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ROTHAMSTED RESEARCH

The Park Grass Plots at Rothamsted 1856 -1949

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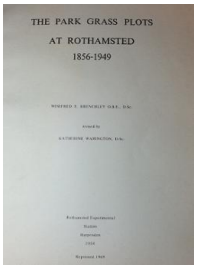

Chapter IV. Effect of Manures and Lime on Individual Plots

Rothamsted Research

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CHAPTER II

FLOWERING PLANTS AND MOSSES

Flowering Plants

A characteristic feature of grassland herbage is the large number of species that occur. During the ninety three years of the experiment i.e. up to 1949, certain changes have taken place, although fundamentally the orders and genera represented have remained practically the same both in number and in kind. During the first years certain species disappeared completely. All of these were originally present in very small quantity and in most cases occurred on a single plot, Carduus arvensis being the only one found on several plots.

The species which have disappeared are:-

Gramineae	None
Leguminosae	Lotus major
	Trifolium minus
	Trifolium procumbens
	Vicia cracca
Miscellaneous	Alchemilla vulgaris
	Carduus arvensis
	Daucus carota
	Galium aparine
	Orchis morio
	Ornithogalum umbellatum
	Plantago media
	Ranunculus auricomus
	Ranunculus repens
	Sonchus oleraceus
	Stellaria holostea
	Veronica officinalis

In 1949, the flora at the first cut of hay (which has been the standard of comparison throughout the experiment) consisted of 65 species, contained in 37 genera and 21 natural orders, little change having taken place since 1919. Their response to the different manures is the subject of chapter V.

A few species occur which do not usually appear in the hay samples, and

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data regarding their distribution, based on field observations are given on page 144

Mosses

During the early years of the experiment only three species of mosses were recognised, viz. Hypnum squarrosum, H.rutabulum and H.heans and they occurred chiefly on the unmanured plots. No species of this genus, however, was found in 1921 or in 1949 when further surveys were made*. In 1921, mosses were almost entirely confined to the unlimed areas. They were plentiful on plots with no manure (2, 3 and 12) and with minerals only (6), small amounts occurring on other mineral plots (4^1, 5^2, 7, 16) and with no manure after ammonium salts (5^1). In 1949, mosses were more plentiful and abundant on both limed and unlimed areas. The influence of manuring on their distribution based on the 1949 survey is as follows:-

Mosses are encouraged by plots receiving complete minerals (6, 7, 14, 15, 16), nitrate of soda (17), or organic manure (13).

They are discouraged on plots receiving ammonium salts (1, 4^2, 9, 10, 11^1, 11^2, 18), incomplete minerals (4^1, 8) and organic manure with minerals and nitrate of soda (19, 20) . Except for Bryum sp. mosses are scarce on the unmanured plots 2 and 3, whether limed or unlimed, though they are plentiful on plot 12, also unmanured and without lime. The principal species here are Brachythecium rutabulum, Eurynchium praelongum with Fissidens bryoides, Bryum capillare and Dicranella heteromalla in addition. In general, liming has little effect on the moss flora, but the addition of lime increased it, particularly the amount of Eurynchium praelongum, on plot 18 and to a less extent on plot 9. Both these plots receive sulphate of ammonia, and minerals without super or complete, respectively. Of the species present over the whole area Eurynchium praelongum is the most abundant, with Brachythecium rutabulum second in importance. Many plots also contain Bryum sp. though this is never plentiful except on plot 6 where mosses are particularly abundant. Other species of special note on this plot are Fissidens bryoides, Brachythecium sp. Phascum cuspidatum and Aulacomnium androgynum.

*Identifications in 1921 and 1949 were kindly carried out by the Staff at Kew Gardens

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Less important species are:- Barbula unguiculata, Funaria hygrometrica, Mnium cuspidatum, M.hornum and Weisia microstoma. The 1949 record differs considerably from that made in 1921, only three species, Barbula unguiculata, Dicranella heteromalla and Aulacomnium androgynum being common to both. Some of the genera listed are similar for both years but four entirely new species were recorded in 1949 viz. Funaria hygrometrica, Mnium cuspidatum M.hornum and Phascum cuspidatum. Both the 1921 and 1949 surveys were made in the spring and examination of the plots later in the year might reveal yet other species. Association of mosses with mole heaps was frequently observed.

CHAPTER III

GENERAL EFFECT OF INDIVIDUAL AND COMBINED MANURES

Unlimed

YIELD. Most manurial treatments give an increase of crop over no manure, though the degree of improvement varies greatly. A decrease, however, usually occurs with ammonium salts either alone or with minerals without super.

Nitrogenous manures alone (Plots 1 and 17). Nitrate of soda generally gives an appreciable increase of yield, but sometimes the crop is little better than that on the unmanured plots. With sulphate of ammonia the yield is usually lower than where no manure is applied. Either type of nitrogenous manure gives rather a poor growth of herbage.

Mineral manures alone (Plots 6, 7, 8, 15). With complete minerals the yield is very considerably increased, being on an average two or three times that of the unmanured plots. In the absence of potash (Plot 8) however, it usually falls to about two-thirds of that with complete minerals. The

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growth of the herbage is generally good.

Nitrogenous and mineral manures combined (Plots 9, 11^1, 11^2, 14, 16). Very heavy yields are obtained with a combination of complete minerals and either nitrate of soda or ammonium sulphate, as much as three tons per acre being reached in some years. Nitrate of soda increases the yield the more rapidly, as a double dressing (= 86 lb. N per acre) often gives as heavy a crop as a triple dressing (= 129 lb. N per acre) of ammonium salts. Seasonal variation is smaller with nitrate of soda than with ammonium sulphate. With heavy dressings of ammonium sulphate, growth may become coarse and rank and the crop is then liable to lodge.

With ammonium salts and minerals without super (Plot 18), the yield is poor and since 1938 it has usually fallen below that of the unmanured plot.

Organic manures (Plots 13, 19, 20). These increase the yield and encourage the grass to get away earlier in the spring than where inorganic manures are used. The type of herbage, however, is much influenced by the other fertilizers applied.

NUMBER OF SPECIES. The largest number of species is found on the unmanured plots, 43 being recorded in 1940, but fluctuations are considerable and only 20 occurred in 1943. With organic manures the number is about 30 and these species are more regular in appearance than those on the unmanured plots. As the applications of inorganic manure, especially of a nitrogenous character, become successively heavier, the number of species decreases until with large dressings of ammonium sulphate only about 8 to 10 survive, of which only 2 or 3 occur in any quantity. Minerals are much less effective than nitrogen in reducing the number of species.

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RELATIVE AMOUNTS OF GRAMINEAE, LEGUMINOSAE AND MISCELLANEOUS SPECIES. (Figures 1,2,3).

Nitrogenous manures alone or combined with minerals (Amm.Salts; Plots 1, 4^2, 9, 10, 11^1, 11^2, 18; Nitrate of Soda; Plots 14, 16, 17). An almost complete elimination of Leguminosae is effected by ammonium salts, whether given alone or with minerals. In the presence of nitrate of soda, reduction is less drastic, but still considerable. Miscellaneous species are also reduced by ammonium salts and where the dressing is heavy the herbage consists almost entirely of grass. With nitrate of soda alone, on the other hand, the quantity of Miscellaneous species may be of the order of 30 per cent (1947 and 1949).

Mineral manures alone (Plots 6, 7, 8, 15). All three groups are well represented here. Leguminous plants are specially encouraged and may constitute one third of the herbage, though in the absence of potash (Plot 8) the proportion is smaller. This beneficial effect is entirely offset by the addition of nitrogen as ammonium salts (Plots 9, 10, 11^1, 11^2). With nitrate of soda, however, the counteraction is less noticeable, and Leguminosae, chiefly Lathyrus pratensis, may constitute almost 12 per cent of the herbage (Plot 16).

Organic manures (Plots 13, 19, 20). These seem to encourage Leguminosae if used alone, but in combination with inorganic fertilizers it is the nature of the latter which is the determining factor. Thus, when farmyard manure is used after prolonged treatment with ammonium salts (Plot 13), Leguminosae are almost or entirely absent, whereas in combination with nitrate of soda and minerals this group is fairly well represented (Plots 19 and 20). The most conspicuous leguminous plant throughout is Lathyrus pratensis, which both shows the most response to manurial treatment, and also the greatest fluctuations with season.

INDIVIDUAL SPECIES. The majority of species vary in quantity with the type of manuring, but it is often uncertain whether the variation is caused by the direct influence of the manure on the species concerned, or whether it is due to lessened or increased competition with other plants. Plantago lanceolata, Leontodon hispidus, Conopodium denudatum, Briza media and Lotus corniculatus, for

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example, which are conspicuous on starved soils tend to disappear with more complete inorganic manuring.

Agrostis vulgaris has increased considerably, and as much as 44.0 per cent may occur on plots receiving heavy ammonium salts and minerals. Festuca rubra is much encouraged with ammonium salts alone, but the addition of minerals brings to the fore Holcus lanatus and Agrostis vulgaris, and to a lesser extent Anthoxanthum odoratum and Arrhenatherum avenaceum.

Ammonium salts and nitrate of soda favour quite different species, for Holcus lanatus is dominant with the former, whereas with the latter Arrhenatherum avenaceum, Dactylis glomerata and Alopecurus pratensis are the most important grasses, Holcus lanatus being almost entirely suppressed.

Minerals encourage Poa pratensis, Lathyrus pratensis and Trifolium pratense, but it is not possible to detect any special effect on species in the Miscellaneous group.

Generally speaking, with moderate or no manuring many species retain their footing even though they may be much reduced in quantity. With excessive manuring, on the other hand, a large number of species tend to disappear entirely, while one or two others increase to such an extent that the balance in the composition of the herbage is seriously upset.

Limed

YIELD. Liming has now increased the yield on all plots with ammonium salts and minerals, and also with complete minerals alone. With ammonium salts alone, lime did not at first have any constant effect, but since 1919 it has caused an improvement. On the unmanured plots lime brings about only a slight increase in crop.

With the light dressing of nitrate of soda, lime formerly improved the yield in certain seasons only, but since 1940 the benefit has been consistent. With the heavy dressing or mineral manuring, on the other hand, there has been a steady decrease in crop from the addition of lime.

When associated with farmyard manure and fish guano (Plot 13), lime decreased the yield till 1944, but since then the position has been reversed.

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NUMBER OF SPECIES. Liming has no constant effect upon the number of species, but it increases them on plots receiving ammonium salts alone or with the addition of minerals, either complete or without super. In the latter case the crop is much increased and an entirely different type of herbage is produced.

RELATIVE AMOUNTS OF GRAMINEAE, LEGUMINOSAE AND MISCELLANEOUS SPECIES.

Since 1919, liming has caused some changes in the proportion of Gramineae. About half the plots show a decrease viz. those receiving ammonium salts (except the largest quantities) a light dressing of nitrate of soda with minerals, farmyard manure, super alone or no manure at all. The only plot showing an increase is that receiving nitrate of soda only. Elsewhere little change has occurred.

Leguminosae are affected in a variable manner and changes in the trends have occurred since 1919. In general no legumes occur where ammonium salts are given, though some may appear where they are applied alone or at a low rate mixed with minerals. Liming has decreased the legumes on the plot with complete minerals and the lower dressing of nitrate of soda but increased them where the higher rate is supplied. The largest increase, however, occurs on the F.Y.M. and fish guano plot where the proportion of Leguminosae has been as high as 41 per cent on the limed compared with 0.2 per cent on the unlimed section. On the remaining plots liming has had little consistent effect.

Miscellaneous species have increased on the limed sections of the unmanured plot 3, those with ammonium salts either with or without other fertilizers, and with F.Y.M. provided artificials are used in addition. Especially large increases have occurred with ammonium salts with minerals without super. Decreases have occurred with minerals or F.Y.M. alone, and to a slight extent where nitrate of soda is given without the addition of minerals. No effect of lime was observed with super alone, or with either dressing of nitrate of soda given with minerals.

INDIVIDUAL SPECIES. On the whole, the effect of lime is more marked on the plots receiving ammonium salts and mineral manures than on those with minerals only, no manure, or with the nitrogen applied as nitrate of soda.

Alopecurus pratensis shows a marked benefit from lime if the manuring is good and soil conditions tend towards acidity. Dactylis glomerata frequently shows a similar response, but Holcus lanatus and Anthoxanthum odoratum are

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reduced by lime. Agrostis vulgaris is usually not affected, but is decreased by lime in the presence of ammonium salts (Plot 1), a response it shares with Festuca rubra. With Poa trivialis the effect varies, an increase sometimes occurring on the limed section of plots with minerals alone or F.Y.M., whereas there is an occasional decrease with heavy nitrate of soda and minerals.

Among the Leguminosae, Lathyrus pratensis shows a variable response. Specially large increases in this species were recorded in 1943 and 1944 on the limed half of the plot receiving F.Y.M. and fish guano. Trifolium pratense and Lotus corniculatus are also usually encouraged by lime.

Of the Miscellaneous species, Plantago lanceolata is always increased by lime on the plot receiving ammonium salts alone, though on other plots its response may vary. Conopodium denudatum is also increased on the limed section of this plot though elsewhere it is usually decreased by lime. Rumex acetosa is variable in response, but where manuring is complete, except for potash, there has been a consistent increase due to lime since 1919.

Silicate of Soda

Silicate of soda applied with heavy ammonium salts has a somewhat similar effect as lime, though it does not generally cause such a large increase in yield. The benefit from silicate is usually greater in the absence of lime and though the effect varies with season the increase in crop may be considerable. Silicate also seems to inhibit the colonization of Epilobium angustifolium on the unlimed areas, for in 1947 none appeared on the plot receiving sodium silicate (11^2), though nearly 12 per cent occurred on the adjacent and similarly manured plot but without silicate (11^1). The large amount of bare ground due to the severity of the preceeding winter made the high figure possible, for this species is normally unable to compete with grass cut for hay. Since the herbage recovered, Epilobium has almost disappeared and the two plots again have a very similar flora. Some differential effects of silicate on individual species in 1947 on plots receiving heavy ammonium salts and minerals are shown in the following table:-

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	Plot 11[2] With Silicate per cent	Plot 11[1] No Silicate per cent
	Unlimed	
Agrostis vulgaris	44.1	4.5
Arrhenatherum avenaceum	12.7	0.3
Holcus lanatus	40.8	81.1
Epilobium angustifolium	-	11.9
	Limed	
Alopecurus pratensis	70.0	78.9
Arrhenatherum avenaceum	11.3	2.9

CHAPTER IV

EFFECT OF MANURES AND LIME ON INDIVIDUAL PLOTS

In this chapter, the plots are considered under six main headings viz. those receiving A. No Manure, B. Mineral Manures, C. Nitrate of Soda, with and without Mineral Manures, D. Ammonium Salts with Mixed Mineral Manures, E. Ammonium salts alone or with Incomplete Mineral Manure, F. Organic Manures. The characteristics of each individual plot are summarized and information provided regarding the pH of the soil, yield of hay and general type of herbage present. Details of the botanical composition follow, showing the chief constituents of the flora in 1949, the changes that have occurred since 1877, and where appropriate, the effect of lime. The tables have been arranged as far as possible to correspond with the above groups.

A. NO MANURE (Table 2).

UNMANURED since 1856 (Plot 3).

Condition of Plot in 1949 (Unlimed)

(a) pH 5.5.

(b) Herbage of a characteristic poverty-stricken type. The plants are nearly all low growing and give a leafy hay.

(c) Growth starts late in spring.

(d) Yield very low (Figure 4).

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(e) Thirty to thirty-six species, only a few of which are important. Considerable seasonal fluctuations.

(f) The three main groups* of plants are all well represented, the proportion of Gramineae being low and very variable. The range as shown by partial separations from 1903-1947 was:-

	Percent.
G	28.6 - 57.0
L	4.2 - 11.0
M	35.3 - 67.2

Main Constituents of the Herbage on Plot 3.

GRAMINEAE	
Festuca rubra Agrostis vulgaris	Usually the most abundant species
Dactylis glomerata Anthoxanthum odoratum Holcus lanatus	Occasionally among the three most abundant species
Avena pubescens	
Briza media	
LEGUMINOSAE	
Lotus corniculatus	Usually the chief species
Lathyrus pratensis	
Trifolium pratense	
MISCELLANEOUS	
Plantago lanceolata	Usually the chief species
Centaurea nigra Leontodon hispidus Poterium sanguisorba	Vary much with season
Achillea millefolium	
Carex praecox	
Conopodium denudatum	
Rumex acetosa	
Scabiosa arvensis	
Ranunculus spp.	Much decreased since 1919

* Abbreviated in text:- G = Gramineae; L = Leguminosae; M = Miscellaneous species.

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OTHER SPECIES:- Alopecurus, Arrhenatherum, Avena flavescens, Cynosurus, Lolium, Poa pratensis; Trifolium repens; Ajuga, Cerastium, Galium, Hieracium, Luzula, Pimpinella, Potentilla, Prunella, Stellaria, Taraxacum, Thymus, Tragopogon, Veronica. (See Tables).

Outline of Principal Changes during the Period 1877-1948.

Yield. Much reduced owing to the continued removal of soil nutrients by the hay without any addition of manure. Seasonal variation large.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1929	1939	1948
G	18	15	17	17	13	13	12	12	11	11
L	4	4	4	4	4	4	3	4	4	4
M	28	24	28	31	26	23	14	20	17	21
Total	50	43	49	52	43	40	29	36	32	36

Seasonal variation is considerable. Species that are reduced to the point of disappearance may reappear occasionally.

Composition of the herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1930	1939	1948
G	70.6	65.5	68.7	71.2	52.2	56.8	47.8	47.6	37.9	53.0
L	8.1	5.4	9.0	8.5	7.8	6.1	4.5	9.3	6.7	7.2
M	21.3	29.1	22.3	20.3	40.0	37.1	47.6	43.1	55.4	39.8

GRAMINEAE. Proportion reduced

Dactylis glomerata — Increased

Lolium perenne, Poa trivialis — Almost disappeared

LEGUMINOSAE. Little changed

MISCELLANEOUS. Increased, fairly steady since 1903

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Poterium sanguisorba
Leontodon hispidus
Plantago lanceolata
} Responsible for greater part of increase

The quantity of the individual Miscellaneous plants varies so much from year to year, that it is difficult to estimate their increase or decrease. Some of the species in the table below seem, however, to show a definite trend.

Changes in the Percentage of Certain Species

	1862	1877	1903	1914	1919	1936	1939	1947	1948
Dactylis glomerata	1.8	0.7	1.1	3.8	8.4	3.0	3.0	12.1	4.5
Lolium perenne	6.4	4.6	-	0.1	-	-	-	-	-
Poa trivialis	1.5	0.6	* <	-	-	0.1	-	-	-
Poterium sanguisorba	-	0.9	13.8	1.8	5.8	9.1	14.6	5.0	5.6
Leontodon hispidus	0.1	1.3	6.0	17.8	6.9	13.6	18.2	12.0	17.9
Plantago lanceolata	7.3	3.2	2.0	3.4	19.1	5.8	11.8	3.7	6.2
Centaurea nigra	0.3	1.1	4.1	9.1	5.8	3.0	2.9	0.6	1.0
Luzula campestris	1.9	1.8	0.5	0.4	0.2	0.6	0.3	0.3	0.1

* < indicates less than 0.05

Effect of Lime

Until 1943 the limed half was not sharply differentiated from the unlimed area. The herbage was of similar character and appearance, growth beginning at much the same time in the spring. Since then an increase in leguminous plants has been a noticeable feature on the area receiving lime.

pH. 7.0

Yield. Considerably increased by liming up to 1943 but no regular effect since.

Number of Species. No constant effect.

Composition of the Herbage.

GRAMINEAE. Increased till 1938, after which generally reduced

LEGUMINOSAE. Increased

MISCELLANEOUS. Results variable till 1935, since when a tendency to increase

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1940		1947	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	13.1	2.9	8.4	1.5	12.1	2.0	8.4	1.1
Anthoxanthum odoratum	2.8	1.0	7.0	3.1	2.8	0.9	5.1	2.6
Avena flavescens	0.6	1.1	0.9	2.8	0.2	2.0	0.6	1.9
Avena pubescens	4.0	14.2	4.2	19.3	5.7	18.2	3.4	13.6
Briza media	4.3	10.5	2.0	9.0	0.9	1.5	4.7	3.6
Poa pratensis	0.1	1.6	0.2	2.0	0.1	2.2	0.3	1.6
Lathyrus pratensis	0.5	2.7	0.9	1.2	0.7	2.3	2.7	2.5
Lotus corniculatus	3.5	3.6	1.6	2.5	6.3	13.7	3.3	5.0
Ranunculus spp.	0.2	1.0	0.4	2.6	0.1	1.9	1.1	8.6
Conopodium denudatum	0.5	0.1	4.7	0.6	1.5	-	5.7	0.9
Leontodon hispidus	17.8	3.6	6.9	1.5	12.3	7.0	12.0	8.8
Rumex acetosa	0.3	0.6	2.0	4.2	0.2	0.3	3.7	1.8

U = Unlimed L = Limed

UNMANURED since 1856 (Plot 12)

Condition of Plot in 1949 (Unlimed)

(a) pH 5.0

(b) Herbage very similar to Plot 3, with minor differences in composition.

(c) Growth starts late in spring.

(d) Yield low but generally higher than on Plot 3.

(e) Thirty to thirty-two species. Considerable seasonal fluctuations.

Main Constituents of the Herbage on Plot 12

The association closely resembles that of Plot 3.

OTHER SPECIES:- As Plot 3, except for Thymus and the addition of traces of Hypochaeris radicata.

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Outline of Principal Changes during the Period 1877-1949

Yield. Reduced, slightly above Plot 3.

Number of Species. Reduced as on Plot 3, but varies with season.

Composition of the herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	72.4	59.0	63.7	68.3	69.3	54.7	53.2	58.6
L	6.2	10.8	10.2	7.5	7.3	5.3	8.5	13.4
M	21.4	30.2	26.1	24.2	23.4	40.0	38.3	28.1

GRAMINEAE. Much the same as on Plot 3.

Dactylis glomerata, Briza media	Probably increased
Festuca pratensis	Much reduced
Poa trivialis, Cynosurus cristatus, Lolium perenne	Almost or entirely disappeared

LEGUMINOSAE. Little changed, slightly more than on Plot 3.

MISCELLANEOUS. Increased, much the same as on Plot 3.

Leontodon hispidus	Responsible for most of increase
Plantago lanceolata, Centaurea nigra, Conopodium dendudatum	Prominent throughout
Luzula campestris	Much decreased

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Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1949
Arrhenatherum avenaceum	0.8	0.7	1.8	0.8	1.1	4.4	0.8
Briza media	1.4	1.7	4.2	3.7	10.3	2.2	6.0
Cynosurus cristatus	0.5	0.4	1.0	0.4	<	-	-
Dactylis glomerata	2.8	3.2	1.9	2.6	4.5	14.4	8.8
Festuca pratensis	10.1	3.9	2.3	3.3	-	-	1.6
Lolium perenne	4.5	3.1	1.9	2.3	0.1	0.1	-
Poa trivialis	2.7	1.9	0.9	0.8	0.1	-	-
Conopodium denudatum	1.6	5.4	2.2	2.8	0.5	10.6	1.3
Leontodon hispidus	0.1	0.1	0.1	0.1	6.5	2.6	10.0
Plantago lanceolata	7.7	8.3	0.4	1.4	5.2	15.1	6.8
Luzula campestris	1.1	3.0	3.0	1.5	0.5	0.3	0.6

< indicates less than 0.05

UNMANURED since 1864, after FARMYARD MANURE 1856-1863 (Plot 2)

Condition of Plot in 1949 (Unlimed)

Closely resembles Plot 3, but yield is consistently higher.

pH 5.0

Outline of Principal Changes during the Period 1877-1949

Yield. Reduced, as on Plot 3.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1919	1939	1949
G	14	17	18	18	13	13	12
L	3	4	4	4	4	3	4
M	13	20	25	28	18	16	16
Total	30	41	47	50	35	32	32

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Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	75.1	84.5	80.0	75.4	60.5	57.9	58.0	53.6
L	1.9	1.6	4.9	6.5	5.7	4.4	10.7	15.4
M	23.0	13.9	15.1	18.0	33.9	37.7	31.3	31.0

GRAMINEAE. Proportion reduced.

Briza media, Dactylis glomerata	Increased
Lolium perenne, Avena flavescens	Reduced
Poa trivialis, Bromus mollis	Disappeared

LEGUMINOSAE. Increased.

Lotus corniculatus	Responsible for most of increase

MISCELLANEOUS. Increased.

Leontodon hispidus, Plantago lanceolata	Large increase in some years
Centaurea nigra	Increased

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1949
Agrostis vulgaris	2.6	4.9	11.0	18.0	8.2	8.5	10.0
Avena flavescens	6.0	5.9	11.6	2.9	1.0	1.2	0.2
Briza media	-	<	0.2	0.7	5.6	3.4	1.8
Bromus mollis	17.8	16.4	3.9	0.2	-	-	-
Lolium perenne	1.4	3.6	3.2	4.9	0.3	0.5	-
Poa trivialis	28.2	15.8	3.1	2.4	-	-	-
Lathyrus pratensis	1.0	1.2	4.0	5.3	0.7	0.8	2.1
Lotus corniculatus	-	0.1	0.2	0.2	3.8	2.7	9.4
Centaurea nigra	<	0.1	1.3	0.9	7.3	4.9	1.3
Leontodon hispidus	-	<	<	<	16.5	2.8	12.4
Plantago lanceolata	1.7	3.1	1.5	3.7	5.5	20.6	5.7

< indicates less than 0.05

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Effect of Lime

In general, the herbage resembles that of Plot 3 limed.

pH. 7.0

Yield. Increased till 1910 when for some years it was depressed. The effect now varies with season, but lime is usually beneficial.

Number of Species. No regular effect.

Composition of the Herbage.

GRAMINEAE	Hardly affected
LEGUMINOSAE	Increased
MISCELLANEOUS	Decreased

Effect of Lime on the Percentage of Certain Species

	1914		1919		1949	
	U	L	U	L	U	L
Agrostis vulgaris	8.2	1.9	8.5	0.5	10.0	0.5
Anthoxanthum odoratum	4.0	1.5	8.8	1.7	1.1	0.4
Avena flavescens	1.0	1.7	1.2	3.7	0.2	1.5
Avena pubescens	4.9	18.1	4.7	20.3	3.5	22.5
Briza media	5.6	2.7	3.4	1.7	1.8	3.9
Dactylis glomerata	3.8	4.9	10.7	15.2	7.9	7.5
Festuca rubra	25.7	24.1	5.3	4.6	15.5	7.4
Poa pratensis	0.5	1.4	0.5	1.8	0.1	1.0
Lathyrus pratensis	0.7	2.4	0.8	2.2	2.1	2.4
Ranunculus spp.	0.3	1.4	0.5	4.4	0.9	2.8
Conopodium denudatum	0.5	0.1	4.4	0.7	3.2	0.2
Leontodon hispidus	16.5	8.5	2.8	1.7	12.4	8.7
Rumex acetosa	0.5	0.4	1.5	2.8	1.4	0.6

U = Unlimed L = Limed

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UNMANURED after AMMONIUM SALTS 1856-1897 (Plot 5^1)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.5.

(b) Herbage rather short and patchy in appearance; clumps of Dactylis glomerata with Festuca rubra frequently dominant.

(c) Growth starts late in spring.

(d) Yield low, often below that of wholly unmanured Plot 3 (Figure 5).

(e) About thirty species or less.

(f) GRAMINEAE form bulk of herbage.

LEGUMINOSAE barely represented.

MISCELLANEOUS plants in good proportion with a large number of species in very small quantity.

Main Constituents of the Herbage on Plot 5^1

GRAMINEAE

Festuca rubra	Forms about half of the total herbage
Agrostis vulgaris, Anthoxanthum odoratum, Dactylis glomerata	Plentiful; order of prevalence varies with season
Arrhenatherum avenaceum	Variable
Poa pratensis	Small amount

MISCELLANEOUS

Centaurea nigra	Usually well represented
Conopodium denudatum, Hieracium pilosella, Hypochaeris radicata, Plantago lanceolata, Rumex acetosa	May be very plentiful
Scabiosa arvensis	Fairly plentiful
Galium verum	Variable

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OTHER SPECIES (Several of rare occurrence only):- Aira, Alopecurus, Avena flavescens, A. pubescens, Bromus, Holcus; Lathyrus, Lotus, Trifolium pratense; Achillea, Cerastium, Heracleum, Leontodon, Luzula, Pimpinella, Ranunculus spp. Stellaria, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Generally reduced since 1898 when manuring was discontinued, but occasionally heavy.

Number of Species. Considerable variation since the application of ammonium salts was discontinued.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1930	1939	1947	1949
G	17	15	15	13	13	11	10	10	9	7	10
L	4	4	3	2	0	3	1	1	5	3	1
M	17	17	13	14	8	17	14	12	17	17	11
Total	38	36	31	29	21	31	25	23	31	27	22

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1930	1934	1947	1949
G	86.3	71.9	84.7	94.1	82.4	86.4	76.6	59.0	70.6	72.8	92.2
L	0.1	0.3	0.5	0.2	-	0.5	0.4	1.5	4.4	1.1	3.1
M	13.6	27.8	14.8	5.8	17.6	13.1	23.0	39.5	25.0	26.1	14.8

GRAMINEAE. Proportion reduced

Anthoxanthum odoratum	Increased
Dactylis glomerata	Increased since change in manuring
Agrostis vulgaris, Holcus lanatus	Decreased
Lolium perenne	Disappeared

LEGUMINOSAE. Little changed

Lotus corniculatus	Chief species throughout

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MISCELLANEOUS. Increased

Centaurea nigra	Increased since change in manuring
Rumex acetosa	Occasionally plentiful

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1949
Agrostis vulgaris	24.3	21.0	26.6	29.5	11.7	17.7	4.5	17.8
Anthoxanthum odoratum	5.8	5.5	3.0	4.1	12.3	8.5	11.7	1.1
Dactylis glomerata	2.4	1.4	0.7	3.3	1.3	9.5	8.9	4.1
Holcus lantatus	10.1	5.2	1.9	3.0	<	0.2	0.6	0.7
Lolium perenne	3.3	1.2	1.0	0.1	-	-	-	-
Centaurea nigra	<	2.4	2.2	0.5	0.7	7.2	3.9	2.0
Rumex acetosa	9.2	15.9	7.1	2.1	14.8	1.4	12.3	1.0

< indicates below 0.05

B. MINERAL MANURES (Tables 3 and 4)

MIXED MINERAL MANURE (Plot 7)

Condition of Plot in 1949 (Unlimed)

(a) pH 5.0.

(b) Herbage very varied and well grown, with thick bottom grass. Colour is good, sometimes rather light.

(c) Growth starts fairly late in spring.

(d) Yield good (Figure 6).

(e) Twenty to thirty-three species.

(f) The three main groups of plants are all well represented, the proportions being very variable, though Leguminosae are always plentiful. The range as shown by the partial separations from 1903-1948 was:-

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Main Constituents of the Herbage on Plot 17

GRAMINEAE

Dactylis glomerata	Usually dominant
Alopecurus pratensis, Holcus lanatus	Usually second in importance
Agrostis vulgaris, Anthoxanthum odoratum, Festuca rubra	Plentiful
Avena pubescens	Considerably less plentiful
Lolium perenne, Briza media, Avena flavescens	Usually in very small quantity; but occasionally more plentiful

MISCELLANEOUS

Plantago lanceolata	Very abundant
Centaurea nigra, Leontodon hispidus	Plentiful

OTHER SPECIES:- Arrhenatherum, Bromus, Cynosurus, Poa pratensis, P.trivialis; Lathyrus, Lotus; Ajuga, Carex, Cerastium, Fritillaria, Luzula, Ophioglossum, Ranunculus spp. Rumex, Taraxacum, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Little variation except for marked falls in 1919 and 1944. Seasonal fluctuations small.

Number of Species. Little variation. LEGUMINOSAE reduced since 1914 and MISCELLANEOUS species since 1903.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1933	1949
G	16	16	17	15	15	14	14	15	9
L	4	3	4	4	4	3	2	1	1
M	13	23	22	29	20	14	15	14	10
Total	33	42	43	48	39	31	31	30	20

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Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1931	1933	1949
G	81.4	75.7	73.3	75.9	56.0	68.8	58.5	80.4	71.5	70.6
L	0.4	0.7	1.4	0.9	2.6	0.6	0.4	0.4	0.1	0.1
M	18.2	23.6	25.3	23.2	41.4	30.6	41.1	19.2	28.5	29.3

GRAMINEAE. Proportion little permanently changed

Dactylis glomerata	Much increased
Alopecurus pratensis	Slightly increased

LEGUMINOSAE. Little changed

MISCELLANEOUS. Little changed

Plantago lanceolata	Variable, usually important
Centaurea nigra, Leontodon hispidus	Increased
Heracleum sphondylium	Disappeared

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1931	1933	1949
Alopecurus pratensis	23.9	21.7	16.3	12.7	9.7	14.3	12.9	18.0	14.3	14.5
Dactylis glomerata	1.8	0.6	0.6	0.6	0.9	5.7	8.3	25.5	17.7	25.4
Heracleum sphondylium	-	-	-	-	-	-	0.3	-	-	-
Centaurea nigra	4.4	4.1	10.3	2.8	11.2	8.0	8.7	5.9	5.2	5.5
Leontodon hispidus	0.1	0.1	0.1	0.3	3.7	4.4	3.4	1.9	1.3	4.0
Plantago lanceolata	3.9	4.8	2.4	8.0	10.7	13.9	24.1	8.0	16.2	14.0

Effect of Lime

pH. 7.0.

Yield. Little consistent change.

Number of Species. No effect.

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Composition of the Herbage.

GRAMINEAE

Avena pubescens, Festuca rubra and to a less extent Avena flavescens are encouraged by lime, while Anthoxanthum odoratum is discouraged; on other species the effect of lime is variable.

Effect of Lime on the Percentage of Certain Species

	1921		1925		1929		1933		1949	
	U	L	U	L	U	L	U	L	U	L
Anthoxanthum odoratum	8.6	3.1	7.1	0.9	2.7	0.2	10.3	0.5	8.7	0.8
Avena flavescens	0.8	2.4	0.4	1.2	0.3	1.5	0.3	2.6	-	1.5
Avena pubescens	4.1	6.9	2.3	15.6	2.3	18.1	1.7	10.5	1.7	20.5
Dactylis glomerata	5.2	10.6	28.3	15.0	18.6	7.6	17.7	10.7	25.4	21.1
Festuca rubra	11.5	21.4	6.2	21.7	6.4	26.8	6.8	29.3	9.4	22.3
Holcus lanatus	15.9	12.6	9.8	6.5	8.8	2.0	13.6	5.9	8.5	20.1
Centaurea nigra	2.0	3.6	1.7	2.4	8.4	3.4	5.2	0.3	5.5	1.4
Plantago lanceolata	29.4	17.7	17.4	10.7	23.0	14.8	16.2	17.1	14.0	5.6

U = Unlimed L = Limed

NITRATE OF SODA (= 43 lb. N per acre) AND MIXED MINERAL MANURE (Plot 16)

Condition of Plot in 1949 (Unlimed)

(a) pH 5.0.

(b) Herbage tall and inclined to lodge, with thick bottom grass. Fairly dark colour, occasional bare patches early in year.

(c) Growth starts fairly early.

(d) Yield heavy, but below Plot 14 (Figure 9).

(e) About twenty-two species, with occasional traces of others.

(f) Composition of herbage variable, the proportion of the three groups changing much with season.

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Per cent

	1914	1919	1947
G	75.6	86.0	68.2
L	15.9	1.2	13.0
M	8.5	12.8	18.8

Main Constituents of the Herbage on Plot 16

GRAMINEAE

Alopecurus pratensis	Usually the chief species
Anthoxanthum odoratum, Dactylis glomerata	Occasionally very plentiful
Bromus mollis	Very variable, prominent in some seasons
Arrhenatherum avenaceum	
Avena pubescens	
Festuca rubra	

LEGUMINOSAE

Lathyrus pratensis	Very variable in quantity

MISCELLANEOUS

Taraxacum vulgare	Occasionally plentiful
Achillea millefolium	
Plantago lanceolata	

OTHER SPECIES:- Agrostis, Avena flavescens, Holcus, Lolium, Poa pratensis, P.trivialis; Lotus, Trifolium pratense, T.repens; Anthriscus, Conopodium, Leontodon, Ranunculus spp. Rumex, Tragopogon (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Slightly reduced soon after 1877, but has since remained constant, except for seasonal fluctuations.

Number of Species. Reduced particularly in the MISCELLANEOUS group.

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Number of Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	17	14	17	15	12	11	8	13
L	3	4	4	4	3	1	4	2
M	14	16	15	22	11	9	11	8
Total	34	34	36	41	26	21	22	23

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	78.0	84.4	81.6	82.9	75.6	86.0	68.2	75.3
L	2.2	1.8	7.4	9.4	15.9	1.2	13.0	11.9
M	19.8	13.8	11.0	7.7	8.5	12.8	18.8	12.8

GRAMINEAE Proportion little permanently changed

Alopecurus pratensis, Arrhenatherum avenaceum	Much increased
Anthoxanthum odoratum, Dactylis glomerata	Increased
Agrostis vulgaris, Festuca rubra	Decreased
Avena flavescens, Holcus lanatus, Lolium perenne, Poa trivailis	Almost disappeared

LEGUMINOSAE Very variable

Lathyrus pratensis	Chief species

MISCELLANEOUS Some increase

Plantago lanceolata, Taraxacum vulgare	Increased
Rumex acetosa	Probably decreased

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Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1949
Agrostis vulgaris	12.5	13.6	12.4	14.6	4.8	1.3	2.3
Alopecurus pratensis	0.7	8.3	15.2	12.2	26.5	50.6	22.5
Arrhenatherum avenaceum	0.1	-	0.2	0.1	2.8	3.3	22.0
Avena flavescens	18.4	14.9	18.8	6.7	3.6	1.2	0.6
Dactylis glomerata	1.6	2.6	3.8	4.6	9.7	20.1	9.9
Festuca rubra	11.1	10.4	10.3	16.7	7.6	1.8	6.2
Holcus lanatus	10.5	11.7	5.1	12.6	1.4	1.7	1.1
Lolium perenne	5.6	6.2	3.1	3.6	-	-	0.1
Poa trivialis	6.9	9.0	6.5	4.8	0.1	0.3	0.1
Plantago lanceolata	1.3	0.8	0.1	0.2	2.9	2.5	6.3
Taraxacum vulgare	0.2	<	-	-	1.4	7.3	0.9
Rumex acetosa	5.5	5.6	1.2	2.2	0.1	1.0	0.2

< indicates below 0.05

Effect of Lime

pH. 7.0.

Yield. Reduced till 1939, since when it has increased. Tendency to lodge lessened.

Number of Species. No constant effect.

Composition of the herbage.

GRAMINEAE Decreased except Avena pubescens and Festuca rubra.

LEGUMINOSAE Decreased.

MISCELLANEOUS Little consistent change.

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1949	
	U	L	U	L	U	L
Agrostis vulgaris	4.8	0.2	1.3	0.2	2.3	0.2
Alopecurus pratensis	26.0	25.5	50.5	35.9	22.5	10.9
Anthoxanthum odoratum	2.8	0.1	2.0	<	4.2	0.2
Avena pubescens	5.0	13.8	2.8	17.6	5.8	15.3
Bromus mollis	7.8	3.0	<	<	0.2	0.6
Dactylis glomerata	9.7	9.5	20.1	18.9	9.9	13.4
Festuca rubra	7.8	30.9	1.8	11.4	6.2	14.4
Holcus lanatus	1.5	0.6	1.7	0.2	1.1	-
Poa trivialis	0.1	1.6	0.3	0.4	0.1	0.4
Lathyrus pratensis	14.4	1.3	1.2	0.7	11.7	8.5
Plantago lanceolata	2.8	0.4	2.5	1.5	6.3	5.3
Taraxacum vulgare	1.4	0.3	7.2	0.1	0.9	3.3

U = Unlimed L = Limed

NITRATE OF SODA (= 86 lb. N per acre) AND MIXED MINERAL MANURE (Plot 14)

Condition of Plot in 1949 (Unlimed)

(a) pH 6.0.

(b) Herbage dark green, very lush, and often lodges badly. Anthriscus sylvestris is conspicuous and Taraxacum vulgare very prevalent in some seasons.

(c) Growth starts very early in spring.

(d) Yield heavy, being higher than that where equal or even greater amounts of nitrogen as sulphate of ammonia are given (Plots 9, 11^1, 11^2).

(e) Ten to eighteen species, with occasional traces of several others.

(f) GRAMINEAE usually forms 90 per cent of the herbage.
LEGUMINOSAE } in small quantity only.
MISCELLANEOUS }

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Main Constituents of the Herbage on Plot 14

GRAMINEAE

Alopecurus pratensis, Arrhenatherum avenaceum	Chief species
Dactylis glomerata	Important
Poa pratensis, Poa trivialis	Usually in fair quantity, some times important
Bromus mollis	Very variable

LEGUMINOSAE

Lathyrus pratensis	Usually the only species

MISCELLANEOUS

Anthriscus sylvestris, Taraxacum vulgare	Chief species
Rumex acetosa, Plantago lanceolata	Quantity small but characteristic

OTHER SPECIES:- (Some of rare occurrence only). Agrostis, Anthoxanthum, Avena flavescens, A.pubescens, Briza, Bromus, Festuca rubra, Holcus; Trifolium repens; Achillea, Agrimonia, Centaurea, Conopodium, Heracleum, Hypochaeris, Leontodon, Pimpinella, Ranunculus spp. (See Tables).

Outline of Principal Changes during the Period 1877-1948

Yield. Little changed.

Number of Species. Reduced, chiefly since 1903.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1935	1948
G	15	14	14	15	13	12	11	10	10
L	3	3	2	1	2	1	1	1	1
M	10	13	14	11	9	6	4	4	5
Total	28	30	30	27	24	19	16	15	16

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Composition of the herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous species

	1862	1867	1872	1877	1903	1914	1919	1935	1940	1948
G	89.5	94.3	92.9	87.8	85.5	92.2	93.0	93.0	96.1	92.4
L	0.1	0.4	1.4	0.8	3.4	4.0	2.4	0.9	0.7	2.1
M	10.4	5.3	5.7	11.4	11.1	3.8	4.6	6.1	3.2	5.5

GRAMINEAE

Alopecurus pratensis Arrhenatherum avenaceum Dactylis glomerata	Increased
Poa trivialis	Much reduced
Poa pratensis	Variable
Festuca rubra	Increased at first, but now practically disappeared
Lolium perenne Holcus lanatus	Disappeared

LEGUMINOSAE

Lathyrus pratensis	Very variable

MISCELLANEOUS

Anthriscus sylvestris	Decreased, especially since 1941
Taraxacum vulgare	Increased considerably
Plantago lanceolata	Increased
Rumex acetosa	Variable

Several unimportant species have disappeared.

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Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1935	1940	1948
Alopecurus pratensis	0.2	3.5	3.7	20.2	28.7	22.6	53.6	61.9	49.1	31.8
Arrhenatherum avenaceum	3.1	-	-	0.3	17.3	40.9	23.4	25.8	30.9	36.2
Avena pubescens	0.9	0.9	0.2	0.5	2.3	3.6	3.7	<	0.1	1.4
Bromus mollis	18.0	17.7	42.1	8.0	23.0	5.2	0.5	1.7	<	0.3
Dactylis glomerata	10.0	7.3	3.3	12.5	0.7	6.2	3.2	2.0	5.7	14.2
Festuca rubra	0.9	1.6	0.2	0.5	2.8	5.9	5.1	0.2	0.1	-
Holcus lanatus	6.6	6.6	3.7	12.8	<	-	-	-	-	-
Lolium perenne	13.8	9.4	5.6	2.6	<	0.1	-	-	-	-
Poa pratensis	1.5	1.1	2.6	4.0	9.2	2.2	0.8	0.7	0.3	4.7
Poa trivialis	22.5	32.9	24.8	21.6	1.0	1.3	1.0	0.6	9.8	2.4
Lathyrus pratensis	0.1	0.4	1.4	0.8	3.3	4.0	2.4	0.9	0.7	2.1
Anthriscus sylvestris	-	1.5	3.9	4.6	9.5	1.0	2.4	4.9	1.3	0.1
Taraxacum vulgare	0.2	0.2	0.2	0.6	0.7	2.0	1.2	0.2	0.7	3.2
Rumex acetosa	6.9	1.1	0.6	4.4	0.6	0.5	1.0	0.9	1.3	0.4

< indicates below 0.05

Effect of Lime

The limed section of Plot 14 is partly shaded by a large tree and both herbage and yield differ in sun and shade areas.

pH. 7.0.

Yield. Slightly reduced by lime, more so in the shade than in the sun.

Number of Species. Hardly affected in recent years. Earlier a tendency to increase in the shade area.

Composition of the herbage. Little regular variation in any of the three groups of plants.

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Effect of Lime on the Percentage of Certain Species

	1935			1940			1948		
	U	L. sun	L. sh.	U	L. sun	L. sh.	U	L. sun	L. sh.
Alopecurus pratensis	61.9	22.3	20.0	49.1	18.5	12.4	31.8	12.1	6.7
Arrhenatherum avenaceum	25.8	38.1	11.0	30.9	52.0	12.1	36.2	45.0	34.7
Dactylis glomerata	2.0	4.5	2.2	5.7	6.0	1.9	14.2	13.6	5.0
Festuca rubra	0.2	9.5	43.2	0.1	5.3	36.6	-	13.3	27.4
Poa pratensis	0.7	4.6	3.2	0.3	1.0	1.6	4.7	2.9	2.9
Lathyrus pratensis	0.9	12.4	4.2	0.7	1.5	15.0	2.0	3.2	3.6
Taraxacum vulgare	0.2	0.2	0.2	0.6	0.9	0.7	3.2	1.1	1.7

U = Unlimed L = Limed

D. AMMONIUM SALTS WITH MIXED MINERAL MANURES (Table 5)

AMMONIUM SALTS (= 86 lb. N per acre) AND MIXED MINERAL MANURE (Plot 9)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.0.

(b) Herbage uneven, luxuriant in parts with some bare patches especially in spring. Colour dark green, comparatively little bottom grass, and hay often stemmy. In 1929 all the herbage on the unlimed half was killed by the severe winter and recolonization during the next two years consisted almost entirely of Holcus lanatus. After 1946 this species decreased rapidly to 51 per cent, but it has since largely regained its dominant position.

The scarcity of MISCELLANEOUS plants brings the plot into sharp contrast with the neighbouring Plots 8, 7, 6.

(c) Growth starts early in spring.

(d) Yield usually high, with large seasonal fluctuations (Figure 10).

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(e) About three to nine species and frequently only one viz. Holcus lanatus.

(f) GRAMINEAE 99 to 100 per cent; 1947 was unusual with 96.4%.

LEGUMINOSAE absent.

MISCELLANEOUS species usually under 1 per cent except in 1947 when they reached 3.6 per cent.

Main Constituents of the Herbage on Plot 9

GRAMINEAE

Holcus lanatus	Since 1930, frequently 100% of herbage
Agrostis vulgaris Anthoxanthum odoratum Arrhenatherum avenaceum Festuca rubra	Relative proportions vary greatly with season

MISCELLANEOUS

Rumex acetosa	The only significant species

OTHER SPECIES (Of rare occurrence only). Alopecurus, Avena flavescens, A. pubescens, Bromus, Dactylis, Lolium, Poa pratensis, P.trivialis; Achillea, Epilobium, Heracleum (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Tendency for reduction at first but since 1929, when the herbage was killed by a severe winter, yields have somewhat increased and become more uniform.

Number of Species. Greatly reduced.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1930	1940	1948
G	13	14	16	13	12	9	8	1	6	5
L	2	2	1	4	1	-	-	-	-	-
M	13	13	13	10	7	5	3	-	-	1
Total	28	29	30	27	20	14	11	1	6	6

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Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1930	1940	1948
G	88.6	77.1	92.2	94.7	95.9	94.7	85.0	100.0	100.0	99.5
L	0.1	0.2	<	0.4	-	-	-	-	-	-
M	11.3	22.8	7.8	4.9	4.1	5.3	15.0	-	-	0.5

GRAMINEAE

Holcus lanatus	Greatly increased, may comprise entire herbage
Agrostis vulgaris	Very variable since 1929
Anthoxanthum odoratum	Increased till 1929 since when almost disappeared
Arrhenatherum avenaceum	

Avena flavescens, A.pubescens, Dactylis glomerata, Lolium perenne, Poa pratensis and P.trivialis have all practically disappeared, but may occur occasionally.

LEGUMINOSAE

Disappeared

MISCELLANEOUS

Rumex acetosa	Very varisble, may have disappeared

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1930	1940	1948
Agrostis vulgaris	12.8	13.4	15.5	12.2	3.8	18.4	12.4	<	5.3	7.8
Anthoxanthum odoratum	1.2	3.6	2.3	2.9	16.2	38.9	5.4	-	0.3	0.4
Arrhenatherum avenaceum	-	2.5	11.4	13.2	43.3	8.6	46.9	-	0.9	0.6
Avena flavescens	9.1	3.8	5.3	0.7	0.2	0.1	-	-	-	-
Avena pubescens	10.2	1.4	0.5	0.1	0.1	-	-	-	-	-
Dactylis glomerata	5.6	4.6	11.9	14.1	5.1	5.0	3.3	-	-	-
Holcus lanatus	12.1	9.8	7.6	10.4	3.9	4.1	12.4	100.0	93.3	90.6
Lolium perenne	4.2	1.0	1.1	0.2	-	-	-	-	-	-
Poa pratensis	10.7	13.0	22.7	18.0	11.7	1.8	0.2	-	-	-
Poa trivialis	8.7	2.1	0.6	0.1	<	-	-	-	-	-
Rumex acetosa	5.4	10.9	4.6	3.6	2.8	4.4	14.8	-	-	-

< indicates below 0.05

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Effect of Lime

pH. 5.0.

Yield. Much increased. Herbage uniform and contrasts sharply with the unlimed half. Tends to lodge.

Number of Species. Increased, especially since 1929.

Effect of Lime on the Percentage of Certain Species

	1914		1919		1930		1940		1948	
	U	L	U	L	U	L	U	L	U	L
Agrostis vulgaris	18.2	2.7	12.4	2.3	-	3.3	5.3	2.6	7.8	4.3
Alopecurus pratensis	1.7	17.7	0.7	25.9	-	57.4	0.1	55.0	-	38.1
Anthoxanthum odoratum	38.5	12.7	5.4	1.1	-	0.8	0.3	2.4	0.4	4.2
Arrhenatherum avenaceum	8.5	38.6	46.8	47.2	-	20.9	0.9	21.9	0.6	14.7
Dactylis glomerata	5.0	6.9	3.3	6.8	-	2.3	-	4.1	-	11.6
Holcus lanatus	4.0	2.2	12.4	0.8	100.0	0.5	93.4	2.1	90.6	2.5
Poa pratensis	1.8	7.5	0.2	5.6	-	7.0	-	2.1	-	9.4
Rumex acetosa	4.4	0.7	14.8	3.5	-	0.1	-	0.3	-	1.1

U = Unlimed L = Limed

Composition of the Herbage.

GRAMINEAE Approach 100 per cent

- Alopecurus pratensis — Much increased
- Arrhenatherum avenaceum, Poa pratensis — Increased
- Holcus lanatus — Much decreased

LEGUMINOSAE Increased

MISCELLANEOUS Increased in some seasons

- Heracleum sphondylium, Taraxacum vulgare — Increased since 1935

Almost every species is affected by liming but the response may vary with season e.g. Arrhenatherum avenaceum.

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AMMONIUM SALTS (= 86 lb. N per acre) AND MIXED MINERAL MANURE WITHOUT POTASH (Plot 10)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.0.

(b) Herbage less luxuriant than on Plot 9, and now differs from it in type.

(c) Growth starts early.

(d) Yield medium, much below that of Plot 9.

(e) About six to sixteen species.

(f) GRAMINEAE usually 98-100 per cent.

LEGUMINOSAE absent.

MISCELLANEOUS species below 2 per cent.

Main Constituents of the Herbage on Plot 10

GRAMINEAE

Agrostis vulgaris, Anthoxanthum odoratum, Holcus lanatus	Chief species
Alopecurus pratensis	Very small amounts
Festuca rubra	Very small amounts till 1948
Arrhenatherum avenaceum	Usually very small amounts, but important in 1945 and 1946

MISCELLANEOUS

Rumex acetosa	Very small amount

OTHER SPECIES (Mostly of very rare occurrence). Avena flavescens, A.pubescens, Dactylis, Poa pratensis, P.trivialis; Achillea, Centaurea, Galium, Heracleum, Hieracium, Leontodon, Luzula, Plantago, Potentilla, Poterium, Scabiosa, Taraxacum, Veronica. (See Tables).

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Outline of Principal Changes during the Period 1877-1948

Yield. Reduced but fluctuating, change first evident in 1909.

Number of Species. Greatly reduced.

Number of Species

	1862	1867	1872	1877	1914	1919	1935	1940	1948
G	16	15	15	15	8	9	8	7	7
L	2	1	2	2	-	-	-	1	-
M	13	11	6	11	4	1	2	-	1
Total	31	27	23	28	12	10	10	8	8

Composition of the Herbage.

The balance between the GRAMINEAE and MISCELLANEOUS species is unchanged except for seasonal fluctuations but the LEGUMINOSAE have practically disappeared.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1935	1940	1948
G	85.5	82.6	94.7	93.4	98.7	92.6	99.9	99.9	99.7
L	0.1	0.1	<	<	-	-	-	<	-
M	14.4	17.3	5.3	6.6	1.3	7.4	0.1	-	0.3

< indicates below 0.05

GRAMINEAE

Anthoxanthum odoratum	Large increase usually maintained
Arrhenatherum avenaceum	Very variable
Alopecurus pratensis	Increase of 1877 maintained until 1929, since when it has become unimportant
Agrostis vulgaris	Reduced at first, but large increase since 1939
Holcus lanatus	Reduced at first, but large increase since 1935
Dactylis glomerata	Reduced

Avena flavescens, A.pubescens, Bromus mollis, Lolium perenne, Poa pratensis and P.trivialis have practically disappeared.

MISCELLANEOUS

Rumex acetosa	The only constant representative; quantity very variable

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Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1935	1940	1948
Agrostis vulgaris	9.4	8.6	14.1	16.3	3.0	4.0	10.3	33.9	51.9
Alopecurus pratensis	2.1	3.0	10.4	15.5	18.6	20.8	0.2	0.1	0.3
Arrhenatherum avenaceum	0.1	11.7	13.2	9.6	4.8	25.9	1.4	0.9	4.1
Anthoxanthum odoratum	1.5	5.3	3.3	5.8	49.4	21.0	21.1	31.5	10.3
Avena flavescens	10.1	2.0	0.8	0.2	-	-	-	-	-
Avena pubescens	10.6	1.6	0.4	0.2	-	-	-	-	-
Bromus mollis	2.5	0.7	1.7	1.6	-	-	-	-	-
Dactylis glomerata	12.5	5.4	3.1	4.9	1.0	1.6	0.1	-	0.3
Holcus lanatus	9.5	8.2	4.4	4.7	1.1	11.6	64.4	31.3	21.6
Lolium perenne	3.0	1.8	0.6	0.2	-	-	-	-	-
Poa pratensis	4.1	14.8	19.6	6.5	0.9	0.3	-	-	-
Poa trivialis	10.2	2.8	1.2	0.5	-	-	0.1	-	-

Effect of Lime

The difference in appearance between limed and unlimed areas is clearly marked. Tendency to lodge increased.

pH. 5.0

Yield. Much increased.

Number of Species. Practically no effect.

Composition of the Herbage.

GRAMINEAE Usually slightly decreased, but seasonal differences.

Alopecurus pratensis, Festuca rubra — Much increased

Anthoxanthum odoratum, Holcus lanatus — Much decreased

LEGUMINOSAE Not affected.

MISCELLANEOUS Slightly increased.

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1935		1948	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	3.0	3.1	4.0	0.5	10.3	1.0	51.9	1.0
Alopecurus pratensis	18.6	46.5	20.8	76.8	0.2	55.2	0.3	28.6
Anthoxanthum odoratum	49.4	15.2	21.0	1.1	21.1	1.9	10.3	1.8
Arrhenatherum avenaceum	4.8	9.2	25.9	8.1	1.4	1.7	5.1	4.1
Festuca rubra	19.0	14.8	6.9	5.2	2.4	33.3	10.2	54.5
Holcus lanatus	1.1	1.5	11.6	0.1	64.4	-	21.6	0.5
Poa pratensis	0.9	4.3	0.3	6.0	-	6.2	-	3.4
Rumex acetosa	1.0	0.2	7.4	0.4	0.1	0.5	0.3	5.0

U = Unlimed L = Limed

AMMONIUM SALTS (= 129 lb. N per acre) AND MIXED MINERAL MANURE
(Plot 11[1])

Condition of Plot in 1949 (Unlimed)

(a) pH 4.0.

(b) Extremely patchy, especially in winter and spring. Herbage consists of large tufts of grass interspersed with extensive bare patches, covered with partially decayed peaty matter. In favourable seasons seedlings of Holcus lanatus quickly spring up on the bare patches. There is practically no bottom grass and the herbage is very coarse and rank, with a tendency to lodge.

(c) Growth starts very early and may be vividly green in January and February, when most other plots are still dormant.

(d) Yield very heavy.

(e) Only four species of any significance, with occasional traces of a few others.

(f) GRAMINEAE form practically all the herbage.
LEGUMINOSAE almost always absent.
MISCELLANEOUS usually below 2 per cent.

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Main Constituents of the Herbage on Plot 11[1]

GRAMINEAE

Holcus lanatus	Dominant species
Arrhenatherum avenaceum	Used to be plentiful in some seasons, now scarce

MISCELLANEOUS

Epilobium angustifolium	Very variable; occasionally important

OTHER SPECIES (Some of rare occurrence only). Agrostis, Alopecurus, Anthoxanthum, Avena pubescens, Dactylis, Festuca rubra, Poa pratensis; Lotus, Trifolium pratense; Leontodon, Ranunculus spp. Rumex (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Reduced but crop heavy in 1932 and 1943.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	15	13	11	11	7	7	6	2
L	1	1	1	-	-	-	1	-
M	12	4	4	4	-	1	2	1
Total	28	18	16	15	7	8	9	3

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
G	89.4	94.1	98.8	97.5	99.8	100.0	98.9	87.8	99.7
L	-	-	-	-	-	-	-	0.2	-
M	10.6	5.9	1.2	2.5	0.2	-	1.1	12.0*	0.3

* The high proportion of Miscellaneous species in 1947 is due to the big influx of Epilobium angustifolium which occurred that year.

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GRAMINEAE.

Holcus lanatus	Much increased
Agrostis vulgaris	Reduced
Alopecurus pratensis	Much reduced

Dactylis glomerata, Festuca rubra, Poa pratensis and P.trivialis seem to have disappeared.

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
Agrostis vulgaris	13.2	19.3	13.6	29.2	1.4	0.5	1.7	4.5	-
Alopecurus pratensis	2.8	13.1	12.4	9.9	28.5	1.2	0.8	1.1	0.1
Dactylis glomerata	24.2	39.3	39.3	17.1	0.2	0.2	0.2	-	-
Festuca rubra	1.5	0.5	0.4	4.2	<	0.1	0.1	0.2	-
Holcus lanatus	9.9	2.9	10.3	20.3	45.6	90.9	64.8	81.1	99.7
Poa pratensis	9.4	12.9	10.4	1.5	0.2	-	-	-	-
Poa trivialis	13.3	0.1	0.1	0.3	-	-	-	-	-

Effect of Lime

pH. 4.5.

Yield. Much increased.

Number of Species. Increased.

Composition of the Herbage.

The contrast between the limed and unlimed areas is greater here than on almost any other plot. The herbage is uniform and there are no bare patches.

GRAMINEAE Proportion little affected.

Alopecurus pratensis	Replaces Holcus lanatus as the dominant species
Arrhenatherum avenaceum	Response varies with season
Dactylis glomerata, Poa pratensis	Increased

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	Per cent
G	22.8 - 74.8
L	8.7 - 40.1
M	10.0 - 48.8

Main Constituents of the Herbage on Plot 7

GRAMINEAE

Festuca rubra Dactylis glomerata	Usually the most abundant species
Agrostis vulgaris Alopecurus pratensis Anthoxanthum odoratum	Frequently important.
Holcus lanatus	Present in fair quantity
Avena pubescens Arrhenatherum avenaceum	Occasionally conspicuous, otherwise insignificant
Bromus mollis	Usually insignificant, but abundant in 1948

LEGUMINOSAE

Lathyrus pratensis	Usually the chief species
Trifolium pratense Lotus corniculatus	Occasionally the chief species

MISCELLANEOUS

Conopodium denudatum Heracleum sphondylium Achillea millefolium Centaurea nigra Plantago lanceolata Rumex acetosa	Vary much with season

OTHER SPECIES:- Avena flavescens, Briza, Festuca pratensis, Lolium, Poa pratensis, P.trivialis; Trifolium repens, Vicia; Carex, Cerastium, Galium, Leontodon, Luzula, Pimpinella, Primula, Ranunculus spp. Scabiosa, Spireae, Stellaria, Taraxacum, Tragopogon, Veronica. (See Tables).

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Outline of Principal Changes during the Period 1877-1948

Yield. Fairly constant except for seasonal fluctuations, with a period of high yields from 1902-1907.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1930	1938	1948
G	18	16	17	17	16	14	12	10	12	13
L	4	4	4	4	4	5	5	4	4	5
M	20	22	20	22	17	14	15	14	11	12
Total	42	42	41	43	37	33	32	28	27	30

Composition of the Herbage. Seasonal effect is very considerable, and the balance of the groups varies from year to year.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1877	1903	1914	1919	1930	1939	1946	1948
G	64.7	74.4	41.7	68.3	52.0	43.5	45.3	28.6	46.6
L	24.7	13.7	33.2	17.0	8.8	35.3	39.7	25.9	19.8
M	10.6	11.9	25.1	14.7	39.2	21.2	15.0	45.5	33.6

GRAMINEAE

Festuca rubra, Dactylis glomerata	Usually dominant
Alopecurus pratensis	Occasionally dominant
Poa trivialis, Avena flavescens	Reduced

LEGUMINOSAE

Lathyrus pratensis	Usually dominant
Trifolium pratense, Lotus corniculatus	Occasionally dominant

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MISCELLANEOUS

Conopodium denudatum
Heracleum sphondylium
Achillea millefolium
Plantago lanceolata
Rumex acetosa

} Occasionally dominant

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1939	1947	1948
Alopecurus pratensis	0.3	0.9	1.2	0.5	4.5	1.7	1.7	1.2	4.5	8.3
Avena flavescens	4.0	4.8	3.7	3.7	6.6	1.8	0.7	0.5	0.8	1.0
Dactylis glomerata	2.6	4.7	1.7	3.7	5.0	10.2	21.6	21.8	20.8	15.7
Festuca rubra	13.7	11.4	14.9	26.6	7.7	31.6	7.2	7.7	4.1	4.6
Poa trivialis	3.8	4.4	2.3	2.1	1.0	0.5	0.4	-	0.2	0.3
Lathyrus pratensis	13.5	6.8	36.7	12.1	22.0	10.7	7.2	28.8	11.4	11.3
Lotus corniculatus	1.3	0.7	0.2	0.1	0.4	0.6	0.5	2.3	0.4	0.5
Trifolium pratense	6.8	4.8	1.1	1.6	6.4	4.7	1.0	4.6	4.3	4.6
Conopodium denudatum	0.9	1.2	0.2	0.3	1.7	0.8	9.5	1.3	4.4	1.4
Heracleum sphondylium	-	0.2	<	0.6	1.9	0.5	4.2	1.3	1.1	1.0
Achillea millefolium	-	-	-	-	8.9	2.5	6.3	2.8	7.6	14.0
Centaurea nigra	<	0.8	0.3	0.1	1.0	6.9	2.6	4.0	7.0	4.3
Plantago lanceolata	0.2	1.1	0.1	0.1	0.1	0.7	1.3	1.6	5.4	6.5

< indicates below 0.05

Effect of Lime

pH. 7.0

Yield. Generally much increased.

Number of Species. No constant effect.

Composition of the Herbage.

GRAMINEAE Proportion increased.

Dactylis glomerata — Unaffected, remains dominant

Alopecurus pratensis
Arrhenatherum avenaceum

} Increased

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Agrostis vulgaris
Anthoxanthum odoratum
Festuca rubra
} Reduced

LEGUMINOSAE No constant effect

MISCELLANEOUS Most species reduced

Effect of Lime on the Percentage of Certain Species

	1914		1919		1936		1940		1947	
	U	L	U	L	U	L	U	L	U	L
Agrostis vulgaris	7.0	4.3	5.4	2.0	6.1	0.5	3.1	0.2	4.7	0.1
Alopecurus pratensis	1.7	9.8	1.7	15.2	0.8	8.4	6.1	22.9	4.5	15.7
Anthoxanthum odoratum	4.2	0.6	3.6	0.5	3.7	0.3	2.6	0.1	6.7	0.3
Avena flavescens	1.9	4.0	0.7	1.0	0.9	2.8	0.6	2.6	0.8	2.1
Avena pubescens	2.6	4.5	2.8	8.8	1.8	4.5	1.8	2.7	1.2	3.9
Bromus mollis	2.1	15.6	0.1	0.6	-	0.8	0.2	7.3	-	0.2
Festuca rubra	31.6	13.3	7.2	5.4	10.0	2.7	6.6	1.2	4.1	1.0
Poa trivialis	0.5	1.9	0.4	1.2	0.1	9.0	0.3	9.3	0.2	2.1
Lathyrus pratensis	10.7	15.9	7.2	19.6	16.0	15.6	8.8	6.4	11.4	5.2
Trifolium pratense	4.7	2.8	1.0	<	9.9	4.5	4.9	2.1	4.3	0.1
Conopodium denudatum	0.8	0.3	9.5	3.7	1.8	0.4	2.0	0.1	4.4	0.1
Heracleum sphondylium	0.5	0.3	4.2	1.6	3.9	5.6	4.8	4.4	1.1	4.6
Achillea millefolium	2.5	0.7	6.3	1.0	2.7	0.9	1.2	0.1	7.6	0.3
Centaurea nigra	6.9	3.5	2.6	1.1	7.7	4.4	3.1	0.1	7.0	1.5
Plantago lanceolata	0.7	0.2	1.3	0.5	3.2	1.1	1.3	0.6	5.4	1.8

U = Unlimed L = Limed

MINERAL MANURE WITHOUT POTASH (Plot 8)

Condition of Plot in 1949 (Unlimed)

(a) pH 5.0.

(b) Herbage shorter and less luxuriant than in the presence of potash (Plot 7); very varied, with much bottom grass; growth patchy, colour usually rather pale.

(c) Growth starts later than Plot 7.

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(d) Yield rather low (Figure 7) and much below that of Plot 7.

(e) Twenty-eight to thirty-six species according to season, number has become more steady since 1935.

(f) The three main groups of plants are all well represented, with a large proportion of Leguminosae. The range as shown by partial separations from 1903-1948 was:-

	Per cent		
G	27.4	-	69.0
L	2.7	-	25.3
M	22.7	-	64.8

Main Constituents of the Herbage on Plot 8

GRAMINEAE

Agrostis vulgaris Arrhenatherum avenaceum Dactylis glomerata Festuca rubra Holcus lanatus Anthoxanthum odoratum	Usually among the most abundant species
Avena flavescens Avena pubescens	Present in fair quantity
Briza media	Small in amount but characteristic

LEGUMINOSAE

Trifolium pratense Lotus corniculatus	Chief species

MISCELLANEOUS

Plantago lanceolata	Chief species
Ranunculus spp. Conopodium denudatum Scabiosa arvensis Achillea millefolium Centaurea nigra Leontodon hispidus Rumex acetosa	Vary in relative abundance

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OTHER SPECIES:- Alopecurus, Bromus, Cynosurus, Lolium, Poa pratensis, P.trivialis; Lathyrus, Trifolium repens; Agrimonia, Ajuga, Carex, Cerastium, Galium, Heracleum, Luzula, Pimpinella, Primula, Prunella, Spireae, Stellaria, Taraxacum, Tragopogon, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1948

Yield. No general reduction but considerable seasonal variation.

Number of Species. Reduced since 1903, but little change after 1914.

Number of Species

	1862	1877	1903	1914	1919	1935	1948
G	17	16	15	15	13	11	14
L	4	4	4	4	4	4	4
M	17	26	23	16	15	17	15
Total	38	46	42	35	32	32	33

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1935	1948
G	71.7	63.0	71.5	81.2	43.5	63.3	46.6	55.6	52.5
L	19.3	8.9	8.0	4.0	18.6	10.7	10.6	11.3	7.3
M	9.0	28.1	20.5	14.8	37.9	26.0	42.8	33.1	40.2

GRAMINEAE Decreased

- Poa trivialis, Lolium perenne — Much reduced
- Cynosurus cristatus, Festuca pratensis — Almost disappeared

LEGUMINOSAE Much increased

- Trifolium pratense — Usually responsible for most of increase
- Lotus corniculatus — Increased

MISCELLANEOUS Increased, but very variable since 1903

- Plantago lanceolata — Responsible for most of increase
- Centaurea nigra, Rumex acetosa — Very variable
- Leontodon hispidus — Considerably increased since 1919

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Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1935	1948
Cynosurus cristatus	0.3	0.2	1.0	1.1	0.5	0.1	-	-	-
Festuca pratensis	2.2	0.4	0.3	0.5	0.1	-	-	-	0.4
Lolium perenne	5.9	2.6	1.9	7.6	0.1	0.4	0.3	-	0.1
Poa trivialis	5.5	3.5	1.6	3.2	0.1	0.2	0.6	-	0.2
Lotus corniculatus	0.2	0.8	3.5	1.2	12.2	1.8	1.3	4.4	3.3
Trifolium pratense	7.7	1.1	0.3	0.4	1.4	5.4	5.0	6.5	2.7
Centaurea nigra	0.2	0.5	0.2	0.8	7.2	9.3	4.8	2.9	2.0
Leontodon hispidus	-	-	-	-	0.9	1.0	0.7	6.1	4.5
Plantago lanceolata	0.7	1.5	0.3	0.3	5.9	8.8	18.5	13.0	15.1
Rumex acetosa	1.9	7.9	2.0	5.8	1.9	0.6	6.9	0.8	2.9

Effect of Lime

pH. 7.0.

Yield. Not much affected for the first few years, but since 1909 it has been reduced.

Number of Species. No constant effect; usually similar to unlimed area.

Composition of the Herbage.

GRAMINEAE — Increased, particularly Avena pubescens and Arrhenatherum avenaceum in certain years.

LEGUMINOSAE — At first decreased, but since 1936 has increased.

MISCELLANEOUS — Decreased.

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1935		1947		1948	
	U	L	U	L	U	L	U	L	U	L
Agrostis vulgaris	7.8	5.3	3.9	2.0	8.8	1.7	4.2	0.9	3.0	1.3
Arrhenatherum avenaceum	3.1	4.0	8.0	18.2	7.7	31.7	12.4	8.3	14.2	14.7
Avena pubescens	5.2	9.4	3.4	12.1	5.8	15.2	1.7	16.7	1.9	11.3
Briza media	1.5	9.4	0.4	2.0	0.4	1.4	0.2	2.4	0.1	0.9
Holcus lanatus	8.0	6.9	11.2	5.2	6.4	5.1	6.5	4.2	7.4	2.1
Lotus corniculatus	1.8	2.1	1.3	1.6	4.4	3.4	1.8	2.1	3.3	5.9
Trifolium pratense	5.4	5.0	5.0	1.5	6.5	4.6	6.5	7.3	2.7	3.5
Scabiosa arvensis*	0.8	1.5	0.8	4.5	2.1	5.8	0.7	4.7	0.9	3.6
Achillea millefolium	2.8	1.3	4.8	2.1	3.6	0.8	4.1	1.1	6.9	4.0
Leontodon hispidus	1.0	0.3	0.7	0.3	6.1	4.1	4.9	3.4	4.4	5.6
Plantago lanceolata	8.8	5.3	18.5	7.7	13.0	7.8	10.0	9.5	15.0	13.1
Rumex acetosa	0.6	0.5	6.9	7.8	0.8	1.1	5.7	2.6	2.9	1.7

U = Unlimed L = Limed

* The increase in Scabiosa arvensis with lime is chiefly evident in the aftermath.

MIXED MINERAL MANURE, AFTER AMMONIUM SALTS 1856-1868 (Plot 6)

Condition of Plot in 1949 (Unlimed)

Closely resembles Plot 7, but proportion of Leguminosae is frequently higher.

pH 5.0.

Outline of Principal Changes during the Period 1877-1949

Yield. Constant, except for seasonal fluctuations.

Number of Species. Probably only affected by season.

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Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1877	1903	1914	1919	1936	1949
G	80.5	80.0	35.6	63.1	57.2	37.5	37.7
L	0.3	6.7	40.8	24.4	11.4	39.4	31.3
M	19.2	13.3	23.6	12.5	31.4	23.1	31.0

GRAMINEAE — Proportion decreased.

- Alopecurus pratensis, Avena pubescens — Increased
- Lolium perenne — Disappeared

LEGUMINOSAE — Much increased.

- Lathyrus pratensis — Responsible for most of increase
- Trifolium pratense — Increased

MISCELLANEOUS — Very variable.

- Centaurea nigra — Increased
- Rumex acetosa — Variable

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1949
Alopecurus pratensis	1.7	<	<	0.1	0.6	1.9	3.0	6.1
Dactylis glomerata	2.1	1.7	1.3	4.1	3.5	27.6	21.2	11.8
Avena pubescens	14.5	0.9	1.8	1.7	7.5	6.5	5.1	3.1
Lolium perenne	4.6	1.4	0.7	2.0	0.1	-	-	-
Trifolium pratense	<	<	<	0.1	5.9	5.2	0.4	5.3
Lathyrus pratensis	0.2	-	1.5	6.6	30.9	17.5	9.9	20.7
Centaurea nigra	-	1.4	1.4	0.4	1.4	6.1	1.8	5.5
Rumex acetosa	12.1	24.3	7.5	7.7	5.2	0.3	10.9	1.5

< indicates below 0.05

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MIXED MINERAL MANURE AFTER NITRATE OF SODA 1858-1875 (Plot 15)

Condition of Plot in 1949 (Unlimed)

(a) PH 5.0.

(b) Herbage varied, compares with that on Plot 7. but seasonal differences not always the same on the two plots. Much bottom grass.

(c) Growth starts later than Plot 7.

(d) Yield medium, average generally below that of Plot 7, but sometimes exceeds it.

(e) Twenty-three to thirty species.

(f) The three groups are well represented, but all are exceptionally variable. The range as shown by the partial separations from 1903-1949 was:-

	Per cent
G	37.8 - 98.5
L	0.0 - 49.9
M	1.5 - 36.5

Main Constituents of the Herbage on Plot 15

GRAMINEAE

Agrostis vulgaris Alopecurus pratensis Dactylis glomerata Festuca rubra	The most abundant species, but precedence varies with season
Anthoxanthum odoratum Arrhenatherum avenaceum Avena pubescens Holcus lanatus	Usually present

LEGUMINOSAE

Lathyrus pratensis	Sometimes plentiful
Trifolium pratense	Usually in small quantity

MISCELLANEOUS

Conopodium denudatum Achillea millefolium Plantago lanceolata Rumex acetosa	The most abundant species, but quantity varies with season

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OTHER SPECIES:- Avena flavescens, Bromus, Lolium, Poa pratensis, P.trivialis; Lotus, Trifolium repens; Centaurea, Galium, Cerastium, Luzula, Pimpinella, Ranunculus spp. Stellaria, Tragopogon (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Reduced after the manuring changed from nitrate of soda to minerals in 1876. A period of high yields followed from 1897-1908, but since then depression has again set in.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1931	1947	1949
G	17	16	16	17	16	14	12	12	10	10
L	4	4	3	4	5	4	2	4	4	4
M	18	19	19	24	15	12	11	12	9	9
Total	39	39	39	43	36	30	25	28	23	23

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1931	1947	1949
G	78.3	80.0	78.8	83.5	50.1	59.4	69.3	80.2	61.9	42.2
L	0.3	0.5	0.1	1.8	29.0	33.1	5.4	7.7	14.1	27.8
M	21.4	19.5	21.1	14.7	20.9	7.5	25.3	12.1	24.0	30.0

GRAMINEAE Proportion reduced in some seasons.

Agrostis vulgaris, Arrhenatherum avenaceum	Increased in some seasons
Alopecurus pratensis	Increased until 1919, then somewhat decreased
Dactylis glomerata	Increased
Poa trivialis	Decreased
Lolium perenne	Much reduced since 1919
Briza media, Cynosurus cristatus	Disappeared

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LEGUMINOSAE Increased in some seasons

Lathyrus pratensis	Chief species to account for increase
Trifolium pratense, Trifolium repens	Some increase

MISCELLANEOUS Little changed, but decreased in a few seasons

Achillea millefolium	Increased, particularly in some seasons
Plantago lanceolata, Rumex acetosa, Conopodium denudatum	Little changed, variable

Ajuga, Anthriscus, Heracleum and Veronica are among other species which were present in small quantity before 1919 but have now disappeared.

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1933	1949
Agrostis vulgaris	7.7	6.9	7.7	12.9	3.0	12.0	11.3	16.8	2.8
Alopecurus pratensis	6.9	6.0	2.5	7.2	10.2	13.8	30.1	10.6	18.6
Arrhenatherum avenaceum	0.1	-	-	-	0.2	0.5	1.5	10.8	0.6
Briza media	0.1	-	0.2	0.3	0.2	-	-	-	-
Cynosurus cristatus	0.1	-	-	0.1	-	-	-	-	-
Dactylis glomerata	2.1	0.2	0.1	0.4	0.5	2.4	4.9	12.3	8.4
Lolium perenne	7.5	3.2	4.4	7.3	-	-	-	0.2	-
Poa trivialis	6.5	23.7	8.0	6.1	1.2	0.4	0.2	0.1	-
Lathyrus pratensis	-	-	-	1.5	16.3	28.0	5.3	7.7	22.3
Trifolium pratense	0.2	-	-	0.3	5.8	2.6	0.1	0.5	1.8
Trifolium repens	-	0.1	0.1	-	6.7	2.4	-	0.9	2.8
Conopodium denudatum	0.6	0.2	0.4	0.8	1.1	0.2	3.6	1.5	1.1
Achillea millefolium	2.5	1.1	2.6	0.6	10. 0	4.3	5.3	1.5	10.0
Plantago lanceolata	6.9	4.7	0.3	0.6	0.2	0.3	3.7	4.4	9.7
Rumex acetosa	6.6	7.3	2.1	5.8	1.6	0.2	7.3	2.3	0.8

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Effect of Lime

pH. 6.5.

Yield. Usually reduced till 1935 since when it has often increased.

Number of Species. No effect.

Composition of the Herbage. Liming did not begin until 1919, and no botanical separation was made before 1921. Little consistent effect is evident on any of the three main groups, but differences in the composition of the herbage are considerable. Avena pubescens is usually encouraged, while Agrostis vulgaris and Anthoxanthum odoratum are discouraged by liming. Lathyrus pratensis, Trifolium pratense and T.repens are all increased by lime in some seasons. Achillea millefolium is much reduced in the presence of lime, while Heracleum sphondylium is favoured by it.

Effect of Lime on the Percentage of Certain Species

	1931		1933		1949	
	U	L	U	L	U	L
Agrostis vulgaris	20.5	2.2	16.8	3.6	2.8	0.5
Alopecurus pratensis	18.3	28.7	10.6	8.9	18.6	6.8
Anthoxanthum odoratum	4.9	0.6	8.2	0.8	1.7	0.3
Arrhenatherum avenaceum	5.8	5.9	10.8	8.0	0.6	13.9
Avena pubescens	3.2	12.6	4.2	12.6	1.1	12.6
Lathyrus pratensis	4.7	3.8	7.8	13.8	223	13.4
Trifolium pratense	0.1	0.5	0.5	6.0	1.7	2.8
Trifolium repens	2.8	1.6	0.9	6.6	2.8	16.5
Heracleum sphondylium	-	1.3	-	1.4	-	3.2
Achillea millefolium	7.7	3.3	1.5	0.8	10.0	1.2
Plantago lanceolata	1.9	5.5	4.4	10.0	9.7	9.6

U = Unlimed L = Limed

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SUPERPHOSPHATE AND SULPHATE OF POTASH, AFTER AMMONIUM SALTS

1856-1897 (Plot 5^2)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.5.

(b) Herbage very patchy and uneven in height. Dactylis glomerata clumps characteristic. Better growth than on Plot 5^1.

(c) Growth starts late in spring.

(d) Yield medium; considerably higher than Plot 5^1 (Figure 5).

(e) Nineteen to twenty-seven species.

(f) Herbage well mixed, but the relative proportions of the three main groups vary widely. The range from 1903-1949 was:-

	Per cent
G	44.6 - 88.7
L	2.2 - 35.5
M	7.7 - 39.9

Main Constituents of the Herbage on Plot 5^2

GRAMINEAE

Festuca rubra	Chief species, abundant
Agrostis vulgaris, Alopecurus pratensis, Anthoxanthum odoratum, Poa pratensis	Well represented but vary in relative abundance
Arrhenatherum avenaceum, Avena pubescens, Dactylis glomerata, Holcus lanatus	Quantities small and variable

LEGUMINOSAE

Lathyrus pratensis	Chief species
Lotus corniculatus, Trifolium pratense	Sometimes well represented

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MISCELLANEOUS

Achillea millefolium	Very prevalent in some years
Scabiosa arvensis, Centaurea nigra, Rumex acetosa	Vary much with season
Luzula campestris	Dominant in 1930, but had disappeared by 1947

OTHER SPECIES:- Poa trivialis; Trifolium repens, Vicia; Cerastium, Conopodium, Galium, Heracleum, Hieracium, Hypochaeris, Pimpinella, Plantago, Ranunculus spp. Stellaria, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Reduced during the first fifteen years following the change in manuring in 1898, but since 1912 has tended to increase, and is always higher than that on Plot 5[1].

Number of Species. Reduced after 1867, and have remained fairly constant since 1919. A temporary drop occurred in 1930.

Number of Species

	1862	1867	1872	1877	1914	1919	1930	1947	1949
G	17	15	15	13	11	11	8	10	9
L	4	4	3	2	4	3	3	4	5
M	17	17	13	14	17	17	8	13	12
Total	38	36	31	29	32	31	19	27	26

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1904	1914	1919	1930	1934	1947	1949
G	86.3	71.9	84.7	94.1	88.7	76.3	63.2	46.0	56.0	49.1	44.6
L	0.1	0.3	0.5	0.2	3.2	8.4	4.5	26.6	35.5	11.0	26.5
M	13.6	27.8	14.8	5.7	8.1	15.3	32.3	27.4	8.5	39.9	28.9

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GRAMINEAE Proportion decreased since change in manuring

Alopecurus pratensis	Increased
Poa pratensis	Some increase
Agrostis vulgaris, Festuca rubra	Decreased
Lolium perenne	Disappeared

LEGUMINOSAE Considerably increased

Lathyrus pratensis, Lotus corniculatus	Much increased

MISCELLANEOUS Increased

Centaurea nigra	Responsible for most of increase

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1926	1949
Alopecurus pratensis	0.7	0.5	0.8	0.2	4.0	11.2	12.6	9.1
Poa pratensis	1.1	0.7	0.6	0.2	4.7	6.3	2.2	2.6
Bromus mollis	-	-	-	-	3.0	0.1	-	-
Agrostis vulgaris	24.3	21.0	26.6	29.5	16.7	8.4	20.7	7.1
Festuca rubra	22.0	30.6	46.6	53.3	34.3	19.6	13.7	11.5
Lolium perenne	3.3	1.2	1.0	0.1	-	-	-	-
Lotus corniculatus	0.1	0.3	0.4	0.1	3.9	3.1	1.6	5.2
Lathyrus pratensis	<	<	<	0.1	2.0	1.3	6.7	16.8
Centaurea nigra	<	2.4	2.2	0.5	9.0	3.4	3.2	5.4
Rumex acetosa	9.2	15.9	7.1	2.1	2.5	18.1	3.0	5.7
Luzula campestris	1.1	0.6	0.2	0.1	0.7	4.3	3.3	1.8

< indicates below 0.05

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SUPERPHOSPHATE OF LIME (Plot 4^1)

Condition of Plot in 1949 (Unlimed)

(a) pH 5.5.

(b) Herbage resembles that of unmanured plots in spring, but later becomes more luxuriant.

(c) Growth starts late in spring.

(d) Yield medium (Figure 8).

(e) Twenty-nine to forty-four species. Considerable seasonal fluctuation but tending to decrease.

(f) The three main groups of plants are all well represented, the proportion being very variable. The range as shown by the partial separations from 1903-1949 was:-

	Per cent.
G	32.5 - 67.7
L	2.6 - 17.6
M	28.4 - 54.0

Main Constituents of the Herbage on Plot 4^1

GRAMINEAE

- *Avena pubescens*
- *Festuca rubra*
- *Dactylis glomerata*
- *Holcus lanatus*
- *Anthoxanthum odoratum*

} Chief species; vary in relation abundance

LEGUMINOSAE

- *Trifolium pratense*
- *Lathyrus pratensis*
- *Lotus corniculatus*
- *Trifolium repens*

} Well represented

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MISCELLANEOUS

Plantago lanceolata
Ranunculus spp.
Achillea millefolium
Leontodon hispidus
Rumex acetosa
} Often very plentiful

OTHER SPECIES:- Agrostis, Alopecurus, Arrhenatherum, Festuca pratensis, Lolium, Poa pratensis; Centaurea, Cerastium, Conopodium, Luzula, Pimpinella, Poterium, Stellaria, Taraxacum, Hypochaeris (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Fairly constant, but fell during 1936-45 since when the former level has been nearly regained.

Number of Species. Reduced, but only Miscellaneous species show a marked change.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
G	16	15	16	16	15	14	14	14	15
L	4	4	5	5	4	5	5	4	5
M	24	25	26	22	22	15	13	14	14
Total	44	44	47	43	41	34	32	32	34

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
G	75.0	66.9	67.0	71.8	43.0	57.7	52.8	46.8	46.7
L	2.8	2.8	8.6	5.5	17.6	17.7	2.7	13.5	14.4
M	22.2	30.3	24.4	22.7	39.4	34.6	44.5	39.7	38.9

GRAMINEAE Proportion reduced

Dactylis glomerata — Increased
Agrostis vulgaris
Lolium perenne
Poa trivialis
} Much decreased

LEGUMINOSAE Variable, but on the whole increased

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MISCELLANEOUS Increased

Leontodon hispidus, Plantago lanceolata	Responsible for most of increase
Rumex acetosa	Variable, dominant in 1947

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1949
Agrostis vulgaris	7.2	6.1	13.9	9.9	-	0.9	0.7	2.0
Alopecurus pratensis	1.3	1.8	0.9	1.4	0.3	0.1	0.1	2.2
Avena pubescens	9.4	5.0	4.1	4.0	9.8	9.9	13.9	5.5
Dactylis glomerata	2.3	1.0	0.6	1.4	1.3	4.6	11.3	7.1
Lolium perenne	9.3	5.2	3.1	4.4	-	0.1	0.2	0.3
Poa trivialis	5.2	5.7	3.8	4.7	0.6	0.6	1.4	0.5
Ranunculus spp.	5.9	1.4	4.3	6.1	1.5	0.4	1.6	3.8
Centaurea nigra	0.4	0.4	1.0	0.7	4.8	8.6	7.5	1.7
Leontodon hispidus	0.6	0.6	0.1	0.9	14.7	12.4	2.5	11.0
Plantago lanceolata	5.6	9.7	3.1	3.8	2.5	6.8	17.8	8.5

Effect of Lime

pH. 7.0

Yield. Consistently decreased.

Number of Species. No effect.

Composition of Herbage.

GRAMINEAE	Reduced or little affected.
LEGUMINOSAE	Considerably increased.
MISCELLANEOUS	Reduced or little affected.

A noticeable feature is the number of species that are affected by liming whether beneficially or adversely. The action of lime on Leontodon hispidus and Rumex acetosa varies with season.

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1949	
	U	L	U	L	U	L
Alopecurus pratensis	-	1.3	0.1	1.5	2.2	2.4
Anthoxanthum odoratum	4.0	1.5	3.2	1.8	3.4	1.1
Avena pubescens	9.9	12.7	13.9	19.8	5.5	18.1
Briza media	2.2	3.4	1.3	2.8	0.5	1.8
Dactylis glomerata	4.6	1.8	11.3	6.4	7.1	4.9
Holcus lanatus	8.6	6.4	9.9	6.8	6.7	4.5
Lathyrus pratensis	1.7	11.2	1.6	5.0	3.0	7.3
Lotus corniculatus	1.1	2.1	0.7	3.6	3.7	7.7
Ranunculus spp.	0.4	1.1	1.6	4.5	3.8	2.3
Leontodon hispidus	12.4	6.8	2.5	2.3	11.0	6.3
Plantago lanceolata	6.8	4.0	17.8	11.2	8.5	9.7
Rumex acetosa	0.7	0.6	10.2	6.2	5.8	2.1

U = Unlimed L = Limed

C. NITRATE OF SODA WITH AND WITHOUT MINERAL MANURES (Table 4).

NITRATE OF SODA (= 43 lb. N per acre) (Plot 17).

Condition of Plot in 1949 (Unlimed)

(a) pH 6.0.

(b) Herbage very mixed, uneven, of a dark blackish green colour; not so tall as on Plot 16.

(c) Growth starts early, but progresses slowly.

(d) Yield medium, rather less variable than on many other plots.

(e) Usually about thirty species with an occasional trace of several others.

(f) GRAMINEAE rather more than twice as plentiful as MISCELLANEOUS species.
LEGUMINOSAE scarce.
A large number of species occur in very small quantity.

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1947		1949	
	U	L	U	L	U	L	U	L
Alopecurus pratensis	1.2	27.2	0.8	63.9	1.1	78.9	0.1	82.0
Anthoxanthum odoratum	0.1	2.1	-	0.1	0.8	0.6	-	<
Arrhenatherum avenaceum	6.6	27.0	31.3	15.5	0.3	2.0	-	2.3
Dactylis glomerata	0.2	4.9	0.2	5.7	-	2.5	-	4.9
Holcus lanatus	90.9	32.0	64.8	11.6	81.1	7.6	99.6	3.5
Poa pratensis	-	2.7	-	2.0	-	4.5	-	5.2

U = Unlimed L = Limed

The percentage of Holcus lanatus on the unlimed area in 1947 would probably have been greater if Epilboium angustifolium had not been so prevalent.

AMMONIUM SALTS (=129 lb. N per acre) AND MIXED MINERAL MANURE WITH SILICATE OF SODA (Plot 11^2)

Condition of Plot in 1949 (Unlimed)

(a) Ph 4.0.

(b) Bare patches rather less extensive than on Plot 11^1, owing to the ameliorating action of the silicate. The latter seems to have decreased Holcus lanatus but increased Agrostis vulgaris and Arrhenatherum avenaceum.

(c) Growth starts very early as on Plot 11^1.

(d) Yield the heaviest of the unlimed plots; generally less variable than that of Plot 11^1.

(e) Eight species, with occasional traces of a few others.

(f) GRAMINEAE form practically all the herbage.
LEGUMINOSAE almost always absent.
MISCELLANEOUS plants usually absent, but occasionally up to 1.5 per cent.

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Main Constituents of the Herbage on Plot 11[2]

GRAMINEAE

Agrostis vulgaris
Arrhenatherum avenaceum
Holcus lanatus

} Relative proportions vary with season

OTHER SPECIES (Mostly of very rare occurrence). Alopecurus, Anthoxanthum, Avena flavescens, A.pubescens, Dactylis, Festuca rubra, Poa pratensis, P.trivialis; Lathyrus, Lotus; Plantago, Ranunculus spp. Rumex (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Reduced, especially since 1904.

Number of Species. Reduced.

Number of Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	14	14	13	11	9	9	7	6
L	-	-	-	-	-	-	-	-
M	7	5	3	5	-	1	1	1
Total	21	19	16	16	9	10	8	7

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1947	1949
G	94.2	95.7	99.3	98.5	100.0	99.6	98.8	99.4
L	-	-	-	-	-	-	-	-
M	5.8	4.3	0.7	1.5	-	0.4	1.2	0.6

GRAMINEAE

Agrostis vulgaris — Much reduced between 1877 and 1914. Temporary increase up to 1947 at expense of Alopecurus pratensis*.

* This increase probably dates from 1929 when most of the herbage was killed by frost, and changes in flora occurred during recolonisation. Precise data are, however, lacking.

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Holcus lanatus	Much increased
Arrhenatherum avenaceum, Alopecurus pratensis	Recently much reduced
Dactylis glomerata, Poa pratensis	Almost disappeared
Festuca rubra	Little affected

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1947	1949
Agrostis vulgaris	18.8	24.2	10.2	17.1	0.5	0.7	44.1	5.3
Alopecurus pratensis	1.5	6.3	22.7	20.1	17.5	29.8	0.8	0.3
Arrhenatherum avenaceum	6.4	4.8	12.7	21.1	20.7	45.7	12.7	0.8
Dactylis glomerata	23.3	38.3	27.2	13.4	0.3	2.8	-	<
Festuca rubra	0.7	2.1	0.3	2.6	<	0.1	0.2	0.1
Holcus lanatus	7.4	4.8	10.6	19.5	59.4	20.4	40.8	92.8
Poa pratensis	5.1	10.4	12.4	4.5	0.7	0.1	0.1	-

< indicates below 0.05

Effect of Lime

pH. 4.5.

Yield. Usually increased but the difference due to lime is much less regular or marked than on Plot 11[1] and yield may occasionally be reduced.

Number of Species. No constant effect.

Composition of the Herbage. Balance between GRAMINEAE, LEGUMINOSAE and MISCELLANEOUS species not affected.

Effect of Lime on the Percentage of Certain Species

	1914		1919		1947		1949	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	0.5	0.2	0.7	-	44.1	0.2	5.3	-
Alopecurus pratensis	17.6	49.7	29.8	76.0	0.8	70.2	0.3	57.6
Arrhenatherum avenaceum	20.8	25.6	45.7	16.3	12.7	11.3	0.8	17.5
Dactylis glomerata	0.3	11.0	2.8	7.3	-	7.8	<	10.3
Holcus lanatus	59.4	6.2	20.4	<	40.8	2.4	92.8	1.6
Poa pratensis	0.7	3.5	0.1	0.2	0.1	6.3	-	10.7

U = Unlimed L = Limed

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The increase in Alopecurus pratensis and the decrease in Holcus lanatus are very marked. Arrhenatherum avenaceum shows a seasonal response to lime similar to that on Plot 11[1].

E. AMMONIUM SALTS ALONE OR WITH INCOMPLETE MINERAL MANURE

(Tables 5 and 6)

AMMONIUM SALTS (= 43 lb. N per acre) ALONE, ALSO WITH FARMYARD MANURE 1856-1863 (Plot 1)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.5.

(b) The herbage is very patchy and areas of bare soil often occur. Later in the season the grass becomes fairly long and very dark green with a tendency to lodge.

(c) Growth starts late.

(d) Yield usually low, occasionally higher than on unmanured plots but may be lower.

(e) About eleven species, with traces of several others.

(f) GRAMINEAE form bulk of herbage.

LEGUMINOSAE absent.

MISCELLANEOUS species up to about 7 per cent, but frequently less.

Main Constituents of the Herbage on Plot 1

GRAMINEAE

Agrostis vulgaris	Chief species
Festuca rubra	Plentiful
Dactylis glomerata	Usually present in small quantities

MISCELLANEOUS

Centaurea nigra, Rumex acetosa	Quantity variable, may be very plentiful
Potentilla reptans	Quantity small but characteristic

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OTHER SPECIES (Mostly of very rare occurrence). Alopecurus, Anthoxanthum, Arrhenatherum, Avena flavescens, A.pubescens, Holcus, Lolium, Poa pratensis P.trivialis; Lathyrus, Lotus, Trifolium pratense, T.repens; Achillea, Anthriscus, Cerastium, Conopodium, Epilobium, Galium, Heracleum, Leontodon, Luzula, Pimpinella, Plantago, Poterium, Ranunculus spp., Taraxacum, Tragopogon, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1948

Yield. Reduced.

Number of Species. Very much reduced.

Number of Species

	1862	1867	1872	1877	1914	1919	1939	1948
G	15	15	18	15	9	10	7	6
L	4	4	3	2	-	-	-	-
M	9	15	15	17	8	5	4	5
Total	28	34	36	34	17	15	11	11

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1939	1948
G	89.0	86.4	82.2	84.0	78.9	86.4	95.3	94.7
L	0.2	1.0	0.3	0.5	-	-	-	-
M	10.8	12.6	17.5	15.5	21.1	13.6	4.7	5.3

GRAMINEAE Increased.

- Agrostis vulgaris, Festuca rubra — Much increased
- Dactylis glomerata — Variable
- Avena pubescens, Poa pratensis — Practically disappeared
- Avena flavescens, Poa trivialis, Bromus mollis, Lolium perenne — Disappeared

LEGUMINOSAE Traces in some years.

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MISCELLANEOUS

Centaurea nigra	Little change, but unusually plentiful in 1914
Rumex acetosa	Variable

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1939	1948
Agrostis vulgaris	0.6	6.5	20.8	23.5	16.0	18.5	52.5	75.4
Avena flavescens	4.0	6.9	6.2	1.4	-	0.1	-	-
Avena pubescens	0.5	1.6	2.8	2.1	0.1	0.2	-	0.2
Bromus mollis	21.9	10.6	4.6	0.8	-	-	-	-
Dactylis glomerata	16.4	6.4	3.3	4.2	9.5	11.3	0.8	3.2
Festuca rubra	0.8	6.2	6.4	10.8	28.1	14.3	40.9	15.6
Lolium perenne	1.4	3.2	1.7	1.7	-	-	-	-
Poa pratensis	1.5	6.6	7.4	1.4	0.6	0.4	0.2	-
Poa trivialis	31.9	22.3	4.4	2.7	-	-	-	-
Centaurea nigra	-	0.2	1.2	0.3	19.2	2.1	0.4	0.8
Rumex acetosa	6.1	5.7	9.3	10.5	0.6	9.9	2.0	2.5

Effect of Lime

The herbage is more even and thicker than when unlimed.

pH. 7.0.

Yield. Generally much increased but effect varies with season.

Number of Species. Considerably increased.

Composition of the Herbage.

GRAMINEAE Reduced.

Agrostis vulgaris	Decreased
Alopecurus pratensis, Avena pubescens, Dactylis glomerata	Increased
Festuca rubra	Effect varies with season

LEGUMINOSAE Slightly increased.

MISCELLANEOUS Considerably increased.

Plantago lanceolata	Accounts for most of increase

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Effect of Lime on the Percentage of Certain Species

	1914		1919		1939		1948	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	16.0	12.3	18.5	8.5	52.5	3.7	75.3	1.5
Alopecurus pratensis	2.0	4.5	1.3	5.9	0.2	4.0	0.1	2.5
Anthoxanthum odoratum	15.0	6.9	17.5	7.9	0.7	2.4	0.2	1.4
Avena pubescens	0.1	5.1	0.2	7.7	-	34.8	0.2	12.1
Dactylis glomerata	9.5	7.0	11.3	23.4	0.8	13.1	3.2	18.3
Festuca rubra	28.1	25.9	14.3	10.6	40.9	15.2	15.6	15.4
Holcus lanatus	7.1	5.5	22.4	10.0	-	3.6	-	5.8
Poa pratensis	0.6	3.9	0.4	1.8	0.2	2.3	-	1.3
Centaurea nigra	19.2	22.2	2.1	4.1	<	4.7	0.7	2.0
Plantago lanceolata	-	-	-	-	-	3.5	-	19.8
Rumex acetosa	0.6	1.0	9.9	11.5	2.0	1.7	2.5	2.1

U = Unlimed L = Limed

< indicates below 0.05

AMMONIUM SALTS (= 86 lb. N per acre) AND SUPERPHOSPHATE OF LIME

(Plot 4^2)

Condition of Plot in 1949 (Unlimed)

(a) pH. 4.0.

(b) Herbage dark green. Tufts of Anthoxanthum odoratum and Festuca rubra with much Agrostis vulgaris at the base are characteristic. Bare patches of undecomposed peaty matter common.

(c) Growth starts early in spring.

(d) Yield medium to low, but very variable (Figure 11).

(e) Eleven to eighteen species with occasional traces of several others till 1919, but only seven present in 1947.

(f) GRAMINEAE form bulk of herbage.

LEGUMINOSAE absent.

MISCELLANEOUS species in fair quantity in some seasons, very scanty in others.

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Main Constituents of the Herbage on Plot 4[2]

GRAMINEAE

Agrostis vulgaris, Festuca rubra	Chief species
Anthoxanthum odoratum	Varies with season
Holcus lanatus	Sometimes fairly plentiful

MISCELLANEOUS

Rumex acetosa	Very variable

OTHER SPECIES (Mostly of rare occurrence). Alopecurus, Avena pubescens, Dactylis, Poa pratensis, P.trivialis; Lathyrus; Achillea, Conopodium, Epilobium, Leontodon (See Tables).

Outline of Principal Changes during the Period 1877-1949

Yield. Considerably reduced, particularly since 1911.

Number of Species. Reduced in all three groups of plants independent of season.

Number of Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
G	14	14	15	13	9	9	8	5	5
L	3	3	2	2	1	-	-	-	-
M	18	13	11	11	5	6	2	2	1
Total	35	30	28	26	15	15	10	7	6

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
G	80.3	86.1	88.7	94.6	93.6	98.7	92.0	97.9	99.8
L	0.1	<	<	<	<	-	-	-	-
M	19.6	13.8	11.3	5.3	6.4	1.3	8.0	2.1	0.2

< indicates below 0.05

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GRAMINEAE

Anthoxanthum odoratum	Increased, very considerably in some seasons
Agrostis vulgaris	Reduced between 1877 and 1919, but had increased again by 1947
Holcus lanatus	Apparently increasing
Festuca rubra	Decreased in some seasons
Lolium perenne, Poa trivialis	Disappeared

LEGUMINOSAE Disappeared.

MISCELLANEOUS

Rumex acetosa	Now the chief species but quantity small and very variable

Changes in the Percentage of Certain Species

	1862	1867	1872	1877	1903	1914	1919	1947	1949
Agrostis vulgaris	19.4	14.0	20.6	24.4	2.0	12.9	4.3	68.8	36.2
Anthoxanthum odoratum	2.2	5.5	1.5	2.4	23.4	7.7	34.1	14.5	10.0
Festuca rubra	6.8	26.1	49.3	55.2	53.6	73.0	47.9	9.6	35.3
Holcus lanatus	16.2	10.5	2.0	6.0	1.1	<	0.3	4.8	17.5
Lolium perenne	6.5	1.4	0.7	0.2	-	-	-	-	-
Poa trivialis	8.1	2.2	2.1	0.3	0.2	-	-	-	-
Rumex acetosa	13.4	8.4	6.9	3.1	0.5	0.5	8.0	1.3	0.2

< indicates below 0.05

Effect of Lime

Herbage greatly improved. Grass tall, thick and less tussocky, though inclined to be rank. Starts into growth much earlier than unlimed area.

pH. 5.5.

Yield. Much increased.

Number of Species. No constant effect until 1919, but much increased by 1947.

Composition of the Herbage.

The GRAMINEAE may be considerably reduced on the limed area in some seasons by an influx of MISCELLANEOUS species. In 1947, for example, the GRAMINEAE comprised

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98 per cent and MISCELLANEOUS species 2 per cent of the herbage on the unlimed area, whereas with lime the GRAMINEAE amounted to only 77 per cent, 21 per cent of the remaining herbage consisting of Rumex acetosa.

Alopecurus pratensis is much increased and Agrostis vulgaris much decreased by lime, but the effect on Anthoxanthum odoratum/Festuca rubra and Rumex acetosa varies with season.

Effect of Lime on the Percentage of Certain Species

	1914		1919		1947		1949	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	12.9	1.0	4.2	0.3	68.8	1.8	36.2	2.2
Alopecurus pratensis	2.5	42.2	1.4	76.1	0.2	32.5	0.7	24.3
Anthoxanthum odoratum	7.7	7.6	34.0	1.1	14.5	4.6	10.0	1.2
Festuca rubra	73.0	35.1	47.9	7.7	9.6	29.8	35.3	57.4
Poa pratensis	1.2	12.6	0.4	12.8	-	5.3	-	6.3
Rumex acetosa	0.5	0.5	8.0	1.6	1.3	20.6	0.2	3.9

U = Unlimed L = Limed

AMMONIUM SALTS (= 86 lb. N per acre) AND MIXED MINERAL MANURE WITHOUT SUPERPHOSPHATE, AFTER MINERALS AND AMMONIUM SALTS SUPPLYING THE CONSTITUENTS OF 1 TON OF HAY, 1865-1904 (Plot 18)

Condition of Plot in 1949 (Unlimed)

(a) pH not determined in 1945. (4.0 in 1957).

(b) Herbage dark green in summer; growth patchy with much bare ground; brown in winter with dead Agrostis vulgaris and Festuca rubra.

(c) Growth starts fairly early, but young green is masked by dead grass.

(d) Yield usually medium, but frequently low especially in later years.

(e) Seven to nineteen species with occasional traces of others.

(f) GRAMINEAE usually form bulk of herbage.

LEGUMINOSAE absent.

MISCELLANEOUS species, chiefly Rumex acetosa, may be up to 20 per cent in some seasons.

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Main Constituents of the Herbage on Plot 18

GRAMINEAE

Agrostis vulgaris	Chief species
Dactylis glomerata	Formerly the chief species, now unimportant
Festuca rubra	Plentiful in some seasons
Alopecurus pratensis, Anthoxanthum odoratum, Arrhenatherum avenaceum, Holcus lanatus	All much less plentiful than the above but quantity varies with season

MISCELLANEOUS

Rumex acetosa	Chief species, but quantity variable
Centaurea nigra	Frequently absent, but may be important e.g. 1938

OTHER SPECIES (Mostly of very rare occurrence). Avena flavescens, Bromus, Poa annua, P.pratensis, P.trivialis; Lotus, Trifolium pratense, T.repens; Achillea, Cerastium, Conopodium, Epilobium, Heracleum, Leontodon, Luzula, Pimpinella, Plantago, Prunella, Ranunculus spp., Stellaria, Taraxacum, Tragopogon (See Tables).

Outline of Principal Changes during the Period 1877-1948

Yield. Fairly constant till the change in manuring in 1905. Reduced since 1908 though seasonal fluctuations are large.

Number of Species. Considerably reduced. Data regarding the effect of the manurial change are unfortunately lacking.

Number of Species

	1867	1872	1877	1914	1919	1928	1946	1948
G	15	18	14	10	10	10	6	6
L	4	4	4	1	-	-	-	-
M	21	22	21	5	5	6	2	3
Total	40	44	39	16	15	16	8	9

Composition of the Herbage.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1872	1877	1914	1919	1928	1946	1948
G	55.5	80.8	84.2	93.3	68.9	96.3	93.7	88.5
L	5.0	3.6	2.0	0.1	-	-	-	-
M	39.5	15.6	13.8	6.7	31.1	3.7	6.3	11.5

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GRAMINEAE

Agrostis vulgaris	Much increased
Dactylis glomerata	Much increased at first, but practically disappeared by 1943
Alopecurus pratensis	Increased at first, then fairly steady but quantity small
Holcus lanatus	Much reduced
Avena flavescens, Avena pubescens, Lolium perenne, Poa trivialis	Disappeared

LEGUMINOSAE — Practically disappeared

MISCELLANEOUS

Centaurea nigra	Almost disappeared, but prominent in 1938
Rumex acetosa	Very variable, probably increased
Ranunculus spp.	Disappeared

Changes in the Percentage of Certain Species

	1867	1872	1877	1914	1919	1928	1946	1948
Agrostis vulgaris	7.3	22.0	16.4	10.0	17.6	59.0	74.6	76.9
Alopecurus pratensis	1.0	0.9	0.8	3.3	5.1	5.3	1.8	0.1
Avena flavescens	3.4	5.8	3.1	0.1	-	<	-	-
Avena pubescens	2.9	2.6	1.9	0.1	0.1	-	-	-
Dactylis glomerata	1.8	1.2	1.3	37.1	34.0	9.3	-	1.3
Holcus lanatus	12.8	7.3	17.5	0.9	2.4	8.2	0.5	--
Lolium perenne	5.2	3.4	6.5	-	-	-	-	-
Poa trivialis	4.8	2.9	2.8	-	-	<	0.1	-
Ranuculus app.	5.7	3.1	2.6	-	-	-	-	-
Centaurea nigra	0.8	0.8	0.9	4.5	1.9	<	-	-
Rumex acetosa	24.3	2.0	4.7	1.1	24.6	3.2	6.2	11.2

< indicates below 0.05

Effect of Lime

In 1920 the plot was divided into three sections, one of which remained unlimed, while the other two received light (3,951 lb. per acre) and heavy (6,788 lb. per acre) dressings of ground lime respectively every four years. These quantities were originally based on the lime requirement of the soil as shown by its pH value (light dressing, LL) and the Hutchinson-Maclennan method (heavy

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dressing, HL). A complete change in the herbage resulted with both levels of lime, the appearance of large quantities of Taraxacum vulgare being the chief feature.

pH. Not determined in 1945. (LL = 7.5; HL = 8.0 in 1957).

Yield. Much increased, especially by the heavy dressing.

Number of Species. Increased.

Number of Species

	1928			1946			1948		
	U	LL	HL	U	LL	HL	U	LL	HL
G	10	11	10	6	13	13	6	14	11
L	-	-	1	-	3	2	-	1	2
M	6	5	6	2	11	9	3	11	6
Total	16	16	17	8	27	24	9	26	19

Composition of the Herbage.

GRAMINEAE

Agrostis vulgaris	Much decreased
Arrhenatherum avenaceum, Dactylis glomerata	Much increased

LEGUMINOSAE Slightly increased

MISCELLANEOUS Much increased

Taraxacum vulgare	Responsible for most of increase
Plantago lanceolata	Increased
Centaurea nigra	Increased in some seasons
Rumex acetosa	Decreased

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Effect of Lime on the Percentage of Certain Species

	1921			1928			1946			1948		
	U	LL	HL	U	LL	HL	U	LL	HL	U	LL	HL
Agrostis vulgaris	50.9	41.2	42.5	59.0	17.5	4.8	74.6	2.0	1.4	76.9	3.4	1.2
Arrhenatherum avenaceum	0.8	2.0	1.7	0.4	2.9	18.1	-	10.1	10.3	0.5	24.6	25.0
Dactylis glomerata	12.0	21.8	12.9	9.3	21.1	37.7	-	12.5	36.5	1.3	35.0	48.3
Festuca rubra	11.4	6.0	7.5	6.2	2.8	3.1	12.5	9.8	5.1	8.9	6.8	2.2
Lathyrus pratensis	-	-	-	-	-	0.2	-	0.1	1.4	-	-	0.5
Trifolium pratense	-	-	-	-	-	-	-	0.4	<	-	0.1	0.1
Centaurea nigra	1.7	2.3	1.8	<	<	0.2	-	10.3	0.9	-	3.5	-
Heracleum sphondylium	0.3	-	0.5	0.1	-	3.1	-	1.5	2.4	-	0.6	1.6
Plantago lanceolata	-	-	-	-	-	-	0.1	17.3	4.5	-	3.8	1.0
Taraxacum vulgare	-	-	-	-	<	0.2	-	22.6	23.4	0.2	8.9	10.8
Rumex acetosa	6.3	11.2	14.1	3.2	2.4	1.0	6.2	0.5	0.9	11.2	0.2	0.4

U = Unlimed; LL = Light Lime; HL = Heavy Lime

< indicates below 0.25

F. ORGANIC MANURES (TABLE 6).

FARMYARD MANURE AND FISH GUANO ALTERNATELY (EACH ONCE IN FOUR YEARS) AFTER CUT WHEAT STRAW, MINERALS AND AMMONIUM SALTS 1856-1897, AND MINERALS AND AMMONIUM SALTS 1898-1904 (Plot 13)

Condition of Plot in 1949 (Unlimed)

(a) pH 4.6.

(b) Herbage very strong and tall; inclined to lodge; little bottom grass.

(c) Growth starts early in spring, especially in years that farmyard manure is applied.

(d) Yield heavy, but less so since 1938. More uniform than on plots receiving large dressings of artificial manures.

(e) Twenty to twenty-six species with occasional traces of several others.

(f) GRAMINEAE usually from 75-86 per cent.

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(f) contd. LEGUMINOSAE very scarce.

MISCELLANEOUS plants 14-25 per cent.

Main Constituents of the Herbage on Plot 13

GRAMINEAE

Alopecurus pratensis	Chief species
Agrostis vulgaris	Relative abundance varies with season
Anthoxanthum odoratum	
Dactylis glomerata	
Festuca rubra	
Holcus lanatus	

MISCELLANEOUS

Plantago lanceolata	Chief species
Conopodium denudatum	Vary with season
Achillea millefolium	
Rumex acetosa	

OTHER SPECIES:- Arrhenatherum, Avena flavescens, A.pubescens, Bromus, Lolium, Poa pratensis, P.trivialis; Lathyrus, Trifolium pratense; Anthriscus, Ajuga, Centaurea, Cerastium, Galium, Heracleum, Hypochaeris, Leontodon, Luzula, Ranunculus spp., Stellaria, Taraxacum, Tragopogon, Veronica (See Tables).

Outline of Principal Changes during the Period 1877-1948

Yield. Slightly reduced at first, but fell sharply when manuring changed in 1904. Some improvement then occurred till 1938 when further reduction set in.

Number of Species. Little changed but considerable seasonal variation.

Composition of the Herbage. Changes are confined to the GRAMINEAE, and probably date from the alteration in manuring in 1904, but unfortunately no complete botanical analysis was made in 1903.

Percentage of Gramineae, Leguminosae and Miscellaneous Species

	1862	1867	1872	1877	1914	1919	1944	1947	1948
G	90.4	86.3	95.4	92.0	96.6	79.8	85.8	76.6	73.8
L	0.3	0.1	0.3	-	0.5	0.1	0.3	0.7	0.5
M	9.3	13.6	4.3	8.0	3.0	20.1	13.9	22.7	25.7

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GRAMINEAE Proportion reduced

Alopecurus pratensis, Anthoxanthum odoratum	Increased
Arrhenatherum avenaceum	Decreased since 1919
Dactylis glomerata, Poa pratensis	Much reduced
Lolium perenne	Almost disappeared

LEGUMINOSAE No change, quantity small

MISCELLANEOUS Increased, large seasonal fluctuations

Change in the Percentage of Certain Species

	1862	1867	1872	1877	1914	1919	1944	1947	1948
Alopecurus pratensis	3.4	4.5	5.9	6.8	18.5	22.2	56.7	27.6	31.9
Anthoxanthum odoratum	0.7	1.9	0.4	0.3	4.0	5.2	4.8	14.2	6.2
Arrhenatherum avenaceum	0.4	2.5	9.2	11.1	24.4	17.3	0.9	2.1	3.4
Dactylis glomerata	27.9	20.3	43.1	40.8	7.6	9.2	6.7	9.8	9.1
Lolium perenne	2.8	1.2	0.2	0.1	-	-	<	-	-
Poa pratensis	3.9	10.3	11.4	10.1	0.8	1.7	1.3	0.9	0.9

Effect of Lime

pH. 6.5

Yield. Increased in some seasons at first, but from 1910-1943 it was reduced. Since then lime has always improved the yield.

Number of Species. Slight increase in some seasons.

Composition of the Herbage. Balance of the three groups little affected except between 1943-1948 when GRAMINEAE increased and LEGUMINOSAE showed large fluctuations. An increase in LEGUMINOSAE (Lathyrus pratensis and Trifolium pratense) began in 1943 and reached a maximum in 1944 and 1945. In 1946 there was a sudden decrease and a low level has since been maintained.

Percentage of Gramineae, Leguminosae and Miscellaneous Species on the Limed Area of Plot 13, 1944-48.

	1944	1945	1946	1947	1948
G	26.4	36.1	62.5	66.9	67.0
L	41.1	36.9	7.6	7.5	10.6
M	32.5	27.0	29.9	25.6	22.4

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GRAMINEAE

Arrhenatherum avenaceum	Usually much increased
Agrostis vulgaris, Anthoxanthum odoratum	Much reduced
Alopecurus pratensis	Effect varies with season

MISCELLANEOUS

Taraxacum vulgare	Increased
Rumex acetosa	Usually reduced

Effect of Lime on the Percentage of Certain Species

	1914		1919		1947		1948	
	U	L	U	L	U	L	U	L
Agrostis vulgaris	11.8	2.4	11.0	3.3	10.9	-	15.7	0.2
Alopecurus pratensis	18.5	18.3	22.2	35.3	27.6	13.7	31.9	10.4
Anthoxanthum odoratum	4.0	1.5	5.2	2.0	14.2	0.8	6.2	0.3
Arrhenatherum avenaceum	24.4	40.4	17.3	20.6	2.1	14.2	3.4	25.9
Festuca rubra	14.6	10.7	5.5	4.7	4.5	1.0	4.0	0.9
Poa pratensis	0.8	1.2	1.7	3.9	0.9	2.3	0.9	1.8
Taraxacum vulgare	-	0.1	-	0.2	0.9	5.4	1.5	3.2
Rumex acetosa	1.8	0.6	15.1	6.3	2.9	2.5	1.9	0.8

U = Unlimed L = Limed

FARMYARD MANURE EVERY FOURTH YEAR, AFTER NITRATE OF SODA AND MINERALS 1872-1904 (Plot 19)

Condition of Plot in 1949 (Unlimed)

(a) pH not determined in 1945. (5.5 in 1957).

(b) Herbage patchy and very dark green in spring; a good thick stand of moderately tall mixed herbage.

(c) Growth starts early, and grows rapidly in the year that manure is applied.

(d) Yield medium.

(e) Twenty-one to twenty-eight species, with occasional traces of several others.

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Usually absent

All other plots.

LIMED

Scabiosa is a marked feature of the aftermath on Plot 8 (minerals without potash), and also sometimes on Plots 2, 3, 12 (unmanured). It has greatly increased and may on occasions reach a figure as high as 8 or 10 percent, e.g. Plots 3 and 8 respectively in 1936.

SPIREA ULMARIA (Filipendula ulmaria)

May occur locally in fair quantity, but more usually absent.

UNLIMED

QUANTITY

Sometimes appreciable

Plots	7, 8	Minerals with and without potash (3 percent 1938; 2 percent 1940 Plot 7)

LIMED

QUANTITY

Much increased

Plot	8	Minerals without potash

Trace

Plot	1	Ammonium salts
	3	Unmanured

Suppressed

Plot	7	Minerals

STELLARIA GRAMINEA

UNLIMED

Less plentiful than previously, but a small quantity is found on a few plots viz.

Plots	1	Ammonium salts
	2, 3, 12	Unmanured
	7, 8, 15	Minerals with and without potash
	13	F.Y.M. and fish guano alternately

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LIMED

Quantity usually slightly decreased, except occasionally with ammonium salts (Plot 1) or minerals (Plot 7).

TARAXACUM VULGARE (T. officinale).

Flowers and dies down early and is much more abundant where it occurs than the hay analyses indicate. Has increased considerably since 1919, particularly on the limed areas.

UNLIMED

QUANTITY

Small

Plots	14, 16	Minerals and nitrate of soda (up to 3 percent Plot 14)
	13, 19, 20	F.Y.M. with and without other fertilizers

Very small

Plots 3, 6, 7, 8, 15, 17, 18.

Absent

All other plots.

LIMED

QUANTITY

Very much increased

Plot	18	Minerals without super and ammonium salts

Considerably increased

Plots	7, 9	Minerals with and without ammonium salts
	13	F.Y.M. and fish guano alternately

Slightly increased

Plots	1	Ammonium salts
	4^1	Super
	2, 3	Unmanured
	11^1, 11^2	Minerals and heavy ammonium salts
	14, 16	Minerals and nitrate of soda
	19, 20	F.Y.M. with and without minerals and sodium nitrate

Unaffected

Plots 4^2, 8, 10, 15, 17.

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TRAGOPOGON PRATENSIS

Has increased since 1915, especially on the limed areas.

UNLIMED

QUANTITY

Fairly plentiful (up to 3 percent)

Plot	20	F.Y.M., minerals and nitrate of soda

Small (under 1 percent)

Plots	3	Unmanured
	6, 7, 15	Minerals

Traces or Absent

All other plots.

LIMED

QUANTITY

Considerably increased

Plots	2	Unmanured
	7, 9	Minerals with and without ammonium salts
	13, 19	F.Y.M. with and without fish guano
	14, 16	Minerals and nitrate of soda
	18	Minerals without super and ammonium salts

URTICA DIOICA

Rarely present, but has occurred in fair amount as follows:-

UNLIMED

Plots	7	Minerals (0.9 percent 1947; 1.7 percent 1948)
	8	Minerals without potash (0.2 percent 1947).

LIMED

Plot	7	Minerals (trace in 1948).

VERONICA CHAMAEDRYS

Occurs in small quantities and is encouraged by lime.

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UNLIMED

QUANTITY

Very small

Plots 3, 12	Unmanured
4^1	Super
5^1, 5^2	Unmanured or minerals after ammonium salts till 1897
6, 7, 8	Minerals with and without potash
13, 19	F.Y.M. with and without fish guano
17	Nitrate of soda
20	F.Y.M., minerals and nitrate of soda

LIMED

QUANTITY

Increased

Plots 2, 3	Unmanured
7, 8, 15	Minerals with and without potash
19(LL)	F.Y.M. after minerals and nitrate of soda.

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Species present 1940-49 in very small amounts which rarely, or never, appear in the Hay Samples.

SPECIES	PLOTS Unlimed	Limed
Agropyron repens	20	-
Bellis perennis	4^1,17	2
Cardamine pratensis	19	-
Chrysanthemum leucanthemum	3,4^1	2,8
Crepis spp.	-	19
Festuca loliacea	-	9,19
Fritillaria meleagris	17 (considerable)	-
Galium mollugo	-	13
Geum urbanum	-	7,19
Hypericum perforatum	12	-
Lapsana communis	-	18
Ophioglossum vulgatum	17	2
Potentilla sterilis	12,17	-
Potentilla tormentilla (P.erecta)	5^1	-
Prunella vulgaris	-	13
Rosa spp.	12,5^1,5^2	17
Rubus spp.	1,4^2,18	-
Senecio jacobea	2,3	1,2,4^1,4^2,8
Stachys betonica (S.officinale)	12	-
Stellaria media	20	18,20
Thymus serpyllum	12	3
Veronica serpyllifolia	12	-
Viola canina	5^1	-

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Fig.1.

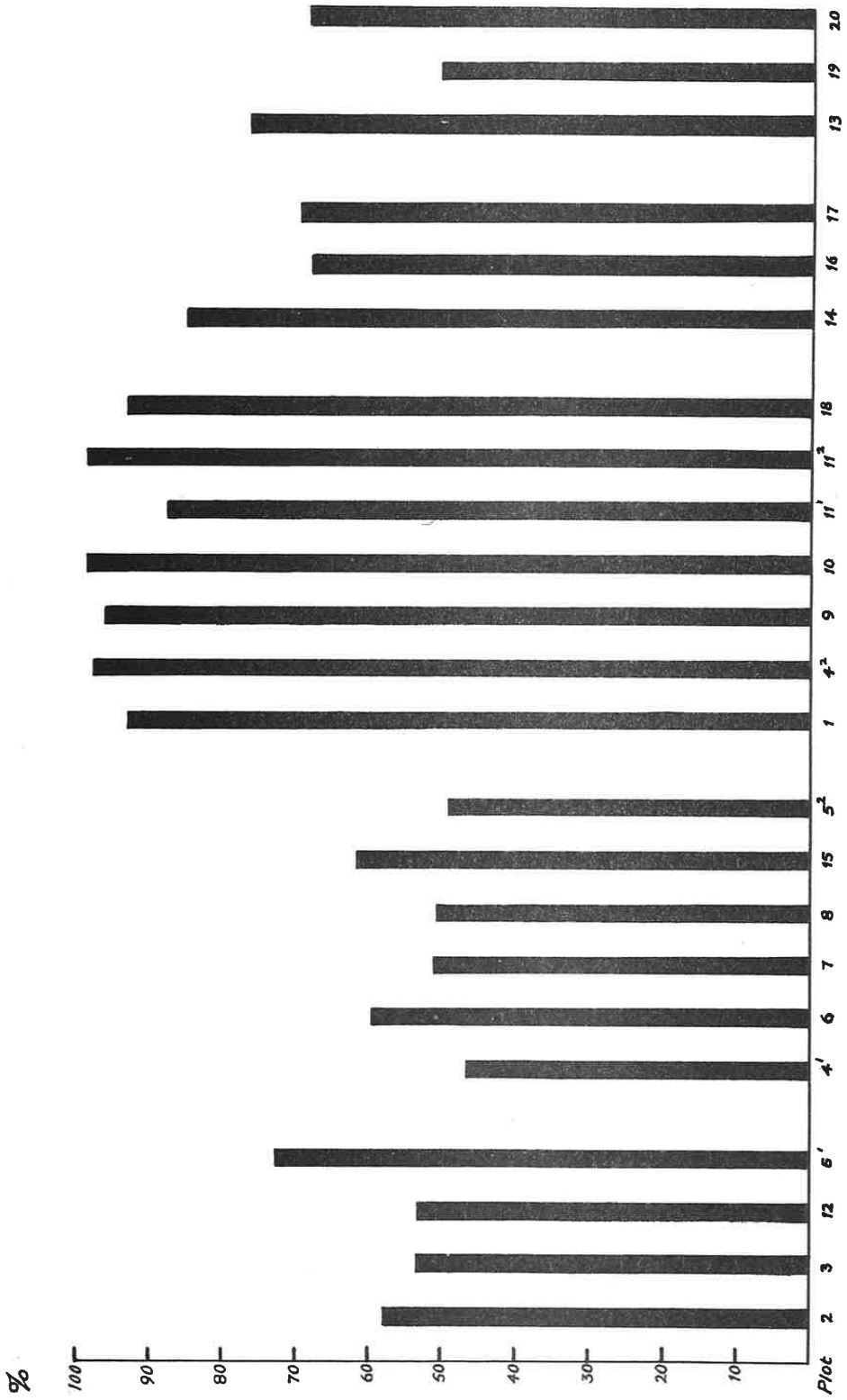

Fig. 1. Percentage of GRAMINEAE in 1947

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Fig.2.

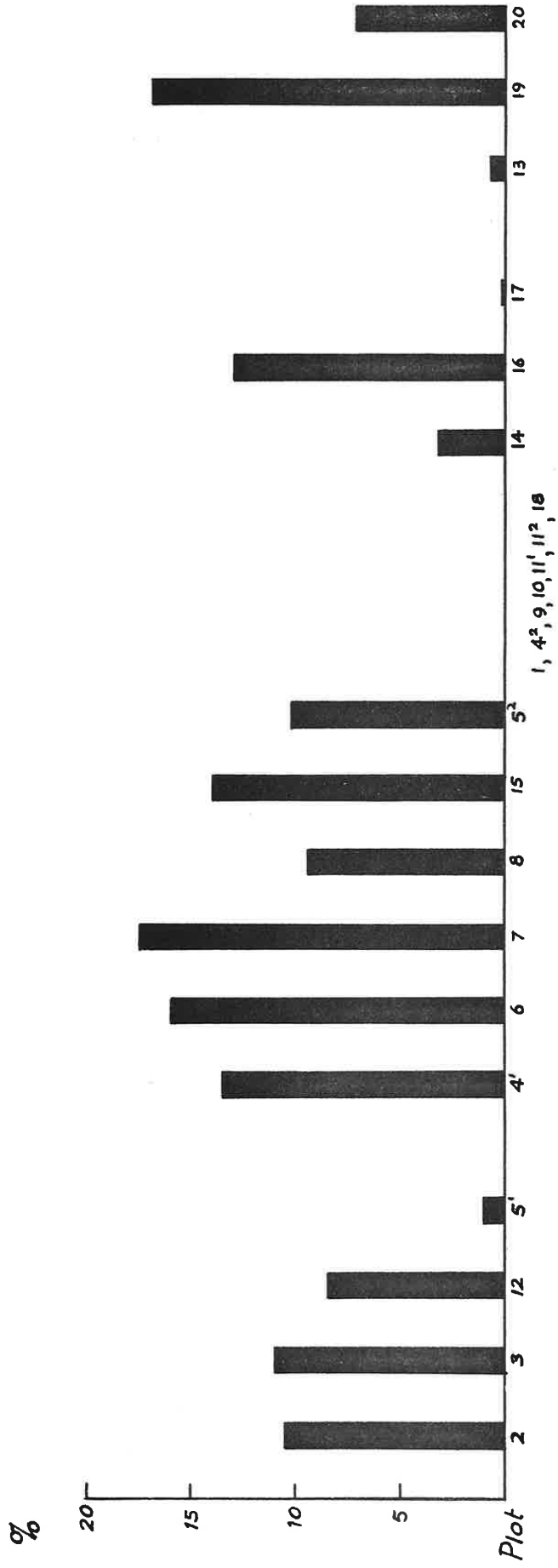

Fig. 2. Percentage of LEGUMINOSAE in 1947

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Fig.3.

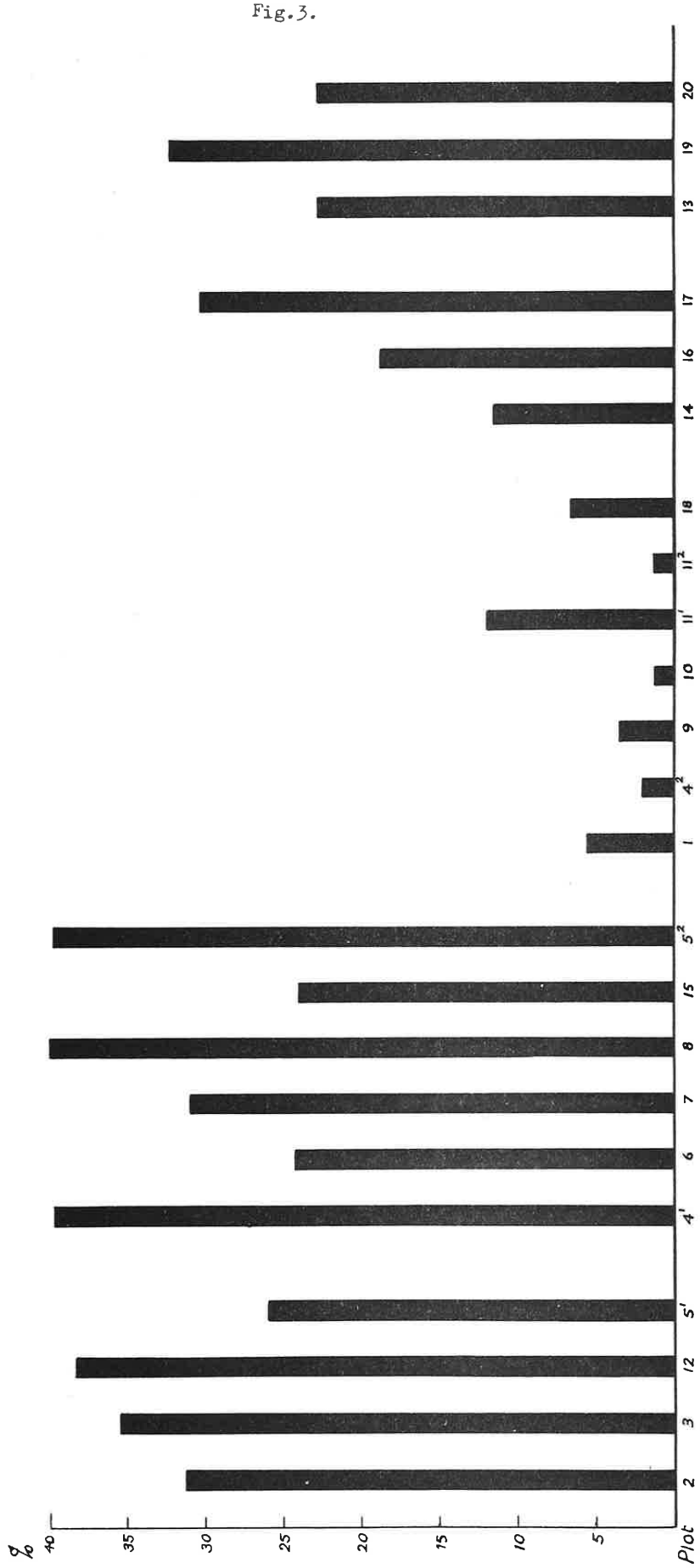

Fig. 3. Percentage of MISCELLANEOUS SPECIES in 1947

NUMBER OF SPECIES, AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES.

NO MANURE.

Manuring	Since 1856.														After F.Y.M., 1856-1863.						After Ammonium Salts, 1856-1897.				
Plot number	3										12			2						5[1]					
Unlimed or Limed	UNLIMED						LIMED					UNLIMED			UNLIMED			LIMED			UNLIMED				
Season	1903	1914	1919	1926	1936	1948	1914	1919	1926	1936	1948	1914	1919	1949	1914	1919	1949	1914	1919	1949	1903	1914	1919	1926	1949
GRAMINEAE																									
Number of species	13	13	12	12	12	11	12	12	14	13	12	14	12	12	13	13	12	13	14	13	15	11	10	10	10
1. Agrostis vulgaris	0.2	13.1	8.4	18.3	14.2	15.6	2.9	1.5	2.2	3.5	0.8	8.5	4.8	3.5	8.2	8.5	10.0	1.9	0.5	0.5	11.7	17.7	4.5	23.6	17.8
2. Aira caespitosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	0.3	0.5	0.7
3. Alopecurus pratensis	0.6	0.3	0.3	1.9	1.2	7.9	1.1	0.6	2.7	2.5	6.2	1.4	1.7	7.6	1.7	1.5	9.6	1.9	1.5	4.1	0.3	0.1	0.7	0.6	0.3
4. Anthoxanthum odoratum	1.3	2.8	7.0	3.1	3.3	0.7	1.1	3.1	0.4	0.2	0.7	2.9	7.7	3.4	4.0	8.8	1.1	1.5	1.7	0.4	12.3	8.5	11.7	12.3	1.1
5. Arrhenatherum avenaceum	0.1	0.1	0.3	0.1	0.1	0.1	0.2	0.5	0.4	0.2	0.1	1.1	4.4	0.8	0.2	1.4	0.4	-	0.3	0.2	0.2	0.4	1.7	4.9	0.5
6. Avena flavescens	0.9	0.6	0.9	0.7	0.6	0.2	1.1	2.8	3.4	4.9	1.2	0.6	0.5	0.2	1.0	1.2	0.2	1.7	3.7	1.5	<	-	-	-	-
7. Avena pubescens	4.8	4.0	4.2	4.3	4.7	2.7	14.2	19.3	18.6	11.9	13.4	2.3	3.6	4.1	4.9	4.7	3.5	18.1	20.3	22.5	<	0.5	0.2	0.3	0.5
8. Brisa media	20.1	4.3	2.0	1.3	3.1	0.2	10.5	9.0	10.9	5.4	1.0	10.3	2.2	6.0	5.6	3.4	1.8	2.7	1.7	3.9	-	-	-	-	-
9. Bromus mollis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	0.2	-	-	-
10. Cynosurus cristatus	0.3	0.1	0.2	0.3	-	-	-	-	0.1	0.1	-	<	-	-	0.3	0.6	-	0.1	0.1	-	<	-	-	-	-
11. Dactylis glomerata	1.1	3.8	8.4	5.2	3.0	4.5	3.1	7.4	8.1	2.9	3.3	4.5	14.4	8.8	3.8	10.7	7.9	4.9	15.1	7.5	1.3	9.5	8.9	8.2	4.1
12. Festuca rubra	17.5	24.7	6.7	7.5	13.0	16.6	23.5	5.1	5.8	7.2	4.1	33.5	10.2	19.4	25.7	5.3	15.5	24.1	4.6	7.4	55.7	47.3	46.7	27.9	55.8
13. Festuca pratensis	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	0.1	-	-	-	-	-	-	-	-
14. Holcus lanatus	5.1	2.9	9.2	6.6	1.6	4.3	4.4	7.7	6.2	2.9	2.5	2.7	4.9	2.8	4.3	10.7	3.3	5.0	9.3	2.0	<	0.2	0.6	1.2	0.7
15. Lolium perenne	-	0.1	-	-	-	-	-	-	0.2	-	-	0.1	0.1	-	0.3	0.5	-	0.1	0.2	0.1	-	-	-	-	-
16. Poa pratensis	0.3	0.1	0.1	0.1	0.1	0.2	1.6	2.0	2.4	3.9	2.1	0.3	0.4	0.2	0.5	0.5	0.1	1.4	1.8	1.0	0.9	1.1	1.4	1.2	0.7
17. Poa trivialis	<	-	-	-	0.1	-	0.1	0.1	0.4	1.5	0.3	0.1	-	-	-	-	-	0.1	0.3	0.3	-	0.2	-	-	-
Stalks	-	-	-	-	-	-	0.7	-	-	-	-	0.9	-	-	0.1	-	-	0.1	-	-	-	0.6	-	-	-
Total	52.3	56.9	47.7	49.4	45.0	53.0	64.5	59.1	61.8	47.1	35.7	69.2	54.9	58.4	60.6	57.8	53.5	63.6	61.1	51.4	82.4	86.3	76.7	80.7	82.2
LEGUMINOSAE																									
Number of Species	4	4	3	4	4	4	3	3	4	4	4	4	3	4	4	3	4	4	4	4	0	3	1	3	1
1. Lathyrus pratensis	2.5	0.5	0.9	1.5	0.7	0.9	2.7	1.2	2.1	0.9	2.0	1.0	2.0	1.1	0.7	0.8	2.2	2.4	2.1	2.4	-	0.2	-	0.1	-
2. Lotus corniculatus	3.6	3.5	1.6	3.0	6.7	3.8	3.5	2.5	4.0	10.3	7.0	4.2	1.7	7.4	3.8	2.7	9.4	2.1	2.5	9.9	-	0.2	0.4	0.5	3.1
3. Trifolium pratense	1.4	2.1	2.1	1.4	2.0	2.5	2.3	1.8	1.5	4.7	6.4	2.1	1.6	4.6	1.0	0.8	3.6	2.8	0.9	4.8	-	0.1	-	0.1	-
4. Trifolium repens	0.1	0.1	-	0.2	0.2	0.3	-	-	0.1	0.3	0.7	<	-	0.2	0.1	-	0.4	0.1	0.1	0.7	-	-	-	-	-
Total	7.6	6.2	4.6	6.1	9.6	7.3	8.5	5.5	7.7	16.2	16.1	7.3	5.3	13.3	5.6	4.3	15.6	7.4	5.6	17.8	0	0.5	0.4	0.7	3.1
MISCELLANEOUS																									
Number of species	26	22	13	22	20	21	18	15	22	16	16	22	15	20	17	15	16	19	14	18	9	17	14	17	11
1 & 2. Ranunculus acris et bulbosum	1.9	0.2	0.4	0.1	0.1	0.1	1.0	2.6	1.7	1.2	3.0	0.1	0.5	0.7	0.3	0.5	0.9	1.4	4.4	2.8	-	0.1	0.3	0.2	-
3. Viola canina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
4. Cerastium vulgatum	1.1	0.2	0.6	0.1	0.3	0.2	0.6	0.8	0.5	0.3	0.2	0.4	0.8	0.1	0.5	0.8	0.2	0.6	1.0	0.3	0.2	0.2	0.4	0.1	-
5. Stellaria graminea	0.9	0.1	-	0.1	0.1	0.2	0.1	0.1	0.1	-	-	0.1	0.3	0.2	0.1	-	0.1	<	0.1	-	-	0.1	0.1	0.2	0.2
6. Linum catharticum	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	0.5	0.6	-	-	-	-	-
7. Agrimonia eupatoria	-	-	-	-	-	-	-	-	0.1	0.2	-	-	-	-	0.1	-	-	0.1	-	-	-	-	-	-	-
8. Alchemilla vulgaris	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	0.3	0.1	-	0.1	-	0.3	0.1	-	0.1	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-
11. Poterium sanguisorba	13.8	1.8	5.8	5.8	9.1	5.6	2.6	3.1	3.6	8.8	11.7	-	-	-	-	-	0.6	-	-	0.1	-	-	-	-	-
12. Spiraea ulmaria	-	-	-	-	-	-	-	-	-	-	0.4	-	-	0.2	-	-	-	-	-	0.3	-	-	-	-	-
14. Conopodium denudatum	0.9	0.5	4.7	5.5	2.5	1.6	0.1	0.6	0.6	0.3	0.1	0.5	10.6	1.3	0.5	4.4	3.2	0.1	0.7	0.2	0.1	0.1	1.3	1.8	2.0
15. Heracleum sphondylium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-
16. Pimpinella saxifraga	0.4	0.6	-	0.7	1.0	0.1	0.7	0.1	0.8	0.8	0.2	0.4	0.1	0.1	0.6	0.1	0.1	0.7	0.2	0.3	-	0.2	0.1	0.1	-
17. Galium verum	<	0.1	-	0.1	0.6	1.1	-	-	-	-	-	0.1	-	0.9	0.2	0.4	1.6	-	-	-	1.4	1.0	2.0	0.3	0.5
18. Scabiosa arvensis	0.8	0.1	-	0.6	4.5	0.9	0.9	1.6	2.7	10.4	2.1	0.5	1.0	1.6	0.2	0.1	0.5	0.1	0.5	1.7	0.5	1.1	0.6	1.4	1.7
19. Achillea millefolium	2.7	0.8	1.6	1.5	2.2	1.3	1.0	1.9	1.2	0.8	1.0	1.4	2.0	1.8	0.9	1.2	1.9	0.7	1.2	1.2	<	0.4	0.7	1.0	1.7
20. Centaurea nigra	4.1	9.1	5.8	2.8	2.9	1.0	10.7	6.2	3.8	3.2	2.0	5.5	3.0	1.8	7.3	4.9	1.3	7.7	4.5	2.5	0.7	7.2	3.9	6.3	2.0
22. Hieracium pilosella	0.2	0.1	-	0.1	-	-	0.1	-	0.1	-	-	<	-	-	-	-	-	0.1	-	-	-	0.2	-	<	-
23. Hypochaeris radicata	<	-	-	-	-	0.1	-	-	-	-	-	0.1	-	0.1	-	-	-	-	-	0.1	-	0.2	-	-	0.4
24. Leontodon hispidus	6.0	17.8	6.9	5.5	13.6	17.9	3.6	1.5	1.7	4.2	12.5	6.5	2.6	10.0	16.5	2.8	12.4	8.5	1.7	8.7	-	-	0.1	0.1	1.7
26. Tuxacum vulgare	<	0.1	-	0.2	0.1	0.1	-	-	0.1	0.1	0.2	-	-	0.2	0.1	-	0.4	-	-	0.5	-	-	-	-	-
27. Tragopogon pratensis	<	0.1	-	0.1	0.3	0.1	-	-	0.1	-	-	<	0.2	0.1	-	0.1	-	<	-	0.2	-	-	-	0.1	-
28. Primula veris	0.1	-	-	0.1	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-
29. Plantago lanceolata	2.0	3.4	19.1	17.4	5.8	6.2	3.6	12.1	9.0	4.9	13.0	5.2	15.1	6.8	5.5	20.6	5.7	7.9	15.4	10.2	-	0.2	0.4	1.7	2.4
30. Veronica chamaedrys	0.6	0.1	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.6	0.2	0.1	-	0.1	0.1	0.1	-	0.1	0.3	0.1	-	0.1	0.1	0.1	-
31. Ajuga reptans	0.1	0.1	0.1	-	-	-	-	-	0.1	-	-	<	0.1	-	-	0.1	-	-	-	-	-	-	-	-	-
32. Prunella vulgaris	0.1	0.1	-	-	0.1	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-
33. Thymus serpyllum	<	-	-	-	0.3	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34. Rumex acetosa	2.2	0.4	2.0	2.4	0.3	2.4	0.6	4.2	3.7	0.6	1.3	0.2	3.0	1.0	0.5	1.5	1.4	0.4	2.8	0.6	14.8	1.4	12.3	4.7	1.0
35. Luzula campestris	0.3	0.4	0.1	0.1	0.6	0.1	0.4	0.2	0.2	0.4	0.2	0.3	0.3	0.6	0.5	0.1	0.4	0.4	0.1	0.3	0.1	0.2	0.8	0.6	1.2
36. Carex praecox	1.2	1.3	0.5	1.0	0.5	-	0.8	0.4	0.4	0.1	-	1.9	0.3	0.4	0.1	-	0.1	0.1	-	-	-	-	-	-	-
Mosses	0.1	-	-	0.1	-	0.1	0.1	-	0.1	-	-	-	-	-	-	-	-	<	-	-	<	-	-	0.1	-
Total	42.0	37.5	47.7	44.6	45.2	30.8	27.1	35.5	30.8	36.9	48.2	23.5	39.9	28.1	34.0	37.7	30.8	29.0	33.4	30.2	17.6	13.1	23.1	18.8	14.8

TABLE 2

Botanical analyses
Plots 3, 12, (2, 5[1])
Unmanured

<= less than 0.05

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TABLE 3.

NUMBER OF SPECIES AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES

Manuring	MIXED MINERAL MANURE = Potassium, Sodium and Magnesium sulphates and Superphosphate of lime																													
	COMPLETE 1856 and since										WITHOUT POTASH after COMPLETE 6 years 1856-1861										COMPLETE after Ammonium salts 13 years, 1856-1868				COMPLETE after Nitrate of Soda 18 years, 1858-1875								
Plot number	7										8										6				15								
Unlimed or Limed	UNLIMED						LIMED					UNLIMED					LIMED				UNLIMED				UNLIMED						LIMED		
Season	1903	1914	1919	1925	1935	1948	1914	1919	1925	1935	1948	1903	1914	1919	1935	1948	1914	1919	1935	1948	1903	1914	1919	1949	1903	1914	1919	1923	1933	1949	1923	1933	1949
GRAMINEAE																																	
Number of species	16	14	12	12	11	13	13	12	13	12	14	15	16	13	11	14	15	13	15	14	15	12	12	11	16	14	12	12	13	10	13	12	12
1. Agrostis vulgaris	3.3	7.0	5.4	11.1	8.3	3.8	4.3	2.0	1.8	0.7	0.4	0.7	7.8	3.9	8.8	3.0	5.3	2.0	1.7	1.3	2.5	7.4	7.6	2.5	3.0	12.1	11.4	13.1	16.8	2.8	13.8	3.6	0.5
2. Aira caespitosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-
3. Alopecurus pratensis	4.5	1.7	1.7	1.1	3.6	8.3	9.8	15.2	8.9	11.3	13.2	0.5	0.4	1.2	0.9	3.6	1.0	1.5	2.7	2.7	0.6	1.9	3.0	6.1	10.2	13.9	30.1	8.5	10.6	18.6	15.5	8.9	6.8
4. Anthoxanthum odoratum	1.4	4.2	3.6	2.3	1.9	3.6	0.6	0.5	0.1	0.8	0.3	1.5	3.9	4.6	3.0	2.4	3.2	1.5	0.4	1.4	1.9	5.0	4.3	2.2	1.7	3.1	3.5	3.8	8.2	1.7	0.2	0.8	0.3
5. Arrhenatherum avenaceum	1.2	1.2	3.1	5.3	0.2	2.4	2.0	2.6	27.3	6.3	11.7	4.2	3.1	8.0	7.5	14.2	4.0	18.2	13.7	14.7	1.9	1.1	3.2	2.2	0.2	0.5	1.5	1.1	10.8	0.6	2.6	8.0	13.9
6. Avena flavescens	6.6	1.9	0.7	0.5	0.4	1.0	4.0	1.0	0.5	3.4	2.5	3.9	2.1	1.2	1.6	0.5	3.2	1.6	5.3	2.1	1.5	0.8	0.2	0.1	5.5	1.7	0.5	0.7	0.8	0.2	0.9	1.9	0.2
7. A.pubescens	4.3	2.6	2.9	1.5	2.5	1.1	4.5	8.8	8.1	8.7	5.2	8.0	5.2	3.4	5.8	1.9	9.4	12.1	15.2	11.3	7.5	6.5	5.1	3.1	4.2	2.0	2.0	2.0	4.2	1.1	3.3	12.5	12.6
8. Brina media	0.1	-	-	0.1	-	-	-	-	-	-	-	5.9	1.5	0.4	0.4	0.1	9.4	2.0	1.4	0.9	0.2	-	-	-	0.2	-	-	-	-	+	-	-	-
9. Bromus mollis	0.6	2.1	0.1	-	-	0.2	15.6	0.6	<	2.9	2.1	-	0.2	-	-	-	-	-	0.1	<	0.2	0.7	0.1	0.2	3.4	2.9	0.1	0.7	0.6	-	2.3	0.2	1.1
10. Cynosurus cristatus	0.1	-	-	-	-	-	-	-	-	-	-	0.5	0.1	-	-	-	0.1	-	0.1	-	-	7.4	-	-	-	-	-	-	-	-	-	-	-
11. Dactylis glomerata	5.0	10.2	21.6	34.1	6.1	15.7	12.5	18.6	22.8	11.2	13.2	1.1	4.0	3.8	2.6	12.6	2.9	5.1	5.3	5.6	3.5	27.6	21.2	11.8	0.5	2.4	5.0	3.3	12.3	8.4	1.6	6.6	4.5
12. Festuca rubra	7.7	31.6	7.1	9.3	20.1	4.6	13.3	5.4	3.2	4.9	1.0	9.5	25.0	6.9	17.6	5.2	21.4	6.0	8.6	2.1	8.8	3.4	6.7	5.3	15.0	13.8	7.4	20.9	9.2	7.0	23.7	13.4	3.7
13. F. pratensis	0.5	0.2	-	-	-	0.3	-	-	-	-	3.3	0.1	-	-	-	0.4	-	-	-	6.9	0.1	1.1	-	-	<	-	-	-	-	-	-	-	-
14. Holcus lanatus	3.1	3.4	4.3	6.5	3.0	2.8	2.5	1.6	0.7	0.2	1.2	6.3	8.0	11.2	6.4	7.4	6.9	5.2	5.1	2.1	2.9	0.1	4.4	2.7	2.3	5.6	-	2.1	4.0	1.4	1.7	1.6	1.6
15. Lolium perenne	0.1	0.2	-	-	-	-	-	-	<	-	0.2	0.1	0.4	0.3	-	0.1	0.1	0.1	0.1	-	<	0.2	6.0	-	<	-	-	-	0.1	-	0.9	-	-
16. Poa pratensis	2.3	1.4	1.2	1.0	1.3	2.6	1.3	1.6	1.1	4.5	1.2	1.0	1.1	1.1	1.1	1.1	1.4	2.0	1.5	1.5	3.7	-	1.3	1.7	2.5	0.4	1.4	1.4	1.1	0.5	1.8	0.3	1.2
17. P. trivialis	1.0	0.5	0.4	<	0.1	0.3	1.9	1.2	0.7	3.7	1.1	0.1	0.2	0.6	-	0.1	0.8	0.7	1.6	0.8	0.2	-	0.1	-	1.2	0.4	0.2	0.2	0.1	-	0.9	0.3	0.4
Stalks	-	0.1	-	-	-	-	0.6	-	-	-	-	-	0.3	-	-	-	0.5	-	-	-	-	-	-	-	-	0.4	-	-	-	-	-	-	-
Total	41.8	68.3	52.1	72.8	47.5	46.7	72.9	59.1	75.2	58.6	56.6	43.4	63.3	46.6	55.7	52.6	69.6	58.0	62.8	53.4	35.6	63.1	57.2	37.7	49.9	59.5	69.5	57.8	78.8	42.2	69.5	58.1	46.8
LEGUMINOSAE																																	
Number of species	4	5	5	4	4	5	4	3	3	3	4	4	4	4	4	4	4	3	3	4	4	5	4	5	5	4	2	3	3	4	3	3	3
1. Lathyrus pratensis	22.0	10.7	7.1	6.1	31.0	11.3	15.9	19.5	1.1	23.6	15.6	3.7	3.4	4.2	0.3	0.6	2.4	5.0	0.7	1.5	30.9	17.5	9.9	20.7	16.3	28.0	5.3	15.1	7.7	22.3	11.2	13.8	13.4
2. Lotus corniculatus	0.4	0.6	0.5	<	2.8	0.5	0.1	<	<	-	<	12.2	1.8	1.3	4.4	3.3	2.1	1.6	3.4	5.9	2.3	1.6	1.1	2.6	<	0.1	-	-	-	0.9	-	-	-
3. Trifolium pratense	6.4	4.7	1.0	0.2	3.1	4.6	2.7	<	<	1.8	3.4	1.4	5.4	5.0	6.5	2.7	5.0	1.5	4.6	3.5	5.9	5.2	0.4	5.3	5.8	2.6	0.1	0.1	0.5	1.7	2.6	6.0	2.8
4. T. repens	4.3	0.9	0.1	-	0.7	3.4	1.0	-	-	6.1	6.3	1.3	0.1	<	0.1	0.7	0.1	-	-	0.1	1.7	0.1	0.1	2.2	6.7	2.4	-	0.3	0.9	2.8	4.6	6.6	16.3
5. T. minus?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	0.2	-	-	-	-	-	-	-	-	-	-	-	-
6. Vicia sepium?	-	0.1	0.1	<	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-
7. Vicia sepium?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	33.1	17.0	8.8	6.5	37.6	19.9	19.7	19.5	1.1	31.5	25.3	18.6	10.7	10.5	11.3	7.3	9.6	8.1	8.7	11.1	40.8	24.4	11.5	31.3	29.0	33.1	5.4	15.4	9.1	27.7	18.4	26.4	32.7
MISCELLANEOUS																																	
Number of species	16	13	14	13	12	12	13	14	11	13	13	23	15	14	17	15	13	15	14	16	20	15	12	13	14	11	10	14	13	9	11	13	12
1 & 2. Ranunculus acris et bulbosus	2.8	0.9	1.9	0.8	0.3	0.7	0.7	4.0	2.1	0.3	1.9	10.9	0.5	2.1	0.8	5.7	0.7	4.6	0.5	2.1	3.7	1.1	4.1	0.8	6.2	0.8	2.7	1.3	0.4	0.4	1.4	0.5	1.8
3. Viola canina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	<	-	-	-	-	-	-	-	-	-	-	-
4. Cerastium vulgatum	0.3	0.2	0.1	-	0.1	-	<	0.1	-	-	<	1.1	0.7	0.5	0.3	0.1	0.7	1.1	0.8	0.4	0.1	0.1	-	-	<	0.1	-	0.1	0.1	-	-	0.1	0.1
5. Stellaria graminea	0.1	-	0.1	<	0.2	-	-	-	-	0.7	-	0.4	0.2	0.1	0.2	0.1	0.1	0.1	0.1	-	<	-	-	-	-	-	-	0.1	-	-	-	-	-
7. Agrimonia eupatoria	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	<	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-
11. Poterium sanguisorba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12. Spiraea ulmaria	0.9	0.7	1.9	1.2	0.1	-	-	-	1.1	-	0.3	0.1	-	-	0.1	-	-	-	-	0.6	-	<	-	-	<	0.1	-	0.1	-	-	-	0.1	-
13. Anthriscus sylvestris	-	-	-	-	-	-	-	-	1.1	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	<	0.1	-	0.1	-	-	-	-	-
14. Conopodium denudatum	1.7	0.8	9.5	2.6	0.2	1.4	0.3	3.7	0.5	0.1	0.1	0.8	0.1	2.9	0.1	0.8	-	0.5	-	0.2	1.3	-	6.7	4.1	1.1	0.2	3.6	2.5	1.5	1.1	2.0	0.7	0.5
15. Heracleum sphondylium	1.3	0.5	4.2	4.2	2.3	1.0	0.3	1.6	12.0	2.9	4.5	-	-	-	0.1	-	-	-	-	-	0.3	0.1	0.3	0.6	-	-	0.3	-	-	-	-	1.4	3.1
16. Pimpinella saxifraga	0.5	-	-	-	-	-	-	<	-	0.1	-	1.0	0.1	0.2	0.6	0.1	0.3	0.1	0.8	0.2	1.3	0.3	0.1	-	0.2	-	-	-	0.1	-	-	-	-
17. Galium verum	-	0.2	0.2	-	-	0.2	-	-	-	-	-	0.5	0.3	0.1	0.4	0.4	0.3	-	0.2	0.1	0.3	-	-	-	-	-	-	0.1	0.1	-	-	-	-	-
18. Scabiosa arvensis	0.1	0.5	0.1	0.3	-	-	0.8	0.6	-	0.1	0.3	2.2	0.8	0.8	2.1	0.9	1.5	4.5	5.7	3.6	0.8	0.8	1.4	1.1	<	-	-	-	-	-	-	-	-
19. Achillea millefolium	8.9	2.5	6.3	1.8	1.8	14.0	0.7	1.0	0.6	0.5	1.0	3.5	2.8	4.8	3.6	6.9	1.5	2.1	0.8	4.0	7.6	3.1	5.0	8.9	10.0	4.3	5.3	1.7	1.5	10.0	1.2	0.9	1.2
20. Centaurea nigra	1.0	6.9	2.5	2.2	5.0	4.3	3.5	1.1	0.8	1.3	0.5	7.2	9.3	4.8	2.9	2.0	9.5	4.5	5.1	2.5	1.3	0.1	1.8	5.5	0.8	1.0	0.6	0.3	0.4	7.6	0.8	0.8	1.4
21. Chrysanthemum leucanthemum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-
22. Hieracium pilosella	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23. Hypochaeris radicata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24. Leontodon hispidus	-	-	-	-	-	-	-	-	-	0.3	-	0.9	1.0	0.7	6.1	4.5	0.5	0.5	4.1	5.6	-	-	-	0.2	-	-	-	-	-	0.3	-	-	-
26. Taraxacum vulgare	-	-	-	-	0.1	0.4	<	0.1	1.4	1.0	1.9	0.1	-	-	0.1	0.1	-	-	0.3	0.1	0.1	<	-	0.2	0.1	0.2	1.3	0.8	0.4	0.1	1.6	0.4	1.9
27. Tragopogon pratensis	1.1	0.2	0.1	<	-	1.1	0.5	1.5	0.1	-	2.6	0.3	-	-	-	-	0.2	0.1	-	0.9	0.3	0.1	0.1	0.3	-	0.1	0.3	0.3	0.1	-	0.1	-	0.3
29. Plantago lanceolata	0.1	0.7	1.3	3.3	3.4	6.3	0.2	0.5	0.2	1.3	4.6	5.9	8.7	18.5	15.0	19.3	5.3	7.7	7.8	13.1	0.1	-	0.1	7.4	0.2	0.3	3.8	13.5	4.4	9.7	4.6	9.7	9.6
30. Veronica chamaedrys	1.5	-	-	<	-	-	<	0.1	<	0.3	0.1	0.7	0.1	0.1	0.4	0.3	-	0.1	0.5	0.2	0.5	0.1	-	-	0.2	-	-	0.1	-	-	0.1	0.1	0.1
31. Ajuga reptans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	0.1	-	-
32. Prunella vulgaris	3.7	0.2	10.6	4.0	0.6	2.2	0.4	7.1	4.8	0.6	0.4	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34. Rumex acetosa	-	-	-	-	-	1.7	-	-	-	-	-	1.9	0.3	6.9	0.7	2.9	0.5	7.8	1.1	1.7	5.2	0.3	10.9	1.3	1.6	0.2	7.4	2.0	2.3	0.8	0.3	0.3	0.6
34(a). Urtica dioica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35. Lasula campestris	0.2	0.2	0.3	0.2	0.9	0.2	<	0.1	-	-	-	0.4	0.4	0.3	0.6	0.3	0.3	0.2	0.2	0.1	0.3	0.2	0.7	0.2	0.6	0.3	0.2	3.6	1.0	0.1	0.3	0.3	0.1
36. Carex praecox	0.4	-	-	-	-	-	-	-	-	-	-	0.2	0.1	-	-	-	-	-	-	-	<	-	-	-	0.1	-	-	-	-	-	-	-	-
37. Ophioglossum vulgatum	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mosses	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	25.2	14.5	39.1	20.6	15.0	33.7	7.4	21.3	23.6	9.7	18.2	38.1	29.6	42.8	33.1	40.2	21.0	33.7	28.3	35.3	25.4	12.3	31.3	30.9	21.1	7.6	25.9	26.7	12.4	30.8	12.6	15.4	20.7

TABLE 3

Botanical analyses
Plots 6, 7, 8, 15
Minerals only (no N)

<= less than 0.05

https://doi.org/10.23637/ERADOC-1-154

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TABLE 4.

NUMBER OF SPECIES AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES.

	MIXED MINERAL MANURE				SUPERPHOSPHATE				NITRATE OF SODA.																											
Manuring	After Ammonium Salts 42 years, 1856-1897.				Alone, 1856 and since.				Alone = 43 lb. N.								With Mixed Mineral Manure. = 43 lb. N.						= 86 lb. N.													
Plot Number	5^2				4^1				17								16						14													
Unlimed or Limed	UNLIMED				UNLIMED			LIMED	UNLIMED						LIMED		UNLIMED			LIMED			UNLIMED							LIMED						
Season	1914	1919	1926	1949	1903	1914	1919	1949	1914	1919	1949	1903	1914	1919	1923	1933	1949	1914	1919	1949	1914	1919	1949	1903	1914	1919	1923	1933	1941	1948	Limed 1923	Rain 1933	Shade 1941	Sun 1941	Shade 1948	Sun 1948	Shade 1948
GRAMINEAE																																					
Number of species	11	11	10	9	15	14	14	15	12	13	13	15	14	14	14	15	9	14	14	15	12	11	12	12	12	11	13	12	11	9	10	9	10	12	10	12	9	12	10	11
1. Agrostis vulgaris	16.7	8.4	20.7	7.1	<	1.0	0.7	2.0	1.6	0.5	0.4	1.8	12.5	6.1	9.2	5.1	1.2	4.0	0.5	0.5	4.9	1.3	2.3	0.1	0.2	0.2	0.1	1.5	0.5	0.1	<	<	0.5	0.6	-	0.5	-	0.1	0.1	0.4
3. Alopecurus pratensis	4.0	11.1	12.6	9.1	0.3	0.1	0.1	2.2	1.3	1.5	2.4	9.7	14.5	12.9	13.3	14.3	14.5	10.3	9.5	7.3	26.5	50.6	22.9	25.6	36.1	10.9	28.7	22.6	53.7	42.5	61.9	59.2	31.8	23.9	22.3	20.0	25.1	18.3	12.1	6.7
4. Anthoxanthum odoratum	6.2	5.1	4.9	0.1	2.4	4.1	3.2	3.4	1.5	1.9	1.1	11.1	4.9	7.3	7.5	10.5	8.7	2.9	0.5	0.8	2.9	2.0	4.2	0.1	<	0.2	0.1	0.2	0.4	-	-	-	-	0.1	-	0.1	-	0.5	-	0.2
5. Arrhenatherum avenaceum	0.4	2.3	7.7	1.8	<	0.5	0.9	7.3	0.1	0.1	0.1	-	0.5	0.3	0.1	0.1	-	0.4	1.9	1.7	2.8	1.3	22.0	1.3	3.1	19.4	17.3	40.9	23.4	33.2	25.8	28.9	36.2	54.8	58.1	11.0	44.5	18.7	45.0	34.7
6. Avena flavescens	-	-	-	-	2.8	2.3	3.1	0.9	1.9	4.8	2.7	1.8	1.2	1.3	1.5	0.3	-	1.3	2.6	1.3	3.6	1.2	0.6	3.0	1.1	0.6	0.5	1.2	0.7	-	0.1	-	0.2	5.0	0.8	11.1	0.8	14.4	5.3	11.6
7. Avena pubescens	1.2	1.7	2.0	5.5	9.8	10.3	14.1	9.5	13.0	20.0	18.1	8.7	3.9	4.9	5.5	1.7	1.7	10.4	10.5	20.5	5.1	2.8	5.8	14.0	17.7	15.3	2.3	3.6	3.7	0.8	<	<	1.4	5.0	0.8	11.1	0.8	14.4	5.3	11.6
8. Briza media	-	-	-	-	11.2	2.3	1.3	0.5	3.5	2.9	1.8	2.2	1.1	0.5	0.2	0.3	0.6	0.4	1.0	0.7	-	-	-	-	-	-	-	-	0.5	3.7	1.7	<	0.5	15.3	0.4	0.7	0.2	0.9	<	-
9. Bromus mollis	3.0	0.1	-	-	-	-	-	0.1	-	-	-	0.2	-	0.1	-	0.1	-	0.4	0.1	0.7	8.0	-	0.2	3.0	<	0.6	23.0	5.2	-	-	-	-	-	-	-	-	-	-	-	-
10. Cynosurus cristatus	-	-	-	-	<	0.1	0.1	-	-	0.2	-	0.2	-	-	-	0.1	-	-	0.2	-	-	-	-	-	-	-	-	-	3.2	5.0	2.0	7.2	14.2	0.6	4.5	2.2	7.2	1.1	13.6	3.0
11. Dactylis glomerata	3.8	7.4	15.1	4.7	1.5	4.7	11.4	7.1	1.8	6.5	4.9	0.9	5.8	8.3	7.5	17.7	25.4	4.3	10.7	21.1	9.7	20.1	9.9	9.5	18.9	15.4	0.7	6.2	5.1	0.2	0.2	<	-	9.2	9.5	43.2	11.4	34.5	15.3	27.4
12. Festuca rubra	34.3	19.6	13.7	11.5	8.8	21.9	5.2	9.1	22.8	5.5	3.6	12.8	14.4	4.3	17.6	6.8	9.4	35.3	29.3	22.3	7.7	1.8	6.2	30.9	11.4	14.4	2.7	5.9	-	-	-	-	-	-	<	0.2	-	-	-	2.3
13. Festuca pratensis	-	-	-	-	<	-	-	0.9	-	-	1.1	0.1	-	-	-	-	-	-	-	0.8	-	-	-	-	-	-	<	-	-	-	-	-	-	0.2	-	-	-	0.1	-	-
14. Holcus lanatus	0.8	1.1	3.7	4.1	4.7	8.9	10.1	6.7	6.6	6.9	4.5	4.8	7.5	10.9	8.7	13.7	8.5	2.7	5.9	2.1	1.5	1.7	1.1	0.6	0.2	-	<	0.1	0.8	0.8	0.7	0.7	4.7	2.6	4.5	3.2	1.3	3.1	2.9	8.9
15. Lolium perenne	-	-	-	-	<	0.1	0.2	0.3	-	-	-	0.5	1.4	0.7	0.7	0.5	0.6	0.4	1.7	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16. Poa pratensis	4.7	6.3	2.2	2.6	0.8	1.0	0.9	0.9	0.8	2.1	1.7	0.2	0.1	0.3	0.6	0.1	-	0.1	-	0.1	0.7	1.2	0.4	0.3	0.5	0.5	9.2	2.2	1.0	7.6	0.6	1.6	2.4	2.8	2.4	0.8	3.9	1.5	1.0	1.1
17. Poa trivialis	0.1	0.1	<	-	0.6	0.6	1.5	0.5	0.5	1.4	1.8	1.0	0.1	0.5	1.4	0.6	-	1.1	1.3	0.6	0.1	0.5	0.1	1.8	0.4	0.4	0.9	1.3	-	-	-	-	-	-	-	-	-	-	-	-
Stalks	1.2	-	-	-	-	-	-	-	0.1	-	-	-	1.2	-	-	-	-	-	-	-	2.3	-	-	0.6	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-
Total	76.4	63.2	82.6	44.5	42.7	57.9	52.8	46.8	55.5	53.9	44.2	56.0	69.0	58.4	65.7	71.7	70.6	74.0	76.1	83.2	75.8	86.5	75.3	90.8	89.6	79.9	85.5	92.3	93.0	93.7	93.0	97.6	92.2	96.0	82.7	94.5	92.6	93.4	93.8	93.4
LEGUMINOSAE																																							
Number of species	4	3	3	5	4	5	5	5	4	3	4	4	3	2	1	1	1	3	1	1	3	1	2	3	2	3	2	1	1	1	1	1	1	1	1	2	1	2	1	3
1. Lathyrus pratensis	2.0	1.3	6.7	16.8	4.8	1.7	1.6	3.0	11.5	5.1	7.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	14.7	1.2	11.7	1.3	0.7	8.5	3.3	4.0	2.4	0.1	0.9	0.3	2.1	0.9	12.4	4.2	4.0	4.9	3.2	3.6
2. Lotus corniculatus	5.9	3.1	1.0	5.1	7.3	1.1	0.8	5.8	2.2	3.7	7.7	2.5	0.4	0.3	-	-	-	1.1	1.8	2.8	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
3. Onobis arvensis	-	-	-	-	-	0.5	0.2	2.4	-	-	-	-	-	-	-	0.1	-	-	-	-	0.8	-	-	0.3	-	0.7	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.5
4. Trifolium pratense	2.5	-	0.4	1.1	2.7	3.1	0.1	2.3	5.0	0.9	4.9	<	0.1	-	-	-	-	-	-	-	0.4	-	0.2	0.7	-	0.4	<	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Trifolium repens	0.1	-	0.2	1.3	2.8	1.3	0.1	2.9	0.2	-	2.5	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Vicia sepium	-	0.2	1.3	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	8.5	4.6	10.4	26.4	17.6	7.7	2.8	14.4	18.9	9.7	22.4	2.6	0.6	0.4	0.1	0.1	0.1	1.3	1.8	2.8	19.9	1.2	11.9	2.3	0.7	9.6	3.3	4.0	2.4	0.1	0.9	0.3	2.1	0.9	12.4	4.3	4.0	5.0	3.2	4.4
MISCELLANEOUS																																							
Number of species	16	16	15	12	22	14	12	14	16	15	13	20	13	14	15	14	10	17	12	13	10	9	7	9	10	9	9	8	8	8	8	8	8	8	8	4	9	3	6	3
1 & 2. Ranunculus acris et bulbosus	0.1	0.6	0.4	0.5	1.5	0.4	1.6	3.8	1.1	4.6	2.3	3.9	0.6	0.8	0.5	0.2	0.4	0.5	0.9	2.1	0.3	0.3	0.2	0.6	0.8	0.4	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-
4. Cerastium vulgatum	0.5	0.2	<	-	0.7	0.6	0.6	0.4	1.0	0.2	-	-	0.5	0.5	0.4	0.2	0.1	0.9	0.5	0.1	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Stellaria graminea	0.3	0.5	0.1	0.1	0.1	0.1	<	-	0.1	0.1	-	0.2	-	0.1	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Agrimonia eupatoria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	-	-	-	-	<	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Poterium sanguisorba	-	-	-	-	8.5	1.1	0.8	0.9	0.1	0.1	2.1	<	-	-	-	-	-	-	-	-	0.1	0.9	-	0.9	3.4	1.5	9.5	1.0	2.4	1.8	4.9	0.8	0.2	0.1	3.9	0.7	0.1	0.6	0.7	0.5
13. Anthriscus sylvestris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.5	0.7	-	1.2	0.4	<	-	-	-	-	-	-	0.1	-	-	-	-	-	-
14. Conopodium denudatum	-	0.1	0.1	0.1	0.2	-	0.4	1.1	-	0.2	-	0.6	0.6	1.2	0.5	-	-	0.3	-	0.2	-	-	-	-	0.3	0.9	-	-	-	-	-	-	-	-	-	-	-	0.1	-
15. Heracleum sphondylium	0.1	0.3	0.6	0.6	-	0.4	-	-	-	-	-	<	-	0.5	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16. Pimpinella saxifraga	0.2	0.4	0.2	0.3	0.5	-	-	0.1	0.5	0.2	0.3	<	-	-	0.1	-	-	0.1	-	0.4	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-
17. Galium verum	0.3	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
18. Scabiosa arvensis	0.1	0.2	1.2	0.9	0.3	0.3	-	0.2	0.8	1.5	2.2	-	-	-	-	0.8	1.2	1.1	0.8	1.0	8.9	0.8	3.9	5.1	1.0	1.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-
19. Achillea millefolium	0.8	2.8	4.5	12.8	1.8	1.6	2.3	5.4	2.8	1.2	2.2	2.8	1.2	0.9	0.3	1.4	0.5	1.4	0.5	1.4	0.6	0.1	-	0.9	0.4	-	<	-	<	-	-	-	-	-	-	-	-	-	-	-
20. Centaurea nigra	9.0	3.4	3.2	5.4	4.8	8.9	7.6	1.7	8.2	5.9	3.5	11.2	0.1	8.7	1.2	5.2	5.5	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22. Hieracium pilosella	0.1	-	-	-	0.4	-	-	-	0.1	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25. Hypochaeris radicata	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24. Leontodon hispidus	0.1	-	-	0.1	14.7	12.9	-	11.0	7.0	2.3	6.3	3.7	4.4	3.4	1.9	1.3	4.0	1.3	1.3	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25. Senecio jacobaea	-	-	-	-	-	-	2.5	0.6	-	-	-	1.5	0.1	0.2	0.4	0.5	1.4	0.5	0.4	0.6	1.4	7.5	0.9	0.3	0.1	5.3	0.7	2.0	1.2	2.6	0.3	0.7	3.2	2.2	0.2	0.2	2.0	0.7	1.1	1.7
26. Tarazacum vulgare	-	-	-	-	0.1	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	0.2	0.1	-	0.7	0.2	0.1	1.4	-	-	-	-	-	-	-	-	-	-	-	0.5	-
27. Tragopogon pratensis	-	0.5	0.1	-	0.1	-	-	-	0.1	0.1	0.7	0.1	-	-	-	16.2	14.0	13.9	17.1	5.6	8.9	2.5	6.5	0.4	1.3	9.3	-	-	-	0.1	-	1.6	-	-	-	0.1	-	0.1	-
29. Plantago lanceolata	0.1	0.6	0.4	0.9	2.5	7.0	18.0	6.5	4.1	11.4	9.7	10.7	14.0	24.1	27.1	0.2	-	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30. Veronica chamaedrys	0.2	0.1	<	-	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.2	0.1	-	0.3	0.2	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32. Ajuga reptans	-	-	-	-	<	-	-	-	-	-	-	0.9	-	0.2	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52. Prunella vulgaris	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	1.7	0.5	0.5	0.7	0.2	0.1	1.0	0.2	0.4	0.7	0.2	0.6	0.5	1.0	1.8	0.9	0.5	0.4	0.8	0.8	0.2	0.8	0.2	0.5	-
34. Rumex acetosa	2.9	14.1	3.0	5.7	1.5	0.7	10.3	5.8	0.6	6.3	2.1	1.8	0.4	0.9	0.3	0.2	-	0.5	0.2	0.1	0.1	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35. Luzula campestris	0.7	4.3	3.5	1.8	0.6	0.5	0.3	0.9	0.6	0.3	0.4	0.8	0.3	0.1	0.8	1.4	1.8	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36. Carex praecox	-	-	-	-	0.5	0.1	-	-	0.1	-	-	0.6	0.1	0.2	0.8	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-
Mosses	-	-	-	-	<	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	13.5	32.2	17.2	29.0	39.3	34.7	44.6	38.9	25.6	35.7	33.4	41.3	30.3	41.4	34.4	28.4	29.3	25.1	22.1	14.0	8.6	12.8	12.9	8.8	9.3	14.5	11.1	5.7	4.8	6.3	5.1	2.6	5.3	5.2	4.9	1.3	5.3	1.5	3.0	2.3

TABLE 4

Botanical analyses

Plots 5^2 & 4^1
Minerals

Plots 14, 16, 17
Nitrate of soda + minerals

<= less than 0.05

TABLE 5.

NUMBER OF SPECIES, AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES.

	AMMONIUM SALTS (400 lb. per acre = 86 lb. N). → With Mixed Mineral Manure																					AMMONIUM SALTS (600 lb. per acre = 129 lb. N). With Mixed Mineral Manure											
	With Potash										Without Potash											As Plot 9							With Silicate of Soda since 1861					
Manuring																						11^1							11^2					
Plot number	9										10																							
Unlimed or Limed	UNLIMED						LIMED						UNLIMED					LIMED																	
Season	1903	1914	1919	1935	1940	1948	1914	1919	1935	1940	1948	1914	1919	1935	1940	1948	1914	1919	1935	1940	1948	1903	1914	1919	1949	1914	1919	1949	1914	1919	1949	1914	1919	1949
GRAMINEAE																																		
Number of species	12	10	9	3	6	5	11	10	10	11	12	9	10	8	7	7	9	8	7	8	7	8	8	7	2	9	9	6	9	9	6	8	7	5
1. Agrostis vulgaris	3.8	18.3	12.5	<	5.3	7.7	2.7	2.3	1.2	2.6	4.3	3.0	4.0	10.3	33.9	51.9	3.1	0.5	1.0	2.1	1.0	1.4	0.5	1.7	-	2.1	0.9	-	0.5	0.7	5.3	0.2	<	-
2. Aira caespitosa	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Alopecurus pratensis	4.1	1.7	0.7	-	0.1	-	17.9	26.0	62.1	55.0	38.1	18.7	20.8	0.2	0.1	0.3	47.1	76.9	55.2	50.3	28.6	28.5	1.1	0.8	0.1	27.3	64.0	82.0	17.6	29.8	0.3	49.7	76.0	37.5
4. Anthoxanthum odoratum	16.2	38.9	5.4	0.1	0.3	0.4	12.8	1.1	2.9	2.4	4.1	49.7	21.1	21.1	31.5	10.3	15.4	1.1	1.9	2.9	1.8	1.0	0.1	<	-	2.1	0.1	-	<	0.1	-	-	-	-
5. Arrhenatherum avenaceum	43.3	8.6	46.9	-	0.9	0.6	39.0	47.3	15.1	21.9	14.7	4.8	26.0	1.4	0.9	5.1	9.3	8.1	1.7	7.7	4.1	23.0	6.6	31.3	-	27.1	15.5	2.3	20.8	45.7	0.8	25.6	16.3	17.5
6. Avena flavescens	0.2	0.1	-	-	-	-	0.2	<	-	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-
7. Avena pubescens	0.1	-	-	-	-	-	-	-	0.1	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8. Briza media	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Bromus mollis	<	-	-	-	-	-	0.3	-	1.3	1.0	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Cynosurus cristatus	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Dactylis glomerata	5.1	5.1	3.3	-	-	-	6.9	6.8	3.6	4.1	11.6	1.0	1.6	0.1	<	0.3	0.7	1.8	<	0.1	-	0.1	0.2	0.2	-	4.9	5.7	4.9	0.3	2.8	<	11.0	7.3	10.3
12. Festuca rubra	7.5	15.4	3.6	-	0.1	0.1	9.3	5.9	1.7	4.7	4.3	19.2	6.9	2.4	2.1	10.3	15.0	5.2	33.3	26.3	54.5	<	0.1	0.1	-	0.2	<	0.4	<	0.1	0.1	<	<	-
14. Holcus lanatus	3.9	4.1	12.4	99.9	93.3	90.6	2.2	0.8	4.4	2.1	2.5	1.1	11.8	64.4	31.3	21.5	1.5	0.1	-	0.2	0.5	45.6	90.9	64.8	93.7	32.0	11.6	3.5	59.5	20.4	92.8	6.1	<	1.6
15. Lolium perenne	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16. Poa pratensis	11.7	1.8	0.2	-	-	-	7.6	9.5	4.1	2.1	9.4	0.9	0.3	-	-	-	4.4	6.0	6.2	6.2	5.4	0.2	-	-	-	2.7	1.9	5.2	0.7	0.1	-	3.5	0.2	10.7
17. Poa trivialis	<	-	-	-	-	-	-	-	-	0.1	<	-	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stalks	-	0.7	0.1	-	-	-	0.1	0.1	-	-	-	0.3	0.2	-	-	-	5.2	-	-	-	-	-	0.5	-	-	1.1	<	-	0.5	-	-	2.8	-	-
Total	95.9	94.7	85.1	100.0	100.0	99.4	99.0	95.8	96.5	96.2	89.7	98.7	92.5	100.0	99.8	99.7	99.7	99.7	99.3	95.8	93.9	99.8	100.0	98.9	99.8	99.5	99.7	98.3	99.9	99.7	99.3	98.9	99.8	97.6
LEGUMINOSAE																																		
Number of species	1	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1. Lathyrus pratensis	<	-	-	-	-	-	-	0.1	0.1	0.7	3.5	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Trifolium pratense	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	0	0	0	0	0	0	0	0.1	0.1	0.7	3.5	0	0	0	<	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MISCELLANEOUS																																		
Number of species	7	5	3	0	0	1	3	4	3	4	7	4	1	2	0	1	2	1	2	1	4	2	0	1	1	2	2	2	0	1	1	2	0	3
4. Cerastium vulgatum	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-
5. Stellaria graminea	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	-	0.1	0.1	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-
12a. Epilobium angustifolium	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13. Anthriscus sylvestris	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14. Conopodium denudatum	0.3	0.1	0.1	-	-	-	-	0.1	-	-	0.1	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15. Heracleum sphondylium	0.6	0.6	-	-	-	-	<	0.3	2.8	2.0	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.1	-	-	-	-	0.6	-	0.1
17. Galium verum	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19. Achillea millefolium	0.4	0.1	-	-	-	-	0.3	-	-	-	0.5	-	-	-	-	-	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-
20. Centaurea nigra	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3
26. Taraxacum vulgare	-	-	-	-	-	-	-	-	0.6	0.5	3.3	-	-	0.1	-	-	-	-	0.2	-	0.4	-	-	-	-	-	-	0.5	-	-	-	-	-	-
27. Tragopogon pratensis	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29. Plantago lanceolata	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
32. Prunella vulgaris	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34. Rumex acetosa	2.8	4.4	14.9	-	-	-	0.7	3.5	0.2	0.3	1.1	1.1	7.4	0.1	-	0.3	0.2	0.4	0.9	4.3	5.0	0.1	-	1.1	-	0.1	0.1	1.3	-	0.4	0.7	0.4	-	1.1
Total	4.2	5.3	15.1	0	0	0.5	1.0	4.0	3.6	3.0	6.7	1.3	7.4	0.2	0	0.3	0.3	0.4	0.7	4.3	6.2	0.1	0	1.1	0.3	0.4	0.2	1.6	0	0.4	0.7	1.0	0	2.5

TABLE 5

Botanical analyses
Plots 9, 10, 11^1, 11^2
Ammonium salts with
& without minerals

<= less than 0.05

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TABLE 6a

NUMBER OF SPECIES AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES

	AMMONIUM SALTS																										
Manuring	Alone = 43 lb N; also F Y M 8 years 1856-63								= 86 lb N with Superphosphate							=86 lb N with Mixed Minerals without Super; after Minerals + Nitrogen, 40 years, 1865-1904.												
Plot number	1								4^2							18											
Unlimed or Limed	UNLIMED				LIMED				UNLIMED				LIMED			UNLIMED					LIGHT LIME			HEAVY LIME		
Season	1914	1919	1939	1948	1914	1919	1939	1948	1903	1914	1919	1949	1914	1919	1949	1914	1919	1923	1928	1948	1923	1928	1948	1923	1928	1948
GRAMINEAE																										
Number of species	10	10	7	6	12	10	11	11	9	10	8	5	8	7	9	11	10	8	10	6	9	11	14	8	10	11
1. Agrostis vulgaris	16.0	18.5	52.5	75.3	12.3	8.5	3.7	1.5	2.0	12.9	4.3	36.2	1.0	0.3	2.2	10.0	17.6	47.9	59.0	76.9	28.3	17.5	3.4	27.2	4.8	1.2
2. Aira caespitosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-
3. Alopecurus pratensis	2.0	1.3	0.1	0.1	4.5	5.9	4.0	2.5	4.6	2.5	1.4	0.7	42.4	76.1	24.3	3.3	5.1	5.1	5.3	0.1	10.3	45.6	2.8	8.3	22.7	3.8
4. Anthoxanthum odoratum	15.0	17.5	0.7	0.2	6.9	7.9	2.4	1.4	23.4	7.7	34.1	10.0	7.6	1.1	1.2	3.6	3.5	19.8	6.9	0.8	2.2	0.5	0.8	2.6	-	-
5. Arrhenetherum avenaceum	0.1	0.4	0.1	-	0.3	1.4	2.2	3.0	1.0	0.3	3.1	-	<	-	2.5	0.1	1.6	0.1	0.4	0.5	2.0	2.9	24.6	2.7	18.1	25.0
6. Avena flavescens	-	0.1	-	-	0.7	0.6	2.2	1.7	-	-	-	-	-	-	-	0.1	-	-	<	-	-	<	-	-	<	-
7. Avena pubescens	0.1	0.2	-	0.2	5.1	7.7	34.8	12.1	-	<	-	-	-	-	0.3	0.1	0.1	-	-	-	0.1	<	3.1	-	<	0.8
9. Bromus mollis	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	0.1
10. Cynosurus cristatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11. Dactylis glomerata	9.5	11.3	0.7	3.2	7.0	23.4	13.1	18.3	0.1	1.0	0.6	-	-	0.1	0.3	37.1	34.0	3.2	9.3	1.3	8.0	21.1	35.0	9.7	37.7	48.3
12. Festuca rubra	28.1	14.3	40.9	15.6	25.9	10.6	15.2	15.4	53.5	73.0	47.9	35.3	35.1	7.7	57.4	37.8	4.2	18.3	6.2	8.9	26.4	2.8	6.8	31.1	3.1	2.2
13. Festuca pratensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
14. Holcus lanatus	7.1	22.4	-	-	5.5	10.0	3.5	5.8	1.1	<	0.3	17.5	0.2	<	0.1	0.9	2.4	0.2	8.2	-	1.3	0.8	0.2	1.5	1.6	-
15. Lolium perenne	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	0.1
16. Poa pratensis	0.6	0.4	0.2	-	3.9	1.8	2.3	1.3	7.7	1.2	0.3	-	12.6	12.8	6.3	0.3	0.4	2.2	0.9	-	6.9	5.4	0.8	4.4	6.3	1.1
17. Poa trivialis	-	-	-	-	-	-	0.2	0.3	0.2	-	-	-	-	-	-	-	-	-	<	-	-	0.2	0.2	-	0.1	0.2
18. Phleum pratense	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	0.1
Stalks	0.4	-	-	-	0.4	-	-	-	-	0.1	-	-	0.2	-	-	0.1	-	-	-	-	-	-	-	-	-	-
Total	78.9	86.4	95.2	94.6	72.6	77.8	83.6	63.3	93.6	98.7	92.0	99.7	99.1	98.1	94.6	93.4	69.0	96.8	96.2	88.5	85.5	96.8	80.8	87.5	94.4	82.9
LEGUMINOSAE																										
Number of species	0	0	0	0	2	2	3	3	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	2
1. Lathyrus pratensis	-	-	-	-	0.5	0.4	1.5	2.0	-	-	-	-	-	-	-	0.1	-	0.1	-	-	-	-	-	-	0.2	0.5
2. Lotus corniculatus	-	-	-	-	0.2	0.3	0.5	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Trifolium pratense	-	-	-	-	-	-	0.1	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	0.1
5. Trifolium repens	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	0.7	0.7	2.1	4.6	-	-	-	-	-	-	-	0.1	-	0.1	-	-	-	-	0.1	-	0.2	0.6
MISCELLANEOUS																										
Number of species	7	5	4	5	9	9	12	14	5	6	2	1	2	3	6	5	5	4	6	3	6	5	11	5	6	6
1. 2. Ranunculus acris et bulbosus	0.1	-	-	-	1.3	2.1	1.1	0.7	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	0.1	-	-	-
4. Cerastium vulgatum	-	-	-	-	0.8	0.9	0.2	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Stellaria graminea	-	-	-	-	0.1	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	0.1	-	-
5a. Stellaria holostea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	-	-	-	1.9	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12. Spiraea ulmaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
13. Anthriscus sylvestris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14. Conopodium denudatum	0.2	1.2	-	0.1	0.2	1.1	0.1	0.1	-	-	-	-	-	-	-	0.8	4.3	0.3	0.3	-	0.8	0.7	0.3	0.5	0.4	0.1
15. Heracleum sphondylium	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	0.2	0.1	-	-	-	0.6	-	3.1	1.6
16. Pimpinella saxifraga	-	-	-	-	0.1	0.1	0.5	0.4	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-
17. Galium verum	0.2	-	2.1	-	-	-	-	-	4.4	0.4	-	-	0.3	0.2	0.4	-	-	-	-	-	-	-	-	-	-	-
18. Scabiosa arvensis	-	-	-	-	-	-	0.9	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19. Achillea millefolium	0.5	0.2	-	-	0.9	1.7	1.1	1.7	<	0.1	-	-	-	-	0.8	0.2	0.2	-	<	-	0.1	0.1	0.2	-	0.3	-
20. Centaurea nigra	19.2	2.1	0.4	0.7	22.2	4.1	4.7	2.0	1.4	0.1	0.1	-	-	-	-	4.5	1.9	-	<	-	0.2	<	3.5	0.3	0.2	-
23. Hypochaeris radicata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24. Leontodon hispidus	-	-	-	-	-	-	0.1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
25. Senecio jacobea	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26. Taraxacum vulgare	-	-	-	-	-	-	0.5	1.0	-	-	-	-	-	-	-	-	-	-	-	0.2	-	<	8.9	-	0.2	10.8
27. Tragopogon pratensis	-	-	-	-	-	-	-	-	-	<	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	2.6
29. Plantago lanceolata	-	-	-	-	-	-	3.5	19.8	-	-	-	-	-	0.1	0.1	-	-	-	-	-	-	-	3.8	-	-	1.0
30. Veronica chamaedrys	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31. Ajuga reptans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32. Prunella vulgaris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34. Rumex acetosa	0.6	9.9	2.0	2.5	1.0	11.5	1.7	2.1	0.5	0.5	8.0	0.2	0.5	1.5	3.9	1.1	24.6	2.5	3.2	11.2	13.1	2.4	0.2	11.7	1.0	0.4
34a. Urtica dioica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-
35. Luzula campestris	0.3	0.2	0.2	0.1	0.5	0.1	0.1	0.1	<	-	-	-	-	-	-	0.1	0.1	0.1	0.1	-	0.1	-	-	0.1	-	-
36. Carex praecox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	21.1	13.6	4.7	5.3	27.1	21.8	14.5	32.1	6.3	1.2	8.1	0.2	0.8	1.8	5.4	6.7	31.1	3.1	3.7	11.5	14.4	3.2	19.0	12.7	5.2	16.5

TABLE 6a
Botanical analyses
Plots 1, 4^2, 18
Ammonium salts
with or without
minerals.

< = less than 0.05

TABLE 6b.

NUMBER OF SPECIES AND PERCENTAGE OF EACH SPECIES AND GROUP OF SPECIES.

	FARMYARD MANURE																													
Manuring	Every fourth year with Fish Guano alternately, after cut wheat straw, minerals and ammonium salts, 1845-1904								Every fourth year, after Super, Sulphate of Potash and Nitrate of Soda, 33 years 1872 - 1904										Every fourth year, with Super, Sulphate of Potash and Nitrate of Soda in other years, after Super and Nitrate of soda, 33 years, 1872-1904											
Plot number	13								19										20											
Unlimed or Limed	UNLIMED				LIMED				UNLIMED					LIGHT LIME			HEAVY LIME			UNLIMED					LIGHT LIME			HEAVY LIME		
Season	1914	1919	1944	1948	1914	1919	1944	1948	1914	1919	1923	1928	1949	1923	1928	1948	1923	1928	1948	1914	1919	1923	1928	1948	1923	1928	1948	1923	1928	1948
GRAMINAE																														
Number of species	10	11	12	9	10	11	9	12	14	13	12	12	12	14	13	13	14	13	12	14	14	13	14	12	12	14	13	13	13	13
1. Agrostis vulgaris	11.8	11.0	8.4	15.7	2.3	3.3	-	0.1	7.6	7.5	14.3	5.8	11.8	14.7	5.1	4.3	10.3	2.4	0.5	4.5	6.6	10.5	4.1	4.1	12.7	4.2	2.5	5.3	1.2	0.1
2. Aira caespitosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Alopecurus pratensis	16.5	22.2	56.7	31.9	18.3	35.3	5.8	10.4	13.4	22.3	16.1	33.2	6.2	16.1	42.6	25.1	14.6	21.1	16.7	11.1	30.3	29.4	46.2	39.2	16.9	30.6	21.9	25.2	24.1	17.6
4. Anthoxanthum odoratum	4.0	5.2	4.8	6.2	1.5	2.0	0.5	0.3	1.0	4.3	11.6	11.6	7.3	9.4	7.9	1.5	1.3	0.7	-	0.6	1.1	0.3	1.9	1.1	5.7	6.4	1.9	1.2	0.7	0.2
5. Arrhenatherum avenaceum	24.4	17.3	0.9	3.4	40.3	20.5	5.9	25.9	3.7	7.9	8.6	7.9	5.7	1.9	3.5	5.5	7.1	15.9	14.3	4.2	4.6	5.6	11.3	15.1	12.4	8.7	21.7	2.0	3.8	17.4
6. Avena flavescens	0.1	0.1	0.1	-	-	<	-	0.1	8.9	3.2	2.0	3.5	1.7	6.6	3.2	3.0	8.7	6.1	3.1	6.1	2.9	6.1	3.4	4.0	2.7	4.1	1.9	5.3	2.6	3.3
7. Avena pubescens	-	0.1	-	-	-	0.1	-	0.3	1.7	3.3	1.9	3.0	0.9	2.7	2.8	1.9	4.3	11.9	5.4	6.3	10.2	7.7	6.6	0.7	5.3	9.3	3.0	11.7	28.9	6.8
9. Bromus mollis	-	-	0.1	-	0.1	-	0.1	0.1	2.1	0.2	1.0	-	-	0.9	0.1	0.2	1.7	0.3	0.3	4.9	0.2	2.5	<	0.2	2.4	0.3	0.1	2.9	0.2	0.2
10. Cynosurus cristatus	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	<	-	-	<	-	-	-	-
11. Dactylis glomerata	7.6	9.2	6.7	9.1	6.4	10.3	8.6	21.5	12.0	15.8	5.3	9.6	3.3	6.4	11.0	10.9	3.7	9.1	13.6	9.9	12.5	6.0	7.0	14.7	4.1	7.1	14.4	2.7	5.6	14.2
12. Festuca rubra	14.6	5.5	3.6	4.0	10.7	4.7	1.1	0.9	21.0	6.1	13.3	8.1	9.8	14.8	3.7	5.0	16.6	13.9	4.5	22.2	4.4	13.9	5.3	3.7	14.9	6.5	2.8	21.1	9.0	4.8
13. Festuca pratensis	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	0.4	-	-	5.7	-	-	-	-	-	-	-	-	-	-	-
14. Holcus lanatus	14.6	7.2	2.7	2.5	14.4	6.4	1.7	4.4	3.5	2.1	3.4	4.9	1.3	2.1	2.6	1.7	0.2	0.9	-	10.4	6.8	1.9	4.1	1.0	2.4	7.9	5.7	1.9	5.0	1.6
15. Lolium perenne	-	-	<	-	-	-	-	-	0.3	0.4	-	<	-	0.1	0.4	-	0.3	<	0.3	0.3	0.3	0.8	0.4	-	-	0.3	0.1	0.2	0.1	0.8
16. Poa pratensis	0.8	1.7	1.8	0.9	1.1	3.9	1.4	1.8	0.8	0.5	0.6	0.3	0.7	2.0	1.1	0.9	2.2	1.4	1.9	0.5	0.6	2.5	1.4	1.3	1.1	0.7	0.4	2.0	2.9	3.0
17. Poa trivialis	0.1	0.4	0.4	0.1	-	0.2	1.2	1.2	2.4	1.4	0.5	2.0	0.5	1.4	4.6	1.8	1.3	6.0	0.7	2.2	1.1	1.1	1.2	1.3	1.9	3.5	3.9	1.2	3.0	4.3
18. Phleum pratense	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stalks	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	1.1	0.1	-	-	-	-	-	-	-	-	-
Total	96.5	79.9	85.7	73.8	95.4	86.7	26.3	67.0	78.7	75.0	78.6	89.9	50.3	79.2	88.6	62.2	72.4	89.7	67.0	84.3	81.7	86.3	92.9	86.4	82.5	89.6	80.3	82.7	87.1	74.3
LEGUMINOSAE																														
Number of species	1	1	1	2	1	1	4	3	4	2	2	2	4	2	2	3	3	3	4	3	1	3	2	3	2	2	3	1	2	3
1. Lathyrus pratensis	0.5	0.1	0.3	0.5	0.9	0.8	30.9	7.9	9.2	6.0	7.3	1.6	13.5	9.3	1.5	7.4	15.5	1.0	7.5	6.4	4.7	1.9	2.6	4.3	9.9	1.8	2.1	5.3	5.1	8.8
2. Lotus corniculatus	-	-	-	-	-	-	0.2	-	0.6	0.1	-	-	1.1	-	-	-	0.5	0.9	1.7	0.1	-	-	-	0.1	-	-	-	-	-	-
4. Trifolium pratense	-	-	-	<	-	-	7.3	2.4	0.1	-	-	-	0.2	-	-	0.1	-	-	0.5	-	-	0.3	-	-	-	-	0.1	-	-	0.2
5. Trifolium repens	-	-	-	-	-	-	2.6	0.3	0.1	-	0.1	0.3	2.7	0.8	0.5	1.0	0.9	2.5	0.7	0.1	-	2.4	0.2	0.6	0.8	1.4	2.8	-	0.2	0.9
Total	0.5	0.1	0.3	0.5	0.9	0.8	41.0	10.6	10.0	6.1	7.4	1.9	17.5	10.1	2.0	8.5	16.9	4.4	10.4	6.6	4.7	4.6	2.8	5.0	10.7	3.2	5.0	5.3	5.3	9.9
MISCELLANEOUS																														
Number of species	6	8	13	12	10	11	12	13	13	14	13	13	13	10	13	12	11	14	8	11	14	11	11	9	9	14	10	13	14	11
1. 2. Ranunculus acris et bulbosus	-	-	-	0.1	-	-	0.9	2.2	1.0	4.8	4.6	1.8	5.7	5.5	2.5	7.9	4.9	1.4	4.0	0.5	2.1	1.9	0.8	1.2	2.6	1.3	1.9	2.1	1.2	1.3
4. Cerastium vulgatum	0.1	0.2	0.3	0.1	0.2	0.7	0.5	0.1	0.4	0.3	0.1	0.2	0.2	0.2	0.3	0.1	0.2	0.3	-	0.1	0.3	-	<	-	0.1	0.3	0.3	0.1	0.2	-
5. Stellaria graminea	0.1	0.1	0.2	0.1	-	0.3	-	-	0.1	<	0.1	<	0.2	-	-	-	-	-	-	-	0.1	-	-	-	-	<	-	-	-	-
5a. Stellaria holostea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10. Potentilla reptans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12. Spiraea ulmaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13. Anthriscus sylvestris	-	0.3	0.2	-	0.7	2.0	2.0	0.7	3.1	0.5	1.6	0.2	-	-	<	-	0.5	0.4	-	2.8	2.5	2.7	0.4	0.6	0.7	0.3	-	3.3	0.3	0.3
14. Conopodium denudatum	0.3	3.2	0.9	0.8	0.9	2.0	-	0.1	0.3	1.7	0.8	0.8	0.3	1.2	0.6	0.4	1.3	0.5	-	0.1	1.5	0.8	-	-	1.3	0.7	-	1.5	0.5	-
15. Heracleum sphondylium	0.3	0.7	0.2	-	0.6	-	-	-	-	-	-	-	1.1	-	<	0.4	0.2	0.5	1.1	-	-	-	0.7	0.1	-	-	0.1	-	0.2	0.2
16. Pimpinella saxifraga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17. Galium verum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.5	-	-	-	-	-	-	0.2	0.1	0.4
18. Scabiosa arvensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19. Achillea millefolium	0.5	0.4	0.7	4.0	<	0.2	0.2	0.3	1.7	1.4	0.1	0.2	10.2	0.1	0.1	5.2	0.1	0.4	2.3	2.2	1.2	0.7	0.3	0.4	0.3	1.0	1.5	0.2	0.5	2.7
20. Centaurea nigra	-	-	0.3	0.1	0.3	0.3	4.0	0.7	1.9	0.4	0.5	0.3	-	-	-	1.0	-	0.1	1.4	2.6	1.4	0.5	0.3	-	-	<	0.7	1.0	0.2	0.2
23. Hypochaeris radicata	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24. Leontodon hispidus	-	-	-	1.7	-	-	0.9	1.3	-	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25. Senecio jacobea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26. Taraxacum vulgare	-	-	0.3	1.5	0.1	0.2	6.2	3.2	0.1	0.1	0.4	<	0.6	0.3	0.1	0.6	0.5	0.4	1.1	0.1	0.1	0.2	0.1	0.7	0.8	1.0	1.1	1.2	2.7	2.3
27. Tragopogon pratensis	-	-	-	0.9	-	<	0.5	1.3	-	0.3	0.1	-	-	-	-	0.4	-	<	2.9	-	0.2	0.1	-	3.3	0.2	0.1	1.1	1.3	0.3	3.8
29. Plantago lanceolata	-	-	6.2	14.7	<	0.1	10.3	11.5	0.2	0.2	0.8	0.5	11.8	0.4	-	10.4	1.9	0.5	9.7	0.1	-	0.1	<	0.9	-	0.4	6.2	0.4	0.5	4.1
30. Veronica chamaedrys	-	-	0.5	0.2	<	0.1	0.7	<	0.2	0.2	0.2	0.4	0.2	0.3	0.3	0.7	-	0.1	-	0.3	0.1	0.1	0.3	0.1	-	0.4	0.3	0.1	0.4	0.1
31. Ajuga reptans	-	-	-	-	-	-	0.1	<	-	0.2	-	0.3	0.2	0.2	0.2	-	0.4	0.5	-	-	0.3	-	-	-	-	0.1	-	-	-	-
32. Prunella vulgaris	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34. Rumex acetosa	1.8	15.1	3.9	1.9	0.6	6.3	0.4	0.8	2.1	8.4	4.3	3.5	1.3	2.1	5.1	2.3	0.3	0.7	0.3	0.3	3.3	2.1	1.4	1.5	0.8	1.6	1.4	0.3	0.3	0.5
34a. Urtica dioica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35. Luzula campestris	-	0.1	<	-	-	-	-	-	0.1	0.1	0.4	0.2	0.2	0.4	<	0.1	0.3	0.1	-	-	<	0.1	<	-	0.1	0.1	-	0.2	<	-
36. Carex praecox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3.1	20.1	13.9	25.5	3.4	12.2	32.7	22.2	11.5	18.6	14.0	8.4	32.4	10.7	9.4	29.5	10.6	5.9	22.8	9.2	13.6	9.3	4.3	8.8	6.9	7.3	14.9	11.9	7.4	15.9

TABLE 6b.
Botanical analyses.
Plots 13, 19, 20
Farmyard manure.

< = less than 0.05.

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