NOT FOR PUBLICATION

PROGRESS REPORT

FORAGE CROP INVESTIGATIONS

1963

FORAGE MANAGEMENT

Crop Science Department
Ontario Agricultural College
Guelph

FORAGE PROGRESS REPORT 1963

This report contains data on Crop Science Department forage trials. It includes data on variety trials and results of breeding experiments. Most of the variety trials are reported in the "1963 Report on Field Trials of Varieties and Mixtures". That report and the present report should be filed together. The report is prepared for use of the members of the Crop Science Department and for those associated with the forage program.

CONTENTS

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

1963 GROWING SEASON WEATHER RECORDS

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Harrow	Max.	56.2	65.5	79.0	82.1	76.1	71.4
	Min.	37.0	45.8	56.1	61.9	58.4	50.7
Ridgetown	Max.	56.1	64.4	77.6	81.2	76.4	70.6
	Min.	35.0	44.2	56.1	60.8	56.3	48.7
Guelph	Max.	54.4	61.9	76.1	79.0	73.3	67.0
	Min.	32.0	40.0	50.3	55.9	51.3	42.6
Kemptville	Max.	52.7	63.9	78.8	81.5	74.3	66.4
	Min.	31.5	41.4	54.1	59.0	52.6	41.5
Ottawa	Max.	52.5	64.0	78.6	80.3	72.6	64.5
	Min.	33.1	41.8	55.5	60.5	53.7	43.4
New Liskeard	Max.	46.8	59.0	75.8	77.4	66.9	66.9
	Min.	27.4	36.1	48.8	55.7	50.6	51.0
Kapuskasing	Max.	43.9	56.3	73.8	75.2	66.8	58.4
	Min.	23.1	31.2	43.5	52.3	45.0	39.9
Gore Bay	Max.	51.2	59.5	73.1	78.1	71.7	63.9
	Min.	28.7	36.0	48.9	55.9	52.1	44.1
Fort Frances	Max.	50.7	60.5	74.7	78.2	75.0	68.6
	Min.	29.3	39.3	54.7	58.2	52.9	47.2

PRECIPITATION						
Harrow	3.5	2.0	2.2	1.5	1.9	1.5
Ridgetown	4.1	3.4	2.1	2.8	1.5	1.3
Guelph	2.7	3.0	0.6	3.2	2.2	1.9
Kemptville	3.2	2.2	0.7	1.6	4.3	4.1
Ottawa	2.5	2.6	1.5	3.2	3.5	4.8
New Liskeard	1.2	1.6	1.4	1.9	6.7	2.1
Kapuskasing	2.7	2.4	3.2	4.9	3.6	1.8
Gore Bay	2.4	1.7	1.3	2.9	2.8	1.2
Fort Frances	3.5	4.4	2.1	4.4	3.9	2.4

DEPARTURES OF 1963 GROWING SEASON FROM NORMAL

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Harrow	Max.	+0.2	-2.8	+0.2	-1.3	-5.5	-3.0
	Min.	+0.2	-1.8	-2.3	-0.8	-2.9	-3.8
Ridgetown	Max.	+2.5	-0.9	+0.4	-1.1	-4.0	-2.0
	Min.	-1.2	-2.2	-0.7	-0.7	-3.9	-5.2
Guelph	Max.	+3.1	-2.0	+1.8	-0.3	-4.4	-2.8
	Min.	-1.3	-3.6	-3.0	-1.5	-4.7	-6.5
Kemptville	Max.	+0.4	-2.6	+2.4	+0.1	-4.8	-3.5
	Min.	-1.3	-2.4	+0.5	+1.1	-2.9	-6.3
Ottawa	Max.	+2.2	-1.4	+3.6	+0.4	-5.6	-3.8
	Min.	+0.7	-1.9	+2.0	+2.6	-1.9	-4.7
New Liskeard	Max.	+0.9	-3.2	+3.4	+0.6	-7.9	+2.0
	Min.	+3.1	-0.3	+1.3	+2.6	-0.1	+7.9
Kapuskasing	Max.	+1.2	-1.2	+4.5	+1.0	-4.7	-2.1
	Min.	+1.6	-3.8	-3.1	+0.3	-5.3	-1.5
Gore Bay	Max.	+2.6	-2.2	+2.4	+0.3	-4.5	-2.6
	Min.	+0.5	-2.6	+0.2	+1.6	-1.8	-2.7
Fort Frances	Max.	+1.7	-2.5	+2.5	-0.1	0	+4.2
	Min.	+0.9	-1.3	+4.0	+1.9	-1.1	+2.7

PRECIPITATION						
Harrow	+0.8	-0.7	-0.9	-1.0	-0.7	-0.8
Ridgetown	+1.0	+0.4	-0.7	0	-0.9	-1.2
Guelph	0	-0.2	-2.4	0	-0.8	-1.0
Kemptville	+0.5	-0.7	-1.9	-1.2	+1.4	+1.1
Ottawa	-0.2	-0.2	-1.6	0	+0.2	+1.6
New Liskeard	-0.5	-0.6	-1.9	-1.7	+3.6	-1.2
Kapuskasing	+1.0	-0.1	+0.3	+1.8	+0.5	-1.3
Gore Bay	-0.2	-0.7	-1.5	+0.7	+0.5	-2.2
Fort Frances	+1.5	+1.7	-2.0	+0.6	0	-0.9

1931-1960 MONTHLY AVERAGES OF RAINFALL AND TEMPERATURE FOR GROWING SEASON

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Harrow	Max.	56.0	68.3	78.8	83.4	81.6	74.4	62.9
	Min.	36.8	47.6	58.4	62.7	61.3	54.5	44.1
Ridgetown	Max.	53.6	65.3	77.2	82.3	80.4	72.6	60.9
	Min.	36.2	46.4	56.8	61.5	60.2	53.9	43.9
Guelph	Max.	51.3	63.9	74.3	79.3	77.7	69.8	57.9
	Min.	33.3	43.6	53.3	57.4	56.0	49.1	39.3
Kemptville	Max.	52.3	66.5	76.4	81.4	79.1	69.9	57.4
	Min.	32.8	43.8	53.6	57.9	55.5	47.8	37.0
Ottawa	Max.	50.3	65.4	75.0	79.9	78.2	68.3	55.9
	Min.	32.4	43.7	53.5	57.9	55.6	48.1	37.5
New Liskeard (1921-1950 normals)	Max.	45.9	62.2	72.4	76.8	74.8	64.9	
	Min.	24.3	36.4	47.5	53.1	50.7	43.1	
Kapuskasing	Max.	42.7	57.5	69.3	74.2	71.5	60.5	48.1
	Min.	21.5	35.0	46.6	52.0	50.3	41.4	33.0
Gore Bay	Max.	48.6	61.7	71.7	77.8	76.2	66.5	55.2
	Min.	28.2	38.6	48.7	54.3	53.9	46.8	37.6
Fort Frances	Max.	49.0	63.0	72.2	78.3	75.0	64.4	53.2
	Min.	28.4	40.6	50.7	56.3	54.0	44.5	34.8

PRECIPITATION							
Harrow	2.7	2.7	3.1	2.5	2.6	2.3	2.2
Ridgetown	3.1	3.0	2.8	2.8	2.6	2.5	2.7
Guelph	2.7	3.2	3.0	3.2	3.0	2.9	2.6
Kemptville	2.7	2.9	2.6	2.8	2.9	3.0	2.6
Ottawa	2.7	2.8	3.1	3.2	3.3	3.2	2.6
New Liskeard (1921-1950 normals)	1.7	2.2	3.3	3.6	2.9	3.3	
Kapuskasing	1.7	2.5	2.9	3.1	3.1	3.1	2.4
Gore Bay	2.6	2.4	2.8	2.2	2.3	3.4	3.1
Fort Frances	2.0	2.7	4.1	3.8	3.9	3.3	1.9

TEST 162 - HAY GROWTH CURVES - 1963

First Crop Data (Yield lbs./acre)

Cut No.	Date Cut	Stage Cut	Height Cms.	% D.M.	Yield D.M.	Weekly Increase D.M.	%* Leaf	Yield* Leaf	Weekly Increase Leaf	Yield* Stem	% Crude Prot.	Yield Crude Prot.	%** Dig. D.M.	Yield** Dig. D.M.
VERNAL														
01	5-6	Veg.	10	19.9	69	--	--	--	--	--	--	--	78.7	49
02	5-13	Veg.	16	18.0	409	340	--	--	--	--	34.4	134	72.9	271
03	5-21	Veg.	23	17.9	1087	678	75.2	813	--	274	28.3	309	76.9	791
04	5-27	Veg.	28	20.8	1665	578	64.3	1015	202	650	24.2	406	77.9	1228
05	6-3	Early bud	45	18.1	2320	655	54.1	1167	152	1153	22.2	516	74.1	1742
06	6-11	Buds emerged	66	19.8	3337	1017	46.8	1553	386	1784	20.2	676	69.0	2323
07	6-17	Late bud	71	20.4	3627	290	42.7	1453	-100	2174	18.8	677	67.5	2352
08	6-24	Late bud	77	25.2	4753	1126	41.3	1824	371	2929	16.4	780	64.7	3200
09	7-2	Late flower	84	27.4	4951	198	40.7	1991	167	2960	15.8	721	61.6	2964
10	7-8	Early seed	93	30.7	5288	337	37.5	1986	-5	3302	14.8	784	59.6	3254
11	7-16	Early seed	96	32.0	6136	848	32.8	2009	23	4127	13.3	817	56.0	3507
12	7-22	Early seed	96	31.8	5435	-701	31.3	1693	-316	3742	13.8	751	55.7	3078
DUPUITS														
01	5-6	Veg.	12	18.7	158	--	--	--	--	--	37.4	60	75.2	94
02	5-13	Veg.	19	16.8	589	431	--	--	--	--	34.5	203	73.7	428
03	5-21	Veg.	28	16.1	1257	668	66.0	749	--	508	29.9	375	76.5	925
04	5-27	Veg.	32	20.3	1812	555	60.8	1079	330	733	24.3	431	77.8	1392
05	6-3	Early bud	46	18.4	2339	527	54.1	1149	70	1190	22.2	522	72.9	1649
06	6-11	Buds emerged	67	19.6	3236	897	45.7	1445	296	1791	20.0	648	66.0	2093
07	6-17	Late bud	77	20.4	3638	402	43.0	1452	7	2186	18.2	662	65.1	2351
08	6-24	Full flower	85	24.8	4248	610	37.9	1530	78	2718	16.0	676	63.8	2594
09	7-2	Early seed	92	29.2	4406	158	37.3	1581	51	2825	14.7	647	59.9	2584
10	7-8	Early seed	96	29,9	5311	905	35.6	1856	275	3455	14.0	718	59.4	3063
11	7-16	Early seed	99	35.1	5575	264	31.0	1793	-63	3782	12.7	709	55.9	3215
12	7-22	Early seed	102	31.5	5163	-412	30.7	1690	-103	3473	13.4	699	55.2	2993

* 4 reps. only

** 5 reps. only

TEST 162 - HAY GROWTH CURVES - 1963

First Crop Data (Yield lbs./Acre)

Cut No.	Date Cut	Stage* Cut	Height* Cms.	%* D.M.	Yield* D.M.	Weekly Increase D.M.	%* Leaf	Yield* Leaf	Weekly Increase Leaf	Yield* Stem	%* Crude Prot.	Yield* Crude Prot.	%* Dig. D.M.	Yield* Dig. D.M.
CLIMAX														
01	5-6	Veg.	19	24.3	314	--	--	--	--	--	23.7	75	81.6	256
02	5-13	Veg.	26	21.1	793	479	--	--	--	--	22.6	185	80.5	635
03	5-21	Veg.	39	19.7	1743	950	--	--	--	--	16.7	293	80.9	1407
04	5-27	Jointing	46	21.8	2565	822	81.4	2088	--	477	14.4	371	80.4	2061
05	6-3	Jointing	64	18.7	3438	873	57.8	1987	-101	1451	12.6	438	75.2	2580
06	6-11	Boot	88	18.7	4634	1196	47.8	2233	246	2401	9.9	465	70.9	3289
07	6-17	Boot	101	20.4	5804	1170	45.6	2626	393	3178	9.8	571	68.3	3963
08	6-24	Heads emerged	109	25.3	6252	448	35.6	2251	-375	4001	8.9	567	65.2	4081
09	7-2	Head Inter Elo.	117	32.6	6876	624	33.9	2339	88	4537	7.7	531	57.5	3958
10	7-8	Flower	117	42.2	7533	657	34.2	2560	221	4973	6.5	491	55.3	4156
11	7-16	Seed	112	39.8	7284	-249	30.4	2225	-335	5059	5.7	416	54.1	3927
12	7-22	Seed	114	42.9	6681	-603	27.3	1836	-389	4845	5.6	376	48.7	3254
ESSEX														
01	5-6	Veg.	19	26.4	353	--	--	--	--	--	25.6	66	78.4	210
02	5-13	Veg.	23	22.9	661	308	--	--	--	--	24.5	161	77.1	511
03	5-21	Veg.	33	21.9	1475	814	--	--	--	--	18.5	280	78.9	1163
04	5-27	Veg.	38	25.1	2151	676	92.4	1998	--	153	14.0	305	78.7	1692
05	6-3	Jointing	56	20.0	2853	702	74.5	2135	137	718	13.9	396	73.4	2093
06	6-11	Jointing	72	19.1	3853	1000	59.4	2324	189	1529	11.6	449	71.3	2735
07	6-17	Boot	90	20.1	4441	588	54.3	2438	114	2003	9.7	432	69.5	3079
08	6-24	Boot	98	24.4	5402	961	46.1	2501	63	2901	8.6	464	65.5	3530
09	7-2	Heads emerged	101	31.8	5692	290	38.8	2220	-281	3472	7.4	420	60.9	3467
10	7-8	Head Inter Elo.	105	38.6	6743	1051	33.3	2250	30	4493	6.8	457	59.3	3091
11	7-16	Flower	104	37.3	7327	584	31.7	2291	41	5036	6.2	457	57.1	4178
12	7-22	Flower	105	40.3	6588	-739	32.0	2121	-170	4467	6.2	418	52.0	3404

* 4 reps. only.

TEST 162 - HAY GROWTH CURVES - 1963

First Crop Data (Yield lbs./Acre)

Cut No.	Date Cut	Stage Cut	Height Cms.	% D.M.	Yield D.M.	Weekly Increase D.M.	%* Leaf	Yield* Leaf	Weekly Increase Leaf	Yield* Stem	% Crude Prot.	Yield Crude Prot.	%** Dig. D.M.	Yield** Diges. D.M.
FRODE														
01	5-6	Veg.	21	21.5	281	--	--	--	--	--	26.6	74	75.3	228
02	5-13	Veg.	26	19.0	864	583	--	--	--	--	23.8	209	73.0	682
03	5-21	Veg.	38	18.3	1441	577	--	--	--	--	16.1	237	77.0	1145
04	5-27	Jointing	46	21.7	2137	696	85.6	1854	--	283	12.6	274	77.4	1714
05	6-3	Boot	65	19.9	2904	767	69.7	2070	216	834	10.6	309	73.9	2216
06	6-11	Heads Emerged	89	21.2	3829	925	59.6	2470	400	1359	9.4	365	66.2	2665
07	6-17	Heads Inter Elo.	105	22.9	4041	212	65.5	2798	328	1243	8.5	355	66.1	2763
08	6-24	Flower	116	27.3	4411	370	71.0	3221	423	1190	7.8	360	61.3	2989
09	7-2	Seed	121	31.4	4546	135	55.3	2541	-680	2005	6.7	287	57.6	2753
10	7-8	Seed	122	37.8	5164	618	64.8	3684	1143	1480	6.6	342	54.4	2933
11	7-16	Seed	123	37.4	5321	157	61.6	3531	153	1790	6.3	339	52.9	2928
12	7-22	Seed	121	35.8	4700	-621	65.9	3184	347	1516	7.0	319	49.8	2458
OTTAWA 100														
01	5-6	Veg.	17	21.4	120	--	--	--	--	--	31.4	38	75.1	91
02	5-13	Veg.	23	18.1	381	261	--	--	--	--	31.9	122	76.2	276
03	5-21	Veg.	36	17.6	957	576	--	--	--	--	24.0	232	77.7	747
04	5-27	Jointing	42	20.3	1679	722	91.2	1580	--	99	20.2	343	78.2	1336
05	6-3	Jointing	63	16.9	2608	929	74.9	1873	293	735	17.1	449	73.8	1951
06	6-11	Heads Emerged	87	18.2	4137	1529	50.6	2056	183	2081	13.8	573	68.2	2854
07	6-17	Heads Emerged	98	19.7	4947	810	41.9	2022	-34	2925	11.9	593	66.6	3344
08	6-24	Flower	113	25.6	5415	468	36.9	1898	-124	3517	10.4	569	61.3	3358
09	7-2	Flower	120	33.3	5903	488	31.2	1822	-76	4081	8.7	513	53.6	3223
10	7-8	Seed	120	41.0	6563	660	29.8	1999	177	4564	8.1	534	51.4	3474
11	7-16	Seed	120	39.6	6657	94	28.9	2044	45	4613	7.5	502	45.6	3122
12	7-22	Seed	122	38.9	6068	-589	32.5	2101	57	3967	6.2	387	41.8	2684

* 4 reps. only
** 5 reps. only

TEST 162 - HAY GROWTH CURVES - 1963

First Crop Data (Yield lbs./acre)

Cut No.	Date No.	Stage Cut	Height Cms.	% D.M.	Yield D.M.	Weekly Increase D.M.	%* Leaf	Yield* Leaf	Weekly Increase Leaf	Yield* Stem	% Crude Prot.	Yield Crude Prot.	%** Diges. D.M.	Yield** Diges. D.M.
SARATOGA														
01	5-6	Veg.	28	22.8	650	--	--	--	--	--	25.8	167	78.5	567
02	5-13	Veg.	38	18.4	1567	917	--	--	--	--	23.2	364	79.0	1361
03	5-21	Jointing	56	18.5	2735	1168	67.8	2298	--	437	16.9	404	79.0	2348
04	5-27	Jointing	61	20.1	3245	510	64.3	2393	95	852	14.5	480	81.3	2835
05	6-3	Boot	90	19.0	4420	1175	46.5	2216	-177	2204	11.3	502	75.4	3455
06	6-11	Heads emerged	115	22.4	5346	926	35.5	2128	-88	3218	8.8	473	67.7	3861
07	6-17	Head Inter Elo.	127	24.3	6243	897	33.7	2309	181	3934	8.2	515	66.2	4243
08	6-24	Head Inter Elo.	133	31.3	6505	262	25.3	1772	-537	4733	6.6	434	62.1	4170
09	7-2	Flower	137	36.8	6544	39	27.4	1823	51	4721	6.4	422	59.4	3953
10	7-8	Seed	136	44.1	7503	959	22.6	1721	-102	5782	5.5	419	59.1	4462
11	7-16	Seed	132	43.4	8393	890	25.4	2285	564	6108	5.5	473	59.1	5073
12	7-22	Seed	135	47.3	7229	-1164	24.4	1943	-342	5286	4.9	363	56.5	4301
CANADIAN														
01	5-6	Veg.	20	24.3	491	--	--	--	--	--	25.4	135	75.0	404
02	5-13	Veg.	26	19.9	781	290	--	--	--	--	26.2	205	77.5	689
03	5-21	Veg.	37	20.0	1567	786	82.3	1474	--	93	20.0	314	78.9	1367
04	5-27	Jointing	46	23.1	1967	400	76.1	1456	-18	511	17.3	334	80.8	1707
05	6-3	Boot	66	19.4	2942	975	57.1	1901	445	1041	14.3	420	76.7	2444
06	6-11	Heads emerged	91	20.6	4874	1932	36.5	1684	-217	3190	9.9	506	70.0	3004
07	6-17	Head Inter Elon.	108	23.3	5278	404	34.9	2056	372	3222	9.3	494	68.1	3871
08	6-24	Head Inter Elon.	118	30.1	5100	-178	26.4	1463	-593	3637	8.3	418	64.0	3399
09	7-2	Flower	119	36.9	5765	665	27.5	1721	258	4044	7.1	425	60.9	3644
10	7-8	Seed	119	42.7	6739	974	23.6	1741	20	4998	6.3	434	59.2	4057
11	7-16	Seed	121	41.8	6949	210	26.3	2595	854	4354	6.2	434	57.9	4104
12	7-22	Seed	118	44.2	6002	-947	23.1	1485	-1110	4517	6.3	388	56.8	3460

* 4 reps only

** 5 reps only

TEST 162 - HAY GROWTH CURVES - 1963

Aftermath Yields (Lbs/Acre)

First Cut			Aftermath Harvest Dates										Afterm.	Total
Cut No.	Date	Yield	7-2	7-8	7-15	7-30	8-6	8-19	8-26	9-4	9-9	10-7]	Total	Yield
VERNAL														
01	5-6	69	4058					2640				933	7631	7700
02	5-13	409	2799					2277				558	5634	6043
03	5-21	1087		2492				2002				480	4974	6061
04	5-27	1665		2539					1963			197	4699	6364
05	6-3	2320			1956				1798			227	3981	6301
06	6-11	3337				2266					1071		3337	6674
07	6-17	3627				2250					1042		3292	6919
08	6-24	4753				1997						877	2874	7627
09	7-2	4951					2005					826	2831	7782
10	7-8	5288					1922					837	2759	8047
11	7-16	6136								2409		163	2572	8708
12	7-22	5435								2038		149	2187	7622
DUPUITS														
01	5-6	158	3518					2742				1001	7261	7419
02	5-13	589	2355					2341				901	5597	6186
03	5-21	1257		2476				2240				982	5698	6955
04	5-27	1812		2549					2280			801	5630	7442
05	6-3	2339			2271				2186			760	5217	7556
06	6-11	3236				2567					1428		3995	7231
07	6-17	3638				2258					1335		3593	7231
08	6-24	4248				2222						1195	3417	7665
09	7-2	4406					2359					1198	3557	7963
10	7-8	5311					2151					1252	3403	8714
11	7-16	5575								2387		752	3139	8714
12	7-22	5163								2015		579	2594	7757

TEST 162 - HAY GROWTH CURVES - 1963

Aftermath Yields (Lbs./Acre)

Cut No.	Date	Yield	Aftermath Harvest Dates											Afterm. Total	Total Yield
			6-24	7-2	7-15	7-30	8-6	8-12	8-19	8-26	9-4	9-9	10-2		
CLIMAX															
01	5-6	314	5669					696						6365	6679
02	5-13	793		4814					578					5392	6185
03	5-21	1743		2903					428					3331	5074
04	5-27	2565		2030					547					2577	5142
05	6-3	3438			929					297				1226	4664
06	6-11	4634				593						157		750	5384
07	6-17	5804					487					200		687	6491
08	6-24	6252						751					118	869	7121
09	7-2	6876						822					154	976	7852
10	7-8	7533							806				82	888	8421
11	7-16	7284									628		74	702	7986
12	7-22	6681									944		76	1020	6681
ESSEX															
01	5-6	353	4987					675						5662	6015
02	5-13	661		4591					396					4987	5648
03	5-21	1475		3366					391					3757	5232
04	5-27	2151		2855					398					3253	5404
05	6-3	2853			1930					245				2175	5028
06	6-11	3853				639						105		744	4597
07	6-17	4441					406					93		499	4940
08	6-24	5402						867					86	953	6355
09	7-2	5692						493					86	579	6271
10	7-8	6743							530				140	670	7413
11	7-16	7327									885		167	1052	8379
12	7-22	6588									784		91	875	7463

TEST 162 - HAY GROWTH CURVES - 1963

Aftermath Yields (Lbs/Acre)

			Aftermath Harvest Dates												Afterm.	Total
Cut	Date	Yield	6-11	6-24	7-8	7-15	7-22	7-30	8-6	8-12	8-19	8-26	9-4	9-9	10-7	Total	Yield
FRODE																	
01	5-6	281	2545				636						546			3727	4008
02	5-13	864		2307						920					146	3373	4237
03	5-21	1441		1176							839				200	2215	3656
04	5-27	2137			1232						579				103	1914	4051
05	6-3	2904				1086					558				112	1756	4660
06	6-11	3829					725				569				117	1411	5240
07	6-17	4041						929					354		121	1404	5445
08	6-24	4411							962					316		1278	5689
09	7-2	4546								1148					149	1297	5843
10	7-8	5164								979					154	1133	6297
11	7-16	5321										895			143	1038	6359
12	7-22	4700										1002			139	1141	5841
OTTAWA 100																	
01	5-6	120	3005				757						592			4354	4474
02	5-13	381		4279						1316					225	5820	6201
03	5-21	957		2599							1368				119	4086	5043
04	5-27	1679			3398						954				165	4517	6196
05	6-3	2608				1670					884				125	2679	5287
06	6-11	4137					863				797				167	1827	5964
07	6-17	4947						974					374		118	1466	6413
08	6-24	5415							922					314		1236	6651
09	7-2	5903								1203					278	1481	7384
10	7-8	6563								1125					251	1376	7939
11	7-16	6657										1276			206	1482	8139
12	7-22	6068										1240			216	1456	7524

TEST 172 - HAY GROWTH CURVES - 1963

Aftermath Yields (Lbs./Acre)

First Cut			Aftermath Harvest Dates										Afterm.	Total
Cut No.	Date	Yield	6-11	6-17	6-24	7-15	7-30	8-6	8-12	8-19	8-26	9-4	10-2	Total	Yield
SARATOGA															
01	5-6	650	3257						1356					4613	5263
02	5-13	1567		2298						894				3192	4759
03	5-21	2735			926					805				1751	4486
04	5-27	3245				1422					352			1774	5019
05	6-3	4420					1361						212	1573	5993
06	6-11	5346						1068					172	1240	6586
07	6-17	6243						943					211	1154	7397
08	6-24	6505							1115				197	1312	7817
09	7-2	6544							1167				203	1370	6544
10	7-8	7503								1013			220	1233	8736
11	7-16	8393										1164		1164	9557
12	7-22	7229										813		813	8042
CANADIAN															
01	5-6	491	3064						731					3795	4286
02	5-13	781		2464						784				3248	4029
03	5-21	1567			1573					605				2178	3745
04	5-27	1967				2063					173			2236	4203
05	6-3	2942					1080						94	1174	4116
06	6-11	4874						748					109	857	5731
07	6-17	5278						551					144	695	5973
08	6-24	5100							700				124	824	5924
09	7-2	5765							875				128	1003	6768
10	7-8	6739								686			149	835	7574
11	7-16	6949										568		568	7517
12	7-22	6002										503		503	6505

TEST 162 - HAY GROWTH CURVES - 1963

Heights and Stages - Alfalfa

First Growth					Aftermaths																		
Cut	Date	Yield	Hgt.	Stage	5-13	5-21	5-27	6-3	6-11	6-17	6-24	7-2	7-8	7-15	7-22	7-30	8-6	8-12	8-19	8-26	9-4	9-9	10-7
VERNAL																							
01	5-6	69	10	Veg.	8 A	14 A	17 A	31 A	51 B	62 D	69 D	81 G	6 A	14 A	24 B	41 C	45 C	49 C	51 D	7 A	14 A		20 A
02	5-13	409	16	Veg.		9 A	11 A	19 A	35 A	47 C	53 C	70 E	4 A	11 A	23 B	34 B	42 C	45 C	49 D	6 A	15 A		18 A
03	5-21	1087	23	Veg.			0	9 A	22 A	30 A	37 B	55 C	58 D	5 A	15 A	31 B	38 B	44 C	45 D	6 A	14 A		18 A
04	5-27	1665	28	Veg.				5 A	18 A	28 A	36 A	51 C	56 D	6 A	16 A	28 B	36 B	40 C	35 C	36 C	7 A		14 A
05	6-3	2320	45	E.Bud					7 A	13 A	19 A	35 B	41 C	44 D	6 A	20 A	32 A	35 B	40 C	41 C	7 A		12 A
06	6-11	3337	66	Bud Emer.						0	8 A	22 A	31 A	34 B	40 C	45 E	8 A	16 A	20 A	25 A	29 A	31 B	7 A
07	6-17	3627	71	Late Bud							0	20 A	27 A	32 A	39 C	46 D	8 A	15 A	19 A	22 A	27 A	29 A	8 A
08	6-24	4753	77	Late Bud								11 A	18 A	23 A	32 C	43 D	8 A	15 A	19 A	23 A	26 A		29 B
09	7-2	4951	84	L.Flower									7 A	15 A	28 B	39 D	45 D	9 A	11 A	17 A	22 A		25 A
10	7-8	5288	93	Early Seed										8 A	19 A	35 C	45 C	9 A	12 A	17 A	21 A		26 A
11	7-16	6136	96	Early Seed											9 A	28 B	38 B	46 C	49 C	42 D	45 D		11 A
12	7-22	5435	96	Early Seed												15 A	30 B	38 B	41 C	46 C	48 D		11 A
DUPUITS																							
01	5-6	158	12	Veg.	9 A	16 A	18 A	31 A	52 B	65 C	75 D	82 G	8 A	18 A	30 C	42 D	51 E	53 E	57 E	7 A	19 A		28 A
02	5-13	589	19	Veg.		6 A	9 A	16 A	36 A	44 B	55 C	67 E	6 A	15 A	29 B	39 D	43 D	47 D	49 E	7 A	17 A		26 A
03	5-21	1257	28	Veg.			0	10 A	25 A	34 B	45 B	58 D	65 E	6 A	20 A	38 C	45 C	49 C	53 D	9 A	19 A		27 A
04	5-27	1812	32	Veg.				0	23 A	34 A	42 B	60 D	65 D	7 A	19 A	39 C	45 C	50 C	53 D	55 D	10 A		25 A
05	6-3	2339	46	Early Bud					8 A	19 A	31 A	51 B	56 C	61 D	8 A	28 B	40 B	45 C	48 C	51 D	10 A		24 A
06	6-11	3236	67	Bud Emerg.						0	11 A	33 A	40 C	46 C	50 D	53 E	10 A	19 A	29 A	34 B	38 B	40 C	12 A
07	6-17	3638	77	Late Bud							7 A	28 A	34 B	40 C	44 D	47 E	9 A	18 A	26 A	31 B	37 B	37 C	11 A
08	6-24	4248	85	Late Bud								17 A	26 A	36 C	43 D	51 F	10 A	18 A	26 A	31 B	35 B		40 A
09	7-2	4406	92	Late Flower									11 A	24 B	36 C	46 E	53 E	9 A	15 A	24 A	33 B		36 A
10	7-8	5311	96	Early Seed										12 A	27 B	45 D	52 E	9 A	14 A	23 A	31 A		37 A
11	7-16	5575	99	Early Seed											12 A	33 C	45 D	53 D	56 D	57 E	59 E		18 A
12	7-22	5163	102	Early Seed												18 A	35 C	43 C	47 C	49 D	53 D		19 A

TEST 162 - HAY GROWTH CURVES - 1963

Heights and Stages - Timothy

Cut	First Growth Date	Yield	Hgt.	Stage	Aftermaths 5-13	5-21	5-27	6-3	6-11	6-17	6-24	7-2	7-8	7-15	7-22	7-30	8-6	8-12	8-19	8-26	9-4	9-9	9-30
CLIMAX																							
01	5-6	314	19	Veg.	15 A	25 A	32 A	48 B	80 C	90 C	99 D	0	6 A	12 A	21 A	26 A	29 A	29 A	15 A	18 A	20 A		9 A
02	5-13	793	26	Veg.		17 A	24 A	41 B	64 C	77 C	86 D	107E	0	0	14 A	20 A	24 A	27 A	30 A	13 A	19 A		9 A
03	5-21	1743	39	Veg.			10 A	30 B	46 B	61 C	74 D	88 E	0	0	12 A	22 A	26 A	27 A	29 A	13 A	18 A		9 A
04	5-27	2565	46	Jointing				24 B	46 B	57 C	67 D	86 E	0	0	15 A	25 A	27 A	30 A	30 A	14 A	17 A		9 A
05	6-3	3438	64	Jointing					5 A	15 A	25 A	33 B	37 C	42 D	15 A	18 A	21 A	21 A	23 A	25 A	12 A		10 A
06	6-11	4634	88	Boot						0	5 A	19 A	23 A	23 A	30 B	43 C	17 A	20 A	20 A	21 A	21 A	23 A	7 A
07	6-17	5804	101	Boot							0	12 A	18 A	19 A	24 A	31 B	32 B	16 A	21 A	23 A	23 A	24 A	7 A
08	6-24	6252	109	Heads Emer.								0	6 A	14 A	22 A	29 A	31 A	34 A	15 A	19 A	21 A		9 A
09	7-2	6876	117	Heads Emer.									0	0	15 A	26 A	32 A	35 A	17 A	22 A	25 A		11 A
10	7-8	7533	117	Flower										0	6 A	19 A	30 A	32 A	39 A	12 A	19 A		9 A
11	7-16	7284	112	Seed											0	12 A	25 A	28 A	32 A	33 A	36 A		9 A
12	7-22	6681	114	Seed												9 A	23 A	27 A	32 A	34 A	35 A		7 A
ESSEX																							
01	5-6	353	19	Veg.	14 A	22 A	29 A	42 B	62 B	71 C	84 C	0	7 A	15 A	23 A	27 A	32 A	32 A	14 A	17 A	22 A		9 A
02	5-13	661	23	Veg.		16 A	20 A	36 B	53 B	65 C	76 C	92 D	0	0	11 A	19 A	26 A	27 A	28 A	13 A	16 A		8 A
03	5-21	1475	33	Veg.			11 A	30 B	46 B	55 C	63 C	77 D	0	0	14 A	22 A	26 A	26 A	28 A	13 A	16 A		9 A
04	5-27	2151	38	Veg.				20 B	37 B	48 B	57 C	71 D	0	0	13 A	21 A	25 A	26 A	27 A	14 A	17 A		8 A
05	6-3	2853	56	Jointing					22 B	32 B	43 C	55 C	60 D	71 D	10 A	17 A	21 A	22 A	23 A	25 A	13 A		7 A
06	6-11	3853	72	Jointing						0	7 A	19 A	22 A	25 A	28 A	40 C	16 A	19 A	20 A	23 A	23 A	23 A	7 A
07	6-17	4441	90	Boot							0	13 A	19 A	21 A	25 A	30 A	30 A	16 A	19 A	19 A	21 A	23 A	7 A
08	6-24	5402	98	Boot								0	8 A	18 A	26 A	29 A	31 A	34 A	14 A	18 A	22 A		9 A
09	7-2	5692	101	Head Emer.									0	0	13 A	23 A	28 A	30 A	14 A	18 A	20 A		9 A
10	7-8	6743	105	Head Emer.										0	5 A	23 A	27 A	30 A	32 A	16 A	20 A		12 A
11	7-16	7327	104	Flower											0	14 A	23 A	29 A	31 A	35 A	39 A		10 A
12	7-22	6588	105	Flower												9 A	20 A	27 A	29 A	35 A	35 A		8 A

TEST 162 - HAY GROWTH CURVES - 1963

Heights and Stages - Orchardgrass

	First Growth				Aftermaths																	
Cut	Date	Yield	Hgt	Stage	5-13	5-21	5-27	6-3	6-11	6-17	6-24	7-2	7-8	7-15	7-22	7-30	8-6	8-12	8-19	8-26	9-4	9-9	10-7
FRODE																							
01	5-6	281	21	Veg	15 A	28 A	32 A	48 B	77 D	16 A	25 A	33 A	35 A	39 A	41 A	19 A	28 A	30 A	31 A	32 A	32 A		16 A
02	5-13	864	26	Veg		17 A	21 A	33 B	58 D	86 F	95 F	16 A	20 A	26 A	31 A	36 A	37 A	40 A	16 A	20 A	24 A		22 A
03	5-21	1441	38	Veg			0	25 A	38 A	42 A	47 A	15 A	21 A	25 A	28 A	32 A	34 A	37 A	38 A	15 A	21 A		22 A
04	5-27	2137	46	Jointing				20 A	33 A	40 A	44 A	47 A	48 A	12 A	22 A	22 A	31 A	33 A	34 A	15 A	19 A		20 A
05	6-3	2904	65	Boot					22 A	34 A	38 A	44 A	46 A	46 A	15 A	26 A	30 A	31 A	33 A	13 A	19 A		21 A
06	6-11	3829	89	Head Emerged						38 A	26 A	34 A	37 A	42 A	44 A	21 A	30 A	33 A	35 A	15 A	20 A		21 A
07	6-17	4041	105	Head Inter Elong							16 A	30 A	34 A	36 A	40 A	44 A	18 A	24 A	28 A	30 A	32 A		15 A
08	6-24	4411	116	Flower								17 A	24 A	29 A	35 A	42 A	45 A	17 A	24 A	26 A	29 A	33 A	13 A
09	7-2	4546	121	Seed									14 A	21 A	29 A	37 A	40 A	43 A	16 A	20 A	25 A		26 A
10	7-8	5164	122	Seed										13 A	27 A	39 A	41 A	42 A	16 A	23 A	26 A		29 A
11	7-16	5321	123	Seed											16 A	29 A	33 A	36 A	40 A	44 A	15 A		21 A
12	7-22	4700	121	Seed												25 A	34 A	40 A	42 A	46 A	16 A		23 A
OTTAWA 100																							
01	5-6	120	17	Veg	15 A	25 A	31 A	49 B	71 D	17 A	26 A	34 A	37 A	40 A	46 A	25 A	33 A	36 A	38 A	41 A	44 A		18 A
02	5-13	381	23	Veg		17 A	23 A	40 B	63 C	81 D	100 F	17 A	21 A	23 A	30 A	41 A	45 A	47 A	18 A	24 A	27 A		30 A
03	5-21	957	36	Veg			10 A	30 A	51 C	68 D	84 E	21 A	23 A	29 A	34 A	38 A	45 A	47 A	50 A	15 A	25 A		29 A
04	5-27	1679	42	Jointing				23 A	50 C	66 D	83 E	100 F	114 F	14 A	26 A	36 A	39 A	41 A	44 A	17 A	27 A		27 A
05	6-3	2608	63	Jointing					23 A	34 A	40 A	48 A	54 A	59 A	17 A	34 A	37 A	38 A	40 A	16 A	23 A		28 A
06	6-11	4137	87	Head Emerged						16 A	27 A	33 A	37 A	39 A	46 A	25 A	34 A	38 A	41 A	16 A	23 A		25 A
07	6-17	4947	98	Head Emerged							16 A	25 A	30 A	36 A	42 A	46 A	19 A	27 A	30 A	33 A	37 A		19 A
08	6-24	5415	113	Flower								15 A	20 A	23 A	31 A	39 A	42 A	20 A	26 A	30 A	34 A	36 A	16 A
09	7-2	5903	120	Flower									8 A	16 A	27 A	35 A	44 A	46 A	19 A	26 A	31 A		33 A
10	7-8	6563	120	Seed										10 A	24 A	37 A	40 A	42 A	18 A	24 A	29 A		29 A
11	7-16	6657	120	Seed											16 A	28 A	37 A	43 A	46 A	50 A	19 A		27 A
12	7-22	6068	122	Seed												24 A	35 A	39 A	43 A	46 A	18 A		27 A

TEST 162 - HAY GROWTH CURVES - 1963

Heights and Stages - Bromegrass

	First Growth				Aftermaths																
Cut	Date	Yield.	Hgt.	Stage	5-13	5-21	5-27	6-3	6-11	6-17	6-24	7-2	7-8	7-15	7-22	7-30	8-6	8-12	8-19	8-26	9-4	9-30
SARATOGA																						
01	5-6	650	28	Veg	16 A	31 A	39 B	57 C	97 D	0	10 A	28 A	33 A	36 B	38 B	43 B	44 B	44 A	8 A	17 A	21 A	9 A
02	5-13	1567	38	Veg		17 A	26 B	46 C	79 D	95 E	0	20 A	25 A	28 A	35 A	39 B	39 B	40 B	40 B	15 A	17 A	8 A
03	5-21	2735	56	Jointing			0	0	27 A	36 A	40 B	19 A	28 A	33 B	37 B	38 B	40 B	42 B	42 B	15 A	20 A	9 A
04	5-27	3245	61	Jointing				0	21 A	31 A	39 A	48 B	51 B	54 B	6 A	21 A	28 A	30 A	31 A	32 A	13 A	9 A
05	6-3	4420	90	Boot					0	15 A	25 A	34 A	36 A	39 B	42 B	47 B	11 A	18 A	21 A	22 A	26 A	11 A
06	6-11	5346	115	Head Emerged						0	11 A	28 A	33 A	36 A	38 B	44 B	45 B	13 A	14 A	20 A	24 A	11 A
07	6-17	6243	127	Head Inter El.							0	21 A	27 A	31 A	34 B	43 B	44 B	13 A	16 A	21 A	23 A	12 A
08	6-24	6505	133	Head Inter El.								0	15 A	23 A	30 A	39 B	40 B	43 B	13 A	17 A	22 A	11 A
09	7-2	6544	137	Flower									0	12 A	27 A	40 A	42 B	45 B	13 A	19 A	22 A	13 A
10	7-8	7503	136	Seed										0	16 A	34 A	37 B	39 B	41 B	17 A	21 A	11 A
11	7-16	8393	132	Seed											5 A	28 A	35 A	39 A	41 B	42 B	46 B	9 A
12	7-22	7229	135	Seed												20 A	31 A	36 A	37 A	39 A	43 A	9 A
CANADIAN																						
01	5-6	491	20	Veg	14 A	18 A	29 B	45 C	82 D	0	7 A	19 A	23 A	25 A	27 A	28 B	32 B	33 B	13 A	15 A	16 A	7 A
02	5-13	781	26	Veg		17 A	21 A	34 C	51 D	80 E	0	19 A	23 A	24 A	26 A	30 B	33 B	33 B	34 B	15 A	17 A	9 A
03	5-21	1567	37	Veg			0	20 B	39 C	56 D	68 E	11 A	19 A	22 A	28 A	28 A	30 A	31 B	32 B	15 A	16 A	8 A
04	5-27	1967	46	Jointing				13 C	37 C	60 D	65 E	75 E	77 F	83 F	9 A	18 A	24 A	27 A	27 A	27 A	14 A	8 A
05	6-3	2942	66	Boot					0	18 A	24 A	30 A	34 A	37 A	39 A	40 B	12 A	18 A	19 A	20 A	21 A	10 A
06	6-11	4874	91	Head Emerged						0	9 A	18 A	26 A	27 A	29 A	33 B	34 B	15 A	17 A	18 A	20 A	9 A
07	6-17	5278	108	Head Inter El.							0	18 A	22 A	26 A	28 A	31 B	33 B	15 A	17 A	19 A	21 A	9 A
08	6-24	5100	118	Head Inter El.								0	14 A	19 A	26 A	30 A	32 A	33 B	13 A	19 A	19 A	8 A
09	7-2	5765	119	Flower									0	15 A	21 A	30 A	32 A	34 B	13 A	17 A	18 A	9 A
10	7-8	6739	119	Seed										0	14 A	26 A	30 A	31 A	33 A	16 A	18 A	9 A
11	7-16	6949	121	Seed											0	21 A	28 A	30 A	31 A	32 A	34 A	8 A
12	7-22	6002	118	Seed												16 A	28 A	30 A	31 A	32 A	33 A	9 A

DRY MATTER YIELD OF HAY GROWTH CURVES
(Lbs. Per Acre)

Cut No.	1961	1962	1963	Mean
VERNAL				
1	86	279	69	145
2	984	519	409	637
3	1594	1748	1087	1476
4	2515	2307	1665	2162
5	3343	3442	2320	3065
6	4390	4171	3337	3966
7	4672	5486	3627	4595
8	5434	5615	4753	5267
9	5898	6558	4951	5802
10	6959	6806	5288	6351
11	6864	6356	6136	6452
12	6350	6471	5435	6085
CLIMAX				
1	292	599	314	402
2	759	1175	793	909
3	1596	2385	1743	1908
4	2301	3072	2565	2646
5	3401	4283	3438	3707
6	4552	5025	4634	4737
7	4964	5589	5804	5452
8	5941	6631	6252	6275
9	6480	6890	6878	6749
10	7680	7250	7533	7488
11	7793	7440	7284	7506
12	8184	7752	6681	7539

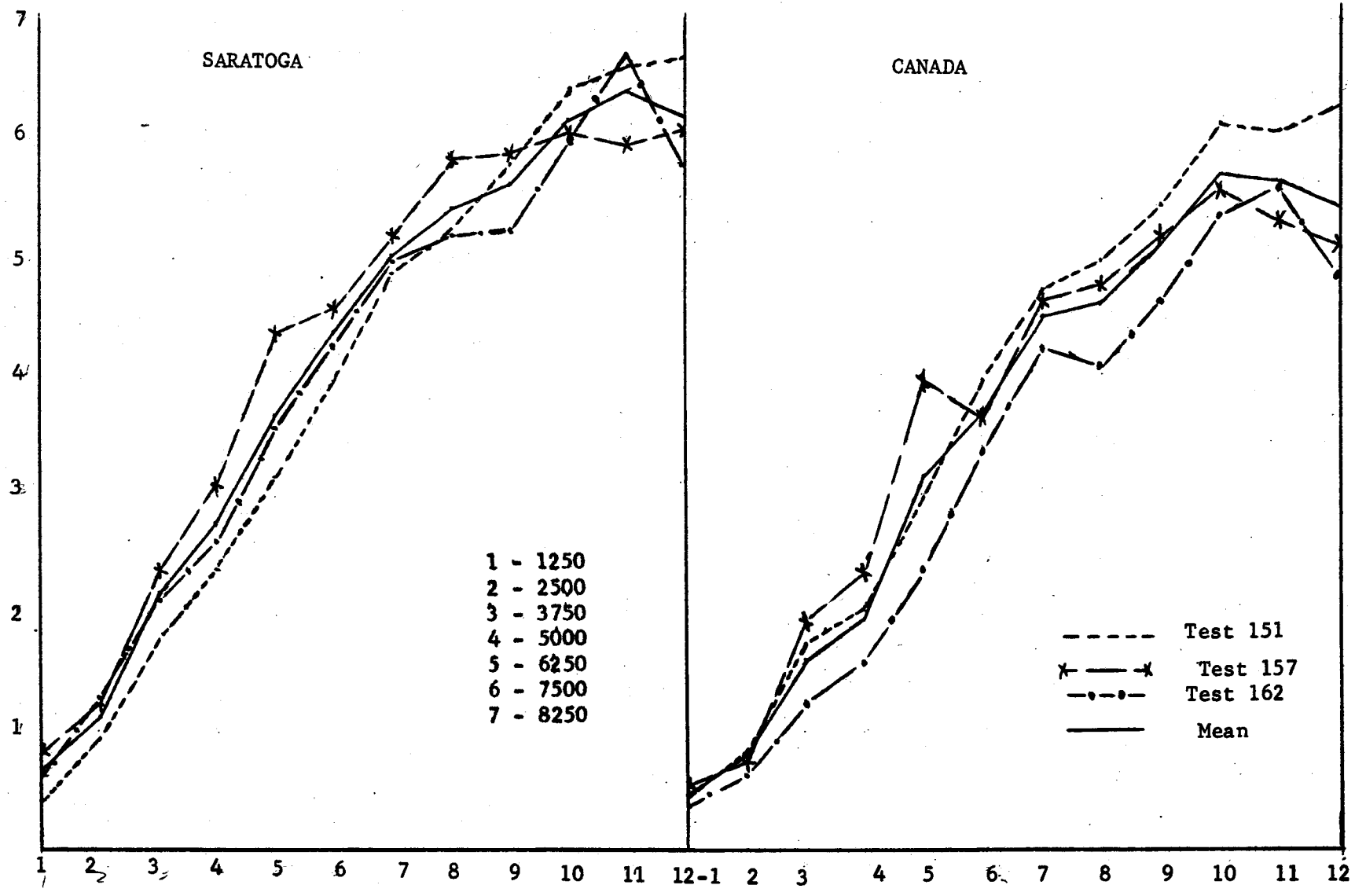
	1961	1962	1963	Mean
DUPUITS				
	291	817	158	422
	1141	1344	589	1025
	2115	2635	1257	2002
	2637	3270	1812	2573
	3603	3936	2339	3293
	4308	4555	3236	4033
	4983	5819	3638	4813
	5780	5592	4248	5207
	6240	6460	4406	5702
	7396	6803	5311	6503
	7758	7473	5575	6935
	7051	6531	5163	6248
ESSEX				
	445	485	353	428
	702	808	661	724
	1477	1929	1475	1627
	1864	2455	2151	2157
	3254	3523	2853	3210
	3762	4291	3853	3969
	4797	4813	4441	4684
	5684	5941	5402	5676
	6355	6734	5692	6260
	7892	6803	6743	7146
	8603	7411	7327	7780
	8696	7412	6588	7565

DRY MATTER YIELD OF HAY GROWTH CURVES

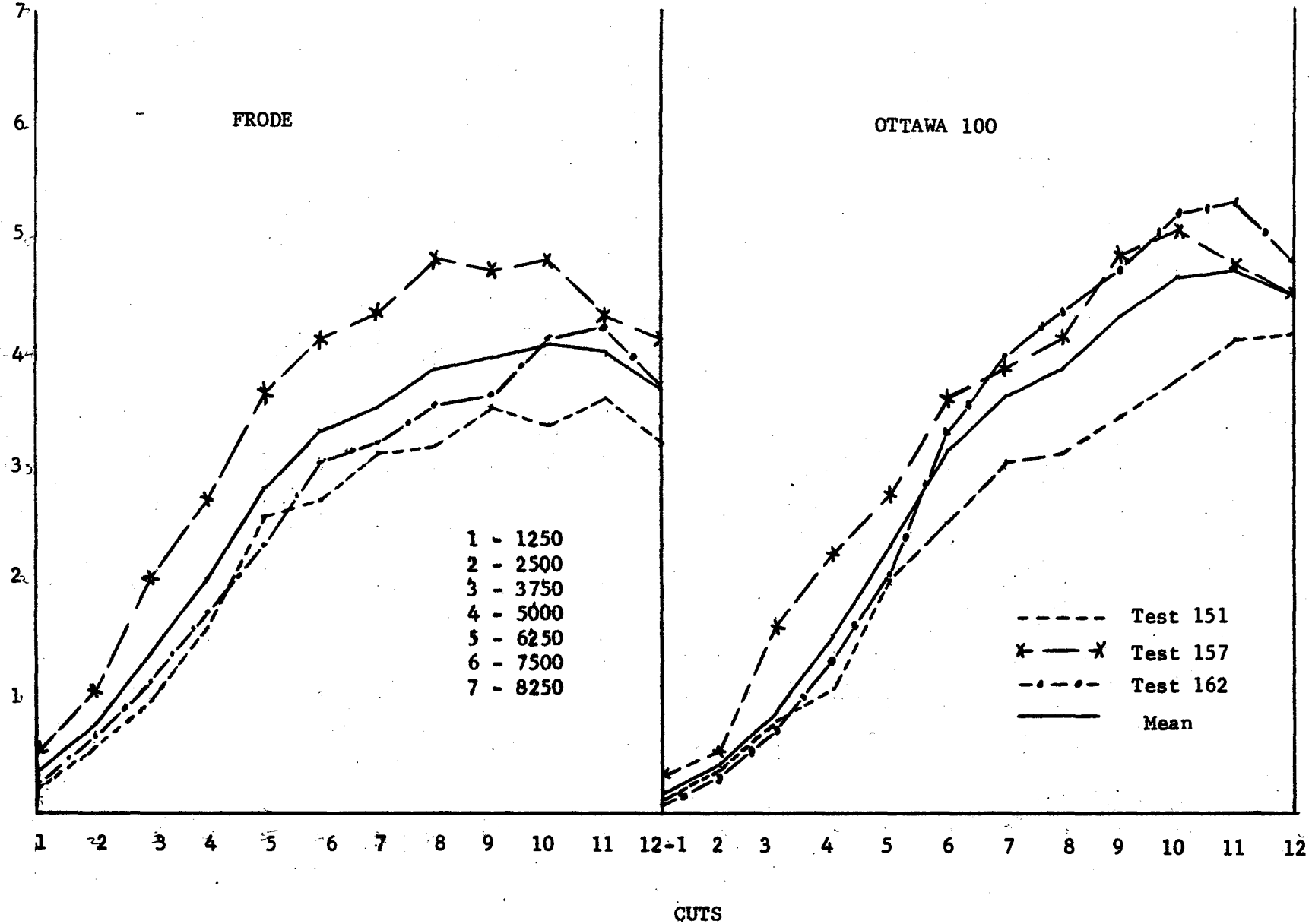
Cut No.	1961	1962	1963	Mean
FRODE				
1	266	675	281	407
2	737	1341	864	981
3	1230	2561	1441	1744
4	2066	3429	2137	2544
5	3218	4616	2904	3579
6	3431	5134	3829	4131
7	3902	5444	4041	4462
8	4056	6093	4411	4853
9	4483	5891	4546	4973
10	4220	6044	5164	5143
11	4581	5385	5321	5096
12	3998	5191	4700	4630
SARATOGA				
1	564	1081	650	765
2	1210	1523	1567	1433
3	2239	2957	2735	2644
4	2952	3872	3245	3356
5	3939	5433	4420	4597
6	4927	5661	5346	5311
7	5944	6404	6243	6197
8	6557	7266	6505	6776
9	7240	7330	6544	7038
10	8058	7525	7503	7695
11	8296	7456	8393	8048
12	8313	7563	7229	7702

	1961	1962	1963	Mean
OTTAWA				
1	191	384	120	232
2	469	654	381	501
3	1083	2042	957	1361
4	1365	2809	1679	1951
5	2593	3473	2608	2891
6	3133	4535	4137	3935
7	3819	4872	4937	4543
8	3885	5137	5415	4812
9	4288	6100	5903	5430
10	4733	6361	6563	5886
11	5171	5949	6657	5926
12	5176	5661	6068	5635
CANADA				
1	522	650	491	554
2	1032	911	781	908
3	2156	2437	1567	2053
4	2535	2894	1967	2465
5	3747	4997	2942	3895
6	4983	4568	4233	4595
7	5899	5779	5278	5652
8	6227	6006	5100	5778
9	6765	6471	5765	6334
10	7673	6974	6739	7129
11	7616	6699	6949	7088
12	7806	6348	6002	6719

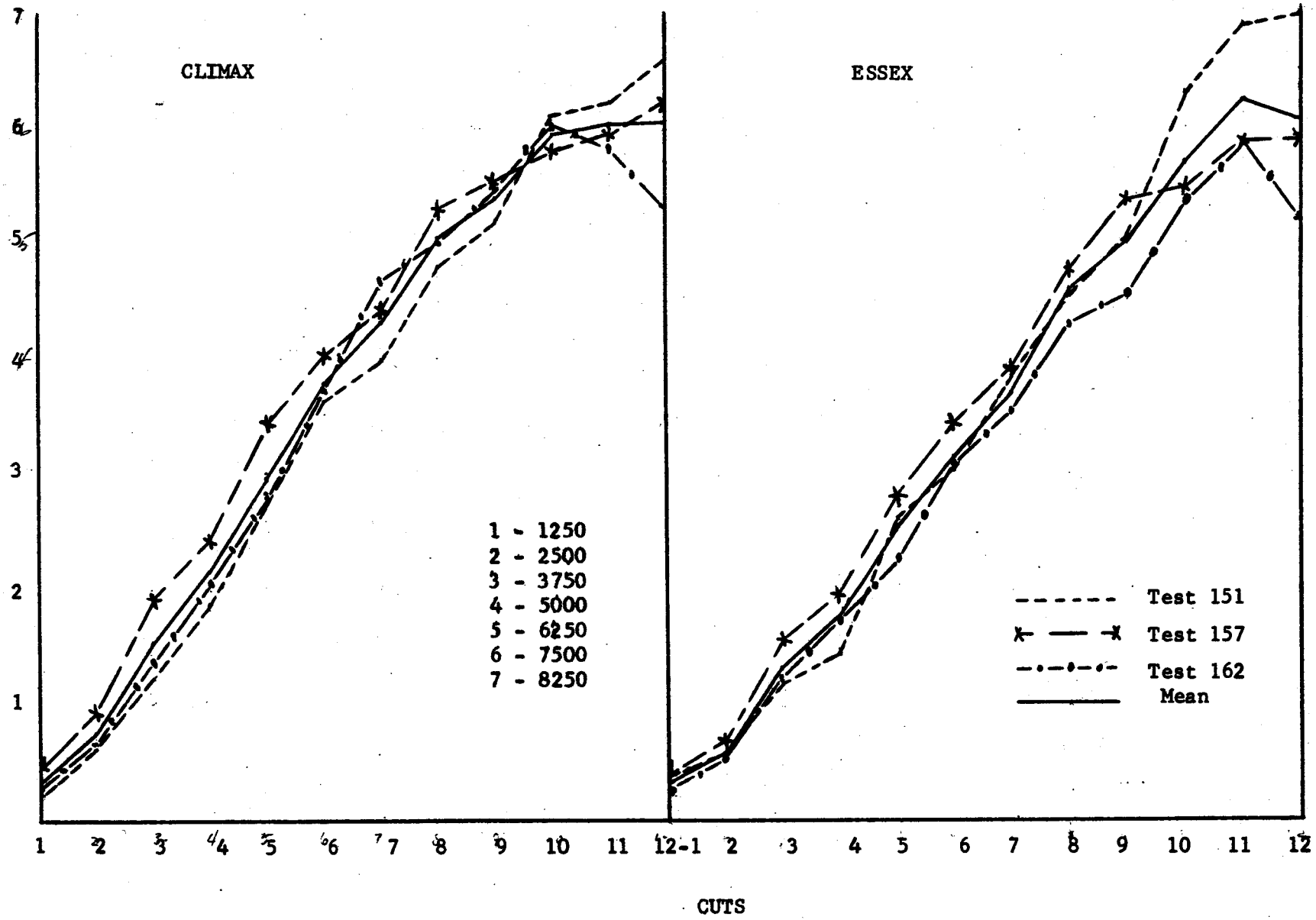
DRY MATTER YIELD



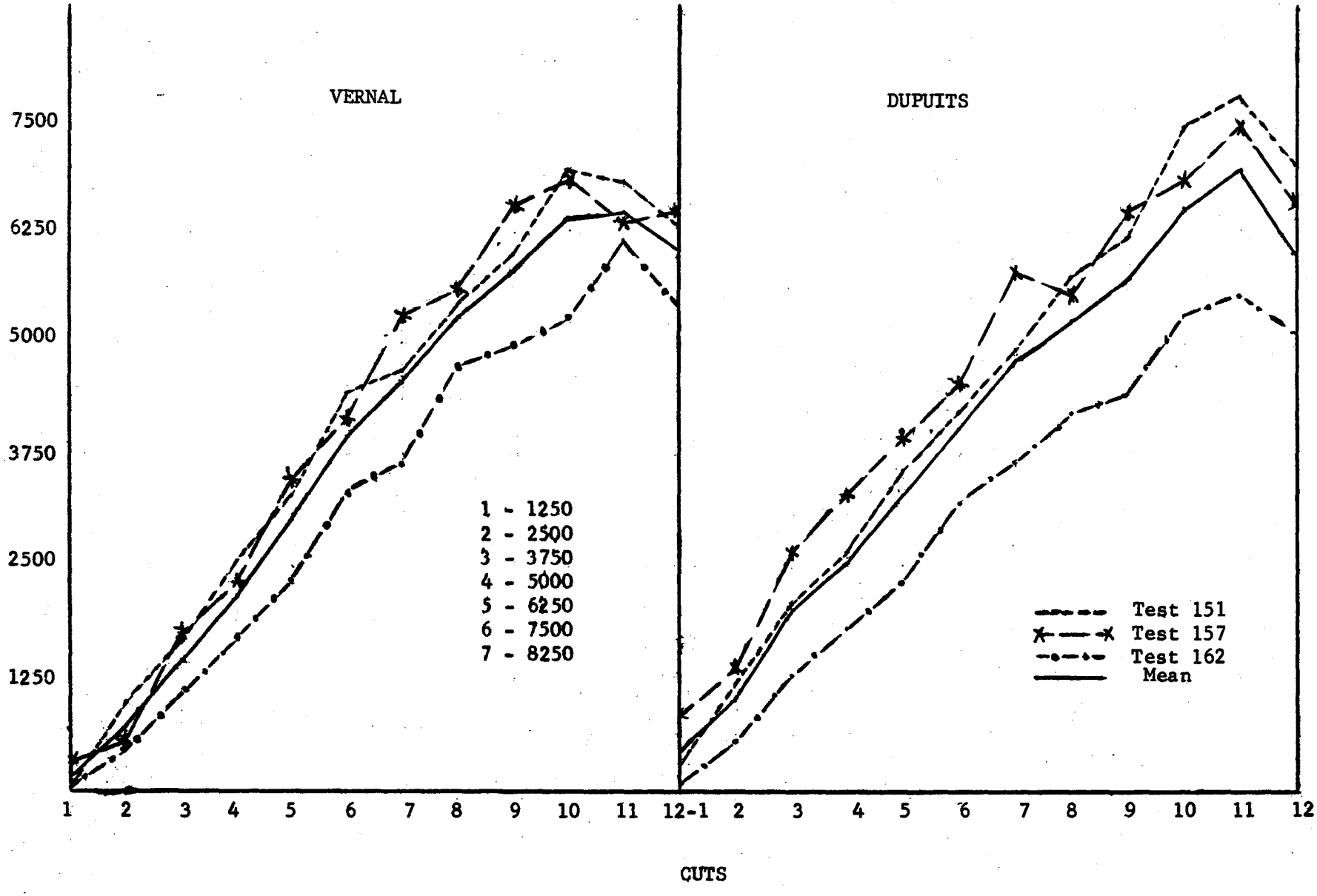
DRY MATTER YIELD



DRY MATTER YIELD



DRY MATTER YIELD



HAY GROWTH CURVE DRY MATTER YIELD (Lbs. Per Acre)

Species - Variety Stage Comparison

Stage	1961	1962	1963	Mean	1961	1962	1963	Mean
VERNAL					DUPUITS			
Vegetative	984	519	409	637	1141	1344	589	1025
Medium Bud	4390	3442	3337	3723	4308	2635	3236	3393
First Flower	5434	5486	4753	5224	5780	4555	4248	4861
Full Flower	5898	5615	4951	5488	6240	5819	4406	5488
Early Seed	6864	6806	5288	6319	7396	6460	5311	6389
CLIMAX					ESSEX			
Vegetative	759	1175	793	909	702	808	661	724
Boot	4964	4283	4634	4627	5684	4813	4441	4979
Heads Emerged	5941	5589	6252	5927	6355	5941	5692	5996
Flower	7680	6890	7533	7368	8603	6803	7327	7578
Early Seed	8184	7440	7284	7636	8696	7412	6588	7565
FRODE					OTTAWA			
Vegetative	737	1341	864	981	469	654	381	501
Boot	2066	2561	2904	2510	2593	2809	2608	2670
Heads Emerged	3218	3429	3829	3492	3133	3473	4137	3581
Flower	4056	5134	4411	4534	4288	4872	5415	4858
Early Seed	4581	6093	4546	5073	5171	6100	6563	5945
SARATOGA					CANADA			
Vegetative	1210	1523	1567	1433	1032	911	781	908
Boot	3939	2957	4420	4534	3747	2894	2942	3194
Heads Emerged	4927	5433	5346	5235	4983	4997	4233	4738
Flower	8058	7266	6544	7289	7673	6006	5765	6481
Early Seed	8296	7330	7503	7710	7616	6974	6739	7110

PER CENT LEAF OF HAY GROWTH CURVES

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
VERNAL					DUPUITS			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	70.3	55.3	75.2	69.9	65.1	48.3	66.0	59.8
4	60.9	56.3	64.3	60.5	57.1	48.5	60.8	55.5
5	47.4	49.8	54.1	50.4	44.2	43.4	54.1	47.2
6	43.1	46.8	46.8	45.6	39.8	41.1	45.7	42.2
7	43.0	45.4	42.7	43.7	41.3	41.7	43.0	42.0
8	41.5	44.0	41.3	42.3	43.1	41.1	37.9	40.7
9	39.0	38.0	40.7	39.2	39.4	33.2	37.3	36.6
10	40.1	36.7	37.5	38.1	37.7	34.3	35.6	35.9
11	32.0	33.2	32.8	32.7	34.8	32.7	31.0	32.8
12	31.4	31.4	31.3	31.4	32.9	24.5	30.7	29.4
CLIMAX					ESSEX			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	----	----	----	----	----	----	----
4	93.4	73.7	81.4	82.8	97.4	87.7	92.4	92.5
5	64.8	55.8	57.8	59.5	75.6	64.9	74.5	71.7
6	63.9	49.2	47.8	53.6	80.0	59.5	59.4	66.3
7	45.1	43.5	45.6	44.8	59.0	52.1	54.3	55.1
8	41.0	34.9	35.6	37.2	54.2	41.2	46.1	47.2
9	34.4	33.3	33.9	33.9	40.8	35.3	38.8	38.3
10	29.8	31.0	34.2	31.7	33.3	34.4	33.3	33.7
11	29.3	32.5	30.4	30.7	35.3	33.4	31.7	33.5
12	30.3	23.5	27.3	27.0	33.6	32.0	32.0	32.5

PER CENT LEAF OF HAY GROWTH CURVES

Cut No.	1961	1962	1963	Mean
FRODE				
1	----	----	----	----
2	----	----	----	----
3	----	59.6	----	----
4	91.6	53.4	85.6	76.9
5	62.6	43.7	69.7	58.7
6	54.6	40.4	59.6	51.5
7	52.1	41.8	65.9	53.1
8	39.1	30.4	71.0	46.8
9	52.0	34.7	55.3	47.3
10	49.6	39.4	64.8	51.3
11	47.8	38.2	61.6	49.2
12	61.8	39.7	65.9	55.8
SARATOGA				
1	----	----	----	----
2	----	----	----	----
3	----	64.0	67.8	65.9*
4	72.0	52.3	64.3	62.9
5	47.6	38.1	46.5	44.1
6	38.2	34.4	35.5	36.0
7	31.3	30.3	33.7	31.8
8	25.9	25.0	25.3	25.4
9	27.1	25.2	27.4	26.5
10	24.0	24.6	22.6	23.7
11	24.3	23.5	25.4	24.4
12	23.3	22.7	24.4	23.5

1961	1962	1963	Mean
OTTAWA			
----	----	----	----
----	----	----	----
----	93.7	----	----
95.5	73.2	91.2	86.6
80.7	60.2	74.9	71.9
72.7	51.6	50.6	58.3
59.2	50.0	41.9	50.4
51.6	41.6	36.9	43.3
54.9	46.3	31.2	44.1
49.6	44.5	29.8	41.3
50.0	46.1	28.9	41.7
48.6	56.8	32.5	45.9
CANADA			
----	----	----	----
----	----	----	----
----	71.1	82.3	76.7*
84.5	60.7	76.1	73.8
50.8	42.8	57.1	50.2
39.2	34.2	36.5	36.6
31.2	27.4	34.9	31.2
26.7	22.2	26.4	25.1
30.5	20.9	27.5	26.3
23.1	18.6	23.6	21.8
22.9	19.6	26.3	22.9
26.1	19.6	23.1	22.9

LEAF YIELD OF HAY GROWTH CURVES
(Lbs. Per Acre)

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
VERNAL					DUPUITS			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	1102	965	813	960	1373	1267	749	1130
4	1470	1285	1015	1257	1507	1584	1079	1390
5	1584	1706	1167	1486	1592	1708	1149	1483
6	1889	1928	1553	1790	1712	1876	1445	1678
7	1994	2490	1453	1979	2230	2431	1452	2038
8	2246	2486	1824	2185	2495	2298	1530	2108
9	2302	2407	1991	2233	2452	2294	1581	2109
10	2787	2475	1986	2416	2786	2328	1850	2321
11	2210	2095	2009	2105	2694	2443	1793	2310
12	2008	2125	1693	1942	2318	1604	1690	1871
CLIMAX					ESSEX			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	-----	----	----
3	----	----	----	----		----	----	----
4	2149	2249	2088	2162	1728	2134	1998	1953
5	2198	2376	1987	2187	2462	2231	2135	2276
6	2663	2456	2233	2451	3007	2587	2324	2639
7	2250	2415	2626	2430	2811	2412	2438	2554
8	2421	2208	2251	2293	3069	2443	2501	2671
9	2220	2227	2339	2262	2594	2339	2220	2384
10	2275	2244	2560	2360	2652	2249	2250	2384
11	2274	2279	2225	2259	3029	2431	2291	2584
12	2457	1722	1836	2005	2932	2301	2121	2451

LEAF YIELD OF HAY GROWTH CURVES
(Lbs. Per Acre)

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
FRODE					OTTAWA			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	1761	----	----	----	----	----	----
4	1919	1815	1854	1863	1304	2044	1580	1643
5	2013	2015	2070	2033	2343	2074	1873	2097
6	1845	2056	2470	2124	2285	2344	2056	2228
7	1988	2259	2798	2348	2250	2433	2022	2235
8	1628	2003	3221	2284	1967	2095	1898	1987
9	2320	2006	2541	2289	2290	2675	1822	2262
10	2052	2284	3684	2673	2260	2622	1999	2304
11	2190	2020	3531	2580	2374	2684	2044	2367
12	2454	2044	3184	2561	2478	3182	2101	2574
SARATOGA					CANADA			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	1891	2298	2095	----	1719	1474	1596
4	2287	2007	2393	2229	2138	1758	1456	1784
5	1977	2064	2216	2086	1900	2138	1901	1980
6	1855	1947	2128	1977	1945	1564	1684	1731
7	1854	1945	2309	2036	1838	1568	2056	1821
8	1689	1819	1772	1760	1667	1330	1463	1487
9	1881	1833	1823	1846	1855	1356	1721	1644
10	1937	1834	1721	1831	1769	1347	1741	1619
11	2025	1685	2285	1998	1742	1355	1951	1683
12	1936	1679	1943	1853	1766	1256	1485	1502

STEM YIELD OF HAY GROWTH CURVES
(Lbs. Per Acre)

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
VERNAL								
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	492	783	261	512	742	1368	387	832
4	945	1022	579	849	1130	1686	692	1002
5	1759	1736	1102	1532	2011	2228	977	1739
6	2501	2243	1781	2175	2596	2679	1721	2332
7	2678	2996	1956	2543	2753	3388	2107	2749
8	3188	3129	2602	2973	3285	3294	2512	3030
9	2596	4151	2590	3445	3788	4166	2648	3534
10	4172	4331	3302	3936	4597	4846	3312	4251
11	4654	4261	4110	4341	5064	5030	4019	4704
12	4342	4346	3731	4139	4733	4927	3817	4492
CLIMAX					ESSEX			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	----	----	----	----	----	----	----
4	152	629	477	419	136	321	152	203
5	1969	1907	1451	1776	1285	1292	718	1098
6	2264	2364	2400	2343	1976	1704	1530	1737
7	2714	3174	3178	3022	1986	2401	2006	2131
8	3520	4423	4000	3981	2615	3498	2901	3005
9	4695	4663	4339	4565	4171	4395	3472	4013
10	5366	5335	4973	5225	5241	4554	4493	4762
11	5519	5161	5059	5246	5574	4980	4887	5147
12	5727	6030	4845	5534	5764	5111	4467	5114

STEM YIELD OF HAY GROWTH CURVES
(Lbs. Per Acre)

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
FRODE					OTTAWA			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	800	----	----	----	135	----	----
4	147	1614	358	706	61	765	169	332
5	1205	2601	910	1572	555	1399	630	861
6	1586	3078	1632	2099	848	2191	2006	1348
7	1914	3185	1475	2191	1569	2439	2770	2259
8	2428	4090	1351	2623	1918	3042	3217	2727
9	2163	3885	2103	2717	1998	3425	3922	3115
10	2168	3760	2007	2645	2473	3739	4713	3641
11	2391	3365	2234	2663	2797	3265	4900	3654
12	1544	3147	1656	2116	2738	2479	4453	3223
SARATOGA					CANADA			
1	----	----	----	----	----	----	----	----
2	----	----	----	----	----	----	----	----
3	----	1066	1065	1065	----	718	373	545
4	665	1865	1345	1292	397	1136	987	840
5	1424	3369	2784	1598	1354	2859	1482	1898
6	2363	3714	3872	3316	1817	3004	2885	2569
7	4090	4459	4478	4342	4061	4211	3785	4019
8	4868	5447	5193	5169	4560	4676	3957	4397
9	4599	5449	4791	4946	4910	5115	4319	4781
10	6121	5691	5935	5915	5904	5627	5549	5693
11	6271	5771	6822	6288	5874	5344	5402	5540
12	6377	5884	6044	6101	6036	5092	4841	5323

PER CENT DRY MATTER HAY GROWTH CURVES

Cut No.	151	157	162	Mean	151	157	162	Mean
VERNAL					DUPUITS			
1	39.0	21.8	19.9	26.9	32.4	15.9	18.7	22.3
2	17.1	19.6	18.0	18.2	14.2	16.0	16.8	15.7
3	17.1	20.4	17.9	18.5	16.3	17.3	16.1	16.6
4	17.4	20.2	20.8	19.5	16.7	19.6	20.3	18.9
5	18.2	21.7	18.1	19.3	18.3	21.1	18.4	19.3
6	18.2	21.3	19.8	19.8	18.7	21.5	19.6	19.9
7	20.5	21.3	20.4	20.7	20.8	22.4	20.4	21.2
8	21.9	22.5	25.2	23.2	21.7	22.1	24.8	22.9
9	23.8	26.0	27.4	25.7	24.4	27.2	29.2	26.9
10	26.7	27.2	30.7	28.2	27.1	28.9	29.9	28.6
11	25.4	28.2	32.0	28.5	28.1	28.6	35.1	30.6
12	27.2	30.4	31.8	29.8	28.4	29.2	31.5	29.7
CLIMAX					ESSEX			
1	37.9	19.9	24.3	27.4	38.4	20.9	26.4	28.6
2	21.1	20.5	21.1	20.9	22.8	22.1	22.9	22.6
3	21.9	20.2	19.7	20.6	23.2	22.2	21.9	22.4
4	22.5	19.9	21.8	21.4	24.6	21.6	25.1	23.8
5	20.9	21.7	18.7	20.4	22.8	22.3	20.0	21.7
6	20.2	21.3	18.7	20.1	19.9	20.9	19.1	20.0
7	21.2	24.9	20.4	22.2	20.6	22.1	20.1	20.9
8	24.6	28.0	25.3	26.0	22.5	25.1	24.4	24.0
9	29.0	36.4	32.6	32.7	24.6	31.1	31.8	29.2
10	34.6	37.7	42.2	38.2	30.9	34.3	38.6	34.6
11	36.5	41.8	39.8	39.4	32.7	38.5	37.3	36.2
12	39.7	41.7	42.9	41.4	36.6	38.8	40.3	38.6

PER CENT DRY MATTER HAY GROWTH CURVES

Cut No.	151	157	162	Mean	151	157	162	Mean
FRODE					OTTAWA			
1	37.8	16.2	21.5	25.2	48.7	18.0	21.4	29.4
2	19.3	17.7	19.0	18.7	20.9	17.5	18.1	18.8
3	20.8	18.1	18.3	19.1	20.0	18.6	17.6	18.7
4	22.1	19.5	21.7	21.1	22.1	19.1	20.3	20.5
5	22.1	23.2	19.9	21.7	21.2	21.7	16.9	19.9
6	22.9	23.3	21.2	22.5	20.7	21.2	18.2	20.0
7	25.7	27.8	22.9	25.5	23.1	24.2	19.7	22.3
8	28.4	30.8	27.3	28.8	26.1	27.1	25.6	26.3
9	32.1	35.8	31.4	33.1	29.2	33.0	33.3	31.8
10	35.5	38.8	37.8	37.4	32.4	34.3	41.0	35.9
11	35.3	41.8	37.4	38.2	33.4	36.7	39.6	36.6
12	35.1	41.7	35.8	37.5	31.0	33.7	38.9	34.5
SARATOGA					CANADA			
1	31.0	19.6	22.8	24.5	31.6	20.4	24.3	25.4
2	20.2	19.0	18.4	19.2	20.1	20.9	19.9	20.3
3	20.4	20.1	18.5	19.7	21.1	20.2	20.0	20.4
4	21.7	22.3	20.1	21.4	22.3	21.7	23.1	22.4
5	22.5	25.8	19.0	22.4	22.4	22.9	19.4	21.6
6	23.4	28.2	22.4	24.7	23.3	23.8	20.6	22.6
7	28.8	33.0	24.3	28.7	27.7	28.9	23.3	26.6
8	32.9	36.7	31.3	33.6	31.6	33.4	30.1	31.7
9	38.2	40.6	36.8	38.5	35.0	36.8	36.9	36.2
10	40.8	41.8	44.1	42.2	39.8	37.9	42.7	40.1
11	44.1	45.1	43.4	44.2	41.6	42.3	41.8	41.9
12	44.2	44.9	47.3	45.5	43.3	43.9	44.2	43.8

HEIGHTS IN CMS. HAY GROWTH CURVES

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
VERNAL					DUPUITS			
1	7	17	10	11.3	10	25	12	15.7
2	19	20	16	18.3	23	33	19	25.0
3	25	38	23	28.7	32	54	28	38.0
4	35	51	28	38.0	42	65	32	46.3
5	47	62	45	51.3	57	76	46	59.7
6	67	75	66	69.3	74	88	67	76.3
7	75	93	71	79.7	84	102	77	87.7
8	88	101	77	88.7	90	107	85	94.0
9	88	96	84	89.3	97	107	92	98.7
10	92	101	93	95.3	101	105	96	100.7
11	100	106	96	100.6	103	108	99	103.3
12	112	98	96	102.0	113	111	102	108.7
CLIMAX					ESSEX			
1	13	23	19	18.3	13	22	19	18.0
2	19	28	26	24.3	19	24	23	22.0
3	24	41	39	34.7	22	38	33	31.0
4	34	53	46	44.3	28	45	38	37.0
5	53	70	64	62.3	42	58	56	52.0
6	72	78	88	79.3	58	68	72	66.0
7	83	90	101	91.3	74	80	90	81.3
8	88	102	109	99.7	82	87	98	89.0
9	87	113	117	105.7	85	101	101	95.7
10	93	113	117	107.7	92	99	105	98.7
11	98	114	112	108.0	99	108	104	103.7
12	100	115	114	109.7	102	107	105	104.7

HEIGHTS IN CMS. HAY GROWTH CURVES

Cut No.	1961	1962	1963	Mean	1961	1962	1963	Mean
FRODE					OTTAWA			
1	12	27	21	20.0	9	21	17	15.7
2	22	34	26	27.3	16	25	23	21.3
3	[illegible]	52	38	37.7	21	42	36	33.0
4	36	64	46	48.7	25	53	42	40.0
5	55	89	65	69.7	41	70	63	58.0
6	70	107	89	88.7	55	89	87	77.0
7	77	116	105	99.3	69	108	98	91.7
8	82	116	116	104.7	73	109	113	98.3
9	82	118	121	107.0	80	119	120	106.3
10	84	119	122	108.3	84	115	120	106.3
11	86	122	123	110.3	90	114	120	108.0
12	93	121	121	111.7	105	121	122	116.0
SARATOGA					CANADA			
1	19	29	28	25.3	17	22	20	19.7
2	29	35	38	34.0	24	26	26	25.3
3	35	59	56	50.0	30	45	37	37.3
4	49	71	61	60.3	41	53	46	46.7
5	73	100	90	87.7	61	85	66	70.7
6	92	117	115	108.0	84	100	91	91.7
7	104	134	127	121.7	96	114	108	106.0
8	108	134	133	125.0	99	114	118	110.3
9	110	129	137	125.3	100	117	119	112.0
10	115	132	136	127.7	102	116	119	112.3
11	117	133	132	127.3	104	117	121	114.0
12	120	139	135	131.3	109	115	118	114.0

TEST 162-B GRASS SHOOT GROWTH ABOVE GROUND - 1963

The shoots of two varieties of timothy, orchardgrass and bromegrass were examined and measured at weekly intervals commencing on May 6. The purpose of this study was to more closely understand how and when these shoots grow and develop. The data presented in the tables which follow were obtained from ten shoots measured in each of three replications. Some points of interest are:

1. The study will not be repeated due to the considerable amount of time it requires.

2. Timothy - Climax grew faster than Essex. It produced a minimum of 5 leaves, but 1/3 of its shoots had 6 leaves. Essex had only 4 leaves with $\frac{1}{2}$ of its shoots producing 5. The lowest leaf turned brown on all timothy shoots by June 3, and $\frac{1}{4}$ of the second leaves turned brown.

The leaf blades and sheaths of the first 4 leaves grew throughout the sampling period, more than doubling their length. All sheath lengths were the same, blade lengths were longer on the middle leaves. The upper sheaths and blades grew their full lengths the week they appeared.

The growing point of both varieties showed above the surface of the soil the same week (May 27). The earlier maturing Climax, however, grew at a faster rate. Climax shoot weights were heavier throughout than Essex, had a higher leaf weight but a lower leaf percentage than Essex.

3. Orchardgrass - The Frode variety grew faster than Ottawa 100. Both varieties produced a minimum of 3 leaves per shoot with 3/4 of the shoots having 4 leaves, $\frac{1}{4}$ with 5. The lower leaf turned brown by heading time but only $\frac{1}{4}$ of the second leaves turned brown.

The leaf sheaths and blades of the lower 3 leaves grew throughout the period and tripled their lengths. The upper sheaths and blades grew their entire length during the week they appeared.

The growing point of both varieties showed above ground at the same time, Frode growing at a faster rate. Frode had the higher percentage of vegetative shoots. The shoot weights of the two varieties were similar.

4. Bromegrass - Saratoga bromegrass shoots were longer throughout than Canada. All shoots of this variety had 6 leaves, 2/3 had 7, 1/5 had 8 and a few 9 or 10. Canada brome shoots all developed 5 leaves, 4/5 had 6, 1/4 had the maximum number 7. By June 3, all lower leaves had turned brown. Later, 4/5 of leaves 2 and 1/3 of leaves 3 turned brown.

The lower two sheaths doubled their lengths, the next two increased by 50 per cent, but again as in the other species the upper sheaths and blades completed their growth the week they appeared. All sheaths were the same length except the short lower one. The blade lengths of the lower 4 leaves increased their lengths by 50 per cent all occurring before the end of May. The longest leaves were in the middle of the plant.

The growing point of both Saratoga and Canada appeared above the soil on May 21. Saratoga grew faster than Canada but both headed on the same date. Saratoga had 20 per cent sterile shoots, Canada, 3 per cent. The individual shoot weight of Saratoga was considerably heavier than Canada throughout. Its leaf weight was higher but leaf percentage the same.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Length	Leaf at Tip	Height Growing Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W.	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.
CLIMAX TIMOTHY																							
May 6	16	3.7	B**	5.1	3.1	3	-	7	3	-	8	4	-	10	5	-	12						
13	22	3.0	B	4.3	2.8	4	6	9	5	7	11	6	7	14	8	9	15						
21	31	3.6	B	4.7	3.1	4	6	10	6	7	13	10	7	17	13	8	21						
27	38	4.0	2	4.8	3.4	4	6	10	7	7	13	12	7	19	14	8	24						
June 3	55	4.3	13	5.5	4.2	7	7	13	10	8	17	12	8	21	15	8	26	15	9	32			
10	78	4.4	37	5.7	4.8	10	8	16	12	8	20	14	8	27	14	8	29	14	9	27	16	10	24
17	87	4.2	51	5.6	5.2	12	7	20	15	8	27	14	8	30	12	8	27	12	8	19	11	7	12
24	82	5.1	49	5.4	5.3	Brown			12	7	26	11	7	25	11	8	23	11	7	13	13	5	6

Per cent of Shoots Examined

May 6	100B	100	100	77	23		
13	100B	100	90	60	10		
21	100B	100	100	83	23		
27	50B	100	100	97	40		
June 3	100A	93Br***	27Br	100	93	27	
10	100A	73Br	13Br	100	100	67	17
17	100A	77Br	13Br	100	100	83	37
24	80H	100Br	33Br	100	100	97	37

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade lengths cms.
** B - Below soil surface; H - Headed
*** Br - Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Length	Leaf at Tip	Height Growing Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.
ESSEX TIMOTHY																							
May 6	15	2.8	B**	4.3	2.6	3	-	7	4	-	7	4	-	9	5	-	10						
13	18	2.9	B	4.1	2.5	3	6	9	4	6	9	5	7	11	6	7	13						
21	27	3.1	B	3.9	2.5	5	5	10	8	6	14	9	6	17									
27	35	3.7	1	4.4	3.1	4	6	10	7	7	14	11	7	19	11	7	19						
June 3	43	3.8	6	4.8	3.6	5	7	11	8	7	15	12	7	20	13	7	26	11	7	21			
10	60	3.9	22	5.1	3.9	9	7	15	12	7	20	13	8	24	16	9	26	13	8	26	14	9	12
17	77	3.7	36	4.9	4.1	12	6	22	14	7	28	13	8	30	14	9	29	11	8	20			
24	67	4.0	36	5.1	4.4	Brown			11	6	22	13	7	23	11	7	21	12	7	17	12	6	8
Per cent of Shoots Examined																							
May 6			100B			100			90			57			17								
13			100B			100			83			43			20								
21			100B			100			100			50											
27			50B			100			100			93			17								
June 3			13B			67Br***			7Br			97			57			7					
10			100A			87Br			17Br			97			80			17					
17			100A			60Br			10Br			100			70			33			7		
24			100A			100Br			23Br			100			87			57			13		

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade lengths cms.
** B - Below soil surface; H - headed
*** Br - Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Length	Leaf at Tip	Height Growing Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W.	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.
FRODE ORCHARDGRASS																							
May 6	19	2.8	B**	3.8	2.2	3	-	9	5	-	11	6	-	12									
13	24	2.5	B	3.9	2.1	4	7	10	7	9	14	8	8	16									
21	37	2.8	5	4.3	2.4	6	8	12	11	8	18	12	8	20									
27	38	3.0	8	3.7	2.5	6	8	12	12	8	18	14	9	22									
June 3	58	3.7	19	4.5	4.1	7	8	13	13	9	18	16	9	23	14	8	23	14	7	21	14	7	14
10	70	3.9	22	4.4	3.9	8	9	14	14	8	22	15	8	29	14	7	25	15	7	18			
17	86	3.9	35	4.7	4.1	9	9	15	17	8	28	17	8	35	13	8	26	14	7	20	16	6	15
Per cent of Shoots Examined																							
May 6			100B**			100			93			27											
13			100B			100			87			20											
21			50B			100			97			40											
27			47B			100			97			50											
June 3			30B;30H			70Br***			100			83			70			43			10		
10			37B;40H			93Br			20Br			83			53			37					
17			33B;43H			93Br			30Br			90			63			43			10		

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade length cms.
** B - Below soil surface; H - Headed
*** Br - Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Length	Leaf at Tip	Height Growing Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W.	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.
OTTAWA 100 ORCHARDGRASS																							
May 6	16	2.5	B**	3.8	2.1	3	-	8	4	-	10	5	-	10									
13	21	2.8	B	4.2	2.2	4	7	9	6	8	12	7	9	14									
21	30	2.9	1	4.3	2.5	5	8	11	9	8	16	11	8	20									
27	35	3.1	2	4.2	2.4	6	8	12	10	8	17	13	9	20									
June 3	54	3.8	13	4.8	3.6	7	7	13	12	8	17	16	8	25	16	8	29	16	8	30			
10	68	4.3	11	4.8	4.2	10	8	20	14	8	23	15	8	29	16	8	28	16	8	26			
17	81	4.2	6	4.3	4.0	11	7	20	19	8	26	17	9	31	17	8	30	15	7	18	14	6	18

Per cent of Shoots Examined

May 6			100B**						100			83			27								
13			100B						100			97			20								
21			87B						100			100			43								
27			53B						100			97			47								
June 3			37B;3H						63Br***			100			93			60			7		
10			33B;60H						63Br			100			90			67			33		
17			20B;77H						67Br			18Br			90			77			23		7

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade length cms.
** B - Below soil surface; H - Headed
*** Br --Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Length	Leaf at Tip	Height Growing Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W.	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.	Leaf 7 S.L.	Leaf 7 B.W.	Leaf 7 B.L.
CANADA BROMEGRASS																										
May 6	22	3.9	B**	4.2	2.6	4	--	10	5	--	13	7	--	15												
13	27	3.2	B	4.8	3.0	4	6	11	6	8	14	8	9	16	11	11	18	11	10	17						
21	38	3.4	3	4.8	2.9	5	8	14	9	9	18	11	10	22	11	8	21									
27	41	3.9	7	5.2	3.6	5	9	13	8	10	16	14	10	20	11	10	23	10	10	21						
June 3	64	5.1	26	6.2	5.3	5	11	17	10	9	17	13	10	21	13	10	24	13	9	25	13	7	22			
10	81	H	H	5.6	5.5	6	10	16	10	10	18	12	11	22	13	11	24	14	10	22	13	10	22	15	8	22
17	94	H	H	6.2	6.1	Brown			10	9	15	12	10	21	13	10	24	13	9	23	13	7	20	11	6	18
Per cent of Shoots Examined																										
May 6			100B**			100			100			60														
13			100B			100			100			77			20			3								
21			27B			100			100			77			17											
27			100A			100			100			93			47			7								
June 3			60H			93Br***			17Br			100			100			73			37					
10			100H			90Br			53Br			13Br			100			90			47			13		
17			3 Sterile			100Br			83Br			30Br			100			100			83			27		

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade length cms.
** B - Below soil surface; H - Headed
*** Br - Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Date	Shoot Lgth.	Leaf at Tip	Hgt. Grow. Point	No Leaves Exposed	No Blades Exposed	Leaf 1* S.L.	Leaf 1* B.W.	Leaf 1* B.L.	Leaf 2 S.L.	Leaf 2 B.W.	Leaf 2 B.L.	Leaf 3 S.L.	Leaf 3 B.W.	Leaf 3 B.L.	Leaf 4 S.L.	Leaf 4 B.W.	Leaf 4 B.L.	Leaf 5 S.L.	Leaf 5 B.W.	Leaf 5 B.L.	Leaf 6 S.L.	Leaf 6 B.W.	Leaf 6 B.L.	Leaf 7 S.L.	Leaf 7 B.W.	Leaf 7 B.L.	Leaf 8 S.L.	Leaf 8 B.W.	Leaf 8 B.L.	Leaf 9 S.L.	Leaf 9 B.W.	Leaf 9 B.L.	Leaf 10 S.L.	Leaf 10 B.W.	Leaf 10 B.L.
SARATOGA BROMEGRASS																																			
5-6	28	3.6	B**	5.3	3.3	5	--	13	6	--	15	8	--	18	8	--	20																		
13	31	3.5	B	5.1	3.2	4	7	12	6	8	15	10	10	19	12	11	21	11	12	21														
21	50	3.9	8	5.3	3.6	6	9	16	10	10	20	14	11	23	17	12	28	11	13	28														
27	60	4.1	16	5.3	3.6	9	11	19	14	12	23	16	12	26	19	13	26	18	12	22														
6-3	83	6.0	31	7.1	6.6	Brown			12	10	19	15	11	22	16	12	25	15	12	28	15	11	27	14	8	22									
10	100	H	H	6.8	6.7	Brown			13	12	21	14	12	25	15	13	28	15	12	29	15	10	26	14	9	24	14	5	16						
17	104	H	H	7.1	6.9	7	10	19	12	9	21	13	10	24	13	11	25	13	10	26	13	9	24	12	8	20	12	9	21	10	9	23	15	9	27

Per cent of Shoots Examined

5-6	100B	100	100	90	37					
13	100B	100	100	87	33	3				
21	100A	100	100	100	47	10				
27	100A	100	100	100	57	3				
6-3	80H	100Br***	37Br	100	100	100	97	60		
10	100H	100Br	67Br	17Br	3Br	100	97	53	17	
17	20 sterile	93Br	77Br	30Br	100	100	90	67	20	7	3

* S.L. - Sheath length cms.; B.W. - Blade width mms.; B.L. - Blade length cms.
** B - Below soil surface; H - Headed
*** Br - Brown leaves.

TEST 162-B

GRASS SHOOT GROWTH ABOVE GROUND - 1963

Weight of 10 Shoots in Grams

Date	% Leaf	Blade Weight	Stem Weight	Total Weight	% Leaf	Blade Weight	Stem Weight	Total Weight
CLIMAX TIMOTHY					**ESSEX TIMOTHY**			
May 6				1.49				1.00
13				1.64				1.16
21				1.90				1.49
27				2.84				2.52
June 3	80	3.16	0.80	3.96	84	2.40	0.44	2.84
10	66	3.88	2.01	5.89	66	2.27	1.17	3.44
17	47	3.89	4.38	8.27	61	3.31	2.14	5.45
FRODE ORCHARDGRASS					**OTTAWA 100 ORCHARDGRASS**			
May 6				0.98				0.94
13				1.88				1.16
21				2.08				2.02
27	87	2.34	0.34	2.68	96	2.42	0.09	2.51
June 3	58	3.03	2.22	5.25	73	2.97	1.12	4.09
10	55	2.63	2.19	4.82	60	3.19	2.15	5.35
SARATOGA BROMEGRASS					**CANADA BROMEGRASS**			
May 6				3.55				1.82
13				4.09				2.90
21				5.90				3.97
27	79	6.87	1.78	8.65	87	3.90	0.57	4.47
June 3	46	5.77	6.86	12.63	60	4.35	2.89	7.25
10	45	7.71	9.43	17.14	45	4.62	5.56	10.18

CLIMATOLOGICAL DATA FROM FORAGE GROWTH CURVE EXPERIMENT

Ontario Research Foundation
Department of Physiography

Water Use

On the enclosed tables and graphs is information on the amount of water used by various species of forage crops grown in the Growth Curve experiment conducted in 1961, 1962, and 1963. Water use was determined from rainfall and soil moisture determinations - core samples (0-6") and neutron readings* (6" to 48"). Estimates were made in the early part of the season using Thornthwaite's P.E. method.

Accumulated rainfall is plotted in addition to the accumulated water use curves and illustrates the loss of water to the water table right up to early June in 1961 and late May 1963. In 1962, little, if any, water was lost to the water table after the start of growth.

In late April and throughout May the rate of water use was much greater in 1962 than in 1961 and 1963, in fact twice as much water was used by May 10th, 1962 as in either of the other two years. By the first of June, 1962 approximately 5" of water had been transpired compared to around 3" in 1961 and 1963. From June 1st to 20th, the rates of use were quite comparable in all three years (.12 to .14 inches per day).

From June 18th until early July the rate of use was much less (.12" per day) in 1962 than in the other two years (0.20"/day in 1961 and 0.26"/day in 1963). There was not as much variability from year to year in the water used during the last three weeks of the Hay Growth Curve (approximately 2.4" in 1961, 2.6" in 1962, and 3" in 1963). Brome grass transpired slightly more water than alfalfa in 1962 and 1963 during the last two weeks. This could have been due to the fact that rainfall during this period (July 10-24) came after a prolonged dry spell in 1962 and 1963 and the grass was more efficient in using this rain water because of a higher proportion of roots near the surface.

The fact that the total use was the least in 1961 and the most in 1963 is a bit hard to explain, since rainfall distribution was near perfect in 1961 and anything but perfect in 1963. Of course stored soil moisture and the water table supplied water right up to the time of rainfall on July 14th, 1963 and the demand was slightly higher in 1963 than in 1961, (shown by the "hour-degree" accumulation curves). Thus if the forage removed the stored soil moisture as efficiently as the rain-water, then it is natural that the water use would be slightly higher in 1963 than in 1961.

However, in 1962, the demand was greater than in either of the other two years and the total use was slightly less than in 1963. The big difference being in the June 18th to July 2nd period. Again the stored soil moisture and the water table supplied the water in 1963, but the water table was likely too low in 1962 to supply any capillary water to the roots.

It is possible that lateral movement of water from the water table

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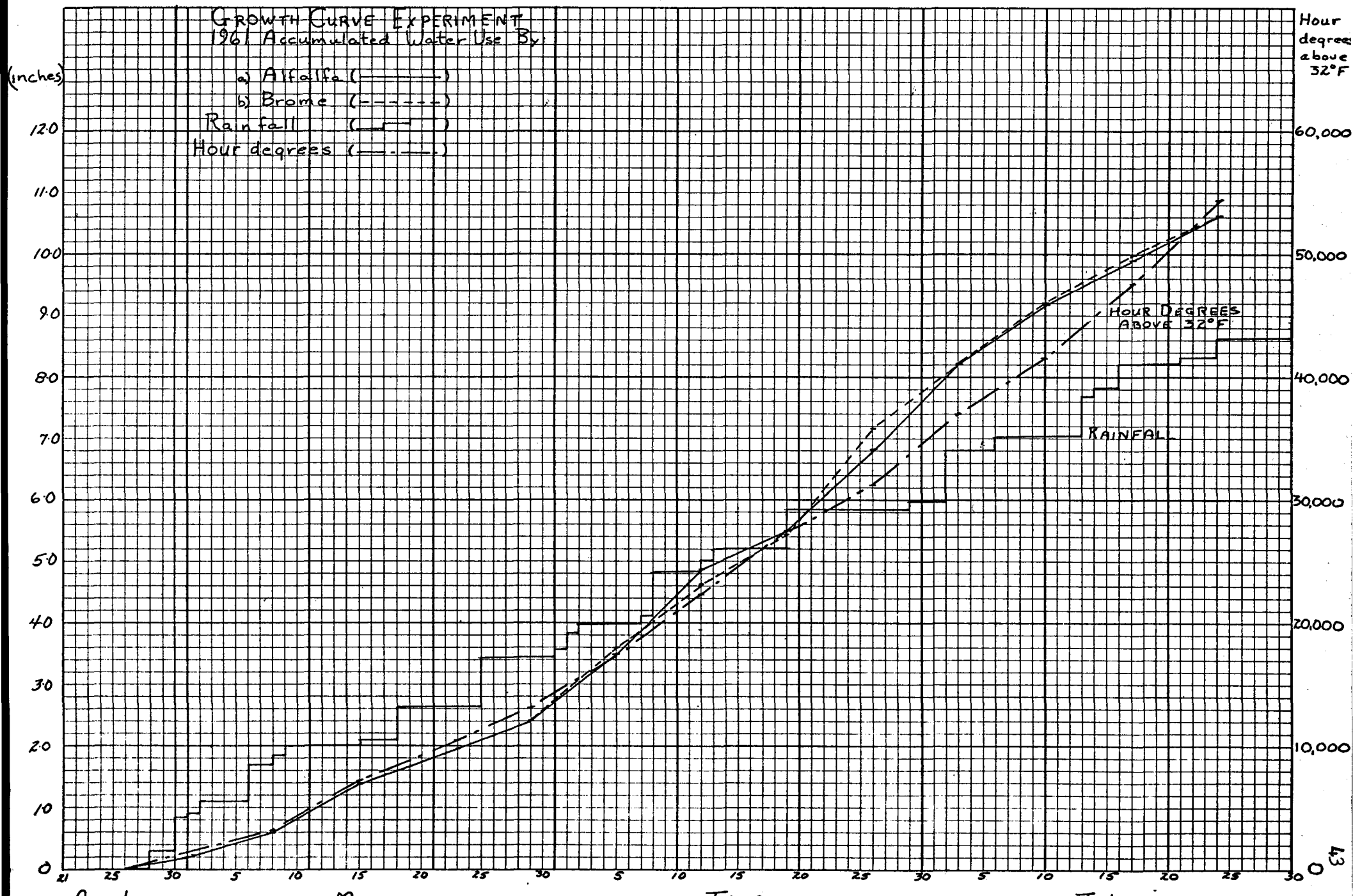
* Neutron meter supplied by the Soil Science Department.

1961 GROWTH CURVE EXPERIMENT

Accumulated Water Use By

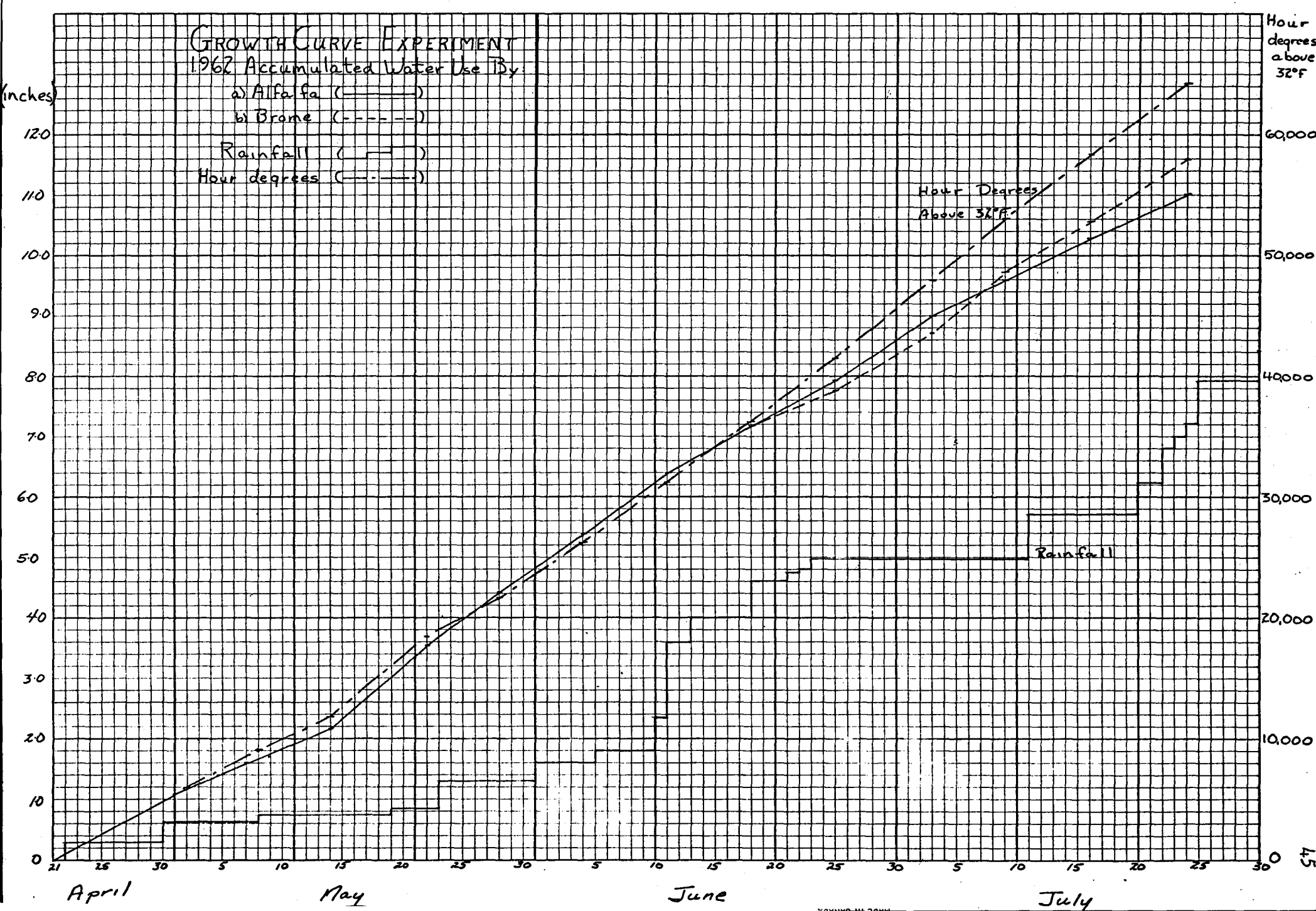
Period	Alfalfa	Brome
April 26 to May 1	0.20	0.20
May 8	0.60	0.60
May 15	1.37	1.37
May 23	1.95	1.95
May 29	2.43	2.43
June 5	3.49	3.59
June 12	4.87	4.65
June 19	5.50	5.46
June 26	6.85	7.16
July 3	8.27	8.19
July 10	9.17	9.22
July 17	9.91	9.97
July 24	10.63	10.65


GROWTH CURVE EXPERIMENT
1961 Accumulated Water Use By:
a) Alfalfa (————)
b) Brome (– – – – –)
Rainfall (⎍⎍⎍)
Hour degrees (— · — · —)
(inches)
Hour degrees above 32°F
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
60,000
50,000
40,000
30,000
20,000
10,000
0
HOUR DEGREES ABOVE 32°F
RAINFALL
21 25 30 5 10 15 20 25 30 5 10 15 20 25 30 5 10 15 20 25 30
April
May
June
July

1962 GROWTH CURVE EXPERIMENT

Accumulated Water Use By

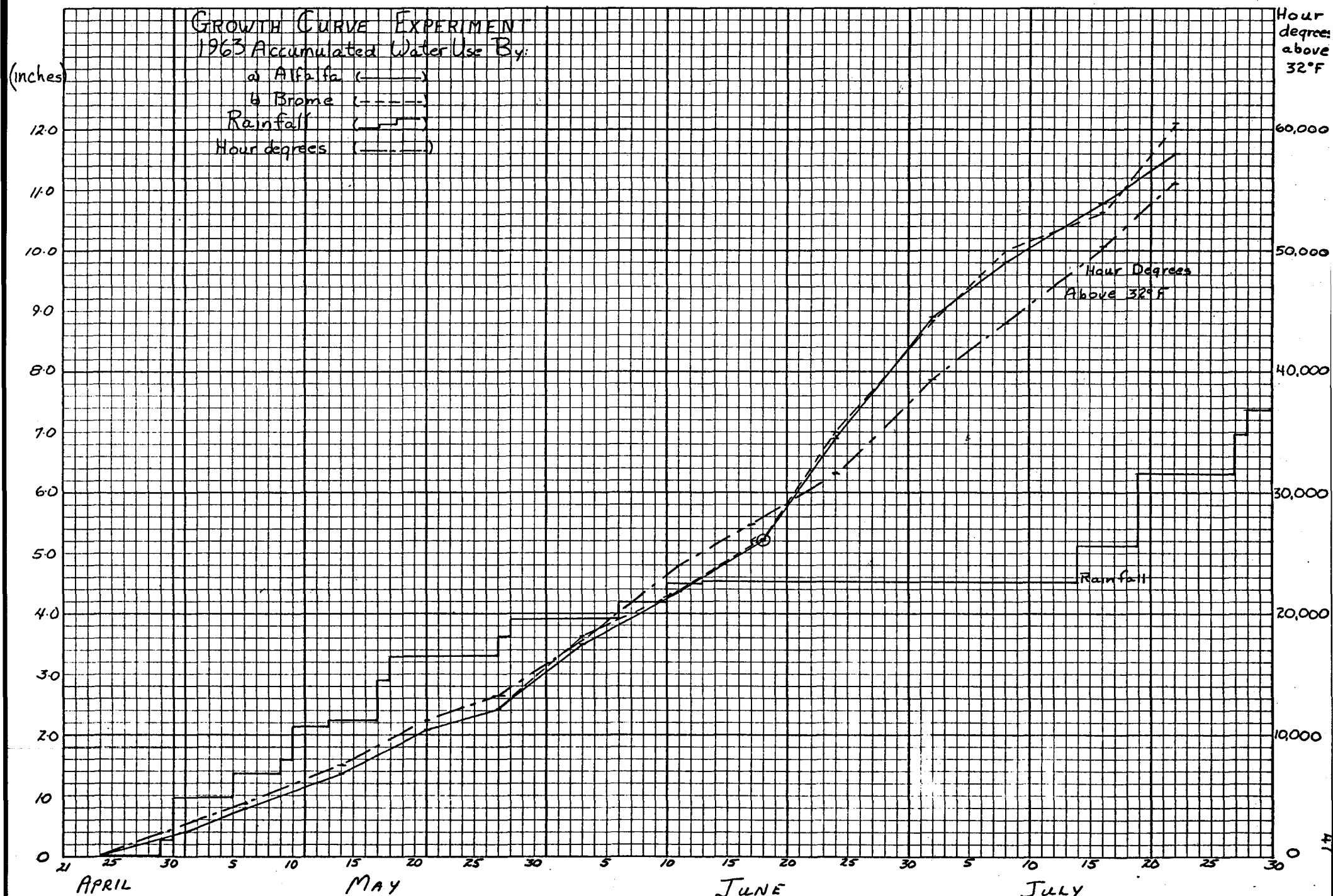
Period	Alfalfa	Brome	Orchard
April 21 to May 1	1.07	1.07	1.07
May 7	1.60	1.60	1.60
May 14	2.16	2.16	2.16
May 22	3.54	3.54	3.54
May 28	4.45	4.44	4.49
June 4	5.37	5.36	5.41
June 11	6.40	6.37	6.16
June 18	7.16	7.13	6.92
June 25	7.93	7.75	7.84
July 3	8.99	8.73	8.55
July 9	9.59	9.74	9.12
July 16	10.29	10.56	9.98
July 24	11.04	11.62	10.50


GROWTH CURVE EXPERIMENT
1962 Accumulated Water Use By:
a) Alfalfa (————)
b) Brome (- - - - -)
Rainfall (⌐¬)
Hour degrees (—·—·—)
(inches)
Hour degrees above 32°F
Hour Degrees Above 32°F.
Rainfall
120
110
100
90
80
70
60
50
40
30
20
10
0
60,000
50,000
40,000
30,000
20,000
10,000
0
21 25 30 5 10 15 20 25 30 5 10 15 20 25 30 5 10 15 20 25 30
April
May
June
July

1963 GROWTH CURVE EXPERIMENT

Accumulated Water Use By

Period	Alfalfa	Brome	Orchard	Timothy
April 24 to May 1	0.38	0.38	0.38	0.38
May 6	0.77	0.77	0.77	0.77
May 13	1.34	1.34	1.34	1.34
May 21	2.08	2.08	2.08	2.08
May 27	2.45	2.45	2.45	2.45
June 3	3.50	3.66	3.61	3.59
June 11	4.36	4.36	4.87	4.05
June 17	5.19	5.24	5.96	4.03
June 24	6.90	7.00	7.73	6.53
July 2	8.92	8.84	9.43	8.35
July 8	9.82	10.00	10.27	9.14
July 16	10.77	10.66	11.14	9.74
July 22	11.60	12.12	11.82	10.53


GROWTH CURVE EXPERIMENT
1963 Accumulated Water Use By:
a) Alfalfa (———)
b) Brome (– – – –)
Rainfall (⎍⎍⎍)
Hour degrees (— · — · —)
(inches)
Hour degrees above 32°F
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
10
0
60,000
50,000
40,000
30,000
20,000
10,000
0
Hour Degrees Above 32°F
Rainfall
21 25 30 5 10 15 20 25 30 5 10 15 20 25 30 5 10 15 20 25 30
APRIL
MAY
JUNE
JULY

continued into late June in 1963 and the moisture readings would show this loss as well as the water used by transpiration. If this is the case then the total use as shown for the June 18th to July 2nd period is too high and total use in 1963 might be lower than that in 1962.

The differences in total water use were not large and it is doubtful if there was a significant difference in total use among years. However, there is no doubt there were significant differences in water use for short periods as pointed out above.

"Hour-degree" Accumulations

Accumulation of hour-degrees above 32°F. from the date of the start of growth are shown in the attached figures along with accumulated water use and rainfall. Temperatures for these accumulations were those recorded hourly just below the crop surface, i.e., temperatures of the air above the soil surface and within the crop canopy.

It is seen that these temperature accumulations run quite parallel to the water use figures up to the middle of June, then fall below in 1961 and 1963 and go above in 1962. Apparently the water supply was not sufficient to keep up with the demand in 1962, but remained adequate in both 1961 and 1963.

The "hour-degree" totals to the end of the hay growth curve were about the same in 1961 and 1963 (54,000 to 55,000), but much higher than this in 1962 (64,000). About one-third of this difference was in the "hour-degrees" accumulated to April 30th and most of the remainder up to May 31st. Thus most of the difference in growth and dry matter production among the 3 years should have occurred by early June. In fact moisture use figures indicate that more forage should have been produced from June 1st to July 24th in 1961 and 1963 than in 1962 and the reverse in April and May according to "hour-degree" accumulations.

Day-degree Accumulations to Flowering and Heading Dates

Hourly temperatures of the air within the forage canopy were averaged for each day and the average day-degrees above 32°F. accumulated from the start of growth in the spring to the date that 50% of the plants had started to flower of alfalfa, timothy, orchard and brome grass. These accumulations are shown in the following table, along with the dates of heading and flowering of each variety.

These totals were very consistent from year to year for the alfalfa varieties and Frode orchard grass, but high in 1962 for the brome varieties, Ottawa orchard and Essex timothy. A delayed heading date for Climax timothy in 1963 makes it similar to the 1962 figure, however it is likely both figures are high as Climax should head out earlier than Essex.

The fact that the totals for the grasses are nearly all too high in 1962 indicates that some of the high daytime temperatures were beyond the optimum for development of these grasses as there were more high temperatures during this period in 1962 than in the other two years.

D.M. Brown
Research Scientist

Heading and flowering dates and accumulated day-degrees above 32°F from start of growth to these dates for 8 varieties of forage

	1961		1962		1963	
	April 26 to		April 21 to		April 24 to	
Saratoga	June 4	710	May 25	854	June 2	726
Canadian	June 5	744	May 26	875	June 3	760
Frode	June 4	710	May 23	805	June 4	794
Ottawa	June 8	828	May 30	993	June 6	861
Climax	June 19	1148	June 14	1393	June 26	1407
Essex	June 25	1290	June 17	1497	June 22	1273
Dupuits	June 23	1243	June 10	1283	June 24	1336
Vernal	June 27	1349	June 12	1340	June 26	1407

TOTAL HOUR DEGREES ABOVE 32°F
FOR FORAGE GROWTH (1961 EXPERIMENT)

From	To	Total Hour Degrees	Accumulated Hour Degrees
April 26	May 8	3186	3186
May 8	May 15	3999	7185
May 15	May 23	3281	10466
May 23	May 29	2615	13081
May 29	June 5	4293	17374
June 5	June 12	5023	22397
June 12	June 19	4755	27152
June 19	June 26	4105	31257
June 26	July 3	5748	37005
July 3	July 10	4625	41630
July 10	July 17	6069	47699
July 17	July 24	6629	54328

TOTAL HOUR DEGREES ABOVE 32°F FOR FORAGE GROWTH GROWTH (1962 EXPERIMENT)

From	To	Total Hour Degrees	Accumulated Hour Degrees
April 21	May 7	8917	8917
May 7	May 14	2858	11775
May 14	May 22	6643	18418
May 22	May 28	3335	21753
May 28	June 4	4557	26310
June 4	June 11	4924	31234
June 11	June 18	5038	36272
June 18	June 25	5250	41522
June 25	July 3	6445	47967
July 3	July 9	5088	53055
July 9	July 16	5327	58382
July 16	July 24	5913	64295

TOTAL HOUR DEGREES ABOVE 32°F

FOR FORAGE GROWTH (1963 EXPERIMENT)

From	To	Total Hour Degrees	Accumulated Hour Degrees
April 24	May 6	4314	4,314
May 6	May 13	3114	7,428
May 13	May 21	3760	11,188
May 21	May 27	2057	13,245
May 27	June 3	4553	17,798
June 3	June 11	6173	23,971
June 11	June 17	3259	27,230
June 17	June 24	4393	31,623
June 24	July 2	7714	39,337
July 2	July 8	4647	43,984
July 8	July 15	6384	50,368
July 15	July 24	4976	55,344

TEST 165 ALFALFA ROW WIDTH AND SPACING TEST

Purpose: To determine the effect of four row widths and a plant blocking upon the yield of Vernal alfalfa.

Procedure: Alfalfa grown in 7, 14, 21, and 28 inch row widths with each width in solid and a 14 inch blocking within the row.

Design: Split plot, six replications. Main plots blocking, sub plots row widths.

Plot Size: Approximately 12 feet long.

Row Width	No.Seeded	No.Harvested
7 inch	9	5
14 "	5	3
21 "	4	2
28 "	3	1

Data Collected:

1. Yield dry matter at first flower
2. Per cent leaf
3. Plant height
4. No. stems per unit area
5. Stem diameter
6. Stand persistence rating
7. Per cent protein
8. Per cent D.D.M.
9. Light readings

Main plots - blocked in 14" spacing to the number of plants per two linear inches of row.

Sub plots - seeded at number of seeds per foot of row,that is seeded using a Planet Jr. calibrated to sow 10 lbs. per acre in 7" rows.

First Flower - all plots cut when first scatter of bloom appear on the crop.

Results:

1. The data collected in the year of seeding are shown in the table. Test established was excellent.
2. In the first cutting, the rows seeded solid produced higher yields, taller plants and more yellow leaves. Blocking the plants reduced yields of dry matter by approximately 50 per cent.
3. In the second cutting, the highest yield was again obtained from the solid rows. A 14" row spacing in both solid and blocked rows gave the best yield. 28" rows gave very low production.
4. At the narrow row spacings, the alfalfa was slightly taller in the solid than in the blocked rows, but the blocked alfalfa had stems which were considerably coarser.
5. The solid rows produced stems considerably lighter in weight with a lower percentage of leaves than the blocked rows.
6. Increasing the row spacing increased the stem weight and per cent leaf in the solid rows but increased only the stem weight of the two narrow spacings in the blocked rows.
7. In total seasonal yield, the solid rows provided more dry matter yield with the 14" spacing being superior.

ALFALFA SPACING TEST (1963) TEST 165

Seeded: April 29, 1963 Location: C 2-3

Treatment	First Cut - July 9 Yield D.M. Lbs/Ac.	Plant Height cms.	Height of Yellow Leaf-cms.	Second Cut - August 27 Yield D.M. Lb/A.	Plant Height Cms.	Height of Yellow Leaf-cms.	No.Stems Per Foot of Row	Stem Diameter mms.	Stem(30) Weight cms.	Per-cent Leaf	Total Yield DM Lbs./Acre
Solid Within Rows											
Row Width - 7"	1735	48	23	3175	71	33	47.7	2.14	25	48	4910
14"	1727	50	14	3670	67	27	65.0	2.25	28	51	5397
21"	1428	52	15	3092	64	24	80.7	2.31	33	54	4520
28"	688	49	9	1773	62	19	89.0	2.27	38	57	2461
Mean	1395	50	15	2927	66	26	70.6	2.24	31	53	4322
Blocked to 14" Spacing Within Row											
Row Width - 7"	1100	45	12	3078	68	22	29.5	2.51	45	55	4178
14"	813	46	5	3315	65	20	39.3	2.60	52	56	4128
21"	576	45	3	2744	67	17	48.0	2.69	56	55	3320
28"	321	50	0	1498	63	13	54.3	2.62	56	57	1819
Mean	703	47	5	2658	66	12	42.8	2.61	52	56	3361

TEST 310 MIXTURE DIVERSITY TRIAL

Results

The data collected in 1963 is shown in the following tables. Some items of interest might be:

1. Delayed harvesting of the Vernal mixtures increased the percentage of brome by the time of medium harvest; increased the percentage of timothy by the late harvest; had no effect on the percentage of the orchard component. With DuPuits all species of grass increased some with delayed harvesting, particularly the brome.

2. Vernal mixtures gave higher yields in the first cut than DuPuits mixtures at the three harvest dates and had a higher percentage of grass.

3. Total seasonal yields were highest from the DuPuits mixtures because of their aftermath production.

4. DuPuits mixtures cut early produced higher yielding aftermaths than when cut at a medium or late date, which were similar in aftermath yield. The Vernal aftermaths were similar in total production regardless of when the first crop was cut for hay.

5. In general, bromegrass grown with Vernal or DuPuits gave the highest total yield.

MIXTURE DIVERSITY TRIAL - TEST 310

Seeded: May 17, 1961

Location: E-18

Early Cut - June 10, 1963

Association	Lbs. D.M./Acre, Alfalfa + Grass				% Alfalfa			% Grass		
	June 10/63	July 19/63	Sept 4/63	Total	June 10	July 19	Sept 4	June 10	July 19	Sept 4
Vernal + Lincoln	5500	1543	2003	9046	74.4	95.8	91.8	25.6	4.2	8.2
+ Climax	4820	1772	2149	8741	94.6	98.2	94.8	5.4	1.8	5.2
+ Frode	5094	1506	2120	8720	72.1	81.1	69.4	27.9	18.9	30.6
Mean	5138	1607	2091	8836	80.3	91.7	85.3	19.7	8.3	14.7
DuPuits + Lincoln	4961	2164	2272	9397	92.6	99.0	98.5	7.4	1.0	1.5
+ Climax	4849	2217	2373	9439	95.3	98.9	95.9	4.7	1.1	4.1
+ Frode	4632	2052	2523	9207	80.9	93.3	74.4	19.1	6.7	25.6
Mean	4814	2144	2389	9348	89.6	97.1	89.6	10.4	2.9	10.4

Association	Lbs. D.M. Per Acre - Alfalfa				Lbs. D.M. Per Acre - Grass			
	June 10	July 19	Sept 4	Total	June 10	July 19	Sept 4	Total
Vernal + Lincoln	4092	1478	1839	7409	1408	65	164	1637
+ Climax	4560	1740	2037	8337	260	32	112	404
+ Frode	3673	1221	1471	6365	1421	285	649	2355
Mean	4108	1480	1782	7370	1030	127	308	1465
DuPuits + Lincoln	4594	2142	2238	8974	367	22	34	423
+ Climax	4621	2193	2276	9090	228	24	97	349
+ Frode	3747	1915	1877	7539	885	229	646	1760
Mean	4320	2083	2130	8534	493	92	259	844

MIXTURE DIVERSITY TRIAL - TEST 310

Seeded: May 17, 1961

Location: E-18

Medium Cut - June 26, 1963

Association	Lbs. D.M./Acre, Alfalfa & Grass				% Alfalfa			% Grass		
	June 26/63	July 30/63	Oct 11/63	Total	June 26	July 30	Oct 11	June 26	July 30	Oct 11
Vernal + Lincoln	6559	2070	1788	10417	54.2	83.2	91.4	45.8	16.8	8.6
+ Climax	5259	1927	1548	8734	88.0	95.7	95.7	12.0	4.3	4.3
+ Frode	6224	2108	1757	10089	73.1	82.2	78.7	26.9	17.8	21.3
Mean	6014	2035	1698	9747	71.8	87.0	88.6	28.2	13.0	11.4
DuPuits + Lincoln	6321	2333	2020	10674	71.7	93.1	97.5	28.3	6.9	2.5
+ Climax	5259	2323	1965	9547	90.2	98.3	98.5	9.8	1.7	1.5
+ Frode	5970	2277	1955	10202	76.4	88.9	88.9	23.6	11.1	11.1
Mean	5850	2311	1980	10141	79.4	93.4	95.0	20.6	6.6	5.0

Association	Lbs. D.M. Per Acre - Alfalfa				Lbs. D.M./Acre - Grass			
	June 26	July 30	Oct 11	Total	June 26	July 30	Oct 11	Total
Vernal + Lincoln	3555	1722	1634	6911	3004	348	154	3506
+ Climax	4628	1844	1481	7953	631	83	67	781
+ Frode	4550	1733	1383	7666	1674	375	374	2423
Mean	4244	1766	1499	7510	1770	269	198	2237
DuPuits + Lincoln	4532	2172	1970	8674	1789	161	50	2000
+ Climax	4744	2284	1935	8963	515	39	30	584
+ Frode	4561	2024	1738	8323	1409	253	217	1879
Mean	4612	2160	1881	8653	1238	151	99	1488

MIXTURE DIVERSITY TRIAL - TEST 310

Seeded: May 17, 1961

Location: E-18

Late Cut - July 5, 1963

Association	Lbs. D.M./Acre, Alfalfa & Grass				% Alfalfa			% Grass		
	July 5/63	Aug. 2/63	Oct. 11/63	Total	July 5	Aug. 2	Oct. 11	July 5	Aug. 2	Oct. 11
Vernal + Lincoln	6955	1758	1766	10479	55.0	90.0	79.5	45.0	10.0	20.5
+ Climax	6613	1776	1889	10278	75.6	97.5	86.2	24.4	2.5	13.8
+ Frode	6088	1799	1847	9734	71.4	83.6	73.1	28.6	16.4	26.9
Mean	6552	1778	1834	10164	67.3	90.4	79.6	32.7	9.6	20.4
DuPuits + Lincoln	6684	2263	2022	10969	58.0	95.3	91.5	42.0	4.7	8.5
+ Climax	5541	2261	1871	9673	84.4	98.6	96.4	15.6	1.4	3.6
+ Frode	5863	2290	2112	10265	67.9	87.8	85.8	32.1	12.2	14.2
Mean	6029	2271	2002	10302	70.1	93.9	91.2	29.9	6.1	8.8

Association	Lbs. D.M. Per Acre - Alfalfa				Lbs. D.M. Per Acre - Grass			
	July 5	Aug. 2	Oct. 11	Total	July 5	Aug. 2	Oct. 11	Total
Vernal + Lincoln	3825	1582	1404	6811	3130	176	362	3668
+ Climax	4999	1732	1628	8359	1614	44	261	1919
+ Frode	4347	1504	1350	7201	1741	295	497	2533
Mean	4390	1606	1461	7457	2162	1172	373	2707
DuPuits + Lincoln	3877	2157	1850	7884	2807	106	172	3085
+ Climax	4677	2229	1804	8710	864	32	67	963
+ Frode	3981	2011	1812	7804	1882	279	300	2461
Mean	4178	2132	1822	8133	1851	139	179	2170

CONDITIONING AND RAKING TIME

TEST 172

Results

The data collected in 1963 was very similar to that obtained in previous tests and is given in the following table and graph. Some of the more significant results were:

1. Conditioned hay was ready to bale much sooner than unconditioned.
2. Conditioned hay in this test, as in all previous studies, lost considerably more leaves than unconditioned hay.
3. Early raking did not impede the speed of drying.
4. Early raking had a marked effect upon reducing the amount of leaf lost.
5. Baling leaf loss caused by the pick-up was again very large.

TEST 172

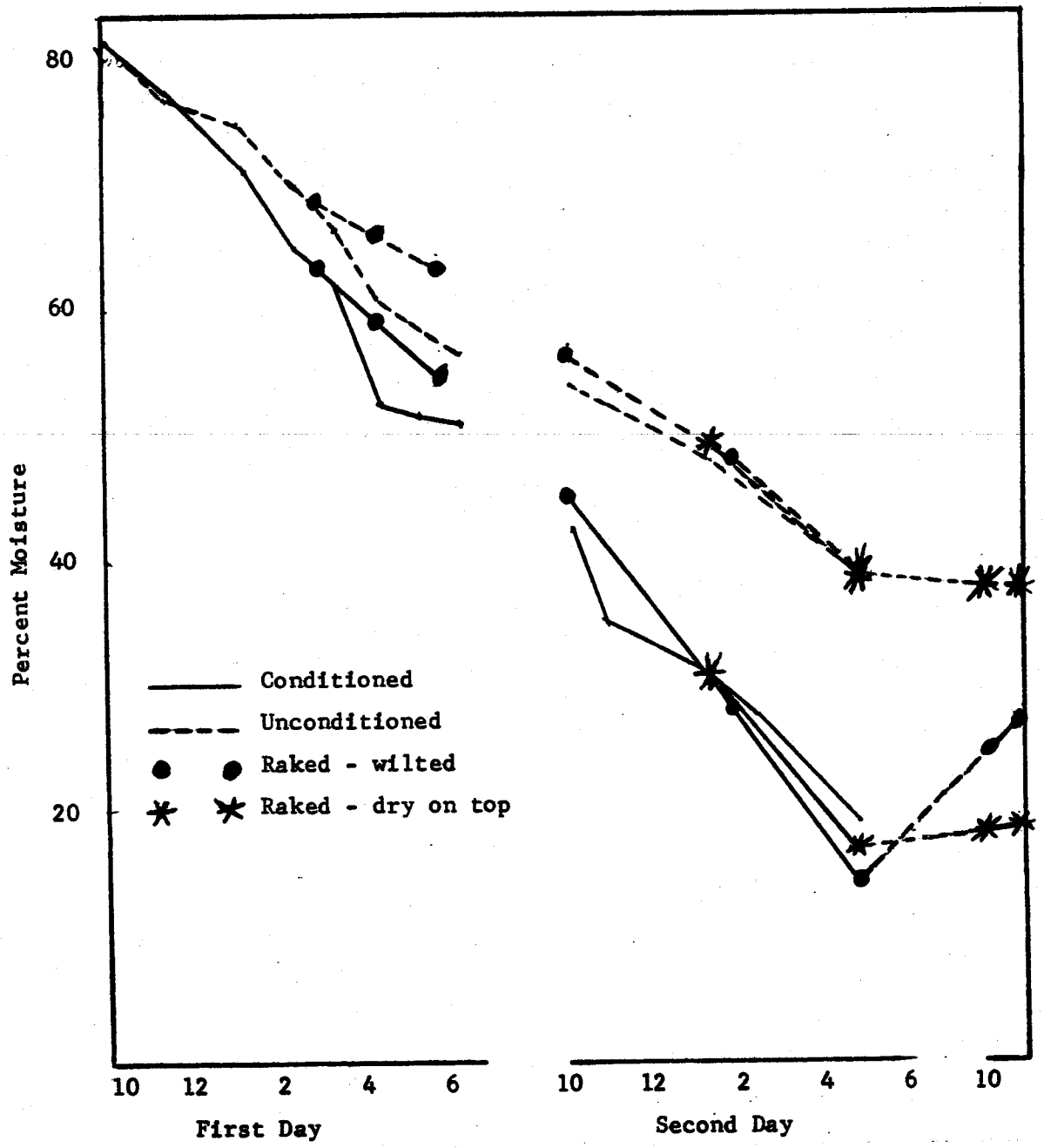
HAY CONDITIONING AND RAKING

Raking Treatment	Per cent Dry Matter When			Hours From Cutting When			Leaf Loss From (Lbs. Per Acre)			Per cent Leaf in Bales
	Raked	Baled	Ready* to Bale	Raked	Baled	Ready* to Bale	Raking	Baling	Total**	
Conditioned										
Wilted on top	35	92	78	5	56	29	56			44.6
Dry on top	69	92	75	27	56	29	372	661	1446	44.0
Swath cured	81	91	Raked	31	56	31	506			42.1
Average							311			43.6
Unconditioned										
Wilted on top	30	84	--	5	56	--	0			47.4
Dry on top	53	84	--	27	56	--	235			45.5
Swath cured	61	85	--	31	56	--	360			41.9
Average							198			44.9

* When 75 per cent dry matter or more
** Includes leaf loss before cutting - averaged 413 lbs./acre

Hay cut June 25; Vernal yield 5,000 lbs./acre; 19 per cent dry matter.

TEST 172 - CONDITIONING AND RAKING



TEST 170 BALE DRYING STUDY

Days After Baling	Stacked		Stooked		Flat	
	Cond.	Uncond.	Cond	Uncnnd.	Cond.	Uncond.
Same day	71	54	71	54	71	54
1	84*	57	74	56	70	51
3	73	61	76	52	73	55
6	70	59	75	62	72	64
8	76	67	82	67	---	72

* Sample taken from top bale of stack.

Many farmers bale hay tough and leave it in the field for drying in stacks, piles, etc. The data presented in the table was obtained from hay baled very tough. The speed of drying of the three bale arrangement used point to the following:

1. Conditioned hay dried the fastest in stooks composed of four bales.

2. Stacked bales did not dry any faster than bales left where they dropped from the baler.

3. Unconditioned hay, at the high moisture content used, dried very slowly in all arrangements tried.

PROGRESS REPORT
ROUGHLAND PASTURE ASSESSMENT AND IMPROVEMENT PROJECT
Crop Science Department, O.A.C. - May 5, 1964

Date of Commencement of ARDA Project: May 1963.

The scope of the project was expanded during 1963 to include the objectives: 1) location and acreages of roughland; 2) the present and potential production; 3) methods of establishing birdsfoot trefoil using chemical sod killers; 4) ecological changes in stands of trefoil; and 5) crop management techniques for maximum utilization and production. The following is a brief report outlining the studies, their locations, and observations made during 1963.

1. Locations and Acreages of Roughland

Three broad groupings of soil association were of concern in the project: 1) shallow soils (0-18" of soil over bedrock); 2) rough soils (those having steep slopes or rough topography) which may or may not contain large boulders on the soil surface and/or rock outcrops; and 3) poorly drained soils having flat topography that prevent early spring tillage.

A map is in the process of being prepared to show the location and acreages of these three soil associations. There are approximately 1.0 million acres of shallow soil, 1.3 million acres of "rough" soil, and 4.0 million acres of poorly drained soil in Ontario. Much of the shallow and "roughland" areas are in pasture and is not suitable for other crops, and some of the poorly drained soils will remain in forage.

2. Present and Potential Production

In order to assess the present and potential production from the natural herbage growing on these lands, and after they have been seeded to trefoil, it was necessary firstly to obtain testing sites and secondly, to establish trefoil plots on which fertilizers could be applied. In order to expedite this phase of the project, six of the sites established in 1963 were selected and fertilizer treatments were applied so that the potential and present production could be determined in 1964.

Treatments: Three rates of fertilizer, 0, 500, and 1000 pounds of 0-20-20 fertilizer were applied to trefoil and to the natural sod at each of the sites in September 1963. Three replications of each fertility treatment were used at each location.

Locations:	Co-operator	Township	County	Description
	Mr. M. Millhouser	Lindsay	Bruce	Shallow soil.
	Mr. Webster	Saugeen	Bruce	Flat, fair-poorly. drained.
	Mr. Webster	Saugeen	Bruce	Rough, hilly.
	Mr. Balls	Albermarle	Bruce	Shallow, poorly drained.
	Mr. Kipfer	Mornington	Perth	Gravelly, rolling.
	Mr. E. Ward	Mulmur	Dufferin	Droughty, rolling, and gravelly.

Observations: In 1963 on the shallow soils the lack of water in mid-summer restricted growth and development to some degree. In the spring of 1964, the vigour and stand of the fertilized trefoil and the natural grasses appeared to be greater than where no fertility was used. To more accurately assess the potential use of this type of land three permanent sites, Bruce, Wentworth and Victoria counties, were located and specific trials designed to assess the potential yield from the shallow soils are being established.

3. Methods of Chemical Establishment

Prior to 1963 some principles concerning chemical renovation evolved from experimental work conducted at the Crop Science Department. They are: 1) the competing grass must be removed if trefoil is to be established successfully; 2) no primary or secondary tillage is required if the competition from the sod has been removed; 3) trefoil can be broadcast on the soil surface at any time from late November to late April with equivalent success; 4) birdsfoot trefoil should be seeded alone at from 5-8 pounds per acre; 5) systemic grass herbicides such as dalapon or contact herbicides like paraquat can be used for the suppression or the killing of the grass provided they are applied to actively growing tissue.

Using these principles a renovation technique was designed and tested under a wide range of soil conditions in 1963.

Treatments:

1. Seed sown in March 1963
2. Fertilizer applied in March 1963
3. Chemicals applied in May 1963
   a. Paraquat 1#/acre
   b. Paraquat 2#/acre
   c. Dalapon 5#/acre.

Locations:

Co-operator	Township	County
Mr. M. Hammond	Amabel	Bruce
Mr. E. McKay	Albemarle	Bruce
Mr. M. Millhouser	Lindsay	Bruce
Mr. Balls	Albemarle	Bruce
Mr. G. Little	Greenock	Bruce
Mr. H. Webster (2 sites)	Saugeen	Bruce
Mr. E. Grier	Mulmur	Dufferin
Mr. E. Ward	Mulmur	Dufferin
Mr. Kipfer	Mornington	Perth
Mr. C. Buchanan	Codrington	Northumberland
Mr. McCalpine	Eldon	Victoria
Mr. L. Graham	Euphrasia	Grey
O.A.C. Plots	Guelph	Wellington

Observations: Plant stand counts were made in July and September of the establishing year. On 12 of the 13 locations the trefoil stand was considered to be satisfactory for production (above 5.0 plants per square foot). The remaining location had, on the average, a trefoil plant stand of below 5.0 plants per square foot and was considered a failure. At two locations it was suspected that the herbicide was applied after the trefoil had germinated with death of the seedlings resulting. The two pound rate of paraquat was considered to be in excess of that required for grass suppression.

The technique as tested using dalapon or the low rate of paraquat appeared to be satisfactory for renovating rough lands. However, further refinements concerning the rate, time of application, and kind of chemical is needed, before any recommendation can be made. In 1964 a new series of trials using lower rates of paraquat and oil emulsions will be tested.

Applications of herbicide, seed and fertilizer may be difficult with conventional equipment, especially on land with steep slopes or if large boulders or rock outcrops are present. In order to overcome this, an application of granular dalapon in September 1963 followed by an application of seed and fertilizer in December were made by means of aircraft. Evaluation of this method of application will occur in 1964.

4. Ecological changes

Using the plots established as part of the methods of renovation in 1963, preliminary data were collected on the effect of grazing, weeds, grass and fertility on establishment. The data indicated that trefoil established in the natural sod in the upper Bruce Peninsula with success but not at other locations. In addition unrestricted grazing throughout the establishing year tended to reduce the plant stand and vigour of trefoil. When grazing was restricted and animals allowed in the field during August, the stand and vigor was rated as good. The presence of perennial weeds such as chicory, blueweed, etc., present not only a problem in establishing trefoil, but also after the trefoil is established. As no chemical is at present available to remove these weeds from established stands of trefoil without injuring this legume, a program of weed control must be instituted before the seeding takes place.

TEST 173 RATE AND METHOD OF SEEDING RAPE

1. Two seedings of this test were made in 1963. The first seeded on July 9 was so badly choked with weeds that a second one was made on July 31, However, a weed spray called Tordon was applied at 6 oz. per acre which gave complete control of all weeds and permitted its harvest.

2. The dry summer caused very light yields. In previous tests, row seedings have been outstandingly superior to broadcast seedings. In 1963 they were quite similar in both tests.

3. The earlier seeding gave higher yields but taller plants with smaller stems and lower percentage of leaves than the later seeding.

4. Although the stand was excellent in both tests, that summary data presented in the 1962 report is a better indication of yield because of the dry 1963 season.

Method and Rate	Per Cent Dry Matter	Green Yield Ton/A	Dry Matter Yield Tons/Acre	Height in Cms.	Diameter of Stems in Cms.	25 Plant Dry Wgt. in Gms.	Per Cent Leaf
Seeded: July 9, 1963						Harvested: Oct. 25/63	
Rows							
½#	11.3	30.4	3.48	89	1.6	1150	38.5
1 #	12.2	22.9	2.79	86	1.4	749	37.4
1½#	11.9	26.7	3.21	86	1.3	848	37.3
2 #	12.1	27.8	3.41	87	1.3	753	32.7
Mean	11.9	27.0	3.22	87	1.4	875	36.5
Broadcast							
2 #	13.0	24.1	3.14	89	1.2	707	34.4
4 #	12.6	23.3	2.88	90	1.1	592	32.3
6 #	13.4	23.7	3.17	88	1.1	521	32.6
Mean	13.0	23.7	3.06	89	1.1	607	33.1
Gen.Mean	12.5	25.4	3.14	88	1.3	741	34.8
Seeded: July 31, 1963						Harvested: Oct. 28, 1963	
Rows							
½#	11.8	21.1	2.49	78	1.9	505	44.7
1 #	11.1	22.7	2.52	78	1.7	349	42.6
1½#	11.3	23.8	2.68	77	1.5	298	42.3
2 #	12.5	24.4	3.03	77	1.4	227	40.1
Mean	11.7	23.0	2.68	78	1.6	345	42.4
Broadcast							
2 #	11.8	22.4	2.63	78	1.5	269	41.8
4 #	11.8	24.2	2.86	80	1.3	216	39.2
6 #	12.9	22.4	2.88	77	1.1	151	35.9
Mean	12.2	23.0	2.79	78	1.3	212	39.0
Gen.Mean	12.0	23.0	2.74	78	1.5	279	40.7

IN VITRO DIGESTION TECHNIQUE FOR FORAGES

The technique currently being used by the Department of Crop Science, O.A.C. is a modification of the method of Tilley and Terry (J. Brit. Grassl. Soc. 18: 104. 1963). The adaptation is much similar to that briefly outlined by Pritchard et al. (Can. J. Plant Sci. 43: 79. 1963). This technique involves incubation first with rumen liquor and then with acid pepsin.

Materials:

(1) Forage. All samples are dried in a "forced-draft" oven at 80°C. They are then ground through a hammer mill[1] equipped with a 0.8 mm. screen and stored in plastic bags.

(2) Rumen liquor. The rumen inoculum is a composite of that taken from three fistulated sheep. The sheep are fed a standard diet of high quality chopped hay at a level slightly below maximum intake. Sheep are fed at 8.15 a.m. and 4.45 p.m. daily. No feed is given on the morning of collection and the water pails are removed at the normal feeding time. Collection begins around 9.30 - 10.00 a.m.

The ingesta is removed under vacuum into a large vacuum flask which is immersed in warm water. The ingesta is then strained through three layers of cheesecloth (wrung as dry as possible) into an insulated thermos which has been preheated with hot water. Some CO_2 is then passed into the flask to displace air from above the rumen liquor and the flask is tightly sealed. It is endeavoured to maintain the temperature of the rumen liquor at approximately 39°C.

The liquor is then taken immediately to the laboratory and transferred into a large beaker which is placed on a magnetic stirrer hot plate[2]. CO_2 is bubbled lightly through the rumen liquor. A thermometer is also placed in the beaker and the temperature is maintained at approximately 39°C. As little time as possible should elapse between the time the ingesta is collected until the inoculations are complete.

(3) Buffer. The buffer is that described by McDougall (Biochem. J. 43: 99. 1948). A stock solution is prepared by dissolving

49.0 gms.	$Na2HCO_3$
18.5 gms.	$Na2HPO_4$, dibasic, anhydrous
2.35 gms.	NaCl
2.85 gms.	KCl
0.20 gms.	$Ca\ Cl_2$, anhydrous
0.30 gms.	$Mg\ Cl_2$, anhydrous

in 1 litre of water and then diluting to 5 litres before use. The buffer is equilibrated with CO_2 (for at least 20 minutes) immediately before using. This lowers the pH to approximately 6.9. The buffer may be stored for some weeks providing that it is re-equilibrated with CO_2 immediately before using.

(4) Pepsin solution. The pepsin solution is made by adding 2.0 gm. of 1: 10,000 pepsin powder to 1000 ml. of 0.1 N H Cl. This solution is not stable and should be made up freshly for each experiment.

Equipment:

(1) Centrifuge tubes (50 ml. capacity) are identified with a number etched into the glass with a diamond pencil. Each tube is closed with a rubber stopper which has been fitted with a gas release valve made on the principle of the Bunsen value. A short length of glass tubing is passed through a stopper so that

1 Christie-Norris Model No. 7437, 8-inch size
2 Gyratherin, Model No. 25-1

the lower end is about flush with the top. A rubber policeman is fitted over the projecting portion of the tubing and a 5-7 mm. slit is made parallel to the length of the tubing. This slit remains closed normally and opens under pressure to release gas from inside the tube.

(2) Centrifuge which has a rapid acceleration and deceleration to and from at least 2500 rpm and has a capacity of 16 tubes. (M.S.E. "super-magnum" centrifuge).

(3) PH meter sensitive to at least 0.05 on scale and measures the pH in the centrifuge tubes. (PH Meter 22, Radiometer).

(4) Water bath with a capacity for 12 racks (192 tubes) for operation at 39°C. (Hotpack Constant-Temperature Bath, Model No. 419).

(5) Automatic pipetting machine with a capacity of from 5 to 50 ml. for rapid dispersing of the buffer. (Brewer Automatic Pipetting Machine).

(6) CO_2 cylinder fitted with a special regulator.

Method:

The centrifuge tubes are placed systematically into 16-hole metal racks. The tubes are dried in an oven, placed in a desicator and finally weighed. Weights are recorded to the nearest 1/10,000 of a gram.

A $\frac{1}{4}$ teaspoon is used to deliver approximately 250 mgms. of forage (when dried) into each tube. The tube plus sample is then dried at 80°C for at least 48 hours. Then the second weight is recorded and the exact dry matter weight of sample calculated. A range of 180 to 300 mgms. is accepted.

Before the start of the incubation, 25 ml. of buffer is added with the automatic pipettor to each of the tubes containing the forage. The tubes are then stoppered and placed into the water bath to equilibrate the temperature. When the inoculum is prepared, each tube is removed from the bath and 5 ml. of inoculum placed in it by means of a syringe, (a holder from a Cornwall continuous pipettor is used to set the syringe to deliver a constant quantity but the continuous filling attachment is not used). Each tube is then gassed with CO_2 (surface gassing only), immediately stoppered and returned to the bath.

The tubes are incubated at 39°C for 48 hours. They are shaken individually and checked for leaks three times daily. The first shaking occurs shortly after adding the rumen liquor. At the end of the fermentation period the rubber stoppers are removed from the tubes. Any residue adherring to the stoppers is transferred back into the tubes with the aid of distilled water from a wash bottle. The tubes are then placed in the refrigerator at 1°C and later removed (by racks) and centrifuged at 2500 rpm for 15 minutes. The supernatants are then decanted. Next, the residue is washed by adding distilled water, stirring, centrifuging and decanting the supernatant.

Twenty-five ml. of pepsin solution is then added by the automatic pipettor to the residue in each tube. The tubes are then stoppered and incubated for another 48 hours at 39°C. They are again shaken individually three times daily. At the end of this incubation, the tubes are centrifuged and washed as before.

The tubes are next placed in an oven and dried at 80°C for at least 48 hours. At the end of the drying period, the tubes are cooled in a desicator and weighed. The dry weight of residue is then calculated. From this is subtracted the weight of residue found in the "blank" tubes (representing undigested food particles and microorganisms derived from the rumen liquor). Four "blank" tubes are included in each run. The weight of undigested residue from the tested forage is thus obtained and the dry matter digestibility calculated.

Our laboratory is equipped to handle an average of approximately 400 tubes per week. Two full-time technicians are required to maintain this capacity. At full capacity, the laboratory schedule is carried out on a two-week basis with the rumen liquor stage of 2 separate runs begun in one week followed by the pepsin stage the following week. This is necessitated because of the time interval spent centrifuging. The large capacity of our laboratory enables forages from all main treatment comparisons to be inoculated with rumen liquor from the same batch. Replicates can be included in the same run (if space) or else confounded with runs. This eliminates the problem of using different sources of rumen liquor with possibly differing digestive efficiency. Three sets of standard forages are included in each run in quadruplicate in order to have an accurate assessment of the digestive efficiency of the particular rumen liquor and pepsin solution.

MODIFICATIONS IN TECHNIQUES

(a) Elimination of moisture determination. A separate sample used for moisture determination was eliminated. This cut out three weighings and thus markedly speeded up the technique. Now, after the dried centrifuge tubes are weighed, a $\frac{1}{4}$ teaspoon is used to deliver approximately 250 mgms. of forage (when dried). The tube + sample is then dried and weighed. The dry matter weight of the sample is then calculated. A range of 180-300 mgms. is accepted.

(b) Elimination of mechanical shaker. The mechanical shaker used in one incubator bath did not appear to be shaking the tubes satisfactorily. A comparison was thus made of twice daily handshaking versus twice daily mechanical shaking for fifteen minutes. The average % DDM for 32 samples each was 72.3 for mechanical shaking compared to 73.9 for handshaking. This variability was too great and thus the mechanical shaker was abandoned. It was then decided to hand shake tubes three times daily - beginning immediately after putting rumen liquor or pepsin solution in the samples.

(c) Other attempts. Other possibilities which appear in the literature for speeding up the procedure were investigated - no washing after rumen liquor and only 24 hours of pepsin digestion. Both attempts proved unreliable.

(d) Design and standards. Forage from all main treatment comparisons will be inoculated with rumen liquor from the same batch. The large capacity of our laboratory enables this. Replicates can be included in the same run (if space) or else confounded with runs. This eliminated the problem which results from using different sources of rumen liquor with possibly differing digestive efficiency.

Three sets of standard forages will still be included in each run in order to have an accurate assessment of the particular rumen liquor and other solutions used. Also, the number of "blank" (no forage added) tubes per run has been increased from two to four to more accurately determine the amount of dry matter present in the residue which represents undigested foodparticles and microorganisms derived from the rumen liquor.

REPRODUCIBILITY OF TECHNIQUE

Three "standard" forages are included in quadruplicate in each run. Analysis of the results from 14 consecutive runs showed that, within a run, the standard error of the mean of quadruplicate measurements was ± .16 digestibility units. Between runs, the standard error of the means was ± .60. This high precision is very gratifying.

One of the "standard" forages has a known *in vivo* dry matter digestibility of 60.0 %. The average *in vitro* dry matter digestibility of this forage from 14 runs was 62.6%. Thus, our technique appears to be slightly overestimating the "true" digestibility.

LIGNIN ANALYSIS AND DEPOSITION

Preliminary investigations in this area were begun. An "ideal" method of analysis for lignin is still unavailable. However, the Sullivan (J. An. Sci. 18: 1292. 1959) technique was selected on the basis of simplicity and speed. However, it proved wholly unsatisfactory with leaf and stem portions. A critical examination of this and other methods of analysis for lignin is in order as this constituent will probably play a central role in future basic studies in forage quality.

DIGESTIBILITY OF FORAGES TREATED WITH KOH

The possibility of treating poor quality forages with KOH in order to make the energy in them more available was investigated. Approximately 2 gms. of each ground forage was soaked in 20 ml. of 1.5% KOH for 24 hours at room temperature. The solubility in KOH of each forage was determined along with the in vitro dry matter digestibility of the remaining insoluble portion.

	% DDM		
	Untreated	KOH Treated Insoluble Portion	% Soluble in KOH
Corn Stover	62.0	80.3	22.1
Corn Cob	47.8	69.7	19.7
Poor Hay (G63-67)	55.0	47.8	20.4
Soybean Stem	39.6	40.0	11.3

The soaking in 1.5% KOH markedly increased the digestibility of the corn stover and corn cobs. The dry matter digestibility of the corn stover even after the readily soluble portion was removed was approximately 80%. However, this concentration of KOH had little effect on the poor quality hay or soybean stems used.

A subsequent study was carried out in which different amounts of 1.5% KOH were added to approximately 250 mgms. of ground corn stover. At least three determinations per treatment were carried out.

Amount of 1.5% KOH Added (ml.)	% D.D.M.
0	61.8
.25	62.2
1.0	65.6*
2.5	81.3*

* Digestibility of portion insoluble in KOH.

It was concluded that a rather high level of KOH is required to obtain a satisfactory response using this procedure.

IN VITRO DRY MATTER DIGESTIBILITY

1. Whole Plant (Test 151, 157, 162)

The in vitro dry matter digestibilities (IVD) of the whole plant material have been completed for five of the six field replications in each of the three successive years or tests. Determinations for the sixth replicate are currently being completed. Digestions were conducted on each sample in duplicate.

Very distinct trends are evident. The overall IVD within a variety remained essentially constant for the first four cuttings. Then, in late May, the digestibilities began to drop rapidly. From then until the end of each study the average rate of decline of the 8 varieties was approximately .44 IVD units per day. However, the rate of depression varied with species.

The earliest maturing species orchardgrass had the lowest digestibility on a date basis. At the later cutting dates the IVDs of orchardgrass were markedly lower than that of bromegrass or alfalfa. However, when compared on a stage of maturity basis, the picture was quite different. At the "heads emerged" stage the orchardgrass had the highest IVD of all the species studied.

Similarly, the latest maturing species, timothy, tended to have the lowest IVD on a stage of maturity basis. Also, there was a general tendency for the later maturing varieties within a species to have a higher IVD on a date basis.

It is noteworthy that the IVD of bromegrass depressed only slightly after June 25. Also, the two varieties of bromegrass were quite similar in digestibility despite the distinct differences in type.

The IVD of alfalfa was rather similar to that of bromegrass throughout the various cutting dates. Vernal tended to have a slightly higher digestibility on a date basis than DuPuits.

On a date basis the IVDs were generally highest in 1961 and invariably the lowest in 1962. Average differences of as great as 6.5 IVD units occurred on a given date between these two years. However, the digestibility curves were very similar from year to year with mainly horizontal shifts occurring relative to date.

It may be concluded that dry matter digestibility is controlled by a combined effect of date of cutting, stage of maturity, and species characteristics. The dangers of an overall application of date of cutting or stage of maturity as an index of digestibility are evident unless regard is given to species and year of harvest.

2. Leaf-Stem (Test 157)

The IVDs of the leaf-stem portions have been completed for the six field replications for 1962. Determinations for the other two years are currently being completed. Single determinations were conducted on each sample.

The results are quite noteworthy. At the early cutting dates, the dry matter digestibility of the leaf and stem portions are quite comparable. With advancing maturity only small differences exist in the IVD between the leaf and stem portions of timothy and bromegrass. If this is borne out by further studies, selection for leafiness in these species would increase the energy digestibility only

slightly. However, marked differences existed in the IVD between the leaf and stem portions of orchardgrass and alfalfa particularly at the later cutting dates. Contrary to that with grasses, the leaves of alfalfa showed no depression in IVD with advancing maturity until the last cutting date. It is interesting that the IVD of both leaf and stem fractions of bromegrass depressed only slightly after June 25. Also, the digestibility of the stems of Saratoga and Canadian bromegrass were much similar despite the wide differences in grass structure. Furthermore, there is a tendency for both the leaf and stem portions of the later maturing varieties within a species to have a higher digestibility on a given date.

PER CENT IN VITRO DRY MATTER DIGESTIBILITIES OVER 3 YEARS*

(TEST 151, 157, 162)

1. WHOLE PLANT

Cut No.	Ave. Date.	Timothy Glimax	Timothy Essex	Orchard Frode	Orchard Ottawa	Brome Saratoga	Brome Canadian	Alfalfa Vernal	Alfalfa DuPuits	Average
A. Date Basis										
1	5-7	81.1	79.3	75.8	75.6	79.0	76.5	76.6	75.2	77.4 +
2	5-14	79.8	78.2	75.1	75.1	79.6	78.7	73.8	76.2	77.0
3	5-22	79.8	78.3	76.1	76.7	77.6	78.2	77.0	76.3	77.5
4	5-28	79.3	78.9	75.8	77.2	78.1	79.0	78.0	75.6	77.8
5	6-4	75.0	74.7	72.0	73.6	73.7	74.5	74.2	72.3	73.7
6	6-11	70.9	71.2	65.0	68.8	67.4	68.6	68.6	67.3	68.5
7	6-18	67.2	69.3	61.9	65.7	63.9	64.3	67.6	65.4	65.7
8	6-25	61.0	64.4	56.9	61.3	60.5	62.0	64.7	63.7	61.8
9	7-3	57.6	61.2	53.3	55.4	60.9	60.5	63.0	60.9	59.1
10	7-9	56.2	59.1	52.4	54.3	60.7	59.6	62.1	60.8	58.1
11	7-16	54.3	56.3	49.7	50.1	59.8	58.1	58.6	58.0	55.6
12	7-23	51.3	53.1	45.9	46.0	58.3	56.6	57.7	55.6	53.1
B. Stage of Maturity Basis										
Vegetative		79.8	78.2	75.1	75.1	79.6	78.7	73.8	76.2	77.0
Boot		70.9	68.0	74.6	74.5	74.8	76.2	70.4	70.3(M.Bud)	72.5
Heads Emerged		63.1	61.4	71.1	70.6	69.2	70.3	65.9	64.7(F.Fl.)	67.0
Flower		57.1	56.4	61.2	61.0	59.3	60.1	63.0	62.0(Fl.F.)	60.0
Early Seed		53.1	53.1	52.1	52.9	59.7	58.8	60.3	61.2	56.4

* With five of six replicates per year completed.

\+ Cut 1 for 1961 deleted.

PER CENT IN VITRO DRY MATTER DIGESTIBILITY

TEST 157 — 2. LEAF-STEM

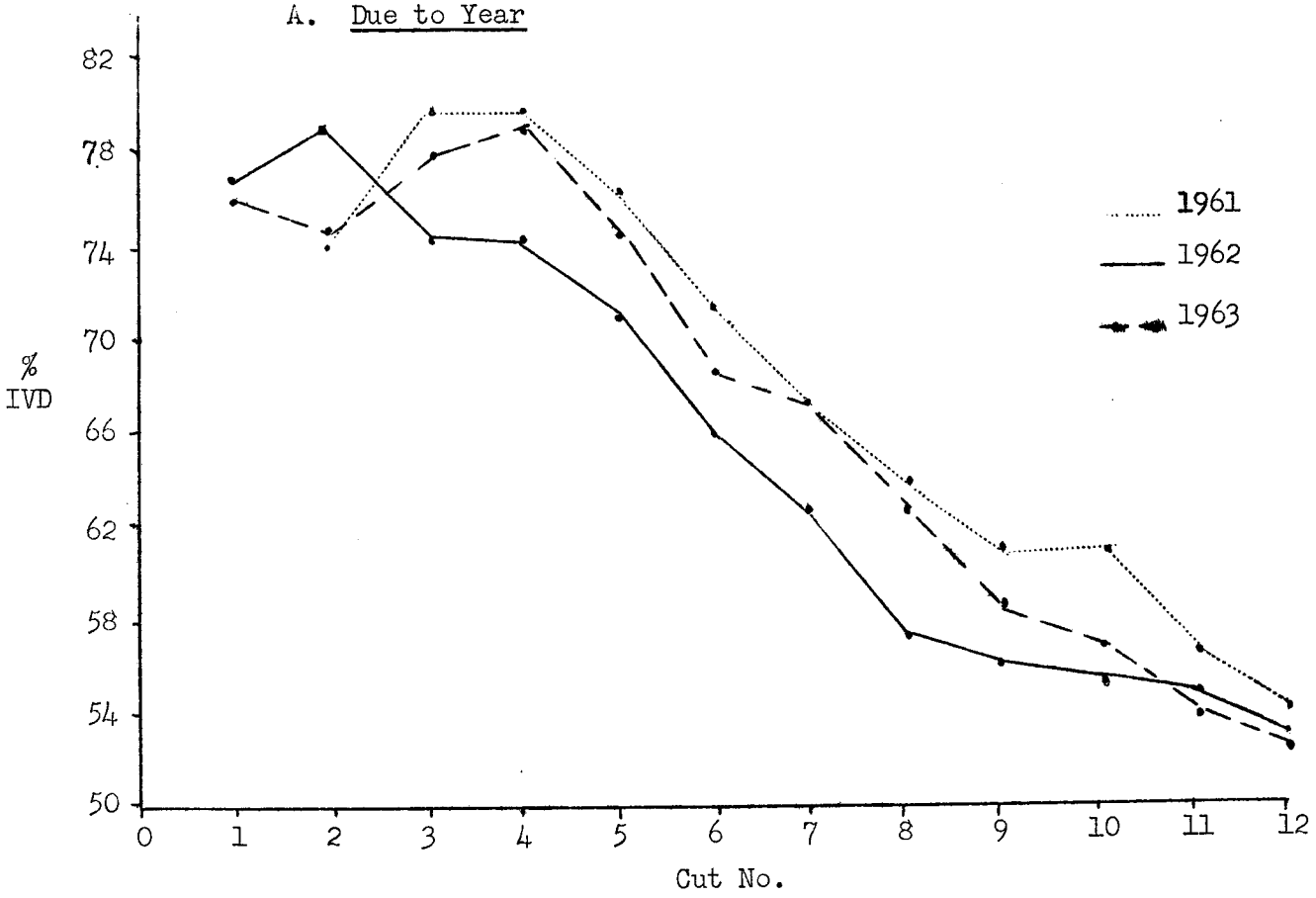
Cut No.	Ave. Date.	Timothy Climax	Timothy Essex	Orchard Frode	Orchard Ottawa	Brome Saratoga	Brome Canadian	Alfalfa Vernal	Alfalfa DuPuits
A. Leaf									
3	5-22			73.0	73.1	76.1	77.4*	77.8	77.2
4	5-28	75.3	77.0	71.2	72.3	74.8	75.6	79.4	77.6
5	6-4	72.7	73.5	69.1	69.1	72.9	70.5	77.8	77.0
6	6-11	70.1	70.1	66.4	65.7	70.1*	67.4	77.3	76.7
7	6-18	66.4	69.6	61.9	64.0	67.8*	64.8	77.0	77.0
8	6-25	63.1	65.9	59.5	62.7	64.4*	63.6	77.3	76.7
9	7-3	59.7	65.1	56.7	59.2	64.0*	62.2	76.6	77.2
10	7-9	58.8	62.2	56.9	58.6	65.1*	60.3	76.5	77.7
11	7-16	56.0	58.5	55.5	57.5	64.0*	59.7	77.2	77.9
12	7-23	52.1	53.4	51.2	54.9	64.2*	57.2	73.1	71.0
B. Stem									
3	5-22			77.1	77.8	75.8	80.4	70.0	65.7
4	5-28	80.1	80.1	75.5	79.8	75.4	79.9	66.4	63.0
5	6-4	74.1	74.9	66.6	74.2	68.8	72.0	61.4	58.8
6	6-11	66.8	70.5	58.2	63.9	63.3	63.9	55.4	53.2
7	6-18	62.4	68.0	50.6	55.3	58.1	57.2	53.4	50.9
8	6-25	58.1	60.2	47.0	50.0	56.2	57.4	52.0	49.6
9	7-3	54.1	57.0	41.4	44.7	58.3	57.4	50.5	48.5
10	7-9	50.9	55.0	39.4	39.8	59.1	58.7	50.0	48.0
11	7-16	53.2	53.9	36.8	39.3	59.5	60.1	49.0	48.1
12	7-23	51.9	52.2	32.6	35.7	59.4	56.6	47.0	46.0

* Due to analytical error 1 rack (16 samples) is being repeated. Average of only 4 of 6 replicates shown.

VARIATION IN IN VITRO DRY MATTER DIGESTIBILITY (IVD)

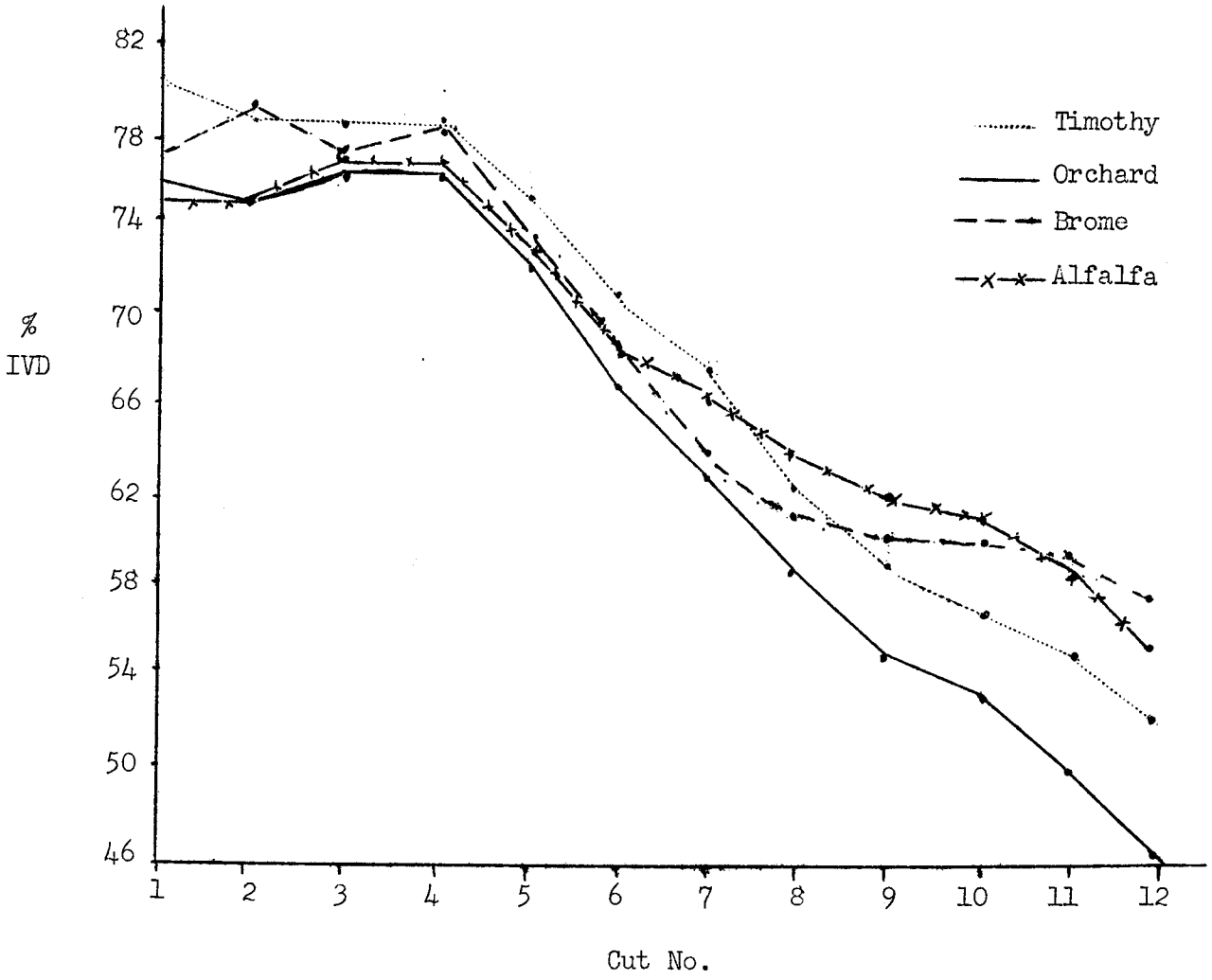
(Test 151, 157, 162)*+

A. Due to Year



* With five of six replicates per year completed.
\+ Cut 1 for 1961 deleted.

B. Due to Species



PER CENT CRUDE PROTEIN

1. Whole Plant (Test 151, 157, 162)

The marked differences in the crude protein content of legumes compared to grasses were again evidenced. The depression in the crude protein content with advancing cutting date or maturity was much more pronounced with the grasses than with alfalfa.

Only minor differences occurred in the protein content of the grasses on a given date. However, there was a tendency for the later maturing varieties within a species to have a higher protein content. Also, the protein content of Canadian was consistently slightly higher than that of Saratoga bromegrass. Furthermore, on a stage of maturity basis, timothy tended to have a slightly lower protein content than the other grasses.

2. Leaf-Stem (Test 151, 157)

Analyses of the crude protein content of leaf-stem fractions have been completed for tests 151 and 157. The protein content of leaves was consistently much higher than that of stems. The depression in the crude protein content with advancing cutting date was much more pronounced with both the leaf and stem portions of grasses than with alfalfa. Also, the stems, in addition to the leaves of alfalfa, were much higher in crude protein content than that of the grasses.

PER CENT CRUDE PROTEIN OVER 3 YEARS

1. WHOLE PLANT

(Test 151, 157, 162)

Cut No.	Ave. Date.	Timothy		Orchard		Brome		Alfalfa		Average
		Climax	Essex	Frode	Orchard	Saratoga	Canadian	Vernal	DuPuits	
A. Date Basis										
1	5-7	26.2	28.2	28.0	31.8	27.4	28.2	32.3	35.8	29.7+
2	5-14	23.0	24.3	23.2	29.0	22.4	25.6	32.0	33.1	26.6
3	5-22	17.1	18.4	16.0	22.4	17.1	20.3	27.1	27.5	20.7
4	5-28	14.6	14.7	13.0	18.0	14.2	17.0	24.1	23.6	17.4
5	6-4	12.5	13.5	10.8	14.6	11.6	13.7	22.3	21.7	15.1
6	6-11	10.3	12.2	9.2	12.2	9.3	10.9	20.3	19.6	13.0
7	6-18	9.5	10.0	8.4	10.7	8.5	9.7	18.8	17.9	11.7
8	6-25	8.6	9.0	7.5	9.4	7.1	8.4	17.4	16.6	10.5
9	7-3	7.5	7.8	6.9	8.2	6.5	7.4	16.1	16.0	9.6
10	7-9	6.7	7.2	6.6	7.6	5.9	6.5	15.8	15.2	8.9
11	7-16	5.9	6.3	6.1	6.9	5.4	6.1	14.4	14.0	8.1
12	7-23	5.7	6.2	6.2	6.3	5.0	5.9	14.4	13.8	7.9
B. Stage of Maturity Basis										
Vegetative		23.0	24.3	23.2	29.0	22.4	25.6	32.0	33.1	26.6
Boot		10.6	9.6	13.3	15.7	13.4	14.7	20.8	21.5(M.Bud)	15.0
Heads Emerged		8.9	8.3	11.0	12.7	10.0	11.7	17.7	17.0(F.Fl.)	12.2
Flower		6.9	6.7	8.2	9.6	6.7	7.2	16.7	16.2(Fl.F.)	9.8
Early Seed		5.7	6.2	6.6	7.6	5.8	6.3	15.6	15.6	8.7

+ Cut 1 for 1961 deleted.

PER CENT CRUDE PROTEIN 2. LEAF-STEM*

(Test 151, 157)

Cut No.	Ave. Date	Timothy Climax	Timothy Essex	Orchard Frode	Orchard Ottawa	Brome Saratoga	Brome Canadian	Alfalfa Vernal	Alfalfa DuPuits
A. Leaf									
3	5-22							33.8	34.4
4	5-28	15.6	16.0	15.6	18.9	15.4	18.4	31.6	32.0
5	6-4	14.2	14.6	13.4	15.6	14.8	17.7	32.3	31.8
6	6-11	13.0	12.9	11.4	13.9	13.4	14.8	30.4	30.2
7	6-18	12.2	12.3	10.6	12.3	12.9	14.8	29.4	28.0
8	6-25	11.7	11.8	9.3	11.5	12.2	13.1	27.5	26.7
9	7-3	10.0	10.4	8.5	9.9	11.9	12.4	26.6	26.0
10	7-9	9.1	9.6	7.9	9.2	11.0	11.9	24.4	23.8
11	7-16	8.4	8.8	7.6	9.0	10.1	11.3	23.8	23.2
12	7-23	7.3	8.2	8.1	8.9	10.2	10.6	23.2	23.4
B. Stem									
3	5-22								
4	5-28	11.6	11.6	8.9	10.0	10.0	13.2	15.2	14.8
5	6-4	9.0	10.2	7.3	8.1	7.4	9.6	13.4	12.2
6	6-11	6.9	8.1	6.2	7.0	6.4	7.8	11.2	10.2
7	6-18	6.1	6.4	5.2	5.8	5.6	7.1	10.0	9.5
8	6-25	5.8	5.8	4.9	5.3	4.7	5.6	9.8	9.2
9	7-3	5.5	5.4	4.8	4.6	4.0	5.0	9.3	9.0
10	7-9	5.0	5.4	4.2	4.3	3.8	4.6	9.2	9.0
11	7-16	4.8	4.9	3.8	4.0	3.7	4.5	9.6	9.0
12	7-23	4.8	4.7	2.9	3.3	4.0	4.4	9.8	9.4

* Average of 2 years data.

PLANT COMPETITION DURING THE SEEDLING YEAR IN ALFALFA-GRASS ASSOCIATIONS ESTABLISHED WITHOUT A COMPANION CROP, 1961 AND 1962.

TESTS 159 AND 164

A part of the data obtained from these studies was used as a M.S.A. thesis by David J. Hume. A partial summary of this thesis is given below. However, the data for the residual effect of seedling year treatments on the hay crop the following year are shown in the table for test 164.

Partial Thesis Summary

Two growth types of alfalfa represented by the varieties DuPuits and Vernal were each sown with either bromegrass, orchardgrass, or timothy in simple mixtures to study inter-specific competition during the seedling year. Competition was studied by determining the effects of the alfalfa varieties on the growth of the grass plants and visa versa. Hay and pasture cutting managements and four combinations of stubble heights were applied and plant characteristics measured.

1. In the pasture management, the greatest interspecific competition occurred during the first aftermath growth. Although differences in the alfalfa and grass growth occurred by the first pasture cutting date, the related effects of one species on its mixture component were small. Plant measurements in September revealed plant vigor differences remained from the first aftermath competition, but yield differences due to competing species had disappeared.

2. Mixtures handled as hay permitted greater development of the first growth before cutting, hence unlike the pasture management, stand, yield and vigor differences among the competing grasses resulted in variations in the top weights and yields of associated alfalfa plants. Grass tiller development was affected by competition from associated alfalfa varieties.

3. Frequent clipping favoured the grass component in mixtures. The grasses were also favoured by higher stubble heights.

4. Stand counts throughout the growing season indicated seeds continued to germinate during the summer.

5. Highest yields were obtained from plots handled as hay. Increasing the grass percentage in the hay by higher cutting, decreased yields. DuPuits-timothy gave the highest yield but had the least vigorous grass.

6. DuPuits-orchard gave the highest pasture yields and much better pasture aftermath production.

TEST 164

HAY YIELDS (1963) FOLLOWING SEEDLING YEAR MANAGEMENTS (1962)

Seeded: 1962
Harvested: June 18, 1963

Man.	Hay Management Yield DM lb/A	% Alfalfa	Yield Alfalfa	% Grass	Yield Grass	Plant Vig-5 Pl. Alfalfa	Plant Vig-5 Pl. Grass	Pasture Management Yield DM lb/A	% Alfalfa	Yield Alfalfa	% Grass	Yield Grass	Plant Vig-5 Pl Alfalfa	Plant Vig-5 Pl Grass
DuPuits														
+ Brome														
*2"-2"	5426	62.1	3369	37.9	2057	13.8	26.8	5179	72.1	3734	27.9	1445	13.3	19.8
2"-6"	5442	60.4	3287	39.6	2155	12.2	36.5	5225	57.7	3015	42.3	2210	13.3	32.4
6"-2"	5340	60.7	3241	39.3	2099	10.8	22.3	5140	67.8	3485	32.2	1655	16.0	40.9
6"-6"	5422	60.4	3275	39.6	2147	12.0	31.1	5489	46.6	2558	53.4	2931	15.4	38.8
+ Orchard														
2"-2"	4779	77.8	3718	22.2	1061	12.2	12.7	4788	75.2	3601	24.8	1187	14.3	16.9
2"-6"	4939	74.9	3699	25.1	1240	18.0	18.8	4691	69.0	3237	31.0	1454	10.1	16.5
6"-2"	4819	74.9	3609	25.1	1210	13.6	14.6	4710	69.9	3292	30.1	1418	11.7	19.1
6"-6"	4937	71.0	3505	29.0	1432	15.1	12.3	5102	57.4	2929	42.6	2173	13.2	19.3
+ Timothy														
2"-2"	4785	78.3	3747	21.7	1038	13.1	11.4	4949	84.9	4202	15.1	747	14.7	8.2
2"-6"	5083	77.6	3944	22.4	1139	16.7	8.4	3975	86.3	3430	13.7	545	13.3	13.7
6"-2"	5128	77.2	3959	22.8	1169	15.4	7.5	5021	82.3	4132	17.7	889	15.2	14.5
6"-6"	5113	80.0	4090	20.0	1023	16.8	10.8	4946	81.0	4006	29.0	940	14.9	14.7
Vernal														
+ Brome														
2"-2"	5689	60.5	3442	39.5	2247	15.2	33.9	5546	55.7	3089	44.3	2457	10.4	31.9
2"-6"	6001	51.3	3079	48.7	2922	15.7	29.7	5593	47.6	2662	52.4	2931	9.5	31.1
6"-2"	5925	53.8	3188	46.2	2737	13.0	33.0	5591	47.1	2633	52.9	2958	14.2	35.8
6"-6"	6104	41.0	2503	59.0	3601	14.3	37.4	5609	48.6	2726	51.4	2883	12.7	38.0
+ Orchard														
2"-2"	5445	72.7	3959	27.3	1486	19.4	15.6	5067	67.7	3430	32.3	1637	11.0	17.1
2"-6"	5429	74.6	4050	25.4	1379	12.1	16.8	4885	63.3	3092	36.7	1793	14.4	13.3
6"-2"	5098	72.6	3701	27.4	1397	15.9	16.2	4942	73.5	3632	26.5	1310	14.8	14.0
6"-6"	5222	72.8	3802	27.2	1420	15.0	22.3	4772	64.7	3087	35.3	1685	13.9	16.3
+ Timothy														
2"-2"	5405	80.3	4340	19.7	1065	28.5	13.1	5187	78.9	4093	21.1	1094	18.6	17.6
2"-6"	5461	77.0	4205	23.0	1256	18.5	11.2	5343	75.1	4013	24.9	1330	17.7	12.4
6"-2"	5306	80.4	4266	19.6	1040	29.5	11.7	5263	79.1	4163	20.9	1100	15.0	8.9
6"-6"	5448	76.1	4146	23.9	1302	15.3	19.5	5428	71.9	3903	28.1	1525	20.0	15.1

* Indicates cutting height of first and second harvests in seeding year; ** Dry weight in grams.

BARLEY VARIETIES AND ESTABLISHMENT

TEST 166

Outline: 1962 Report.

Results:

The data collected in 1963 is shown in the tables. Some points of interest might be:

1. Establishment of this test was good. By fall, barley had 15% fewer alfalfa plants than oats or no companion; the brome plants had thinned about 20% and 40% under each, respectively. There were little differences among the barley varieties and mixed grain in stand.

2. Alfalfa plants were taller under the Herta variety throughout and its early development also appears to be faster under it.

3. The alfalfa plant weights were higher in the early samplings under Herta and Garry but the October sampling showed smaller top weights from the mixed grain and Garry. This may have been due to oat grain shatter and their seedling development. The brome weights were also lower.

5. The brome and alfalfa plants which were cut to a 2 inch height following grain harvest, were similar in height and development on October 1 under the various companion crops, but were taller and more vigorous where no companion crop was used.

TEST 166 BARLEY VARIETY AND ESTABLISHMENT (1963)

Seeded: April 29, 1963 Underseeded with Vernal and Lincoln Location: C-2

10 Plant Samples

	Variety					
	York	Herta	Parkland	Mix.Grain	Garry	No Companion
Main Stems Per Foot of Row	33.5	36.3	22.8	34.0	25.3	
Establishment						
Spring						
Vernal	29.4	30.5	26.9	29.3	29.2	41.9
Lincoln	14.1	15.2	13.5	17.2	15.7	25.0
Fall						
Vernal	22.1	22.3	21.4	21.5	24.0	25.1
Lincoln	12.3	12.6	12.2	11.6	15.1	20.6
July 4, 1963						
Vernal Alfalfa						
Height	23	24	22	22	23	36
Tillers	1.0	1.0	1.0	1.0	1.0	1.4
Dry Weight	1.06	1.28	.96	1.12	1.21	5.52
Lincoln Brome						
Height	18	17	21	19	20	27
Tillers	1.0	1.0	1.0	1.0	1.0	3.3
Dry Weight	.32	.36	.46	.49	.70	4.84
July 25, 1963						
Vernal Alfalfa						
Height	24	30	26	22	26	46
Tillers	2.1	2.7	2.1	2.2	2.0	2.6
Dry Weight	2.06	2.65	2.06	1.56	2.08	12.48
Lincoln Brome						
Height	18	17	19	19	18	37
Tillers	1.5	1.2	1.5	1.4	1.2	4.5
Dry Weight	.53	.56	.60	.75	.66	9.75
August 7, 1963						
Vernal Alfalfa						
Height	36	41	39	33	31	52
Tillers	2.7	2.8	2.8	2.4	2.4	3.7
Dry Weight	--	3.73	3.62	3.53	3.44	19.69
Lincoln Brome						
Height	28	28	27	26	24	59
Tillers	2.4	2.0	2.2	2.4	1.6	5.9
Dry Weight	.87	.89	.87	1.03	1.12	19.72
October 1, 1963						
Vernal Alfalfa						
Height	32	34	32	31	28	47
Tillers	4.6	4.6	4.8	5.0	4.4	4.2
Dry Weight	12.0	12.7	12.9	10.8	10.4	19.5
Lincoln Brome						
Height	24	23	23	22	21	28
Tillers	8.0	7.7	8.5	7.4	8.0	8.5
Dry Weight	7.4	7.2	7.6	6.6	6.6	10.8

OAT LODGING AND FORAGE ESTABLISHMENT

TEST 167

Outline: 1962 Report.

Results:

The data collected in 1963 is shown in the tables. Some of the results are:

1. Early severe and late lodged oats were reduced in yield with the former also having lighter seed and more hull.

2. The companion crop of oats reduced the stand of both alfalfa and brome. Early lodging and late severe reduced stands of alfalfa and brome in the fall.

3. Lodged oats intercepted more light at ground level than unlodged and this increased as the season advanced. Late moderate lodging produced the best stand and had less light intercepted than the other treatments.

4. In all cases the plants were more vigorous where no companion crop was used. At the first lodging date, July 4, the alfalfa and brome were twice as tall, further developed and several times heavier under the no companion crop as under oats.

5. At the second lodging, July 31, in general, the alfalfa and brome seedlings had not grown under the oats since the previous sampling but they had doubled in development and weight under the no companion crop. For the characters studied, the early lodged oat treatments gave alfalfa and brome plants similar to those as under unlodged oats.

6. At the time of oat harvest (August 7) the alfalfa plants were the same height and development under all oat treatments. However, they were slightly heavier under the late severe lodging where the stand was thinner. The bromegrass was lighter in weight and had fewer stools under this treatment. Both species had twice the height and development and several times the top growth weight where no companion crop was used.

7. Although all plots were trimmed off to 2 inches following oat harvest, the no companion crop plants still were more vigorous on October 1. All the alfalfa was similar in height but the thinner stand under late severe lodging was reflected in heavier and more developed plants. Bromegrass again showed less development under this treatment.

TEST 167

OAT LODGING (1963)

Seeded: April 29, 1963 Location: C-2 Oats Harvested: Aug. 8

Lodging Treatment	Oat Yield and Quality: Oat Yield Lb/A	Oat Weight Lb./A.	1000 Seed Wt. Gms.	Per Cent Hull	Establishment: Plants/Square Foot: Spring: Vernal	Spring: Lincoln	Fall: Vernal	Fall: Lincoln	% Light Interception: July 4	July 31	Aug. 8
Early, moderate	2077	33.7	26.0	30.2	31.8	14.4	13.8	7.8	74	77	84
Early, severe	1707	29.5	25.3	32.3	29.5	14.0	14.2	7.4	79	80	82
Late, moderate	1818	33.6	27.9	29.6	30.9	14.1	20.8	12.5	69	79	80
Late, severe	1745	33.8	27.5	29.8	30.8	12.5	14.4	9.7	72	82	86
No lodging	2056	33.3	26.4	30.2	29.8	13.7	20.2	11.8	70	72	78
No companion					33.9	18.5	21.2	17.3	49	74	79

Straw Yield - 3778 lb/acre.

TEST 167
Seeded: April 29

OAT LODGING (1963)

10 Plant Samples

Location: C-2

	Lodging Treatment					
	Early, Moderate	Early, Severe	Late, Moderate	Late, Severe	No Lodging	No Companion
July 4, 1963						
Vernal Alfalfa						
*Height					18.0	37.0
Tillers					1.0	1.2
**Dry Weight					.8	6.7
Lincoln Brome						
Height					25.0	31.0
Tillers					1.0	2.7
Dry Weight					.6	6.3
July 25, 1963						
Vernal Alfalfa						
Height	16.0	20.0			16.0	41.0
Tillers	1.6	1.9			1.6	3.0
Dry Weight	.7	.8			.6	13.1
Lincoln Brome						
Height	25.0	28.0			21.0	40.0
Tillers	1.0	1.1			1.1	5.1
Dry Weight	.7	.7			.5	14.3
August 7, 1963						
Vernal Alfalfa						
Height	26.0	25.0	26.0	28.0	28.0	45.0
Tillers	2.1	2.1	2.1	2.0	2.1	3.8
Dry Weight	1.6	1.4	1.6	2.0	1.3	16.9
Lincoln Brome						
Height	29.0	30.0	28.0	24.0	24.0	54.0
Tillers	2.1	1.9	2.0	1.6	2.0	5.4
Dry Weight	1.0	1.0	1.0	.7	.9	22.1
October 1, 1963						
Vernal Alfalfa						
Height	20.0	21.0	19.0	19.0	21.0	32.0
Tillers	3.9	4.2	4.8	4.9	3.9	4.2
Dry Weight	7.9	8.9	8.2	9.5	9.3	13.9
Lincoln Brome						
Height	18.0	20	18.0	16.0	17.0	26.0
Tillers	8.0	8.1	9.1	7.5	7.9	8.6
Dry Weight	6.4	6.6	7.5	5.2	7.3	9.4

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FORAGE PROGRESS REPORT 1963

This report contains data on Crop Science Department forage trials. It includes data on variety trials and results of breeding experiments. Most of the variety trials are reported in the "1963 Report on Field Trials of Varieties and Mixtures". That report and the present report should be filed together. The report is prepared for use of the members of the Crop Science Department and for those associated with the forage program.

CONTENTS

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

1963 GROWING SEASON WEATHER RECORDS

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Harrow	Max.	56.2	65.5	79.0	82.1	76.1	71.4
	Min.	37.0	45.8	56.1	61.9	58.4	50.7
Ridgetown	Max.	56.1	64.4	77.6	81.2	76.4	70.6
	Min.	35.0	44.2	56.1	60.8	56.3	48.7
Guelph	Max.	54.4	61.9	76.1	79.0	73.3	67.0
	Min.	32.0	40.0	50.3	55.9	51.3	42.6
Kemptville	Max.	52.7	63.9	78.8	81.5	74.3	66.4
	Min.	31.5	41.4	54.1	59.0	52.6	41.5
Ottawa	Max.	52.5	64.0	78.6	80.3	72.6	64.5
	Min.	33.1	41.8	55.5	60.5	53.7	43.4
New Liskeard	Max.	46.8	59.0	75.8	77.4	66.9	66.9
	Min.	27.4	36.1	48.8	55.7	50.6	51.0
Kapuskasing	Max.	43.9	56.3	73.8	75.2	66.8	58.4
	Min.	23.1	31.2	43.5	52.3	45.0	39.9
Gore Bay	Max.	51.2	59.5	73.1	78.1	71.7	63.9
	Min.	28.7	36.0	48.9	55.9	52.1	44.1
Fort Frances	Max.	50.7	60.5	74.7	78.2	75.0	68.6
	Min.	29.3	39.3	54.7	58.2	52.9	47.2

PRECIPITATION						
Harrow	3.5	2.0	2.2	1.5	1.9	1.5
Ridgetown	4.1	3.4	2.1	2.8	1.5	1.3
Guelph	2.7	3.0	0.6	3.2	2.2	1.9
Kemptville	3.2	2.2	0.7	1.6	4.3	4.1
Ottawa	2.5	2.6	1.5	3.2	3.5	4.8
New Liskeard	1.2	1.6	1.4	1.9	6.7	2.1
Kapuskasing	2.7	2.4	3.2	4.9	3.6	1.8
Gore Bay	2.4	1.7	1.3	2.9	2.8	1.2
Fort Frances	3.5	4.4	2.1	4.4	3.9	2.4

DEPARTURES OF 1963 GROWING SEASON FROM NORMAL

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Harrow	Max.	+0.2	-2.8	+0.2	-1.3	-5.5	-3.0
	Min.	+0.2	-1.8	-2.3	-0.8	-2.9	-3.8
Ridgetown	Max.	+2.5	-0.9	+0.4	-1.1	-4.0	-2.0
	Min.	-1.2	-2.2	-0.7	-0.7	-3.9	-5.2
Guelph	Max.	+3.1	-2.0	+1.8	-0.3	-4.4	-2.8
	Min.	-1.3	-3.6	-3.0	-1.5	-4.7	-6.5
Kemptville	Max.	+0.4	-2.6	+2.4	+0.1	-4.8	-3.5
	Min.	-1.3	-2.4	+0.5	+1.1	-2.9	-6.3
Ottawa	Max.	+2.2	-1.4	+3.6	+0.4	-5.6	-3.8
	Min.	+0.7	-1.9	+2.0	+2.6	-1.9	-4.7
New Liskeard	Max.	+0.9	-3.2	+3.4	+0.6	-7.9	+2.0
	Min.	+3.1	-0.3	+1.3	+2.6	-0.1	+7.9
Kapuskasing	Max.	+1.2	-1.2	+4.5	+1.0	-4.7	-2.1
	Min.	+1.6	-3.8	-3.1	+0.3	-5.3	-1.5
Gore Bay	Max.	+2.6	-2.2	+2.4	+0.3	-4.5	-2.6
	Min.	+0.5	-2.6	+0.2	+1.6	-1.8	-2.7
Fort Frances	Max.	+1.7	-2.5	+2.5	-0.1	0	+4.2
	Min.	+0.9	-1.3	+4.0	+1.9	-1.1	+2.7

PRECIPITATION						
Harrow	+0.8	-0.7	-0.9	-1.0	-0.7	-0.8
Ridgetown	+1.0	+0.4	-0.7	0	-0.9	-1.2
Guelph	0	-0.2	-2.4	0	-0.8	-1.0
Kemptville	+0.5	-0.7	-1.9	-1.2	+1.4	+1.1
Ottawa	-0.2	-0.2	-1.6	0	+0.2	+1.6
New Liskeard	-0.5	-0.6	-1.9	-1.7	+3.6	-1.2
Kapuskasing	+1.0	-0.1	+0.3	+1.8	+0.5	-1.3
Gore Bay	-0.2	-0.7	-1.5	+0.7	+0.5	-2.2
Fort Frances	+1.5	+1.7	-2.0	+0.6	0	-0.9

1931-1960 MONTHLY AVERAGES OF RAINFALL AND TEMPERATURE FOR GROWING SEASON

TEMPERATURE		APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Harrow	Max.	56.0	68.3	78.8	83.4	81.6	74.4	62.9
	Min.	36.8	47.6	58.4	62.7	61.3	54.5	44.1
Ridgetown	Max.	53.6	65.3	77.2	82.3	80.4	72.6	60.9
	Min.	36.2	46.4	56.8	61.5	60.2	53.9	43.9
Guelph	Max.	51.3	63.9	74.3	79.3	77.7	69.8	57.9
	Min.	33.3	43.6	53.3	57.4	56.0	49.1	39.3
Kemptville	Max.	52.3	66.5	76.4	81.4	79.1	69.9	57.4
	Min.	32.8	43.8	53.6	57.9	55.5	47.8	37.0
Ottawa	Max.	50.3	65.4	75.0	79.9	78.2	68.3	55.9
	Min.	32.4	43.7	53.5	57.9	55.6	48.1	37.5
New Liskeard (1921-1950 normals)	Max.	45.9	62.2	72.4	76.8	74.8	64.9	
	Min.	24.3	36.4	47.5	53.1	50.7	43.1	
Kapuskasing	Max.	42.7	57.5	69.3	74.2	71.5	60.5	48.1
	Min.	21.5	35.0	46.6	52.0	50.3	41.4	33.0
Gore Bay	Max.	48.6	61.7	71.7	77.8	76.2	66.5	55.2
	Min.	28.2	38.6	48.7	54.3	53.9	46.8	37.6
Fort Frances	Max.	49.0	63.0	72.2	78.3	75.0	64.4	53.2
	Min.	28.4	40.6	50.7	56.3	54.0	44.5	34.8

PRECIPITATION							
Harrow	2.7	2.7	3.1	2.5	2.6	2.3	2.2
Ridgetown	3.1	3.0	2.8	2.8	2.6	2.5	2.7
Guelph	2.7	3.2	3.0	3.2	3.0	2.9	2.6
Kemptville	2.7	2.9	2.6	2.8	2.9	3.0	2.6
Ottawa	2.7	2.8	3.1	3.2	3.3	3.2	2.6
New Liskeard (1921-1950 normals)	1.7	2.2	3.3	3.6	2.9	3.3	
Kapuskasing	1.7	2.5	2.9	3.1	3.1	3.1	2.4
Gore Bay	2.6	2.4	2.8	2.2	2.3	3.4	3.1
Fort Frances	2.0	2.7	4.1	3.8	3.9	3.3	1.9

ALFALFA

In 1963 yield data and other observations were taken from Preliminary Trials seeded in 1960 and in 1962 and from a Performance Trial seeded in 1961. In addition a second Performance Trial together with some introductions were seeded and successfully established.

Alfalfa Provincial Preliminary Trial, 1960 (Test 545)

In this test seeded in 1960 there was a thinning of the stand, especially in the section harvested as pasture, as shown in the table below.

Number of Plants per Square Foot, November 12, 1963

	Normal Management	Mismanaged Section
High Seed Narragansett	5-6	3.5-4
Narragansett	4.5-5.5	3.5-4.5
Vernal	4.5-5	3-4
Cayuga	4.5-5.5	3.5-4.5
DuPuits	5.5-6	3-4
Saranac	5.5-6	3.5-4
Haymor (502)	5.5-6.5	3-3.5
Orchies	4.5-5	3-4

Although the plant counts shown above do not provide any indication that bacterial wilt is affecting the stand, it is interesting to note that in 1963 Saranac and Wilt-resistant Narragansett outyielded their wilt susceptible counterparts by 400-500 pounds whereas in 1962 there was little difference.

In none of the three years from 1961-63 did Cayuga or Haymor show to advantage. The leading variety over the three-year period, Saranac, was in third position in 1961, second in 1962, and first in 1963. High Seed Set Narragansett owes its second place ranking mainly to its high yields in the first cut of 1961 and 1962. Although Vernal was outyielded by DuPuits and Saranac and by the two Narragansett derivatives, it outyielded all the others.

The same 13 varieties were sown at Kemptville in the same year. Over the three-year period the best variety outyielded the poorest by only 12% but the ranking at the two stations showed some lack of parallelism. DuPuits was among the highest at Guelph and second last at Kemptville, while Cayuga was well down at Guelph and well up at Kemptville. On the other hand, Saranac excelled at both localities.

ALFALFA PROVINCIAL SCREENING TRIAL, GUELPH, 1960 SEEDING

Test 545

1961-3 Yields in Lbs. D.M. per Acre

	1963					1962			1961		Three-Year Average			
	Cut 1 Jun.13	Cut 2 Jul.11	Cut 3 Aug.21	Aft. Past.	Total	Hay	Aft. Past.	Total	Hay	Aft. Past.	Hay	Past.	Total	Rank
High Seed Set Narragansett	3935	1343	1862	3205	7140	4088	3636	7724	4658	3466	4227	3436	7663	2
Wilt Resistant Flemish	4609	1480	1950	3430	8039	3519	3901	7420	4373	3616	4167	3649	7816	1
Vernal	4262	1089	1782	2871	7133	3749	3526	7275	4744	3348	4252	3248	7500	5
Wilt Resistant Narragansett	4454	1275	1772	3047	7501	3565	3569	7134	4813	3394	4277	3337	7614	4
DuPuits	4298	1501	1815	3316	7614	3289	4132	7421	4222	3614	3936	3687	7623	3
Cardinal	3974	1462	1827	3289	7263	3323	3927	7250	4389	3547	3895	3588	7483	6
Narragansett	4026	1187	1840	3027	7053	3633	3520	7133	4555	3391	4071	3313	7377	7
Orchies	3655	1314	1817	3131	6786	3389	3888	7277	4073	3595	3706	3538	7244	11
Haymor NK 502	4101	1332	1787	3119	7220	3211	3772	6983	4323	3488	3878	3459	7337	8
Cayuga	4031	1324	1732	3056	7087	3524	3595	7119	4060	3486	3872	3379	7251	10
NK 503	4052	1070	1710	2780	6832	3461	3452	6933	4338	3279	3950	3170	7127	13
N.Y. Syn A	4319	1430	1675	3105	7424	3321	3701	7022	4293	3093	3978	3300	7278	9
NK 504	4212	1332	1812	3144	7356	3477	3571	7048	3832	3380	3840	3365	7205	12
Mean	4149	1319	1799	3118	7267	3505	3706	7210	4359	3438	4004	3421	7425	
	N.S.	275	N.S.			319		N.S.	N.S.	142				
	9.6	14.6	7.8			6.3		5.0	10.2	3.0				

ALFALFA PROVINCIAL PRELIMINARY TRIAL, 1962 - TEST 573

1962 Seeding on 11E

In this O.A.C. test, as in the corresponding one at Kemptville, Mega and Glacier looked very promising. Since both of these are likely to have a satisfactory level of winterhardiness they may provide strong competition to DuPuits in the future.

PROVINCIAL ALFALFA PRELIMINARY TRIAL, 1962 SEEDING, GUELPH

Test 573

1963 Yields in Pounds Dry Matter per Acre

	Cut 1		Cut 2	Cut 3	Summer Aft.		October Aft.		Seasonal Total	
	Yield	Rank	Yield	Yield	Yield	Rank	Yield	Rank	Yield	Rank
Vernal	4385	2	2010	2925	4935	11	1595	10	10915	8
DuPuits	4016	10	2380	3025	5405	1	1921	2	11342	3
Beaver	4075	7	1830	2836	4666	12	1042	12	9783	12
Tuna	4054	8	2320	2815	5135	6	1555	11	10744	9
Glacier	4427	1	2350	2915	5265	4	1738	8	11430	2
Eynsford	4049	9	2160	3103	5263	5	1976	1	11288	5
Progress (CL-10)	3892	12	1960	3061	5021	9	1696	9	10609	11
Mega	4312	4	2400	2968	5368	2	1824	6	11504	1
Warrior (NK 507)	4150	5	2240	3028	5268	3	1906	3	11324	4
NK 508	4148	6	2130	2978	5108	7	1881	4	11137	7
A 9 H	3927	11	2070	2901	4971	10	1846	5	10744	9
Europe	4351	3	2230	2870	5100	8	1751	7	11202	6
Mean	4146		2175	2953	5128		1722		10996	
L.S.D. 5%	324		129	153	347		191		674	
C.V.	6.8		5.1	4.5	4.7		7.7		4.4	

No winter damage.

Order of maturity and speed of recovery after cutting:

DuPuits, Mega, Glacier, Europe, Eynsford;
Tuna, 507, 508;
A 9 H;
CL10, Vernal, Beaver.

ALFALFA PERFORMANCE TRIAL, 1961 - TEST 570

Seeded in 1961 on 18E

In the section managed as hay and aftermath pasture the difference between the four leading varieties, i.e. disregarding Beaver, was less than 5%. In the pasture section, over the 2-year period, there was an 8% spread. The overall averages for the five varieties for 1962-3 were

Ontario Variegated	9394 lbs.
H.S. Narragansett	9201 lbs.
Vernal	9098 lbs.
Cayuga	9052 lbs.
Beaver	8294 lbs.

As shown by the above averages and by the accompanying tables no one variety has shown any distinct superiority over the others. On the other hand, Beaver, with a yield about 10% lower than that of the other four, can definitely be regarded as unsatisfactory for this area.

ALFALFA, FINAL EVALUATION TRIAL, GUELPH, 1961 SEEDING

Test 570

1963 Yields in Lbs. D.M. (Legume + grass) per Acre

Variety	Management System: Hay and Aftermath Pasture					Management System: Pasture				
	Cut 1 Jun.17	Cut 2 Jul.17	Cut 3 Aug.21	Cut 4 Oct.11	Total	Cut 1 May 31	Cut 2 Jul. 2	Cut 3 Jul.31	Cut 4 Sept.4	Total
Cayuga	4942 83	1605 96	2400 88	1220	10167	2822 96	2005 99	1667 99	1430 96	7924
Vernal	5062 75	1380 95	2423 77	1120	9985	3001 88	1867 99	1612 98	1295 94	7775
Beaver	5162 55	1317 93	2103 71	650	9232	3152 72	1602 97	1362 93	1022 88	7138
Ont. Variegated	4710 75	1690 98	2435 90	1250	10085	2983 98	2167 100	1570 100	1462 99	8182
Cornell 3	4772 66	1667 97	2393 89	1360	10192	2626 97	2015 100	1560 100	1387 96	7588
Mean	4930	1532	2350	1120	9932	2917	1931	1555	1319	7722

ALFALFA, EVALUATION TEST, O.A.C., 1961 SEEDING

Test 570

Summary of 1962-63 Yields
Yields in Lbs. D.M. per Acre

Variety		Hay and Aftermath Pasture						Pasture Management					
		Hay		Aft.(2-3 cuts)		Total	Rank	Spring		Summer (3 cuts)		Total	Rank
Cayuga	1962	3797		4410		8207		3752		6158		9910	
	1963	4942		5225		10167		2822		5102		7924	
	Mean	4370	5	4817	3	9187	4	3287	4	5630	2	8917	2
Vernal	1962	4352		4610		8962		3932		5742		9674	
	1963	5062		4923		9985		3001		4774		7775	
	Mean	4707	2	4766	4	9473	2	3466	2	5258	4	8724	4
Beaver	1962	4672		3684		8356		3490		4961		8451	
	1963	5162		4070		9232		3152		3986		7138	
	Mean	4917	1	3877	5	8794	5	3321	3	4473	5	7794	5
Ont. Var.	1962	4212		4420		8632		4053		6625		10678	
	1963	4710		5375		10085		2983		5199		8182	
	Mean	4461	4	4887	2	9358	3	3518	1	5912	1	9430	1
Cornell 3	1962	4452		4508		8960		3935		6129		10064	
	1963	4472		5420		10192		2626		4962		7588	
	Mean	4612	3	4964	1	9576	1	3280	5	5546	3	8826	3
Mean	1962	4297		4327		8624		3832		5923		9755	
	1963	4930		5002		9932		2917		4805		7722	
	Mean	4613		4665		9278		3374		5364		8738	

ALFALFA PERFORMANCE TRIAL, 1963 - TEST 575

Seeded in 1963 on 11E

This test, a DuPuits type performance trial, included Tuna, Glacier, Alfa, as well as DuPuits. Saratoga bromegrass was sown along with the alfalfa. The test consisted of two sections, one to be managed as hay and aftermath pasture, the other as pasture.

ALFALFA WINTERHARDINESS TRIAL, 1963 - TEST 581

Seeded in 1963 on 11E and 6E

This test contains six strains of alfalfa representative of a quantity of seed imported from Argentina and Australia. It was sown with bromegrass and is to be managed as a hay and aftermath pasture regime.

BIRDSFOOT TREFOIL PERFORMANCE TRIAL, 1963 - TEST 576

1963 Seeding on 6E

The following strains were successfully established in company with timothy to be handled as pasture, and as hay plus aftermath pasture:

Leo, Fargo, Empire, Viking, Barr, Douglas, O.A.C. Composite.

Fargo originates in S. Dakota, Douglas in Washington State, Barr was sent from Kemptville, presumably of Empire origin. Composite is a mixture of strains derived from Synthetic B.

Throughout the summer, the O.A.C. Composite displayed considerably more seedling vigor than anything else. After this material was cut back in August, the recovery rate as recorded on September 25 was as follows:

Barr, closely followed by Composite and Viking.
Douglas noticeably behind Viking.
Far behind these came Leo, followed closely and in order by Empire and Fargo.

BIRDSFOOT TREFOIL INTERSPECIFIC HYBRID TRIAL, 1963 - TEST 576H

1963 Seeding on 6E

Seed was collected from the F_1 interspecific hybrids between L. Corniculatus and L. uliginosus, located on 18E. Seed from some of the better early plants was bulked to form an early strain. Similarly medium and late strains were bulked. The three maturity types were seeded in four replicates, the purpose being to gain information on the agronomic performance of these hybrids.

BIRDSFOOT TREFOIL SELECTION NURSERY, 1963

A nursery of about 3400 Empire and 700 Leo plants was established on range E9. The Empire group, consisting of 57 families, represents the third cycle of selection in this type of trefoil. The basis of selection was seed size, seedling vigor, and field performance.

For each of the 57 families 90-150 seedlings were started in the greenhouse and all plants low in seedling vigor were discarded. Fifty thrifty seedlings per family were transferred to the field in May. For some of the more promising families a second series was used. At first bloom the nursery was sprayed with paraquat to remove all vegetation whether trefoil or weeds. Nevertheless, seed was produced on the regrowth and to eliminate the growth of volunteer seedlings simazine was applied at a later date. Considerable damage was done in this nursery by white grubs.

Thirty rows were not sprayed but were hand-weeded. Seed from over 600 plants, representing about 10 from each family was hand harvested and cleaned. Plants with a low volume of seed were discarded and for each of the remaining 570 the weight of 100 seeds was obtained. These values ranged from 94 to 169 mg./100 seeds, the average being 132. The distribution was as follows:

Class:	90-99	100-109	110-119	120-129	130-139	140-149	150-159	160-169
Frequency:	2	24	80	153	156	83	43	20

Family averages, which in most cases was the average of 10 plants, ranged from 115 mg. to 145 mg. It is thought that when, in 1964, selections are made from the entire nursery, families with low average seed weight will be heavily discriminated against.

STRAIN TRIALS IN A WEED-FREE ENVIRONMENT

Five yield trials, one of Empire and four of the Viking type, and each consisting of 64 strains in a lattice design, were seeded on 7,8E on a weed-free environment basis.

The land was prepared and marked out for the trials in May. Time was given to permit weed seeds to germinate and for the seedling to emerge. These were then removed by an application of prometryne. On June 19, the trials were seeded in the usual way. Establishment was quite uneven, varying from poor to good. Irrigation water was applied but to no avail. In mid-summer purslane completely obliterated the rows. Primarily because of unsatisfactory establishment and secondarily because of the weed problem, all five tests were abandoned.

The primary cause of this failure was a combination of dry weather and late seeding. It is suggested that for the weed-free environment technique to be successful, sufficient water must be available in the soil to germinate the weed seeds before the trials are sown, and to ensure germination of the trefoil as soon as it is sown.

WHITE CLOVER STRAIN TRIAL, 1962 (574)

Comments on White Clover Strain Trial

Apart from a little injury suffered by California, the test wintered in excellent shape.

At the time of the first cut, May 27, Syn. B was showing a little less vigor, to the eye, than Syn. A, but their yields were identical.

Order of flowering, June 21, ranked from earliest to latest.

Common, C.B. Pasture
S-100
New Zealand, Nordic, Kersey
Syn. B, C.B. Hay, Pilgrim
California, Merit
Syn. A, Granladino

June growth - in reverse order to the above, i.e. Granladino most, Common least.

July growth - as in June in the main, but little difference between Syn. A and Syn. B.

August, September, October - no growth.

Test 574 - White Clover - Seeded in 1962 with Orchard Grass
Lbs. of Forage D.M. per Acre

	Cut 1 - May 27		Cut 2 - June 21		Cut 3 - Aug. 2			
	Yield	% Leg.	Yield	% Leg.	Yield	% Leg.	Total	Rank
S-100	2010	39	2320	48	867	19	5197	8
California	2167	44	2247	55	1253	51	5667	3
Ottawa A	1944	36	2241	51	1037	37	5222	7
Kersey	2133	50	2303	52	932	45	5368	4
N. Zealand	1910	40	2199	50	720	16	4829	13
Granladino	2055	39	2223	55	1059	50	5337	5
Pilgrim	2156	42	2288	57	1236	50	5680	2
Common	1854	34	2255	50	750	20	4859	11
Ottawa B	1944	39	2184	53	858	47	4986	10
Nordic	2189	41	2236	52	856	27	5281	6
Merit	2279	39	2307	57	1178	55	5764	1
C.B. Pasture	1944	32	2160	47	754	11	4858	12
C.B. Hay	2011	41	2232	49	771	23	5014	9
Mean	2046		2245		944	52	5235	
L.S.D. at 5%	159		N.S.		184			
C.V.	6.7%		6.0%		16.9%			

Comments: Based on yield and general vigor, Merit appeared to be the most promising variety.

Red Clover, Test 572, 1961 Seeding, Ontario Agricultural College, Guelph

D.M. D.M. in Lbs. per Acre

Variety	1963 Cut 1 Hay Jun.18	1963 Cut 2 A'math Jul.31	1963 Season Total	1962 Cut 1 Hay Jun.15	1962 Cut 2 A'math Jul.27	1962 Season Total	1962-63 Cut 1 Hay	1962-63 Cut 2 A'math	1962-63 2-Year Total
Lasalle, east	4314	826	5140	4521	2862	7383	8835	3688	12523
Lasalle, west	4013	678	4691	4475	2643	7118	8488	3321	11809
Lakeland	4199	675	4874	4574	2636	7210	8773	3311	12084
Dollard, found.	3896	503	4399	4180	2657	6837	8076	3160	11236
Dollard, cert.	4104	859	4963	4609	2766	7375	8713	3625	12338
Ottawa, breeders	4062	572	4634	4164	2659	6823	8226	3231	11457
Ottawa, Bishops	2927	508	3435	4210	2543	6753	7137	3051	10188
Chesapeake	2953	787	3740	4198	2892	7090	7151	3679	10830
Mean	3807	676	4483	4365	2707	7072	8175	3383	11554
L.S.D. 5%	508	N.S.		N.S.	220	N.S.			
C.V.	9%	30%		9%	7%	7%			
English	1893	trace	1893	4369	2458	6827	6269	2458	8727
Tetraploid	3907	820	4727	3801	2027	5828	7708	2847	10555

Some Notes on the Red Clover Strain Trial

April, 1963 - Winter survival
Badly damaged - Burgess (English variety)
Moderate damage - Chesapeake, Ottawa Bishops
Slight damage - Dollard, Lasalle, Lakeland, Tetraploid
No damage - Ottawa Breeders

July to present time - drought

At the time of the second cutting, July 31, Burgess was reduced to a ground cover of 15-20%, Bishop's 35%, Chesapeake 60%, remainder 70-80%. Ottawa Breeders had the best stand at this date.

ORCHARDGRASS MANAGEMENT TEST, 1959 (601)

The purpose of this experiment was to study the interaction of varieties with levels of fertility and systems of clipping. Both mean performance and variability are being studied, in order to obtain further data on possible systems of variety testing. Five varieties were used and these are listed in the tables according to their relative maturity from Sterling (early) to S-37 (late). Two levels of nitrogen fertility were applied early in the spring. The aftermath received a uniform application. There was some winter damage during 1960-61 and its effect can be seen in the relative yields in 1961 as compared to 1960.

In the analyses of variance for yield, fertility, cutting time and variety mean squares were significant in every case. The interaction of fertility and cutting time was significant for cuts 1 and 2 in both years. As the level of fertility increased, the differences among the cutting times increased. The varietal interactions were significant only in 1961, so more data are required in this regard.

For percent vegetative and percent leaf three mean squares were significant in both years; namely, those for cutting times for varieties and for their interaction. Cutting each variety at its own bloom date naturally resulted in a lower percent vegetative and percent leaf, than when all were cut at the same time. For percent leaf, there was a significant variety x fertility interaction, also.

The only inter-varietal variances which showed any consistent trend, were those for the yields of the first cut. In those, the variances were lowest under the low nitrogen treatment and highest when the varieties were grown with alfalfa.

This experiment has been reseeded, and will be continued.

Results 1960-61

Cutting Treatment		Fertility Level 50 lbs. N	150 lbs. N	Alfalfa[1]	Mean
A. YIELD (lbs./acre)					
1. Cut 1	Pasture	2888	3493	3733	3380
	Hay - (1)[2]	3910	4928	6142	4990
	- (2)[3]	3465	4466	5250	4390
	Mean	3423	4298	5054	4260
2. Cut 2	Pasture	1155	1393	1956	1500
	Hay - (1)	1008	1218	1148	1130
	- (2)	934	1141	1404	1160
	Mean	1036	1250	1505	1260

B. PERCENT VEGETATIVE[4]

Variety	Cutting Treatment Hay - (1)	Hay - (2)	Mean
Sterling	24.8	27.0	25.9
Potomac	31.4	32.8	32.1
Latar	33.1	43.0	38.0
Aurora	37.2	48.5	42.8
S-37	53.6	54.2	53.9
Mean	36.0	41.1	38.6

C. PERCENT LEAF[5]

Variety	Cutting Treatment Hay (1)	M Hay (2)	Mean	Fertility Level 50# N	150# N	Alfalfa	Mean
Sterling	23.0	23.3	23.2	23.1	23.6	22.8	23.2
Potomac	23.0	23.6	23.3	23.5	23.4	23.0	23.3
Latar	25.6	29.6	27.6	27.1	28.0	27.6	27.6
Aurora	24.2	30.7	27.4	27.2	27.4	27.9	27.4
S-37	25.0	27.8	26.4	25.8	25.3	28.0	26.4
Mean	24.2	27.0	25.6	25.3	25.5	25.8	25.6

D. INTER-VARIETAL VARIANCES

Fertility Level	Cut 1 - Yield
50 lbs. N	28150
150 lbs. N	44700
Alfalfa	118500
Mean	53000

E. VARIETY MEANS - YIELD, CUT 1

Variety	1960	1961
Sterling	5610 b	3930 a
Potomac	5990 a	3460 b
Latar	5790 ab	2810 c
Aurora	5520 b	2940 c
S-37	4960 c	1560 d

1/ Data refer only to the orchardgrass portion of the mixture.
2/ Under hay (1) treatment each variety was cut when at anthesis.
3/ Under hay (2) treatment, all varieties were cut when Sterling at anthesis.
4/ All shoots without a visible head were classed as vegetative.
5/ Pertains only to those shoots with a visible head.

ORCHARDGRASS SELECTION NURSERY, 1960 (618)

Out of 6,000 plants, 151 were selected and put into 4 polycross nurseries. These plants were selected on the basis of visual vigour ratings during the year, height at anthesis and maturity. All were average or above in spring vigour, superior in midsummer vigour, tall, and of the same general maturity as Frode. Polycross nurseries #1, #2, and #3 are made up of plants selected under low, medium and high nitrogen levels, respectively. Polycross #4 is comprised of 10 plants selected solely on visual observations at the time of anthesis.

All polycrosses were planted in August and September, 1963. Polycross #4 was planted at Ridgetown, and the remainder at O.A.C.

Number of Plants Selected for Polycross Nurseries, 1963

Source	PX #1	PX #2	PX #3	PX #4	Total
Frode	8	13	3	4	28
Aron	11	6	7	1	25
G-1585 (Netherlands)	11	6	2	1	20
Hercules	5	4	9	1	19
Danish	6	9	1	2	18
Trifolium	4	3	5	0	12
Hespeler Polycross	4	3	4	0	11
G-1588 (Italy)	1	0	3	1	5
G-1586 (N.Z.)	1	2	0	0	3
Potomac	2	1	0	0	3
Tardus II	0	1	2	0	3
Avon	1	0	0	0	1
G-1583 (Turkey)	0	1	0	0	1
G-1591 (Greece)	1	0	0	0	1
G-1596 (Turkey)	1	0	0	0	1
Chinook	0	0	0	0	0
Total	56	49	36	10	151

ORCHARDGRASS - LOCAL COLLECTIONS AND INTRODUCTIONS, 1961

In 1960, 55 collections of orchardgrass seed were made in the counties of Oxford, Bruce and Simcoe. Seed was collected from orchardgrass plants growing along roadsides and in meadows which appeared to have been down for some time.

In 1959, 22 introductions of orchardgrass from various parts of the world were obtained from the U.S.D.A. These introductions plus the collections made above were evaluated in 1962-63. Out of these 77 seed lots, seven were selected as being worthy of further study. These lots were chosen on the basis of relative vigour, height, leafiness and colour in relation to the variety, Frode. These seed lots will be used as sources for any new selection nursery.

Experiment 622 - Superior Entries Selected, 1963

Entry No.	Code	Origin	Description
26	O-107	Oxford Co. Roadside near Innerkip	Later than Frode. Dark green color.
38	O-156	Simcoe Co. Unclipped pasture	Frode maturity. Leafy.
47	O-163	Simcoe Co. Roadside near Tottenham	Frode maturity. Tall.
52	O-126	Bruce Co. Pasture field	Frode maturity. Very vigorous in spring.
63	G-1580	Introduction from Sweden	Similar to Frode.
64	G-1581	Introduction from Sweden	Early. Leafy. Dark green.
76	G-1599	Introduction from Argentina	Late. Good spring vigor.

ORCHARDGRASS CLONES AND SOIL FERTILITY, 1962 (625)

In Experiment 618, nitrogen fertilizer was applied at three different rates to spaced plants in a 3' x 3' spacing. No differences in the performance of these plants due to level of nitrogen could be detected. This lack of response could have been due to the wide spacing, an initial high level of nitrogen, or a combination of these two factors. To study this problem further, 20 clones were propagated vegetatively and planted at the Kaine farm in a split-plot design. These plants were grown under six different treatments - three spacings (whole plots) and two levels of nitrogen (sub-plots). The levels of nitrogen were 100 and 300 lbs. per acre applied in three equal applications.

There was a small difference between the nitrogen treatments in almost every case. However, the difference was generally as great in the 3' x 3' spacing as in the 1' x 1' spacing. This study is being continued.

Treatment		Characteristic					
Spacing	Fertilizer	Spring Vigour	Hay Vigour	Heading Date	Plant Height	Aftermath Vigour	Fall Vigour
1' x 1'	Low	4.0	4.3	11.6	34.4	3.4	1.7
	High	3.9	4.4	11.9	35.4	3.7	1.9
2' x 2'	Low	2.9	3.4	14.2	28.1	4.5	3.7
	High	3.0	3.8	14.5	27.7	4.8	4.0
3' x 3'	Low	3.8	4.6	12.3	29.7	4.5	4.3
	High	3.9	4.9	12.7	30.4	4.5	4.6

STUDIES ON MALE STERILITY (635)

During 1963, plants of orchardgrass, timothy and bromegrass were screened for non-shedding of pollen. A few heads on each plant were bagged before anthesis, and at anthesis the remaining heads were examined for evidence of pollen. At seed maturity, the bagged heads were harvested from each plant. From this material, information will be obtained on levels of self-fertility. Out of 6,000 plants of orchardgrass, 19 were selected for lack of pollen shedding; in timothy, 4 out of the 1,600 screened; and in bromegrass, 1 out of 4,000.

In the fall of 1963, these male sterile plants as well as a number of normal plants were brought into the greenhouse. Heading was induced and at anthesis, only 12 of the orchardgrass plants and 2 of the timothy plants did not shed pollen. These plants were crossed in the growth chamber with a number of normal plants.

In orchardgrass, preliminary results indicate that about 10% of the plants are self-sterile, and about 5 plants per 1,000 set as much seed when selfed as when crossed.

Orchardgrass - Normal Clones, 1963

Designation	Nursery Location	Source	Heading Date
	(B-304)		
N-1	1122-12	Chinook (Alberta)	June 5
N-2	1128-6	Avon (Mac. College)	June 5
N-3	1129-2	Frode (Sweden)	June 8
N-4	1125-7	Frode (Sweden)	June 8
N-5	1129-1	Frode (Sweden)	June 11
N-6	1125-2	Frode (Sweden)	June 11
N-7	1125-14	Frode (Sweden)	June 11
N-8	1125-18	Frode (Sweden)	June 11
N-9	1125-16	Frode (Sweden)	June 12
N-10	1228-4	Frode (Sweden)	June 12
N-11	1125-9	Frode (Sweden)	June 19
N-12	1129-7	Frode (Sweden)	June 19
N-13	1228-2	Frode (Sweden)	June 15
N-14	1228-3	Frode (Sweden)	June 15

EXPERIMENT 635 - ORCHARDGRASS - MALE STERILE CLONES IDENTIFIED, 1963

Group	Designation	Nursery Location	Source	Heading Date (1963)	Seed Set Under Bag (seeds/head)	Vigour (Jun.4/63)	O.P. Seed Set	Growth Chamber 1963-64 Crosses Made
A = Non-Shedding of Pollen								
	MS-1	1121-2	Introduction (Turkey)	Jun.11	0	5	Fair	N-8, -7.
	MS-3	1201-4	Oron (O.A.C.)	Jun. 5	0	4	Good	N-1, -2, -7.
	MS-4	1201-14	Oron (O.A.C.)	Jun. 5	1-2	5	Good	N-2, -13.
	MS-5	1203-4	Chinook (Alberta)	Jun.11	0	3	Good	N-1, -6.
	MS-7	2516-20	Introd. (Turkey)	Jun.19	0	3	----	N-12.
	MS-8	2637-7	Introd. (Turkey)	Jun.10	0	6	Good	N-5, -8, MS-17.
	MS-10	3711-9	Introd. (Turkey)	------	-	6	----	N-8, -13, MS-13.
	MS-11	3811-3	Oron (O.A.C.)	Jun.13	0	6	Good	N-9, -10.
	MS-12	3813-8	Introd. (Turkey)	Jun.10	0	6	Poor	N-5, -8.
	MS-15	4403-13	Introd. (Netherlands)	Jun.10	0	5	Good	N-8, -10.
	MS-18	5708-9	Hercules (Ottawa)	Jun.10	1-2	3	Good	N-5, -7, MS-14.
	MS-19	5710-17	Introd. (Greece)	Jun.11	1-2	5	----	N-5, -7, MS-9.
B = Plants Non-Shedding in Field, Shedding in Greenhouse								
	MS-2	1107-15	Hercules (Ottawa)	Jun.15	0	1	----	N-3, -11.
	MS-6	2416-9	Oron (O.A.C.)	Jun.19	0	4	----	N-11,-14,MS-10,-13.
	MS-9	2637-10	Introd. (Turkey)	Jun.10	0	5	----	N-6, -8, MS-19.
	MS-13	3918-12	Introd. (Turkey)	Jun.15	0	4	----	N-12, -14, MS-10.
	MS-14	3918-15	Introd. (Turkey)	Jun.12	0	5	----	N-6, -7, MS-14
	MS-16	4411-15	Introd. (Turkey)	Jun.13	0	5	----	N-9, -10.
	MS-17	5630-7	Potomac (Maryland)	Jun. 8	1-2	5	----	N-4, MS-8.

EXPERIMENT 635 - MALE-STERILE CLONES - TIMOTHY. IDENTIFIED 1963.

Designation	Location (D-18)	Source	Heading Date (1963)	Vigour* (July 22/63)	Growth Chamber 1963-64 Crosses
MS-1**	56-20	Medon (2000 r)	July 4	4	N-2, -4
MS-2	71-05	Climax (10,000 r)	July 1	4	N-4
MS-3	71-18	Climax (10,000 r)	July 2	5	N-6
MS-4**	74-06	Climax (check)	June 27	6	None

* Rating: 0 (poor) to 9 (excellent).
** Shed pollen in growth chamber, 1964.

Normal Plants - Timothy

Designation	Nursery Location	Source	Heading Date (1963)
N-1	54-17	Climax (2000 r)	June 27
N-2	64-13	Medon (10,000 r)	June 27
N-3	82-01	Medon (check)	July 2
N-4	87-14	Climax (2000 r)	July 2
N-5	66-18	Climax (10,000 r)	July 4
N-6	54-20	Climax (2000 r)	July 4

O.E.C.D. Test (Timothy), 1962 (631)

At the request of Mr. Jan Pauksens, Plant Products Division, a timothy test sent out by the O.E.C.D.* was planted in 1962. This test was designed to evaluate the differences among lots of certified seed. Two varieties, labelled A and B, were each represented by 4 different seed lots, and these were grown with 6 named varieties. In our test, seed lots of Variety A were relatively uniform. However, there were large differences among the lots of B. One lot of Variety B was extremely late, while another had many prostrate plants.

* Organization for European Community Development.

EXPERIMENT 631 - O.E.C.D. TEST (TIMOTHY), 1962

Sample	Code	Entry No.	May 14 Spring Vigour	Jun.18 Height	Date Headed	Date Initial Bloom	Date 50% Bloom	Height July 4	No. heads/ ft. of row Jul. 4	Comments
Otoffe, basic	PP13	13	2.5	31"	Jun.25	Jun.27	Jul. 1	33"	40	
Hudemij, "	PP14	12	4.5	23"	Jun.25	Jul. 4	Jul. 8	30"	12	Appears variable. Pasture type.
Variety A	PP40	1	2.5	29"	Jun.18	Jun.25	Jun.27	36"	37	
"	PP41	5	2.0	29"	Jun.18	Jun.25	Jul. 4	35"	40	
"	PP42	6	2.5	32"	Jun.18	Jun.27	Jul. 4	36"	27	
"	PP43	7	2.0	29"	Jun.20	Jun.25	Jul. 4	36"	37	
Variety B	PP44	8	5.0	9"	Jul.22	Jul.30	Aug. 3	12"	0	
"	PP45	4	4.0	21"	Jun.25	Jun.28	Jul.14	37"	10	Appears variable. Pasture type.
"	PP46	3	4.0	27"	Jun.20	Jun.27	Jul. 1	35"	20	Pasture type.
"	PP47	2	3.0	32"	Jun.20	Jun.27	Jun.30	34"	40	Some prostrate stems.
King	Lat.NL1907	11	5.0	9"	Jul.15	Jul.25	Aug. 1	11"	0	
Omnia	Ca61-4006	9	2.5	28"	Jun.25	Jun.27	Jul. 4	31"	33	Some prostrate stems.
Climax	61-91474	14	3.0	32"	Jun.25	Jul. 1	Jul. 4	33"	30	
Drummond	TY5-15	10	4.0	20"	Jul. 4	Jul.10	Jul.15	27"	25	

BROME-ALFALFA COMPETITION STUDY - GUELPH - 1960 (TEST 217)

This trial was seeded on range B-1 in 1960 to obtain additional information on the competitive effects of brome varieties and alfalfa varieties. The trial included Saratoga, Canadian Common and Lincoln bromegrass as representing different levels of aggressiveness. Saratoga represents the most competitive level and Lincoln the least competitive. Climax timothy and Frode orchardgrass were also included to compare their competitive effects on alfalfa with those of brome. The grass varieties were seeded in mixture with Vernal alfalfa and DuPuits alfalfa representing a less agressive alfalfa variety and a highly aggressive alfalfa variety respectively. The seed mixtures used were 10 lbs./acre alfalfa and 10 lb./acre of bromegrass; 8 lbs./acre of orchardgrass; 6 lbs./acre of timothy. The portion of the test including DuPuits alfalfa was discontinued in the spring of 1962 due to non-uniform winterkill of the alfalfa in these plots and the negligible grass content in the plots.

Two management levels, pasture and hay, were also used. Under the pasture management, the plots were cut prior to bud or at very early bud of alfalfa. Under the hay management, plots were harvested at first show to 1/10 bloom of alfalfa. This meant that the grasses were in the vegetative stage under pasture management (except orchardgrass) and between heading and anthesis under the hay management except orchardgrass which was post-anthesis.

The trial was fertilized with 300 lbs./acre of 0-20-20 fertilizer during early September each year.

A summary of the yield data of the mixtures including Vernal alfalfa for the three years 1961-63 is reported in Tables 1, 2 and 3. All species and varieties of grasses yielded approximately the same in mixture with Vernal alfalfa except for orchardgrass which had a slightly lower yield. This was the case under both hay and pasture management. Under pasture management, the Climax timothy mixture appeared very slightly superior; however, the data of Tables 2 and 3 indicate that this was due to greater legume yield as a result of less grass competition. The level of grass competition also explains the lower yield of the Frode orchardgrass mixture. With the increased competition of the orchardgrass the alfalfa component yielded less and was not made up by the orchardgrass yield. As a result, the mixture yield was reduced.

The order of competitiveness of the grass, most to least, was Frode orchardgrass, Saratoga, Can. Common bromegrass, Climax timothy, and Lincoln bromegrass under the hay management. Under pasture management, Climax timothy appeared slightly more competitive than Can. Common bromegrass. As expected, Frode orchardgrass provided more grass in the aftermath than Saratoga; however, in the first harvest of each year, Saratoga provided the highest grass content to the mixture.

Lincoln bromegrass exhibited very little competitive ability. This fact could explain many of the complaints regarding the establishment of brome in mixture. Lincoln should be deleted from the recommended brome variety list as soon as adequate seed supplies of Redpatch are available.

Although Saratoga appears to be highly competitive, total mixture yield does not indicate that it is too competitive. If less grass is desired in the mixture, then Saratoga should be seeded at 2 to 3 lbs. less per acre.

The 1963 data are presented in Tables 4 to 6. Previous years' data can be found in previous annual forage reports.

Table 1. Summary of the yield data (pounds per acre dry matter) from the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217) over the three years (1961, 1962, 1963). Legume + Grass Yield Data.

Management and Variety	Cut 1				Aftermath Total				Season Total			
	1961 Jun.1	1962 May 28	1963 Jun.4	Total	1961[1]	1962[2]	1963[3]	Total	1961	1962	1963	Total
PASTURE												
Vernal +												
Can. Common	3370	3737	3377	10484	6967	4836	3785	15588	10337	8573	7163	26073
Lincoln	3430	3725	3368	10523	7156	4917	3865	15938	10586	8642	7233	26451
Saratoga	3804	3972	3514	11290	6855	4519	3710	15084	10659	8551	7157	26357
Climax	3391	3995	3458	10844	7527	4829	4250	16606	10918	8824	7703	27445
Frode	3568	2993	2860	9421	6877	4004	3760	14641	10445	6997	6620	24062
Alone	3479	3587	3153	10219	7274	4918	3505	15697	10753	8505	6658	25916
Mean Pasture	3507	3668	3288	10463	7109	4681	3812	15602	10616	8349	7089	26054
HAY	Jun.21	Jun.7	Jun.18									
Vernal +												
Can. Common	5066	3976	4382	13424	5690	4621	2089	12400	10756	8597	6471	25824
Lincoln	5403	3792	4164	13359	5670	5032	2229	12931	11073	8824	6392	26299
Saratoga	5610	4095	4492	14197	5641	4492	2172	12305	11251	8587	6664	26502
Climax	5095	3958	4297	13350	5624	4938	1991	12553	10749	8916	6288	26153
Frode	5573	2732	3552	11857	6181	3635	1788	11604	11754	6367	5340	23451
Alone	4807	3815	3697	12319	5690	5278	2038	13006	10497	9093	5735	25325
Mean Hay	5259	3728	4097	13084	5771	4664	2051	12486	11030	8394	6146	25570
Mean Hay + Pasture	4383	3696	3693	11772	6440	4774	1881	13095	10823	8370	6619	25812

[1] three cuts on pasture management; two cuts on hay management.

[2] two cuts on pasture management; two cuts on hay management.

[3] two cuts on pasture management; one cut on hay management.

Table 2.. Summary of the yield data (lbs./acre, D.M.) from the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217) over the three years (1961, 1962, 1963). Grass Component Yield Data.

Management and Variety	Cut 1				Aftermath Total				Season Total			
	1961	1962	1963	Total	1961[1]	1962[2]	1963[3]	Total	1961	1962	1963	Total
PASTURE												
Vernal +												
Can. Common	632	556	1008	2196	686	283	579	1548	1318	849	1587	3754
Lincoln	533	315	616	1464	250	31	358	639	782	346	973	2101
Saratoga	1623	1270	1575	4468	1739	620	1490	3849	3362	1890	3064	8316
Climax	350	1072	1139	2561	491	312	758	1561	841	1384	1897	4122
Frode	1669	1328	1415	4412	2649	908	1803	5360	4318	2236	3218	9772
Mean Pasture	962	908	1150	3020	1162	431	998	2591	2124	1341	2148	5613
HAY												
Vernal +												
Can. Common	1493	2049	1968	5510	1781	816	890	3487	3274	2865	2858	8997
Lincoln	1129	1324	1631	4084	468	255	391	1114	1597	1579	2022	5198
Saratoga	3016	2694	2315	8025	2177	1046	1018	4241	5193	3740	3333	12266
Climax	759	1392	1808	3959	424	245	250	919	1183	1637	2016	4836
Frode	2527	1709	1214	5450	3021	1314	699	5034	5548	3023	1913	10484
Mean Hay	1785	1834	1787	5406	1575	735	649	2959	3360	2569	2428	8357
Mean Hay + Pasture	1374	1371	1469	4214	1368	583	536	2487	2742	1955	2288	6985

[1] three cuts on pasture management; two cuts on hay management.

[2] two cuts on pasture management; one cut on hay management.

[3] two cuts on pasture management; one cut on hay management.

Table 3. Percent Grass in the mixtures over the three years, 1961-62-63, from the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217). Percent Grass.

Management and Variety	Cut 1				Cut 2				Cut 3				Cut 4
	1961	1962	1963	Mean	1961	1962	1963	Mean	1961	1962	1963	Mean	1961
PASTURE													
Vernal +													
Can. Common	18.6	15.4	31.0	21.7	13.2	6.4	17.5	12.4	7.1	6.1	15.0	9.4	4.1
Lincoln	15.6	8.7	18.0	14.1	5.3	0.9	10.0	5.4	1.3	0.3	9.0	3.5	2.0
Saratoga	42.2	31.6	43.5	39.1	28.3	14.7	35.0	26.0	25.1	12.0	39.0	25.4	9.0
Climax	10.3	27.0	33.3	23.5	11.8	8.8	23.0	14.5	0.0	3.4	17.0	6.8	3.8
Frode	44.8	45.1	50.0	46.6	36.7	23.1	42.5	34.1	36.1	24.8	53.0	38.0	57.1
Mean Pasture	26.3	21.7	35.2	27.7	19.1	9.0	25.7	17.9	13.9	8.0	26.7	16.2	15.2
HAY													
Vernal +													
Can. Common	29.4	52.0	45.0	42.1	32.0	20.1	42.5	31.5	30.8	13.1		14.6	
Lincoln	21.1	34.6	39.0	31.6	10.2	5.9	19.0	11.7	4.9	3.5		4.2	
Saratoga	52.6	66.0	52.0	56.9	36.3	25.4	47.0	36.2	43.2	20.4		31.8	
Climax	14.6	35.2	38.0	29.3	7.4	6.4	12.5	8.8	7.4	3.1		5.2	
Frode	44.4	62.5	38.0	48.3	42.9	35.7	40.0	39.5	58.9	38.8		48.9	
Mean Hay	32.4	45.1	42.5	40.0	25.8	16.7	28.9	23.8	29.0	13.6		21.3	
Mean Hay + Pasture	29.4	33.4	38.9	33.9	22.4	12.8	27.3	20.8	21.4	10.8		16.1	

Table 4. Summary of the Yield Data (pounds per acre dry matter) from the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217). 1963 Results.

Management and Variety	Legume Component				Grass Component				Legume + Grass*			
	Cut 1 Jun. 4	Cut 2 Jul.18	Cut 3 Sept.5	Season Total	Cut 1 Jun. 4	Cut 2 Jul.18	Cut 3 Sept.5	Season Total	Cut 1 Jun. 4	Cut 2 Jul.18	Cut 3 Sept.5	Season Total
PASTURE												
Vernal + Can. Common	2047	1349	1656	5052	1008	266	313	1587	3377	1643	2142	7163
Lincoln	2218	1545	1711	5474	616	171	187	973	3368	1771	2094	7233
Saratoga	1619	1090	1026	3735	1575	576	914	3064	3514	1649	2061	7157
Climax	2059	1604	1517	5180	1139	426	332	1897	3458	2049	2201	7703
Frode	1445	938	1017	3401	1415	675	1128	3218	2860	1613	2147	6620
Alone	2314	1376	1571	5261	----	---	----	----	3153	1540	1965	6658
Mean Pasture	1950	1317	1416	4684	1150	423	575	2148	3288	1710	2102	7089
HAY	Jun.18	Aug. 2			Jun.18	Aug. 2			Jun.18	Aug. 2		
Vernal + Can. Common	2397	1128		3525	1968	890		2858	4382	2089		6471
Lincoln	2533	1617		4150	1631	391		2022	4164	2229		6392
Saratoga	2095	1062		3157	2315	1018		3333	4492	2172		6664
Climax	2455	1473		3927	1808	250		2016	4297	1991		6288
Frode	2339	1090		3429	1214	699		1913	3552	1788		5340
Alone	3015	1648		4663	----	---		----	3697	2038		5735
Mean Hay	2472	1336		3808	1787	649		2428	4097	2051		6145
Mean Hay + Past.	2211	1327		4246	1469	536		2288	3693	1881		6619
L.S.D.												
Management .05	388	N.S.		260	118	61		316	454	225		253
.01	608	N.S.		407	185	96		495	712	352		395
Entries .05	368	252	398	170	259	135	146	133	248	218	N.S.	129
.01	491	336	539	229	347	182	199	369	330	291	N.S.	172
Man.x Ent. .05	N.S.	N.S.		240	366	191		547	N.S.	N.S.		N.S.
.01	N.S.	N.S.		320	503	257		734	N.S.	N.S.		N.S.
C.V. (%)	17.0	23.1	23.7	4.9	21.3	30.6	19.2	20.5	8.2	14.1	10.4	2.2

* Includes weeds

Table 4. (Continued) Mean Yields (D.M. lbs./acre) of the Grass Varieties over the two systems of management in the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217). 1963 Results.

	Legume Component				Grass Component				Legume + Grass			
	Cut 1	Cut 2	Cut 3*	Season Total	Cut 1	Cut 2	Cut 3*	Season Total	Cut 1	Cut 2	Cut 3*	Season Total
Vernal +												
Can. Common	2222	1238	1656	4288	1488	578	313	2222	3880	1866	2142	6817
Lincoln	2376	1581	1711	4812	1123	281	187	1497	3766	2000	2094	6813
Saratoga	1857	1076	1026	3446	1945	797	914	3198	4003	1911	2061	6911
Climax	2256	1539	1517	4554	1473	338	332	1957	3877	2017	2201	6995
Frode	1892	1014	1017	3415	1314	687	1128	2565	3206	1701	2147	5980
Alone	2665	1512	1571	4962	----	---	----	----	3425	1789	1965	6197

* Mean of the pasture management only.

Table 5. Mean Percent Grass in the Mixture in 1963 for Test 217.

	Cut 1	Cut 2	Cut 3
		PASTURE MANAGEMENT	
Vernal +			
Vernal + Can. Common	31.0	17.5	15.0
Lincoln	18.0	10.9	9.0
Saratoga	43.5	35.0	39.0
Climax	33.3	23.0	17.0
Frode	50.0	42.5	53.0
Mean of Pasture	35.2	25.7	26.7
		HAY MANAGEMENT	
Vernal + Can. Common	45.0	42.5	
Lincoln	39.0	19.0	
Saratoga	52.0	47.0	
Climax	38.0	12.5	
Frode	38.0	40.0	
Mean of Hay	42.5	28.9	
	38.9	27.3	

Table 6. Percent ground cover and percent grass of the ground cover for the grass-legume mixtures of the Brome-Alfalfa Competition Study - Guelph - 1960 (Test 217). April, 1963.

	Ground Cover %	Grass Stand %
PASTURE MANAGEMENT		
Vernal + Can. Common	86	26
Lincoln	85	16
Saratoga	88	40
Climax	90	35
Frode	92	58
Alone	82	8
HAY MANAGEMENT		
Vernal + Can. Common	82	38
Lincoln	82	35
Saratoga	88	45
Climax	84	32
Frode	80	56
Alone	80	9

BROME POLYCROSS NURSERIES 1961

These nurseries are outlined in the 1960 report. Seed was harvested from the IB and II nurseries in 1963. The other two nurseries, IA and III, were discarded when the Brampton farm was no longer available.

NURSERY IB

	Seed Yield per plot in grams	Seed Yield in lbs./acre	100 Seed weight in grams	Seed Fertility in percent
20-9	31.0	330.4	.472	43.6
21-1	52.0	554.3	.534	55.0
36-16	16.8	180.0	.468	23.3
126-7	60.6	645.5	.486	57.6
133-2	45.7	486.8	.488	40.4
145-9	32.7	353.0	.468	59.0
149-19	36.0	383.8	.490	44.3
152-6	47.7	508.1	.480	41.1
187-13	31.7	337.6	.454	35.4

NURSERY II Location - Valeriote formerly DeVos

	Seed Yield per plot in grams	Seed Yield in lbs./acre	100 Seed weight in grams	Seed Fertility in percent
21-1	45.1	480.9	.544	40.1
47-2	34.6	368.3	.424	49.0
56-1	26.7	284.3	.412	27.4
126-12	56.7	604.1	.442	43.5
128-16	31.2	332.8	.440	47.3
139-16	57.5	613.6	.454	57.0
151-2	26.2	279.5	.406	22.3
154-5	35.7	380.2	.486	39.0
162-5	35.1	374.3	.478	45.0

BROME SYNTHETIC TEST - GUELPH - 1960 (TEST 218)

Yield data and other available data for 1963 are presented in the 1963 Report on Field Trials of Varieties and Mixtures in Ontario. A summary of the yield data from 1961, 1962 and 1963 is also presented in the Report. Material is available from each test year for *in vitro* digestibility evaluation; however, this evaluation has not been completed at this time.

In 1963, three replications were used to obtain seed production data. In addition, seed weight per 100 seeds was also determined as an index of quality, and the percent of fertile florets was determined. Percent fertility was calculated from the number of potential florets and the number of florets containing seeds in three spikelets on each of two panicles.

The data are presented below. All attributes measured were low, no doubt reflecting the drought conditions which prevailed during the growing season of 1963. Saratoga had an extremely low yield of seed. Redpatch, although lower than Lincoln, had a much better yield than Saratoga. This difference in yield between Redpatch and Saratoga could be accounted for by the superior fertility percent and seed weight of Redpatch over Saratoga. Lincoln, as usual, had a low seed weight. Rather surprising was the low seed weight of Carlton. The high percent fertility of Carlton gave a relatively high seed yield for Carlton.

Seed yield, seed weight and percent fertility, in 1963, of seven brome varieties in the Brome Synthetic Test, 1960, Guelph (Test 218)

Variety	Seed Yield in lbs./acre	Weight of 100 Seeds in grams	Fertility %
Carlton	242	.2892	67.5
Sac	251	.3220	48.4
Common	198	.3388	44.3
Lincoln	305	.2960	55.3
Saratoga	120	.3020	38.4
Redpatch (Ott.Syn.C)	202	.3440	49.2
Ott. Syn. B	126	.3292	38.7
L.S.D. .05 level	290	.0236	N.S.
.01 level	N.S.	.0332	N.S.
C.V. (%)	25.01	4.16	24.8

Seed Increase of *Bromus catharticus* and *B. autleticus*

Four introduced strains of *Bromus catharticus* and one strain of *B. autleticus* were seeded for seed increase. Quite good seed yields were obtained. Data were not obtained with regard to actual seed yields per acre.

These strains had looked the most promising in the test of annual brome species and in limited other testing. Seed was increased for additional testing.

PLANT SELECTIONS FROM SOURCE NURSERIES

1963

Selected plants from two of the three source nurseries were transferred to a holding nursery on Range E-5. Plants were selected on the basis of morphological growth type, phenotypically "superior" plants, high seed weight and other miscellaneous reasons. 184 selections were obtained from the source nursery on Range D-1 and 202 selections were transferred from the source nursery on Range D-12.

PLOT UNIFORMITY STUDY ON PURE STAND BROME AND ALFALFA-BROME MIXED STAND - 1961 (TESTS 232, 233)

A pure stand block of Saratoga brome and a mixed stand block of Saratoga brome and Vernal alfalfa were established in 1961.

This material was harvested in 1963 similar to the methods used in 1962. That is, the material was harvested at the bloom stage in three by three foot basic units. Approximately 450 basic units were harvested from each of the pure and mixed stands. The data are now waiting statistical analyses in the statistical service laboratory.

BROME TRIALS SEEDED IN 1963

Brome Variety Screening Trial, 1963 (234)

This trial includes nine new brome synthetics which will be evaluated relative to recommended varieties. The trial is located on D-17, and was planted on May 3. No companion crop was used. Plot size is 5' x 16½' with 3' at the front of plots harvested repeatedly as pasture; 5' at rear of plot overseeded with Vernal alfalfa (10 lbs./acre); and center of plot area harvested for yield. It was seeded at the rate of 12 lbs. per acre.

The entries include:

1) Saratoga - check
2) Lincoln - check
3) S-6324 - Sask. Northern type synthetic (9 clones) - Syn. 1 gen.
4) S-5824 - Sask. Southern type synthetic (12 clones) - Syn. 2 gen.
5) Ott. Syn. D - Ott. high seed set synthetic - Syn. 1 gen.
6) Ott. Syn. 6 - Ott. southern type pasture synthetic - Syn. 1 gen.
7) Ott. Syn. 7 - Ott. restricted creeping synthetic - Syn. 1 gen.
8) Guelph Syn. 1 - Nine high seed weight clones - Syn. 1 gen.
9) S-6325
10) Brandon 986
11) Brandon 988

This trial established well with all varieties appearing to have the same stand except the Guelph Synthetic 1 which was somewhat lighter. However, the Guelph Syn. 1 had outstanding seedling vigor and was superior to Saratoga in this respect. It had a more gross appearance than did the other varieties. S-5824 appeared to have similar vigor to Saratoga. Lincoln had the poorest vigor along with S-6325, Ott. Syn. 6 and 7. The remainder appeared to be intermediate between Saratoga and Lincoln for seedling vigor.

Brome Variety Performance Trial, 1963 (235)

This test is to compare the relative performance of new brome varieties and recommended varieties in mixture with Vernal alfalfa in order to consider the new varieties for recommendation and/or license.

Seeded on D-17, May 3, at seeding rate of 10 lbs./acre of brome and 10 lbs./acre Vernal alfalfa.

Entries include:

1) Saratoga
2) Lincoln
3) Redpatch (Ott. Syn. C) - 21 clone southern type synthetic - Syn. 2 gen.
4) Blair (R.P. 100) - 8 clone southern type synthetic - Syn. 2 gen. (Rudy Patrick Seed Co.)
5) Sac - southern type - Syn. 3 gen.

This test established satisfactorily. In mid-July the vigor of brome varieties was best for Saratoga and decreased through Redpatch, Blair, Sac and Lincoln. This order describes the stand of grasses in the mixture as well.

Seed Yield Test of Brome and Orchard Varieties, 1963 (236)

This trial was seeded in order to obtain seed production data from the recommended varieties and some potential varieties of brome and orchardgrass. The trial is located on D-17 and was seeded May 8 in rows 3' apart and 16½' long at the seeding rate of 5 lbs./acre for brome and 4 lbs./acre for the orchard varieties. The entries include the following brome varieties: Saratoga, Lincoln, Redpatch, Ottawa Syn. D., Blair, and S-6324; orchard varieties: Frode, Tardus II, Rideau, Coxa, Pennlate, and Motycka. The varieties established satisfactorily with uniform stands.

Annual Phalaris Species, 1962 (616-2)

Thirteen annual species of the genus Phalaris were evaluated in relation to perennial ryegrass and common reed canarygrass. Most of the species were less vigorous in the spring than perennial ryegrass, yet were of the same general maturity. As a result, many of them had produced less forage by anthesis. Seed was harvested from four species for further evaluation.

Species	Origin	June 15 Vigour[1]	July 4[3] Height[2] (ins.)	July 4[3] Stage
Phalaris canariensis #1	Iran	3	19	Headed
" " #2	Brazil	3	24	Bloom
" " #3	Turkey	2.5	24	Bloom
" " #4	Iran	2.5	17	Headed
" " #5	Jordan	2.5	24	Bloom
" paradoxa	Turkey	2.5	22	Headed
" minor	Argentina	1	24	Bloom
" cverulescens #1	Turkey	2.5	22	50% Headed
" angusta	Argentina	4.5	12	Headed
" daviesii	Australia	5	6	Boot
" cverulescens #2	U.S.A.	4	12	Headed
" tuberosa #1	U.S.A.	4.5	8	Boot
" tuberosa #2	U.S.A.	4.5	12	Headed
" arundinacea	Canada	5	6	Vegetative
Lolium multiflorum		2	20	Headed

1/ Vigour rating: 1 (good) to 5 (poor).

2/ Visual estimate.

3/ Seed Harvested from P. canariensis #2
P. " #3
P. paradoxa
P. minor
P. cverulescens #1

ANNUAL FORAGES - GUELPH LOCATION

1963

Name	Type	Yield Lbs. D.M./A.	% Moisture at harvest (%)
Sudan SX-11	Sorghum sudan hybrid	10819	21.7
Sudangrass	Piper variety	6944	29.0
R.P. 30F	Sorghum sudan hybrid	10500	18.2
R.P. Mor-Su	" " "	13372	27.9
Funk 77F	" " "	11658	23.1
Funk 92F	" " "	13186	20.0
Funks 101F	" " "	10085	20.6

Planted: June 3

Harvested: September 18

Row Width: 27"

Seeding Rate: 4 lbs./acre sorghum sudan
20 lbs./acre sudan

ANNUAL FORAGES - KEMPTVILLE

1963

Seeding: 30 lbs./acre in 36" rows

Date of Seeding: June 13

Previous Crop: Corn

Fertilizer: 300# 5-20-20 broadcast

Harvested: September 16

Field Notes on height and growth: September 4

Name	Green weight per acre (tons)	D.M. (%)	D.M./ acre (tons)	Height Sept.4	Remarks
Silage Funks Lindsey 92F	22.0	19.4	4.3	5'	Promising
Silage Funks Lindsey 101F	13.0	19.3	2.5	4'3"	Bushy - suggest 14" rows
Silage Funks Lindsey 77F	13.7	19.0	2.6	6'	Tall, not bushy, suggest 7" - 9" rows.
Silage Funks Lindsey 551	10.4	19.5	2.0	3'	Pollen stage.
Silage Sorghum R.P. Mor-Su	18.3	26.0	4.8	7'	Silage only.
Silage Sorghum R.P. 30F	21.7	23.9	5.2	6'	Shot blade (too late).
Silage Sorghum Sidax SX11	18.3	23.4	4.3	6'6"	Good.
Sudan Grass	9.8	29.3	2.9	6'	Seeds setting.
Grain Sorghum R10 (245)	11.9	25.6	3.0	4'	Late pollinating.
Grain Sorghum NK (210)	14.0	26.4	3.7	4'	Milk stage.
Grain Sorghum NK 135	11.2	27.3	3.1	4'6"	Milk stage.
Grain Sorghum R12 (140)	13.2	22.3	2.9	3'3"	Shot blade stage.
Grain Sorghum NK (140)	12.0	26.6	3.2	3'6"	Milk stage.

RUSSIAN COMFREY - 1963

This species has been reported from time to time to have a high protein content. There is a need for high yielding species with high protein content for livestock feed. It was decided to harvest samples of the Russian Comfrey growing on Range E-5 to observe protein content and percent digestible dry matter (*in vitro* technique) at different stages of development.

A sample was not taken of the first vegetative growth. Four samples were taken at pre-flower, full flower, post-flower development stages and also of the aftermath from the pre-flower harvest. No yield data were obtained but percent dry matter at the various stages of development except for the pre-flower were determined. The percent dry matter was low in all harvests. This is noteworthy, particularly so for the post-flower stage, which appeared very mature and unpalatable.

The percent protein ranged from 21.1 percent for the pre-flower harvest and decreased to 15.2 for the post-flower harvest. Apparently the species does have a relatively high protein content which is maintained fairly satisfactorily even in quite mature stages of development.

The percent digestible dry matter data are surprising when it is noted that D.D.M. is maintained at a high level (65%) even at the post-flower stage of development. This is contrary to any previous results obtained with grasses and legumes. Two estimates of percent D.D.M. were obtained to check the unexpected results. The D.D.M. of the aftermath growth was about 12% lower than that of the first growth.

Russian Comfrey warrants further study, particularly with regard to an explanation of the D.D.M. data.

Summary of Russian Comfrey Data Obtained in 1963

Date of Cut	Stage of Development	% D.M.	% D.D.M.			% Protein
			Run 1	Run 2	Mean	
June 11	Late bud	-	65.3	64.3	64.8	21.1
June 21	Full flower	12.8	66.7	65.9	66.3	17.0
July 2	Dried flowers	13.6	65.4	65.4	65.4	15.2
July 22*	Vegetative	15.0	53.2	53.0	53.1	17.7

* Regrowth from June 11 cut

DESCRIPTION OF NEW FORAGE VARIETIES

The following list notes the varieties licensed during 1963-64 and some of their characteristics. The experimental data from which they were recommended for licensing are available. The experimental data is located in the file labelled Plant Products (Arthur Dumais).

Bromegrass - "Redpatch"

Licence No. 911
Issued: Feb. 19, 1964

Origin: Developed by the Genetics and Plant Breeding Research Institute, Central Experimental Farm, Ottawa, Ontario.

Breeding Method Employed: This strain is a 21-clone synthetic. The original nursery material was obtained from seven standard varieties, seven clonal lines from Cornell University, and seven strains obtained from the Research Station, Saskatoon, Sask. Selections were made over a 4-year period from 3-foot spaced plants; O.P. seed was collected and the clones numbered and established in a clonal row nursery. One hundred and forty-two O.P. lines, and two standard varieties were set up in a 3-replicated test. Two-year average yields were calculated, and the highest yielding 21 clones, used to collect O.P. seed, were used to set up a 21 clone polycross block. Polycross progeny tests were run on this material at Ottawa. Syn. 1 seed was used to conduct tests at different stations in eastern Canada, in comparison with other brome varieties.

Characteristics: This variety comes into head 3 to 4 days earlier than Saratoga but otherwise is similar in general characteristics. The characters of leafiness, aftermath recovery and disease resistance were selected for in the build-up of selected material. On some stations the aftermath is greater, and on others, less than Saratoga.

Timothy - "Astra"

Licence No. 893
Issued: Jan. 14, 1964

Origin: Developed by the Plant Breeding Institute, Weibullsholm, Landskrona, Sweden.

Breeding Method: This variety was developed by mass selection. To produce breeders' seed, large numbers of plants are started from breeders' seed produced previously. These plants are established in isolation. Undesirable plants are removed by roguing prior to anthesis and prior to seed harvest. Seed is harvested from the remaining plants and bulked to form breeders' seed.

Characteristics: The average yield of Astra for all tests conducted in Ontario is slightly below Climax under a hay plus aftermath pasture management. Only one test, seeded at Ottawa, has been subjected to a pasture management. In this test, Astra yielded as well as Climax. Differences in yield between Astra and Climax were not significant according to the statistical analyses at any location.

Astra has a slightly higher percentage of total leaf than Climax. When growing in the field, Astra does not exhibit as prominent a flag-leaf as does Climax. This criterion readily distinguishes this variety from Climax.

None of the stations have indicated any disease susceptibility or winterkilling on plots of Astra.

The growth pattern of Astra is similar to that of Climax and both varieties mature at the same time.

Name and Address of Producer: Weibullsholm Plant Breeding Institute, Landskrona, Sweden.
Licence requested by Ontario Seed Cleaners and Dealers, Toronto.

Meadow Fescue - "Mimer"

Licence No. 865
Issued: Dec. 20, 1963

Origin: Developed by the Plant Breeding Institute, Weibullsholm, Landskrona, Sweden.

Breeding Method; Mimer was developed by mass selection and has been used in Sweden for a number of years. Breeder's seed has been produced generation after generation in isolation under natural conditions. It is considered to be in genetic equilibrium under these natural conditions.

Undesirable plants are rogued prior to anthesis. Seed of the remaining plants is bulked to form breeder's seed.

Characteristics: Mimer is higher in yield than either Ensign or Common meadow fescue. Data from Guelph indicates that it is not as leafy as Common, but is almost as high in per cent protein.

Mimer is similar to Ensign and Common in its growth pattern, and is similar to Ensign in maturity. It is more resistant to leaf rust (Puccinia graminis) than Ensign.

The licensing of this variety is supported by the Forage Crop Sub-Committee of the Ontario Committee on Field Crop Recommendations.

Meadow Fescue - "Trader"

Licence No. 905
Issued: Jan. 31, 1964.

Origin: Genetics and Plant Breeding Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.

Breeding Method: A synthetic variety developed from 15 progeny-tested clones. The source material was varieties and strains of European origin.

Characteristics: Trader is a leafy type somewhat later in maturing than Common and Ensign. It recovers well after defoliation and appears to form a better basal growth than Ensign in pastures.

Both hay and pasture yield data indicate that Trader is equal to other varieties in yield and is consistently higher yielding than Ensign, the only pedigreed meadow fescue in commercial production in Canada.

Limited seed yield data at Ottawa do not show significant differences between Trader and Ensign.

The components of this variety were selected for resistance to leaf rust (Puccinea coronata). Limited data indicate a marked superiority to Ensign and Common in this regard.

The licensing of this variety was recommended by:

Genetics and Plant Breeding Research Institute
Department of Agriculture,
Ottawa, Ontario.

and

The Ontario Field Crops Recommendation Committee,
Ontario Agricultural College, Guelph, Ontario.

Red Clover - "Lakeland"

Licence No. 899
Issued: Jan. 23, 1964

Origin: Lakeland was developed by the Wisconsin Agricultural Experiment Station in co-operation with the Crops Research Division, ARS, U.S.D.A. It was named in 1959 and released to the National Foundation Seed Project for Foundation seed production and allocation in the same year. Certified seed production started in 1961.

Pedigree and Breeding History: Lakeland was developed by recurrent mass selection with artificial inoculations of the fungi causing northern anthracnose and powdery mildew during the late 1940's and the 1950's. Source varieties used in development were Wisconsin Mildew Resistant, Dollard, and Kenland with some contributions from Albert, Cumberland, Ottawa, Redon, and Scott.

Varietal Description: Lakeland is a high yielding, double cut type of red clover. It persists well and is equal to Ottawa and Dollard. It is highly resistant to northern anthracnose and powdery mildew, which favors higher quality hay than many other varieties. All other Canadian grown varieties are highly susceptible. Maturity in respect to bloom date is similar to Dollard. Like other very hardy types, Lakeland exhibits more fall growth dormancy than less hardy types. In seed producing ability, it has proved to be one of the top varieties in all tests.

Lakeland appears to be best adapted to the humid area latitude belt from 41 to 49° North extending eastward from North Dakota and Hebraska in the United States and Canada.

Licence requested by Rudy-Patrick Seed Co., Kansas City, Mo.

Sorghum - "R.P. Mor-Su"

Licence No. 912
Issued: Feb. 24, 1964

Origin: Original cross made and tested at Rudy-Patrick Research Center, R. R. #3, Ames, Iowa.

Pedigree: It is a three-way cross between an F_1 male sterile, sweet stalked sorgo hybrid x a sudan grass selection. The parents of the sorgo hybrid are a white-seeded Kafir male sterile selection crossed with a high sugar selection from Waconia Orange sorgo. The sudan grass male in the crossing block is a derivative of Piper sudan grass.

Hybrid Description and Traits: R.P. Mor-Su is a hybrid sorgo male sterile x sudan grass cross. It is characterized by vigorous seed germination and early growth, even under cool soil and climatic conditions. R.P. Mor-Su is rapid in growth and recovers very well following cutting at heights above 4 to 5 inches. It is high in yielding ability for green chop and wilted haylage usage. It also has performed well for grazing and silage. It is best adapted to the northern parts of the United States and southern Ontario in Canada.

In maturity, R.P. Mor-Su is intermediate between Piper sudan grass and Sudax. It heads and blooms a week to two weeks later than Piper and a few days earlier than Sudax. It is one of the earliest sorghum-sudan grass hybrids on the market.

Height - R.P. Mor-Su is a tall growing hybrid; at maturity it averages 5 to 10 inches taller than Sudax and one or two or more feet taller than Piper, depending on the location.

Disease Resistance - High level of resistance to sorghum leaf diseases. Is quite resistant to Helminthosporium leaf blight compared with Piper which is highly susceptible. R.P. Mor-Su shows little or no damage under rust epiphytotics also.

Prussic Acid Potential - R.P. Mor-Su probably should be considered as medium in HCN content compared with Piper which is low and Sorghum almum which is high. It has been similar to Sweet Sudan grass and lower than Sudax in several measurements of this trait.

Seed Stock - Planting seed of Mor-Su is reddish-brown in color, and the glumes are absent.

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Young, W.S. Can you help your alfalfa produce longer? Information Branch to Seed Fair Issues.

Young, W.S. Why the trend to haylage? O.S.C.I.A. Proc., January 1964.