49	37.70
1955	3.81	2.32	1.76	0.58	4.14	2.34	2.45	0.64	1.46	4.68	3.67	5.83	33.68
1956	5.18	0.09	0.77	1.90	0.82	2.42	3.42	3.75	5.91	1.66	1.04	6.66	33.62
1957	3.24	4.76	2.96	0.13	2.52	1.73	3.99	2.77	3.28	3.11	2.40	3.11	34.00
Ringwood and Deer Leap (Fordingbridge, Furze Hill)													
1947	3.19	1.60	6.48	2.47	1.81	1.41	1.08	0.57	1.10	0.94	1.42	3.51	25.58
1948	6.07	1.12	1.24	1.50	3.13	2.44	0.88	3.18	2.62	2.27	1.76	5.82	32.03
1949	0.77	1.49	1.48	1.67	2.26	0.44	0.88	1.17	2.51	7.53	4.45	1.70	26.35
1950	0.79	5.35	1.75	2.47	1.35	1.31	4.61	3.25	4.04	1.01	6.31	1.97	34.21
1951	3.88	5.87	4.50	3.40	2.79	0.46	1.68	5.04	4.10	1.60	10.16	3.34	46.82
1952	2.51	0.69	3.69	2.12	3.12	1.08	0.42	3.59	4.51	4.64	4.02	2.96	33.35
1953	1.30	1.99	0.80	2.77	2.64	3.48	4.80	2.50	3.29	4.39	2.32	0.97	31.25
1954	2.19	3.14	4.23	0.31	2.27	3.44	3.24	4.52	3.23	3.52	5.63	3.32	39.04
1955	3.61	1.86	1.24	0.50	3.95	3.20	0.45	0.07	1.90	4.31	2.98	5.29	29.36
1956	4.62	0.22	0.84	2.17	0.45	1.81	1.69	4.04	4.58	2.78	1.08	5.47	29.75
Bramshill (Heckfield, Park Corner)													
1950	0.76	4.28	0.86	2.73	1.45	1.27	4.61	3.80	3.04	0.50	5.43	1.65	30.38
1951	3.15	5.45	4.15	2.74	2.65	1.38	1.08	4.92	3.30	0.87	6.79	2.21	38.69
Bagley, Kennington, Wytham (Kennington Nursery)													
1945	1.37	1.77	0.76	1.21	2.69	3.22	2.05	1.28	1.95	2.72	0.14	3.57	22.73
1946	1.36	1.84	0.99	1.41	2.99	2.19	1.12	3.65	3.25	0.77	4.15	1.99	25.71
1947	1.24	1.35	4.50	1.95	1.95	1.04	1.88	0.53	1.02	0.34	1.34	1.87	19.01
1948	4.95	0.85	0.72	1.66	4.92	2.30	0.93	3.99	2.16	2.77	1.46	2.24	28.95
1949	0.89	1.10	1.66	1.15	2.41	0.71	1.50	1.29	2.29	6.14	2.61	1.11	22.86
1950	0.53	4.13	0.67	2.12	2.18	1.52	4.07	3.14	3.25	0.65	4.30	1.12	27.68
1951	2.07	3.48	3.71	2.46	2.35	1.23	1.24	4.23	2.41	0.97	5.05	1.78	30.98
1952	1.45	0.49	2.27	1.60	2.07	1.02	0.32	3.75	1.10	3.06	3.43	2.42	22.98
1953	0.78	1.31	0.66	2.20	1.72	2.07	3.58	2.33	2.15	1.90	2.23	0.65	21.58
1954	1.11	2.11	2.34	0.40	2.02	3.41	2.18	3.80	2.01	1.89	4.37	2.08	27.72
1955	2.96	1.17	1.27	0.80	4.67	2.69	0.20	0.44	2.16	1.71	1.31	3.20	22.58
1956	4.15	0.41	0.58	1.54	0.20	2.57	2.04	4.24	2.65	1.98	0.78	3.57	24.71
Ampthill (Ampthill, Lyme Road)													
1949	0.70	1.19	1.20	1.34	1.60	0.81	1.30	1.85	0.68	4.34	2.95	1.42	19.47
1950	0.81	3.32	0.57	2.09	4.27	1.45	5.90	2.39	2.88	0.40	4.80	1.14	30.02
1951	3.12	4.01	3.15	2.74	2.37	0.65	1.25	4.23	2.14	1.20	4.52	1.54	30.92
1952	1.45	0.59	3.17	1.80	1.66	1.73	0.37	2.78	2.98	2.91	3.70	2.19	25.39
1953	1.12	1.56	0.57	2.05	1.60	1.56	2.98	2.58	1.16	2.34	1.40	0.68	19.60
1954	1.03	2.41	2.28	0.26	2.43	2.83	2.78	3.58	1.66	1.99	3.72	2.10	27.07
1955	2.24	1.62	1.10	0.44	4.14	1.97	0.05	0.78	1.54	1.82	1.23	2.05	18.98
1956	3.73	0.59	0.74	1.20	0.41	2.29	3.89	3.55	1.80	1.66	0.61	2.67	23.14
Lynford Point (Santon Downham)													
1948	4.52	0.74	0.59	1.64	3.88	2.59	-	2.65	1.68	2.06	1.33	1.52	-
Wykeham, Wykeham Moor, Reasty Top, Harwood Dale, Rosedale Banks (Kirkby Mooraside, Ravenswyke)													
1947	2.52	3.08	4.58	2.32	1.50	2.20	1.98	0.16	2.25	0.40	2.04	1.91	24.94
1948	7.07	1.52	1.01	1.28	1.51	4.78	1.32	3.17	1.77	1.21	0.63	3.32	28.59
1949	1.05	0.75	1.50	2.04	1.85	0.60	2.01	2.38	0.82	3.33	4.23	2.52	23.08
1950	1.80	3.69	1.38	2.25	1.51	1.28	2.40	4.17	3.04	2.09	4.41	2.86	30.88
1951	2.04	2.51	3.19	1.69	3.12	1.63	1.52	5.62	1.84	1.45	6.32	3.60	33.23
Widehaugh (Widehaugh Nursery)													
1947	1.44	4.00	4.35	3.62	1.67	2.91	4.58	0.19	0.79	0.61	2.58	1.83	28.57
1948	5.65	1.31	1.15	1.82	0.67	3.39	2.20	4.70	2.21	1.52	1.38	2.20	28.20
1949	1.40	1.50	0.43	1.20	0.43	0.81	1.82	2.19	-	-	-	-	-
1950	2.27	4.42	0.80	2.01	1.78	1.66	2.83	4.25	2.48	1.49	3.87	1.03	28.89
Longtown (Longtown)													
1948	8.42	2.04	1.79	2.64	1.22	3.98	2.17	6.90	5.40	2.86	4.18	2.27	43.87
1949	2.59	2.23	1.19	2.19	1.55	0.98	3.18	2.37	0.59	5.71	3.85	6.26	32.69
1950	1.52	3.09	2.95	1.51	2.53	3.65	3.30	6.14	7.04	2.91	2.76	1.36	38.76
Nagshead (Nagshead Nursery)													
1947	3.66	0.69	9.08	4.07	3.33	2.39	2.92	1.39	1.70	0.68	2.66	2.40	34.97
1948	6.48	2.32	1.71	3.90	3.92	2.99	1.26	3.60	3.40	3.27	1.94	6.57	41.36
1949	1.44	2.19	1.73	2.76	3.40	0.59	0.73	1.71	2.67	8.30	4.01	1.73	31.26
1950	0.68	7.47	3.43	2.44	2.07	1.16	3.95	5.36	4.52	1.23	5.97	1.61	39.89
Tair Onen (1947 Pentre Meyrick; 1948-51 Tair Onen Nursery)													
1947	4.41	1.10	7.87	2.58	2.44	2.45	4.43	0.86	2.63	1.75	5.63	4.46	40.61
1948	7.43	2.46	1.57	2.68	5.58	3.51	3.40	8.95	4.98	6.66	3.10	3.88	54.20
1949	1.86	2.41	2.14	3.21	5.09	0.84	1.28	3.11	3.88	8.26	5.29	5.97	43.34
1950	1.46	6.80	2.14	3.20	1.71	1.61	6.14	9.71	6.25	5.15	6.80	4.18	55.15
1951	5.58	3.99	5.72	4.30	2.35	0.84	1.51	6.22	4.21	2.73	7.63	3.29	48.37

Table 19

NUMBER OF RAIN DAYS

Number of days rainfall was 0.01 inches or more. Data obtained from same source as total rainfall.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Wareham (1945-47 Wareham Trigon., 1948-57 Wareham Nursery)													
1945	15	15	8	9	16	17	10	10	16	10	10	24	160
1946	16	14	10	10	16	16	6	23	20	11	20	19	181
1947	21	9	28	15	15	13	11	6	10	7	17	12	164
1948	24	14	5	15	8	15	7	19	10	15	16	16	164
1949	12	11	9	9	12	6	5	7	13	16	18	20	138
1950	9	17	9	16	9	6	16	21	19	12	21	14	169
1951	18	21	20	16	14	9	9	20	12	7	20	15	181
1952	21	7	16	12	10	6	8	16	17	16	18	16	163
1953	10	13	5	15	8	12	12	11	14	12	16	9	137
1954	13	17	20	5	13	14	12	18	25	24	22	16	199
1955	22	14	8	9	18	13	3	6	17	10	10	22	152
1956	21	4	7	10	8	13	14	19	15	12	13	23	159
1957	19	22	17	4	12	8	17	16	18	16	5	17	171
Ringwood and Deer Leap (Fordingbridge, Furze Hill)													
1947	21	9	27	14	18	9	11	5	7	5	10	11	147
1948	27	15	6	12	9	15	9	15	8	14	10	20	160
1949	11	7	8	9	8	5	5	8	9	18	18	15	121
1950	8	20	12	16	11	7	19	19	21	9	20	10	172
1951	21	25	27	15	15	6	8	19	14	11	26	17	204
1952	20	12	17	12	15	9	6	15	18	16	16	17	173
1953	6	9	6	16	10	14	21	11	13	11	13	8	138
1954	10	14	18	4	13	18	15	20	25	21	20	15	193
1955	15	16	10	9	21	11	5	2	12	9	11	25	146
1956	17	6	6	10	7	10	13	22	12	17	10	17	147
Bramshill (Heckfield, Park Corner)													
1950	12	21	12	19	13	11	20	19	24	8	20	18	197
1951	20	24	25	18	19	10	8	23	15	12	27	17	218
Bagley, Kennington, Wytham (Kennington Nursery)													
1945	17	12	8	9	16	15	11	13	15	11	5	19	151
1946	14	17	7	11	13	18	8	19	18	8	20	18	171
1947	17	9	23	14	15	11	16	2	7	6	18	12	150
1948	25	10	5	13	13	16	9	14	13	11	14	17	160
1949	16	9	8	10	15	4	6	8	8	16	15	16	131
1950	9	20	12	17	10	11	19	15	21	10	22	18	184
1951	17	22	21	14	16	9	8	20	11	12	24	15	189
1952	15	8	12	15	16	10	4	14	14	18	13	19	158
1953	9	8	6	15	10	14	19	8	14	9	11	11	134
1954	9	15	14	6	15	15	15	19	21	17	23	14	183
1955	16	13	7	10	18	12	2	6	11	13	10	22	140
1956	18	9	6	11	4	12	12	21	11	12	10	19	145
Ampthill (Ampthill, Lyme Road)													
1949	5	6	5	10	10	6	5	6	5	13	14	16	101
1950	8	17	9	20	11	6	15	16	20	5	20	14	161
1951	17	21	20	14	15	7	9	16	13	9	24	14	179
1952	14	9	16	12	11	10	4	17	15	16	14	19	157
1953	12	11	7	13	11	14	17	11	11	14	8	14	143
1954	10	17	13	6	16	18	20	19	20	18	18	13	188
1955	14	18	11	10	16	12	3	8	9	13	15	19	148
1956	21	13	7	10	4	18	13	23	11	13	10	20	163
Lynford Point (Santon Downham)													
1948	25	9	4	13	13	16	-	15	12	9	12	11	-
Wykeham, Wykeham Moor, Reasty Top, Harwood Dale, Rosedale Banks (Kirkby Moorside, Ravenswyke)													
1947	20	18	20	11	11	10	17	2	10	9	13	13	154
1948	25	19	5	12	11	19	9	15	13	10	9	15	162
1949	10	10	18	8	12	8	9	10	7	13	21	24	150
1950	11	18	12	18	15	10	13	21	19	16	18	16	187
1951	15	14	20	14	15	11	11	15	10	5	21	17	168
Widehaugh (Widehaugh Nursery)													
1947						no data							
1948	21	18	17	14	5	20	12	18	16	15	14	15	185
1949						no data							
1950	10	18	9	20	13	10	14	19	15	11	20	11	170
Longtown (Longtown)													
1948	22	13	11	15	7	16	10	17	18	18	14	13	174
1949						no data							
1950													
Nagshead (Nagshead Nursery)													
1947													
1948													
1949						no data							
1950													
Tair Onen (Tair Onen Nursery)													
1947						no data							
1948	20	14	8	14	8	17	10	15	11	15	12	12	156
1949													
1950						no data							
1951													

Table 20

MEAN AIR TEMPERATURE

Mean of maximum and minimum temperatures. The table gives interpolated air temperatures (to nearest 0.5°F) calculated by the Meteorological Office using records from meteorological stations shown in brackets after name of nursery.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Wareham (Poole, Swanage, Shaftesbury, Weymouth, Blandford)													
1945	34.5	46.0	46.0	50.5	55.5	58.0	62.0	62.5	60.0	55.5	47.0	46.5	51.5
1946	39.5	45.0	42.0	50.0	52.5	56.0	61.5	59.5	58.0	52.5	48.0	39.0	50.5
1947	38.5	30.5	42.0	48.5	55.5	60.0	63.0	68.0	61.0	53.5	48.0	43.5	51.0
1948	43.5	41.5	47.5	49.0	53.5	57.5	60.5	60.5	58.5	52.0	49.0	45.0	51.5
1949	43.5	43.5	42.5	50.5	52.5	60.0	64.0	63.5	63.0	56.5	46.5	44.5	52.5
1950	41.5	43.5	43.5	47.5	53.5	61.5	61.5	61.0	57.0	52.0	45.5	37.0	50.5
1951	42.0	41.5	42.5	46.0	51.0	57.5	63.0	60.0	59.0	51.5	49.5	45.0	51.0
1952	40.0	39.5	45.0	49.5	55.0	58.5	63.0	62.5	54.0	51.0	42.0	40.5	50.0
1953	38.0	39.5	42.0	47.5	55.0	59.0	60.5	62.5	57.0	52.5	49.0	47.0	51.0
1954	39.0	39.0	44.5	46.5	53.0	56.5	58.5	59.5	57.0	55.5	47.0	46.0	50.0
1955	40.0	37.5	39.0	48.0	50.5	58.0	64.0	65.0	58.5	50.0	46.5	45.5	50.5
1956	41.0	32.0	42.0	45.0	53.5	57.0	61.0	58.0	59.0	50.5	43.5	44.0	49.0
1957	43.0	43.5	48.5	49.0	52.0	59.5	62.5	61.0	57.5	53.5	45.0	41.0	51.5
Ringwood and Deer Leap (Southampton, Porton, Ringwood)													
1947	36.5	30.0	41.0	48.5	56.0	61.0	64.0	68.0	60.5	52.0	46.0	41.5	50.5
1948	43.0	41.0	49.0	50.0	55.5	57.5	62.0	60.0	58.0	52.0	48.0	43.0	51.5
1949	43.0	43.0	42.5	51.0	53.0	61.0	65.0	64.5	65.0	55.5	46.0	43.5	52.5
1950	40.0	44.0	47.0	48.0	50.5	62.0	61.5	61.5	57.0	51.0	44.5	34.5	50.0
1951	41.0	40.0	41.0	45.5	51.5	58.5	63.0	59.5	58.5	51.5	48.0	44.0	50.0
1952	38.5	39.0	45.0	50.5	57.0	59.0	63.5	63.0	53.0	50.0	41.0	39.0	50.0
1953	38.0	39.5	43.5	48.0	56.0	58.5	60.0	62.5	58.0	52.5	48.5	46.0	50.5
1954	37.5	38.5	44.5	46.5	53.0	57.0	58.0	59.5	56.0	55.0	46.0	45.0	49.5
1955	38.5	36.5	39.0	49.0	50.5	58.5	64.5	65.5	59.5	50.0	45.5	44.5	50.0
1956	40.5	31.0	45.0	46.0	54.5	57.0	61.5	58.0	59.5	49.5	43.5	43.0	49.0
Bramshill (Shinfield, South Farnborough)													
1950	40.0	43.5	46.0	47.0	53.0	62.5	62.0	61.0	56.5	50.0	43.5	34.5	50.0
1951	40.0	39.5	41.0	45.0	51.0	58.0	63.0	60.0	58.5	49.5	47.5	43.5	49.5
Bagley, Kennington, Wytham (Oxford, Abingdon)													
1945	33.0	46.0	47.0	51.0	55.0	59.0	63.0	61.5	59.0	54.0	45.0	41.5	51.0
1946	37.5	44.0	42.0	50.5	51.5	56.0	63.0	59.5	58.0	50.5	47.0	37.0	49.5
1947	35.5	28.5	40.0	48.5	57.0	61.0	64.5	67.0	60.0	51.0	45.5	42.0	50.0
1948	43.0	41.0	47.5	49.0	53.5	57.5	61.5	60.5	58.5	50.5	45.5	43.0	51.0
1949	42.5	42.5	41.5	51.0	52.5	60.0	65.0	63.5	63.0	54.5	44.0	43.0	52.0
1950	39.5	43.5	46.0	47.0	53.0	62.5	61.5	61.0	56.5	50.0	42.5	34.5	50.0
1951	40.0	40.0	41.0	45.5	51.0	58.0	62.5	60.0	58.5	49.0	48.0	43.0	49.5
1952	38.0	38.5	45.0	50.0	57.0	59.5	64.0	62.5	53.0	48.5	39.5	37.0	49.5
1953	37.5	40.0	42.0	46.5	55.5	58.5	60.5	62.5	58.0	50.5	47.5	57.5	50.5
1954	37.5	38.0	43.5	46.0	52.5	57.5	59.0	59.5	56.0	54.5	45.5	44.5	49.5
1955	37.0	35.5	38.5	50.0	50.5	58.5	64.5	66.0	58.0	49.0	45.0	42.5	49.5
1956	39.0	31.0	44.0	45.5	54.5	50.5	62.0	58.0	58.5	49.5	43.0	42.5	48.5
Ampthill (Silsoe, Woburn, Cranfield)													
1949	41.0	41.0	40.0	50.0	51.0	58.5	63.0	62.5	62.5	53.0	42.5	48.0	51.0
1950	39.0	42.0	45.0	46.0	51.5	61.5	61.0	60.5	56.0	49.5	42.0	33.0	49.0
1951	38.5	38.5	39.5	44.0	50.0	57.0	61.5	59.5	58.0	48.0	47.0	41.5	48.5
1952	37.0	37.0	44.0	49.5	56.5	58.5	63.0	61.5	52.0	47.5	38.5	36.5	48.5
1953	37.0	38.5	41.5	45.5	54.5	56.5	60.0	61.0	57.0	49.5	46.5	44.5	49.5
1954	36.5	36.5	42.5	45.0	52.0	56.5	58.0	58.5	55.5	54.0	44.5	43.5	48.5
1955	36.0	34.0	37.0	48.5	49.5	57.0	63.0	64.5	57.5	48.5	44.0	42.0	48.5
1956	38.0	29.5	43.0	43.5	53.5	55.5	60.5	56.5	58.0	48.5	41.5	42.0	47.5
Lynford Point (Santon Downham, Mildenhall, Thetford)													
1948	41.5	39.5	46.0	46.5	51.0	56.5	58.5	58.5	56.5	48.0	41.0	40.0	48.5
Wykeham, Wykeham Moor, Reasty Top, Harwood Dale, Rosedale Banks (Scarborough, Ampleforth, Leeming)													
1947	34.5	29.5	34.5	45.0	51.5	57.5	59.5	61.5	57.5	51.0	43.0	40.5	47.0
1948	38.5	38.5	44.5	46.5	49.5	53.5	57.5	56.5	55.0	49.0	43.0	40.5	48.0
1949	39.5	40.5	39.5	48.0	49.0	55.5	60.0	60.0	59.0	51.5	42.5	40.5	49.0
1950	38.5	38.5	44.0	43.0	48.0	58.5	59.0	58.0	53.5	48.0	40.0	33.0	46.5
1951	36.0	36.5	37.0	42.0	46.0	53.0	59.0	56.5	55.0	48.0	45.0	39.5	46.0
Widehaugh (Cockle Park, Chopwellwood, Birtley)													
1947	35.5	29.5	34.5	45.5	52.0	57.0	60.0	62.5	56.5	50.5	42.5	40.0	47.0
1948	38.0	39.5	45.5	46.5	48.5	53.5	58.5	56.0	54.5	48.0	44.0	39.5	47.5
1949	40.0	41.0	39.5	48.5	50.0	56.0	60.0	59.5	59.0	51.0	43.0	40.5	49.0
1950	39.0	38.5	44.5	43.5	49.5	58.5	58.5	58.5	53.5	48.5	40.5	33.0	47.0
Longtown (Carlisle, Ruthwell, Silloth, Keswick)													
1948	36.5	37.5	41.5	46.5	50.5	54.5	58.5	56.5	54.5	49.0	44.0	40.5	47.5
1949	42.0	42.5	42.0	48.5	50.5	58.0	60.5	60.5	59.0	51.5	44.5	43.0	50.5
1950	40.5	40.5	45.0	44.5	51.5	58.5	59.0	58.5	54.0	49.0	41.5	33.5	48.0
Nagshead (Ross, Ruscombe, Parkend)													
1947	35.5	27.5	38.5	47.0	55.0	59.5	61.5	65.0	58.0	50.5	45.0	41.5	49.0
1948	42.0	40.0	47.0	47.5	51.5	56.5	60.0	58.5	57.0	50.0	45.0	42.0	49.5
1949	41.5	42.0	41.0	49.5	51.5	59.5	64.0	62.5	61.0	53.0	44.0	42.5	51.0
1950	39.0	42.0	44.0	45.5	51.5	59.5	59.0	58.5	55.0	49.0	41.0	34.0	48.0
Tair Onen (Fairwood Common, Cardiff, Cantref)													
1947	37.0	29.0	39.5	46.5	54.5	48.5	60.0	65.5	58.5	51.5	46.0	42.5	49.0
1948	42.5	40.0	47.5	47.5	52.0	55.0	59.0	58.5	56.0	50.0	46.0	42.0	49.5
1949	42.0	41.5	42.0	49.0	52.0	59.5	63.5	62.0	60.5	53.5	44.0	43.0	51.0
1950	39.5	41.5	45.5	45.5	53.0	60.0	59.0	58.5	54.0	49.0	42.5	35.0	48.5
1951	39.0	38.5	39.5	44.0	49.5	57.0	61.0	57.5	56.5	49.5	46.5	43.0	48.5

Table 21

TOTAL HOURS OF SUNSHINE

Data obtained from nearest recording station. Location shown in brackets after name of nursery.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Wareham (Swanage)													
1945	88	67	174	216	193	220	204	203	91	126	70	45	1697
1946	49	66	113	217	228	165	247	198	129	95	61	87	1655
1947	62	34	89	169	143	234	234	292	152	128	47	44	1628
1948	42	65	184	245	292	206	220	187	166	116	85	54	1862
1949	84	126	120	222	287	289	280	243	148	113	83	63	2058
1950	31	72	146	183	212	232	220	214	127	108	80	62	1687
1951	52	91	98	210	179	293	278	208	102	139	82	54	1786
1952	108	94	97	200	230	269	233	226	175	117	73	63	1885
1953	55	89	167	198	238	203	214	270	166	113	46	37	1796
1954	68	82	131	243	189	185	169	200	182	97	56	52	1654
1955	40	107	179	200	233	218	318	255	194	142	81	32	1999
1956	67	94	172	201	280	205	192	235	118	131	91	24	1810
1957	61	76	116	189	248	321	204	191	132	103	69	67	1777
Ringwood and Deer Leap (Southampton)													
1947	66	31	72	149	159	210	198	242	147	131	72	48	1525
1948	44	85	177	209	239	165	193	151	144	113	82	70	1672
1949	75	124	127	225	245	279	302	236	159	134	80	68	2054
1950	41	79	153	210	215	262	199	208	122	105	71	59	1724
1951	51	76	94	208	191	279	233	193	94	144	69	54	1686
1952	93	82	88	159	221	235	208	202	159	99	61	64	1671
1953	43	70	152	189	226	190	195	243	172	107	48	29	1664
1954	72	62	122	224	168	151	160	149	171	88	58	45	1470
1955	29	90	175	179	223	179	284	221	172	126	74	30	1782
1956	60	97	159	171	268	166	188	188	121	124	89	23	1654
Bramshill (South Farnborough)													
1950	34	71	140	169	182	259	206	185	114	96	51	30	1537
1951	51	60	89	188	153	249	208	161	92	90	66	42	1449
Bagley, Kennington, Wytham (Oxford)													
1945	51	66	152	209	156	182	159	145	65	112	31	46	1374
1946	50	79	107	203	163	150	197	134	98	79	43	75	1378
1947	60	26	71	151	147	186	144	275	160	107	75	38	1440
1948	46	93	160	205	237	124	174	134	146	94	69	65	1547
1949	51	115	112	182	233	242	262	210	151	125	76	65	1824
1950	41	67	139	164	174	244	174	171	113	97	57	55	1496
1951	49	58	93	200	152	252	217	175	111	106	75	70	1558
1952	94	96	105	178	207	218	194	180	140	105	72	78	1667
1953	42	76	141	183	223	140	203	237	152	84	54	28	1563
1954	76	80	108	202	146	157	157	123	169	94	60	54	1426
1955	40	86	162	174	217	155	268	188	153	120	71	47	1681
1956	50	79	150	164	246	145	168	162	94	116	78	18	1470
Ampthill (Silsoe)													
1949	60	109	102	188	217	243	243	238	155	133	79	62	1829
1950	40	61	135	152	151	276	195	174	126	104	57	37	1508
1951	49	61	96	184	142	241	176	189	139	105	66	67	1515
1952	82	86	85	172	222	221	200	193	126	114	65	66	1632
1953	38	65	134	172	216	120	211	233	169	70	59	40	1527
1954	77	69	112	184	151	156	150	143	190	114	60	70	1476
1955	42	88	166	179	228	168	272	193	181	130	54	69	1770
1956	65	72	157	179	242	150	174	169	114	108	64	19	1513
Lynford Point (Mildenhall)													
1948	42	70	171	195	244	175	181	141	131	94	63	50	1557
Wykeham, Wykeham Moor, Reasty Top, Harwood Dale, Rosedale Banks (Ampleforth)													
1947	31	41	66	129	195	159	162	257	146	84	92	33	1395
1948	27	62	140	150	210	165	164	102	86	82	37	32	1257
1949	41	99	103	138	202	240	203	199	118	82	46	34	1505
1950	18	72	132	132	130	206	172	139	95	97	52	39	1284
1951	38	60	93	206	170	204	188	140	117	106	45	39	1406
Widehaugh (Chopwellwood)													
1947	34	41	73	132	152	162	163	231	140	85	112	45	1370
1948	31	60	150	138	188	163	141	110	104	77	72	60	1294
1949	58	105	94	128	203	221	187	132	101	80	44	56	1409
1950	23	88	145	129	123	240	186	128	118	101	63	45	1389
Longtown (Eskdalemuir)													
1948	21	66	130	124	231	131	160	70	83	79	57	37	1189
1949	28	63	134	116	205	232	172	139	132	55	44	33	1353
1950	34	69	90	113	144	186	126	114	80	67	57	51	1131
Nagshead (Parkend)													
1947	53	24	74	122	127	169	178	272	144	105	75	40	1383
1948	40	91	155	184	253	160	178	127	145	84	35	52	1504
1949	48	96	147	162	216	242	250	188	122	86	60	55	1672
1950	41	50	129	166	182	232	159	154	114	90	52	58	1427
Tair Onen (Cardiff)													
1947	44	25	76	149	140	170	163	291	136	112	68	30	1404
1948	40	84	169	197	298	160	173	148	151	92	54	60	1626
1949	52	100	141	160	217	283	268	204	125	93	62	44	1749
1950	40	45	112	166	203	240	195	198	126	92	74	66	1557
1951	44	91	76	223	182	259	241	178	85	116	72	50	1627

Table 22

Fertilizers

	Roth.No.	Analysis		Origin and description
NITROGEN FERTILIZERS				
		% N (total)		
ammonium sulphate	-	20.6		commercial product. From 1951 onwards a coarsely crystalline product was used
ammonium nitrate	-	35.0		chemical grade. Applied in solution
'Nitro-Chalk'	-	15.5		commercial product. A granular mixture of ammonium nitrate and calcium carbonate
calcium nitrate anhydrous, $Ca(NO_3)_2$	N.231	15.3		5 lb. batch of granulated material specially prepared on British Pilot Plant in 1947
anhydrous, $Ca(NO_3)_2$	N.319 RF.28	16 15.5		granulated materials prepared in Dutch Pilot Plant between 1950 and 1951
double salt $5\ Ca(NO_3)_2.NH_4NO_3.10H_2O$	-	15.5		granulated commercial product imported from Holland
urea	-	46.7		chemical grade
uric acid	-	33.4		chemical grade
ammonium alginate	S.4460	3.4		
dried blood	-	12-14		commercial product
crushed hoof	-	14		pure crushed hoof (uncalcined) from commercial sources
dicyandiamide	N.235	66		received from Ministry of Supply
		% N (total)	% P_2O_5	
formalised casein fine (75% less than 2 mm.)	N.204 N.215 N.228	12.0 12.0 10.7	4.3 n.d. 3.1	waste product from plastic manufacture
		% N (total)	U/F ratio of reactant	
urea-formaldehyde	N.255	37.6	1.33	prepared by U.S.Department of Agriculture, Beltsville, Md.
	N.258 N.259 N.260 N.264	38.0 37.2 39.2 35.7	1.40 1.26 1.50 1.33	prepared by I.C.I. according to the method described by Clark, Yee and Love (Ind. Eng. Chem. 40, 7, 1181)
	N.253	22.3		"flash", ground urea-formaldehyde plastic mouldings. (a waste product from the plastics industry)
oxidised coal	N.338	1.8		made on laboratory scale by the British Coal Utilization Research Association. The material was prepared from medium rank coal at about 200°C.
PHOSPHORUS FERTILIZERS				
		% P_2O_5		
superphosphate	-	17-19 water-sol.		commercial product powdered 1945-1952, granular 1953 onwards
monocalcium phosphate	-	28 water-sol.		chemical grade
triple superphosphate	P.638	47 water-sol.		
Gafsa rock phosphate	-	26-30 total		commercial product, 80% through 100 mesh sieve or finer
Bessemer basic slag	-	15-17 total (around 90% citric sol.)		commercial product
dicalcium phosphate	P.484 P.556	51 total 35 total		chemical grade precipitated bone phosphate
fused tricalcium phosphate	P.479	29 total		high-temperature product prepared by defluorinating phosphate rock. (made by T.V.A., United States)

Table 22 cont.

	Roth.No.	Analysis		Origin and description
		POTASSIUM FERTILIZERS		
		% K_2O		
potassium chloride	-	50-60		commercial product 1945-51 standard material 1952 coarsely crystalline, from Germany
	K.15	50		pellets made with 1% graphite, prepared on the laboratory scale
potassium sulphate	-	49		commercial product
potassium alginate	S.4461	15.3		
mica mineral (Mysil)	K.1	5		samples from Cornish kaolin mines
glauconite sand				all samples derived from the Bracklesham Beds (Eocene), Knaphill Brickworks, Surrey
crude	K.8	7		"semi-prepared" crude glauconite sand dried and screened roughly 30/50 mesh, containing 15% or more of 'clay'
			% Mg	
finely ground	K.3 K.11	7	2.3	pulverised to approximately 180/200 mesh

sieve analysis of mica and glauconite sand

	% sample retained on mesh: 20	40	60	80	100	200	% sample passing 200 mesh
K.1	0	1	4	8	9	19	59
K.8	2	35	25	17	2	15	4
K.3	0	0	1	6	5	59	29
K.11	0	0	0	2	1	43	54

		MAGNESIUM FERTILIZERS		
		% MgO		
magnesium sulphate Epsom salts $MgSO_4.7H_2O$	-	17		chemical grade, used up to 1951
kieserite $MgSO_4.H_2O$	-	28		commercial product from Germany, used from 1952 onwards
magnesium chloride $MgCl_2.6H_2O$	-	20		chemical grade

FERTILIZERS SUPPLYING TWO OR MORE NUTRIENTS

		% N (total)	% P_2O_5 (total)	% K_2O	
Organic fertilizers					
tankage	N.209 P.541	7.2	18.8	-	commercial grade of meat and bone meal
bone meal	P.557 P.593	3.7 3.6	26.6 25.1	- -	commercial product commercial product
maize ash	S.3225	-	39	18	calcined ash, imported from Argentine
dried poultry manure	S.5075	2.0	2.0	1.1	commercial product

Table 22 cont.

FERTILIZERS SUPPLYING TWO OR MORE NUTRIENTS (continued)

Inorganic fertilizers	% N total	% P_2O_5 total	% P_2O_5 water-sol.	% K_2O total	% MgO total
		Analysis			
COMMERCIAL GRADE					
ammonium phosphate (Roth.No. P.558)	11	47		0	-
Concentrated Compound Fertilizer, No.1, granular	12		11.9	15	-
National Compound Fertilizer No.6, granular	6	9	8.25	6	-
potassic superphosphate, powdered	0	15	13.75	8	-
granular	0	15	13.75	8	-
granular	0	17	15	9	-
granular	0	13.5	12.5	7.5	-
granular	0	13	12	13	-
granular	0	10	9.25	20	-
Compound fertilizer, granular	5	10	9.25	5	-
CHEMICAL GRADE					
potassium monohydrogen phosphate, K_2HPO_4	-	40.8		54.1	
potassium dihydrogen phosphate, KH_2PO_4	-	52.2		34.6	
magnesium ammonium phosphate, $MgNH_4PO_4.6H_2O$	5.7	28.9		-	16.4
magnesium orthophosphate (acid) $MgHPO_4.3H_2O$	-	40.8		-	23.1

Table 23

Micro-nutrients, liming materials, acidifying agents, and soil conditioner

MICRO-NUTRIENTS

	Origin and description
ferrous sulphate $FeSO_4.7H_2O$	chemical grade
ferrous ammonium sulphate $Fe(NH_4)_2(SO_4)_2.6H_2O$	chemical grade
manganese sulphate $MnSO_4.4H_2O$	chemical grade
manganese ammonium sulphate $Mn(NH_4)_2(SO_4)_2.6H_2O$	chemical grade
copper sulphate $CuSO_4.5H_2O$	chemical grade
zinc sulphate $ZnSO_4.7H_2O$	chemical grade
ammonium molybdate $(NH_4)_6Mo_7O_{24}.4H_2O$	chemical grade
sodium borate $Na_2B_4O_7.10H_2O$	chemical grade
fritted trace elements (analysis: 7% iron, 3.2% copper, 3.2% zinc, 2.5% manganese, 0.68% boron, 0.13% molybdenum)	commercial product

LIMING MATERIALS (all commercial grades)

High-calcium limestones
ground chalk, Hitchin, Hertfordshire
ground Portland limestone, Swanage, Dorset
coarse limestone dust, Pistyll Gwyn Quarry, North Wales, 95% $CaCO_3$, fineness: 40% through 100 mesh sieve

Magnesium limestone
finely ground, Alveston, Gloucester (3-8% Mg)

ACIDIFYING AGENTS (all commercial grades)

flowers of sulphur
ground rock sulphur, fineness: 90% through 300 mesh sieve
sulphuric acid
ammonium sulphate (fertilizer grade)
aluminium sulphate (iron-free) 17-18% Al_2O_3

SOIL CONDITIONER

Krilium "Krilium CRD-189" (sodium salt of a hydrolysed polyacrilonitrile)

Table 24

Uncomposted bulky organic materials, applied to the plots as such and used in making compost

All bulky organic manures applied to experiments described in Tables 1 to 164, and most of the materials used in making composts are listed in Tables

Fresh hopwaste. Fresh hopwaste also called 'spent hops' (Humulus lupulus) is a by-product of the brewing industry. It has been used both in making composts and for direct application to the plots. Normally, it has been applied to the land within a few hours of leaving the brewery; it was never stored for more than a day.

Dried hopwaste. This was purchased from a fertilizer merchant with the assurance that nothing had been added to it.

Bracken. Bracken (Pteridium aquilinum) has been used both in making composts and for direct application to the plots. The fronds are cut in midsummer (whenever possible as early as the first or second week of July) to obtain material with a high nutrient content. Bracken collected at Bagley and Wytham was chaffed into 1½ inch lengths, that collected in the Wareham district into ½ inch lengths.

Green chaffed bracken for compost making. Normally, composts are made shortly after cutting, and a sample of the fresh material is sent to Rothamsted. However, the batch from which the abnormally dry sample S.5792 was taken, was dried, in the open, from June to September.

Dried chaffed bracken for direct application to plots. To avoid leaching all batches of bracken (with the exception of S.4843) were dried and stored under cover until they were applied to the land in the early spring of the following season. S.4843, the first batch to be collected, was left exposed in the open until December and was heavily leached.

Cereal straw (barley and wheat). Straw was used for compost making and for direct application to the plots.

Peat. Granular sedge peat from Somerset was used in all experiments. It was either applied as such or reinforced with fertilizer. Only one sample was analysed.

Sawdust. S.6166 and S.6293: coarse softwood; S.6285 mixed soft and hardwood; S.6158 type of wood not known;

Dried grass and Grass silage. From Hertfordshire Institute of Agriculture.

Sewage sludge.

S.4430 Digested primary sedimentation sludge containing some surplus activated sludge from the West Middlesex Works.

S.4705, S.4737 Sludge from West Middlesex Works, selected as a good sludge of domestic origin. Partially dried material was taken to another works for grinding. The appearance, analysis and behaviour of the sludge suggest that considerable amounts of sludge from the second works were mixed with the West Middlesex batch during the grinding and bagging.

ANALYSES

The analyses for total N were made on fresh samples but are recorded, for simplicity, as percentages of dry matter. Materials marked * have been used in making composts.

Rothamsted Sample No. S	Date[1]	% of fresh matter	% of dry matter: total N	P	K	Mg	ash	org. matter	% of org. matter N
fresh hopwaste									
FROM ABINGDON BREWERY									
4804	Mar. 1946	12.0	4.00	0.65	0.17	n.d.	8.0	92.0	4.35
4835	Mar. 1946	13.0	5.62	1.05	0.20	n.d.	8.9	91.1	6.17
4845	Mar. 1946	12.2	5.74	1.63	0.14	n.d.	12.8	87.2	6.58
5105	Mar. 1947	14.8	5.56	2.17	0.21	n.d.	13.0	87.0	6.39
5133	Apr. 1947	10.2	5.71	1.71	0.13	n.d.	10.3	89.7	6.37
5138	Apr. 1947	12.5	5.74	2.09	0.21	n.d.	14.2	85.8	6.69
5147	Apr. 1947	15.4	5.33	2.07	0.21	n.d.	14.8	85.2	6.26
5257*	Aug. 1947	15.0	5.33	1.16	0.20	n.d.	10.8	89.2	5.98
5439	Mar. 1948	13.5	5.73	1.02	0.12	n.d.	9.9	90.1	6.36
5474	Mar. 1948	11.8	3.47	0.79	0.15	n.d.	11.1	88.9	3.90
5593*	Oct. 1948	14.1	5.29	1.50	0.11	n.d.	9.7	90.3	5.86
5714	Mar. 1949	10.7	3.87	0.67	0.09	n.d.	7.3	92.7	4.17
5718	Mar. 1949	12.4	5.10	1.56	0.14	n.d.	9.1	90.9	5.61
5794*	Sept.1949	13.0	4.09	0.75	0.09	n.d.	19.3	80.7	5.07
5882	Feb. 1950	13.5	5.39	0.99	0.20	n.d.	9.3	90.7	5.94
5891	Mar. 1950	13.1	5.26	0.63	1.10	n.d.	10.8	89.2	5.89
FROM OXFORD BREWERY									
5954*	Aug. 1950	13.2	4.81	0.84	0.15	0.42	7.8	92.2	5.22
6029	Mar. 1951	12.3	6.60	1.35	0.09	0.59	7.9	92.1	7.17
6082*	July 1951	19.7	4.53	1.20	0.25	0.34	10.5	89.5	5.06
6160	Feb. 1952	15.6	3.99	0.65	0.25	0.28	7.2	92.8	4.30
6215*	July 1952	22.2	3.15	0.93	0.20	0.05	38.5	61.5	5.12
6396+7*	July 1953	19.7	4.01	1.06	0.22	0.37	21.7	78.3	5.12
6546+7*	July 1954	18.3	4.84	1.24	0.26	0.47	15.7	84.3	5.74
6718+21*	July 1955	16.3	4.98	0.94	0.19	0.38	8.3	91.7	5.43
FROM DORCHESTER BREWERY									
6086*	July 1951	17.2	5.27	0.72	0.17	0.26	19.0	81.0	6.51
6220*	July 1952	16.5	5.60	0.95	0.16	0.26	14.2	85.8	6.53
6400*	July 1953	17.4	5.08	0.98	0.16	0.48	17.0	83.0	6.12
6549*	July 1954	13.1	4.49	0.93	0.12	0.43	11.7	88.3	5.08
6730*	July 1955	14.6	4.60	0.97	0.26	0.36	11.0	89.0	5.17
dried hopwaste									
4419	Mar. 1945	89.3	4.49	0.72	0.04	n.d.	5.5	94.5	4.75

[1] refers to delivery date for hopwaste and cutting date for bracken.

Table 24 cont.

Rothamsted Sample No. S	Date (Harvest)	% of fresh matter	% of dry matter: total N	P	K	Mg	ash	org. matter	% of org. matter N
green chaffed bracken used for making compost									
FROM BAGLEY WOOD									
5263*	Aug. 1947	38.8	2.22	0.13	2.87	n.d.	7.9	92.1	2.41
5792*	June 1949	85.8	2.44	0.23	1.93	n.d.	6.0	94.0	2.59
5950*	Aug. 1950	31.0	1.48	0.10	2.22	0.17	7.2	92.8	1.60
6081*	July 1951	23.9	2.53	0.23	2.56	0.17	7.6	92.4	2.74
6214*	July 1952	34.7	2.32	0.15	2.43	0.13	7.9	92.1	2.52
6395+8*	July 1953	24.4	2.53	0.21	2.40	0.20	7.9	92.1	2.75
6544+5*	July 1954	22.8	2.66	0.19	2.74	0.17	8.7	91.3	2.91
6720+2*	July 1955	23.6	2.71	0.21	2.85	0.19	8.2	91.8	2.95
FROM WYTHAM HILL									
5594*	Aug. 1948	24.0	2.52	0.06	3.01	n.d.	9.8	90.2	2.79
FROM WAREHAM DISTRICT									
6085*	July 1951	35.1	2.39	0.15	1.88	0.17	5.7	94.3	2.53
6221*	July 1952	32.0	1.68	0.14	1.54	0.17	5.5	94.5	1.78
6401*	July 1953	32.8	1.76	0.11	1.66	0.20	6.1	93.9	1.87
6548*	July 1954	25.8	2.71	0.19	2.24	0.19	6.7	93.3	2.90
6729*	July 1955	27.0	2.21	0.23	2.25	0.20	6.7	93.3	2.37
dried chaffed bracken									
FROM BAGLEY WOOD									
4843	July 1945	48.8	0.98	0.07	0.17	n.d.	7.0	93.0	1.05
5134	July 1946	83.6	2.54	0.23	2.17	n.d.	6.9	93.1	2.73
5303	Aug. 1947	82.8	2.27	0.17	2.37	n.d.	7.4	92.6	2.45
5886	June 1949	84.1	2.26	0.21	1.73	n.d.	6.5	93.5	2.42
6027	Aug. 1950	80.2	2.42	0.24	2.15	0.14	8.4	91.6	2.64
6157	July 1951	78.3	1.67	0.18	2.34	0.13	7.0	93.1	1.79
dried bracken									
FROM WYTHAM HILL									
5715	Aug. 1948	81.4	1.96	0.12	1.85	n.d.	6.6	93.4	2.10
barley straw									
5252*	1946	85.7	0.70	0.15	0.70	n.d.	11.3	88.7	0.79
5374	1947	90.8	0.70	0.10	0.79	n.d.	7.8	92.2	0.76
wheat straw									
5163	1946	89.4	0.46	0.05	0.75	n.d.	6.6	93.4	0.49
5434	1947	87.9	0.71	0.17	1.25	n.d.	7.1	92.9	0.76
5585*	1948	86.4	0.53	0.06	0.92	n.d.	5.8	94.2	0.56
5716	1948	77.5	0.42	0.07	0.77	n.d.	6.8	93.2	0.45
5793*	1949	90.5	0.66	0.06	0.76	n.d.	6.5	93.5	0.70
5881	1949	83.7	0.46	0.06	0.80	n.d.	6.8	93.2	0.50
5955*	1950	84.4	0.82	0.12	0.77	0.08	9.2	90.8	0.90
6028	1950	81.2	0.96	0.10	0.57	0.06	6.1	93.9	1.02
6091*	1951	86.7	0.44	0.05	0.84	0.08	6.0	94.0	0.47
6159	1951	84.2	0.47	0.06	0.81	0.08	6.0	94.0	0.50
	Date applied								
peat[1]									
5071	1947	53.2	2.13	0.03	0.07	n.d.	6.9	93.1	2.29
sawdust									
6158	1952	59.3	0.30	0.03	0.19	0.04	2.1	97.9	0.31
6166	1952	60.8	0.11	0.01	0.05	0.02	0.7	99.3	0.11
6285	1953	43.3	0.14	0.01	0.08	0.01	0.9	99.1	0.14
6293	1953	59.5	0.18	0.02	0.20	0.03	1.9	98.1	0.18
dried grass									
5684	1949	90.1	1.83	0.21	1.40	n.d.	9.8	90.2	2.03
5876	1950	88.9	1.29	0.21	1.15	n.d.	6.5	93.5	1.38
grass silage									
5680	1949	24.1	2.85	0.29	2.16	n.d.	23.6	76.4	3.73
5887	1950	21.2	2.79	0.38	2.29	n.d.	10.3	89.7	3.11
sewage sludge									
4430	1945	45.4	2.38	1.43	0.26	n.d.	58.0	42.0	5.67
4705	1946	76.8	2.59	1.99	0.34	n.d.	59.4	40.6	6.38
4737	1946	82.2	3.00	2.70	0.36	n.d.	62.6	37.4	8.02

* materials marked with an asterisk have been used in compost making

[1] peat was used in several years but only one sample was analysed

Table 25

Composts, peat and farmyard manure

Hopwaste - dried blood compost	fresh hopwaste rotted with dried blood
Hopwaste compost	hopwaste rotted by itself
Bracken - dried blood compost	chaffed green bracken rotted with dried blood
Bracken-superphosphate compost	chaffed green bracken composted with 56 kg. superphosphate (28 kg. in 1948 and 1951) per ton of bracken
Bracken-hopwaste-bonemeal compost	75% chaffed green bracken and 25% fresh hopwaste (by volume) rotted with 13 kg. of bonemeal per ton of bracken
Bracken-hopwaste compost	75% chaffed green bracken and 25% hopwaste (by volume)
Bracken-hopwaste compost (stored)	as above but stored under cover for a further 12 months
Straw-hopwaste compost	50% chaffed wheat straw and 50% fresh hopwaste (by volume)
Straw-fertilizer compost	
made with inorganic NP	
S.4829, S.4839	wheat straw (unchaffed) rotted with NP fertilizer and reinforced after rotting with 'Nitro-Chalk' and ammonium phosphate
S.5073, S.5433	wheat straw (unchaffed) rotted with NP fertilizer
S.5488, S.5708, S.5878, S.6023, S.6156	chaffed wheat straw rotted with 66 kg. 'Nitro-Chalk' and 56 kg. superphosphate (28 kg. for S.6023) per ton of straw
made with organic NP	chaffed wheat straw rotted with 63 kg. dried blood and 49 kg. bonemeal (25 kg. for S.6024) per ton of straw
Peat with NP fertilizer	peat reinforced with 'Nitro-Chalk' and ammonium phosphate
Farmyard manure	a fresh strawy manure from a deep covered yard under bullocks
Grass-straw compost	66% fresh young grass and 33% wheat straw (by volume) made in the open
Molinia - dried blood compost	Molinia cuttings rotted with dried blood

Notes on analyses

The analyses for total N and for N as ammonium and nitrate were made on fresh samples but are recorded, for simplicity, as percentages of dry matter.

Table 25 cont.

ANALYSES[2]

Rothamsted Sample No. S	Date[1]	% of fresh dry matter	% of dry matter: total N	NH_3-N	NO_3-N	P	K	Mg	ash	org. matter	% of org. matter: total N
hopwaste compost prepared with dried blood											
MADE AT BAGLEY											
4414	1945	34.4	2.90	0.08	0.17	0.76	0.13	n.d.	50.1	49.9	5.82
4432	1945	35.6	2.90	0.06	0.18	0.80	0.11	n.d.	51.7	48.3	6.00
4716	1946	25.0	3.56	0.03	0.20	1.68	0.22	n.d.	29.0	71.0	5.01
4803	1946	20.4	4.56	0.08	0.22	1.48	0.17	n.d.	27.4	72.6	6.28
hopwaste compost											
MADE AT BEDFORD COLLEGE											
4833	1946	25.0	3.36	0.04	0.31	1.32	0.16	n.d.	44.6	55.4	6.06
4847	1946	27.5	3.16	0.07	0.23	1.23	0.22	n.d.	47.6	52.4	6.03
MADE AT BAGLEY											
4834	1946	17.8	5.28	0.35	0.24	1.20	0.17	n.d.	23.4	76.6	6.89
4846	1946	16.2	5.62	0.30	0.30	1.24	0.17	n.d.	17.7	82.3	6.83
5132	1947	21.6	4.24	0.06	0.32	1.13	0.13	n.d.	28.3	71.7	5.91
5440	1948	29.8	3.56	nil	0.14	1.40	0.18	n.d.	36.9	63.1	5.64
MADE AT KENNINGTON											
5149[2]	1947	23.5	3.16	nil.	0.10	n.d.	n.d.	n.d.	41.6	58.4	5.41
5707	1949	23.3	3.76	0.02	0.20	1.06	0.23	n.d.	39.8	60.2	6.25
5877	1950	18.9	4.92	0.02	0.13	1.30	0.37	n.d.	22.5	77.5	6.35
6021	1951	16.6	5.65	0.26	0.18	1.20	0.42	0.55	16.8	83.2	6.79
6153	1952	19.7	4.45	0.01	0.19	1.17	0.32	0.36	24.4	75.6	5.89
bracken compost prepared with dried blood											
MADE AT BAGLEY											
4415	1945	28.2	3.82	0.61	0.25	0.21	0.80	n.d.	27.4	72.6	5.26
4431	1945	29.6	4.07	0.68	0.32	0.23	0.85	n.d.	25.1	74.9	5.44
4836	1946	35.0	2.43	0.16	0.27	0.31	0.95	n.d.	28.6	71.4	3.40
4844	1946	35.5	2.42	0.14	0.28	0.30	0.98	n.d.	30.4	69.6	3.48
bracken compost prepared with superphosphate											
MADE AT BAGLEY											
5450	1948	35.0	2.51	0.58	0.11	0.87	2.08	n.d.	22.1	77.9	3.22
MADE AT KENNINGTON											
5711	1949	27.1	1.50	0.04	0.01	1.56	0.44	n.d.	25.2	74.8	2.00
5883	1950	26.0	1.74	0.07	0.05	1.24	1.05	n.d.	27.1	72.9	2.39
6025	1951	25.2	2.40	0.05	0.01	0.83	2.34	0.25	16.3	83.7	2.87
6150	1952	23.5	3.00	0.21	0.12	1.47	2.69	0.18	21.8	78.2	3.84
bracken-hopwaste compost prepared with bonemeal											
MADE AT KENNINGTON											
5125	1947	28.3	3.30	0.02	0.20	0.92	1.27	n.d.	29.3	70.7	4.67
bracken-hopwaste compost											
MADE AT BAGLEY											
5438	1948	26.8	3.42	0.20	0.09	0.78	1.77	n.d.	28.6	71.4	4.79
5706	1949	26.8	2.98	0.01	0.43	0.67	1.34	n.d.	31.4	68.6	4.34
MADE AT KENNINGTON											
5879	1950	36.9	3.52	0.12	0.10	0.65	1.54	n.d.	34.9	65.1	5.41
6015	1951	26.3	3.58	0.12	0.18	0.49	1.75	0.33	21.5	78.5	4.56
6026	1951	24.2	2.73	0.17	0.12	0.46	1.76	0.30	21.5	78.5	3.48
6152	1952	24.3	3.81	0.07	0.13	0.75	2.22	0.31	30.0	70.1	5.44
6151	1952	23.3	3.73	0.06	0.21	0.78	2.14	0.33	27.2	72.8	5.12
6308	1953	29.1	3.89	0.33	0.05	0.71	2.28	0.13	25.0	75.0	5.19
6500	1954	22.1	3.53	0.13	0.20	0.86	1.78	0.33	24.7	75.3	4.69
6654	1955	20.9	3.74	0.05	0.02	0.94	1.99	0.33	27.1	72.9	5.13
6670	1955	21.5	3.56	0.07	0.09	0.84	1.97	0.33	23.9	76.1	4.68
6862	1956	21.8	4.20	n.d.	n.d.	0.94	2.98	0.47	21.1	78.9	5.32
bracken and hopwaste compost											
MADE AT WAREHAM											
5892	1950	28.5	2.89	0.08	0.25	0.67	0.93	n.d.	34.7	65.3	4.43
6016	1951	20.4	4.27	0.01	0.16	0.50	1.44	0.36	19.2	80.8	5.28
6165	1952	17.9	4.25	0.01	0.24	0.41	1.64	0.26	12.8	87.2	4.87
6292	1953	16.0	3.85	0.01	0.05	0.44	1.44	0.24	11.9	88.2	4.37
6315	1953	17.7	3.69	0.01	0.00	0.46	1.30	0.18	16.0	84.0	4.39
6486	1954	17.1	3.88	0.01	0.07	0.45	1.19	0.37	13.2	86.8	4.46
6498	1954	17.4	3.98	0.00	0.08	0.51	1.21	0.38	15.4	84.6	4.70
6632	1955	16.2	3.89	0.01	0.26	0.48	1.54	0.28	11.9	88.1	4.42
6649	1955	16.8	3.81	0.01	0.02	0.46	1.54	0.30	12.9	87.1	4.37
6665	1955	16.5	4.17	0.02	0.01	0.51	1.96	0.30	11.8	88.2	4.73
6841	1956	16.6	3.54	n.d.	n.d.	0.50	1.89	0.32	12.3	87.7	4.04
6860	1956	16.6	3.75	n.d.	n.d.	0.54	1.85	0.30	11.5	88.5	4.24
7042	1957	18.8	4.08	0.02	0.26	0.59	2.26	0.34	13.3	86.7	4.70

[1] Date refers to cropping season in which organic manures were applied.

[2] made in the open

Table 25 cont.

ANALYSES[2]

Rothamsted Sample No. S	Date[1] Date	% of fresh dry matter	% of dry matter: total N	NH_3-N	NO_3-N	P	K	Mg	ash	org. matter	% of org. matter: total N
bracken and hopwaste compost, stored											
MADE AT KENNINGTON											
6307	1953	33.3	3.47	0.01	0.28	0.71	2.05	0.08	29.7	70.3	4.94
6501	1954	37.5	3.66	0.01	0.24	0.64	2.34	0.36	28.5	71.5	5.12
6664	1955	30.9	3.44	0.01	0.44	0.84	2.08	0.35	25.5	74.5	4.62
straw and hopwaste compost											
MADE AT BAGLEY											
5447	1948	27.2	3.56	0.02	0.18	0.90	0.44	n.d.	33.7	66.3	5.37
MADE AT KENNINGTON											
5709	1949	16.0	4.16	0.02	0.42	1.30	0.80	n.d.	25.8	74.2	5.61
5880	1950	16.1	4.55	0.02	0.12	0.80	0.76	n.d.	19.1	80.9	5.62
6022	1951	18.2	4.41	0.23	0.14	0.82	0.91	0.45	20.6	79.4	5.55
6154	1952	20.5	4.21	0.07	0.17	0.98	0.78	0.36	21.5	78.5	5.36
straw-compost prepared with inorganic fertilizer											
MADE AT ROTHAMSTED											
4829	1946	24.4	3.52	0.80	0.38	1.51	1.34	n.d.	38.5	61.5	5.72
4839	1946	24.8	3.59	0.77	0.41	1.44	1.29	n.d.	38.6	61.4	5.85
5073	1947	24.4	2.45	0.22	0.05	1.06	1.26	n.d.	42.7	57.3	4.28
5433	1948	26.3	2.25	0.06	0.02	1.06	0.73	n.d.	39.4	60.6	3.71
MADE AT BAGLEY											
5448	1948	26.2	2.39	0.02	0.17	1.03	0.86	n.d.	31.8	68.2	3.50
MADE AT KENNINGTON											
5708	1949	22.4	2.52	0.56	0.69	1.45	1.29	n.d.	31.0	69.0	3.65
5878	1950	31.0	3.02	0.94	0.59	1.52	0.90	n.d.	38.1	61.9	4.88
6023	1951	30.3	3.36	1.07	0.70	0.53	1.08	0.20	29.2	70.8	4.75
6156	1952	31.5	3.50	0.89	0.65	1.61	1.23	0.19	34.1	65.9	5.31
straw-compost prepared with concentrated organic fertilizer											
MADE AT BAGLEY											
5449	1948	25.6	3.15	0.01	0.27	1.28	1.13	n.d.	30.6	69.4	4.54
MADE AT KENNINGTON											
5710	1949	20.1	3.36	0.40	0.60	1.75	2.04	n.d.	23.5	76.5	4.39
5884	1950	28.7	4.12	0.40	0.30	2.02	1.23	n.d.	31.7	68.3	6.03
6024	1951	34.4	4.07	0.51	0.12	0.86	1.32	0.16	22.3	77.7	5.24
6155	1952	23.5	4.22	0.65	0.31	2.47	1.22	0.21	23.5	76.5	5.52
peat reinforced with inorganic fertilizer											
MADE AT ROTHAMSTED											
4838	1946	29.5	3.08	1.00	0.46	0.96	0.12	n.d.	9.3	90.7	3.40
4828A	1946	28.4	3.15	1.06	0.48	0.95	0.09	n.d.	10.3	89.7	3.51
farmyard manure											
MADE AT ROTHAMSTED											
4413	1945	24.2	2.17	0.49	0.01	0.32	2.54	n.d.	28.8	71.2	3.05
4434	1945	23.0	2.22	0.47	0.04	0.29	3.03	n.d.	20.7	79.3	2.80
grass-straw compost											
MADE AT KENNINGTON											
5681	1949	32.5	2.31	0.01	0.07	0.52	3.63	n.d.	59.5	40.5	5.70
5885	1950	24.0	3.81	0.19	0.18	0.85	4.81	n.d.	37.3	62.7	6.08
Molinia compost made with dried blood											
MADE AT BAGLEY											
4416	1945	35.2	3.20	0.56	0.13	0.19	0.32	n.d.	42.8	57.2	5.60
4433	1945	39.1	3.21	0.47	0.11	0.19	0.28	n.d.	42.8	57.2	5.60

[1] Date refers to cropping season in which organic manures were applied.

[2] The analyses for total N and for N as ammonium and nitrate were made on fresh samples but are recorded, for simplicity, as percentages of dry matter.

Table 26

'Partial sterilants', fungicides, insecticides and other biological inhibitors and accelerators

formalin, commercial product
40% formaldehyde used 1947 to 1950. (This material polymerises during very cold weather)
38% formaldehyde (containing 10% methanol added as sterilizer) used from 1951 onwards

paraformaldehyde (solid polymer, containing about 96% equivalent formaldehyde), commercial product
granular, used 1949 to 1952
powdered, used 1953 to 1955

chloropicrin, commercial product

ethylene dibromide, commercial product

'D-D', mixture of 1,2-dichloropropane and 1,3-dichloropropene. Commercial product

CBP.55 mixture of chlorinated and brominated hydrocarbons of which at least 55% weight of the total is in the form of chlorobromopropene

CBP.Emulsible (which can be made from CBP.55 plus a suitable diluent and emulsifier) contains approximately 50% weight CBP.55

OS.1897 1,2, dibromo-chloropropane

cresylic acid commercial grade (mixture of phenols and cresols)

bleaching powder calcium chloro-hypochlorite, commercial product

potassium dichromate, chemical grade

sodium chlorate, chemical grade

dicyandiamide (Roth.No. N.235) see under 'nitrogen fertilizers'

Thiuram, commercial product containing 50% tetramethylthiuram disulphide

tetrachlornitrobenzene dust containing 3% active ingredient

calomel dust, commercial product containing 4% active ingredient

"Perenox" cuprous oxide, commercial product containing about 50% copper

sodium permanganate, chemical grade

'cuprammonium' 1 part copper sulphate + 4 parts ammonium carbonate. Laboratory preparation.

'red lead' lead tetraoxide

Gammexane, 3½% B.H.C. commercial product

Dieldrin 50% wettable powder, commercial product

Aldrin 40% wettable powder, commercial product

methanol chemical grade

sucrose chemical grade

wheat flour

hexamine (Roth.No. N.277) hexamethylene tetramine

vaporizing oil is a light mineral oil, specific gravity 0.82, boiling range 145-250°C, aromatic hydrocarbons 12-35%

Part B

SEEDBED EXPERIMENTS

Table 27

Seedcovers

Ringwood R 28, Wareham W 29

Years and Species

1948	seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-1956	1+0 Sitka spruce seedbeds

Design and Treatments

R 28 1948-1950 32 plots in 4 blocks of 8; 2 blocks unsteamed and 2 steamed in November 1947

W 29 1948-1956[1] 32 plots in 4 blocks of 8; highest order interaction confounded from 1955 owing to introduction of formalin tests

Ringwood	Wareham	
1948-49	1948-51	8 seedcovers (4 calcareous and 4 non-calcareous)
1950	1952-56	residual effect of 8 seedcovers (St. Austell quartz used on all plots)
-	1955 only	test on presence and absence of formalin (250 ml. per sq.yd. applied in 5 l. water)

SEEDCOVERS

non-calcareous covers

Norway spruce litter[2] weighed down with light cover of St. Austell quartz
Bedford sand (Leighton Buzzard, Beds.) as used at Kennington Nursery, Oxford.
Doncaster quartzite grit (Auckley, Yorks.) selected to replace calc. oolite gravel
St. Austell quartz from china clay workings, Cornwall.

calcareous covers

calcareous sea grit (Porthcawl, Glam.) as used at Tair Onen Nursery, Glam.
calcareous oolite gravel (W.Ayton, Yorks.) as used at Wykeham and Harwood Dale nurseries, Yorks.
calcareous shore sand (Bude, Cornwall), as used at Hallwill Nursery, N.Devon.
carboniferous limestone chips as used at Tair Onen Nursery, Glam.

[1] The experiment was continued after 1956 but results are presented only up to that date
[2] Oak litter in 1948

	Rothamsted TV/M Nos.[3]		per cent $CaCO_3$		Mechanical composition: 1948 percentage over						1949 percentage over					
	1948	1949	1948	1949	5	3	2	1	.5	.25 mm.	5	3	2	1	.5	.25 mm.
litter + St. Austell	78+95	99+100	<1													
Bedford sand	94	no sample	<1	-	0	0	0	4	30	98	-	-	-	-	-	-
Doncaster quartzite	98	103	<1		13	46	55	68	76	89	42	87	96	100	100	100
St. Austell quartz	95	100	<1		23	73	84	93	99	100	15	54	70	84	89	95
calcareous sea grit	96	no sample	9	-	73	95	96	97	99	100	-	-	-	-	-	-
calcareous oolite gravel	92	102	33		25	86	95	99	100	100	22	96	98	98	99	100
calcareous shore sand	97	101	54		0	0	0	0	4	72	0	0	0	0	9	66
limestone chips	93	104	92		12	39	55	72	81	85	19	48	61	76	84	88

[3] no samples were taken in 1950 and 1951

Basal dressing

			units	1948	1949	1950	1951	1952	1953	1954	1955	1956
				rate per sq.yd.								
N	seedbed	ammonium sulphate	g.N	8½	5	-	-	-	-	-	-	-
		'Nitro-Chalk'	g.N	-	-	4½	-	-	-	-	-	-
	topdressed 'Nitro-Chalk'	early	g.N	-	4½	4½	4½	4½	4½	4½	4½	4½
		late	g.N	-	-	-	4½	4½	4½	4½	4½	4½
P	superphosphate		g.P	5½	4½	4½	4½	4½	4½	4½	9	9
K	potassium chloride		g.K	7	4	4½	4½	8½	8½	8½	9	9
Mg	kieserite		g.Mg	-	-	-	-	4½	1½	3	3	3

Dates

	Ringwood 1948	1949	1950	Wareham 1948	1949	1950	1951	1952	1953	1954	1955	1956
formalin (winter before cropping)	-	-	-	-	-	-	-	-	-	-	23/12	-
seedbed (P, K, Mg; N 1948-1950)	30/3	16/3	7/3*	1/4	17/3	8/3*	6/3	5/3**	3/3	24/2	11/3	7/3
N topdressed early	-	20/6	26/6	-	21/6	27/6	26/6	24/6	24/6	24/6	28/6	26/6
late	-	-	-	-	-	-	1/8	14/8	30/7	4/8	3/8	31/7
Broadcast sowing of seed and application of seedcover	28/4	8/4	29/3	23/4	1/4	28/3	28/3	9/4	17/3	16/3	18/3	23/3

* N raked in (after forking in of fertilizer) during final preparation of seedbed

** half P dressing (2.5 g.P) forked in with K and Mg
half P dressing (2.5 g.P) spread on the surface after forking

Table 27 cont.

Ringwood, R 28

Height in inches	SITKA SPRUCE 1948 no steam	1948 steam	1949 no steam	1949 steam	1950 no steam	1950 steam	SCOTS PINE 1948 no steam	1948 steam
MEANS								
Norway spruce litter[2]	0.58	1.24	0.77	0.76	0.86	1.03	1.46	1.97
Bedford sand	0.49	0.95	0.67	1.38	0.54	0.52	1.22	1.80
Doncaster quartzite	0.47	1.04	0.50	0.93	0.76	0.68	1.28	1.81
St. Austell quartz	0.57	0.88	0.64	1.05	0.92	0.48	1.40	1.58
calc. sea grit	0.52	0.94	0.40	0.74	0.53	0.62	1.51	1.79
calc. oolite gravel	0.52	1.08	0.44	0.63	0.68	0.68	1.48	1.92
limestone chips	0.71	0.88	0.31	0.64	0.45	0.58	1.44	2.20
calc. shore sand	0.39	0.99	0.35	0.89	0.36	0.66	1.32	2.10
S.E.±	0.110	0.091	0.089	0.099	0.041	0.093	0.171	0.175
DIFFERENCE								
calc.- non-calc. cover	0.01	-0.05	-0.27*	-0.30**	-0.26**	-0.04	0.09	0.22
S.E.±	0.078	0.064	0.063	0.070	0.029	0.066	0.121	0.124
c.v.%	29.3	12.9	24.8	15.9	9.1	20.1	17.4	13.0
Number of plants per square yard								
MEANS								
Norway spruce litter[2]	450	402	384	471	510	675	462	504
Bedford sand	708	888	852	1041	459	609	618	540
Doncaster quartzite	444	582	285	408	417	675	582	498
St. Austell quartz	390	756	177	597	582	705	462	516
calc. sea grit	234	432	243	447	303	540	402	354
calc. oolite gravel	366	378	144	354	432	492	408	534
limestone chips	510	696	87	228	507	930	414	372
calc. shore sand	636	762	231	303	453	681	486	498
S.E.±	65.9	85.1	83.1	65.4	82.9	111.0	44.6	62.8
DIFFERENCE								
calc.- non-calc. cover	-62	-90	-248*	-296**	-68	-5	-104*	-75
S.E.±	46.6	60.2	58.8	46.3	58.6	78.5	31.6	44.4
c.v.%	19.9	19.7	39.1	19.2	25.1	23.7	13.2	18.5

Wareham, W 29

Height in inches	SITKA SPRUCE 1948	1949	1950	1951	1952	1953	1954	1955	1956	SCOTS PINE 1948
MEANS										
Norway spruce litter[2]	1.41	1.53	1.34	1.98	2.32	2.46	3.15	1.86	2.32	2.34
Bedford sand	1.74	1.73	2.00	2.08	2.16	2.11	2.64	1.69	2.26	2.45
Doncaster quartzite	1.44	1.57	2.42	2.08	2.14	2.35	3.02	1.81	2.09	1.73
St. Austell quartz	1.75	1.65	2.12	2.08	2.33	2.27	3.09	1.92	2.01	1.98
calc. sea grit	1.61	1.52	1.90	1.94	1.69	1.81	2.06	1.26	1.26	1.70
calc. oolite gravel	1.53	1.52	1.80	1.63	1.52	1.70	1.92	1.22	0.98	1.70
limestone chips	1.23	1.22	1.93	1.39	1.48	1.25	1.22	0.94	0.66	1.86
calc. shore sand	1.02	2.02	1.53	2.01	1.28	0.70	0.77	0.73	0.61	1.71
S.E.±	0.101	0.144	0.235	0.157	0.128	0.164	0.223	0.126	0.130	0.116
DIFFERENCE										
calc.- non-calc. cover	-0.24**	-0.05	-0.18	-0.31*	-0.74**	-0.93**	-1.48**	-0.78**	-1.29**	-0.38**
S.E.±	0.072	0.102	0.166	0.111	0.090	0.116	0.158	0.090	0.092	0.082
EFFECT OF FORMALIN WITH										
non-calc. cover	-	-	-	-	-	-	-	-0.05	-0.19	-
calc. cover	-	-	-	-	-	-	-	0.13	0.15	-
S.E.±	-	-	-	-	-	-	-	0.126	0.130	-
c.v.%	13.8	18.0	25.0	16.5	13.7	17.9	20.0	17.7	17.1	12.1
Number of plants per square yard										
MEANS										
Norway spruce litter[2]	573	278	690	730	662	1000	954	1104	1228	450
Bedford sand	390	996	993	800	616	930	888	1176	1286	351
Doncaster quartzite	393	404	820	927	690	926	938	1191	1264	90
St. Austell quartz	636	502	964	856	538	1036	968	1143	1161	201
calc. sea grit	339	210	658	933	648	930	874	1272	1210	48
calc. oolite gravel	414	294	702	982	837	978	880	1149	1236	81
limestone chips	381	194	531	849	771	966	801	1302	1198	78
calc. shore sand	75	608	120	988	980	838	852	1328	1258	24
S.E.±	63.2	51.6	74.4	61.6	71.2	70.3	56.4	61.7	61.0	-
DIFFERENCE										
calc.- non-calc. cover	-196**	-219**	-364**	110*	182**	-45	-85*	109*	-9	-215
S.E.±	44.7	36.5	52.6	43.5	50.3	49.7	39.9	43.6	43.1	-
EFFECT OF FORMALIN WITH										
non-calc. cover	-	-	-	-	-	-	-	152*	53	-
calc. cover	-	-	-	-	-	-	-	-19	14	-
S.E.±	-	-	-	-	-	-	-	61.7	61.0	-
c.v.%	31.7	23.7	21.7	13.9	19.8	14.8	12.6	10.2	9.9	-

[2] Oak litter in 1948

Table 28

Manuring, seedcover, acidification

Harwood Dale HD 2

Years and Species 1948-1950 1+0 Sitka spruce seedbeds

Design 48 plots in 4 blocks of 12; 2 blocks under transplants in 1944 and 1945
2 blocks under seedbeds with calcareous seedcover in 1944 and 1945

Factorial test on:	1948-1950		1948-1950		1948
	unmanured compost fertilizer	×	non-calcareous cover v.calcareous cover	×	no acidification v.aluminium sulphate

Treatments

	units	rate per sq.yd. 1948	1949	1950
Compost of bracken and hopwaste (Roth.No. 1948 S.5438; 1949 S.5706; 1950 S.5892)	kg.	2¼	2¼	2¼
fertilizer				
N ammonium sulphate in seedbed	g.N	8½	5	4½
'Nitro-Chalk' topdressed	g.N	-	4½	4½
P superphosphate	g.P	5½	4½	4½
K potassium chloride	g.K	7	4	4½
aluminium sulphate (Ral) applied in February	g.	450	-	-

Seedcovers

		Rothamsted Numbers 1948	1949	1950
non-calcareous cover (T)	Doncaster quartzite	TV/M 98	TV/M 103	not sampled
calcareous cover (Tc)	calc. Oolite gravel	TV/M 92	TV/M 102	not sampled

Dates

Acidification	Manuring					Broadcast sowing of seed		
1948	1948	1949		1950		1948	1949	1950
	seed-bed	seed-bed	top-dressed	seed-bed	top-dressed			
2/2	10/4	27/3	20/7	24/3	10/7	23/4	5/4	5/4

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	1948		1949		1950		1948		1949		1950	
	Site of seed-beds	Site of trans-plants	Site of seed-beds	Site of trans-plants	Site of seed-beds	Site of trans-plants	Site of seed-beds	Site of trans-plants	Site of seed-beds	Site of trans-plants	Site of seed-beds	Site of trans-plants
Mean	0.75	1.19	1.67	2.13	1.19	1.70	671	615	339	606	592	765
Unmanured	0.69	0.86	1.50	1.68	1.00	1.30	722	681	374	633	603	769
Compost	0.80	1.19	1.86	1.83	1.16	1.58	724	650	314	468	573	712
Fertilizer	0.77	1.51	1.65	2.90	1.42	2.23	567	514	328	716	598	814
S.E.±	0.050	0.091	0.168	0.212	0.087	0.092	49.2	48.4	79.4	69.8	61.4	29.0
Effect of[1]												
(Tc-T)'	0.04	0.12	-0.36	-0.12	-0.33**	-0.31**	-94	68	-20	-6	-68	-119**
Ral'	-0.20**	0.02	0.09	0.27	0.27*	-0.17	7	-62	14	77	77	-13
(Tc-T)'Ral'	-0.06	0.01	-0.23	-0.14	-0.18	0.12	15	-6	-22	-128	-46	-6
S.E.±	0.058	0.105	0.194	0.245	0.100	0.106	56.8	55.9	91.8	80.6	70.9	33.5
Effect of (Tc-T)' with												
Unmanured	0.04	-0.08	-0.07	0.20	-0.22	0.41*	-36	96	70	63	105	-76
Compost	0.02	0.20	-0.64	0.04	-0.23	-0.05	-114	46	27	12	-63	-138*
Fertilizer	0.06	0.23	-0.39	-0.58	-0.55**	-1.30**	-132	62	-159	-93	-246	-142*
Effect of Ral' with												
Unmanured	-0.38**	0.21	0.10	-0.08	0.41*	-0.19	-132	-60	-260	-117	3	-92
Compost	-0.10	0.20	0.22	0.98*	0.17	-0.16	36	-34	54	336*	96	48
Fertilizer	-0.12	-0.34	-0.05	-0.10	0.24	-0.17	117	-92	246	12	132	4
S.E.±	0.101	0.182	0.337	0.424	0.173	0.184	98.4	96.8	158.8	139.6	122.8	57.9
c.v.%	19.0	21.6	28.5	28.2	20.6	15.3	20.7	22.4	33.2	16.3	29.5	10.7

[1] averaging over unmanured, compost and fertilizer

Table 29

Acidification and fertilizer

Old Kennington K 4

Years and Species: 1946 seedbed plots split for 1+0 Sitka spruce (SS) v. 1+0 Scots pine (SP)
1947 seedbed plots with 1+0 Sitka spruce only

Design and Treatments: 3 blocks of 24 plots

NO ACIDIFICATION: unmanured
hopwaste compost (1946 only)
fertilizer (applied 1946 and 1947)

WINTER ACIDIFICATION (1946 only): 3 heavy rates of sulphuric acid, 3 heavy rates of sulphur

SPRING ACIDIFICATION (1946 only): 2 light rates of sulphuric acid, 2 light rates of sulphur each with and without fertilizer (applied in 1946 and 1947)

2 rates of nitric acid, 2 rates of ammonium sulphate
(rate 1 supplying 11 g. N
rate 2 supplying 32 g. N)

	units	rate per sq.yd.	Roth.No.
hopwaste compost	kg.	2¼	S.4846
fertilizer consisting of			
ammonium sulphate	g.N	7	
ammonium phosphate	g.N	4	P.558
	g.P	7	
potassium sulphate	g.K	5	

Dates

			1946	1947
winter acidification	26/11/45	fertilizer	29/3	6/5
spring acidification	25/ 2/46	broadcast sowing of seed	16/4	7/5
hopwaste compost	10/ 4/46			

	equivalent g. sulphuric acid per sq. yd.	Height in inches 1946 SS	Height in inches 1946 SP	Height in inches 1947 SS	Number of plants per sq.yd. 1946 SS	Number of plants per sq.yd. 1946 SP	Number of plants per sq.yd. 1947 SS
no basal fertilizer							
no acidification	0	0.46	1.04	0.57	1260	630	982
hopwaste compost	0	1.25	1.27	0.72	1053	552	892
S.E.±		0.089	0.062	0.065	112.9	42.6	73.0
winter acid[1]	230	1.22	1.26	0.72	1212	564	1112
	460	1.34	1.31	1.12	1320	450	1144
	690	1.55	1.34	1.00	1038	492	1092
winter sulphur	230	1.29	1.26	0.72	1104	642	1104
	460	1.22	1.18	0.96	1080	438	996
	690	1.24	1.16	1.12	978	594	860
spring acid[1]	115	1.04	1.22	0.70	1182	534	1196
	230	1.18	1.20	0.68	1056	486	892
spring sulphur	115	0.91	1.15	0.80	1074	474	1088
	230	1.06	1.29	0.89	1098	636	1080
S.E.±		0.125	0.088	0.092	159.6	60.2	103.2
basal fertilizer							
no acidification	0	1.04	1.31	1.26	1185	477	816
S.E.±		0.089	0.062	0.065	112.9	42.6	73.0
spring acid[1]	115	1.27	1.32	1.26	1302	462	836
	230	1.78	1.47	1.40	906	402	928
spring sulphur	115	1.14	1.23	0.91	1146	480	1012
	230	1.11	1.29	1.30	1146	546	1048
no basal fertilizer							
spring nitric acid[1]	35	0.83	1.16	0.71	1182	570	1040
	115	0.99	1.15	0.80	1302	492	1128
spring amm.sulphate	35	0.76	1.05	0.65	1182	456	916
	115	1.10	1.19	0.69	1134	504	940
S.E.±		0.125	0.088	0.092	159.6	60.2	103.2
c.v.%		19.6	12.4	17.7	24.0	20.0	18.0

[1] applied in 11 l. water per square yard

NOTE. The amounts of material per sq.yd. are expressed in the table below as g. sulphuric acid of equal acidifying power based on the assumption that $H_2SO_4 = S = (NH_4)_2SO_4 = 2HNO_3$

Table 30

Acidification and manuring

Old Kennington K 9, Kennington Extension KE 14

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design 32 plots in 2 blocks of 16, confounding highest order interaction

Factorial test on:

4 levels of sulphuric acid (1947 only) × nitrogen × phosphorus × compost

Treatments

	units	rate per sq.yd. 1947	1948	1949
sulphuric acid applied in 4½ l. water				
none		0	-	-
level 1 (2% v/v)	ml. conc. H_2SO_4	90	-	-
2 (4% v/v)	ml. conc. H_2SO_4	180	-	-
3 (6% v/v)	ml. conc. H_2SO_4	270	-	-
N ammonium sulphate	g.N	11	8½	9[1]
P superphosphate	g.P	7½	5½	4½
C bracken and hopwaste compost[2]	kg.	2¼	2¼	2¼
basal dressing of potassium sulphate	g.K	5	7	4½

[1] including 4½ g.N topdressed as ammonium sulphate in K 9, and as 'Nitro-Chalk' in KE 14
[2] Rothamsted numbers: 1947 S.5125; 1948 S.5438; 1949 S.5706

Dates	1947	1948	1949
application of acid	1/1	-	-
seedbed manuring	2/4	22/3	11/3
N topdressing	-	-	24/6

	1947 K 9	1947 KE 14	1948 K 9	1948 KE 14	1949 K 9	1949 KE 14
broadcast sowing of seed	9/5	2/5	30/4	27/4	29/3	25/3

SITKA SPRUCE

Height in inches	1947 Mean	N'	P'	C'	1948 Mean	N'	P'	C'	1949 Mean	N'	P'	C'
K 9 Mean	1.40	0.05	-0.00	0.12*	1.16	0.18**	0.23**	0.18**	0.96	-0.01	0.15**	0.19**
S.E.±	0.023	0.046	0.046	0.046	0.026	0.051	0.051	0.051	0.022	0.043	0.043	0.043
sulphuric acid												
level 0	1.22	0.34**	-0.03	0.06	0.88	0.27*	0.11	0.18	0.97	-0.03	0.10	0.28**
1	1.52	-0.06	-0.05	0.15	1.12	0.22*	0.08	0.08	0.89	0.06	0.39**	0.21*
2	1.43	-0.09	-0.03	0.10	1.30	0.21	0.15	0.15	0.95	0.02	-0.01	0.08
3	1.43	0.01	0.10	0.18	1.36	0.02	0.58**	0.32**	1.04	-0.08	0.13	0.20*
S.E.±	0.046	0.091	0.091	0.091	0.051	0.102	0.102	0.102	0.043	0.086	0.086	0.086
c.v.%	9.2				13.6				12.7			
KE 14 Mean	1.50	-0.13	0.22**	0.50**	1.08	0.00	0.33**	0.27**	1.09	-0.19**	0.14**	0.05
S.E.±	0.034	0.068	0.068	0.068	0.025	0.050	0.050	0.050	0.016	0.031	0.031	0.031
sulphuric acid												
level 0	1.62	-0.29	0.22	0.18	0.97	0.09	0.14	0.18	1.18	-0.27**	0.16*	-0.09
1	1.56	-0.38*	0.05	0.44**	1.09	-0.04	0.22*	0.09	1.08	-0.09	0.18*	-0.00
2	1.46	-0.05	0.31*	0.73**	1.12	0.00	0.44**	0.42**	1.12	-0.19**	0.15*	0.16*
3	1.35	0.20	0.32*	0.67**	1.13	-0.04	0.50**	0.38**	1.00	-0.21**	0.10	0.12
S.E.±	0.068	0.136	0.136	0.136	0.050	0.099	0.099	0.099	0.031	0.063	0.063	0.063
c.v.%	12.8				13.0				8.1			

Number of plants per square yard

	1947 Mean	N'	P'	C'	1948 Mean	N'	P'	C'	1949 Mean	N'	P'	C'
K 9 Mean	846	1	-64	10	734	8	-53	-47	891	-18	-9	-189*
S.E.±	35.6	71.2	71.2	71.2	19.4	38.9	38.9	38.9	35.0	70.0	70.0	70.0
sulphuric acid												
level 0	678	162	-78	-18	585	66	-66	144	876	-93	-102	-270
1	807	36	-36	12	808	159	-81	-15	886	-144	-15	-66
2	1059	60	-36	-66	783	-228*	96	-24	988	81	108	-24
3	838	-255	-105	111	759	36	-162	-294**	814	82	-26	-394*
S.E.±	71.2	142.4	142.4	142.4	38.9	77.8	77.8	77.8	70.0	140.0	140.0	140.0
c.v.%	23.8				15.0				22.2			
KE 14 Mean	1008	23	10	-74	806	-77	-38	-8	840	-40	-76	-273**
S.E.±	27.2	54.4	54.4	54.4	29.5	59.1	59.1	59.1	20.7	41.4	41.4	41.4
sulphuric acid												
level 0	981	30	78	-240*	888	-120	-30	-108	809	-158	-68	-346**
1	972	72	18	42	798	-222	258	246	836	-39	105	-339**
2	1030	-45	-33	-21	717	-60	-234	-36	886	-32	-64	-212*
3	1050	36	-24	-78	820	93	-147	-135	828	69	-276	-195*
S.E.±	54.4	108.8	108.8	108.8	59.0	118.1	118.1	118.1	41.4	82.8	82.8	82.8
c.v.%	15.3				20.8				14.0			

Table 30 cont.

SCOTS PINE

Height in inches		1947 Mean	1947 N'	1947 P'	1947 C'	1948 Mean	1948 N'	1948 P'	1948 C'
K 9	Mean	1.88	-0.09	0.21*	-0.01	1.63	0.11	0.17	0.02
	S.E.±	0.039	0.078	0.078	0.078	0.041	0.082	0.082	0.082
sulphuric acid									
level	0	1.84	-0.26	0.03	0.00	1.56	0.10	-0.19	0.09
	1	1.96	0.24	0.05	0.02	1.58	0.10	0.28	0.01
	2	1.87	0.01	0.33	-0.17	1.66	0.10	0.24	-0.04
	3	1.85	-0.35*	0.42*	0.11	1.73	0.14	0.35	0.02
	S.E.±	0.078	0.156	0.156	0.156	0.082	0.164	0.164	0.164
	c.v.%	11.7				14.2			
KE 14	Mean	1.94	-0.05	0.04	0.30**	1.55	0.12	0.05	0.26**
	S.E.±	0.022	0.044	0.044	0.044	0.035	0.070	0.070	0.070
sulphuric acid									
level	0	2.01	-0.04	0.18	-0.11	1.39	-0.26	0.08	0.18
	1	1.99	0.05	0.07	0.39**	1.58	0.07	0.18	0.23
	2	2.02	-0.11	-0.04	0.34**	1.59	0.17	-0.02	0.32*
	3	1.76	-0.12	-0.06	0.60**	1.64	0.48**	-0.03	0.32*
	S.E.±	0.044	0.088	0.088	0.088	0.070	0.139	0.139	0.139
	c.v.%	6.4				12.7			
Number of plants per square yard									
K 9	Mean	924	-32	-14	-104	747	10	-5	-71*
	S.E.±	32.7	65.4	65.4	65.4	15.0	30.1	30.1	30.1
sulphuric acid									
level	0	963	108	114	-102	753	54	102	-66
	1	946	-165	123	-75	782	15	-63	-81
	2	926	-129	-291*	-267	724	15	-51	-39
	3	861	60	0	30	730	-45	-9	-99
	S.E.±	65.4	130.7	130.7	130.7	30.1	60.1	60.1	60.1
	c.v.%	20.0				11.4			
KE 14	Mean	1132	12	-51	-6	632	-27	14	-20
	S.E.±	40.8	81.6	81.6	81.6	17.2	34.5	34.5	34.5
sulphuric acid									
level	0	1046	-45	-285	-9	590	-105	75	-81
	1	1182	42	114	120	656	-3	3	87
	2	1242	78	-108	-144	675	-72	24	-54
	3	1060	-27	75	9	609	72	-48	-30
	S.E.±	81.6	163.1	163.1	163.1	34.5	69.0	69.0	69.0
	c.v.%	20.4				15.3			

Table 31

Forms and rates of acidification

Old Kennington K 14, Ringwood R 20, Kennington Extension KE 23

Years and Species 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-50: K 14, R 20 1+0 Sitka spruce seedbeds
1949 only: KE 23

Design K 14 and KE 23 32 plots in 4 blocks of 8
R 20 32 plots in 4 blocks of 8, 2 blocks unsteamed, 2 blocks steamed in November 1947

Acidification treatments[1] (K,R in 1948 and 1949; KE 1948 only)

		rate in g. per sq.yd. winter 47/48 level 1	winter 47/48 level 2	winter 48/49 level 1	winter 48/49 level 2
	no acidification	-	-	-	-
Ral	aluminium sulphate	340	680	340	680
Rs	sulphur	57	113	57	113
Ra	ammonium sulphate	227	454	227	454

[1] supplying equal amounts of sulphur

Basal manuring

			units	rate per sq.yd. 1948	1949	1950
N	seedbed	ammonium sulphate	g.N	8½	5	-
		'Nitro-Chalk'	g.N	-	-	4½
	topdressed	'Nitro-Chalk'[2]	g.N	-	4½	4½
P	superphosphate		g.P	5½	4½	4½
K	potassium chloride		g.K	7	4	4½

[2] as ammonium sulphate in K 14 in 1949

Dates

	1948 K	1948 R	1948 KE	1949 K	1949 R	1949 KE	1950 K	1950 R
Acidification treatments (in winter before cropping)	6/1	31/12	6/1	19/12	23/12	-	-	-
Manuring								
seedbed (N, P, K)	22/3	30/3	22/3	10/3	16/3	10/3	22/2[3]	7/3[3]
N topdressed	-	-	-	24/6	20/6	24/6	6/7	26/6
Broadcast sowing of seed	30/4	28/4	27/4	31/3	29/3	25/3	25/3	29/3

[3] N raked in at K on 9/3 and R 7/3 during final preparation of seedbed

1948 — Height in inches

	SITKA SPRUCE K 14	R 20	KE 23	SCOTS PINE K 14	R 20	KE 23
Mean	0.93	0.88	0.99	1.33	1.68	1.29
no acidif.	0.68	0.76	1.05	1.06	1.53	1.36
Ral	0.94	0.92	1.10	1.32	1.65	1.46
Rs	0.96	0.69	0.83	1.43	1.54	1.26
Ra	1.16	1.17	0.98	1.50	2.02	1.09
EFFECTS (2-1)' WITH						
Ral'	0.22**	-0.01	-0.06	0.08	0.16	0.02
Rs'	0.05	-0.25*	-0.28**	-0.00	-0.27	-0.14
Ra'	0.11	0.30**	0.12*	0.10	0.26	0.04
EFFECT OF STEAM WITH						
no acidif.	-	0.32**	-	-	0.23	-
Ral	-	0.09	-	-	0.61**	-
Rs	-	-0.02	-	-	-0.04	-
Ra	-	0.19	-	-	0.01	-
S.E.±	0.060	0.102	0.058	0.097	0.138	0.107
c.v.%	9.2	16.5	8.2	10.3	11.6	11.7

1948 — Number of plants per sq.yd.

	SITKA SPRUCE K 14	R 20	KE 23	SCOTS PINE K 14	R 20	KE 23
Mean	882	1051	732	787	706	614
no acidif.	867	1106	834	819	753	650
Ral	867	1110	780	765	744	654
Rs	974	1018	554	748	616	500
Ra	822	970	759	816	712	651
EFFECTS (2-1)' WITH						
Ral'	60	-90	-60	-24	36	78
Rs'	45	69	-171*	-81	39	-195**
Ra'	-72	-3	-36	-60	141	0
EFFECT OF STEAM WITH						
no acidif.	-	87	-	-	-48	-
Ral	-	384**	-	-	-72	-
Rs	-	-45	-	-	-57	-
Ra	-	39	-	-	39	-
S.E.±	120.6	123.5	78.1	71.3	88.7	65.9
c.v.%	19.2	16.5	15.1	12.7	17.7	15.2

Height in inches

SITKA SPRUCE

	1949 K 14	1949 R 20
Mean	0.96	0.84
no acidif.	1.00	0.83
Ral	0.93	1.02
Rs	1.01	-[1]
Ra	0.89	0.66
EFFECT (2-1)' WITH		
Ral'	-0.05	0.02
Rs'	-0.05	-[1]
Ra'	-0.30**	-0.00
EFFECT OF STEAM WITH		
no acidif.	-	0.12
Ral	-	0.14
Rs	-	-[1]
Ra	-	0.20
S.E.±	0.073	0.093
c.v.%	10.8	15.7

	1949 KE 23	1950 K 14	1950 R 20
Mean	0.94	1.81	1.36
no acidif.	1.11	1.42	0.79
Ral resid.	0.82	1.59	0.94
Rs resid.	0.90	2.03	2.09
Ra resid.	0.91	2.22	1.63
EFFECT (2-1)' WITH			
Ral resid.'	0.02	0.10	0.22
Rs resid.'	0.12	0.42*	0.24
Ra resid.'	0.13	0.22	0.34
EFFECT OF STEAM WITH			
no acidif.	-	-	0.02
Ral resid.	-	-	0.11
Rs resid.	-	-	0.11
Ra resid.	-	-	-0.18
S.E.±	0.097	0.156	0.286
c.v.%	14.6	12.2	29.7

[1] crop failed

Table 31 cont.

Number of plants per sq.yd.

SITKA SPRUCE	1949 K 14	1949 R 20		1949 KE 23	1950 K 14	1950 R 20
Mean	657	584	Mean	1394	1254	890
no acidif.	818	609	no acidif.	1589	1221	838
Ral	718	703	Ral resid.	1546	1196	892
Rs	478	-[1]	Rs resid.	1118	1151	937
Ra	614	440	Ra resid.	1324	1446	890
EFFECT (2-1)' WITH:			EFFECT (2-1)' WITH:			
Ral'	-51	22	Ral resid.'	0	-16	27
Rs'	-456**	-[1]	Rs resid.'	-237	-58	94
Ra'	75	122	Ra resid.'	-608	303	-98
EFFECT OF STEAM WITH:			EFFECT OF STEAM WITH:			
no acidif.	-	132	no acidif.	-	-	78
Ral'	-	-106	Ral resid.	-	-	210*
Rs	-	-[1]	Rs resid.	-	-	158
Ra	-	-14	Ra resid.	-	-	82
S.E.±	116.1	123.4	S.E.±	261.3	156.6	75.7
c.v.%	24.9	30.0	c.v.%	26.6	17.7	12.1

[1] crop failed

Table 32

Acidification

Nagshead Nd 5, Tair Onen TO 5

Years and Species 1948 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 4½ feet)

Design and Treatments 4 × 4 Latin Square

Acidification treatments	rate in g. per sq.yd.	Basal manuring		units	rate per sq.yd.
no acidification	-	N	ammonium sulphate	g.N	8½
aluminium sulphate[1]	454	P	superphosphate	g.P	5½
sulphur	85	K	potassium chloride	g.K	7
ammonium sulphate[1]	340				

[1] supplying the same amount of sulphur as in sulphur treatments

Dates

acidification		manuring		broadcast sowing of seed	
Nagshead	Tair Onen	Nagshead	Tair Onen	Nagshead	Tair Onen
10/3	10/3	22/4	10/3	26/4	29/4

SITKA SPRUCE

1948	Height in inches		Number of plants per sq.yd.	
	Nagshead	Tair Onen	Nagshead	Tair Onen
Mean	0.54	0.35	1002	389
no acidification	0.45	0.30	990	365
aluminium sulphate	0.47	0.35	969	478
sulphur	0.62	0.40	1188	433
ammonium sulphate	0.60	0.36	866	280
S.E.±	0.023	0.009	169.8	37.6
c.v.%	8.4	5.3	33.9	19.3

Table 33

Acidification of fallow land during season before cropping

Old Kennington K 26, Ampthill Am 3, Ringwood R 4

Years and Species 1949 fallow; 1950-1951 1+0 Sitka spruce seedbeds

Design

K 26	64 plots in 4 blocks of 16	
Am 3	24 plots in 4 blocks of 6	
R 4	32 plots in 4 blocks of 8	

Factorial test on:

K 26	4 levels of acidification	×	(sulphur v. ammonium sulphate)	× fertilizer (F)
Am 3	3 levels of acidification	×	(sulphur v. ammonium sulphate)	with basal fertilizer
R 4	4 levels of acidification	×	(sulphur v. ammonium sulphate)	with basal fertilizer

Treatments

Acidification (for details of levels see below)

Fertilizer

		units	rate per sq.yd. 1950	1951
N	seedbed 'Nitro-Chalk'	g.N	4½	-
	topdressed 'Nitro-Chalk' early	g.N	4½	4½
	late	g.N	-	4½
P	superphosphate	g.P	4½	4½
K	potassium chloride	g.K	4½	4½

Dates

	1950 K	1950 Am	1950 R	1951 K	1951 Am	1951 R
Manuring						
seedbed (P,K; N 1950[1])	22/2	3/3	7/3	1/3	12/3	8/3
topdressings early	6/7	30/6	26/6	28/6	4/7	25/6
late	-	-	-	2/8	3/8	1/8
Broadcast sowing of seed	27/3	27/3	30/3	11/4	14/4	17/4

[1] N raked in (after forking in other fertilizers) during final preparation of seedbed

ACIDIFICATION TREATMENTS[2] OF FALLOW LAND

SITKA SPRUCE

Old Kennington

	g. per sq.yd. Dec.1948	May 1949	Height in inches 1950 -	1950 F	1951 -	1951 F	Number of plants per sq.yd. 1950 -	1950 F	1951 -	1951 F
no acidification	-	-	0.85	1.21	0.73	0.85	836	952	531	502
S.E.±			0.067		0.053		44.0		61.5	
sulphur level 1	50	50	1.10	1.55	0.60	0.74	912	860	700	498
2	100	100	1.20	1.99	0.65	0.77	1176	1100	664	600
3	150	150	1.29	2.12	0.75	1.08	1154	1056	702	534
ammonium sulphate level 1	100	100	1.20	1.66	0.64	0.72	848	1022	764	500
2	200	200	1.34	2.28	0.54	0.80	956	1110	626	778
3	300	300	2.00	2.39	0.50	0.68	896	962	622	705
S.E.±			0.095		0.075		62.2		87.0	
c.v.%			12.6		20.6		12.7		28.4	

Ampthill

	g.per sq.yd. May 1949	Height in inches 1950	1951	Number of plants per sq.yd. 1950	1951
no acidification	-	1.58	1.17	208	518
S.E.±		0.090	0.080	28.2	46.3
sulphur level 1	75	2.28	1.48	161	672
2	150	2.66	1.42	188	426
ammonium sulphate level 1	150	2.30	1.53	260	606
2	300	2.57	1.66	219	402
S.E.±		0.127	0.113	39.9	65.5
c.v.%		11.7	16.0	38.6	25.1

Ringwood

	g.per sq.yd. Dec.1948	Height in inches 1950	1951	Number of plants per sq.yd. 1950	1951
no acidification	-	1.52	1.01	748	825
S.E.±		0.074	0.059	37.0	29.6
sulphur level 1	50	1.99	1.04	830	792
2	100	2.49	1.16	916	982
3	150	2.63	1.59	795	916
ammonium sulphate level 1	100	2.20	1.26	706	921
2	200	2.46	1.30	765	868
3	300	2.41	1.35	771	806
S.E.±		0.104	0.084	52.4	41.8
c.v.%		9.7	13.8	13.3	9.7

[2] treatments were not applied on equal sulphur basis, but on equal full acidifying power taking into account the effect of ammonium

Table 34

Soil reaction and nitrogen treatments on various conifer and hardwood species
Kennington Extension KE 27, Wareham W 27

(Results of 1+0 seedbeds are given below; for 1+1 transplants see Table)

Species and Years[1]

COMMON NAMES	BOTANICAL NAMES	YEARS
Sitka spruce	Picea sitchensis (Bongard) Carrière	1948-56
Norway spruce	Picea abies (Linnaeus) Karst	1948-51
Douglas fir*	Pseudotsuga taxifolia (Poiret) Britton	1948-54
Western hemlock*	Tsuga heterophylla (Rafinesque) Sargent	1948-56
Lodgepole pine*	Pinus contorta Loudon	1948-50, 1952-56
Monterey pine*	Pinus radiata D.Don	1948
Scots pine	Pinus sylvestris Linnaeus	1948-51
Corsican pine	Pinus nigra var. calabrica (Loudon) Schneider	1948-52
Austrian pine*	Pinus nigra var. austriaca (Hoess) Ascherson and Graebner	1948
Maritime pine*	Pinus pinaster Aiton	1948
Aleppo pine	Pinus halepensis Miller	1949-50, 1955-56
Western red cedar*	Thuja plicata Lambert	1948, 1954-56
European larch	Larix decidua Miller	1948
Japanese larch	Larix leptolepis (Siebold and Zuccarini) Gordon	1948-53
-	Abies concolor (Gordon) Engelmann	1949-50
-	Abies magnifica* A.Murray	1948
-	Abies nordmanniana* (Steven) Spach	1948
Ash*	Fraxinus excelsior Linnaeus	1948-49, 1953-54
Birch	Betula verrucosa Ehrhart, Betula pubescens Ehrhart } mixed	1949-50
Yellow birch*	Betula lutea Michaux	1948
Beech*	Fagus sylvatica Linnaeus	1948
Pedunculate oak*	Quercus robur Linnaeus	1948

[1] The experiments were continued after 1956, but results are presented only up to that date

ALL SPECIES SOWN IN BANDS

Note 1948 species marked * single replication only
1949 onward 4-fold replication for all species

Table 34 cont.

Design and Treatments 4 blocks of 3 beds. Length of bed per block: KE 48 feet, W 36 feet

Soil reaction was first changed in the winter of 1947-48 (with further adjustments in some later years) by application of calcium carbonate (Rc) and aluminium sulphate (Ral) or sulphur (Rs) in progressively increasing amounts (to one yard strips) along the length of the site from least acid to most acid, each sequence occurring four times.

Nitrogen treatments. During 1951, 1952 and 1953 'Nitro-Chalk' and ammonium sulphate were compared with 'no nitrogen'. In 1954 the 'no nitrogen' treatment was replaced by calcium nitrate. These treatments were tested on the three beds of each of the four sequences.

Soil reaction treatments

KE 27		Year of application 1948	1949	1951	1954	Total 1948-56
		g. $CaCO_3$ per sq.yd.				
HIGH LIME	R7c	1450	720	720	720	3610
	R6c	1090	360	360	360	2170
MEDIUM LIME	R5c	720	360	-	-	1080
	R4c	540	180	-	-	720
LOW LIME	R3c	360	-	-	-	360
	R2c	180	-	-	-	180
	R1c	90	-	-	-	90
UNTREATED	0	-	-	-	-	-
		g. sulphur[1] per sq.yd.				
LOW ACID	R1s	28	-	-	-	28
	R2s	56	-	-	-	56
	R3s	85	-	-	20	105
	R4s	113	-	-	40	153
MEDIUM ACID	R5s	141	-	-	60	201
	R6s	170	-	-	80	250
	R7s	198	-	-	100	298

W 27		Year of application 1948	1949	1951	1954	Total 1948-56
		g. $CaCO_3$ per sq.yd.				
HIGH LIME	R7c	1450	720	720	720	3610
	R6c	1090	360	360	360	2170
MEDIUM LIME	R5c	720	360	-	-	1080
	R4c	540	180	-	-	720
LOW LIME	R3c	360	-	-	-	360
	R2c	180	-	-	-	180
	R1c	90	-	-	-	90
UNTREATED	0	-	-	-	-	-
		g. sulphur[1] per sq.yd.				
ACID	R1s	28	-	-	-	28
	R2s	56	-	-	20	76
	R3s	113	-	-	40	153

[1] applied as aluminium sulphate in 1948 and as rock sulphur in 1954

Nitrogen treatments

1951-1953		1954-1956	
no N	no nitrogen	Nca[2]	calcium nitrate
Nc	'Nitro-Chalk'	Nc	'Nitro-Chalk'
Ns	ammonium sulphate	Ns	ammonium sulphate

all applied at 9 g.N per sq.yd. in equal divided topdressings in late June and early August

Basal dressings

			units	1948 KE	1948 W	1949	1950	1951	1952	1953	1954	1955	1956
				rate per sq.yd.									
N	seedbed	hoof	g.N	-	-	9		see under 'Nitrogen treatments'					
		ammonium sulphate	g.N	8½	13	-							
		'Nitro-Chalk'	g.N	-	-	-	3						
	topdressed	'Nitro-Chalk'	g.N	-	-	-	3						
P	superphosphate		g.P	5½	8½	4½	3½	4½	4½	4½	4½	9	9
K	potassium chloride		g.K	7	10½	4½	3½	4½	4½	9	9	9	9
Mg	kieserite		g.Mg	-	-	-	-	-	-	1½	3	3	3

Dates

		1948	1949	1950	1951	1952	1953	1954	1955	1956
		Year of cropping								
Reaction treatments (in winter before cropping)	KE	16/1	23/12	-	25/1	-	-	12/1	-	-
	W	11/2	29/12	-	25/1	-	-	20/1	-	-
Manuring										
seedbed (P,K,Mg; N 1948-50)	KE	20/3	17/3	14/3[3]	28/3	27/2	2/3	8/3	22/3	10/3
	W	25/3	1/3	26/1[3]	21/3	5/3	3/3	9/3	10/3	7/3
N topdressed early	KE	-	-	11/7	28/6	18/6	30/6	29/6	5/7	6/7
	W	-	-	30/6	26/6	24/6	24/6	24/6	28/6	27/6
N topdressed late	KE	-	-	-	2/8	12/8	5/8	5/8	4/8	25/7
	W	-	-	-	31/7	14/8	30/7	4/8	3/8	31/7
BAND sowing of seed	KE	14/4	19/3-13/4	21/3	12/4	25-28/4	16/3	25/3	26/4	4/4
	W	9-28/4	23/3-29/4	28/3-3/4	6/4	10-28/4	17/3	24/3	29/3	24/3

[2] 1954: anhydrous salt; 1955: double salt, $5Ca(NO_3)_2.NH_4NO_3.10H_2O$

[3] N raked in at KE on 14/3 at W on 21/3 during final preparation of seedbed

Table 34 cont.

Kennington Extension, KE 27

		HIGH LIME		MED. LIME		LOW LIME			UN-TREATED	LOW ACID				MEDIUM ACID		
		R7c	R6c	R5c	R4c	R3c	R2c	R1c	0	R1s	R2s	R3s	R4s	R5s	R6s	R7s
Soil reaction, pH in H_2O																
1948[1]	Ns	7.0	6.4	6.4	5.8	5.9	5.1	5.1	4.8	4.6	4.5	4.4	4.3	4.2	4.2	4.2
1949	Nh	7.6	7.3	7.3	7.0	6.0	5.4	5.2	5.1	5.1	5.0	4.8	4.8	4.8	4.7	4.7
1950	Nc	7.6	7.4	7.0	6.7	6.0	5.5	5.3	5.2	5.1	5.0	4.9	5.0	4.8	4.8	4.8
1951[2]	Mean	7.8	7.6	7.1	6.6	5.8	5.2	5.1	4.9	4.8	4.8	4.7	4.7	4.7	4.8	4.6
1951[3]	no N	7.8	-	-	6.8	5.8	-	-	5.1	-	-	-	-	-	-	4.8
	Nc	7.8	-	-	6.7	6.0	-	-	5.0	-	-	-	-	-	-	4.8
	Ns	7.8	-	-	6.2	5.6	-	-	4.8	-	-	-	-	-	-	4.4
1952	Mean	7.3	7.0	6.7	6.3	5.6	5.1	5.0	4.9	4.8	4.7	4.6	4.6	4.6	4.6	4.5
	no N	7.4	7.1	6.6	6.4	5.8	5.2	5.2	5.0	5.0	4.8	4.8	4.8	4.6	4.6	4.6
	Nc	7.3	7.0	6.9	6.4	6.0	5.4	5.2	5.0	4.8	4.9	4.8	4.8	4.7	4.8	4.6
	Ns	7.1	6.8	6.4	6.0	5.1	4.8	4.6	4.6	4.5	4.4	4.4	4.4	4.5	4.4	4.4
1953	Mean	7.0	7.1	6.5	6.0	5.4	5.0	4.9	4.8	4.7	4.6	4.6	4.5	4.5	4.5	4.5
	no N	7.2	6.9	6.8	6.2	5.4	5.0	5.0	5.0	4.8	4.8	4.6	4.6	4.6	4.6	4.6
	Nc	7.1	7.3	6.4	6.1	5.8	5.3	5.0	5.0	4.8	4.7	4.8	4.6	4.7	4.6	4.6
	Ns	6.8	7.0	6.4	5.8	5.0	4.8	4.6	4.5	4.4	4.3	4.3	4.2	4.2	4.3	4.3
1954	Mean	7.7	7.6	6.7	6.1	5.4	5.1	4.9	4.9	4.9	4.6	4.4	4.2	4.1	3.8	3.7
	Nca	7.8	7.6	6.8	6.2	5.5	5.2	5.1	4.9	5.0	4.6	4.5	4.2	4.4	3.9	3.7
	Nc	7.4	7.8	7.0	6.4	5.7	5.3	5.1	5.1	5.0	4.9	4.5	4.4	4.1	3.9	3.9
	Ns	7.9	7.5	6.3	5.6	5.0	4.7	4.6	4.6	4.5	4.4	4.3	4.0	3.8	3.7	3.5
1955	Mean	6.7	6.6	6.3	5.5	5.2	4.9	4.7	4.8	4.6	4.6	4.5	4.4	4.2	4.1	4.2
	Nca	6.2	6.5	6.5	5.9	5.6	4.8	4.7	4.8	4.7	4.7	4.4	4.3	4.2	4.1	4.2
	Nc	6.7	6.6	6.2	5.6	5.4	5.1	4.9	5.0	4.8	4.7	4.7	4.5	4.4	4.2	4.3
	Ns	7.2	6.7	6.2	5.1	4.7	4.7	4.4	4.5	4.5	4.4	4.3	4.2	4.1	4.1	4.1
1956	Mean	7.4	7.1	6.2	5.4	5.0	4.6	4.5	4.4	4.4	4.3	4.2	4.1	4.0	4.0	3.9
	Nca	7.4	7.1	6.5	5.5	5.2	4.7	4.5	4.4	4.4	4.4	4.2	4.1	4.0	4.0	3.8
	Nc	7.5	7.2	6.5	5.7	5.2	4.8	4.7	4.6	4.5	4.4	4.4	4.3	4.1	4.1	4.0
	Ns	7.4	7.0	5.7	4.9	4.5	4.3	4.2	4.1	4.2	4.1	4.0	3.9	3.8	3.8	3.8
Soil reaction, pH in 0.01M $CaCl_2$																
1949	Nh	7.1	7.0	6.9	6.7	5.6	5.0	4.8	4.7	4.6	4.4	4.3	4.2	4.2	4.2	4.2
1950	Nc	7.1	7.0	6.8	6.0	5.3	4.8	4.6	4.5	4.4	4.3	4.2	4.2	4.1	4.1	4.1
1951[2]	Mean	7.3	7.2	6.8	6.2	5.3	4.6	4.4	4.3	4.2	4.2	4.1	4.0	4.0	4.1	4.0
1951[3]	no N	7.2	-	-	6.2	5.2	-	-	4.4	-	-	-	-	-	-	4.1
	Nc	7.2	-	-	6.2	5.6	-	-	4.5	-	-	-	-	-	-	4.2
	Ns	7.2	-	-	5.6	4.9	-	-	4.2	-	-	-	-	-	-	4.0
1952	Mean	6.6	6.3	6.0	5.7	4.9	4.4	4.3	4.2	4.1	4.1	4.0	4.0	4.0	4.1	4.1
	no N	6.6	6.4	6.0	5.6	5.0	4.4	4.4	4.3	4.2	4.1	4.0	4.0	4.0	4.0	4.0
	Nc	6.6	6.4	6.2	5.8	5.2	4.6	4.4	4.4	4.2	4.2	4.2	4.2	4.0	4.2	4.2
	Ns	6.6	6.2	5.9	5.6	4.6	4.2	4.0	4.0	4.0	4.0	3.9	4.0	3.9	4.0	4.0
1953	Mean	6.7	6.6	6.1	5.6	5.0	4.6	4.5	4.4	4.4	4.2	4.2	4.2	4.2	4.1	4.1
	no N	6.6	6.5	6.2	5.8	5.0	4.6	4.6	4.5	4.4	4.3	4.2	4.2	4.2	4.2	4.2
	Nc	6.8	6.8	6.2	5.6	5.2	4.8	4.6	4.6	4.4	4.4	4.4	4.2	4.3	4.2	4.2
	Ns	6.6	6.6	6.0	5.4	4.6	4.4	4.3	4.2	4.2	4.0	4.0	4.0	4.0	4.0	4.0
1954	Mean	7.2	7.0	6.2	5.6	4.8	4.6	4.4	4.3	4.3	4.2	4.0	3.9	3.8	3.7	3.6
	Nca	7.1	7.0	6.1	5.8	4.9	4.7	4.4	4.4	4.3	4.2	4.1	3.8	3.9	3.7	3.6
	Nc	7.2	7.2	6.4	5.8	5.1	4.7	4.6	4.5	4.4	4.3	4.1	4.3	3.9	3.8	3.8
	Ns	7.4	7.0	6.0	5.0	4.4	4.1	4.1	4.0	4.1	3.9	3.9	3.7	3.5	3.5	3.3
1955	Mean	6.4	6.2	5.7	5.1	4.7	4.3	4.2	4.2	4.2	4.1	4.0	3.9	3.8	3.7	3.7
	Nca	6.3	6.1	5.9	5.3	4.9	4.3	4.3	4.2	4.2	4.0	4.0	3.9	3.8	3.8	3.7
	Nc	6.4	6.1	5.8	5.4	4.8	4.5	4.3	4.3	4.3	4.2	4.1	4.0	3.8	3.8	3.8
	Ns	6.4	6.4	5.5	4.7	4.4	4.1	4.1	4.0	4.0	3.9	3.8	3.7	3.7	3.7	3.6
1956	Mean	7.1	6.8	6.0	5.0	4.6	4.3	4.2	4.1	4.1	4.0	3.9	3.9	3.8	3.8	3.7
	Nca	7.1	6.9	6.3	5.3	4.9	4.4	4.3	4.2	4.2	4.1	4.0	3.9	3.8	3.8	3.6
	Nc	7.1	6.9	6.2	5.3	4.8	4.5	4.4	4.4	4.3	4.2	4.1	4.0	3.9	3.9	3.8
	Ns	7.0	6.6	5.4	4.6	4.2	4.1	3.9	3.8	3.8	3.8	3.7	3.7	3.6	3.6	3.6

[1] no pH readings in 0.01M $CaCl_2$ for 1948

In 1951 two methods of sampling were adopted: [2] all reaction treatments were sampled bulking the three nitrogen treatments

[3] all nitrogen treatments were sampled selecting only certain of the reaction treatments

Table 34 cont.

Wareham, W 27

		HIGH LIME		MED. LIME		LOW LIME			UN-TREATED	ACID		
	R7c	R7c	R6c	R5c	R4c	R3c	R2c	R1c	0	R1s	R2s	R3s
Soil reaction, pH in H_2O												
1948[1]	Ns	6.0	5.6	5.3	5.2	4.7	4.3	4.1	4.2	3.9	3.8	3.3
1949	Nh	6.7	6.4	6.0	5.3	4.6	4.1	4.0	4.0	4.0	4.0	4.0
1950	Nc	6.8	6.8	6.4	5.8	4.4	4.0	4.0	3.9	3.8	3.8	3.8
1951[2]	Mean	7.4	7.0	6.4	5.6	5.0	4.5	4.4	4.3	4.2	4.3	4.4
1951[3]	no N	6.9	-	-	5.8	5.0	-	-	4.3	-	-	4.0
	Nc	7.5	-	-	5.4	5.0	-	-	4.4	-	-	4.0
	Ns	6.9	-	-	5.0	4.3	-	-	4.2	-	-	4.2
1952	Mean	6.3	6.2	5.7	4.9	4.3	4.0	4.0	3.8	3.8	3.9	3.9
	no N	6.4	6.6	6.2	5.2	4.5	4.2	4.2	3.9	3.8	4.0	4.0
	Nc	6.2	6.0	5.6	4.8	4.6	4.2	4.1	4.0	4.0	4.0	4.2
	Ns	6.2	6.0	5.3	4.6	4.0	3.6	3.6	3.5	3.4	3.6	3.6
1953	Mean	6.9	6.8	6.0	5.5	4.8	4.6	4.6	4.6	4.7	4.6	4.6
	no N	7.2	6.8	6.2	5.6	5.0	4.7	4.7	4.8	4.6	4.6	4.7
	Nc	6.7	7.1	6.1	5.6	5.1	4.9	4.8	4.7	5.0	4.8	4.6
	Ns	6.7	6.4	5.6	5.4	4.4	4.4	4.3	4.2	4.4	4.2	4.4
1954	Mean	7.6	7.2	6.3	5.7	5.0	4.7	4.5	4.5	4.5	4.1	4.0
	Nca	7.6	7.3	6.5	5.9	5.2	4.8	4.7	4.6	4.5	4.2	4.0
	Nc	7.7	7.3	6.5	5.9	5.2	5.0	4.7	4.7	4.6	4.2	4.2
	Ns	7.5	7.1	5.8	5.3	4.7	4.2	4.1	4.1	4.4	3.9	3.7
1955	Mean	6.9	6.7	5.7	5.1	4.4	4.1	4.0	3.9	3.8	3.8	3.7
	Nca	6.6	6.7	5.9	5.4	4.7	4.3	4.2	4.1	3.9	3.7	3.6
	Nc	7.0	6.8	6.1	5.2	4.6	4.4	4.4	4.0	4.0	3.9	3.8
	Ns	7.2	6.7	5.0	4.6	3.9	3.8	3.5	3.6	3.6	3.6	3.7
1956	Mean	7.1	6.8	5.6	4.9	4.3	4.1	4.0	3.9	3.9	3.8	3.8
	Nca	7.2	6.9	5.9	5.3	4.5	4.2	4.1	4.0	4.0	3.9	3.9
	Nc	7.1	6.9	6.0	5.0	4.6	4.3	4.3	4.1	4.1	3.9	3.9
	Ns	7.0	6.8	5.0	4.4	3.9	3.7	3.7	3.6	3.6	3.7	3.7
Soil reaction, pH in 0.01M $CaCl_2$												
1949	Nh	6.6	6.3	6.0	5.4	4.6	4.1	4.0	3.9	3.9	3.9	3.9
1950	Nc	6.6	6.5	6.1	5.5	4.2	3.8	3.8	3.6	3.5	3.6	3.6
1951[2]	Mean	6.9	6.6	5.8	5.0	4.2	3.8	3.7	3.6	3.6	3.6	3.6
1951[3]	no N	6.7	-	-	5.2	4.3	-	-	3.6	-	-	3.6
	Nc	6.9	-	-	5.0	4.4	-	-	3.7	-	-	3.6
	Ns	6.6	-	-	4.6	4.0	-	-	3.5	-	-	3.6
1952	Mean	6.2	6.0	5.4	4.7	4.1	3.7	3.6	3.5	3.4	3.5	3.5
	no N	6.2	6.2	5.8	5.0	4.2	3.8	3.6	3.5	3.4	3.4	3.4
	Nc	6.3	6.0	5.4	4.6	4.2	3.8	3.7	3.6	3.6	3.6	3.6
	Ns	6.2	6.0	5.0	4.4	3.8	3.6	3.4	3.4	3.4	3.4	3.4
1953	Mean	6.5	6.2	5.6	4.8	4.1	3.9	3.8	3.7	3.7	3.7	3.7
	no N	6.8	6.4	5.8	5.0	4.1	3.8	3.8	3.8	3.6	3.6	3.7
	Nc	6.6	6.5	5.8	4.9	4.4	4.1	4.0	3.9	4.0	4.0	3.8
	Ns	6.2	5.8	5.1	4.6	3.8	3.6	3.5	3.4	3.6	3.4	3.6
1954	Mean	6.9	6.6	5.5	4.8	4.2	3.8	3.8	3.6	3.7	3.4	3.4
	Nca	6.9	6.6	5.7	5.1	4.3	3.9	4.0	3.7	3.7	3.5	3.4
	Nc	6.9	6.6	5.7	4.9	4.3	4.0	3.9	3.9	3.8	3.5	3.5
	Ns	6.9	6.5	5.0	4.4	3.8	3.5	3.4	3.4	3.5	3.3	3.2
1955	Mean	6.6	6.2	5.4	4.7	4.0	3.7	3.6	3.6	3.5	3.5	3.4
	Nca	6.4	6.2	5.7	5.0	4.2	3.9	3.8	3.8	3.6	3.5	3.5
	Nc	6.6	6.4	5.6	4.9	4.2	4.0	3.9	3.7	3.7	3.5	3.5
	Ns	6.6	6.1	4.8	4.2	3.6	3.4	3.3	3.3	3.3	3.4	3.4
1956	Mean	6.7	6.4	5.2	4.5	4.0	3.7	3.7	3.6	3.6	3.5	3.5
	Nca	6.8	6.5	5.6	4.9	4.2	3.9	3.8	3.7	3.7	3.6	3.6
	Nc	6.7	6.5	5.7	4.7	4.2	4.0	3.9	3.8	3.8	3.6	3.6
	Ns	6.5	6.2	4.5	3.9	3.4	3.2	3.3	3.2	3.2	3.3	3.3

[1] no pH readings in 0.01M $CaCl_2$ for 1948

In 1951 two methods of sampling were adopted: [2] all reaction treatments were sampled bulking the three nitrogen treatments

[3] all nitrogen treatments were sampled selecting only certain of the reaction treatments

Table 34 cont.

Height in inches

Kennington Extension

	HIGH LIME		MED. LIME		LOW LIME				LOW ACID				MEDIUM ACID		
	R7c	R6c	R5c	R4c	R3c	R2c	R1c	0	R1s	R2s	R3s	R4s	R5s	R6s	R7s
SITKA SPRUCE															
1948	0.78	0.81	0.93	0.82	0.94	0.87	1.10	1.12	1.00	1.02	0.88	1.07	1.06	1.21	1.08
1949	0.76	0.78	0.81	0.80	0.71	0.83	0.82	0.76	0.80	0.73	0.62	0.50	0.52	0.46	0.53
1950	1.64	1.92	2.01	2.21	2.43	2.62	2.29	2.26	1.94	1.76	1.80	1.77	1.66	1.64	1.52
1951	1.00	1.13	1.41	1.57	1.94	2.15	2.35	2.32	2.36	2.20	2.11	1.98	1.78	1.75	1.80
1952	1.00	1.14	1.17	1.27	1.48	1.55	1.76	1.58	1.59	1.59	1.58	1.52	1.63	1.50	1.44
1953	1.24	1.44	1.55	1.82	2.12	2.29	2.44	2.55	2.59	2.41	2.36	2.37	2.32	2.28	2.30
1954	1.12	1.31	1.82	2.14	2.54	2.71	2.62	2.64	2.70	2.64	2.28	1.53	1.01	0.91	0.78
1955	0.70	0.77	0.89	0.91	0.97	1.11	1.02	1.10	1.06	0.94	0.94	0.93	0.84	0.75	0.81
1956	0.80	0.98	1.28	1.58	1.85	2.05	2.19	2.24	2.22	2.23	2.14	1.97	1.84	1.86	1.78
TSUGA															
1950	0.77	0.87	1.02	1.15	1.19	1.14	1.20	1.00	0.88	0.80	0.85	0.67	0.69	0.55	0.54
1951	0.44	0.60	0.69	0.80	0.84	0.90	0.96	0.91	0.90	0.94	0.82	0.85	0.81	0.80	0.76
1952	0.35	0.54	0.69	0.78	0.84	0.97	1.02	1.02	1.13	1.12	1.13	1.10	1.08	1.07	0.88
1953	0.63	0.89	1.15	1.41	1.64	1.86	2.00	2.03	2.05	2.06	1.89	1.81	1.75	1.86	1.91
1954	0.46	0.61	1.00	1.09	1.27	1.53	1.60	1.65	1.63	1.54	1.39	0.93	0.59	0.49	0.39
1955	0.35	0.45	0.53	0.60	0.57	0.62	0.61	0.63	0.61	0.56	0.49	0.50	0.45	0.42	0.40
PINUS CONTORTA															
1949	1.31	1.22	1.02	1.32	1.24	1.18	1.15	1.18	1.24	1.19	1.16	1.00	1.05	1.00	0.94
1950	2.24	2.32	2.42	2.47	2.76	2.70	2.84	2.74	2.78	2.92	3.05	2.96	2.70	2.61	2.71
1952	1.18	1.38	1.53	1.66	1.69	1.90	1.95	1.90	2.00	2.11	1.96	1.92	2.03	2.19	2.07
1953	1.51	1.84	2.18	2.27	2.61	2.86	2.82	2.80	2.96	2.83	2.83	2.84	2.88	2.85	2.86
1954	1.08	1.22	1.75	1.92	2.15	2.31	2.21	2.32	2.35	2.30	2.18	1.81	1.35	1.27	1.17
1955	0.84	0.97	1.14	1.14	1.23	1.24	1.22	1.25	1.26	1.28	1.24	1.17	1.20	1.16	1.11
1956	1.06	1.24	1.38	1.54	1.84	1.94	2.07	2.10	2.15	2.20	2.14	2.03	2.00	1.86	1.92

Wareham

	HIGH LIME		MED. LIME		LOW LIME				ACID		
	R7c	R6c	R5c	R4c	R3c	R2c	R1c	0	R1s	R2s	R3s
SITKA SPRUCE											
1948	1.08	1.32	1.32	1.68	1.48	1.58	1.90	1.74	1.27	0.63	0.54
1949	0.82	0.93	1.01	1.16	1.45	1.38	1.32	1.76	1.20	1.38	1.06
1950	1.66	2.06	2.20	2.72	2.95	2.52	1.96	1.52	1.88	1.96	2.21
1951	1.07	1.53	2.04	2.70	2.83	2.43	2.09	1.92	2.11	1.88	1.67
1952	0.99	1.34	1.78	1.95	1.96	1.62	1.59	1.67	1.78	1.76	1.66
1953	0.81	1.32	1.88	2.39	2.41	2.00	1.88	1.78	1.69	1.66	1.73
1954	0.59	0.99	1.89	2.42	2.47	2.13	1.93	1.82	1.68	0.83	0.47
1955	0.87	1.05	1.69	1.84	1.88	1.83	1.74	1.70	1.71	1.71	1.64
1956	0.92	1.18	1.96	2.34	2.35	2.32	2.27	2.06	1.90	2.02	2.13
TSUGA											
1950	0.60	0.80	0.97	1.15	1.34	1.08	1.08	1.07	1.43	1.20	1.20
1952	0.30	0.38	0.56	0.72	0.89	0.92	0.79	0.73	0.84	0.78	0.81
1953	0.58	0.92	1.60	2.15	2.29	1.87	1.75	1.66	1.81	1.73	1.61
1954	0.34	0.41	0.83	1.01	1.08	0.98	0.91	0.84	0.80	0.54	0.42
1955	0.60	0.77	1.16	1.18	1.18	1.15	1.12	1.00	0.97	0.94	1.00
1956	0.50	0.62	1.18	1.35	1.42	1.41	1.49	1.20	1.10	1.41	1.41
PINUS CONTORTA											
1949	2.62	2.95	2.69	2.82	3.71	3.34	2.60	2.74	2.62	2.37	1.67
1950	2.46	3.32	3.53	3.96	4.35	4.61	4.34	4.64	4.56	4.60	4.33
1952	0.89	1.27	1.80	2.22	2.40	2.10	2.00	2.02	1.99	2.12	2.08
1953	0.87	1.37	2.17	2.77	3.36	2.95	3.01	2.96	2.85	3.01	2.78
1954	0.46	0.63	1.35	1.82	2.06	1.85	1.89	1.85	1.61	0.93	0.53
1955	0.86	1.10	1.99	2.32	2.53	2.43	2.53	2.42	2.30	2.09	2.17
1956	0.86	1.16	1.92	2.52	2.60	2.54	2.57	2.38	2.46	2.42	2.50

The above results are averaged over nitrogen treatments for the years 1951-1956

Table 34 cont.

		Kennington Extension						Wareham				
		HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID	MED. ACID	HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID
SITKA SPRUCE												
1948	Ns	0.80	0.87	0.97	1.12	1.00	1.12	1.20	1.50	1.65	1.73	0.81
1949	Nh	0.77	0.81	0.78	0.75	0.66	0.50	0.88	1.09	1.38	1.76	1.22
1950	Nc	1.78	2.11	2.43	2.26	1.82	1.60	1.86	2.46	2.48	1.53	2.02
1951	Mean	1.06	1.49	2.14	2.33	2.16	1.78	1.30	2.37	2.45	1.92	1.89
	no N	0.95	1.09	1.77	1.98	2.03	1.64	1.39	2.33	2.06	1.72	1.69
	Nc	1.00	1.47	2.09	2.38	2.21	1.68	1.06	2.36	2.41	2.08	1.88
	Ns	1.24	1.90	2.57	2.63	2.25	2.01	1.45	2.42	2.89	1.95	2.09
1952	Mean	1.07	1.22	1.60	1.59	1.57	1.52	1.17	1.87	1.72	1.67	1.74
	no N	0.94	1.08	1.40	1.35	1.47	1.49	1.20	1.88	1.68	1.59	1.76
	Nc	1.09	1.20	1.62	1.72	1.62	1.52	1.00	1.57	1.65	1.68	1.78
	Ns	1.18	1.38	1.77	1.69	1.62	1.56	1.30	2.14	1.83	1.74	1.67
1953	Mean	1.34	1.68	2.28	2.55	2.43	2.30	1.07	2.14	2.10	1.78	1.69
	no N	1.13	1.34	1.87	2.06	2.26	2.19	0.77	1.56	1.40	1.28	1.28
	Nc	1.36	1.70	2.38	2.78	2.49	2.40	0.93	1.98	2.51	2.14	2.02
	Ns	1.53	2.02	2.60	2.82	2.55	2.31	1.50	2.87	2.38	1.91	1.79
1954	Mean	1.22	1.98	2.62	2.64	2.29	0.90	0.79	2.16	2.18	1.82	1.00
	Nca	0.96	1.39	2.17	2.38	2.06	1.08	0.62	1.80	2.19	2.03	1.26
	Nc	1.22	1.90	2.73	2.73	2.53	0.98	0.77	1.94	2.28	2.00	1.10
	Ns	1.46	2.66	2.96	2.81	2.27	0.63	0.98	2.72	2.05	1.43	0.62
1955	Mean	0.74	0.90	1.03	1.09	0.97	0.80	0.96	1.76	1.82	1.70	1.69
	Nca	0.73	0.85	1.06	1.22	1.02	0.80	0.86	1.49	1.83	1.70	1.84
	Nc	0.73	0.89	1.02	1.06	1.00	0.74	0.89	1.61	1.74	1.70	1.64
	Ns	0.75	0.95	1.02	1.00	0.89	0.86	1.13	2.20	1.88	1.69	1.58
1956	Mean	0.89	1.43	2.03	2.24	2.14	1.82	1.05	2.15	2.31	2.06	2.01
	Nca	0.63	1.14	1.78	1.97	2.07	1.78	0.80	1.74	2.16	1.98	1.91
	Nc	0.82	1.32	2.00	2.20	2.14	1.72	0.98	2.10	2.48	2.17	2.08
	Ns	1.23	1.84	2.31	2.55	2.20	1.98	1.37	2.61	2.31	2.02	2.05
NORWAY SPRUCE												
1948	Ns	1.23	1.32	1.38	1.50	1.31	1.28	1.79	1.92	2.21	1.88	0.74
1949	Nh	0.83	0.87	0.81	0.84	0.77	0.71	0.92	1.02	1.11	1.27	0.88
1950	Nc	2.36	2.48	2.50	2.48	2.27	2.18	2.32	2.52	2.53	2.07	1.91
1951	Mean	1.55	1.80	1.95	1.92	1.78	1.65	1.44	2.00	1.92	1.48	1.51
	no N	1.40	1.43	1.70	1.85	1.72	1.44	1.53	1.90	1.70	1.31	1.39
	Nc	1.47	1.86	2.02	1.88	1.78	1.76	1.28	1.92	1.87	1.55	1.60
	Ns	1.79	2.12	2.15	2.03	1.85	1.75	1.52	2.17	2.20	1.59	1.53
DOUGLAS FIR												
1948		2.17	2.22	2.67	2.42	1.92	1.83	1.94	2.36	1.78	2.18	0.79
1950		2.70	3.03	3.24	2.95	3.00	2.71	4.26	4.62	5.07	5.53	5.32
1951	Mean	2.66	3.00	2.95	2.77	2.94	2.60	3.24	3.96	4.02	4.13	4.11
	no N	2.47	2.56	2.55	2.78	2.62	2.26	3.19	3.50	2.99	3.28	3.59
	Nc	2.50	3.18	3.29	2.76	3.03	2.94	3.22	3.96	4.31	4.37	4.36
	Ns	3.00	3.26	3.00	2.77	3.16	2.61	3.33	4.44	4.75	4.73	4.39
1952	Mean	2.56	2.70	2.30	2.14	2.15	2.49	2.46	3.30	2.76	2.32	2.38
	no N	2.59	2.81	2.32	2.05	2.17	2.63	2.67	3.56	2.61	2.45	2.62
	Nc	2.52	2.64	2.31	2.10	1.98	2.43	2.26	3.12	2.74	2.32	2.42
	Ns	2.58	2.65	2.28	2.27	2.29	2.39	2.43	3.23	2.93	2.18	2.11
1953	Mean	5.43	5.44	5.63	5.62	5.42	5.43	4.00	6.01	5.95	5.49	5.30
	no N	5.08	4.83	5.40	5.49	5.54	5.30	3.86	5.38	5.03	5.17	5.20
	Nc	5.52	5.80	6.07	5.98	5.66	5.80	3.73	5.98	6.40	5.75	5.62
	Ns	5.69	5.68	5.41	5.39	5.07	5.19	4.41	6.67	6.40	5.54	5.06
1954	Mean	2.26	3.03	3.10	3.19	2.71	1.26	1.49	2.71	2.75	2.45	1.48
	Nca	1.96	2.79	3.09	3.20	2.58	1.35	1.28	2.38	2.86	2.53	1.61
	Nc	2.39	3.05	3.03	3.25	2.94	1.18	1.47	2.60	2.49	2.41	1.58
	Ns	2.45	3.25	3.18	3.13	2.62	1.25	1.73	3.15	2.90	2.42	1.26
TSUGA												
1948	Ns	0.46	0.46	0.64	0.83	0.93	0.91	0.90	1.04	1.45	1.37	0.78
1950	Nc	0.82	1.08	1.18	1.01	0.80	0.59	0.70	1.06	1.16	1.07	1.28
1951	Mean	0.52	0.75	0.90	0.91	0.88	0.79					
	no N	0.54	0.81	0.83	0.76	0.74	0.80			CROP FAILURE		
	Nc	0.43	0.69	0.92	0.94	0.95	0.67					
	Ns	0.58	0.74	0.95	1.03	0.94	0.90					
1952	Mean	0.45	0.73	0.95	1.02	1.12	1.01	0.34	0.64	0.87	0.73	0.81
	no N	0.43	0.67	0.89	0.97	1.29	1.10	0.31	0.55	0.89	0.80	0.84
	Nc	0.42	0.84	0.94	1.06	1.03	1.05	0.32	0.61	0.98	0.83	0.86
	Ns	0.48	0.69	1.00	1.02	1.05	0.88	0.39	0.75	0.73	0.56	0.73
1953	Mean	0.76	1.28	1.83	2.03	1.95	1.84	0.75	1.88	1.97	1.67	1.72
	no N	0.57	0.93	1.40	1.56	1.66	1.67	0.45	1.22	1.12	1.18	1.19
	Nc	0.65	1.23	1.92	2.12	2.13	2.04	0.72	1.82	2.46	1.94	2.09
	Ns	1.06	1.67	2.18	2.42	2.06	1.82	1.08	2.59	2.33	1.88	1.87
1954	Mean	0.53	1.04	1.47	1.65	1.37	0.49	0.38	0.92	0.99	0.84	0.59
	Nca	0.40	0.59	0.91	1.21	1.06	0.62	0.32	0.57	0.81	0.71	0.57
	Nc	0.47	0.93	1.34	1.78	1.54	0.46	0.37	0.84	1.11	1.07	0.73
	Ns	0.73	1.62	2.15	1.97	1.52	0.38	0.45	1.36	1.04	0.76	0.46
1955	Mean	0.40	0.56	0.60	0.63	0.54	0.42	0.69	1.17	1.15	1.00	0.97
	Nca	0.34	0.51	0.57	0.66	0.53	0.46	0.63	1.00	1.12	1.06	0.98
	Nc	0.47	0.58	0.62	0.64	0.62	0.39	0.66	1.08	1.21	1.04	0.99
	Ns	0.39	0.60	0.60	0.59	0.46	0.42	0.78	1.44	1.13	0.91	0.94
1956	Mean							0.56	1.27	1.44	1.20	1.31
	Nca			CROP FAILURE				0.38	0.89	1.09	0.90	1.11
	Nc							0.57	1.24	1.59	1.30	1.34
	Ns							0.73	1.67	1.64	1.41	1.48

Table 34 cont.

		Kennington Extension						Wareham				
		HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID	MED. ACID	HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID
PINUS CONTORTA												
1948	Ns	0.88	0.84	1.01	1.10	1.17	1.50	2.06	2.56	2.88	2.17	0.98
1949	Nh	1.26	1.17	1.19	1.18	1.15	1.00	2.78	2.76	3.22	2.74	2.22
1950	Nc	2.28	2.45	2.76	2.74	2.93	2.67	2.89	3.74	4.43	4.64	4.50
1952	Mean	1.28	1.59	1.85	1.90	2.00	2.10	1.08	2.01	2.16	2.01	2.07
	no N	1.32	1.64	1.76	1.90	2.11	2.12	1.12	1.96	1.94	1.97	2.04
	Nc	1.13	1.46	1.82	1.86	1.94	2.04	1.08	1.89	2.21	1.98	2.13
	Ns	1.39	1.69	1.97	1.95	1.94	2.13	1.03	2.18	2.33	2.09	2.02
1953	Mean	1.67	2.22	2.76	2.80	2.87	2.86	1.12	2.47	3.10	2.95	2.88
	no N	1.72	2.09	2.46	2.50	2.94	2.86	1.23	2.27	2.62	2.73	2.69
	Nc	1.54	2.10	2.93	2.91	2.96	3.08	1.01	2.40	3.14	2.91	2.94
	Ns	1.76	2.48	2.89	3.00	2.70	2.64	1.11	2.73	3.55	3.23	3.00
1954	Mean	1.16	1.84	2.22	2.32	2.16	1.26	0.54	1.58	1.94	1.85	1.02
	Nca	1.05	1.54	1.92	2.09	2.09	1.34	0.44	1.35	2.15	1.97	1.17
	Nc	1.20	1.80	2.20	2.31	2.27	1.40	0.60	1.56	1.95	1.89	1.03
	Ns	1.22	2.18	2.54	2.56	2.12	1.06	0.59	1.84	1.70	1.69	0.87
1955	Mean	0.91	1.14	1.23	1.25	1.24	1.16	0.98	2.15	2.50	2.42	2.19
	Nca	0.89	1.12	1.25	1.26	1.24	1.18	0.85	1.84	2.60	2.58	2.55
	Nc	0.90	1.09	1.26	1.32	1.31	1.13	0.96	1.98	2.40	2.44	2.06
	Ns	0.93	1.23	1.18	1.18	1.17	1.16	1.14	2.64	2.50	2.25	1.95
1956	Mean	1.15	1.46	1.95	2.11	2.13	1.93	1.01	2.22	2.57	2.38	2.46
	Nca	1.06	1.25	1.75	1.89	1.97	1.78	0.76	1.88	2.44	2.28	2.44
	Nc	1.01	1.37	1.76	2.01	2.07	1.89	0.91	2.10	2.69	2.42	2.51
	Ns	1.38	1.77	2.33	2.42	2.35	2.10	1.37	2.68	2.58	2.45	2.44
PINUS RADIATA												
1948	Ns	3.40	3.19	3.18	2.70	2.88	3.63	4.55	5.85	6.36	5.42	3.13
SCOTS PINE												
1948	Ns	1.73	1.71	1.83	1.81	1.69	1.74	1.95	2.27	2.15	1.62	0.78
1949	Nh	1.15	1.09	1.14	1.19	1.19	1.16	2.12	2.23	2.44	2.22	1.70
1950	Nc	2.52	2.60	2.71	2.47	2.42	2.37	3.55	3.75	4.18	4.33	4.42
1951	Mean	2.16	2.49	2.57	2.50	2.50	2.27	2.33	2.73	2.57	2.59	2.70
	no N	2.25	2.38	2.35	2.48	2.36	2.14	2.06	2.57	2.22	2.16	2.38
	Nc	2.17	2.44	2.62	2.57	2.53	2.24	2.36	2.81	2.71	2.74	2.80
	Ns	2.05	2.67	2.74	2.46	2.62	2.43	2.58	2.81	2.78	2.86	2.92
CORSICAN PINE												
1948	Ns	0.91	0.97	1.04	1.00	0.88	0.83	1.58	1.69	1.69	1.80	1.05
1949	Nh	0.85	1.01	0.97	1.01	1.05	1.00	1.78	1.88	1.96	1.81	1.64
1950	Nc	1.21	1.27	1.27	1.30	1.31	1.33	2.02	2.11	2.49	2.48	2.63
1951	Mean	1.15	1.27	1.32	1.33	1.35	1.27	1.41	1.66	1.66	1.74	1.73
	no N	1.11	1.27	1.33	1.32	1.34	1.26	1.33	1.56	1.36	1.57	1.59
	Nc	1.15	1.19	1.32	1.41	1.34	1.23	1.29	1.61	1.80	1.88	1.76
	Ns	1.20	1.36	1.31	1.26	1.36	1.31	1.62	1.82	1.83	1.77	1.85
1952	Mean	1.66	1.69	1.64	1.57	1.66	1.70	1.19	1.40	1.34	1.29	1.34
	no N	1.66	1.66	1.61	1.59	1.69	1.68	1.26	1.40	1.22	1.23	1.23
	Nc	1.59	1.72	1.62	1.50	1.64	1.66	1.11	1.37	1.36	1.40	1.42
	Ns	1.73	1.68	1.68	1.64	1.64	1.77	1.20	1.42	1.45	1.25	1.36
AUSTRIAN PINE												
1948	Ns	1.12	1.25	1.06	1.20	1.03	1.10	1.74	2.07	2.40	1.93	0.96
PINUS PINASTER												
1948	Ns	1.84	2.46	2.17	2.17	2.64	3.71	3.94	5.74	6.25	5.09	3.18
PINUS HALEPENSIS												
1949	Nh	3.06	2.69	2.72	2.77	2.68	2.32	5.05	5.13	4.31	2.90	1.51
1950	Nc	2.65	2.57	2.45	2.47	2.44	2.27	3.80	3.90	3.47	1.75	1.26
1955	Mean	3.92	3.80	3.08	2.82	2.58	2.15	2.80	3.36	2.54	2.18	1.82
	Nca	3.78	3.75	3.15	2.98	2.85	2.43	2.68	3.30	2.94	2.59	2.00
	Nc	4.05	3.87	3.21	2.67	2.60	2.11	2.92	3.42	2.94	2.64	2.16
	Ns	3.94	3.78	2.88	2.82	2.29	1.91	2.81	3.37	1.73	1.32	1.30
1956	Mean	4.20	4.03	3.51	3.48	3.22	2.54	3.37	3.70	2.71	2.25	1.92
	Nca	4.27	4.10	3.52	3.66	3.46	2.89	3.17	3.74	3.12	2.64	2.11
	Nc	4.22	4.11	3.41	3.31	3.09	2.35	3.38	3.72	3.14	2.70	2.24
	Ns	4.10	3.87	3.60	3.46	3.12	2.36	3.57	3.66	1.87	1.41	1.42

Table 34 cont.

			Kennington Extension						Wareham				
			HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID	MED. ACID	HIGH LIME	MED. LIME	LOW LIME	UN-TREATED	LOW ACID
THUJA													
	1948	Ns	0.92	1.19	1.07	0.94	0.84	0.53	0.62	0.72	0.65	0.77	0.58
	1954	Mean	1.00	1.30	1.15	0.78	0.58		0.34	0.86	0.53	0.44	0.42
		Nca	0.80	1.01	1.01	0.65	0.52	crop	0.29	0.78	0.51	0.39	0.42
		Nc	1.00	1.18	1.30	0.87	0.64	failed	0.31	0.85	0.58	0.50	0.44
		Ns	1.21	1.72	1.14	0.80	0.58		0.42	0.97	0.51	0.45	0.39
	1955	Mean	1.37	1.40	0.76	0.54	0.48	0.41	0.74	1.20	0.86	0.85	0.88
		Nca	1.40	1.54	0.88	0.61	0.52	0.45	0.67	1.24	0.92	0.77	0.80
		Nc	1.34	1.45	0.79	0.52	0.47	0.40	0.71	1.12	0.96	0.97	1.00
		Ns	1.37	1.21	0.61	0.48	0.45	0.38	0.83	1.26	0.70	0.81	0.83
	1956	Mean							1.06	1.63	1.30	1.09	1.06
		Nca							0.88	1.67	1.30	1.21	1.11
		Nc			crop failure				0.99	1.72	1.50	1.27	1.22
		Ns							1.31	1.51	1.09	0.80	0.87
EUROPEAN LARCH													
	1948	Ns	2.61	2.85	3.48	3.77	2.63	2.68	2.28	3.17	3.24	2.78	1.47
JAPANESE LARCH													
	1948	Ns	2.19	2.44	2.76	2.77	3.08	2.81			crop failure		
	1949	Nh	4.00	4.14	3.89	3.04	2.41	2.19	4.39	4.83	5.04	3.53	2.18
	1950	Nc	6.10	6.18	6.76	6.55	5.85	5.11	6.86	7.81	7.59	7.96	7.99
	1951	Mean	5.13	5.91	5.65	4.99	5.18	4.36	4.32	6.50	6.28	5.36	5.17
		no N	5.25	5.35	5.19	5.28	4.99	4.03	4.25	5.77	5.11	4.85	4.84
		Nc	4.60	5.94	5.22	4.54	5.24	4.38	3.81	6.49	6.73	5.72	5.59
		Ns	5.55	6.43	6.54	5.17	5.32	4.66	4.90	7.25	7.00	5.51	5.08
	1952	Mean	4.50	4.75	4.22	4.00	3.88	4.01	3.43	5.19	4.32	3.61	3.54
		no N	4.08	4.38	4.10	3.84	3.99	4.23	3.48	4.85	3.47	3.24	3.49
		Nc	4.52	4.78	4.28	4.03	3.77	3.66	3.19	4.92	4.64	3.98	4.09
		Ns	4.89	5.08	4.27	4.12	3.87	4.14	3.62	5.80	4.84	3.60	3.03
	1953	Mean	6.40	6.92	6.12	5.73	5.70	5.52	3.18	5.56	5.31	4.51	4.32
		no N	6.26	6.10	5.64	5.19	5.86	5.69	2.92	4.43	3.83	3.46	3.60
		Nc	6.10	6.89	6.17	5.48	5.44	5.39	3.14	5.41	5.98	5.07	5.13
		Ns	6.84	7.78	6.54	6.52	5.80	5.47	3.49	6.86	6.12	5.01	4.24
ABIES CONCOLOR													
	1949	Nh	1.28	1.30	1.38	1.26	1.16	1.02	1.71	1.87	1.72	1.26	1.10
	1950	Nc	1.09	1.13	1.22	1.27	1.21	1.17			crop failure		
ABIES MAGNIFICA													
	1948	Ns	1.50	1.32	1.49	1.42	1.38	1.43	1.10	1.28	1.26	1.20	0.82
ABIES NORDMANNIANA													
	1948	Ns	1.27	1.40	1.28	1.31	1.42	1.46	1.18	1.23	1.10	1.17	0.89
ASH													
	1949	Nh	4.96	5.32	4.77	3.50	3.05	1.56	1.01	1.14	1.09	0.78	crop failed
	1953	Mean	4.44	4.65	3.34	1.98	1.56	1.23	1.05	1.47	1.12	0.90	0.83
		no N	3.81	4.15	3.45	2.07	1.66	1.26	1.05	1.41	1.16	0.89	0.80
		Nc	4.72	5.68	3.78	1.96	1.50	1.20	0.99	1.46	1.22	1.03	1.00
		Ns	4.80	4.12	2.79	1.90	1.51	1.22	1.09	1.54	0.98	0.78	0.69
	1954	Mean	3.33	3.57	3.14	1.89	1.43		1.09	1.62	1.05	0.70	
		Nca	3.09	3.71	3.06	1.98	1.46	crop	1.10	1.68	1.19	0.78	crop
		Nc	3.37	4.00	3.72	2.05	1.47	failed	1.07	1.53	1.14	0.78	failed
		Ns	3.54	3.00	2.62	1.64	1.36		1.10	1.66	0.82	0.54	
BIRCH													
	1949	Nh	3.25	4.22	5.81	5.20	6.00	7.79	9.68	12.32	19.00	26.79	crop failed
	1950	Nc	10.50	9.01	10.88	8.82	8.92	8.16	7.78	8.83	11.95	15.60	15.58
BETULA LUTEA													
	1948	Ns	1.06	1.35	1.80	2.31	4.30	3.96	3.41	4.76	5.08	6.46	2.42
BEECH													
	1948	Ns	4.60	4.70	3.68	3.72	3.62	3.86	4.72	4.43	4.33	3.40	2.37
OAK													
	1948	Ns	5.06	4.52	4.12	4.36	3.96	3.98	3.20	3.76	3.12	2.96	2.57

Table 35

Ammonium alginate, ammonium sulphate

Old Kennington K 6

Years and Species: seedbed plots split for 1+0 Sitka spruce (SS) v. 1+0 Scots pine (SP); 1946 only

Design and Treatments: 4 blocks of 3 plots

	g.N per sq.yd.
untreated	-
ammonium alginate (S.4460)	11
ammonium sulphate	11

NO BASAL FERTILIZER

Dates: N fertilizer 29/3; broadcast sowing of seed 13/4

	Height in inches		Number of plants per sq.yd.	
1946	SS	SP	SS	SP
no nitrogen	0.54	1.00	806	522
ammonium alginate	0.75	1.04	986	518
ammonium sulphate	0.90	1.07	990	522
S.E.±	0.057	0.034	186.0	90.2
c.v.%	15.6	6.6	39.8	34.6

Table 36

Forms of nitrogen and times of application

Ringwood R 23

Years and Species: 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds (Results not given below, as basal N had been applied in error)

Design and Treatments: 32 plots in 4 blocks of 8, 2 blocks unsteamed and 2 blocks steamed in November 1947

Factorial test on:

v. Nc / Ns × As × Ae

		units	rate per sq.yd.
Nc	'Nitro-Chalk'	g.N	5½
Ns	ammonium sulphate	g.N	5½
basal	superphosphate	g.P	5½
basal	potassium sulphate	g.K	7

Dates

application of nitrogen		1948		1948
As	applied seedbed	31/3	application of P and K	31/3
Ae	applied early summer	28/6	broadcast sowing of seed	28/4

	Height in inches				Number of plants per sq.yd.			
1948	SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
	no steam	steam	no steam	steam	no steam	steam	no steam	steam
Mean	0.45	1.20	1.19	1.91	754	920	635	611
Effects:								
As'	0.06	-0.07	0.12	-0.06	30	-52	-28	22
Ae'	0.17**	0.37**	0.35**	0.58**	36	-22	-70	104*
As'e'	0.04	0.08	-0.03	0.12	27	16	76	56
(Ns-Nc)'	0.08	0.02	0.02	0.01	78	-152*	32	104*
As'(Ns-Nc)'	0.03	0.04	0.08	0.13	93	-34	76	26
Ae'(Ns-Nc)'	0.09	0.05	0.03	-0.04	81	-28	-14	22
S.E.±	0.038	0.071	0.054	0.118	88.6	62.5	76.4	35.4
c.v.%	17.0	11.9	9.1	12.3	23.4	13.5	24.0	11.6

Table 37

Nitrogen forms

Wareham W 54

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design 36 plots in 4 blocks of 9

Treatments (1949 ONLY)

SITKA SPRUCE

	Roth. No.	Height in inches 1949	Height in inches 1950	Number of plants per sq.yd. 1949	Number of plants per sq.yd. 1950
no nitrogen		1.32	1.33	932	992
S.E.±		0.116	0.139	45.2	36.8
9 g.N per sq.yd. as					
hoof	N.254	1.19	1.51	806	1038
formalised casein	N.228	1.08	1.69	948	1005
formalised urea	N.255	1.47	1.62	849	994
formalised urea	N.260	1.10	1.90	933	927
formalised urea	N.259	1.12	1.84	828	1008
formalised urea	N.258	1.26	1.58	825	988
'flash'	N.253	1.36	1.68	945	1036
S.E.±		0.164	0.197	63.9	52.0
c.v.%		26.2	24.4	14.4	10.4

Basal dressing 1949 and 1950

4½ g. P per sq.yd. as superphosphate
4½ g. K per sq.yd. as potassium chloride

Dates	1949	1950
Manuring	17/3	8/3
Broadcast sowing of seed	21/3	25/3

Table 38

Forms of nitrogen

Old Kennington K 47, Ampthill Am 16, Ringwood R 36, Kennington Extension KE 57, Bagley B 32, Wareham W 61

Years and Species 1951 1+0 Sitka spruce seedbeds

Design 20 plots in 4 blocks of 5

Basal dressing, per sq.yd. superphosphate 4½ g.P, potassium chloride 4½ g.K
Bagley only: 150 g. of ground chalk applied on March 29

Dates / Treatments	K 47	Am 16	R 36	KE 57	B 32	W 61
seedbed (N forms except 'Nitro-Chalk'; P, K)	1/3	12/3	8/3	1/3	29/3	6/3
'Nitro-Chalk' topdressed early	28/6	4/7	25/6	28/6	29/6	26/6
late	2/8	3/8	1/8	2/8	2/8	1/8
Broadcast sowing of seed	11/4	12/4	17/4	5/4	18/4	3/4

SITKA SPRUCE

1951 Treatments (9 g.N per sq.yd.)[1]	Height in inches K 47	Am 16	R 36	KE 57	B 32	W 61	Number of plants per sq.yd. K 47	Am 16	R 36	KE 57	B 32	W 61
no nitrogen	0.97	1.25	1.21	1.92	1.35	1.15	1122	800	1066	1314	1704	1186
formalised urea	1.24	1.58	1.48	1.64	1.44	1.12	1270	832	1174	1462	1737	1136
crushed hoof	1.32	1.64	1.32	1.92	1.70	1.26	1239	824	1082	1256	1836	1090
formalised casein	1.74	1.75	1.67	2.29	1.76	1.46	1158	825	1088	1238	1576	1026
'Nitro-Chalk'	1.47	1.76	1.58	2.58	1.65	1.36	1131	861	1065	1359	1898	1210
S.E.±	0.084	0.106	0.076	0.115	0.153	0.130	73.1	65.4	80.6	65.2	164.1	77.8
c.v.%	12.4	13.2	10.5	11.1	19.4	20.5	12.4	15.8	14.8	9.8	18.7	13.8

[1] formalised urea (N.260), crushed hoof (N.254), formalised casein (N.228) forked in with basal P and K; 'Nitro-Chalk' applied in two equal summer topdressings of 4½ g.N

Table 39

Rates and times of 'Nitro-Chalk'

Ringwood R 34, Kennington Extension KE 51

Species and Years R 34, KE 51 1950 only 1+0 Sitka spruce seedbeds

Design R 34 24 plots in 4 blocks of 6
KE 51 20 plots in 4 blocks of 5

SITKA SPRUCE, 1950

Treatments	g.N per sq.yd.	Height in inches R 34	Height in inches KE 51	Number of plants per sq.yd. R 34	Number of plants per sq.yd. KE 51
'Nitro-Chalk' applied					
none	-	0.61	1.31	383	1088
S.E.±		0.042	0.112	27.6	106.1
seedbed	4½	0.69	1.38	440	1248
early summer	4½	0.88	1.68	525	1392
seedbed + early summer (in two equal dressings of 2¼ g.)	4½	0.82	1.45	546	1434
seedbed + early summer (in two equal dressings of 4½ g.)	9	0.93	1.77	477	1562
S.E.±		0.060	0.112	39.0	106.1
c.v.%		15.8	14.8	17.1	15.8

Basal fertilizer

	rate per sq.yd.
superphosphate	4½ g.P
potassium chloride	4½ g.K

Dates

Manuring	R 34	KE 51
P, K in seedbed	7/3	23/2
N in seedbed	7/3	9/3
N topdressed	26/6	6/7
Broadcast sowing of seed	30/3	28/3

Table 40

Levels of 'Nitro-Chalk' and ammonium sulphate

Old Kennington K 31

Years and Species 1949-1952 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8

Factorial test on:

4 levels of nitrogen × ('Nitro-Chalk' v. ammonium sulphate)

Treatments 1949, 1950, 1951, 1952 applied on 4 occasions (seedbed, early summer, mid-summer, late summer)

SITKA SPRUCE

	dressings in g. N per sq.yd. per occasion	dressings in g. N per sq.yd. per annum		Height in inches 1949	1950	1951	1952	Number of plants per sq.yd. 1949	1950	1951	1952
no N	none	none		0.83	0.70	0.64	0.70	1342	742	608	307
			S.E.±	0.030	0.080	0.046	0.055	55.6	60.4	66.3	40.3
'Nitro-Chalk'											
level 1	1½	6		0.88	0.91	0.76	0.84	1302	804	806	296
2	3	12		0.77	1.15	0.90	1.08	1032	876	912	288
3	4½	18		0.80	1.11	0.94	0.94	1264	766	711	322
ammonium sulphate											
level 1	1½	6		0.90	1.34	1.20	1.17	1252	926	980	549
2	3	12		0.80	1.82	1.48	1.26	1318	1016	855	492
3	4½	18		0.86	1.78	1.57	1.58	1106	1149	834	584
			S.E.±	0.042	0.113	0.065	0.077	78.8	85.5	93.8	57.0
			c.v.%	10.1	19.0	12.7	14.8	12.7	19.5	23.8	29.0

Basal dressing except 1950 4½ g. P per sq.yd. as superphosphate and 4½ g. K per sq.yd. as potassium chloride

Dates	1949	1950	1951	1952
Manuring				
seedbed P, K	10/3	-	13/4	26/2
seedbed N	10/3	9/3	13/4	22/4
topdressing of N				
early summer	25/5	15/6	1/6	4/6
mid-summer	24/6	6/7	28/6	7/7
late summer	2/8	15/8	2/8	12/8

	1949	1950	1951	1952
Broadcast sowing of seed	30/3	24/3	16/4	23/4

Table 41

Times of application and forms of nitrogen; watering test

Kennington Extension KE 16, Wareham W 23

Years and Species — 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design and Treatments — KE 16 1947-1949; W 23 1947-1948 — 32 plots in 2 blocks of 16, confounding highest order interaction

Factorial test on:

Nitrogen applied

Date 1 × Date 2 × Date 3 × Ns v.Nc[1] ammonium sulphate 'Nitro-Chalk' × W watering

	units	rate per sq.yd. 1947	1948	1949
N forms (rate per occasion)	g.N	5½	5½	4½
superphosphate[2]	g.P	7	5½	4½
potassium sulphate	g.K	5[3]	7	4½

[1] Nca calcium nitrate (N.231) in 1947

BASAL PK FERTILIZER

[2] Gafsa at W in 1947 [3] 10g. at W in 1947

Nitrogen treatments. At Wareham in 1947 and 1948 and at Kennington Extension in 1949 the nitrogen topdressings were applied dry, but at Kennington Extension in 1947 and 1948 they were applied in 2 to 2½ l. water.

Watering treatments. The original intention had been to compare 'no watering' with 'watering in dry spells'. This comparison was in fact made at Wareham in 1947 and 1948, and also at Kennington Extension in 1947. However, in 1948 and 1949 it was decided to apply some water to the whole of the section at Kennington Extension and the watering treatment in KE 16 during these two seasons is therefore that applied in excess of normal practice.

Dates

application of fertilizer	1947 KE	1947 W		1948 KE	1948 W	1949 KE
Nitrogen						
Date 1 Ae (applied in early summer)	11/6	11/6	As (applied in seedbed)	22/3	1/4	10/3
Date 2 Am (applied in mid-summer)	11/7	10/7	Ae (applied in early summer)	30/6	29/6	24/6
Date 3 Al (applied in late summer)	28/8	6/8	Al (applied in late summer)	3/8	3/8	2/8
basal phosphorus and potassium	2/4	10/4		22/3	1/4	10/3
broadcast sowing of seed	3/5	25/4		27/4	16/4	25/3

Height in inches	1947 SITKA SPRUCE KE 16	1947 SITKA SPRUCE W 23	1947 SCOTS PINE KE 16	1947 SCOTS PINE W 23		1948 SITKA SPRUCE KE 16	1948 SITKA SPRUCE W 23	1948 SCOTS PINE KE 16	1948 SCOTS PINE W 23	1949 SITKA SPRUCE KE 16
Mean	2.03	2.30	2.76	3.21	Mean	1.24	2.38	1.67	3.38	1.69
EFFECTS:					EFFECTS:					
Ae'	0.06	0.37**	0.20**	0.48**	As'	-0.08	0.13	0.02	0.25*	-0.23**
Am'	0.36**	-0.01	0.32**	0.35**	Ae'	0.18**	0.01	0.23**	0.29**	-0.24**
Al'	0.14	-0.00	0.01	-0.01	Al'	0.27**	0.00	0.39**	0.18	0.04
Ae'm'	-0.12	-0.12	-0.27**	-0.26**	As'e'	0.00	-0.17	0.04	-0.19*	-0.16*
Ae'l'	-0.05	-0.15	-0.02	-0.08	As'l'	-0.06	-0.01	0.07	-0.15	0.03
Am'l'	-0.07	-0.14	0.08	0.01	Ae'l'	0.00	-0.28	0.02	0.01	-0.08
(Nca-Ns)'	-0.15	0.12	-0.09	0.06	(Nc-Ns)'	-0.06	-0.11	0.05	0.10	0.06
(Nca-Ns)'Ae'	0.04	-0.06	-0.03	-0.08	(Nc-Ns)'As'	0.08	-0.07	-0.08	-0.15	0.08
(Nca-Ns)'Am'	-0.27*	-0.07	-0.17*	-0.04	(Nc-Ns)'Ae'	-0.01	-0.10	0.02	0.13	-0.14*
(Nca-Ns)'Al'	-0.11	0.07	-0.06	-0.09	(Nc-Ns)'Al'	0.04	0.23	0.11	0.00	0.20**
W'	0.75**	0.63**	1.01**	0.46**	W'	0.27**	-0.08	0.16*	0.14	0.92**
W'Ae'	0.25*	0.01	0.29**	0.10	W'As'	-0.02	0.06	-0.06	0.14	-0.00
W'Am'	0.38**	-0.04	0.33**	0.17*	W'Ae'	-0.02	-0.14	-0.03	-0.07	-0.03
W'Al'	0.25*	0.01	0.13*	0.08	W'Al'	0.16**	-0.38*	0.02	-0.16	0.08
(Nca-Ns)'W'	-0.03	-0.05	-0.11	-0.02	(Nc-Ns)'W'	-0.09	-0.07	0.01	0.04	0.02
S.E.±	0.109	0.094	0.057	0.072	S.E.±	0.048	0.171	0.061	0.086	0.062
c.v.%	15.2	11.5	9.9	6.4	c.v.%	11.0	20.3	10.3	7.2	10.4

Number of plants per square yard

Mean	1095	1181	1134	993	Mean	940	784	635	570	1064
EFFECTS:					EFFECTS:					
Ae'	19	50	-38	-50	As'	-22	26	20	-56	-8
Am'	47	-41	-46	-53	Ae'	-12	-104*	-3	-41	-51
Al'	-41	22	29	2	Al'	-66	18	-8	40	-77
Ae'm'	5	-91	-34	-49	As'e'	-112	-33	12	-37	-150**
Ae'l'	22	-16	-1	-29	As'l'	16	-118*	-32	14	14
Am'l'	86	25	-47	88	Ae'l'	9	-16	6	17	-52
(Nca-Ns)'	-7	28	-64	-17	(Nc-Ns)'	34	50	45*	-31	-62
(Nca-Ns)'Ae'	50	-109	-22	-61	(Nc-Ns)'As'	-21	-9	9	40	14
(Nca-Ns)'Am'	-11	-14	-38	47	(Nc-Ns)'Ae'	22	-9	-14	43	-41
(Nca-Ns)'Al'	5	-77	79	-56	(Nc-Ns)'Al'	-10	58	-12	-83	0
W'	-5	94	11	-4	W'	40	70	40	-70	182**
W'Ae'	-2	74	26	-53	W'As'	-36	-60	20	-2	-43
W'Am'	-7	-59	-14	-47	W'Ae'	46	18	-9	-32	26
W'Al'	-71	-8	-17	80	W'Al'	-22	50	10	31	98*
(Nca-Ns)'W'	-58	16	-26	49	(Nc-Ns)'W'	-20	-87	6	-91	-58
S.E.±	57.3	54.0	44.3	56.1	S.E.±	45.6	46.1	19.4	43.6	36.5
c.v.%	14.8	12.9	11.1	15.9	c.v.%	13.7	16.6	8.6	21.9	9.7

Table 42

Times of 'Nitro-Chalk' topdressings and test on urea

Kennington Extension KE 72A, Bagley B 38A, Wareham W 100B

Years and Species 1953 1+0 Sitka spruce seedbeds. Plot size: 3 ft. × 1½ ft.

Design 20 plots in 4 blocks of 5 plots

Basal fertilizer, rate per sq.yd.	
superphosphate	4½ g.P
potassium chloride	9 g.K
kieserite	1½ g.Mg

Treatment applications	Dates KE	B	W
P, K, Mg fertilizer	24/2	25/2	4/3
N topdressed early	30/6	1/7	25/6
late	5/8	5/8	30/7
Broadcast sowing of seed	19/3	20/3	13/3

SITKA SPRUCE

1953

Treatments	g.N per sq.yd. topdressed early	late	Height in inches KE 72A	B 38A	W 100B	Number of plants per sq.yd. KE 72A	B 38A	W 100B
no nitrogen	-	-	1.19	2.14	1.08	1101	596	1006
'Nitro-Chalk'	4½	-	1.46	2.16	2.62	1054	694	892
'Nitro-Chalk'	-	4½	1.39	1.80	2.68	1012	615	792
'Nitro-Chalk'	4½	4½	1.78	2.22	2.74	981	634	898
urea	4½	4½	1.88	2.42	2.98	992	602	939
S.E.±			0.104	0.149	0.143	80.8	34.6	69.9
c.v.%			13.5	13.8	11.8	15.7	11.0	15.4

Table 43

Oxidised coal tested at three rates

Ringwood R 63, Kennington Extension KE 78

Years and Species 1953-1954 1+0 Sitka spruce seedbeds

Design R 63 16 plots in 4 × 4 Latin Square KE 78 20 plots in 4 blocks of 5 plots

Basal fertilizer, rate per sq.yd.		units	1953	1954
'Nitro-Chalk' topdressed	early	g.N	4½	4½
	late	g.N	4½	4½
superphosphate		g.P	4½	4½
potassium chloride		g.K	9	9
kieserite		g.Mg	1½	3
formalin at R only (applied in 3 to 5 l. water)		ml.	250	250

Treatment applications	Dates 1953 R	KE	1954 R	KE
formalin	27/2	-	10/12	-
P,K,Mg fertilizer, compost	27/2	24/2	25/2	5/3
oxidised coal	27/2	24/2	-	-
N topdressed early	23/6	30/6	23/6	29/6
late	30/7	5/8	3/8	5/8
Broadcast sowing of seed	27/3	19/3	6/4	25/3

SITKA SPRUCE

Treatments, rate per sq.yd.		Height in inches R 63 1953	1954	KE 78 1953	1954	Number of plants per sq.yd. R 63 1953	1954	KE 78 1953	1954
MEANS									
no oxidised coal		2.68	1.71	2.57	1.86	1010	830	765	442
applied in 1953 only									
oxidised coal[1]	200 g.	2.64	1.41	2.56	1.89	934	717	740	486
	400 g.	2.75	1.66	2.64	1.66	974	706	752	423
	600 g.	2.88	1.74	2.77	1.95	988	891	741	552
applied in 1953 and 1954									
4½ kg. compost[2]		-	-	2.40	1.44	-	-	498	448
S.E.±		0.065	0.058	0.119	0.125	105.9	115.4	50.8	66.8
c.v.%		4.8	7.1	9.2	14.2	21.7	29.4	14.5	28.4

[1] R.E.S. No. N.338 [2] compost of bracken and hopwaste (without basal fertilizer) R.E.S. Nos: 1953 S.6308; 1954 S.6500

Table 44

Rates and forms of phosphorus

Bagley B 27

Years and Species 1950-1951 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8

Factorial test on:

			g.P per sq.yd.
no phosphorus		level	
fused tricalcium phosphate[1]	×	1	2½
dicalcium phosphate (dihydrate)[2]		v.2	4½
superphosphate			

[1] Roth.No. P.479

[2] Roth.No. P.484

SITKA SPRUCE

	Height in inches				Number of plants per sq.yd.			
	1950		1951		1950		1951	
Treatments	Mean	Effect of level (2-1)'	Mean	Effect of level (2-1)'	Mean	Effect of level (2-1)'	Mean	Effect of level (2-1)
no phosphorus	0.88	-	1.17	-	1156	-	1310	-
tricalcium phosphate	1.37	0.53**	1.83	0.14	1118	-39	1390	-214
dicalcium phosphate	1.52	0.36*	1.69	0.50*	1108	-26	1430	-190
superphosphate	1.92	0.85**	1.80	0.12	1131	-6	1504	-75
S.E.±	0.072	0.143	0.090	0.180	56.1	112.3	68.6	137.2
c.v.%	14.2		15.7		14.1		13.8	

Basal dressings	units	1950	1951
ground chalk	g.	150	-
'Nitro-Chalk' (in two equal dressings of 4½ g.N)	g.N	9	9
potassium sulphate	g.K	4½	4½

Dates		1950	1951
Manuring			
ground chalk		7/2	-
'Nitro-Chalk'	seedbed	9/3	-
	topdressed early	11/7	29/6
	topdressed late	-	2/8
phosphate forms, potassium sulphate		23/2	29/3
Broadcast sowing of seed		30/3	18/4

Table 45

Forms and amounts of potassium

Wareham W 11

Species and Years seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1946 only

Design and Treatments 36 plots in 3 blocks of 12

7 FORMS OF POTASSIUM; chloride and sulphate at 2 rates, the others at one rate

Basal hoof (or uric acid) at 17 g. N per sq.yd.

Basal dicalcium phosphate at 10 g. P per sq.yd. was applied with all materials except the Argentine plant ash and potassium dihydrogen phosphate. The plant ash supplied 10 g. P per sq.yd.; potassium dihydrogen phosphate supplied 7 g. P and had 2 g. P added in the form of dicalcium phosphate

Roth. Numbers Argentine plant ash S.3225; potassium alginate S.4461; mica mineral K.1; ground glauconite sand K.3

Dates Manuring 25/3 Broadcast sowing of seed 12/4

1946

		Height in inches		Number of plants per sq.yd.	
		SITKA SPRUCE	SCOTS PINE	SITKA SPRUCE	SCOTS PINE
basal N as hoof					
no potassium		1.14	1.33	1023	546
S.E.±		0.111	0.090	61.6	39.5
potassium as	g.K				
chloride	10	2.78	2.40	924	720
chloride	20	2.65	2.45	912	630
sulphate	10	2.92	2.28	774	534
sulphate	20	2.92	2.15	990	528
dihydrogen phosphate	10	2.94	2.44	900	540
Argentine plant ash	10	2.97	2.58	816	612
alginate	10	2.69	2.86	990	690
mica mineral	40	1.13	1.35	1050	618
glauconite sand (ground)	40	3.23	2.43	852	582
basal N as uric acid					
potassium sulphate	10	3.20	2.63	846	570
S.E.±		0.157	0.127	87.2	55.9
c.v.%		11.0	10.0	16.4	16.3

Table 46

Forms and rates of potassium fertilizer; test on watering

Wareham W 22

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine

Design and Treatments 32 plots in 2 blocks, confounding highest order interaction

Potassium treatments 1947 and 1948

	rates in g. K per sq.yd.				
no potassium	-	-	-	-	-
potassium chloride v.potassium sulphate	2½	5	10	20	-
finely ground glauconitic sand[1] v.crude glauconitic sand[1]	-	-	10	20	40

each of above tested with and without watering in dry periods

[1] Rothamsted numbers: finely ground K 11, crude K 8

Basal dressing

	units	rate per sq.yd. 1947	1948
hoof	g.N	11	8½
Gafsa	g.P	7½	-
superphosphate	g.P	-	5½

Dates

	1947	1948		1947	1948
manuring	10/4	1/4	broadcast sowing of seed	25/4	16/4

			Height in inches				Number of plants per sq.yd.			
			SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
		S.E.	1947	1948	1947	1948	1947	1948	1947	1948
Mean			1.78	1.68	2.93	2.76	1229	655	1018	556
no potassium		a	1.36	0.97	2.46	1.71	1278	456	999	465
Averaging rates										
crude glauconitic sand		b	1.45	1.36	2.49	2.12	1164	620	944	594
ground glauconitic sand		b	1.67	1.82	2.78	2.63	1192	792	1024	572
potassium chloride		c	2.03	1.87	3.30	3.45	1245	682	1053	568
potassium sulphate		c	2.09	1.98	3.22	3.19	1266	650	1044	550
Averaging forms										
glauconitic sand	10 g.K	a	1.62	1.33	2.52	2.18	1146	837	1167	618
	20 g.K	a	1.58	1.69	2.58	2.56	1122	717	954	570
	40 g.K	a	1.49	1.76	2.81	2.39	1266	564	831	561
Averaging forms										
soluble potassium salts	2½ g.K	a	1.98	1.81	3.13	3.16	1299	645	918	597
	5 g.K	a	1.94	2.18	3.27	3.39	1251	708	1005	507
	10 g.K	a	2.01	1.66	3.24	3.24	1239	612	1146	585
	20 g.K	a	2.30	2.05	3.42	3.49	1233	699	1125	549
Effect of water with:										
glauconitic sand[2]		d	0.32	0.20	0.32*	0.18	-72	28	-44	-6
soluble potassium salts[2]		e	0.84**	0.12	0.23	-0.02	195*	75	63	111
Standard errors		a	0.167	0.194	0.121	0.194	92.2	68.7	77.2	57.4
		b	0.137	0.159	0.099	0.158	75.2	56.1	63.0	46.8
		c	0.118	0.137	0.085	0.137	65.2	48.6	54.6	40.6
		d	0.193	0.224	0.140	0.224	106.4	79.3	89.2	66.2
		e	0.167	0.194	0.121	0.194	92.1	68.7	77.2	57.4
c.v.%			18.8	23.1	8.2	14.0	15.0	21.2	15.1	20.8

[2] averaging forms and rates

Table 47

Fertilizers

Ringwood R 24, Wareham W 31

Years and Species 1948: R 24 and W 31 seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-50: R 24
1949-54: W 31 1+0 Sitka spruce seedbeds

Design R 24 16 plots in 2 blocks of 8; one block unsteamed and one steamed (Ms) in November 1947
W 31 16 plots in 2 blocks of 8; confounding highest order interaction

All factorial combinations of:

R 24 nitrogen × phosphorus × potassium

W 31 nitrogen × phosphorus × potassium × ground chalk

Treatments

				R 24 rate per sq.yd.			W 31 rate per sq.yd.				
			units	1948	1949	1950	1948	1949	1950	1950-53	1954
N	seedbed	ammonium sulphate	g.N	8½	4½	-	8½	4½	-	-	-
		'Nitro-Chalk'	g.N	-	-	4½	-	-	4½	-	-
	topdressed	'Nitro-Chalk' early	g.N	-	4½	4½	-	4½	4½	4½	4½
		late	g.N	-	-	-	-	-	-	4½	4½
P	superphosphate		g.P	5½	4½	4½	5½	4½	4½	4½	4½
K	potassium chloride		g.K	7	4½	4½	7	4½	4½	4½	9
Rc	ground chalk		g.	-	-	-	-	150	-	-	100
basal magnesium as kieserite			g.Mg	-	-	-	-	-	-	-	3

Dates	R 24			W 31						
Manuring	1948	1949	1950	1948	1949	1950	1951	1952	1953	1954
winter, ground chalk	-	-	-	-	23/2	-	-	-	15/12	-
seedbed (P,K,Mg; N in 1948-50)	31/3	16/3	7/3[1]	1/4	17/3	8/3	7/3	12/3	3/3	24/2
topdressing of N early	-	20/6	26/6	-	21/6	27/6	26/6	24/6	24/6	24/6
late	-	-	-	-	-	-	1/8	14/8	30/7	4/8
Broadcast sowing of seed	28/4	30/3	29/3	23/4	1/4	27/3	28/3	9/4	17/3	16/3

[1] N raked in (after forking in other fertilizers) during final preparation of seedbed

Ringwood, R 24

	Height in inches				Number of plants per sq.yd.			
	SITKA SPRUCE			SCOTS PINE	SITKA SPRUCE			SCOTS PINE
	1948	1949	1950	1948	1948	1949	1950	1948
Mean	0.76	0.81	0.45	1.49	958	737	527	682
Effects:								
N'	0.05	0.19	0.28*	0.05	-140	-10	11	75
P'	0.05	-0.05	0.00	-0.37*	-70	166	-1	21
K'	0.02	0.19	0.10	0.12	158	30	11	-48
N'P'	-0.05	-0.03	0.01	-0.01	-8	40	-17	9
N'K'	-0.07	0.02	0.09	0.04	118	-150	64	-78
P'K'	0.14	0.24*	0.15	-0.04	-166	3	16	-36
N'Ms'	-0.00	0.03	0.13	0.06	2	38	-35	-51
P'Ms'	0.04	-0.05	-0.00	-0.26	-2	190	-44	45
K'Ms'	0.02	0.04	0.02	0.08	-158	-51	64	72
S.E.±	0.077	0.090	0.072	0.121	124.7	111.2	25.5	56.5
c.v.%	20.2	22.2	32.2	16.2	26.0	30.1	9.6	16.5

Table 47 cont.

Wareham, W 31

	SITKA SPRUCE							SCOTS PINE
	1948	1949	1950	1951	1952	1953	1954	1948
Height in inches								
Mean	1.28	1.00	1.17	0.96	1.14	0.99	1.21	1.69
Effects:								
N'	-0.21	-0.33**	0.51	0.26**	-0.13	0.30*	0.87**	-0.24
P'	1.84**	0.93**	0.88*	0.75**	1.09**	0.68**	0.92**	1.86**
K'	0.20	0.29**	0.50	0.30**	0.48**	0.46**	0.24*	0.32
Rc'	-	0.18	-0.58	0.11	0.24*	0.23*	0.25*	-
N'P'	-0.17	-0.01	0.36	0.15*	0.02	0.20	0.67**	-0.19
N'K'	0.14	0.06	0.49	0.13	0.24*	0.39**	0.04	-0.00
P'K'	0.23	0.20*	0.50	0.26*	0.43**	0.45**	0.08	0.36
S.E.±	0.114	0.081	0.267	0.063	0.075	0.099	0.101	0.157
c.v.%	17.9	16.2	45.7	13.0	13.1	20.0	16.7	18.6
Number of plants per square yard								
Mean	535	739	880	904	820	1021	1026	578
Effects:								
N'	82	19	-78	-74	70	32	-50	-32
P'	-110*	-53	-147	-88	-81	-62	51	-104
K'	14	-77	21	-23	26	-82	-18	-2
Rc'	-	-25	135	23	93	-83	-6	-
N'P'	20	-40	57	-23	12	-23	44	32
N'K'	-158**	-49	-51	-49	-74	-169*	20	32
P'K'	-62	116	-117	-59	-75	-71	-66	80
S.E.±	36.5	50.8	84.9	56.2	32.4	55.6	65.8	74.7
c.v.%	13.6	13.8	19.3	12.4	7.9	10.9	12.8	29.6

Table 48

Fertilizers

Wareham W 50

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design 32 plots in 2 blocks of 16, confounding highest order interaction

All factorial combinations of

N × P × K × F (1949 only) × Rc (1949 only)

Treatments

			units	rate per sq.yd. 1949	1950
N	seedbed	ammonium sulphate	g.N	3	-
		'Nitro-Chalk'	g.N	-	3
	topdressed	'Nitro-Chalk'	g.N	3	3
P	superphosphate		g.P	3	3
K	potassium sulphate		g.K	3	3
Rc	ground chalk		g.	150	-
F	materials as used in N,P,K above			as N,P,K above	-

Dates

Treatment application	1949	1950
ground chalk	23/2	-
seedbed (N, P, K)	17/3	8/3
N topdressed	21/6	27/6
Broadcast sowing of seed	31/3	25/3

SITKA SPRUCE

	Height in inches		Number of plants per sq.yd.	
	1949	1950	1949	1950
Mean	0.85	1.38	483	848
Effects				
N'	0.03	0.43**	75	42
P'	0.25*	0.72**	-34	14
K'	0.05	-0.03	32	135*
N'P'	0.07	0.55**	38	82
N'K'	0.16	0.15	63	20
P'K'	0.14	0.32*	-39	30
F'	-0.09	-0.02	41	64
N'F'	-0.10	0.09	82	20
P'F'	-0.17	-0.12	-44	-25
K'F'	-0.03	-0.32*	-98	-21
Rc'	-0.09	0.00	-67	-57
N'Rc'	-0.09	0.16	-32	-21
P'Rc'	-0.10	0.00	-26	53
K'Rc'	0.04	0.08	37	63
F'Rc'	-0.03	0.15	-8	-17
S.E.±	0.083	0.135	55.0	52.1
c.v.%	27.7	27.7	32.4	17.4

Table 49

Fertilizers and various conifer species

Ampthill Am 46, Bagley B 13, Wareham W 46

Species and Years[1] 1+0 seedbeds Species sown in 1 in. drills 1949-54 and in 4 in. bands 1955 onwards. (Sitka spruce sown broadcast at Bagley 1949-54 and Ampthill 1954 only)

common name	scientific name	Am 46	B 13	W 46
Sitka spruce	Picea sitchensis (Bongard) Carrière	1954-56	1949-56	1949-56
Western hemlock	Tsuga heterophylla (Rafinesque) Sargent	1955-56	1955-56	1949-56
Douglas fir	Pseudotsuga taxifolia (Poiret) Britton	-	-	1950-54
Lodgepole pine	Pinus contorta (Loudon)	1955-56	1955-56	1950-56
Corsican pine	Pinus nigra var. calabrica (Loudon) Schneider	-	-	1949-53
Western red cedar	Thuja plicata Lambert	1955-56	1955-56	1954-56
Japanese larch	Larix leptolepis (Siebold and Zuccarini) Gordon	-	-	1949-54

Owing to crop failure no results can be given for the following: W 46 1949 all species; Am 46 1955 Thuja, 1956 all species

[1] The experiments were continued after 1956 but results are presented only up to that date

Design Am 46 32 plots in 4 blocks of 8, confounding two 3-term and one 4-term interactions
2 additional plots per block (one unmanured, one compost) making 40 plots in all

B 13, W 46 32 plots in 2 blocks of 16, confounding highest order interactions

Factorial test on:

B 13, W 46 N × P × K × F (1949, 1954-56) × Rc (1949)[2] × Mg (1954-56)

Am 46 N × P × K × F × Mg

Factorial treatments

		units	rate per sq.yd. 1949	1950	1951-53	1954	1955-56
N	seedbed ammonium sulphate	g.N	3	-	-	-	-
	'Nitro-Chalk'	g.N	-	4½	-	-	-
	topdressed 'Nitro-Chalk'[3] early	g.N	3	4½	4½	3	3
	late	g.N	-	-	4½	3	3
P	superphosphate	g.P	3	4½	4½	3	6
K	potassium sulphate	g.K	3	4½	4½	6	6
Mg	kieserite	g.Mg	-	-	-	3	3
Rc	ground chalk	g.	150	-	-	-[2]	-
F	materials as used in NPK above		as NPK above	-	-	as NPK above	as NPK above

[2] To even out residues from ground chalk (Rc) applied in 1949, the 'no Rc' plots received 150 g. ground chalk and the 'Rc' plots 100 g. ground chalk in December 1953

[3] N applied as ammonium sulphate at Ampthill 1954-56

AMPTHILL ONLY

Additional treatments

unmanured
bracken and hopwaste compost applied annually at 4½ kg. per sq.yd.
(Roth.Numbers: 1954 S.6500; 1955 S.6665; 1956 S.6862)

Basal dressings

250 ml. formalin per sq.yd. in 4 to 5 l. water applied annually during winter before cropping

Dates

	Bagley 1949	1950	1951	1952	1953	1954	1955	1956	Ampthill 1954	1955	1956
formalin in winter before cropping	-	-	-	-	-	-	-	-	12/12	21/12	10/12
ground chalk	25/2	-	-	-	9/12	-	-	-	-	-	-
seedbed (C, N, P, K, Mg)	15/3	3/3	29/3	28/2	25/2	5/3	16/3	23/3	2/3	21/3	12/3
N topdressed											
early summer	27/6	11/7	29/6	18/6	1/7	29/6	4/7	28/6	30/6	6/7	2/7
late summer	-	-	2/8	12/8	5/8	9/8	4/8	25/7	6/8	5/8	7/8
sowing of seed	5/4	30/3	18/4	16/4	20/3	5/4	22/4	3/4	30/3	20/4	26/3

	Wareham 1949	1950	1951	1952	1953	1954	1955	1956
ground chalk	25/2	-	-	-	15/12	-	-	-
seedbed (C, N, P, K, Mg)	17/3	8/3	7/3	1/3	3/3	24/2	11/3	7/3
N topdressed								
early summer	21/6	27/6	26/6	24/6	24/6	24/6	28/6	26/6
late summer	-	-	31/7	14/8	30/7	4/8	3/8	31/7
sowing of seed	5/4	28/3-3/4	11/4	10/4-26/4	17/3	24/3	3/4	24/3

Table 49 cont.

Height in inches

Bagley, B 13	SITKA SPRUCE 1949	1950	1951	1952	1953
Mean	1.17	1.49	1.32	1.13	2.05
EFFECTS					
N'	-0.07	0.19*	0.07	0.21*	0.35*
P'	0.19*	0.16*	0.44**	0.56**	0.33*
K'	0.08	0.50**	0.49**	0.36**	0.44**
N'P'	0.08	0.12	0.26**	0.20*	0.16
N'K'	0.06	0.22**	0.23**	0.10	0.34*
P'K'	-0.02	0.01	0.05	0.23*	0.14
N'P'K'	0.04	0.01	0.05	0.04	0.13
F'	0.02	0.12	0.27**	0.19*	-0.16
N'F'	0.12	0.03	-0.08	0.01	-0.10
P'F'	-0.08	-0.02	-0.03	0.03	0.01
K'F'	0.03	-0.04	0.14	0.13	-0.07
Rc'	0.34**	0.40**	0.31**	0.08	-0.17
N'Rc'	-0.02	0.35**	0.29**	0.02	0.11
P'Rc'	-0.15	-0.09	-0.16*	-0.21*	0.10
K'Rc'	-0.04	0.05	0.17*	0.09	-0.16
F'Rc'	0.06	-0.02	-0.07	-0.05	0.11
S.E.±	0.083	0.073	0.073	0.081	0.119
c.v.%	20.1	13.8	15.6	20.4	16.5

	SITKA SPRUCE 1954	1955	1956
Mean	1.72	1.07	1.77
EFFECTS			
N'	0.48**	0.05	0.20
P'	0.47**	0.32*	0.83**
K'	0.14	0.00	0.06
N'P'	0.08	0.07	0.14
N'K'	0.14	0.01	-0.16
P'K'	-0.01	-0.09	0.07
N'P'K'	0.09	0.04	0.00
F'	0.81**	0.16	1.08**
N'F'	-0.14	0.07	-0.05
P'F'	0.03	-0.06	-0.12
K'F'	-0.30**	0.01	-0.06
Mg'	-0.01	-0.10	0.14
N'Mg'	-0.04	0.04	0.18
P'Mg'	-0.01	0.08	0.06
K'Mg'	-0.12	-0.10	-0.09
F'Mg'	-0.01	-0.16	-0.01
S.E.±	0.073	0.131	0.134
c.v.%	12.0	34.6	21.5

Bagley, B 13	TSUGA 1955	1956	PINUS CONTORTA 1955	1956	THUJA 1955	1956
Mean	0.91	1.36	1.78	1.98	0.59	1.10
EFFECTS						
N'	-0.07	0.02	-0.01	0.05	-0.01	0.12
P'	0.13**	0.33**	0.02	0.25	0.20**	0.49**
K'	0.05	0.03	0.16	0.26	-0.02	-0.07
N'P'	0.12**	0.19**	0.14	-0.09	-0.02	0.04
N'K'	0.03	0.03	-0.04	0.07	0.02	0.10
P'K'	-0.07	0.05	-0.08	0.02	-0.09	-0.04
N'P'K'	0.07	0.10	0.07	-0.13	0.04	-0.01
F'	-0.02	0.44**	0.06	0.72**	0.15**	0.38**
N'F'	0.01	-0.05	0.03	0.02	0.05	-0.01
P'F'	-0.18**	-0.30**	-0.08	-0.13	-0.12*	-0.08
K'F'	0.00	0.04	-0.10	-0.21	0.05	-0.08
Mg'	-0.06	0.08	-0.19	-0.04	-0.02	0.03
N'Mg'	-0.04	-0.03	-0.13	0.17	0.05	0.09
P'Mg'	0.01	0.01	0.12	-0.06	0.00	0.06
K'Mg'	-0.02	-0.19**	-0.09	-0.08	0.00	-0.02
F'Mg'	-0.06	0.01	-0.10	-0.18	-0.01	-0.12
S.E.±	0.039	0.060	0.146	0.124	0.046	0.061
c.v.%	12.2	12.6	23.2	17.7	22.2	15.6
MEANS						
unmanured	-	-	-	-	-	-
compost	-	-	-	-	-	-

Ampthill, Am 46	SITKA SPRUCE 1954	1955	TSUGA 1955	P.CONT. 1955
Mean	2.62	1.26	1.00	1.20
EFFECTS				
N'	0.99**	0.06	0.06	0.04
P'	0.03	0.11*	0.09*	-0.08*
K'	0.03	0.06	-0.02	0.08*
N'P'	0.11	-0.00	0.01	0.02
N'K'	0.00	0.05	-0.02	0.02
P'K'	0.03	0.07	0.01	0.04
N'P'K'	-0.10	-0.08	0.00	-0.09*
F'	0.92**	0.11	0.10*	0.04
N'F'	-0.34**	-0.03	-0.11*	0.02
P'F'	-0.03	0.03	-0.04	0.04
K'F'	0.08	-0.05	-0.01	0.02
Mg'	0.25**	0.10	0.13**	0.04
N'Mg'	0.08	-0.11*	-0.04	0.04
P'Mg'	0.20*	-0.03	-0.05	-0.01
K'Mg'	0.00	-0.02	-0.11*	0.01
F'Mg'	0.16	0.05	-0.06	0.04
S.E.±	0.079	0.051	0.039	0.035
c.v.%	8.6	11.5	11.0	8.4
MEANS				
unmanured	1.44	1.13	0.69	1.12
compost	1.92	1.22	1.02	1.28

Wareham, W 46	SITKA SPRUCE 1950	1951	1952	1953
Mean	1.60	0.80	0.94	0.73
EFFECTS				
N'	0.49*	0.47**	-0.14	0.27**
P'	1.45**	0.61**	1.02**	0.59**
K'	0.38	0.33**	0.28**	0.37**
N'P'	0.34	0.26*	-0.09	0.26**
N'K'	0.14	0.20	0.06	0.32**
P'K'	0.16	0.20	0.24**	0.33**
N'P'K'	0.01	0.17	0.02	0.29**
F'	0.53*	-0.04	0.07	0.06
N'F'	-0.01	0.01	0.07	0.10
P'F'	-0.29	-0.34**	-0.09	-0.01
K'F'	-0.28	-0.15	-0.06	0.02
Rc'	-0.65**	0.07	0.34**	0.12
N'Rc'	0.09	0.05	0.03	0.10
P'Rc'	-0.56*	-0.10	0.13	0.05
K'Rc'	-0.12	0.06	0.11	0.02
F'Rc'	-0.01	0.30*	0.05	0.02
S.E.±	0.217	0.108	0.079	0.077
c.v.%	38.4	38.0	23.8	29.9

	SITKA SPRUCE 1954	1955	1956
Mean	1.44	1.65	1.36
EFFECTS			
N'	0.22**	0.04	0.31**
P'	0.17*	0.49**	0.22*
K'	0.16*	0.20**	0.09
N'P'	0.15	0.05	0.13
N'K'	0.09	-0.02	0.21*
P'K'	0.11	0.23**	0.07
N'P'K'	0.01	-0.04	0.15
F'	1.09**	0.79**	0.86**
N'F'	-0.20*	-0.03	-0.07
P'F'	-0.13	-0.26**	-0.25*
K'F'	-0.00	-0.14*	-0.04
Mg'	0.05	0.09	0.03
N'Mg'	0.03	0.05	-0.02
P'Mg'	0.06	-0.08	0.03
K'Mg'	0.04	-0.08	-0.08
F'Mg'	0.19*	0.12	0.11
S.E.±	0.073	0.062	0.084
c.v.%	14.4	10.6	17.5

Table 49 cont.

Height in inches

Wareham, W 46

TSUGA

	1950	1951	1952	1953
Mean	0.88	0.57	0.66	0.81
EFFECTS				
N'	0.30	0.13	-0.11	0.13
P'	0.43*	0.22**	0.58**	0.46**
K'	0.29	0.18*	0.22**	0.37**
N'P'	0.11	0.06	-0.07	0.15
N'K'	0.13	0.07	0.02	0.31**
P'K'	0.14	0.02	0.15	0.21*
N'P'K'	0.04	-0.06	0.04	0.17*
F'	0.12	0.04	0.03	0.11
N'F'	0.08	0.02	-0.09	0.12
P'F'	-0.29	-0.09	-0.04	-0.04
K'F'	-0.12	-0.05	0.06	0.08
Rc'	-0.41*	-0.06	0.10	0.04
N'Rc'	-0.10	0.00	0.03	0.10
P'Rc'	-0.33	-0.05	-0.10	0.05
K'Rc'	-0.13	-0.07	-0.02	0.04
F'Rc'	-0.07	0.05	0.15	-0.09
S.E.±	0.172	0.060	0.073	0.073
c.v.%	55.3	30.0	31.4	25.6

TSUGA

	1954	1955	1956
Mean	0.76	0.94	1.12
EFFECTS			
N'	0.11**	-0.06	0.10
P'	0.12**	0.18*	0.19
K'	0.13**	0.12	0.09
N'P'	0.17**	-0.02	-0.02
N'K'	0.07	-0.02	0.07
P'K'	-0.01	-0.01	0.11
N'P'K'	0.04	0.07	0.13
F'	0.52**	0.38**	0.77**
N'F'	-0.08*	-0.10	-0.21*
P'F'	0.05	-0.22*	-0.08
K'F'	0.02	-0.07	-0.05
Mg'	0.06	0.02	-0.10
N'Mg'	0.01	0.08	-0.02
P'Mg'	0.04	0.08	0.06
K'Mg'	0.00	-0.04	-0.03
F'Mg'	0.09*	-0.08	0.08
S.E.±	0.037	0.078	0.099
c.v.%	13.7	23.5	25.0

PINUS CONTORTA

	1950	1951	1952	1953
Mean	2.76	1.60	1.59	1.48
EFFECTS				
N'	1.11**	0.59**	-0.04	0.06
P'	1.61**	1.19**	1.27**	0.66**
K'	0.49*	0.68**	0.63**	0.58**
N'P'	0.21	0.21	-0.04	0.27
N'K'	0.53*	0.25	0.08	0.04
P'K'	0.23	0.33	0.30**	0.24
N'P'K'	0.19	0.03	0.11	0.23
F'	1.15**	0.06	0.19*	0.13
N'F'	0.24	-0.03	0.08	0.16
P'F'	-0.81**	-0.41*	-0.30**	0.09
K'F'	-0.02	-0.21	0.08	-0.02
Rc'	-0.44*	-0.08	0.32**	0.09
N'Rc'	-0.08	0.04	-0.00	0.04
P'Rc'	-0.28	-0.17	0.20*	0.11
K'Rc'	-0.27	0.15	0.08	-0.09
F'Rc'	0.04	0.29	-0.10	0.03
S.E.±	0.197	0.182	0.085	0.144
c.v.%	20.2	32.1	15.1	27.6

PINUS CONTORTA

	1954	1955	1956
Mean	1.49	1.82	1.75
EFFECTS			
N'	0.11	-0.08	0.26*
P'	0.15	0.34**	0.10
K'	0.14	0.28*	0.23*
N'P'	0.44**	-0.10	0.03
N'K'	0.10	0.00	0.22
P'K'	0.08	0.27*	0.10
N'P'K'	-0.12	-0.03	0.13
F'	0.77**	0.65**	0.81**
N'F'	-0.16	0.03	-0.03
P'F'	-0.13	-0.41**	-0.28*
K'F'	0.11	-0.14	-0.28*
Mg'	-0.02	0.06	-0.06
N'Mg'	0.04	-0.02	0.09
P'Mg'	-0.00	0.14	-0.02
K'Mg'	0.08	-0.11	-0.05
F'Mg'	0.15	0.10	0.22
S.E.±	0.118	0.109	0.108
c.v.%	22.5	16.9	17.4

DOUGLAS FIR

	1950	1951	1952	1953
Mean	2.93	2.32	1.44	2.82
EFFECTS				
N'	0.88**	0.60**	-0.12	0.43*
P'	1.56**	1.05**	1.06**	0.64**
K'	0.91**	1.00**	0.69**	1.25**
N'P'	0.13	0.47*	-0.14	-0.09
N'K'	0.46	0.47*	-0.05	0.17
P'K'	0.18	0.62**	0.43**	0.65**
N'P'K'	0.07	0.21	0.08	0.30
F'	0.99**	0.28	0.28*	0.21
N'F'	0.19	-0.14	-0.01	0.25
P'F'	-0.66*	-0.04	-0.05	-0.16
K'F'	0.07	0.02	0.01	0.18
Rc'	-0.18	-0.25	0.23*	-0.25
N'Rc'	0.07	-0.09	0.19	-0.02
P'Rc'	0.01	-0.18	-0.23	0.35
K'Rc'	-0.17	0.10	0.03	0.00
F'Rc'	0.03	-0.12	0.09	-0.17
S.E.±	0.281	0.187	0.107	0.181
c.v.%	27.1	22.8	21.0	18.2

DOUGLAS FIR

	1954
Mean	1.86
EFFECTS	
N'	0.29
P'	0.15
K'	0.17
N'P'	-0.07
N'K'	0.11
P'K'	0.14
N'P'K'	-0.02
F'	1.45**
N'F'	-0.15
P'F'	0.02
K'F'	-0.17
Mg'	0.09
N'Mg'	-0.23
P'Mg'	-0.03
K'Mg'	0.07
F'Mg'	0.25
S.E.±	0.147
c.v.%	22.1

Table 49 cont.

Height in inches

Wareham, W 46

	CORSICAN PINE 1950	1951	1952	1953	JAPANESE LARCH 1950	1951	1952	1953
Mean	1.82	1.15	1.19	1.15	4.83	3.03	2.47	2.28
EFFECTS								
N'	0.50**	0.27**	-0.09	0.10	0.84**	0.96**	-0.08	0.46
P'	0.82**	0.40**	0.45**	0.27**	3.17**	2.00**	2.33**	1.55**
K'	0.38*	0.38**	0.30**	0.28**	1.00**	1.23**	1.16**	1.10**
N'P'	0.00	0.17**	-0.04	0.02	0.54*	0.55	-0.31*	0.56
N'K'	0.16	0.16**	0.00	0.10	0.64*	0.14	0.34*	0.35
P'K'	0.03	0.11*	0.05	0.09	0.75**	0.57	0.78**	0.59
N'P'K'	-0.08	0.08	0.06	0.10	0.22	-0.01	0.10	0.59*
F'	0.62**	0.05	0.05	0.06	1.86**	0.52	0.76**	0.09
N'F'	0.08	-0.05	-0.04	0.07	0.04	0.05	0.07	0.23
P'F'	-0.40*	-0.17**	-0.08	0.03	-1.58**	-0.80*	-0.13	0.01
K'F'	0.08	-0.02	-0.03	0.05	0.02	-0.28	0.18	-0.17
Rc'	-0.15	-0.08	0.06	-0.06	-0.28	0.12	0.58**	0.21
N'Rc'	0.07	-0.02	0.05	0.00	0.22	-0.23	0.23	-0.09
P'Rc'	-0.05	-0.01	0.02	0.11	-0.10	-0.10	0.20	0.18
K'Rc'	-0.01	0.09	0.03	-0.01	-0.32	-0.05	-0.01	-0.16
F'Rc'	-0.00	0.06	0.05	-0.05	-0.40	0.56	0.10	0.09
S.E.±	0.135	0.044	0.042	0.057	0.233	0.315	0.140	0.276
c.v.%	21.0	10.8	10.1	14.0	13.7	29.4	16.1	34.3

	THUJA 1954	1954	1955	1956
Mean	3.01	0.41	0.62	0.92
EFFECTS				
N'	0.17	0.07	0.01	0.22**
P'	0.41	0.18**	0.32**	0.25**
K'	-0.16	0.06	0.12*	0.07
N'P'	0.35	0.09*	0.05	0.10
N'K'	-0.06	0.02	0.05	0.10
P'K'	0.76*	0.04	0.02	0.01
N'P'K'	-0.15	0.03	0.03	0.06
F'	2.24**	0.14**	0.20**	0.72**
N'F'	-0.19	-0.05	-0.00	-0.10
P'F'	0.17	0.03	-0.09	-0.08
K'F'	-0.11	-0.01	-0.01	-0.02
Mg'	-0.10	-0.00	0.05	-0.07
N'Mg'	-0.01	0.04	0.05	0.06
P'Mg'	0.47	0.00	0.14*	0.16*
K'Mg'	0.28	0.02	-0.02	-0.04
F'Mg'	0.27	0.01	-0.06	-0.08
S.E.±	0.336	0.040	0.053	0.072
c.v.%	31.6	27.8	24.2	22.1

Number of plants per square yard

	Bagley, B 13 1949	1950	1951	1952	1953
Mean	1950	1400	1211	801	792
N'	-106	20	1	-28	-74
P'	54	88	5	23	50
K'	-55	150	29	-4	4
F'	-102	33	13	-16	14
Rc'	-123	4	-8	-34	-41
S.E.±	82.5	71.5	66.9	39.7	43.6
c.v.%	12.0	14.5	15.6	14.0	15.6

	SITKA SPRUCE 1954	Am 46 1954
Mean	1280	836
N'	-20	4
P'	-3	2
K'	-48	-29
F'	-51	-69
Mg'	21	-46
S.E.±	31.3	40.7
c.v.%	6.9	13.8

Table 50

Fertilizers topdressings in summer

Ringwood R 43, Kennington Extension KE 35, Bagley B 36, Wareham W 67

Years and Species 1951 1+0 Sitka spruce seedbeds (Plot size: R and KE 3 feet × 1½ feet) B and W 3 feet × 1¼ feet)

Design B : 16 plots in 4 blocks of 4 } confounding highest order interaction between pairs of blocks
KE,W: 24 plots in 6 blocks of 4 }
R : 32 plots in 8 blocks of 4 }

Factorial combinations of: N × P × K

Treatments, all topdressed	units	rate per sq.yd.
N 'Nitro-Chalk' early summer	g.N	4½
'Nitro-Chalk' late summer	g.N	4½
P superphosphate (granular) early summer	g.P	4½
K potassium chloride (pellets)[1] early summer	g.K	4½

Dates	R 43	KE 35	B 36	W 67
Treatments				
early summer	25/6	28/6	29/6	26/6
late summer	1/8	2/8	2/8	1/8
Broadcast sowing of seed	19/4	5/4	18/4	5/4

Basal dressing Bagley only: 150 g. per sq.yd. of ground chalk applied in December 1950

[1] laboratory preparation, Roth.No. K.15

SITKA SPRUCE

1951	Height in inches R 43	KE 35	B 36	W 67	Number of plants per sq.yd. R 43	KE 35	B 36	W 67
Mean	1.10	2.26	1.75	0.49	890	804	1332	693
Effects								
N'	0.29**	-0.07	-0.17*	-0.01	-116*	-12	46	-34
P'	0.19**	-0.25	0.22**	0.40**	86	57	194	-78**
K'	0.04	-0.04	0.03	-0.05	-32	45	210	0
N'P'	0.21**	0.22	0.07	0.03	32	32	-21	-52
N'K'	-0.01	-0.05	0.10	-0.00	-33	40	68	-24
P'K'	0.04	-0.01	-0.03	-0.08	20	-19	142	18
S.E.±	0.038	0.152	0.051	0.046	50.5	32.8	117.9	23.8
c.v.%	9.7	16.5	5.8	23.0	16.1	10.0	17.7	8.4

Table 51

Fertilizers on oak and beech

Kennington Extension KE 60, 61, Wareham W 63

Species and Years KE 60, W 63: 1+0 beech seedbeds (Fagus sylvatica) 1951 only
KE 61 : 1+0 oak seedbeds (Quercus sp.)

Design 20 plots in 2 blocks of 10

All factorial combinations of: N × P × K

Treatments		units	rate per sq.yd.
N	'Nitro-Chalk' topdressed early	g.N	4½
	late	g.N	4½
P	superphosphate	g.P	4½
K	potassium sulphate	g.K	4½

Dates	KE and W
Manuring P, K	24/1
N early	28/6
N late	2/8
sowing of seed	15/3

Height in inches

1951	BEECH KE 60	OAK KE 61	BEECH W 63
Mean	7.90	7.15	5.48
Effects			
N'	-0.09	0.07	-0.27
P'	0.72	0.02	0.59**
K'	-0.22	0.43	0.26
N'P'	0.37	0.02	-0.27
N'K'	-0.58	0.07	-0.35
P'K'	0.59	-0.88*	0.04
S.E.±	0.383	0.358	0.154
c.v.%	9.7	10.0	5.6

Table 52

Forms of nitrogen, forms of phosphorus

Old Kennington K 3, Kennington Extension KE 3, Bagley B 4, Wareham W 4A and W 4B

Species and Years K, KE, B, WA seedbed plots split for 1+0 Sitka spruce (SS) v. 1+0 ash[*]) 1945 only
WB seedbed plots split for 1+0 Scots pine[+] (SP) v. 1+0 birch[×])

Design and Treatments K, KE 4 blocks of 10; B 3 blocks of 10; WA and WB 2 blocks of 10

Factorial test on:

no N	no nitrogen	no P	no phosphorus
Nn	ammonium nitrate solution in 3 divided dressings	Pb	Bessemer basic slag
Nhb	crushed hoof and dried blood (N.202) (N.207)	PbRc or Ps	basic slag, ground chalk (B and W) superphosphate (K and KE)

	units	rate per sq.yd.
Nn	g.N	10
Nh	g.N	9) 11
Nb	g.N	2)
Pb or Ps	g.P	9
Rc (ground chalk)	g.	113

Additional treatments: hopwaste compost, 4½ kg. per sq.yd.
(Roth. S. No. K, KE, B: 4414; W: 4432)

Dates

	K	KE	B	W A and B
application of manures (except Nn)	9/3	16/3	16/3	15/3
Nn watered on 1st	18/5	18/5	18/5	25/5
2nd	18/7	18/7	18/7	- /7
3rd	29/8	29/8	28/8	28/8
broadcast sowing of seed Sitka spruce, Scots pine	23/3	23/3	21/3	18-24/4
ash, birch	16/3	16/3	19/3	18-24/4

[*] ash (Fraxinus excelsior) [+] Scots pine (Pinus sylvestris) [×] birch (Betula verrucosa)

1945

	Height in inches					Number of plants per sq.yd.				
	SITKA SPRUCE				SCOTS PINE	SITKA SPRUCE				SCOTS PINE
	K 3	KE 3	B 4	W 4	W 4	K 3	KE 3	B 4	W 4	W 4
MEANS										
no N	0.68	1.51	1.51	0.40	0.61	1310	1320	1206	978	945
Nn	0.85	1.64	1.69	1.36	0.95	1102	1419	1366	1101	1164
Nhb	1.01	1.90	1.96	1.30	1.14	1182	1346	1422	966	954
no P	0.83	1.14	1.07	0.29	0.52	1202	1502	1396	1218	1023
Pb	0.78	1.68	2.07	1.36	1.08	1218	1338	1242	789	1026
PbRc	-	-	2.02	1.40	1.10	-	-	1356	1038	1014
Ps	0.93	2.22	-	-	-	1174	1245	-	-	-
S.E.±	0.054	0.066	0.147	0.041	0.065	83.6	77.0	81.8	90.8	78.7
EFFECTS										
[1]N'	0.26**	0.26**	0.31	0.93**	0.43**	-167	62	188	56	114
[2]P'	0.02	0.81**	0.98**	1.09**	0.57**	-5	-210*	-97	-304*	-3
S.E.±	0.066	0.080	0.181	0.050	0.080	102.3	94.2	100.2	111.2	96.4
N'P'	0.15*	-0.04	0.01	0.67**	0.31**	92	89	103	-12	69
S.E.±	0.070	0.085	0.192	0.053	0.084	108.6	100.0	106.2	118.0	102.2
N' with:										
no P	0.06	0.31*	0.30	0.04	0.02	-290	-56	51	72	22
Pb	0.30*	0.21	0.51	1.53**	0.66**	-299	245	306	-166	256
PbRc	-	-	0.13	1.22**	0.62**	-	-	207	261	63
Ps	0.41**	0.26	-	-	-	-88	-2	-	-	-
P' with:										
no N	-0.18	0.86**	0.96**	0.20*	0.16	-128	-328	-234	-288	-94
Nn	-0.01	0.77**	1.06**	1.57**	0.59**	34	36	-165	-333	-76
Nhb	0.25*	0.79**	0.90**	1.50**	0.97**	79	-338*	108	-292	162
S.E.±	0.114	0.139	0.313	0.086	0.138	177.2	163.2	173.5	192.7	167.0
MEANS										
hopwaste compost	1.38	2.52	2.74	2.53	1.72	1350	1256	1128	1080	666
S.E.±	0.093	0.113	0.255	0.071	0.113	144.7	133.3	141.7	157.3	136.3
c.v.%	20.6	12.9	24.3	8.5	16.3	24.0	19.7	18.7	21.7	19.5

[1] N' = mean of N forms minus no N, averaging over no P and P forms
[2] P' = mean of P forms minus no P, averaging over no N and N forms

Table 52 cont.

1945	Height in inches				Number of plants per sq.yd.			
		ASH		BIRCH		ASH		BIRCH
	K 3	KE 3	W 4	W 4	K 3	KE 3	W 4	W 4
MEANS								
no N	1.51	3.98	0.77	0.28	139	80	148	1269
Nn	1.80	4.73	1.00	0.51	121	92	140	1971
Nhb	2.48	5.02	1.17	1.14	116	76	140	1881
no P	1.74	3.56	0.75	0.26	132	74	147	1557
Pb	2.00	5.05	1.09	0.69	122	83	137	1761
PbRc	-	-	1.10	0.97	-	-	144	1803
Ps	2.05	5.12	-	-	122	90	-	-
S.E.±	0.165	0.308	0.033	0.067	14.6	10.9	9.8	122.5
EFFECTS								
[1]N'	0.63**	0.90*	0.31**	0.55**	-21	3	-8	657**
[2]P'	0.28	1.53**	0.35**	0.57**	-10	12	-6	225
S.E.±	0.202	0.378	0.040	0.082	17.9	13.4	12.0	150.0
N'P'	0.37	0.08	0.16**	0.40**	46*	8	-30*	-348
S.E.±	0.214	0.401	0.043	0.087	19.0	14.2	12.8	159.1
N' with:								
no P	0.14	0.80	0.09	0.02	-83*	-7	32	1120**
Pb	0.86*	0.64	0.39**	0.58**	3	6	8	495
PbRc	-	-	0.46**	1.05**	-	-	-63*	356
Ps	0.90*	1.28	-	-	18	11	-	-
P' with:								
no N	-0.21	1.42*	0.13	0.04	-72*	2	33	688*
Nn	0.08	1.32	0.49**	0.38*	14	0	-2	-148
Nhb	0.99**	1.84**	0.43**	1.30**	28	35	-51*	135
S.E.±	0.349	0.655	0.070	0.143	31.0	23.1	20.8	259.8
MEANS								
hopwaste compost	3.12	5.08	1.57	1.34	74	56	156	1746
S.E.±	0.285	0.534	0.057	0.116	25.3	18.9	17.0	212.1
c.v.%	27.8	23.2	7.8	23.2	41.3	47.7	16.7	17.5

[1] N' = mean of N forms minus no N, averaging over no P and P forms
[2] P' = mean of P forms minus no P, averaging over no N and N forms

Table 53

Rates of nitrogen, phosphorus and potassium

Wytham Wy 1, Deerleap D 1

Species and Years: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1946 only

Design and Treatments: 27 plots in 3 blocks of 9 confounding two high-order interactions
1 additional compost plot per block making a total of 30 plots

Factorial test on:

						rate per sq.yd. level 1	level 2
no N		no P		no K	N as hoof	g.N	11	22
N_1	×	P_1	×	K_1	P as Bessemer basic slag	g.P	5	10
N_2		P_2		K_2	K as potassium sulphate	g.K	5	10

Additional treatment: hopwaste compost (S.4834) at 2½ kg. per sq.yd.

Dates

	Wytham	Deer Leap		Wytham	Deer Leap
Manuring	1/5	26/3	Broadcast sowing of seed	2/5	12/4

1946	Height in inches				Number of plants per sq.yd.			
	SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
	Wy 1	D 1	Wy 1	D 1	Wy 1	D 1	Wy 1	D 1
Mean	0.52	0.77	0.95	1.22	911	1059	580	693
EFFECTS								
N_1'	0.10	0.68**	0.06	0.72**	-138	-276**	8	-52
N_2'	0.09	0.81**	0.12**	0.80**	26	-296**	46	-94
P_1'	0.15	0.75**	0.04	0.74**	-272*	-170*	-20	-122
P_2'	0.19*	0.68**	0.05	0.78**	-140	108	-4	-66
K_1'	0.02	0.01	-0.02	0.15	92	0	16	36
K_2'	0.03	0.18	0.01	0.14	-48	-26	-34	-8
S.E.±	0.085	0.117	0.039	0.099	123.2	75.4	48.2	76.8
N_2'P_2'	0.04	0.52**	0.03	0.53**	-264	-294**	-15	141
N_2'K_2'	0.00	0.08	0.01	0.03	-117	159	39	78
P_2'K_2'	0.01	0.24	0.05	0.20	132	-102	-72	27
S.E.±	0.104	0.144	0.048	0.122	150.9	92.4	59.1	94.1
c.v.%	34.6	32.3	8.7	17.3	29.0	15.2	17.8	23.6
Mean of compost plots	0.69	1.23	0.99	1.39	768	1008	594	732

Table 54

Forms and rates of nitrogen and phosphorus with a test of potassium

Kennington Extension KE 10, Wareham W 10

Species and Years: Seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1946 only

Design and Treatments: 64 plots in 4 blocks of 16, confounding 3 high-order interactions in half-replicate
2 additional plots (compost and unmanured) in each block, making a total of 72 plots

Factorial test on:

Nc 'Nitro-Chalk'	×	level	×	Pb Bessemer basic slag	×	level	×	K
Nb dried blood		1 v.2		Pg Gafsa min.phosphate		1 v.2		
Nh crushed hoof				Pd dicalcium phosphate				
Nf form.casein				Ps superphosphate				

	units	per sq.yd. level 1	per sq.yd. level 2
Nc forked in	g.N	6	11
Nc topdressed	g.N	6	11
Nb, Nh, Nf	g.N	11	22
P forms	g.P	7	14
K as potassium sulphate	g.K	5 (KE) 10 (W)	

Rothamsted numbers: Nb N.211; Nh N.212; Nf N.204; Pd P.556

Additional treatments:

unmanured
hopwaste compost 2¼ kg. per sq.yd. Roth.Numbers: KE S.4846 W S.4834

Dates

	KE	W
application of all manures (except Nc topdressed)	29/3	26/3
Nc topdressed	16/5	29/5
Broadcast sowing of seed	12/4	12/4

1946	Kennington Extension Height in inches SS	SP	Number of plants per sq.yd. SS	SP	Wareham Height in inches SS	SP	Number of plants per sq.yd. SS	SP
MEANS								
Unmanured	0.88	1.06	1264	621	0.48	0.72	1359	752
Compost	1.60	1.38	1026	513	1.62	1.77	1233	698
S.E.±	0.110	0.083	102.3	44.1	0.136	0.128	102.2	48.2
Fertilizers	1.72	1.40	1076	502	2.14	2.13	1136	640
S.E.±	0.028	0.021	25.6	11.0	0.034	0.032	25.6	12.0
Nc	1.41	1.26	1070	431	1.97	1.98	1143	628
Nb	1.74	1.40	1156	525	2.16	2.03	1062	621
Nh	1.74	1.44	1055	513	2.13	2.11	1140	632
Nf	2.00	1.50	1020	539	2.30	2.41	1198	681
Pb	1.48	1.26	1056	524	2.09	2.04	1238	669
Pg	1.49	1.25	1135	471	2.16	2.14	1102	654
Pd	1.88	1.52	1097	502	2.16	2.21	1084	626
Ps	2.03	1.58	1014	511	2.16	2.14	1118	613
S.E.±	0.055	0.041	51.2	22.0	0.068	0.064	51.1	24.1
EFFECTS								
$(N_2-N_1)'$ with:								
Mean	0.14*	0.12**	-43	-38	0.27**	0.00	-30	-8
S.E.±	0.055	0.041	51.2	22.0	0.068	0.064	51.1	24.1
Nc	-0.06	0.10	7	-115*	0.34*	0.02	-27	-86
Nb	0.25*	-0.05	-184	7	0.25	-0.16	68	-22
Nh	0.26*	0.15	-9	-50	0.22	-0.04	-29	14
Nf	0.11	0.30**	16	7	0.28*	0.18	-133	61
S.E.±	0.110	0.083	102.3	44.1	0.136	0.128	102.2	48.2
P_1	0.12	0.10	26	-56	0.32**	0.05	42	-8
P_2	0.16*	0.15*	-111	-19	0.22*	-0.04	-102	-9
S.E.±	0.078	0.058	72.4	31.2	0.096	0.090	72.3	34.1
$(P_2-P_1)'$ with:								
Mean	0.18**	0.05	-48	12	0.07	0.16*	45	-46
S.E.±	0.055	0.041	51.2	22.0	0.068	0.064	51.1	24.1
Pb	0.07	0.08	115	-4	0.18	0.20	126	-34
Pg	0.00	-0.10	-214*	-2	0.20	0.16	171	-110*
Pd	0.36**	0.02	-34	-27	-0.08	0.23	0	-36
Ps	0.31**	0.22*	-61	81	-0.02	0.07	-117	-2
S.E.±	0.110	0.083	102.3	44.1	0.136	0.128	102.2	48.2
N_1	0.17*	0.03	20	-7	0.12	0.21*	117	-45
N_2	0.20*	0.08	-117	30	0.02	0.12	-27	-46
S.E.±	0.078	0.058	72.4	31.2	0.096	0.090	72.3	34.1
K' with:								
Mean	0.02	0.02	-29	-61**	1.46**	1.02**	79	-2
S.E.±	0.055	0.041	51.2	22.0	0.068	0.064	51.1	24.1
N_1	0.04	-0.01	-63	-81*	1.30**	0.86**	108	-7
N_2	-0.00	0.06	4	-42	1.63**	1.18**	50	3
P_1	0.04	0.00	30	-40	1.49**	0.94**	125	51
P_2	-0.00	0.04	-89	-82*	1.44**	1.10**	33	-54
S.E.±	0.078	0.058	72.4	31.2	0.096	0.090	72.3	34.1
c.v.%	12.8	11.8	18.9	17.6	12.6	12.0	17.9	14.9

Table 55

Forms and rates of nitrogen and phosphorus

Wareham W 21

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine

Design and Treatments 64 plots in 2 blocks of 32, confounding highest order interaction

Factorial test on:

no N	no nitrogen			no P	no phosphorus		
Nh	crushed hoof	×	level 1 v.2	Pb	Bessemer basic slag	×	level 1 v.2
Nf	formalised casein[2]			Pg	Gafsa mineral phosphate		
Nc/s[1]	ammonium sulphate or 'Nitro-Chalk'			Ps	superphosphate		

	units	rate per sq. yd. 1947 level 1	1947 level 2	1948 level 1	1948 level 2
N forms	g.N	8	17	6	11
P forms	g.P	5	10	4	7
potassium sulphate	g.K	10		7	

[1] 1947: 'Nitro-Chalk' topdressed
1948: ammonium sulphate in seedbed

[2] Roth. No. N.228

BASAL K as potassium sulphate

Dates	1947	1948		1947	1948
manuring (except Nc topdressed)	10/4	1/4	broadcast sowing of seed	25/4	16/4
Nc topdressed	1/6	-			

	Height in inches				Number of plants per sq.yd.			
	SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
	1947	1948	1947	1948	1947	1948	1947	1948
Mean	1.46	1.56	2.62	2.82	1129	902	1000	661
MEANS								
no N	1.24	1.29	2.12	1.99	1232	910	1000	644
Nh	1.46	1.56	2.64	3.05	1096	885	956	640
Nf	1.66	1.84	3.30	3.43	1030	911	1065	623
Nc/s	1.50	1.55	2.42	2.83	1156	902	976	736
no P	0.61	0.91	1.65	1.76	1088	968	1000	705
Pb	1.76	1.55	3.00	3.22	1225	791	1015	610
Pg	1.74	1.51	3.03	3.15	1008	930	970	650
Ps	1.75	2.26	2.81	3.17	1195	919	1014	679
S.E.±	0.068	0.085	0.061	0.079	57.4	34.5	34.3	33.1
EFFECTS								
N'	0.30**	0.36**	0.66**	1.11**	-138*	-11	-1	22
P'	1.14**	0.86**	1.30**	1.42**	55	-88*	-0	-58
S.E.±	0.078	0.098	0.070	0.092	66.3	39.9	39.6	38.2
N'P'	0.00	0.18	0.13	0.27*	-29	-7	12	-20
S.E.±	0.090	0.113	0.081	0.106	76.6	46.0	45.7	44.1
$(N_2-N_1)'$	-0.21*	0.11	-0.16*	0.26**	-58	64	-66	34
$(P_2-P_1)'$	0.14	-0.01	0.20**	0.04	1	22	25	-14
S.E.±	0.078	0.098	0.070	0.092	66.3	39.9	39.6	38.2
$(N_2-N_1)'$ with:								
Nh	-0.25	-0.12	-0.22	0.09	-210	147*	86	-12
Nf	-0.12	0.22	0.06	0.50**	-82	-4	-129	88
Nc/s	-0.27	0.24	-0.32*	0.20	120	51	-153*	27
$(P_2-P_1)'$ with:								
Pb	-0.08	0.11	0.18	0.17	98	-106	34	-57
Pg	0.35*	0.23	0.27*	0.10	0	78	8	-2
Ps	0.15	-0.37*	0.14	-0.13	-94	94	33	16
S.E.±	0.136	0.170	0.122	0.159	114.8	69.1	68.5	66.2
P' with:								
no N	1.14**	0.59**	1.10**	1.01**	99	-78	-18	-29
Nh	1.32**	1.17**	2.10**	2.28**	122	-76	59	-94
Nf	0.69**	0.59**	0.27	0.29	93	-21	-60	15
Nc/s	1.42**	1.11**	1.71**	2.12**	-94	-178*	18	-126
S.E.±	0.156	0.196	0.141	0.183	132.6	79.7	79.1	76.4
c.v.%	18.6	21.8	9.3	11.2	20.4	15.3	13.8	20.0

Table 56

Forms of nitrogen and phosphorus with a test of potassium

Ringwood R 2, Kennington Extension KE 15, Wytham Wy 4, Bagley B 7

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design and Treatments 32 plots in 2 blocks of 16, confounding highest order interaction

Factorial test on:

no N	no nitrogen		no P	no phosphorus								units	rate per sq.yd. 1947	1948	1949
Nh	crushed hoof		Pb	Bessemer basic slag							all N forms	g.N	11	8	9
Nf	formalised casein[2]	×	Pg	Gafsa mineral phosphate	×	K					all P forms	g.P	7	6	4½
[1]Nc/s	ammonium sulphate or 'Nitro-Chalk'		Ps	superphosphate							potassium sulphate	g.K	5	7	4½

[1]1947: 'Nitro-Chalk' topdressed; 1948: ammonium sulphate in seedbed; 1949: 4½ g.N as ammonium sulphate in seedbed
4½ g.N as 'Nitro-Chalk' topdressed

[2]Rothamsted N. Number N.228

Dates

	1947				1948				1949			
	R	KE	Wy	B	R	KE	Wy	B	R	KE	Wy	B
manuring (except Nc)	26/3	2/4	31/3	31/3	11/3	22/3	23/3	22/3	16/3	10/3	15/3	10/3
Nc topdressed	3/6	12/6	12/6	12/6	-	-	-	-	20/6	24/6	27/6	24/6
broadcast sowing of seed	29/4	3/5	29/4	1/5	28/4	27/4	23/4	20/4	29/3	23/3	9/4	5/4

SITKA SPRUCE

Height in inches

	1947				1948				1949			
	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7
Mean	0.86	1.32	1.40	0.96	0.62	1.02	1.64	1.23	0.76	1.16	1.48	1.40
MEANS												
no N	0.96	1.32	1.19	1.07	0.33	0.92	1.43	1.19	0.70	1.19	1.57	1.71
Nh	0.86	1.39	1.44	0.90	0.64	1.06	1.63	1.22	0.71	1.21	1.45	1.57
Nf	0.93	1.44	1.62	0.91	1.00	1.18	2.01	1.33	0.85	1.13	1.53	1.15
Nc/s	0.71	1.15	1.34	0.96	0.49	0.92	1.51	1.19	0.77	1.12	1.38	1.17
no P	0.83	1.20	0.69	0.71	0.61	1.02	1.40	0.76	0.71	1.10	1.29	0.97
Pb	0.93	1.25	1.18	0.95	0.54	0.96	1.74	1.30	0.64	1.10	1.55	1.52
Pg	0.81	1.27	1.17	0.98	0.59	1.01	1.59	1.38	0.82	1.21	1.37	1.56
Ps	0.89	1.59	2.55	1.21	0.73	1.08	1.84	1.50	0.85	1.23	1.73	1.56
S.E.±	0.031	0.046	0.101	0.033	0.052	0.038	0.056	0.063	0.020	0.053	0.097	0.092
EFFECTS												
N'	-0.12**	0.00	0.27*	-0.14**	0.38**	0.14*	0.29**	0.05	0.08*	-0.04	-0.12	-0.42**
P'	0.05	0.16*	0.94**	0.34**	0.01	0.00	0.32**	0.64**	0.06*	0.08	0.26*	0.58**
S.E.±	0.036	0.053	0.116	0.038	0.060	0.044	0.065	0.073	0.023	0.061	0.112	0.106
K'	0.01	0.02	0.08	0.12**	0.15*	0.05	0.01	0.32**	0.12**	0.03	0.00	0.50**
S.E.±	0.031	0.046	0.101	0.033	0.052	0.038	0.056	0.063	0.020	0.053	0.097	0.092
N'P'	0.12*	0.19*	0.17	0.00	-0.01	0.02	-0.06	0.21*	0.06	0.17*	-0.06	0.05
S.E.±	0.041	0.061	0.134	0.044	0.070	0.051	0.075	0.084	0.027	0.071	0.130	0.122
N'K'	-0.01	-0.01	0.12	0.07	0.04	0.01	0.07	0.11	-0.01	-0.16*	-0.01	0.08
P'K'	-0.00	0.03	0.06	0.01	0.13	0.04	-0.03	0.08	0.07*	0.12	0.11	0.23
S.E.±	0.036	0.053	0.116	0.038	0.060	0.044	0.065	0.073	0.023	0.061	0.112	0.106
P' with:												
no N	-0.12	-0.12	0.68*	0.34**	0.02	-0.03	0.42*	0.32	-0.03	-0.18	0.36	0.50*
Nh	0.10	0.38**	1.12**	0.32**	-0.00	-0.03	0.27	0.77**	0.05	0.21	0.37	0.94**
Nf	0.02	0.14	1.07**	0.43**	0.14	0.01	0.29	0.72**	0.13*	-0.02	0.16	0.29
Nc/s	0.20*	0.27*	0.90**	0.27**	-0.12	0.05	0.30*	0.74**	0.10	0.29*	0.17	0.59*
S.E.±	0.072	0.106	0.232	0.077	0.121	0.089	0.130	0.146	0.046	0.122	0.224	0.212
N' with:												
no P	-0.30**	-0.28*	0.02	-0.15	0.40*	0.11	0.38*	-0.26	-0.01	-0.30*	-0.02	-0.49*
Pb	-0.08	0.02	0.33	-0.14	0.23	0.24*	0.39*	0.13	0.13*	0.12	-0.37	-0.36
Pg	-0.10	0.02	0.48	-0.16	0.38*	0.15	0.17	0.19	-0.01	0.22	0.22	-0.36
Ps	-0.02	0.26*	0.28	-0.14	0.50**	0.05	0.21	0.16	0.20**	-0.22	-0.31	-0.46
S.E.±	0.072	0.106	0.232	0.077	0.121	0.089	0.130	0.146	0.046	0.122	0.224	0.212
K' with:												
no N	0.02	0.04	-0.09	0.01	0.10	0.03	-0.10	0.16	0.14**	0.27*	0.01	0.37
Nh	0.14*	0.04	0.01	0.26**	0.12	0.06	0.13	0.44**	0.10*	0.03	-0.36	0.54*
Nf	0.08	0.10	0.10	0.09	0.26*	0.02	0.01	0.34	0.22**	-0.02	0.16	0.56*
Nc/s	-0.05	-0.10	0.32	0.10	0.14	0.10	-0.01	0.35*	0.05	-0.16	0.18	0.52*
no P	0.02	-0.03	-0.01	0.10	-0.04	-0.00	0.05	0.20	0.02	-0.15	-0.17	0.16
Pb	-0.01	0.06	-0.04	0.05	0.19	0.13	0.05	0.43**	0.25**	0.15	-0.06	0.74**
Pg	0.02	-0.04	0.21	0.22*	0.15	0.06	0.03	0.18	0.13*	-0.00	0.16	0.62**
Ps	0.00	0.09	0.16	0.10	0.31*	0.02	-0.10	0.46**	0.11*	0.13	0.07	0.47*
S.E.±	0.062	0.092	0.201	0.066	0.104	0.077	0.112	0.126	0.040	0.106	0.194	0.184
c.v.%	10.2	9.8	20.3	9.8	23.8	10.6	9.7	14.5	7.5	12.9	18.6	18.5

Table 56 cont.

SCOTS PINE — Height in inches

	1947				1948			
	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7
Mean	1.89	2.40	2.42	1.96	1.08	1.63	2.10	1.80
MEANS								
no N	1.80	2.32	2.35	2.19	0.86	1.50	1.70	1.50
Nh	1.90	2.44	2.44	2.08	1.20	1.74	2.27	2.04
Nf	1.97	2.60	2.59	1.83	1.38	1.74	2.64	1.82
Nc/s	1.88	2.23	2.30	1.72	0.86	1.56	1.82	1.84
no P	1.90	2.28	1.98	1.70	1.12	1.63	2.09	1.60
Pb	1.91	2.37	2.25	2.19	1.04	1.58	2.06	1.83
Pg	1.85	2.42	2.02	1.76	1.02	1.74	2.10	1.76
Ps	1.89	2.52	3.44	2.18	1.12	1.58	2.17	2.00
S.E.±	0.056	0.059	0.122	0.082	0.058	0.046	0.112	0.066
EFFECTS								
N'	0.12	0.11	0.09	-0.32*	0.29**	0.18**	0.54**	0.40**
P'	-0.01	0.15	0.59**	0.34**	-0.06	0.00	0.02	0.27**
S.E.±	0.064	0.068	0.142	0.094	0.067	0.053	0.130	0.076
K'	0.03	0.00	0.04	0.39**	0.17*	-0.00	0.04	0.44**
S.E.±	0.056	0.059	0.122	0.082	0.058	0.046	0.112	0.066
N'P'	0.07	0.14	0.04	0.15	-0.05	0.12	-0.10	0.16
S.E.±	0.074	0.078	0.163	0.109	0.077	0.061	0.150	0.088
N'K'	-0.04	-0.11	-0.05	0.19	0.13	-0.04	0.06	0.32**
P'K'	-0.02	0.03	0.09	0.21	0.06	0.03	-0.00	0.15
S.E.±	0.064	0.068	0.142	0.094	0.067	0.053	0.130	0.076
P' with:								
no N	-0.12	-0.06	0.54	0.12	0.02	-0.18	0.17	0.03
Nh	0.16	0.28	0.67*	0.18	-0.16	0.15	-0.08	0.60**
Nf	-0.04	0.01	0.67*	0.39	-0.11	-0.07	-0.01	0.15
Nc/s	-0.06	0.39*	0.49	0.69**	0.02	0.11	0.02	0.30
S.E.±	0.128	0.136	0.283	0.188	0.134	0.106	0.260	0.152
N' with:								
no P	0.02	-0.11	0.04	-0.54*	0.37*	-0.00	0.68*	0.16
Pb	0.11	0.08	0.04	-0.38	0.02	0.25*	0.62*	0.30
Pg	0.20	0.13	0.16	-0.57*	0.34*	0.24	0.33	0.56**
Ps	0.17	0.33*	0.14	0.23	0.43*	0.24	0.52	0.59**
S.E.±	0.128	0.136	0.283	0.188	0.134	0.106	0.260	0.152
K' with:								
no N	0.08	0.17	0.12	0.11	-0.03	0.06	-0.05	-0.03
Nh	-0.04	-0.16	-0.45	0.78**	0.46**	-0.05	0.17	0.64**
Nf	-0.03	0.08	0.12	0.20	0.30*	0.12	0.20	0.42*
Nc/s	0.10	-0.09	0.38	0.48*	-0.05	-0.15	-0.14	0.76**
no P	0.06	-0.04	-0.10	0.07	0.08	-0.06	0.05	0.22
Pb	0.06	0.20	-0.26	0.38*	0.16	0.19	-0.02	0.41*
Pg	-0.06	-0.12	0.21	0.35	0.12	-0.18	0.15	0.32*
Ps	0.06	-0.02	0.32	0.75**	0.33*	0.02	0.00	0.83**
S.E.±	0.111	0.117	0.245	0.163	0.116	0.092	0.225	0.132
c.v.%	8.3	6.9	14.3	11.8	15.2	8.0	15.2	10.4

SITKA SPRUCE — Number of plants per sq.yd.

	1947				1948				1949			
	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7
Mean	1147	1125	1114	974	720	860	1673	841	563	942	1720	2281
MEANS												
no N	1274	1096	1056	1058	782	928	1688	808	558	890	1831	2400
Nh	1164	1239	1164	945	654	886	1515	810	466	982	1766	2296
Nf	1167	1072	1089	992	752	786	1617	798	634	928	1654	2136
Nc/s	984	1094	1146	900	692	838	1872	948	594	968	1631	2293
no P	1128	1155	1202	956	777	890	1762	924	523	992	1954	2299
Pb	1209	1114	1107	918	646	892	1534	742	493	839	1631	2126
Pg	1164	1112	1064	960	724	831	1658	830	686	929	1591	2296
Ps	1088	1120	1083	1060	730	826	1737	868	551	1008	1706	2404
S.E.±	47.6	74.1	58.4	67.8	48.2	38.2	89.4	61.5	40.8	56.3	157.0	113.8
EFFECTS												
N'	-168*	38	77	-112	-82	-92	-20	44	7	69	-147	-158
P'	26	-40	-117	24	-76	-40	-120	-110	54	-67	-311	-24
S.E.±	55.0	85.6	67.5	78.3	55.7	44.1	103.2	71.1	47.1	65.0	181.3	131.4
K'	22	-5	-51	-100	43	8	35	-79	67	77	158	-15
S.E.±	47.6	74.2	58.5	67.8	48.2	38.2	89.4	61.6	40.8	56.3	157.0	113.8
c.v.%	11.7	18.6	14.8	19.7	19.0	12.5	15.2	20.7	20.4	16.9	25.8	14.1

Table 56 cont.

SCOTS PINE

Number of plants per sq.yd.

	1947				1948			
	R 2	KE 15	Wy 4	B 7	R 2	KE 15	Wy 4	B 7
Mean	823	1111	1037	929	578	653	800	750
MEANS								
no N	890	1065	1032	942	651	650	852	766
Nh	794	1066	982	948	546	658	770	754
Nf	820	1168	1026	924	537	646	738	688
Nc/s	789	1143	1108	902	579	657	840	790
no P	822	1058	998	942	606	664	874	748
Pb	838	1102	1088	891	532	674	772	732
Pg	807	1113	1076	1010	568	615	772	760
Ps	825	1170	988	873	606	658	780	759
S.E.±	42.9	32.2	47.4	30.8	61.5	30.1	32.8	51.9
EFFECTS								
N'	-88	61	7	-18	-97	4	-70	-22
P'	2	71	53	-18	-37	-16	-100*	2
S.E.±	49.6	37.2	54.8	35.6	71.0	34.8	38.0	59.9
K'	7	-12	12	-106**	48	-20	-5	-12
S.E.±	42.9	32.2	47.4	30.8	61.5	30.1	32.9	51.9
c.v.%	14.9	8.2	13.0	9.4	30.2	13.1	11.6	19.7

Table 57

Forms of nitrogen and phosphorus; test on potassium

Wareham W 51

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design and Treatments 32 plots in 2 blocks of 16, confounding highest order interaction

Factorial test on:

										rate per sq.yd.
no N	no nitrogen		no P	no phosphorus				units	1949 and 1950
Nh	crushed hoof		Pb	Bessemer basic slag			all N forms	g.N	9
Nf	formalised casein	×	Pg	Gafsa mineral phosphate	×	K	all P forms	g.P	4½
Nc/s	ammonium sulphate[1] 'Nitro-Chalk'		Ps	superphosphate			potassium sulphate	g.K	4½

[1] 1949: 4½ g. N as ammonium sulphate in seedbed
4½ g. N as 'Nitro-Chalk' topdressed

1950: 4½ g. N as 'Nitro-Chalk' in seedbed
4½ g. N as 'Nitro-Chalk' topdressed

Dates

	seedbed manuring	Nitrogen topdressing	broadcast sowing of seed
1949	17/3	21/6	31/3
1950	8/3	27/6	25/3

SITKA SPRUCE

	Height in inches		Number of plants per sq.yd.	
	1949	1950	1949	1950
Mean	1.37	1.70	878	964
MEANS				
no N	1.28	1.13	938	998
Nh	1.30	1.82	733	930
Nf	1.48	2.18	914	1009
Nc/s	1.42	1.69	928	920
no P	1.30	1.49	826	893
Pb	1.50	1.83	830	958
Pg	1.31	1.72	931	967
Ps	1.38	1.78	925	1040
S.E.±	0.134	0.169	47.9	46.3
EFFECTS				
N'	0.12	0.77**	-80	-45
P'	0.10	0.29	69	95
S.E.±	0.154	0.195	53.3	53.5
K'	-0.11	0.26	122*	-40
S.E.±	0.134	0.169	47.9	46.3
P' with				
no N	0.42*	0.08	55	147
Nh	0.28	0.69	81	104
Nf	-0.01	0.10	90	37
Nc/s	-0.29	0.29	49	91
S.E.±	0.171	0.355	140.7	124.1
c.v.%	27.6	28.2	15.5	13.6

Table 58

Rates of phosphorus and potassium: test on magnesium

Old Kennington K 82, Ampthill Am 50, Ringwood R 79, Kennington Ext. KE 84, Bagley B 49, Wareham W 84

Years and Species 1955-1956[1] 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding three high-term interactions; 2 additional plots in each block (confounding highest order interaction between pairs of blocks) making a total of 40 plots

Factorial test on:

32 main plots	4 levels of P	×	4 levels of K	×	Mg
8 additional plots	no P (basal K)	×	no K (basal P)	×	Mg

Treatments (1955 and 1956)

g.P per sq.yd. (superphosphate)					g.K per sq.yd. (potassium chloride)					g.Mg per sq.yd. (kieserite)
no P[2]	low P		high P		no K[3]	low K		high K		Mg
0	3	6	9	12	0	3	6	9	12	3

[1] The experiment was continued after 1956 but results are presented only up to that date

[2] basal 7½ g.K [3] basal 7½ g.P

Basal dressings

Nitrogen: 9 g.N per sq.yd, applied in two equal summer topdressings of 4½ g. (ammonium sulphate at K, Am) ('Nitro-Chalk' at R, KE, B, W)

Formalin (K, Am, R only): 250 ml. per sq.yd. applied in 4 to 5 l. water

Ground chalk (1955 only): 150 g. per sq.yd. applied at B in March, 100 g. per sq.yd. applied at W in January

Dates	1955						1956					
Treatment application	K	Am	R	KE	B	W	K	Am	R	KE	B	W
formalin	31/1	21/12	22/12	-	-	-	20/1	10/12	7/12	-	-	-
P, K, Mg fertilizer	15/3	21/3	9/3	16/3	16/3	11/3	13/3	12/3	7/3	12/3	23/3	7/3
N topdressed early	4/7	6/7	29/6	4/7	4/7	28/6	6/7	2/7	26/6	6/7	28/6	26/6
late	4/8	5/8	2/8	4/8	4/8	3/8	25/7	7/8	31/7	25/7	25/7	31/7
Broadcast sowing of seed	18/4	13/4	1/4	6/4	18/4	18/3	27/3	19/3	27/3	23/3	29/3	23/3

Height in inches

	K 82		Am 50		R 79		KE 84		B 49		W 84	
	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956
Mean of treated plots	1.28	2.43	1.07	2.52	2.06	2.27	1.67	1.88	2.93	3.48	2.13	1.97
EFFECTS												
(high-low P)'	-0.08	0.08	-0.02	0.18	0.10*	0.25*	0.05*	0.04	0.48**	0.63**	0.53**	0.12
(high-low K)'	0.04	-0.21	0.04	-0.14	-0.12**	-0.00	-0.02	-0.11	-0.08	-0.28**	-0.16	-0.07
(high-low P)' × (high-low K)'	-0.08	-0.25	0.06	0.32	0.01	-0.16	0.03	0.24*	0.08	-0.08	0.05	-0.07
Mg'	-0.00	0.02	0.01	-0.08	-0.07	-0.11	-0.01	0.04	0.11	0.29**	0.15	0.12
(high-low P)' × Mg'	-0.09	-0.07	0.01	0.12	-0.08	-0.02	-0.04*	0.07	-0.10	-0.09	0.21*	-0.00
(high-low K)' × Mg'	0.04	0.05	-0.03	-0.15	0.03	-0.05	-0.03	0.08	0.16	-0.01	0.01	0.03
(high-low P)' × (high-low K)' × Mg'	0.04	-0.01	-0.04	0.05	-0.03	-0.03	0.01	-0.12	-0.05	-0.03	0.24*	0.05
MEANS												
no P	1.26	2.10	0.99	1.70	1.72	1.30	1.65	1.64	2.36	2.26	0.63	0.61
3 P	1.35	2.37	1.03	2.23	2.00	2.01	1.62	1.84	2.58	2.91	1.84	1.75
6 P	1.30	2.41	1.12	2.63	2.03	2.27	1.66	1.89	2.80	3.41	1.89	2.07
9 P	1.27	2.44	1.04	2.54	2.13	2.33	1.67	1.78	3.02	3.65	2.29	2.01
12 P	1.21	2.50	1.08	2.68	2.10	2.46	1.71	2.03	3.31	3.93	2.50	2.05
no K	1.24	2.36	1.11	3.08	2.19	2.48	1.74	2.12	2.81	2.93	1.94	1.28
3 K	1.24	2.54	1.08	2.76	2.12	2.37	1.69	1.96	2.94	3.63	2.21	1.98
6 K	1.28	2.53	1.01	2.43	2.13	2.17	1.66	1.91	3.00	3.60	2.21	2.03
9 K	1.34	2.49	1.07	2.52	1.95	2.23	1.62	1.72	2.86	3.38	2.13	1.98
12 K	1.26	2.16	1.11	2.37	2.05	2.30	1.68	1.94	2.91	3.30	1.97	1.89
S.E.± (not applicable to no P, no K plots)	0.049	0.142	0.041	0.206	0.041	0.088	0.020	0.098	0.075	0.054	0.094	0.081
c.v.%	10.8	16.5	10.9	23.1	5.6	11.0	3.4	14.8	7.2	4.4	12.5	11.7

Table 58 cont.

Number of plants per sq.yd.

	K 82		Am 50		R 79		KE 84		B 49		W 84	
	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955	1956
Mean of treated plots	863	431	673	595	888	1487	1204	490	1136	1261	1200	1685
EFFECTS												
(high-low P)'	17	-13	34	63*	15	-62	-51	-53	-21	20	17	34
(high-low K)'	139*	-34	-2	-9	-132*	-86	-15	8	29	36	42	-62
(high-low P)' × (high-low K)'	-69	-26	53	35	-6	-15	-50	47	122*	36	-136**	-9
Mg'	39	79*	-10	45	-16	21	-32	84	-82	18	-86	-4
(high-low P)' × Mg'	86	-62	64	-40	75	-10	29	10	-7	10	-73	-75
(high-low K)' × Mg'	-35	30	87	-69*	-81	2	102	12	1	63	56	-15
(high-low P)' × (high-low K)' × Mg'	16	-13	-3	-11	2	-19	-24	16	-15	7	-97*	-27
MEANS												
no P	990	406	600	537	962	1508	1314	624	1209	1300	1316	1827
3 P	780	451	707	518	909	1542	1256	517	1152	1253	1289	1735
6 P	930	424	604	610	852	1493	1203	518	1142	1249	1094	1601
9 P	907	413	618	580	926	1427	1178	452	1147	1286	1205	1678
12 P	837	436	762	673	866	1485	1178	476	1104	1256	1212	1726
no K	832	444	573	632	956	1426	1098	524	1262	1260	1245	1710
3 K	831	460	757	634	988	1536	1211	442	1036	1220	1209	1719
6 K	757	436	591	566	920	1524	1211	532	1208	1266	1149	1713
9 K	956	488	596	626	755	1505	1250	458	1187	1290	1222	1678
12 K	910	340	747	555	890	1382	1143	531	1114	1268	1220	1630
S.E.± (not applicable to no P, no K plots)	61.6	34.0	51.5	23.6	60.1	43.2	68.3	39.0	47.2	61.0	42.5	42.3
c.v.%	20.2	22.3	21.7	11.2	19.2	8.2	11.4	22.4	11.8	13.7	10.0	7.1

Table 59

Comparison of single and triple superphosphate with a test on levels of magnesium

Ringwood R 80

Years and Species 1955-1956 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8; 2 additional plots in each block making 40 plots in all

Factorial test on:

32 main plots	single superphosphate v. triple superphosphate	×	4 levels of magnesium
8 additional plots	triple superphosphate + calcium sulphate	×	Mg

Treatments

MAIN PLOTS	rate per sq.yd.	ADDITIONAL PLOTS	rate per sq.yd.
single superphosphate	9 g.P	triple superphosphate + calcium sulphate	9 g.P 56 g. $CaSO_4.2H_2O$
triple superphosphate	9 g.P		
kieserite	0 g.Mg 2 g.Mg 4 g.Mg 6 g.Mg	kieserite	3 g.Mg

Basal dressing

'Nitro-Chalk'	9 g.N[1] per sq.yd. applied in two equal summer topdressings of 4½ g.
potassium chloride	9 g.K per sq.yd.
formalin (drench)	250 ml. per sq.yd. applied in 4 l. water

[1] additional 3 g.N as 'Nitro-Chalk' applied in late October 1956

Dates		1955	1956
Treatments			
formalin		-	7/12
P, K, Mg fertilizer		14/4	7/3
N topdressed	early	30/6	26/6
	late	2/8	31/7
Broadcast sowing of seed		20/4	27/3

SITKA SPRUCE

	1955					1956				
g.Mg	0	2	3	4	6	0	2	3	4	6
Height in inches										
single superphosphate	1.35	1.30	-	1.30	1.33	2.15	2.12	-	2.28	2.28
triple superphosphate	1.36	1.40	-	1.33	1.27	2.14	2.29	-	2.09	1.99
triple superphosphate + calcium sulphate	1.30	-	1.34	-	-	2.05	-	2.06	-	-
S.E.±			0.037					0.113		
c.v.%			5.6					10.5		
Number of plants per sq.yd.										
single superphosphate	998	1076	-	1080	1158	1545	1696	-	1544	1670
triple superphosphate	1162	1184	-	1292	1162	1676	1844	-	1724	1662
triple superphosphate + calcium sulphate	1000	-	1166	-	-	1730	-	1602	-	-
S.E.±			80.4					65.9		
c.v.%			14.2					7.9		

Table 60

Forms of nitrogen, test on high calcium and dolomitic limestones and on magnesium sulphate

Ringwood R 54, Bagley B 39, Wareham W 70

Years and Species 1952-1954 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8, confounding three 4-term interactions. Half replicate from 1954 owing to introduction of test on magnesium
Additional test: two plots without nitrogen in each block, making 40 plots in all

Factorial test on:

calcium nitrate 'Nitro-Chalk' ammonium sulphate formalised casein	×	no limestone or magnesium magnesium sulphate, 1952+53 high calcium limestone, 1952 dolomitic limestone, 1952	×	level 1 v.2	×	magnesium sulphate, 1954

Additional test on plots without nitrogen

no limestone or magnesium magnesium sulphate, 1952+53 high calcium limestone, 1952 dolomitic limestone, 1952	×	magnesium sulphate, 1954	

Treatments

			units	rate per sq.yd. 1952	1953	1954
Nca	calcium nitrate (anhydrous salt)	topdressed early	g.N	4½	4½	4½
Nc	'Nitro-Chalk'	late	g.N	4½	4½	4½
Ns	ammonium sulphate					
Nf	formalised casein (N.228)	applied in seedbed	g.N	9	9	9
Mg	magnesium sulphate	level 1	g.Mg	3	1	3
		level 2	g.Mg	6	2	-
		additional test	g.Mg	4½	1½	-
Rc	high calcium limestone	level 1	g.	40	-	-
		level 2	g.	80	-	-
		additional test	g.	60	-	-
Rd	dolomitic limestone	level 1 (supplying 3 g. Mg)	g.	40	-	-
		level 2 (supplying 6 g. Mg)	g.	80	-	-
		additional test (supplying 4½ g. Mg)	g.	60	-	-

Basal dressing

superphosphate	g.P	4½[1]	4½	4½
potassium chloride	g.K	9	9	9
formalin (at Ringwood only)[2]	ml.	-	-	250

[1] at B and W: half P (2¼ g.P) forked in; half P (2¼ g.P) spread on the surface after forking

[2] applied in 5 l. water on 10.12.53.

Dates	1952			1953			1954		
Treatments	R 54	B 39	W 70	R 54	B 39	W 70	R 54	B 39	W 70
limestones	23/1	25/1	23/1	-	-	-	-	-	-
Nf, P, K, Mg	4/3	28/2	5/3	27/2	25/2	3/3	25/2	5/3	24/2
Nca, Nc, Ns topdressed early	23/6	18/6	24/6	23/6	1/7	24/6	23/6	29/6	24/6
late	15/8	12/8	14/8	30/7	5/8	29/7	3/8	5/8	4/8
Broadcast sowing of seed	17/4	16/4	4/4	27/3	20/3	20/3	5/4	5/4	16/3

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	1952			1953			1952			1953		
N plots only	R 54	B 39	W 70	R 54	B 39	W 70	R 54	B 39	W 70	R 54	B 39	W 70
MEANS												
no Mg, Rc or Rd	0.86	1.73	1.05	1.35	1.87	3.36	584	849	771	1005	923	1192
Mg	0.82	1.74	1.32	1.31	1.78	3.33	554	834	750	995	874	1179
Rc	0.83	1.56	1.67	1.10	1.96	3.24	526	808	760	943	1036	1130
Rd	0.86	1.72	1.39	1.19	1.83	3.50	537	880	739	918	892	1304
S.E.±	0.032	0.113	0.143	0.040	0.125	0.101	35.1	32.4	24.2	33.5	48.1	81.2
Effect of (2-1) with:												
Mg	-0.10	-0.12	-0.17	0.04	-0.44	0.12	-102	9	27	-4	213*	-69
Rc	0.04	0.00	0.11	-0.02	-0.29	-0.27	118	-15	-21	68	94	84
Rd	0.10	-0.39	0.08	-0.07	0.01	-0.01	-15	-106	22	0	-192	-4
S.E.±	0.064	0.225	0.286	0.080	0.250	0.203	70.3	64.8	48.4	66.9	96.2	162.5
c.v.%	11.0	18.4	29.1	10.6	19.7	9.5	18.1	10.6	9.0	9.9	14.7	19.2

Table 60 cont.

SITKA SPRUCE

Height in inches

	1952 R 54	1952 B 39	1952 W 70	1953 R 54	1953 B 39	1953 W 70	1954 R 54	1954 B 39	1954 W 70
MEANS									
no N	0.78	1.91	1.51	0.37	1.58	1.64	1.55	1.11	1.30
Nca	0.72	1.58	1.33	0.74	1.89	3.29	1.65	1.55	3.42
Nc	0.86	1.69	1.29	1.09	1.84	3.19	1.97	1.78	3.45
Ns	0.91	1.67	1.53	1.24	1.60	3.21	2.02	1.41	3.10
Nf	0.87	1.80	1.29	1.87	2.11	3.74	2.39	1.68	3.16
S.E.±	0.032	0.113	0.143	0.040	0.125	0.101	0.112	0.134	0.106
All plots									
Mean	0.83	1.73	1.39	1.06	1.80	3.01	1.91	1.51	2.88
EFFECTS									
N'	0.06	-0.23	-0.15	0.87**	0.28	1.71**	0.46**	0.49**	1.98**
S.E.±	0.036	0.126	0.160	0.044	0.140	0.113	0.125	0.150	0.119
[1]R'	0.04	-0.11	0.27*	[1]R' resid. -0.15**	0.08	0.04	[1]R' resid. -0.05	-0.00	0.07
[2]Mg'	-0.01	0.13	0.07	[2]Mg' 0.02	-0.10	0.10	Mg' 0.20	0.22	-0.10
							[2]Mg' resid. -0.07	-0.11	0.07
S.E.±	0.029	0.101	0.128	0.036	0.112	0.091	0.100	0.120	0.095
N' × R'	-0.07	0.04	0.19	N' × R' resid. -0.09	-0.04	-0.03	N' × R' resid. 0.07	0.16	-0.00
N' × Mg'	0.02	-0.13	-0.18	N' × Mg' 0.02	-0.02	0.05	N' × Mg' 0.18	-0.09	-0.01
S.E.±	0.036	0.126	0.160	0.044	0.140	0.113	0.125	0.150	0.119
N plots only									
Mean	0.84	1.68	1.36	1.24	1.86	3.36	2.00	1.61	3.28
EFFECTS									
[1]R'	0.01	-0.10	0.35*	[1]R' resid. -0.19**	0.07	0.03	[1]R' resid. -0.03	0.06	0.06
[2]Mg'	-0.00	0.08	-0.00	[2]Mg' 0.02	-0.11	0.12	Mg' 0.27*	0.18	-0.11
							[2]Mg' resid. -0.07	-0.10	0.11
R'× Mg'	0.04	0.08	-0.28	R'× resid.Mg' 0.07	-0.02	0.14	R' resid.× Mg' -0.12	0.09	-0.16
							Mg'× Mg' resid. 0.08	0.11	-0.34**
S.E.±	0.032	0.113	0.143	0.040	0.125	0.101	0.112	0.134	0.106
EFFECT OF R' WITH:									
no N	0.14*	-0.18	-0.04	no N -0.00	0.15	0.09	no N -0.16	-0.26	0.07
Nca	0.04	0.05	0.40	Nca -0.17*	0.02	-0.19	Nca 0.04	0.19	-0.08
Nc	0.06	-0.02	0.63*	Nc -0.02	0.32	0.03	Nc 0.13	0.19	0.20
Ns	0.06	-0.08	0.62*	Ns -0.09	0.14	-0.04	Ns -0.11	-0.05	0.05
Nf	-0.12	-0.32	-0.26	Nf -0.46**	-0.22	0.30	Nf -0.17	-0.10	0.10
S.E.±	0.064	0.225	0.286	0.080	0.250	0.203	0.224	0.268	0.213
EFFECT OF Mg' WITH:									
no N	-0.04	0.34	0.36	no N -0.02	-0.06	0.02	no N -0.08	0.36	-0.09
Nca	-0.02	0.44	-0.22	Nca -0.02	0.04	0.05	Nca 0.21	0.11	-0.18
Nc	0.03	0.14	-0.10	Nc 0.01	-0.33	0.09	Nc 0.46	0.23	0.01
Ns	-0.03	0.14	0.05	Ns 0.04	-0.16	0.43*	Ns 0.17	0.47	0.20
Nf	0.01	-0.38	0.27	Nf 0.07	0.01	-0.10	Nf 0.26	-0.08	-0.47*
S.E.±	0.064	0.225	0.286	0.080	0.250	0.203	0.224	0.268	0.213
c.v.%	11.0	18.4	29.1	10.6	19.7	9.5	16.6	25.1	10.4

[1] mean of Rc and Rd

[2] mean of 1952+53 Mg and Rd

Table 60 cont.

SITKA SPRUCE — Number of plants per sq.yd.

	1952 R 54	1952 B 39	1952 W 70	1953 R 54	1953 B 39	1953 W 70	1954 R 54	1954 B 39	1954 W 70
MEANS									
no N	549	937	772	946	920	1190	814	1065	848
Nca	507	813	756	998	898	1238	820	1051	898
Nc	546	868	815	910	930	1202	886	1129	1019
Ns	592	908	729	994	1000	1095	853	1100	988
Nf	554	783	720	958	898	1269	886	1174	917
S.E.±	35.1	32.4	24.2	33.5	48.1	81.2	52.6	53.0	39.2
All plots									
Mean	550	862	758	961	929	1199	852	1104	934
EFFECTS									
N'	1	-94*	-17	20	12	11	47	48	108*
S.E.±	39.3	36.2	27.0	37.4	53.8	90.8	58.8	59.3	43.8
[1]R'	-21	-10	-14	-40	53	32	62	-34	38
[2]Mg'	-21	28	-19	-30	-70	52	8	-80	-62
							58	1	1
S.E.±	31.4	29.0	21.6	29.9	43.0	72.7	47.1	47.4	35.1
N' × R'	-41	30	7	-73	31	-2	-36	65	-38
N' × Mg'	28	-0	-7	31	-66	71	9	124	36
S.E.±	39.3	36.2	27.0	37.4	53.8	90.8	58.8	59.3	43.8
N plots only									
Mean	550	843	755	965	932	1201	861	1113	956
EFFECTS									
[1]R'	-37	3	-11	-70	65	32	48	-8	23
[2]Mg'	-9	28	-21	-17	-96	81	11	-30	-47
							55	-16	13
R'× Mg'	21	43	-0	-8	-47	94	14	104	-51
							20	-7	-52
S.E.±	35.1	32.4	24.2	33.5	48.1	81.2	52.6	53.0	39.2
c.v.%	18.1	10.6	9.0	9.9	14.7	19.2	17.5	13.6	11.9

[1] mean of Rc and Rd [2] mean of 1952+53 Mg and Rd

Table 61

Magnesium sulphate, high calcium and dolomitic limestones, ammonium molybdate

Ringwood R 37, Bagley B 33, Wareham W 62

Years and Species 1951 1+0 Sitka spruce seedbeds

Design 16 plots in 2 blocks of 8

Treatments

	rate in g. per sq.yd. limestone	magnesium sulphate
no magnesium sulphate or limestone	-	-
magnesium sulphate ($MgSO_4.7H_2O$)	-	50[1]
high calcium limestone	150	-
dolomitic limestone	150	-

with factorial test on
ammonium molybdate, 0.41 g. per sq.yd. supplying 0.2 g. Mo, applied in solution (½ l. at Ringwood and Bagley, 1 l. at Wareham)

[1] containing 5 g. Mg

Dates

Treatments	R 37	B 33	W 62
limestones	23/1	25/1	23/1
seedbed, P, K, Mg(as sulphate)	8/3	29/3	6/3
ammonium molybdate	19/3	29/3	6/3
N topdressed early	25/6	29/6	26/6
late	1/8	2/8	1/8
Broadcast sowing of seed	17/4	18/4	30/3

Basal fertilizer, rate per sq.yd.

'Nitro-Chalk', 9 g.N in two equal topdressings of 4½ g.; superphosphate 4½ g.P; potassium chloride 4½ g.K

SITKA SPRUCE

1951

MEANS	Height in inches R 37	B 33	W 62	Number of plants per sq.yd. R 37	B 33	W 62
none	1.43	1.94	2.25	968	1318	1148
high calcium limestone	1.20	2.01	1.90	792	1164	1218
magnesium sulphate	1.40	2.11	1.96	903	1125	1172
dolomitic limestone	1.24	1.85	2.17	886	1240	1242
EFFECT OF						
ammonium molybdate	-0.10	0.04	-0.03	206**	-32	-24
S.E.±	0.059	0.232	0.191	58.1	66.7	45.3
c.v.%	9.0	23.4	18.4	13.1	11.0	7.6

Table 62

Times of application of nitrogen, forms of nitrogen and phosphorus, test on dolomite

Wareham W 53

Years and Species 1949-1955 1+0 Sitka spruce seedbeds

Design 32 plots in 2 blocks of 16, with the highest order interaction confounded
2 additional compost plots per block, making a total of 36 plots

Factorial test on:

1949-1951 (Nc v. Ns) × As × Ae × Al × (Pg v. Ps)

1952-1955 (Nc v. Ns) × Ae × Al × (Pg v. Ps) × Rd applied 1952 only

Factorial Treatments

applied annually (except dolomite)

Nitrogen forms	units	rate per sq.yd.
Ns ammonium sulphate	g.N	
Nc 'Nitro-Chalk'	g.N	4½

Nitrogen times

As applied in seedbed
Ae applied in early summer
Al applied in late summer

Phosphate forms		
Pg Gafsa mineral phosphate	g.P	4½
Ps superphosphate	g.P	

Dolomite		
Rd containing 4½ g. Mg	g.	60

BASAL DRESSINGS

K as potassium sulphate	g.K	4½	1949-1951
		9	1952-1955

Additional treatments

bracken and hopwaste compost applied annually at 2¼ kg. per sq.yd.

Roth. Numbers	1949	1950	1951	1952	1953	1954	1955
	S.5706	S.5879	S.6016	S.6165	S.6315	S.6498	S.6665

Dates

Manuring	1949	1950	1951	1952	1953	1954	1955
winter (dolomite)	-	-	-	23/1	-	-	-
seedbed (N, P, K, compost)	17/3	8/3	6/3[1]	11/3	3/3	24/2	11/3
N topdressed							
early summer	21/6	27/6	26/6	24/6	24/6	24/6	28/6
late summer	n.d.	9/8	1/8	14/8	29/7	4/8	3/8
Broadcast sowing of seed	31/3	25/3	3/4	4/4	13/3	17/3	19/3

[1] N applied on 20/3

Height in inches SITKA SPRUCE

	1949	1950	1951	1952	1953	1954	1955
MEANS							
Compost	1.04	1.82	2.10	2.53	1.90	2.20	1.73
Fertilizer	0.88	1.98	2.44	2.36	2.07	2.50	1.86
EFFECTS							
(Nc-Ns)'	0.09	-0.18	0.26*	0.22	0.16	0.29	0.10
(Ps-Pg)'	0.23*	-0.39**	-0.10	0.09	-0.13	-0.32	-0.00
(Nc-Ns)'(Ps-Pg)'	-0.01	0.08	0.05	0.12	-0.07	0.03	0.07
As'	0.05	0.41**	0.19*	-	-	-	-
Ae'	-0.02	0.60**	0.28**	0.12	0.46**	0.71**	0.52**
Al'	0.02	0.46**	0.34**	-0.10	0.40**	0.91**	0.15
As'e'	0.22*	0.01	-0.18	-	-	-	-
As'l'	-0.15	0.30*	0.18	-	-	-	-
Ae'l'	-0.10	0.14	-0.19	0.01	-0.22	-0.37*	-0.29**
(Nc-Ns)'As'	-0.08	-0.04	0.03	-	-	-	-
(Nc-Ns)'Ae'	-0.01	-0.14	0.10	0.11	0.13	0.34*	-0.06
(Nc-Ns)'Al'	-0.09	-0.03	0.02	-0.09	0.03	0.20	0.04
(Ps-Pg)'As'	-0.13	-0.44**	0.02	-	-	-	-
(Ps-Pg)'Ae'	-0.08	0.12	0.03	0.04	-0.14	-0.24	-0.09
(Ps-Pg)'Al'	-0.11	-0.18	0.14	-0.05	0.01	-0.15	-0.04
Rd'	-	-	-	0.18	0.02	0.12	0.02
Ae'Rd'	-	-	-	-0.20	-0.09	-0.02	0.23*
Al'Rd'	-	-	-	0.22	0.12	0.17	0.10
(Nc-Ns)'Rd'	-	-	-	-0.03	0.13	-0.19	0.03
(Ps-Pg)'Rd'	-	-	-	-0.00	-0.20	-0.09	-0.09
S.E.±	0.097	0.123	0.091	0.124	0.126	0.155	0.082
c.v.%	31.1	17.6	10.6	14.8	17.3	17.5	12.5

Table 62 cont.

Number of plants per square yard SITKA SPRUCE

	1949	1950	1951	1952	1953	1954	1955
MEANS							
Compost	963	1270	1024	694	1006	831	1240
Fertilizer	1012	1186	1131	720	1038	902	1490
EFFECTS							
(Nc-Ns)'	27	-49	-15	31	51	-52	98
(Ps-Pg)'	105	47	-78	31	30	-9	70
(Nc-Ns)'(Ps-Pg)'	-82	3	-1	39	-1	-36	77
As'	69	18	-66	-	-	-	-
Ae'	-27	204*	57	-41	-16	126**	-46
Al'	-72	-135	-16	-29	-40	1	-105
As'e'	-120	60	-57	-	-	-	-
As'l'	96	12	-75	-	-	-	-
Ae'l'	-69	-90	12	-12	8	44	-42
(Nc-Ns)'As'	102	37	16	-	-	-	-
(Nc-Ns)'Ae'	-102	71	-42	-12	30	2	-53
(Nc-Ns)'Al'	5	-28	-2	-6	-4	31	45
(Ps-Pg)'As'	-98	164	-59	-	-	-	-
(Ps-Pg)'Ae'	-105	113	19	18	-15	13	1
(Ps-Pg)'Al'	-86	64	-14	-12	-58	0	-80
Rd'	-	-	-	-26	-70	-3	-46
Ae'Rd'	-	-	-	-4	6	-10	72
Al'Rd'	-	-	-	8	46	-27	-73
(Nc-Ns)'Rd'	-	-	-	24	-71	111**	9
(Ps-Pg)'Rd'	-	-	-	-43	-2	-32	-16
S.E.±	60.8	92.7	37.1	34.8	43.2	37.1	55.8
c.v.%	17.2	22.1	9.3	13.7	11.8	11.6	10.6

Table 63

Times of application of nitrogen and potassium; forms of nitrogen

Old Kennington K 46, Ampthill Am 17, Ringwood R 35, Kennington Extension KE 56, Bagley B 35, Wareham W 64

Years and Species 1951 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 1¼ feet)

Design and Treatments 64 plots in 4 blocks of 16, confounding 3 high-term interactions

Factorial test on:

Nitrogen forms		times of nitrogen (at 4½ g.N per sq.yd. on each occasion)				times of potassium sulphate (at 4½ g.K per sq.yd. on each occasion)		
Nc	'Nitro-Chalk'	×	As	× Ae	× Al	×	Af	× Ae
v. Ns	ammonium sulphate							

Basal dressing 4½ g.P per sq.yd. as superphosphate at all centres
Bagley only: 150 g. ground chalk per cq.yd. applied January 1950

Dates

Treatments	K 46	Am 17	R 35	KE 56	B 35	W 64
Nitrogen						
As applied on surface of seedbed	13/4	27/3	19/3	21/3	13/4	20/3
Ae applied topdressed in early summer	28/6	4/7	25/6	28/6	29/6	26/6
Al applied topdressed in late summer	2/8	3/8	1/8	2/8	2/8	1/8
Potassium						
Af applied on the surface after forking in superphosphate	21/3	12/3	8/3	21/3	29/3	6/3
Ae applied topdressed in early summer	28/6	4/7	25/6	28/6	29/6	26/6
Basal superphosphate	21/3	12/3	8/3	1/3	29/3	6/3
Broadcast sowing of seed	16/4	11/4	19/4	5/4	18/4	5/4

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
1951	K 46	Am 17	R 35	KE 56	B 35	W 64	K 46	Am 17	R 35	KE 56	B 35	W 64
Mean	1.33	1.49	1.43	2.27	1.49	2.00	849	1024	864	922	1101	804
Effects:												
NAs'	0.03	0.14**	-0.07	-0.12	-0.02	-0.09	-29	-29	24	12	-39	-19
NAe'	0.11**	0.22**	-0.01	0.27**	-0.13**	0.06	-6	-16	-40	-57*	-49	-104**
NAl'	0.37**	0.26**	0.14**	0.38**	0.04	0.30*	-22	-5	-7	21	41	35
(Ns-Nc)'	0.29*	0.24**	0.15**	0.03	-0.04	-0.11	-36	41	-38	-8	34	-6
(Ns-Nc)'As'	0.01	0.01	-0.02	-0.03	-0.01	0.19	26	-79	27	-36	4	-20
(Ns-Nc)'Ae'	0.07*	0.11**	-0.03	-0.02	0.10*	0.18	-23	21	2	3	-0	-7
(Ns-Nc)'Al'	0.16**	0.09*	0.03	-0.09	-0.05	-0.04	-53	31	-71	25	4	22
NAs'Ae'	0.06*	0.04	-0.07	-0.07	-0.07	0.01	-14	-10	72	34	35	-22
NAs'Al'	-0.02	-0.04	-0.02	-0.03	-0.00	-0.01	-60	-52	14	-4	-86	-58*
NAe'Al'	-0.03	-0.11**	-0.13**	-0.21**	-0.12*	-0.23	-55	-71	54	-38	-2	-24
KAf'	-0.06*	-0.08*	0.12**	0.13*	0.10*	0.71**	-20	-6	-28	13	28	-17
KAe'	-0.06*	-0.04	0.03	0.11	0.09*	0.07	42	66	3	-8	-27	-40
KAf'Ae'	0.04	-0.00	-0.09*	0.06	-0.04	-0.05	-21	18	20	2	-90	-10
NAs' × KAf'	-0.01	0.10**	0.01	0.06	0.07	0.00	9	-23	8	-19	24	-4
NAe' × KAf'	0.06*	-0.02	-0.00	-0.05	0.09*	0.01	-21	4	-48	12	68	-29
NAl' × KAf'	-0.08*	0.08*	0.06	0.08	-0.00	0.25	19	-75	-5	-30	-16	-16
NAs' × KAe'	-0.01	0.03	0.01	-0.07	0.04	-0.14	-26	-103*	-21	-25	-118*	16
NAe' × KAe'	-0.04	0.02	0.00	0.01	-0.08	0.02	50	-50	-18	19	-88	-19
NAl' × KAe'	-0.02	-0.05	-0.01	-0.10	0.01	0.16	-44	54	-36	-32	76	-3
(Ns-Nc)' × KAf'	-0.04	0.04	-0.04	-0.04	-0.02	0.12	-17	-29	5	-38	-16	-20
(Ns-Nc)' × KAe'	0.04	-0.03	0.05	0.02	0.04	-0.16	-10	65	-16	22	-4	33
S.E.±	0.028	0.034	0.035	0.064	0.043	0.125	35.8	45.2	36.4	22.5	48.4	26.0
c.v.%	8.5	9.2	9.9	11.3	11.4	25.0	16.8	17.6	16.9	9.7	17.6	12.9

Table 64

Forms of nitrogen and times of nitrogen topdressing; tests of potassium and magnesium topdressings
(Ringwood R 51, Kennington Extension KE 71, Bagley B 37, Wareham W 71)

Years and Species 1952 only. 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 1½ feet)

Design 32 plots in 4 blocks of 8 confounding three high-term interactions

Factorial test on: (Nc v. Ns) × Ae × Al × K × Mg

Treatments (topdressed)

Nitrogen forms	units	rate per sq.yd.
Ns ammonium sulphate Nc 'Nitro-Chalk'	g.N	4½
Potassium		
K potassium chloride	g.K	4½
Magnesium		
Mg kieserite	g.Mg	4½

Nitrogen times
Ae topdressed in early summer
Al topdressed in late summer

Basal manuring (in seedbed)		R 51, KE 71	B 37, W 71
P superphosphate	g.P	4½	4½[1]
K potassium chloride	g.K	4½	4½

[1] half P dressing (2¼ g.P) forked into the seedbed; half P dressing (2¼ g.P) spread on the surface after forking

Dates

Manuring	R 51	KE 71	B 37	W 71
seedbed (P, K)	4/3	27/2	28/2	5/3
topdressed early N; K, Mg	23/6	19/6	19/6	24/6
late N	15/8	12/8	12/8	14/8
Broadcast sowing of seed	17/4	18/4	16/4	4/4

1952 SITKA SPRUCE

	Height in inches				Number of plants per sq.yd.			
	R 51	KE 71	B 37	W 71	R 51	KE 71	B 37	W 71
Mean	1.00	2.14	1.86	1.53	456	450	1005	820
Effect of								
N Ae'	0.07*	0.25**	-0.16*	-0.05	22	1	-30	-34
N Al'	0.07*	0.22**	0.11	0.04	37	-43	38	-23
(Ns-Nc)'	-0.05*	-0.07	-0.12	0.03	-26	-12	-17	21
K'	-0.08**	-0.03	-0.09	0.19	29	73*	46	-63
Mg'	0.02	0.03	-0.09	-0.04	19	2	49	21
(Ns-Nc)'K'	0.00	-0.06	-0.07	-0.23*	52	6	42	-3
(Ns-Nc)'Mg'	0.07*	0.06	0.07	-0.02	19	0	76	-72
K'Mg'	-0.05	0.02	-0.03	-0.01	1	-63	12	5
S.E.±	0.024	0.049	0.063	0.097	29.4	32.7	64.3	38.8
c.v.%	6.9	6.5	9.6	17.9	18.2	20.5	18.1	13.4

Table 65

Rates and times of phosphorus and potassium; test on dolomite and kieserite

Ringwood R 53, Kennington Extension KE 66, Bagley B 42, Wareham W 69

Years and Species 1952-1954 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding three high-term interactions. Half replicate from 1953 owing to introduction of test on magnesium
Additional test: one unmanured and one compost plot in each block, making a total of 40 plots

Factorial test on:

all years		1952		all years		all years		1952		1953+1954
(P level 1 v.2)	×	(P whole v. divided)	×	(K level 1 v.2)	×	(K whole v. divided)	×	Rd	×	Mg

Treatments

			units	rate per sq.yd. 1952	1953	1954
TEST ON RATES OF APPLICATION						
P	superphosphate	level 1	g.P	3	3	3
		2	g.P	6	6	6
K	potassium chloride	level 1	g.K	6	6	6
		2	g.K	12	12	12
Rd	dolomitic limestone (60 g.)		g.Mg	4½	-	-
Mg	kieserite		g.Mg	-	1½	3

TEST ON TIMES OF APPLICATION

P normal all forked into seedbed divided half forked into seedbed
half applied to surface immediately after forking

K normal all forked into seedbed divided half forked into seedbed
half topdressed in early summer

Basal dressings

'Nitro-Chalk' 9 g.N per sq.yd. applied in two equal summer topdressings of 4½ g.

Formalin (Ringwood 1954 only): 250 ml. per sq.yd. applied in 5 l. water in December 1953

Additional test

	Roth. S. Nos. of compost samples 1952 KE	1952 B	1952 R,W	1953 KE,B	1953 R,W	1954 KE,B	1954 R,W
unmanured							
bracken and hopwaste compost, 4½ kg. per sq.yd.	6151	6152	6165	6308	6315	6500	6498

Dates

	R 53 1952	1953	1954	KE 66 1952	1953	1954	B 42 1952	1953	1954	W 69 1952	1953	1954
Manuring and liming												
Rd	23/1	-	-	25/1	-	-	25/1	-	-	23/1	-	-
P,K,Mg,compost forked in	11/3	27/2	25/2	27/2	24/2	5/3	28/2	25/2	5/3	12/3	3/3	24/2
P after forking	11/3	-	-	27/2	-	-	28/2	-	-	12/3	-	-
N,K early summer	23/6	23/6	23/6	19/6	30/6	29/6	19/6	1/7	29/6	24/6	24/6	24/6
N late summer	15/8	30/7	3/8	12/8	5/8	5/8	12/8	5/8	9/8	14/8	29/7	4/8
Broadcast sowing of seed	17/4	26/3	5/4	23/4	19/3	25/3	16/4	20/3	5/4	4/4	20/3	16/3

SITKA SPRUCE

Height in inches

	R 53 1952	1953	1954	KE 66 1952	1953	1954	B 42 1952	1953	1954	W 69 1952	1953	1954
MEANS												
Unmanured	0.86	0.34	1.28	1.56	1.38	0.91	1.13	1.94	1.17	1.43	1.57	1.04
Compost	1.30	0.96	1.[illegible]3	1.50	1.88	1.22	1.32	2.75	2.04	2.30	2.58	1.88
S.E.±	0.083	0.047	0.173	0.133	0.106	0.091	0.108	0.160	0.187	0.189	0.216	0.198
Fertilizers	1.00	0.90	2.30	1.67	1.89	1.62	1.21	2.56	2.36	1.68	3.35	3.08
S.E.±	0.029	0.017	0.061	0.047	0.037	0.032	0.038	0.056	0.066	0.067	0.076	0.070
EFFECT OF												
$(P_2-P_1)'$	0.16*	0.14**	0.46**	0.10	0.27**	0.26**	0.29**	0.46**	0.40*	0.23	0.24	-0.03
P divided'	-0.06	-	-	-0.12	-	-	-0.10	-	-	0.08	-	-
$(P_2-P_1)'$ × P div.'	0.05	-	-	-0.08	-	-	0.07	-	-	-0.18	-	-
$(K_2-K_1)'$	0.05	0.04	0.06	-0.08	-0.05	-0.19**	-0.14	-0.11	-0.20	-0.12	0.13	0.15
K divided'	-0.07	-0.08*	-0.07	-0.01	-0.17*	-0.09	-0.09	-0.02	0.08	0.11	-0.13	-0.25
$(K_2-K_1)'$ × K div.'	-0.02	-0.06	-0.02	-0.06	-0.07	-0.04	0.00	-0.00	0.10	0.13	-0.09	-0.11
$(P_2-P_1)'$ × $(K_2-K_1)'$	0.09	0.04	-0.06	0.01	0.10	0.05	0.01	-0.18	0.04	-0.01	-0.07	-0.05
$(P_2-P_1)'$ × K div.'	0.01	0.03	0.02	0.02	0.00	0.00	-0.02	0.08	-0.06	-0.14	0.00	-0.07
Rd'	-0.03	-0.07*	-0.02	0.05	0.10	-0.03	0.16	0.32**	0.22	0.19	0.11	0.08
Rd' × $(P_2-P_1)'$	-0.10	0.02	-0.05	-0.00	-0.04	0.02	-0.16	0.13	0.22	0.13	-0.20	0.12
Rd' × $(K_2-K_1)'$	0.00	0.04	-0.07	-0.03	0.02	-0.01	-0.04	0.21	-0.11	0.22	0.23	0.15
Mg'	-	0.01	-0.07	-	0.08	0.13	-	0.08	0.22	-	-0.10	0.03
Mg' × $(P_2-P_1)'$	-	0.06	-0.00	-	-0.00	0.07	-	-0.03	0.07	-	-0.09	0.05
Mg' × $(K_2-K_1)'$	-	0.02	-0.11	-	0.04	-0.06	-	-0.18	-0.03	-	0.18	0.14
Mg' × Rd'	-	0.04	-0.09	-	-0.02	0.13	-	0.05	0.10	-	-0.04	-0.20
S.E.±	0.059	0.033	0.122	0.094	0.075	0.064	0.077	0.113	0.132	0.134	0.153	0.140
c.v.%	16.3	11.1	16.2	16.2	11.5	12.1	17.8	12.7	16.9	22.0	14.0	14.4

Table 65 cont.

Number of plants per square yard — SITKA SPRUCE

	R 53			KE 66			B 42			W 69		
	1952	1953	1954	1952	1953	1954	1952	1953	1954	1952	1953	1954
MEANS												
Unmanured	660	878	876	358	632	846	780	984	1394	849	1396	1136
Compost	651	778	840	374	520	489	658	898	1820	764	1071	992
S.E.±	76.5	61.8	69.1	64.2	56.5	45.8	57.3	68.3	186.8	37.4	138.0	58.1
Fertilizers	604	964	921	413	616	670	698	1064	1731	828	1414	1127
S.E.±	27.0	21.9	24.4	22.7	20.0	16.2	20.2	24.1	66.0	13.2	48.8	20.6
EFFECT OF												
$(P_2-P_1)'$	-21	-12	32	6	38	-44	1	78	73	-13	182	11
P divided'	-31	-	-	-29	-	-	28	-	-	-23	-	-
$(P_2-P_1)'$ × P div.'	-42	-	-	-105*	-	-	-6	-	-	-59	-	-
$(K_2-K_1)'$	21	10	42	53	-2	-2	-53	71	-35	-35	82	-20
K divided'	-15	0	-3	18	2	34	-7	-16	63	11	-208*	-23
$(K_2-K_1)'$ × K div.'	-30	80	-48	75	-30	-17	-4	52	110	-7	-71	8
$(P_2-P_1)'$ × $(K_2-K_1)'$	-29	26	-24	6	-2	-6	-15	-45	85	-11	-167	30
$(P_2-P_1)'$ × K div.'	-27	-3	-14	-26	-81	5	14	15	-128	-38	129	-92*
Rd'	-21	-50	8	24	45	3	-28	40	-78	23	40	-1
Rd' × $(P_2-P_1)'$	12	-82	-21	-16	9	60	-101*	52	9	26	-29	75*
Rd' × $(K_2-K_1)'$	-23	-18	-10	-11	-22	-30	23	-40	-195	-37	120	-18
Mg'	-	34	-44	-	43	-10	-	14	-6	-	-62	18
Mg' × $(P_2-P_1)'$	-	48	-10	-	6	31	-	-15	8	-	-157	90*
Mg' × $(K_2-K_1)'$	-	-22	1	-	11	8	-	25	33	-	28	60
Mg' × Rd'	-	-50	33	-	-30	46	-	-40	224	-	-30	22
S.E.±	54.1	43.7	48.9	45.4	39.9	32.4	40.5	48.3	132.0	26.4	97.6	41.1
c.v.%	25.0	13.2	15.2	32.0	18.6	13.7	16.3	13.1	21.9	9.1	20.0	10.4

Table 66

Comparison of chloride and sulphate applied as potassium and magnesium salts, with test on rates

Wareham W 89

Years and Species 1955 1+0 Sitka spruce seedbeds

Design 16 plots in 2 blocks of 8; 2 additional "low-salt" plots in each block, making 20 in all

Factorial test on: potassium v.magnesium × chloride v.sulphate × level 1 v.2

Treatments, rate per sq.yd.

	level 1	level 2
Potassium		
KCl	6.0 g.K	12.0 g.K
K_2SO_4	6.0 g.K	12.0 g.K
Magnesium		
$MgCl_2$	1.9 g.Mg	3.8 g.Mg
$MgSO_4$	1.9 g.Mg	3.8 g.Mg

$MgCl_2$:- the same amount of chloride as KCl
$MgSO_4$:- the same amount of sulphate as K_2SO_4

All K plots:- 1.9 g.Mg as $MgHPO_4.3H_2O$
All Mg plots:- 6.0 g.K as K_2HPO_4

SITKA SPRUCE

1955

	Height in inches		Number of plants per sq.yd.	
	Means	EFFECT (level 2-1)'	Means	EFFECT (level 2-1)'
"low-salt"	2.02	-	1379	-
KCl	1.98	0.24	1635	18
K_2SO_4	1.92	-0.20	1472	-123
$MgCl_2$	1.93	0.35	1499	-27
$MgSO_4$	1.84	-0.11	1359	-174
S.E.±	0.096	0.192	88.6	177.2
c.v.%	9.9		12.0	

Basal dressing for main plots, rate per sq.yd.

K plots: 9 g.P applied as $CaH_4P_2O_8.H_2O$ + $MgHPO_4.3H_2O$

Mg plots: 9 g.P applied as $CaH_4P_2O_8.H_2O$ + K_2HPO_4

All plots: 'Nitro-Chalk' 9 g.N in two equal topdressings of 4½ g.

Additional plots: 'low-salt', rate per sq.yd.

The four additional plots received 9 g.P, 9 g.K, 2.8 g.Mg as K_2HPO_4, $MgHPO_4.3H_2O$, $CaH_4P_2O_8.H_2O$ plus 9 g.N as 'Nitro-Chalk'

Dates

Treatments applications

P, K, Mg fertilizer		April 13
N topdressed	early	June 28
	late	August 3

Broadcast sowing of seed April 24

Table 67

Micro-nutrients

Old Kennington K 12, Kennington Extension KE 20, Wytham Wy 6

Species and Years seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1947 only

Design and Treatments 8 plots. Half-replicate

All factorial combinations of:

		g. element per sq.yd. (applied in 1 l. water)
Fe	ferrous sulphate ($FeSO_4.7H_2O$)	0.40
× Mn	manganese sulphate ($MnSO_4.4H_2O$)	0.49
× Cu	copper sulphate ($CuSO_4.5H_2O$)	0.25
× Zn	zinc sulphate ($ZnSO_4.7H_2O$)	0.23
× B	sodium borate ($Na_2B_4O_7.10H_2O$)	0.06

Basal manuring	units	rate per sq.yd.
ammonium sulphate	g.N	8½
superphosphate	g.P	7½
potassium chloride	g.K	7

Dates

manuring	application of micro-nutrients		broadcast sowing of seed		
	Fe, Mn, Cu, Zn	B	K	KE	Wy
3/4	23/6	24/7	8/5	5/5	29/4

1947 Height in inches

	SITKA SPRUCE			SCOTS PINE		
	K 12	KE 20	Wy 6	K 12	KE 20	Wy 6
Mean	0.89	1.91	2.48	1.82	2.67	3.72
Effects						
Fe'	-0.17	-0.30	0.01	0.17	-0.27	-0.36
Mn'	0.02	-0.02	-0.15	-0.14	-0.03	-0.26
Cu'	-0.08	-0.01	-0.33	-0.49	-0.09	-0.60
Zn'	-0.04	-0.05	-0.11	0.16	0.15	0.40
B'	0.06	0.00	-0.01	-0.02	0.07	-0.02

Table 68

Micro-nutrients

Old Kennington K 18A, K 18B, Ringwood R 26, R 27

Years and Species 1948 seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949 1+0 Sitka spruce seedbeds

Design K 18A and K 18B 8 plots each 1948 single replicate; 1949 half-replicate

R 26 16 plots in 2 blocks of 8, one block unsteamed, one block steamed (Ms) in November 1947
R 27 16 plots in 2 blocks of 8, one block unsteamed, one block steamed (Ms) in November 1947

R 26 and R 27 1948 no confounding; 1949 highest order interaction confounded

Factorial test on:

K 18A, R 26: B, 1948+49 × Mn, 1948+49 × Fe, 1948+49 × Mg, 1949

K 18B, R 27: Cu, 1948+49 × Zn, 1948+49 × Mn, 1949 × Mg, 1948+49

Treatments

The micro-nutrients (finely powdered) applied in the seedbeds were mixed with the compound fertilizer, those topdressed in June were mixed with ammonium sulphate. In the case of manganese ammonium sulphate and ferrous ammonium sulphate the basal dressing of ammonium sulphate was reduced so as to give the same amount of N on all plots.

		g.element per sq.yd. 1948	1949
B	sodium borate $Na_2B_4O_7.10H_2O$ applied in seedbed	0.06	0.06
Mn	manganese sulphate $MnSO_4.4H_2O$ applied in seedbed	2.4	2.4
	manganese ammonium sulphate $MnSO_4(NH_4)_2SO_4.6H_2O$ topdressed in June	-	1.3
Fe	ferrous sulphate $FeSO_4.7H_2O$ applied in seedbed	2.0	2.0
	ferrous ammonium sulphate $Fe(NH_4)_2(SO_4)_2.6H_2O$ topdressed in June	-	1.3
Mg	magnesium sulphate $MgSO_4.7H_2O$ applied in seedbed	4.9	4.9
Cu	copper sulphate $CuSO_4.5H_2O$ applied in seedbed	1.2	1.2
Zn	zinc sulphate $ZnSO_4.7H_2O$ applied in seedbed	1.2	1.2

Basal manuring

		units	rate per sq.yd. 1948	1949
N	ammonium sulphate seedbed	g.N	8½	5
	topdressed	g.N	-	4½
P	superphosphate	g.P	5½	4½
K	potassium chloride	g.K	7	4

Dates

	1948 K 18	1948 R 26/27	1949 K 18	1949 R 26/27
seedbed treatment	22/3	31/3	10/3	16/3
topdressings	-	-	24/6	20/6
broadcast sowing of seed	30/4	28/4	1/4	30/3

Height in inches

Old Kennington

K 18A	No. of plots	SCOTS PINE 1948	SITKA SPRUCE 1948	SITKA SPRUCE 1949
Mean	8	0.99	0.84	0.83
EFFECTS				
Mg'	4-4	-	-	0.14
Mn'	4-4	0.02	0.00	0.05
Fe'	4-4	-0.00	-0.06	-0.06
B'	4-4	0.11	0.04	0.12

K 18B	No. of plots	SCOTS PINE 1948	SITKA SPRUCE 1948	SITKA SPRUCE 1949
Mean	8	1.20	0.76	0.93
EFFECTS				
Mg'	4-4	0.12	-0.02	0.05
Mn'	4-4	-	-	0.11
Cu'	4-4	0.06	0.11	0.09
Zn'	4-4	-0.06	-0.00	0.12

Ringwood

R 26	1948	1948	1949
Mean	1.35	0.50	0.95
EFFECTS			
Mg'	-	-	-0.03
Mn'	0.24	0.14**	0.00
Fe'	-0.15	0.01	-0.11*
B'	-0.14	0.02	-0.13*
Mg'Ms'	-	-	0.05
Mn'Ms'	0.00	0.14**	0.00
Fe'Ms'	-0.10	-0.02	-0.05
B'Ms'	-0.14	-0.01	-0.09
S.E.±	0.118	0.022	0.042
c.v.%	17.6	9.0	8.8

R 27	1948	1948	1949
Mean	1.15	0.49	0.82
EFFECTS			
Mg'	0.14*	0.06*	0.09
Mn'	-	-	-0.01
Cu'	0.16*	-0.02	-0.01
Zn'	-0.10	0.01	-0.05
Mg'Ms'	0.27**	0.00	0.02
Mn'Ms'	-	-	0.08
Cu'Ms'	0.07	-0.02	-0.08
Zn'Ms'	0.15*	-0.00	0.06
S.E.±	0.050	0.023	0.048
c.v.%	8.6	9.2	11.6

Table 69

Foliar applications of manganese, zinc, copper and molybdenum

Old Kennington K 88, Ampthill Am 56, Ringwood R 85, Kennington Extension KE 71/2
Bagley B 37/8, Wareham W 90

Years and Species	1955-1956	W 90	1+0 Sitka spruce seedbeds
	1956 only	K 88, Am 56, R 85, KE 71/2, B 37/8 (crop failed at Old Kennington)	

Design 16 plots in 2 blocks of 8 confounding highest order interaction; 2 additional untreated plots in each block making 20 plots in all

Factorial test on: manganese × zinc × copper × molybdenum

	1955 g.per sq.yd. atom	1955 g.per sq.yd. element	1956 (sum of two applications) g.per sq.yd. atom	1956 (sum of two applications) g.per sq.yd. element
Mn as $MnSO_4.4H_2O$	1/200	0.28	1/140	0.39
Zn as $ZnSO_4.7H_2O$	1/400	0.16	1/280	0.23
Cu as $CuSO_4.5H_2O$	1/400	0.16	1/280	0.23
Mo as $(NH_4)_6Mo_7O_{24}.4H_2O$	1/1000	0.10	1/700	0.14

Notes on application of treatments

1955 and 1956 The treatments for each plot was made up in distilled water (300 ml. in 1955 and 200 ml. in 1956), 1/1600 "Shellestol" wetter added and applied by power spray using a precision sprayer fitted with Allman jet 000.

1955 Single treatment application in early summer

1956[1] Treatments applied in two equal dressings, one in early and one in late summer

[1] Treatments were divided into two groups: a) Mn, Mo, MnMo b) Cu, Zn, CuZn
a) treatments were applied first; b) treatments after an interval of approximately 48 hours

The b) treatments received enough $Ca(OH)_2$ to precipitate completely Cu and Zn, i.e. 0.13 g. $Ca(OH)_2$ for either Zn or Cu above, and 0.25 g. $Ca(OH)_2$ where the two treatments occur together

Basal fertilizer, rate per sq.yd. (1955 and 1956)

ammonium sulphate at K and Am) 'Nitro-Chalk' at R, KE, B, W)	9 g.N in two equal topdressings of 4½ g.
superphosphate	9 g.P
potassium chloride	9 g.K
kieserite	3 g.Mg

Dates

Treatments		1955 W	1956 K	Am	R	KE	B	W
P, K, Mg fertilizer		13/4	13/3	5/3	7/3	13/3	23/3	7/3
Mn, Mo	early	28/6	28/6	2/7	25/6	28/6	28/6	25/6
	late	-	25/7	7/8	30/7	25/7	25/7	30/7
Cu, Zn	early	28/6	6/7	10/7	27/6	6/7	6/7	27/6
	late	-	27/7	9/8	8/8	27/7	27/7	8/8
N topdressed	early	28/6	6/7	2/7	26/6	6/7	6/7	28/6
	late	3/8	30/7	9/8	31/7	30/7	30/7	31/7
Broadcast sowing of seed		24/4	27/3	19/3	27/3	24/3	29/3	20/3

SITKA SPRUCE

	1955 W 90	1956 Am 56	R 85	KE 71/2	B 37/8	W 90
Height in inches						
Mean	2.35	1.35	1.44	1.86	3.00	2.38
EFFECTS						
Mn'	0.03	-0.02	-0.07	-0.09	0.19	0.03
Zn'	-0.20	0.18	0.11	-0.12	-0.08	-0.21
Cu'	0.83**	-0.01	-0.03	-0.31	-0.03	0.12
Mo'	-0.11	0.00	0.02	0.08	-0.07	-0.03
S.E.±	0.143	0.101	0.069	0.163	0.116	0.135
c.v.%	12.1	15.0	9.5	17.5	7.7	11.3
Number of plants per sq.yd.						
Mean	1401	567	1719	540	1229	1236

Table 70

Rates of limestone, forms of nitrogen, tests on fritted trace elements and copper

Wareham W 88

Years and Species 1955-1957 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding three high-term interactions; half replicate from 1956 through introduction of test on copper. 2 additional plots in each block making 40 plots in all

MAIN PLOTS
Factorial test on:

1955		each year		1955		1956, 1957
4 levels of ground chalk	×	4 forms of nitrogen	×	fritted trace elements	×	copper soil treatment

ADDITIONAL PLOTS

1955 'low salt fertilizer' + ground chalk
compost

1956-1957 foliar copper treatment
compost

Treatments

MAIN PLOTS

ground chalk 200, 400 and 600 g. per sq.yd. of ground chalk applied in February 1955

Forms of nitrogen applied at 9 g.N per sq.yd.
hoof and formalised casein: dug in with P, K, Mg fertilizer before sowing
'Nitro-Chalk' and calcium nitrate: applied in two equal summer topdressings of 4½ g. per sq.yd.

Fritted trace elements 10 g. per sq.yd. applied together with P, K, Mg fertilizer
(7% iron, 3.2% copper, 3.2% zinc, 2.5% manganese, 0.68% boron, 0.13% molybdenum)

Copper, soil dressing 0.8 g.Cu (1/80 g. atom) per sq.yd. made up in 200 ml. distilled water applied by power spray after digging in fertilizer

ADDITIONAL PLOTS

'Low salt' fertilizer N, P, K, Mg (rates similar to those in main plots) given as $MgNH_4PO_4$, + 400 g. ground chalk, 'Nitro-Chalk', triple superphosphate and potassium chloride

Copper, foliar treatment 0.11 g.Cu (1/560 g. atom) per sq.yd. made up in 200 ml. distilled water with a 1/1600 Shellestol wetter, and 0.13 g. $Ca(OH)_2$, applied by power spray (Allman jet 000) in late June and late July

Bracken and hopwaste compost 4½ kg. per sq.yd. (Roth.Nos: 1955 S.6665; 1956 S.6860; 1957 S.7042)

Basal fertilizer 9 g.P as superphosphate, 9 g.K as potassium chloride and 3 g.Mg as kieserite applied to all main plots in all three years

also (in 1956 and 1957) to additional plots receiving copper foliar treatment, together with 9 g.N as 'Nitro-Chalk' in two equal topdressings of 4½ g.N

Dates

Treatment application		1955	1956	1957
ground chalk		2/2	-	-
hoof, formalised casein, P, K, Mg fertilizer, compost, fritted trace elements		11/3	8/3	21/2
soil copper dressing		-	8/3	21/2
foliar copper	early	-	27/6	25/6
	late	-	31/7	30/7
'Nitro-Chalk', calcium nitrate topdressed	early	28/6	27/6	25/6
	late	3/8	31/7	30/7
Broadcast sowing of seed		18/3	20/3	28/3

Table 70 cont.

SITKA SPRUCE

	Height in inches			Number of plants per sq.yd.		
	1955	1956	1957	1955	1956	1957
MEANS (main plots)						
no ground chalk	1.85	1.61	1.10	1099	1130	1330
ground chalk[1] 200 g.per sq.yd.	1.50	1.39	0.95	1052	1212	1313
400	1.48	1.40	0.90	1129	1176	1332
600	1.72	1.43	0.80	1076	1262	1371
no nitrogen/calcium nitrate[2]	1.13	1.36	0.61	1258	1389	1205
'Nitro-Chalk'	1.89	1.56	1.02	1220	1245	1472
hoof	1.68	1.25	0.86	864	1084	1236
formalised casein	1.86	1.65	1.25	1014	1063	1434
EFFECTS OF						
fritted trace elements[1]	-0.04	0.00	-0.02	16	-4	12
copper, soil treatment	-	-0.04	-0.01	-	-46	68
S.E.±	0.100	0.048	0.071	87.4	66.4	57.3
MEANS (additional plots)						
'low salt' fertilizer + ground chalk	1.76	-	-	1383	-	-
copper, foliar treatment	-	1.49	1.01	-	1317	1474
compost	1.20	1.27	1.34	1383	1296	1296
S.E.±	0.142	0.069	0.100	123.7	93.9	81.0
c.v.%	17.6	9.5	20.4	21.6	15.4	12.0

[1] applied 1955 only [2] no nitrogen in 1955, calcium nitrate in 1956 and 1957

Table 71

Rates of foliar copper application

Wareham W 89

Years and Species 1956-1957 1+0 Sitka spruce seedbeds

Design 16 plots in 4 blocks of 4; one additional compost plot in each block making 20 plots in all

Treatments		g. element rate per sq.yd. (sum of two applications)	SITKA SPRUCE Height in inches 1956	1957	Number of plants per sq.yd. 1956	1957
foliar copper spray						
Cu as $CuSO_4.5H_2O$	none	-	2.03	1.58	1095	1128
	level 1	0.08	2.34	1.62	1162	1050
	2	0.16	2.24	1.65	1209	1052
	4	0.32	2.36	1.50	1152	1012
bracken and hopwaste compost, 4½ kg. per sq.yd.			0.99	1.30	993	1014
(Roth.Nos: 1956 S.6860, 1957 S.7042)		S.E.±	0.105	0.142	44.5	35.6
		c.v.%	9.4	17.8	7.7	6.7

NOTE: The copper dressings were applied by power spray using a precision sprayer fitted with Allman jet 000. The treatments for each plot were made up in 200 ml. distilled water, including Shellestol wetter (1 part in 1600) and enough $Ca(OH)_2$ to precipitate the copper.

Saturated solution of $Ca(OH)_2$ added per single application: level 1: 25.4 ml., level 2: 50.9 ml., level 4: 101.8 ml.

Basal fertilizer, rate per sq.yd. (omitting compost plots)

'Nitro-Chalk' (in two equal dressings of 4½ g.)	9 g.N
superphosphate	9 g.P
potassium chloride	9 g.K
kieserite	3 g.Mg

Treatment applications	Dates 1956	1957
P, K, Mg fertilizer	8/3	21/2
Cu, N applied early	26/6	25/6
Cu, N applied late	31/7	29/7
Broadcast sowing of seed	20/3	28/3

Table 72

Bulky organic manures and fertilizers

Old Kennington K 1, Kennington Extension KE 1, Bagley B 1, Wareham W 1A and W 1B

Years and Species K, KE, B, WA Seedbed plots split for 1+0 Sitka spruce v. 1+0 ash[*] } 1945 only
WB Seedbed plots split for 1+0 Scots pine[+] v. 1+0 birch[×] }

Design and Treatments 3 Lattice Squares each of 25 plots

All combinations of:

				Organic manures	units	rate per sq.yd.
no organic manure			no fertilizer	all materials	kg.	4½
Cd farmyard manure	with	Nhb	crushed hoof and dried blood	**Fertilizers**		
Cm Molinia compost		Pb	Bessemer basic slag	Nb	g.N	2) 11
Cb bracken compost		NhbPb	crushed hoof, dried blood, basic slag	Nh	g.N	9)
Ch hopwaste compost		NnPb	ammonium nitrate solutions in 3 equal dressings, basic slag	Nn	g.N	10
				Pb	g.P	9

	Cd		Cm		Cb		Ch		Nb	Nh
	K,KE,B	W	K,KE,B	W	K,KE,B	W	K,KE,B	W		
Rothamsted S. Numbers:	4413	4434	4416	4433	4415	4431	4414	4432	4633	3943

Dates

Treatment applications		K	KE	B	W
all manures except Nn		9/3	15/3	15/3	15/3
Nn solutions topdressed	1st	18/5	18/5	18/5	25/5
	2nd	18/7	18/7	18/7	-/7
	3rd	29/8	29/8	28/8	28/8

Broadcast sowing of seed	K	KE	B	W
Sitka spruce, Scots pine	22/3	23/3	20/3	18-24/4
ash, birch	16/3	17/3	19/3	18-24/4

[*] ash (Fraxinus excelsior) [+] Scots pine (Pinus sylvestris) [×] birch (Betula verrucosa)

Height in inches

	SITKA SPRUCE			SCOTS PINE		ASH				BIRCH
	K 1	KE 1	B 1	W 1A	W 1B	K 1	KE 1	B 1	W 1A	W 1B
MEANS(averaging -,Nhb,Pb,NhbPb)										
no org. manure	0.95	1.44	1.43	0.65	0.89	2.26	3.53	1.36	0.85	0.82
Cd	1.00	1.66	1.78	2.68	2.22	2.92	4.46	1.60	1.71	3.86
Cm	1.38	2.19	2.16	3.19	2.42	3.74	5.18	1.60	1.56	6.26
Cb	1.33	2.17	1.97	3.18	2.52	4.10	5.16	1.65	1.78	6.71
Ch	1.40	2.53	3.18	2.79	2.15	3.62	6.35	1.96	1.75	3.54
S.E.±	0.066	0.083	0.123	0.146	0.068	0.301	0.282	0.121	0.077	0.260
EFFECT OF										
[1]Nhb' with:										
no org. manure	0.10	0.12	0.04	0.36	0.32*	0.97	0.40	0.22	0.16	0.58
Cd	0.08	0.43*	0.33	0.02	0.48**	0.20	1.05	0.63*	-0.04	2.30**
Cm	0.10	-0.38*	-0.00	-0.29	0.04	0.77	-0.71	0.35	0.13	0.95
Cb	0.32*	0.22	0.16	-0.29	-0.21	-0.76	0.43	0.13	-0.18	0.38
Ch	0.09	0.40*	0.64*	0.14	0.22	1.34*	-0.30	-0.10	-0.22	1.05*
[2]Pb' with:										
no org. manure	-0.04	0.44*	1.42**	0.72*	0.72**	0.80	1.06	0.68**	0.44**	1.08*
Cd	-0.02	0.34*	0.90**	0.92**	0.44**	0.03	1.35*	0.40	0.50**	1.06*
Cm	-0.34*	0.44*	1.12**	0.96**	0.72**	1.20	0.85	0.85**	1.03**	1.79**
Cb	-0.08	0.16	0.95**	1.05**	0.61**	0.84	2.37**	0.80**	0.92**	1.78**
Ch	-0.01	-0.22	0.28	-0.26	0.04	-0.46	-0.60	0.90**	0.56**	0.73
Nhb' × Pb' with:										
no org. manure	-0.04	0.20	0.26	0.34	0.34*	0.50	0.86	0.18	0.08	0.54
Cd	0.13	-0.02	0.41	0.28	0.45**	0.00	0.08	0.23	-0.14	1.24*
Cm	0.04	-0.26	0.04	0.13	-0.18	-0.30	0.25	0.25	-0.06	0.78
Cb	0.14	0.42*	0.33	0.33	0.45**	-0.26	-0.07	0.17	-0.24	0.20
Ch	-0.23	0.30	-0.27	-0.44	0.22	-0.36	0.54	-0.33	0.36*	0.41
S.E.±	0.131	0.166	0.245	0.292	0.136	0.602	0.563	0.242	0.155	0.521
MEANS(averaging Pb,NhbPb,NnPb)										
no org. manure	1.01	1.57	2.13	1.17	1.34	2.51	4.15	1.66	1.09	1.29
Cd	1.05	1.89	2.08	3.26	2.58	2.99	5.47	1.80	1.90	4.22
Cm	1.38	2.31	2.60	3.89	2.83	4.39	5.49	2.01	1.94	6.85
Cb	1.36	2.21	2.42	3.82	2.90	4.50	6.24	2.11	2.28	7.63
Ch	1.40	2.38	3.29	2.76	2.18	3.30	6.20	2.55	2.02	3.76
S.E.±	0.076	0.096	0.142	0.169	0.079	0.348	0.325	0.140	0.089	0.301
EFFECT OF										
Nhb'(Pb present) with:										
no org. manure	0.06	0.32	0.29	0.71	0.66**	1.47	1.27	0.40	0.25	1.12
Cd	0.21	0.41	0.74*	0.30	0.93**	0.20	1.13	0.86*	-0.19	3.55**
Cm	0.13	-0.65**	0.03	-0.16	-0.14	0.47	-0.46	0.60	0.07	1.73*
Cb	0.46*	0.63*	0.49	0.04	0.24	-1.03	0.36	0.30	-0.42	0.57
Ch	-0.14	0.71**	0.37	-0.29	0.45*	0.97	0.24	-0.43	0.14	1.46
Nn'(P present) with:										
no org. manure	0.27	-0.11	0.13	0.82	0.62**	0.27	0.90	0.07	0.19	0.34
Cd	0.27	0.36	-0.09	0.52	0.90**	0.27	1.56	0.43	-0.29	1.29
Cm	0.57**	-0.61*	-0.35	0.57	0.07	0.40	-0.56	0.24	-0.36	-0.04
Cb	0.43*	0.22	0.18	0.37	0.36	-0.56	-0.14	0.33	-0.09	0.39
Ch	-0.07	0.21	0.08	0.18	0.26	0.23	0.57	0.20	0.04	0.28
S.E.±	0.185	0.235	0.347	0.413	0.193	0.851	0.797	0.343	0.219	0.736
c.v.%	18.2	14.5	19.7	19.1	11.1	31.1	19.2	24.3	17.0	21.0

[1] mean of no Pb and Pb [2] mean of no Nhb and Nhb

Table 72 cont.

Number of plants per sq.yd.

	SITKA SPRUCE			SCOTS PINE		ASH				BIRCH
	K 1	KE 1	B 1	W 1A	W 1B	K 1	KE 1	B 1	W 1A	W 1B
MEANS(averaging -,Nhb,Pb,NhbPb)										
no org. manure	1080	1581	1610	1244	1107	109	101	120	126	1648
Cd	726	1292	1064	760	993	112	95	93	80	1208
Cm	788	1380	1413	890	1110	96	100	103	112	1162
Cb	902	1322	1326	860	1030	94	104	94	104	1116
Ch	838	1222	1272	990	1148	95	91	107	140	1610
S.E.±	59.3	96.3	85.3	57.1	54.8	11.5	7.3	12.1	9.4	51.7
EFFECT OF										
[1]Nhb' with:										
no org. manure	-72	-84	-105	-105	66	-7	7	-34	5	255*
Cd	144	213	153	-21	102	-36	19	3	-7	-141
Cm	147	144	36	3	186	-32	18	-7	-12	-351**
Cb	57	117	-204	63	63	12	18	8	-25	-6
Ch	-225	51	-150	-12	-33	8	30*	-6	1	81
[2]Pb' with:										
no org. manure	66	-666**	-141	-285*	-150	-7	-12	43	33	-579**
Cd	18	-153	111	207	-36	44	7	25	47*	255*
Cm	117	132	-24	87	18	2	18	31	-20	33
Cb	-93	-87	-174	81	87	-8	-25	-32	9	-60
Ch	-291*	171	156	138	-21	12	2	14	7	171
Nhb' × Pb' with:										
no org. manure	-162	72	-45	219	-30	-12	-43**	5	1	-9
Cd	-162	45	-27	117	0	20	0	6	5	15
Cm	-135	120	-162	99	-24	-34	-2	48	4	9
Cb	-27	-57	102	21	21	-4	30*	-6	7	-54
Ch	195	129	-18	66	-153	22	-10	-34	31	-135
S.E.±	118.6	192.6	170.6	114.2	109.6	23.0	14.6	24.2	18.8	103.4
MEANS(averaging Pb,NhbPb,NnPb)										
no org. manure	1074	1298	1562	1100	1084	96	92	131	132	1460
Cd	716	1284	1088	922	968	125	115	110	95	1342
Cm	760	1466	1304	998	1130	101	113	113	107	1212
Cb	814	1300	1228	942	1110	86	91	79	97	1086
Ch	754	1336	1288	1066	1106	99	96	101	130	1666
S.E.±	68.5	111.2	98.5	65.9	63.3	13.3	8.4	14.0	10.9	59.7
EFFECT OF										
Nhb'(Pb present) with:										
no org. manure	-234	-12	-150	114	36	-19	-36	-29	6	246
Cd	-18	258	126	96	102	-17	19	9	-2	-126
Cm	12	264	-126	102	162	-65	16	41	-8	-342*
Cb	30	60	-102	84	84	8	48*	2	-18	-60
Ch	-30	180	-168	54	-186	29	19	-40	32	-54
Nn'(Pb present) with:										
no org. manure	-234	144	-6	54	174	-38	-26	-46	-30	426**
Cd	-66	336	-30	222	30	-34	60**	19	-26	-42
Cm	-252	192	-354	246	114	-22	21	3	10	-72
Cb	-108	96	-84	168	150	-9	24	5	-46	-30
Ch	168	174	-270	48	-186	10	24	-60	-26	-114
S.E.±	167.8	272.4	241.2	161.5	154.9	32.5	20.6	34.3	26.6	146.3
c.v.%	24.2	24.4	22.5	20.3	17.5	40.1	25.2	41.1	29.9	13.2

[1] mean of no Pb and Pb [2] mean of no Nhb and Nhb

Table 73

Bulky manures and fertilizers

Kennington Extension KE 9, Wareham W 9

Species and Years — seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1946 only

Design and Treatments — 128 plots in 4 blocks of 32, confounding 3 high-order interactions
4 additional compost plots in each block, making a total of 144 plots

ALL COMBINATIONS OF THE FOLLOWING MATERIALS (each material tested at 2 levels) WITH

		double rate kg.per sq.yd.
S	dried sewage sludge	2¼
Uh	fresh hopwaste	9
Ub[1]	chaffed bracken	4½
Ch(L)[2]	hopwaste compost ex "Bedford College, London"	4½
Ch(O)	hopwaste compost ex Bagley, Oxford	4½
Cb	bracken compost	4½
CsF[3]	reinforced rotted straw	4½
CpF[3]	reinforced peat	2½

		units	g.per sq.yd.
F	'Nitro-Chalk'	g.N	7
	ammonium phosphate	g.N	4
	(P.558)	g.P	7

		units	rate per sq.yd.
N	as crushed hoof	g.N	11
P	in KE 9 as superphosphate	g.P	7
	W 9 as Bessemer basic slag	g.P	
K	in KE 9 as potassium sulphate	g.K	5
	W 9 as potassium sulphate	g.K	10

[1] used at KE only [2] used at W only

[3] These materials were reinforced in January 1946 by adding the fertilizer 'F' at the double rate to peat and to straw compost which had been prepared in 1945 by rotting straw with N and P fertilizers

Additional treatments

Ch(L) hopwaste compost (Bedford College)
Ch(O) hopwaste compost (Bagley) — both at 1 and 2¼ kg. per sq.yd.

Rothamsted S. Nos.

material used at	S	Uh	Ub	Ch(L)	Ch(O)	Cb	CsF	CpF	hoof
KE	4737	4845	4843	4847	4846	4844	4839	4838	4675
W	4737	4835	-	4833	4834	4836	4829	4828A	4675

Dates

	KE	W		KE	W
application of manures	29/3	26/3	broadcast sowing of seed	15/4	12/4

Height in inches

1946

Kennington Extension

	Mean	level (2-1)'	N'	Ps'	K'
SITKA SPRUCE					
Mean	1.65	0.19**	0.15**	0.46**	0.02
S.E.±	0.018	0.036	0.036	0.036	0.036
S	1.27	-0.02	-0.05	0.51**	-0.08
Uh	2.00	0.32**	0.28**	0.22*	-0.06
Ub	1.23	0.01	0.21*	0.64**	-0.01
Ch(O)	2.06	0.46**	0.30**	0.39**	0.29**
Cb	1.59	0.19	0.10	0.78**	0.04
CsF	1.46	0.01	0.06	0.38**	0.11
CpF	1.82	0.33**	0.16	0.39**	0.01
F	1.78	0.22*	0.13	0.38**	-0.12
S.E.±	0.051	0.101	0.101	0.101	0.101
SCOTS PINE					
Mean	1.40	0.12**	0.07**	0.23**	0.02
S.E.±	0.012	0.024	0.024	0.024	0.024
S	1.13	0.00	0.04	0.17*	0.00
Uh	1.70	0.45**	0.00	0.08	0.06
Ub	1.16	0.01	0.07	0.29**	0.02
Ch(O)	1.66	0.32**	0.16*	0.18*	0.07
Cb	1.36	0.11	0.10	0.43**	-0.09
CsF	1.25	0.03	-0.03	0.18*	0.07
CpF	1.45	0.05	0.12	0.33**	-0.01
F	1.48	-0.01	0.10	0.20**	0.02
S.E.±	0.033	0.067	0.067	0.067	0.067

Wareham

	Mean	level (2-1)'	N'	Pb'	K'
SITKA SPRUCE					
Mean	1.91	0.34**	0.42**	0.08*	0.58**
S.E.±	0.020	0.041	0.041	0.041	0.041
S	1.31	0.19	0.18	0.65**	0.52**
Uh	2.27	0.50**	0.12	-0.07	0.93**
Ch(L)	1.81	0.59**	0.77**	-0.42**	0.58**
Ch(O)	2.18	0.10	0.26*	0.35**	1.03**
Cb	1.50	0.28*	0.99**	0.66**	0.08
CsF	2.55	0.34**	0.21	0.07	-0.03
CpF	1.92	0.58**	0.38**	-0.36**	0.57**
F	1.74	0.11	0.44**	-0.21	0.97**
S.E.±	0.058	0.116	0.116	0.116	0.116
SCOTS PINE					
Mean	2.02	0.31**	0.32**	0.05	0.45**
S.E.±	0.020	0.041	0.041	0.041	0.041
S	1.59	0.23*	0.06	0.67**	0.52**
Uh	2.40	0.18	-0.16	-0.08	0.60**
Ch(L)	1.82	0.18	0.68**	-0.29*	0.31*
Ch(O)	2.12	0.35**	0.38**	-0.06	0.74**
Cb	1.82	0.44**	0.79**	0.32**	-0.07
CsF	2.39	0.34**	0.21	0.15	0.05
CpF	2.10	0.51**	0.25*	-0.11	0.61**
F	1.93	0.22	0.37**	-0.20	0.81**
S.E.±	0.058	0.115	0.115	0.115	0.115

Table 73 cont.

Additional plots	Height in inches: SITKA SPRUCE KE 9	SITKA SPRUCE W 9	SCOTS PINE KE 9	SCOTS PINE W 9	Number of plants per sq.yd.: SITKA SPRUCE KE 9	SITKA SPRUCE W 9	SCOTS PINE KE 9	SCOTS PINE W 9
MEAN	1.44	1.16	1.24	1.30	1540	1169	703	642
EFFECTS								
Rate (1-½)'	0.20	0.30*	0.16*	0.37**	-7	-65	11	52
Diff. Ch(O) - Ch(L)	0.08	0.12	-0.09	0.28*	-56	29	79	-43
(Rate 1-½)'(O-L)'	0.02	-0.07	-0.06	0.14	-92	-7	-11	-34
S.E.±	0.101	0.116	0.067	0.115	187.4	113.7	69.0	53.1
c.v.%	12.4	12.7	9.6	11.9	22.6	19.7	20.2	16.4

1946

Number of plants per sq.yd.

	Kennington Extension: Mean	level (2-1)'	N'	Ps'	K'		Wareham: Mean	level (2-1)'	N'	Pb'	K'
SITKA SPRUCE											
Mean	1673	-166*	-35	-200**	64	Mean	1154	10	48	-33	9
S.E.±	33.1	66.2	66.2	66.2	66.2	S.E.±	20.1	40.2	40.2	40.2	40.2
S	1864	-128	146	-313	299	S	1156	50	81	-68	40
Uh	1610	-331	-353	-38	398*	Uh	1056	-16	-29	20	-137
Ub	1619	-448*	43	-497*	11	Ch(L)	1135	-25	16	196	142
Ch(O)	1738	-2	34	-56	-205	Ch(O)	1166	63	-14	22	86
Cb	1694	-58	-86	-405*	76	Cb	1203	-25	241*	119	-74
CsF	1590	-353	92	-160	-47	CsF	1158	-65	2	-160	7
CpF	1605	52	-34	-2	-52	CpF	1155	-11	-20	-227	25
F	1665	-58	-122	-126	32	F	1205	110	110	-169	-16
S.E.±	93.7	187.4	187.4	187.4	187.4	S.E.±	56.8	113.7	113.7	113.7	113.7
SCOTS PINE											
Mean	690	14	-36	-3	11	Mean	661	1	33	-22	2
S.E.±	12.2	24.4	24.4	24.4	24.4	S.E.±	9.4	18.8	18.8	18.8	18.8
S	670	-108	-99	40	-9	S	667	56	-56	16	56
Uh	583	108	-36	-108	-81	Uh	666	36	4	9	-32
Ub	704	54	40	36	-86	Ch(L)	637	36	54	32	-36
Ch(O)	742	68	45	-58	14	Ch(O)	668	45	50	-99	90
Cb	685	2	-133	7	56	Cb	708	-79	74	11	-43
CsF	734	-18	-104	45	-18	CsF	667	-47	83	-34	20
CpF	721	16	-16	16	88	CpF	613	-20	47	-74	-43
F	680	-14	9	0	122	F	660	-20	11	-38	2
S.E.±	34.5	69.0	69.0	69.0	69.0	S.E.±	26.6	53.1	53.1	53.1	53.1

Table 74

Compost, sewage sludge and fertilizer

Wytham Wy 2, Deer Leap D 2

Species and Years: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine. 1946 only

Design and Treatments: 32 plots in 4 blocks of 8, confounding highest order interaction with pairs of blocks
2 additional plots per block (one unmanured, one compost), making a total of 40 plots

Factorial test on:

	S	dried sewage sludge[1]	×	level	×	P	×	K		bulky manures in kg. (at double rate)		rate per sq.yd.		fertilizers
v.	Ch	hopwaste compost[2]		1 v.2						S	1	Bessemer basic slag	g.P	5
										Ch	2¼	potassium sulphate	g.K	10

Additional treatments

no manure
Ch hopwaste compost[2] level 4 at 4½ kg. per sq.yd.

[1] Roth.No. S.4737 [2] Roth.Nos. Wy: S.4846; D: S.4834

Dates

	Wytham	Deer Leap		Wytham	Deer Leap
manuring	1/5	26/3	broadcast sowing of seed	2/5	12/4

1946

	Height in inches				Number of plants per sq.yd.			
	SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
	Wy 2	D 2	Wy 2	D 2	Wy 2	D 2	Wy 2	D 2
Means								
S	0.56	0.70	0.90	1.05	1104	1184	642	737
Ch[3]	1.11	0.88	1.22	1.13	978	1112	600	651
S.E.±	0.062	0.055	0.025	0.048	54.5	74.8	26.2	29.3
Effect of level (2-1)' with:								
S	0.11	0.35**	0.02	0.20*	-70	-9	-56	-34
Ch	0.34*	0.76**	0.30**	0.31**	20	-284	-61	25
Effect of 'P' with:								
Mean	0.25*	0.14	0.11**	0.07	11	-20	-2	-88*
S.E.±	0.088	0.078	0.036	0.068	77.1	105.8	37.1	41.4
S	0.25	0.26*	0.04	0.19	-65	50	-88	-142*
Ch[3]	0.24	0.03	0.18**	-0.05	88	-90	83	-34
S.E.±	0.125	0.111	0.050	0.096	109.1	149.7	52.4	58.5
Effect of K' with:								
Mean	-0.05	-0.10	0.02	-0.01	68	130	-90*	-16
S.E.±	0.088	0.078	0.036	0.068	77.1	105.8	37.1	41.4
S	-0.12	-0.03	-0.03	-0.02	97	153	-115*	34
Ch[3]	0.02	-0.16	0.06	0.01	38	108	-65	-65
S.E.±	0.125	0.111	0.050	0.096	109.1	149.7	52.4	58.5
Means of additional plots								
unmanured	0.40	0.34	0.90	0.78	1282	1188	585	711
Ch level 4	1.99	1.54	1.64	1.58	968	1184	495	886
S.E.±	0.125	0.111	0.050	0.096	109.1	149.7	52.4	58.5
c.v.%	27.8	27.0	9.2	17.4	20.5	26.0	17.1	16.3

[3] omitting additional treatment level 4

Table 75

Bulky manures and fertilizers

Old Kennington K 10, Ringwood R 3, Kennington Extension KE 18, Wareham W 20

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design K 10 1947 only
R 3, KE 18 } 1947-49 64 plots in 2 blocks of 32, confounding highest order interaction
W 20 1947-48 (see footnote)

Factorial test on:

8 TREATMENTS (7 bulky manures including 3 with added fertilizer, and 1 of fertilizer alone) × N × P × K

Treatments

1947	1948-49	Bulky manures	rate in kg. per sq.yd. (all years)	Rothamsted S. Numbers 1947	1948	1949
Ch	Ch	hopwaste compost	2¼	5132	5440	5707
Cbh	Cbh	bracken and hopwaste compost	2¼	5125	5438	5706
Cs	Cs	straw compost[1]	2¼	5073	5433	5708
Uh	Uh	fresh hopwaste	4½	5133(K,KE) 5147(R,W)	5439(KE) 5474(R,W)	5714(KE) 5718(R)
UsNP	UsNPK	chaffed wheat straw	½	5163	5434	5716
UbNP	UbNPK	chaffed green bracken	½	5134	5303	5715
UptNP	UptNPK	dried peat	½	5071	n.d.	n.d.
NP	NPK	fertilizer alone	rate given below	--	-	-

[1] made with inorganic nitrogen and phosphorus fertilizer

Fertilizers

rate in g. per sq.yd.

	units	1947	1948	1949
N as hoof	g.N	11	6	6
P as superphosphate[2]	g.P	7	4	3
K as potassium sulphate	g.K	5[3]	5	3

[2] Gafsa in W 20 (1947 only)
[3] 10 g. K in W 20

Dates

	1947 K	1947 R	1947 KE	1947 W	1948 R	1948 KE	1948 W	1949 R	1949 KE
manuring	3/4	9/4	2/4	10/4	31/3	23/3	1/4	16/3	11/3
broadcast sowing of seed	8/5	29/4	5/5	25/4	28/4	27/4	16/4	29/3	23/3

1947 Height in inches

	K 10 SITKA SPRUCE Mean	N'	P'	K'	K 10 SCOTS PINE Mean	N'	P'	K'
Mean	0.96	0.03	0.04	-0.02	1.88	-0.09	0.12*	0.01
S.E.±	-	0.036	0.036	0.036	-	0.054	0.054	0.054
Ch	1.05	0.20	-0.09	-0.04	1.89	0.32*	0.22	0.21
Cbh	1.04	0.18	0.12	0.08	1.97	0.06	0.29	0.12
Cs	0.84	-0.03	0.23*	0.11	1.99	-0.36*	0.26	-0.01
Uh	0.88	-0.06	-0.04	0.05	1.92	-0.01	0.37*	-0.07
Us NP	0.89	-0.02	0.15	-0.14	1.84	-0.30	0.02	-0.12
Ub NP	0.97	-0.03	0.06	-0.13	1.71	-0.25	0.12	-0.03
Upt NP	1.07	-0.02	-0.09	0.02	1.88	-0.09	-0.19	-0.02
NP	0.99	0.03	-0.02	-0.12	1.83	-0.12	-0.15	-0.02
S.E.±	0.051	0.101	0.101	0.101	0.077	0.154	0.154	0.154
c.v.%	14.9				11.6			

Note: In 1948 Sitka spruce halves of plots in W 20 suffered severe windblow. Height and plant number results had to be estimated for the 10 most severely affected plots (using "missing plot technique").

Table 75 cont.

Height in inches

	R 3				KE 18				W 20			
1947	Mean	N'	P'	K'	Mean	N'	P'	K'	Mean	N'	P'	K'
SITKA SPRUCE												
Mean	1.01	-0.17**	0.05	0.05	1.53	-0.11**	0.09*	0.03	2.02	-0.05	0.25**	0.27**
S.E.±	-	0.037	0.037	0.037	-	0.036	0.036	0.036	-	0.057	0.057	0.057
Ch	1.12	-0.02	-0.14	0.18	1.56	-0.10	0.04	0.12	2.13	0.20	0.48**	0.43*
Cbh	1.11	-0.13	0.16	-0.18	1.52	-0.03	0.04	0.09	2.50	-0.04	0.46**	0.08
Cs	0.92	-0.20	-0.00	0.06	1.29	-0.31**	0.09	-0.05	2.02	0.45**	0.46**	-0.08
Uh	1.06	-0.24*	0.13	0.17	1.56	0.03	0.10	-0.13	1.96	-0.24	0.19	0.48**
Us NP	0.92	-0.20	-0.10	-0.04	1.57	-0.15	0.06	0.06	1.96	-0.48**	-0.17	0.09
Ub NP	0.84	-0.14	0.18	0.10	1.60	-0.12	0.22*	0.06	1.99	-0.29	0.37*	-0.08
Upt NP	1.14	-0.28*	0.11	0.12	1.54	-0.02	0.03	0.14	2.00	-0.02	-0.13	0.52**
NP	1.00	-0.17	0.08	-0.01	1.57	-0.17	0.14	-0.02	1.63	0.04	0.36*	0.73**
S.E.±	0.052	0.104	0.104	0.104	0.051	0.101	0.101	0.101	0.081	0.161	0.161	0.161
c.v.%	14.6				9.4				11.3			
SCOTS PINE												
Mean	1.72	-0.04	-0.03	0.03	2.12	-0.15**	0.05	0.04	2.61	-0.05	0.11	0.38**
S.E.±	-	0.036	0.036	0.036	-	0.045	0.045	0.045	-	0.084	0.084	0.084
Ch	1.85	0.09	-0.13	0.04	2.17	0.04	-0.23	-0.02	2.72	0.15	0.08	0.28
Cbh	1.68	0.06	-0.09	-0.11	2.26	-0.10	0.12	0.01	2.92	0.02	0.24	-0.06
Cs	1.73	0.15	-0.10	0.13	2.04	-0.26	0.04	0.18	2.71	0.63*	0.20	0.26
Uh	1.72	-0.16	-0.06	0.12	2.11	-0.22	0.04	-0.07	2.40	-0.06	0.08	0.50*
Us NP	1.76	0.02	-0.04	0.04	2.04	-0.17	0.20	0.01	2.50	-0.06	-0.36	0.25
Ub NP	1.59	-0.24*	-0.04	0.09	2.10	-0.38**	0.06	0.14	2.70	-0.60*	-0.00	0.12
Upt NP	1.77	-0.16	0.19	0.08	2.10	0.06	0.08	0.06	2.58	-0.32	0.45	0.55*
NP	1.70	-0.12	0.05	-0.16	2.18	-0.20	0.12	-0.01	2.33	-0.19	0.22	1.11**
S.E.±	0.050	0.101	0.101	0.101	0.064	0.128	0.128	0.128	0.119	0.237	0.237	0.237
c.v.%	8.3				8.5				12.9			
1948												
SITKA SPRUCE									(see note on preceding page)			
Mean	0.67	0.23**	0.08*	0.05	1.18	0.10*	0.12**	0.06	1.97	0.20	0.07	0.29*
S.E.±	-	0.037	0.037	0.037	-	0.038	0.038	0.038	-	-	-	-
Ch	0.65	0.42**	0.26*	0.15	1.24	0.18	0.09	0.04	2.07	0.16	-0.14	0.40
Cbh	0.63	0.21	0.17	0.12	1.11	0.16	0.08	0.18	2.07	0.26	-0.22	0.59
Cs	0.37	0.12	0.08	0.03	0.95	-0.04	0.41**	0.21	1.39	-0.12	0.59	-0.18
Uh	0.80	0.05	0.04	0.13	1.33	0.13	0.09	-0.07	1.86	-0.11	0.24	0.52
Us NPK	0.64	0.06	-0.03	-0.19	1.25	-0.00	0.11	0.12	1.80	0.49	-0.22	0.41
Ub NPK	0.87	0.42**	-0.04	0.04	1.23	0.16	0.04	0.06	1.92	0.35	0.26	0.24
Upt NPK	0.76	0.34**	0.26*	0.12	1.22	0.13	-0.07	-0.07	2.18	0.34	0.09	0.32
NPK	0.62	0.24*	-0.10	0.03	1.14	0.07	0.19	0.03	2.47	0.25	-0.05	0.02
S.E.±	0.052	0.104	0.104	0.104	0.054	0.109	0.109	0.109	-	-	-	-
c.v.%	22.0				13.1				-			
SCOTS PINE												
Mean	1.48	0.22**	0.00	0.08	1.56	0.08*	0.08	-0.03	3.37	0.14	0.21*	0.30**
S.E.±	-	0.041	0.041	0.041	-	0.042	0.042	0.042	-	0.092	0.092	0.092
Ch	1.48	0.28*	-0.08	0.11	1.48	0.06	0.18	-0.06	3.07	0.32	0.12	0.55*
Cbh	1.45	0.05	-0.00	0.12	1.48	0.32*	0.21	0.15	3.65	0.56*	0.17	0.14
Cs	1.21	0.26*	0.13	-0.01	1.52	0.11	-0.02	0.08	3.16	0.19	0.73**	0.31
Uh	1.58	-0.06	0.03	0.28*	1.68	-0.12	0.06	-0.04	3.09	0.09	0.22	1.46**
Us NPK	1.41	0.29*	-0.16	-0.14	1.52	-0.04	0.18	-0.06	3.35	0.16	-0.42	-0.22
Ub NPK	1.83	0.40**	-0.00	0.12	1.60	0.12	0.13	-0.01	3.56	-0.50	0.30	-0.20
Upt NPK	1.52	0.29*	0.09	0.22	1.64	0.15	-0.06	-0.14	3.64	0.26	0.27	0.22
NPK	1.34	0.25*	0.05	-0.02	1.55	0.09	-0.05	-0.14	3.45	0.05.	0.29	0.17
S.E.±	0.058	0.115	0.115	0.115	0.059	0.117	0.117	0.117	0.131	0.262	0.262	0.262
c.v.%	11.0				10.6				11.0			
1949												
SITKA SPRUCE												
Mean	0.81	-0.01	0.14**	0.04	1.41	-0.03	0.18**	-0.01				
S.E.±	-	0.039	0.039	0.039	-	0.035	0.035	0.035				
Ch	0.89	0.17	0.18	0.29*	1.46	-0.13	0.08	0.08				
Cbh	0.82	-0.14	0.18	0.12	1.38	0.03	0.11	0.06				
Cs	0.46	0.05	0.03	-0.05	1.28	0.00	0.30**	0.08				
Uh	0.77	-0.30*	-0.00	0.02	1.33	0.19	0.17	-0.04				
Us NPK	0.72	-0.06	0.09	-0.07	1.51	-0.22*	0.05	-0.14				
Ub NPK	0.79	0.05	0.29*	0.01	1.39	-0.02	0.33**	-0.00				
Upt NPK	1.00	0.05	0.30*	-0.00	1.49	-0.05	0.17	-0.00				
NPK	1.00	0.06	0.01	-0.02	1.46	-0.06	0.20*	-0.14				
S.E.±	0.056	0.112	0.112	0.112	0.049	0.098	0.098	0.098				
c.v.%	19.5				9.8							

Table 75 cont.

Number of plants per sq.yd.

	1947				1948			1949	
SITKA SPRUCE	K 10	R 3	KE 18	W 20	R 3	KE 18	W 20	R 3	KE 18
Mean	629	834	1058	854	611	796	735	346	868
Means									
Ch	690	1000	1152	962	561	734	756	524	910
Cbh	610	854	1041	974	568	820	806	373	915
Cs	628	987	1108	1070	687	886	813	301	1037
Uh	580	702	976	668	654	728	618	317	776
Us NP	561	818	1006	735	634	774	648	206	599
Ub NP	640	780	981	795	543	784	684	228	757
Upt NP	681	770	1032	854	603	784	826	388	920
NP	642	766	1164	777	636	855	729	430	1028
S.E.±	58.2	57.1	63.2	71.8	52.2	49.6	-	56.0	57.4
Effects									
N'	-19	-122**	-24	-65	-28	-40	-16	-7	-16
P'	37	-40	-114*	-111*	26	63	-4	52	-22
K'	-23	-26	3	45	-1	58	-56	-64	42
S.E.±	41.1	40.4	44.7	50.8	36.9	35.1	-	39.6	40.6
c.v.%	26.2	19.4	16.9	23.8	24.1	17.6	-	45.8	18.7
SCOTS PINE									
Mean	957	750	990	1021	578	626	628		
Means									
Ch	1026	750	969	1094	578	596	633		
Cbh	981	746	1080	1042	627	580	676		
Cs	948	836	1035	1100	588	645	651		
Uh	976	636	926	914	578	594	648		
Us NP	994	830	978	888	512	638	483		
Ub NP	890	724	960	940	592	624	580		
Upt NP	932	711	994	1136	570	656	651		
NP	912	768	976	1053	584	672	700		
S.E.±	62.4	47.6	45.8	70.9	45.1	26.1	44.4		
Effects									
N'	-86	-82*	30	-46	-65	-25	-3		
P'	50	78*	12	-100	15	8	-10		
K'	-14	-30	-21	46	-48	-11	-9		
S.E.±	44.1	33.7	22.9	50.1	31.9	18.4	31.4		
c.v.%	18.4	18.1	13.2	19.6	22.2	11.8	20.1		

Table 76

Bulky organic manures and fertilizers

Wytham Wy 3, Bagley B 6

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design 32 plots in 2 blocks of 16, confounding highest order interaction

Factorial test on:

4 TREATMENTS (3 organic manures, and one other treatment[1]) × N × P × K

[1] 1947 Unmanured; 1948, 1949 fertilizer (F) equal to N, P, K shown in fertilizer table below

Treatments

Organic manures

		rate in kg. per sq. yd. (all years)	Rothamsted S. Numbers 1947	1948	1949
Ch	hopwaste compost	2¼	5132	5440	5707
Cbh	bracken and hopwaste compost	2¼	5125	5438	5706
Uh	fresh hopwaste	4½	5133[1]	5439	5714

Fertilizers

	units	rate per sq.yd. 1947	1948	1949
N as hoof	g.N	11	6	6
P as superphosphate[2]	g.P	7	4	3
K as potassium sulphate	g.K	5	5	3

[1] 5105 used at Wy 3

[2] Dafsa at B (1947 only)

Dates

	1947 Wy	1947 B	1948 Wy	1948 B	1949 Wy	1949 B
manuring	31/3	3/4	23/3	24/3	15/3	15/3
broadcast sowing of seed	29/4	1/5	23/4	20/4	9/4	5/4

Height in inches

	Wy 3 Mean	N'	P'	K'	B 6 Mean	N'	P'	K'
1947								
SITKA SPRUCE								
Mean	2.26	0.23*	0.84**	0.05	1.18	0.00	0.20**	0.06
Ch	2.49	0.23	0.74**	-0.04	1.34	0.28*	0.10	0.07
Cbh	2.29	0.22	0.75**	-0.02	1.30	0.02	0.39**	0.20
Uh	2.79	0.29	0.14	0.29	1.16	-0.24	0.01	0.03
unmanured	1.46	0.18	1.73**	-0.03	0.94	-0.04	0.28	-0.06
S.E.±	0.095	0.189	0.189	0.189	0.066	0.132	0.132	0.132
c.v.%	11.8				15.9			
SCOTS PINE								
Mean	3.28	-0.07	0.95**	0.08	2.62	-0.04	0.18	0.29
Ch	3.34	-0.15	0.93**	-0.04	2.63	0.36	-0.08	0.08
Cbh	3.44	0.22	0.78**	0.08	3.15	0.04	0.24	-0.04
Uh	3.74	0.01	0.48	0.23	2.60	-0.28	0.52*	0.76**
unmanured	2.60	-0.38	1.61**	0.07	2.10	-0.29	0.07	0.39
S.E.±	0.118	0.235	0.235	0.235	0.110	0.221	0.221	0.221
c.v.%	10.1				11.9			
1948								
SITKA SPRUCE								
Mean	1.98	0.15**	0.21**	-0.09	1.39	0.12	0.15	0.14
Ch	1.89	0.17	0.35**	-0.01	1.33	0.36	0.22	0.20
Cbh	1.86	0.04	0.12	-0.08	1.22	0.05	0.06	-0.10
Uh	2.32	0.17	0.16	-0.19	1.59	0.15	-0.06	0.43*
F	1.84	0.20*	0.21*	-0.10	1.40	-0.07	0.38	0.01
S.E.±	0.046	0.093	0.093	0.093	0.098	0.197	0.197	0.197
c.v.%	6.6				20.0			
SCOTS PINE								
Mean	2.49	0.21*	0.16*	-0.00	2.06	0.20	0.16	0.13
Ch	2.53	0.39*	0.17	-0.02	1.84	0.27	0.00	-0.04
Cbh	2.36	0.13	0.15	-0.14	1.86	0.39	0.47*	0.17
Uh	2.73	0.05	0.18	-0.01	2.36	-0.09	0.12	0.39
F	2.36	0.26	0.16	0.16	2.19	0.22	0.04	-0.02
S.E.±	0.071	0.142	0.142	0.142	0.101	0.201	0.201	0.201
c.v.%	8.1				13.8			
1949								
SITKA SPRUCE								
Mean	2.04	-0.04	0.21*	-0.12	1.75	-0.00	0.31*	0.08
Ch	2.06	-0.10	0.04	-0.45**	1.78	0.03	0.14	0.11
Cbh	1.97	0.04	0.14	-0.19	2.00	0.16	0.07	-0.14
Uh	2.06	-0.13	0.35*	0.18	1.70	0.01	0.52	0.51
F	2.07	0.06	0.34*	-0.04	1.52	-0.21	0.52	-0.17
S.E.±	0.075	0.150	0.150	0.150	0.124	0.248	0.248	0.248
c.v.%	10.4				20.0			

Table 76 cont.

Number of plants per sq.yd.

	SITKA SPRUCE						SCOTS PINE			
	1947		1948		1949		1947		1948	
	Wy 3	B 6	Wy 3	B 6	Wy 3	B 6	Wy 3	B 6	Wy 3	B 6
Mean	1174	986	1562	834	1112	1858	966	984	741	827
MEANS										
Ch	1173	988	1788	852	1137	1952	1020	1026	708	832
Cbh	1248	1014	1466	816	1191	1796	998	930	752	868
Uh	1082	908	1326	756	894	1568	810	970	723	800
unmanured	1194	1035	-	-	-	-	1038	1010	-	-
F	-	-	1670	914	1226	2117	-	-	780	808
S.E.±	38.0	75.4	107.8	43.3	63.8	114.8	26.1	58.3	41.5	35.7
EFFECTS										
N'	-98*	-46	46	56	46	75	-13	-40	37	-51
P'	152**	-62	-20	46	73	24	13	16	-61	16
K'	25	60	72	-37	90	8	-32	36	-34	-57
S.E.±	38.0	75.4	107.8	43.3	63.8	114.8	26.1	58.3	41.5	35.7
c.v.%	9.2	21.6	19.5	14.7	16.2	17.5	7.6	16.8	15.8	12.2

Table 77

Compost, fertilizers, sulphur, water and seedcovers

Nagshead Nd 1, Widehaugh Wd 1, Tair Onen TO 1, Harwood Dale HD 1, Wykeham Moor WM 1

Years and Species

1947-48	Wd 1	
1947-49	Nd 1, TO 1	1+0 Sitka spruce seedbeds (3 feet × 4½ feet)
1947-50	HD 1, WM 1	

Design 64 plots in 4 blocks of 16, confounding three 4-term interactions
TO 1 and WM 1 half-replicate from 1948 owing to introduction of seedcover test

Factorial test on:

N × P × K × compost × sulphur[1] × watering[1] × (non-calc. v. calcareous seedcover)[1]

[1] these factors are restricted to the following seasons and centres

	Nd 1	Wd 1	TO 1	HD 1	WM 1
1947	Rs × W	Rs × W	Rs × W	Rs × W	Rs × W
1948	Rs	Rs × W	res.Rs × (T v.Tc)	res.Rs × W	res.Rs × W × (T v.Tc)
1949	Rs	-	-	res.Rs × W	res.Rs × W (T v.Tc)
1950	-	-	-	res.Rs	res.Rs × (T v.Tc)

Treatments

		units	1947	rate per sq.yd. 1948	1949	1950
N	hoof	g.N	11	8½	9	9
P	superphosphate	g.P	7½	5½	4½	4½
K	potassium sulphate or chloride[2]	g.K	12	7	4½	4½
C	compost[3]	kg.	2¼	2¼	2¼	2¼
Rs	sulphur	g.	85	57	57	-
W	watering in dry spells					
T v.Tc	non-calcareous v. calcareous seedcover at TO and WM					

[2] sulphate in 1947 and 1950, chloride in 1948 and 1949

[3] 1947 hopwaste compost. Roth.No. 1947 S.5149; 1948-50 bracken-hopwaste compost. Roth.No. 1948 S.5438, 1949 S.5706, 1950 S.5892

Seedcovers

	1947	1948	1949	1950
Nd	Rough sand	Bedford sand	Trelleck grit	-
Wd	Whin Sill grit	Doncaster quartzite	-	-
TO	Calc. sea grit	Bedford sand v. Calc. sea grit	-	-
HD	Calc. Oolite gravel	Doncaster quartzite	Doncaster quartzite	Doncaster quartzite
WM	Calc. Oolite gravel	Doncaster quartzite v. Calc. Oolite gravel	Doncaster quartzite v. Calc. Oolite gravel	Doncaster quartzite v. Calc. Oolite gravel

Rothamsted Numbers:

non-calc. covers Rough sand TV/M 39, Whin Sill TV/M 34, Bedford sand TV/M 77, Donc. quartzite TV/M 75
calc. covers Calc. sea grit S.5325/6 (13% $CaCO_3$), Calc. Oolite gravel S.5271 (40% $CaCO_3$)

Dates

	1947					1948					1949				1950	
	Nd	Wd	TO	HD	WM	Nd	Wd	TO	HD	WM	Nd	TO*	HD	WM	HD	WM
sulphur	16/4	n.d.	15/4	17/4	24/4	1/3	3/2	-	-	-	21/3	-	-	-	-	-
fertilizer	16/4	n.d.	15/4	17/4	24/4	30/3	16/4	20/4	13/4	13/4	22/3	25/3	27/3	25/3	24/3	27/3
compost	16/4	n.d.	11/4	15/4	18/4	13/4	16/4	20/4	13/4	13/4	22/3	25/3	27/3	25/3	24/3	27/3
broadcast sowing of seed	30/4	n.d.	22/4	2/5	29/4	28/4	24/4	5/5	22/4	22/4	1/4	12/4	31/3	31/3	4/4	3/4

* crop failure; no results presented in table below

Table 77 cont.

SITKA SPRUCE	Height in inches					Number of plants per sq.yd.				
	Nagshead			Widehaugh		Nagshead			Widehaugh	
	1947	1948	1949	1947	1948	1947	1948	1949	1947	1948
Mean	0.68	0.66	0.41	0.86	0.70	369	671	366	526	557
Effects:										
N'	0.06**	0.15**	-0.02	0.06**	0.10**	-87**	-67	-89**	-128**	-24
P'	0.01	0.04	-0.01	0.09**	0.12**	6	13	-12	-3	-1
K'	0.04*	0.03	0.04	-0.06*	-0.00	-17	88	32	-113**	-22
C'	0.04*	0.02	-0.02	0.01	0.08*	-5	-109*	-171**	-48	-123**
Rs'	0.11**	0.27**	0.18**	-0.04	0.27**	59**	88	-39	-26	-27
W'	0.02	-	-	0.11**	0.03	-4	-	-	150**	88*
N'P'	-0.00	0.02	0.06*	0.02	0.03	-36*	-4	8	28	9
N'K'	0.00	0.00	0.00	-0.02	0.01	14	56	8	29	-59
N'C'	-0.01	-0.02	0.01	-0.02	-0.03	0	-26	11	-19	40
N'Rs'	0.01	0.08**	-0.04	-0.00	0.02	13	-13	70**	42	-30
N'W'	-0.04*	-	-	-0.01	0.00	2	-	-	-13	20
P'K'	0.02	-0.04	0.00	-0.04	-0.00	2	6	-48*	10	48
P'C'	-0.02	0.04	0.02	-0.02	0.02	-2	-35	10	34	-16
P'Rs'	-0.03	0.05	-0.05*	-0.01	0.00	-9	-58	-26	71**	-4
P'W'	0.02	-	-	0.03	0.02	-35*	-	-	36	12
K'C'	0.01	-0.03	-0.01	-0.02	0.02	-9	-84	37	6	-59
K'Rs'	-0.03	-0.04	0.01	-0.03	0.00	-55**	40	-1	-50*	38
K'W'	0.01	-	-	-0.04	0.01	15	-	-	4	-1
C'Rs'	-0.03	-0.02	-0.05*	-0.03	-0.01	16	-18	-71**	27	-50
C'W'	0.00	-	-	0.00	-0.02	-2	-	-	18	-14
Rs'W'	0.04*	-	-	-0.02	-0.01	-6	-	-	44	68
S.E.±	0.016	0.023	0.023	0.020	0.027	15.7	51.1	21.8	23.2	35.6
c.v.%	9.2	14.1	22.5	9.5	15.6	17.1	30.4	23.8	17.6	25.5

Height in inches

	Tair Onen		Harwood Dale				Wykeham Moor			
	1947	1948[1]	1947	1948	1949	1950	1947	1948	1949	1950
Mean	1.12	0.69	1.73	1.02	1.64	0.88	1.39	1.25	2.17	1.32
Effects:										
N'	0.10**	0.02	-0.18*	0.12**	-0.02	0.13**	0.16*	0.14**	0.08	0.08
P'	0.19**	-0.01	0.11	0.15**	0.22**	0.10*	0.65**	0.08	0.22*	0.18**
K'	-0.00	0.00	0.12	-0.16**	-0.06	0.02	0.18**	0.02	0.12	0.06
C'	0.16**	0.07**	0.14*	0.01	0.30**	0.20**	0.68**	0.27**	0.36**	-0.04
Rs'	-0.43**	-0.03	-0.11	0.16**	0.07	0.00	-0.78**	0.14**	0.18*	-0.03
W'	0.05*	-	0.11	0.03	-0.02	-	0.42**	0.10*	-0.05	-
(Tc-T)'	-	0.00	-	-	-	-	-	0.09*	-0.07	-0.11*
N'P'	0.03	0.02	0.04	0.04	0.12*	0.02	-0.01	0.05	0.24*	-0.01
N'K'	0.00	-0.01	-0.02	-0.04	-0.05	-0.04	0.14*	0.08	0.04	0.01
N'C'	0.11**	0.06**	-0.02	-0.04	0.05	0.02	-0.02	-0.00	-0.18*	-0.00
N'Rs'	0.04	0.02	0.09	0.02	0.04	0.03	-0.29**	0.11*	0.00	-0.11*
N'W'	0.01	-	0.09	0.02	0.14**	-	0.17*	0.08	0.29**	-
P'K'	0.07*	-0.02	-0.02	-0.10**	-0.10	0.02	-0.06	0.08	0.14	0.10*
P'C'	0.03	-0.02	0.02	-0.00	0.07	0.07*	-0.15*	-0.08	0.17	-0.07
P'Rs'	0.10**	0.00	0.01	0.01	-0.00	0.01	-0.32**	0.08	-0.08	0.04
P'W'	0.01	-	0.06	0.01	-0.03	-	0.05	-0.09*	-0.22*	-
K'C'	-0.06*	-0.03	-0.04	-0.01	-0.18**	-0.06	-0.02	-0.05	-0.14	-0.12*
K'Rs'	-0.01	0.00	0.01	0.06*	0.08	0.04	-0.12	0.07	0.11	-0.09
K'W'	-0.01	-	-0.05	0.03	-0.11*	-	0.04	0.00	-0.03	-
C'Rs'	0.07*	-0.02	-0.05	0.05	0.11*	0.08*	-0.03	0.04	0.17	0.06
C'W'	0.07*	-	0.11	-0.01	0.08	-	0.19**	-0.05	-0.11	-
Rs'W'	0.05	-	-0.05	0.02	-0.03	-	-0.25**	0.10*	0.07	-
S.E.±	0.026	0.022	0.065	0.029	0.047	0.034	0.061	0.041	0.084	0.046
c.v.%	9.0	12.7	15.1	11.4	11.4	15.5	17.4	13.2	15.4	13.9

[1] practically crop failure

Table 77 cont.

Number of plants per sq.yd.

SITKA SPRUCE	Tair Onen 1947	Tair Onen 1948[1]	Harwood Dale 1947	Harwood Dale 1948	Harwood Dale 1949	Harwood Dale 1950	Wykeham Moor 1947	Wykeham Moor 1948	Wykeham Moor 1949	Wykeham Moor 1950
Mean	1208	89	446	859	929	898	937	1257	1145	848
Effects:										
N'	-79	-17	-69*	35	18	5	-4	84	17	-122**
P'	25	9	15	12	68*	13	-50	77	11	-58
K'	125	10	35	-98**	-80**	-2	58	-38	16	-52
C'	28	-48**	-21	-69*	-117**	-9	37	-25	-36	-101**
Rs'	-443**	10	-538**	21	39	-10	-639**	-60	23	11
W'	-32	-	44	25	65*	-	161**	169**	263**	-
(Tc-T)'	-	-100**	-	-	-	-	-	110*	6	-86*
N'P'	5	-3	-2	47	-6	-28	43	-26	49	22
N'K'	-64	2	3	11	-34	-26	70	-25	29	11
N'C'	242**	6	-11	-52	0	8	-23	-82	-48	-22
N'Rs'	183*	-10	60*	6	-20	3	-26	59	-44	20
N'W'	-51	-	4	-18	-23	-	-48	-43	98	-
P'K'	-24	-1	33	-27	23	3	8	13	28	3
P'C'	62	-16	3	40	11	30	53	14	47	66
P'Rs'	90	-4	36	77*	-3	-3	-12	15	-30	50
P'W'	12	-	49	42	-18	-	12	71	-11	-
K'C'	-6	-18	46	14	14	-26	-72	8	-21	-18
K'Rs'	32	-6	-12	3	32	60	-16	-58	-36	9
K'W'	87	-	18	22	-66*	-	-17	82	26	-
C'Rs'	-39	-7	35	-6	-26	39	6	-38	15	3
C'W'	-19	-	10	-52	-17	-	18	96*	4	-
Rs'W'	179*	-	3	-37	10	33	2	-32	102	-
S.E.±	78.2	9.2	28.4	30.0	26.5	32.7	40.8	45.8	62.8	32.6
c.v.%	-	41.7	25.6	14.0	11.4	14.5	17.4	14.5	21.9	15.4

[1] practically crop failure

Table 78

Compost and Fertilizers. Longtown, Lo 1; Lynford Point, LP 2

Years and Species Lo 1 1948-50: 1+0 Sitka spruce seedbed ($4\frac{1}{2}$ feet × 3 feet)
LP 2 1948: seedbed plots (3 feet × 3 feet) split for 1+0 Sitka spruce(SS) v. 1+0 Scots pine(SP)

Design Lo 1 64 plots in 4 blocks of 16 (2 additional unmanured plots in each block, making 72 plots in all)
LP 2 32 plots in 4 blocks of 8, confounding highest order interaction between pairs of blocks 1 additional unmanured plot in each block, making 36 plots in all

Factorial combinations of: compost × nitrogen × phosphorus × potassium

Dates	Lo 1948	Lo 1949	Lo 1950	LP 1948
manuring	19/4	8/4	12/4	19/3
broadcast sowing of seed	26/4	12/4	18/4	n.d.

Manuring		units	rate per sq.yd. 1948	rate per sq.yd. 1949-50
C[1]	bracken and hopwaste compost	kg.	$2\frac{1}{4}$	$2\frac{1}{4}$
N	as hoof	g.N	$8\frac{1}{2}$	9
P	as superphosphate	g.P	$5\frac{1}{2}$	$4\frac{1}{2}$
K	as chloride[2] or sulphate[2]	g.K	7	$4\frac{1}{2}$

[1] Rothamsted Numbers: Lo 1948 S.5438; 1949 S.5706; 1950 S.5879; LP 1948 S.5438
[2] Lo chloride in 1948 and 1949, sulphate in 1950; LP sulphate

	Longtown, Lo 1						Lynford Point, LP 2			
	Height in inches			Number of plants per sq.yd.			Height in inches		Number of plants per sq.yd.	
	SITKA SPRUCE			SITKA SPRUCE			SS	SP	SS	SP
	1948	1949	1950	1948	1949	1950	1948	1948	1948	1948
Mean	0.60	0.86	0.70	674	462	439	0.79	1.12	232	431
Effects										
C'	0.10*	0.28**	0.27**	-37	-88**	-5	0.14**	0.08*	-1	-9
N'	0.04	-0.10*	0.09**	-55*	-79**	-39	0.02	0.16**	-91*	-94*
P'	-0.06	-0.04	0.04	-18	-24	-14	0.03	0.11**	-7	48
K'	0.07	0.09*	0.14**	11	23	68**	-0.06	0.02	-25	80
C'N'	0.01	-0.10*	-0.02	-16	31	-27	0.03	-0.08	21	24
C'P'	0.05	0.01	0.03	14	2	-28	0.04	-0.03	29	29
C'K'	-0.09*	-0.07	-0.07**	-37	14	-75**	-0.02	-0.02	15	-63
N'P'	0.00	-0.01	-0.02	10	-24	4	0.00	0.05	-72	-20
N'K'	0.00	-0.02	-0.01	38	-3	49*	0.07	0.02	51	-79
P'K'	-0.05	-0.04	-0.00	29	7	-17	0.04	0.14**	3	8
S.E.±	0.037	0.040	0.025	27.2	21.6	20.0	0.042	0.035	34.6	43.5
c.v.%	24.8	18.6	14.1	16.2	18.8	18.2	15.0	8.7	42.2	28.5

Table 79

Composts, uncomposted organic materials and fertilizers

Bagley B 12

Years and Species 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-52: 1+0 Sitka spruce seedbeds

Design and Treatments 96 plots in 4 blocks of 24

9 bulky manures, each tested with and without fertilizer (at rate 1 below)

Additional test: unmanured, fertilizer rate 1, fertilizer rate 2 (duplicates per block)

COMPOSTS		kg. per sq.yd. (all years)
Ch	fresh hopwaste composted without nitrogen	2¼
Cbh	75% chaffed green bracken and 25% fresh hopwaste (by volume)	2¼
Csh	50% chaffed wheat straw and 50% fresh hopwaste (by volume)	2¼
Cs in	chaffed wheat straw composted with 66 kg. 'Nitro-Chalk' and 56 kg. superphosphate (28 kg. in 1951) per ton of straw	2¼
Cs org	chaffed wheat straw composted with 63 kg. dried blood and 49 kg. bonemeal (25 kg. in 1951) per ton of straw	2¼
Cbp	chaffed green bracken composted with 56 kg. of superphosphate (28 kg. in 1948, 1951) per ton of bracken	2¼

UNCOMPOSTED ORGANIC MATERIALS		
UbP	dried chaffed green bracken applied as such together with a dressing of superphosphate equivalent to that in 'Fertilizer Rate 1'	¾
Us NP	chaffed wheat straw applied as such together with a dressing of nitrogen (as 'Nitro-Chalk', ammonium sulphate or both) and superphosphate, both equivalent to the amount applied in 'Fertilizer Rate 1'	¾
Uh	fresh hopwaste	4½

	Fertilizers Rate 1 (Rate 2 = double Rate 1)	units	rate per sq.yd. 1948	1949	1950	1951	1952
N	seedbed ammonium sulphate	g.N	5	4	-	-	-
	'Nitro-Chalk'	g.N	-	-	3	-	-
	topdressed 'Nitro-Chalk' early	g.N	-	3	3	3	3
	late	g.N	-	-	-	3	3
P	superphosphate	g.P	3½	3½	3½	3½	3½
K	potassium chloride	g.K	4	3	3½	3½	3½

Rothamsted S. Numbers of bulky manures

	1948	1949	1950	1951	1952
Ch	5440	5707	5877	6021	6153
Cbh	5438	5706	5879	6026	6152
Csh	5447	5709	5880	6022	6154
Cs in	5448	5708	5878	6023	6156
Cs org	5449	5710	5884	6024	6155
Cbp	5450	5711	5883	6025	6150
Ub	5303	5715	5886	6027	6157
Us	5434	5716	5881	6028	6159
Uh	5439	5714	5882	6029	6160

Dates	1948	1949	1950	1951	1952
Manuring					
seedbed (bulky manures, P, K; N 1948-50)	24/3	11/3	22/2*	29/3	28/2
N topdressed early	-	27/6	11/7	29/6	18/6
late	-	-	-	2/8	12/8
Broadcast sowing of seed	21/4	5/4	30/3	18/4	5/4

* N raked in 9/3 during final preparation of seedbed

Table 79 cont.

Bagley, B 12

	Height in inches						Number of plants per sq.yd.					
	SITKA SPRUCE					SCOTS PINE	SITKA SPRUCE					SCOTS PINE
Bulky manures	1948	1949	1950	1951	1952	1948	1948	1949	1950	1951	1952	1948
MEANS (averaging with and without fertilizer)												
Ch	1.29	1.55	2.53	2.46	2.22	1.89	849	1953	1001	1198	917	792
Cbh	1.27	1.46	2.28	2.20	2.31	1.86	946	1936	1123	1294	881	699
Csh	1.38	1.57	2.51	2.53	2.46	1.84	807	1741	1012	1243	824	716
Cs in	1.14	1.90	2.92	2.64	2.93	1.83	909	1817	1079	1165	905	740
Cs org	1.30	1.68	3.08	2.62	2.63	1.93	804	1436	892	1048	830	740
Cbp	1.43	1.58	2.33	2.56	2.62	2.15	958	1898	1076	1143	886	747
UbP	1.12	1.41	2.50	2.02	2.05	2.05	870	1733	962	1229	780	770
Us NP	1.06	1.45	2.34	2.21	2.00	2.02	868	1472	856	1100	711	728
Uh	0.97	1.62	2.51	1.90	1.78	1.90	864	1382	963	1190	855	723
S.E.±	0.073	0.120	0.128	0.142	0.172	0.069	43.6	124.5	45.3	69.2	41.4	31.2
EFFECT OF FERTILIZER WITH												
Ch	0.49**	-0.26	1.45**	1.20**	0.67	0.09	-78	-87	-206*	-114	-74	0
Cbh	0.31*	0.26	0.85**	0.28	0.35	0.16	63	72	-28	-102	58	42
Csh	0.44**	-0.10	1.26**	0.73*	-0.20	0.25	-18	128	-124	-112	40	-195**
Cs in	0.23	0.72**	0.63*	0.21	0.62	0.15	0	-116	70	-274	46	-135*
Cs org	0.36*	0.18	0.57*	-0.24	0.24	0.32*	144	554*	-178	-70	-87	-3
Cbp	-0.08	0.12	1.12**	0.62*	0.27	-0.22	-141	-162	-200*	-69	90	66
UbP	0.22	0.08	0.46	0.15	0.47	0.16	78	-190	-174	-22	-108	-3
Us NP	0.03	0.20	0.80**	0.25	-0.38	0.20	-57	4	-171	134	-33	-27
Uh	0.38*	0.70**	1.29**	0.64*	0.62	0.34*	-162	45	-168	-99	12	72
S.E.±	0.146	0.239	0.256	0.285	0.344	0.139	87.3	249.0	90.5	138.4	82.7	62.3
No bulky manures												
MEANS												
Unmanured (=0)	0.86	1.20	1.38	1.15	1.21	1.54	1028	2141	1200	1232	959	861
Fert. rate 1	1.27	1.15	2.41	2.36	2.08	1.89	909	2020	1082	1271	916	754
Fert. rate 2	1.48	1.28	3.08	2.68	2.37	2.10	852	2264	1022	1333	938	800
S.E.±	0.073	0.120	0.128	0.142	0.172	0.069	43.6	124.5	45.3	69.2	41.4	31.2
DIFFERENCES												
Fert. rate 1-0	0.41**	-0.05	1.04**	1.21**	0.87**	0.35**	-118	-121	-118	40	-44	-106*
Fert. rate 2-1	0.21*	0.12	0.67**	0.32	0.28	0.21*	-57	244	-60	62	22	45
S.E.±	0.146	0.239	0.256	0.285	0.344	0.139	87.3	249.0	90.5	138.4	82.7	62.3
c.v.%	16.9	22.7	14.6	17.7	21.9	10.2	13.9	19.4	12.5	16.3	13.5	11.7

Table 80

Bulky manures and fertilizers

Wareham W 49

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design and Treatments 64 plots in 4 blocks of 16

5 bulky manures, each tested with and without Standard Fertilizer (F), at 'Standard Fertilizer rate 1' below

Additional test: unmanured; Standard Fertilizers, rates 1 and 2; Reduced Salt Fertilizers, rates 1 and 2

		Roth. S. No. 1949	1950	kg.per sq.yd. (both years)
COMPOSTS				
Cbh	75% chaffed green bracken and 25% hopwaste (by volume)	5706	5879	2¼
Csin	chaffed wheat straw composted with 66 kg. 'Nitro-Chalk' and 56 kg. superphosphate per ton of straw	5708	5878	2¼
Cbp	chaffed green bracken composted with 56 kg. superphosphate per ton of straw	5711	5883	2¼
UNCOMPOSTED ORGANIC MATERIALS				
UbP	dried chaffed green bracken applied as such together with a dressing of superphosphate equivalent to that in 'Standard Fertilizer rate 1'	5715	5886	¾
UhK	fresh hopwaste applied as such together with a dressing of potassium equivalent to that in 'Standard Fertilizer rate 1'	5718	5891	4½

		units	rate per sq.yd. 1949	1950
Standard Fertilizer Rate 1 (Rate 2 = double Rate 1)				
seedbed	ammonium sulphate	g.N	4	-
	'Nitro-Chalk'	g.N	-	3
topdressed 'Nitro-Chalk'		g.N	3	3
superphosphate		g.P	3½	3½
potassium chloride		g.K	3	3½
Reduced Salt Fertilizer Rate 1 (Rate 2 = double Rate 1)				
formalised casein (Roth.No. N.228)		g.N	7	6
bonemeal (Roth.No. P.593)		g.P	3½	3½
potassium sulphate		g.K	3	3½

Dates

	Manuring: seedbed	Manuring: topdressings	Broadcast sowing of seed
1949	17/3	21/6	31/3
1950	8/3	27/6	27/3

SITKA SPRUCE

	Height in inches 1949	1950	Number of plants per sq.yd. 1949	1950
Bulky manures				
MEANS (averaging with and without standard fertilizer)				
Cbh	0.63	2.65	637	926
Csin	0.77	2.50	519	919
Cbp	1.10	2.47	478	1000
UbP	1.02	2.87	362	852
UhK	0.90	4.02	465	1048
S.E.±	0.100	0.261	61.6	59.8
EFFECT OF STANDARD FERTILIZER				
Cbh	0.04	0.62	56	-63
Csin	0.30	0.62	-228	14
Cbp	0.26	0.37	-206	106
UbP	0.74**	1.21*	-70	84
UhK	0.12	0.78	78	39
S.E.±	0.200	0.522	123.2	119.5
No bulky manures				
MEANS				
Unmanured	0.59	1.83	690	909
S.E.±	0.100	0.261	61.6	59.8
Standard Fertilizer rate 1	0.78	2.48	633	908
Standard Fertilizer rate 2	0.72	2.57	567	940
Reduced Salt Fertilizer rate 1	0.76	2.37	856	921
Reduced Salt Fertilizer rate 2	0.61	2.87	1022	914
S.E.±	0.142	0.369	87.1	84.5
c.v.%	35.4	27.5	29.6	18.1

Table 81

Compost (stored and new), fertilizer (reduced salt and standard), formalin

Ringwood R 62, Kennington Extension KE 77

Years and Species 1953-1955 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding highest order interaction with pairs of blocks;
2 additional plots in each block: one without treatment, one with formalin but unmanured

Factorial test on: standard compost / stored compost × standard fertilizer / reduced salt fertilizer × level 1 v.2 × formalin

Treatments

COMPOSTS

C standard bracken and hopwaste compost
C old bracken and hopwaste compost, stored for one year more than standard

	LEVEL 1	LEVEL 2
	kg. per sq.yd.	
	2½	4½

FERTILIZERS

		N	P	K	Mg	N	P	K	Mg
		g. element per sq.yd.							
F	standard fertilizer ('Nitro-Chalk')[1], superphosphate, potassium chloride, kieserite	4.5	3	6	2	9	6	12	4
Frs	reduced salt fertilizer ('Nitro-Chalk')[1], dimagnesium phosphate[2], potassium sulphate	4.5	3	6	2	9	6	12	4

Mf 250 ml. formalin applied in 3 to 5 l. water

applied in two equal summer topdressings

[2] magnesium orthophosphate (acid) $MgHPO_4, 3H_2O$

Dates

Treatment applications	Ringwood 1953	Ringwood 1954	Ringwood 1955	Kennington Extension 1953	Kennington Extension 1954	Kennington Extension 1955
P, K, Mg fertilizer formalin, compost	27/2	25/2	8/3	24/2	5/3	16/3
N topdressed early	23/6	23/6	30/6	30/6	29/6	4/7
late	30/7	3/8	2/8	5/8	5/8	4/8
Broadcast sowing of seed	27/3	5/4	2/4	19/3	26/3	12/4

Rothamsted S. Numbers

	1953	1954	1955
C			
R	6315	6498	6665
KE	6308	6500	6670
C old			
R/KE	6307	6501	6664

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	R 62			KE 77			R 62			KE 77		
	1953	1954	1955	1953	1954	1955	1953	1954	1955	1953	1954	1955
MEANS												
unmanured	0.99	0.66	0.72	2.87	0.88	1.24	998	917	975	585	795	916
S.E.±	0.063	0.086	0.048	0.088	0.106	0.084	32.7	81.5	40.4	34.3	45.5	38.9
Composts	1.66	1.36	1.22	3.23	1.75	1.52	919	821	1046	554	727	649
Fertilizers	2.14	0.95	0.90	3.27	1.71	1.39	1062	732	958	639	791	848
S.E.±	0.044	0.061	0.034	0.062	0.075	0.060	23.2	57.6	28.6	24.3	32.2	27.5
C old	1.53	1.46	1.28	3.26	1.66	1.52	986	752	1010	602	655	662
C	1.80	1.26	1.17	3.20	1.85	1.53	852	891	1081	507	800	635
Frs	2.10	0.90	0.91	3.27	1.72	1.37	1037	718	963	575	812	819
F	2.19	1.00	0.89	3.27	1.70	1.41	1086	746	953	704	770	878
S.E.±	0.063	0.086	0.048	0.088	0.106	0.084	32.7	81.5	40.4	34.3	45.5	38.9
EFFECTS												
(Comp-Fert.)'	-0.48**	0.41**	0.32**	-0.04	0.04	0.13	-143**	89	87*	-85*	-64	-200**
S.E.±	0.063	0.086	0.048	0.088	0.106	0.084	32.8	81.5	40.4	34.3	45.5	38.9
Mf' with:												
unmanured	0.41**	0.67**	0.21*	0.50**	0.03	-0.16	68	194	132	-111	-138	-216*
S.E.±	0.126	0.172	0.095	0.175	0.213	0.169	65.5	163.0	80.8	68.7	91.0	77.8
manured plots	0.70**	1.28**	0.50**	0.90**	0.90**	0.12	120**	-13	277**	-69	-25	-37
S.E.±	0.063	0.086	0.048	0.088	0.106	0.084	32.8	81.5	40.4	34.3	45.5	38.9
Composts	0.49**	1.44**	0.59**	0.90**	1.11**	0.17	156**	45	267**	-94	-1	-86
Fertilizers	0.91**	1.12**	0.42**	0.90**	0.70**	0.06	83	-71	287**	-44	-49	12
S.E.±	0.089	0.122	0.067	0.124	0.151	0.119	46.3	115.3	57.2	48.6	64.4	55.0
C old	0.59**	1.66**	0.62**	1.01**	1.14**	0.20	213**	126	178*	-30	94	-122
C	0.38**	1.24**	0.57**	0.80**	1.08**	0.14	99	-36	356**	-159*	-96	-50
Frs	0.69**	1.08**	0.56**	0.90**	0.84**	-0.01	112	3	411**	20	-82	-21
F	1.13**	1.16**	0.28**	0.89**	0.56*	0.14	54	-146	164	-108	-15	45
S.E.±	0.126	0.172	0.095	0.175	0.213	0.169	65.5	163.0	80.8	68.7	91.0	77.8
(level 2-1)' with:												
manured plots	0.39**	0.33**	0.12*	0.10	0.37**	-0.04	42	-63	-71	-16	-86	-8
S.E.±	0.063	0.086	0.048	0.088	0.106	0.084	32.8	81.5	40.4	34.3	45.5	38.9
Composts	0.45**	0.40**	0.18*	0.05	0.22	0.08	-39	-93	-45	-28	-119	-132*
Fertilizers	0.33**	0.25*	0.06	0.15	0.52**	-0.16	122*	-34	-97	-4	-52	117*
S.E.±	0.089	0.122	0.067	0.124	0.151	0.119	46.3	115.3	57.2	48.6	64.4	55.0
C old	0.54**	0.44*	0.20*	0.21	0.06	0.08	54	-138	-56	-12	-244*	-56
C	0.36**	0.36	0.16	-0.12	0.37	0.08	-132	-48	-34	-45	6	-208*
Frs	0.42**	0.42*	0.03	0.24	0.69**	-0.12	-14	84	-90	-22	-88	192*
F	0.25	0.09	0.10	0.07	0.35	-0.20	258**	-152	-104	15	-15	42
S.E.±	0.126	0.172	0.095	0.175	0.213	0.169	65.5	163.0	80.8	68.7	91.0	77.8
c.v.%	10.3	22.9	13.4	7.8	19.3	16.9	9.3	28.6	11.5	16.3	16.8	14.1

Table 82

Bulky manures and fertilizers

Old Kennington K 11, Kennington Extension KE 17, Wareham W 24

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design and Treatments

K 11	1947 only	16 plots in 4 × 4 Latin Square
KE 17	1947-1949	24 plots in 4 blocks of 6
W 24	1947-1948	16 plots in 4 blocks of 4

	1947			1948		1949
	K	KE	W	KE	W	KE
	unmanured	unmanured	unmanured	unmanured	unmanured	unmanured
	DPM	DPM	DPM	-	-	-
	-	Cbh	-	Cbh	Cbh	Cbh
	UhK	UhK	UhK	UhK	UhK	UhK
	NhPK	NhPK	NhPK	NhPK	-	NhPK
	-	-	-	NsPK	NsPK	-
	-	-	-	-	-	NscPK

	Rothamsted Numbers 1947	1948	1949	Treatments		units	rate per sq.yd. 1947	1948	1949
	S.5075	-	-	DPM	dried poultry manure	kg.	½	-	-
	S.5125	S.5438	S.5706	Cbh	bracken and hopwaste compost	kg.	2¼	2¼	2¼
				UhK					
K,KE	S.5133	S.5439	S.5714	Uh	fresh hopwaste	kg.	4½	4½	4½
W	S.5138	S.5474		K	potassium sulphate	g.K	5[1]	7	4½
				NhPK					
	N.227		N.229	Nh	crushed hoof	g.N	11	8	9
				P	superphosphate[2]	g.P	7	6	4½
				K	potassium chloride[3]	g.K	5[1]	7	4½
				NsPK or Ns/c PK					
				Ns	ammonium sulphate	g.N	-	8	5
				Nc	'Nitro-Chalk' topdressed	g.N	-	-	4½
				P, K	as for NhPK				

[1] 10 g. in W 24 [2] Gafsa at W in 1947 [3] sulphate in 1947

Dates

	1947 K	1947 KE	1947 W	1948 KE	1948 W	1949 KE
manuring	3/4	2/4	10/4	23/3	1/4	11/3 ('Nitro-Chalk' 24/6)
broadcast sowing of seed	8/5	5/5	25/4	27/4	16/4	25/3

1947

Height in inches

	SITKA SPRUCE K 11	KE 17	W 24	SCOTS PINE K 11	KE 17	W 24
none	0.88	1.50	0.34	1.86	2.22	1.28
Dpm	0.89	1.58	2.13	1.79	2.40	2.97
Cbh	-	1.63	-	-	2.28	-
UhK	0.96	1.76	2.37	1.92	2.28	3.21
NhPK	1.04	1.60	2.42	2.12	2.28	3.30
S.E.±	0.038	0.077	0.095	0.099	0.060	0.148
c.v.%	8.1	9.6	10.5	10.4	5.2	11.0

Number of plants per sq.yd.

	SITKA SPRUCE K 11	KE 17	W 24	SCOTS PINE K 11	KE 17	W 24
none	909	1220	1047	1002	1134	1089
Dpm	783	1143	882	933	1056	1140
Cbh	-	1188	-	-	1059	-
UhK	615	1140	795	1089	1026	966
NhPK	696	1209	960	1062	1194	993
S.E.±	65.3	72.9	40.5	78.9	50.4	33.5
c.v.%	17.4	12.3	8.8	15.5	9.1	6.4

1948

Height in inches

	SITKA SPRUCE KE 17	W 24	SCOTS PINE KE 17	W 24
none	0.84	0.90	1.36	1.24
Cbh	1.02	1.39	1.43	3.12
UhK	1.42	1.92	1.65	3.43
NhPK	1.18	-	1.51	-
NsPK	1.11	2.37	1.54	3.77
S.E.±	0.046	0.131	0.072	0.134
c.v.%	8.7	15.8	9.8	9.3

Number of plants per sq.yd.

	SITKA SPRUCE KE 17	W 24	SCOTS PINE KE 17	W 24
none	804	966	669	651
Cbh	720	900	621	585
UhK	672	708	582	627
NhPK	789	-	672	-
NsPK	864	840	609	678
S.E.±	55.7	85.2	40.2	41.5
c.v.%	14.4	20.0	12.6	13.0

1949

	Height in inches SITKA SPRUCE KE 17	No. of plants per sq.yd. SITKA SPRUCE KE 17
none	1.28	1977
Cbh	1.22	1518
UhK	1.02	994
NhPK	1.21	1840
Ns/c PK	1.23	1874
S.E.±	0.073	173.0
c.v.%	12.0	20.4

Table 83

Compost, fertilizer and additional treatments

Old Kennington K 17, Ringwood R 25, Kennington Extension KE 26, Bagley B 11

Years and Species 1948 seedbed plots split for 1+0 Sitka spruce (SS) v. 1+0 Scots pine (SP)
1949-51 1+0 Sitka spruce seedbeds

Design and Treatments K 17, KE 26 1948-50) B 11 1948-51) 24 plots in 4 blocks of 6
R 25 1948-50 16 plots in 2 blocks of 8

R 25 compost × fertilizer × Rh(1949) or Rs(1949,1950); one block unsteamed, one steamed (Ms) Nov. 1947

K 17, KE 26 unmanured compost fertilizer × Rh(1948) or Rs(1949,1950)

B 11 unmanured compost fertilizer × Rh(1948) or Rc(1949)

		units	rate per sq.yd. 1948	1949	1950	1951
C	bracken and hopwaste compost[1]	kg.	2¼	2¼	2¼	2¼
F						
N	seedbed ammonium sulphate	g.N	8½	5	-	-
	'Nitro-Chalk'	g.N	-	-	4½	-
	topdressed 'Nitro-Chalk'[2]	g.N	-	4½	4½	9
P	superphosphate	g.P	5½	4½	4½	4½
K	potassium chloride	g.K	7	4	4½	4½
Rh	sulphuric acid[3]	ml.	35	-	-	-
Rs	sulphur	g.	-	25	25	-
Rc	ground chalk (B 11 only, applied 25.2.49)	g.	-	150	-	-

[1] Rothamsted Numbers: 1948 S.5438; 1949 S.5706; 1950 S.5879; 1951 S.6026
[2] ammonium sulphate in K 17, 1949
[3] 35 ml. conc. H_2SO_4 applied in 3½ l. water, i.e. 1% v/v

Dates

	1948 K	R	KE	B	1949 K	R	KE	B	1950 K	R	KE	B	1951 B
Treatment applications:													
P, K, compost forked in (including N in 1948,1949)	22/3	31/3	22/3	24/3	11/3	16/3	11/3	11/3	22/2	7/3	23/2	22/2	29/3
N raked in before sowing	-	-	-	-	-	-	-	-	9/3	7/3	9/3	9/3	-
N topdressed	-	-	-	-	24/6	20/6	24/6	27/6	6/7	26/6	6/7	11/7	29/6, 2/8
Rh, Rs topdressed	1/5	3/5	28/4	22/4	25/5	1/6	25/5	-	15/6	22/5	15/6	-	-
Broadcast sowing of seed:	30/4	28/4	27/4	21/4	31/3	30/3	28/3	5/4	24/3	29/3	28/3	30/3	18/4

B 11 Height in inches

	1948 SS	SP		1949 SS	1950 SS	1951 SS
Means			Means			
-	0.56	1.18	-	1.08	0.91	1.13
C	0.86	1.37	C	1.37	1.64	1.87
F	1.14	1.60	F	1.49	2.25	2.29
S.E.±	0.073	0.054	S.E.±	0.109	0.074	0.099
Effects			Effects			
Rh'	-0.62**	-0.73**	Rc'	0.24	0.29**	0.10
S.E.±	0.084	0.063	S.E.±	0.126	0.085	0.114
c.v.%	24.3	11.2	c.v.%	23.6	13.0	15.8

Number of plants per sq.yd.

	1948 SS	SP		1949 SS	1950 SS	1951 SS
Means			Means			
-	886	522	-	2558	1207	1185
C	786	444	C	2164	1184	1349
F	690	435	F	2714	1323	1268
S.E.±	32.4	-	S.E.±	117.5	31.2	57.7
Effects			Effects			
Rh'	-315**	-674	Rc'	158	40	90
S.E.±	37.5	-	S.E.±	135.7	36.0	66.6
c.v.%	11.6	-	c.v.%	13.4	7.1	12.9

Table 83 cont.

Height in inches

	1948 SS	1948 SP		1949 SS	1950 SS
K 17					
Means			Means		
-	0.50	0.89	-	0.80	0.76
C	0.63	1.02	C	0.98	1.29
F	0.69	1.00	F	0.99	1.57
S.E.±	0.020	0.037	S.E.±	0.030	0.119
Effects			Effects		
Rh'	0.14**	0.06	Rs'	0.03	0.17
S.E.±	0.023	0.042	S.E.±	0.035	0.137
c.v.%	12.4	10.7	c.v.%	9.4	27.9
R 25					
Means			Means		
-	0.69	1.38	-	1.10	0.32
C	0.74	1.34	C	0.94	0.67
F	0.62	1.28	F	1.16	0.86
CF	0.65	1.38	CF	1.16	1.44
S.E.±	0.046	0.099	S.E.±	0.063	0.110
Effects			Effects		
Rh'	0.00	-0.19	Rs'	0.18*	0.03
Rh'Ms'	-0.02	-0.10	Rs'Ms'	-0.10	0.12
S.E.±	0.046	0.099	S.E.±	0.063	0.110
c.v.%	13.6	14.8	c.v.%	11.5	26.9
KE 26					
Means			Means		
-	0.79	1.11	-	1.24	0.95
C	1.00	1.23	C	1.32	1.59
F	1.02	1.32	F	1.10	1.65
S.E.±	0.016	0.047	S.E.±	0.050	0.108
Effects			Effects		
Rh'	0.00	0.00	Rs'	-0.12*	-0.29*
S.E.±	0.019	0.054	S.E.±	0.058	0.125
c.v.%	5.0	10.9	c.v.%	11.6	21.9

Number of plants per sq.yd.

	1948 SS	1948 SP		1949 SS	1950 SS
K 17					
Means			Means		
-	694	777	-	788	825
C	774	752	C	653	737
F	748	618	F	784	812
S.E.±	67.5	50.0	S.E.±	56.6	57.7
Effects			Effects		
Rh'	70	-13	Rs'	-45	-20
S.E.±	77.9	57.8	S.E.±	65.3	66.6
c.v.%	25.7	19.6	c.v.%	21.5	20.6
R 25					
Means			Means		
-	1002	354	-	722	596
C	927	318	C	544	544
F	714	354	F	868	688
CF	915	483	CF	348	759
S.E.±	55.7	33.0	S.E.±	41.3	30.7
Effects			Effects		
Rh'	75	-346**	Rs'	134*	109*
Rh'Ms'	-243**	-14	Rs'Ms'	-128*	136**
S.E.±	55.7	33.0	S.E.±	41.3	30.7
c.v.%	12.6	17.7	c.v.%	13.4	9.5
KE 26					
Means			Means		
-	796	624	-	1293	1164
C	868	654	C	1076	946
F	794	555	F	1118	1013
S.E.±	40.5	35.1	S.E.±	86.8	42.0
Effects			Effects		
Rh'	-23	-42	Rs'	-46	-42
S.E.±	46.8	40.5	S.E.±	100.2	48.6
c.v.%	14.0	16.2	c.v.%	21.1	11.4

Table 84

Manuring with grass silage, grass compost, and dried grass

Old Kennington K 30

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design and Treatments 4 × 4 Latin Square

Roth. Nos. 1949	1950		kg. per sq.yd.	SITKA SPRUCE Height in inches 1949	1950	Number of plants per sq.yd. 1949	1950
S.5680	S.5887	grass silage	1¾	0.75	0.96	928	712
S.5681	S.5885	grass compost[2]	2¼	0.79	0.75	921	688
S.5684	S.5876	dried grass	¾	0.66	0.77	892	556
		NPK fertilizer[1]		0.86	1.04	1066	879
		S.E.±		0.045	0.087	71.5	64.0
		c.v.%		11.6	19.8	15.0	18.1

[1] 9 g.N per sq.yd. in two topdressings of 4½ g.N each (ammonium sulphate in 1949, 'Nitro-Chalk' in 1950) 4½ g.P per sq.yd. as superphosphate. 4½ g.K per sq.yd. as potassium chloride

[2] grass-straw compost

Dates

Manuring	1949	1950
grass products	25/2	22/2
NPK in seedbed	10/3	22/2 (N raked in on 9/3)
N topdressed	24/6	6/7
Broadcast sowing of seed	30/3	24/3

Table 85

Miscellaneous organic manures

Old Kennington K 2, Kennington Extension KE 2, Bagley B 2, Wareham W 2A and B

Species and Years K, KE, B, WA seedbed plots split for 1+0 Sitka spruce v. 1+0 ash[≈] } 1945 only
WB seedbed plots split for 1+0 Scots pine[+] v. 1+0 birch[×] }

Design and Treatments 5 × 5 Latin Square

Roth. S.No.		rate per sq.yd.
-	no manure	-
4541	tankage	140 g.
4430	sewage sludge	2¼ kg.
4419	dried hopwaste	1 kg.
4414	hopwaste compost used at K,KE,B	4½ kg.
4432	hopwaste compost used at W	4½ kg.

Dates	K	KE	B	W
application of manures	9/3	16/3	16/3	15/3
broadcast sowing of seed Sitka spruce, Scots pine	23/3	23/3	21/3	18-24/4
ash, birch	16/3	17/3	19/3	18-24/4

1945

	Height in inches K 2	KE 2	B 2	WA 2	WB 2	Number of plants per sq.yd. K 2	KE 2	B 2	WA 2	WB 2
	SITKA SPRUCE				SCOTS PINE	SITKA SPRUCE				SCOTS PINE
no manure	0.92	1.25	0.95	0.28	0.59	1127	1681	1436	1004	1174
tankage	1.04	2.03	2.16	1.48	1.72	1012	1343	1397	796	911
sewage sludge	0.96	1.52	2.27	2.26	1.72	1220	1508	1224	792	1022
dried hopwaste	1.09	1.99	1.62	1.08	1.46	1105	1483	1188	731	1019
hopwaste compost	1.40	2.50	2.78	2.12	1.90	1138	1231	1285	911	1116
S.E.±	0.057	0.125	0.156	0.150	0.090	92.2	105.0	72.8	70.8	73.4
c.v.%	11.8	15.0	17.8	23.2	13.6	18.5	16.3	12.6	18.7	15.7
	ASH[1]				BIRCH	ASH[1]				BIRCH
no manure	1.56	3.48	1.00	0.69	0.26	122	79	96	112	2128
tankage	1.98	4.56	2.76	0.92	1.79	132	96	96	95	1642
sewage sludge	2.18	4.34	2.16	1.51	1.89	106	101	109	130	1706
dried hopwaste	2.98	6.12	2.20	0.90	1.22	148	66	81	92	1400
hopwaste compost	3.14	6.40	3.20	1.42	3.19	96	105	94	127	1692
S.E.±	0.339	0.499	0.730	0.046	0.151	20.5	10.2	15.7	17.4	102.0
c.v.%	32.0	22.3	71.0	9.4	20.2	37.6	26.4	37.6	36.0	13.3

≈ ash (Fraxinus excelsior) + Scots pine (Pinus sylvestris) × birch (Betula verrucosa)

[1] The results for ash are unreliable, as too small a sample was assessed.

Table 86

Compost and fertilizer

Large-scale plots in four Conservancy Nurseries - Culmhead, Tair Onen, Bramshill, Reasty Top

Years and Species				
	Culmhead	1950 only	1+0 Sitka spruce seedbeds	1+0 Douglas fir seedbeds (drill sowing)
	Tair Onen	1950	1+0 Sitka spruce seedbeds	1+0 Japanese larch seedbeds (drill sowing)
		1951[1]	2+0 Sitka spruce seedbeds	1+0 Sitka spruce seedbeds (drill sowing)
	Bramshill	1950	1+0 Sitka spruce seedbeds	1+0 Douglas fir seedbeds (Broadcast sowing)
		1951	1+0 Douglas fir seedbeds	1+0 Sitka spruce seedbeds (broadcast sowing)
		1952 onwards	continued under the supervision of the Research Branch of the Forestry Commission	
	Reasty Top	1950	1+0 Sitka spruce seedbeds	1+0 Japanese larch seedbeds (drill sowing)
		1951[1]	1+0 Japanese larch seedbeds	1+0 Sitka spruce seedbeds (drill sowing)

Note: Douglas fir (Pseudotsuga taxifolia); Japanese larch (Larix leptolepis)

Design 4 × 4 latin squares

Plot sizes:	Culmhead	Tair Onen	Bramshill	Reasty Top
	4 beds of 24 feet	SS 3 beds of 21 feet JL 3 beds of 24 feet	4 beds of 24 feet	4 beds of 33 feet

Factorial combinations of compost × fertilizer

Treatments C = compost, F = fertilizer	units	Culmhead 1950	Tair Onen 1950	Bramshill 1950	Bramshill 1951	Reasty Top 1950
C straw and hopwaste compost	kg.	4	4½	6	4	3½
F 'Nitro-Chalk' seedbed	g.N	4½	4½	4½	-	5½
'Nitro-Chalk' topdressed early	g.N	4½	4½	4½	-	5½
late	g.N	-	-	-	4½	-
superphosphate	g.P	4½	3½	6	4½	4½
potassium chloride	g.K	4½	3½	6	4½	4½
Basal dressing of ground chalk	g.	-	-	80	-	50

Dates Treatments	Culmhead 1950	Tair Onen 1950	Bramshill 1950	Bramshill 1951	Reasty Top 1950
ground chalk	-	-	1/3	-	21/4
compost, P, K	28/3	21/3	20/3	23/4	3/4
N in seedbed	21/4	31/3	5/4	-	7/5
N topdressed early	11/7	11/7	6/7	-	20/7
late	-	-	-	8/8	-
Sowing of seed					
Sitka spruce	28/4	7/4	13/4	11/5	12/5
Japanese larch	-	23/4	-	-	14/5
Douglas fir	24/4	-	13/4	11/5	-

[1] crop too irregular for assessment

Bramshill

	Height in inches				Number of plants per sq.yd.			
	SITKA SPRUCE 1950	SITKA SPRUCE 1951	DOUGLAS FIR 1950	DOUGLAS FIR 1951	SITKA SPRUCE 1950	SITKA SPRUCE 1951	DOUGLAS FIR 1950	DOUGLAS FIR 1951
Mean	2.98	1.23	5.82	2.53	207	1152	274	140
Effects								
C'	0.13	-0.22	-0.13	-0.65**	15	-133	-6	-7
F'	0.48*	0.79**	0.89*	1.28**	34**	-32	9	-7
C'F'	-0.31	-0.17	0.04	-0.48**	-8	73	-10	1
S.E.±	0.192	0.118	0.252	0.118	8.5	63.7	14.8	6.9
c.v.%	12.9	19.3	8.7	9.4	8.2	11.0	10.8	9.9

Height in inches, 1950

	SITKA SPRUCE Culmhead	SITKA SPRUCE Tair Onen	SITKA SPRUCE Reasty Top	DOUGLAS FIR Culmhead	JAPANESE LARCH Tair Onen	JAPANESE LARCH Reasty Top
Mean	0.98	0.84	1.07	1.93	2.43	2.35
Effects						
C'	0.23*	0.12*	0.27**	0.44**	0.15	0.60**
F'	0.29**	-0.11*	0.36**	0.14*	0.08	0.85**
C'F'	0.04	0.07	0.02	0.04	-0.01	0.05
S.E.±	0.075	0.036	0.069	0.057	0.140	0.100
c.v.%	15.4	8.6	13.0	5.9	11.5	8.5

Table 87

Forms and rates of nitrogen; test of sawdust and formalin

Old Kennington K 58, Ampthill Am 23, Ringwood R 55, Kennington Extension KE 68

Years and Species 1952-1954 1+0 Sitka spruce seedbeds (crop failed at Ampthill in 1952)

Design 32 plots in 8 blocks of 4 confounding highest order interaction between pairs of blocks
1 additional plot without nitrogen or sawdust in each block, making a total of 40 plots
1952: no formalin 1953 and 1954: 4 blocks with basal formalin, 4 blocks without formalin

Factorial test on: (Nc v. Ns) × (level 1 v.2) × sawdust (1952 and 1953 only)

Treatments

			g.N per sq.yd. level 1	2			rate per sq.yd.
Nc	'Nitro-Chalk'	topdressed early	4½	9	Usd	sawdust[1]	2 kg.
Ns	ammonium sulphate	late	4½	9	Mf	formalin drench[2]	250 ml.

[1] Rothamsted S. Nos:

	1952	1953		1952	1953
K,Am,KE	6158	6285	R	6166	6293

[2] applied in 4 to 6 l. water

Basal fertilizer

	units	1952 K,Am	1952 R	1952 KE	1953 K,Am	1953 R	1953 KE	1954 K,Am	1954 R	1954 KE
superphosphate	g.P	4½	4½	4½	4½	4½	4½	4½	4½	4½
potassium chloride	g.K	4½	9	9	4½	9	9	4½	9	9
kieserite	g.Mg	-	4½	-	-	1½	1½	-	3	3

Dates

		1952 K	1952 Am	1952 R	1952 KE	1953 K	1953 Am	1953 R	1953 KE	1954 K	1954 Am	1954 R	1954 KE
Treatment applications													
formalin		-	-	-	-	13/1	16/1	21/1	14/1	8/12	12/12	10/12	9/12
sawdust		26/2	29/2	4/3	27/2	13/1	16/1	21/1	14/1	-	-	-	-
P, K, Mg fertilizer		26/2	29/2	4/3	27/2	24/2	26/2	27/2	24/2	5/3	2/3	25/2	5/3
nitrogen topdressed	early	18/6	26/6	23/6	18/6	30/6	2/7	23/6	30/6	29/6	30/6	23/6	29/6
	late	12/8	-	15/8	12/8	6/8	10/8	30/7	5/8	5/8	6/8	3/8	5/8
Broadcast sowing of seed		23/4	30/4	17/4	24/4	18/3	24/3	27/3	19/3	27/3	30/3	26/4	25/3

SITKA SPRUCE

Height in inches

	1952 K 58	1952 R 55	1952 KE 68	1953 K 58	1953 Am 23	1953 R 55	1953 KE 68	1954 K 58	1954 Am 23	1954 R 55	1954 KE 68
Mean	1.19	0.84	1.36	2.10	1.70	1.53	2.28	2.14	2.05	1.37	1.72
EFFECTS											
$(N_2-N_1)'$	0.04	-0.11**	-0.05	0.30**	0.16*	0.15*	-0.13	0.32**	0.22*	-0.16*	0.01
(Ns-Nc)'	0.08*	0.04	-0.06	0.41**	0.42**	0.16**	-0.00	0.62**	0.51**	0.13	0.01
$(N_2-N_1)'$ × (Ns-Nc)'	0.07	-0.01	-0.06	0.22*	0.25**	-0.03	-0.10	0.06	0.16	-0.11	0.01
[3]Usd'	-0.10**	-0.23**	-0.51**	-0.36**	-0.48**	-0.44**	-0.10	-0.27*	0.01	0.68**	0.04
Usd' × $(N_2-N_1)'$	0.02	0.06	0.17	0.04	0.08	0.20**	-0.04	-0.09	0.02	-0.03	0.06
Usd' × (Ns-Nc)'	-0.13**	-0.12**	-0.08	0.00	-0.14*	0.15*	0.06	0.04	-0.04	0.24**	0.06
Mf' × $(N_2-N_1)'$	-	-	-	0.02	0.07	0.00	0.14	-0.06	0.03	-0.18*	-0.07
Mf' × (Ns-Nc)'	-	-	-	0.04	0.08	-0.01	-0.03	0.07	0.01	-0.06	0.02
Mf' × Usd'	-	-	-	-0.19*	-0.29**	-0.42**	0.00	-0.04	-0.01	-0.02	0.15
S.E.±	0.035	0.029	0.083	0.076	0.057	0.055	0.099	0.097	0.090	0.072	0.078
Plots without sawdust											
Mean	1.10	0.90	1.67	1.86	1.61	1.32	2.23	1.68	1.55	0.84	1.50
EFFECT of N	0.27**	0.11**	-0.12	0.85**	0.66**	0.86**	0.20	1.20**	0.98**	0.39**	0.40**
S.E.±	0.043	0.036	0.101	0.093	0.070	0.067	0.121	0.118	0.110	0.088	0.096
c.v.%	8.7	9.9	16.4	10.9	10.0	11.1	12.4	14.2	13.8	16.5	13.5

[3] residues in 1954

Table 87 cont.

Number of plants per sq.yd.

	1952			1953				1954			
	K 58	R 55	KE 68	K 58	Am 23	R 55	KE 68	K 58	Am 23	R 55	KE 68
Mean	516	525	265	784	489	1041	585	524	821	848	745
EFFECTS											
$(N_2-N_1)'$	-8	-42	-12	26	-26	-10	-27	36	72*	-139**	-40
$(Ns-Nc)'$	50	24	5	-9	14	39	52	41	93**	-10	31
$(N_2-N_1)' \times (Ns-Nc)'$	14	-5	-6	-76	39	15	-17	70*	15	-49	-25
[3]Usd'	58	-195**	-70*	72	-15	29	-115**	-113**	51	116**	25
Usd' × $(N_2-N_1)'$	7	47	16	34	18	28	-4	-1	58*	-46	-44
Usd' × $(Ns-Nc)'$	40	-53	71*	3	-6	-16	41	-18	74*	-12	-58
Mf' × $(N_2-N_1)'$	-	-	-	27	-1	23	-77*	-9	27	16	12
Mf' × $(Ns-Nc)'$	-	-	-	-16	-50*	-86*	-59	-25	33	-77*	-62
Mf' × Usd'	-	-	-	-25	-44*	20	-31	37	-45	-130**	-62
S.E.±	34.6	27.0	28.8	41.2	20.5	40.7	30.7	29.1	26.4	30.3	46.8
Plots without sawdust											
Mean	485	606	312	736	519	1008	665	632	828	843	772
EFFECT of N	5	33	-23	23	-44	38	-46	-103**	-65	-106*	-80
S.E.±	42.3	33.0	35.2	50.5	25.0	49.9	37.6	35.7	32.4	37.2	57.3
c.v.%	19.2	14.1	29.5	15.1	11.6	11.2	14.3	14.8	9.0	10.0	17.5

[3] residues in 1954

Table 88

Residual effects of green manures and leys

Kennington Extension KE 3, Wareham W 25

Years and Species 1947: green crops
1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine

Design and Treatments 32 plots in 2 blocks of 16, confounding one three-term interaction. Half replicate

Factorial test on:

			seedrate in g.
	G	oats, S.171 (6 parts) and Westernwolth Italian ryegrass (1 part)	17½
×	B	buckwheat	7½
×	C	Alsike and white clover (N.Z.Mother Stock), equal parts	1
×	L	bitter blue lupins	7½
×	T	tares	15
×	R	winter rye	15

On plots which were to be followed by winter rye the crops were trampled down in late July or early August, calcium cyanamide (57 g. per sq.yd.) was sprinkled over the produce and after a few days, dug in. 4 to 6 weeks later (following a good rain) winter rye was sown, and subsequently dug in early in the spring, in preparation for 1948 conifer seedbeds.

All crops not followed by winter rye were cut down to 4 inches above ground level and left to rot on the plots until early spring, when they were dug in.

Dates

	manuring KE	manuring W	sowing of seed KE	sowing of seed W
1947 green crops (except rye)	12/5	7/5	12/5	7/5
rye	1/8[1]	29/7[1]	28/8	13/9
1948 conifers (broadcast)	22/3	4/4	27/4	19/4

[1] application of cyanamide

Basal manuring

	units	rate per sq.yd. 1947 KE	1947 W	1948 KE and W
ammonium sulphate	g.N	6	6	8½
superphosphate	g.P	2½	7	5½
potassium chloride	g.K	5	12	7
ground limestone	g.	-	85	-

1948

Height in inches

	SITKA SPRUCE KE 3	SITKA SPRUCE W 25	SCOTS PINE KE 3	SCOTS PINE W 25
Mean	1.12	1.60	1.48	3.43
Effects				
G'	0.16*	0.03	0.10	-0.18
B'	-0.08	-0.16**	-0.00	-0.16
C'	-0.02	-0.10	0.01	-0.27*
L'	0.03	-0.10	0.04	-0.09
T'	-0.10	-0.03	-0.01	0.07
R'	-0.01	-0.56**	0.04	-0.54**
G'R'	-0.04	0.13*	0.02	0.02
B'R'	-0.04	0.08	-0.20*	-0.08
C'R'	0.00	0.25**	0.20*	-0.20
L'R'	0.05	-0.08	-0.04	-0.12
T'R'	-0.05	-0.03	-0.03	-0.02
S.E.±	0.056	0.049	0.081	0.109
c.v.%	14.2	8.6	15.5	9.0

Number of plants per sq.yd.

	SITKA SPRUCE KE 3	SITKA SPRUCE W 25	SCOTS PINE KE 3	SCOTS PINE W 25
Mean	810	535	696	517
Effects				
G'	67	-91	-5	66
B'	19	-115*	-8	-102*
C'	-61	-26	-13	60
L'	-22	22	94	0
T'	-17	-8	-4	12
R'	16	79	4	-6
G'R'	100	58	23	8
B'R'	22	-44	-79	-38
C'R'	-16	20	55	46
L'R'	77	-28	-70	8
T'R'	-14	-1	40	20
S.E.±	45.3	41.8	42.7	31.9
c.v.%	15.7	22.4	17.3	17.5

Table 89

Residual effects of green manures and comparison of compost and fertilizer

Kennington Extension KE 34, KE 46, KE 47; Wareham W 28, W 48, W 58

Years and Species	TREATMENT CROPS	TEST CROPS OF 1+0 SS SEEDBEDS	
		First year	Second year
1948	KE 34, W 28	- -	- -
1949	KE 46, W 48	KE 34, W 28	- -
1950	KE 47, W 58	KE 46, W 48	KE 34, W 28
1951	KE 34, W 28	KE 47, W 58	KE 46, W 48
1952	- -	KE 34, W 28	KE 47, W 58
Plot size:	4 ft. × 4½ ft.	3 ft. × 3 ft.	

Design At both centres 3 trials of identical design (48 plots in 4 blocks of 12) were laid out in consecutive years to form together a rotation experiment. The first season of each trial was devoted to six cropping treatments to be follwed in the second and third year by test crops of 1+0 Sitka spruce seedbeds.

Factorial test on: 6 cropping treatments (with basal fertilizer) × compost v. fertilizer on test crops

Cropping treatments	1948	1949 to 1951	seedrate (all years) g.per sq.yd.
lupins	yellow and blue lupins 1 crop	yellow lupins 2 crops	10
rye	spring oats var.'potato' followed by midsummer rye	winter rye 2 crops (3 crops in 1950)	30[1]
ryegrass	Westernwolth Italian + perennial ryegrass S.24	perennial ryegrass S.23	5
clover	white clover S.100 + Alsike clover	white clover S.100	1
conifer seedbeds	plots split for Sitka spruce v. Scots pine	Sitka spruce	standard rate
fallow	bare fallow	bare fallow	-

[1] 15 g. in 1948 and second crop in 1949

Manuring of TREATMENT CROPS, rate per sq.yd.

Fertilizer		units	1948	1949	1950	1951
N as 'Nitro-Chalk'[2]						
lupins	seedbed first crop	g.N	8½*	5*	4½	-
rye	seedbed first crop	g.N	8½*	5*	4½	4½
	digging in first crop[3]	g.N	-	4½	4½	4½
	seedbed second crop	g.N	5½	-	-	-
ryegrass	seedbed	g.N	8½*	5*	4½	4½
	after each cut	g.N	2½	4½	4½	4½
clover	seedbed	g.N	8½*	5*	4½	-
conifer	seedbeds	g.N	8½*	5*	4½	-
	topdressed early	g.N	-	4½	4½	4½
	topdressed late	g.N	-	-	-	4½
fallow			8½*	5*	4½	-
P as superphosphate						
applied in seedbed to all plots (including fallow)		g.P	5½	4½	4½	4½
K as potassium chloride						
applied in seedbed to all plots (including fallow)		g.K	7	4	4½	4½
ground chalk (Wareham only)		g.	140	250	250	200

[2] amounts marked with * were given as ammonium sulphate [3] oats in 1948

Manuring of TEST CROPS, rate per sq.yd.

	units	1949	1950	1951	1952
compost[ø]	kg.	4½	4½	4½	4½
Fertilizer					
N ammonium sulphate seedbed	g.N	5	-	-	-
'Nitro-Chalk' seedbed	g.N	-	4½	-	-
'Nitro-Chalk' topdressed early	g.N	4½	4½	4½	4½
'Nitro-Chalk' topdressed late	g.N	-	-	4½	4½
P superphosphate	g.P	4½	4½	4½	4½
K potassium chloride	g.K	4	4½	4½	4½

ø Roth.Nos: 1949 KE and W S.5706; 1950 KE and W S.5879; 1951 KE S.6015, W S.6016; 1952 KE S.6151, W S.6165

Table 89 cont.

Dates	TREATMENT CROPS								TEST CROPS							
	Kennington Extension				Wareham				Kennington Extension				Wareham			
	1948	1949	1950	1951	1948	1949	1950	1951	1949	1950	1951	1952	1949	1950	1951	1952
Manurial applications																
ground chalk	-	-	-	-	25/3	11/3	7/1	13/2	-	-	-	-	-	-	-	-
compost	-	-	-	-	-	-	-	-	11/3	23/2	1/3	26/2	17/3	8/3	6/3	5/3
N, P, K seedbed	19/4	7/4	9/3	1/3	25/3	19/3	15/3	6/3	11/3	23/2	1/3	26/2	17/3	8/3	6/3	5/3
N on conifers																
early summer	-	28/6	6/7	28/6	-	15/7	27/6	26/6	24/6	6/7	28/6	18/6	21/6	27/6	26/6	24/6
late summer	-	-	-	2/8	-	-	-	1/8	-	-	2/8	12/8	-	-	1/8	14/8
Broadcast sowing of conifer seed	20/4	14/4	28/3	3/4	19/4	1/4	27/3	28/3	28/3	28/3	5/4	19/4	5/4	27/3	30/3	9/4

Crops	TREATMENT CROPS date of sowing								TREATMENT CROPS date of digging in							
	Kennington Extension				Wareham				Kennington Extension				Wareham			
	1948	1949	1950	1951	1948	1949	1950	1951	1948	1949	1950	1951	1948	1949	1950	1951
lupins crop 1	8/5	21/4	10/5	1/5	-/5	2/4	9/5	17/5	3/8	18/7	13/7	16/7	31/7	20/7	26/7	23/7
crop 2	-	25/7	14/7	19/7	-	4/8	26/7	23/7	-	18/9	5/10	20/9	-	28/11	25/10	4/9
oats/rye crop 1	19/4	21/4	20/4	3/4	-/5	2/4	20/4	30/3	3/7	18/7	15/6	14/6	20/7	17/6	8/6	15/6
crop 2	13/8	20/7	16/6	23/6	9/8	4/8	15/6	18/6	-/10	14/9	3/8	20/9	8/1	28/11	26/7	4/9
crop 3	-	-	8/8	-	-	-	26/7	-	-	-	5/10	-	-	-	22/9	-
ryegrass	19/4	21/4	20/4	3/4	-/5	2/4	20/4	11/4	6/10	12/10	27/10	20/9	8/1	28/11	31/10	4/9
clover	19/4	21/4	20/4	3/4	-/5	2/4	20/4	11/4	12/10	12/10	27/10	20/9	8/1	28/11	31/10	4/9
conifers	20/4	14/4	28/3	3/4	19/4	1/4	27/3	28/3	-	-	-	-	-	-	-	-

SITKA SPRUCE

Height in inches	First crops				Second crops		
	1949	1950	1951	1952	1950	1951	1952
	KE 34	KE 46	KE 47	KE 34	KE 34	KE 46	KE 47
Mean	1.31	2.43	1.77	1.72	2.78	1.97	1.26
compost	1.41	2.42	1.56	1.69	2.72	1.87	1.09
fertilizer	1.21	2.44	1.98	1.75	2.84	2.08	1.42
S.E.±	0.020	0.072	0.051	0.043	0.079	0.056	0.031
clover	1.06	2.39	1.65	1.61	2.83	1.87	1.28
lupins	1.25	2.34	1.61	1.67	2.71	1.97	1.24
rye	1.33	2.29	1.74	1.61	2.80	1.95	1.20
ryegrass	1.33	2.84	1.79	1.76	2.72	2.06	1.25
conifers	1.43	2.32	1.77	1.87	2.90	2.09	1.25
fallow	1.45	2.38	2.06	1.81	2.72	1.90	1.30
S.E.±	0.035	0.124	0.089	0.075	0.136	0.098	0.053
Difference (fertilizer-compost) with:							
Mean	-0.20**	0.02	0.41**	0.06	0.12	0.21*	0.33**
S.E.±	0.029	0.101	0.072	0.061	0.111	0.080	0.043
clover	-0.22**	-0.26	0.22	0.02	0.19	0.58**	0.16
lupins	-0.22**	0.00	0.32	0.01	0.06	-0.10	0.45**
rye	-0.10	0.29	0.34	-0.01	0.19	0.20	0.32**
ryegrass	-0.30**	-0.12	0.42*	0.11	0.08	0.50*	0.35**
conifers	-0.10	-0.07	0.60**	0.05	0.18	0.00	0.47**
fallow	-0.26**	0.26	0.58**	0.18	0.02	0.08	0.21
S.E.±	0.070	0.248	0.178	0.150	0.272	0.195	0.106
c.v.%	7.6	14.5	14.2	12.4	13.8	14.0	11.9
	W 28	W 48	W 58	W 28	W 28	W 48	W 58
Mean	1.57	3.13	2.22	2.21	3.19	2.05	1.95
compost	1.69	3.34	2.04	2.24	2.99	1.98	1.89
fertilizer	1.45	2.93	2.41	2.19	3.40	2.13	2.02
S.E.±	0.076	0.105	0.091	0.065	0.144	0.059	0.057
clover	1.50	3.42	2.26	2.23	3.10	1.74	1.90
lupins	1.42	2.30	2.80	2.02	3.87	2.38	2.11
rye	1.55	2.92	2.42	2.18	2.93	2.26	1.97
ryegrass	1.24	3.01	2.14	2.12	2.89	2.18	1.96
conifers	1.85	2.99	1.59	2.42	3.57	2.06	1.88
fallow	1.86	4.15	2.12	2.30	2.81	1.70	1.89
S.E.±	0.132	0.182	0.158	0.112	0.249	0.102	0.099
Difference (fertilizer-compost) with:							
Mean	-0.24*	-0.41*	0.37**	-0.05	0.41	0.15	0.12
S.E.±	0.108	0.148	0.129	0.092	0.203	0.083	0.080
clover	0.19	0.30	0.00	-0.30	0.54	-0.34	0.08
lupins	-0.08	-1.17**	-0.01	-0.08	-0.37	0.38	0.15
rye	-0.53	-0.61	0.16	0.04	1.03*	0.36	0.21
ryegrass	-0.34	-0.89*	0.37	0.25	0.88	0.13	0.16
conifers	-0.06	-0.10	0.95**	-0.01	-0.11	0.34	0.16
fallow	-0.65*	0.02	0.73*	-0.18	0.50	0.00	-0.02
S.E.±	0.264	0.363	0.317	0.224	0.498	0.203	0.197
c.v.%	23.7	16.4	20.2	14.3	22.1	14.0	14.3

Table 89 cont.

SITKA SPRUCE

Number of plants per sq.yd.

	First crops				Second crops		
	1949	1950	1951	1952	1950	1951	1952
	KE 34	KE 46	KE 47	KE 34	KE 34	KE 46	KE 47
Mean	1145	949	1022	722	1298	1273	357
compost	1106	915	944	723	1187	1243	249
fertilizer	1185	984	1100	721	1410	1302	464
S.E.±	43.1	24.2	34.5	26.3	40.5	39.3	26.0
clover	1013	899	1030	682	1181	1214	371
lupins	1162	905	975	705	1309	1116	332
rye	1087	998	1105	771	1226	1354	337
ryegrass	1185	964	1003	632	1327	1324	369
conifers	1126	932	979	696	1328	1342	393
fallow	1299	998	1040	846	1420	1287	339
S.E.±	74.6	41.9	59.7	45.5	70.2	68.1	45.0
Difference (fertilizer-compost) with:							
Mean	79	68	155**	-2	223**	59	215**
S.E.±	60.9	34.2	48.8	37.2	57.3	55.6	36.8
clover	44	26	72	-45	140	27	64
lupins	-60	28	96	66	148	69	255**
rye	292	56	134	156	120	-78	232*
ryegrass	63	213*	196	33	226	190	315**
conifers	92	18	200	15	258	128	240*
fallow	42	69	232	-234*	444**	18	183
S.E.±	149.2	83.8	119.4	91.1	140.4	136.3	90.1
c.v.%	18.4	12.5	16.5	17.8	15.3	15.1	35.7
	W 28	W 48	W 58	W 28	W 28	W 48	W 58
Mean	1006	1190	1080	704	1024	901	626
compost	936	1164	1084	638	952	850	626
fertilizer	1076	1215	1077	769	1096	952	626
S.E.±	39.2	38.8	16.5	31.1	38.0	39.2	16.7
clover	880	1246	1062	658	1030	914	566
lupins	1030	1180	1128	634	1000	879	594
rye	966	1153	1052	710	919	909	700
ryegrass	980	1108	1054	734	1110	824	625
conifers	1058	1161	1074	692	1019	968	643
fallow	1123	1288	1113	793	1067	913	629
S.E.±	67.8	67.1	28.5	53.8	65.9	67.8	28.9
Difference (fertilizer-compost) with:							
Mean	139*	51	-7	131**	144*	102	-1
S.E.±	55.4	54.8	23.3	43.9	53.8	55.4	23.6
clover	88	122	-69	153	393**	112	66
lupins	147	99	57	298**	-6	57	-12
rye	345*	28	-68	176	50	138	24
ryegrass	38	-6	20	52	144	136	70
conifers	-69	-63	-30	46	160	218	-56
fallow	286*	126	48	58	124	-52	-98
S.E.±	135.6	134.3	57.1	107.6	131.8	135.7	57.8
c.v.%	19.0	16.0	7.5	21.6	18.2	21.3	13.0

Table 90

Steam

Ringwood R 20 - R 30

Years and Species 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-50: 1+0 Sitka spruce seedbeds

Design and Treatments

A test on steaming by the hollow spike 'Harrow' method was carried out in November 1947 on a strip of land (270 feet × 32 feet running NE-SW). This strip was split into 18 pairs of large plots (15 feet × 16 feet) with one plot steamed and one unsteamed in each pair. These large plots were divided into 9 square yard plots in 3 × 3 arrangement, with 3 foot paths to reduce risk of contamination. The central plots in each group of 9 square yard plots were either left unmanured or received compost[1]; the remaining 8 square yard plots formed the blocks of the 11 experiments, R 20 to R 30. (Detailed results of these experiments are shown elsewhere)

[1] the compost of bracken and hopwaste was applied annually at the rate of 2¼ kg. per sq.yd.
Roth. S. Numbers: 1948 S.5438; 1949 S.5706; 1950 S.5892

The table below shows the effect of steam for three equal lengths of the strip of land on which the steaming test was carried out; the three lengths occupying the sites of R 20 to R 22, R 23 to R 27, R 28 to R 30 respectively.

Results are given for the following sets of plots:

		Number of plots from which results are derived		
		R 20-22	R 23-27	R 28-30
Unmanured	occupying central position of group of 9 plots	6	6	4 or 6
Compost	occupying central position of group of 9 plots	6	6	4 or 6
Fertilizer	selected from R 20 to R 30, omitting plots with treatments other than N, P, K only	12 or 16	10 or 12	16 or 32
Whole expt.	omitting unmanured and compost treated plots	96	96	72 or 96

Results showing the interaction of steam with other treatments are shown under the experiment in question

	SCOTS PINE			SITKA SPRUCE						
	1948			1948			1949			1950
	R 20-22	R 23-27	R 28-30	R 20-22	R 23-27	R 28-30	R 20-22	R 23-27	R 28-30	R 28-30
Height in inches										
Mean										
Unmanured	1.30	1.24	1.21	0.71	0.59	0.72	0.74	0.63	0.53	0.34
Compost	1.52	1.39	1.53	0.71	0.75	0.78	0.76	0.82	0.81	0.75
Fertilizer	1.48	1.34	1.60	0.67	0.60	0.76	0.80	0.88	0.77	0.74
Whole expt.	1.74	1.41	1.55	0.81	0.68	0.77	0.79	0.84	0.82	1.16
Effect of steam with										
Unmanured	0.30	0.27	0.56	0.19	0.61	0.52	-0.03	0.19	0.31	0.04
Compost	0.16	0.65	0.64	0.07	0.56	0.54	0.11	0.64	0.41	-0.15
Fertilizer	0.22	0.45	0.83	0.16	0.48	0.60	0.04	0.35	0.51	-0.06
Whole expt.	0.14	0.55	0.64	0.06	0.56	0.56	0.17	0.30	0.34	-0.02
Number of plants per square yard										
Mean										
Unmanured	672	596	480	1152	796	801	898	1087	632	482
Compost	724	572	546	1000	874	762	535	636	557	575
Fertilizer	708	611	664	1053	807	963	658	896	583	614
Whole expt.	680	601	520	968	887	692	541	866	576	674
Effect of steam with										
Unmanured	0	0	48	264	400	186	200	434	128	124
Compost	-24	-40	-36	-48	212	120	294	308	254	282
Fertilizer	-27	30	0	18	134	198	69	216	460	197
Whole expt.	2	-12	-21	86	188	184	63	184	202	141

Table 91

Steam, formalin and acid

Ampthill Am 1

Years and Species 1949-1951 1+0 Sitka spruce seedbeds

Design and Treatments

A test on steaming by the 'Hoddesden Pipe' method was carried out in March 1949 on two strips of land, each 64 feet × 15 feet. Each strip was split into 2 pairs of MAIN PLOTS (Plot size 16 feet × 15 feet) with one plot steamed and one unsteamed in each pair. Each MAIN PLOT was divided into 6 SPLIT PLOTS of 2.7 square yards for tests on formalin, sulphuric acid and nitrogen.

Total number of MAIN PLOTS : 8 SPLIT PLOTS : 48

Split plot treatments

Factorial test on:

untreated
formalin × nitrogen
sulphuric acid

NO BASAL FERTILIZER

		units	rate per sq.yd. 1949	1950	1951
formalin[1]		ml.	450	-	-
sulphuric acid[2]		ml.	135	-	-
'Nitro-Chalk'	seedbed	g.N	-	4½	-
	topdressed early	g.N	4½	4½	4½
	topdressed late	g.N	4½	-	4½

[1] applied in 4½ l. water

[2] 135 ml. conc. H_2SO_4 applied in 4½ l. water, i.e. 3% v/v

Dates

Treatment applications	1949	1950	1951
sulphuric acid, formalin	12/3	-	-
'Nitro-Chalk' seedbed	-	3/3	-
topdressed early	7/7	30/6	4/7
topdressed late	29/8	-	3/8
Broadcast sowing of seed	2/4	25/3	11/4

SITKA SPRUCE

Height in inches

Split Plot Treatments	1949 unsteamed	1949 steamed	1950 unsteamed	1950 steamed	1951 unsteamed	1951 steamed
Mean	1.57	2.52	1.72	2.15	0.89	0.85
untreated	1.06	2.47	1.33	1.69	0.86	0.65
sulphuric acid	crop failure		2.02	2.79	0.99	1.14
formalin	2.07	2.58	1.83	1.97	0.82	0.76
S.E.±	0.066	0.090	0.077	0.116	0.050	0.040
EFFECT OF NITROGEN						
alone	0.05	0.18	0.19	0.60*	0.25*	0.14
with sulphuric acid	crop failure		0.64**	0.45	0.22*	-0.19*
with formalin	-0.12	-0.10	0.19	0.38	0.00	0.30**
S.E.±	0.132	0.180	0.154	0.233	0.099	0.080
c.v.%	11.9	10.1	12.7	15.3	15.8	13.2

Number of plants per sq.yd.

Split Plot Treatments						
Mean	779	768	370	403	758	785
untreated	800	798	321	410	703	680
sulphuric acid	crop failure		450	361	747	760
formalin	758	738	341	439	824	914
S.E.±	56.8	45.7	34.7	35.7	58.3	55.6
EFFECT OF NITROGEN						
alone	208	111	84	41	-106	-150
with sulphuric acid	crop failure		123	126	-192	123
with formalin	10	51	-3	-37	-212	-172
S.E.±	113.6	91.4	69.5	71.4	116.6	111.2
c.v.%	20.6	16.8	26.5	25.0	21.8	20.0

Table 92

Steam, formalin and nitrogen

Ampthill Am 10

Years and Species 1950 only. 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 8 feet)

Design 32 plots in 4 blocks of 8

All factorial combinations of: steam × formalin × nitrogen

Treatments

Ms	steaming	by Hoddesden pipe method, March 10-14, 1950
Mf	formalin	500 ml. per sq.yd. applied in 5 l. water, sealed off with 2½ l. on 16/3
N	'Nitro-Chalk'	4½ g.N per sq.yd. raked in during final preparation of seedbed on 23/3 4½ g.N per sq.yd. topdressed on 30/6

NO BASAL MANURING Broadcast sowing of seed: 3/4

SITKA SPRUCE

1950	Height in inches	Number of plants per sq.yd.
Mean	2.63	153
Effects		
Ms'	0.56**	-13
Mf'	0.66**	-55*
Ms'Mf'	-0.39**	-18
N'	0.27*	-20
N'Ms'	-0.06	-23
N'Mf'	0.14	-2
N'Ms'Mf'	0.02	1
S.E.±	0.113	19.6
c.v.%	12.2	36.7

Table 93

Rates of formalin

Old Kennington K 43, Ampthill Am 7, Am 8, Ringwood R 29

Years and Species 1950 only 1+0 Sitka spruce seedbeds

Design K 43, R 29 32 plots in 8 blocks of 4 (R 29: 4 blocks unsteamed, 4 blocks steamed in November 1947)
Am 7, Am 8 24 plots in 6 blocks of 4 (Plot size: ½ sq.yd.)

Basal dressings (K and R only)

	units	rate per sq.yd.
'Nitro-Chalk' seedbed	g.N	4½
topdressed	g.N	4½
superphosphate	g.P	4½
potassium chloride	g.K	4½

Dates	K 43	Am 7,8	R 29
formalin application	22/2	3/3	7/3
manuring			
seedbed (N, P, K)	22/2[2]	-	7/3[2]
N topdressed	6/7	-	26/6
Broadcast sowing of seed	27/3	5/4	29/3

SITKA SPRUCE

1950	Height in inches				Number of plants per sq.yd.			
Treatments	K 43	Am 8 (pH 6.4)	Am 7 (pH 5.3)	R 29	K 43	Am 8 (pH 6.4)	Am 7 (pH 5.3)	R 29
no formalin	0.81	1.16	1.59	0.73	345	327	173	820
formalin[1], in ml per sq.yd.								
125	1.86	1.62	2.35	1.84	795	433	170	910
250	2.06	1.82	2.70	2.23	752	484	172	901
500	2.28	2.36	2.85	2.93	868	481	103	940
S.E.±	0.053	0.098	0.149	0.072	60.0	30.4	22.3	42.4
c.v.%	8.6	13.7	15.4	10.5	24.6	17.3	35.1	13.4

[1] applied in 4 to 5 l. water, sealed off with 2 l. water

[2] N raked in during final preparation of seedbed K 43: 9/3 R 29: 13/3

Table 94

Rates and times of formalin

Old Kennington K 48, Ampthill Am 18, Ringwood R 39, Kennington Ext. KE 58, Bagley B 31, Wareham W 59

Years and Species 1951 1+0 Sitka spruce seedbeds

Design 36 plots in 4 blocks of 9

Factorial test on: 4 levels of formalin × (winter v. spring application)

Basal fertilizer, rate per sq.yd.

'Nitro-Chalk', 9 g.N in two equal dressings of 4½ g., topdressed early and late summer
superphosphate, 4½ g.P
potassium chloride, 4½ g.K

Bagley only: 150 g. ground chalk applied in December 1950

Dates Treatment application		K 48	Am 18	R 39	KE 58	B 31	W 59
formalin[1] winter		12/12	9/12	23/1	12/12	12/12	23/1
spring[2]		21/3	12/3	8/3	1/3	29/3	6/3
P, K in seedbed		1/3	12/3	8/3	1/3	29/3	6/3
nitrogen topdressed	early	28/6	4/7	25/6	28/6	29/6	26/6
	late	2/8	3/8	1/8	2/8	2/8	1/8
Broadcast sowing of seed		11/4	11/4	14/4	5/4	18/4	30/3

[1] applied in 3 to 5 l. water, sealed off with 2 l. water [2] applied after forking in fertilizer

1951 SITKA SPRUCE

Treatments FORMALIN, ml. per sq.yd.	K 48	Am 18	R 39	KE 58	B 31	W 59
	Height in inches					
MEANS						
none	1.63	1.34	1.58	2.34	2.20	2.06
S.E.±	0.111	0.102	0.068	0.123	0.135	0.169
Mean of 3 levels[3]	3.48	2.57	2.46	3.05	2.37	2.95
S.E.±	0.064	0.059	0.039	0.071	0.078	0.098
125	2.90	2.38	2.39	2.83	2.63	2.60
250	3.71	2.62	2.42	2.98	2.10	2.82
500	3.82	2.72	2.56	3.34	2.38	3.44
S.E.±	0.111	0.102	0.068	0.123	0.135	0.169
DIFFERENCES (spring-winter) with:						
Mean of 3 levels	0.21	0.24	-0.04	0.41**	-0.00	-0.03
S.E.±	0.128	0.118	0.078	0.142	0.156	0.196
125	-0.06	0.33	0.12	0.54*	-0.12	0.36
250	0.34	0.16	-0.24	0.58*	-0.08	-0.24
500	0.36	0.22	0.01	0.13	0.18	-0.21
S.E.±	0.221	0.204	0.136	0.246	0.270	0.339
In addition						
250 in winter + 250 in spring	3.88	2.88	2.21	3.06	2.75	3.28
S.E.±	0.156	0.144	0.096	0.174	0.191	0.240
c.v.%	10.1	12.4	8.6	12.4	16.1	17.2
	Number of plants per square yard					
MEANS						
none	1129	972	1125	930	1741	1099
S.E.±	56.6	57.0	44.5	47.5	101.0	34.6
Mean of 3 levels	1173	951	1194	1004	1971	1074
S.E.±	32.7	32.9	25.7	27.4	58.3	20.0
125	1228	868	1214	1010	1874	1060
250	1143	1044	1188	988	2072	1051
500	1149	942	1179	1012	1966	1112
S.E.±	56.6	57.0	44.5	47.5	101.0	34.6
DIFFERENCES (spring-winter) with:						
Mean of 3 levels	42	-68	90	-60	36	-30
S.E.±	65.4	65.8	51.4	54.9	116.6	40.0
125	128	40	80	-4	3	-14
250	99	-147	6	54	58	-74
500	-102	-99	186*	-231*	48	-4
S.E.±	113.3	114.0	89.0	95.1	201.9	69.2
In addition						
250 in winter + 250 in spring	1174	792	1230	1156	1742	1038
S.E.±	80.1	80.6	62.9	67.2	142.8	48.9
c.v.%	13.8	17.2	10.6	13.3	15.1	9.1

[3] i.e., 125 ml., 250 ml., 500 ml.

Table 95

Rates and times of formalin

Old Kennington K 55, Ampthill Am 21, Ringwood R 48, Kennington Extension KE 64

Years and Species 1952 1+0 Sitka spruce seedbeds (crop failed at Ampthill)

Design 40 plots in 4 blocks of 10

Factorial test on: 4 levels of formalin drench × (winter v. spring application)

Additional test: neat formalin injected × (winter v. spring application)

Treatments

	neat formalin, ml. per sq.yd. level 1	2	3	
Formalin drench	125	250	500	(winter: applied in 3 to 5 l. water, sealed off with 2 l. water (spring: applied in 4 to 6 l. water, sealed off with 1½ to 2 l. water
Formalin neat injected	-	250	-	36 shots of 7 ml. injected 4 in. deep, 6 in. apart

Basal fertilizer, rate per sq.yd.

			units	K,Am	R	KE
N[1]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	4½
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	4½	-

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE

Dates

Treatment application		K	Am	R	KE
formalin	winter	18/12	28/12	21/12	18/12
	spring[2]	27/2	29/2	4/3	28/2
P, K, Mg fertilizer		26/2	29/2	4/3	27/2
nitrogen topdressed	early	18/6	26/6	25/6	18/6
	late	12/8	-	15/8	12/8
Broadcast sowing of seed		23/4	30/4	16/4	19/4

[2] applied after forking in fertilizer

SITKA SPRUCE

1952

Treatments	Height in inches K 55	R 48	KE 64	Number of plants per sq.yd. K 55	R 48	KE 64
MEANS						
no treatment	1.20	1.12	1.68	469	694	687
S.E.±	0.102	0.055	0.072	57.7	29.9	34.1
formalin drench						
Mean of 3 levels	2.24	1.88	2.67	762	718	621
S.E.±	0.059	0.032	0.041	33.4	17.3	19.7
level 1	2.00	1.83	2.59	754	737	574
2	2.19	1.77	2.70	758	694	676
3	2.52	2.03	2.74	772	723	613
formalin injected neat						
level 2	1.55	1.42	1.94	436	694	582
S.E.±	0.102	0.055	0.072	57.7	29.9	34.1
DIFFERENCES (spring-winter) with:						
formalin drench						
Mean of 3 levels	-0.29*	-0.30**	-0.32**	-14	32	36
S.E.±	0.117	0.063	0.083	66.7	34.6	39.4
level 1	-0.21	-0.04	-0.04	-54	2	64
2	-0.28	-0.31**	-0.10	100	54	-84
3	-0.38	-0.54**	-0.82**	-87	39	128
formalin injected neat						
level 2	0.33	-0.12	0.00	-36	48	117
S.E.±	0.203	0.110	0.143	115.5	59.9	68.3
c.v.%	15.2	9.5	8.7	25.6	12.0	15.4

Table 96

Formalin, dolomitic limestone, high calcium limestone

Wareham W 75, W 76

Years and Species W 75 1952-1954, W 76 1953-1954 1+0 Sitka spruce seedbeds

Design 16 plots in 4 blocks of 4 plots; confounding 3-term interaction with pairs of blocks in 1954

Factorial test on:

Formalin × dolomitic limestone × high calcium limestone (1954 only)

Treatments

		units	rate per sq.yd. W 75 1952	W 75 1953	W 75 1954	W 76 1953	W 76 1954
Mf	formalin[1]	ml.	250	250	250	250	250
Rd	dolomitic limestone (containing 4.5 g.Mg)	g.	60	-	-	60	-
Rc	high calcium limestone	g.	-	-	200	-	200

Basal fertilizer (all years) rate per sq.yd.

'Nitro-Chalk' topdressed	early	4½ g.N
	late	4½ g.N
superphosphate		4½ g.P
potassium chloride		9 g.K

Note W 75 cleared from Calluna in January 1952
W 76 cleared from Calluna in January 1953

Dates	1952	1953	1954
Treatment applications			
limestone	23/1	20/1	15/12
formalin winter	-	20/1	15/12
spring	5/3	-	-
P, K, fertilizer	5/3	3/3	9/3
N topdressed early	24/6	24/6	24/6
late	14/8	30/7	4/8
Broadcast sowing of seed	3/4	13/3	25/3

[1] applied in 4 to 5 l. water, sealed off with 2 l. water in 1952

SITKA SPRUCE

	First year after Calluna W 75 1952	W 76 1953		Second year after Calluna W 75 1953	W 76 1954	Third year after Calluna W 75 1954
Height in inches						
Mean	1.56	2.11	Mean	2.71	1.69	1.51
EFFECTS			EFFECTS			
Mf'	0.21	0.59**	Mf'	-0.02	0.00	-0.61*
Rd'	-0.50**	-0.47**	Rd' residual	-0.62*	-0.31	0.36
Mf' × Rd'	-0.27	-0.21	Mf' × Rd' residual	0.28	-0.31	0.02
S.E.±	0.128	0.122	Rc'	-	-0.23	0.30
c.v.%	16.4	11.6	Mf' × Rc'	-	-0.20	0.05
			Rd' residual × Rc'	-	0.18	0.08
			S.E.±	0.202	0.251	0.212
			c.v.%	14.9	29.7	28.0

Number of plants per sq.yd.						
Mean	806	1056	Mean	1472	746	737
EFFECTS			EFFECTS			
Mf'	46	-242	Mf'	44	-4	-25
Rd'	-2	184	Rd' residual	26	-47	29
Mf' × Rd'	-131*	4	Mf' × Rd' residual	78	50	61
S.E.±	46.0	123.6	Rc'	-	14	-50
c.v.%	11.4	23.4	Mf' × Rc'	-	55	14
			Rd' residual × Rc'	-	-25	-1
			S.E.±	71.9	57.8	42.5
			c.v.%	9.8	15.5	11.5

Table 97

Formalin test on plots laid down for mycological observations

Old Kennington K 76,80; Ampthill Am 43,53; Ringwood R 74,82; Kennington Ext. KE 82,87; Bagley B 46,48; Wareham W 81,87

Years	Species	Experiments	Design
1954-1955	1+0 Sitka spruce seedbeds	K 76, Am 43, B 46, W 81	4 plots in 2 × 2 Latin Square
		R 74, KE 82	4 plots in 2 blocks of 2
1955	seedbed plots (7½ ft. × 3 ft.) split into 2 square yards for 1+0 Sitka spruce v. 1+0 Aleppo pine	Am 53 R 82, KE 87, B 48, W 87 K 80	8 plots in two 2 × 2 Latin Squares 8 plots in 4 blocks of 2

Treatments

untreated

formalin 250 ml. per sq.yd. applied in water (1954: 5 to 6 l., 1955: 4 to 5 l.)

Basal fertilizer, rate per sq.yd.

			units	1954 K/Am	1954 all others	1955 all centres
N[1]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	9
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	3	3

[1] ammonium sulphate at K and Am, 'Nitro-Chalk' at R, KE, B, W

Dates

Treatment applications	1954 K	1954 Am	1954 R	1954 KE	1954 B	1954 W	1955 K	1955 Am	1955 R	1955 KE	1955 B	1955 W
formalin	8/12	12/12	10/12	9/12	9/12	11/12	31/1	21/12	22/12	31/1	4/1	23/12
P, K, Mg fertilizer	5/3	4/3	25/2	5/3	5/3	24/2	15/3	21/3	9/3	16/3	16/3	11/3
N topdressed early	29/6	30/6	23/6	29/6	29/6	24/6	4/7	6/7	30/6	4/7	4/7	28/6
late	5/8	6/8	3/8	5/8	9/8	4/8	4/8	5/8	2/8	4/8	4/8	3/8
Broadcast sowing of seed	27/3	30/3	5/4	25/3	5/4	17/3	15/4	6/4	1/4[2]	12/4	18/4	19/3[3]

[2] R 82 5/4 [3] W 87 3/4

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	K 76	Am 43	R 74	KE 82	B 46	W 81	K 76	Am 43	R 74	KE 82	B 46	W 81
1954												
no formalin	2.37	2.51	1.22	2.02	2.45	3.06	672	1734	840	681	702	1122
formalin	3.82	3.42	2.44	2.69	4.42	3.16	855	1920	1077	648	609	1011
1955												
no formalin	0.85	0.72	0.58	0.92	1.30	2.18	534	342	678	867	636	1179
formalin	1.44	1.28	1.22	1.01	1.24	1.62	828	228	1197	1071	912	963
	K 80	Am 53	R 82	KE 87	B 48	W 87	K 80	Am 53	R 82	KE 87	B 48	W 87
1955												
no formalin	1.01	0.67	0.79	1.61	1.59	1.84	926	1408	891	1280	1262	1203
formalin	1.24	0.87	1.66	1.66	2.14	2.10	1152	1136	826	1191	1302	1044

ALEPPO PINE

1955												
no formalin	3.45	2.38	2.21	3.30	1.75	3.35	410	446	513	504	554	332
formalin	4.36	2.51	2.79	3.15	1.76	3.84	388	396	516	501	458	490

Table 98

Formalin

Ampthill Am 14, Am 15

Years and Species Am 14 1951-1952, Am 15 1951 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 8 feet)

Design 4 × 4 Latin Squares

test on:

Am 14 formalin (1951) × formalin (1952)

Am 15 formalin (1951)[1]

[1] test on transplants in 1952 (see separate table)

Treatments (Am 14, Am 15)

	rate in ml. per sq.yd. 1951	1952
formalin, applied in 4 l. water (sealed off with 2 l. water)	500	250

NO BASAL MANURING

Dates

	1951	1952		1951	1952
formalin	12/3	29/2	broadcast sowing of seed	12/4	30/4

SITKA SPRUCE

	Height in inches			Number of plants per sq.yd.		
	Am 15	Am 14		Am 15	Am 14	
	1951	1951	1952	1951	1951	1952
Mean	1.42	1.59	0.94	1036	810	183
Effects						
formalin current'	0.98**	1.26**	0.23*	-197*	-273**	-68
formalin residues'	-	-	0.25*	-	-	57
formalin curr. × resid.'	-	-	-0.15	-	-	-19
S.E.±	0.090	0.094	0.069	59.3	48.5	30.9
c.v.%	12.7	11.8	14.7	11.5	12.0	33.7

Table 99

Method of formalin application

Ampthill Am 2

Years and Species 1949 only 1+0 Sitka spruce

Design 12 plots in 3 blocks of 4

Treatments	Height in inches (formalin treated positions underlined) distance in inches from end of plot 9	13½	18	22½	27	Number of plants per sq.yd. distance in inches from end of plot 9	13½	18	22½	27
untreated	1.1	-	1.1	-	1.0	426	-	462	-	498
450 ml. formalin applied										
neat in 2 drills 18 inches apart	1.8	1.5	1.1	1.5	2.3	288	372	510	516	300
dilute[1] in 2 drills 18 inches apart	1.9	1.4	1.0	1.6	2.4	570	660	540	492	366
dilute[1] uniformly over the whole plot	2.2	-	2.3	-	2.1	318	-	522	-	516

[1] in 4½ l. water

NO BASAL FERTILIZER

Dates formalin 12/3 broadcast sowing of seed 2/4

Table 100

Times and methods of formalin application

Old Kennington K 71,78 Ampthill Am 40,48 Ringwood R 71,76

Years and Species 1+0 Sitka spruce 1954 K 71, Am 40, R 71
1955 K 78, Am 48, R 76

Design 36 plots in 4 blocks of 9; 1 additional untreated plot in each block making a total of 40 plots

Factorial test on:

formalin neat (Mfn)		autumn
formalin neat + water (Mfn + W)	×	winter
formalin drench (Mf)		spring

Treatments, all applied at the rate 150 ml. formalin per sq.yd.

Mfn	neat formalin applied by power spray to soil surface
Mfn + W	as Mfn but followed after one to three hours by the same amount of water as that applied in the drench
Mf	formalin as drench, applied in 4 to 6 l. water

Basal fertilizer, rate per sq.yd.

			units	1954 K/Am	1954 R	1955 K/Am/R
N[1]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	9
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	3	3

[1] ammonium sulphate at K and Am
'Nitro-Chalk' at R

Dates

Year of cropping:- Treatment applications		1954 K	1954 Am	1954 R	1955 K	1955 Am	1955 R
BEFORE SOWING							
formalin	autumn	6/11	7/11	16/11	28/10	3/11	25/10
	winter	8/12	14/12	10/12	1/2	29/12	22/12
	spring	5/3	2/3	25/2	15/3	18/3	8/3
P, K, Mg fertilizer		5/3	2/3	25/2	15/3	18/3	8/3
TOPDRESSED							
Nitrogen	early	29/6	30/6	23/6	4/7	6/7	30/6
	late	5/8	6/8	3/8	4/8	5/8	2/8
Broadcast sowing of seed		27/3	31/3	6/4	20/4	13/4	2/4

SITKA SPRUCE

Height in inches

	1954 Am 40	1954 K 71	1954 R 71	1955 Am 48	1955 K 78	1955 R 76
Untreated	1.82	1.91	1.60	0.72	0.82	0.94
autumn						
Mfn	2.32	3.00	1.98	0.87	1.14	1.60
Mfn + W	2.35	2.82	2.39	0.96	0.96	1.73
Mf	2.64	3.33	2.51	1.07	1.29	1.73
winter						
Mfn	2.24	2.66	2.41	0.89	1.04	1.01
Mfn + W	2.44	2.73	2.39	0.89	1.14	1.32
Mf	2.70	3.55	2.58	0.81	1.23	1.64
spring						
Mfn	2.79	2.37	2.55	0.73	0.78	1.22
Mfn + W	3.16	2.92	2.50	0.78	0.84	1.40
Mf	3.20	3.22	2.52	0.92	1.03	1.48
S.E.±	0.089	0.136	0.113	0.064	0.072	0.063
Averaging times						
Mfn	2.45	2.68	2.31	0.83	0.98	1.28
Mfn + W	2.65	2.82	2.43	0.88	0.98	1.48
Mf	2.85	3.37	2.54	0.94	1.18	1.62
S.E.±	0.051	0.078	0.065	0.037	0.041	0.036
c.v.%	6.0	9.5	9.7	14.9	13.9	8.9

Number of plants per sq.yd.

	1954 Am 40	1954 K 71	1954 R 71	1955 Am 48	1955 K 78	1955 R 76
Untreated	1196	738	900	850	363	1062
autumn						
Mfn	1352	892	874	974	657	1174
Mfn + W	1322	884	993	930	658	1006
Mf	1524	975	818	825	652	952
winter						
Mfn	1374	831	806	920	366	1122
Mfn + W	1320	940	951	906	582	1068
Mf	1428	850	796	758	795	993
spring						
Mfn	1590	783	808	1026	561	1092
Mfn + W	1548	669	780	968	596	984
Mf	1526	784	816	1062	664	1083
S.E.±	90.2	60.5	80.1	75.8	69.5	65.1
Averaging times						
Mfn	1439	836	830	973	528	1130
Mfn + W	1397	831	908	934	612	1020
Mf	1493	870	810	882	704	1010
S.E.±	52.1	34.9	46.3	43.8	40.1	37.6
c.v.%	11.0	14.5	18.8	16.4	23.6	12.3

Table 101

Methods, rates and times of formalin application

Old Kennington K 81, Ampthill Am 49, Ringwood R 77

Years and Species 1955 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding highest order interaction; 2 additional untreated plots per block making 40 plots in all

Formalin treatments

RATES 100 ml. (level 1) v. 200 ml. (level 2) per sq.yd.

× TIMES winter (Aw) v. spring (Af)

× METHODS coarse jet: neat, by power spray, using a precision sprayer fitted with Allman jet 4 one pass for single rate, two for double rate (in imitation of full-scale machine application)

fine jet: neat, by power spray, using a precision sprayer fitted with Allman jet 000

drill: neat, in 4 drills each of 25 or 50 ml. Drills 2 in. deep, 1½ in. wide, 9 in. apart

drench: applied in 4 to 5 l. water by watering can

Basal fertilizer, rate per sq.yd.

ammonium sulphate (K and Am), 'Nitro-Chalk' (R), 9 g.N in two equal topdressings of 4½ g. superphosphate 9 g.P; potassium chloride 9 g.K; kieserite 3 g.Mg

Dates		K	Am	R
Treatment applications:	formalin in winter	1/2	29/12	23/12
	formalin in spring, P, K, Mg fertilizer	15/3	18/3	8/3
	N topdressed early	4/7	6/7	29/6
	late	4/8	5/8	2/8
Broadcast sowing of seed		18/4	13/4	1/4

SITKA SPRUCE

1955

	Height in inches			Total Number of plants per sq.yd.			Number of usable[1] plants per sq.yd.		
	K 81	Am 49	R 77	K 81	Am 49	R 77	K 81	Am 49	R 77
MEANS									
Untreated	0.66	0.64	1.07	269	635	1303	4	16	181
coarse jet	0.86	0.87	1.28	308	856	1070	19	67	301
fine jet	0.84	0.78	1.31	320	757	1203	12	40	371
drill	1.35	0.90	1.42	404	823	1279	133	113	485
drench	1.14	0.88	1.53	644	908	1277	138	90	565
S.E.±	0.058	0.048	0.030	42.0	102.3	60.0	-	-	38.2
EFFECT OF (Af-Aw)' WITH:									
coarse jet	-0.22	-0.11	-0.14*	-12	-234	38	-14	-56	-86
fine jet	-0.12	-0.09	-0.01	66	-68	-69	-9	-32	4
drill	0.02	0.12	-0.10	-56	-94	-112	25	44	-135
drench	-0.15	-0.12	0.10	168	67	-72	-62	-33	57
EFFECT OF (level 2-1)' WITH:									
coarse jet	0.17	0.13	0.09	-96	288	182	14	44	110
fine jet	0.16	-0.07	-0.01	12	-110	45	18	-10	46
drill	0.24	0.04	0.06	96	239	12	51	37	72
drench	0.31*	0.08	0.16*	209*	90	-23	153	53	124
S.E.±	0.116	0.096	0.060	83.9	204.6	120.0	-	-	76.4
c.v.%	15.6	15.9	6.2	28.3	34.6	14.0	-	-	25.1

[1] plants over 1½ in. high

Table 102

Formalin and chloropicrin

Old Kennington K 63B, Ampthill Am 33B, Ringwood R 60B, Kennington Extension KE 76B

Years and Species 1953 to 1955 1+0 Sitka spruce seedbeds (Plot size: 3 ft. × 6 ft.)

Design 16 plots in 8 blocks of 2 Blocks 1, 3, 6, 8 cropped in 1953 and 1955
Blocks 2, 4, 5, 7 cropped in 1954

Treatments applied during winter before cropping

Mf formalin 250 ml. per sq.yd. applied 1953 in 4 to 5 l. water, 1954 and 1955 5 to 6 l. water

Mcp chloropicrin 32 ml. per sq.yd. applied as 16 shots of 2 ml. injected 9 in. apart in all years; 4 in. deep in 1953 and 6 in. deep in 1954 and 1955

Basal fertilizer, rate per sq.yd.

			1953		1954		1955
		units	K,Am	R,KE	K,Am	R,KE	all centres
N[1]	topdressed early	g.N	4½	4½	4½	4½	4½
	late	g.N	4½	4½	4½	4½	4½
P	superphosphate	g.P	4½	4½	4½	4½	9
K	potassium chloride	g.K	4½	9	4½	9	9
Mg	kieserite	g.Mg	-	1½	-	3	3

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE

Dates

	1953				1954				1955			
Treatment application	K	Am	R	KE	K	Am	R	KE	K	Am	R	KE
formalin, chloropicrin	13/1	29/1	22/1	15/1	8/12	12/12	10/12	9/12	3/1	20/12	22/12	3/1
P, K, Mg fertilizer	23/2	26/2	27/2	24/2	5/3	4/3	25/2	5/3	15/3	21/3	8/3	16/3
N topdressed early	30/6	2/7	23/6	30/6	29/6	30/6	23/6	29/6	4/7	6/7	30/6	4/7
late	6/8	10/8	30/7	5/8	5/8	6/8	3/8	5/8	4/8	5/8	2/8	4/8
Broadcast sowing of seed	18/3	25/3	18/3	19/3	26/3	31/3	6/4	26/3	21/4	13/4	1/4	20/4

SITKA SPRUCE

	1953				1954				1955			
	K 63B	Am 33B	R 60B	KE 76B	K 63B	Am 33B	R 60B	KE 76B	K 63B	Am 33B	R 60B	KE 76B
Height in inches												
Mean	2.80	2.97	2.65	3.39	2.49	3.11	2.39	2.76	1.46	1.13	1.66	1.51
EFFECT (Mcp-Mf)'	-0.06	-0.62	-0.21	0.02	-0.06	-0.26	0.03	-0.09	0.32	0.18	0.30	0.39
Number of plants per sq.yd.												
Mean	704	518	920	619	664	1515	652	906	733	550	1272	824
EFFECT (Mcp-Mf)'	-54	-234	-33	-52	81	-26	-99	71	78	-87	-98	66

Table 103

Times and rates of formalin and chloropicrin

Old Kennington K 68, Ampthill Am 30, Ringwood R 59

Years and Species 1953 1+0 Sitka spruce seedbeds

Design 16 plots in 4 blocks of 4 plots confounding highest order interaction; 1 untreated plot per block making 20 plots in all

Factorial test on: formalin (Mf) v.chloropicrin (Mcp) × level 1 v.2 × winter v.spring

Treatments

formalin	level 1	167 ml. per sq.yd.	applied in 3 to 5 l. water
	2	333 ml. per sq.yd.	
chloropicrin	level 1	24 ml. per sq.yd.	12 shots of 2 ml. 4 in. deep, 9 in. apart in one direction, 12 in. apart in the other
	2	48 ml. per sq.yd.	24 shots of 2 ml. 4 in. deep, 9 in. apart in one direction, 6 in. apart in the other

Basal fertilizer, rate per sq.yd.

			units	K/Am	R
N[1]	topdressed	early	g.N	4½	4½
		late	g.N	4½	4½
P	superphosphate		g.P	4½	4½
K	potassium chloride		g.K	4½	9
Mg	kieserite		g.Mg	-	1½

[1] ammonium sulphate at K and Am 'Nitro-Chalk' at R

Dates

Treatment applications		K	Am	R
formalin, chloropicrin	winter	13/1	16/1	22/1
	spring	23/2	26/2	27/2
P, K, Mg fertilizer		23/2	26/2	27/2
N topdressed	early	30/6	2/7	23/6
	late	6/8	10/8	30/7
Broadcast sowing of seed		18/3	24/3	31/3

SITKA SPRUCE

1953

	Height in inches			Number of plants per sq.yd.		
	K 68	Am 30	R 59	K 68	Am 30	R 59
MEANS						
no treatment	1.77	1.78	1.37	648	408	1114
S.E.±	0.101	0.155	0.096	53.8	39.7	61.0
formalin	2.80	2.70	2.41	716	366	1148
chloropicrin	2.47	2.94	2.74	664	404	1093
winter	2.79	2.80	2.78	730	386	1162
spring	2.48	2.84	2.37	650	384	1078
S.E.±	0.072	0.110	0.068	38.0	28.1	43.1
EFFECTS						
(Mcp-Mf)' with:						
Mean of winter and spring	-0.33**	0.24	0.33**	-52	38	-55
S.E.±	0.101	0.155	0.096	53.8	39.7	61.0
winter	-0.66**	0.27	-0.10	-99	-16	-2
spring	-0.01	0.22	0.76**	-6	93	-108
S.E.±	0.143	0.220	0.136	76.1	56.2	86.2
(level 2-1)' with:						
Mean of treated plots	0.12	0.13	-0.15	33	-52	49
S.E.±	0.101	0.155	0.096	53.8	39.7	61.0
formalin	0.13	0.05	0.10	-94	-45	27
chloropicrin	0.10	0.20	-0.40*	160	-58	70
winter	0.13	0.27	-0.19	54	-70	-46
spring	0.10	-0.01	-0.11	12	-33	144
S.E.±	0.143	0.220	0.136	76.1	56.2	86.2
c.v.%	8.2	11.9	8.3	15.8	20.4	10.9

Table 104

Times of application of formalin and chloropicrin

Kennington Extension KE 79/80, Bagley B 44/45, Wareham W 78/79

Years and Species 1+0 Sitka spruce seedbeds

At each of these centres two parallel sets of experiments were laid down side by side to be cropped in alternate years so that treatments could be applied during the fallow season

	1953 and 1955	1954 and 1956
Fallow	KE 80, B 45, W 79	KE 79, B 44, W 78
Cropped	KE 79, B 44, W 78	KE 80, B 45, W 79

Design 16 plots in 4 blocks of 4

KE 79/80 and W 78/79 1 additional untreated plot per block making 20 plots in all
B 44/45 2 additional untreated plots per block making 24 plots in all

Factorial test on:

1953	formalin (Mf)	v.	chloropicrin (Mcp)	×	winter (Aw)	v.	spring (Af) application
1954-1956	formalin (Mf)	v.	chloropicrin (Mcp)	×	summer (Ae)	v.	winter (Aw) application

Treatments

formalin 250 ml. per sq.yd. applied in water (for dilution see below)

chloropicrin 32 ml. per sq.yd. applied as 16 shots of 2 ml. injected 4 in. deep in 1953 and 6 in. deep in 1954, 1955, 1956; all 9 in. apart

dilution of formalin, l. water per sq.yd.

Year of cropping:	1953		1954		1955		1956	
	Aw	Af	Ae	Aw	Ae	Aw	Ae	Aw
	4 to 5	4 to 5½	10	5 to 6	5 to 8	4 to 5	5	3 to 4

Basal fertilizer, rate per sq.yd.		units	1953	1954	1955	1956
'Nitro-Chalk' topdressed	early	g.N	4½	4½	4½	4½
	late	g.N	4½	4½	4½	4½
superphosphate		g.P	4½	4½	9	9
potassium chloride		g.K	9	9	9	9
kieserite		g.Mg	1½	3	3	3

150 g. of ground limestone applied at Bagley in December 1952

Dates	Year of cropping											
	KE 79/80				B 44/45				W 78/79			
Treatment applications	1953	1954	1955	1956	1953	1954	1955	1956	1953	1954	1955	1956
BEFORE SOWING												
Mf and Mcp summer	-	1/7	30/6	5/7	-	1/7	30/6	5/7	-	25/6	24/6	28/6
winter	14/1	9/12	3/1	13/12	15/1	9/12	4/1	13/12	20/1	11/12	23/12	9/12
spring	24/2	-	-	-	25/2	-	-	-	28/2	-	-	-
P, K, Mg fertilizer	24/2	5/3	16/3	9/3	25/2	5/3	16/3	23/3	28/2	24/2	11/3	7/3
TOPDRESSED												
nitrogen early	30/6	29/6	4/7	6/7	1/7	29/6	4/7	28/6	24/6	24/6	28/6	26/6
late	5/8	5/8	4/8	25/7	5/8	9/8	4/8	25/7	30/7	4/8	3/8	31/7
Broadcast sowing of seed	19/3	25/3	12/4	24/3	20/3	5/4	18/4	29/3	25/3	16/3	24/3	23/3

SITKA SPRUCE

1953

Treatments	Height in inches			Number of plants per sq.yd.		
	KE 79	B 44	W 78	KE 79	B 44	W 78
MEANS						
none	2.47	4.84	2.30	753	670	951
S.E.±	0.177	0.139	0.160	51.6	26.0	67.4
Mf	3.17	5.72	3.47	691	591	1054
Mcp	3.42	4.84	3.62	603	638	1053
S.E.±	0.125	0.139	0.113	36.5	26.0	47.6
Mean of treated plots	3.30	5.28	3.54	647	615	1053
EFFECTS						
(Mcp-Mf)'	0.25	-0.88**	0.15	-88	47	-1
(Af-Aw)'	-0.24	-0.83**	-0.36*	-4	-152**	4
(Mcp-Mf)' × (Af-Aw)'	0.03	-0.59**	-0.12	4	16	56
S.E.±	0.177	0.197	0.160	51.6	36.8	67.4
c.v.%	11.3	7.7	9.7	15.4	11.6	13.0

Table 104 cont.

SITKA SPRUCE

	1954			1955			1956		
Height in inches	KE 80	B 45	W 79	KE 79	B 44	W 78	KE 80	B 45 see note	W 79
MEANS									
none	2.61	3.24	3.08	0.93	2.02	1.80	1.64	3.13	2.00
S.E.±	0.155	0.140	0.221	0.080	0.171	0.152	0.173	0.103	0.101
Mf	2.86	3.25	3.65	1.18	2.99	2.03	2.35	3.64	2.65
Mcp	3.12	3.28	3.78	1.67	2.85	2.19	2.91	4.02[1]	3.17
S.E.±	0.110	0.140	0.156	0.056	0.171	0.107	0.122	0.103[2]	0.072
Mean of treated plots	2.99	3.26	3.71	1.42	2.92	2.11	2.63	3.64[3]	2.91
EFFECTS									
(Mcp-Mf)'	0.26	0.03	0.12	0.49**	-0.14	0.16	0.56**	-	0.52**
(Aw-Ae)'	0.04	-0.52*	0.62*	0.37**	0.14	0.29	0.78**	0.20[3]	0.32**
(Mcp-Mf)' × (Aw-Ae)'	-0.47*	-0.25	0.13	0.06	-0.98**	0.23	-0.13	-	-0.58**
S.E.±	0.155	0.198	0.221	0.080	0.241	0.152	0.173	0.205	0.101
c.v.%	10.7	12.2	12.3	12.1	18.4	14.8	14.2	8.3	7.4
Number of plants per sq.yd.									
MEANS									
none	825	1157	898	1053	1074	1371	712	1308	1456
S.E.±	41.6	46.4	38.3	105.5	72.3	50.8	68.4	37.9	67.3
Mf	763	1070	921	1010	1065	1230	838	1216	1436
Mcp	843	1018	940	913	938	1163	881	1293[1]	1381
S.E.±	29.4	46.4	27.1	74.6	72.3	35.9	48.4	37.9[2]	47.6
Mean of treated plots	803	1044	931	962	1002	1197	860	1216[3]	1408
EFFECTS									
(Mcp-Mf)'	80	-52	20	-98	-127	-67	43	-	-56
(Aw-Ae)'	-58	-242**	12	-120	166	-157**	70	40[3]	-116
(Mcp-Mf)' × (Aw-Ae)'	-146**	23	-45	-50	-41	-16	25	-	-87
S.E.±	41.6	65.6	38.3	105.5	102.2	50.8	68.4	75.8	67.3
c.v.%	10.3	12.1	8.3	21.6	19.9	8.2	16.5	8.5	9.5

Note: As plant numbers on McpAw plots were only between 180 and 450, they have been omitted from these averages

[1] mean of Ae plots only [2] S.E. for Mcp ±0.145, ±53.6 [3] Mf plots only

Table 105

Times and rates of formalin and chloropicrin

Old Kennington K 64/65, Ampthill Am 34/35, Ringwood R 64/65

Years and Species 1+0 Sitka spruce seedbeds

At each of these centres two parallel sets of experiments were laid down side by side to be cropped in alternate years so that treatments could be applied during the fallow season

	1954 and 1956	1955
Fallow	K 65, Am 35, R 65	K 64, Am 34, R 64
Cropped	K 64, Am 34, R 64	K 65, Am 35, R 65

Design 32 plots in 4 blocks of 8 plots confounding a high-order interaction with pairs of blocks; 2 additional untreated plots per block making 40 plots in all

Factorial test on:

formalin (Mf) v.chloropicrin (Mcp) × level 1 v.2 × summer autumn winter spring

Treatments

formalin level 1 167 ml. per sq.yd. } applied in water; for dilution see below
2 333 ml. per sq.yd. }

chloropicrin level 1 24 ml. per sq.yd. 12 shots of 2 ml. injected 6 in. deep, 9 in. apart in one direction, 12 in. apart in the other

2 48 ml. per sq.yd. 24 shots of 2 ml. injected 6 in. deep, 9 in. apart in one direction, 6 in. apart in the other

dilution of formalin, l. water per sq.yd.

Year of cropping:	1954		1955		1956	
	Am	K/R	Am	K/R	Am	K/R
summer	6	10	5	7 to 8	5	5
autumn	5	4 to 6	4	5 to 6	4	4 to 5
winter	5	5 to 6	5	4 to 5	4	3 to 4
spring	4	4	4	4 to 5	5	3 to 4

Basal fertilizer, rate per sq.yd.

			units	1954 K/Am	1954 R	1955	1956
N[1]	topdressed	early	g.N	4½	4½	4½	4½
		late	g.N	4½	4½	4½	4½
P	superphosphate		g.P	4½	4½	9	9
K	potassium chloride		g.K	4½	9	9	9
Mg	kieserite		g.Mg	-	3	3	3

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R

Dates

Year of cropping:	1954			1955			1956		
Treatment applications	K	Am	R	K	Am	R	K	Am	R
BEFORE SOWING									
formalin and chloropicrin									
summer	1/7	2/7	24/6	30/6	2/7	23/6	5/7	6/7	29/6
autumn	6/11	7/11	16/11	28/10	3/11	25/10	24/10	24/10	18/10
winter	8/12	12/12	10/12	3/1	21/12	22/12	13/12	10/12	7/12
spring	5/3	2/3	25/2	15/3	18/3	8/3	2/3	5/3	6/3
P, K, Mg fertilizer	5/3	2/3	25/2	15/3	18/3	8/3	2/3	5/3	6/3
TOPDRESSED									
N early	29/6	30/6	23/6	4/7	6/7	29/6	6/7	2/7	26/6
late	5/8	6/8	3/8	4/8	5/8	2/8	25/7	7/8	31/7
Broadcast sowing of seed	26/3	30/3	6/4	15/4	19/4	2/4	29/3	27/3	28/3

Table 105 cont

SITKA SPRUCE

	1954			1955			1956		
	K 64	Am 34	R 64	K 65	Am 35	R 65	K 64	Am 34	R 64
Height in inches									
MEANS									
untreated	1.69	2.14	1.50	0.90	0.92	0.94	1.39	1.08	0.96
S.E.±	0.076	0.057	0.062	0.048	0.036	0.046	0.102	0.034	0.065
Mf	2.71	2.96	2.35	1.24	1.23	1.44	1.72	1.63	2.10
Mcp	2.68	2.82	2.33	1.74	1.48	1.38	2.01	1.70	2.42
S.E.±	0.054	0.040	0.044	0.034	0.026	0.033	0.072	0.024	0.046
summer	2.23	2.49	2.24	1.31	1.19	1.34	1.60	1.56	1.98
autumn	2.93	2.81	2.38	1.64	1.41	1.55	1.82	1.71	2.46
winter	2.95	3.05	2.39	1.62	1.40	1.44	2.12	1.76	2.47
spring	2.69	3.20	2.34	1.39	1.42	1.31	1.94	1.62	2.13
S.E.±	0.076	0.057	0.062	0.048	0.036	0.046	0.102	0.034	0.065
EFFECTS									
(Mcp-Mf)' with:									
Mean of 4 times	-0.03	-0.14*	-0.02	0.49**	0.25**	-0.06	0.29*	0.06	0.32**
S.E.±	0.076	0.057	0.062	0.048	0.036	0.046	0.102	0.034	0.065
summer	0.35*	0.38**	0.41**	0.68**	0.25**	0.24*	0.53*	0.12	0.82**
autumn	-0.28	-0.21	-0.12	0.42**	0.21**	-0.18	-0.03	0.20**	0.47**
winter	-0.18	-0.49**	-0.20	0.07	0.16*	-0.08	0.36	0.05	-0.23
spring	-0.02	-0.24*	-0.18	0.78**	0.39**	-0.21*	0.29	-0.11	0.22
S.E.±	0.153	0.113	0.124	0.097	0.073	0.092	0.205	0.069	0.130
(level 2-1)' with:									
Mean of treated plots	0.26**	0.15*	0.11	0.10*	0.08*	0.02	-0.00	0.10**	0.18*
S.E.±	0.076	0.057	0.062	0.048	0.036	0.046	0.102	0.034	0.065
Mf	0.20	0.20*	0.15	0.12	0.10	0.11	0.00	0.16**	0.20*
Mcp	0.32**	0.10	0.08	0.09	0.06	-0.06	-0.00	0.05	0.15
S.E.±	0.108	0.080	0.088	0.069	0.052	0.065	0.145	0.049	0.092
summer	0.13	-0.05	0.09	0.08	-0.12	0.06	0.03	-0.05	0.36*
autumn	0.23	0.21	0.28*	0.18	0.20*	0.11	-0.28	0.28**	0.10
winter	0.34*	0.02	0.19	0.05	0.09	-0.10	0.32	0.10	0.05
spring	0.34*	0.41**	-0.10	0.11	0.13	0.02	-0.08	0.09	0.20
S.E.±	0.153	0.113	0.124	0.097	0.073	0.092	0.205	0.069	0.130
c.v.%	8.6	5.8	8.1	10.0	8.1	9.9	16.4	6.3	9.2
Number of plants per sq.yd.									
MEANS									
untreated	478	706	951	542	1540	1133	359	488	1366
S.E.±	45.6	70.4	42.4	44.0	79.2	57.3	40.6	26.6	59.6
Mf	608	804	902	984	1384	1100	465	530	1406
Mcp	572	835	829	856	1335	973	509	524	1366
S.E.±	32.2	49.8	30.0	31.2	56.0	40.5	28.7	18.8	42.2
summer	569	810	954	778	1383	1118	467	544	1515
autumn	647	829	950	918	1378	982	483	521	1365
winter	589	770	854	1119	1352	1035	523	492	1346
spring	554	869	705	865	1327	1010	474	551	1316
S.E.±	45.6	70.4	42.4	44.0	79.2	57.3	40.6	26.6	59.6
EFFECTS									
(Mcp-Mf)' with:									
Mean of 4 times	-36	32	-74	-129**	-49	-127*	44	-6	-40
S.E.±	45.6	70.4	42.4	44.0	79.2	57.3	40.6	26.6	59.6
summer	32	24	99	-78	-216	-6	112	22	-102
autumn	-4	164	-84	171	204	36	114	14	51
winter	-16	12	60	-180	-21	-126	20	-30	-34
spring	-153	-74	-369**	-428**	-164	-412**	-69	-32	-74
S.E.±	91.2	140.8	84.8	88.1	158.4	114.5	81.1	53.3	119.2
(level 2-1)' with:									
Mean of treated plots	52	-85	-10	66	27	5	56	-19	-46
S.E.±	45.6	70.4	42.4	44.0	79.2	57.3	40.6	26.6	59.6
Mf	44	-115	34	32	84	50	31	-24	-38
Mcp	61	-55	-54	100	-29	-40	82	-14	-54
S.E.±	64.5	99.6	60.0	62.3	112.0	81.0	57.4	37.7	84.3
summer	4	-9	138	-21	-171	153	154	-34	39
autumn	104	-68	27	66	60	-126	-15	-62	-75
winter	-38	36	-69	63	210	-9	94	45	-242
spring	138	-298*	-135	158	10	2	-9	-26	94
S.E.±	91.2	140.8	84.8	88.1	158.4	114.5	81.1	53.3	119.2
c.v.%	22.7	25.0	13.6	14.8	16.0	15.3	24.8	14.6	12.2

Table 106

Rates and spacing of chloropicrin; test on formalin

Old Kennington K 72, Ampthill Am 44, Ringwood R 73

Years and Species 1954 1+0 Sitka spruce seedbeds

Design 40 plots in 4 blocks of 10 plots

Treatments

chloropicrin injected 6 in. deep; 1 ml. (level 1) and 2 ml. (level 2) per injection hole

4 shots per sq.yd. placed in a line along the centre of the plot

8 shots per sq.yd. placed in two parallel lines 18 in. apart

16 shots per sq.yd. placed on a grid with injection points 9 in. apart

Formalin at 62½ ml. per sq.yd. (level 1) and 125 ml. per sq.yd. (level 2) applied as drench, in 5 to 6 l. water

Basal fertilizer, rate per sq.yd.

			units	K/Am	R
N[1]	topdressed	early	g.N	4½	4½
		late	g.N	4½	4½
P	superphosphate		g.P	4½	4½
K	potassium chloride		g.K	4½	9
Mg	kieserite		g.Mg	-	3

[1] ammonium sulphate at K and Am, 'Nitro-Chalk' at R

Dates

Treatment applications		K	Am	R
formalin, chloropicrin		8/12	12/12	10/12
P, K, Mg fertilizer		5/3	4/3	9/3
N topdressed	early	29/6	30/6	23/6
	late	5/8	6/8	3/8
Broadcast sowing of seed		29/3	30/3	6/4

SITKA SPRUCE

1954

	Height in inches			Total number of plants per sq.yd.			Number of usable[2] plants per sq.yd.		
	Am 44	K 72	R 73	Am 44	K 72	R 73	Am 44	K 72	R 73
MEANS									
Untreated	1.80	1.42	1.44	1317	356	875	998	127	316
S.E.±	0.120	0.094	0.063	82.0	47.9	40.7	91.3	39.8	41.0
chloropicrin 4 shots	2.24	1.84	1.80	1486	526	869	1287	294	497
8 shots	2.64	2.12	2.08	1622	644	858	1534	478	596
16 shots	2.90	2.40	2.33	1606	687	821	1592	580	638
formalin drench	2.82	2.49	2.14	1534	754	832	1479	625	608
S.E.±	0.120	0.094	0.063	82.0	47.9	40.7	91.3	39.8	41.0
EFFECTS OF (LEVEL 2-1)' WITH:									
chloropicrin 4 shots	0.23	0.43*	-0.03	22	-116	40	81	0	-16
8 shots	0.20	0.51*	0.35**	230	-26	-78	230	99	90
16 shots	0.38	0.31	0.04	200	-18	-52	213	21	-90
formalin drench	0.50*	0.34	0.09	87	134	-87	126	142	-30
S.E.±	0.239	0.188	0.126	164.0	95.9	81.4	182.6	79.5	81.9
c.v.%	13.6	12.9	9.1	15.3	22.8	13.5	18.7	26.8	21.9

[2] plants over 1½ in. high

Table 107

Formalin, chloropicrin and various conifer species

Old Kennington K 63A, Ampthill Am 33A, Ringwood R 60A, Kennington Extension KE 76A

Species and Years 1+0 seedbeds All species sown in bands

COMMON NAMES	BOTANICAL NAMES	YEARS K 63A	Am 33A	R 60A	KE 76A
Sitka spruce	Picea sitchensis (Bongard) Carrière	1953-56	1953-56	1953-56	1953-56
Western hemlock	Tsuga heterophylla (Rafinesque) Sargent	1953-56	1953-56	1953-56	1953-56
Douglas fir	Pseudotsuga taxifolia (Poiret) Britton	1953-54	1953-54	1953-54	1953-54
Lodgepole pine	Pinus contorta Loudon	1953-56	1953-56	1953-56	1953-56
Corsican pine	Pinus nigra var. calabrica (Loudon) Schneider	1953	1953	1953	1953
Western red cedar	Thuja plicata Lambert	1954-56	1954-56	1954-56	1954-56
Japanese larch	Larix leptolepis (Siebold and Zuccarini) Gordon	1953-54	1953-54	1953-54	1953-54

Owing to crop failure no results can be given for the following:

K 63A	1954	Douglas fir and Thuja;	1956	all species	R 60A	1954	Douglas fir
Am 33A	1955	Tsuga and Thuja;	1956	all species	KE 76A	1956	all species

Design 4 × 4 Latin Square Factorial test on: formalin × chloropicrin

Factorial treatments applied during winter before cropping

formalin 250 ml. per sq.yd. applied 1953 in 4 to 5 l. water, 1954 and 1955 5 to 6 l. water

chloropicrin 32 ml. per sq.yd. applied as 16 shots of 2 ml. injected 9 in. apart in all years; 4 in. deep in 1953 and 6 in. deep in 1954, 1955, 1956.

Basal fertilizer, rate per sq.yd.

		units	1953 K,Am	1953 R,KE	1954 K,Am	1954 R,KE	1955 all centres	1956 all centres
N[1]	topdressed early	g.N	4½	4½	4½	4½	4½	4½
	late	g.N	4½	4½	4½	4½	4½	4½
P	superphosphate	g.P	4½	4½	4½	4½	9	9
K	potassium chloride	g.K	4½	9	4½	9	9	9
Mg	kieserite	g.Mg	-	1½	-	3	3	3

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE

Dates

	1953 K	Am	R	KE	1954 K	Am	R	KE	1955 K	Am	R	KE	1956 K	Am	R	KE
Treatment applications																
formalin, chloropicrin	13/1	29/1	22/1	15/1	8/12	12/12	10/12	9/12	3/1	21/12	22/12	3/1	13/12	10/12	7/12	20/1
P, K, Mg fertilizer	23/2	26/2	27/2	24/2	5/3	4/3	25/2	5/3	15/3	21/3	8/3	16/3	13/3	5/3	7/3	9/3
N topdressed early	30/6	2/7	23/6	30/6	29/6	30/6	23/6	29/6	4/7	6/7	30/6	4/7	6/7	2/7	26/6	6/7
late	6/8	10/8	30/7	5/8	5/8	6/8	3/8	5/8	4/8	5/8	2/8	4/8	25/7	7/8	31/7	25/7
Sowing of seed	18/3	25/3	18/3	19/3	26/3	31/3	6/4	26/3	21/4	21/4	5/4	20/4	3/4	26/3	27/3	3/4

Table 107 cont

Height in inches

	SITKA SPRUCE				TSUGA				PINUS CONTORTA			
	1953	1954	1955	1956	1953	1954	1955	1956	1953	1954	1955	1956
Old Kennington K 63A												
Mean	2.98	1.80	1.30	-	1.88	1.19	0.68	-	3.13	2.04	1.50	-
EFFECTS												
Mf'	1.20**	0.44*	0.13	-	0.49**	0.08	0.10	-	1.15**	0.43*	0.10	-
Mcp'	1.09**	0.66**	0.99**	-	0.66**	0.19	0.30*	-	1.46**	0.80**	0.91**	-
Mf'Mcp'	-0.50**	-0.29	-0.13	-	-0.43**	-0.22	-0.05	-	-0.48*	-0.18	-0.37**	-
S.E.±	0.076	0.125	0.074	-	0.073	0.131	0.080	-	0.167	0.156	0.066	-
c.v.%	5.1	13.9	11.5	-	7.8	22.0	23.6	-	10.7	15.3	8.8	-
Ampthill Am 33A												
Mean	2.88	2.57	1.16	-	1.76	1.76	-	-	2.94	2.56	1.41	-
EFFECTS												
Mf'	1.30**	0.83**	0.21	-	0.32**	0.51**	-	-	0.91**	0.75**	0.19	-
Mcp'	0.58*	0.65**	0.43**	-	0.19*	0.50**	-	-	0.88**	0.71**	0.67**	-
Mf'Mcp'	-0.41	-0.08	-0.13	-	-0.06	0.02	-	-	-0.18	-0.27	-0.06	-
S.E.±	0.174	0.064	0.087	-	0.071	0.132	-	-	0.099	0.118	0.136	-
c.v.%	12.1	5.0	15.0	-	8.1	15.0	-	-	6.7	9.3	19.2	-
Ringwood R 60A												
Mean	2.22	1.40	1.23	1.80	2.14	0.98	0.94	1.94	2.91	1.51	1.37	1.45
EFFECTS												
Mf'	0.52**	0.62**	0.34**	0.72**	0.66**	0.35*	0.23*	1.04**	0.45*	0.78**	0.15**	0.36**
Mcp'	0.59**	1.08**	0.44**	0.82**	0.67**	0.72**	0.37**	1.10**	0.66**	1.00**	0.41**	0.54**
Mf'Mcp'	-0.46**	-0.50*	-0.10	-0.48**	-0.36**	-0.06	-0.19*	-0.18	-0.73**	-0.43*	-0.11*	-0.36**
S.E.±	0.095	0.141	0.043	0.117	0.050	0.107	0.072	0.180	0.119	0.101	0.034	0.088
c.v.%	8.6	20.1	7.0	13.0	4.7	21.9	15.2	18.6	8.2	13.4	5.0	12.1
Kennington Extension KE 76A												
Mean	2.93	2.02	1.39	-	2.08	1.06	0.85	-	3.75	2.06	1.63	-
EFFECTS												
Mf'	0.63*	0.82**	0.31	-	0.20	0.20*	0.25*	-	0.83**	0.96**	0.36*	-
Mcp'	0.82*	0.15	0.51*	-	0.34	0.01	0.41**	-	0.97**	0.70**	0.43**	-
Mf'Mcp'	-0.26	0.13	0.06	-	-0.28	-0.23*	0.04	-	-0.60*	0.30*	-0.12	-
S.E.±	0.244	0.127	0.155	-	0.185	0.071	0.093	-	0.189	0.108	0.099	-
c.v.%	16.7	12.6	22.3	-	17.8	13.5	21.8	-	10.1	10.5	12.2	-

	Old Kennington K 63A					Ringwood R 60A						
	DOUGLAS FIR	JAPANESE LARCH		CORSICAN PINE	THUJA	DOUGLAS FIR	JAPANESE LARCH		CORSICAN PINE	THUJA		
	1953	1953	1954	1953	1955	1953	1953	1954	1953	1954	1955	1956
Mean	7.13	9.49	5.44	2.34	1.49	4.23	5.01	2.34	1.37	0.82	0.96	1.73
EFFECTS												
Mf'	0.74**	2.22**	0.65*	0.33**	0.23	0.23	0.55	1.08**	0.33*	0.23*	0.06	0.45*
Mcp'	1.49**	2.18**	0.51*	0.46**	0.53*	0.24	0.82	0.95**	0.14	0.67**	0.32**	0.83**
Mf'Mcp'	-1.00**	-1.59**	-0.09	-0.20*	-0.07	-1.04*	-0.99*	-0.34	-0.41*	-0.10	-0.13*	-0.18
S.E.±	0.098	0.345	0.184	0.060	0.195	0.285	0.376	0.194	0.104	0.078	0.054	0.139
c.v.%	2.8	7.3	6.8	5.1	26.1	13.5	15.0	16.6	15.2	19.1	11.2	16.0

	Ampthill Am 33A						Kennington Extension KE 76A						
	DOUGLAS FIR		JAPANESE LARCH		CORSICAN PINE	THUJA	DOUGLAS FIR		JAPANESE LARCH		CORSICAN PINE	THUJA	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954	1955
Mean	5.62	3.52	7.64	5.50	2.08	2.35	6.16	2.87	9.01	5.47	2.18	1.67	1.40
EFFECTS													
Mf'	1.05**	0.90**	2.36**	1.21**	0.31**	0.35	0.07	0.59	0.96*	0.74*	0.00	0.17	-0.08
Mcp'	1.09**	0.82**	1.63**	0.58*	0.36**	0.25	0.80**	-0.00	1.80**	0.26	0.37**	-0.02	0.09
Mf'Mcp'	-0.46*	-0.18	-0.75**	-0.25	0.06	-0.02	-0.46**	0.00	-1.15*	1.28**	-0.36**	-0.37	0.11
S.E.±	0.164	0.103	0.124	0.234	0.049	0.155	0.093	0.315	0.330	0.284	0.055	0.168	0.072
c.v.%	5.8	5.9	3.3	8.5	4.7	13.2	3.0	21.9	7.3	10.4	5.0	20.1	10.2

Table 107 cont.

Number of plants per yard of drill

	SITKA SPRUCE				TSUGA				PINUS CONTORTA			
	1953	1954	1955	1956	1953	1954	1955	1956	1953	1954	1955	1956
Old Kennington K 63A												
Mean	74	53	72	-	40	114	31	-	49	71	62	-
EFFECTS												
Mf'	-11	13	13*	-	-6	-39	6	-	7	24	13	-
Mcp'	2	20*	22**	-	-8	32	30**	-	5	26	12	-
Mf'Mcp'	-19	-11	0	-	16*	-42	-3	-	-3	-8	13	-
S.E.±	10.8	6.9	4.9	-	5.7	22.1	3.9	-	3.6	12.7	5.4	-
c.v.%	29.3	26.0	13.6	-	28.8	38.6	24.9	-	14.6	35.7	17.6	-
Ampthill Am 33A												
Mean	70	190	94	-	57	194	-	-	54	100	40	-
EFFECTS												
Mf'	8	34	18	-	-0	41	-	-	0	5	-5	-
Mcp'	6	-3	-32	-	-3	26	-	-	-0	3	4	-
Mf'Mcp'	-6	-48	2	-	4	-38	-	-	-6	0	-4	-
S.E.±	8.2	21.1	17.1	-	6.8	25.8	-	-	3.0	11.5	8.4	-
c.v.%	23.3	22.2	36.2	-	23.9	26.6	-	-	11.0	23.0	41.4	-
Ringwood R 60A												
Mean	184	81	193	182	262	199	178	213	118	78	172	152
EFFECTS												
Mf'	-2	-6	12	-16	76	12	24*	-6	2	18	22	-25
Mcp'	-11	-30	6	-12	60	2	49**	-7	-1	3	1	-14
Mf'Mcp'	-24	-3	-30	-16	-43	17	-17	-15	-17	-9	-9	13
S.E.±	19.8	12.5	15.3	14.6	33.3	8.2	9.1	10.8	27.8	8.4	9.7	20.7
c.v.%	21.5	30.8	15.9	16.0	25.4	8.3	10.2	10.2	47.0	21.5	11.2	27.2
Kennington Extension KE 76A												
Mean	100	73	67	-	88	123	52	-	71	74	61	-
EFFECTS												
Mf'	13	9	11	-	0	-27	1	-	6	0	-7	-
Mcp'	5	-10	-4	-	-23	19	3	-	-11*	6	-10	-
Mf'Mcp'	-18	-0	14	-	-6	-35	-2	-	-5	-12	3	-
S.E.±	13.8	5.8	15.4	-	11.0	33.5	8.9	-	4.1	6.0	5.0	-
c.v.%	27.5	15.7	45.8	-	25.2	54.5	34.2	-	11.6	16.2	16.5	-

	Old Kennington K 63A					Ringwood R 60A						
	DOUGLAS FIR	JAPANESE LARCH		CORSICAN PINE	THUJA	DOUGLAS FIR	JAPANESE LARCH		CORSICAN PINE		THUJA	
	1953	1953	1954	1953	1955	1953	1953	1954	1953	1954	1955	1956
Mean	54	64	56	42	38	67	128	91	62	143	246	304
EFFECTS												
Mf'	5	-10	-4	6	7	1	-1	4	-20	10	70**	2
Mcp'	-0	4	6	0	6	2	-42	-6	-38*	20*	15	3
Mf'Mcp'	3	-4	-1	-2	5	-4	23	-5	-17	-3	-54*	33
S.E.±	5.2	8.3	6.8	4.4	4.8	9.4	12.9	5.0	14.4	8.2	18.4	14.4
c.v.%	19.5	26.0	24.3	21.0	25.2	28.0	20.1	11.0	46.5	11.5	14.9	9.5

	Ampthill Am 33A						Kennington Extension KE 76A						
	DOUGLAS FIR		JAPANESE LARCH		CORSICAN PINE	THUJA	DOUGLAS FIR		JAPANESE LARCH		CORSICAN PINE	THUJA	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954	1955
Mean	61	116	61	94	58	137	45	64	84	77	46	72	72
EFFECTS													
Mf'	-0	17*	6	12	12**	41	4	-2	-9	14	4	6	-14
Mcp'	-6	5	4	-15	10**	-3	13	6	-27*	2	-5	-8	12
Mf'Mcp'	-1	-3	-0	-3	-5	-45	-4	-8	10	2	2	-16	7
S.E.±	3.8	14.2	3.8	14.9	2.5	27.4	6.8	8.6	10.4	6.2	5.8	16.7	15.7
c.v.%	12.4	24.4	12.5	31.7	8.7	40.0	30.3	26.8	24.8	16.0	25.6	46.4	43.6

Table 108

Formalin, paraformaldehyde, flour

Old Kennington K 27, Ringwood R 30, Wareham W 52

Years and Species 1949-1950 1+0 Sitka spruce seedbeds

Design K 27 24 plots in 3 blocks of 8
R 30 32 plots in 4 blocks of 8, 2 blocks unsteamed, 2 blocks steamed in November 1947
W 52 16 plots in 2 blocks of 8

Factorial test on:

K 27, R 30 untreated, wheat flour, paraformaldehyde, formalin × (winter v. spring application)

W 52 untreated, wheat flour, paraformaldehyde, formalin × (level 1 v.2)

Treatments applied for 1949 cropping season

	units	rate per sq.yd. Old Kennington Ringwood	Wareham level 1	Wareham level 2
untreated	-	-	-	-
wheat flour	g.	200	100	200
paraformaldehyde	g.	200	100	200
formalin[1]	ml.	450	225	450

[1] applied in 4½ l. water
[2] no basal fertilizer in K 27
[3] ammonium sulphate in K 27 in 1949

Basal fertilizer

		units	rate per sq.yd. 1949	1950[2]
N seedbed	ammonium sulphate	g.N	5	-
	'Nitro-Chalk'	g.N	-	4½
topdressed	'Nitro-Chalk'[3]	g.N	4½	4½
P	superphosphate	g.P	4½	4½
K	potassium chloride	g.K	4	4½

Dates

	1949 K	1949 R	1949 W	1950 K	1950 R	1950 W
flour, paraformaldehyde, formalin winter	19/12	23/12	-	-	-	-
spring	25/2	23/2	23/2	-	-	-
basal fertilizer						
seedbed (N, P, K)	10/3	16/3	17/3	-	7/3	8/3
N topdressed	24/6	20/6	21/6	-	26/6	27/6
broadcast sowing of seed	30/3	30/3	31/3	25/3	30/3	25/3

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	K 27		R 30		W 52		K 27		R 30		W 52	
Means	1949	1950	1949	1950	1949	1950	1949	1950	1949	1950	1949	1950
untreated	0.86	0.73	0.67	0.77	1.57	2.08	663	820	628	478	880	1000
flour	0.84	0.78	0.64	0.76	1.34	1.79	487	906	730	465	684	933
paraformaldehyde	1.10	0.84	1.18	1.06	1.37	2.20	758	1040	503	590	580	933
formalin	1.27	0.88	1.23	0.98	1.71	2.36	908	1157	1014	742	718	915
S.E.±	0.048	0.032	0.054	0.070	0.150	0.239	68.2	62.2	60.7	50.9	55.5	63.1
Difference: Late-early for												
flour	0.05	0.08	-0.07	0.06	-	-	-126	-76	-150	135	-	-
paraformaldehyde	0.08	0.07	0.10	-0.07	-	-	52	120	-26	-118	-	-
formalin	-0.06	-0.09	-0.07	-0.23	-	-	100	18	-48	-142	-	-
Difference: Level 2-1 for												
flour	-	-	-	-	0.01	0.76	-	-	-	-	-132	30
paraformaldehyde	-	-	-	-	0.06	-0.46	-	-	-	-	-195	-234
formalin	-	-	-	-	-0.07	-0.57	-	-	-	-	-63	-66
S.E.±	0.096	0.064	0.108	0.139	0.300	0.478	136.4	124.4	121.4	101.7	111.0	126.1
Effect of steam with												
untreated	-	-	0.50**	-0.00	-	-	-	-	363**	228*	-	-
flour	-	-	0.30*	-0.20	-	-	-	-	168	-39	-	-
paraformaldehyde	-	-	0.16	-0.23	-	-	-	-	-50	68	-	-
formalin	-	-	0.08	-0.00	-	-	-	-	42	136	-	-
S.E.±	-	-	0.108	0.139	-	-	-	-	121.4	101.7	-	-
c.v.%	11.5	9.8	16.4	22.1	19.9	22.6	23.8	15.6	23.8	25.2	15.5	13.3

Table 109

Rates and methods of application of formalin, rates of paraformaldehyde; tests on chloropicrin and ethylene dibromide
Old Kennington K 59, Ampthill Am 22, Ringwood R 49, Kennington Extension KE 65

Years and Species 1952 1+0 Sitka spruce seedbeds (crop failed at Ampthill)

Design 40 plots in 4 blocks of 10

Treatments		rate of application per sq.yd.	method of application
paraformaldehyde (granular)	level 1	50 g.	incorporated by double digging
	2	100 g.	
formalin drench	level 1	125 ml. (neat)	applied in 4 to 6 l. water, sealed off with 1½ to 2 l. water
	2	250 ml. (neat)	
formalin injected neat	level 1	112 ml.	16 shots of 7 ml. injected 4 in. deep, 9 in. apart
	2	250 ml.	36 shots of 7 ml. injected 4 in. deep, 9 in. apart
chloropicrin		32 ml.	16 shots of 2 ml. injected 4 in. deep, 9 in. apart
ethylene dibromide (20% v/v)		32 ml.[1]	16 shots of 2 ml. injected 4 in. deep, 9 in. apart

[1] containing 6 ml. of the neat substance diluted with 'white spirit' (petroleum distillate)

Basal fertilizer, rate per sq.yd.

			units	K, Am	R	KE
N[2]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	4½
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	4½	-

Treatment application	Dates	K	Am	R	KE
P, K, Mg fertilizer, formalin etc.[3]		28/2	29/2	4/3	28/2
nitrogen topdressed	early	18/6	26/6	25/6	18/6
	late	12/8	-	15/8	12/8
Broadcast sowing of seed		23/4	30/4	16/4	23/4

[2] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE [3] applied after forking in fertilizer

SITKA SPRUCE
1952

Treatments		Height in inches K 59	R 49	KE 65	Number of plants per sq.yd. K 59	R 49	KE 65
Mean		1.47	1.62	2.05	395	700	444
untreated		1.07	1.25	1.70	340	678	482
ethylene dibromide		1.13	1.92	1.62	273	716	396
paraformaldehyde	level 1	1.16	1.24	1.66	296	693	426
	2	1.36	1.22	1.74	363	674	417
formalin injected neat	level 1	1.26	1.42	1.66	412	666	502
	2	1.29	1.62	2.28	332	730	476
formalin drench	level 1	1.83	1.81	2.46	598	795	464
	2	1.86	1.85	2.52	532	688	448
chloropicrin		2.62	2.62	3.12	466	686	345
S.E.±		0.116	0.081	0.094	51.5	31.9	54.4
c.v.%		15.8	10.0	9.2	26.0	9.1	24.5

Table 110

Formalin drench, paraformaldehyde, D-D, ethylene dibromide, with a test of neat formalin applied to soil surface

Old Kennington K 69, Ampthill Am 31, Ringwood R 58

Years and Species 1953 1+0 Sitka spruce seedbeds

Design 16 plots in 2 blocks of 8. 2 additional untreated plots in each block making 20 plots in all

formalin drench
paraformaldehyde
D-D
ethylene dibromide
× no spray
v.neat formalin spray

Treatments (rate per sq.yd.)

formalin drench	250 ml. applied in 4 to 5 l. water
paraformaldehyde	100 g. of powdered material incorporated by double digging
D-D	24 shots of 2 ml. injected 4 in. deep; 6 in. apart in one direction, 9 in. apart in the other
ethylene dibromide	diluted with white spirit (50 v/v). 48 shots of 2 ml. (2 shots per hole) of the diluted material, i.e. 48 ml. of the neat substance, injected 4 in. deep; 6 in. apart in one direction, 9 in. apart in the other
formalin neat	100 ml. neat formalin applied by power spray to soil surface after forking in fertilizer

Basal fertilizer, rate per sq.yd.

			units	K/Am	R
N[1]	topdressed	early	g.N	4½	4½
		late	g.N	4½	4½
P	superphosphate		g.P	4½	4½
K	potassium chloride		g.K	4½	9
Mg	kieserite		g.Mg	-	1½

[1] ammonium sulphate at K and Am, 'Nitro-Chalk' at R

Treatment applications		Dates K	Am	R
partial sterilzing agents (except neat formalin)		13/1	16/1	22/1
P, K, Mg fertilizer, formalin		24/2	26/2	27/2
nitrogen topdressed	early	30/6	2/7	23/6
	late	6/8	10/8	30/7
Broadcast sowing of seed		18/3	24/3	31/3

SITKA SPRUCE

1953

Treatments	Height in inches K 69	Am 31	R 58	Number of plants per sq.yd. K 69	Am 31	R 58
Mean	2.22	2.31	2.25	627	486	1165
no treatment	1.66	1.78	1.30	644	508	1128
ethylene dibromide	2.15	2.46	2.76	602	490	1104
D-D	2.08	2.67	2.75	578	434	1190
paraformaldehyde	2.06	1.90	1.51	614	508	1098
formalin drench	3.14	2.74	2.94	698	490	1304
S.E.±	0.079	0.091	0.070	51.7	47.8	55.0
Effect of formalin neat with:						
Mean	-0.05	0.16	0.06	3	14	-12
ethylene dibromide	-0.18	0.25	0.27	33	171	-162
D-D	0.13	0.55*	-0.12	-45	-129	213
paraformaldehyde	0.00	-0.00	-0.00	-105	-51	192
formalin drench	-0.14	-0.14	0.07	129	63	93
S.E.±	0.158	0.182	0.139	103.4	95.5	110.0
c.v.%	7.1	7.9	6.2	16.5	19.7	9.4

Table 111

Times of application of formalin, paraformaldehyde, D-D, and ethylene dibromide

Old Kennington K 66/67, Ampthill Am 36/37, Ringwood R 66/67

Years and Species 1+0 Sitka spruce seedbeds

At each of these centres two parallel sets of experiments were laid down side by side to be cropped in alternate years so that treatments could be applied during the fallow season.

	1954	1955
Fallow	K 67, Am 37, R 67	K 66, Am 36, R 66
Cropped	K 66, Am 36, R 66	K 67, Am 37, R 67

Design 32 plots in 4 blocks of 8; 2 additional untreated plots in each block making 40 plots in all

formalin drench
paraformaldehyde × summer v.winter application
D-D
ethylene dibromide

Treatments

formalin drench	250 ml. applied in water (for diluting see below)
paraformaldehyde	100 g. powdered material incorporated by double digging
D-D	24 shots of 2 ml. injected 6 in. deep, 6 in. apart in one direction, 9 in. apart in the other
ethylene dibromide	diluted with white spirit (50 v/v). 48 shots of 2 ml. (2 shots per hole) of the diluted material, i.e. 48 ml. of the neat substance injected 6 in. deep, 6 in. apart in one direction, 9 in. apart in the other

dilution of formalin, l. water per sq.yd.

Year of cropping:-	1954		1955	
	summer	winter	summer	winter
	10	5 to 6	5 to 8	4 to 5

Basal fertilizer, rate per sq.yd.

		units	1954 K/Am	1954 R	1955 K/Am/R
N[1] topdressed	early	g.N	4½	4½	4½
	late	g.N	4½	4½	4½
P	superphosphate	g.P	4½	4½	9
K	potassium chloride	g.K	4½	9	9
Mg	kieserite	g.Mg	-	3	3

[1] ammonium sulphate at K and Am, 'Nitro-Chalk' at R

Dates

Treatment applications		1954 K	1954 Am	1954 R	1955 K	1955 Am	1955 R
BEFORE SOWING							
partial sterilizing agents	summer	1/7	2/7	24/6	30/6	2/7	23/6
	winter	8/12	12/12	10/12	3/1	21/12	22/12
P, K, Mg fertilizer		5/3	4/3	9/3	15/3	18/3	8/3
TOPDRESSED Nitrogen	early	29/6	30/6	23/6	4/7	6/7	29/6
	late	5/8	6/8	3/8	4/8	5/8	2/8
Broadcast sowing of seed		26/3	30/3	6/4	15/4	6/4	2/4

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	1954			1955			1954			1955		
	K 66	Am 36	R 66	K 67	Am 37	R 67	K 66	Am 36	R 66	K 67	Am 37	R 67
MEANS												
Mean	2.31	2.56	1.94	1.21	0.93	1.28	558	1015	889	1099	1117	1322
no treatment	1.91	2.37	1.41	1.04	0.75	0.98	489	888	908	1064	1190	1353
summer												
ethylene dibromide	2.00	2.22	2.14	1.00	0.90	1.38	568	820	872	1016	960	1380
D-D	2.26	2.48	2.46	1.15	0.85	1.41	567	1029	958	1100	1184	1344
paraformaldehyde	2.44	2.66	1.52	1.22	0.93	1.28	513	1041	908	1077	1142	1386
formalin drench	2.44	2.78	2.00	1.14	0.92	1.22	736	1232	957	1358	1130	1281
winter												
ethylene dibromide	1.78	1.92	2.21	1.07	0.85	1.22	483	861	788	752	982	1084
D-D	2.56	2.79	2.21	1.59	1.12	1.45	430	1034	834	1132	1106	1286
paraformaldehyde	2.40	2.54	1.48	1.33	1.07	1.23	537	988	900	1130	1056	1318
formalin drench	3.44	3.44	2.59	1.50	1.15	1.67	762	1368	861	1296	1232	1438
S.E.±	0.127	0.144	0.090	0.093	0.055	0.046	45.4	80.1	57.5	116.0	70.2	70.5
EFFECTS (winter-summer) with:												
ethylene dibromide	-0.22	-0.30	0.06	0.08	-0.05	-0.16*	-86	40	-84	-264	22	-296**
D-D	0.30	0.31	-0.26	0.44**	0.27**	0.04	-136*	4	-124	33	-78	-58
paraformaldehyde	-0.04	-0.11	-0.05	0.12	0.14	-0.05	24	-52	-8	52	-86	-68
formalin drench	1.00**	0.66**	0.60**	0.37**	0.23**	0.44**	26	136	-96	-62	102	158
S.E.±	0.180	0.204	0.128	0.131	0.078	0.065	64.3	113.3	81.4	164.0	99.3	99.7
c.v.%	11.0	11.3	9.3	15.3	11.9	7.1	16.3	15.8	12.9	21.1	12.6	10.7

Table 112

Test on chloropicrin, chlorobromopropene, dibromochloropropane and D-D

Ampthill Am 47

Years and Species 1954 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8, confounding highest order interaction with pairs of blocks

6 'partial sterilizing agents' × level 1 v.2

Treatments

	rate per sq.yd. level 1	rate per sq.yd. level 2
untreated (in duplicate)		
Injection treatments of 1 ml. per shot applied 6 in. deep		
chloropicrin, chlorobromopropene[1] (CBP 55), dibromochloropropane (OS 1897), D-D	12 shots[3]	24 shots[3]
Drench treatments[2] of emulsible concentrates applied in 4 l. water		
chlorobromopropene (50% by weight of active material present in injection treatment)	30 ml.	60 ml.
dibromochloropropane (40% by weight of active material present in injection treatment)	60 ml.	120 ml.

[1] containing 55% by weight of active material

[2] allowing for differences in specific gravity, rates used in injection and drench treatments are comparable

[3] 12 shots: 12 in. apart in one direction, 9 in. in the other
24 shots: 6 in. apart in one direction, 9 in. in the other

Basal fertilizer, rate per sq.yd.

ammonium sulphate 9 g.N in two equal topdressings of 4½ g.; superphosphate 4½ g.P; potassium chloride 4½ g.K

Dates

Treatment applications: 'partial sterilizing agents' and P, K fertilizers on March 4
N topdressed early on June 30, topdressed late on August 6

Broadcast sowing of seed: March 31

SITKA SPRUCE

1954

Treatments		Height in inches: Mean	Height in inches: Effect (level 2-1)'	Number of plants per sq.yd.: Mean	Number of plants per sq.yd.: Effect (level 2-1)'
untreated		2.44	-	1280	-
D-D	injected	2.48	0.36	1452	156
dibromochloropropane	injected	1.30	-0.75	718	-108
dibromochloropropane	drench	2.57	-0.55	1278	30
chlorobromopropene	injected	2.95	0.04	1516	-24
chlorobromopropene	drench	3.35	-0.36	1558	-204
chloropicrin	injected	3.31	0.76	1462	288
	S.E.±	0.148	0.363	99.8	244.8
	c.v.%	11.4	-	15.1	-

Table 113

Methods of chloropicrin and chlorobromopropene application

Old Kennington K 87, Ampthill Am 55, Ringwood R 86

Years and Species 1956 1+0 Sitka spruce seedbeds

Design 16 plots in 4 blocks of 4; one additional untreated plot in each block making 20 plots in all

Factorial test on:
(chloropicrin v. chlorobromopropene) × (injection v. drill application)

Treatments

Untreated

Injection treatment

chlorobromopropene (CBP 55)
chloropicrin
} 32 ml. per sq.yd. applied as 16 shots of 2 ml. 6 in. deep, 9 in. apart

Drill treatment

chlorobromopropene (CBP 55)
chloropicrin
} 32 ml. per sq.yd. applied in 4 drills of 8 ml; drills 2 in. deep, 1½ to 2 in. wide, 9 in. apart

Basal fertilizer, rate per sq.yd.

ammonium sulphate (K and Am), 'Nitro-Chalk' at R 9 g.N in two equal topdressings of 4½ g.

superphosphate 9 g.P; potassium chloride 9 g.K; kieserite 3 g.Mg

Dates

Treatment application	K	Am	R
chlorobromopropene, chloropicrin P, K, Mg fertilizer	2/3	5/3	6/3
N topdressed early	6/7	2/7	26/6
late	25/7	7/8	31/7
Broadcast sowing of seed	27/3	27/3	28/3

SITKA SPRUCE

1956

	Height in inches			Number of plants per sq.yd.		
	K 87	Am 55	R 86	K 87	Am 55	R 86
MEANS						
Untreated	1.06	1.30	1.14	124	534	1524
S.E.±	0.162	0.140	0.057	26.2	31.0	67.1
chlorobromopropene	1.87	1.69	2.04	156	540	1368
chloropicrin	2.52	1.83	2.34	259	523	1574
S.E.±	0.114	0.099	0.041	18.5	22.0	47.4
DIFFERENCE (DRILL-INJECTION)'						
Mean	-0.75**	0.40*	-0.17*	-52	22	160*
chlorobromopropene	0.00	0.32	0.10	39	15	225*
chloropicrin	-1.50**	0.48*	-0.44**	-142**	28	96
S.E.±	0.229	0.198	0.081	37.0	43.9	94.8
c.v.%	16.4	16.7	5.8	27.2	11.6	9.0

Table 114

Times and rates of chloropicrin, formalin drench, neat formalin in drills and chlorobromopropene

Old Kennington K 86, Ampthill Am 54, Ringwood R 84

Years and Species 1956 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8 confounding highest order interaction; 2 additional untreated plots in each block making 40 plots in all

Factorial test on: neat formalin in drills, formalin drench, chlorobromopropene, chloropicrin × level 1 v.2 × winter v.spring

Treatments

neat formalin in drills: 167 ml. and 333 ml. applied in 6 drills, of either 28 ml. or 56 ml. per drill drills 1½ to 2 in. wide, 6 in. apart, 2 in. deep

formalin drench: 167 ml. and 333 ml. applied in 3 to 5 l. water

chlorobromopropene (CBP 55): 24 ml. and 48 ml. as either 12 shots[1] or 24 shots[2], each of 2 ml., injected 6 in. deep

chloropicrin: 24 ml. and 48 ml. as either 12 shots[1] or 24 shots[2], each of 2 ml., injected 6 in. deep

Basal fertilizer

ammonium sulphate (K and Am), 'Nitro-Chalk' (R), 9 g.N in two equal topdressings of 4½ g; superphosphate 9 g.P; potassium chloride 9 g.K; kieserite 3 g.Mg

Dates			K	Am	R
Treatment application:	'partial sterilizing agents'	winter	13/12	10/12	7/12
		spring	2/3	5/3	6/3
	P, K, Mg fertilizer		2/3	5/3	6/3
	N topdressed	early	6/7	2/7	26/6
		late	25/7	7/8	31/7
Broadcast sowing of seed			27/3	27/3	28/3

[1] 12 shots: 12 in. apart in one direction, 9 in. in the other

[2] 24 shots: 6 in. apart in one direction, 9 in. in the other

SITKA SPRUCE

	Height in inches			Number of plants per sq.yd.		
	K 86	Am 54	R 84	K 86	Am 54	R 84
MEANS						
untreated	1.45	1.38	1.28	254	586	1592
S.E.±	0.134	0.112	0.050	46.8	35.0	47.0
formalin neat	2.11	1.68	1.96	332	428	1611
formalin drench	2.25	1.95	2.20	396	605	1612
chlorobromopropene	2.43	1.63	2.22	297	538	1533
chloropicrin	2.53	1.89	2.50	411	485	1529
S.E.±	0.134	0.112	0.050	46.8	35.0	47.0
EFFECT OF (SPRING-WINTER)' WITH:						
Mean	0.66**	-0.08	-0.22**	72	-87*	-52
S.E.±	0.134	0.112	0.050	46.8	35.0	47.1
formalin neat	0.64*	0.23	0.22*	140	-246**	-168
formalin drench	0.18	-0.42	-0.56**	108	2	135
chlorobromopropene	1.00**	-0.20	-0.53**	30	-64	-138
chloropicrin	0.84**	0.04	-0.04	9	-40	-38
S.E.±	0.268	0.224	0.100	93.6	70.0	94.1
EFFECT OF (LEVEL 2-1)' WITH:						
Mean	0.58**	0.14	0.15**	4	1	-47
S.E.±	0.134	0.112	0.050	46.8	35.0	47.1
formalin neat	0.19	0.26	0.18	-160	-90	-15
formalin drench	0.80**	0.07	0.26*	99	14	-108
chlorobromopropene	0.84**	0.03	-0.11	27	112	-60
chloropicrin	0.51	0.18	0.27*	51	-32	-4
S.E.±	0.268	0.224	0.100	93.6	70.0	94.1
spring	0.28	0.01	0.21**	30	31	6
winter	0.88**	0.26	0.09	-22	-28	-100
S.E.±	0.189	0.158	0.071	66.2	49.5	66.5
c.v.%	17.6	18.6	7.0	39.4	18.8	8.4

Table 115

Soil reaction and formalin

Old Kennington K 8, Ringwood R 1, Kennington Extension KE 13, Wytham Wy 5, Bagley B 5, Wareham W 19

Years and Species 1947 and 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design K 8, R 1, KE 13, B 5 1947-1949 32 plots in 2 blocks)
Wy 5 1947-1949 16 plots in 2 blocks) confounding highest order interaction
W 19 1947 only 16 plots in 2 blocks)

Factorial test on:

1947 Rh × Rs × Rc × Mf × (Ps v. Pb) no test on Rs at Wy and on (Ps v. Pb) at W

1948 residual Rh × residual Rs × residual Rc × Mf × (Ps v. Pb)

1949 K 8, R 1 Ra on plots which had either Rh or Rs in 1947 × residual Rc × Mf × (Ps v. Pb)
KE 13 residual Rh × residual Rs × residual Rc × Mf × (Ps v. Pb)
Wy 5 residual Rh × residual Rc × Mf × (Ps v. Pb)
B 5 residual Rh × residual Rs × Rc × Mf × (Pb v. Ps)

		units	factorial treatments, rate per sq.yd. 1947	1948	1949
applied winter					
Rh	sulphuric acid[1]	ml.	135	-	-
Rs	sulphur	g.	85	-	-
Ra	ammonium sulphate	g.	-	-	170
applied spring					
Rc	ground chalk	g.	255	-	150
Mf	formalin[2]	ml.	450	450	450
Ps	superphosphosphate	g.P	7½	5½	4½
Pb	Bessemer basic slag	g.P			

basal dressing, rate per sq.yd.	units	1947	1948	1949
hoof	g.N	11	8½	9
Gafsa, W only	g.P	7½	-	-
potassium sulphate	g.K	4½[3]	7	4½

[3] 9½ g. at Wareham

[1] 135 ml conc. H_2SO_4 applied in 4½ l. water, i.e. 3% v/v, supplying the same amount of sulphur as in sulphur treatment

[2] applied in 4½ l. water

Year of cropping:-	date of application Rh, Rs 1947	Ra 1949	Rc 1947	Rc 1949	Mf 1947	Mf 1948	Mf 1949	N, P, K 1947	N, P, K 1948	N, P, K 1949	date of broadcast sowing of seed 1947	1948	1949
K 8	1/1	19/12	2/4	-	2/4	22/3	25/2	3/4	22/3	10/3	7/5	30/4	29/3
R 1	17/1	23/12	26/3	-	26/3	11/3	23/2	9/4	31/3	16/3	29/4	28/4	29/3
KE 13	1/1	-	2/4	-	2/4	22/3	25/2	3/4	22/3	10/3	2/5	27/4	23/3
Wy 5	1/1	-	31/3	-	31/3	23/3	25/2	31/3	23/3	15/3	29/4	26/4	9/4
B 5	2/1	-	31/3	25/2	31/3	23/3	25/2	31/3	22/3	10/3	1/5	20/4	5/4
W 19	17/12	-	28/3	-	28/3	-	-	10/4	-	-	25/4	-	-

1947

SITKA SPRUCE

	Height in inches K 8	R 1	KE 13	Wy 5	B 5	W 19	Number of plants per sq.yd. K 8	R 1	KE 13	Wy 5	B 5	W 19
Mean	1.48	1.31	1.36	2.21	1.40	1.44	820	817	937	917	1067	890
Effects and interactions												
Rh'	0.11*	0.12	-0.17*	0.10	0.28*	-0.10	39	-85	-166*	10	-32	45
Rs'	-0.11**	-0.40**	-0.10	-	-	-	-87	-227**	-332**	-	-	-
Rc'	-0.01	0.12	0.02	-0.26	0.26*	-0.22	-62	143	128	16	32	225
Mf'	0.26**	0.11	-0.03	0.62**	0.33*	0.15	282**	-31	201**	278**	230	45
(Pb-Ps)'	-0.09*	-0.13	-0.09	-0.70**	-0.22	-	12	44	150*	-44	52	-
Rh'Rs'	-0.22**	-0.37**	-0.18*	-	-	-	-118*	-122	-20	-	-	-
Rh'Rc'	0.08*	0.16	-0.01	0.59**	0.48**	0.50	6	194*	172*	76	-40	111
Rh'Mf'	-0.14**	0.02	-0.07	-0.40*	-0.01	0.01	-164**	29	120	-124	-148	-81
Rh'(Pb-Ps)'	0.10*	0.02	0.22*	0.04	0.12	-	-34	32	96	22	118	-
Rs'Rc'	-0.03	0.16	0.11	-	-	-	81	145	200**	-	-	-
Rs'Mf'	-0.29**	-0.05	0.05	-	-	-	-130*	-80	57	-	-	-
Rs'(Pb-Ps)'	0.11*	0.03	0.16	-	-	-	26	40	96	-	-	-
Rc'Mf'	0.12**	0.02	0.09	0.09	-0.15	-	171**	125	-39	56	106	-
Rc'(Pb-Ps)'	0.05	-0.04	-0.12	-0.22	-0.01	-	-45	5	54	-116	-76	-
Mf'(Pb-Ps)'	0.07	0.05	0.07	-0.10	0.07	-	32	-16	-134*	-4	98	-
S.E.±	0.037	0.096	0.080	0.130	0.108	-	47.3	70.7	61.5	79.2	98.0	-
c.v.%	7.1	20.7	16.7	11.8	15.4	-	16.3	24.5	18.6	17.3	18.3	-

Table 115 cont.

	Height in inches						Number of plants per sq.yd.					
1947	K 8	R 1	KE 13	Wy 5	B 5	W 19	K 8	R 1	KE 13	Wy 5	B 5	W 19
SCOTS PINE												
Mean	1.87	1.89	2.22	2.99	2.45	1.84	1028	635	1121	973	845	988
Effects and interactions												
Rh'	-0.04	0.05	-0.22**	-0.16	-0.30*	-0.55	-62	-46	-186*	-46	-204**	-249
Rs'	-0.03	-0.32**	-0.20**	-	-1.44**	-	-75	-186*	-201*	-	-405**	-
Rc'	-0.06	0.06	0.09	-0.37	0.52**	-0.19	57	68	142	-46	266**	33
Mf'	0.18**	0.08	0.14*	0.38	0.60**	0.03	214**	-68	250**	104	78	93
(Pb-Ps)'	-0.03	-0.02	-0.03	-0.98*	0.01	-	27	6	-117	-34	106*	-
Rh'Rs'	-0.03	-0.12	-0.12*	-	-0.18	-	81	-168*	-46	-	-122*	-
Rh'Rc'	0.03	0.07	0.06	0.40	0.30*	0.27	51	46	129	116	-42	111
Rh'Mf'	-0.03	0.04	-0.00	-0.29	0.00	0.23	-76	70	-45	-46	52	15
Rh'(Pb-Ps)'	-0.00	0.00	0.05	0.51	0.10	-	-6	69	2	8	87	-
Rs'Rc'	-0.00	0.03	0.01	-	0.07	-	38	51	171*	-	222**	-
Rs'Mf'	-0.12*	-0.04	0.07	-	0.26	-	-24	-36	99	-	140**	-
Rs'(Pb-Ps)'	-0.01	-0.01	0.02	-	0.14	-	-2	-4	76	-	96*	-
Rc'Mf'	0.03	0.03	0.01	0.05	-0.32*	-	144*	40	-70	164*	12	-
Rc'(Pb-Ps)'	-0.06	-0.04	-0.00	-0.41	0.15	-	-14	60	-54	-88	-62	-
Mf'(Pb-Ps)'	-0.04	-0.02	-0.12*	-0.09	-0.17	-	63	-57	-123	-106	15	-
S.E.±	0.054	0.083	0.047	0.313	0.126	-	58.6	69.4	72.9	53.8	44.8	-
c.v.%	8.2	12.4	6.0	20.9	14.6	-	16.0	30.9	18.5	11.1	15.1	-
1948												
SITKA SPRUCE												
Mean	1.20	1.30	1.31	1.80	1.46	-	738	732	872	1438	903	-
Effects and interactions												
Rh'res.	0.15*	0.37**	0.04	0.09	0.02	-	109*	94	-52	84	61	-
Rs'res.	0.18**	0.41**	-0.04	-	-0.03	-	97*	170*	-50	-	-53	-
Rc'res.	-0.12	-0.24**	-0.03	-0.03	-0.01	-	-145**	4	32	-75	13	-
Mf'	0.47**	0.52**	0.28**	0.34**	-0.04	-	181**	125	-52	150	-58	-
(Pb-Ps)'	-0.19**	-0.16*	-0.02	-0.05	0.03	-	-13	-44	-73	-99	52	-
Rh'res.× Rs'res.	-0.14*	-0.01	-0.08	-	0.01	-	-35	-10	77	-	19	-
Rh'res.× Rc'res.	0.02	-0.00	0.01	0.02	0.04	-	-4	-41	4	84	40	-
Rh'res.× Mf'	-0.00	-0.03	-0.05	0.02	0.05	-	-125**	-31	-29	-177	44	-
Rh'res.× (Pb-Ps)'	0.02	-0.12	0.08	0.00	-0.07	-	2	-86	-29	72	-32	-
Rs'res.× Rc'res.	-0.02	-0.12	0.00	-	-0.01	-	56	14	-25	-	49	-
Rs'res.× Mf'	-0.06	-0.15	-0.06	-	-0.05	-	-41	-44	23	-	50	-
Rs'res.× (Pb-Ps)'	0.06	-0.06	0.01	-	0.29**	-	101*	29	26	-	64	-
Rc'res.× Mf'	-0.03	0.05	-0.03	-0.04	0.03	-	92*	-25	88*	-126	23	-
Rc'res.× (Pb-Ps)'	0.02	0.05	0.04	-0.13	-0.12	-	-14	-11	-2	57	13	-
Mf'(Pb-Ps)'	0.02	-0.06	0.06	0.05	-0.09	-	56	-73	-17	-120	71	-
S.E.±	0.058	0.073	0.072	0.074	0.070	-	40.6	59.4	37.4	95.0	33.6	-
c.v.%	13.8	16.0	15.5	8.2	13.5	-	15.4	23.0	12.1	13.2	10.5	-
1948												
SCOTS PINE												
Mean	1.71	2.02	1.89	2.44	2.45	-	778	790	718	782	867	-
Effects and interactions												
Rh'res.	0.03	0.12	-0.07	0.09	-0.04	-	50	38	31	-16	45	-
Rs'res.	0.11*	0.22*	0.11*	-	-0.22	-	95	-4	32	-	-30	-
Rc'res.	-0.08	-0.04	0.04	-0.10	0.14	-	-85	75	-5	26	-36	-
Mf'	0.32**	0.52**	0.22**	0.42**	0.25*	-	68	-126	16	8	-46	-
(Pb-Ps)'	0.02	-0.10	-0.09*	-0.15	0.25*	-	-17	-104	43	-14	51	-
Rh'res.× Rs'res.	0.02	0.10	0.01	-	0.04	-	2	0	-20	-	-27	-
Rh'res.× Rc'res.	-0.10	-0.01	0.09*	-0.03	0.04	-	-10	2	-64*	16	9	-
Rh'res.× Mf'	-0.03	0.10	-0.01	-0.08	0.08	-	62	38	-7	22	-10	-
Rh'res.× (Pb-Ps)'	-0.08	-0.10	-0.03	-0.08	0.11	-	13	-33	5	20	39	-
Rs'res.× Rc'res.	0.04	0.08	-0.04	-	0.16	-	59	16	-14	-	69	-
Rs'res.× Mf'	-0.10	-0.19*	0.06	-	-0.06	-	-88	-10	40	-	-34	-
Rs'res.× (Pb-Ps)'	-0.00	-0.00	0.00	-	0.10	-	16	-21	64*	-	57	-
Rc'res.× Mf'	0.10	0.06	-0.02	-0.04	0.21	-	-10	-24	8	-20	14	-
Rc'res.× (Pb-Ps)'	-0.09	0.18*	0.03	-0.06	-0.10	-	-26	22	-34	50	-42	-
Mf'(Pb-Ps)'	-0.01	-0.13	0.05	-0.19	0.10	-	7	-10	44	56	22	-
S.E.±	0.048	0.074	0.039	0.115	0.105	-	45.0	74.7	29.5	43.0	41.2	-
c.v.%	7.9	10.4	5.8	9.4	12.1	-	16.3	26.7	11.6	11.0	13.5	-

Table 115 cont.

1949 SITKA SPRUCE	Height in inches					Number of plants per sq.yd.				
	K 8	R 1	KE 13	Wy 5	B 5	K 8	R 1	KE 13	Wy 5	B 5
Mean	0.99	1.00	1.14	1.73	1.63	702	748	829	1688	2117
Effects and interactions										
Rh'res.	-0.15**	-0.12	-0.14**	-0.25	-0.12	-37	-96	-38	-106	89
Rs'res.	-0.12*	-0.19*	-0.07	-	-0.18	10	-45	-3	-	117
Rc'res.	-0.02	-0.07	0.15**	-0.06	0.14	50	-27	24	-39	-19
Mf'	0.10*	0.56**	0.02	0.06	0.12	212**	48	-2	234	-128
(Pb-Ps)'	-0.10*	-0.10	0.03	-0.21	0.01	-142**	-150*	25	18	63
Rh'res.× Rs'res.	-0.20**	0.01	0.03	-	0.02	75	-42	44	-	-171
Rh'res.× Rc'res.	-0.00	0.06	-0.05	0.13	0.03	89*	45	54	52	154
Rh'res.× Mf'	-0.01	-0.17*	-0.01	-0.26	0.14	-40	-66	-3	116	138
Rh'res.× (Pb-Ps)'	0.04	0.05	-0.03	0.08	-0.05	2	0	92	86	12
Rs'res.× Rc'res.	-0.03	-0.07	0.02	-	-0.08	19	-0	52	-	97
Rs'res.× Mf'	-0.00	-0.24**	0.03	-	0.00	50	-15	-64	-	-268*
Rs'res.× (Pb-Ps)'	-0.04	-0.09	0.02	-	-0.15	-44	-115	-37	-	155
Rc'res.× Mf'	0.01	-0.01	-0.06	-0.01	-0.03	10	60	15	-60	-57
Rc'res.× (Pb-Ps)'	0.01	-0.09	0.11**	-0.07	0.03	-11	-3	115*	39	-115
Mf'(Pb-Ps)'	-0.02	-0.03	-0.04	-0.10	-0.02	28	-120*	-73	-156	-30
S.E.±	0.048	0.070	0.036	0.163	0.108	36.3	55.3	49.4	100.7	120.2
c.v.%	13.6	19.7	8.9	18.9	18.8	14.6	20.9	16.9	12.0	16.0

Table 116

Acidification and formalin

Old Kennington K 15, Ringwood R 21, Kennington Extension KE 24

Years and Species

1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine

1949-50: K 15, R 21 — 1+0 Sitka spruce seedbeds

1949 only: KE 24

Design

K 15 — 32 plots in 4 blocks of 8, confounding three high-order interactions in 1949 and 1950

KE 24 — 32 plots in 4 blocks of 8, confounding highest order interaction in 1949

R 21 — 32 plots in 4 blocks of 8, confounding three high-order interactions in 1949 and 1950 (2 blocks unsteamed, 2 blocks steamed (Ms) in November 1947)

Factorial test on:

	treatments for 1948 crop		treatments for 1949 crop
K 15, R 21	Rs × Mf × Mp ×	Rs ×	Mf
KE 24	Rs × Mf × Mp ×	×	Mf

Treatments

		units	rate per sq.yd. 1948	1949	1950
Rs	sulphur applied in winter	g.	85	85	-
Mf	formalin[1] applied in spring	ml.	450	450	-
Mp	sodium permanganate[2] after sowing	g.	11	-	-
Basal manuring					
N	seedbed — ammonium sulphate	g.N	8½	5	-
	'Nitro-Chalk'	g.N	-	-	4½
	topdressed 'Nitro-Chalk'[3]	g.N	-	4½	4½
P	superphosphate	g.P	5½	4½	4½
K	potassium chloride	g.K	7	4	4½

[1] applied in 4½ l. water [2] applied in 3½ l. water [3] as ammonium sulphate in K 15 in 1949

Dates

	1948 K	1948 R	1948 KE	1949 K	1949 R	1949 KE	1950 K	1950 R
sulphur (in winter before cropping)	6/1	31/12	6/1	19/12	23/12	-	-	-
formalin	5/3	11/3	5/3	25/2	23/2	25/2	-	-
sodium permanganate	10/5	3/5	10/5	-	-	-	-	-
manuring								
seedbed (N*, P, K)	22/3	30/3	22/3	10/3	16/3	10/3	22/2	7/3
N topdressed	-	-	-	24/6	20/6	24/6	6/7	26/6
broadcast sowing of seed	30/4	28/4	27/4	31/3	29/3	25/3	25/3	29/3

* N raked in at K on 9/3 and at R on 7/3 during final preparation of seedbed

1948

	SITKA SPRUCE Height in inches K 15	R 21	KE 24	Number of plants per sq.yd. K 15	R 21	KE 24	SCOTS PINE Height in inches K 15	R 21	KE 24	Number of plants per sq.yd. K 15	R 21	KE 24
Mean	1.01	0.82	0.96	813	960	620	1.36	1.59	1.30	575	675	392
Effects												
Rs'	0.28**	-0.16**	-0.29**	-80	-13	-256**	0.29**	-0.04	-0.13**	-70	-105*	-99
Mf'	0.32**	0.21**	-0.03	-5	-16	-104*	0.24**	0.08	0.10*	34	-6	46
Mp'	0.03	0.01	-0.03	-215**	-22	68	-0.16**	0.06	-0.20**	-458**	-26	-472
Rs' × Mf'	-0.06	-0.03	-0.13**	43	-8	83	-0.02	0.04	0.01	8	-72	-8
Rs' × Mp'	0.04	-0.05	0.06	-89	-92	73	0.06	-0.10	0.04	-25	14	-76
Rs' × Ms'	-	0.06	-	-	-34	-	-	-0.00	-	-	87	-
Mf' × Mp'	0.04	0.02	-0.03	-56	25	-10	-0.18**	0.04	-0.04	88*	-2	27
Mf' × Ms'	-	0.04	-	-	-52	-	-	0.12	-	-	-39	-
Mp' × Ms'	-	-0.02	-	-	-49	-	-	0.09	-	-	-16	-
S.E.±	0.043	0.053	0.033	64.2	46.6	40.4	0.049	0.082	0.041	37.6	42.9	-
c.v.%	12.1	18.2	9.7	22.3	13.7	18.3	10.3	14.5	9.0	18.5	18.0	-

Table 116 cont.

SITKA SPRUCE

1949	Height in inches			Number of plants per sq.yd.		
	K 15	R 21	KE 24	K 15	R 21	KE 24
Mean	1.06	1.06	1.17	803	672	968
Effects						
Rs'	-0.12**	-0.42**	-	-195**	-597**	-
Mf'	0.17**	0.66**	-0.21**	87	132*	-66
Rs'res.	0.06	-0.03	-0.14**	-221**	-121*	-330**
Mf'res.	0.08	-0.06	0.08	-71	98	3
Rs' × Mf'	-0.06	-0.16*	-	32	142*	-
Rs' × Rs'res.	-0.02	-0.29**	-	-103*	-130*	-
Rs' × Mf'res.	-0.02	-0.01	-	-1	18	-
Rs' × Ms'res.	-	0.14*	-	-	84	-
Mf' × Rs'res.	-0.04	-0.10	-0.00	85	-85	24
Mf' × Mf'res.	-0.06	-0.06	-0.05	29	-1	16
Mf' × Ms'res.	-	0.14*	-	-	105	-
Rs'res. × Mf'res.	0.04	0.03	-0.12**	60	-101	-7
Rs'res. × Ms'res.	-	0.09	-	-	-42	-
Mf'res. × Ms'res.	-	-0.01	-	-	-39	-
S.E.±	0.037	0.058	0.033	41.6	50.7	50.1
c.v.%	9.9	15.6	8.1	14.6	21.3	14.7

SITKA SPRUCE

1950	Height in inches		Number of plants per sq.yd.	
	K 15	R 21	K 15	R 21
Mean	1.92	1.21	1036	900
Effects (2nd year residues in brackets)				
Rs'res.	0.39**	0.67**	-12	26
Mf'res.	0.05	0.21	46	28
(Rs'res.)	0.09	0.15	28	61
(Mf'res.)	0.12	-0.19	-4	-10
Rs'res. × Mf'res.	0.00	-0.13	2	-23
Rs'res. × (Rs'res.)	-0.16	-0.12	44	-98*
S.E.±	0.120	0.158	34.3	37.6
c.v.%	17.7	36.9	9.3	11.8

Table 117

Acidification, straw, steam, nitrogen and formalin

Old Kennington K 16, Ringwood R 22, Kennington Extension KE 25

Years and Species 1948: seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949: 1+0 Sitka spruce seedbeds

Design K 16, KE 25 32 plots in 4 blocks of 8, confounding three high-order interactions in 1949
R 22 32 plots in 4 blocks of 8, confounding highest order interaction (2 blocks unsteamed, 2 blocks steamed (Ms) in November 1947)

Factorial test on:	1948+49		1948		1948		1949		1949
K 16	Ra	×	UsNs	×	Mf	×	Us	×	additional Ns
R 22	Ra	×	UsNs	×	Mf	×	Us		
KE 25	Ra[1]	×	UsNs	×	Mf	×	Us	×	additional Nc

Factorial treatments

		units	rate per sq.yd. treatment for 1948 crop	rate per sq.yd. treatment for 1949 crop
Ra	heavy rate of ammonium sulphate applied in winter	g.	340	340
UsNs	chaffed straw applied in winter (R.E.S. No. S.5374)	g.	900	-
	+ammonium sulphate topdressed in summer	g.N	8½	-
Mf	formalin applied in spring[2]	ml.	450	-
Us	chaffed straw applied in winter (R.E.S. No. S.5434)	g.	-	900
Ns at K	ammonium sulphate additional summer topdressing	g.N	-	4½
Nc at KE	'Nitro-Chalk' additional summer topdressing	g.N	-	4½

Basal manuring

N	seedbed ammonium sulphate	g.N	8½	5
	topdressed 'Nitro-Chalk'[3]	g.N	-	4½
P	superphosphate	g.P	5½	4½
K	potassium chloride	g.K	7	4

Dates	1948 K	1948 R	1948 KE	1949 K	1949 R	1949 KE
Winter applications (ammonium sulphate and straw)	6/1	31/12	6/1	19/12	23/12	19/12
Spring applications						
formalin	5/3	11/3	5/3	-	-	-
seedbed N, P, K	22/3	30/3	22/3	10/3	16/3	10/3
topdressed N (basal)	30/6	28/6	30/6	24/6	20/6	24/6
(additional)	-	-	-	24/6	-	2/8
Broadcast sowing of seed	30/4	28/4	27/4	31/3	29/3	25/3

[1] 1948 only [2] applied in 4½ l. water [3] as ammonium sulphate in K 16 in 1949

1948

	SITKA SPRUCE Height in inches			Number of plants per sq.yd.			SCOTS PINE Height in inches			Number of plants per sq.yd.		
	K 16	R 22	KE 25	K 16	R 22	KE 25	K 16	R 22	KE 25	K 16	R 22	KE 25
Mean	1.08	0.74	1.09	739	892	716	1.41	1.95	1.34	757	657	668
Effects												
Ra'	0.34**	0.15**	-0.10	-77	-133	-65	0.29**	0.35**	-0.10*	-79	-14	-14
UsNs'	0.23**	0.33**	0.06	-5	-151*	-116**	0.04	0.46**	0.15**	-94	3	2
Mf'	0.37**	0.16**	0.10	139**	1	43	0.18**	0.14	0.17**	131*	26	-16
Ra' × UsNs'	-0.02	-0.11*	-0.00	-40	29	79*	-0.07	-0.17	0.03	-25	-8	-16
Ra' × Mf'	-0.10	-0.00	-0.10	-16	127	34	-0.22**	-0.06	-0.07	-10	-6	-16
Ra' × Ms'	-	-0.09	-	-	94	-	-	-0.05	-	-	20	-
UsNs' × Mf'	-0.09	0.06	0.09	-31	-134	46	0.02	0.01	-0.11*	17	-56	22
UsNs' × Ms'	-	-0.04	-	-	-2	-	-	-0.02	-	-	-30	-
Mf' × Ms'	-	-0.05	-	-	41	-	-	-0.12	-	-	-56	-
S.E.±	0.063	0.049	0.059	42.0	66.9	36.8	0.059	0.092	0.046	48.6	41.2	22.6
c.v.%	16.4	18.7	15.3	16.0	21.3	14.5	11.9	13.3	9.6	18.2	17.7	9.5

Table 117 cont.

SITKA SPRUCE

1949	Height in inches		Number of plants per sq.yd.	
	K 16	R 22	K 16	R 22
Mean	0.87	0.68	680	512
Effects				
Ra'	-0.07	-0.12**	-127*	-14
Us'	-0.03	-0.02	-21	-36
Ns'	-0.04	-	30	-
UsNs'resid.	-0.01	-0.02	35	-134**
Mf'resid.	0.13*	-0.04	-65	-74
Ra' × Us'	0.03	0.06	8	28
Ra' × Ns'	-0.03	-	-93	-
Ra' × UsNs'resid.	-0.07	0.05	116	68
Ra' × Mf'resid.	-0.00	-0.08*	42	38
Ra' × Ms'resid.	-	-0.12**	-	-34
Us' × Ns'	-0.01	-	-17	-
Us' × UsNs'resid.	-0.01	0.02	-52	-68
Us' × Mf'resid.	-0.12*	-0.04	43	-73
Us' × Ms'resid.	-	-0.08*	-	-21
Ns' × UsNs'resid.	-0.02	-	16	-
Ns' × Mf'resid.	0.02	-	87	-
UsNs'resid.× Mf'resid.	-0.02	-0.01	54	74
UsNs'resid.× Ms'resid.	-	0.03	-	77
Mf'resid.× Ms'resid.	-	0.02	-	74
S.E.±	0.051	0.036	55.6	42.2
c.v.%	16.6	14.8	23.2	23.4

SITKA SPRUCE

	Height in inches	No. of plants per sq.yd.
	KE 25	KE 25
Mean	1.07	768
Effects		
Ra'resid.	-0.24**	-20
Us'	0.09	-371**
Nc'	-0.02	-17
UsNs'resid.	-0.18**	-214**
Mf'resid.	0.23**	-39
Ra'resid.× Us'	-0.04	-77
Ra'resid.× Nc'	0.00	40
Ra'resid.× UsNs'resid.	0.09	66
Ra'resid.× Mf resid.	-0.03	-17
Us' × Nc'	-0.03	36
Us' × UsNs'resid.	-0.06	-1
Us' × Mf'resid.	-0.01	-93
Nc' × UsNs'resid.	0.03	-19
Nc' × Mf'resid.	-0.03	37
UsNs'resid.× Mf'resid.	-0.03	54
S.E.±	0.048	60.7
c.v.%	12.8	22.3

Table 118

Fertilizer, formalin and sulphuric acid

Nagshead Nd 6, Tair Onen TO 6

Years and Species 1948 1+0 Sitka spruce seedbeds (Plot size: 3 feet × 4½ feet)

Design and Treatments 16 plots in 2 blocks of 8

all factorial combinations of:

fertilizer × formalin × sulphuric acid

	rate per sq.yd.		
fertilizer	8½	g.	N as ammonium sulphate
	5½	g.	P as superphosphate
	7	g.	K as potassium chloride
formalin	450	ml.	formalin applied in 4½ l. water
sulphuric acid	35	ml.	conc. acid topdressed in 3½ l. water, i.e. 1% v/v

Dates

Formalin		Fertilizer		Sulphuric acid		Broadcast sowing of seed	
Nd	TO	Nd	TO	Nd	TO	Nd	TO
15/3	10/3	22/4	29/4	2/5	6/5	28/4	5/5

SITKA SPRUCE

1948	Height in inches		Number of plants per sq.yd.	
	Nagshead	Tair Onen	Nagshead	Tair Onen
Mean	0.61	0.39	1059	373
EFFECTS				
fertilizer'	0.04	0.00	-164	-11
formalin'	0.23**	0.04	23	2
acid'	0.09*	0.07*	212*	153*
fertilizer' × formalin'	0.03	-0.03	26	33
fertilizer' × acid'	-0.01	0.00	-145	74
formalin' × acid'	0.01	-0.01	-65	-51
S.E.±	0.035	0.030	75.5	64.3
c.v.%	11.6	15.3	14.3	34.5

Table 119

Formalin and acidification

Old Kennington K 49, Ampthill Am 20, Ringwood R 40

Years and Species 1+0 seedbeds

K 49	1951-1953	band-sowing of 6 species (crop failures: 1952 Tsuga and Douglas fir; 1953 Tsuga)
	1954-1956	broadcast sowing of Sitka spruce
Am 20, R 40	1951-1952	broadcast sowing of Sitka spruce. (Crop failed at Ampthill in 1952)

common name	scientific name
Sitka spruce	Picea sitchensis (Bongard) Carrière
Western hemlock	Tsuga heterophylla (Rafinesque) Sargent
Douglas fir	Pseudotsuga taxifolia (Poiret) Britton
Lodgepole pine	Pinus contorta (Loudon)
Corsican pine	Pinus nigra var. calabrica (Loudon) Schneider
Japanese larch	Larix leptolepis (Siebold and Zuccarini) Gordon

Design K 49 (1951-1953), Am 20, R 40 — 32 plots in 4 blocks of 8; 2 additional plots per block making a total of 40 plots

K 49 (1954-1956) — 32 plots in 4 blocks of 8, confounding three high-term interactions 2 additional plots per block making a total of 40 plots

All factorial combinations of:

K 49
Ra(1951,1952) × Mf(all years) × Ns(1951 to 1953) × Upt(1954 to 1956) × Rs(1954 to 1956)

Am 20
Ra(both years) × Mf(both years) × Ns(both years)

R 40
Ra(1951) × Mf(both years) × Ns(both years)

Factorial treatments		units	rate per sq.yd. K 49, Am 20, R 40 1951	1952	1953	K 49 only 1954	1955	1956
Ra	heavy rate of ammonium sulphate applied in winter	g.	250	250[1]	-	-	-	-
Mf	formalin[2]	ml.	500	250	250	250	250	250
Ns	ammonium sulphate topdressed early	g.N	4½	4½	4½	-	-	-
	late	g.N	4½	4½	4½	-	-	-
Upt	granulated peat	g.	-	-	-	500	500	500
Rs	flowers of sulphur	g.	-	-	-	25	25	25

[1] no Ra at Ringwood

[2] 1951-1953 spring treatments, 1954-1956 winter treatments
All treatments applied in 3 to 6 l. water, sealed off with 1½ to 2 l. water in 1951 and 1952

Basal dressings							
ammonium sulphate topdressed early	g.N	-	-	-	4½	4½	4½
late	g.N	-	-	-	4½	4½	4½
superphosphate	g.P	4½	4½	4½	4½	9	9
potassium chloride	g.K	4½	4½[3]	4½	4½	9	9
kieserite	g.Mg	-	-[3]	-	-	3	3

[3] Ringwood: 9 g.K, 4½ g.Mg

Dates	1951 K	Am	R	1952 K	Am	R	1953 K	1954 K	1955 K	1956 K
Winter application										
ammonium sulphate	12/12	9/12	23/1	18/12	28/12	-	-	-	-	-
peat, sulphur, formalin	-	-	-	-	-	-	-	8/12	31/1	13/12
spring application										
fertilizer (P, K, Mg)	1/3	12/3	8/3	26/2	29/2	4/3	23/2	5/3	15/3	13/3
formalin	21/3	12/3	8/3	27/2	29/2	4/3	23/2	-	-	-
summer topdressings										
ammonium sulphate early	28/6	4/7	25/6	18/6	26/6	25/6	30/6	29/6	4/7	6/7
late	2/8	3/8	1/8	12/8	-	15/8	6/8	5/8	4/8	25/7
sowing of seed	16/4	5/4	19/4	28/4	30/4	17/4	18/3	27/3	15/4	29/3

Table 119 cont.

Old Kennington, K 49

	TSUGA	DOUGLAS FIR		PINUS CONTORTA			CORSICAN PINE			JAPANESE LARCH		
	1951	1951	1953	1951	1952	1953	1951	1952	1953	1951	1952	1953
Height in inches												
Mean	1.60	4.10	4.72	2.67	1.68	1.99	1.53	1.60	1.72	7.08	4.09	4.82
Effects												
Ra'[1]	0.49**	0.38**	0.33*	0.04	0.09	0.55**	0.18**	0.01	0.10*	1.42**	-0.10	0.46
Ns'	0.64**	0.66**	0.66**	0.50**	0.24*	0.54**	0.07	0.09	0.14**	1.05**	0.43	2.22**
Mf'	0.42**	1.37**	0.62**	1.40**	1.15**	0.48**	0.43**	0.45**	0.11*	2.22**	2.40**	1.38**
Ra'Ns'	-0.05	-0.04	-0.30	-0.33**	-0.10	-0.14	-0.02	-0.11	-0.04	-1.10**	-0.50	-0.33
Ra'Mf'	-0.09	-0.37**	0.07	-0.41**	0.19	-0.04	-0.08	0.25**	-0.12*	-0.18*	0.66*	-0.29
Ns'Mf'	-0.05	-0.15	0.06	-0.17**	0.04	-0.06	-0.16**	-0.00	-0.06	0.05	-0.12	0.12
Ra'Ns'Mf'	-0.20**	-0.04	-0.25	-0.08	-0.01	-0.22*	-0.06	-0.05	0.00	-0.35**	0.24	-0.48
S.E.±	0.068	0.115	0.156	0.056	0.113	0.086	0.052	0.076	0.048	0.070	0.280	0.297
Means												
Unmanured	0.72	2.45	3.60	1.19	1.10	1.06	1.14	1.47	1.38	3.94	2.96	2.80
Fertilizer	0.82	2.54	3.94	1.27	1.15	1.20	1.01	1.52	1.40	4.26	3.08	2.96
S.E.±	0.097	0.162	0.221	0.080	0.160	0.122	0.074	0.107	0.068	0.098	0.396	0.420
c.v.%	13.5	8.6	9.7	6.7	20.4	13.4	10.2	13.6	8.3	3.0	20.4	18.9
Number of plants per yard of drill												
Mean	51	71	54	131	72	60	40	59	52	66	63	88
Effects												
Ra'[1]	4	-2	1	-23	0	5	2	-1	0	-6	-3	5
Ns'	-9	-1	3	11	8	1	4	-1	7	9	5	-13
Mf'	10	-19	12	6	3	-3	-2	12	-0	16	2	-11
Ra'Ns'	0	2	5	-27	-2	4	1	-6	-2	-1	-4	9
Ra'Mf'	-0	-5	0	0	6	-3	5	-4	-1	3	-1	16
Ns'Mf'	-10	-3	2	-4	2	5	-7	-8	-1	-1	-2	-4
Ra'Ns'Mf'	-2	-3	6	4	1	3	4	2	-3	6	10	-5
Means												
Unmanured	51	83	56	146	82	70	45	60	50	72	67	99
Fertilizer	44	75	53	116	76	50	32	58	40	59	66	76

SITKA SPRUCE

Old Kennington, K 49

	Height in inches			Number of plants per sq.yd.		
	1954	1955	1956	1954	1955	1956
Mean	2.60	1.19	2.09	918	1220	489
Effects						
Ra' residues	0.18*	0.04	-0.24*	63	-37	-23
Ns' residues	0.20*	0.04	0.08	-19	-82	-4
Mf'	0.29**	0.17**	0.20*	45	0	-59
Ra' residues × Mf'	-0.47**	-0.04	0.05	-12	-76	2
Rs'	0.01	-0.06	-0.12	61	-136	-102
Ra' residues × Rs'	-0.04	-0.04	-0.05	-27	123	-38
Mf'Rs'	-0.14	-0.08	-0.03	-9	34	-23
Upt'	-0.04	0.11*	0.06	4	162	1
Ra' residues × Upt'	0.20*	0.07	0.26*	-17	-82	-18
Mf'Upt'	0.08	-0.01	0.05	-44	-99	27
Rs'Upt'	-0.08	0.02	0.01	-42	176	-55
S.E.±	0.083	0.041	0.093	47.0	98.6	64.3
Means						
Unmanured	0.68	1.04	0.99	808	1504	776
Fertilizer	1.72	0.87	1.89	700	1431	672
S.E.±	0.117	0.058	0.132	66.5	139.4	90.9
c.v.%	10.1	10.1	13.4	15.0	21.9	34.0

[1] residues only in R 40 1952 and K 49 1953

Table 119 cont.

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	Am 20	R 40		K 49			Am 20	R 40		K 49		
	1951	1951	1952	1951	1952	1953	1951	1951	1952	1951	1952	1953
Mean	1.85	1.59	1.08	2.65	1.50	1.93	852	940	566	117	56	79
Effects												
Ra'[1]	0.16*	-0.18	-0.06	0.61**	0.03	0.50**	-29	37	-28	18	2	-7
Ns'	0.32**	0.31**	0.13	0.28**	0.23	0.93**	32	9	-46	-9	-1	-4
Mf'	1.43**	0.92**	0.38**	1.57**	1.12**	0.45**	224**	-23	-28	29*	-19**	-11
Ra'Ns'	-0.05	-0.40**	0.01	-0.21**	-0.12	-0.10	132	-8	-62	3	-2	15
Ra'Mf'	-0.36**	0.02	-0.34**	-0.21**	0.28	-0.08	-147*	-57	-34	4	-9	-5
Ns'Mf'	0.02	-0.08	-0.04	-0.19*	0.02	0.04	99	-81*	-12	-17	-5	7
Ra'Ns'Mf'	0.01	-0.17	-0.11	-0.14*	-0.07	0.01	127	48	4	-7	8	-0
S.E.±	0.075	0.100	0.090	0.072	0.173	0.115	69.0	34.4	38.5	11.4	4.4	8.7
Means												
Unmanured	0.56	0.84	0.46	0.89	0.75	0.90	602	944	528	124	55	89
Fertilizer	0.76	0.94	0.70	0.98	0.79	0.91	933	885	508	124	69	96
S.E.±	0.106	0.141	0.127	0.102	0.245	0.163	97.5	48.7	54.4	16.1	6.3	12.4
c.v.%	13.1	19.5	26.0	8.9	36.3	18.8	23.4	10.4	19.5	27.3	22.0	30.2

[1] residues only in R 40 1952 and K 49 1953

Table 120

Forms of nitrogen; test on formalin and fritted trace elements

Old Kennington K 57, Ampthill Am 24

Years and Species 1952-1955 1+0 Sitka spruce seedbeds (crop failed at Ampthill in 1952)

Design 1952-1953 32 plots in 4 blocks of 8; 2 additional plots per block making a total of 40 plots

1954-1955 32 plots in 4 blocks of 8, highest order interaction confounded between pairs of blocks; 2 additional plots per block making a total of 40 plots

Factorial test on:

calcium nitrate
'Nitro-Chalk'
ammonium sulphate × formalin × fritted trace elements (1954 and 1955 only)
formalised casein

Additional test on plots without nitrogen:

formalin × fritted trace elements (1954 and 1955 only)

Treatments

			units	rate per sq.yd. 1952	1953	1954	1955
calcium nitrate[1] 'Nitro-Chalk' ammonium sulphate	topdressed	early	g.N	4½	4½	4½	4½
		late	g.N	4½	4½	4½	4½
formalised casein (N.228) applied in seedbed			g.N	9	9	9	9
formalin[2] (Mf)			ml.	250	250	250	250
fritted trace elements (Fte) (7% iron, 3.2% copper, 3.2% zinc, 2.5% manganese, 0.68% boron, 0.13% molybdenum)			g.	-	-	10	10

Basal dressings

superphosphate	g.P	4½	4½	4½	9
potassium chloride	g.K	4½	4½	4½	9
kieserite	g.Mg	-	-	-	3

Dates

			1952 K 57	1952 Am 24	1953 K 57	1953 Am 24	1954 K 57	1954 Am 24	1955 K 57	1955 Am 24
Treatment applications										
formalin winter			-	-	-	-	8/12	14/12	31/1	20/12
spring[3]			27/2	29/2	23/2	26/2	-	-	-	-
form. casein, P, K, Mg, Fte			26/2	29/2	23/2	26/2	5/3	2/3	15/3	21/3
calcium nitrate 'Nitro-Chalk' ammonium sulphate	topdressed	early	18/6	26/6	30/6	2/7	29/6	30/6	4/7	6/7
		late	12/8	-	6/8	10/8	5/8	6/8	4/8	5/8
Broadcast sowing of seed			23/4	30/4	18/3	24/3	27/3	30/3	15/4	6/4

[1] 1952-1954: anhydrous salt, 1955: double salt, $5Ca(NO_3)_2.NH_4NO_3.10H_2O$

[2] 1952 and 1953 spring applications; 1954 and 1955 winter applications all treatments applied in 5 to 6 l. water, sealed off with 2 l. water in 1952

[3] applied after forking in fertilizer

Table 120 cont.

SITKA SPRUCE

Height in inches

MEANS	1952 K 57	1953 K 57	1953 Am 24	1954 K 57	1954 Am 24	1955 K 57	1955 Am 24
without formalin							
no nitrogen	0.98	1.15	0.74	0.86	0.61	0.81	0.68
calcium nitrate	1.04	1.51	0.91	0.95	1.00	0.86	0.66
'Nitro-Chalk'	1.10	1.66	1.09	1.38	1.22	0.78	0.69
ammonium sulphate	1.24	2.00	1.42	1.86	1.91	1.02	0.89
formalised casein	1.13	1.95	1.14	0.98	1.28	0.98	0.85
with formalin							
no nitrogen	1.66	1.50	1.51	1.33	1.30	1.22	1.07
calcium nitrate	2.04	2.42	1.64	1.77	1.84	1.30	1.01
'Nitro-Chalk'	2.24	2.44	2.03	2.22	2.40	1.22	0.94
ammonium sulphate	2.39	2.64	1.94	2.79	2.69	1.22	1.07
formalised casein	2.18	2.92	1.99	1.98	2.62	1.25	1.10
S.E.±	0.092	0.100	0.103	0.116	0.137	0.059	0.052
All plots							
Mean	1.60	2.02	1.44	1.61	1.69	1.07	0.90
EFFECTS							
N'	0.35**	0.87**	0.40**	0.64**	0.91**	0.06	0.03
S.E.±	0.072	0.079	0.082	0.092	0.108	0.046	0.041
Mf'	1.00**	0.73**	0.76**	0.81**	0.97**	0.35**	0.28**
Fte'	-	-	-	-0.06	0.16	0.02	-0.00
S.E.±	0.058	0.063	0.065	0.073	0.087	0.037	0.033
N'Mf'	0.20**	0.24**	-0.01	0.21*	0.17	-0.04	-0.07
N'Fte'	-	-	-	-0.06	0.06	0.01	0.05
S.E.±	0.072	0.079	0.082	0.092	0.108	0.046	0.041
N plots only							
Mean	1.67	2.19	1.52	1.74	1.87	1.08	0.90
EFFECTS							
Mf'	1.08**	0.82**	0.76**	0.90**	1.04**	0.33**	0.26**
Fte'	-	-	-	-0.08	0.19	0.02	0.01
Mf'Fte'	-	-	-	-0.02	0.16	-0.04	0.06
S.E.±	0.065	0.071	0.073	0.082	0.097	0.042	0.036
c.v.%	11.5	9.9	14.3	14.4	16.2	11.0	11.5

Number of plants per sq.yd.

	1952 K 57	1953 K 57	1953 Am 24	1954 K 57	1954 Am 24	1955 K 57	1955 Am 24
without formalin							
no nitrogen	650	656	694	489	870	868	1134
calcium nitrate	496	652	622	483	758	814	1011
'Nitro-Chalk'	570	621	578	375	660	932	1212
ammonium sulphate	693	698	681	543	718	884	1071
formalised casein	538	519	378	390	714	728	694
with formalin							
no nitrogen	706	736	930	758	800	990	1242
calcium nitrate	588	768	765	680	896	1018	1294
'Nitro-Chalk'	578	634	861	718	770	994	1234
ammonium sulphate	663	736	795	609	844	990	1137
formalised casein	654	708	660	630	886	820	1178
S.E.±	45.8	49.8	81.8	77.4	71.4	63.0	108.4
All plots							
Mean	614	673	696	567	792	904	1121
EFFECTS							
N'	-80*	-29	-145*	-70	-54	-32	-84
S.E.±	36.2	39.4	64.6	61.2	56.4	49.8	85.7
Mf'	48	88**	212**	237**	95*	118**	193*
Fte'	-	-	-	38	-111*	18	-88
S.E.±	28.9	31.5	51.7	49.0	45.2	39.8	68.6
N'Mf'	-5	4	-15	-28	104	-2	53
N'Fte'	-	-	-	-101	80	-10	-197*
S.E.±	36.2	39.4	64.6	61.2	56.4	49.8	85.7
N plots only							
Mean	598	667	668	554	781	898	1104
EFFECTS							
Mf'	46	89*	206**	212**	136*	117*	214*
Fte'	-	-	-	-2	-80	14	-166*
Mf'Fte'	-	-	-	20	68	24	7
S.E.±	32.4	35.2	57.8	54.8	50.5	44.5	76.6
c.v.%	14.9	14.8	23.5	27.4	18.0	13.9	19.3

Table 121

Forms of nitrogen; test on formalin, magnesium and fritted trace elements

Ringwood R 52, Kennington Extension KE 67

Years and Species 1952-1955 1+0 Sitka spruce seedbeds

Design 1952-1953 32 plots in 4 blocks of 8, highest order interaction confounded between pairs of blocks
2 additional plots per block making a total of 40 plots

1954-1955 32 plots in 4 blocks of 8, confounding 3 high-term interactions;
2 additional plots per block making a total of 40 plots

Factorial test on:

calcium nitrate
'Nitro-Chalk'
ammonium sulphate × formalin × magnesium × fritted trace elements (1954 and 1955 only)
formalised casein

Additional test on plots without nitrogen

formalin × magnesium × fritted trace elements (1954 and 1955 only)

Treatments			rate per sq.yd.			
		units	1952	1953	1954	1955
calcium nitrate[1] / 'Nitro-Chalk' / ammonium sulphate — topdressed	early	g.N	4½	4½	4½	4½
	late	g.N	4½	4½	4½	4½
formalised casein (N.228) applied in seedbed		g.N	9	9	9	9
formalin[2] (Mf)		ml.	250	250	250	250
kieserite (Mg)		g.Mg	4½	1½	3	3
fritted trace elements (Fte) (7% iron, 3.2% copper, 3.2% zinc, 2.5% manganese, 0.68% boron, 0.13% molybdenum)		g.	-	-	10	10

Basal dressing

superphosphate	g.P	4½	4½	4½	9
potassium chloride	g.K	9	9	9	9

Dates		1952		1953		1954		1955	
		R 52	KE 67	R 52	KE 67	R 52	KE 67	R 52	KE 67
Treatment applications									
formalin	winter	-	-	-	-	10/12	9/12	23/12	31/1
	spring[3]	4/3	28/2	27/2	24/2	-	-	-	-
formalised casein, P, K, Mg, Fte		4/3	27/2	27/2	24/2	25/2	5/3	9/3	16/3
calcium nitrate / 'Nitro-Chalk' / ammonium sulphate — topdressed	early	23/6	18/6	23/6	30/6	23/6	29/6	30/6	4/7
	late	15/8	12/8	30/7	5/8	3/8	5/8	2/8	4/8
Broadcast sowing of seed		17/4	24/4	26/3	19/3	5/4	25/3	1/4	12/4

[1] 1952-1954 anhydrous salt; 1955 double salt, $5Ca(NO_3)_2.NH_4NO_3.10H_2O$

[2] 1952 and 1953 spring application; 1954 and 1955 winter application
All treatments applied in 4 to 6 l. water, sealed off with 1½ to 2 l. water in 1952

[3] applied after forking in fertilizer

Table 121 cont.

SITKA SPRUCE

Height in inches

	1952		1953		1954		1955	
	R 52	KE 67	R 52	KE 67	R 52	KE 67	R 52	KE 67
without formalin								
no nitrogen	0.82	1.04	0.44	1.40	0.27	1.06	0.55	0.98
calcium nitrate	0.88	1.25	0.79	1.63	0.28	1.54	0.65	1.34
'Nitro-Chalk'	1.02	1.38	1.13	1.81	0.38	1.96	0.57	1.16
ammonium sulphate	0.92	1.42	1.28	1.91	0.43	1.66	0.60	1.15
formalised casein	0.93	1.29	1.50	1.78	0.64	1.78	0.79	1.26
with formalin								
no nitrogen	1.16	2.09	1.16	2.26	0.91	1.94	1.02	1.65
calcium nitrate	1.16	1.92	2.68	2.42	1.08	2.10	0.98	1.56
'Nitro-Chalk'	1.10	2.08	2.78	2.64	1.26	2.14	0.90	1.54
ammonium sulphate	1.25	1.98	2.36	2.32	1.40	1.84	0.79	1.30
formalised casein	1.15	2.10	2.78	2.66	1.82	2.18	1.20	1.66
S.E.±	0.106	0.131	0.089	0.137	0.122	0.157	0.038	0.082
All plots								
Mean	1.04	1.66	1.69	2.08	0.85	1.82	0.80	1.36
EFFECTS								
N'	0.06	0.11	1.11**	0.31*	0.32**	0.44**	0.02	0.06
S.E.±	0.083	0.103	0.047	0.108	0.061	0.124	0.030	0.064
Mf'	0.25**	0.76**	1.32**	0.75**	0.90**	0.40**	0.34**	0.36**
Mg'	-0.13	-0.04	-0.01	-0.13	0.10	-0.00	-0.01	-0.07
Fte'	-	-	-	-	0.02	-0.04	0.02	-0.05
S.E.±	0.067	0.083	0.038	0.087	0.048	0.099	0.024	0.052
N'Mf'	-0.05	-0.18	0.38**	-0.07	0.16*	-0.27*	-0.08*	-0.19*
N'Mg'	0.08	0.09	0.04	0.08	-0.01	0.08	-0.02	0.04
N'Fte'	-	-	-	-	0.04	0.22	-0.02	0.01
S.E.±	0.083	0.103	0.047	0.108	0.061	0.124	0.030	0.064
N plots only								
Mean	1.05	1.68	1.91	2.14	0.91	1.90	0.81	1.37
EFFECTS								
Mf'	0.23**	0.68**	1.48*	0.73**	0.96**	0.33**	0.31**	0.28**
Mg'	-0.10	-0.00	0.01	-0.09	0.10	0.03	-0.02	-0.06
Fte'	-	-	-	-	0.04	0.04	0.02	-0.05
Mf'Mg'	-0.13	-0.03	-0.03	0.03	0.11	0.06	-0.06*	0.03
Mf'Fte'	-	-	-	-	0.02	0.06	0.05	0.03
Mg'Fte'	-	-	-	-	0.10	-0.02	0.00	0.06
S.E.±	0.075	0.092	0.042	0.097	0.054	0.111	0.027	0.058
EFFECT OF Mg WITH								
no nitrogen	-0.26	-0.19	-0.08	-0.26	0.12	-0.14	0.02	-0.14
calcium nitrate	-0.20	0.11	-0.08	-0.04	0.27*	0.28	-0.12*	-0.10
'Nitro-Chalk'	-0.10	-0.08	-0.05	0.06	-0.00	-0.04	0.02	-0.20
ammonium sulphate	-0.07	0.00	0.22*	-0.14	0.20	0.04	0.08	-0.00
formalised casein	-0.01	-0.04	-0.06	-0.26	-0.08	-0.17	-0.05	0.08
S.E.±	0.149	0.185	0.084	0.194	0.108	0.222	0.053	0.115
c.v.%	20.3	15.8	7.0	13.2	18.0	17.3	9.4	12.0

Table 121 cont.

SITKA SPRUCE

Number of plants per sq.yd.

	1952		1953		1954		1955	
	R 52	KE 67	R 52	KE 67	R 52	KE 67	R 52	KE 67
without formalin								
no nitrogen	684	375	966	686	898	692	1122	738
calcium nitrate	628	255	1000	663	795	802	1186	954
'Nitro-Chalk'	681	332	987	658	792	882	1137	952
ammonium sulphate	658	352	1042	567	1024	1000	1143	846
formalised casein	702	316	1010	645	880	848	957	798
with formalin								
no nitrogen	730	340	1136	636	1086	866	1048	1050
calcium nitrate	662	276	1100	538	1006	862	1107	951
'Nitro-Chalk'	666	242	1137	579	933	934	1068	980
ammonium sulphate	704	302	1108	489	1136	816	1068	945
formalised casein	682	330	1186	597	998	909	1006	730
S.E.±	42.2	40.5	43.6	41.3	67.5	94.0	68.7	96.1
All plots								
Mean	680	312	1067	606	955	861	1084	894
EFFECTS								
N'	-34	-57	21	-69*	-47	103	-1	0
S.E.±	33.4	32.0	34.5	32.7	53.3	74.3	54.3	76.0
Mf'	18	-28	132**	-76**	154**	33	-50	74
Mg'	-21	11	10	-1	71	21	-42	9
Fte'	-	-	-	-	-26	28	-29	-12
S.E.±	26.7	25.6	27.6	26.1	42.7	59.5	43.5	60.8
N'Mf'	-18	4	-23	-16	-21	-88	15	-149
N'Mg'	-6	-2	-75*	32	-28	-4	69	111
N'Fte'	-	-	-	-	16	184*	9	124
S.E.±	33.4	32.0	34.5	32.7	53.3	74.3	54.3	76.0
N plots only								
Mean	673	300	1071	592	946	882	1084	894
EFFECTS								
Mf'	11	-27	123**	-82*	145**	-3	-44	14
Mg'	-24	10	-20	12	60	19	-14	54
Fte'	-	-	-	-	-20	102	-26	38
Mf'Mg'	0	-52	-17	52	-3	53	36	12
Mf'Fte'	-	-	-	-	12	17	-47	-104
Mg'Fte'	-	-	-	-	78	29	-15	-55
S.E.±	29.8	28.6	30.8	29.2	47.7	66.5	48.6	68.0
EFFECT OF Mg WITH								
no nitrogen	-10	14	130*	-52	116	27	-152	-168
calcium nitrate	-24	-18	-57	116	50	39	34	204
'Nitro-Chalk'	-33	12	12	-52	-3	-56	-93	-168
ammonium sulphate	-63	-6	99	-15	177	56	-18	138
formalised casein	26	-52	-132*	0	15	38	20	40
S.E.±	59.7	57.2	61.7	58.4	95.4	132.9	97.2	135.9
c.v.%	12.4	25.9	8.2	13.6	14.1	21.8	12.6	21.5

Table 122

Fertilizers and formalin

Old Kennington K 44, Ringwood R 33, Kennington Extension KE 50

Years and Species 1950-1953 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8, confounding two 3-term and one 4-term interactions

Factorial test on:

nitrogen × phosphorus × potassium × current formalin × residual formalin (from 1951)

Treatments

		units	1950 all centres	1951 all centres	1952 K	1952 R, KE	1953 K	1953 R, KE
N[1]	seedbed	g.N	4½	-	-	-	-	-
	topdressed early	g.N	4½	4½	4½	4½	4½	4½
	late	g.N	-	4½	4½	4½	4½	4½
P	superphosphate	g.P	4½	4½	4½	4½	4½	4½
K	potassium sulphate	g.K	4½	4½	4½	9	4½	9
Mf	formalin[2]	ml.	500	500	250	250	250	250

[1] 1950-1951, 'Nitro-Chalk' at all centres; 1952-1953, ammonium sulphate at K, 'Nitro-Chalk' at R and KE
[2] applied in 4 to 5 l. water all years; sealed off with 2 l. water 1950 to 1952

Dates

Treatments	1950++ K	1950++ R	1950++ KE	1951 K	1951 R	1951 KE	1952 K	1952 R	1952 KE	1953 K	1953 R	1953 KE
formalin, seedbed manuring (P,K; N 1950)	22/2	7/3	22/2	1/3+	8/3	1/3	27/2	4/3	28/2	24/2	27/2	24/2
N topdressed early	6/7	26/6	6/7	28/6	25/6	28/6	18/6	25/6	18/6	30/6	23/6	30/6
late	-	-	-	2/8	1/8	2/8	12/8	15/8	12/8	6/8	30/7	5/8
Broadcast sowing of seed	27/3	30/3	28/3	11/4	17/4	5/4	23/4	16/4	18/4	18/3	31/3	19/3

+ formalin applied on 21/3

++ N raked in during final preparation of seedbed; K and KE on 9/3 and R on 13/3

Height in inches

SITKA SPRUCE

	K 44 1950	K 44 1951	K 44 1952	K 44 1953	R 33 1950	R 33 1951	R 33 1952	R 33 1953	KE 50 1950	KE 50 1951	KE 50 1952	KE 50 1953
Mean	1.32	0.97	0.92	1.57	0.74	1.10	0.87	0.62	2.21	2.77	1.82	1.85
Effects												
N'	0.11	0.10	0.18*	0.81**	0.22**	0.25**	0.09*	0.43**	0.15	0.31*	-0.10	0.06
P'	0.33**	0.42**	0.42**	0.33**	0.32**	0.44**	0.39**	0.12*	0.48**	0.44**	0.18	0.12
K'	-0.05	0.01	-0.08	-0.03	0.18**	0.33**	0.32**	0.17**	0.28**	0.28*	0.14	0.22*
N'P'	0.14	0.11	0.10	0.21*	0.19**	0.30**	0.14**	0.10	0.28**	0.06	-0.03	0.11
N'K'	-0.16	0.09	0.01	-0.10	0.15**	-0.02	0.07	0.19**	0.06	0.20	-0.03	0.04
P'K'	0.05	-0.02	0.13	0.12	0.11**	0.16*	0.16**	0.13*	0.12	0.17	0.18	0.10
Mf current'	1.01**	0.64**	0.27**	0.11	0.53**	0.67**	0.29**	0.27**	0.85**	1.04**	0.36**	0.36**
Mf residues'	-	0.02	-0.02	-0.05	-	0.03	0.16**	0.23**	-	0.19	0.42**	0.06
Mf curr.' × resid.'	-	-0.24**	-0.10	-0.05	-	-0.24**	-0.21**	0.06	-	-0.34**	0.08	-0.25*
N' × Mf current'	-0.16	0.05	0.03	-0.06	0.03	0.04	-0.01	0.16*	-0.20*	-0.14	-0.06	-0.10
P' × Mf current'	0.29**	0.18**	0.16*	0.17	0.31**	0.31**	0.30**	0.06	0.36**	0.20	0.09	0.07
K' × Mf current'	-0.01	0.07	-0.12	-0.13	-0.01	-0.08	0.04	0.09	-0.33**	-0.34**	0.01	-0.13
Means												
no Mf	-	0.52	0.74	1.51	-	0.63	0.54	0.41	-	1.98	1.47	1.51
Mf current	-	1.40	1.11	1.67	-	1.55	1.05	0.61	-	3.36	1.75	2.13
Mf residues	-	0.78	0.83	1.51	-	0.90	0.91	0.57	-	2.52	1.81	1.83
both	-	1.18	0.99	1.57	-	1.34	0.99	0.90	-	3.22	2.24	1.93
S.E.±	0.076	0.054	0.063	0.077	0.035	0.067	0.042	0.055	0.092	0.108	0.110	0.088
c.v.%	16.2	15.6	19.5	13.8	13.2	17.2	13.8	24.7	11.7	11.0	17.0	13.4

Table 122 cont.

Number of plants per sq.yd. SITKA SPRUCE

	K 44				R 33				KE 50			
	1950	1951	1952	1953	1950	1951	1952	1953	1950	1951	1952	1953
Mean	669	671	240	656	618	728	577	1067	1264	1285	592	542
Effects												
N'	-19	-9	-14	-24	-10	-83	1	111	283**	-31	-33	-39
P'	69	-92*	-7	65	12	-2	-54	18	96	-19	-22	28
K'	-9	75	-16	15	36	-37	-16	4	99	55	-20	-45
N'P'	1	41	10	40	-24	45	-26	-32	-64	-176*	-27	-54
N'K'	-64	-49	12	-51	4	-2	-27	-25	15	-99	10	-15
P'K'	-6	47	45	57	15	-15	32	29	124	72	-2	44
Mf current'	442**	124**	30	103*	38	49	81	34	-206*	30	-106	-2
Mf residues'	-	-19	-5	-12	-	-47	33	95	-	-52	-1	25
Mf curr.' × resid.'	-	-29	21	-6	-	-87	-66	-208**	-	130*	-16	81*
N' × Mf current'	-62	-82*	-17	-43	-18	58	0	-78	69	-37	-77	2
P' × Mf current'	60	-1	36	15	30	105	24	16	5	31	41	70*
K' × Mf current'	-35	-25	11	-6	-2	-21	67	76	-88	-125	25	35
Means												
no Mf	-	604	238	608	-	683	487	898	-	1360	637	571
Mf current	-	757	248	717	-	819	634	1141	-	1261	548	488
Mf residues	-	614	212	602	-	723	586	1202	-	1179	652	515
both	-	709	263	698	-	685	601	1028	-	1339	530	594
S.E.±	55.5	35.8	38.6	42.2	34.0	58.2	56.0	53.9	71.0	59.8	55.9	30.7
c.v.%	23.5	15.1	45.5	18.2	15.6	22.6	27.5	14.3	15.9	13.2	26.7	16.0

Table 123

Winter and spring application of formalin; hoof

Kennington Extension KE 59, Bagley B 30, Wareham W 60

Years and Species 1951 1+0 Sitka spruce seedbeds

Design 32 plots in 4 blocks of 8

all factorial combinations of:

formalin applied in winter (Aw) × formalin applied in spring (Af) × hoof (Nh)

Treatments	rate per sq.yd.
formalin (applied in 4 to 5 l. water, sealed off with 2 to 3 l. water)	250 ml.
hoof	9 g.N

Dates	KE 59	B 30	W 60
Treatment applications			
formalin (winter)	12/12	12/12	23/1
formalin (spring), fertilizers	1/3	29/3	6/3
Broadcast sowing of seed	5/4	18/4	3/4

Basal manuring

superphosphate 4½ g.P
potassium chloride 4½ g.K

150 g. per sq.yd. of ground chalk applied at Bagley only in December 1950

SITKA SPRUCE

1951	Height in inches			Number of plants per sq.yd.		
	KE 59	B 30	W 60	KE 59	B 30	W 60
Mean	2.57	1.62	1.79	1223	1438	1120
Effects						
Aw'	0.68**	0.34*	0.22	-7	59	-43
Af'	1.04**	0.20	0.70**	-71	-42	-3
Aw'Af'	-0.35**	0.03	-0.01	115	35	8
Nh'	-0.21*	0.15	-0.06	32	-1	-36
Aw'Nh'	-0.14	0.07	-0.37	-49	-8	-37
Af'Nh'	0.11	0.09	-0.20	-33	-3	48
Aw'Af'Nh'	0.25*	-0.22	-0.24	-14	-72	35
S.E.±	0.100	0.153	0.180	68.3	59.8	53.9
c.v.%	11.0	26.7	28.4	15.8	11.7	13.6

Table 124

Compost, fertilizer, formalin

Old Kennington K 42, Ampthill Am 5, Ringwood R 32, Kennington Ext. KE 49, Bagley B 26, Wareham W 55

Years and Species Am 5 1950-1951 (crop failed in 1951); All other centres 1950-1955 — 1+0 Sitka spruce seedbeds

Design Am 5 16 plots in 2 blocks of 8

all other centres 1950-1954 32 plots in 4 blocks of 8; 1955 32 plots in 4 blocks of 8, confounding highest order interaction

Factorial test on:

1950-1954 compost × fertilizer × formalin

1955 compost × (winter v. spring) × fertilizer × (winter v. spring) × formalin resid.

Treatments — rate per sq.yd.

		units	1950 all centres	1951 K,Am R,KE	1951 B W	1952 K	1952 R,KE B,W	1953 K	1953 R,KE B,W	1954 K	1954 R,KE B,W	1955 all centres
C	bracken and hopwaste compost	kg.	4½	4½	4½	4½	4½	4½	4½	4½	4½	4½
F	fertilizer											
	N[1] seedbed	g.N	4½	-	-	-	-	-	-	-	-	-
	topdressed early	g.N	4½	4½	4½	4½	4½	4½	4½	4½	4½	4½
	late	g.N	-	4½	4½	4½	4½	4½	4½	4½	4½	4½
	P superphosphate	g.P	4½	4½	4½	4½	4½[2]	4½	4½	4½	4½	9
	K potassium chloride	g.K	4½	4½	4½	4½	9	4½	9	4½	9	9
	Mg kieserite	g.Mg	-	-	-	-	4½[3]	-	1½	-	3	3
Mf	formalin*	ml.	500	500	250	250	250	250	250	250	250	-

[1] 1950-1951: 'Nitro-Chalk' at all centres; 1952-1955: ammonium sulphate at K, 'Nitro-Chalk' at R, KE, B, W

[2] at B and W: half P (2¼ g.P) forked in with K and Mg; half P (2¼ g.P) spread on the surface after forking

[3] no Mg in KE 49

* applied in 4 to 5 l. water (all years); sealed off with 2 l. water in 1950 to 1952

Rothamsted S. Numbers for compost samples

1950	1951			1952			1953		1954		1955	
all centres	K B	Am KE	R W	K KE	R W	B	K,KE B	R W	K,KE B	R W	K KE,B	R W
5879	6026	6015	6016	6151	6165	6152	6308	6315	6500	6498	6654	6632

Dates of treatment application

Year of cropping:	formalin (in winter before cropping) 1950	1951	1952	1953	1954	winter manuring (C, P, K, Mg) 1955 only	seedbed manuring (C, P, K, Mg; N 1950+) 1950	1951	1952	1953	1954	1955
Am	3/3	12/3	-	-	-	-	3/3	12/3	-	-	-	-
K	22/2	21/3	27/2	23/2	5/3	31/1	22/2	21/3	26/2	23/2	5/3	15/3
R	7/3	8/3	4/3	27/2	25/2	23/12	7/3	8/3	4/3	27/2	25/2	9/3
KE	22/2	1/3	28/2	24/2	5/3	31/1	22/2	1/3	26/2	24/2	5/3	16/3
B	23/2	29/3	28/2	25/2	5/3	31/1	23/2	29/3	28/2	25/2	5/3	16/3
W	8/3	6/3	5/3	28/2	24/2	23/12	8/3	6/3	5/3	28/2	24/2	11/3

	N topdressed (early) 1950	1951	1952	1953	1954	1955	N topdressed (late) 1951	1952	1953	1954	1955	Broadcast sowing of seed 1950	1951	1952	1953	1954	1955
Am	30/6	4/7	-	-	-	-	3/8	-	-	-	-	28/3	14/4	-	-	-	-
K	6/7	28/6	18/6	30/6	29/6	4/7	2/8	12/8	6/8	5/8	4/8	27/3	11/4	23/4	18/3	26/3	15/4
R	26/6	25/6	25/6	23/6	23/6	30/6	1/8	15/8	30/7	3/8	2/8	30/3	17/4	16/4	31/3	31/3	31/3
KE	6/7	28/6	18/6	30/6	29/6	4/7	2/8	12/8	5/8	5/8	4/8	28/3	5/4	18/4	19/3	26/3	5/4
B	11/7	29/6	18/6	1/7	29/6	4/7	2/8	12/8	5/8	9/8	4/8	30/3	18/4	16/4	20/3	5/4	18/4
W	27/6	24/6	24/6	24/6	24/6	28/6	1/8	14/8	29/7	4/8	3/8	27/3	3/4	4/4	25/3	17/3	21/3

\+ N raked in during final preparation of seedbed

Table 124 cont.

SITKA SPRUCE

	Height in inches						Number of plants per sq.yd.					
	K 42	Am 5	R 32	KE 49	B 26	W 55	K 42	Am 5	R 32	KE 49	B 26	W 55
1950												
Mean	1.52	1.81	1.21	2.72	2.62	3.25	657	330	446	1245	816	852
EFFECTS												
C'	-0.08	0.27*	0.78**	0.90**	1.57**	1.43**	-359**	8	-169**	98	-101	-54
F'	0.61**	0.40**	0.44**	0.18	1.42**	1.74**	38	11	27	17	-19	-34
C'F'	-0.04	0.08	-0.03	-0.29*	0.02	-0.65**	34	17	100	54	-44	-8
Mf'	1.00**	0.93**	0.78**	1.18**	0.63**	0.76**	210**	-35	140*	-229**	-426**	47
C'Mf'	-0.17	0.12	0.37**	-0.24**	0.44**	0.44*	-104	19	-60	-124	164*	-53
F'Mf'	0.30**	-0.00	0.07	-0.06	-0.04	-0.25	63	-152*	-8	-115	-34	-4
C'F'Mf'	0.02	-0.02	-0.09	-0.02	0.12	-0.05	9	-41	22	46	54	-23
S.E.±	0.100	0.095	0.104	0.109	0.084	0.173	50.3	46.1	59.5	72.2	62.4	34.3
c.v.%	18.6	10.5	24.2	11.3	9.1	15.1	21.7	28.0	37.7	16.4	21.6	11.4
1951												
Mean	1.04		1.70	3.05	2.24	2.93	621		575	1078	1207	1019
EFFECTS												
C'	0.15*		0.73**	0.20	0.95**	0.92**	-196**		-270**	-289**	-320**	61
F'	0.42**		0.78**	0.64**	0.84**	1.29**	-59		76	-22	-64	119**
C'F'	-0.10		-0.19**	-0.29	-0.28*	0.08	29		21	100	-162*	-56
Mf'	0.76**		1.19**	1.00**	1.00**	1.04**	205**		-30	-4	64	-26
C'Mf'	0.10		0.38**	-0.08	0.62**	0.42**	-32		28	-64	143*	-77
F'Mf'	0.22**		0.29**	-0.03	0.28*	-0.21	-53		11	-35	41	16
C'F'Mf'	-0.04		-0.13*	0.22	-0.06	-0.19	-55		12	-28	-33	-1
S.E.±	0.070		0.062	0.196	0.110	0.132	38.8		46.2	66.6	66.2	38.1
c.v.%	19.0		10.3	18.2	13.9	12.8	17.7		22.7	17.5	15.5	10.6
1952												
Mean	0.97		1.68	1.80	2.02	2.46	237		434	456	810	635
EFFECTS												
C'	-0.18*		1.31**	-0.07	0.84**	0.87**	-234**		-156**	-308**	-45	-2
F'	0.38**		0.50**	0.36**	0.92**	0.75**	-57		12	-53	7	25
C'F'	-0.17*		-0.24*	0.00	-0.10	-0.16	7		71*	106*	-78	10
Mf'	0.35**		1.00**	0.99**	0.63**	-0.09	76*		-38	-15	42	-50
C'Mf'	-0.12		0.30**	0.35**	0.61**	0.42**	-43		-7	-6	14	22
F'Mf'	-0.01		0.20	0.06	0.10	0.20	-31		-6	-69	21	-3
C'F'Mf'	-0.06		-0.20*	0.09	0.01	-0.10	18		0	74	15	-16
S.E.±	0.068		0.096	0.094	0.099	0.097	31.0		26.7	49.4	43.2	25.5
c.v.%	19.8		16.1	14.8	13.8	11.1	37.0		17.4	30.6	15.1	11.4
1953												
Mean	1.85		1.22	2.08	2.62	2.64	535		890	485	688	1005
EFFECTS												
C'	0.95**		0.70**	0.20*	0.92**	0.99**	-125**		-86*	-98**	-139**	-2
F'	0.83**		0.82**	0.41**	0.68**	1.20**	-2		-49	-3	3	-11
C'F'	-0.15*		0.00	-0.27**	-0.45**	-0.18	28		102**	17	37	-8
Mf'	0.45**		0.46**	0.37**	0.02	-0.25*	-0		172**	-110**	-184**	-51
C'Mf'	0.07		-0.09	0.11	0.19	0.21	-45		-67	8	-6	-6
F'Mf'	0.06		0.20**	-0.09	-0.14	-0.01	-17		37	64*	4	-24
C'F'Mf'	-0.04		-0.07	0.02	0.21	0.14	67		-90*	5	-6	8
S.E.±	0.058		0.051	0.095	0.101	0.113	33.7		33.4	30.6	30.7	38.2
c.v.%	8.9		11.8	12.9	10.9	12.1	17.8		10.6	17.8	12.6	10.8
1954												
Mean	1.59		1.06	1.35	2.50	2.74	554		680	555	1379	981
EFFECTS												
C'	0.21**		0.74**	0.02	0.91**	1.04**	-301**		-117*	-344**	-104	-124*
F'	1.29**		0.58**	0.32**	1.25**	2.07**	-128**		-86	-108	-113	86
C'F'	-0.33**		-0.14	-0.10	-0.39**	-0.12	100*		62	116	141*	14
Mf'	0.72**		0.93**	0.37**	0.34**	-0.41**	65		109*	56	-142*	-110*
C'Mf'	-0.17**		0.26*	0.16	0.38	0.14	-9		52	-36	65	5
F'Mf'	0.23**		0.21	0.03	-0.00	0.20	91*		112*	81	-64	116*
C'F'Mf'	-0.12*		-0.31**	0.02	0.06	0.41**	-56		-14	-8	-24	-14
S.E.±	0.047		0.104	0.098	0.093	0.118	36.5		46.9	59.3	61.1	49.6
c.v.%	8.4		27.7	20.6	10.5	12.2	18.6		20.0	30.2	12.5	14.2

Table 124 cont.

1955

	SITKA SPRUCE				
	K 42	R 32	KE 49	B 26	W 55
			Height in inches		
Mean	0.99	0.94	1.12	1.32	1.90
EFFECTS					
C'	0.22**	0.53**	0.01	0.61**	0.34**
F'	0.08**	0.25**	0.02	0.39**	0.61**
C'F'	0.01	-0.11	0.10*	-0.29**	-0.24**
(spring-winter)'	0.10**	0.07	-0.02	0.03	-0.02
C'(spring-winter)'	-0.03	0.04	-0.03	-0.12	0.03
F'(spring-winter)	0.04	0.08	0.01	0.10	0.06
C'F'(spring-winter)'	-0.02	-0.05	0.06	-0.09	-0.02
Mf resid.'	0.29**	0.07	-0.00	-0.18*	-0.07
C'Mf resid.'	-0.07*	0.01	-0.08	-0.16*	0.15
F'Mf resid.'	-0.09**	-0.09	-0.02	-0.06	0.07
C'F'Mf resid.'	0.05	-0.07	0.01	0.04	0.06
(spring-winter)'Mf resid.'	-0.00	-0.09	0.03	-0.02	-0.04
C'(spring-winter)'Mf resid.'	-0.01	-0.03	-0.00	0.02	-0.03
F'(spring-winter)'Mf resid.'	-0.03	0.05	-0.02	-0.12	0.08
S.E.±	0.026	0.059	0.047	0.070	0.081
c.v.%	7.5	17.7	11.9	15.1	12.1
			Number of plants per sq.yd.		
Mean	848	681	729	650	1081
EFFECTS					
C'	-163*	-124**	-338**	-105	-55
F'	82	-21	-84	-99	1
C'F'	73	4	138*	49	20
(spring-winter)'	115	7	43	0	-32
C'(spring-winter)'	-146*	-65	-90	5	-25
F'(spring-winter)'	13	45	171*	-87	-92
C'F'(spring-winter)'	20	-9	69	34	-22
Mf resid.'	89	- 51	-48	23	-5
C'Mf resid.'	-13	62	-2	-39	69
F'Mf resid.'	49	25	44	27	24
C'F'Mf resid.'	116	-28	13	13	-7
(spring-winter)'Mf resid.'	-74	-28	49	17	-17
C'(spring-winter)'Mf resid.'	-61	32	-27	18	-9
F'(spring-winter)'Mf resid.'	-166*	2	70	-38	15
S.E.±	55.9	35.3	57.9	60.9	44.7
c.v.%	18.6	14.6	22.3	26.6	11.7

Table 125

Compost, fertilizer, formalin

Ringwood R 61

Years and Species 1953-1956 1+0 Sitka spruce seedbeds. Plot size: 6 ft. × 3 ft.

Design 16 plots in 4 blocks of 4 confounding highest order interaction between pairs of blocks

Factorial test on: compost × fertilizer × formalin

Treatments		units	rate per sq.yd. 1953	1954	1955	1956
C	bracken and hopwaste compost[1]	kg.	4½	4½	4½	4½
F	fertilizer					
	N topdressed early	g.N	4½	4½	4½	4½
	late	g.N	4½	4½	4½	4½
	P superphosphate	g.P	4½	4½	9	9
	K potassium chloride	g.K	9	9	9	9
	Mg kieserite	g.Mg	1½	3	3	3
Mf	formalin applied in 4 l. water	ml.	250	250	250	250

[1] RES.Nos: 1953 S.6315; 1954 S.6498; 1955 S.6665; 1956 S.6860

Dates

Treatment applications	1953	1954	1955	1956
compost, P, K, Mg fertilizer, formalin	27/2	25/2	8/3	6/3
N topdressed early	23/6	23/6	30/6	26/6
late	30/7	3/8	2/8	31/7
Broadcast sowing of seed	27/3	5/4	1/4	27/3

SITKA SPRUCE

	Height in inches 1953	1954	1955	1956	Number of plants per sq.yd. 1953	1954	1955	1956
Mean	1.98	1.28	1.04	1.22	1089	772	1004	1504
EFFECTS								
C'	0.46**	0.70**	0.47**	0.39**	-2	34	249	-218**
F'	1.57**	0.69**	0.17*	0.77**	100*	62	92	88
Mf'	0.80**	1.43**	0.38**	0.53**	91	81*	44	-68
C'F'	0.16	0.09	-0.08	-0.07	-74	66	-123	-40
C'Mf'	-0.13	0.19	0.15*	-0.04	61	-22	-39	-164*
F'Mf'	0.29	0.37	0.02	0.13	55	154**	-28	-20
S.E.±	0.090	0.109	0.049	0.069	38.9	29.9	119.2	54.4
c.v.%	9.1	17.1	9.5	11.3	7.1	7.7	23.7	7.2

Table 126

Compost, fertilizer and chlorpicrin

Old Kennington K 41, Ampthill Am 38, Ringwood R 31, Kennington Extension KE 48, Bagley B 25, Wareham W 77

Years and Species 1950-1955 K 41, R 31, KE 48, B 25; 1953-1955 Am 38, W 77 — 1+0 Sitka spruce seedbeds

Design K 41, KE 48, B 25: 1950-1952 4 × 4 Latin Square; 1953-1955 16 plots in 2 blocks of 8, confounding highest order interaction

Am 38, R 31, W 77: 16 plots in 2 blocks of 8, confounding highest order interaction

Factorial test on:

1950-1952 compost × fertilizer

1953-1955 compost × fertilizer × current chlorpicrin × residual chlorpicrin (from 1954)

Treatments

		units	1950 all centres	1951 all centres	1952 K	1952 R,KE B,	1953 K Am	1953 R,KE B,W	1954 K Am	1954 R,KE B,W	1955 all centres
			rate per sq.yd.								
C	bracken and hopwaste compost	kg.	4½	4½	4½	4½	4½	4½	4½	4½	4½
F	fertilizer										
	N[1] seedbed	g.N	4½	-	-	-	-	-	-	-	-
	topdressed early	g.N	4½	4½	4½	4½	4½	4½	4½	4½	4½
	late	g.N	-	4½	4½	4½	4½	4½	4½	4½	4½
	P superphosphate	g.P	4½	4½	4½	4½[2]	4½	4½	4½	4½	9
	K potassium chloride	g.K	4½	4½	4½	9	4½	9	4½	9	9
	Mg kieserite	g.Mg	-	-	-	4½[3]	-	1½	-	3	3
Mcp	chloropicrin (16 shots/plot depth: 4 in. 1953, 6 in. 1954-55)	ml.	-	-	-	-	32	32	32	32	32

[1] 1950-1951, 'Nitro-Chalk' at all centres; 1952-1955, ammonium sulphate at K and Am, 'Nitro-Chalk' at R,KE,B,W
[2] half dressings forked in with other fertilizers, half spread on the surface after forking at KE and B
[3] no Mg in KE 48

Rothamsted S. Numbers for compost samples

1950 all centres	1951 K B	1951 Am KE	1951 R	1952 K KE	1952 R	1952 B	1953 K,Am KE,B	1953 R W	1954 K,Am KE,B	1954 R W	1955 K,Am KE,B	1955 R W
5879	6026	6015	6016	6151	6165	6152	6308	6315	6500	6498	6670	6665

Date of treatment applications

	Chlorpicrin (winter before cropping) 1953	1954	1955	seedbed manuring (C, P, K, Mg; N in 1950*) 1950	1951	1952	1953	1954	1955	N topdressed (early) 1950	1951	1952	1953	1954	1955
Am	26/2	12/12	21/12	-	-	-	26/2	2/3	21/3	-	-	-	2/7	30/6	6/7
K	23/2	8/12	31/1	22/2	21/3	26/2	23/2	5/3	15/3	6/7	28/6	18/6	30/6	29/6	4/7
R	27/2	10/12	22/12	7/3	8/3	5/3	27/2	25/2	9/3	26/6	25/6	25/6	23/6	23/6	30/6
KE	24/2	9/12	31/1	22/2	1/3	26/2	24/2	5/3	16/3	6/7	28/6	18/6	30/6	29/6	4/7
B	25/2	9/12	4/1	23/2	29/3	28/2	25/2	5/3	16/3	11/7	29/6	18/6	1/7	29/6	4/7
W	28/2	11/12	23/12	-	-	-	28/2	24/2	11/3	-	-	-	24/6	24/6	28/6

	N topdressed (late) 1951	1952	1953	1954	1955
Am	-	-	10/8	6/8	5/8
K	2/8	12/8	6/8	5/8	4/8
R	1/8	15/8	30/7	3/8	2/8
KE	2/8	12/8	5/8	5/8	4/8
B	2/8	12/8	5/8	9/8	4/8
W	-	-	29/7	4/8	3/8

Broadcast sowing of seed

	1950	1951	1952	1953	1954	1955
Am	-	-	-	25/3	30/3	6/4
K	27/3	11/4	23/4	18/3	26/3	15/4
R	30/3	17/4	16/4	31/3	5/4	1/4
KE	28/3	5/4	18/4	19/3	19/3	5/4
B	30/3	18/4	16/4	20/3	5/4	18/4
W	-	-	-	25/3	16/3	24/3

* N raked in during final preparation of seedbed

Table 126 cont.

SITKA SPRUCE

	Height in inches				Number of plants per sq.yd.			
	K 41	R 31	KE 48	B 25	K 41	R 31	KE 48	B 25
1950								
Mean	0.62	0.70	2.76	1.89	342	475	1048	1154
C'	0.04	0.44**	0.86**	1.18**	-199**	-242**	-197	-214
F'	0.14**	0.26**	0.82**	1.26**	4	164**	-1	3
C'F'	-0.09*	-0.04	-0.44**	-0.06	-16	-23	28	40
S.E.±	0.035	0.044	0.098	0.101	21.3	47.8	90.8	114.2
c.v.%	11.3	12.5	7.1	10.6	12.4	20.1	17.3	19.8
1951								
Mean	0.56	0.98	2.02	1.63	480	681	1041	1159
C'	-0.04	0.50**	-0.11	0.56**	-247**	-128**	-272*	-148
F'	0.12*	0.45**	0.73**	0.50**	-34	-32	-85	-50
C'F'	-0.09	-0.02	-0.44	-0.04	-79	-37	-5	55
S.E.±	0.047	0.053	0.190	0.134	64.8	32.8	106.2	101.0
c.v.%	16.9	10.9	18.8	16.4	27.0	9.7	20.4	17.4
1952								
Mean	0.72	0.91	1.15	1.80	163	576	451	800
C'	0.08	0.71**	-0.30**	0.42**	-124**	66	-292**	33
F'	0.23**	0.26**	0.35**	0.70**	-8	-9	-68	33
C'F'	-0.14	-0.06	-0.06	-0.20*	4	-51	94	108*
S.E.±	0.058	0.056	0.048	0.060	27.3	61.5	42.9	32.2
c.v.%	16.2	12.3	8.4	6.7	33.5	21.4	19.0	8.0

	K 41	Am 38	R 31	KE 48	B 25	W 77	K 41	Am 38	R 31	KE 48	B 25	W 77
1953												
Mean	2.07	2.40	1.90	2.07	3.15	2.60	526	524	926	560	643	1011
C'	0.87**	0.35*	1.22**	0.47**	1.23**	1.03**	-45	13	-139	-20	-425**	-117*
F'	0.80**	0.41**	0.71**	0.40**	1.04**	0.91**	70	16	26	8	-65	69
C'F'	-0.19	-0.30*	-0.07	-0.20*	-0.83**	-0.40	21	22	76	74	92	150*
Mop curr.'	0.74**	1.53**	2.16**	1.20**	0.75**	0.73*	76	-44	59	30	-310**	16
C' × Mop curr.'	0.24*	-0.16	0.60**	0.52**	0.41*	0.31	-12	16	-149	42	-35	-2
F' × Mop curr.'	-0.21	-0.04	0.18	-0.12	-0.20	0.37	-56	22	1	21	10	-46
S.E.±	0.095	0.114	0.123	0.067	0.173	0.229	58.3	33.1	66.4	40.1	48.0	49.5
c.v.%	9.2	9.5	13.0	6.5	11.0	17.6	22.2	12.6	14.3	14.3	14.9	9.8
1954												
Mean	1.86	2.15	1.27	1.23	2.92	3.14	484	874	516	478	1377	805
C'	0.25	0.55**	0.68*	0.08	1.14**	0.81*	-205**	-137	-134*	-185*	40	23
F'	1.37**	0.94**	0.47	0.30*	1.56**	1.90**	-32	40	-52	-77	-42	74
C'F'	-0.30	-0.09	-0.22	-0.26	-0.32	0.30	82	104	22	17	184	-16
Mop curr.'	0.50*	0.46*	1.22**	0.43*	0.85*	0.41	142*	-11	-92	79	-46	-40
Mop resid.'	0.20	0.37*	0.16	0.13	0.30	0.57	47	-7	52	88	219*	-10
Mop curr.'× resid.'	-0.07	-0.38*	-0.29	0.04	0.16	-0.57	-71	58	65	59	52	74
C' × Mop curr.'	0.31	-0.04	0.09	0.21	0.82*	0.17	19	155	44	38	120	-46
F' × Mop curr.'	-0.11	0.24	0.23	0.15	-0.39	0.12	-73	-64	0	-19	-118	23
S.E.±	0.188	0.136	0.223	0.116	0.273	0.242	52.0	79.4	43.1	52.4	81.2	59.6
c.v.%	20.2	12.7	35.2	18.8	18.7	15.4	21.5	18.2	16.7	21.9	11.8	14.8
1955												
Mean	1.01	1.01	1.19	1.32	1.97	1.81	747	709	867	1129	878	1325
C'	0.12	0.04	0.49**	0.16	0.93**	0.43*	-251*	-196	-7	-448**	-69	43
F'	0.10	-0.16*	0.15	-0.03	0.70**	0.58**	101	-26	-76	-39	44	53
C'F'	0.05	-0.10	-0.16	0.10	-0.34**	-0.18	26	-32	55	-39	-52	11
Mop curr.'	0.13	0.22**	0.60**	0.26**	0.81**	0.66**	103	-340*	28	100	184	-74
Mop resid.'	0.06	0.08	-0.01	0.01	-0.14	-0.04	-32	-11	182**	86	68	16
Mop curr.'× resid.'	-0.02	-0.06	-0.15	-0.03	-0.19*	-0.09	-251*	-32	-79	46	-117	13
C' × Mop curr.'	-0.11	0.04	-0.06	0.23*	0.51**	0.17	76	92	-52	260*	-4	112
F' × Mop curr.'	-0.11	-0.13	-0.06	0.08	0.13	0.20	-133	118	122*	-3	27	-4
S.E.±	0.061	0.057	0.086	0.069	0.060	0.130	95.8	97.2	41.3	87.4	81.8	80.0
c.v.%	12.1	11.2	14.5	10.4	6.1	14.4	25.6	27.4	9.5	15.5	18.7	12.2

Table 127

Soil inversion and acidification

Old Kennington K 19A and K 19B

Years and Species 1948 seedbed plots split for 1+0 Sitka spruce v. 1+0 Scots pine
1949-51 1+0 Sitka spruce seedbeds

Design and Treatments

K 19A 32 plots in 8 blocks of 4; 4 blocks with soil dug normally and 4 blocks with soil inverted

K 19B 8 plots in 4 blocks of 2; 2 blocks with soil dug normally and 2 blocks with soil inverted

K 19A Acidification treatments[1] (applied 1948 and 1949 only)	rate in g. per sq.yd. winter 47/48	winter 48/49
no acidification	-	-
aluminium sulphate	454	454
sulphur	85	85
ammonium sulphate	340	340

[1] supplying equal amounts of sulphur

K 19A Basal manuring		units	rate per sq.yd. 1948	1949	1950	1951
N seedbed	ammonium sulphate	g.N	8½	5	-	-
	'Nitro-Chalk'	g.N	-	-	4½	-
topdressed	'Nitro-Chalk'[2] early	g.N	-	4½	4½	4½
	late	g.N	-	-	-	4½
P superphosphate		g.P	5½	4½	4½	4½
K potassium chloride		g.K	7	4	4½	4½

[2] as ammonium sulphate in 1949

K 19B	rate in kg. per sq.yd. (applied annually)
Unmanured	-
Compost[3] of bracken and hopwaste	2¼

K 19B

NO BASAL MANURING

[3] Rothamsted Numbers:-
1948 S.5438; 1949 S.5706; 1950 S.5879; 1951 S.6026

SOIL INVERSION

The soil was inverted by double digging to interchange surface soil and subsoil before applying acidification treatments to see whether it might be easier to acidify the subsoil where the surface soil had acquired too high a pH by liming, application of basic slag or other means.

Dates

Treatments in winter before cropping	1948	1949	1950	1951
soil inversion	1/1	-	-	-
soil acidification	6/1	19/12	-	-
Manuring				
seedbed (C, P, K; N 1948-1950)	22/3	11/3	22/2+	21/3
N topdressed early	-	24/6	6/7	28/6
late	-	-	-	2/8
Broadcast sowing of seed	30/4	1/4	27/3	11/4

+ N raked in on 9/3 during final preparation of seedbed

	SITKA SPRUCE								SCOTS PINE	
Height in inches	1948		1949		1950		1951		1948	
	normal	inverted	normal	inverted	normal	inverted	normal	inverted	normal	inverted
19A and 19B Mean	0.94	0.81	0.80	0.75	1.87	1.84	1.12	1.22	1.28	1.17
19A										
no acidification	0.69	0.64	0.82	0.87	1.51	1.55	0.87	0.84	1.03	1.07
aluminium sulphate	0.98	1.02	0.68	0.79	1.88	1.92	1.38	1.84	1.34	1.42
sulphur	0.98	0.82	1.00	0.92	2.29	1.97	1.43	1.21	1.38	1.17
ammonium sulphate	1.36	1.06	0.71	0.35	2.48	2.58	1.16	1.40	1.72	1.37
S.E.±	0.052	0.061	0.059	0.068	0.084	0.116	0.176	0.155	0.102	0.068
c.v.%	10.3	14.0	14.8	18.8	8.2	11.6	29.1	23.5	15.0	10.8
19B										
Unmanured	0.72	0.33	0.81	0.68	1.08	0.90	0.80	0.68	0.97	0.86
Compost	0.66	0.70	0.80	0.94	1.34	1.46	0.74	0.94	0.94	0.76
Number of plants per square yard										
19A and 19B Mean	850	995	409	492	1340	1390	620	836	796	879
19A										
no acidification	873	1029	468	662	1234	1474	558	716	864	861
aluminium sulphate	939	987	392	536	1474	1276	810	912	768	870
sulphur	852	954	234	314	1450	1400	645	897	771	903
ammonium sulphate	708	975	284	360	1504	1396	578	828	717	852
S.E.±	66.4	49.2	80.4	101.7	50.6	66.4	73.1	50.1	53.0	67.8
c.v.%	15.8	10.0	47.0	43.4	7.1	9.6	22.6	11.9	13.6	15.5
19B										
Unmanured	888	918	804	711	1260	1641	693	1005	798	960
Compost	870	1140	531	468	807	1164	330	645	924	858

Table 128

Soil inversion, acidification, manuring and formalin

Nagshead Nd 2,3,4, Tair Onen TO 2,3,4, Widehaugh Wd 2,3,4, Wykeham Old Wk 1,2,3

Years and Species			
	1949-1950	Nagshead and Tair Onen	
	1948-1950	Widehaugh (crop failed in 1949)	1+0 Sitka spruce seedbeds
	1948-1949	Wykeham Old	

SOIL INVERSION

At each centre a site, approximately 60 feet × 40 feet was divided into 4 pairs of strips (each 60 feet × 5 feet) of which one strip in each pair was inverted by double digging to interchange surface soil and subsoil. The four inverted and the four normal strips were divided into 72 plots, comprising 64 experimental plots for tests on soil acidification, manuring and formalin and 8 untreated plots. Inversion was carried out at Widehaugh and Wykeham Old Nursery during January 1948 for cropping during the same season, and at Tair Onen and Nagshead in August 1948 for cropping in 1949.

Design and Treatments

Nd 2, TO 2, Wd 2, Wk 1	32 plots in 8 blocks of 4; 4 blocks with soil dug normally and 4 with soil inverted
Nd 3 and 4, TO 3 and 4 Wd 3 and 4, Wk 2 and 3	16 plots in 4 blocks of 4, highest order interaction confounded between pairs of blocks; 2 blocks with soil dug normally and 2 with soil inverted

Nd 2, TO 2, Wd 2, Wk 1

Acidification test (treatments not repeated in 1950)		rate in g. per sq.yd. winter[2] 47/48	winter 48/49
none	no acidification	-	-
Ral	aluminium sulphate[1]	454	454
Rs	sulphur	85	85
Ra	ammonium sulphate[1]	340	340

[1] supplying the same amount of sulphur as in sulphur treatment [2] Wd and Wk only

Nd 2, TO 2, Wd 2, Wk 1

Basal manuring			units	rate per sq.yd. 1948	1949	1950
N	seedbed	amm.sulphate	g.N	8½	5	5
	topdressed	'Nitro-Chalk'	g.N	-	4½	4½
P	superphosphate		g.P	5½	4½	4½
K	potassium chloride		g.K	7	4	4

Nd 3, TO 3, Wd 3, Wk 2

Factorial test on N × P × K rates and materials as shown above under basal manuring of Nd 2, TO 2, Wd 2, Wk 1

Nd 4, TO 4, Wd 4, Wk 3

Factorial test on compost × fertilizer × formalin

C bracken and hopwaste compost, 2½ kg. per sq.yd., annually (Roth.Nos. 1948 S.5438; 1949 S.5706; 1950 S.5892)

F N, P, K fertilizer applied annually, rates and materials as shown above

Mf 450 ml. formalin per sq.yd. in 4½ l. water, applied annually

Dates season of cropping:-	1948 Wd	1948 Wk	1949 Nd	1949 TO	1949 Wd	1949 Wk	1950 Nd	1950 TO	1950 Wd
acidification in winter before cropping	3/2	2/2	28/9	30/9	23/2	21/1	-	-	-
formalin	12/3	6/3	21/2	4/3	15/3	26/2	8/3	10/3	2/3
manuring seedbed	14/4	7/4	23/3	13/4	7/4	26/3	16/3	17/3	29/3
topdressing	-	-	12/7	12/7	n.d.	1/7	7/7	11/7	14/7
broadcast sowing of seed	23/4	23/4	5/4	14/4	15/4	1/4	29/3	30/3	5/4

SITKA SPRUCE

Height in inches	Nd 2,3,4 1949	Nd 2,3,4 1950	TO 2,3,4 1949	TO 2,3,4 1950	Wd 2,3,4 1948	Wd 2,3,4 1950	Wk 1,2,3 1948	Wk 1,2,3 1949
All 64 experimental plots								
32 normal plots	0.36	0.77	0.80	0.72	0.79	0.80	1.03	1.31
32 inverted plots	0.52	0.90	0.83	0.62	0.75	0.77	0.73	0.91
8 Untreated plots								
4 normal plots	0.33	0.49	0.70	0.50	0.61	0.66	0.94	1.44
4 inverted plots	0.43	0.48	0.55	0.32	0.54	0.61	0.61	0.92

Number of plants per square yard								
All 64 experimental plots								
32 normal plots	520	1004	242	1060	688	380	538	812
32 inverted plots	679	1092	525	1162	821	409	634	589
8 Untreated plots								
4 normal plots	600	830	270	1041	861	573	680	886
4 inverted plots	712	814	666	993	914	616	830	712

Table 128 cont.

SITKA SPRUCE

Height in inches	Nd 2,3,4		TO 2,3,4		Wd 2,3,4		Wk 1,2,3	
	1949	1950	1949	1950	1948	1950	1948	1949
Acidification test								
MEANS								
no acidification	0.30	0.85	0.85	0.76	0.75	0.86	0.83	1.12
aluminium sulphate	0.43	0.95	0.81	0.78	0.83	0.62	0.83	0.84
sulphur	0.36	1.03	0.77	0.83	0.92	0.99	0.86	0.81
ammonium sulphate	0.36	1.18	0.78	0.85	0.83	0.64	0.82	0.46
EFFECT OF INVERSION WITH								
no acidification	0.10	0.20*	0.13	-0.04	-0.01	-0.06	-0.24**	-0.46**
aluminium sulphate	0.01	0.09	0.04	-0.05	-0.02	-0.15	-0.35**	-0.64**
sulphur	0.06	0.32**	-0.25	0.04	-0.01	0.08	-0.54**	-0.73**
ammonium sulphate	0.00	0.29**	0.09	0.05	-0.04	-0.02	-0.18*	0.12
S.E.±	0.058	0.083	0.135	0.053	0.045	0.106	0.073	0.140
c.v.%	22.7	11.8	23.9	9.3	7.6	19.1	12.3	24.5
NPK test								
MEAN	0.39	0.73	0.81	0.46	0.72	0.78	0.94	1.27
EFFECTS								
N'	-0.04	0.39**	0.01	0.16**	0.08	0.15	0.00	-0.24**
P'	0.08*	-0.01	-0.04	0.04	0.03	0.09	-0.02	0.09
K'	0.08*	-0.03	0.12*	0.12*	-0.08	0.00	-0.09	-0.02
N' × inversion'	0.01	0.02	0.15**	-0.01	0.06	0.02	0.04	-0.06
P' × inversion'	0.04	0.08	0.06	0.04	0.00	0.07	0.02	-0.08
K' × inversion'	0.04	0.01	0.05	-0.02	0.00	0.02	-0.10	-0.06
S.E.±	0.030	0.048	0.034	0.033	0.046	0.061	0.058	0.056
c.v.%	15.3	13.2	8.3	14.4	12.9	15.7	12.2	8.9
Test on compost, fertilizer and formalin								
MEAN	0.68	0.79	0.93	0.75	0.80	0.90	0.96	1.52
EFFECTS								
C'	0.12	0.28*	-0.01	0.26**	0.04	0.14	0.02	0.16
F'	-0.14	0.34**	-0.02	0.26**	0.05	0.10	-0.01	0.18
Mf'	0.34	0.16	0.04	0.05	0.17**	0.28**	0.23**	0.67**
C' × inversion'	0.03	0.20	0.09	-0.05	-0.01	-0.04	0.09	0.07
F' × inversion'	-0.13	-0.07	0.06	0.07	-0.03	0.05	-0.07	-0.24
Mf' × inversion'	0.14	0.11	-0.04	-0.08	-0.00	0.03	0.00	0.31
S.E.±	0.082	0.089	0.081	0.055	0.026	0.063	0.054	0.168
c.v.%	24.2	22.6	17.4	14.7	6.4	14.1	11.3	22.1

Number of plants per square yard								
Acidification test								
MEANS								
no acidification	387	1117	340	1058	736	368	540	836
aluminium sulphate	609	1154	266	1086	751	237	514	720
sulphur	494	1070	243	1012	674	344	508	379
ammonium sulphate	480	1119	238	1192	760	225	352	648
EFFECT OF INVERSION WITH								
no acidification	315	88	78	408*	136	188**	216*	-256*
aluminium sulphate	354*	159	314**	87	-8	-81	-39	-390**
sulphur	99	75	-12	238	82	-81	-32	-512**
ammonium sulphate	-39	-90	252**	-81	231*	12	87	-282*
S.E.±	155.1	107.6	84.6	154.2	104.6	46.4	94.0	108.8
c.v.%	44.6	13.6	44.3	20.1	20.2	22.3	27.7	23.8
NPK test								
MEAN	668	1132	540	1108	839	520	617	677
EFFECTS								
N'	-82	122	-11	70	93	-190*	-7	44
P'	170*	170	-1	32	-90	47	-85	-71
K'	80	8	-164	2	-96	-31	-154*	94*
N' × inversion'	164*	1	-16	94	36	-55	-47	-64
P' × inversion'	77	34	-44	98	18	38	-137	4
K' × inversion'	71	4	-31	158*	-72	-52	-89	-77
S.E.±	63.6	94.6	108.3	58.6	68.3	68.0	57.5	36.4
c.v.%	19.1	16.7	40.1	10.6	16.2	26.0	18.6	10.7
Test on compost, fertilizer and formalin								
MEAN	718	942	407	1209	652	371	687	784
EFFECTS								
C'	15	86	-206*	-25	-129	-116	-2	-196
F'	-274**	155	-181	-73	-160*	-137	-316**	-94
Mf'	30	86	-55	236	0	-41	-19	-16
C' × inversion'	-27	-23	-55	53	-87	-23	62	-135
F' × inversion'	-2	10	-158	14	-56	61	7	-213
Mf' × inversion'	-158	-80	79	-43	-42	-2	-38	-15
S.E.±	73.1	75.7	78.5	177.2	63.3	70.3	54.4	134.2
c.v.%	20.3	16.1	38.5	29.4	19.4	37.8	15.9	34.1

Table 129

'Cuprammonium', cresylic acid, formalin

Old Kennington K 5

Years and Species 1946 seedbed plots split for 1+0 Sitka spruce (SS) v. 1+0 Scots pine (SP)
1947 seedbed plots with 1+0 Sitka spruce only

Design and Treatments 4 × 4 Latin Square

	1946 rate per sq.yd. (applied in 9 l. water)	1947 (residue only)
untreated	-	-
'cuprammonium'	4 g. copper sulphate ($CuSO_4.5H_2O$) + 24 g. ammonium carbonate	-
cresylic acid	225 ml.	-
formalin	180 ml.	-

NO BASAL FERTILIZER

Dates

	1946 only		1946	1947
all treatments	25/2	broadcast sowing of seed	13/4	7/5

	Height in inches			Number of plants per sq.yd.		
	SS 1946	SP 1946	SS 1947	SS 1946	SP 1946	SS 1947
untreated	0.70	1.03	0.71	774	513	198
'cuprammonium'	0.82	1.11	0.67	954	392	186
cresylic acid	1.01	1.30	0.86	860	608	387
formalin	1.04	1.23	0.93	1148	616	396
S.E.±	0.063	0.074	0.051	90.6	57.6	22.7
c.v.%	14.2	12.6	12.8	19.4	21.3	15.8

Table 130

Formalin, alcohol and sucrose

Old Kennington K 29

Years and Species 1949-1950 1+0 Sitka spruce

Design 4 × 4 Latin Square

Treatments

	units	rate per sq.yd. 1949	1950
untreated	-	-	-
methanol[1]	ml.	200	200
sucrose	g.	200	200
formalin[1]	ml.	450	500

Basal fertilizer (1949 only)

		units	rate per sq.yd.
N	seedbed ammonium sulphate	g.N	5
	topdressed 'Nitro-Chalk'	g.N	4½
P	superphosphate	g.P	4½
K	potassium chloride	g.K	4

[1] 1949 applied in 4½ l. water; 1950 applied in 5 l. water, sealed off with 2 l. water

Dates

experimental treatments 1949	1950	basal fertilizer (1949 only) seedbed	topdressed	broadcast sowing of seed 1949	1950
25/2	22/2	10/3	24/6	30/3	24/3

SITKA SPRUCE

	Height in inches		Number of plants per sq.yd.	
	1949	1950	1949	1950
untreated	0.97	0.74	988	682
alcohol	0.97	0.68	1173	825
sucrose	1.04	0.94	1266	928
formalin	1.21	1.48	1641	1413
S.E.±	0.060	0.105	117.8	149.4
c.v.%	11.3	21.8	18.6	31.1

Table 131

Bleaching powder, hexamine, 'cuprammonium', sulphuric acid, formalin

Old Kennington K 28, Ampthill Am 6

Years and Species 1950 1+0 Sitka spruce seedbeds (Plot size: 3 ft. × 1½ ft.)

Design 64 plots in 4 blocks of 16 8 treatments × (level 1 v.2)

	Dates	Am 6	K 28		Am 6	K 28
NO BASAL MANURING	Pre-sowing treatments	3/3	22/2	Broadcast sowing of seed	28/3	24/3
	Post-sowing treatments	29/3	29/3			

		Height in inches				Number of plants per sq.yd.			
		Am 6		K 28		Am 6		K 28	
Pre-sowing treatments	double rate per sq.yd.	Mean	EFFECT (level 2-1)'	Mean	EFFECT (level 2-1)'	Mean	EFFECT (level 2-1)'	Mean	EFFECT (level 2-1)'
no treatment	-	0.96	-	0.83	-	287	-	712	-
bleaching powder[1]	100 g.	0.99	0.16	0.92	0.14	162	-36	728	22
hexamine	50 g.	1.46	0.47*	0.92	-0.13	190	-12	480	-339*
formalin[2]	500 ml.	2.13	0.14	1.56	0.16	259	-28	1112	-58
Post-sowing treatments[3]									
no treatment	-	1.14	-	0.82	-	316	-	843	-
'cuprammonium'	5 g.ø	1.10	0.12	0.77	0.06	371	-14	874	-2
sulphuric acid	50 ml.	1.08	-0.08	0.97	0.12	243	-69	1024	-90
formalin	25 ml.	1.38	0.26	0.86	0.08	127	-130	1123	86
S.E.±		0.097	0.194	0.056	0.111	34.1	68.2	82.1	164.2
c.v.%		21.5		16.4		39.2		26.9	

[1] calcium chloro-hypochlorite (commercial)
[2] applied in 4 l. water, sealed off with 2 l. water
[3] applied in 2½ l. water followed by watering during dry spells in April

ø 1 g. copper sulphate ($CuSO_4.5H_2O$) + 4 g. ammonium carbonate

Table 132

Fungicides

Old Kennington K 45, Ampthill Am 9, Kennington Extension KE 55, Bagley B 28

Years and Species 1950 1+0 Sitka spruce seedbeds (crop failure at Ampthill)

Design K 45 20 plots in 4 blocks of 5

KE 55 10 plots in 2 blocks of 5

B 28 16 plots in 4 blocks of 4

Basal dressings per sq.yd.

ground chalk (Bagley only) 150 g. applied in February

'Nitro-Chalk', 9 g.N in 2 equal dressings of 4½ g.

potassic superphosphate (Bagley only) 4½ g.P, 4½ g.K

Dates Treatments	K 45	Am 9	KE 55	B 28
potassic superphosphate	-	-	-	9/3
Fungicides	29/3	30/3	29/3	31/3
'Nitro-Chalk' after sowing	29/3	30/3	30/3	31/3
'Nitro-Chalk' early summer	6/7	30/6	6/7	11/7
Broadcast sowing of seed	25/3	29/3	29/3	30/3

SITKA SPRUCE

1950		Height in inches			Number of plants per sq.yd.		
Treatments applied after sowing	rate in g. per sq.yd.	K 45	KE 55	B 28	K 45	KE 55	B 28
no fungicide	-	1.19	1.30	3.02	690	963	864
Thiuram (4%)[1]	10	1.18	1.60	2.51	579	1296	976
Tetrachlornitrobenzene (3%)[1]	10	1.20	1.36	3.11	726	1155	957
Calomel dust (4%)[1]	10	1.18	1.04	2.62	717	885	880
Cuprous oxide[2] (omitted at Bagley)	8	1.24	1.48	-	520	1038	-
S.E.±		0.042	-	0.265	48.4	-	54.0
c.v.%		7.0	-	18.8	14.9	-	11.8

[1] applied mixed with 100 g. sand Figures in parenthesis are per cent active ingredient
[2] applied in 2½ l. water

Table 133

Tests on peat, sulphur and potassium dichromate

Old Kennington K 74, Ampthill Am 41, Ringwood R 69

Years and Species 1954 to 1956 K 74, Am 41[1]
1954 to 1955 R 69 — 1+0 Sitka spruce seedbeds

[1] owing to crop failure no results can be presented for Am 41 in 1956

Design 16 plots in 4 blocks of 4 confounding highest order interaction

Factorial test on: peat (Upt) × sulphur (Rs) × potassium dichromate (Mdc)

Treatments

Upt granulated peat — 500 g. per sq.yd. forked in winter + 500 g. per sq.yd. applied on surface and cultivated in lightly after digging in fertilizer

Rs flowers of sulphur — 25 g. per sq.yd. applied in winter

Mdc potassium dichromate — 10 g. per sq.yd. (in 100 ml. water in 1954; 200 ml. water in 1955 and 1956) applied by power spray to soil surface in winter

Basal fertilizer, rate per sq.yd.

			units	1954 K/Am	1954 R	1955+1956 K/Am/R
N[2]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	9
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	3	3

Dates — Year of cropping:-	1954 K	1954 Am	1954 R	1955 K	1955 Am	1955 R	1956 K	1956 Am
Treatment applications								
Upt (winter), Rs, Mdc	8/12	14/12	10/12	31/1	29/12	22/12	13/12	10/12
Upt (spring), P, K, Mg fertilizer	5/3	4/3	25/2	15/3	21/3	8/3	13/3	5/3
N topdressed early	29/6	30/6	23/6	4/7	6/7	30/6	6/7	2/7
late	5/8	6/8	3/8	4/8	5/8	2/8	25/7	7/8
Broadcast sowing of seed	26/3	30/3	31/3	15/4	6/4	1/4	27/3	19/3

[2] ammonium sulphate at K and Am, 'Nitro-Chalk' at R

SITKA SPRUCE

	K 74 1954	K 74 1955	K 74 1956	Am 41 1954	Am 41 1955	R 69 1954	R 69 1955
Height in inches							
Mean	2.33	0.76	2.24	2.51	0.92	0.90	1.03
EFFECT OF							
Upt'	0.39**	0.03	-0.04	0.30*	-0.01	0.17	0.02
Rs'	0.59**	0.08*	0.74**	-0.01	0.05	0.15	-0.01
Mdc'	0.27*	0.06	0.24	0.24	0.23**	0.38**	0.24**
Upt' × Rs'	0.05	-0.03	0.04	-0.06	-0.11	0.08	0.12
Upt' × Mdc'	-0.04	-0.02	-0.23	-0.19	-0.05	-0.10	-0.08
Rs' × Mdc'	-0.18	0.00	0.13	-0.18	-0.06	-0.17	-0.14
S.E.±	0.076	0.033	0.162	0.108	0.052	0.072	0.060
c.v.%	6.5	8.8	14.4	8.6	11.4	16.0	11.6
Number of plants per sq.yd.							
Mean	628	931	691	1571	656	836	893
EFFECT OF							
Upt'	154*	-96	-36	282**	260	58	15
Rs'	210*	170	272*	-147	-173	63	-93
Mdc'	230**	44	27	27	-142	130*	126
Upt' × Rs'	-3	135	63	-32	62	-42	86
Upt' × Mdc'	32	-117	-16	26	-62	-38	-26
Rs' × Mdc'	3	-104	-180	110	-181	-36	-146
S.E.±	59.0	133.4	90.3	65.4	131.4	42.2	65.0
c.v.%	18.8	28.7	26.2	8.3	40.1	10.1	14.6

Table 134

Miscellaneous treatments

Old Kennington K 50, Ampthill Am 19, Ringwood R 38

Years and Species 1951 only 1+0 Sitka spruce seedbeds

Design 40 plots in 4 blocks of 10

1951
SITKA SPRUCE

Treatments	rate per sq.yd.	Height in inches K 50	Am 19	R 38	Number of plants per sq.yd. K 50	Am 19	R 38
Untreated	-	0.99	1.14	1.60	892	820	1208
S.E.±		0.053	0.132	0.044	60.9	84.8	62.2
Gammexane 3½% B.H.C.[1]	60 g.	0.96	0.77	1.34	963	644	1296
sodium chlorate	25 g.	0.85	0.94	1.47	981	730	1186
heavy rate of ammonium sulphate	250 g.	1.29	1.36	1.21	788	914	1239
urea	100 g.	1.41	1.57	0.92	912	876	1260
urea + dicyandiamide	100 g.) 25 g.)	1.14	0.75	0.90	1071	376	951
hexamine	125 g.	1.00	0.75	0.92	916	650	1134
paraformaldehyde (granular)	200 g.	1.94	1.38	1.34	1107	807	882
formalin applied in 3-5 l. water and sealed off with 1-2 l. water	500 ml.	1.90	2.36	2.42	1156	990	1292
S.E.±		0.075	0.186	0.062	86.2	119.9	88.0
c.v.%		13.0	30.6	9.1	17.4	31.5	15.1

Basal manuring	units	rate per sq.yd.
'Nitro-Chalk' topdressed early	g.N	4½
late	g.N	4½
superphosphate	g.P	4½
potassium chloride	g.K	4½

[1] 20 g. applied on 3 occasions

[2] except formalin, paraformaldehyde, 'Gammexane'

Dates	K 50	Am 19	R 38
experimental treatments[2] applied in winter before cropping	12/12	9/12	23/1
P, K fertilizer	1/3	12/3	8/3
formalin, paraformaldehyde, 'Gammexane'	21/3	12/3	8/3
N topdressed early, 'Gammexane'	28/6	4/7	25/6
late, 'Gammexane'	2/8	3/8	1/8
Broadcast sowing of seed	11/4	5/4	19/4

Table 135

Formalin and vaporizing oil

Ampthill Am 39, Ringwood R 68

Years and Species 1953 1+0 Sitka spruce seedbeds

Design 4 × 4 Latin Square formalin drench × vaporizing oil

Treatments

formalin 250 ml. per sq.yd. applied in 4 to 5 l. water

vaporizing oil 50 ml. per sq.yd. of Vaporizing Oil applied by power spray as pre-emergent weedkiller

Note. From 1953 onwards it has been normal practice to apply T.V.O. pre-emergent spray to all seedbeds. In 1953 the treatment was tested in these two experiments to see whether the spray had any effect on the growth of the seedlings.

Basal fertilizer, rate per sq.yd.

		units	Am	R
N[1]	topdressed early	g.N	4½	4½
	late	g.N	4½	4½
P	superphosphate	g.P	4½	4½
K	potassium chloride	g.K	4½	9
Mg	kieserite	g.Mg	-	1½

[1] ammonium sulphate at Am; 'Nitro-Chalk' at R

Dates: Treatment applications	Am	R
P, K, Mg fertilizer, formalin	26/2	27/2
vaporizing oil	17/4	24/4
N topdressed early	2/7	23/6
late	10/8	30/7
Broadcast sowing of seed	25/3	31/3

SITKA SPRUCE
1953

Treatments	Height in inches Am 39	R 68	Number of plants per sq.yd. Am 39	R 68
none	1.83	1.22	658	1132
vaporizing oil	1.80	1.31	708	1104
formalin	2.33	1.80	633	1203
both	2.27	1.90	615	1220
S.E.±	0.059	0.034	46.9	50.8
c.v.%	5.7	4.4	14.4	8.7

Table 136

Test on Aldrin and Dieldrin

Ampthil Am 39

Years and Species 1954 1+0 Sitka spruce seedbeds

Design 16 plots in 4 × 4 Latin Square

Treatments

Aldrin 0.7 g. 40% wettable powder } in 100 ml. emulsion supplying 0.28 g. per sq.yd. of the active ingredients
Dieldrin 0.6 g. 50% wettable powder }

applied by power spray to soil surface after digging in fertilizer, and incorporated by light forking

Basal dressings, rate per sq.yd.

ammonium sulphate 9 g.N in two equal topdressings of 4½ g.; superphosphate 4½ g.P; potassium chloride 4½ g.K
formalin 250 ml. in 5 l. water

Dates

Treatment applications: formalin on December 14, Aldrin, Dieldrin, PK fertilizer on March 2
N topdressed early on June 30, topdressed late on August 6

Broadcast sowing of seed: March 30

SITKA SPRUCE

1954

	Height in inches	Number of plants per sq.yd.
Untreated	3.02	686
Dieldrin	3.05	732
Aldrin	3.26	636
S.E.±	0.082	63.6
c.v.%	5.3	18.6

Table 137

Soil conditioner

Old Kennington K 56, Ampthill Am 28, Ringwood R 56, Kennington Extension KE 74

Years and Species 1952 1+0 Sitka spruce seedbeds (crop failed at Ampthill)

Design 4 × 4 Latin Square

Basal fertilizer, rate per sq.yd.

			units	K,Am	R	KE
N[1]	topdressed	early	g.N	4½	4½	4½
		late	g.N	4½	4½	4½
P	superphosphate		g.P	4½	4½	4½
K	potassium chloride		g.K	4½	9	9
Mg	kieserite		g.Mg	-	4½	-

Dates

Treatment applications	K	Am	R	KE
P, K, Mg fertilizer	26/2	29/2	4/3	27/2
Krilium forked in	26/2	29/2	4/3	27/2
Krilium raked in	17/4	24/4	16/4	16/4
nitrogen topdressed early	18/6	26/6	23/6	18/6
late	12/8	-	15/8	12/8
Broadcast sowing of seed	23/4	30/4	16/4	19/4

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE

SITKA SPRUCE

1952

Treatments	rate per sq.yd.	Height in inches K 56	R 56	KE 74	Number of plants per sq.yd. K 56	R 56	KE 74
no soil conditioner	-	1.00	0.78	2.08	294	411	848
Krilium incorporated into the top 3 to 4 inches by double forking in February	30 g.	0.88	0.85	2.17	291	450	748
Krilium raked into the surface inch shortly before sowing	30 g.	0.94	0.69	1.88	249	462	482
Krilium applied by both methods	60 g.	0.94	0.83	1.70	243	370	544
S.E.±		0.057	0.049	0.133	40.0	48.0	40.5
c.v.%		12.2	12.3	13.6	29.7	22.7	12.4

(The material used was "Krilium CRD-189", the sodium salt of a hydrolyzed polyacrylonitrile)

Part C

TRANSPLANT EXPERIMENTS

	Tables
Treatments applied to transplant beds lined out with seedlings from uniformly treated seedbeds	*138-152*
Extension of seedbed experiments to uniformly treated transplant beds	*153-179*
Extension of seedbed experiments to transplant beds, which had received contrasted treatments	*180-190*

Treatments applied to transplant beds lined out with seedlings from uniformly treated seedbeds

Table 138

Forms of acidification and times of nitrogen application

Old Kennington K 37

Years and Species 1949-1950 1+1 Sitka spruce transplants, 162 plants per plot in 1949, 216 plants per plot in 1950 (plot size: 4½ ft. × 5 ft.)

Origin of seedlings 1949 Wareham (Old Nursery) 1+0 seedbeds manured with compost
1950 Bagley 1+0 seedbeds manured with fertilizer

Design 32 plots in 4 blocks of 8, confounding highest order interaction between pairs of blocks

Factorial test on: no acidification, aluminium sulphate, sulphur, ammonium sulphate × 'Nitro-Chalk' applied early × 'Nitro-Chalk' applied late

Treatments		rate per sq.yd. 1949	rate per sq.yd. 1950
aluminium sulphate		250 g.	-
sulphur		50 g.	-
ammonium sulphate		100 g.	-
'Nitro-Chalk' applied early	Ae	3 g.N	3 g.N
applied late	Al	3 g.N	3 g.N

Treatment applications (Year of cropping:)	Dates 1949	Dates 1950
acidifying agents	19/12	-
'Nitro-Chalk' first topdressing	19/4	4/5
second topdressing	24/6	11/7
Transplanting	17/3	18/2

Height in inches

SITKA SPRUCE

Treatments applied to TRANSPLANT BEDS	1949 Mean	1949 Effect of 'Nitro-Chalk' Ae'	1949 Al'	1949 Ae'l'	1950 Mean	1950 Effect of 'Nitro-Chalk' Ae'	1950 Al'	1950 Ae'l'
Mean	5.4	-0.2	-0.2	-0.1	5.5	-0.7	0.5	0.0
S.E.±	0.05		0.10		0.18		0.35	
no acidification	5.2	-0.1	-0.5*	-0.5*	5.4	-1.0	0.5	0.1
aluminium sulphate	5.5	-0.0	-0.2	-0.3	5.4	-0.8	0.7	0.0
sulphur	5.7	-0.4	-0.2	0.4	5.9	-0.2	1.1	0.7
ammonium sulphate	5.3	-0.3	0.2	-0.2	5.5	-0.8	-0.2	-0.6
S.E.±	0.10		0.20		0.35		0.70	
c.v.%	5.3				18.0			

Table 139

Soil reaction on four conifer species

Kennington Extension KE 27, Wareham W 27
(Results for 1+1 transplants are given below; for 1+0 seedbeds see SEEDBED Table 34)

Years and Species 1948-1950 Sitka spruce, Norway spruce (Picea abies), Scots pine (Pinus sylvestris), Corsican pine (Pinus nigra var. calabrica)

Number of replicates 1948	Number of replicates 1949,1950	Number of plants per species per 1 yd. strip 1948 KE	1948 W	1949 KE,W	1950 KE,W
2	4	12	18	18	24

Origin of seedlings Wareham Old Nursery, 1+0 seedbeds manured with compost

Design, Treatments and Basal fertilizer For details see SEEDBED Table 34

Dates	1948 KE	1948 W	1949 KE	1949 W	1950 KE	1950 W
Manuring						
before transplanting	20/3	-	17/3	1/3	14/3	26/1
topdressed April/May	-	6/4	-	-	4/5	12/4
June/July	-	-	-	-	11/7	27/6
Transplanting	2/4	17/3	17/3	3/3	17/2	17/2

Height in inches

	Kennington Extension HIGH LIME	MED. LIME	LOW LIME	UNTREATED	LOW ACID	MED. ACID	Wareham HIGH LIME	MED. LIME	LOW LIME	UNTREATED	LOW ACID
SITKA SPRUCE											
1948	6.0	6.3	8.0	7.8	8.4	9.2	9.0	10.4	11.4	8.8	3.2
1949	5.6	6.9	7.5	7.7	7.7	6.8	7.9	8.1	8.8	9.6	9.7
1950	9.5	10.8	11.7	11.9	12.1	11.7	12.1	13.0	13.5	15.0	15.6
NORWAY SPRUCE											
1948	4.7	6.2	6.6	6.6	6.3	6.2	5.5	5.3	5.9	4.7	3.1
1949	5.3	5.5	6.1	6.1	6.1	6.0	7.0	7.4	7.4	6.7	6.3
1950	7.4	8.4	8.4	8.5	8.4	8.4	6.9	7.3	7.2	7.8	7.9
SCOTS PINE											
1948	4.2	5.5	4.8	4.8	5.3	4.7	5.7	5.5	5.8	5.0	4.2
1949	6.5	6.5	7.2	7.2	7.5	7.2	7.6	7.6	7.6	8.0	7.2
1950	5.6	5.7	5.7	6.0	6.0	6.1	6.2	6.1	6.6	6.4	6.6
CORSICAN PINE											
1948	-	-	-	-	-	-	2.6	2.7	2.9	2.7	2.1
1949	3.5	3.8	4.1	3.7	4.1	3.9	3.6	3.8	4.0	3.9	3.9
1950	3.2	3.1	3.1	2.8	3.1	3.1	4.7	4.4	4.4	4.7	4.8

Table 140

Forms of nitrogen

Wareham W 32

Years and Species 1948 only. Transplant plots (6 ft. 8 in. × 5 ft.) split for 1+1 Sitka spruce v. 1+1 Scots pine 120 plants per species

Origin of seedlings Wareham Old Nursery, 1+0 seedbeds manured with hopwaste compost

Design 32 plots in 4 blocks of 8

Basal fertilizer, rate per sq.yd. 6 g.P as superphosphate, 7 g.K as potassium sulphate

Dates

P and K fertilizer applied before transplanting on April 1; N topdressed on May 7

Transplanting: April 12

Treatments applied as topdressings to TRANSPLANT BEDS	Roth. No.	Height in inches: SITKA SPRUCE	Height in inches: SCOTS PINE
no nitrogen	-	4.3	4.4
8½ g.N per sq.yd. as			
formalised urea	N.264	4.8	4.3
formalised casein	N.228	4.1	4.5
hoof	N.229	4.7	4.4
ammonium sulphate	-	4.5	4.4
urea	-	6.6	4.5
'Nitro-Chalk'	-	6.1	5.0
S.E.±		0.34	0.18
c.v.%		14.0	8.0

Table 141

Forms and rates of potassium fertilizer

Wareham W 16

Years and Species 1947 and 1948 Transplant plots (3 ft. × 3 ft. 4 in.) split for 1+1 Sitka spruce v. 1+1 Scots pine, 36 plants per species

Origin of seedlings 1946 and 1947 Wareham Old Nursery, 1+0 seedbeds manured with bracken and hopwaste compost

Design and Treatments 32 plots in 2 blocks of 16

Potassium treatments applied in 1947[2] ONLY

	rate in g.K per sq.yd.				
no potassium	-	-	-	-	-
potassium chloride v.potassium sulphate	2½	5	10	20	-
finely ground glauconitic sand[1] v.crude glauconitic sand[1]	-	-	10	20	40

[1] Rothamsted numbers: finely ground K 11, crude K 8

Basal dressing

	units	rate per sq.yd. 1947[2]	1948[3]
hoof	g.N	11	-
ammonium sulphate	g.N	-	8½
Gafsa	g.P	7½	-
superphosphate	g.P	-	5½

[2] applied before transplanting

[3] applied topdressed

Dates	1946/47	1948		1947	1948
Manuring	December 17	April 7	Transplanting	April 21	March 9

Height in inches

Treatments applied to TRANSPLANT BEDS	SITKA SPRUCE 1947	SITKA SPRUCE 1948	SCOTS PINE 1947	SCOTS PINE 1948
Mean	6.1	5.4	2.9	5.6
no potassium	4.7	5.9	2.7	6.2
S.E.±	0.21	0.49	0.18	0.32
Averaging rates				
crude glauconite sand	4.8	4.4	2.7	4.9
ground glauconite sand	5.7	5.4	3.0	5.6
S.E.±	0.17	0.40	0.15	0.26
potassium chloride	7.1	5.5	3.0	5.6
potassium sulphate	7.2	5.7	2.8	5.8
S.E.±	0.15	0.35	0.13	0.23
Averaging forms				
glauconite sand				
10 g. K	4.6	5.4	3.1	5.4
20 g. K	5.4	4.7	2.8	5.2
40 g. K	5.8	4.6	2.7	5.1
Averaging forms				
soluble potassium salts				
2½ g. K	7.0	6.2	2.9	6.1
5 g. K	7.4	5.7	3.0	5.6
10 g. K	6.8	5.4	2.8	5.5
20 g. K	7.4	5.1	3.0	5.7
S.E.±	0.21	0.49	0.18	0.32
c.v.%	6.9	18.3	12.6	11.6

Table 142

Rates of nitrogen, phosphorus and potassium

Wareham W 15

Years and Species 1947-1948 Transplant plots (2 ft. 6 in. × 3 ft. 4 in.) split for 1+1 Sitka spruce v. 1+1 Scots pine, 30 plants per species

Origin of seedlings 1946 and 1947 Wareham Old Nursery, 1+0 seedbeds manured with hopwaste compost

Design 27 plots in 3 blocks of 9, confounding three high-order interactions

Factorial test on:

3 levels of N × 3 levels of P × 3 levels of K

Treatments, rate per sq.yd.

FERTILIZER APPLIED BEFORE TRANSPLANTING 1947

	units		level 1	2	3
N	g.N	crushed hoof	5½	11	16½
P	g.P	Gafsa mineral phosphate	3½	7	10½
K	g.K	potassium sulphate	4½	9	13½

FERTILIZER APPLIED TOPDRESSED 1948

	level 1	2	3
ammonium sulphate	0	5½	11
superphosphate	0	3½	7
potassium sulphate	0	4½	9

Dates

	1947	1948		1947	1948
Manuring:	December 17	April 3	Transplanting:	April 21	March 10

Height in inches

Treatments applied to TRANSPLANT BEDS	SITKA SPRUCE 1947	SITKA SPRUCE 1948	SCOTS PINE 1947	SCOTS PINE 1948
Mean	6.3	8.0	2.9	5.8
EFFECTS				
$(N_2-N_1)'$	0.4	-2.3**	0.1	0.2
$(N_3-N_1)'$	0.3	-3.4**	0.1	0.1
$(P_2-P_1)'$	0.1	0.6	-0.1	-0.4*
$(P_3-P_1)'$	0.5*	0.8	0.0	-0.3
$(K_2-K_1)'$	0.2	1.2*	0.2*	0.1
$(K_3-K_1)'$	-0.1	0.1	0.3**	0.3
S.E.±	0.22	0.47	0.09	0.16
$(N_3-N_1)' \times (P_3-P_1)'$	0.3	-1.0	0.0	-0.0
$(N_3-N_1)' \times (K_3-K_1)'$	0.1	-0.2	0.1	0.2
$(P_3-P_1)' \times (K_3-K_1)'$	-0.3	0.5	0.1	0.1
S.E.±	0.27	0.57	0.11	0.19
c.v.%	7.4	12.5	7.2	5.8

Table 143

Fertilizers

Wareham W 80

Years and Species 1953-1956 1+1 Sitka spruce transplants, 200 plants per plot (8 ft. × 3¾ ft.)

The experiment was continued after 1956 but results are presented only up to that date

Origin of seedlings Wareham seedbeds manured with NPK fertilizer in 1952 and NPK Mg fertilizer 1953-1955

Design 32 plots in 4 blocks of 8; 1953 confounding highest order interaction
1954-56 confounding three high-term interactions

In addition: one unmanured and one compost treated plot per block, making 40 plots in all

Factorial test on: N × P × K × F × Mg (1954-56)

Factorial treatments		units	rate per sq.yd. 1953-54	1955-56
N 'Nitro-Chalk' topdressed	early	g.N	2¼	2¼
	late	g.N	2¼	2¼
P superphosphate		g.P	3	6
K potassium chloride		g.K	6	6
Mg kieserite		g.Mg	3	3
F materials as used in NPK above			as NPK above	as NPK above

Additional treatments unmanured

bracken and hopwaste compost applied annually at 4½ kg. per sq.yd.
(Roth.Nos: 1953 S.6292; 1954 S.6486; 1955 S.6649; 1956 S.6841)

Dates	1953	1954	1955	1956
Manuring				
P, K, Mg fertilizer, compost before transplanting	20/1	19/1	2/2	17/1
N topdressed early	29/4	27/4	19/5	7/5
late	24/6	24/6	28/6	26/6
Transplanting	24/3	13/4	12/4	30/3

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	1953	1954	1955	1956
Mean	12.7	8.5	9.4	7.7
EFFECTS				
N'	2.8**	1.8**	0.4	0.7**
P'	0.6**	0.1	0.5*	-0.2
K'	0.4**	0.2	1.0**	0.6**
N'P'	-0.2	0.2	-0.2	0.2
N'K'	0.6**	0.2	0.3	0.1
P'K'	-0.2	-0.6	0.4	-0.4
N'P'K'	0.4*	0.1	-0.1	-0.2
F'	3.6**	1.5**	1.8**	0.9**
N'F'	-1.1**	-0.4	-0.3	-0.1
P'F'	-0.6**	-0.1	-0.7**	-0.5*
K'F'	-0.4*	-0.2	-1.1**	-0.7**
Mg'	-	-0.3	0.0	-0.2
N'Mg'	-	-0.0	0.0	-0.5*
P'Mg'	-	-0.1	-0.2	0.3
K'Mg'	-	0.2	0.0	-0.0
F'Mg'	-	0.1	0.5*	-0.4*
S.E.±	0.15	0.27	0.22	0.18
MEANS				
unmanured	8.6	7.0	7.5	6.4
compost	10.0	7.1	9.3	9.6
S.E.±	0.21	0.38	0.31	0.25
c.v.%	3.5	9.3	6.8	6.4

Table 144

Forms and rates of nitrogen and phosphorus with a test of potassium

Kennington Extension KE 7, Wareham W 7

Years and Species 1946-1947 1+1 Sitka spruce transplants, 105 plants per plot (4 ft. 2 in. × 3 ft. 6 in.)

Origin of seedlings Wareham: Wareham Old Nursery seedbeds manured with compost

Kennington Extension: 1946 Bagley seedbeds manured with compost
1947 Bagley and Wareham Old Nursery seedbeds manured with compost

Design and Treatments 64 plots in 4 blocks of 16; confounding 3 high-order interactions; half replicate
2 additional plots (compost and unmanured) in each block, making a total of 72 plots

Factorial test on:

no nitrogen
'Nitro-Chalk'
crushed hoof
formalised casein
× level 1 v.2 ×
no phosphorus (KE 7)
or Gafsa mineral phosphate (W 7)
Bessemer basic slag
dicalcium phosphate
superphosphate
× level 1 v.2 × potassium

	units	rate per sq.yd. level 1 (1946)	rate per sq.yd. level 2 (1946)	1947
'Nitro-Chalk' forked in	g.N	5½	11	none
topdressed	g.N	5½	11	none
other forms of nitrogen	g.N	11	22	none
forms of phosphorus	g.P	5	10	none
potassium KE as sulphate	g.K	9		none
W as chloride	g.K	14		SEE NOTE
Additional treatments:				
unmanured	-	-		-
hopwaste compost	kg.	2¼		none

Rothamsted numbers: crushed hoof N.212; formalised casein N.204; dicalcium phosphate P.556

compost: KE S.4803; W S.4716

NOTE: 9 g.K as potassium sulphate was applied to ALL PLOTS at Wareham in 1947 including additional unmanured and compost plots

Dates	1946 KE	1946 W	1947 KE	1947 W
Manuring				
compost	12/3	10/1	-	-
application of all fertilizers (except 'Nitro-Chalk' topdressed)	12/3	30/1	-	10/4[1]
'Nitro-Chalk' topdressed	26/4	25/3	-	-
Transplanting	30/3	15/2	29/4	22/4

[1] potassium sulphate only

Table 144 cont.

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	Kennington Extension 1946	Kennington Extension 1947	Wareham 1946	Wareham 1947
MEANS				
unmanured	9.8	6.1	3.5	4.2
compost	10.0	6.3	5.2	5.2
S.E.±	0.33	0.18	0.73	0.24
no nitrogen	10.1	6.4	4.7	4.4
'Nitro-Chalk'	9.7	6.4	7.0	4.5
crushed hoof	9.8	6.4	8.4	5.1
formalised casein	10.3	6.3	8.1	5.9
no phosphorus	9.6	6.4	Gafsa mineral phosphate 7.2	5.6
Bessemer basic slag	9.7	6.3	Bessemer basic slag 6.4	4.3
dicalcium phosphate	10.3	6.4	dicalcium phosphate 6.5	4.7
superphosphate	10.2	6.4	superphosphate 8.1	5.3
S E.±	0.16	0.09	S.E.± 0.36	0.12
Mean of all fertilizer plots	9.9	6.4	Mean of all fertilizer plots 7.1	5.0
EFFECTS				
N'	-0.2	-0.0	N' 3.1**	0.8**
P'	0.5*	-0.0	- -	-
S.E.±	0.19	0.10	S.E.± 0.42	0.14
(level N_2-N_1)' with:				
Mean	-0.3*	-0.1	Mean 0.4	0.2*
S.E.±	0.16	0.08	S.E.± 0.35	0.11
'Nitro-Chalk'	-0.2	0.2	'Nitro-Chalk' 0.8	-0.1
crushed hoof	-0.5	0.0	crushed hoof 0.5	0.3
formalised casein	-0.1	-0.1	formalised casein 0.6	0.8**
S.E.±	0.32	0.18	S.E.± 0.74	0.24
P_1	-0.3	-0.1	P_1 0.2	0.3*
P_2	-0.3	0.0	P_2 0.6	0.0
S.E.±	0.23	0.13	S.E.± 0.51	0.17
(level P_2-P_1) with:				
Mean	0.3*	0.0	Mean 0.7*	-0.1
S.E.±	0.16	0.08	S.E.± 0.35	0.11
no phosphorus	-	-	Gafsa mineral phosphate 0.9	-0.1
Bessemer basic slag	0.2	0.0	Bessemer basic slag 0.9	-0.3
dicalcium phosphate	0.4	-0.1	dicalcium phosphate 0.1	0.1
superphosphate	0.4	-0.1	superphosphate 0.8	-0.3
S.E.±	0.32	0.18	S.E.± 0.74	0.24
N_1	0.4	0.0	N_1 0.5	0.0
N_2	0.4	0.1	N_2 0.9	-0.3*
S.E.±	0.23	0.13	S.E.± 0.51	0.17
K' with:				
Mean	0.2	0.3*	Mean 4.1**	-0.5**
S.E.±	0.16	0.08	S.E.± 0.35	0.11
N_1	0.2	0.3*	N_1 3.7**	-0.6**
N_2	0.2	0.3*	N_2 4.5**	-0.5**
P_1	0.3	0.3*	P_1 4.1**	-0.5**
P_2	0.2	0.2	P_2 4.2**	-0.6**
S.E.±	0.23	0.13	S.E.± 0.51	0.17
c.v.%	6.6	5.7	c.v.% 20.7	9.7

Table 145

Forms of nitrogen and phosphorus with a test of potassium

Wareham W 17

Years and Species 1947-1948 Transplant plots (3 ft. × 3 ft. 4 in.) split for 1+1 Sitka spruce v. 1+1 Scots pine, 36 plants per species

Origin of seedlings 1946 and 1947 Wareham Old Nursery, 1+0 seedbeds manured with hopwaste compost

Design 16 plots in 2 blocks of 8, confounding highest order interaction

Factorial test on:

	N forms		P forms		
1947	crushed hoof formalised casein[1]	×	Bessemer basic slag Gafsa mineral phosphate dicalcium phosphate[2] superphosphate	×	K
1948	residues	×	residues with BASAL K		

[1] R.E.S. No. N.228 [2] R.E.S. No. P.556

	units	rate per sq.yd. 1947	1948
N forms	g.N	11	-
P forms	g.P	7½	-
potassium sulphate	g.K	9½	7

Dates	1947	1948
cropping year:		
manuring	17/12	7/4
transplanting	21/4	9/3

Height in inches

Treatments applied to TRANSPLANT BEDS	SITKA SPRUCE 1947	SITKA SPRUCE 1948	SCOTS PINE 1947	SCOTS PINE 1948
Mean	5.7	7.6	2.7	4.7
MEANS				
crushed hoof	5.5	7.0	2.7	4.7
formalised casein	5.8	8.3	2.8	4.7
S.E.±	0.25	0.29	0.08	0.08
Bessemer basic slag	5.7	7.6	3.0	4.6
Gafsa mineral phosphate	6.1	8.7	2.8	5.0
dicalcium phosphate	5.1	7.1	2.5	4.6
superphosphate	5.8	7.2	2.7	4.6
S.E.±	0.35	0.40	0.12	0.12
EFFECT OF K	2.4**	-	0.1	-
S.E.±	0.35	-	0.12	-
c.v.%	12.4	10.6	8.7	5.1

Table 146

Forms of nitrogen and phosphorus; tests on potassium and magnesium

Ringwood R 12, Bagley B 20, Wareham W 41

Years and Species

R 12, B 20: 1949 only 1+1 Sitka spruce transplants, 162 plants per plot (4½ ft. × 5 ft.)

W 41* 1949-1956 1+1 Sitka spruce transplants (plot size: 6¾ ft. × 7½ ft.)
Number of plants per plot: 1949 360, 1950-53 500, 1954-56 300 plants

* The experiment was continued after 1956 but results are presented only up to that date

Origin of seedlings

		centre	manuring of 1+0 seedbeds
R and B	1949	Wareham (Old Nursery)	hopwaste compost
W	1949	Wareham	bracken and hopwaste compost
W	1950-1952	Wareham	NPK fertilizer
W	1953-1956	Wareham	NPK Mg fertilizer

Design and Treatments 32 plots in 4 blocks of 8 confounding 3 high-term interactions

W 41: half replicate from 1954 owing to introduction of test on magnesium

Factorial test on: no nitrogen / crushed hoof / ammonium sulphate / 'Nitro-Chalk' × no phosphorus / Bessemer basic slag / Gafsa mineral phosphate / superphosphate × potassium × magnesium (1954-1956)

	units	rate per sq.yd. 1949-1953	1954-1955	1956
'Nitro-Chalk') topdressed early	g.N	3	3	3
ammonium sulphate) late	g.N	3	3	3
hoof applied before transplanting	g.N	6	6	6
P forms	g.P	3	3	9
K as potassium sulphate	g.K	3	3	9
Mg as kieserite	g.Mg	-	3	3

Dates	Ringwood	Bagley	Wareham							
Manuring	1949	1949	1949	1950	1951	1952	1953	1954	1955	1956
hoof, P, K, Mg	23/12	22/12	23/12	5/1	23/1	23/1	21/1	20/1	2/2	17/1
'Nitro-Chalk') topdressed early	20/4	20/4	22/4	13/4	26/6	24/6	29/4	27/4	19/5	8/5
ammonium sulphate) late	23/6	27/6	22/6	27/6	31/7	14/8	24/6	24/6	28/6	27/6
Transplanting	28/1	23/3	20/1	20/1	2/2 to 2/3	27/2	24/2	12/4	3/4	19/4

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	Ringwood	Bagley	Wareham							
	1949	1949	1949	1950	1951	1952	1953	1954	1955	1956
Mean	7.0	9.5	8.5	11.5	9.1	7.8	8.5	7.6	7.8	7.3
MEANS										
no nitrogen	7.0	9.7	8.3	8.7	7.7	7.5	8.0	7.0	7.2	6.6
hoof	7.2	9.7	8.8	12.0	10.0	8.2	8.3	7.3	8.0	7.6
ammonium sulphate	7.0	9.5	8.6	13.0	9.1	7.8	9.0	8.1	7.8	7.6
'Nitro-Chalk'	6.7	9.0	8.5	12.4	9.8	7.8	8.8	8.0	8.0	7.3
no phosphorus	6.8	9.6	8.2	11.2	8.8	7.4	7.8	7.0	7.5	6.7
Bessemer basic slag	6.9	8.7	8.9	11.4	9.4	8.0	8.7	7.6	7.7	6.8
Gafsa mineral phosphate	6.9	9.9	8.6	11.6	9.0	8.0	9.0	7.6	7.6	7.5
superphosphate	7.2	9.6	8.4	11.9	9.4	8.1	8.5	8.3	8.2	8.1
S.E.±	0.16	0.45	0.23	0.28	0.13	0.19	0.24	0.27	0.21	0.26
EFFECTS										
N'	0.0	-0.4	0.4	3.8**	1.9**	0.4	0.7*	0.8*	0.7**	0.9**
P'	0.2	-0.2	0.5	0.5	0.4**	0.6*	0.9**	0.8*	0.3	0.8*
S.E.±	0.18	0.52	0.26	0.33	0.15	0.22	0.28	0.31	0.24	0.31
K'	0.5**	0.2	0.2	1.2**	0.6**	1.1**	4.0**	2.0**	2.2**	2.4**
Mg'	-	-	-	-	-	-	-	0.3	0.2	0.3
S.E.±	0.16	0.45	0.23	0.28	0.13	0.19	0.24	0.27	0.21	0.26
N'K'	0.2	0.6	0.2	0.3	0.4**	0.4	1.6**	0.8*	1.0**	0.7*
P'K'	-0.0	0.4	-0.1	-0.2	0.1	0.4	0.6	0.0	0.2	0.2
S.E.±	0.18	0.52	0.26	0.33	0.15	0.22	0.28	0.31	0.24	0.31
K'Mg'	-	-	-	-	-	-	-	-0.1	-0.0	-0.5
S.E.±	-	-	-	-	-	-	-	0.27	0.21	0.26
Effects of K with:										
no nitrogen	0.3	-0.6	-0.0	0.8	-0.1	0.5	1.6**	0.8	0.7	1.3*
hoof	0.7*	-0.9	0.1	0.8	1.5**	2.1**	4.7**	1.9**	3.7**	2.8**
ammonium sulphate	0.5	0.8	0.2	2.2**	0.5	0.9*	5.2**	2.2**	2.4**	3.1**
'Nitro-Chalk'	0.5	1.5	0.6	1.1	0.5	0.8*	4.6**	3.1**	2.2**	2.4**
no phosphorus	0.6	-0.5	0.3	1.6*	0.4	0.5	3.2**	2.0**	2.0**	2.1**
Bessemer basic slag	0.5	0.8	-0.0	0.5	0.4	1.1*	4.2**	2.8**	2.4**	2.8**
Gafsa mineral phosphate	0.2	0.7	0.4	0.8	0.8*	1.8**	4.4**	2.6**	2.6**	2.5**
superphosphate	0.7*	-0.3	0.0	2.0**	0.8*	1.0*	4.3**	0.7	2.0**	2.2**
S.E.±	0.32	0.90	0.46	0.57	0.26	0.38	0.48	0.53	0.42	0.53
c.v.%	6.5	13.4	7.5	7.0	4.1	6.8	8.0	9.9	7.7	10.3

Table 147

Forms of nitrogen and phosphorus; test on ground chalk

Wareham W 42

Years and Species 1949-1951 1+1 Sitka spruce transplants, 360 plants per plot in 1949
500 plants per plot 1950-51 (plot size: 6¾ ft. × 7½ ft.)

Origin of seedlings

	centre	manuring of 1+0 seedbeds
1949	Wareham (Old Nursery)	compost
1950-1951	Wareham	NPK fertilizer

Design and Treatments 16 plots in 2 blocks of 8

Factorial test on:

formalised casein[1] v.ammonium sulphate × bonemeal[1] v.superphosphate × ground chalk

	rate per sq.yd.
N forms (all years)	6 g.N
P forms (all years)	3 g.P
ground chalk (1949 only)	100 g.

[1] Roth.Nos: formalised casein N.228, bonemeal P.593

Basal dressings (all years) 3 g.K per sq.yd. as potassium sulphate

Dates

Year of cropping:-	1949	1950	1951
Manuring			
formalised casein, P, K, ground chalk	23/12	5/1	23/1
ammonium sulphate topdressed early	22/4	13/4	26/6
late	22/6	27/6	31/7
Transplanting	21/4	10/3	24/4

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS

	1949	1950	1951
MEANS			
formalised casein + bonemeal	9.0	12.9	13.2
formalised casein + superphosphate	9.0	12.0	12.1
ammonium sulphate + bonemeal	9.1	13.8	11.2
ammonium sulphate + superphosphate	8.9	13.1	11.2
S.E.±	0.26	0.34	0.38
EFFECT OF ground chalk	0.2	0.2	0.2
S.E.±	0.26	0.34	0.38
c.v.%	5.9	5.2	6.4

Table 148

Times of application and forms of nitrogen; test on phosphorus and potassium

Rosedale Banks RB 1, Reasty Top RT 1

Years and Species 1948-1951[1] 1+1 Sitka spruce transplants, 1008 plants per plot (12 ft. × 12 ft.)

Origin of seedlings	1948	1949	1950	1951
RB	2+0 Banks	2+0 Harwood Dale	1+0 Breadey Heathland	1+0 Springwood
RT	2+0 Broxa Heathland	2+0 Harwood Dale	1+0 Breadey Heathland	1+0 Springwood

Design 1948 32 plots in 4 blocks of 8, confounding highest order interaction between pairs of blocks
1949-1951 32 plots in 4 blocks of 8, confounding 3 high-term interactions

Factorial test on:

1948 Nitrogen applied early v.Nitrogen applied late × phosphorus × potassium

1949-1951 'Nitro-Chalk' v.ammonium sulphate × Nitrogen applied early v.Nitrogen applied late × phosphorus × potassium

[1] crop failure at Rosedale Banks in 1951

Treatments

		units	rate per sq.yd. per occasion 1948	1949-1951
Ns	ammonium sulphate	g.N	6	3
Nc	'Nitro-Chalk'	g.N	-	3
P	superphosphate	g.P	6	3
K	potassium chloride	g.K	7	3

		time of nitrogen application 1948	1949 and 1950	1951
Ae	nitrogen applied early	before transplanting	topdressed May	topdressed June
Al	nitrogen applied late	topdressed April	topdressed July	topdressed August

Dates

		1948 RB	1948 RT	1949 RB	1949 RT	1950 RB	1950 RT	1951 RB	1951 RT
Manuring	P, K before transplanting	5/3	11/3	25/4	14/4	13/3	7/3	28/4	17/4
	N before transplanting	5/3	11/3	-	-	-	-	-	-
	N first topdressing	28/4	27/4	24/5	22/5	18/5	12/5	8/6	7/6
	N second topdressing	-	-	20/7	19/7	12/7	8/7	10/8	9/8
Transplanting		12/3	23/3	4/5	2/5	31/3	15/3	23/5	26/4

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	Rosedale Banks 1948	1949	1950	Reasty Top 1948	1949	1950	1951
Mean	7.1	6.1	7.7	6.2	5.3	6.9	4.2
EFFECTS							
Ae'	-0.0	-0.0	0.6**	0.5*	0.9**	-0.0	0.0
Al'	0.9**	0.2	0.7**	0.9**	0.4**	0.3	0.4*
Ae'l'	-0.0	-0.1	-0.2	-0.4*	0.1	-0.6	-0.0
(Nc-Ns)'	-	-0.1	-0.3	-	0.2	0.4	0.5*
Ae'(Nc-Ns)'	-	-0.1	-0.2	-	0.2	0.2	0.1
Al'(Nc-Ns)'	-	0.1	0.4*	-	-0.0	0.6	0.5*
P'	0.4**	0.0	0.6**	0.8**	0.4**	1.1**	0.7**
Ae'P'	0.1	-0.0	-0.3	0.3	0.4**	0.4	-0.0
Al'P'	-0.0	-0.0	-0.4*	0.3	-0.0	0.2	-0.1
(Nc-Ns)'P'	-	-0.1	-0.3	-	0.1	-0.8*	-0.4
K'	-0.1	-0.0	0.2	-0.1	0.1	0.8*	0.3
Ae'K'	-0.0	-0.0	0.2	-0.2	0.1	0.4	0.1
Al'K'	-0.1	-0.0	0.2	-0.2	0.0	0.1	-0.0
(Nc-Ns)'K'	-	-0.0	-0.2	-	0.0	0.5	0.6**
P'K'	0.1	0.1	0.1	0.1	0.0	0.4	0.0
S.E.±	0.08	0.10	0.16	0.20	0.12	0.33	0.19
c.v.%	3.1	4.9	5.8	9.1	6.4	13.5	12.6

Table 149

Rates of foliar copper applications

Wareham W 89

Years and Species 1956-1957 1+1 Sitka spruce transplants, 72 plants per plot (3 ft. × 3 ft.)

Origin of seedlings Wareham seedbeds manured with NPKMg fertilizer

Design 16 plots in 4 blocks of 4

Treatments

foliar copper spray		g. element rate per sq.yd. (sum of two applications)	SITKA SPRUCE Height in inches 1956	1957
Cu as $CuSO_4.5H_2O$	none	-	8.6	8.7
	level 1	0.08	8.8	9.2
	2	0.16	9.2	8.4
	4	0.32	9.0	9.7
		S.E.±	0.14	0.38
		c.v.%	3.2	8.5

NOTE: The copper dressings were applied by power spray using a precision sprayer fitted with Allman jet ooo. The treatments for each plot were made up in 200 ml. distilled water, including 'Shellestol wetter' (1 part in 1600) and enough $Ca(OH)_2$ to precipitate the copper.

Saturated solution of $Ca(OH)_2$ added per single application: Cu level 1 25.4 ml.
2 50.9 ml.
4 101.8 ml.

Basal fertilizer, rate per sq.yd.

'Nitro-Chalk' (in two equal topdressings of 3 g.)	6 g.N
superphosphate	9 g.P
potassium chloride	9 g.K
kieserite	3 g.Mg

Dates	1956	1957
Treatment applications		
P, K, Mg fertilizer	8/3	15/1
Cu, N applied early	8/5	23/4
Cu, N applied late	27/6	25/6
Transplanting	16/4	22/3

Table 150

Bulky manures and fertilizers

Kennington Extension KE 8

Years and Species 1946-1947 1+1 Sitka spruce transplants, 105 plants per plot (4 ft. 2 in. × 3 ft. 6 in.)

Origin of seedlings 1946 Bagley seedbeds manured with compost
1947 Bagley and Wareham Old Nursery seedbeds manured with compost

Design 40 plots in 2 blocks of 20

unmanured (in duplicate) and 8 materials × test on potassium

Treatments	Roth.No.	1946 ONLY rate per sq.yd.
1 unmanured	-	-
2 hopwaste compost	S.4803	2¼ kg.
3 fresh hopwaste	S.4804	4½ kg.
4 dried sewage sludge	S.4705	1 kg.
5 hoof bonemeal	N.212 P.557	14 g.N 3 g.N, 7½ g.P
6 'Nitro-Chalk' ammonium phosphate	- P.558	13 g.N 4 g.N, 7½ g.P
7 peat + dried sewage sludge[1]	-	1 kg.
8 peat + hoof and bonemeal[1]	-	1 kg.
9 peat + 'Nitro-Chalk' and ammonium phosphate[1]	-	1 kg.
all 9 treatments with test on potassium sulphate	-	9 g.K

[1] 1 kg. of peat was composted with the materials at the rates listed under 4, 5, 6 respectively

Dates	1946	1947		1946	1947
all manures (except 'Nitro-Chalk') before transplanting	12/3	-	Transplanting	28/3	29/4
'Nitro-Chalk' topdressed	26/4	-			

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS, 1946 only	1946 Mean	1946 Effect of K	1947 Mean	1947 Effect of K
Mean	9.9	0.2	6.5	0.4
S.E.±	-	0.20	-	0.13
unmanured	10.1	-0.3	6.7	0.8**
S.E.±	0.22	0.44	0.14	0.28
hopwaste compost	10.3	0.1	6.6	1.2**
fresh hopwaste	8.8	-0.2	6.4	0.0
dried sewage sludge	9.2	-0.0	6.0	0.0
peat composted with sewage sludge	10.1	0.8	6.1	-0.2
hoof and bonemeal	10.1	0.5	6.3	0.3
peat composted with hoof and bonemeal	10.7	0.5	6.5	-0.1
'Nitro-Chalk' and ammonium phosphate	10.3	0.2	6.8	0.8*
peat composted with 'Nitro-Chalk' and ammonium phosphate	9.7	0.8	6.5	0.8
S.E.±	0.31	0.62	0.20	0.40
c.v.%	6.2		6.2	

Table 151

Acidification, formalin and fertilizer

Old Kennington K 51

Years and Species 1951-1952 1+1 Sitka spruce transplants, 500 plants per plot in 1951, 320 plants per plot in 1952 (plot size: 7 ft. × 7½ ft.)

Origin of seedlings 1950 Bagley seedbeds manured with fertilizer

1951 Old Kennington seedbeds treated with formalin and fertilizer

Design 32 plots in 4 blocks of 8 confounding three high-term interactions; one additional untreated plot per block making 36 plots in all

Factorial test on: Ra × Mf × N × P × K

Treatments		units	1951, 1952 rate per sq.yd.
Ra	heavy rate of ammonium sulphate applied in winter	g.	125
Mf	formalin applied as drench in winter	ml.	250
N	ammonium sulphate topdressed in June	g.N	3
	August	g.N	3
P	superphosphate applied in winter	g.P	3
K	potassium chloride applied in winter	g.K	3

Dates

Treatment applications	Year of cropping:	1951	1952
acidification		24/1	18/12
P, K, fertilizer		24/1	25/1
formalin		25/1	25/1
nitrogen topdressed	June	28/6	19/6
	August	2/8	13/8
Transplanting		23/4	25/2

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	1951	1952 (no formalin plots only)
Mean	7.5	5.6
EFFECTS		
Ra'	-1.0*	0.7
Mf'	2.1**	- [1]
N'	0.3	0.1
P'	0.5	0.3
K'	0.2	0.2
S.E.±	0.34	0.35
c.v.%	13.3	12.5

[1] In 1952 transplants were killed on plots with formalin

Table 152

Forms of nitrogen; tests on potassium, magnesium, formalin

Ampthill Am 25, Ringwood R 47

Years and Species 1952-1955 1+1 Sitka spruce transplants; plot size: 8 ft. × 3¾ ft.

1952-1953 200 plants per plot
1954-1955 152 plants per plot

Origin of seedlings Am 25 Ampthill seedbeds treated with formalin and fertilizer
R 47 Ringwood seedbeds treated with formalin and fertilizer

Design 16 plots in 2 blocks of 8 confounding highest order interaction

Factorial test on: Nc v.Ns × K × Mg × Mf

Treatments

			rate per sq.yd.			
			1952-53	1954	1955	
		units	Am and R	Am and R	Am	R
Nc	'Nitro-Chalk' topdressed early	g.N	3	3	3	3
	late	g.N	3	3	3	3
Ns	ammonium sulphate topdressed early	g.N	3	3	3	3
	late	g.N	3	3	3	3
K	potassium chloride before transplanting	g.K	-	3	4½	3
	topdressed	g.K	3	-	-	-
Mg	kieserite	g.Mg	3	3	3	3
Mf	formalin[1]	ml.	250	250	250	250

[1] 1952: applied in 3 l. water, sealed off with 2 l. water
1953-55: applied in 3½-5 l. water

Basal fertilizer, rate per sq.yd.

Ampthill: 1952-54 3 g.P as superphosphate, 1955 4½ g.P as superphosphate

Ringwood: 1952-54 3 g.P as superphosphate, 3 g.K as potassium chloride
1955 4½ g.P as superphosphate, 3 g.K as potassium chloride

Dates	Year of cropping:-	1952		1953		1954		1955	
Treatment applications		Am	R	Am	R	Am	R	Am	R
formalin		28/12	21/12	16/1	22/1	12/12	10/12	20/12	22/12
P, K, Mg fertilizer before transplanting		8/2	23/1	26/2	27/2	18/1	20/1	21/3	1/2
K topdressed		26/6	25/6	23/4	28/4	-	-	-	-
N topdressed	early	26/6	25/6	23/4	28/4	29/4	27/4	25/5	19/5
	late	21/8	15/8	2/7	23/6	30/6	23/6	6/7	29/6
Transplanting		19/3	26/3	8/4	15/4	11/3	7/4	21/4	14/4

SITKA SPRUCE

Height in inches

Treatments applied to TRANSPLANT BEDS	Ampthill				Ringwood[2]			
	1952	1953	1954	1955	1952	1953	1954	1955
Mean	9.0	10.0	8.7	6.1	8.3	9.2	7.2	7.0
EFFECTS								
(Ns-Nc)'	-0.0	0.1	0.4	0.1	-0.2	0.9**	1.0**	-0.2
K'	-0.4*	0.1	-0.3	0.1	-0.2	0.3	0.3	0.4
Mg'	-0.1	-0.2	0.2	-0.0	-0.4	-0.0	0.1	0.2
Mf'	2.1**	1.8**	2.2**	1.0**	3.1**	5.2**	3.1**	1.8**
(Ns-Nc)' × Mf'	-0.6**	0.5	0.2	-0.2	-0.0	-0.3	0.4	0.2
S.E.±	0.14	0.30	0.26	0.17	0.28	0.24	0.23	0.17
c.v.%	3.2	6.0	6.1	5.6	6.8	5.3	6.5	4.8

[2] Note: this experiment received BASAL K in all years

Extension of seedbed experiments to uniformly treated transplant beds

Table 153

Acidification and fertilizer

Old Kennington 47/K 7(1+1) from 46/K 4 and K 5 (1+0)

Years and Species 1947 only. Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 36 plants per species

Design 72 plots in 3 blocks of 24

Treatments For full details of treatments applied to seedbeds in 1946 see SEEDBED Table 29

At the end of 1946 1+0 seedlings were taken from the following selected treatments and transplanted into beds manured uniformly with NPK fertilizer

K 4	NO ACIDIFICATION	unmanured compost fertilizer
	WINTER ACIDIFICATION	sulphuric acid sulphur
	SPRING ACIDIFICATION	sulphuric acid sulphur nitric acid ammonium sulphate
K 5	FORMALIN CRESYLIC ACID	

Basal manuring of transplant beds, rate per sq.yd.

11 g.N as hoof, 7½ g.P as superphosphate, 4½ g.K as potassium sulphate

Dates

Manuring: April 19 Transplanting: April 21

Height in inches

Treatments applied to SEEDBEDS	equivalent g. sulphuric acid per sq.yd.	SITKA SPRUCE 1+0 1946	SITKA SPRUCE 1+1 1947	SCOTS PINE 1+0 1946	SCOTS PINE 1+1 1947
ex K 4					
no basal fertilizer					
no acidification	0	0.46	2.0	1.04	2.2
hopwaste compost	0	1.25	4.5	1.27	3.0
S.E.±		0.089	0.27	0.062	0.24
winter acid	230	1.22	3.4	1.26	2.5
	460	1.34	3.9	1.31	2.8
	690	1.55	3.6	1.34	2.9
winter sulphur	230	1.29	4.0	1.26	2.4
	460	1.22	3.8	1.18	2.5
	690	1.24	3.7	1.16	2.5
spring acid	115	1.04	3.1	1.22	2.9
	230	1.18	3.6	1.20	2.6
spring sulphur	115	0.91	3.8	1.15	2.5
	230	1.06	3.2	1.29	3.3
S.E.±		0.125	0.38	0.088	0.34
basal fertilizer					
no acidification	0	1.04	4.0	1.31	2.9
S.E.±		0.089	0.27	0.062	0.24
spring acid	115	1.27	3.8	1.32	2.9
	230	1.78	4.5	1.47	3.0
spring sulphur	115	1.14	4.0	1.23	2.6
	230	1.11	3.8	1.29	2.6
no basal fertilizer					
spring nitric acid	35	0.99	3.3	1.15	2.7
spring amm.sulphate	35	1.10	3.2	1.19	3.0
S.E.±		0.125	0.38	0.088	0.34
c.v.%		19.6		12.4	
ex K 5					
formalin		1.04	2.8	1.23	2.2
cresylic acid		1.01	3.0	1.30	2.5
S.E.±		0.063	0.38	0.074	0.34
c.v.%		14.2	18.7	12.6	22.2

Table 154

Acidification and manuring

Old Kennington K, Kennington Extension KE

Years and Species

	1+1		1+0	
1948	48/K 21	from	47/K 9	transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 40 plants per species
	48/KE 29	from	47/KE 14	
1949	49/K 33	from	48/K 9	1+1 Sitka spruce transplants, 54 plants per plot
	49/KE 39	from	48/KE 14	

Design 1948 K 21 16 plots in 1 block
KE 29 32 plots in 2 blocks of 16
1949 K 33, KE 39 32 plots in 2 blocks of 16

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 30

1+0 seedlings from the following treatments were transplanted into beds manured uniformly with NPK fertilizer

Factorial test on: 4 levels of sulphuric acid × nitrogen × phosphorus × compost

Manuring of transplant beds, rate per sq.yd.

1948 5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride topdressed

1949 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates		1948 K	1948 KE	1949 K	1949 KE
Manuring topdressed	April/May	7/5	7/5	19/4	20/4
	June	-	-	24/6	24/6
Transplanting		14/4	12/4	17/3	21/3

Height in inches

Old Kennington

Treatments applied to SEEDBEDS	K 9 1+0 1947 Mean	N'	P'	C'	K 21 1+1 1948 Mean	N'	P'	C'
SITKA SPRUCE								
Mean	1.46	0.06	-0.06	0.03	4.8	-0.0	0.1	0.2
S.E.±	0.068		0.137		0.16		0.32	
Sulphuric acid level 0	1.35	0.40	-0.08	0.06	4.7	0.6	-0.5	-0.3
1	1.56	-0.12	0.00	0.16	4.7	0.0	-0.1	-0.0
2	1.54	-0.36	0.02	0.14	4.4	-1.2	0.0	0.4
3	1.37	0.32	-0.18	-0.24	5.3	0.4	1.0	0.6
S.E.±	0.137		0.273		0.32		0.64	
c.v.%	18.7				13.3			
SCOTS PINE								
Mean	1.94	0.03	0.25*	-0.07	5.0	0.2	0.1	-0.1
S.E.±	0.043		0.086		0.08		0.16	
Sulphuric acid level 0	1.91	-0.17	0.13	0.00	5.4	-0.2	-0.2	-0.1
1	1.96	0.02	-0.14	0.09	4.9	0.1	0.2	0.0
2	2.10	0.27	0.27	-0.22	4.8	0.6	-0.1	-0.4
3	1.81	-0.00	0.74**	-0.14	4.7	0.4	0.6	-0.1
S.E.±	0.086		0.172		0.16		0.32	
c.v.%	8.8				6.4			

Table 154 cont.

Height in inches

Kennington Extension

Treatments applied to SEEDBEDS	KE 14 1+0 1947 Mean	N'	P'	C'	KE 29 1+1 1948 Mean	N'	P'	C'
SITKA SPRUCE								
Mean	1.50	-0.13	0.22**	0.50**	7.5	-0.4	0.1	0.3
S.E.±	0.034		0.068		0.15		0.30	
Sulphuric acid level 0	1.62	-0.29	0.22	0.18	7.7	-0.6	-0.4	-0.2
1	1.56	-0.38*	0.05	0.44**	7.4	-0.6	0.2	1.0
2	1.46	-0.05	0.31*	0.73**	7.5	0.1	0.0	0.1
3	1.35	0.20	0.32*	0.67**	7.4	-0.5	0.5	0.4
S.E.±	0.068		0.136		0.30		0.61	
c.v.%	12.8				11.5			
SCOTS PINE								
Mean	1.94	-0.05	0.04	0.30**	5.4	0.1	0.1	0.0
S.E.±	0.022		0.044		0.10		0.19	
Sulphuric acid level 0	2.01	-0.04	0.18	-0.11	5.4	0.2	0.4	0.2
1	1.99	0.05	0.07	0.39**	5.5	0.2	-0.4	0.4
2	2.02	-0.11	-0.04	0.34**	5.1	0.4	0.0	-0.5
3	1.76	-0.12	-0.06	0.60**	5.6	-0.4	0.4	-0.2
S.E.±	0.044		0.088		0.19		0.38	
c.v.%	6.4				9.9			

Old Kennington

	K 9 1+0 1948 Mean	N'	P'	C'	K 33 1+1 1949 Mean	N'	P'	C'
SITKA SPRUCE								
Mean	1.16	0.18**	0.23**	0.18**	4.7	0.2	-0.2	0.3
S.E.±	0.026		0.051		0.11		0.21	
Sulphuric acid level 0	0.88	0.27*	0.11	0.18	4.3	0.8	-0.2	0.3
1	1.12	0.22*	0.08	0.08	4.8	-0.2	0.5	0.1
2	1.30	0.21	0.15	0.15	4.9	-0.2	-0.8	0.2
3	1.36	0.02	0.58**	0.32**	5.0	0.4	-0.2	0.7
S.E.±	0.051		0.102		0.21		0.43	
c.v.%	13.6				12.8			

Kennington Extension

	KE 14 1+0 1948 Mean	N'	P'	C'	KE 39 1+1 1949 Mean	N'	P'	C'
SITKA SPRUCE								
Mean	1.08	0.00	0.33**	0.27**	5.4	0.3	0.5*	0.3
S.E.±	0.025		0.050		0.08		0.17	
Sulphuric acid level 0	0.97	0.09	0.14	0.18	4.6	0.8*	-0.2	0.4
1	1.09	-0.04	0.22*	0.09	5.4	0.2	0.5	0.2
2	1.12	0.00	0.44**	0.42**	5.7	-0.1	0.6	0.4
3	1.13	-0.04	0.50**	0.38**	5.6	0.2	1.0*	0.3
S.E.±	0.050		0.099		0.17		0.34	
c.v.%	13.0				8.9			

Table 155

Forms and rates of acidification

Old Kennington 49/K 34(1+1) from 48/K 14(1+0)

Years and Species 1949 only 1+1 Sitka spruce transplants, 54 plants per plot

Design 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 31

1+0 seedlings from all seedbed plots were transplanted into beds treated with uniform nitrogen fertilizer

Basal manuring of transplant beds, rate per sq.yd. 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates Manuring: April 19, June 24 Transplanting: March 17

	SITKA SPRUCE Height in inches	
	K 14	K 34
Treatments applied to SEEDBEDS	1+0	1+1
	1948	1949
Mean	0.93	4.6
MEANS		
no acidification	0.68	3.9
aluminium sulphate	0.94	4.3
sulphur	0.96	4.8
ammonium sulphate	1.16	5.2
EFFECT (level 2-1) WITH:		
aluminium sulphate	0.22**	0.2
sulphur	0.05	0.2
ammonium sulphate	0.11	0.2
S.E.±	0.060	0.30
c.v.%	9.2	9.3

Table 156

Acidification

Old Kennington 51/K 53(1+1) from 50/K 26(1+0), Ringwood 51/R 41(1+1) from 50/R 4(1+0)

Years and Species 1951 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 33

K 26 seedlings from plots treated with fertilizer) transplanted into beds manured uniformly
R 4 seedlings from all plots) with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

	K	R		K	R
Manuring					
before transplanting	29/3	8/3	Transplanting	20/4	23/4
topdressed June	28/6	25/6			
August	2/8	1/8			

	Height in inches SITKA SPRUCE			
	K 26	K 53	R 4	R 41
Treatments applied to fallow land before sowing	1+0	1+1	1+0	1+1
	1950	1951	1950	1951
no acidification	1.21	4.4	1.52	5.7
S.E.±	0.067	0.24	0.074	0.12
sulphur				
level 1	1.55	4.2	1.99	5.7
2	1.99	4.4	2.49	5.5
3	2.12	5.2	2.63	5.8
ammonium sulphate				
level 1	1.66	4.0	2.20	5.9
2	2.28	5.2	2.46	5.9
3	2.39	4.7	2.41	5.8
S.E.±	0.085	0.34	0.104	0.17
c.v.%	9.4	14.9	9.7	5.9

Table 157

Times of application and forms of nitrogen; watering test

(Old Kennington K, Kennington Extension KE, Wareham W, Ringwood R)

Years and Species

	1+1		1+0	
1948	48/K 22 48/KE 30	from	47/KE 16	Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 40 plants per species
	48/W 35	from	47/W 23	Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 72 plants per species
1949	49/KE 41	from	48/KE 16	1+1 Sitka spruce transplants } 54 plants per plot
	49/R 15	from	48/R 23	1+1 Sitka spruce transplants }
1950	50/KE 52	from	49/KE 16	1+1 Sitka spruce transplants, 50 plants per plot

Design K, KE, W 32 plots in 2 blocks of 16

R 16 plots in 2 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Tables 36 and 41

Except for R 15 1+0 seedlings from all the plots in each of the seedbed experiments concerned were transplanted into beds treated with uniform basal fertilizer. In the case of R 15 only plants from the 2 steamed blocks in R 23 were selected.

Factorial test on:

K 22, KE 30, W 35

Date 1	Ae (applied in early summer)	×	Nca	calcium nitrate	×	W watering
× Date 2	Am (applied in mid-summer)		v.Ns	ammonium sulphate		
× Date 3	Al (applied in late summer)					

KE 41, KE 52

Date 1	As (applied in seedbed)	×	Nc	'Nitro-Chalk'	×	W watering
× Date 2	Ae (applied in early summer)		v.Ns	ammonium sulphate		
× Date 3	Al (applied in late summer)					

R 15

Date 1	As (applied in seedbed)	×	Nc	'Nitro-Chalk'	(steamed plots only)
× Date 2	Ae (applied in early summer)		v.Ns	ammonium sulphate	

Basal manuring of transplant beds, rate per sq.yd.

1948

K, KE 5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride topdressed

W 2½ g.P as superphosphate before transplanting; 57 g. of Concentrated Compound Fertilizer topdressed supplying 7 g.N, 3 g.P, 7 g.K

1949 and 1950

KE and R 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates	1948			1949		1950
	K	KE	W	KE	R	KE
Manuring						
before transplanting	-	-	1/4	-	-	-
topdressed April/May	7/5	7/5	10/5	20/4	20/4	4/5
June/July	-	-	-	24/6	23/6	11/7
Transplanting	14/4	12/4	15/4	18-21/3	2/2	10/3

Table 157 cont.

Height in inches

Treatments applied to SEEDBEDS	Kennington Extension and Old Kennington						Wareham			
	SITKA SPRUCE			SCOTS PINE			SITKA SPRUCE		SCOTS PINE	
	KE 16	K 22	KE 30	KE 16	K 22	KE 30	W 23	W 35	W 23	W 35
	1+0	1+1	1+1	1+0	1+1	1+1	1+0	1+1	1+0	1+1
	1947	1948	1948	1947	1948	1948	1947	1948	1947	1948
Mean	2.03	5.6	8.5	2.76	5.6	5.9	2.30	5.5	3.21	5.3
EFFECTS										
Ae'	0.06	0.0	-0.0	0.20**	-0.1	-0.0	0.37**	0.1	0.48**	0.6**
Am'	0.36**	0.6*	0.4*	0.32**	0.6*	0.3	-0.01	-0.0	0.35**	0.3*
Al'	0.14	-0.2	0.1	0.01	0.2	0.2	-0.00	0.2	-0.01	0.1
Ae'm'	-0.12	0.1	-0.3	-0.27**	-0.0	-0.0	-0.12	-0.3	-0.26**	-0.2
Ae'l'	-0.05	-0.4	0.1	-0.02	-0.1	-0.3	-0.15	0.1	-0.08	-0.3*
Am'l'	-0.07	0.0	0.1	0.08	0.2	-0.2	-0.14	-0.3	0.01	-0.0
(Nca-Ns)'	-0.15	0.3	0.0	-0.09	-0.2	-0.3	0.12	0.2	0.06	0.1
(Nca-Ns)'Ae'	0.04	0.0	-0.1	-0.03	0.0	-0.1	-0.06	0.0	-0.08	-0.0
(Nca-Ns)'Am'	-0.27*	0.3	0.3	-0.17*	0.3	0.4*	-0.07	0.1	-0.04	-0.3*
(Nca-Ns)'Al'	-0.11	0.2	-0.2	-0.06	-0.6*	-0.1	0.07	0.3	-0.09	0.1
W'	0.75**	0.1	0.1	1.01**	0.3	0.0	0.63**	0.1	0.46**	0.6**
W'Ae'	0.25*	0.1	0.0	0.29**	0.1	0.3	0.01	0.0	0.10	0.0
W'Am'	0.38**	-0.1	0.6*	0.33**	-0.3	-0.0	-0.04	-0.2	0.17*	0.2
W'Al'	0.25*	0.1	0.4	0.13*	0.2	0.2	0.01	-0.4*	0.08	0.2
(Nca-Ns)'W'	-0.03	-0.1	0.0	-0.11	-0.3	-0.3	-0.05	-0.2	-0.02	-0.1
S.E.±	0.109	0.26	0.19	0.057	0.22	0.16	0.094	0.17	0.072	0.14
c.v.%	15.2	13.5	6.4	9.9	10.9	7.7	11.5	8.6	6.4	7.3

Treatments applied to SEEDBEDS	Kennington Extension			
	SITKA SPRUCE			
	KE 16	KE 41	KE 16	KE 52
	1+0	1+1	1+0	1+1
	1948	1949	1949	1950
Mean	1.24	5.0	1.69	8.1
EFFECTS				
As'	-0.08	0.2	-0.23**	-0.2
Ae'	0.18**	0.1	-0.24**	0.4
Al'	0.27**	0.4*	0.04	-0.1
As'e'	0.00	0.1	-0.16*	-0.2
As'l'	-0.06	-0.0	0.03	0.0
Ae'l'	0.00	0.0	-0.08	0.1
(Nc-Ns)'	-0.06	-0.0	0.06	-1.0**
(Nc-Ns)'As'	0.08	0.2	0.08	0.0
(Nc-Ns)'Ae'	-0.01	-0.2	-0.14*	-0.1
(Nc-Ns)'Al'	0.04	0.0	0.20**	-0.2
W'	0.27**	0.6*	0.92**	0.3
W'As'	-0.02	0.2	-0.00	0.6**
W'Ae'	-0.02	-0.0	-0.03	-0.0
W'Al'	0.16**	0.0	0.08	0.3
(Nc-Ns)'W'	-0.09	0.2	0.02	-0.2
S.E.±	0.048	0.19	0.062	0.18
c.v.%	11.0	10.6	10.4	6.1

In the presence of STEAM	Ringwood	
	SITKA SPRUCE	
	R 23	R 15
	1+0	1+1
	1948	1949
Mean	1.20	5.2
EFFECTS		
As'	-0.07	0.3
Ae'	0.37**	0.5
As'e'	0.08	0.0
(Ns-Nc)'	0.02	0.1
(Ns-Nc)'As'	0.04	0.7*
(Ns-Nc)'Ae'	0.05	-0.1
S.E.±	0.071	0.23
c.v.%	11.9	9.0

Table 158

Rates and forms of phosphorus

Bagley 51/B 34(1+1) from 50/B 27(1+0)

Years and Species 1951 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 44

Seedlings from all plots were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates				
	Manuring before transplanting	2/4		
	topdressed June	29/6	Transplanting	24/4
	August	2/8		

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	B 27 1+0 1950 Mean	Effect of level (2-1)'	B 34 1+1 1951 Mean	Effect of level (2-1)'
no phosphorus	0.88	-	11.8	-
tricalcium phosphate	1.37	0.53**	10.7	1.3
dicalcium phosphate	1.52	0.36*	11.1	-1.8
superphosphate	1.92	0.85**	10.8	-0.4
S.E.±	0.072	0.143	0.47	0.94
c.v.%	14.2		11.9	

Table 159

Magnesium sulphate, high calcium and dolomitic limestones, ammonium molybdate

Ringwood 52/R 44(1+1) from 51/R 37(1+0), Bagley 52/B 41(1+1) from 51/B 33(1+0)

Years and Species 1952 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 16 plots in 2 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 61

Seedlings from all plots were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
3 g.N, 1½ g.P, 3 g.K as concentrated compound fertilizer topdressed in June
3 g.N as 'Nitro-Chalk' topdressed in August

Dates	Manuring	R	B		R	B
	before transplanting	23/1	25/1			
	topdressed in June	25/6	19/6	Transplanting	25/3	11/3
	August	15/8	13/8			

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	R 37 1+0 1951	R 44 1+1 1952	B 33 1+0 1951	B 41 1+1 1952
Mean	1.32	5.4	1.98	11.6
MEANS				
none	1.43	5.6	1.94	11.1
high calcium limestone	1.20	5.2	2.01	11.4
magnesium sulphate	1.40	5.2	2.11	11.9
dolomitic limestone	1.24	5.4	1.85	11.8
EFFECT OF				
ammonium molybdate	-0.10	0.0	0.04	-0.2
S.E.±	0.059	0.23	0.231	0.29
c.v.%	9.0	8.7	23.4	5.0

Table 160

Fertilizers

Wareham 51/W 56(1+1) from 50/W 46(1+0)

Years and Species 1951 only. Each plot split for 1+1 Tsuga heterophylla (Western hemlock) and 1+1 Corsican pine (Pinus nigra var. calabrica) transplants, 38 plants per plot per species

Design 32 plots in 2 blocks of 16

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 49

Seedlings from all plots were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

4 g.N as ammonium sulphate, 3½ g.P as superphosphate, 3 g.K as potassium chloride topdressed in May; 3 g.N as 'Nitro-Chalk' topdressed in June

Dates

Manuring: May 21 June 26 Transplanting: 24/4

Height in inches

Treatments applied to SEEDBEDS	TSUGA W 46 1+0 1950	TSUGA W 56 1+1 1951	CORSICAN PINE W 46 1+0 1950	CORSICAN PINE W 56 1+1 1951
Mean	0.88	7.5	1.82	3.4
EFFECTS				
N'	0.30	0.8	0.50**	0.4
P'	0.43*	1.4*	0.82**	1.2**
K'	0.29	0.7	0.38*	0.5*
N'P'	0.11	0.3	0.00	0.0
N'K'	0.13	-0.5	0.16	0.3
P'K'	0.14	0.4	0.03	0.1
N'P'K'	0.04	0.0	-0.08	-0.3
F'	0.12	0.9	0.62**	0.9**
N'F'	0.08	-0.0	0.08	0.2
P'F'	-0.29	-1.6**	-0.40*	-0.4
K'F'	-0.12	-0.2	0.08	0.4
Rc'	-0.41*	-0.9	-0.15	-0.5*
N'Rc'	-0.10	0.6	0.07	0.3
P'Rc'	-0.33	-1.2*	-0.05	0.2
K'Rc'	-0.13	0.4	-0.01	0.1
F'Rc'	-0.07	-0.8	-0.00	0.0
S.E.±	0.172	0.50	0.135	0.19
c.v.%	55.3	19.0	21.0	16.2

Table 161

Rates of nitrogen, rates and forms of phosphorus

Kennington Extension 47/KE 12(1+1) from 46/KE 10(1+0), Wareham 47/W 14(1+1) from 46/W 10(1+0)

Years and Species 1947 only. Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 72 plants per species

Design 32 plots in 4 blocks of 8; half replicate
1 additional compost plot in each block making 36 plots in all

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 54

At the end of 1946 1+0 seedlings were taken from the following selected treatments and transplanted into beds manured uniformly with NPK fertilizer

Factorial test on: nitrogen level 1 v.2 × 4 forms of phosphorus × level 1 v.2 (all with basal K)

Additional plots with hopwaste compost

Basal manuring of transplant beds, rate per sq.yd.

KE 11 g.N as hoof, 7½ g.P as superphosphate, 4½ g.K as potassium sulphate
W 11 g.N as hoof, 7½ g.P as Gafsa mineral phosphate, 9½ g.K as potassium sulphate

Dates

Manuring: KE April 15, W December 17 Transplanting: KE April 16, W May 1

Height in inches

Treatments applied to SEEDBEDS	SITKA SPRUCE KE 10 1+0 1946	KE 12 1+1 1947	W 10 1+0 1946	W 14 1+1 1947	SCOTS PINE KE 10 1+0 1946	KE 12 1+1 1947	W 10 1+0 1946	W 14 1+1 1947
Compost	1.60	9.0	-	-	1.38	2.9	-	-
Mean of fertilizer plots	1.73	9.0	2.81	6.9	1.41	3.2	2.64	4.6
MEANS								
Bessemer basic slag	1.54	9.0	2.47	6.7	1.33	3.2	2.38	4.3
Gafsa mineral phosphate	1.52	8.4	2.87	6.9	1.30	2.9	2.70	4.6
dicalcium phosphate	1.83	9.2	3.04	6.8	1.51	3.4	2.85	4.9
superphosphate	2.03	9.3	2.86	7.3	1.52	3.2	2.65	4.8
S.E.±	0.085	0.17	0.154	0.33	0.058	0.12	0.081	0.14
EFFECT OF (LEVEL P_2-P_1)' WITH								
Mean	0.17	0.2	-0.08	-0.3	0.07	0.1	0.25**	0.1
S.F.±	0.085	0.17	0.154	0.32	0.058	0.11	0.080	0.14
Bessemer basic slag	0.11	-0.5	-0.23	1.2	0.14	0.1	0.47**	0.6*
Gafsa mineral phosphate	0.13	0.5	0.27	-0.2	-0.15	0.1	0.15	0.1
dicalcium phosphate	0.38*	0.7*	-0.16	-1.2	-0.10	0.0	0.26	-0.1
superphosphate	0.33	0.1	-0.20	-0.7	0.40**	0.0	0.10	-0.1
S.E.±	0.170	0.34	0.308	0.66	0.116	0.25	0.161	0.28
N_1	0.11	0.1	-0.21	-0.3	0.06	0.0	0.26*	0.1
N_2	0.22	0.4	0.05	-0.2	0.11	0.2	0.23	0.1
S.E.±	0.120	0.24	0.218	0.47	0.082	0.17	0.114	0.20
EFFECT OF (LEVEL N_2-N_1)' WITH								
Mean	0.12	0.3	0.57**	0.8*	0.16*	0.3**	0.16	0.4**
S.E.±	0.085	0.17	0.154	0.32	0.058	0.11	0.080	0.14
P_1	0.07	0.1	0.44	0.7	0.15	0.2	0.18	0.4*
P_2	0.18	0.4	0.70**	0.8	0.18*	0.4*	0.15	0.4*
S.E.±	0.120	0.24	0.218	0.47	0.082	0.17	0.114	0.20
c.v.%	13.9	5.4	15.5	13.5	11.6	11.5	8.7	8.9

Table 162

Forms of nitrogen and forms of phosphorus with a test of potassium

Kennington Extension KE, Wytham Wy, Bagley B, Wareham W

Years and Species

	1+1		1+0	
1948	48/KE 28	from	47/KE 15	transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 40 plants per species
	48/Wy 11	from	47/Wy 4	
	48/W 33	from	47/W 21	transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 72 plants per species
1949	49/KE 40	from	48/KE 15	1+1 Sitka spruce transplants, 54 plants per plot
	49/Wy 16	from	48/Wy 4	
	49/B 18	from	48/B 7	

Design

1948	KE 28	16 plots in 2 blocks of 8	1949	KE 40	32 plots in 2 blocks of 16
	Wy 11, W 33	24 plots in 2 blocks of 12		Wy 16, B 18	24 plots in 2 blocks of 12

Treatments For full details of treatments applied to seedbeds see SEEDBED Tables 55 and 56

1+0 seedlings from the following selected treatments were transplanted into beds treated with uniform basal fertilizer

Factorial test on:

1948	KE 28	4 forms of nitrogen	×	4 forms of phosphorus		(all with potassium)
	Wy 11	4 forms of nitrogen	×	3 forms of phosphorus	×	potassium
	W 33	4 forms of nitrogen	×	3 forms of phosphorus		
1949	KE 40	4 forms of nitrogen	×	4 forms of phosphorus	×	potassium
	Wy 16, B 18	4 forms of nitrogen	×	3 forms of phosphorus	×	potassium

Basal manuring of transplant beds, rate per sq.yd.

1948	KE	5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride, topdressed
	Wy	2½ g.P as superphosphate before transplanting; 5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride, topdressed
	W	2½ g.P as superphosphate before transplanting; 57 g. of concentrated compound fertilizer topdressed supplying 7 g.N, 3 g.P, 7 g.K
1949	KE	6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.
	Wy, B	6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting

Dates

		1948			1949		
		KE	Wy	W	KE	Wy	B
Manuring before transplanting		-	19/4	1/4	-	22/12	22/12
topdressed	April/May	7/5	11/5	10/5	20/4	-	-
	June	-	-	-	24/6	-	-
Transplanting		12/4	19/4	13/4	21/3	25/3	23/3

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	Kennington Ext. 1+0 1947	Kennington Ext. 1+1 1948	Wytham 1+0 1947	Wytham 1+1 1948	Wareham 1+0 1947	Wareham 1+1 1948
Mean	1.34	7.1	1.64	10.2	1.71	5.4
MEANS						
no nitrogen	1.34	6.7	1.36	9.6	1.44	5.4
hoof	1.42	7.4	1.72	10.1	1.71	5.5
formalised casein	1.48	7.2	1.89	11.0	1.83	5.4
'Nitro-Chalk'	1.10	7.3	1.57	10.0	1.86	5.4
no phosphorus	1.18	6.7	-	-	-	-
Bessemer basic slag	1.28	7.4	1.18	10.9	1.82	5.5
Gafsa mineral phosphate	1.25	7.5	1.17	10.1	1.59	6.0
superphosphate	1.63	6.9	2.55	9.5	1.72	4.7
S.E.±	0.065	0.21	0.088	0.41	0.101	0.32
EFFECTS						
N'	-0.01	0.5	0.36**	0.7	0.36*	0.1
P'	0.20**	0.6*	-	-	-	-
S.E.±	0.059	0.24	0.117	0.55	0.135	0.43
K'	-	-	0.11	-0.3	-	-
S.E.±	-	-	0.101	0.47	-	-
c.v.%	7.6	5.8	15.1	11.4	16.8	16.7

Table 162 cont.

Height in inches

SCOTS PINE

Treatments applied to SEEDBEDS	Kennington Ext.		Wytham		Wareham	
	1+0	1+1	1+0	1+1	1+0	1+1
	1947	1948	1947	1948	1947	1948
Mean	2.40	5.5	2.57	6.0	2.85	5.4
MEANS						
no nitrogen	2.40	5.3	2.48	5.3	2.37	4.6
hoof	2.36	5.7	2.61	6.1	3.09	5.6
formalised casein	2.64	5.4	2.76	6.4	3.26	6.0
'Nitro-Chalk'	2.19	5.7	2.42	6.0	2.67	5.4
no phosphorus	2.26	5.8	-	-	-	-
Bessemer basic slag	2.47	5.4	2.25	5.7	2.91	5.6
Gafsa mineral phosphate	2.35	5.3	2.02	6.0	2.90	5.5
superphosphate	2.50	5.6	3.44	6.1	2.74	5.2
S.E.±	0.083	0.28	0.135	0.33	0.072	0.15
EFFECTS						
N'	-0.00	0.3	0.11	0.8	0.63**	1.0**
P'	0.18	-0.4	-	-	-	-
S.E.±	0.096	0.33	0.180	0.44	0.096	0.20
K'	-	-	0.09	-0.8*	-	-
S.E.±	-	-	0.122	0.38	-	-
c.v.%	6.9	10.2	14.9	15.6	7.1	7.8

SITKA SPRUCE

	Kennington Ext.		Wytham		Bagley	
	1+0	1+1	1+0	1+1	1+0	1+1
	1948	1949	1948	1949	1948	1949
Mean	1.02	5.1	1.72	8.4	1.39	7.7
MEANS						
no nitrogen	0.92	4.9	1.53	7.7	1.27	7.7
hoof	1.06	5.2	1.70	8.5	1.41	8.5
formalised casein	1.18	5.6	2.08	9.1	1.51	8.3
ammonium sulphate	0.92	4.8	1.58	8.2	1.38	6.4
no phosphorus	1.02	4.9	-	-	-	-
Bessemer basic slag	0.96	5.0	1.74	8.4	1.30	8.2
Gafsa mineral phosphate	1.01	5.1	1.59	8.3	1.38	7.2
superphosphate	1.08	5.4	1.84	8.4	1.50	7.8
S.E.±	0.038	0.20	0.054	0.24	0.059	0.30
EFFECTS						
N'	0.14*	0.3	0.26**	0.9*	0.16	-0.0
P'	0.00	0.3	-	-	-	-
S.E.±	0.044	0.23	0.072	0.32	0.079	0.40
K'	0.05	0.1	-0.01	-0.2	0.36**	1.8**
S.E.±	0.038	0.20	0.063	0.28	0.068	0.35
c.v.%	10.6	11.2	8.9	8.2	12.0	11.1

Table 163

Bulky manures and fertilizers

Kennington Extension 47/KE 11(1+1) from 46/KE 9(1+0), Wareham 47/W 13(1+1) from 46/W 9(1+0)

Years and Species 1947 only. Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 72 plants per species

Design 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds in 1946 see SEEDBED Table 73

At the end of 1946 1+0 seedlings from the following selected treatments were transplanted into beds manured uniformly with NPK fertilizer

Factorial test on:

8 materials (all at level 2, with basal K) × N × P

Basal manuring of transplant beds, rate per sq.yd.

KE 11 g.N as hoof, 7½ g.P as superphosphate, 4½ g.K as potassium sulphate
W 11 g.N as hoof, 7½ g.P as Gafsa mineral phosphate, 9½ g.K as potassium sulphate

Dates

Manuring: KE April 14, W December 17 Transplanting: KE April 15, W May 1

Height in inches

	SITKA SPRUCE		SCOTS PINE	
	Kennington Extension			
Treatment applied to SEEDBEDS	1+0	1+1	1+0	1+1
	1946	1947	1946	1947
General Mean	1.80	8.5	1.47	3.0
EFFECTS				
N'	0.15*	0.2	0.03	0.2
P'	0.43**	0.5	0.11*	0.3*
N'P'	-0.09	0.0	0.02	0.1
S.E.±	0.056	0.30	0.047	0.14
MEANS				
dried sewage sludge	1.23	8.4	1.14	2.6
fresh hopwaste	2.21	8.7	1.96	3.4
chaffed green bracken	1.27	7.4	1.17	2.6
hopwaste compost from Bagley	2.52	8.6	1.82	3.2
bracken compost	1.74	9.0	1.34	3.0
reinforced rotted straw	1.59	8.6	1.31	3.0
reinforced peat	2.00	8.5	1.45	3.0
NP fertilizer	1.84	8.9	1.60	3.0
S.E.±	0.078	0.42	0.066	0.20
c.v.%	8.7	10.0	9.0	13.8
	Wareham			
	1+0	1+1	1+0	1+1
	1946	1947	1946	1947
General Mean	2.39	7.1	2.40	4.6
EFFECTS				
N'	0.55**	0.3	0.23	1.0**
P'	0.30*	0.4	0.06	0.0
N'P'	0.00	0.0	-0.22	-0.5*
S.E.±	0.127	0.38	0.129	0.23
MEANS				
dried sewage sludge	1.65	6.5	2.07	3.4
fresh hopwaste	3.03	8.2	2.74	5.3
hopwaste compost from Bedf.Coll.	2.34	7.0	2.04	4.1
hopwaste compost from Bagley	2.90	8.2	2.67	4.7
bracken compost	1.72	6.3	1.99	3.9
reinforced rotted straw	2.56	7.4	2.54	4.9
reinforced peat	2.56	6.6	2.70	5.0
NP fertilizer	2.39	6.7	2.46	5.3
S.E.±	0.180	0.53	0.182	0.33
c.v.%	15.0	15.1	15.2	14.4

Table 164

Bulky manures and fertilizers

Ringwood R, Kennington Extension KE, Wytham Wy, Bagley B, Wareham W

Years and Species

	1+1		1+0	
1948	48/R 9	from	47/R 3	Transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine
	48/Wy 10	from	47/Wy 3	Number of plants per species: Ringwood 54, Wytham 80, Wareham 72
	48/W 34	from	47/W 20	
1949	49/KE 43	from	48/KE 18	1+1 Sitka spruce transplants, 54 plants per plot
	49/Wy 15	from	48/Wy 3	
	49/B 17	from	48/B 6	

Design

1948			1949		
	R 9	16 plots in 2 blocks of 8		KE 43	32 plots, 1 block only
	Wy 10	28 plots in 2 blocks of 14		Wy 15	32 plots in 2 blocks of 16
	W 34	32 plots in 2 blocks of 16		B 17	32 plots in 2 blocks of 16

Treatments For full details of treatments applied to seedbeds see SEEDBED Tables 75 and 76

1+0 seedlings from the following selected treatments were transplanted into beds treated with uniform basal fertilizer

Factorial test on:

R 9	4 treatments (3 organic manures and no manure) × P × K
Wy 10	3 bulky manures × N × P × K; also additional plots with basal P
W 34	6 bulky manures × P × K fertilizer, fertilizer + peat × N × P
KE 43	8 treatments (7 bulky manures and 1 of fertilizer alone) × N × P × K
Wy 15, B 17	4 treatments (3 organic manures and 1 of fertilizer alone) × N × P × K

Basal manuring of transplant beds, rate per sq.yd.

1948	R	5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride, topdressed
	Wy	2½ g.P as superphosphate before transplanting; 5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride, topdressed
	W	2½ g.P as superphosphate before transplanting; 57 g. of concentrated compound fertilizer topdressed supplying 7 g.N, 3 g.P, 7 g.K
1949	KE	6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.
	Wy, B	6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting

Dates

Year of cropping:	1948			1949		
	R	Wy	W	KE	Wy	B
Manuring before transplanting	-	19/4	1/4	-	22/12	22/12
topdressed April/May	6/5	14/5	10/5	20/4	-	-
June/July	-	-	-	24/6	-	-
Transplanting	14/4	19/4	15/4	21/3	25/3	23/3

Height in inches

	Ringwood				Wytham			
	SITKA SPRUCE		SCOTS PINE		SITKA SPRUCE		SCOTS PINE	
Treatments applied to SEEDBEDS	R 3	R 9	R 3	R 9	Wy 3	Wy 10	Wy 3	Wy 10
	1+0	1+1	1+0	1+1	1+0	1+1	1+0	1+1
	1947	1948	1947	1948	1947	1948	1947	1948
Mean	1.14	3.9	1.75	4.8	2.52	9.0	3.50	6.8
MEANS								
hopwaste compost	1.13	3.7	1.80	5.1	2.49	9.3	3.34	6.9
bracken and hopwaste compost	1.18	3.8	1.64	4.8	2.29	8.8	3.44	6.7
fresh hopwaste	1.18	4.0	1.80	4.8	2.79	8.8	3.74	6.7
NP fertilizer	1.08	4.0	1.76	4.3	-	-	-	-
S.E.±	0.124	0.19	0.067	0.25	0.111	0.59	0.120	0.20
EFFECTS								
N'	-	-	-	-	0.25	0.1	0.03	-0.0
P'	0.03	-0.2	-0.01	-0.3	0.54**	-0.1	0.73**	0.3
K'	0.07	0.2	0.00	0.2	0.08	-0.5	0.09	0.4
S.E.±	0.124	0.19	0.067	0.25	0.128	0.68	0.139	0.23
c.v.%	21.7	10.0	7.6	10.5	12.4	18.7	9.7	8.2
Additional fertilizer plots								
basal P	-	-	-	-	2.33	9.6	3.40	7.0

Table 164 cont.

Height in inches	SITKA SPRUCE		SCOTS PINE	
	Wareham			
	W 20	W 34	W 20	W 34
Treatments applied to SEEDBEDS	1+0	1+1	1+0	1+1
	1947	1948	1947	1948
Mean	2.13	5.4	2.65	4.9
MEANS				
hopwaste compost	2.03	4.8	2.64	4.5
bracken and hopwaste compost	2.52	6.0	2.91	5.3
straw compost	1.80	5.5	2.39	4.3
fresh hopwaste	2.08	5.5	2.44	5.1
wheat straw + NP fertilizer	2.20	5.5	2.53	4.8
bracken + NP fertilizer	2.14	5.4	3.00	5.4
S.E.±	0.097	0.50	0.124	0.27
EFFECTS				
P'	0.37**	0.9*	0.15	0.3
K'	0.09	0.5	0.12	0.4
S.E.±	0.079	0.41	0.101	0.22
MEANS				
NPK fertilizer + peat	2.26	6.3	2.86	5.7
NPK fertilizer	1.99	5.5	2.89	5.3
S.E.±	0.097	0.50	0.124	0.27
EFFECTS				
N'	-0.10	-0.6	-0.40*	-0.5
P'	0.22	0.3	0.32	0.5
S.E.±	0.137	0.71	0.175	0.38
c.v.%	9.1	18.1	9.1	10.7

	SITKA SPRUCE			
	Wytham		Bagley	
	Wy 3	Wy 15	B 6	B 17
	1+0	1+1	1+0	1+1
	1948	1949	1948	1949
Mean	1.98	9.6	1.39	8.1
MEANS				
hopwaste compost	1.89	9.3	1.33	8.1
bracken and hopwaste compost	1.86	9.4	1.22	7.5
fresh hopwaste	2.32	9.9	1.59	7.9
NPK fertilizer	1.84	9.7	1.40	8.8
S.E.±	0.046	0.29	0.098	0.41
EFFECTS				
N'	0.15**	0.2	0.12	0.9
P'	0.21**	0.8*	0.15	0.3
K'	-0.09	-0.2	0.14	0.3
S.E.±	0.046	0.29	0.098	0.41
c.v.%	6.6	8.6	20.0	14.5

	SITKA SPRUCE	
	Kennington Extension	
	KE 18	KE 43
	1+0	1+1
	1948	1949
Mean	1.20	5.2
MEANS		
hopwaste compost	1.29	5.8
bracken and hopwaste compost	1.14	4.8
straw compost	0.92	4.8
fresh hopwaste	1.34	5.2
wheat straw + NPK fertilizer	1.31	5.3
bracken + NPK fertilizer	1.23	5.7
NPK fertilizer + peat	1.25	5.6
NPK fertilizer	1.16	4.9
S.E.±	0.061	0.37
EFFECTS		
N'	0.06	-0.2
P'	0.11	0.2
K'	-0.01	-0.0
S.E.±	0.043	0.26
c.v.%	10.2	14.0

Table 165

Composts, uncomposted organic materials and fertilizers

Bagley 49/B 19(1+1) from 48/B 12(1+0), 50/B 23(1+1) from 49/B 12(1+0)

Years and Species 1949 1+1 Sitka spruce transplants, 54 plants per plot
1950 1+1 Sitka spruce transplants, 50 plants per plot

Design 1949 48 plots in 2 blocks of 24
1950 72 plots in 3 blocks of 24

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 79

1+0 seedlings from all seedbed treatments were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

1949 6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting

1950 150 g. of ground chalk, 3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

Year of cropping:	1949	1950		1949	1950
Manuring before transplanting	22/12	7/2	Transplanting	23/3	17/3
topdressed May	-	4/5			
July	-	11/7			

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	B 12 1+0 1948 Mean	Effect of fertilizer	B 19 1+1 1949 Mean	Effect of fertilizer	B 12 1+0 1949 Mean	Effect of fertilizer	B 23 1+1 1950 Mean	Effect of fertilizer
Bulky manures								
Ch	1.39	0.52**	8.4	0.2	1.72	-0.27	14.2	1.4
Cbh	1.39	0.18	9.3	-0.0	1.60	0.26	14.5	1.2
Csh	1.44	0.33*	8.5	0.9	1.71	-0.27	14.9	-0.7
Csin	1.22	0.24	8.8	1.7	2.21	0.92**	15.2	0.1
Csorg	1.31	0.52**	8.9	1.7	1.94	0.11	15.7	-0.4
Cbp	1.54	-0.03	9.7	1.2	1.80	0.21	14.9	0.3
Ubp	1.06	0.28	7.9	0.9	1.49	0.08	14.2	1.0
Us NP	1.07	-0.10	9.1	0.2	1.64	0.22	14.9	0.0
Uh	1.11	0.44*	8.1	1.1	1.80	0.90**	14.8	1.6*
S.E.±	0.080	0.160	0.43	0.86	0.141	0.282	0.37	0.73
No bulky manures								
MEANS								
Unmanured (-0)	0.83		6.3		1.21		12.0	
Fertilizer rate 1	1.28		7.6		1.33		12.0	
Fertilizer rate 2	1.53		9.0		1.42		12.6	
S.E.±	0.080		0.43		0.141		0.37	
DIFFERENCES								
Fertilizer rate 1-0	0.46**		1.3*		0.12		-0.0	
Fertilizer rate 2-1	0.25*		1.4*		0.09		0.6	
S.E.±	0.113		0.61		0.199		0.52	
c.v.%	12.7		10.1		20.8		6.3	

Table 166

Bulky manures and fertilizers

Kennington Extension KE, Bagley B, Wareham W

Years and Species

	1+1		1+0	
1949	49/KE 42	from	48/KE 17	1+1 Sitka spruce transplants, 54 plants per plot
	49/KE 44	from	48/KE 46	
	49/W 44	from	48/W 24	
1950	50/KE 54	from	49/KE 26	1+1 Sitka spruce transplants, 50 plants per plot
	50/B 22	from	49/B 11	

Design

1949	KE 42	24 plots in 4 blocks of 6	1950	KE 54	24 plots in 4 blocks of 6
	KE 44	8 plots in 4 blocks of 2		B 22	16 plots in 4 blocks of 4
	W 44	24 plots in 2 blocks of 12			

Treatments For full details of treatments applied to seedbeds see SEEDBED Tables 82 and 83

1+0 seedlings from the following selected treatments were transplanted into beds treated with uniform basal fertilizer

1949	KE 42	unmanured, 2 bulky manures, fertilizer
	KE 44	compost, fertilizer
	W 44	2 bulky manures, fertilizer
1950	KE 54	(compost v. fertilizer) × sulphur, topdressed after sowing
	B 22	(compost v. fertilizer) × ground chalk

Basal manuring of transplant beds, rate per sq.yd.

1949	KE	6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.
	W	6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
1950	KE	6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.
	B	3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

Year of cropping:-	1949		1950	
	KE	W	KE	B
Manuring before transplanting	-	29/12	-	7/2
topdressed April/May	20/4	-	4/5	4/5
June/July	24/6	-	11/7	11/7
Transplanting	21/3	11/3	10/3	17/3

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	Kennington Extension				Wareham		Kennington Ext.		Bagley	
	KE 26	KE 44	KE 17	KE 42	W 24	W 44	KE 26	KE 54	B 11	B 22
	1+0	1+1	1+0	1+1	1+0	1+1	1+0	1+1	1+0	1+1
	1948	1949	1948	1949	1948	1949	1949	1950	1949	1950
MEANS										
unmanured	-	-	0.84	4.8	-	-	1.24	7.6	-	-
bracken and hopwaste compost	1.00	5.6	1.02	5.0	1.39	6.2	1.32	7.9	1.37	12.5
fresh hopwaste	-	-	1.42	5.6	1.92	7.3	-	-	-	-
fertilizer	1.02	5.3	1.11	5.3	2.37	7.4	1.10	8.1	1.49	12.1
EFFECTS OF										
sulphur	-	-	-	-	-	-	-0.12*	-0.1	-	-
ground chalk	-	-	-	-	-	-	-	-	0.24	-0.1
S.E.±	-	-	0.046	0.21	0.131	0.18	0.058	0.25	0.126	0.45
c.v.%	-	-	8.7	8.2	15.8	7.3	11.6	7.9	23.6	7.3

Table 167

Compost, fertilizers, sulphur, water and seedcovers

Rosedale Banks RB, Harwood Dale HD, Wykeham Moor WM, Reasty Top RT

Years and Species 1+1 Sitka spruce transplants

	1+1		1+0	Number of plants per plot
1948	48/RB 3 48/RT 3	from	47/WM 1	195
1949	49/RB 3 49/RT 3	from	48/WM 1	162
	49/WM 2	from	48/WM 1	108
1950	50/RB 3 50/RT 3 50/WM 2	from	49/WM 1	200
	50/HD 3	from	49/HD 1	200

Design	1948	1949	1950
RB 3, RT 3	24 plots in 4 blocks of 6	24 plots in 4 blocks of 6	64 plots in 4 blocks of 16
WM 2	-	64 plots in 4 blocks of 16	64 plots in 4 blocks of 16
HD 3	-	-	64 plots in 4 blocks of 16

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 77

1+0 seedlings from the following treatments (selected treatments only for RB 3 and RT 3 in 1948 and 1949) were transplanted into beds treated with uniform basal fertilizer

Factorial test on:

	1948	1949	1950
RB 3, RT 3	P,C,P+C × N × K × W	P,C,P+C × N × K × W	N × P × K × C × Rs[1] × W × (T v.Tc)
WM 2	-	N × P × K × C × Rs[1] × W × (T v.Tc)	N × P × K × C × Rs[1] × W × (T v.Tc)
HD 3	-	-	N × P × K × C × Rs[1] × W

[1] residues

Basal manuring of transplant beds, rate per sq.yd.

1948

RB, RT 2½ g.P as superphosphate before transplanting; 57 g. of concentrated compound fertilizer topdressed supplying 7 g.N, 3 g.P, 7 g.K

1949

RB 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

RT, WM 6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting

1950

RB 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

HD, WM, RT 3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting; 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

	1948		1949			1950			
	RB	RT	RB	RT	WM	RB	RT	HD	WM
Manuring before transplanting	8/3	11/3	-	14/4	22/3	-	6/3	4/3	14/3
topdressed April/May	28/4	27/4	24/5	-	-	22/5	5/6	31/5	31/5
July	-	-	20/7	-	-	12/7	13/7	10/7	11/7
Transplanting	16/3	26/3	21/4	23/4	24/3	6/4	17/3	8/3	22/3

Table 167 cont.

Height in inches

SITKA SPRUCE

Treatments applied to SEEDBEDS	WM 1	RT 3	RB 3	WM 1	RT 3	RB 3
	1+0	1+1	1+1	1+0	1+1	1+1
	1947	1948	1948	1948	1949	1949
MEANS						
P	2.09	6.4	6.9	1.08	5.6	5.1
C	1.82	6.6	7.6	1.31	6.2	5.6
P+C	2.44	6.4	7.3	1.28	6.0	5.6
S.E.±	0.162	0.14	0.16	0.042	0.23	0.18
EFFECTS						
N'	0.47*	0.5**	0.5*	0.07	-0.0	0.1
K'	0.31	-0.3	0.4*	-0.07	0.0	0.0
W'	0.78**	-0.5*	-0.4	-0.05	0.4	-0.1
(Tc-T)'	-	-	-	0.07	0.1	0.2
S.E.±	0.188	0.16	0.18	0.048	0.26	0.21
N' with						
P	0.30	0.6*	0.8*	0.01	0.2	-0.1
C	0.71*	0.3	0.3	0.12	-0.2	0.0
P+C	0.40	0.7*	0.5	0.09	-0.2	0.5
K' with						
P	0.32	-0.4	0.6	-0.02	-0.5	0.1
C	0.70*	-0.1	0.7*	-0.10	0.1	-0.1
P+C	-0.10	-0.4	0.1	-0.09	0.4	0.1
W' with						
P	0.36	-0.8**	-0.4	-0.11	0.5	-0.4
C	0.98**	-0.1	-0.2	0.14	0.4	0.6
P+C	0.98**	-0.4	-0.4	-0.18*	0.5	-0.6
S.E.±	0.325	0.28	0.31	0.083	0.46	0.36
c.v.%	21.7	6.1	6.0	9.7	11.0	9.4

	WM 1	WM 2	WM 1	RB 3	RT 3	WM 2	HD 1	HD 3
	1+0	1+1	1+0	1+1	1+1	1+1	1+0	1+1
	1948	1949	1949	1950	1950	1950	1949	1950
Mean	1.25	8.7	2.17	7.6	6.9	10.2	1.64	10.7
EFFECTS								
N'	0.14**	0.2	0.08	0.5**	0.3*	0.6*	-0.02	0.4**
P'	0.08	-0.3	0.22*	0.3	-0.1	-0.1	0.22**	0.1
K'	0.02	0.3	0.12	0.4*	0.1	-0.0	-0.06	0.7**
C'	0.27**	-0.2	0.36**	0.5*	0.3*	0.7**	0.30**	0.9**
Rs'	0.14**	1.0**	0.18*	-0.0	-0.0	0.2	0.07	-0.0
W'	0.10*	-0.2	-0.05	-0.2	-0.1	-0.3	-0.02	-0.2
(Tc-T)'	0.09*	0.3	0.07	-0.1	-0.0	0.0	-	-
N'P'	0.05	0.1	0.24*	0.1	0.2	0.4	0.12*	0.2
N'K'	0.08	0.5*	0.04	-0.1	-0.2	-0.3	-0.05	-0.1
N'C'	-0.00	-0.0	-0.18*	-0.2	-0.2	-0.2	0.05	0.0
N'Rs'	0.11*	0.3	0.00	-0.1	0.1	-0.0	0.04	0.3*
N'W'	0.08	-0.1	0.29**	0.2	0.0	0.1	0.14**	0.2
P'K'	0.08	0.2	0.14	0.4	-0.1	0.3	-0.10	-0.2
P'C'	-0.08	0.3	0.17	0.2	-0.0	-0.2	0.07	0.2
P'Rs'	0.08	0.6**	-0.08	-0.1	-0.0	0.1	-0.00	-0.1
P'W'	-0.09*	-0.3	-0.22*	0.0	0.1	-0.1	-0.03	0.3*
K'C'	-0.05	-0.4*	-0.14	-0.2	-0.1	-0.2	-0.18**	-0.5**
K'Rs'	0.07	-0.1	0.11	0.2	-0.1	-0.2	0.08	-0.2
K'W'	0.00	-0.0	-0.03	-0.1	-0.1	0.0	-0.11*	-0.1
C'Rs'	0.04	0.3	0.17	0.2	0.0	0.1	0.11*	0.2
C'W'	-0.05	0.2	-0.11	-0.1	-0.2	-0.1	0.08	0.4*
Rs'W'	0.10*	-0.4*	0.07	0.2	-0.2	0.1	-0.03	-0.2
S.E.±	0.041	0.17	0.084	0.18	0.12	0.21	0.047	0.13
c.v.%	13.2	7.6	15.4	9.3	7.0	8.3	11.4	4.9

Table 168

Steam and formalin

Ampthill 50/Am 13(1+1) from 49/Am 1(1+0)

Years and Species 1950 only 1+1 Sitka spruce transplants, 200 plants per plot

Design 32 plots in 8 blocks of 4; 4 blocks lined out with seedlings from steamed blocks and 4 from unsteamed blocks

Treatments For full details of treatments applied to seedbed see SEEDBED Table 91

Seedlings from all plots without sulphuric acid treatments were transplanted into beds manured uniformly with nitrogen fertilizer

Basal manuring of transplant beds, rate per sq.yd. 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates 'Nitro-Chalk' topdressed May 1 and June 30; transplanted February 7

Height in inches

SITKA SPRUCE

Treatments applied to SEEDBEDS	Am 1 1+0 1949		Am 13 1+1 1950	
	no steam	steam	no steam	steam
Mean	1.57	2.52	8.2	9.1
EFFECTS				
Mf'	1.01**	0.11	2.2**	-0.1
N'	-0.03	0.04	0.5	-0.4
Mf'N'	-0.08	-0.14	-0.0	-0.2
S.E.±	0.094	0.127	0.27	0.24
c.v.%	11.9	10.1	6.7	5.3

Table 169

Rates and times of formalin

	1+1		1+0		1+1		1+0
Old Kennington	52/K 61	from	51/K 48	Ampthill	52/Am 26	from	51/Am 18
Ringwood	52/R 45	from	51/R 39	Kennington Ext.	52/KE 69	from	51/KE 58
Bagley	52/B 40	from	51/B 31	Wareham	52/W 73	from	51/W 59

Years and Species 1952 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 36 plots in 4 blocks of 9

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 94

Seedlings from all plots were transplanted into beds treated uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

R, KE, B, W 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
3 g.N, 1½ g.P, 3 g.K as concentrated compound fertilizer topdressed in June
3 g.N as 'Nitro-Chalk' topdressed in August

K, Am 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
6 g.N as ammonium sulphate applied in two equal topdressings of 3 g.

Dates	K	Am	R	KE	B	W
Manuring						
before transplanting	25/1	8/2	23/1	25/1	25/1	23/1
topdressed June	19/6	26/6	25/6	19/6	19/6	24/6
August	13/8	21/8	15/8	13/8	13/8	14/8
Transplanting	1/3	18/3	25/3	20/2	11/3	28/2

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBED Experiments	K 48	K 61	Am 18	Am 26	R 39	R 45
	1+0	1+1	1+0	1+1	1+0	1+1
FORMALIN, ml. per sq.yd.	1951	1952	1951	1952	1951	1952
MEANS						
none	1.63	4.5	1.34	6.7	1.58	5.3
S.E.±	0.111	0.18	0.102	0.18	0.068	0.08
Mean of 3 levels[1]	3.48	5.4	2.57	8.1	2.46	5.2
S.E.±	0.064	0.10	0.059	0.10	0.039	0.04
125	2.90	4.9	2.38	8.2	2.39	5.2
250	3.71	5.7	2.62	8.1	2.42	5.1
500	3.82	5.8	2.72	8.0	2.56	5.3
S.E.±	0.111	0.18	0.102	0.18	0.068	0.08
DIFFERENCES (spring-winter) with:						
Mean of 3 levels	0.21	0.4*	0.24	-0.0	-0.04	0.0
S.E.±	0.128	0.21	0.118	0.21	0.078	0.09
125	-0.06	0.5	0.33	0.1	0.12	0.0
250	0.34	0.4	0.16	0.1	-0.24	0.3*
500	0.36	0.4	0.22	-0.4	0.01	-0.3*
S.E.±	0.221	0.37	0.204	0.36	0.136	0.16
In addition						
250 in winter + 250 in spring	3.88	5.4	2.88	8.7	2.21	5.5
S.E.±	0.156	0.26	0.144	0.26	0.096	0.11
c.v.%	10.1	10.0	12.4	6.6	8.6	4.2

[1] i.e., 125 ml., 250 ml., 500 ml.

Table 169 cont.

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBED Experiments	KE 58	KE 69	B 31	B 40	W 59	W 73
	1+0	1+1	1+0	1+1	1+0	1+1
FORMALIN, ml. per sq.yd.	1951	1952	1951	1952	1951	1952
MEANS						
none	2.34	9.5	2.20	11.3	2.06	7.4
S.E.±	0.123	0.14	0.135	0.19	0.169	0.18
Mean of 3 levels[1]	3.05	10.5	2.37	11.5	2.95	8.6
S.E.±	0.071	0.08	0.078	0.11	0.098	0.10
125	2.83	10.4	2.63	11.8	2.60	8.4
250	2.98	10.6	2.10	11.5	2.82	8.8
500	3.34	10.5	2.38	11.3	3.44	8.7
S.E.±	0.123	0.14	0.135	0.19	0.169	0.18
DIFFERENCES (spring-winter) with:						
Mean of 3 levels	0.41**	0.6**	-0.00	0.2	-0.03	0.4*
S.E.±	0.142	0.17	0.156	0.22	0.196	0.21
125	0.54*	0.6	-0.12	0.2	0.36	-0.1
250	0.58*	0.6*	-0.08	0.0	-0.24	0.8*
500	0.13	0.5	0.18	0.5	-0.21	0.6
S.E.±	0.246	0.29	0.270	0.38	0.339	0.36
In addition						
250 in winter + 250 in spring	3.06	10.4	2.75	12.0	3.28	8.8
S.E.±	0.174	0.20	0.191	0.27	0.240	0.26
c.v.%	12.4	4.0	16.1	4.7	17.2	6.1

[1] i.e., 125 ml., 250 ml., 500 ml.

Table 170

Rates of formalin

Old Kennington 51/K 54(1+1) from 50/K 43(1+0), Ringwood 51/R 42(1+1) from 50/R 29(1+0)

Years and Species 1951 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 32 plots in 8 blocks of 4

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 93

Seedlings from all plots transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

Manuring	K	R		K	R
before transplanting	29/3	8/3	Transplanting	4/4	23/4
topdressed June	28/6	25/6			
August	2/8	1/8			

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	K 43	K 54	R 29	R 42
	1+0	1+1	1+0	1+1
	1950	1951	1950	1951
no formalin	0.81	3.6	0.73	5.2
formalin in ml. per sq.yd.				
125	1.86	6.2	1.84	6.0
250	2.06	6.6	2.23	6.5
500	2.28	7.0	2.93	6.8
S.E.±	0.053	0.18	0.072	0.18
c.v.%	8.6	8.9	10.5	8.2

Table 171

Formalin, paraformaldehyde, flour

Old Kennington 50/K 40(1+1) from 49/K 27(1+0), Ringwood 50/R 17(1+1) from 49/R 30(1+0)

Years and Species 1950 1+1 Sitka spruce transplants, 50 plants per plot

Design K 40 24 plots in 3 blocks of 8
R 17 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds in 1949 see SEEDBED Table 108

Seedlings from all plots were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

K 40 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

R 17 3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

	K	R
Manuring before transplanting	-	29/3
topdressed April/May	4/5	12/4
June/July	11/7	26/6
Transplanting	6/3	31/3

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	K 27	K 40	R 30	R 17
	1+0	1+1	1+0	1+1
	1949	1950	1949	1950
MEANS				
untreated	0.86	6.8	0.67	5.5
wheat flour	0.84	6.5	0.64	5.7
paraformaldehyde	1.10	7.7	1.18	7.7
formalin	1.27	7.7	1.23	8.0
S.E.±	0.048	0.18	0.054	0.28
DIFFERENCE (late-early)'				
wheat flour	0.05	-0.7	-0.07	-0.9
paraformaldehyde	0.08	-0.1	0.10	0.7
formalin	-0.06	-0.1	-0.07	-0.8
S.E.±	0.096	0.37	0.108	0.56
EFFECT OF STEAM				
untreated	-	-	0.50**	2.6**
wheat flour	-	-	0.30*	1.4*
paraformaldehyde	-	-	0.16	1.2
formalin	-	-	0.08	0.8
S.E.±	-	-	0.108	0.56
c.v.%	11.5	6.3	16.4	11.9

Table 172

Soil reaction and formalin

Old Kennington K, Ringwood R, Kennington Extension KE, Wytham Wy, Bagley B

Years and Species

	1+1		1+0	
1948	48/K 20	from	47/K 8	transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 40 plants per species
	48/R 5	from	47/R 1	1+1 Scots pine transplants, 54 plants per plot
	48/K 23 48/Wy 12	from	47/Wy 5	transplant plots split for 1+1 Sitka spruce v. 1+1 Scots pine, 40 plants per species
1949	49/K 32 49/R 13 49/KE 38 49/Wy 17 49/B 16	from from from from from	48/K 8 48/R 1 48/KE 13 48/Wy 5 48/B 5	1+1 Sitka spruce transplants, 54 plants per plot

Design

1948	K 20, R 5	32 plots in 2 blocks of 16	1949	K 32, R 13, KE 38, B 16	32 plots in 2 blocks of 16
	K 23, Wy 12	16 plots in 2 blocks of 8		Wy 17	16 plots in 2 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 115

1+0 seedlings from the following treatments were transplanted into beds manured uniformly with NPK fertilizer

Factorial test on:

1948	K 20, R 5	Rs	×	Rh	×	Rc	×	Mf	× (Ps v. Pb)
	K 23, Wy 12	Rh	×	Rc	×	Mf	×	(Ps v. Pb)	
1949	K 32, R 13, KE 38, B 16	Rs	×	Rh	×	Rc	×	Mf	× (Ps v. Pb)
	Wy 17	Rh	×	Rc	×	Mf	×	(Ps v. Pb)	

Basal manuring of transplant beds, rate per sq.yd.

1948	K, R	5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride, topdressed
	Wy	2½ g.P as superphosphate before transplanting; 5 g.N as ammonium sulphate, 3½ g.P as superphosphate, 4 g.K as potassium chloride topdressed
1949	K, KE, R	6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.
	Wy, B	6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting

Dates

Year of cropping:-	1948			1949				
	K	R	Wy	K	R	KE	Wy	B
Manuring before transplanting	-	-	19/4	-	-	-	22/12	22/12
topdressed April/May	7/5	6/5	11/5	19/4	20/4	20/4	-	-
June	-	-	-	24/6	23/6	24/6	-	-
Transplanting	14/4	14/4	20/4	17/3	2/2	21/3	25/3	23/3

Table 172 cont.

Height in inches

Treatments applied to SEEDBEDS	SITKA SPRUCE K 8 1+0 1947	SITKA SPRUCE K 20 1+1 1948	SCOTS PINE K 8 1+0 1947	SCOTS PINE K 20 1+1 1948	SCOTS PINE R 1 1+0 1947	SCOTS PINE R 5 1+1 1948
Mean	1.48	4.6	1.87	5.2	1.89	4.8
EFFECTS						
Rh'	0.11*	-0.0	-0.04	0.2	0.05	0.2
Rs'	-0.11**	-0.4	-0.03	0.1	-0.32**	-0.4*
Rc'	-0.01	0.3	-0.06	0.1	0.06	0.0
Mf'	0.26**	0.0	0.18**	0.1	0.08	-0.0
(Pb-Ps)'	-0.09*	0.2	-0.03	0.0	-0.02	-0.2
Rh'Rs'	-0.22**	0.1	-0.03	0.1	-0.12	-0.1
Rh'Rc'	0.08*	-0.4*	0.03	0.0	0.07	0.1
Rh'Mf'	-0.14**	-0.0	-0.03	0.0	0.04	0.0
Rh'(Pb-Ps)'	0.10*	0.2	-0.00	0.0	0.00	0.1
Rs'Rc'	-0.03	0.0	-0.00	-0.1	0.03	0.1
Rs'Mf'	-0.29**	-0.5**	-0.12*	-0.0	-0.04	0.1
Rs'(Pb-Ps)'	0.11*	0.2	-0.01	0.3*	-0.01	-0.1
Rc'Mf'	0.12**	-0.7**	0.03	-0.1	0.03	-0.2
Rc'(Pb-Ps)'	0.05	-0.3	-0.06	-0.0	-0.04	-0.1
Mf'(Pb-Ps)'	0.07	0.1	-0.04	-0.0	-0.02	-0.2
S.E.±	0.037	0.17	0.054	0.14	0.083	0.14
c.v.%	7.1	10.2	8.2	7.6	12.4	8.2

	SITKA SPRUCE Wy 5 1+0 1947	SITKA SPRUCE K 23 1+1 1948	SITKA SPRUCE Wy 12 1+1 1948	SCOTS PINE Wy 5 1+0 1947	SCOTS PINE K 23 1+1 1948	SCOTS PINE Wy 12 1+1 1948
Mean	2.21	4.7	8.3	2.99	6.1	6.7
EFFECTS						
Rh'	0.10	-0.1	-0.4	-0.16	0.2	0.3
Rc'	-0.26	0.3	0.0	-0.37	0.4	0.3
Mf'	0.62**	0.4	1.3	0.38	0.5	0.2
(Pb-Ps)'	-0.70**	-0.2	-1.3	-0.98*	-0.3	-0.7
Rh'Rc'	0.59**	-0.4	-0.4	0.40	0.2	-0.1
Rh'Mf'	-0.40*	0.3	0.1	-0.29	-0.8*	-0.9
Rh'(Pb-Ps)'	0.04	-0.1	1.8	0.51	0.3	0.4
Rc'Mf'	0.09	-0.3	-2.0	0.05	-0.9*	-1.2
Rc'(Pb-Ps)'	-0.22	-0.6	-1.4	-0.41	-0.3	0.3
Mf'(Pb-Ps)'	-0.10	-0.3	-0.3	-0.09	0.1	-0.5
S.E.±	0.130	0.31	1.42	0.313	0.31	0.56
c.v.%	11.8	13.2	34.1	20.9	10.2	16.7

	SITKA SPRUCE K 8 1+0 1948	K 32 1+1 1949	R 1 1+0 1948	R 13 1+1 1949	KE 13 1+0 1948	KE 38 1+1 1949	Wy 5 1+0 1948	Wy 17 1+1 1949	B 5 1+0 1948	B 16 1+1 1949
Mean	1.20	5.1	1.30	4.6	1.31	5.8	1.80	8.5	1.46	7.3
EFFECTS										
Rh' res.	0.15*	0.4	0.37**	0.3	0.04	-0.2	0.09	0.2	0.02	0.3
Rs' res.	0.18**	0.1	0.41**	0.6**	-0.04	0.0	-	-	-0.03	0.2
Rc' res.	-0.12	-0.3	-0.24**	-0.1	-0.03	0.0	-0.03	0.1	-0.01	-0.6
Mf'	0.47**	0.6*	0.52**	0.9**	0.28**	0.3	0.34**	0.0	-0.04	0.5
(Pb-Ps)'	-0.19**	0.0	-0.16*	0.1	-0.02	-0.3	-0.05	-0.1	0.03	-0.0
Rh' res. × Rs' res.	-0.14*	-0.6*	-0.01	0.0	-0.08	0.0	-	-	0.01	0.2
Rh' res. × Rc' res.	0.02	-0.2	-0.00	-0.4	0.01	0.1	0.02	0.0	0.04	0.0
Rh' res. × Mf'	-0.00	-0.1	-0.03	0.1	-0.05	0.3	0.02	-0.0	0.05	-0.3
Rh' res. × (Pb-Ps)'	0.02	0.4	-0.12	-0.2	0.08	0.1	0.00	-0.2	-0.07	0.5
Rs' res. × Rc' res.	-0.02	0.0	-0.12	0.0	0.00	-0.2	-	-	-0.01	-0.3
Rs' res. × Mf'	-0.06	-0.1	-0.15	-0.3	-0.06	-0.0	-	-	-0.05	-0.3
Rs' res. × (Pb-Ps)'	0.06	0.1	-0.06	-0.2	0.01	0.2	-	-	0.29**	0.8*
Rc' res. × Mf	-0.03	0.0	0.05	-0.2	-0.03	-0.1	-0.04	-0.4	0.03	-0.3
Rc' res. × (Pb-Ps)'	0.02	-0.1	0.05	0.2	0.04	0.1	-0.13	-0.1	-0.12	0.2
Mf' (Pb-Ps)'	0.02	-0.2	-0.06	0.0	0.06	-0.6*	0.05	0.2	-0.09	0.1
S.E.±	0.058	0.25	0.073	0.21	0.072	0.22	0.074	0.27	0.070	0.35
c.v.%	13.8	13.7	16.0	13.1	15.5	10.6	8.2	6.4	13.5	13.4

Table 173

Acidification and formalin

Old Kennington 50/K 39(1+1) from 49/K 15(1+0), Ringwood 50/R 18(1+1) from 49/R 21(1+0)
Kennington Extension 50/KE 53(1+1) from 49/KE 24(1+0)

Years and Species 1950 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design K, KE 32 plots in 4 blocks of 8
R 16 plots in 4 blocks of 4

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 116

K, KE seedlings from all plots } transplanted into beds manured
R seedlings from all plots except those with sulphur in 1949 } uniformly with fertilizer

Basal manuring of transplant beds, rate per sq.yd.

K, KE 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

R 3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

Manuring	K	R	KE
before transplanting	-	29/3	-
topdressed April/May	4/5	12/4	4/5
June/July	11/7	26/6	11/7
Transplanting	6/3	31/3	10/3

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	Old Kennington		Ringwood		Kennington Extension	
	K 15	K 39	R 21	R 18	KE 24	KE 53
	1+0	1+1	1+0	1+1	1+0	1+1
	1949	1950	1949	1950	1949	1950
Mean	1.06	6.4	1.27	6.7	1.17	8.2
EFFECTS						
Rs'	-0.12**	-0.2	-	-	-	-
Mf'	0.17**	0.2	0.81**	2.3**	-0.21**	-0.1
Rs' res.	0.06	-0.1	0.27*	0.5	-0.14**	-0.2
Mf' res.	0.08	0.2	-0.05	0.1	0.08*	0.1
Rs' × Mf'	-0.06	0.1	-	-	-	-
S.E.±	0.037	0.30	0.087	0.37	0.033	0.26
c.v.%	9.9	13.1	13.8	11.2	8.1	9.0

Table 174

Acidification, straw, steam and formalin

Old Kennington 49/K 35(1+1) from 48/K 16(1+0), Ringwood 49/R 14(1+1) from 48/R 22(1+0)

Years and Species 1949 only 1+1 Sitka spruce transplants, 54 plants per plot

Design K 35 32 plots in 4 blocks of 8
R 14 16 plots in 2 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 117

1+0 seedlings from all treatments in K 16 and selected treatments in R 32 were transplanted into beds manured with uniform nitrogen fertilizer

Factorial test on: K 35 Ra × UsNs × Mf
R 14 UsNs × Mf, all in the presence of Ra
(half of the plots derived from steamed (Ms), half from unsteamed blocks)

Basal manuring of transplant beds, rate per sq.yd. 6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates

		K	R		K	R
nitrogen topdressed	early	19/4	20/4	Transplanting	17/3	2/2
	late	24/6	23/6			

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	K 16 1+0 1948	K 35 1+1 1949	R 22 1+0 1948	R 14 1+1 1949
Mean	1.08	5.3	0.82	5.1
EFFECTS				
Ra'	0.34**	0.6**	-	-
Us'	0.23**	0.7**	0.22	-0.0
Mf'	0.37**	0.8**	0.16	0.2
Ra'Us'	-0.02	-0.1	-	-
Ra'Mf'	-0.10	-0.5*	-	-
Us'Mf'	-0.09	-0.0	0.13	0.3
Us'Ms'	-	-	-0.10	0.2
Mf'Ms'	-	-	-0.04	0.0
S.E.±	0.063	0.21	0.096	0.31
c.v.%	16.4	11.1	23.3	12.1

Table 175

Formalin and acidification

Old Kennington 52/K 60(1+1) from 51/K 49(1+0), Ampthill 52/Am 27(1+1) from 51/Am 20(1+0)
Ringwood 52/R 46(1+1) from 51/R 40(1+0)

Years and Species 1952 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design
K 16 plots in 4 blocks of 4
Am, R 32 plots in 4 blocks of 8

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 119

K seedlings from formalin plots only) transplanted into beds manured uniformly
Am, R seedlings from all plots) with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

K, Am 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
6 g.N as ammonium sulphate in two equal topdressings of 3 g.

R 3 g.P as superphosphate, 3 g.K as potassium chloride applied before transplanting
3 g.N, 1½ g.P, 3 g.K as concentrated compound fertilizer topdressed in June
3 g.N as 'Nitro-Chalk' topdressed in August

Dates

	K	Am	R
Manuring before transplanting	25/1	8/2	23/1
topdressed in June	19/6	26/6	25/6
August	12/8	21/8	15/8
Transplanting	1/3	18/3	25/3

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBEDS	Old Kennington (Mf plots only)		Ampthill		Ringwood	
	K 49	K 60	Am 20	Am 27	R 40	R 46
	1+0	1+1	1+0	1+1	1+0	1+1
	1951	1952	1951	1952	1951	1952
Mean	3.43	5.6	1.85	7.0	1.59	5.4
EFFECTS						
Ra'	0.40**	0.6**	0.16*	0.6**	-0.18	0.3*
Ns'	0.09	0.3**	0.32**	0.4	0.31**	0.1
Mf'	-	-	1.43**	1.1**	0.92**	0.6**
Ra'Ns'	-0.35**	-0.5**	-0.05	-0.4*	-0.40**	0.1
Ra'Mf'	-	-	-0.36**	-0.2	0.02	0.3*
Ns'Mf'	-	-	0.02	-0.0	-0.08	-0.0
Ra'Ns'Mf'	-	-	0.01	0.0	-0.17	-0.0
S.E.±	0.100	0.07	0.075	0.18	0.100	0.13
c.v.%	5.8	2.6	13.1	7.2	19.5	6.7

Table 176

Soil inversion and acidification

Old Kennington 51/K 52(1+1) from 50/K 19(1+0)

Years and Species 1951 only. 1+1 Sitka spruce transplants, 50 plants per plot

Design 19A 32 plots in 8 blocks of 4
19B 8 plots in 4 blocks of 2

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 127

Seedlings from all plots were transplanted into beds manured uniformly with NPK fertilizer

Basal manuring of transplant beds, rate per sq.yd.

3½ g.P as superphosphate, 3½ g.K as potassium chloride applied before transplanting
6 g.N as 'Nitro-Chalk' applied in two equal topdressings of 3 g.

Dates Manuring before transplanting 29/3
topdressed 28/6 and 2/8 Transplanting 20/4

SITKA SPRUCE

Height in inches

Treatments applied to SEEDBED Experiment	K 19 1+0 1950 normal	K 19 1+0 1950 inverted	K 52 1+1 1951 normal	K 52 1+1 1951 inverted
19A with basal NPK fertilizer				
Mean	2.04	2.00	4.8	4.6
no acidification	1.51	1.55	4.3	4.5
aluminium sulphate	1.88	1.92	4.5	4.5
sulphur	2.29	1.97	5.3	4.5
ammonium sulphate	2.48	2.58	5.3	5.1
S.E.±	0.084	0.116	0.29	
c.v.%	8.2	11.6	11.9	
19B without basal fertilizer				
untreated	1.08	0.90	3.2	4.4
bracken and hopwaste compost	1.34	1.46	3.7	4.8

Table 177

Observation trial on 1+0 seedlings grown in experimental plots at Wareham, transplanted into own and six Conservancy Nurseries

Ringwood, Delamere, Tair Onen, Kershopefoot, Widehaugh, Harling

Batches of between 1300 and 1500 1+0 Sitka spruce seedlings and about 800 1+0 Scots pine seedlings were sent, in the spring of 1947, from Wareham to several Conservancy nurseries. Local stock plants of the same age were to have been transplanted alongside the Wareham seedlings, but suitable plants were not available in all the nurseries.

Years and Species 1947 Sitka spruce and Scots pine

Origin of seedlings mixed batches of 1+0 Sitka spruce and Scots pine derived from

a) 46/W 11 plots manured with hoof, dicalcium phosphate, and various potassium fertilizers

b) 'local Conservancy stock' 1+0 or 2+0 seedlings

About 700 Sitka spruce and 700 Scots pine seedlings from the same plots as those sent to the Conservancy nurseries were transplanted into unmanured beds at Wareham

Heights in inches of 1+0 seedlings, 1946

Sitka spruce	2.88
Scots pine	2.45

Height in inches of transplants, 1947

Nurseries	plants from Wareham		'local Conservancy stock'		
	% survival	Height in inches	lined-out as	% survival	Height in inches
SITKA SPRUCE					
Ringwood	81	5	1+0	6	1
Delamere	83	6½	1+0	46	2½
Tair Onen	88	6	2+0	no data	5
Kershopefoot	87	5	2+0	85	5
Widehaugh	98	4½	(2+0 Grade I (2+0 Grade II	98 95	8½ 5
Wareham	95	5½	-	-	-
SCOTS PINE					
Ringwood	96	4	1+0	58	2
Delamere	98	4	-	-	-
Tair Onen	65	4½	-	-	-
Kershopefoot	87	3½	-	-	-
Widehaugh	91	3	-	-	-
Harling	60	3	1+0	20	3
Wareham	99	4½	-	-	-

Table 178

Observation plots on seedlings transplanted in own and in three other nurseries

Old Kennington, Ringwood, Kennington Extension, Wytham, Wareham

Years and Species 1948 Sitka spruce and Scots pine

Origin of seedlings

Wytham Wy 6 1+0 seedbeds manured with fertilizer (ammonium sulphate, superphosphate, potassium chloride)

Wareham W 22 1+0 seedbeds manured with fertilizer (hoof, Gafsa mineral phosphate, potassium chloride)

Lay-out

seedlings grown at:	transplanted into:
Wytham and Wareham	Old Kennington K 24/25 Ringwood R 7/8 Kennington Extension KE 31/32
Wytham	Wytham Wy 13
Wareham	Wareham W 36

EACH NURSERY ORIGIN REPRESENTED BY A SINGLE TRANSPLANT PLOT OF ABOUT 300 to 400 PLANTS

Manuring of transplant beds

At Old Kennington, Ringwood and Kennington Extension half of each plot and at Wareham and Wytham the whole plot had received NPK fertilizer at the following rates:

		rate per sq.yd.		
K, R, KE:	ammonium sulphate, superphosphate, potassium chloride supplying	5 g.N	3½ g.P	4 g.K
Wy:	ammonium sulphate, superphosphate, potassium chloride supplying	5 g.N	6 g.P	4 g.K
W:	concentrated compound fertilizer and superphosphate supplying	7 g.N	5½ g.P	7 g.K

Dates

	K	KE	R	Wy	W
Manuring (topdressed)	7/5	7/5	6/5	11/5	10/5
Transplanting	14/4	12/4	14/4	20/4	13/4

ORIGIN OF SEEDLINGS	Height in inches 1+0 1947	Height in inches 1+1 1948				
		Old Kennington[1]	Ringwood[1]	Kennington Extension[1]	Wytham	Wareham
Sitka spruce						
Wytham	2.44	5.7	6.3	9.2	9.4	-
Wareham	2.39	6.7	6.7	9.9	-	5.1
Scots pine						
Wytham	3.61	6.5	6.0	6.4	6.6	-
Wareham	3.34	6.7	6.6	7.0	-	5.7

[1] averaging manured and unmanured halves of plots

Table 179

Observation plots on seedlings grown in four nurseries and transplanted into three other nurseries

Old Kennington, Ringwood, Kennington Extension

Years and Species 1949 Sitka spruce

Origin of seedlings

Kennington Extension
Wytham
Bagley
Wareham

1+0 seedbeds manured with NPK fertilizer supplying ammonium sulphate, superphosphate, potassium chloride

Lay-out

1948 seedlings grown at each of the following nurseries:	1949 transplanted into:
Kennington Extension, Wytham, Bagley, Wareham	Old Kennington K 36 Ringwood R 16 Kennington Extension KE 45

EACH NURSERY ORIGIN WAS REPRESENTED BY A SINGLE TRANSPLANT PLOT OF 162 PLANTS

Manuring of transplant beds Half of each plot received topdressings of 'Nitro-Chalk' at the rate of 6 g.N per sq.yd. in two equal dressings. Results given below represent means of manured and unmanured halves.

Dates	Old Kennington	Ringwood	Kennington Extension
Topdressing of 'Nitro-Chalk'	19/4 24/6	20/4 23/6	20/4 24/6
Transplanting	17/3	18/2	21/3

SITKA SPRUCE

Height in inches

1948 nurseries	averaging 1949 nurseries: early 1949	late 1949	shoot growth
Kennington Extension	1.70	4.9	3.2
Wytham	1.92	5.6	3.6
Bagley	2.01	5.9	3.9
Wareham	2.95	7.2	4.2

1949 nurseries	averaging 1948 nurseries: late 1949	shoot growth
Old Kennington 36	5.3	3.2
Ringwood 16	6.0	3.8
Kennington Extension 45	6.4	4.2

Extension of seedbed experiments to transplant beds, which had received contrasted treatments

Table 180

Miscellaneous organic manures and fertilizers

Wareham Sitka spruce 46/W 5(1+1) from 45/W 1A, W 2A, W 4A(1+0)
Scots pine 46/W 6(1+1) from 45/W 1B, W 2B, W 4B(1+0)

Years and Species 1946 W 5 1+1 Sitka spruce } 180 plants per main plot
W 6 1+1 Scots pine

Plot size for manuring: MAIN plot 5 ft. × 5 ft.
SPLIT plot 5 ft. × 2½ ft.

Design 45 main plots in 3 blocks of 15; each main plot split for test on potassium

Treatments For full details of treatments applied to seedbeds see SEEDBED Tables 52, 72 and 85

Factorial combinations of

Treatments applied to SEEDBEDS 1945

Cd	farmyard manure
Cb	bracken compost
Ch	hopwaste compost
T	tankage[1]
S	sewage sludge[1]
NP	ammonium nitrate or dried blood + hoof Bessemer basic slag

Treatments applied to TRANSPLANT BEDS 1946

		rate per sq.yd.
Ch	hopwaste compost[2]	2¼ kg.
S	dried sewage sludge[2]	1 kg.
NP	crushed hoof[2] Bessemer basic slag	17 g.N 7½ g.P
ALL PLOTS SPLIT FOR TEST ON		
K	potassium chloride	14 g.K

[1] seedlings grown with tankage and sewage sludge were lined out on half plots

[2] Rothamsted numbers: hopwaste compost S.4716; sewage sludge S.4705; hoof N.212

Dates Manuring: January 10, 1946 Transplanting: February 16-21, 1946

Height in inches

1+1
1946

Treatments applied to SEEDBEDS	Height in inches 1+0 1945	Treatments applied to TRANSPLANT BEDS: Means Ch	S	NP	Mean	Effect of K Ch	S	NP	Mean
SITKA SPRUCE									
Cd	3.26	5.4	6.5	10.1	7.3	0.2	0.4	3.8**	1.5**
Cb	3.82	6.2	7.5	10.5	8.1	0.0	0.2	4.4**	1.5**
Ch	2.35	5.5	6.1	8.8	6.8	0.1	0.7	6.3**	2.3**
T	1.48	4.8	5.1	7.4	5.8	0.7	1.0	5.4**	2.4**
S	2.26	5.6	6.2	8.7	6.8	1.1	0.4	6.5**	2.7**
NP	1.54	5.2	5.7	7.4	6.1	1.0	1.5*	5.2**	2.6**
S.E.±	-		0.39		0.22		0.57		0.33
Mean	2.55	5.5	6.2	8.8	6.8	0.5*	0.7**	5.3**	2.2**
S.E.±	-		0.16				0.23		0.14
c.v.%			9.9						
SCOTS PINE									
Cd	2.58	4.7	4.3	5.4	4.8	0.3	0.1	0.6**	0.4**
Cb	2.90	4.6	5.2	5.0	4.9	0.3	0.2	0.9**	0.4**
Ch	1.94	3.3	3.9	3.7	3.6	0.2	0.5*	0.6**	0.4**
T	1.72	3.2	3.7	4.1	3.7	0.7**	0.2	0.7**	0.6**
S	1.72	3.3	4.2	4.1	3.9	0.3	0.2	0.5*	0.3**
NP	1.49	3.1	3.3	3.5	3.3	0.2	0.4*	0.5*	0.4**
S.E.±	-		0.29		0.17		0.20		0.12
Mean	2.12	3.7	4.1	4.3	4.0	0.3**	0.3**	0.6**	0.4**
S.E.±	-		0.12				0.08		0.05
c.v.%			12.5						

Table 181

Bulky organic manures and fertilizers

Kennington Extension 46/KE 5(1+1) from 45/KE 1 and KE 3(1+0)

Years and Species 1946 1+1 Sitka spruce transplants, 105 plants per plot (4 ft. 2 in. × 3 ft. 6 in.)

Design 63 plots in 3 blocks of 21

Treatments For full details of treatments applied to seedbeds in 1945 see SEEDBED Tables 52 and 72

Factorial combination of:

Treatments applied to SEEDBEDS 1945	Treatments applied to TRANSPLANT BEDS 1946	rate per sq.yd.
farmyard manure + basic slag		
molinia compost + basic slag		
bracken compost + basic slag	unmanured	-
hopwaste compost + basic slag		
hopwaste compost	hopwaste compost[1]	2¼ kg.
basic slag	crushed hoof[1]	17 g.N
superphosphate	+ superphosphate	7½ g.P

[1] Rothamsted numbers: hopwaste compost S.4803; hoof N.212

Dates Manuring: March 12, 1946 Transplanting: March 25, 1946

SITKA SPRUCE

Height in inches

1+1
1946

Treatments applied to SEEDBEDS	Height in inches 1+0 1945	Treatments applied to TRANSPLANT BEDS: unmanured	hopwaste compost	crushed hoof superphosphate	Mean
farmyard manure + basic slag	1.89	10.1	10.7	11.2	10.7
molinia compost + basic slag	2.31	10.9	11.1	10.7	10.9
bracken compost + basic slag	2.21	10.0	10.6	11.9	10.8
hopwaste compost + basic slag	2.38	10.6	10.4	10.7	10.6
hopwaste compost	2.59	10.5	11.8	11.3	11.2
basic slag	1.68	10.5	10.4	10.3	10.4
superphosphate	2.22	10.9	10.6	10.8	10.8
S.E.±	0.086		0.44		0.26
Mean	2.18	10.5	10.8	11.0	10.8
S.E.±	0.032		0.17		0.10
c.v.%	12.7		7.1		

Table 182

Bulky organic manures and fertilizers

Kennington Extension KE 1, Bagley B 1, Wareham W 1A and W 1B

Years and Species	1946 1+1		1945 1+0	
Kennington Extension	KE 1	from	KE 1	Sitka spruce, 72 plants per plot
Bagley	B 1	from	B 1	Sitka spruce, 72 plants per plot
Wareham	W 1A	from	W 1A	Sitka spruce, 56 plants per plot
	W 1B	from	W 1B	Scots pine, 60 plants per plot

Design 75 plots in 3 blocks of 25. Plot size for manuring: 3 ft. × 3 ft.

Treatments SEEDLINGS GROWN IN EXPERIMENTS KE 1, B 1, W 1A and W 1B WERE LIFTED AT THE END OF THE GROWING SEASON AND TRANSPLANTED INTO THE PLOTS FROM WHICH THEY CAME

For details of treatments applied to seedbeds see SEEDBED Table 72

	1945 Treatments applied to SEEDBEDS	1946 Treatments applied to TRANSPLANT BEDS	rate per sq.yd.
	no organic manure	-	
	farmyard manure	-	
	molinia compost	-	
	bracken compost	-	
	hopwaste compost	-	
Nh	crushed hoof + dried blood	crushed hoof[1]	17 g.N
Nn	ammonium nitrate	'Nitro-Chalk' (2 equal dressings)	17 g.N
P	Bessemer basic slag	Bessemer basic slag	7½ g.P
K	-	potassium sulphate (Bagley and Wareham only)	9 g.K

[1] Rothamsted number: N.212

Dates

	1946 KE	B	W		1946 KE	B	W
Manuring	15/3	15/3	9/1	Transplanting	21/3	1/4	15/2

Height in inches

	Kennington Extension SITKA SPRUCE 1+0 1945	1+1 1946	Bagley SITKA SPRUCE 1+0 1945	1+1 1946	Wareham SITKA SPRUCE 1+0 1945	1+1 1946	SCOTS PINE 1+0 1945	1+1 1946
[1]MEANS								
no organic manure	1.44	9.9	1.43	8.0	0.65	3.3	0.89	2.9
farmyard manure	1.66	10.5	1.78	11.6	2.68	8.7	2.22	5.3
molinia compost	2.19	11.1	2.16	10.2	3.19	8.8	2.42	5.3
bracken compost	2.17	10.8	1.97	10.7	3.18	9.2	2.52	5.8
hopwaste compost	2.53	10.0	3.18	10.4	2.79	7.6	2.15	4.9
Mean of 4 bulky organic manures	2.14	10.6	2.27	10.7	2.96	8.6	2.33	5.3
EFFECTS								
Nh'	0.16	-0.8	0.28	-1.0	-0.10	4.1	0.14	0.3
P'	0.18	-0.3	0.82	2.8	0.66	1.4	0.45	0.9
Nh'P'	0.10	0.1	0.12	0.9	0.08	1.1	0.24	0.4
K'	-	-	-	-0.0	-	1.3	-	0.4
Nh'K'	-	-	-	0.5	-	0.9	-	-0.1
P'K'	-	-	-	0.6	-	-0.2	-	0.3
Nh'P'K'	-	-	-	0.3	-	-0.4	-	0.2
[2]Mean of 4 bulky organic manures	2.20	10.2	2.60	12.0	3.43	9.6	2.62	5.9
EFFECTS (P present)								
Nh'	0.27	-0.7	0.40	-0.1	-0.02	5.2	0.38	0.8
Nn'	0.05	-1.0	-0.05	-0.4	0.42	3.5	0.40	0.7

[1] averaging no fertilizer, Nh, P, NhP [2] averaging P, NhP, NnP

Table 183

Miscellaneous organic manures and fertilizers
Kennington Extension 46/KE 6(1+1) from 45/KE 2(1+0)

Years and Species 1946 1+1 Sitka spruce transplants, 105 plants per plot (4 ft. 2 in. × 3 ft. 6 in.)

Design 20 plots in 1 block

Treatments For full details of treatments applied to seedbeds see SEEDBED Table 85

Treatments applied to SEEDBEDS 1945	Treatments applied to TRANSPLANT BEDS 1946	rate per sq.yd.
	unmanured	-
	hopwaste compost[1]	2¼ kg.
tankage		
sewage sludge	hopwaste compost + potassium sulphate	2¼ kg. 9 g.K
dried hopwaste	crushed hoof[1] superphosphate	17 g.N 7½ g.P
hopwaste compost		
	crushed hoof[1] superphosphate potassium sulphate	17 g.N 7½ g.P 9 g.K

[1] Rothamsted numbers: hopwaste compost S.4803; hoof N.212

Dates Manuring: March 12, 1946 Transplanting: March 28, 1946

SITKA SPRUCE

Height in inches

	1+0 1945	1+1 1946
Treatments applied to SEEDBEDS		
tankage	2.03	11.1
sewage sludge	1.52	10.6
dried hops	1.99	11.2
hopwaste compost	2.50	11.5
S.E.±	0.125	0.30
Treatments applied to TRANSPLANT BEDS		
MEANS		
unmanured	-	10.2
hopwaste compost	-	11.8
crushed hoof + superphosphate	-	10.9
S.E.±	-	0.24
EFFECT OF K WITH		
hopwaste compost	-	0.1
crushed hoof + superphosphate	-	2.0**
S.E.±	-	0.48
c.v.%	15.0	6.1

Table 184

Compost and fertilizers

Wareham W 12

Years and Species 1947-1948 Transplant plots (3 ft. × 3 ft. 4 in.) split for 1+1 Sitka spruce v. 1+1 Scots pine 36 plants per species

Origin of seedlings

	1946	1947
C	hopwaste compost (46/W 9)	Wareham Old Nursery 1+0 seedbeds manured with hopwaste compost
F	fertilizer (46/W 11)	

Design 32 plots in 2 blocks of 16, confounding highest order interaction

Treatments For full details of treatments applied to seedbeds in 1946 see SEEDBED Tables 45 and 73

Factorial combination of:

Treatments applied to SEEDBEDS

1946

C hopwaste compost

v. F fertilizer (uric acid, dicalcium phosphate, potassium sulphate)

1947

seedlings manured uniformly with hopwaste compost

Treatments applied to TRANSPLANT BEDS

	1947	rate per sq.yd.
C	bracken and hopwaste compost[1]	2¼ kg.
× N	crushed hoof[1]	11 g.N
× P	Gafsa mineral phosphate	7½ g.P
× K	potassium sulphate	9 g.K
	1948	
C	no application in 1948	-
× N	ammonium sulphate	8½ g.N
× P	superphosphate	5½ g.P
× K	potassium sulphate	7 g.K

[1] Rothamsted numbers: bracken and hopwaste compost S.5125; hoof N.212

Dates

Year of cropping:	1947	1948		1947	1948
Manuring	17.12.46.	3.4.48.	Transplanting	1.5.47.	12.3.48.

Height in inches

	1947						1948	
	SITKA SPRUCE			SCOTS PINE			SITKA SPRUCE	SCOTS PINE
	Treatments applied to SEEDBEDS							
	Origin C	Origin F	Mean	Origin C	Origin F	Mean	Mean	Mean
Mean height as 1+0, 1946	1.34	3.20	2.27	1.70	2.63	2.16	-	-
Mean height as 1+1, 1947	5.7	7.3	6.5	2.0	4.7	3.3	5.6	4.4
S.E.±	0.16		0.11	0.14		0.10	0.10	0.05
Effects of treatments applied to TRANSPLANT BEDS								
C'	2.2**	1.7**	2.0**	0.2	-0.3	-0.0	1.3**	-0.2*
N'	0.5	2.6**	1.6**	0.2	-0.1	0.1	-1.4**	0.1
P'	0.8*	1.4**	1.1**	-0.1	0.3	0.1	0.9**	0.3*
K'	0.6	0.4	0.5	-0.0	-0.1	-0.1	0.7**	0.3*
C'N'	0.8*	0.6	0.8**	0.2	-0.3	-0.1	-0.1	-0.1
C'P'	-0.5	-0.2	-0.4	-0.2	-0.4	-0.3	-0.6**	-0.3*
C'K'	-0.6	-0.3	-0.5	-0.1	-0.2	-0.1	-0.4	-0.0
N'P'	-0.3	0.1	-0.1	0.1	0.5	0.3	-1.1**	0.3*
N'K'	0.1	0.2	0.2	0.0	-0.5	-0.2	0.2	0.4**
P'K'	-0.0	-0.3	-0.2	0.0	0.2	0.2	0.3	0.5**
S.E.±	0.31		0.22	0.28		0.20	0.20	0.11
c.v.%	9.5			16.9			9.9	7.0

Table 185

Observation plots on seedlings grown in old and new parts of nursery transplanted into old and new parts of nursery

Wareham W 3A, W 3B

Years and Species 1949 Sitka spruce

Origin of seedlings

Old Nursery Section 10 1+0 seedbeds manured with bracken compost. No fertilizer had ever been applied to this section.

New Nursery Section 4 1+0 seedbeds manured with NPK fertilizer, (N as ammonium sulphate or hoof, P as superphosphate, K as potassium chloride or sulphate). No compost had ever been applied to this section.

Design

W 3B	Old Nursery	4 plots in 2 blocks of 2	Plot size: 9 ft. × 5 ft., 324 plants per plot
W 3A	New Nursery	4 plots in 2 × 2 Latin Square	

Test on:

seedlings grown with		transplanted into beds
compost in old nursery v. fertilizer in new nursery	×	with compost in old nursery (W 3B) with fertilizer in new nursery (W 3A)

Manuring of transplant beds, rate per sq.yd.

W 3B	Old Nursery	4½ kg. of hopwaste compost
W 3A	New Nursery	6 g.N as hoof, 3 g.P as superphosphate, 3 g.K as potassium chloride

Dates

	W 3A	W 3B
Application of compost (S.5706)	-	2/3
fertilizer	29/12	-
Transplanting	10/3	10/3

1949

SITKA SPRUCE

TRANSPLANTED INTO	Height in inches
Old Nursery manured with compost	
from old nursery with compost	8.9
from new nursery with fertilizer	9.8
New Nursery manured with fertilizer	
from old nursery with compost	8.1
from new nursery with fertilizer	9.4

Table 186

Residual effect of green manures and comparison of compost and fertilizer

Kennington Extension, Wareham

Years and Species Sitka spruce

		1950	1951	1952			1950	1951	1952
KE 62	from	49/KE 34	50/KE 34	51/KE 47	W 65	from	49/W 28	50/W 28	51/W 58
KE 63	from	-	50/KE 46	51/KE 46	W 66	from	-	50/W 48	51/W 48

Design and Treatments

MAIN PLOTS: 8 plots in 4 blocks of 2 (plot size: 7½ ft. × 15 ft.)

Manuring treatments applied to transplant beds		rate per sq.yd.
C	compost	2¼ kg. bracken and hopwaste compost[1]
F	fertilizer	6 g.N as 'Nitro-Chalk' in two equal topdressings 3 g.P as superphosphate 3 g.K as potassium chloride

SPLIT PLOTS: Each main plot was divided into 12 split plots (50 trees) for test on cropping and manuring treatments applied to seedbed experiments. For details see SEEDBED Table 89

		KE	W		KE	W		KE	W
[1] Rothamsted numbers:	1950	S.5879	S.5879	1951	S.6015	S.6016	1952	S.6151	S.6165

Dates

Treatment applications		1950 KE	1950 W	1951 KE	1951 W	1952 KE	1952 W
ground chalk, 100 g. per sq.yd.		-	7/1	-	-	-	-
compost, PK fertilizer		17/2	2/3	24/1	23/1	25/1	24/1
'Nitro-Chalk' topdressed	early	4/5	12/4	28/6	26/6	19/6	24/6
	late	6/7	27/6	2/8	31/7	13/8	14/8
Transplanting		9/3	9/3	2/4	5/3	11/2	13/2

SITKA SPRUCE

Height in inches

Kennington Extension	first year test crops 1+0 1949	1+1 1950	1+0 1950	1+1 1951	1+0 1951	1+1 1952	second year test crops 1+0 1950	1+1 1951	1+0 1951	1+1 1952
Mean	1.31	11.7	2.43	12.0	1.77	5.8	2.78	8.3	1.97	7.8
EFFECTS										
(F-C)' on seedbeds	-0.20**	-0.1	0.02	-0.5**	0.41**	0.5**	0.12	-0.2	0.21*	0.2
(F-C)' on transplants	-	(-0.5)	-	(0.1)	-	(-0.1)	-	(0.8)	-	(-0.5)
(F-C)' on seedbeds × (F-C)' on transplants	-	-0.1	-	0.0	-	-0.0	-	-0.2	-	-0.0
S.E.±	0.029	0.12	0.101	0.17	0.072	0.10	0.111	0.19	0.080	0.12
MEANS (cropping treatments of seedbed experiment)										
clover	1.06	11.6	2.39	11.7	1.65	5.7	2.83	8.3	1.87	7.6
lupins	1.25	11.6	2.34	11.8	1.61	5.8	2.71	7.8	1.97	7.9
rye	1.33	11.7	2.29	12.1	1.74	5.9	2.80	8.4	1.95	8.1
ryegrass	1.33	11.6	2.84	12.2	1.79	5.6	2.72	8.7	2.06	7.8
conifers	1.43	12.0	2.32	12.2	1.77	5.8	2.90	8.4	2.09	7.9
fallow	1.45	12.1	2.38	11.7	2.06	6.3	2.72	7.9	1.90	7.7
S.E.±	0.035	0.15	0.124	0.21	0.089	0.12	0.136	0.23	0.098	0.15
c.v.%	7.6	5.2	14.5	7.0	14.2	8.3	13.8	11.2	14.0	7.8

(S.E. does not apply to figures in brackets)

Table 186 cont.

SITKA SPRUCE

Height in inches

Wareham	first year test crops						second year test crops			
	1+0	1+1	1+0	1+1	1+0	1+1	1+0	1+1	1+0	1+1
	1949	1950	1950	1951	1951	1952	1950	1951	1951	1952
Mean	1.57	15.8	3.13	6.3	2.22	7.7	3.19	6.2	2.05	6.7
EFFECTS										
(F-C)' on seedbeds	-0.24*	-1.1**	-0.41*	-0.2	0.37**	-0.3**	0.41	-0.0	0.15	-0.1
(F-C)' on transplants	-	(-0.0)	-	(1.2)	-	(-0.2)	-	(0.2)	-	(0.4)
(F-C)' on seedbeds × (F-C)' on transplants	-	-0.0	-	0.0	-	-0.0	-	-0.1	-	0.1
S.E.±	0.108	0.22	0.148	0.13	0.129	0.09	0.203	0.10	0.083	0.12
MEANS (cropping treatments of seedbed experiment)										
clover	1.50	15.4	3.42	6.4	2.26	7.9	3.10	6.0	1.74	6.6
lupins	1.42	15.3	2.30	6.0	2.80	7.8	3.87	6.4	2.38	6.6
rye	1.55	15.6	2.92	6.5	2.42	7.5	2.93	6.3	2.26	6.8
ryegrass	1.24	15.0	3.01	6.4	2.14	7.9	2.89	6.0	2.18	7.0
conifers	1.85	16.5	2.99	6.2	1.59	7.4	3.57	6.1	2.06	6.7
fallow	1.86	16.7	4.15	6.4	2.12	7.6	2.81	6.0	1.70	6.8
S.E.±	0.132	0.27	0.182	0.16	0.158	0.11	0.249	0.12	0.102	0.14
c.v.%	23.7	6.9	16.4	10.0	20.2	5.9	22.1	8.1	14.0	8.7

(S.E. does not apply to figures in brackets)

Table 187

Test on steam

Ampthill Am 12

Years and Species 1951 Sitka spruce

Design and Treatments 16 plots in 4 × 4 Latin Square. Plot size for steaming: 7½ ft. × 8 ft. (300 plants)

Seedlings grown in 1950 on steamed and unsteamed plots were, in 1951, transplanted (within the same experimental site) into plots with and without residual effects from the initial steaming in March 1950

SITKA SPRUCE

Height in inches

1950 seedlings grown on	1951 transplanted into	1+0 1950	1+1 1951
unsteamed plots	unsteamed plots	1.46	5.5
unsteamed plots	plots steamed in March 1950		5.0
plots steamed[1] in March 1950	unsteamed plots	2.65	6.5
plots steamed in March 1950	plots steamed in March 1950		5.6
	S.E.±	0.131	0.22
	c.v.%	18.0	8.0

[1] by Hoddesden Pipe method

NO MANURES APPLIED IN EITHER YEAR

Dates Steaming: March 3, 1950 Transplanting: March 8 to 16, 1951

Table 188

Formalin and chloropicrin

Old Kennington K, Ampthill Am, Ringwood R, Kennington Extension KE

Years and Species 1953-1955 1+1 Sitka spruce

1+1		1+0		1+1		1+0
1953 to 1955		1952	1953/54	1954 to 1955		1953/54
K 63C	from	K 55	K 63B	Am 33C	from	Am 33B
R 60C	from	R 48	R 60B			
KE 76C	from	KE 64	KE 76B			

Design This series of experiments was designed to test seedlings grown on formalin- and chloropicrin- treated soils, when transplanted into untreated, formalin-, and chloropicrin- treated plots. In the preliminary season of 1953 seedlings grown on formalin- treated plots had to be used throughout.

MAIN PLOTS 12 plots in 4 blocks of 3 (Plot size: 6 ft. × 7½ ft.)

Treatments applied to TRANSPLANT PLOTS — rate per sq.yd.

untreated		-
Mf	formalin	250 ml. formalin applied in 4 to 6 l. water
Mcp	chloropicrin	32 ml. applied as 16 shots of 2 ml. injected 9 in. apart; 4 in. deep in 1953, 6 in. deep in 1954 and 1955

Basal fertilizer for TRANSPLANT PLOTS, rate per sq.yd.

			units	1953 K	1953 R/KE	1954 K/Am	1954 R/KE	1955 all centres
N[1]	topdressed	early	g.N	3	3	3	3	3
		late	g.N	3	3	3	3	3
P	superphosphate		g.P	4½	4½	4½	4½	4½
K	potassium chloride		g.K	4½	9	4½	9	9
Mg	kieserite		g.Mg	-	1½	-	3	3

[1] ammonium sulphate at K and Am; 'Nitro-Chalk' at R and KE

SPLIT PLOTS

1954[2] and 1955 Each main plot was split into two (114 plants per half plot) to compare seedlings grown with formalin and with chloropicrin. For full details of treatments applied to seedbeds see SEEDBED Table 102

[2] In 1953 the stocking on the chloropicrin plots of Am 33B was very low, and seedlings grown with formalin had to be used for transplanting into Am 33C in 1954

Dates

Year of cropping:-	1953			1954				1955			
	K	R	KE	K	Am	R	KE	K	Am	R	KE
Treatment applications											
formalin, chloropicrin	14/1	22/1	15/1	8/12	12/12	10/12	9/12	3/1	20/12	22/12	3/1
P, K, Mg fertilizer	24/2	27/2	24/2	12/1	18/1	20/1	12/1	16/3	21/3	1/2	16/3
N topdressed early	20/4	28/4	22/4	28/4	29/4	27/4	28/4	23/5	25/5	19/5	23/5
late	30/6	23/6	30/6	29/6	2/7	23/6	29/6	5/7	6/7	29/6	5/7
Transplanting	31/3	15/4	1/4	12/3	11/3	8/4	12/3	25/3	21/4	20/4	28/3

Table 188 cont.

SITKA SPRUCE

Height in inches of 1+0 seedlings

Treatments applied to SEEDBEDS	Old Kennington 1953	Old Kennington 1954	Ampthill 1953	Ampthill 1954	Ringwood 1953	Ringwood 1954	Kennington Ext. 1953	Kennington Ext. 1954
Mean	2.80	2.49	3.28	3.11	2.65	2.39	3.39	2.76
difference (Mcp-Mf)'	-0.06	-0.06	-	-0.26	-0.21	0.03	0.02	-0.09

Height in inches of 1+1 transplants

	Old Kennington 1953	Old Kennington 1954	Old Kennington 1955	Ampthill 1954	Ampthill 1955	Ringwood 1953	Ringwood 1954	Ringwood 1955	Kennington Extension 1953	Kennington Extension 1954	Kennington Extension 1955
Treatments applied to SEEDBEDS[1]											
Mean	11.6	9.0	8.1	12.3	6.0	9.3	8.0	6.3	12.5	11.2	9.1
difference (Mcp-Mf)'	-	0.1	-0.3*	-	-0.3	-	0.1	-0.4**	-	0.4*	-0.3**
S.E.±	-	0.18	0.14	-	0.17	-	0.25	0.11	-	0.17	0.10
Treatments applied to TRANSPLANT BEDS[2]											
Mean	11.6	9.0	8.1	12.3	6.0	9.3	8.0	6.3	12.5	11.2	9.1
untreated	10.8	8.8	7.7	10.2	5.1	8.3	5.0	5.0	10.6	10.3	8.8
Mf	12.2	9.5	8.0	13.3	6.2	10.9	9.9	7.1	13.8	11.5	9.9
Mcp	11.7	9.0	8.6	13.5	6.7	8.6[3]	9.2	7.0	13.1	12.1	8.8
S.E.±	0.83	0.23	0.17	0.42	0.21	-	0.33	0.16	0.36	0.21	0.15
Difference of SEEDBED treatments (Mcp-Mf)' with the following TRANSPLANT treatments											
untreated	-	0.6	0.4	-	-0.2	-	-0.3	-0.3	-	0.1	-0.2
Mf	-	-0.8*	-1.1**	-	-0.3	-	0.4	0.0	-	0.9*	-0.4
Mcp	-	0.5	-0.1	-	-0.5	-	0.4	-0.9**	-	0.3	-0.2
S.E.±	-	0.32	0.24	-	0.30	-	0.47	0.23	-	0.30	0.21
c.v.%	7.1	5.4	4.3	6.9	7.3	-	8.4	5.3	2.9	3.9	3.3

[1] averaging transplant treatments [2] averaging seedbed treatments

[3] Many plants on chloropicrin plots were discoloured; 14 per cent died

Table 189

Test on formalin

Ampthill Am 15

Years and Species 1952 Sitka spruce

Design and Treatments 16 plots in 4 × 4 Latin Square. Plot size: 3 ft. × 8 ft. (200 plants)

Seedlings grown in 1951 on formalin treated as well as on untreated plots were, in 1952, transplanted (within the same experimental site) into plots with and without residual effects from the initial formalin application in March 1951.

SITKA SPRUCE

Height in inches

1951 seedlings from plots	1952 transplanted into plots	1+0 1951	1+1 1952
without formalin	without formalin	0.93	5.3
without formalin	with formalin in March 1951		6.0
with formalin[1] in March 1951	without formalin	1.91	5.8
with formalin in March 1951	with formalin in March 1951		6.8
	S.E.±	0.090	0.18
	c.v.%	12.7	5.9

[1] 500 ml. per sq.yd. applied in 4 l. water, sealed off with 2 l. water

NO MANURES APPLIED IN EITHER YEAR

Dates Formalin application: March 12, 1951 Transplanting: March 18, 1952

Table 190

Observation plots on formalin, chloropicrin and various conifer species

Old Kennington K, Ringwood R

Years and Species	1+1		1+0	
1954	K 73	from	K 63A	6 species in 1954, 4 species in 1955
1954 1955	R 72	from	R 60A	

Lay-out Seedlings of several species grown with formalin or chloropicrin were transplanted into untreated, formalin- and chloropicrin- treated plots.

MAIN PLOTS 24 plots in 1954, 16 plots in 1955. Single replicate. (Plot size: 6 ft. × 7½ ft.)

Treatments applied to TRANSPLANT PLOTS		rate per sq.yd.
untreated (in duplicate)		-
Mf	formalin	250 ml. formalin applied in 5 to 6 l. water
Mcp	chloropicrin	32 ml. applied as 16 shots of 2 ml. injected 9 in. apart, 6 in. deep

Basal fertilizer for TRANSPLANT PLOTS, rate per sq.yd.

		units	1954 K	1954 R	1955 R
N[1]	topdressed early	g.N	3	3	3
	late	g.N	3	3	3
P	superphosphate	g.P	4½	4½	4½
K	potassium chloride	g.K	4½	9	9
Mg	kieserite	g.Mg	-	3	3

[1] ammonium sulphate at K; 'Nitro-Chalk' at R

Dates

Year of cropping:	1954 K	1954 R	1955 R
Treatment applications			
formalin, chloropicrin	8/12	10/12	22/12
P, K, Mg fertilizer	12/1	20/1	1/2
N topdressed early	28/4	27/4	19/5
late	29/6	23/6	29/6
Transplanting	12/3	7/4	20/4

SPLIT PLOTS Each main plot was split into two to compare seedlings grown with formalin and with chloropicrin (38 trees per species per plot). For full details of species grown and treatments applied to seedbeds see SEEDBED Table 107

SPECIES Sitka spruce (Picea sitchensis), Douglas fir (Pseudotsuga taxifolia), Tsuga heterophylla (Western hemlock), Pinus contorta (Lodgepole pine), Corsican pine (Pinus nigra var. calabrica), Thuja plicata (Western red cedar), Japanese larch (Larix leptolepis)

OLD KENNINGTON

Height in inches

1+0 seedlings, 1953

Treatments applied to SEEDBEDS	Sitka spruce	Tsuga het.	Pinus cont.	Corsic. Pine	Douglas Fir	Jap. Larch
Mean	3.23	2.09	3.37	2.44	7.63	10.29
difference (Mcp-Mf)'	-0.11	0.17	0.31	0.14	0.75**	-0.04
S.E.±	0.107	0.104	0.236	0.084	0.139	0.488
c.v.%	5.1	7.8	10.7	5.1	2.8	7.3

1+1 transplants, 1954

Treatments applied to SEEDBEDS (averaging transplant treatments)	Sitka spruce	Tsuga het.	Pinus cont.	Corsic. Pine	Douglas Fir	Jap. Larch
Mean	10.9	10.0	6.6	4.7	16.7	26.4
difference (Mcp-Mf)'	-0.7	-0.4	0.1	0.5	0.4	-1.0
Treatments applied to TRANSPLANT BEDS (averaging seedbed treatments)						
Mean	10.9	10.0	6.6	4.7	16.7	26.4
untreated	8.6	8.2	5.4	4.3	15.2	25.1
Mf	13.0	12.2	7.0	4.5	16.4	26.4
Mcp	13.2	11.6	8.4	5.6	20.1	28.9
Difference of seedbed (Mcp-Mf) for transplant treatments						
untreated	-0.6	-0.2	0.4	0.4	0.8	-0.7
Mf	-1.7	-0.9	-0.5	0.6	0.1	-1.9
Mcp	0.3	-0.4	0.0	0.6	0.0	-0.6

Table 190 cont.

Height in inches

RINGWOOD

1+0 seedlings, 1953

Treatments applied to SEEDBEDS	Sitka spruce	Tsuga het.	Pinus cont.	Corsic. Pine	Douglas Fir	Jap. Larch
Mean	2.45	2.33	3.28	1.58	4.75	5.51
difference (Mcp-Mf)	0.08	0.01	0.22	-0.19	0.01	0.26
S.E.±	0.135	0.071	0.168	0.147	0.403	0.532
c.v.%	8.6	4.7	8.2	15.2	13.5	15.0

1+1 transplants, 1954

Treatments applied to SEEDBEDS (averaging transplant treatments)	Sitka spruce	Tsuga het.	Pinus cont.	Corsic. Pine	Douglas Fir	Jap. Larch
Mean	10.3	11.0	7.2	3.6	13.4	19.4
difference (Mcp-Mf)	0.6	0.5	0.5	-0.2	0.6	0.4
Treatments applied to TRANSPLANT BEDS (averaging seedbed treatments)						
Mean	10.3	11.0	7.2	3.6	13.4	19.4
untreated	8.0	9.4	6.6	3.2	12.2	17.5
Mf	12.2	13.1	7.3	3.7	13.9	21.0
Mcp	13.0	12.1	8.4	4.2	15.4	21.8
Difference of seedbed treatments (Mcp-Mf) with transplant treatments						
untreated	1.4	0.2	0.8	-0.4	-0.4	-0.0
Mf	0.9	0.8	0.6	-0.2	1.4	2.0
Mcp	-1.2	1.0	-0.3	0.1	2.0	-0.3

1+0 seedlings, 1954

Treatments applied to SEEDBEDS	Sitka spruce	Tsuga het.	Pinus cont.	Thuja plic.
Mean	1.65	1.01	1.72	0.87
difference (Mcp-Mf)	0.46	0.37	0.22	0.44*
S.E.±	0.199	0.152	0.143	0.111
c.v.%	20.1	21.9	13.4	19.1

1+1 transplants, 1955

Treatments applied to SEEDBEDS (averaging transplant treatments)	Sitka spruce	Tsuga het.	Pinus cont.	Thuja plic.
Mean	5.8	5.9	3.9	5.8
difference (Mcp-Mf)	0.6	0.6	0.4	0.8
Treatments applied to TRANSPLANT BEDS (averaging seedbed treatments)				
Mean	5.8	5.9	3.9	5.8
untreated	4.7	4.6	4.0	6.0
Mf	6.7	7.0	4.7	8.0
Mcp	7.2	7.4	3.0	3.2
Difference of seedbed treatments (Mcp-Mf) with transplant treatments				
untreated	0.5	0.6	0.6	1.3
Mf	1.2	0.1	0.0	1.6
Mcp	0.0	1.2	0.4	-0.9

APPENDIX

Nursery Cropping Histories

NOTES

An account of the cropping and manuring practised before experimental work began, is given in Tables 1 to 17. On the plans which follow (Tables 191 to 196) the cropping sequence since the start of experimentation is shown for the six main nurseries. No rigid crop rotation was adhered to. The land not used for experimentation was left fallow or carried ley or green crops.

Tree crops

Most of the experiments were devoted to tests on conifer seedlings and transplants; a few tested broadleaved trees such as ash, beech, oak or poplars. On the plans no distinction has been made between different species.

Fallow

Cultural operations consisted of ploughing or, in small confined areas, hand-digging. More recently, summer ploughing has been replaced by the use of a springtine or rotary cultivator.

Leys

The leys were cut at intervals during the growing season and normally dug in in the autumn.

Liming: 100 g. slaked lime or 150 to 200 g. ground limestone per square yard.

Manuring: 2 to 3 g.P and 2 to 5 g.K per square yard applied as part of a compound commercial fertilizer. Nitrogen was applied partly as ammonium sulphate in the compound fertilizer and partly as 'Nitro-Chalk' topdressed at intervals during the growing season.

Seed mixture: normally ryegrass, cocksfoot and clover (white) and Alsike.

Green crops

Lupins: Yellow or blue

Seradella

Key to diagrams

Experimental site. Figure denotes experimental number.

non-experimental ley

non-experimental green crops

Areas left blank denote fallow (not to scale).

Table 191

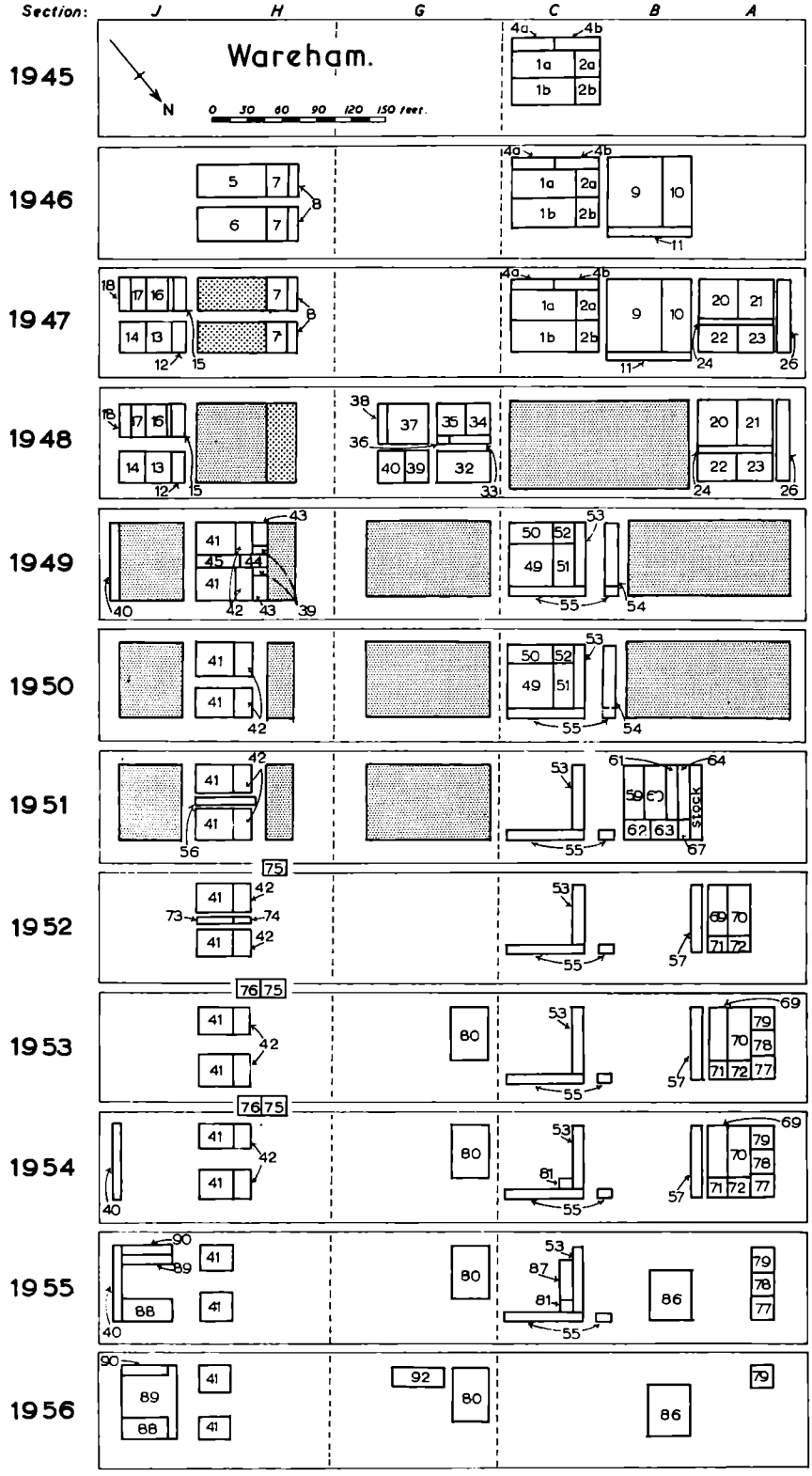

Section: J H G C B A
1945
Wareham.
N
0 30 60 90 120 150 feet.
1946
1947
1948
1949
1950
1951
STOCK
1952
1953
1954
1955
1956

Table 191 cont.

Wareham contd.

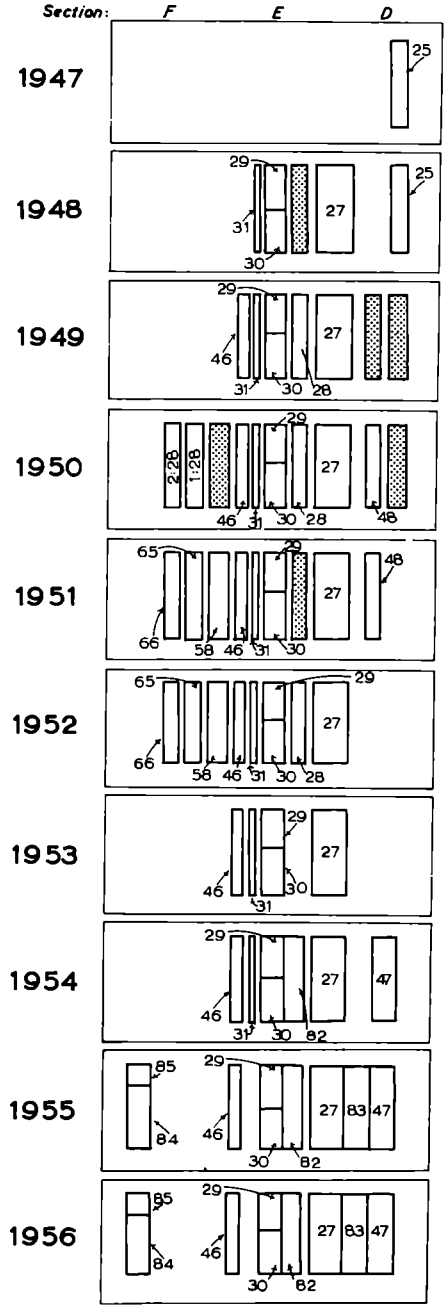


Table 192

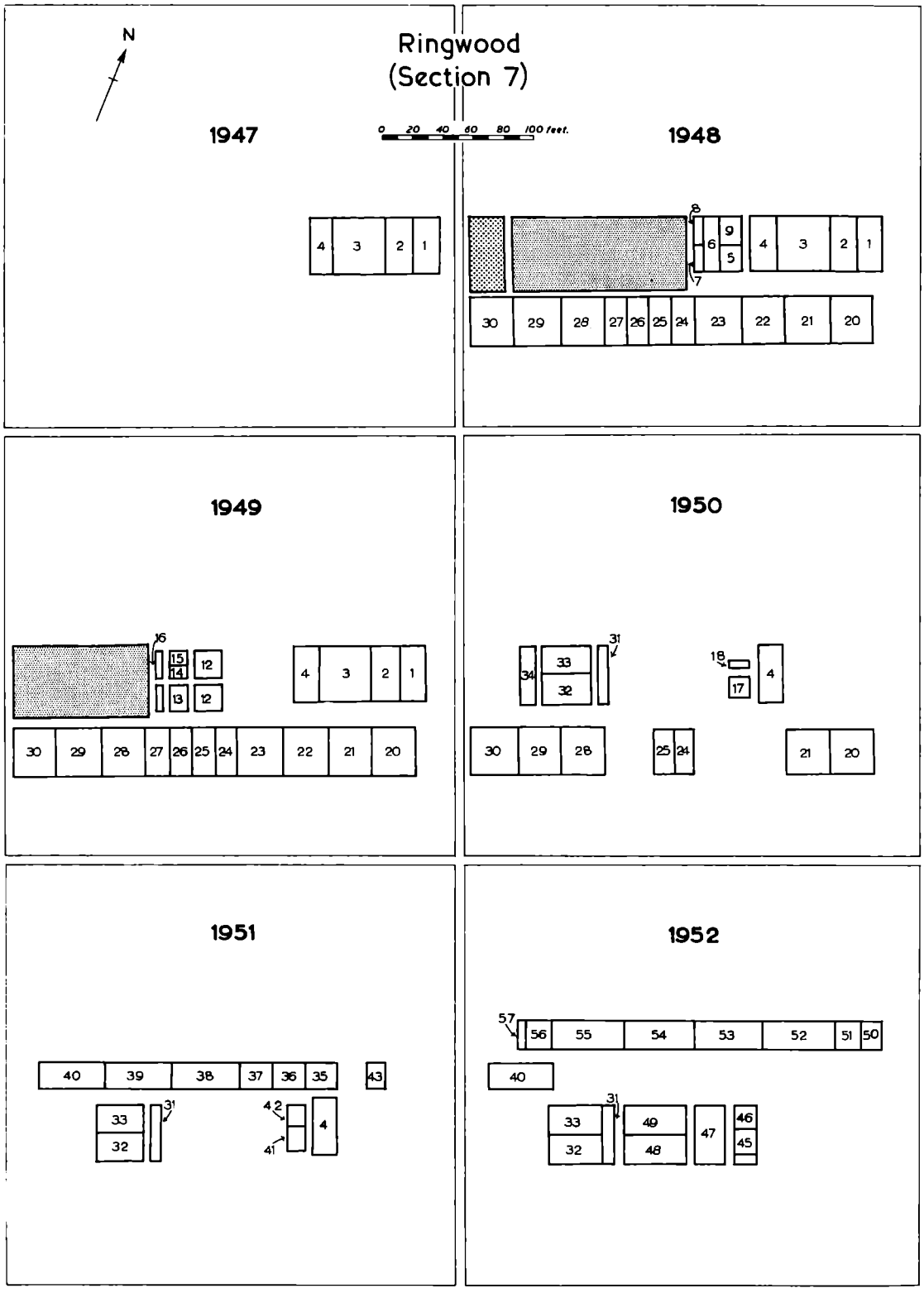

Ringwood
(Section 7)
N
0 20 40 60 80 100 feet.
1947
4 3 2 1
1948
8 6 9 5 7
4 3 2 1
30 29 28 27 26 25 24 23 22 21 20
1949
16 15 14 13 12 12
4 3 2 1
30 29 28 27 26 25 24 23 22 21 20
1950
31 33 32 34
18 17 4
30 29 28 25 24 21 20
1951
40 39 38 37 36 35 43
33 32 31
42 41 4
1952
57 56 55 54 53 52 51 50
40
33 32 31 49 48 47 46 45

Table 192 cont.

Ringwood contd. (Section 7)

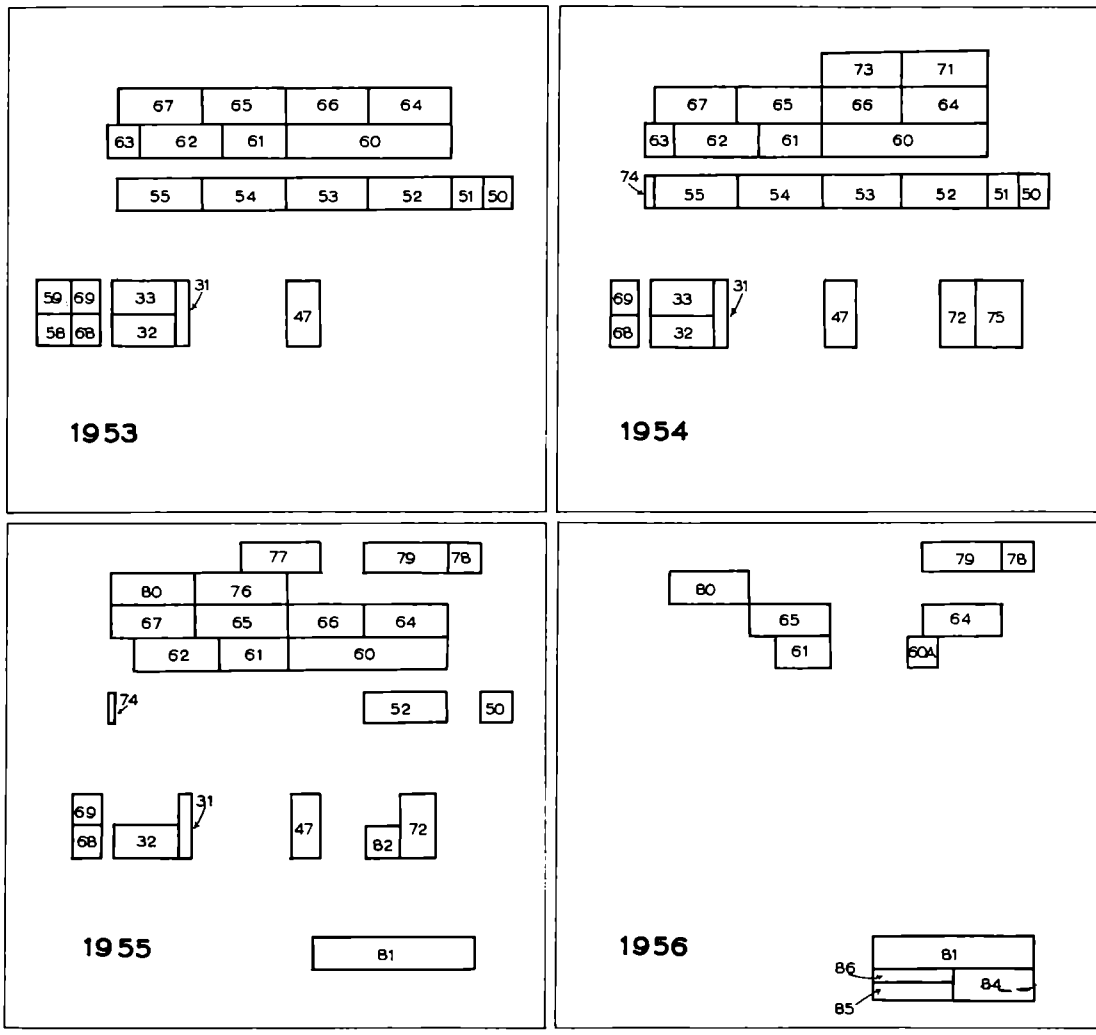


Table 193

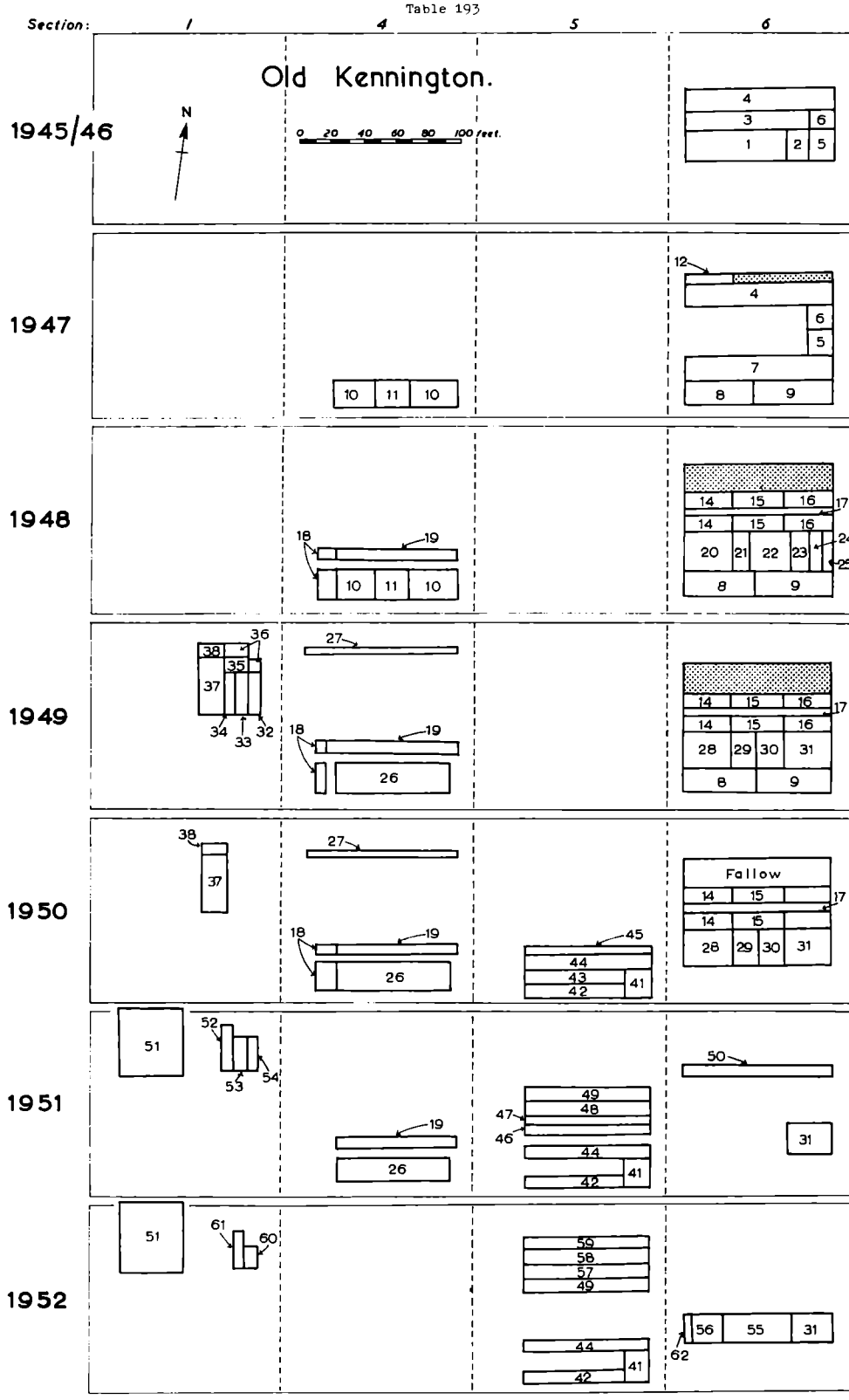

Section: 1 4 5 6
Old Kennington.
1945/46
N
0 20 40 60 80 100 feet.
4
3 6
1 2 5
1947
12
4
6
5
7
8 9
10 11 10
1948
14 15 16 17
14 15 16
20 21 22 23 24 25
8 9
18 19
10 11 10
1949
36
38
35
37
34 33 32
27
18 19
26
14 15 16 17
14 15 16
28 29 30 31
8 9
1950
38
37
27
18 19
26
45
44
43 41
42
Fallow
14 15 17
14 15
28 29 30 31
1951
51
52
53 54
19
26
49
48
47
46
44
41
42
50
31
1952
51
61
60
59
58
57
49
44
41
42
56 55 31
62

Table 193 cont.

Old Kennington contd.

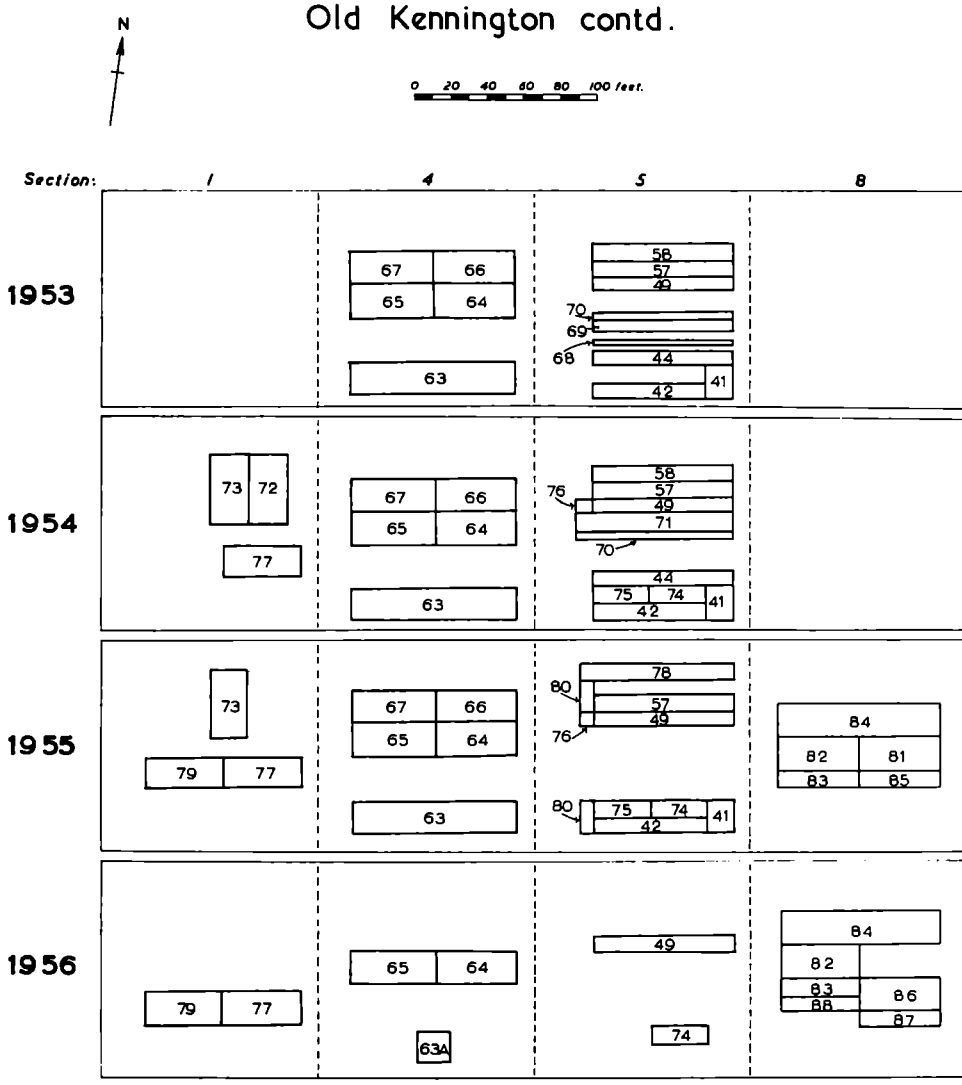
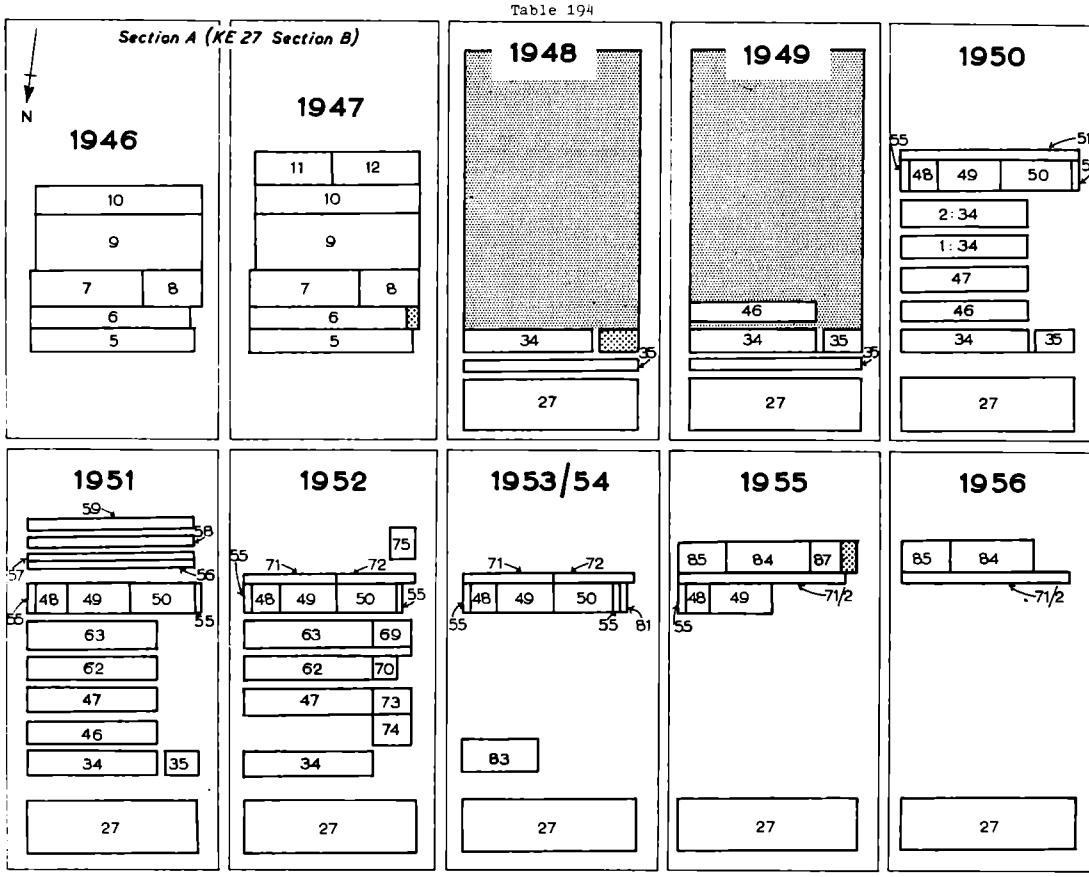


Table 194



Kennington Extention.

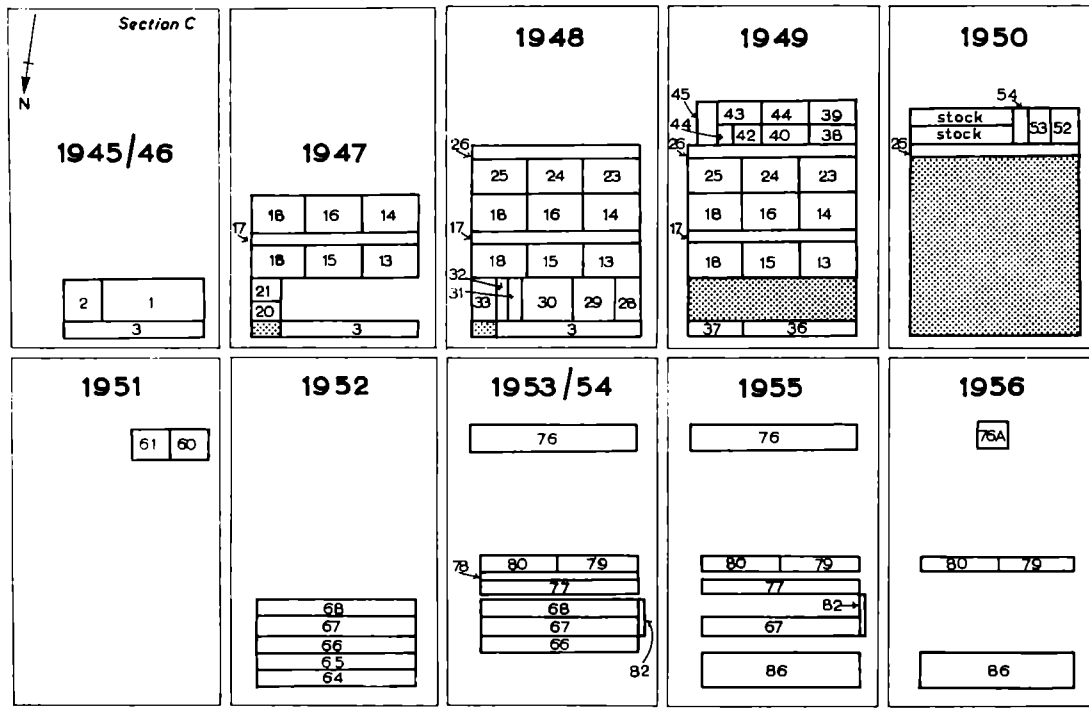
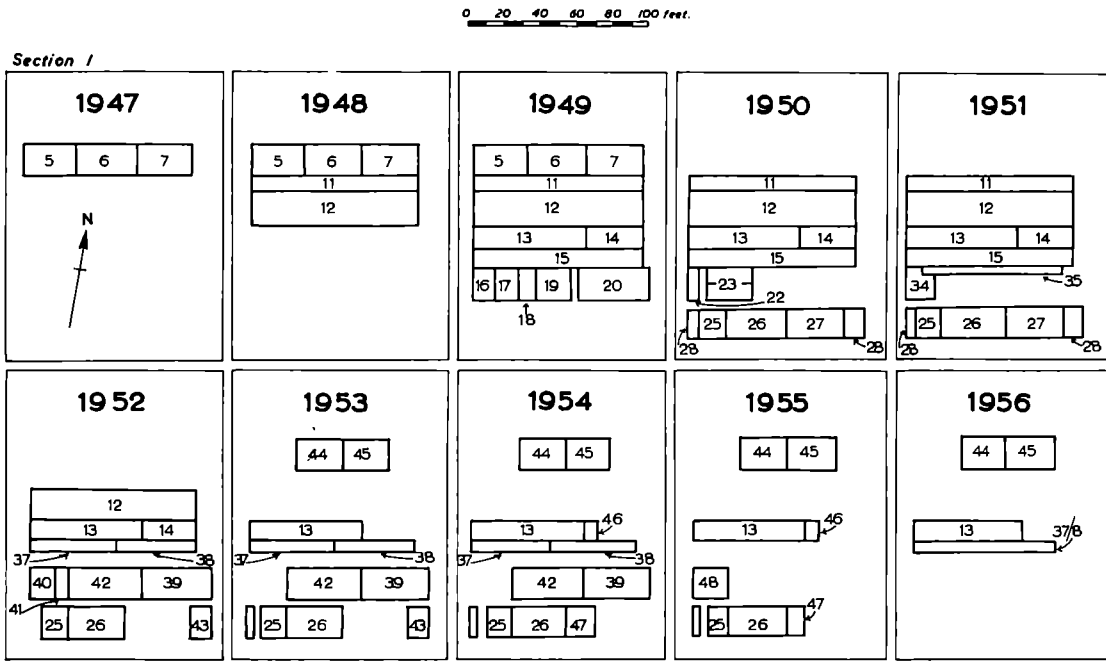


Table 195

Bagley Wood.



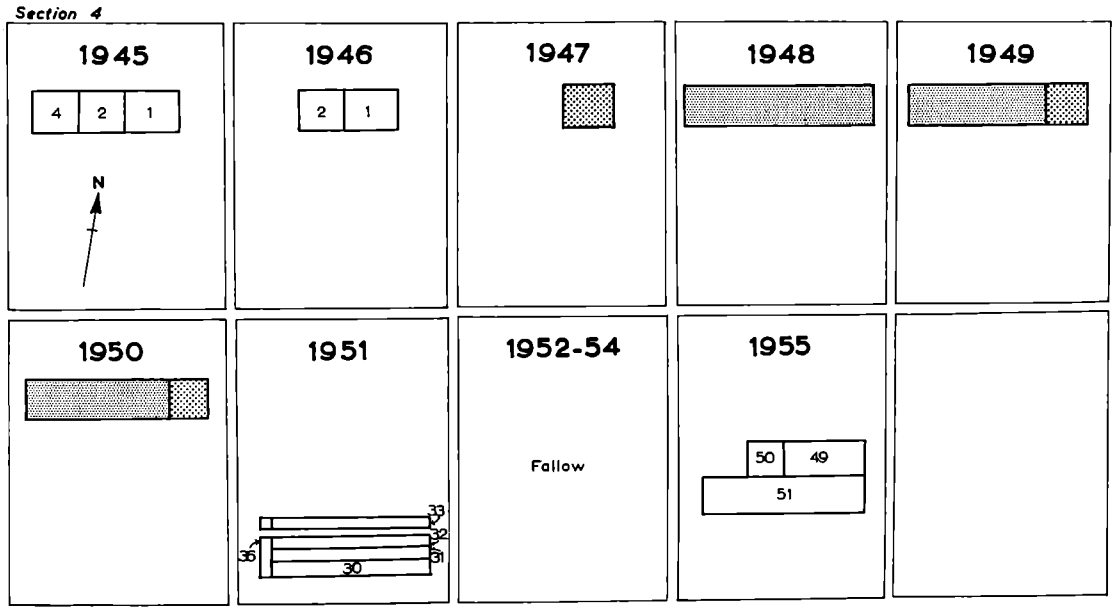
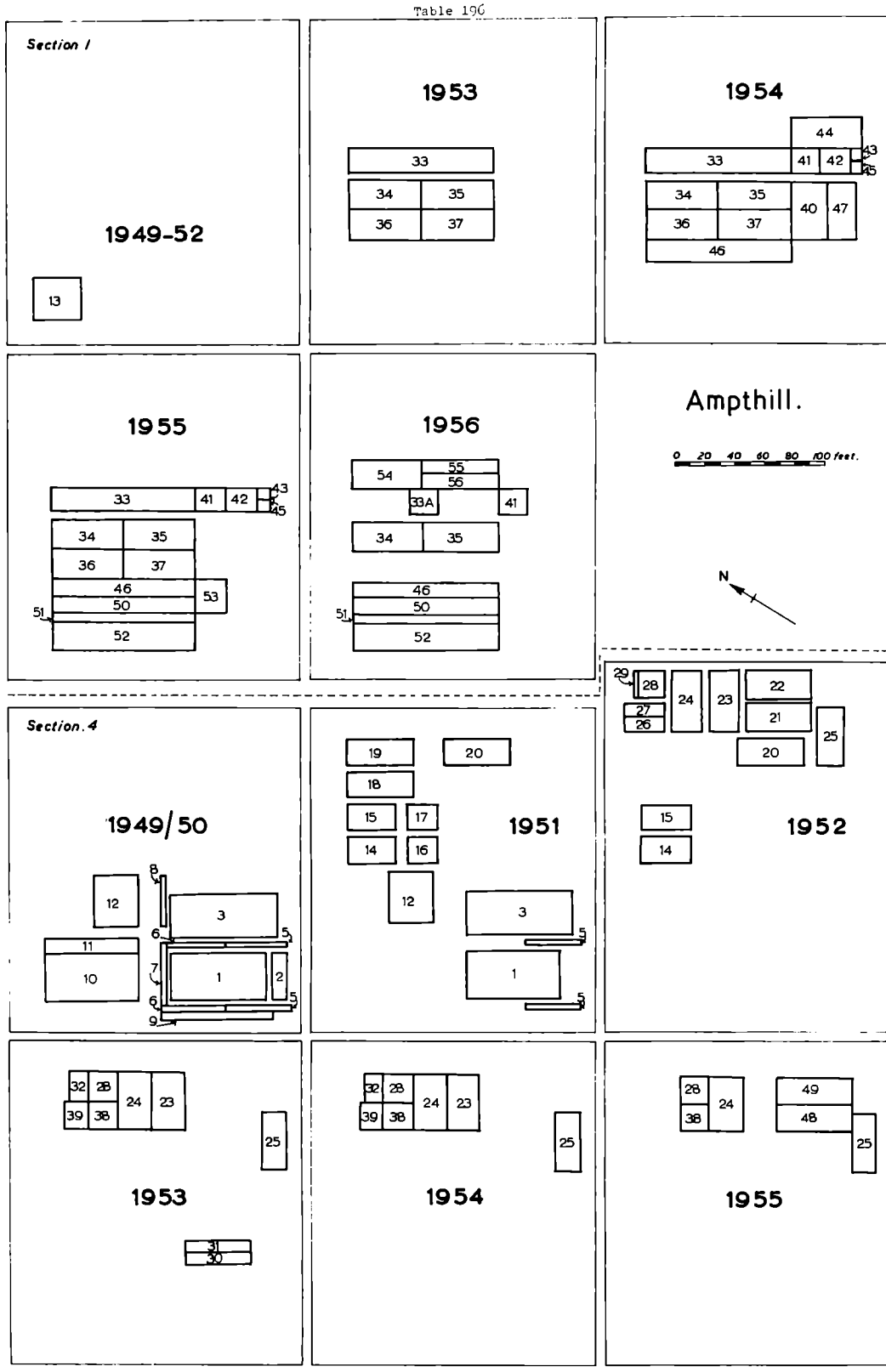


Table 196


Section I
1949-52
13
1953
33
34
35
36
37
1954
44
33
41
42
43
45
34
35
36
37
40
47
46
1955
33
41
42
43
45
34
35
36
37
46
53
50
51
52
1956
54
55
56
33A
41
34
35
46
50
51
52
Ampthill.
0 20 40 60 80 100 feet.
N
Section. 4
1949/50
12
8
3
6
5
11
10
7
1
2
6
5
9
1951
19
20
18
15
17
14
16
12
3
5
1
5
1952
29
28
24
23
22
27
26
21
25
20
15
14
1953
32
28
24
23
39
38
25
31
30
1954
32
28
24
23
39
38
25
1955
28
24
49
38
48
25

SUPPLEMENTARY TABLES

Goodey, J.B. The relationship between the nematode *Hoplolaimus uniformis* and Sitka spruce. Tables 197-213 (For text see first volume of this Bulletin)

Notes

Samples of Sitka spruce and of a few other species were taken over a period of 5 years from 1951, and altogether some 750 samples were examined. They were usually of 48 seedlings from each plot or bulked series of plots, taken in late November of early December, when all other observations had been made on the experiments. Several samples from some experiments were also taken throughout the year. The seedlings had plenty of soil adhering to the roots. In the laboratory 12 random seedlings were steeped in water and the eelworm extracted from the resulting suspension.

The data in these tables (all from Ringwood) are presented mostly as effects of the various treatment and compared with plant heights obtained by the standard grid assessment. Means, except where noted, are arithmetic.

Table 197 (see Table 87)

1954	Eelworms/plant 2/12/54	Seedling height in inches
Mean	51	0.84
EFFECTS		
(ammonium sulphate-Nitro-Chalk)'	59	0.19*
(sawdust residues)'	-115	0.70**
(ammonium sulphate-Nitro-Chalk)' × (sawdust residues)'	-65	0.18
S.E.±		0.080
c.v.%		19.2

Table 198 (see Table 100)

1954	Eelworms/plant 2/12/54	Seedling height in inches
untreated	10	1.60
S.E.±		0.113
autumn		
neat formalin	7	1.98
neat formalin + water	5	2.39
formalin drench	1	2.51
winter		
neat formalin	7	2.41
neat formalin + water	3	2.39
formalin drench	2	2.58
spring		
neat formalin	0	2.55
neat formalin + water	2	2.50
formalin drench	1	2.52
S.E.±		0.113
c.v.%		9.7

Table 199 (see Table 103)

1953	Eelworms/plant (12/12/53) log(x+1)	calculated	Seedling height in inches
MEANS			
untreated	2.00	99	1.37
S.E.±	0.050		0.096
formalin	1.59	38	2.42
chloropicrin	0.62	3	2.74
winter	0.88	7	2.78
spring	1.33	20	2.37
S.E.±	0.035		0.068
EFFECTS			
(chloropicrin-formalin)' for:			
Mean	-0.97**		0.33**
S.E.±	0.050		0.096
winter	-1.43**		-0.10
spring	-2.47**		0.76**
S.E.±	0.071		0.136
(level 2-1)' for:			
Mean of treated plots	-0.14*		-0.15
S.E.±	0.050		0.096
formalin	-0.04		0.10
chloropicrin	-0.10		-0.40
winter	-0.31**		-0.19
spring	0.17*		-0.11
S.E.±	0.071		0.136
c.v.%	7.8		8.3

Table 200 (see Table 105)

	1954		1956		1955	
	Eelworms/100g. soil	Seedling height in inches	Eelworms/plant	Seedling height in inches	Eelworms/plant 1/12/55	Seedling height in inches
MEANS						
untreated	45	1.50	18	0.96	13	0.94
S.E.±		0.062		0.065		0.046
formalin	4.5	2.35	4	2.10	6.25	1.44
chloropicrin	3.0	2.33	0	2.42	0.5	1.38
S.E.±		0.044		0.046		0.033
summer	12	2.24	4.5	1.98	6.5	1.34
autumn	3	2.38	0	2.46	1.5	1.55
winter	0	2.39	0	2.47	1.5	1.44
spring	0	2.34	3.5	2.13	4	1.31
S.E.±		0.062		0.065		0.040
EFFECTS						
(chloropicrin-formalin)' for:						
Mean	-6	-0.02	-16	0.32**	23	-0.06
S.E.±		0.062		0.065		0.046
summer	0	0.41**	-9	0.82**	-13	0.24*
autumn	-6	-0.12	0	0.47**	-1	-0.18
winter	0	-0.20	0	-0.23	-3	-0.08
spring	0	-0.18	-7	0.22	-6	-0.21*
S.E.±		0.124		0.130		0.091
c.v.%		8.1		9.2		9.9

Table 201 (see Table 106)

1954		Eelworms/plant 2/12/54	Seedling height in inches
untreated		34	1.44
S.E.±			0.063
	per sq.yd.		
chloropicrin	16 shots of 1 ml.	1	2.31
	16 shots of 2 ml.	0	2.35
formalin	62½ ml.	2	2.10
	125 ml.	1	2.18
S.E.±			0.089
c.v.%			9.1

Table 202 (see Table 107)

	Eelworms/plant				Height in inches				
1953 (sampled 12/12/53)	untreated				untreated				S.E.±
Larix leptolepis	190				3.83				0.376
Lodgepole pine	192				1.99				0.119
Picea sitchensis	108				1.44				0.095
Western hemlock	34				1.30				0.050
Pinus nigra	274				0.93				0.104
Pseudotsuga taxifolia	164				3.48				0.285
1954	-	Mf	Mcp	Both	-	Mf	Mcp	Both	S.E.±
Larix leptolepis	27	1	1	0	1.16	2.57	2.44	3.19	0.194
Lodgepole pine	37	1	0	0	0.40	1.61	1.83	2.18	0.101
Picea sitchensis	77	0	1	0	0.30	1.42	1.88	2.00	0.141
Western hemlock	11	0	0	0	0.41	0.82	1.19	1.48	0.107
Thuja plicata	21	0	0	0	0.33	0.65	1.09	1.22	0.078
Pseudotsuga taxifolia	17	1	1	0	0.75	1.10	2.30	2.23	0.219

Note:
Mf = formalin
Mcp = chloropicrin

Table 203 (see Table 109)

1952	Eelworms/plant 23/12/52	Seedling height in inches
MEANS		
untreated	15.5	1.25
formalin drench	0.3	1.85
chloropicrin	0	2.62
ethylene dibromide	0	1.92
S.E.±		0.081
c.v.%		10.0

Table 204 (see Table 110)

1953	Eelworms/plant (12/12/53) log(x+1)	calculated value	Seedling height in inches
MEANS			
untreated	2.18	150	1.30
ethylene dibromide	0.18	1	2.76
D-D	0.65	3	2.75
paraformaldehyde	1.73	53	1.51
formalin drench	0.92	7	2.94
S.E.±	0.162		0.070
Effect of formalin neat with:			
Mean	-0.27		0.06
S.E.±	0.162		0.070
ethylene dibromide	-0.35		0.27
D-D	-0.10		-0.12
paraformaldehyde	-0.63		-0.00
formalin drench	0.00		0.07
S.E.±	0.323		0.139
c.v.%	28.6		6.2
	not sig.		

Table 205 (see Table 111)

	1954		1955	
	Eelworms/100g. soil 3/11/54	Seedling height in inches	Eelworms/plant	Seedling height in inches
MEANS				
untreated	81	1.41	14.5	0.98
S.E.±		0.064		0.032
summer				
ethylene dibromide	0	2.14	0	1.38
"D-D"	0	2.46	0	1.41
paraformaldehyde	54	1.52	7	1.28
formalin drench	24	2.00	7	1.22
winter				
ethylene dibromide	0	2.21	0	1.22
"D-D"	0	2.21	0	1.45
paraformaldehyde	48	1.48	4	1.23
formalin drench	6	2.59	4	1.67
S.E.±		0.900		0.046
EFFECTS (winter-summer) for:				
ethylene dibromide	0	0.06	0	-0.16*
"D-D"	0	-0.26	0	0.04
paraformaldehyde	-6	-0.05	-3	-0.05
formalin drench	-18	0.60**	-3	0.44**
S.E.±		0.128		0.065
c.v.%		9.3		7.1

Table 206 (see Table 114)

1956	Eelworms/plant 22/11/56	Seedling height in inches
MEANS		
untreated	21	1.28
S.E.±		0.050
formalin neat	2	1.96
formalin drench	2.5	2.20
chlorobromopropene	0.5	2.22
chloropicrin	0	2.50
S.E.±		0.050
EFFECT OF (SPRING-WINTER)' FOR:		
Mean	-2	-0.22**
S.E.±		0.050
formalin neat	-2	0.22*
formalin drench	5	-0.56**
chlorobromopropene	-1	-0.53**
chloropicrin	0	-0.04
S.E.±		0.100
c.v.%		7.0

Table 207 (see Table 122)

	Eelworms/plant			Seedling height in inches		
	5/11/51	3/12/52	29/11/53	1951	1952	1953
Mean	23.3	5.8	73.1	1.10	0.87	0.62
	log(10x+1)	log(10x+1)	log(x+1)			
Mean	2.37	1.77	1.87			
Effects						
N'	-0.07	-0.09	-0.10	0.25**	0.09*	0.43**
P'	-0.02	0.21	-0.08	0.44**	0.39**	0.12*
K'	0.07	0.22	0.10	0.33**	0.32**	0.17**
formalin current'	-0.71**	-0.45**	-0.45**	0.67**	0.29**	0.27**
formalin residues'	-0.07	-0.32*	-0.18*	0.03	0.16**	0.23**
formalin current × residues'	0.20*	0.10	-0.16*	-0.24**	-0.21**	0.06
S.E.±	0.092	0.135	0.069	0.067	0.042	0.055
c.v.%	11.0	21.6	10.5	17.2	13.8	24.7

Table 208 (see Table 124)
(C = compost, F = fertilizer, Mf = formalin)

	Eelworms/plant					Seedling height in inches				Eelworms/100g. soil
	3/6/52	23/12/52	30/11/53	2/12/54	24/11/55	1952	1953	1954	1955	25/2/54
Mean	0.55	4.8	42.9[G]	13.1	21[G]	1.68	1.22	1.06	0.94	22.4
Mean	0.81[2]	1.69[2]		1.15[3]						1.37[3]
EFFECTS										
C'	-0.40**	-0.01	-4	-0.40*	-266	1.31**	0.70**	0.74**	0.53**	-0.02
F'	0.01	0.03	41	-0.01	-140	0.50**	0.82**	0.58**	0.25**	0.55
C'F'	0.10	0.02	-56	0.06	130	-0.24*	0.00	-0.14	-0.11	-0.04
Mf'	-0.33*	-1.34**	-344	-0.74**		1.00**	0.46**	0.93**		-0.84*
C'Mf'	0.06	0.18	-42	-0.26		0.30**	-0.09	0.26*		-0.05
F'Mf'	0.10	0.01	-40	-0.09		0.20	0.20**	0.21		0.18
C'F'Mf'	-0.15	0.02	46	0.06		-0.20*	-0.07	-0.31**		-0.17
(spring-winter)'					10				0.07	
Mf residues'					21				0.07	
S.E.±	0.137	0.175		0.159		0.096	0.051	0.104	0.059	0.279
c.v.%	47.9	29.3		27.6		16.1	11.8	27.7	17.7	40.7

Table 209 (see Table 125)
(C = compost, F = fertilizer, Mf = formalin)

	Eelworms/plant							Seedling height in inches			
	28/5/53	2/7/53	13/8/53	11/12/53	24/11/54	1/12/55	22/11/56	1953	1954	1955	1956
Mean	0.21	0.80	0.17	28.7	12.2	7.1	9.7	1.98	1.28	1.04	1.22
Mean	1.35[1]	1.91[1]	1.25[1]	2.46[2]	2.09[2]	1.86[2]	1.99[2]				
EFFECTS											
C'	-0.14	-0.10	0.13	-0.13	-0.43**	-0.46*	-0.36**	0.46**	0.70**	0.47**	0.39**
F'	0.29	-0.20	-0.10	-0.24	-0.34**	-0.37*	-0.52**	1.57**	0.69**	0.17**	0.77**
Mf'	-0.55	-0.27	-0.71**	-0.23	-0.31**	-0.11	-0.32*	0.80**	1.43**	0.38**	0.53**
C'F'	0.19	0.31	-0.08	-0.07	-0.26*	0.09	-0.04	0.16	0.09	-0.08	-0.07
C'Mf'	0.02	0.03	0.26	0.02	-0.01	-0.05	-0.01	0.13	0.19	0.15*	-0.04
F'Mf'	-0.25	0.13	0.16	0.06	-0.25	-0.25	-0.05	0.29	0.37	0.02	0.13
S.E.±	0.351	0.159	0.181	0.103	0.075	0.131	0.096	0.090	0.109	0.049	0.069
c.v.%	52.0	16.6	28.9	8.4	7.2	14.1	9.6	9.1	17.1	9.5	11.3

	Eelworms/100g. soil							
	3/3/53	25/2/54	27/4/54	25/6/54	24/11/54	20/4/55	1/7/55	25/10/55
Mean	8.8	51.5	23.6	13.8	140.3	24.1	21.4	25.9
Mean	0.99[3]	1.72[3]	1.39[3]	1.14[3]	2.15[3]	1.40[3]	1.35[3]	1.43[3]
EFFECTS								
C'	0.07	0.31	-0.38	-0.34	-0.47*	-0.19	0.12	-0.23
F'	-0.13	-0.20	-0.32	0.04	-0.14	-0.30	0.33	-0.09
Mf'	0.04	-0.42	-1.41**	-1.61**	-0.41*	-0.66	-0.56*	-0.29
C'F'	0.13	0.22	0.00	-0.07	-0.08	-0.19	0.03	-0.32
C'Mf'	0.24	0.09	-0.38	-0.32	-0.17	-0.20	0.08	-0.20
F'Mf'	-0.17	-0.38	-0.39	0.10	-0.20	0.05	0.10	-0.16
S.E.±	0.223	0.268	0.267	0.259	0.134	0.135	0.196	0.243
c.v.%	45.2	31.1	38.4	45.5	12.5	19.2	29.1	34.1

[1] log(100x+1)

[2] log(10x+1)

[3] log(x+1)

G = geometric mean

Table 210 (see Table 126)
(C = compost, F = fertilizer, Mcp = chloropicrin)

	Eelworms/plant					Seedling height in inches			
	3/6/52	3/12/52	29/11/53	2/12/54	1/12/55	1952	1953	1954	1955
Mean	1.31	15.4	3.21	17	4	0.91	1.90	1.27	1.19
Mean log(10x+1)	1.15	2.19	1.52						
EFFECTS									
C'	-0.45**	-0.01	-0.30**			0.71**	1.22**		
F'	-0.14	0.38*	-0.13			0.26**	0.71**		
C'F'	0.25	-0.02	-0.06			-0.06	-0.07		
Mcp current'			-0.78**	-24	7		2.16**	1.22	0.60**
C' × Mcp current'			-0.21*				0.60**		
F' × Mcp current'			-0.17*				0.18		
Mcp residues'				2	-2			0.16	-0.01
Mcp interaction'				-6	1			-0.29	-0.15
S.E.±	0.124	0.137	0.058			0.056	0.123	0.223	0.086
c.v.%	21.6	12.5	7.7			12.3	13.0	35.2	14.5

Table 211 (see Table 152)

	Eelworms/plant		Transplant height in inches	
	23/12/52	12/12/53	1952	1953
Mean	323	898	8.3	9.2
EFFECTS				
(Ns-Nc)'		-1832		0.9**
K'		64		0.3
Mg'		-1818		0.0
Mf'	-645	-12506	3.1**	5.2**
(Ns-Nc)'Mf'		1490		-0.3
S.E.±			0.28	0.24
c.v.%			6.8	5.3

Note:
Ns = ammonium sulphate
Nc = 'Nitro-Chalk'
K = potassium chloride
Mg = kieserite
Mf = formalin

Table 212 (see Table 188)

1953	Eelworms/plant 2/12/53	Transplant height in inches 1953
untreated	632	8.3
formalin	16	10.9
chloropicrin	0	8.6

Table 213 (see Table 190)

1954			Eelworms/plant 2/12/54			Transplant height in inches		
COMMON NAMES	BOTANICAL NAMES	Origin	-	Mf	Mcp	-	Mf	Mcp
Sitka spruce	Picea sitchensis	Mf	404	58	0	7.3	11.8	13.6
		Mcp	248	6	2	8.8	12.7	12.4
Tsuga	Western hemlock	Mf	168	2	0	9.4	12.7	11.6
		Mcp	156	4	0	9.5	13.5	12.6
Pinus contorta	Lodgepole pine	Mf	88	2	0	6.2	7.0	8.5
		Mcp	74	2	2	7.0	7.6	8.2

Note: Mf = formalin, Mcp = chloropicrin

INDEXES

Note: To make it as easy as possible for the reader to distinguish between results from seedbed and transplant experiments the following convention has been adopted:

Table numbers, not followed by a letter, give results obtained in SEEDBED experiments (27-137). For tables 1-26 and 191-196 see under Nursery Index below.

'T' Table numbers followed by the letter 'T', give results of TRANSPLANT experiments in which the treatments shown in the table were applied to the transplant beds, and where these were lined out with uniformly treated seedlings

'E' Table numbers followed by the letter 'E', give results of TRANSPLANT experiments with differentially treated seedlings lined out in uniformly treated transplant beds

'ET' Table numbers followed by the letters 'ET', give results of TRANSPLANT experiments with differentially treated seedlings lined out in differentially treated transplant beds

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