PROGRESS REPORT

FORAGE CROP INVESTIGATIONS

1961

FORAGE MANAGEMENT

Field Husbandry Department
Ontario Agricultural College
Guelph

FORAGE PROGRESS REPORT - 1961

This report contains data on O.A.C. trials. It is not complete in that only the data summarized by May 1, 1962, are included. However, it does contain much of the data. The report is prepared for use of the members of the Field Husbandry Department and for those associated with the forage program.

A federal-provincial program is in operation in variety and mixture testing and in orchardgrass breeding. This report does not cover data collected by other stations in this co-ordinated program. The complete set of data from all stations is available.

CONTENTS

(Year refers to year trial was seeded, and number in brackets is experiment number)

DEPARTURES OF 1961 GROWING SEASON

WEATHER RECORDS FROM NORMAL

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Harrow	Max.	-7.5	-5.1	-3.3	-3.1	-2.8	1.4	1.4
	Min.	-1.4	-2.2	-1.5	1.0	2.5	5.5	3.9
Ridgetown	Max.	-4.8	-1.8	-2.0	-2.1	-1.9	4.9	-
	Min.	-2.4	-3.4	-1.7	0.6	1.3	4.5	-
Guelph	Max.	-5.9	-2.9	-1.3	-1.9	-1.5	5.1	4.4
	Min.	-1.3	-3.7	-1.6	0.0	2.1	6.0	2.8
Kemptville	Max.	-2.3	-3.2	-3.3	-2.6	-1.6	6.3	3.3
	Min.	0.1	-3.7	-2.9	0.1	-0.6	4.6	2.7
Ottawa	Max.	-0.9	-2.6	-3.0	-2.7	-1.5	6.3	5.1
	Min.	2.1	-1.1	-1.5	2.6	2.5	5.7	4.4
New Liskeard	Max.	-3.6	-6.4	-5.3	-0.7	-2.9	-	-
	Min.	2.2	-3.1	-1.6	0.9	0.1	-	-
Kapuskasing	Max.	1.3	-3.6	-4.6	-1.2	0.6	1.7	-0.1
	Min.	5.0	-1.8	-2.5	0.5	-0.1	3.5	1.5
Gore Bay	Max.	-0.4	-0.4	-3.0	-1.8	0.1	6.4	1.9
	Min.	0.9	-3.1	-3.4	-0.9	-1.3	5.0	2.4
Fort Francis	Max.	-3.3	0.5	5.4	0.7	4.3	-2.4	1.4
	Min.	-2.2	-3.9	-1.5	-1.7	-1.0	0.2	1.1

RAINFALL							
Harrow	2.5	-0.1	-0.3	-0.4	0.9	1.1	-0.8
Ridgetown	2.9	-1.1	0.9	-0.4	1.5	0.4	
Guelph	-0.1	-0.4	-0.7	-0.5	2.6	-0.8	-1.3
Kemptville	0.4	-0.4	1.6	0.4	0.0	-1.9	-1.0
Ottawa	0.9	-0.4	0.0	0.5	0.1	-1.8	-1.2
New Liskeard	-0.2	0.2	0.7	-1.5	4.0	4.9	-
Kapuskasing	-1.5	1.2	0.7	2.0	1.6	1.6	-0.4
Gore Bay	-0.6	-1.6	-0.5	-0.4	-0.4	3.4	-1.2
Fort Frances	-0.5	-0.8	-3.5	0.9	-0.5	3.6	-1.1

1961 GROWING SEASON WEATHER RECORDS

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Harrow	Max.	48.6	63.3	75.6	80.7	79.1	76.1	63.9
	Min.	34.8	44.6	56.2	63.2	62.5	59.9	47.4
Ridgetown	Max.	47.9	63.0	74.7	79.8	78.2	77.0	-
	Min.	33.1	42.4	54.6	61.7	61.0	58.4	-
Guelph	Max.	44.8	60.7	72.8	77.0	75.8	75.0	61.7
	Min.	31.1	39.2	51.0	56.9	57.7	55.0	41.5
Kemptville	Max.	49.2	63.3	73.2	78.8	77.2	76.4	60.4
	Min.	31.9	40.4	50.8	58.1	55.0	52.7	39.5
Ottawa	Max.	48.9	62.7	72.2	77.1	76.3	75.1	60.5
	Min.	33.3	42.1	51.5	60.1	57.6	53.6	41.2
New Liskeard	Max.	42.3	55.8	67.1	76.1	71.9	-	-
	Min.	26.5	33.3	45.9	54.0	50.8	-	-
Kapuskasing	Max.	43.5	54.0	64.8	73.3	71.9	62.9	47.8
	Min.	24.4	32.1	42.6	51.7	49.5	45.1	33.4
Gore Bay	Max.	47.4	58.9	68.3	75.9	75.5	70.7	56.6
	Min.	28.2	35.4	45.0	53.8	52.3	52.4	39.7
Fort Frances	Max.	44.7	62.8	76.9	78.3	78.6	61.6	53.5
	Min.	26.2	37.3	49.6	55.1	53.1	45.5	36.1
RAINFALL								
Harrow		5.0	2.3	2.7	1.9	3.1	3.6	1.0
Ridgetown		5.9	2.0	3.8	2.5	3.9	3.3	-
Guelph		2.6	2.7	2.4	3.0	5.5	2.2	1.1
Kemptville		3.0	2.9	4.2	3.9	2.6	1.3	1.8
Ottawa		3.5	2.4	3.4	4.0	3.1	1.3	1.5
New Liskeard		1.5	2.4	4.0	2.1	6.9	8.2	-
Kapuskasing		0.2	3.5	3.5	5.3	4.8	4.8	1.7
Gore Bay		1.7	0.7	2.0	1.6	1.7	6.5	1.6
Fort Frances		1.6	1.8	0.4	4.5	3.4	6.9	1.0

Provincial Mixture Trials

Well drained mixture trials.

Only those data from tests that have completed three consecutive years of harvest are included in this report. The data from each test are presented and they are summarized as to zone averages.

The presently recommended "general purpose" mixtures; (No. 3 alfalfa 8 red clover 2 timothy 4 bromegrass 6; and No. 1 alfalfa 10 bromegrass 10) were among the highest yielding mixtures included in all zones except 8. In zone 8 the mixture containing alfalfa 10 timothy 6 consistently yielded more forage each crop year than did mixture alfalfa 10 bromegrass 10. The yield from the general purpose mixture (No. 1) was maintained in this zone where Rhizoma was substituted for Vernal alfalfa.

No changes are suggested in the presently recommended mixtures.

Imperfectly drained mixture trials.

The required four years data have not been collected in some zones from the Series A trials. The Series B trials have produced only during the first crop year. No changes in the recommended mixtures are suggested.

However the "general purpose" mixture alfalfa 8 ladino 1 timothy and bromegrass 6 (a mixture added to the recommended list last year) was among the highest yielding during the first crop year (Series B).

The use of nitrogen (166 lbs.) doubled the production of originally complex mixtures during the 4th drop year. This increase in yield was not different from those yields obtained from the trefoil mixtures in the 4th year.

STATUS OF MIXTURE TESTS

1961

Zone	Testing Station	Hay-Pasture Test		Pasture Test
		Drainage Good	Drainage Imperfect	
1	Ridgetown	1958[1]	1958[1]	
4	Guelph	1957[1]	1957 1960[2]	
	Mindemoya	1958[1]		
5	Kemptville	1957[1]		1959
	Ottawa	1957[1]		
6	Arthur		1958[1]	
7	Eau Claire		1957	
	Noelville		1957	
	Fort William	1957[1] 1958[1]		
	New Liskeard	1959[1]		
8	Kapuskasing	1957[1]	1957[1]	

1 Series A - discontinued or to be discontinued

2 Series B test

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF GOOD DRAINAGE

Series A

COMPOSITION OF MIXTURES

Mixture No.	Component and seeding rate
1	Vernal 8 + Lasalle 2 + Climax 4 + Lincoln 6
2	Vernal 8 + Lasalle 2 + Climax 4 + Orchard 3
3	Vernal 8 + Lasalle 2 + Climax 4
4	Vernal 10 + Lincoln 10
5	Vernal 6 + Lasalle 3 + Ladino 1 + Climax 5 + Lincoln 6
6	Vernal 5 + Lasalle 3 + Alsike 1 + Ladino 1 + Climax 3 + Lincoln 5 + Orchard 2
7	Vernal 8 + DuPuits 2 + Climax 6
8	Vernal 5 + DuPuits 5 + Climax 4 + Lincoln 6
9	Vernal 10 + Climax 6
10	Vernal 6 + Lasalle 4 + Climax 2 + Lincoln 5 + Orchard 4
11	Rhizoma 5 + Lasalle 2 + Altaswede 2 + Alsike 1 + Climax 4 + Lincoln 4 + Meadow fescue 3
12	Rhizoma 5 + Altaswede 4 + Alsike 1 + Climax 8
13	Rhizoma 8 + Lasalle 2 + Climax 4 + Lincoln 6

PROVINCIAL HAY PASTURE MIXTURES FOR AREAS OF GOOD DRAINAGE - SERIES A

Zone Average of Hay + Aftermath

Yield in 1000's pounds of dry matter

Mix No.	Zone 1°				Zone 4				Zone 5				Zone 7				Zone 8			
	1st+	2nd	3rd	Ave.	1st	2nd	3rd	Ave.	1st	2nd	3rd	Ave.	1st	2nd	3rd	Ave.	1st	2nd	3rd	Ave.
7	5.9	6.9	10.3	7.7	9.1	8.6	7.2	9.4	8.8	8.8	6.6	8.1	5.6	7.2	4.9	5.9	2.7	3.0	4.3	3.3
8	6.9	7.1	10.8	8.3	9.3	8.7	9.1	10.4	9.6	10.0	6.8	8.8	5.8	7.7	5.1	6.2	2.7	3.4	4.4	3.5
3	6.2	6.3	9.7	7.4	9.1	8.8	8.8	9.5	8.5	8.6	6.8	7.9	5.7	7.6	5.0	6.1	2.2	3.3	3.3	2.9
1	6.7	7.7	11.2	8.5	9.2	9.2	8.4	10.0	8.8	9.3	6.8	8.3	5.8	8.0	7.0	6.9	2.2	3.3	3.0	2.8
2	6.0	6.4	8.8	7.1	8.5	8.5	8.0	9.5	8.2	9.6	6.8	8.2	5.6	7.1	4.6	5.8	2.5	2.9	2.5	2.6
10	6.5	6.9	10.5	8.0	8.2	8.5	8.7	9.5	8.2	9.6	6.7	8.1	5.7	6.9	4.4	5.7	3.3	3.3	2.3	3.0
4	6.8	7.5	10.9	8.4	8.8	9.3	9.2	10.3	9.4	9.7	6.8	8.7	5.8	7.4	5.3	6.3	2.1	2.7	4.0	2.9
9	6.2	6.3	9.4	7.3	8.9	9.0	7.8	9.7	8.2	8.6	6.7	7.8	5.6	7.6	4.9	6.0	2.3	2.9	4.6	3.3
5	5.7	7.3	10.8	7.9	8.5	8.0	8.4	9.6	8.8	9.0	6.5	8.1	5.8	7.6	5.1	6.2	2.4	4.0	2.6	3.0
6	6.4	7.1	10.7	8.1	7.9	7.8	8.1	8.8	8.2	9.5	6.7	8.1	5.5	7.5	4.7	5.9	3.2	3.7	2.7	3.2
11													5.5	7.3	4.9	5.8	3.1	4.3	3.5	3.6
12													6.0	7.2	5.2	6.1	3.6	4.3	3.5	3.8
13													5.8	7.3	5.4	6.2	2.8	4.1	4.2	3.7

+ 1st, 2nd, 3rd = crop years

o Zone 1 - average yield of 1 test for 3 years
4 - average yield of 1 test for 3 years
5 - average yield of 2 tests for 3 years
7 - average yield of 2 tests for 3 years
8 - average yield of 1 test for 3 years

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF GOOD DRAINAGE - SERIES A

Location: Guelph Year seeded: 1957 Harvest year : 1960

Mixture No.	Dry matter in lbs.* per acre																	
	Hay				Aftermath										Total Hay + Aftermath			
					First			Second			Total							
	1958	1959	1960	Ave.	1958	1959	1960	1958	1959	1960	1958	1959	1960	Ave.	1958	1959	1960	Ave.
7	6839	4695	3973	5169	2904	2022	4233	1838	1914	----	5584	3936	4233	4584	12422	8631	7206	9420
8	7292	4595	4626	5504	3294	2120	4442	1927	1955	----	6246	4075	4442	4921	13538	8670	9068	10425
3	7154	4527	4304	5328	2741	1835	3959	1638	1974	----	4766	3809	3959	4178	11920	8337	8263	9507
1	7405	5261	4302	5656	2816	1938	4069	1675	1960	----	4873	3898	4069	4280	12556	9159	8371	10029
2	7327	4742	4111	5393	2771	1834	3849	1591	1941	----	4726	3775	3849	4117	12053	8517	7960	9510
10	6659	5008	4811	5493	2571	1627	3952	1508	1900	----	4440	3527	3952	3973	11099	8535	8763	9456
4	7599	5291	5066	5985	2779	2014	4143	1627	1990	----	4783	4004	4143	4310	12381	9295	9209	10295
9	7470	4798	3636	5301	2707	2027	4169	1722	2174	----	4760	4201	4169	4377	12330	8999	7805	9711
5	6603	5117	4789	5503	2682	1168	3648	1564	1685	----	4706	2853	3648	3402	11309	7970	8437	9572
6	5847	4805	4364	5005	2617	1484	3756	1504	1563	----	4571	3047	3756	3791	10418	7852	8120	8797

* Note: Yields of dry matter to nearest pound per acre

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF GOOD DRAINAGE - SERIES A

Location: Guelph Year seeded: 1956 Harvest year: 1960

Per cent legume in hay

Year	Mixture									
	1	2	3	4	5	6	7	8	9	10
1958	71	68	71	51	60	66	78	74	70	59
1959	49	58	54	53	40	37	70	46	63	50
1960	53	40	68	58	35	25	51	38	59	38

PROVINCIAL HAY- PASTURE MIXTURES FOR AREAS OF GOOD DRAINAGE - SERIES B

Location: New Liskeard Year seeded: 1959 Harvest year: 1961

Dry matter in lbs.* per acre

Mixture No.	Components	Hay			Aftermath		Hay & Aftermath	
		1960	1961	Ave.	1960	1961	1960	1961
3	DuPuits 10 / Lincoln 10	1826	1300	1563	1318	—	3144	1300
4	Vernal 8 / Las. 2 / Climax 6	1940	2352	2146	1263	—	3203	2352
1	Vernal 8 / Las. 2 / Cli. 4 / Linc. 6	2335	2266	2301	1304	—	3639	2266
2	Vernal 10 / Lincoln 10	1994	1971	1983	986	—	2980	1971
11	Vernal 10 / Climax 6	1802	2327	2065	1190	—	2992	2327
8	Lasalle 6 / Ladino 2 / Climax 6	1578	1793	1686	784	—	2362	1793
7	Rhiz.7 / Las.2 / Lad.1 / Cli.4 / Lin.6	2204	2540	2372	1156	—	3360	2540
9	Rhiz.5 / Las.2 / Mam.2 / Alsike 1 / Chi.4 / Linc.4 / Mead. fes. 3	2137	2127	2132	784	—	2921	2127
10	Rhiz.5 / Mam.4 / Alsike 1 / Cli.8	1676	2366	2021	1172	—	2848	2366
5	Empire 7 / Climax 5	954	1743	1349	354	—	1308	1743
6	Viking 7 / Climax 5	1533	1968	1751	1015	—	2548	1968

* Yields of dry matter to nearest pound per acre

PROVINCIAL HAY - PASTURE MIXTURES FOR GOOD DRAINAGE - SERIES "B"

Location - New Liskeard Year seeded 1959 Harvest year 1960

Per cent legume in Hay 1961

	1	2	3	4	5	6	7	8	9	10	11
1960	69	70	69	85	35	43	69	70	59	64	84
1961	50	44	28	45	35	14	46	10	50	54	49

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE

Series A

COMPOSITION OF MIXTURES

Mixture No.	Components and seeding rates
1	Vernal 6 + Lasalle 3 + Ladino 1 + Climax 5 + Lincoln 6
2	Vernal 2 + Lasalle 5 + Alsike 2 + Climax 6
3	Vernal 3 + Lasalle 5 + Alsike 2 + Climax 4 + Orchard 2 + Meadow fescue 3
4	Vernal 3 + Lasalle 5 + Ladino 1 + Alsike 1 + Climax 3 + Orchard 2 + Lincoln 5
5	Vernal 4 + Viking 3 + Climax 6
6	Viking 5 + Lincoln 8
7	Viking 5 + Lincoln 5 + Climax 2
8	Viking 5 + Climax 5
9	Lasalle 6 + Alsike 2 + Climax 6
10	Empire 5 + Climax 5
11	Empire 5 + Alsike 1 + Climax 5
12	Viking 5 + Reed canary 6
13	Viking 5
14	Empire 5
15	Viking 5 + Alsike 1 + Climax 5

PROVINCIAL HAY PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES A

Zone Average of Hay + Aftermath

Yield is 1000's pounds of dry matter

Mix No.	Zone 1°				Zone 4						Zone 6				Zone 7				Zone 8			
	1st	2nd	3rd	Ave.	1st	2nd	3rd	4th 1+	4th 2	Ave.	1st	2nd	3rd	Ave.	1st	2nd	3rd	Ave.	1st	2nd	3rd	Ave.
1	5.9	7.2	10.6	7.9	5.7	6.3	4.3	3.9	7.6	5.1	9.2	6.7	5.7	6.4	4.8	4.3	5.2	4.8	4.8	3.4	2.8	3.7
2	5.6	5.7	9.8	7.0	7.1	6.1	4.6	3.4	7.8	5.3	9.0	6.8	4.6	6.0	4.8	4.6	5.2	4.9	5.0	2.8	2.3	3.4
3	5.7	5.8	9.7	7.0	6.6	4.9	3.4	3.3	7.7	4.6	8.4	6.2	4.6	5.7	4.8	4.1	3.5	4.1	5.1	2.9	1.9	3.3
4	5.5	6.6	9.4	7.2	6.3	5.1	3.5	4.2	8.0	4.8	8.8	6.4	4.6	5.8	4.5	4.2	3.4	4.0	5.3	3.0	2.3	3.6
5	5.2	5.6	9.3	6.7	6.5	7.1	5.9	6.1	8.6	6.4	8.9	6.6	6.4	6.6	4.5	4.2	4.9	4.6	2.4	2.9	2.3	2.6
9	4.5	4.7	5.6	4.9	6.4	5.7	4.2	3.3	7.1	4.9	8.1	6.6	3.3	5.5	5.0	4.9	5.6	5.2	4.8	2.8	2.2	3.3
13	5.1	5.8	8.9	6.6	5.3	7.1	5.6	6.8	8.2	6.2	4.9	4.7	4.9	4.8	4.6	3.6	4.5	4.2	1.6	2.3	2.2	2.1
8	5.4	6.0	9.6	7.0	5.3	7.4	6.5	7.5	8.2	6.7	5.9	5.3	3.9	4.8	4.9	4.4	5.0	4.8	1.7	3.1	2.6	2.4
6	5.2	7.4	10.6	7.7	5.5	7.5	6.0	7.3	8.3	6.6	5.9	4.9	4.1	4.6	4.3	3.9	4.6	4.3	2.2	3.1	2.7	2.7
7	5.1	7.1	9.9	7.4	4.9	8.1	6.1	7.5	8.7	6.7	6.7	5.7	4.1	5.2	4.9	4.1	4.9	4.7	1.9	2.8	2.7	2.5
15	4.8	6.5	9.4	6.9	5.9	6.2	4.8	6.4	8.2	5.8	6.5	5.6	4.5	5.2	5.0	4.3	5.2	4.8	2.4	3.3	3.1	3.0
12	4.8	6.2	9.0	6.7	4.2	6.9	6.1	6.9	8.2	6.0	5.6	5.4	3.5	4.8	4.3	3.8	5.8	4.7	1.4	3.0	2.3	2.3
14	3.5	4.9	7.9	5.4	5.5	6.0	6.3	5.7	7.1	5.9	4.1	4.1	4.4	4.2	4.2	3.3	4.5	4.0	1.2	2.5	1.9	1.9
10	3.4	5.9	9.1	6.2	6.0	5.7	7.0	7.0	7.9	6.4	4.6	4.4	4.0	4.2	4.6	4.2	5.4	4.7	2.8	3.4	2.7	3.0
11	4.0	5.5	8.8	6.1	6.0	5.6	6.1	6.2	8.2	6.0	6.3	5.6	3.3	4.8	4.6	4.2	5.4	4.7	2.5	2.9	2.8	2.7

\+ 1 = no nitrogen; 2 = 100 lbs. nitrogen spring, 33 lbs. after hay, 33 lbs. after 1st pasture.

o Zone 1 = average yield of 1 test for 3 years
4 = average yield of 1test for 4 years
6 = average yield of 1 test for 3 years
7 = average yield of 2 tests for 3 years
8 = average yield of 1 test for 3 years

PROVINCIAL HAY - PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES "A"

Location - Guelph (Kaine farm) Year seeded 1957 Harvest year 1961

Mixture No.	Dry matter in lbs. per acre														
	Hay					Aftermath					Hay and Aftermath				
	1958	1959	1960	1961[1]	AVE.	1958	1959	1960	1961[1]	AVE.	1958	1959	1960	1961[1]	AVE.
1	3605	5195	3651	2911	3841	2130	1125	677	966	1225	5735	6319	4318	3877	5062
2	4624	5028	3996	2876	4131	2455	1092	565	573	1171	7080	6120	4561	3449	5303
3	4140	3744	2658	2364	3227	2456	1172	733	990	1338	6597	4916	3391	3354	4565
4	3906	3818	2663	2187	3144	2436	1264	832	1007	1410	6343	5082	3495	4194	4779
5	4000	5018	4538	3932	4372	2741	2073	1339	2126	2070	6491	7090	5876	6058	6379
9	4137	4840	3786	2780	3886	2302	850	425	503	1020	6439	5690	4211	3283	4906
13	2770	4153	3501	4236	3665	2664	2957	2128	2548	2574	5343	7109	5629	6784	6216
8	3028	4407	4587	4539	4140	2282	2976	1961	3007	2557	5310	7384	6548	7546	6697
6	3033	4367	3713	4399	3878	2444	3132	2259	2897	2683	5478	7499	5972	7286	6559
7	3015	4810	4117	4557	4125	1886	3278	2004	2943	2528	4901	8088	6121	7499	6652
15	4103	5063	3702	4211	4270	1823	1605	1180	2196	1701	5926	6168	4882	6407	5846
12	2065	4146	3867	4036	3529	2122	2762	2192	2839	2479	4187	6908	6059	6875	6007
14	4500	4303	4601	3951	4339	1036	1714	1740	1708	1550	5536	6017	6341	5659	5888
10	4802	4192	5545	4098	4659	1185	1534	1445	1890	1514	5987	5726	6990	6988	6423
11	3882	4638	4931	4116	4392	2110	935	1175	1968	1547	5992	5573	6106	6184	5964

1 - No nitrogen added.

PROVINCIAL HAY - PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES "A"

Location - Guelph (Kaine farm) Year seeded 1957 Harvest year 1961

Mixture No.	Hay					Aftermath					Hay and Aftermath				
	1958	1959	1960	1961[1]	AVE	1958	1959	1960	1961[1]	AVE	1958	1959	1960	1961[1]	AVE
1	3605	5195	3651	5850	4575	2130	1125	677	1787	1430	5735	6319	4318	7637	6002
2	4624	5028	3996	5717	4841	2455	1092	565	2019	1533	7080	6120	4561	7836	6399
3	4140	3744	2658	4846	3847	2456	1172	733	2869	1808	6597	4916	3391	7715	5655
4	3906	3818	2663	5176	3890	2436	1264	832	2848	1845	6343	5082	3495	8024	5736
5	4000	5018	4538	5597	4788	2741	2073	1339	2992	2286	6491	7090	5876	8589	7012
9	4137	4840	3786	5561	4581	2302	850	425	1566	1286	6439	5690	4211	7127	5867
13	2770	4153	3501	5445	3967	2664	2957	2128	2605	2589	5343	7109	5629	8150	6558
8	3028	4407	4587	5447	4367	2282	2976	1961	2711	2483	5310	7384	6548	8158	6850
6	3033	4367	3713	5227	4085	2444	3132	2259	3098	2733	5478	7499	5972	8325	6819
7	3015	4810	4117	6111	4513	1886	3278	2004	2624	2448	4901	8088	6121	8735	6961
15	4103	5063	3702	5594	4616	1823	1105	1180	2576	1671	5926	6168	4882	8170	6287
12	2065	4146	3867	5266	3836	2122	2762	2192	2897	2493	4187	6908	6059	8163	6329
14	4500	4303	4601	5114	4630	1036	1714	1740	2095	1647	5536	6017	6341	7109	6251
10	4802	4192	5545	5733	5068	1185	1534	1445	2150	1579	5987	5726	6990	7883	6647
11	3882	4638	4931	5972	4856	2110	935	1175	2181	1600	5992	5573	6106	8153	6456

1 - 160# Nitrogen added - spring 100#, after hay 33#, after first pasture 33#.

PROVINCIAL HAY - PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES "A"

Location - Guelph (Kaine farm) Year seeded - 1957 Harvest year 1961

Per cent Legume

1958	55	63	41	39	40	48	36	43	56	52	62	56	92	87	66
1959	16	25	15	14	28	31	33	34	26	38	35	36	44	38	40
1960	0	0	0	0	13	70	29	44	0	49	45	35	46	65	18
1961[1]	0	0	0	0	35	58	60	50	0	43	48	53	57	53	30
1961[2]	0	0	0	0	32	28	25	30	0	30	38	45	0	30	15

1. - without nitrogen

2. - with nitrogen

PROVINCIAL HAY - PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES "A"

Location: Arthur | Year seeded 1958 | Harvest year 1961

Mixture No.	Dry matter in lbs. * per acre											
	Hay				Aftermath				Hay and Aftermath			
	1959	1960	1961	AVE.	1959	1960	1961	AVE.	1959	1960	1961	AVE.
1	5077	3086	4369	4177	4139	1145	1383	2222	9216	4231	5752	6400
2	4892	3701	3886	4160	4074	854	737	1888	8966	4555	4623	6048
3	4686	2926	3653	3755	3760	1095	955	1937	8446	4020	4608	5691
4	4839	3026	3655	3840	3966	1016	964	1982	8805	4042	4619	5822
5	4755	2967	4493	4072	4184	1339	1951	2491	8938	4306	6444	6563
9	4569	4303	3105	3992	3502	786	218	1502	8071	5090	3323	5495
13	3121	3463	3622	3402	1803	1120	1315	1413	4923	4583	4937	4814
8	3971	4153	3270	3798	1965	560	598	1041	5935	4713	3868	4839
6	4219	3265	3185	3556	1665	640	930	1078	5884	3905	4115	4635
7	4830	3989	3341	4053	1851	827	765	1148	6681	4816	4106	5201
15	4390	4002	3384	3913	2082	694	1082	1286	6472	4696	4466	5211
12	3831	4422	2739	3664	1759	845	746	1117	5590	5267	3485	4781
14	2531	3268	3580	3128	1619	719	781	1040	4154	3986	4361	4167
10	3226	3562	3246	3345	1389	558	712	886	4615	4120	3958	4231
11	4490	4580	3015	4028	1785	380	236	800	6275	4960	3251	4829

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES A

Location: Arthur Year seeded: 1958 Harvest year 1961

Per cent legume in hay

Year	Mixture														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1959	63	60	45	40	87	16	9	20	47	17	5	9	59	26	17
1960	8	9	14	11	15	14	6	15	10	14	5	9	34	22	11
1961	43	20	21	14	71	28	18	21	10	35	5	19	53	24	41

PROVINCIAL HAY-PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE

Series B

COMPOSITION OF MIXTURES

Mixture No.	Components and seeding rates
1	Vernal 8 + Ladino 1 + Climax 4 + Lincoln 6
2	Vernal 2 + Red clover (comp.) 5 + Alsike 2 + Climax 6
3	Viking 8 + Climax 4
4	Empire 8 + Climax 4
5	Vernal 10 + Climax 6
6	Vernal 8 + Red clover (comp.) 2 + Climax 6
7	Empire 8 + Essex 4
8	Viking 8 + Red clover (comp.) 1 + Climax 4
9	Alsike 2 + Com. red 6 + Com. Timothy 6
10	Vernal 2 + Viking 8 + Climax 4
11	Vernal 4 + Viking 6 + Climax 4
12	Vernal 6 + Viking 4 + Climax 4
13	Vernal 2 + Empire 8 + Climax 4
14	Vernal 4 + Empire 6 + Climax 4
15	Vernal 6 + Empire 4 + Climax 4
16	Alsike 2 + Lasalle 6 + Climax 6

PROVINCIAL HAY - PASTURE MIXTURES FOR AREAS OF IMPERFECT DRAINAGE - SERIES "B"

Location - Guelph | Year seeded - 1960 | Harvest year 1961

Mixture No.	Hay 1961			Aftermath						Hay and Aftermath		
	OAC	Kaine	AVE	OAC			Kaine farm			OAC	Kaine	AVE
				Aug. 2	Oct. 3	Total	Aug. 9	Oct. 4	Total			
5	6735	5225	5980	3178	2609	5787	2369	1629	4008	12522	9233	10878
1	7280	5398	6489	2956	2553	5509	2314	1296	3610	13089	9008	11049
2	6404	5918	6161	2688	2236	4924	2690	1312	4002	11328	9920	10624
6	6641	5836	6239	3196	2381	5577	2704	1421	4125	12218	9961	11090
16	6707	5110	5909	2359	2350	4709	2235	1169	3404	11416	8514	9965
9	6442	5194	5818	1966	2697	4663	1811	998	2809	11105	8003	9554
3	6761	4376	5569	1818	2732	4550	1804	1392	3196	11311	7572	9442
4	5955	4305	5135	1543	2696	4239	1356	1054	2410	10204	6715	8460
7	5893	3938	4916	1987	2532	4519	1221	919	2140	10412	6078	8245
10	6101	4629	5365	2897	2631	5528	2103	1381	3484	11629	8113	9871
11	6343	5052	5698	3105	2654	5759	2296	1687	4983	12102	10035	11069
12	5347	4875	5611	2916	2593	5509	2237	1669	3906	11856	8781	10319
13	6772	4846	5809	2767	2530	5297	2174	1702	3876	12069	8712	10391
14	6073	4938	5506	2767	2772	5539	2203	1581	3784	11612	8712	10162
15	6743	5381	6062	3256	2505	5761	2328	1678	4006	12504	9387	10946
8	6492	4796	5644	2293	2797	5090	2359	1139	3498	11582	8294	9938
Roskilde		3975					1655	1312	2967		6942	

Exp. 488. PROVINCIAL HAY - PASTURE FAIR DRAINAGE - SERIES "B"

Location: O.A.C. Year Seeded 1960 Harvest Year 1961

Mixture No.	Percent Composition								
	Hay								
	Alfalfa	Red Clover	Alsike	Ladino	Trefoil	Total Legume	Timothy	Brome	Total Grass
5	73					73	28		28
1	45			09		54	19	27	46
2	06	69	03			78	23		23
6	39	34				73	28		28
16		74	05			79	21		21
9		69	05			74	30		30
3					34	34	66		66
4					34	34	66		66
7					42	42	58		58
10	34				12	46	54		54
11	45				11	56	44		44
12	45				10	55	48		48
13	50				10	60	40		40
14	45				10	55	45		45
15	65				06	71	29		29
8		43			12	55	45		45

Exp. 486

PROVINCIAL HAY - PASTURE FAIR DRAINAGE - SERIES "B"

Location: Kaine Farm

Year Seeded 1960

Harvest Year 1961

Mixture No.	Percent Composition								
	Hay								
	Alfalfa	Red Clover	Alsike	Ladino	Trefoil	Total Legume	Timothy	Brome	Total Grass
5	56					56	41		41
1	36			18		54	36		36
2	02	64	18			84	14		14
6	24	59				83	12		12
16		89	0			89	10		10
9		86	0			86	09		09
3					43	43	48		48
4					51	51	43		43
7					51	51	38		38
10	26				16	43	45		45
11	34				14	48	46		46
12	45				10	55	40		40
13	26				23	56	36		36
14	34				26	53	41		41
15	56				09	65	30		30
8		43			15	65	31		31

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TEST 151 - GROWTH CURVE - 1961

FIRST CROP DATA (Yield/Lbs/Ac.)

VERNAL

Cut No.	Date Cut	Stage Cut	Height CMS.	% D.M.	Yield D.M.	Weekly Increase D.M.	% Leaf	Yield Leaf	Yield Stem	Weekly Increase Leaf	% Crude Protein	Yield Crude Protein
1	5- 8	Veg.	7	—	86	—	—	—	—	—	—	—
2	5-15	Veg.	19	17.1	1071	985	—	—	—	—	31.8	289
3	5-23	Veg.	25	17.1	1836	765	70.3	1268	568	—	29.0	538
4	5-29	Veg.	35	17.4	3348	1512	60.9	2035	1313	767	25.2	838
5	6- 5	E. Bud	47	18.2	3343	-5	47.4	1584	1759	-451	23.0	786
6	6-12	Bud	67	18.2	4390	1047	43.1	1889	2501	305	20.5	894
7	6-19	Bud	75	20.5	4672	282	43.0	1994	2678	105	18.3	852
8	6-26	Bud	88	21.9	5434	762	41.5	2246	3188	252	17.5	951
9	7- 3	Full Fl.	88	23.8	5898	464	39.0	2302	3596	56	16.2	954
10	7-10	Full Fl.	92	26.7	6959	1061	40.1	2787	4172	485	15.9	1106
11	7-17	Seed	100	25.4	6864	-95	32.0	2210	4654	-577	15.2	1045
12	7-24	Seed	112	27.2	6350	-514	31.4	2008	4342	-202	15.1	961
DUPUITS												
1	5- 8	Veg.	10	—	291	—	—	—	—	—	—	—
2	5-15	Veg.	23	14.2	1141	850	—	—	—	—	33.4	322
3	5-23	Veg.	32	16.3	2960	1819	65.1	1908	1052	—	28.5	837
4	5-29	E. Bud	42	16.7	3033	73	57.1	1735	1298	-173	24.7	739
5	6- 5	E. Bud	57	18.3	3603	570	44.2	1592	2011	-143	22.8	821
6	6-12	Bud	74	18.7	4308	705	39.8	1712	2596	120	20.2	870
7	6-19	Bud	84	20.8	4983	675	41.3	2230	2753	518	18.2	912
8	6-26	E. Fl.	90	21.7	5780	797	43.1	2495	3285	265	16.5	955
9	7- 3	Full Fl.	97	24.4	6240	460	39.4	2452	3788	-43	16.4	1025
10	7-10	E. Seed	101	27.1	7396	1156	37.7	2786	4597	334	15.8	1167
11	7-17	Seed	103	28.1	7758	362	34.8	2694	5064	-92	15.1	1178
12	7-24	Seed	113	28.4	7051	-707	32.9	2318	4733	-376	14.0	991

TEST 151 - GROWTH CURVE - 1961

FIRST CROP DATA (Yield/Lbs/Ac.)

CLIMAX

Cut No.	Date Cut	Stage Cut	Height CMS.	% D.M.	Yield D.M.	Weekly Increase D.M.	% Leaf	Yield Leaf	Yield Stem	Weekly Increase Leaf	% Crude Protein	Yield Crude Protein
1	5- 8	Veg.	13	--	292	—	—	—	—	—	—	—
2	5-15	Veg.	19	21.1	762	470	—	--	--	--	22.8	147
3	5-23	Veg.	24	21.9	1588	826	—	—	--	--	16.8	270
4	5-29	Veg.	34	22.5	2220	632	93.4	2068	152	—	13.4	299
5	6- 5	Joint	53	20.9	3401	1181	64.8	2198	1969	130	9.5	391
6	6-12	Joint	72	20.2	4218	817	63.9	2663	2264	465	9.7	419
7	6-19	Boot	83	21.2	4964	746	45.1	2250	2714	-413	8.4	431
8	6-26	Head	88	24.6	5941	977	41.0	2421	3520	171	7.6	454
9	7- 3	Head	87	29.0	6480	539	34.4	2220	4695	-201	6.9	449
10	7-10	Flower	93	34.6	7641	1161	29.8	2275	5366	55	6.5	496
11	7-17	Flower	98	36.5	7793	152	29.3	2274	5519	-1	5.5	432
12	7-24	Flower	100	39.7	8184	391	30.3	2457	5727	183	4.8	396
ESSEX												
1	5- 8	Veg.	13	--	445	—	—	—	—	—	—	—
2	5-15	Veg.	19	22.8	702	257	—	—	--	—	27.5	136
3	5-23	Veg.	22	23.3	1549	847	—	—	--	—	18.0	279
4	5-29	Veg.	28	24.6	1659	110	97.4	1609	50	—	14.6	243
5	6- 5	Veg.	42	22.8	3254	1595	75.6	2462	1285	853	11.9	388
6	6-12	Joint	58	19.9	3762	508	80.0	3007	1976	545	12.2	397
7	6-19	Joint	74	20.9	4797	1035	59.0	2811	1986	-196	9.4	456
8	6-26	Boot	82	22.5	5684	887	54.2	3069	2615	258	8.4	479
9	7- 3	Head	85	24.6	6355	671	40.8	2594	4171	-475	7.5	492
10	7-10	Head	92	30.9	7892	1537	33.3	2652	5241	58	7.1	561
11	7-17	Flower	99	32.7	8603	711	35.3	3029	5574	377	6.1	521
12	7-24	Flower	102	36.6	8696	93	33.6	2932	5764	-97	5.6	487

TEST 151 - GROWTH CURVE - 1961

FIRST CROP DATA (Yield/Lbs/Ac.)

FRODE

Cut No.	Date Cut	Stage Cut	Height CMS	% D.M.	Yield D.M.	Weekly Increase D.M.	% Leaf	Yield Leaf	Yield Stem	Weekly Increase Leaf	% Crude Protein	Yield Crude Protein
1	5- 8	Veg.	12	—	266	—	—	—	—	—	—	—
2	5-15	Veg.	22	19.3	799	533	—	—	—	—	23.1	146
3	5-23	Veg.	23	20.8	1259	460	—	—	—	—	14.9	188
4	5-29	Veg.	36	22.1	2028	769	91.6	1883	145	—	12.5	256
5	6- 5	Head	55	22.1	3218	1190	62.6	2013	1205	130	9.8	318
6	6-12	Head	70	22.9	3431	213	54.6	1845	1586	-168	8.1	282
7	6-19	Head	77	25.7	3902	471	52.1	1988	1914	143	7.6	304
8	6-26	Head	82	28.4	4056	154	39.1	1628	2428	-360	6.9	281
9	7- 3	Head	82	32.1	4483	427	52.0	2320	2163	692	6.5	291
10	7-10	Head	84	35.5	4220	-263	49.6	2052	2168	-268	5.0	255
11	7-17	Seed	86	35.3	4581	361	47.8	2190	2391	138	5.4	291
12	7-24	Seed	93	35.1	3998	-583	61.8	2454	1544	264	5.4	220
OTTAWA												
1	5- 8	Veg.	9	—	191	—	—	—	—	—	—	—
2	5-15	Veg.	16	20.9	469	278	—	—	—	—	24.4	84
3	5-23	Veg.	21	20.0	1184	715	—	—	—	—	21.8	260
4	5-29	Veg.	25	22.1	1399	215	95.5	1334	65	—	16.5	230
5	6- 5	Boot	41	21.2	2898	1499	80.7	2343	555	1009	12.7	368
6	6-12	Head	55	20.7	3133	235	72.7	2285	848	-58	10.3	328
7	6-19	Head	69	23.1	3819	686	59.2	2250	1569	-35	9.2	350
8	6-26	Head	73	26.1	3885	66	51.6	1967	1918	-283	8.3	320
9	7- 3	Head	80	29.2	4288	403	54.9	2290	1998	323	7.3	316
10	7-10	Head	84	32.4	4733	445	49.6	2260	2473	-30	6.9	326
11	7-17	Seed	90	33.4	5171	438	50.0	2374	2797	114	6.1	316
12	7-24	Seed	105	31.0	5176	5	48.6	2438	2738	64	5.8	300

TEST 151 - GROWTH CURVE - 1961

FIRST CROP DATA - (Yield/Lbs/Ac.)

SARATOGA

Cut No.	Date Cut	Stage Cut	Height CMS.	% D.M.	Yield D.M.	Weekly Increase D.M.	% Leaf	Yield Leaf	Yield Stem	Weekly Increase Leaf	% Crude Protein	Yield Crude Protein
1	5- 8	Veg.	19	—	564	—	—	--	—	—	--	—
2	5-15	Veg.	29	20.2	1311	737	--	--	--	--	20.6	275
3	5-23	Veg.	35	20.4	2239	928	--	--	--	--	16.6	376
4	5-29	Veg.	49	21.7	3290	1051	72.0	2672	618	—	13.8	455
5	6- 5	Boot	73	22.5	4167	877	47.6	1977	1424	-695	11.1	465
6	6-12	Head	92	23.4	4927	760	38.2	1855	2363	-122	8.6	430
7	6-19	Head	104	28.8	5944	1017	31.3	2110	3834	255	7.7	461
8	6-26	Head	108	32.9	6557	613	25.9	1689	4868	-421	6.7	439
9	7- 3	Head	110	38.2	6915	358	27.1	1881	4599	192	5.8	401
10	7-10	Head	115	40.8	8058	1143	24.0	1937	6121	56	5.7	461
11	7-17	Seed	117	44.1	8296	238	24.3	2025	6271	88	4.7	392
12	7-24	Seed	120	44.2	8313	17	23.3	1936	6377	-89	4.5	375
CANADA												
1	5- 8	Veg.	17	--	522	—	--	--	--	--	--	--
2	5-15	Veg.	24	20.1	967	445	--	--	—	--	24.6	203
3	5-23	Veg.	30	21.1	2069	1102	—	--	--	--	19.5	401
4	5-29	Veg.	41	22.3	2535	466	84.5	2138	397	--	15.9	407
5	6- 5	Boot	61	22.4	3747	1208	50.8	1900	1354	-238	12.1	455
6	6-12	Head	84	23.3	4983	1240	39.2	1945	1817	45	10.6	530
7	6-19	Head	96	27.7	5899	916	31.2	1838	4061	-107	8.7	513
8	6-26	Head	99	31.6	6227	328	26.7	1667	4560	-171	8.1	501
9	7- 3	Head	100	35.0	3765	538	30.5	2065	4290	398	7.4	503
10	7-10	Head	102	39.8	7673	908	23.1	1769	5904	-296	5.5	485
11	7-17	Seed	104	41.6	7616	-57	22.9	1742	5874	-27	5.1	391
12	7-24	Seed	109	43.3	7806	190	26.1	2040	5766	298	4.8	376

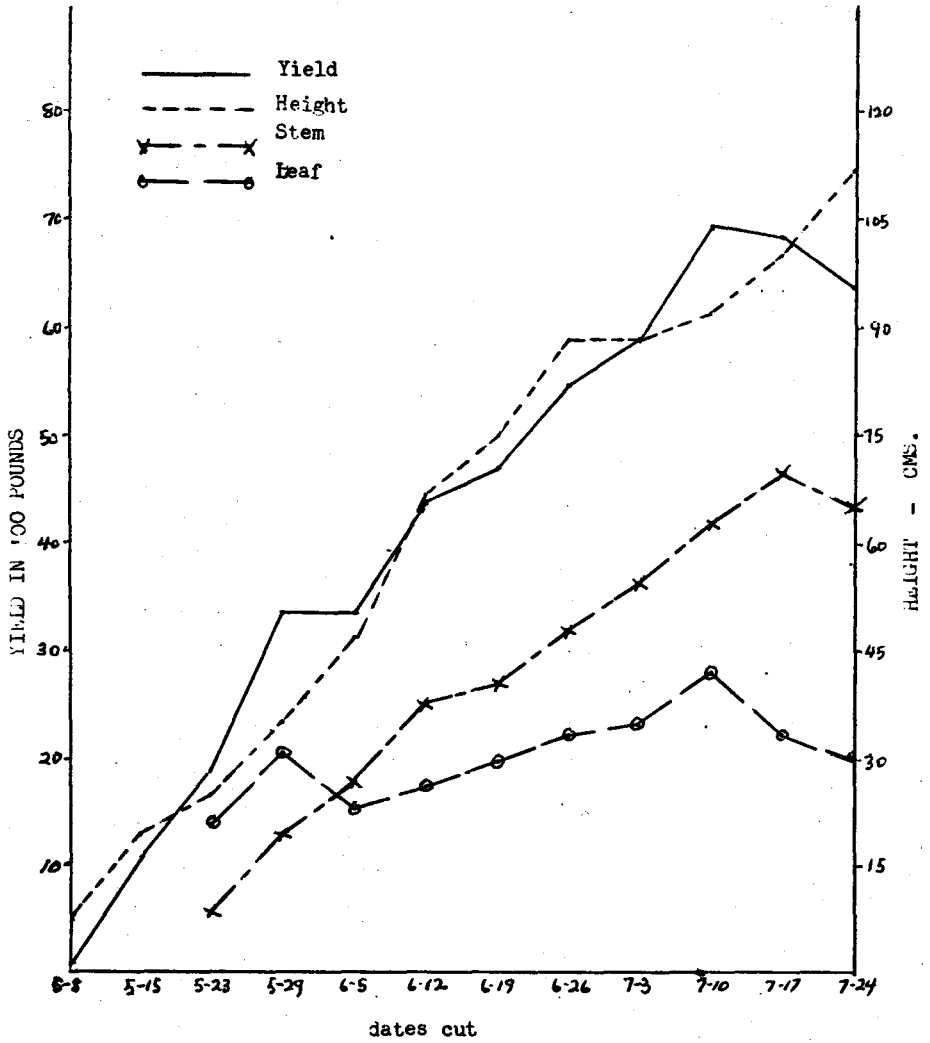
Test 151

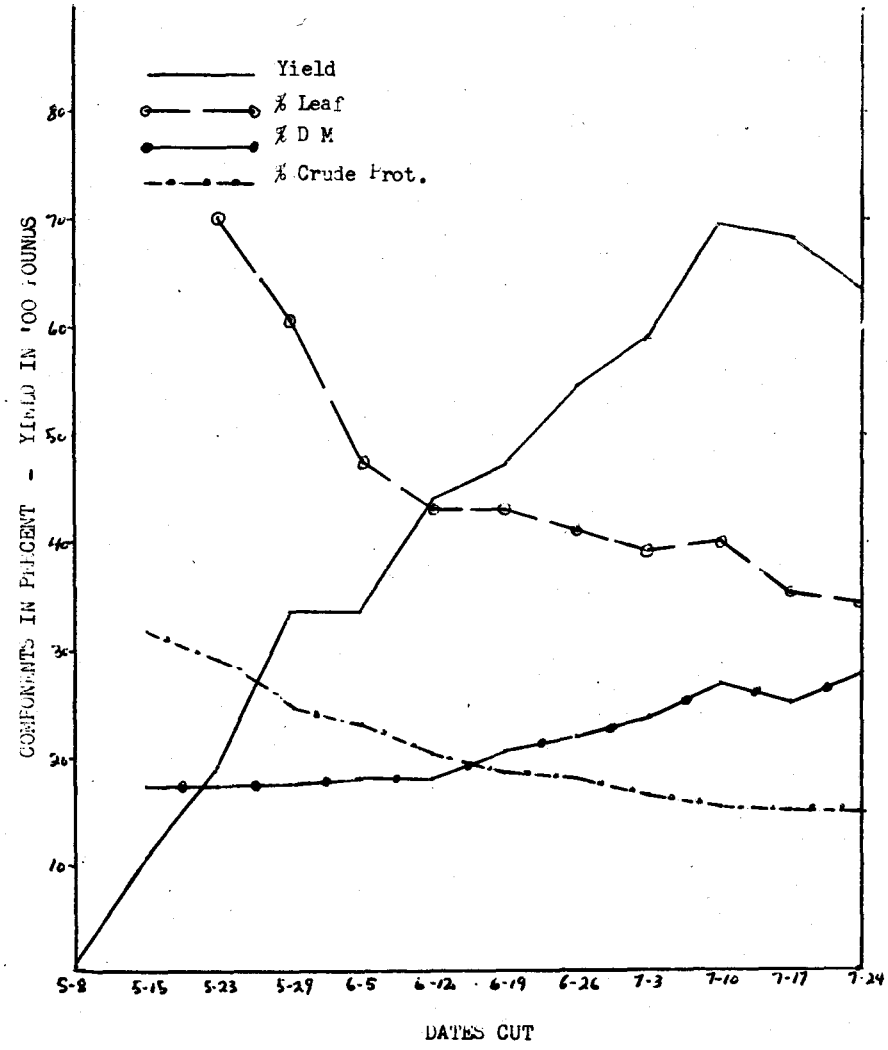
GROWTH CURVE - 1961

Per Cent Crude Protein

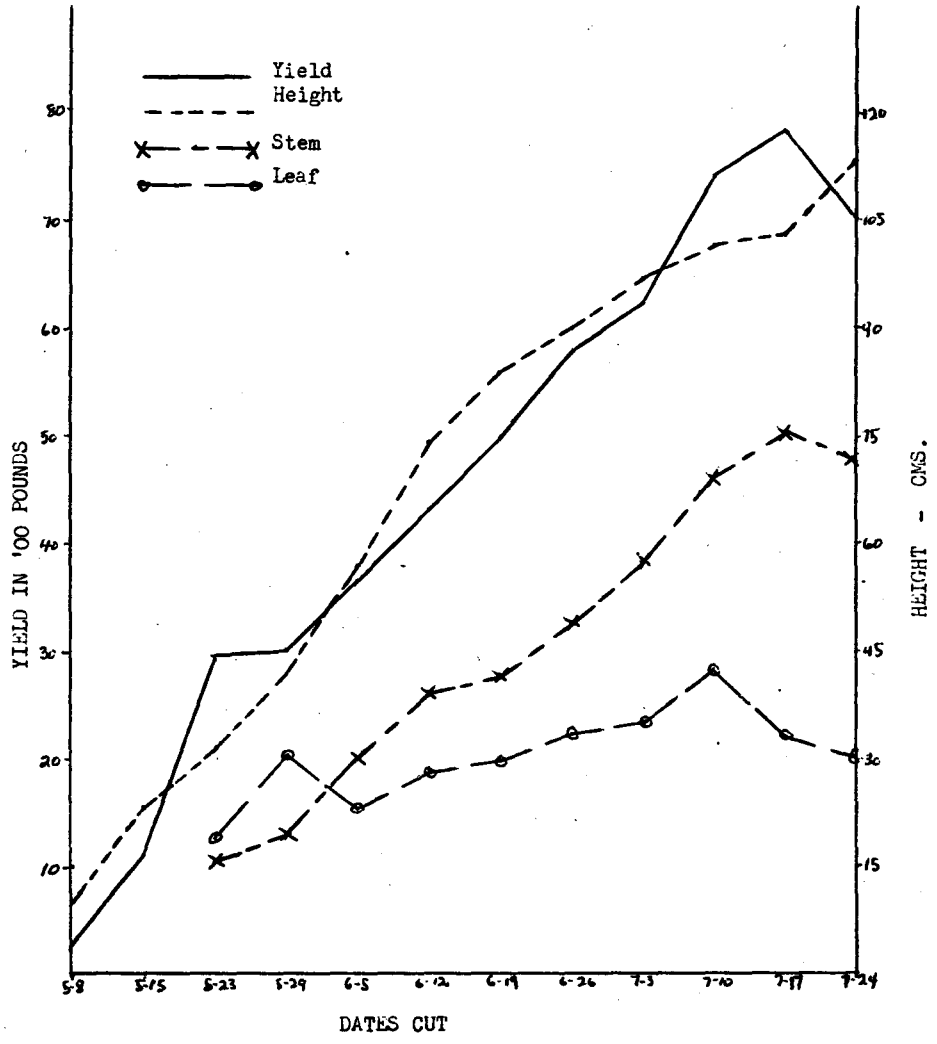
First No.	Growth Date	Alfalfa		Timothy		Orchard		Brome	
		Vernal	DuPuits	Climax	Essex	Frode	Ott. 200	Saratoga	Canada
1	5-8	22.4	28.0	19.0	19.3	18.4	18.0	20.8	21.1
2	5-15	31.8	33.4	23.1	24.4	22.8	27.5	20.6	24.6
3	5-23	29.0	28.5	16.8	18.0	14.9	21.8	16.6	19.5
4	5-29	25.2	24.7	13.4	14.6	12.5	16.5	13.8	15.9
5	6-5	23.0	22.8	9.5	11.9	9.8	12.7	11.1	12.1
6	6-12	20.5	20.2	9.7	12.2	8.1	10.3	8.6	10.6
7	6-19	18.3	18.2	8.4	9.4	7.6	9.2	7.7	8.7
8	6-26	17.5	16.5	7.6	8.4	6.9	8.3	6.7	8.1
9	7-3	16.2	16.4	6.9	7.5	6.5	7.3	5.8	7.4
10	7-10	15.9	15.8	6.5	7.1	5.0	6.9	5.7	5.5
11	7-17	15.2	15.1	5.5	6.1	5.4	6.1	4.7	5.1
12	7-24	15.1	14.0	4.8	5.6	5.4	5.8	4.5	4.8

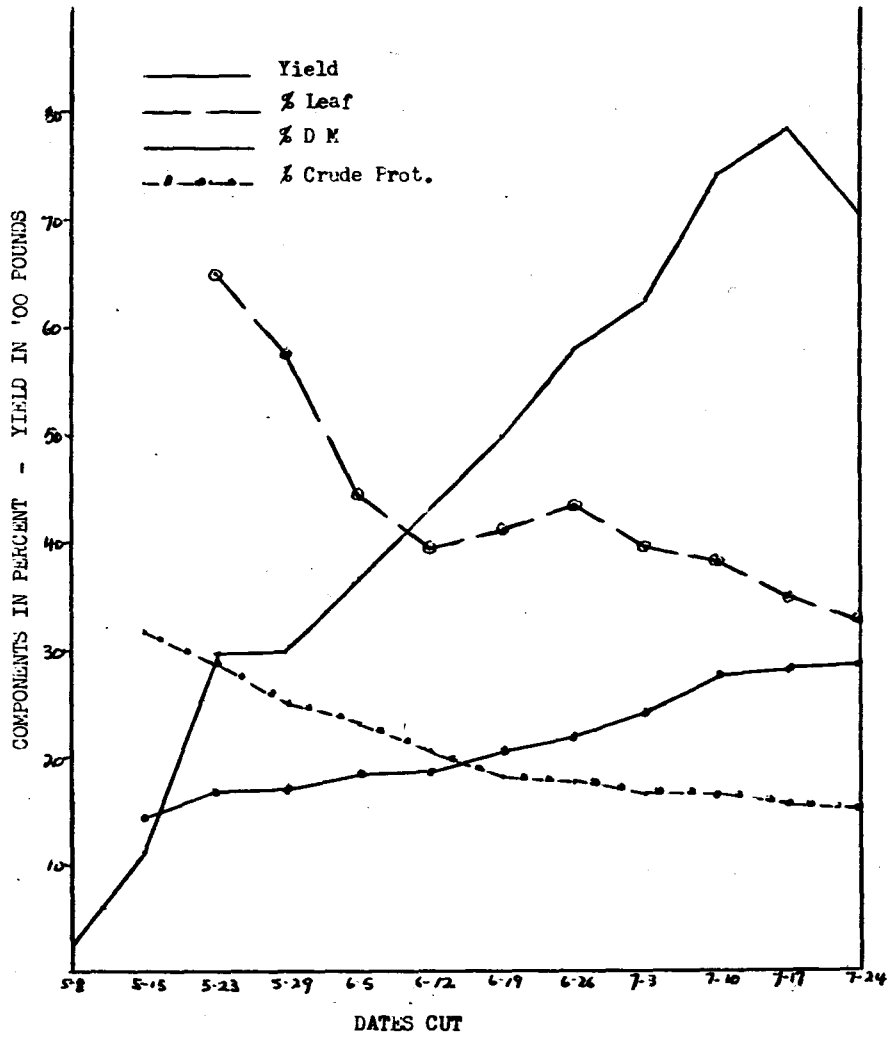
VERNAL ALFALFA 1961



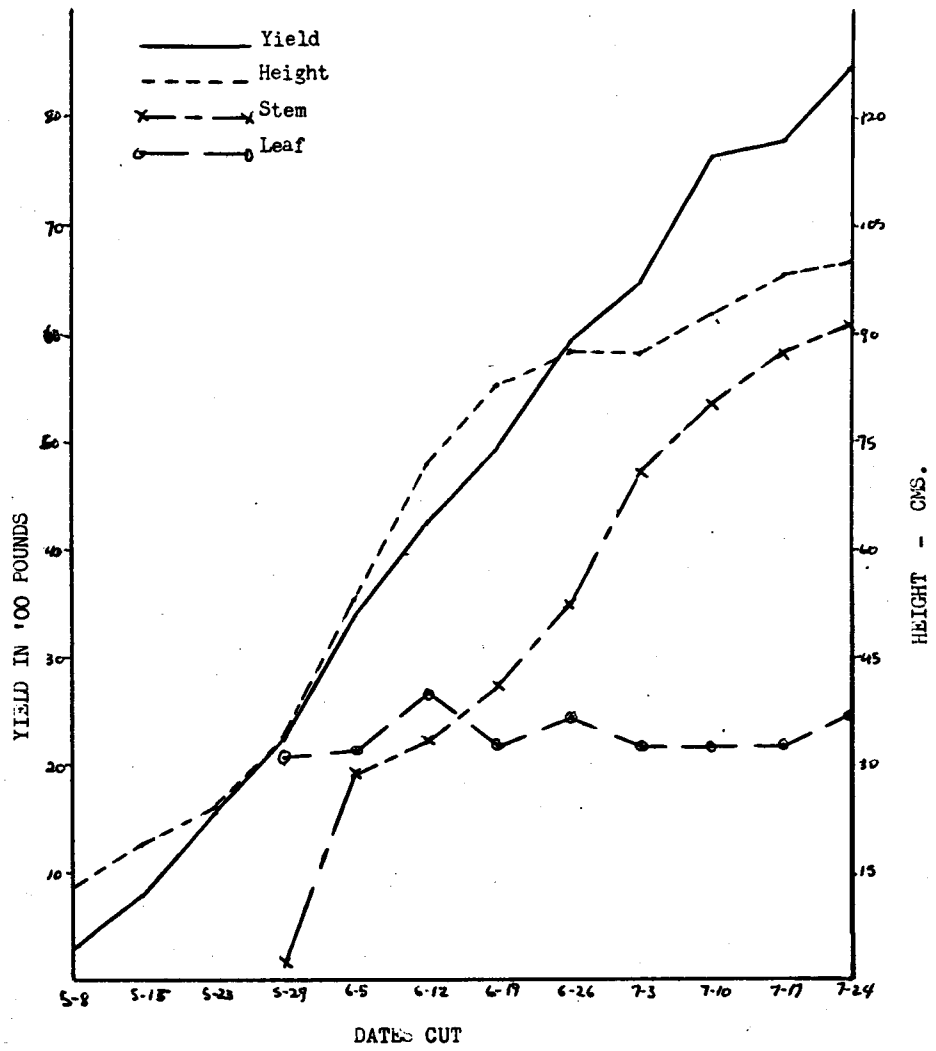


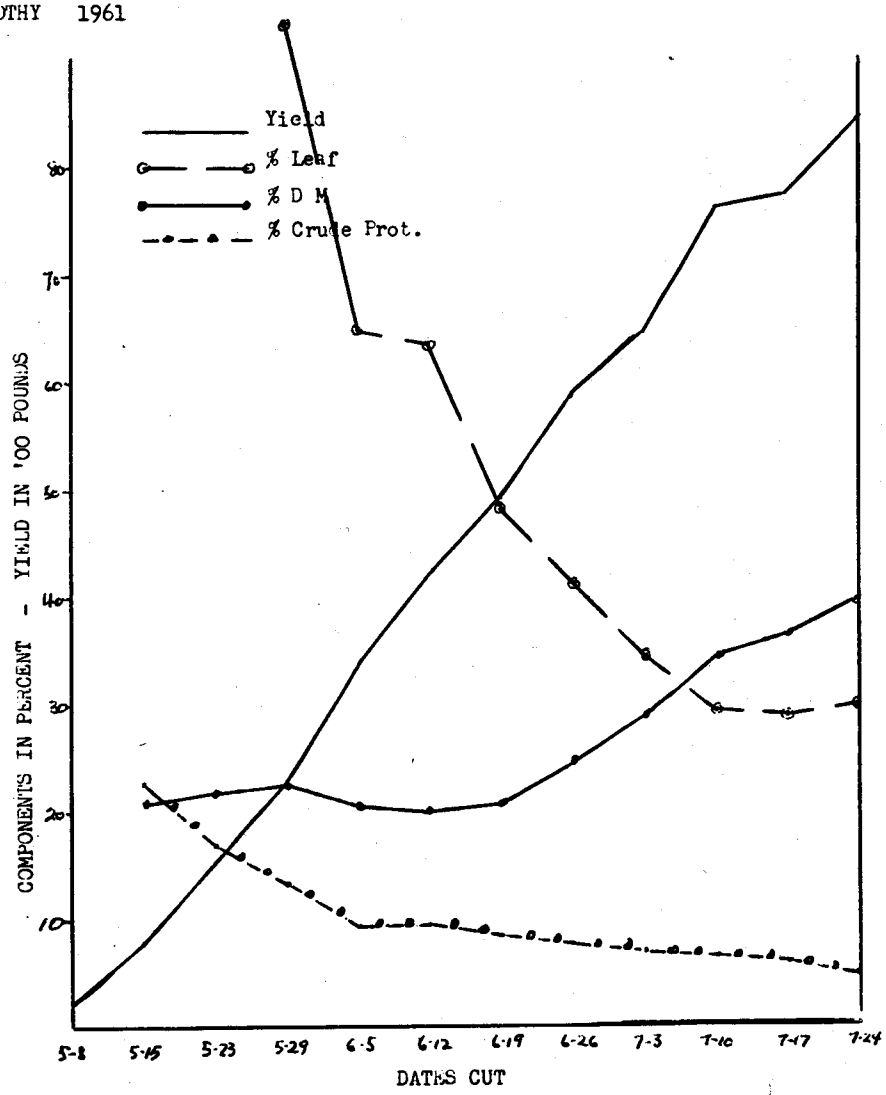
DUPUITS ALFALFA 1961



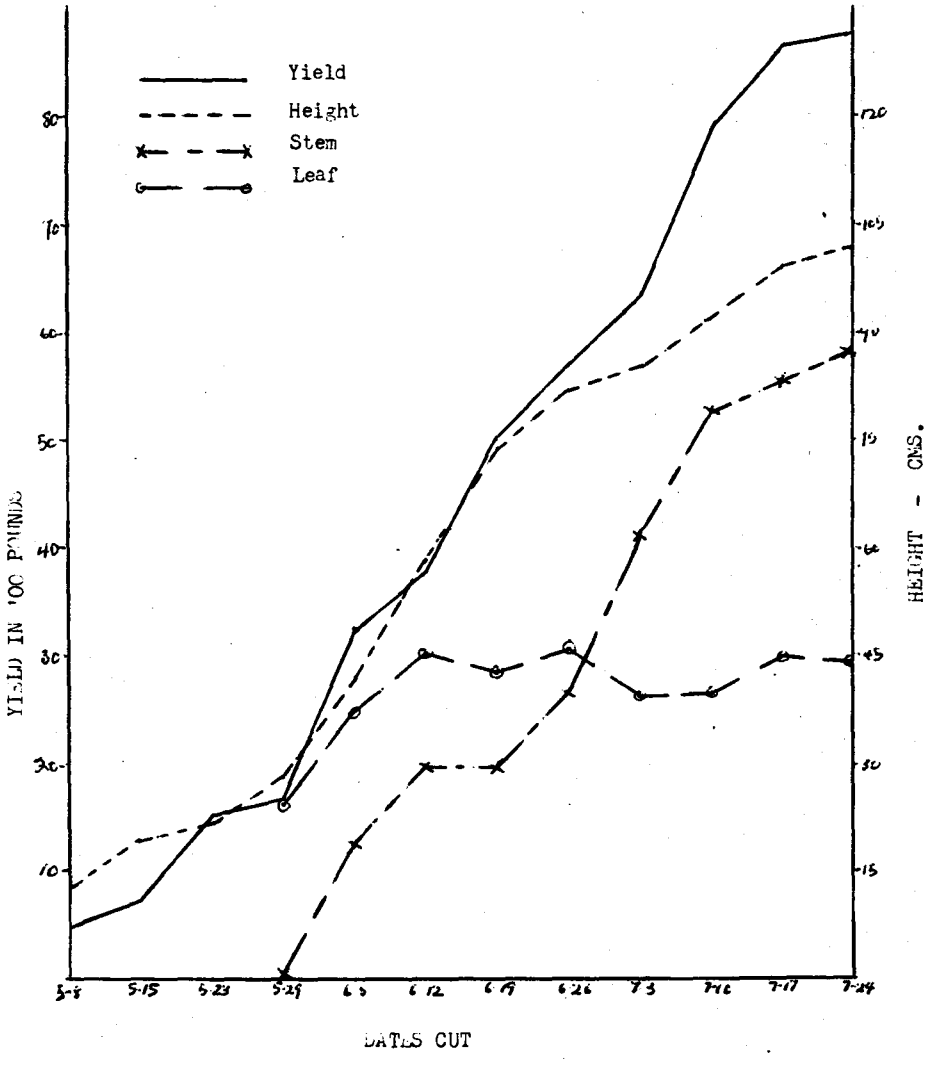


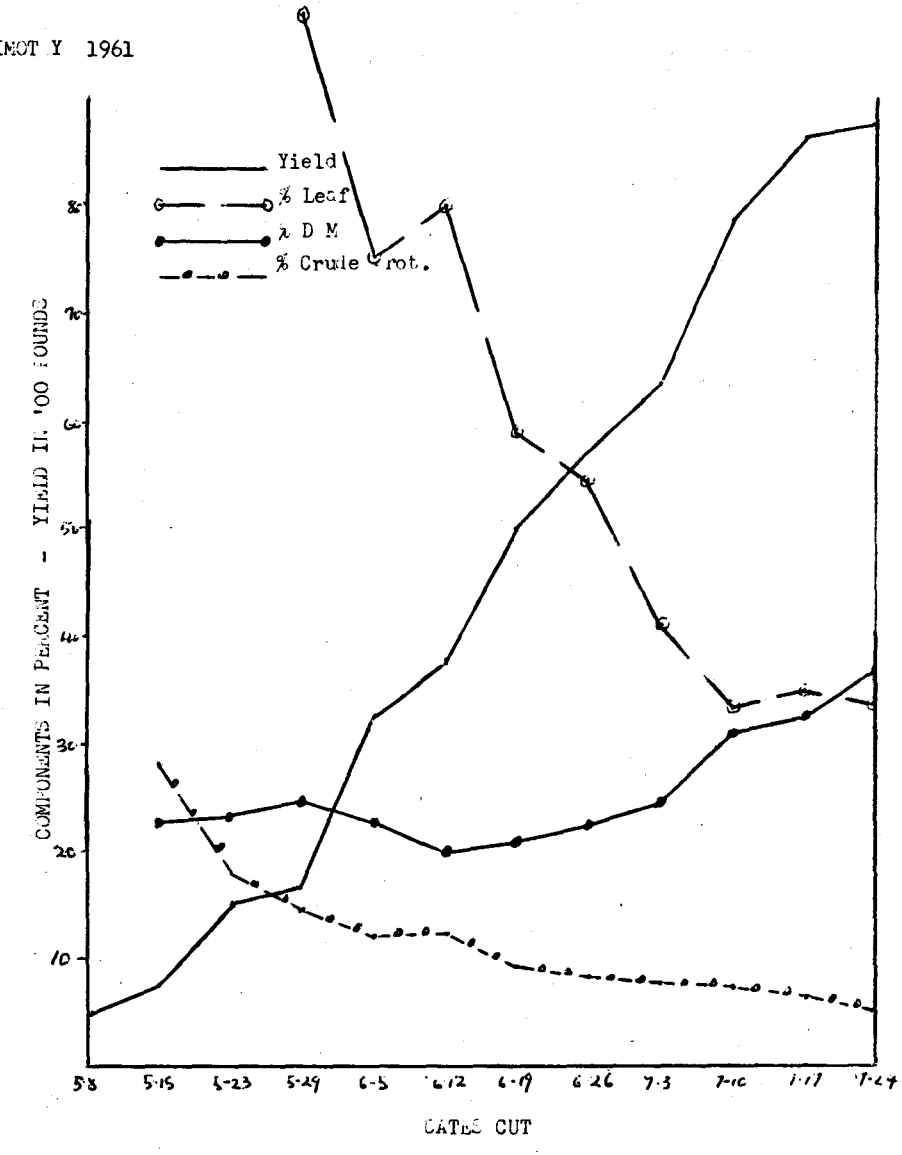
CLIMAX TIMOTHY 1961

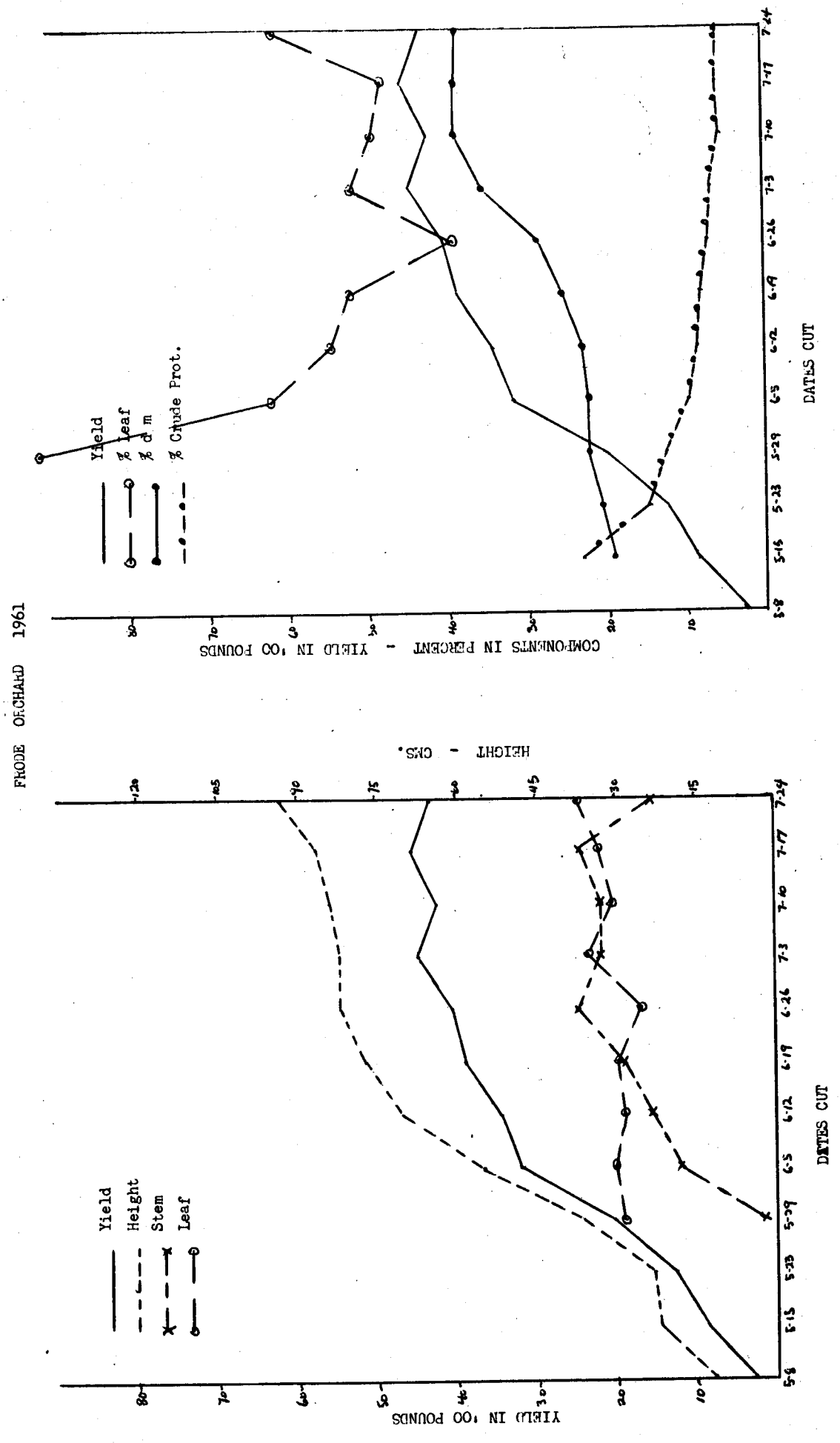




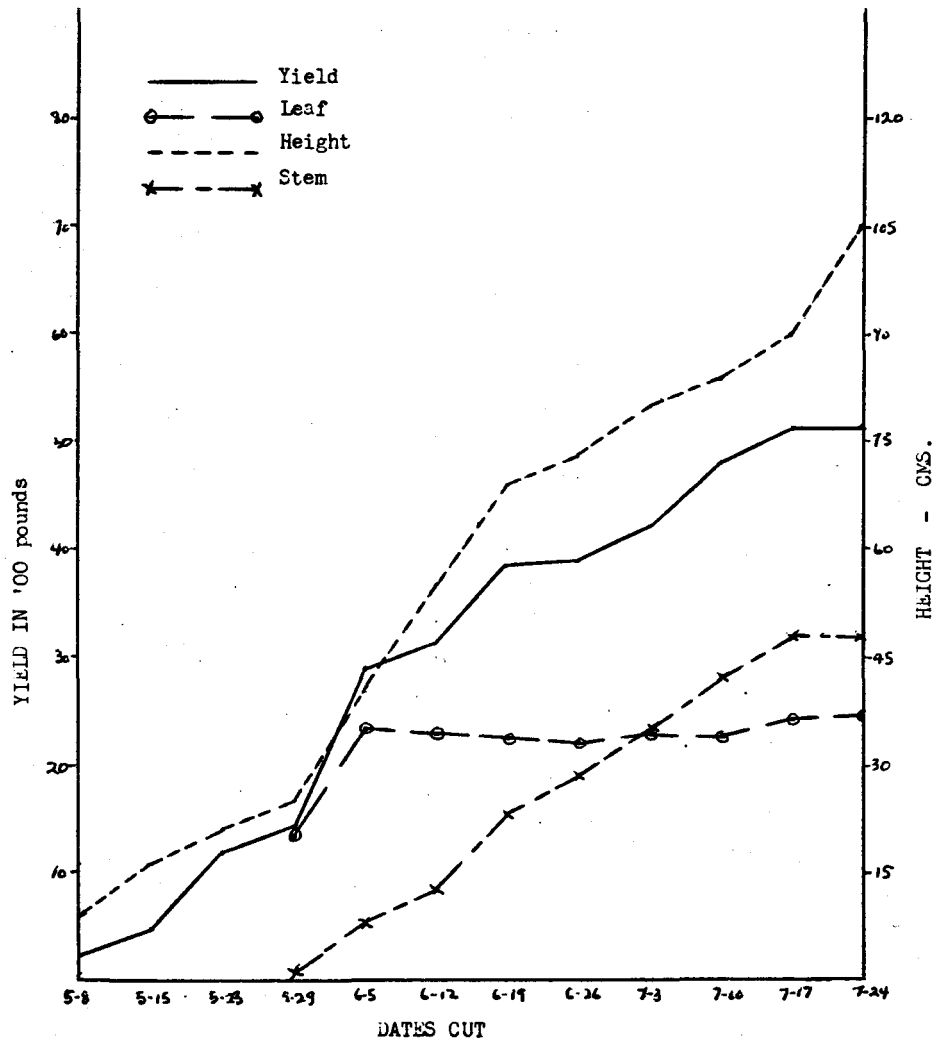
ESSEX TIMOTHY 1961

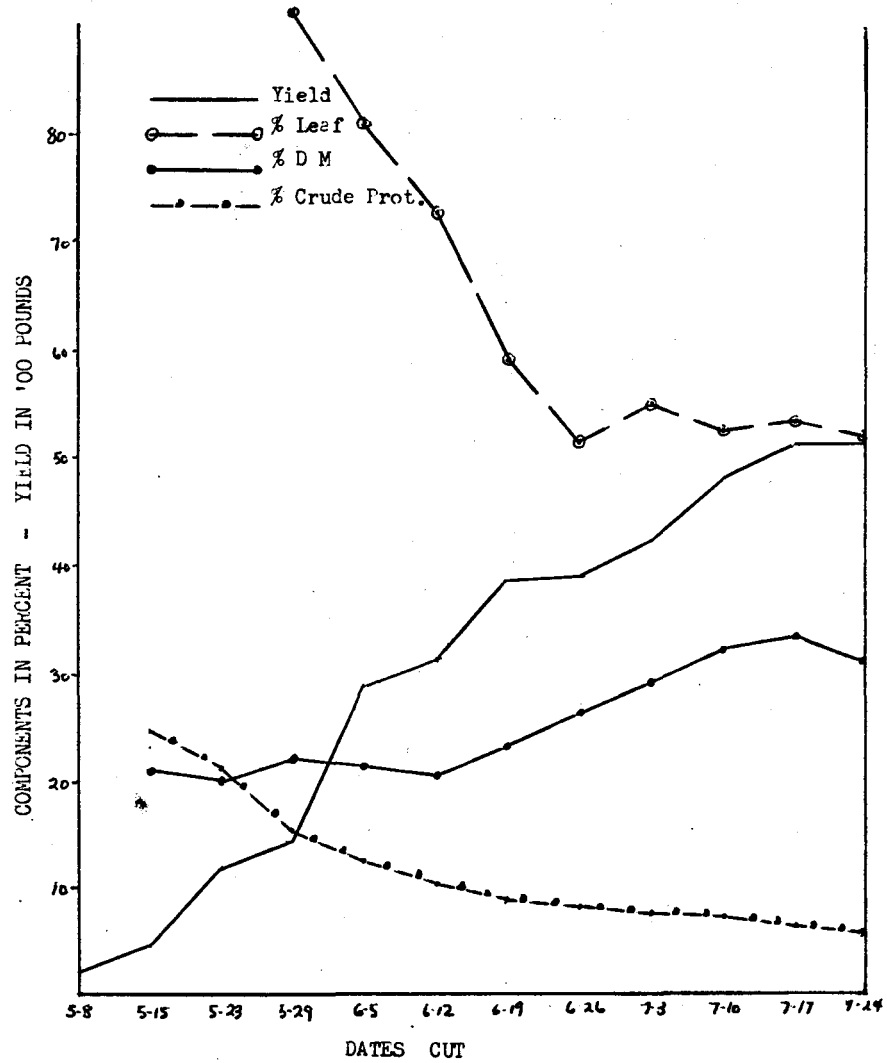




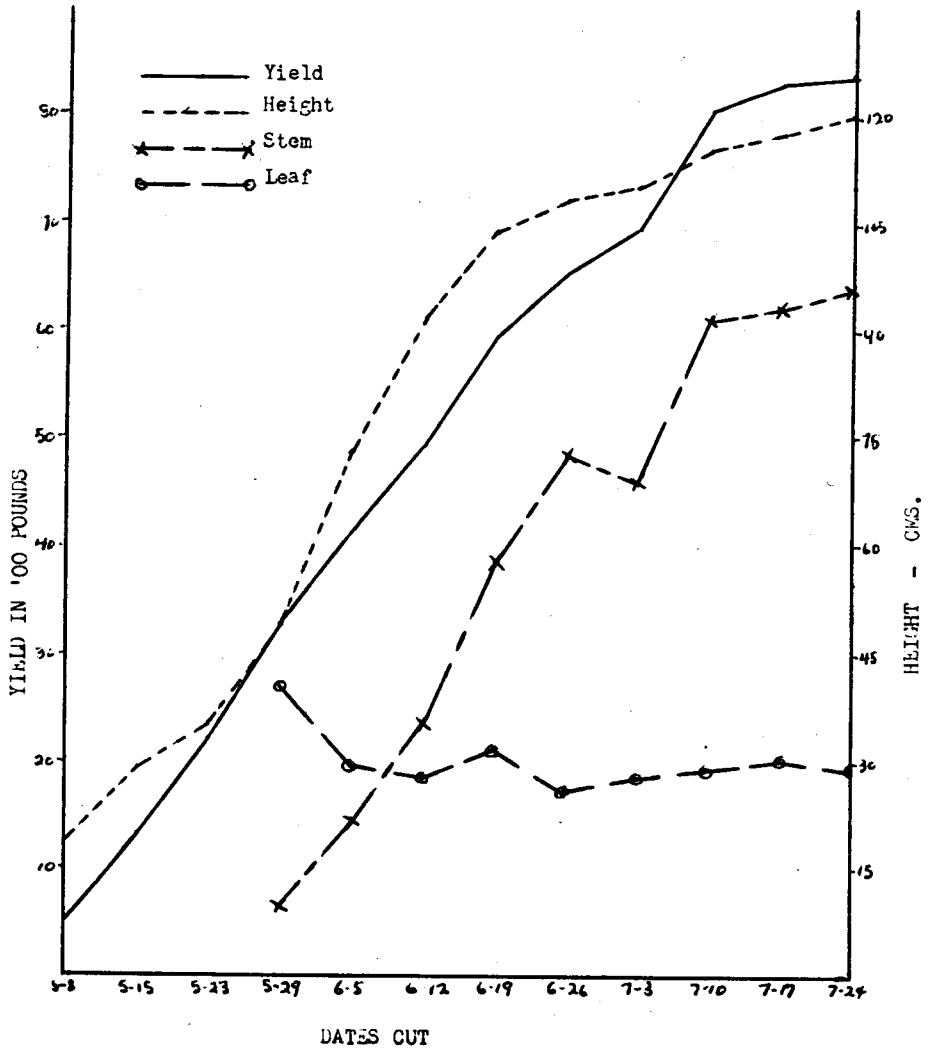

FRODE ORCHARD 1961
Yield
% Leaf
% d m
% Crude Prot.
COMPONENTS IN PERCENT - YIELD IN 100 POUNDS
DATES CUT
Yield
Height
Stem
Leaf
HEIGHT - CMS.
YIELD IN 100 POUNDS
DATES CUT

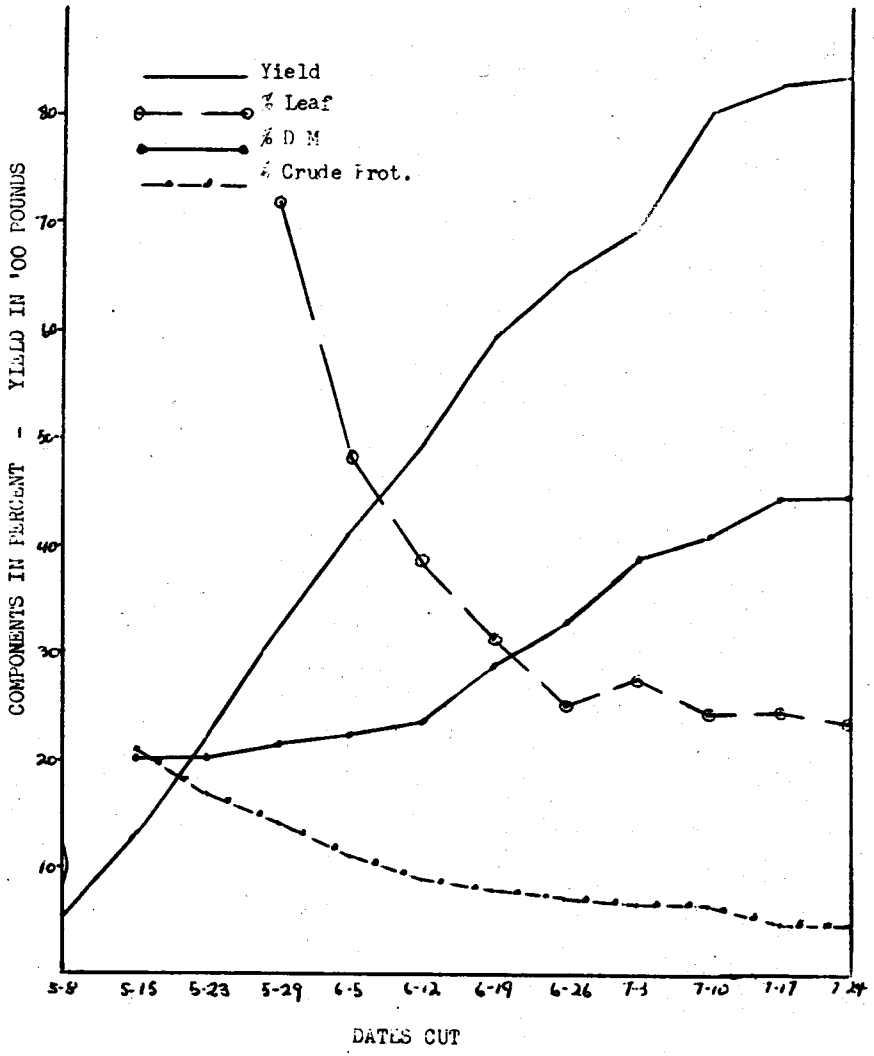
OTTAWA 100 Orchard 1961



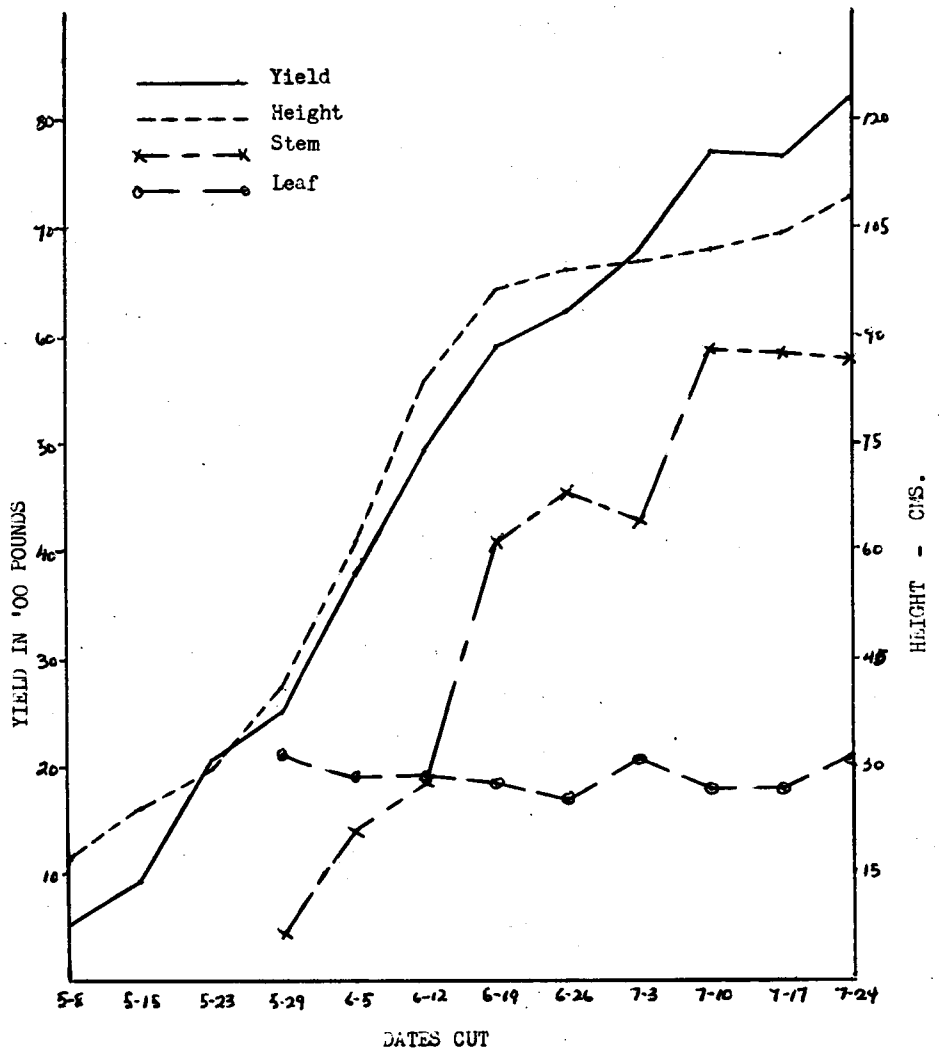


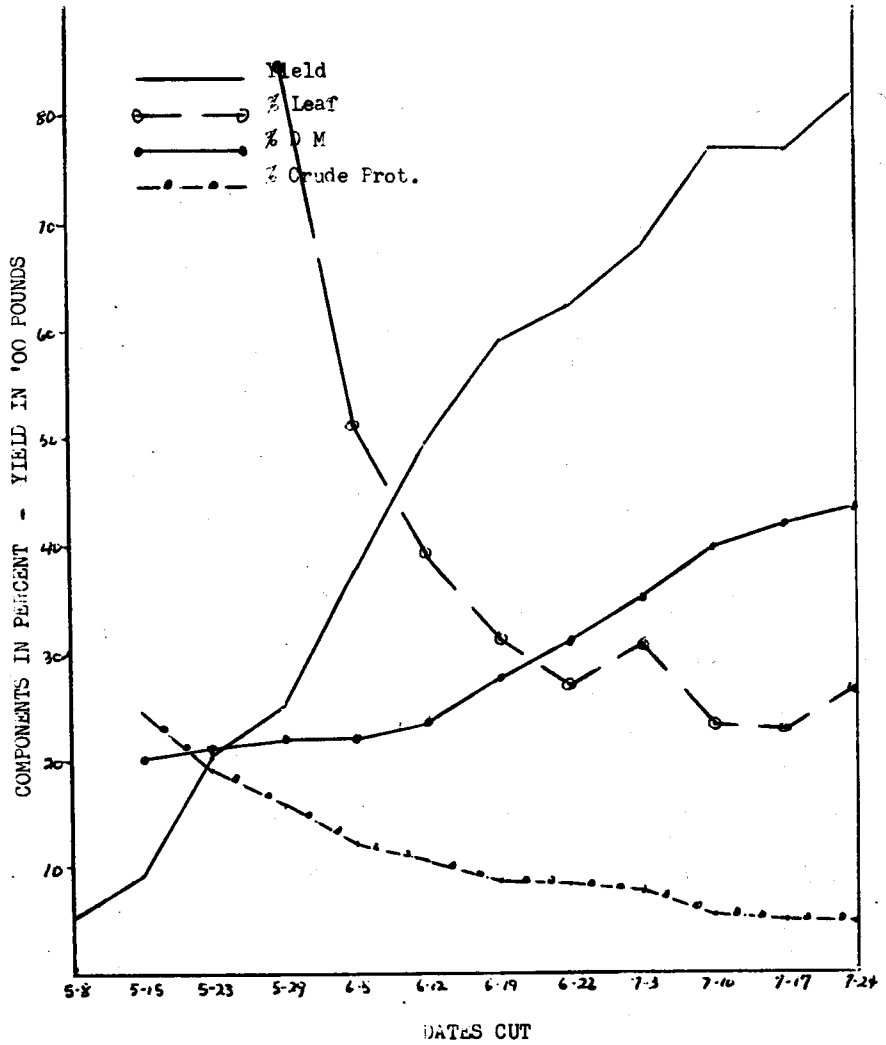
SARATOGA BROME 1961





CANADA BROME 1961





VERNAL

Test 151 - GROWTH CURVE - 1961
Aftermath Yields (lbs/A.)

FIRST CUT			AFTERMATH HARVEST DATES											After-math Total	Total Yield
No.	Date	Yield	6-26	7-10	7-17	7-24	7-31	8-8	8-14	8-21	8-28	9-5	9-11	9-18		
1	5-8	86	5059				2530						1907		9496	9582
2	5-15	1071		3899					2290					1328	7517	8588
3	5-23	1836			3778					2446				1144	7368	9204
4	5-29	3348			3347					2279				1043	6669	10017
5	6-5	3343				3189						2051			5240	8583
6	6-12	4390						3480						1982	5462	9852
7	6-19	4672					2777						2060		4837	9509
8	6-26	5434					2667						1923		4590	10024
9	7-3	5898						2895						1827	4722	10620
10	7-10	6959							2928					1548	4476	11435
11	7-17	6864								2373				1396	3769	10633
12	7-24	6350									2453			694	3147	9497
DUPUITS																
1	5-8	291	5021				2880						2107		10008	10299
2	5-15	1141		3844					2630					1508	7982	9123
3	5-23	2960			3901					2763				1438	8102	11062
4	5-29	3033			3691					2675				1344	7710	10743
5	6-5	3603				3595						2226			5821	9424
6	6-12	4308						4225						2135	6360	10668
7	6-19	4983					3253						2341		5594	10577
8	6-26	5780					3176						2123		5299	11079
9	7-3	6240						3363						2103	5546	11706
10	7-10	7396							3291					1938	5229	12625
11	7-17	7758								3258				1712	4970	12728
12	7-24	7051									2775			1129	3904	10955

Test 151 GROWTH CURVE - 1961

CLIMAX Aftermath Yields (lbs/A.)

	FIRST CUT		AFTERMATH HARVEST DATES										Aftermath Total	Total Yield
No.	Date	Yield	6-26	7-3	7-10	7-17	8-8	8-14	8-21	8-28	9-5	10-2		
1	5-8	292	6263					2650				2057	10970	11262
2	5-15	762	5124					2598				1887	9609	10371
3	5-23	1588	4001					2449				1924	8374	9962
4	5-29	2220			4009				2323			1655	7987	10207
5	6-5	3401				2103				2568			4671	8072
6	6-12	4218					2911					2025	4936	9154
7	6-19	4964						2897				1942	4839	9803
8	6-26	5941							2498			1458	3956	9897
9	7-3	6480								2611			2611	9091
10	7-10	7641									2466		2466	10107
11	7-17	7793									2225		2225	10018
12	7-24	8184									1965		1965	10149
ESSEX														
1	5-8	445	6126					2327				1923	10376	10821
2	5-15	702		5422				1649				2202	9273	9975
3	5-23	1549		4777				1595				2139	8511	10060
4	5-29	1659			4644				1357			1728	7729	9388
5	6-5	3254				2725				2117			4842	8096
6	6-12	3762					2756					1913	4669	8431
7	6-19	4797						2810				1833	4643	9440
8	6-26	5684							2524			1560	4084	9768
9	7-3	6355								2363			2363	8718
10	7-10	7892									2084		2084	9976
11	7-17	8603									2152		2152	10755
12	7-24	8696									1528		1528	10224

TEST 151 - GROWTH CURVE - 1961

AFTERMATH YIELDS (Lbs/Ac)

FRODE

FIRST CUT			AFTERMATH HARVEST DATES												
Cut No.	Date	Yield	6-12	6-19	7- 3	7-10	7-24	7-31	8- 8	8-14	8-21	9- 5	9-11	9-18	Aftermath Total	Total Yield
1	5- 8	266	3750				2272					2416			8172	8438
2	5-15	799		2438				2566				1853			6857	7656
3	5-23	1259		2073				2626				1675			6374	7633
4	5-29	2028			2435				2087				1823		6345	8373
5	6- 5	3218				2483				2045				1797	6325	9543
6	6-12	3431							2816					1975	4791	8222
7	6-19	3902						2644				1753			4397	8299
8	6-26	4056							2324				1894		4217	8273
9	7- 3	4483							2066				2040		4106	8589
10	7-10	4220								1925				1817	3752	7962
11	7-17	4581									2076			1418	3494	8075
12	7-24	3998										2220			2220	6218
	OTTAWA															
1	5- 8	191	3504				2511					1963			7978	8169
2	5-15	469		2934				2207				1642			6783	7252
3	5-23	1184		2326				2694				1683			6703	7887
4	5-29	1399			2671				2027				1728		6426	7825
5	6- 5	2898				2432				2160				1363	5955	8853
6	6-12	3133							2998					1699	4697	7830
7	6-19	3819						2287				1560			3847	7666
8	6-26	3885							2160				1697		3857	7742
9	7- 3	4288							1854				1558		3412	7700
10	7-10	4733								1793				1556	3349	8082
11	7-17	5171									1876			1327	3176	8374
12	7-24	5176										1870			1870	7046

TEST 151 - GROWTH CURVE - 1961

Aftermath Yields (lbs./a)

SARATOGA

FIRST CUT			AFTERMATH HARVEST DATES											
No.	Date	Yield	6-12	6-19	6-26	7-10	7-24	7-31	8-8	8-14	8-21	9-5	9-25	Aftermath Total	Total Yield
1	5- 8	564	4549					2483					1807	8840	9404
2	5-15	1311		3142					2294				1610	7046	8357
3	5-23	2239			1449				2454				1410	5313	7552
4	5-29	3290				2302					1983		874	5159	8449
5	6- 5	4167					2670					1450		4120	8287
6	6-12	4927							2919				1681	4600	9527
7	6-19	5944							2524				1571	4095	10039
8	6-26	6557								2283			1310	3593	10150
9	7- 3	6915								2005			1277	3282	10197
10	7-10	8058								1620			1570	3190	11248
11	7-17	8296									1611		1279	2890	11186
12	7-24	8313										1662		1662	9975
CANADA BROME															
1	5- 8	522	4425					2659					1197	8281	8803
2	5-15	967		2311					1916				985	5212	6179
3	5-23	2079			2076				2000				1310	5386	7465
4	5-29	2535				2228					1523		1071	4822	7357
5	6- 5	3747					2542					1171		3713	7460
6	6-12	4983							2801				1367	4168	9151
7	6-19	5899							2284				1322	3606	9505
8	6-26	6227								1984			1106	3090	9317
9	7- 3	6765								2005			1187	3192	9957
10	7-10	7673								1470			1356	2826	10499
11	7-17	7616									1554		1127	2681	10297
12	7-24	7806										1502		1502	9308

Heights and Stages - Alfalfa

Cut No.	Date	First Growth Yield	Height	Stage	Aftermaths 5-15	5-23	5-29	6-5	6-12	6-19	6-26	7-3	7-10	7-17	7-24	7-31	8-8	8-14	8-21	8-29	9-5	9-11	9-18	9-25	11-7
VERNAL																									
1	5-8	86	7	A	14	21	30	44B	63C	74	87	10	19	36B	52C	60	8A	17	22	29B	37	43C	7A	-	14
2	5-15	1071	19	A		6	7	14	28	39B	49C	62	68	10	24	35B	46C	58	6	15	28B	35	43	5	7
3	5-23	1836	25	A			0	9	22	35B	45	59C	66	70D	13	29B	42C	48	53	8	21	32B	38	5	7
4	5-29	3348	35	A				0	14	26	35B	47	52C	62D	11	26	37B	43C	50	9	20	29B	37	5	6
5	6-5	3343	47	B					6	15	25	36	46B	54C	62	8	22	31B	34	38	43	8	12	-	12
6	6-12	4390	67	C						2	12	26	35B	45	57C	61	68D	5	15	26B	35	41	47C	5	6
7	6-19	4672	75	C							3	16	28	39B	52C	57	8	17	24	30B	35	40	0	5	8
8	6-26	5434	88	C								9	20	38B	54C	59	9	16	23	30B	34	41C	0	5	8
9	7-3	5898	88	E									8	25	48B	56C	60	6	13	25B	36	43	45	5	7
10	7-10	6959	92	E										12	31B	43	56C	64	6	17	27B	41	46	5	7
11	7-17	6864	100	F											15	33B	48C	57	61	9	25B	37	48	5	7
12	7-24	6350	112	F												11	26B	38C	46	56	10	22	32B	5	8
DUPUITS																									
1	5-8	291	10	A	15	23	32	46B	66C	78	89D	13	28	47B	63C	71D	10	25B	35	43C	46	51	6	-	18
2	5-15	1141	23	A		5	7	15	29	45B	54	70C	74D	12	32B	45C	55	62	7	22	35B	43	49	5	9
3	5-23	2960	32	A			0	10	26	43B	50	63C	71	73D	18	39B	51C	60	62	11	25B	43	53	5	11
4	5-29	3033	42	B				0	19	37B	48	60C	66	70D	17	33B	48C	57	63	14	31B	42	50	5	12
5	6-5	3603	57	B					7	21	33B	46	53	61C	69D	11	31B	39	46C	47	49	10	16	-	21
6	6-12	4308	74	C						7	19	39B	48	58C	72	80D	83E	10	19	37B	43C	53	56	5	13
7	6-19	4983	84	C							7	23	39B	54C	66	70D	9	24B	34	42	44C	51	5	-	17
8	6-26	5780	90	D								16	30	50C	65	74D	10	24B	33	42C	48	50	5	-	17
9	7-3	6240	97	E									10	33B	56C	70	75E	8	20	36B	43	46C	53	5	14
10	7-10	7396	101	F										15	42B	54C	67D	74	9	26B	41	52C	55	5	13
11	7-17	7758	103	F											19	38C	55	64	69	12	34B	47C	53	5	13
12	7-24	7051	113	F												11	35B	48C	52	60	14	33B	38	5	11

Stages: A - Veg; B - Early bud; C - Bud emergence; D - First flower; E - Full flower; F - Early seed

Heights and Stages - Timothy

First Growth				Aftermaths																	
Cut No.	Date	Height	Stage	5-15	5-23	5-29	6-5	6-12	6-19	6-26	7-3	7-10	7-17	7-24	7-31	8-8	8-14	8-21	8-29	9-5	9-11	9-25	11-7
CLIMAX																							
1	5-8	13	A	17	24	34	52B	70	81C	93D	0	11	20	35	45	50B	60C	15	29	40	49	49	8
2	5-15	19	A		14	21	38	59B	72C	78D	0	10	18	35	45	53B	60C	15	30	38	48	49	8
3	5-23	24	A			13	26	46B	58B	73D	0	10	19	34	44	55B	62C	16	23	38	46	49	7
4	5-29	34	A				17	32	44B	50C	63D	69	13	21	27	39	50B	52C	20	27	33	38	8
5	6-5	54	B					0	14	21	31	38B	50C	18	23	32	42	48	52B	16	21	27	11
6	6-12	72	B						0	4	16	23	32	48	53B	66C	13	19	33	47	51	53	7
7	6-19	83	C							0	8	12	26	44	49	57C	64C	15	26	36	44	48	8
8	6-26	88	D								0	11	22	39	45	52	55B	60C	19	26	34	42	8
9	7-3	87	D									0	12	28	39	43	50B	53C	57D	16	20	27	11
10	7-10	93	E										0	15	26	36	49	54B	57	60C	16	26	11
11	7-17	98	E											8	20	33	45	50	57B	63B	14	28	12
12	7-24	100	E												12	21	33	40	46	52	16	29	13
ESSEX																							
1	5-8	13	A	16	20	29	45	60B	71	80C	0	10	20	38	46	50	53B	15	25	39	41	45	8
2	5-15	19	A		14	17	31	48B	62B	71C	75D	0	10	20	30	38	52B	17	28	40	44	48	8
3	5-23	22	A			14	24	44	57B	66	72D	0	10	21	30	40	51B	18	27	37	44	49	8
4	5-29	28	A				19	34	48B	61C	72D	76	4	13	18	27	33	41	20	29	36	43	7
5	6-5	42	A					16	24	32B	42C	45	56D	15	21	26	36	40	48	16	20	29	13
6	6-12	58	B						0	9	19	24	32	48	50B	60C	12	18	28	42	46	48	8
7	6-19	74	B							0	9	17	24	37	44	51	59B	13	26	36	44	47	7
8	6-26	82	C								0	11	18	32	42	50	54B	57	20	31	35	41	8
9	7-3	85	D									0	11	27	33	42	49	51	52B	15	21	30	14
10	7-10	92	D										0	15	25	33	42	45	57	52B	16	26	12
11	7-17	99	E											5	14	28	37	45	48	49B	15	26	12
12	7-24	102	E												0	16	29	37	44	51	16	29	.13

Stages: A - Veg.; B - Jointing; C - Boot; D - Heads emerged; E - Flower; F - Seed

Heights and Stages - Orchardgrass

Cut No.	Date	First Growth Yield	Height	Stage	Aftermaths 5-15	5-23	5-29	6-5	6-12	6-19	6-26	7-3	7-10	7-17	7-24	7-31	8-8	8-14	8-21	8-29	9-5	9-11	9-25	11-7
FRODE																								
1	5-8	266	12	A	18	26	35	52D	64D	17	28	37	42	51	60	16	31	43	50	57	65	15	22	10
2	5-15	799	22	A		13	18	29	44D	60D	15	30	38	49	61	63	19	34	41	55	63	15	21	12
3	5-23	1259	23	A			12	23	36C	51D	16	32	40	47	58	69	19	35	42	57	66	15	20	10
4	5-29	2028	36	A				16	32	45	53	60	15	33	49	55	65	17	27	40	54	61	13	10
5	6-5	3218	55	D					17	28	40	52	60	18	39	43	53	62	19	37	49	55	61	10
6	6-12	3431	70	D						15	28	38	46	54	62	64	71	16	26	37	50	59	69	12
7	6-19	3902	77	D							14	29	36	45	58	64	20	38	41	53	63	15	21	12
8	6-26	4056	82	D								17	27	38	52	59	68	16	29	42	54	69	14	12
9	7-3	4483	82	D									14	25	45	55	61	17	30	40	57	61	14	13
10	7-10	4220	84	D										14	29	38	51	59	17	39	52	56	62	11
11	7-17	4581	86	F											18	30	42	52	59	24	40	48	56	13
12	7-24	3998	93	F												15	33	43	51	61	69	15	26	17
OTTAWA																								
1	5-8	191	9	A	13	20	27	43	58D	16	25	35	43	51	58	17	32	38	45	50	57	15	21	11
2	5-15	469	16	A		13	18	31	43C	62D	15	29	38	44	58	64	20	35	40	47	55	15	20	11
3	5-23	1184	21	A			11	22	35C	55D	16	28	40	45	57	63	19	35	39	46	56	15	21	11
4	5-29	1399	25	A				16	33	43	50	60	15	28	29	42	54	15	26	37	48	53	14	10
5	6-5	2898	41	C					17	30	37	47	52	17	35	44	52	56	16	34	41	47	53	9
6	6-12	3133	55	D						15	25	35	43	52	61	61	71	15	27	32	44	51	57	12
7	6-19	3819	69	D							13	25	35	41	53	56	20	32	37	46	53	15	20	13
8	6-26	3885	73	D								16	25	34	45	51	60	16	25	35	46	51	14	12
9	7-3	4288	80	D									16	25	42	47	60	16	28	36	45	50	14	12
10	7-10	4733	84	D										17	29	36	47	53	18	36	48	50	58	11
11	7-17	5171	90	F											18	27	37	48	53	24	36	40	47	11
12	7-24	5176	105	F												15	23	36	39	48	58	15	22	15

Stages: A - Veg.; B - Jointing; C - Boot; D - Heads emerged; E - Flower; F - Seed.

Heights and Stages - Bromegrass

Cut No.	Date	Height	Stage	5-15	5-23	5-29	6-5	6-12	6-19	6-26	7-3	7-10	7-17	7-24	7-31	8-8	8-14	8-21	8-29	9-5	9-11	9-25	11-7
		Frist Growth		Aftermaths																			
SARATOGA																							
1	5-8	19	A	20	27	39	63C	84D	0	10	22	32	46	55	58	9	19	31	39	52	54	54	7
2	5-15	29	A		13	16	33C	45D	78D	0	16	24	35	47	53	57	0	16	31	41	46	46	7
3	5-23	35	A			0	0	18	30	42D	14	24	30	47	52	57	6	15	29	43	49	49	8
4	5-29	49	A				0	13	24	33	49	55	5	20	35	42	44	51	12	24	34	34	7
5	6-5	73	C					0	14	25	38	44	57	60	0	19	34	38	43	50	18	26	12
6	6-12	92	D						0	11	25	36	50	62	68	71	0	15	33	44	53	53	7
7	6-19	104	D							0	13	25	36	52	57	63	0	13	32	45	51	51	8
8	6-26	108	D								0	14	29	44	53	60	63	0	20	36	49	49	8
9	7-3	110	D									0	19	38	48	57	59	10	20	34	42	42	8
10	7-10	115	D										0	24	39	46	54	15	32	43	49	49	8
11	7-17	117	F											12	22	36	45	51	21	32	41	41	8
12	7-24	120	F												9	24	35	41	48	53	18	29	13
CANADA BROME																							
1	5-8	17	A	17	24	35	58C	78D	0	10	22	33	48	57	58	8	18	25	34	42	45	45	6
2	5-15	24	A		13	18	35C	57D	76	0	13	22	28	39	46	50	6	15	24	35	39	39	7
3	5-23	30	A			6	21	27C	39D	57	15	23	32	45	50	54	5	16	25	37	42	42	7
4	5-29	41	A				0	13	24	35	48	53	0	20	33	39	47	50	17	26	33	34	7
5	6-5	61	C					0	14	22	34	42	51	55	0	18	29	33	39	47	19	25	10
6	6-12	84	D						0	12	26	36	46	55	60	63	0	15	30	38	44	44	7
7	6-19	96	D							0	14	21	33	43	52	57	0	15	29	42	48	48	8
8	6-26	99	D								0	12	23	42	51	55	58	0	18	34	43	43	8
9	7-3	100	D									0	16	37	44	52	55	7	21	34	42	42	8
10	7-10	102	D										0	21	32	43	54	17	26	35	41	42	7
11	7-17	104	F											11	24	34	40	44	23	33	38	38	7
12	7-24	109	F												7	21	34	39	44	50	17	24	10

Stages: A - Veg.; B - Jointing; C - Boot; D - Heads emerged; E - Flower; F - Seed

F
8J

TEST 151 - GROWTH CURVE - 1961

HEIGHT YELLOWING LOWER LEAVES (CMS.)

VARIETY	DATE	TOTAL HEIGHT	YELLOW LEAF HEIGHT
Vernal	5-23	25	11
DuPuits		32	16
Vernal	6-5	47	22
DuPuits		57	24
Vernal	6-12	67	31
DuPuits		74	31
Vernal	6-26	88	53
DuPuits		90	61
Vernal	7-3	88	57
DuPuits		97	60
Vernal	7-24	112	80
DuPuits		113	86
BRAMPTON			
Vernal	6-27	89	51
Vernal	7-12	103	73

TEST 151 - BRAMPTON SHEEP HAYS - 1961

	DATE	VERNAL	CLIMAX	FRODE	SARATOGA
YIELD	(lbs/ac)				
	5-16	1161	853	497	783
	5-30	2912	2510	1502	1887
	6-14	4313	4096	2435	3597
	6-27	4851	5632	3539	4959
	7-11	4826	5985	3658	5025
HEIGHT	(CMS.)				
	5-16	--	--	--	--
	5-30	43	41	36	45
	6-14	77	77	78	93
	6-27	89	98	85	106
	7-11	103	103	88	117
STAGE					
	5-16	--	--	--	--
	5-30	Vegetative	Joint	Boot	Boot
	6-14	Early Bud	Boot	Flower	Headed
	6-27	First flower	Headed	Late flower	Late flower
	7-11	Early Seed	Flower	Seed	Early Seed

TEST 151 - BRAMPTON SHEEP HAYS - 1961

DATE	VERNAL	CLIMAX	FRODE	SARATOGA
CRUDE PROTEIN (%)				
5-16	24.4	22.0	17.4	16.8
5-30	20.5	16.2	12.7	14.6
6-14	17.3	11.9	9.4	10.9
6-27	17.4	11.2	8.3	7.7
7-11	15.3	8.0	7.5	5.7
PROTEIN PER ACRE (LBS)				
5-16	283	188	86	132
5-30	597	407	191	275
6-14	746	487	229	392
6-27	844	631	294	382
7-11	738	478	274	286
DRY MATTER (%)				
5-16	15.9	19.5	26.2	26.1
5-30	17.8	20.5	23.1	22.5
6-14	19.8	19.6	23.6	25.9
6-27	23.6	26.4	27.2	31.6
7-11	27.9	33.1	30.0	37.5

Drying Time Comparison of Conditioned and Unconditioned Hay (1961)

Location: Brampton — % Dry Matter — Harvested: July 4, 5, 6/61

Date	Time	Swath*		Windrow*	
		Conditioned	Unconditioned	Conditioned	Unconditioned
July 4	10:15 a.m.	25.8	24.8		
	12:40 p.m.	30.8	27.8		
	2:30 p.m.	35.3	30.0		
	4:30 p.m.	41.4	32.4		
July 5	9:30 a.m.	49.1	36.5		
	11:15 a.m.	57.3	37.0		
	12:45 p.m.	61.5	41.8		
	2:30 p.m.	64.3	41.6		
	4:15 p.m.	65.1	43.2		
	6:15 p.m.	70.8	49.2		
July 6	9:30 a.m.	68.8	51.1		
	11:15 a.m.	68.2	51.7		
	1:30 p.m.	72.0	58.2	76.6	
	3:30 p.m.	76.5	57.9	81.0	
	5:30 p.m.	83.3	62.5	83.1	62.9

* Each a mean of three samples.

Progress in Forage Evaluation With the In Vitro Technique Artificial Rumen

Purpose: To assess the effect of management on the digestibility of forages. To determine the digestibility of clones as an aid in selection in the forage breeding program.

Materials and Equipment

50 ml. centrifuge tubes
constant temperature bath (38-40°C)
pH meter (.05 accuracy) (Radiometer)
16 place vertical head centrifuge
meter balance (Stanton Ultramatic)
Co_2 gas (tank fitted with special regulator)
Christie Norris Hammer Mill (0.8 mm. screen)

Solutions:

phosphate - carbonate buffer - ref: McDougall E. 1948 Biochen J. 43: 99-100
strained rumen liquor
mercuric chloride (5.0 gms. $Hgcl_2$ per 100 mls. H_2O)
pepsin solution (4.0 gms. pepsin powder per 1000 mls. 0.1%. Hcl.

Procedure

1. Weigh dried tubes.
2. Weigh 250 mgms. of ground forage into tubes.
3. Add 25 mls. of phosphate buffer to each tube.
4. Pre-incubate in constant temperature bath.
5. Add 5 mls. of strained rumen liquor.
6. Cap and incubate for 48 hours.
7. Shake occasionally.
8. Stop action with $Hgcl_2$ (2 mls.)
9. Centrifuge at 2500 r.p.m. for 15 minutes. Decand liquid, wash with distilled water and centrifuge for an additional 15 minutes.
10. Add 25 mls. of pepsin solution and stir, cap, and replace in bath.
11. Incubate for 48 hours.
12. Centrifuge for 15 minutes at 2500 r.p.m., wash and centrifuge for an additional 15 minutes.
13. Place tube in oven for drying.
14. After 48 hours in oven, place tube in dessicator, then weigh residue.

Results

Table 1 The digestibility of alfalfa hay(harvested May 29, 1961,) during the first eight runs.

Sheep No.	Run No.	Date	Samples 1	2	3	4	Ave.
1	1	Jan. 29	74.2	67.5	72.5	68.9	70.8
	2	" 30	62.6	60.9	69.0	57.0	62.4
	3	Feb. 5	66.8	69.2	71.7	68.0	68.9
	4	" 6	66.6	65.7	61.3	66.9	65.2
	5	" 12	67.2	67.0	68.8	66.1	67.3
	6	" 13	68.3	68.4	69.3	68.9	68.7
	7	" 19	66.7	65.5	63.5	63.3	64.8
	8	" 20	64.1	61.9	63.4	63.0	63.1
		Ave.					66.3

Sheep No.	Run No.	Date	1	2	3	4	Ave.
2	1	Jan. 29	67.4	68.8	66.4	67.4	67.5
	2	" 30	71.4	62.9	64.9	62.4	65.4
	3	Feb. 5	64.3	64.0	63.9	64.1	64.1
	4	" 6	66.7	68.0	67.3	66.0	67.0
	5	" 12	65.1	63.7	60.1	66.3	63.8
	6	" 13	63.4	62.6	67.4	63.2	64.2
	7	" 19	64.1	65.0	66.4	64.2	64.9
	8	" 20	59.8	59.0	60.2	61.5	60.2
		Ave.					64.6

Analysis of Variance

	D.F.	M.S.	
Runs	7	37.95	
Sheep	1	49.52	
Sheep x Runs	7	18.51	xx
Among samples with Sheep x Runs	47	5.14	
SE ±	1.4		
CV	3.3%		

The first eight runs included mistakes made in using the procedure. Even with this, the standard error was relatively low and indicated that the technique could be operated by agronomists without too much difficulty. The greatest variability occurred between sheep and among the various runs. These data indicated that two samples of each forage would be adequate.

Table 2 Use of mixed inoculant on alfalfa hay(harvested May 29, 1961.)

Run No.	Date	Samples 1	2	Ave.
9	Feb. 27	64.0	62.9	63.5
10	Mar. 5	65.0	64.4	64.7
11	Mar. 6	62.5	62.5	62.5
12	Mar. 12	65.6	63.7	64.7
13	Mar. 13	65.0	66.8	65.9
	Ave.			64.2

* 3 *

Analysis of Variance

	D.F.	M.S.
Runs	4	3.42
Samples/RxS	5	.81
SE ±	0.9	
CV =	1.47	

The use of a mixture of inoculum from both sheep removed much of the variability. The variability among runs was four times as high as that concerned with the uncontrolled error

Table 3 Age of inoculant on digestibility of alfalfa hay (Harvested May 29, 1961.)

Time from removal to injecting into tubes	Run Number and Date 9 Feb. 27	11 Mar. 6	Ave.
10 minutes	65.3	66.7	66.1
20 minutes	64.1	65.9	65.0
30 minutes	62.8	68.4	65.6
40 minutes	61.7	65.7	63.7
50 minutes	63.9	65.0	64.5
60 minutes	63.7	65.3	64.5
120 minutes	62.6	64.0	63.3

Analysis of Variance

	D.F.	M.S.
Run	1	41.28
Samples	1	.69
Periods	6	3.91
Run x Samples	1	3.58
Run x Period	6	9.71
Samples x Period	6	1.94

It has been found in other runs that where precautions are not taken to keep the inoculum close to 40°C after removal from the sheep, a low digestion occurs. In these two runs, the inoculum was gathered in a suction flask which was immersed in hot water (about 100°F.) The inoculant is then transferred from the suction flask to a pre-heated vaccum flask for transportation to the laboratory. In all cases using this technique, the viability of the rumen liquor was high. This allowed a greater length of time before the inoculum need be necessarily injected into the tubes.

Periods of digestion x particle size x species x time of harvest

Periods of digestion

1. 48 hour rumen liquor
2. 48 hour rumen liquor ± 24 hour pepsin
3. 48 hour rumen liquor ± 48 hour pepsin

Particle size
1. coarse
2. fine 0.8 mm screen

Species
1. alfalfa (Brampton)
2. bromegrass (Brampton)

Time of harvest
1. early - May 29, 1961
2. late - July 11, 1961

Analysis of Variance

	D.F.	M.S.	
Runs	1	7.31	
Periods	2	43.29	x
Grind	1	385.20	xx
Species	1	118.14	xx
Early vs Late	1	7860.83	xx
Runs x Periods	2	3.34	
Runs x grind	1	63.22	
Runs x species	1	30.05	
Runs x Early vs Late	1	17.60	
Periods x Grind	2	5.80	
Periods x Species	2	206.45	xx
Periods x E. vs. L.	2	5.31	
Grind x Species	1	3.05	
Grind x E. vs. L.	1	162.50	xx
Species x E. vs. L.	1	776.92	xx
Error	75	9.47	

S.E. = ∕
C.V. =

Table 4 Periods of digestion x species on alfalfa and bromegrass hay (harvested May 29, 1961.)

	Alfalfa	Bromegrass	Ave.
48 hour R.L.	53.1	57.3	55.2
(48 hour R.L. ∕ 24 hour pepsin	57.7	51.6	54.6
(48 hour R.L. ∕ 48 hour pepsin	59.3	54.6	56.9
Ave.	56.7	54.5	

There was an increase in the digestibility rating of alfalfa where the pepsin digestion was used. However, an unexplainable decrease in the digestibility of bromegrass occurred where pepsin digestion was used. This was the case even when an improved pepsin technique was used (Table 9).

Table 5 Species x Early vs. Late

	Early	Late	Ave.
Alfalfa	62.9	50.5	56.7
Bromegrass	66.4	42.6	54.5
Ave.	64.7	46.6	

Although early cut alfalfa may be slightly lower in digestibility than early cut bromegrass, it does not lose digestibility to the same extent as brome when cut later. With advancing maturity and delayed cutting time, the digestibility of alfalfa does not decrease as fast as the digestibility of brome.

Table 6 Fineness of Grind x Early vs. Late.

	Grind		
	Coarse	Fine	Ave.
Early	63.9	65.3	64.6
Late	43.2	49.8	46.5
Ave.	53.6	57.6	

The use of fine grind (0.8 mm screen) improved the digestibility ratings. However, particle size did not affect the digestibility of early cut material as much as that of the late cut material. With early cut material, digestibility was increased 1.4 units by changing the size of grind from coarse to fine. A like adjustment in grind on late cut material resulted in a 6.6 unit change in digestibility.

Table 7 The improvement of the pepsin digestion - alfalfa hay.

	Run Number and Dates			
Period of Digestion	13	14	15	Ave.
48 hr. R.L.	63.0	63.0	64.0	63.3
48 hr. R.L. / 48 hr. pepsin	66.7	66.8	64.4	66.0
	17	18	19	Ave.
48 hr. R.L.	64.2	62.8	62.6	63.2
48 hr. R.L. / 48 hr. pepsin	72.6	70.2	69.4	70.7

Although the early runs (up to #15) showed an advantage when the pepsin digestion stage was used on alfalfa, the gain in digestibility was small (approximately 3.0 digestibility units). In the following runs (17, 18, etc.), the contents of tubes were stirred thoroughly and shaken. This resulted in an average increase of approximately 7.0 digestible units.

Table 8 Storage of samples between rumen liquor and pepsin stages.

Run No.	Date	Treatment	DDM Ave.
13	Mar. 12	Not stored after R.L. x	67.5
		Store 48 hrs. at 34°F centrifuge pepsin	64.8
19	Apr. 2	Not stored after R.L.	72.8
		Stored 48 hrs. at 34°F centrifuged, stored 48 hrs. 34°F in dry state pepsin	71.8
		Stored 96 hrs. at 34°F centrifuged pepsin	71.9
		Centrifuge stored 96 hrs. in dry state pepsin	72.5

x Rumen Liquor Stage

It is possible to store samples between the rumen liquor and the pepsin stage. Since the adaption of this technique was for evaluation of a large number of samples, the principle of storage allows the following technique to be followed, thereby increasing the capacity of the laboratory. The suggested system is as follows:

Week 1	Monday	196 samples in Rumen Liquor
	Wednesday	196 samples removed from Rumen Liquor stage and stored. A second 196 samples into Rumen Liquor stage.
	Thursday	Centrifuge first 196 samples and stored until following Monday.
	Friday	Second 196 samples removed from Rumen Liquor stage.
Week 2	Monday	First 196 samples into pepsin.
	Tuesday	Second 196 samples centrifuged.
	Wednesday	First 196 samples removed from pepsin centrifuged and in oven. Second 196 samples into pepsin.
	Friday	Second 196 samples removed from pepsin, centrifuged and in oven.

Table 9 Use of Standard Samples

Period of Digestion	Sample	Run Number and Date 17 Mar. 26	18 Mar. 27	19 Apr. 2	Ave.
48 hr. R.L.	G611	64.8	61.8	60.7	62.3
	Mac Alf.	63.7	50.2	54.7	56.2
	Mac Brome	62.4	62.9	57.6	61.0
48 hr. R.L.	G611	72.3	70.2	69.3	70.3
∕	Mac Alf.	59.5	57.7	58.9	58.7
48 hr. pepsin	Mac Brome	56.3	56.9	58.7	57.3

Table 10 Periods of Rumen Liquor and R.L. ∕ pepsin digestion on Standard Samples

	Rumen Liquor 12	24	36	48	48 ∕ 48 pepsin
G611	45.0	56.5	58.1	60.7	69.3
Mac Brome	28.0	42.2	50.3	57.6	58.7
Mac Alf	36.1	46.4	48.4	54.7	58.9
Purdue Alfalfa	31.2	41.3	45.1	50.7	54.2

The assessment of the standard samples is as yet not completed. MacDonald College's preliminary In Vitro digestion on a 24 hour R.L. basis was 54% for the alfalfa and 51% for the brome. These digestibilities were obtained on a 24 hour digestion for the alfalfa and 36 hours for the brome. The energy digestibilty as measured by In Vivo trials at MacDonald College were 60% for alfalfa and 54.4% for bromegrass. These values were obtained by using 48 hour R.L. + 48 hour pepsin for the alfalfa and between 36 and 48 hours R.L. (only) for brome, using the In Vitro technique. These limited data indicate that for grasses the Rumen Liquor stage need only be used for estimating digestibility but the pepsin stage is needed when estimating the digestibility of legumes.

Table 11 Centrifuge vs. filtration techniques.

Run No.	Date	% D.D.M. Tilley	Alexander
14	Mar. 13	68.3	74.2
17	Mar. 26	71.5	65.5
18	Mar. 27	70.8	65.8

The filtration test as described by Alexander has shown that it has the possibility of being used, but more work is necessary in determining the correct procedures in our laboratory.

Conclusions

A great many work hours during the months of February, March and April of 1962 have been spent on becoming familiar with the In Vitro technique as devised by Dr. Tilley of the Hurley Grassland Research Station. The results have warranted the time and have indicated that this technique can be usefully applied to agronomic work and operated by agronomists with limited background in animal and/or nutritional science. Thus, one of the questions posed when commencing this project was answered.

However, in the operation of this biological technique, there are problems that must be of constant concern to the operator. The foremost is the health and well being of the fistulated animals. A sudden change in environment, feed, or operator will affect the viability of the rumen liquor and thus result in marked changes in the digestibility ratings obtained. The animals should be kept in a cool place and fed a standard diet of high quality chopped forage at a level slightly below maximum intake. Thus, the technician operating the laboratory should be in charge of or must be closely associated with these animals at all times.

In order to facilitate operation of this technique, it is also necessary to know what field techniques must be used in gathering and processing the samples for digestion trials. A study is planned for the summer of 1962 which involves the size and number of samples that need to be taken from each replication and the effect of drying temperature on digestibility.

The second major question which was posed at the beginning was the relationship between the results of this particular laboratory and those from In Vivo trials. At the present time there are no animal trials being conducted at this station from which In Vivo-In Vitro relationship can be determined. However, the standard forages supplied by MacDonald College and Purdue University have In Vivo digestibility ratings. It is believed that when the series of runs concerned with this problem is completed that a relationship between In Vitro and In Vivo digestibility will be available. It is expected that when this relationship is determined, these standard samples will be used in every run in order to estimate the degree of error. The corrections made in the digestibilities of each sample, as a result of knowing the error would tend to reduce the variability among runs.

It is planned that the digestibility of all grasses will be estimated on the basis of the rumen liquor stage only. Where legumes are used, a pepsin stage will be added.

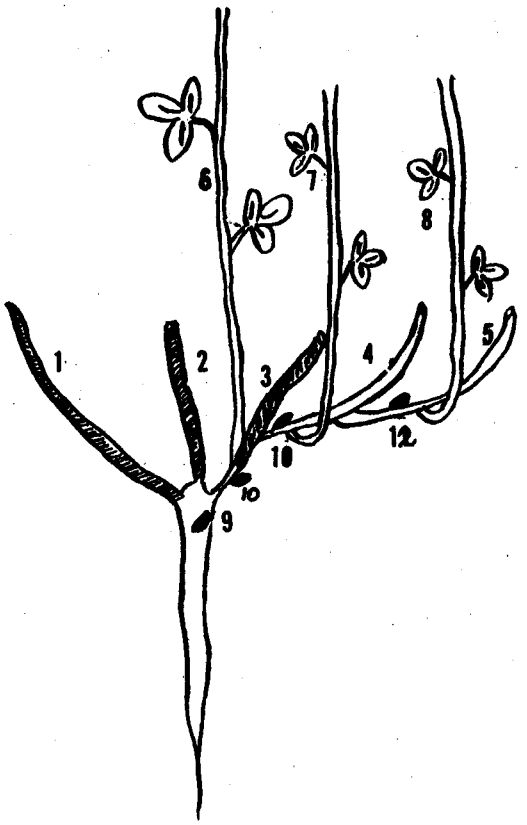
Alfalfa - Empire Mixtures for Pasture 1958 Exp. 434

(+ Fall cut only in seeding year)

Pounds of dry matter per acre

		NARRAGENSETT					VERNAL					GRIMM				
Alfalfa	Empire	1958	1959	1960	1961	AVE.	1958	1959	1960	1961	AVE.	1958	1959	1960	1961	AVE.
3	3	1502	7229	5689	7404	5456	1619	6447	5586	6557	5052	1513	6250	5613	5919	4824
	6	1523	7291	6035	7446	5574	1672	6739	5910	7268	5397	1605	6490	5536	5581	4803
	9	1488	7404	5735	7187	5454	1582	6680	5931	6666	5215	1610	6328	5590	6112	4910
	Ave.	1504	7308	5820	7346	5495	1624	6622	5809	6830	5221	1576	6356	5580	5871	4846
6	3	1503	6998	5330	7140	5243	1749	7188	5183	6696	5204	1357	6731	5203	5971	4816
	6	1577	7534	5285	6951	5337	1670	7586	5496	6924	5419	1505	7018	5067	5779	4842
	9	1492	7148	5246	6693	5145	1796	7425	5997	7378	5649	1484	7379	5316	6081	5065
	Ave.	1524	7227	5287	6928	5242	1738	7400	5559	6999	5424	1449	7043	5195	5944	4908
9	3	1511	8104	5693	7478	5697	1649	7222	5073	6645	5147	1498	7328	4506	5579	4728
	6	1397	7577	5550	7062	5397	1687	7531	5197	7004	5355	1557	7443	4659	5343	4751
	9	1472	7963	5590	7069	5524	1767	7503	5472	7218	5490	1568	7021	4968	5770	4832
	Ave.	1460	7881	5611	7203	5539	1701	7418	5247	6956	5331	1541	7264	4711	5564	4770

CLASSIFICATION AS TO THE ORIGIN
OF GROWTH IN ALFALFA
1961



1 - Primary Growth
2 - Primary Growth (Seedling Stem)
3 - Primary Growth
4 - Primary Axillary (Stubble)
5 - Secondary Axillary (Stubble)
6 - Primary Axillary (Growth)
7 - Secondary Axillary (Growth)
8 - Tertiary Axillary (Growth)
9 - Crown Bud
10 - Primary Axillary (Bud)
11 - Secondary Axillary (Bud)

NUMBER AND ORIGIN OF BUDS OF VERNAL ALFALFA - 1961

Management			Total Buds Per Plant	Per Cent Buds Arising				Date
Cut 1	Cut 2	Cut 3		Primary	Secondary	Tertiary	Quarterly	
Bud	-	-	0.4	100.0	--	--	--	June
Bud	6"	-	0.3	100.0	--	--	--	July 7
"	Bud	-	5.8	10.3	55.2	34.5	--	18
"	1/10	-	13.6	22.1	35.3	42.6	--	31
"	Bud	6"	10.4	13.5	45.2	41.3	--	Aug. 3
"	"	Bud	11.0	14.6	42.7	42.7	--	26
"	"	1/10	12.2	18.9	35.2	45.9	--	Sept. 7
Bud	1/10	6"	8.9	25.8	42.7	31.5	--	Aug. 21
"	"	Bud	7.8	20.5	34.6	28.2	16.7	Sept. 7
"	"	1/10	25.2	20.5	42.3	37.2	--	25
Bud--Bud--Bud--Bud			16.3	18.0	29.4	41.6	4.3	Oct. 18
Bud-1/10-1/10 ---			22.7	19.8	38.8	33.9	--	Dec. 4
1/10	-	-	5.5	1.8	98.2	—	--	July 7
1/10	6"	-	6.7	40.3	52.2	7.5	--	July 17
1/10	Bud	-	5.2	34.5	39.7	25.8	--	25
1/10	1/10	-	10.4	28.9	39.4	31.7	--	Aug. 3
1/10	Bud	6"	3.7	13.5	24.3	56.8	--	Aug. 14
1/10	Bud	Bud	9.5	11.6	35.8	52.6	—	Sept. 6
1/10	Bud	1/10	15.6	20.9	43.7	35.4	—	Sept. 19
1/10	1/10	6"	7.4	8.1	31.1	52.7	—	Aug. 22
1/10	1/10	Bud	12.8	18.8	40.6	40.6	—	Sept. 6
1/10	1/10	1/10	17.6	16.4	41.0	42.6	—	Sept. 25
F.F.	-	-	9.4	34.0	66.0	--	--	July 14
F.F.	6"	-	7.9	19.0	74.7	6.3	—	July 25
-	Bud	-	5.2	27.7	50.0	22.3	—	31
-	1/10	-	10.9	20.0	23.8	56.2	—	Aug. 18
F.F.	Bud	6"	8.9	7.9	31.4	50.6	—	Aug. 22
-	"	Bud	10.8	23.1	30.6	46.3	—	Sept. 5
-	"	1/10	14.6	19.9	34.9	37.0	—	Sept. 25
F.F.	1/10	6"	-	--	--	--	—	—
-	1/10	Bud	20.5	26.3	32.7	27.4	—	Oct. 2
-	1/10	1/10	15.9	16.3	21.4	41.5	—	Oct. 6

PLANT POPULATION AND ROOT WEIGHT OF VERNAL ALFALFA 1961

Management	Plant Population	Root wgt. In Mgms.	Management	Plant Population	Root wgt. In Mgms.	Management	Plant Population	Root wgt. In Mgms.
Bud	15.8	437	1/10	18.0	552	F.F.	23.0	831
Bud 6"	28.3	749	1/10 6"	16.8	709	F.F. 6"	19.3	407
" Bud	18.5	322	" Bud	20.3	353	" Bud	23.5	352
" 1/10	20.0	645	" 1/10	17.8	543	" 1/10	18.5	584
Bud Bud 6"	23.0	337	1/10 Bud 6"	23.8	308	F.F. Bud 6"	22.8	355
" " Bud	21.0	411	" " Bud	21.5	448	Bud	18.3	578
" " 1/10	14.0	553	" " 1/10	18.8	533	1/10	12.0	574
Bud 1/10 6"	21.5	429	1/10 1/10 6"	21.2	443	F.F. 1/10 6"	14.8	438
" " Bud	17.8	488	Bud	21.5	558	Bud	14.8	609
" " 1/10	14.8	591	1/10	16.8	874	1/10	13.5	689

ORIGIN AND WEIGHT OF STEMS DURING AFTERMATH RECOVERY OF VERNAL ALFALFA - 1961

Management Cut 1	Cut 2	Cut 3	Stems per Plant	Per cent Stem arising from: Primary	Secondary	Tertiary	Weight per stem in mgm. Primary	Secondary	Tertiary	Weight of Top Growth of 10 plants
Bud			3.5	76.8	23.2	0.0	--	--	--	--
Bud	6"		7.6	32.0	65.5	2.5	--	--	--	--
Bud	Bud		5.8	3.4	96.5	0.0	160	134	--	7.79
Bud	1/10		5.2	2.3	97.7	0.0	1316	532	--	28.76
Bud	Bud	6"	6.9	1.6	16.9	81.5	100	51.4	78.7	4.72
Bud	Bud	Bud	5.7	0.0	12.3	87.7	--	44.0	265	16.62
Bud	Bud	1/10	3.9	0.0	22.4	77.6	--	632.0	591	23.36
Bud	1/10	6"	7.4	2.7	44.7	52.6	400	95.2	101	7.91
Bud	1/10	Bud	4.6	5.4	22.6	72.0	180	776	226	16.16
Bud	1/10	1/10	5.2	1.6	51.6	31.9	188	299	279	14.21
1/10			2.86	97.9	2.1	0.0	--	--	--	--
1/10	6"		6.7	6.0	88.0	6.0	250	105	--	7.20
1/10	Bud		5.3	3.8	96.2	0.0	300	178	--	9.73
1/10	1/10		4.9	12.3	85.7	2.0	413	437	1200	22.06
1/10	Bud	6"	5.9	1.5	15.4	83.1	--	57	79	4.43
1/10	Bud	Bud	6.1	1.3	22.2	76.5	28	271	204	12.16
1/10	Bud	1/10	5.1	1.0	17.3	81.7	90	292	183	10.15
1/10	1/10	6"	7.1	0.0	12.6	87.3		118	93	6.83
1/10	1/10	Bud	5.7	2.0	12.8	85.2	550	357	196	12.19
1/10	1/10	1/10	4.3	0.0	30.3	69.7	--	402	296	14.59
F.F.			4.1	87.8	12.2	0.0	--	--	--	--
F.F.	6"		5.4	15.5	81.2	3.3	105	115	70	5.81
F.F.	Bud		4.7	10.6	80.9	8.5	156	142	115	6.65
F.F.	1/10		5.2	15.4	82.7	1.9	491	534	200	27.13
F.F.	Bud	6"	5.9	0.0	10.2	89.8	--	168	88	7.17
F.F.	Bud	Bud	6.1	1.6	8.2	90.2	140	258	229	16.97
F.F.	Bud	1/10	4.2	0.0	14.3	85.7	--	350	182	16.39
F.F.	1/10	6"	6.8	5.9	33.8	60.3	--	--	--	--
F.F.	1/10	Bud	4.2	4.8	33.3	61.9	217	149	142	10.12
F.F.	1/10	1/10	4.3	0.0	18.6	81.4	--	270	328	12.41

Aftermath Production and Distribution from Vernal Alfalfa cut as hay at Bud Stage

Guelph 1961 (4491)

Lbs. D.M. per Acre

First Harvest	Second Harvest	Third Harvest	Fourth Harvest	Fifth Harvest	Total
3592[1] Bud[2] June 11[3] 100%[4]	457 6" June 30 100%	959 6" July 19 100%	751 6" Aug. 8 100%	452 6" Aug. 30 87%	6011
				459 Veg. Oct. 13	6068
			2476 Bud Sept 6 77%	459 6" Aug. 22 83%	8018
				1864 Bud Sept 19	9248
				1854 1/10 Sept 27	9238
			2477 1/10 Sept. 27 69%	424 6" Oct. 6	7809
		2148 Bud Aug. 3 100%	634 6" Aug. 22 100%	414 6" Sept. 17 88%	7245
			1864 Bud Sept 19 96%		8071
			1854 1/10 Sept 27 95%		8051
		2742 1/10 Aug. 8 84%	547 6" Aug. 8 99%	424 6" Oct. 6 78%	7762
			1491 Bud Sept 20 94%		8282
			1277 Flower Oct. 17 85%		8068

(Continued on following page)

First Harvest	Second Harvest	Third Harvest	Fourth Harvest	Fifth Harvest	Total
3592 Bud June 11 100%	2496 Bud July 18 100%	448 6" Aug. 8 100%	491 6" Aug. 8 98%		7029
			1358 Pre Flower Oct. 6 69%		7894
		2411 Bud Aug. 26 99%	493 6" Sept 13 99%		8992
			8281 Pre flower Oct 16 98%		9327
		2586 1/10 Sept 7 90%	546 6" Oct. 10 100%		9220
			580 Veg. Oct. 16 100%		9254
	3801 1/10 July 31 100%	973 6" Aug. 21 100%	566 6" Sept 13 96%		8992
			830 Pre bud Oct. 15 87%		9256
		2239 Bud Sept 17 97%	265 6" Oct 13 100%		9957
		2211 1/10 Sept 25 99%			9664

1 Yield in lbs. D.M.
2 Stage
3 Date of cut
4 % alfalfa

Aftermath Production and Distribution from Vernal Alfalfa cut as hay at 1/10 Bloom
Guelph 1961 (4491)
(lbs. D.M. per acre)

First Harvest	Second Harvest	Third Harvest	Fourth Harvest	Total
5106 [1] 1/10 bloom [2] June 29 [3] 100% [4]	838 6" July 17 100%	656 6" Aug. 2 100%	653 6" Aug. 28 96%	7584
			384 Veg. Oct. 2 82%	7973
		2261 Bud Aug. 25 97%	635 6" Sept. 14 97%	8840
			871 Veg. Oct. 17 98%	9046
		2529 1/10 Sept. 6 87%	416 6" Oct. 13 95%	8849
			560 Veg. Oct. 17 100%	9033
	1968 Bud July 25 100%	584 6" Aug. 14 99%	662 6" Sept. 14 89%	8720
			625 Veg. Oct. 16 73%	8283
		1887 Bud Sept. 5 94%		8961
		224 1/10 Sept. 19 93%		9322
	2646 1/10 Aug. 3 100%	684 6" Aug. 22 100%	485 6" Sept. 14 97%	8891
			597 Veg. Oct. 16 87%	9033
		1690 Bud Sept. 5 98%		9442

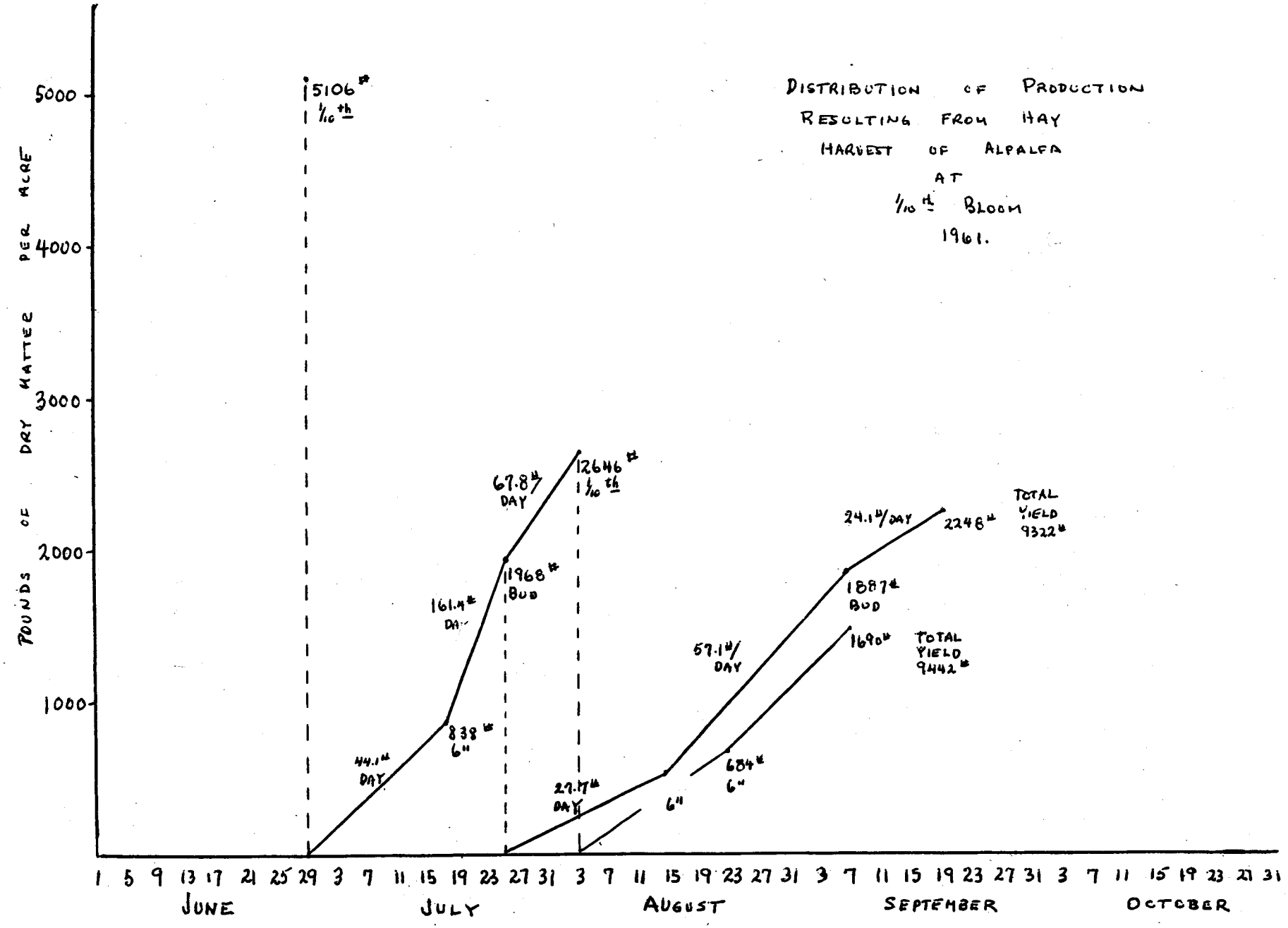
1 Yield in lbs. of D.M.
2 Stage
3 Date of cut
4 % alfalfa

Aftermath Production and Distribution from Vernal Alfalfa
cut as hay at Full Flower
Guelph 1961 (4491)

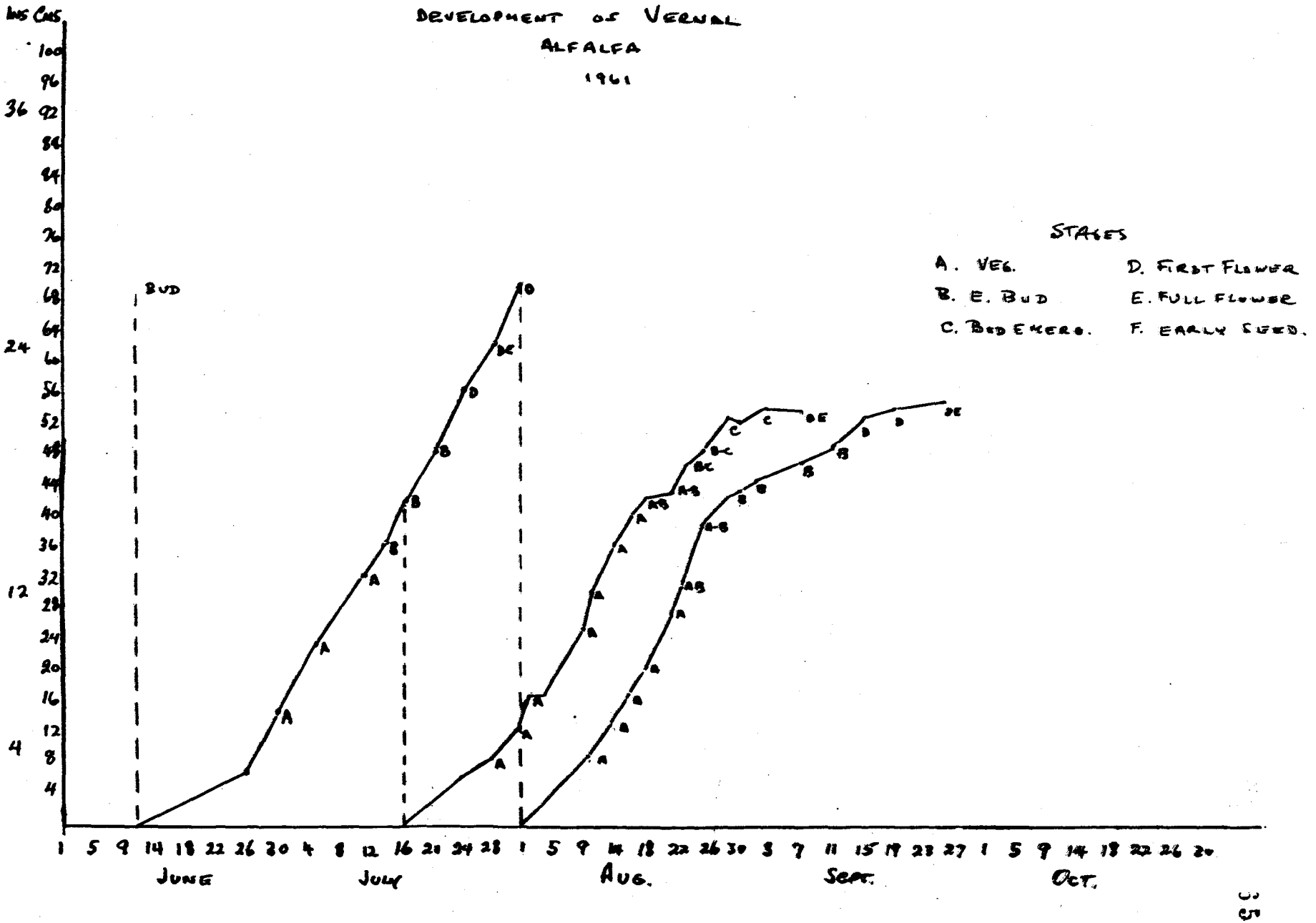
(lbs D.M. per Acre)

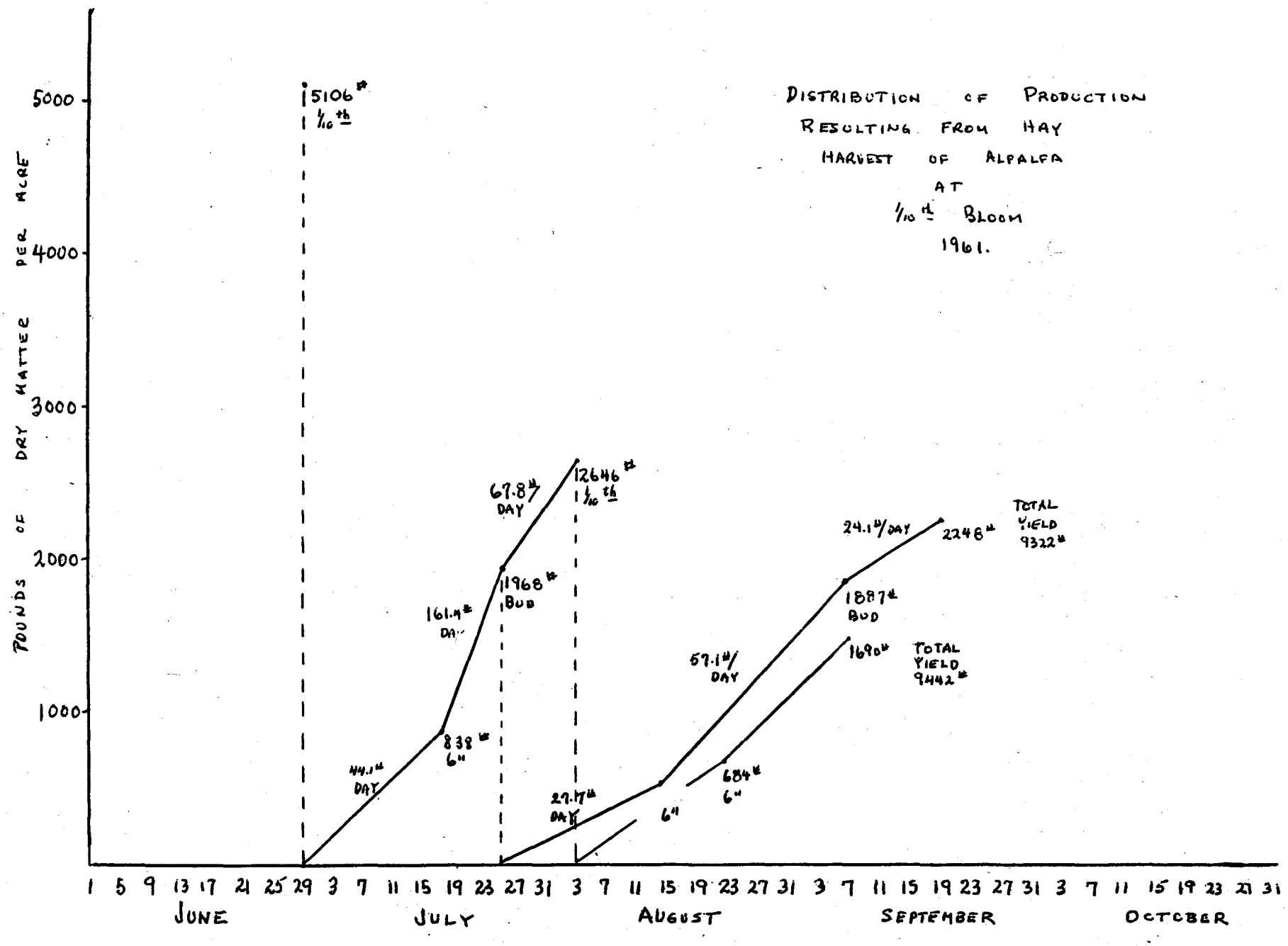
First Harvest	Second Harvest	Third Harvest	Fourth Harvest	Total
4938 [1] F. Flower[2] July 12[3] 100%[4]	688 6" July 25 100%	779 6" Aug. 11 97%	301 6" Sept 1 90%	6706
			1172 Veg. Oct. 2 67%	7441
		2282 Bud Sept. 5 86%	515 6" Oct. 13 99%	8423
		2749 1/10 Sept. 19 83%		8375
	1479 Bud July 31 100%	711 6" Aug. 22 100%	395 6" Sept. 14 94%	7523
			594 Veg. Oct. 16 75%	7772
		1618 Bud Sept. 5 97%		8035
		2139 1/10 Sept. 25 72%		8556
	3350 1/10 Aug. 18 98%	256 6" Sept. 1 97%	657 6" Sept. 27 99%	9201
			538 Veg. Oct. 16 90%	9082
		1344 Bud Oct. 2 95%		9632
		1413 Pre flower Oct. 6 95%		9701

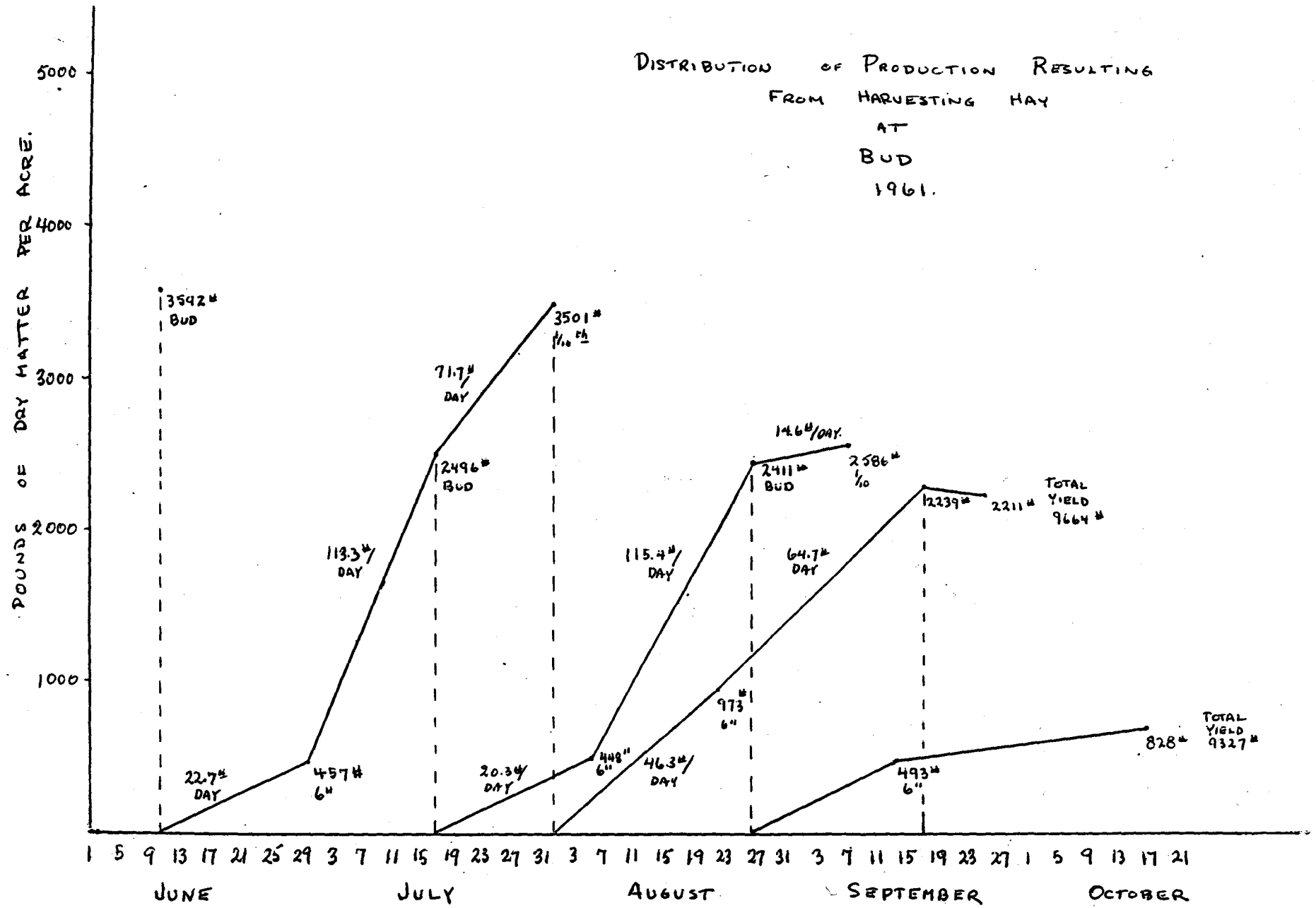
1 Yield in lbs. of D.M.
2 Stage
3 Date of cut
4 % alfalfa

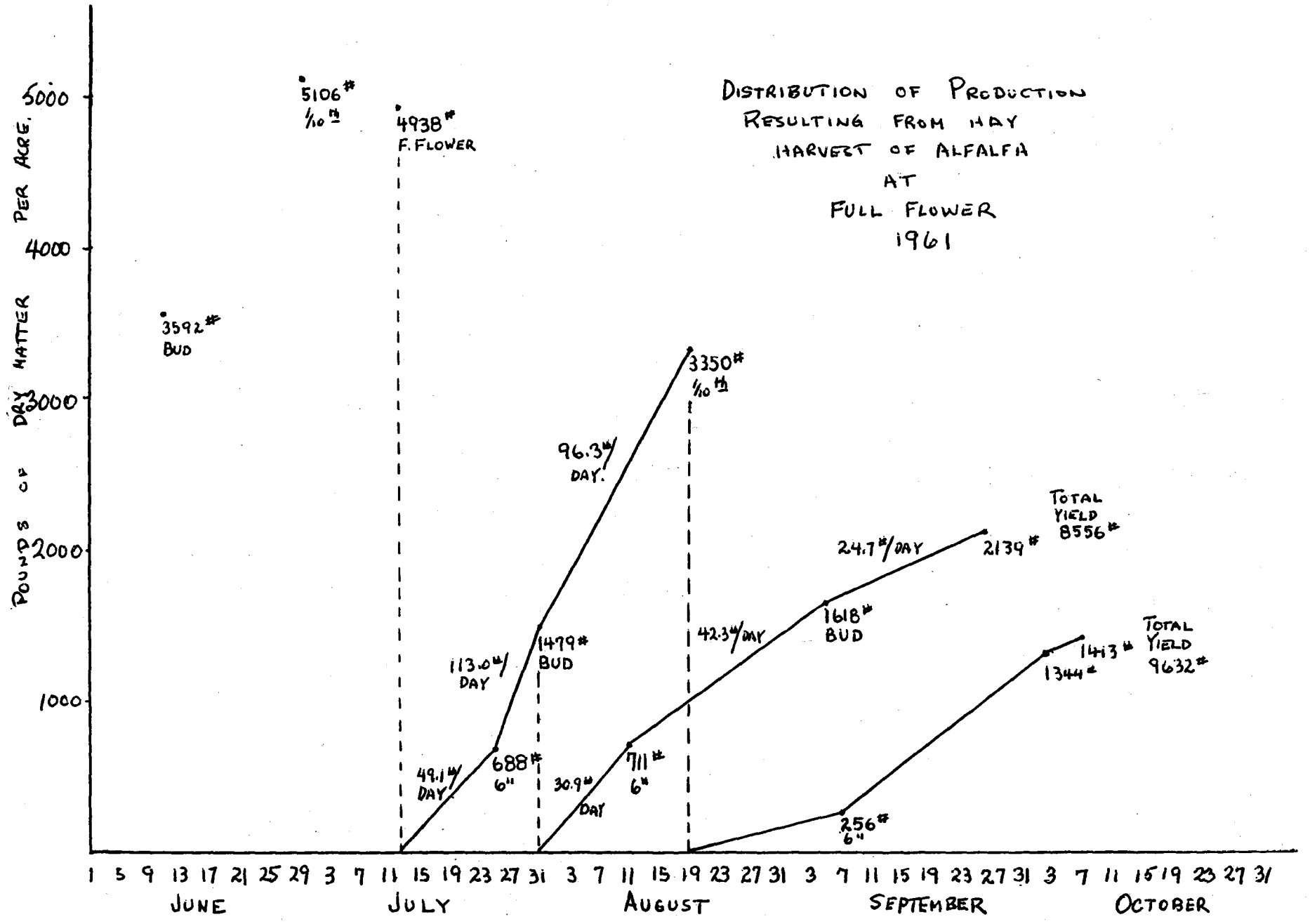

DISTRIBUTION OF PRODUCTION RESULTING FROM HAY HARVEST OF ALFALFA AT 1/10th BLOOM 1961.
POUNDS OF DRY MATTER PER ACRE
5000
4000
3000
2000
1000
5106#
1/10th
12646#
1/10th
67.8#/DAY
1968#
BUD
161.4#
DAY
838#
6"
44.1#
DAY
27.7#
DAY
57.1#/DAY
1887#
BUD
1690#
TOTAL YIELD 9442#
684#
6"
24.1#/DAY
2248#
TOTAL YIELD 9322#
1 5 9 13 17 21 25 29 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

Height and Stage of Aftermath Development of Vernal Alfalfa 1961

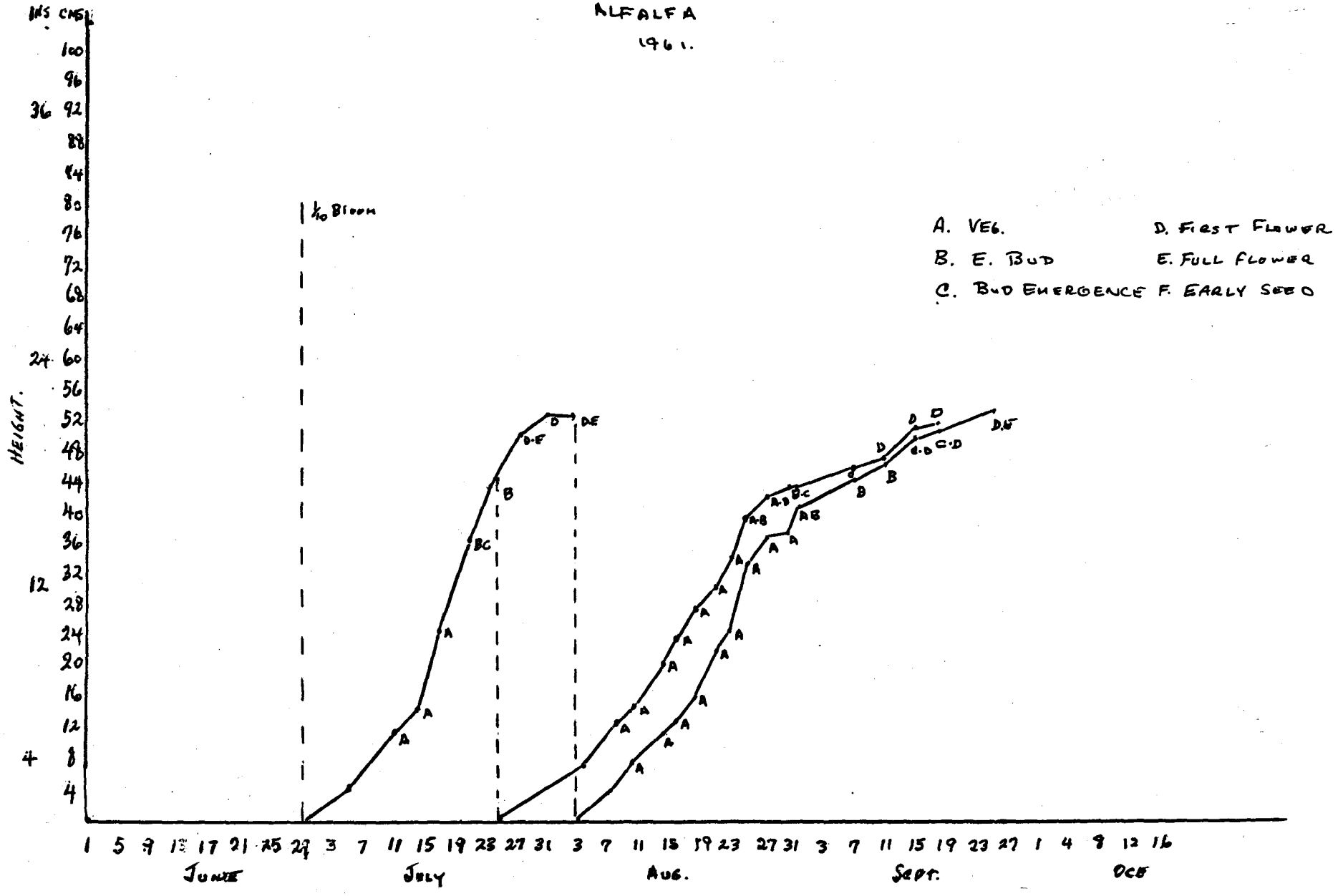



DISTRIBUTION OF PRODUCTION RESULTING FROM HAY HARVEST OF ALFALFA AT 1/10th BLOOM 1961.
POUNDS OF DRY MATTER PER ACRE
5000
4000
3000
2000
1000
5106# 1/10th
12646# 1/10th
67.8#/DAY
1968# BUD
161.4#/DAY
838# 6"
44.1#/DAY
27.7#/DAY
6"
57.1#/DAY
1887# BUD
1690#
TOTAL YIELD 9442#
684# 6"
24.1#/DAY
2248#
TOTAL YIELD 9322#
1 5 9 13 17 21 25 29 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

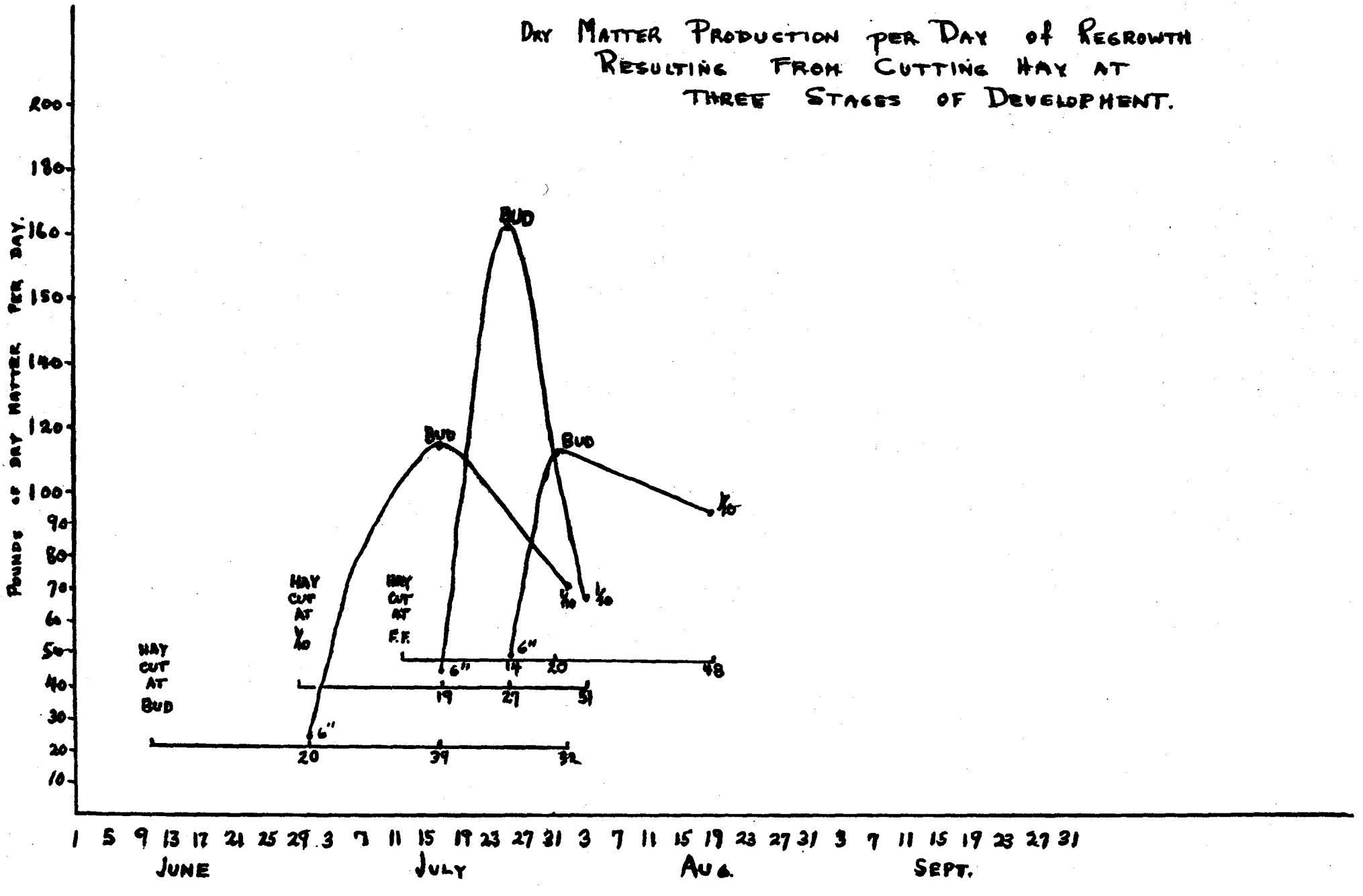

DISTRIBUTION OF PRODUCTION RESULTING FROM HARVESTING HAY AT BUD 1961.
POUNDS OF DRY MATTER PER ACRE.
5000
4000
3000
2000
1000
3542# BUD
3501# 1/10 BUD
71.7# DAY
2496# BUD
113.3# DAY
22.7# DAY
457# 6"
20.3# DAY
448# 6"
14.6# DAY
2411# BUD
2586# 1/10
115.4# DAY
64.7# DAY
2239#
2211#
TOTAL YIELD 9664#
973# 6"
46.3# DAY
493# 6"
828#
TOTAL YIELD 9327#
1 5 9 13 17 21 25 29 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 1 5 9 13 17 21
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER


DISTRIBUTION OF PRODUCTION RESULTING FROM HAY HARVEST OF ALFALFA AT FULL FLOWER 1961
POUNDS OF DRY MATTER PER ACRE.
5000
4000
3000
2000
1000
5106#
1/10 BLOOM
4938#
F. FLOWER
3592#
BUD
3350#
1/10 BLOOM
96.3#/DAY
113.0#/DAY
1479#
BUD
49.1#/DAY
688#
6"
30.9#/DAY
711#
6"
42.3#/DAY
1618#
BUD
24.7#/DAY
2139#
TOTAL YIELD
8556#
1344#
1413#
TOTAL YIELD
9632#
256#
6"
1 5 9 13 17 21 25 29 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31 3 7 11 15 19 23 27 31
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

Height and Stage of Aftermath Development of Vernal Alfalfa 1961.



Dry Matter Production per Day of Regrowth Resulting from Cutting Hay at Three Stages of Development.



Progress Report
Renovation of Roughland Areas

Department of Field Husbandry

Roughland areas which are used as beef or sheep pastures in Ontario can be divided into three broad groups based upon the ease of cultivation: 1) level or rolling fields where normal methods of tillage are possible 2) moderately hilly fields where plowing with modern equipment is impractical but limited cultivation is possible and 3) excessively hilly fields or areas where large limestone boulders and/or small pot holes makes any sort of tillage impossible. All of these areas are characterized by high weed populations, fair to poor stands of Canada bluegrass and soils, draughty and low in fertility.

Renovation of these areas requires the removal of the existing vegetation and the establishment of a long term legume - birdsfoot trefoil. The method of removal of the vegetation will vary and depend upon topography. Proper seed bed preparation is by far the best method of establishment of this legume. However, methods to replace or supplement tillage must be found for use in areas where cultivation is limited or impossible. Herbicides offer promise in the control and/or removal of theeexisting bluegrass and weeds thus allowing for easy preparation of a seed bed with some implement other than a plow, or the production of a mulch of dead material which presents erosion and into which trefoil can be seeded. Trefoil can also be introduced into inaccessible areas by means of cattle.

Research towards the solution of the problem of renovation of these lands has been in three directions: 1) chemical plus cultivation 2) chemical application alone, and 3) the use of animals.

In order to carry out this project, land conforming to the characteristics outlined was necessary. Areas in Dufferin and Grey County were selected. Tests are being condicted at approximately ten locations and under conditions which would be experienced by the farmers who attempt to renovate such land.

1. Chemical and Cultivation

The objective of this section of the research program was to determine 1) the chemical(s) that should be used and their residual action, 2) the time of seeding trefoil, and 3) the need for cultivation.

Dalapon in amino triazole can be used as herbicides to control bluegrass. Dalapon has been used to the greater extent. Data pretaining to the residual action of these chemicals indicated that if these chemicals are used approximately 21 days should elapse before trefoil should be seeded (table 1).

Table 1. Residual action of three chemicals on the germination of trefoil - Greenhouse, Guelph, 1960-61.

Days after seeding	Dalapon 5# acre			Amino Triazole 2# acre			Brushkill 20 oz/acre		
	1	2	Ave.	1	2	Ave.	1	2	Ave.
0	74.1%/	83.3	78.7	3.7	1.6	2.7	39.2	8.2	23.7
7	47.2	48.0	47.6	6.9	12.3	9.6	50.9	1.6	25.3
14	47.2	55.6	51.4	4.5	122.2	63.4	53.9	257.4	155.6
21	129.8	125.5	127.6	33.3	122.1	82.7	62.1	102.8	82.5

/ Per cent establishment of check.

Trefoil should not be seeded in draughty soils later than the third week in May. In areas where adequ te moisture is available, this legume can be seeded up to about mid June. Summer and fall seedings usually fail to overwinter. Trefoil can be seeded in late November, in March, or May and an adequate plant stand can be obtained. (table 2)

Table 2. The date of planting on plant stand and yield of birdsfoot trefoil - Kaine Farm, Guelph, 1959.

Date of Seeding	Plants per square foot	Yield of dry matter
November	6.4	1199
March	6.0	1325
May	5.9	1213

/ Yield of first pasture cut only.

Results at Guelph and at five locations in Dufferin and Grey Counties indicated that "dorment" or late fall seedings will produce equally as well as those made in the early or late spring.

Dalapon applied in September materially helps land preparation. Numerous discings were found necessary to reduce the grass competition where no Dalapon was applied. Increasing the rate of Dalapon above five pounds per acre did not increase the ease of cultivation in the fall. (table 3) However, the higher rate of Dalapon maintained control of the spring growth of bluegrass whereas the five pound rate did not.

Table 3. Effect of fall Dalapon upon the establishment of birdsfoot trefoil seeded at three dates.

Rate of Dalapon ≠	Trefoil plants per square foot. ° November 1960	March 1961	April 1961	Ave.
0	13.2*	23.9	50.1	29.1
5	26.2	17.1	37.1	26.8
10	38.5	21.6	25.8	28.6
Ave.	25.9	20.9	37.6	

≠ Dalapon applied in September, 1960.
° Counts made fall, 1961.
* Ave. of five locations.

However, the purpose of cultivation is not to remove the grass, but to prepare a seed bed for the trefoil. Where the herbicide is applied in the fall and discing is also conducted in the fall, only one or two cultivations were required. If this chemical is applied in the fall and cultivation is delayed until spring, it was found that at least four cultivations were necessary. (table 4)

Table 4. Date of Dalapon application and number of discings on trefoil establishment. Kay Farm, Guelph, 1958.

Date of Dalapon ≠ application	No. of discings 0	2	4	Average
Fall (Sept. 1957)	0.2*	0.0	1.6	0.6
Spring (May 1958)	1.2	1.6	1.9	1.5

≠ Dalapon 5# acre
* Number of plants per square foot

Increasing the rate of dalapon to ten pounds per acre using this delayed cultivation decreased the difficulty in spring cultivation (table 5) However, discing or some form of cultivation was necessary when dalapon is applied in the fall and tillage delayed until the spring.

Table 5 Discing on the establishment of trefoil Dufferin and Grey Counties, 1961. o

	Fall dalapon		Spring dalapon	
	Disced	Not Disced	Disced	Not Disced
Check	13.0*	4.9	13.0	4.9
5	14.0	6.8	20.6	8.1/
10	24.5	6.3	14.8	16.6

/ 5# spring rate poorly ap lied - resulting stands spotty
* trefoil plants per square foot.
o average of five locations.

At this rate during the first week of May when the bluegrass is just beginning to emerge, it was observed during 1961 that where no cultivation was condicted, the trefoil plants were prostrate in growth habit which was in diredt contrast to those where the soil was loose. However, idscing does allow for the production of weeds (table 6).

Table 6 Spring dalapon and dsicing on stand of trefoil Hadati Farm, Guelph, 1960.

Rate of application	Discing No.	Trefoil plants /sq.ft.	Weed Per Cent
0	0	0.3	Trace
5	0	46.6	Trace
5	2	43.1	15

2. Chemical Only

There is a distinct possibility that herbicides may be used without cultivation in the renovation of roughland. If this were true, the land classified in No. 2 and 3 may be easily renovated.

Certain restrictions are placed on this method as indicated by present research results and practical observations: 1) the chemical must be applied in the spring and 2) a better method for application of the herbicides must be found that will assure an accurate and even distribution on rough or rocky land.

The former restriction is not difficult to overcome; however, the latter presents many problems. There are two possibilities of overcoming this restriction: 1) the use of a spray gun connected to the tank with a long hose (2) using granularherbicide in a cyclone seeder. Dalapon has been produced on an experimental basis in the granular form.

Preliminary work with this form of Dalapon has shown that it posseses the same characteristics as the wettable powder form. (table 7)

Table 7. Granular and wettable powder Dalapon on bluegrass kill and establishment of trefoil. Greenhouse, 1960-61.

	Plants per square foot	% Bluegrass kill
Check	10.5	0
Granular 5# acre	10.0	96
10	5.0	100
W. Powder 5	14.0	98
10	10.5	100

Both of these forms of dalapon effectively reduced bluegrass in flats in the greenhouse and allowed the establishment of trefoil.

It has been found (table 1) that trefoil could be seeded at the same time as dalapon is applied. There was a reduction in germination when seeded with the dalapon, but it did not appear to reduce the level below that required for adequate establishment. Laboratory and field trials were conducted in 1961 to further determine the influence of dalapon on germination and establishment.

In the laboratory it was found that dalapon in either form did not inhibit or retard the germination of trefoil seed when seeded at the same time as the herbicide was applied. (table 8)

Table 8. The effect of dalapon upon germination of trefoil in the laboratory. Guelph, 1960-61.

Rate	Dalapon				Seedling wet.	
	Wet. Powder		Granular			
	8 days	15 days	8 days	15 days	Wet. Powder 15 days	Granular 15 days
Check	94.5%	97.0	99.5	98.0	5.24	6.12
5	97.0	98.5	98.0	94.0	5.93	7.62
10	87.5	97.5	99.0	95.5	6.94	8.43
15	97.0	96.5	98.5	93.5	6.59	8.85

Rates of dalapon as high as fifteen pounds per acre did not interfere with germination.

Data obtained from experiments conducted under field conditions also indicated that granular or a wettable powderd dalapon could be applied at seeding time and that the granular form was as effective in grass removal as the wettable powder (table 9). Rates above five pounds per acre of granular dalapon were found to be more than satisfactory for control of bluegrass.

Table 9 Dalapon upon establishment of trefoil and bluegrass - Dufferin County °, 1961.

Rate	Granular		Wettable Powder		Ave.
	Trefoil	Bluegrass	Trefoil	Bluegrass	
0	0.5 /	100%	1.8	100%	1.2
5	7.5	Trace	11.9	Trace	9.7
10	9.1	Trace	7.6	Trace	8.4
Ave.	8.6		10.1		

° Average of two locations
/ Number of trefoil plants.

Although it seems probable that a mixture of dalapon seed could be used effectively in renovating roughland pastures, there are still many problems to be solved. Further research is necessary to confirm these findings and to determine a system for control of broadleaf weeds.

3. Renovation Methods via Animal

These methods of renovating roughland pastures, although feasible, require more time for establishment and production. They are less costly than the chemical renovation but since they do not allow for the control of the existing vegetation the establishment of trefoil is slow and less certain than those methods that do. Up to 10 years may be necessary for renovation.

Trefoil islands have been suggested as a cheap method of renovating roughland pastures. Essentially, this involves the use of a small area of workable land which is seeded to trefoil and fenced. The fences are removed and the cattle are allowed to graze the trefoil after it has set seed. In the process of grazing seed is taken in by the animal and excreted in some other part of the field. Evidence that trefoil is moving either by means of cattle or by pod shattering is available on farms in Ontario. The rate of spread may depend on the location of the island in respect to salt blocks and to water troughs. Gradually, over a period of years, the field should be covered with trefoil.

Several County Soil and Crop Improvement members in Grey, Bruce and Dufferin Counties are trying this method of renovating roughland areas. Evaluation of these will require many years of observations.

Information was gathered at Guelph during the fall of 1960 on the effect of feeding seed to dairy animals. It was found that only the hard seed content remained viable after being excreted by the animal (Table 10).

Table 10. Effect of feeding trefoil seed to animals on germination - Guelph, 1960.

State of seed	Fecal Seed		Lab. Seed
	Soft	Hard	
Germ	1.2%	8.3%	67.0%
Dead	98.8	3.3	2.5
Hard	0.0	88.4	29.3
T. L. S.	1.2	96.7	96.3

The quick germinating seed was dead. The seeds were swollen, had partially germinated and were without seed coats.

Seed is excreted by animals from about 24 hours to 72 after ingestion (Table 11).

Table 11. Effect of feeding trefoil seed to animals - Guelph, 1960.

State of Seed	Number of seeds per 0.5 oz.			
	0 to 24	24 to 48	48 to 72	72 to 96
Total	61.4	71.7	43.0	21.0
Hard	6.1	18.4	23.5	11.0
Soft	55.3	53.3	20.5	10.0
Lbs.*	33	30	28	28

* lbs. of manure collected

Prior to harvesting seed from trefoil the pods contain a very high proportion of hard seed. Seed taken from a plant by an animal may be from 50 to 70% hard seed. Hard seed can be scarified by low temperatures such as are found during winter.

Manure containing seed was spread on small plots in November 1960 and in flats in the greenhouse. Only a few trefoil plants resulted from the manure kept in the greenhouse. Here flats were allowed adequate moisture and the temperature was kept approximately 70°F. However, in the field the equivalent plots established extremely well and the population was above that which could be attributed to hard seed alone. Seedling year yields were high. (Table 12)

Therefore, renovation by this method is possible. The animal would be allowed to graze trefoil that has set seed during late July and August. The hard seeds will be excreted but will not germinate until the following spring. The effects of the winter climateon the feces may also be important for no seed will germinate from within freshly excreted feces. It was found that trefoil would not germinate unless the feces was broken and distributed thinly over the soil. This may be accomplished in part by the winter conditions which breaks up the fecew and allows the trefoil seed to reach the ground level.

Table 12. Seedling year growth of faecal and lab seed+ 1960-61

	Field Sept. 1961 lbs. d n/acre
Faecal seed*	
Innoculated	2145
Non innoculated	1646
Lab seed	
Innoculated	809
Non innoculated	850

\+ faecal and laboratory seed broadcast seeded in plots Nov. 8, 1960
* seed fed to animals and recovered in manure

SUMMARY

Where land can be cultivated to a limited extent (Groups 1 & 2) reasonable success can be expected by the use of the two following methods.

1. Application of dalapon in September, discing and fertilizing in October and seeding in late November or early spring.

2. Application of dalapon in early May and discing fertilization 20-21 days later.

Where excessively rocky or hilly land is to be renovated the proposed experimental methods of dalapon and seed and fertilizer together and applied in a cyclone seeder needs wider testings. Also a solution of the problem of perennial weeds on these soils is imperative to the success of this once "over method".

Renovation of roughlands by means of animals is at the best a ten year proposition.

Oat Varieties and Forage Establishment (1960)

Seeded: May, 1960 — Test 145 — Location: B

Variety	Oat Heading Rate	Establishment Oct 4/60 - plants/sq.ft. Alfalfa	Establishment Oct 4/60 - plants/sq.ft. Trefoil	Establishment April 24/61 - plants/sq.ft. Alfalfa	Establishment April 24/61 - plants/sq.ft. Trefoil	Trefoil Vigour Oct. 4/60	Trefoil Vigour May 11/61	Hay Yields - lbs. D.M./acre: First Cut-June 30 Alfalfa	First Cut-June 30 Trefoil	Second Cut-Aug. 9 Alfalfa	Second Cut-Aug. 9 Trefoil	Total Alfalfa	Total Trefoil
Branch	1	25.8	17.3	21.3	15.5	2.8	3.5	5543	3575	3346	2242	8889	5817
	2½	23.6	15.6	20.0	14.8	3.4	3.6	5531	3584	3360	2240	8891	5824
	Ave.	24.7	16.4	20.7	15.2	3.1	3.6	5537	3580	3353	2241	8890	5821
Rodney	1	25.9	16.1	22.0	18.0	2.0	3.2	5395	3433	3367	2292	8762	5725
	2½	25.4	16.2	20.8	19.8	3.2	3.6	5542	3545	3583	2209	9125	5754
	Ave.	25.6	16.1	21.4	18.9	2.6	3.4	5468	3489	3475	2250	8943	5739
Clintland	1	25.3	19.8	20.3	19.0	1.6	1.6	5621	4199	3442	2179	9063	6378
	2½	27.4	18.9	23.8	18.8	1.6	1.8	5481	4066	3578	2066	9059	6132
	Ave.	26.3	19.3	22.1	18.9	1.6	1.7	5551	4143	3510	2123	9061	6266
Shield	1	22.7	17.0	21.0	17.5	2.0	2.3	5335	4322	3525	2216	8860	6538
	2½	24.5	17.0	21.8	17.5	2.0	2.3	5530	3940	3553	2139	9083	6079
	Ave.	23.6	17.0	21.4	17.5	2.0	2.3	5432	4131	3539	2178	8971	6309

Oat Varieties and Forage Establishment (1961)

Seeded: May 12 — Test 152 — Location C-8

Variety	Oat Seeding Rate-bu/ac.	Oat Yield lbs./acre.	Total Oat Stems 3 ft. of row	Establishment Alfalfa	June 15* Trefoil
Branch	1	2400	45	30	16
	2½	2692	60	30	15
	Ave.	2546	53	30	16
Rodney	1	2326	52	29	18
	2½	2511	64	33	14
	Ave.	2418	58	31	16
Clintland	1	2110	50	35	14
	2½	2165	63	32	14
	Ave.	2137	57	34	14
Shield	1	2195	56	31	16
	2½	2353	68	28	15
	Ave.	2274	62	30	16

* No fall counts taken.

Oat Lodging (1961)

Test 153

Seeded: May 13 — Location C-8 — Oats Harvested: Aug. 11

Lodging Treatment	Oat Yield and Quality: Oat Yield lbs./ Acre	Oat Weight lbs./per bushel	1000 Seed Weight - gms.	Per cent Hull	Establishment Plants/square foot: Alfalfa	Trefoil	Brome
Early moderate	1988	26.7	28.8	33.4	22.3	15.8	10.5
Early, severe	1623	25.3	28.2	31.5	25.1	10.6	9.5
Late, moderate	1953	27.7	28.2	29.9	20.8	17.5	8.9
Late, severe	1917	27.8	26.9	31.2	22.5	17.9	9.5
No lodging	1917	28.0	29.3	30.2	24.6	15.1	13.2
No companion					23.2	16.8	10.2

Rape Varieties - 1961

Yield in Tons per Acre

Seeded - July 11 Location - C - 1 Harvested Nov. 3

Variety	Per cent D.M.	Yield* D.M.	Green Weight
New Zealand Club Root	12.4	1.47	11.8
New Zealand Essex Broadleaf	13.1	1.59	12.3
New Zealand Giant	12.6	2.27	17.0
New Zealand Aphid Resistant	12.5	1.42	11.3
Sharpes	13.1	1.37	10.6
Pritchards Rape	14.3	2.05	14.4
Pritchards Gigantic	13.4	1.97	14.5
- 2063	14.5	1.90	13.1
Gartons Early Giant	14.8	2.32	15.3

* Mean 2 reps

Rate of Seeding Rape (1961)
Test 155

Seeded: July 11 Location: C-1 Harvested: Nov. 3

Method and Rate		Per cent Dry Matter	Yield Green Tons/A.	Yield Dry Matter Tons/A.	Height in cms.	Diameter of Stems in cms.	Dry weight of 25 plants-gms.	Per cent Leaf
Rows	½	10.0	23.4	2.35	116	1.6	796	30.4
	1	10.5	26.7	2.79	110	1.5	717	31.5
	1½	10.7	22.7	2.41	117	1.5	610	29.1
	2	10.3	22.6	2.33	114	1.4	477	27.9
	Ave.	10.4	23.9	2.47	114	1.5	650	29.7
Broadcast	2	11.7	15.4	~~2.35~~ 1.76	115	1.2	437	25.6
	4	11.7	15.2	~~2.36~~ 1.77	109	1.1	289	24.6
	6	12.4	13.9	~~2.29~~ 1.71	101	0.9	236	24.8
	Ave.	11.9	14.8	~~2.33~~ 1.75	108	1.1	320	25.0

Variety Used: Garton's Early Giant

Rate of Seeding Kale (1961)
Test 156

Seeded: June 13 Location: C-1 Harvested: Aug. 17

Method and Rate	Per Cent Dry Matter	Yield Green Tons/Acre	Yield Dry Matter Tons/A.	Height cms.	Diameter of Stem in cms.	Dry weight of 25 plants-gms.	Per Cent Leaf
27 inch rows							
Dunn's Marrowstem							
1	8.1	25.1	2.04	85	2.7	804	52.9
2	7.8	30.5	2.38	86	2.1	640	47.9
3	7.8	32.8	2.55	85	1.9	457	48.3
4	7.6	33.7	2.59	82	1.6	387	48.6
5	7.7	32.9	2.52	84	1.7	412	48.5
Ave.	7.8	31.0	2.41	84	2.0	540	49.2
Sharpe's 1000-Headed 1	8.4	23.7	2.00	87	1.9	833	53.9
2	8.1	29.7	2.43	83	1.5	557	52.0
3	8.5	26.6	2.26	84	1.4	518	52.9
4	8.4	30.4	2.56	87	1.4	453	49.6
5	9.1	28.8	2.58	82	1.2	406	52.1
Ave.	8.5	27.8	2.36	85	1.5	553	52.1
Broadcast							
Dunn's Marrowstem							
2	8.0	23.9	1.91	76	1.9	449	49.3
4	8.1	26.0	2.10	78	1.7	401	48.5
6	8.3	24.5	2.03	79	1.6	332	45.6
8	8.4	24.9	2.11	78	1.5	281	46.3
Ave.	8.2	24.8	2.04	78	1.7	366	47.4
Sharpe's 1000 Headed							
2	9.6	21.2	2.02	72	1.4	421	51.0
4	9.8	21.9	2.13	76	1.1	326	48.0
6	9.6	24.7	2.70	79	1.2	353	48.2
8	9.9	23.9	2.35	73	1.0	293	51.4
Ave.	9.7	22.9	2.30	75	1.2	348	50.0

Rate of Seeding Kale (1961)
Test 156

Seeded: June 13 Location: C-1 Harvested: Nov. 1

Method and Rate	Per Cent Dry Matter	Yield Green Tons/Acre	Yield Dry Matter Tons/A.	Height cms.	Diameter of Stem in cms.	Dry Weight of 25 plants-gms.	Per cent Leaf
27 inch rows							
Dunn's Marrowstem							
1	12.4	40.4	4.91	135	3.3	2350	24.9
2	10.9	50.1	5.44	125	2.8	1544	26.1
3	12.7	52.8	6.56	133	2.9	1856	24.5
4	12.7	57.0	7.22	127	2.6	1303	24.2
5	13.3	52.5	7.00	126	2.4	1219	23.0
Ave.	12.4	50.5	6.23	129	2.8	1654	24.5
Sharpe's 1000							
Headed							
1	15.9	37.7	5.99	129	2.2	1881	29.0
2	14.6	44.4	6.26	125	1.7	1290	27.5
3	15.8	38.8	6.11	118	1.6	1107	26.4
4	15.2	53.6	8.12	121	1.9	1179	26.4
5	15.1	32.9	4.96	115	1.6	995	27.7
Ave.	15.3	41.5	6.29	122	1.8	1290	27.4
Broadcast							
Dunn's Marrowstem							
2	11.5	50.9	5.21	121	2.7	1877	24.9
4	12.7	52.0	6.60	125	2.2	1566	22.4
6	13.1	45.9	6.01	119	1.8	1147	23.1
8	12.6	49.1	6.11	112	1.7	1143	23.9
Ave.	12.5	49.5	5.98	119	2.1	1433	23.6
Sharpe's 1000							
Headed							
2	17.1	41.0	6.96	108	1.7	1481	31.6
4	15.8	36.0	5.70	112	1.2	1011	27.5
6	14.5	41.3	5.98	114	1.3	1205	27.7
8	16.3	42.1	6.81	108	1.4	879	28.5
Ave.	15.9	40.1	6.36	111	1.4	1144	28.8

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