PROGRESS REPORT ON SEED PRODUCTION RESEARCH

prepared by

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for

PRESENTATION AT THE GRASS-LEGUME SEED INSTITUTE
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Weather:

Variety Performance Trials:

Other Trials:

UPDATE ON THE NEW RESEARCH SITE

1997 was the beginning of a transition period for the test plots in Roseau. The traditional base of operation for the grass and legume research operation at the old Welin farm and more recently the Baumgartner farm is in the process of moving to a new location. The old site will be maintained through 1998 but a new location is being phased in. The new 40 acre site is located 2 miles north and about 4 miles west of Roseau on land donated by Peggy Magnusson.

A new shed was constructed on the site last summer for plot equipment storage. There are also 2 offices in the building; 1 for research activities and 1 for Minnesota Crop Improvement use. Alleys for the new plots were seeded last fall. A limited amount of plots were also started last year at this site. More new research will be initiated on this site next year but it will be several years before operation are in full swing.

The Cenex farm just west of Roseau will be an important location in the interim. We have been fortunate to be operating on this site for the past 16 years or so to some degree and would like to thank Cenex for its use. Hopefully we will be able to continue working on this area in the future.

1997 WEATHER

Precipitation for the year was very close to average. This is of course somewhat misleading because of the timing of the rains and temperatures during the year. A cool spring delayed spring fieldwork in most areas. Some areas were short of precipitation for grass seed crops during this time. Weather during harvest was somewhat dryer than its been for a couple of years. Late fall was extremely wet with water standing in many areas. This is quite unusual and although good fall moisture is beneficial, it remains to be seen what effect this will have.

TEST PLOTS

Tables 2-14 have performance evaluations of a number of species of grasses and legumes. Kentucky bluegrass and timothy trials are all older stands and data over a number of years and should give a good indication of relative yields of the varieties included.

New trials of birdsfoot trefoil, red clover, cicer milkvetch and perennial ryegrass have data reported for the first time. 25 lines of perennial ryegrass (some of them from our breeding program) are in a winter hardiness trial in table14. Management studies are included in tables 15-25.

Table 1. Monthly precipitation and average Park Kentucky bluegrass seed yields at Roseau, MN from 1967 to 1997.

Year	MONTHLY PRECIPITATION (inches)												TOTAL	DEPARTURE FROM NORMAL	Park Seed[1] Yield lbs/A
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC			
1967	1.13	.39	.59	2.89	.89	2.23	4.95	1.69	.83	1.11	.70	1.76	19.16	-1.79	
1968	.62	T	1.25	.63	1.46	6.47	6.13	8.49	2.35	1.26	1.06	.21	29.98	+9.03	650
1969	3.07	.11	.05	1.27	3.31	2.29	3.70	4.28	3.29	1.91	.30	.73	24.31	+3.36	488
1970	.71	.41	1.38	2.56	5.93	4.07	3.55	.83	2.77	1.49	1.21	.37	25.28	+4.33	673
1971	.54	.13	.26	1.50	2.24	2.29	3.58	.69	3.33	2.97	.29	.50	19.02	-1.93	492
1972	.68	.76	.50	.70	1.66	5.03	1.92	1.53	4.22	1.4	.38	.32	19.10	-1.85	405
1973	.09	.17	1.18	.90	2.46	2.21	4.04	2.09	5.67	1.19	.67	.75	21.40	+0.45	422
1974	.88	.87	.16	2.72	4.12	1.56	2.56	10.97	.42	.66	.15	1.4	26.47	+5.52	642
1975	1.10	.29	.64	1.40	1.52	4.96	2.26	1.75	1.79	1.49	.20	.65	18.05	-2.90	504
1976	1.13	.50	1.05	.77	.54	5.82	1.52	3.72	.34	.07	T	.37	15.83	-5.12	146
1977	.14	.62	1.02	.27	2.43	3.71	2.28	1.74	3.83	.87	2.27	.26	19.44	-1.51	140
1978	.36	.26	.17	1.00	1.97	1.92	6.25	3.25	3.44	.23	.98	.79	20.62	-0.33	507
1979	.50	1.01	1.06	2.77	1.89	1.91	3.7	1.59	.45	1.40	1.02	.16	17.46	-3.49	415
1980	.55	.82	.35	.00	.24	1.75	3.35	5.19	4.12	1.66	.94	.18	19.15	-1.80	62
1981	.27	.16	.66	.56	2.79	6.85	2.63	2.41	3.63	1.75	.90	.99	23.60	+2.65	625
1982	1.30	.45	.74	.24	1.38	2.00	5.53	2.71	1.92	2.91	.46	.57	20.21	-0.74	595
1983	1.31	1.26	1.17	.53	2.76	4.03	1.62	3.34	2.81	2.26	.66	.10	21.85	+0.90	605
1984	T	.95	T	.72	.72	4.46	3.78	.99	.37	4.32	.10	1.02	17.18	-3.77	613
1985	.12	.33	.06	1.07	4.35	4.62	1.08	8.72	1.6	1.04	1.68	.38	25.05	+4.10	525
1986	.30	.90	.26	2.96	1.4	2.43	3.59	2.04	2.52	.65	1.97	.36	19.38	-1.57	488
1987	.47	.30	.10	.59	4.37	2.25	4.8	2.22	.82	.92	.73	.35	17.92	-3.03	288
1988	.60	.09	1.75	.00	1.74	1.34	5.53	1.70	2.24	.12	.77	1.05	16.81	-4.14	152
1989	3.27	.32	2.86	.10	2.82	5.46	1.60	2.56	1.24	.41	.62	.45	21.71	+0.76	320
1990	.55	.20	1.12	1.09	.47	3.19	2.48	.62	.91	.16	.18	.72	11.69	-9.26	160
1991	.56	.64	.58	2.87	3.19	5.94	3.40	1.99	7.42	1.64	1.36	.70	30.29	+9.34	210
1992	.61	.68	.45	2.27	1.99	2.36	2.72	4.51	2.76	.12	1.27	.88	20.62	-0.33	630
1993	.68	.05	.27	1.01	1.63	5.06	5.87	4.69	.72	.71	.45	.65	21.79	+0.84	490
1994	.21	.33	.46	.02	.16	2.54	3.03	3.48	3.94	1.38	2.72	.32	18.59	-2.20	230
1995	.57	.59	1.23	.61	2.50	2.13	4.59	3.59	1.81	1.33	1.54	1.46	21.95	+1.16	300
1996	.94	.48	.22	1.65	4.62	1.64	7.34	1.78	1.77	1.75	2.73	1.07	25.99	+5.20	250
1997	1.06	.14	1.02	.84	2.02	3.36	4.02	1.31	4.01	2.45	.19	.25	20.67	-.12	350

[1] Seed yield estimates of Park Kentucky bluegrass on 2-4 year old stands at Roseau test plots with 100 lbs/A of nitrogen.

Table 2. Percent heading, height, lodging, harvest date, and seed yield for 24 Kentucky bluegrass varieties seeded on the Baumgartner farm, Roseau 1991. 1997 data and 1993-97 seed yields.

Variety	MSP#	% heading 6-12	% heading 6-17	Height (In.) at harvest	Lodging at harvest[1]	Harvest Date	Seed yield (lb/A) 1993	1994	1995	1996	1997	5 yr Avg.
Abbey	2606	16	74	20	1	7-12	989	317	259	107	212	377
Aspen	2608	26	73	22	1	7-13	470	123	181	69	152	199
BA-13	2822	33	86	19	1	7-13	644	410	241	123	201	324
Baron	2514	14	55	18	1	7-15	708	346	281	60	176	314
Blacksburg	2568	6	16	17	1	7-16	390	47	38	7	29	102
Challenger	2569	15	54	20	1	7-16	789	120	136	22	165	247
Cheri	2607	15	63	20	1	7-16	662	261	225	65	125	268
Columbia	2570	21	73	26	1.3	7-16	555	129	192	69	129	215
Compact	2652	11	59	22	1	7-10	677	138	192	45	105	231
CPP86-14-5	2825	11	46	20	1	7-15	548	96	109	31	112	179
CPP86-36-6	2826	13	48	20	1	7-16	194	71	76	33	125	100
Donna (Lucia)	2566	41	85	22	1	7-16	608	457	294	114	161	327
Four Aces (RE-88)	2823	26	69	22	1	7-13	503	149	169	54	154	206
Midnight	2611	9	36	20	1	7-15	686	223	207	71	176	273
Minnfine (2405)	2692	93	100	31	5.3	7-10	508	203	421	230	321	337
Miracle (CPP141)	2594	49	85	21	1.8	7-15	717	535	388	94	140	375
Newport	2372	66	96	25	1	7-10	570	297	252	190	227	307
Opal	2654	10	50	22	1	7-10	519	116	185	36	76	186
Park	2556	70	100	31	2.3	7-10	548	147	308	114	140	252
Rugby	2609	26	70	23	1	7-15	579	129	223	74	109	223
Silvia (CPP139)	2593	45	84	26	2	7-13	604	138	252	83	107	237
Unique (C-76)	2824	13	73	21	1.3	7-15	486	198	203	169	185	248
LSD at 5% level		15	15	3	.8	3	242	98	65	45	65	56

[1]1=no lodging; 9=severe lodging.
Experimented Design: RCB with 4 reps.

Table 3. Powdery mildew, height, harvest date, lodging and seed yield for 16 Kentucky bluegrass varieties seeded on the Baumgartner Farm in 1992.

		Powdery mildew[1]			1997 Harvest			Seed yield (lb/A)					
Variety	MSP#	6-17-93	6-15-94	6-6-95	Height (in.)	Date	Lodging[2]	1993	1994	1995	1996	1997	94-97 Ave.
Abbey	2606	1.6	0.5	0	16	7-12	1.0	180	394	361	161	103	255
Aspen	2608	1.3	0.8	0	22	7-14	1.0	176	131	161	109	136	134
BA73-366	2716	1.5	0.5	0.4	17	7-15	1.0	250	359	277	149	85	217
Bar VB 1184	2860	1.8	3.5	2.4	19	7-15	1.5	140	118	89	35	40	71
Baritia	2862	1.6	3.8	2.3	21	7-14	2.5	165	100	107	59	36	75
Barmax	2861	0.3	0	0	16	7-9	1.0	584	407	564	415	216	401
Blacksburg	2857	1.3	2.2	1.1	20	7-15	1.0	107	74	53	30	20	44
Midnight	2858	3.8	2.8	0.4	18	7-15	1.0	163	374	192	120	107	198
Minnfine (2405)	2692	0.3	0	0	31	7-9	2.3	521	296	482	348	350	369
Newport	2852	0.6	2.0	0.1	25	7-11	1.3	559	379	277	580	232	367
Opal	2654	0	0	0	24	7-11	1.3	274	71	243	117	112	136
Park OT 433	2601	0	0	0	--	--	--	408	102	116	56	NH	--
Park	2556	3.4	2.0	1.4	31	7-9	1.5	307	250	306	180	210	237
Park OT 442	2602	0	0	0	--	--	--	499	134	178	66	NH	--
Rugby	2609	3.0	2.5	0.9	24	7-15	1.0	241	187	239	225	169	205
Unique	2859	0.1	0	0	20	7-15	1.0	272	412	223	397	350	346
LSD at 5% level		0.8	1.7	0.7	2	2	1.0	128	87	80	72	69	45

Experiment design: RCB 4 reps.

[1]0 = no mildew, 5 = severe mildew

[2]1 = no lodging, 10 = severe lodging

Table 4. Plant heading, height, lodging, harvest date and seed yield for 11 timothy strains seeded in August 1990 on Baumgartner Farm, Roseau, MN. 1997 data and 1992-1997 seed yields.

Variety	MSP No.	Percent Heading 6-21	Plant Height (in.) at Harvest	Lodging[b] at Harvest	Harvest Date	Seed Yield 1992	1993	1994	1995	1996	1997	6 yr. Ave.
Climax	2713	90	50	3.3	8-5	691	642	415	419	359	644	528
FFR-TM 8501	2766	100	49	1.8	8-3	700	463	384	357	283	589	463
FFR-TM 8601	2767	100	50	1.5	8-1	520	546	301	265	433	618	447
Goliath	2758	92	47	3.0	8-3	778	497	348	319	285	624	475
Heidemij	2715	8	40	2.3	8-13	714	361	442	377	230	402	421
Motim	1595	33	45	4.5	8-13	687	568	241	473	178	404	425
SV 8406	2746	92	46	2.5	8-4	698	358	277	374	303	580	432
SV 8407	2747	92	48	3.8	8-1	823	647	562	435	370	604	574
SV 8414	2748	98	47	3.3	8-3	767	526	495	484	453	716	574
SV 8423	2749	100	46	3.3	8-5	841	477	475	466	408	633	550
SV 8505	2750	98	47	3.0	8-5	725	546	529	564	475	700	590
LSD at 5% level		6	3	1.4	3	121	144	137	153	113	154	77

[a] Experimental design: RCB with 4 reps.
[b] 1 = no lodging, 9 = severe lodging.

Table 5. Percent heading, height, lodging, harvest date and seed yield for 5 timothy strains seeded in August, 1993 on Baumgartner Farm, Roseau, MN.[1] 1996 data and 1994-96 seed yield

Variety	MSP No.	Percent Heading 6-27	[2]Lodging at Harvest	Harvest (in.) 7-13	Harvest Date	Seed Yield (lb/A) 1994	1995	1996	1997	4 yr. Ave.
Climax	2713	93	1.8	49	8-4	359	399	522	615	474
Goliath	2851	75	4.5	44	8-4	488	479	433	540	485
Heidemij	2715	11	3.5	38	8-13	575	439	442	600	514
Tarmo	2923	93	5.3	43	8-4	526	671	624	586	602
Timfor	2876	98	1.5	47	8-3	577	508	589	544	555
LSD at 5% level		11	1.7	1	4	108	127	113	144	66

[1] Experimental design: RCB with 4 reps.
[2] 1 = no lodging, 9 = severe lodging.

Table 6. Percent heading, harvest height and seed yield for 8 reed canarygrass strains seeded on Cenex Farm 7/26/95. 1997 data.

Variety	MSP#	% heading 6-11	% heading 6-20	Harvest height (in.)	Seed Yield (#/AC) 1996	Seed Yield (#/AC) 1997
Fu Sr 8702	3010	9	61	67	214	638
Fu Sr 8703	3011	8	63	67	129	589
LQ Sr 9102	3012	4	65	70	143	453
LQ Sr 9104	3013	T	68	67	138	466
Mn-76	2408	15	66	69	76	299
Palaton	2983	5	64	69	243	769
Venture	2661	10	68	67	210	609
Vantage	2925	8	68	69	187	645
LSD at 5% level		7	9	2	77	220

Experimental design: RCB with 4 reps.

Table 7. Harvest height, harvest date and seed yield for 6 reed canarygrass strains seeded on the Baumgartner Farm, 8/93.

Variety	MSP#	Harvest Height (in.)	Harvest date	Seed Yield (lb/A) 1995	1996	1997	3 yr. Ave.
Lara	2920	59	7-15	132	149	36	106
Palaton	2660	64	7-15	395	493	350	413
PSC 114442LA	2921	64	7-11	132	125	78	112
PS4	2919	63	7-15	303	453	163	306
Vantage	2925	64	7-14	239	341	100	227
Venture	2661	63	7-14	397	439	198	345
LSD at 5% level		3	2	83	114	85	72

Experimental design: RCB with 4 reps.

Table 8. Vigor and seed yield for 15 birdsfoot trefoil strains seeded 6/12/96 on Cenex farm near Roseau.

Strain	MSP#	Seedling Vigor[1] 7/10/96	Seed yield (lbs/A)
Empire	2947	3.5	366
Fusarium resistant Norcen sel.	3057	6.5	524
Leo	2951	3.3	546
Nueltin (LC6F)	2969	7.3	426
NC7-1 yr. Hiforage	2971	7.5	355
NC3-2 yr. Hiforage	3063	7.5	537
Norcen	2948	6.5	549
Roseau (NC3M)	2967	7.3	506
Norcen 'F' syn. 2 ('N' fixation)	2788	6.8	602
Norcen 'N' syn. 2 ('N' utilization)	2789	8.0	475
Steadfast (ARS-2620)	3065	6.5	314
Trevig	2964	6.3	497
Viking	2949	5.5	415
Winter Hardy Norcen Sel.	2977	8.0	413
WIT	2924	5.5	468
LSD at 5% level		1.4	129

Experimental Design: RCB with 4 reps

[1] 1 = least vigor, 9 = best vigor

Table 9. Seed yield for 8 kura clover varieties seeded in 1994 on Baumgartner Farm, Roseau, MN.

Strain	MSP #	Seed Yield (lb/A) 1995	1996	1997	3 yr. Ave.
Monaro	2908	225	400	104	243
Monaro (coated)	2909	363	416	102	294
NF-93	2928	285	297	85	223
Prostrate Spreader	2941	207	312	80	200
Rhizo	2950	109	247	79	145
SFP-92 (syn2)	2952	243	423	155	274
Upright Bunch	2940	252	366	149	256
Upright Spreader	2939	201	291	133	208
LSD at 5% level		98	107	68	53

Experimental design: RCB with 4 reps.

Table 10. Percent heading, height, and seed yield for 5 quackgrass selections and a timothy-quackgrass mixture, seeded on Cenex Farm 7/26/95. 1996 data.[2]

Selection	MSP#	% heading 6-16	6-23	Harvest date	Lodging at harvest[2]	Height (in.) at harvest	Seed Yield (lb/A) 1996	1997
Everett	2975	4	50	8-2	2.5	44	161	428
Hi forage	2976	3	49	8-5	3	45	308	341
1994 Roseau ecotype	3015	3	49	8-1	3	44	254	397
1994 Roseau Common	3014	3	48	8-5	2.5	44	297	308
1993 Common	3016	2	46	8-3	3	42	342	363
1994 Roseau Common[1] +	3014+	3	48	8-3	1.3	44	243	326
Climax Timothy	2713						112	16
LSD at 5% level		3	5	2	2	1	108	93

[1]Timothy and quackgrass mixed. Seed yields reported for both species but Timothy not included in analysis.
[2]1= no lodging, 9 = severe lodging.
Experimental design: RCB with 4 reps.

Table 11. Vigor and seed yield for 6 red clover strains seeded 6/12/96 on Baumgartner farm.

Strain	MSP#	Seedling[1] Vigor 7/10/96	1997 Seed Yield (lbs/A)
C456	3074	7.5	442
C328	3073	7.3	435
C11	3072	7.5	404
HC60	3075	7.8	448
Arlington	3070	3.0	571
Marathan	3071	6.8	502
LSD at 5% level		1.5	99

Experimental Design: RCB w/4 reps
[1] 1 = poor vigor, 9 = best vigor

Table 12. Vigor and seed yield for 4 cicer milkvetch and 1 Canada milkvetch (SD 301) strains seeded 6/12/96 on Baumgartner farm.

Strain	Species	MSP#	Seedling[1] Vigor 7/10/96	1997[2] Seed Yield (lbs/A)
Hi Pal	Cicer milkvetch	3069	6.0	155
Lutana	Cicer milkvetch	2910	6.3	137
Monarch	Cicer milkvetch	2984	6.3	77
Windsor	Cicer milkvetch	3068	7.0	68
SD 301	Canada milkvetch	3080	2.0	1029
LSD at 5% level			1.4	215

Experimental Design: RCB w/3 reps
Seeded in 18" rows @ 5.5#/AC.
[1] 1 = poor vigor, 9 = best vigor
[2] Excess residual nitrogen (Summer fallowed in 1995) may have reduced Cicer milkvetch yields.

Table 13. Data for seven Perennial ryegrass strains seeded August 23, 1996 on Baumgartner farm. 1997 data.

Strain	MSP#	Winter Injury[1] 5/20	Winter Injury[1] 5/29	% Heading 6/26	Harvest date	Seed Yield (lbs/A)
Brightstar	3092	2.6	2.5	33	8-5	774
Delray	3105	3.0	2.9	73	8-1	430
NK-200	3009	1.8	1.5	4	8-6	1117
P1 (Betts cross)	3106	3.0	2.6	73	8-1	868
PST-2M3	3093	2.4	1.8	30	8-6	801
Tophat	3029	2.8	2.4	63	8-4	905
TQ x Spread	3102	2.4	2.6	53	8-6	868
LSD at 5% level		1.1	1.2	11	2	237

Experimental Design: RCB with 4 reps

[1] Winter injury: 1 = no injury to 5 = dead

Table 14. Winter hardiness trial for 25 perennial ryegrass strains seeded 8/25/96 on the Baumgartner farm and seeded 8/29/96 at Rosemount.

Entry	MSP#	Rosemount Winter Injury[1]		Roseau Winter Injury[1]			
				No cover		Under wheat	
		5/6/97	4/27/97	5/20/97	5/29/97	5/20/97	5/29/97
Affinity	3030	4.8	4.8	3.3	3.3	1.4	1
Annual common	3052	5	5	5	5	5	5
Brightstar	3092	4.6	4.6	3.4	3.4	1.3	1.5
Brenda	2761	5	5	nr[3]	nr	nr	nr
Delray (Helms. 96)	3105	5	5	4.8	4.9	1.9	1.5
Envy II	3081	4.6	4.6	3.1	2.8	1.5	1.5
Essence	3083	4.8	4.7	3.6	3.5	1.4	1.4
k9 bulk	3101	4.6	4.6	3.4	3.1	1.2	1.3
NK-200	3009	4.1	4	3.1	2.8	1.3	1.1
Omega III	3025	4.8	4.7	3.8	3.8	2	1.3
p1 (Helms. 96)	3106	5	5	4.8	4.8	2	1.9
p1	3018	5	5	4.8	4.8	1.5	1.3
p22	3053	5	5	4.3	4.4	2.4	2.3
p24	3054	5	5	4.4	4.7	3	2.6
p32	3055	5	5	4.3	4.1	2.4	1.9
p45	3056	5	5	4.8	4.8	2.9	2.5
Panther	3082	4.4	4.3	3.6	3.8	1.9	1.4
Tophat	3084	4.5	4.5	3	3.1	1.4	1.4
TQ x Spread	3050	4.7	4.7	3.5	3.6	1.9	1.4
TQ x spread syn.2	3102	4.8	4.7	3.9	3.5	1.3	1
2slx-101x3348	3087	4.9	5	4.5	4.4	1.5	1.4
3348x2slx-101	3088	5	5	3.9	4	2	1.8
2XX-94x3227	3089	np[2]	np	4.3	4.2	2.25	2
3327x2xx-94 (2DLL-2)	3090	5	5	4.4	4.1	2.5	2
3260x2LA	3091	np	np	nr	nr	nr	nr
WH x TQ	3103	4.6	4.6	np	np	np	np
W hardy comp	3104	4.5	4.6	np	np	np	np
LSD @ 5% level		0.3	0.3	0.6	0.8	1	0.9

Experimental Design: RCB w/4 reps

[1] Winter Injury: 1 = no injury; 5 = dead

[2] np = not planted

[3] nr = insufficient stand to rate

Table 15. 'Midnight' Kentucky Bluegrass - Residue Management X Fertility Trial. Helmstetter farm north of Roosevelt, 1996-97 data.

Residue Treatment	Nitrogen[4] Rate (lb/A)	Harvest Ht. (in.) '97	Seed yield[6] (lb/A) '96	'97	2 yr. Ave.
[1]Burn only	Urea 100/120 in 1996	17	321	93	207
	Urea 150/180 in 1996	16	381	237	309
	AS 50 + (Urea 50/70 in 1996)	16	390	177	283
	AS 50 + (Urea 100/130 in 1996)	16	327	153	240
	Amm. nitrate 100/120 in 1996	16	384	197	290
			Avg. 361	171	266
[2]Gramoxone +	Urea 100/120 in 1996	16	479	221	350
Burn	Urea 150/180 in 1996	16	613	175	394
	AS 50 + (Urea 50/70 in 1996)	16	477	188	332
	AS 50 + (Urea 100/130 in 1996)	16	680	200	440
	Amm. nitrate 100/120 in 1996	15	526	134	330
			Avg. 555	184	369
2X Gramoxone +	Urea 100/120 in 1996	15	477	138	308
Burn	Urea 150/180 in 1996	17	678	176	427
	AS 50 + (Urea 50/70 in 1996)	16	553	177	365
	AS 50 + (Urea 100/130 in 1996)	16	731	175	453
	Amm. nitrate 100/120 in 1996	16	642	198	420
			Avg. 616	173	395
[3]Gramoxone +	Urea 100/120 in 1996	17	341	236	289
Burn + Roundup strip - '95	Urea 150/180 in 1996	18	406	234	320
	AS 50 + (Urea 50/70 in 1996)	18	346	234	290
	AS 50 + (Urea 100/130 in 1996)	18	504	276	390
	Amm. nitrate 100/120 in 1996	18	462	222	342
			Avg. 412	240	326
No Treatment - 1995	Urea 100/120 in 1996	16	243	252	
[5]Paraquat burn +	Urea 150/180 in 1996	16	245	161	
Roundup strip - '96	AS 50 + (Urea 50/70 in 1996)	16	248	244	
	AS 50 + (Urea 100/130 in 1996)	17	196	216	
	Amm. nitrate 100/120 in 1996	15	219	201	
			Avg. 230	215	
LSD at 5% level			All plots 132	140	98
LSD at 5% level			Avg. residue treatments only 65	54	58

Experimental design: split-block with 4 reps.

[1]all burn treatments done in mid-August - 1995 + 1996 - Burn treatment alone burned poorly. 2X Gramoxone extra treatment burned slightly better than the normal 1 pass treatment.

[2]1 pt/A Gramoxone extra + .05% COC applied as a burning aid. The 2X treatment was sprayed a second time from the opposite direction.

[3]2"-3" Roundup strips applied to fall regrowth every 10" Sept. 14, 1995.

[4]all fertilizer applied Oct. 15, 1996. 0+42+126 was applied to entire area in 1995. AS50 = ammonium sulfate (50+0+0+57 sulfur). Total nitrogen rates in 1995 were 100 #/Ac and 150 #/Ac; in 1996 were 120 #/A and 180 #/A.

[5]2"-3" Roundup strips applied to fall regrowth every 10", Sept. 3, 1996.

Table 16. The effect of Post burn Roundup renovation on 5 Kentucky bluegrass varieties seeded In 1988 on the Baumgartner farm, Roseau, MN - 1996-97 data.

Variety	Renovation[1] Treatment	% heading 6/5/97	Harvest - 1997 Ht. (in.) 1997	Lodging[2]	Date	Seed yield (lb/A) 1996	1997	2 yr Ave.
Abbey	no treatment	T	22	1.0	7-9	661	445	553
	3" strip - '95	3	28	2.3	7-9	210	508	359
	7" strip - '95	T	27	2.0	7-11	66	525	296
	3" strip - '96	2	27	1.8	7-13		426	---
Aspen	no treatment	2	23	1.0	7-16	278	319	299
	3" strip	2	27	1.8	7-16	162	375	269
	7" strip	2	28	3.3	7-16	32	417	225
	3" strip - '96	2	26	3.8	7-16		299	---
Midnight	no treatment	0	22	1.0	7-17	367	287	327
	3" strip	0	23	2.5	7-17	168	304	236
	7" strip	0	27	4.5	7-17	43	311	177
	3" strip - '96	0	24	2.3	7-17		176	---
Park	no treatment	29	32	3.8	7-9	316	328	322
	3" strip	41	32	5.0	7-9	105	462	284
	7" strip	38	32	6.0	7-9	52	498	275
	3" strip - '96	30	32	5.3	7-9		330	---
Rugby	no treatment	14	30	2.0	7-14	299	398	349
	3" strip	10	30	3.8	7-16	85	508	297
	7" strip	9	30	4.8	7-16	27	525	276
	3" strip - '96	5	31	4.3	7-16		426	---
LSD at 0.05						123	128	

[1]2 pts/A Roundup applied in 3" and 7" strips every 10" Sept. 13, 1995 and Sept. 4, 1996. Bicycle sprayer w/6502E nozzles 25 PSI and 12 GPA output used in application.
[2]1=no lodging, 10=severe lodging.

Table 17. Nitrogen-Sulfur Trial Applied to 'Park' Kentucky Bluegrass on the Byron Tviet farm north of Roosevelt, Oct. 15, 1996. 1997 data.

Fertilizer	Harvest Ht. (in.)	Seed Yield (lbs/A) Visual Estimate	Actual
50# AS+ 70# Amm. Nit.	31	417	500
50# AS+ 70# Urea	30	400	461
120# Urea	32	350	485
120# Amm. Nit.	30	300	479
LSD at 5% level	1	112	133 (N.S.)

50# AS = 50# 'N' + 57# Sulfur
other rates are actual nitrogen ('N') rates
Soil Test - 16#/Ac SO_4 - Sulfur

Table 18. 'Park' Kentucky Bluegrass Renovation - Weed Control Study.[1] Cenex farm - Roseau, MN. 1997 data.

Treatment[2]	Timing	% Heading 6/9	% Heading 6/13	% Heading 6/19	Harvest Ht. (in.)	Harvest Lodging[3]	Seed Yield (lbs/A)
1. 3/4 pt./Ac. Banvel+ 3/4 pt./Ac. 2,4-D Amine	Fall 9/17/96	34	53	89	36	3.8	460
2. 3/4 pt./Ac. Banvel+ 3/4 pt./Ac. 2,4-D Amine	Spring 5/21/97	30	48	85	35	3.3	391
3. .025#/Ac. Beacon+ 0.25% nonionic surfactant	Fall 9/17/96	25	44	84	34	1.5	381
4. .025#/Ac. Beacon+ 0.25% nonionic surfactant	Spring 5/21/97	29	46	83	34	1.5	509
5. Banvel+ 2,4-D+ [4]Roundup strip	Fall 9/17/96 Fall 8/23/96	34	49	84	35	3.3	392
6. Beacon+ [4]Roundup strip	Fall 9/17/96 Fall 8/23/96	25	43	83	33	1.0	336
7. Assure II 10 oz/Ac. nonionic surfactant	Fall 9/19/96	5	10	20	34	1.0	30
8. No treatment	--------	39	60	88	34	5.3	402
LSD at 5% level		7	8	14	1.7	1.7	122

Experimental Design - RCB w/4 reps

[1] Seeded in 1990

[2] 3/4 pt./Ac. Banvel = .375A#: Dicamba
3/4 pt./Ac. 2,4-D = .375#A:2,4-D
.025#/Ac. Beacon = .02# A:Primisulfuron

[3] 1 = no lodging, 9 = flat

[4] 3" Roundup strip applied every 10" at 1/2 pt./Ac.

Table 19. Fine Fescue Variety X Residue Management Trial Seeded on the Baumgartner Farm 7/24/94. 1997 data.

Strain Species	Residue Treatment[1]	% heading 6/5	6/13	6/20	Harvest Ht.	Lodging[4]	Date	Base Yields[2] lbs/A	Seed Yield lbs/A
Boreal Creeping red fescue	Burn	0	23	63	31	6.3	7-17	339	442
	Rake off straw	0	20	52	30	6.7	7-17		373
	Rake off clip	0	22	65	31	6.3	7-17		442
	Rake off strip	0	22	65	31	4.7	7-17		412
Hector Strong Creeping fescue	Burn	2	20	67	30	5.7	7-17	214	372
	Rake off straw	0	12	57	30	6.0	7-17		394
	Rake off clip	0	20	63	30	6.7	7-17		500
	Rake off strip	0	18	62	29	5.3	7-17		385
Mary Chewings fescue	Burn	T	15	43	27	2.7	7-15	348	150
	Rake off straw	2	27	53	28	3.0	7-15		279
	Rake off clip	2	30	53	26	1.3	7-15		141
	Rake off strip	3	27	50	27	1.3	7-15		204
Victor Creeping red fescue	Burn	0	22	63	31	3.7	7-17	187	248
	Rake off straw	0	23	57	30	5.7	7-17		235
	Rake off clip	2	27	62	30	4.7	7-17		238
	Rake off strip	0	20	60	29	3.0	7-17		193
67135 Sheep fescue[3]	Burn	33	80	100	31	1.0	7-15	312	337
	Rake off strip	37	78	100	31	2.3	7-15		384
	Rake off clip	40	78	100	31	2.3	7-15		428
	Rake off strip	33	78	100	30	2.3	7-15		266
LSD at 5% level		4	12	12	2	2.4			153

Experimental Design: RCB w/4 reps

[1]All plots cut 7/25/96. Burn and rake off treatments done 8/9/96. Clip treatment done 8/10/96 to 3" height. Rake off strip treatment = same as rake off then 10" Roundup strip applied every 20" @2 pts/Ac (4 pts./Ac in strips) 8/10/96.

[2]Base yield in 1996 are for varieties only. Straw was raked off entire area in 1995.

[3]Establishment of 67135 was marginal and stands are thin.

[4]1 = no lodging; 9 = severe lodging

Table 20. 'Venture' Reed Canarygrass Renovation X Fertility Trial - Cenex farm, Roseau, MN. 1996-1997 data.

Renovation Treatment[1]	Fertility[2]	Harvest Height (in.)	Harvest Date	Seed Yield lbs/A 1996	1997	2 yr. Ave.
3" Roundup strip every 10" - 9/13/95	60+30+30	60	7-11	136	292	214
	120+60+60	66	7-14	202	498	350
	180+90+90	66	7-15	298	460	380
No treatment	60+30+30	58	7-13	258	211	234
	120+60+60	64	7-15	521	398	460
	180+90+90	64	7-15	611	423	517
LSD at 5% level				86	43	

[1] All plots burned August 11, 1995 - Residue not removed in 1996.
[2] Fertilizer October 13, 1995.

Table 21. 'Venture' reed canarygrass residue management trial. Seeded in 1991 on Cenex farm. 1997 data.

Residue Treatment	% Heading 6/12	Harvest Height	Seed Yield (lbs/A)
Burn Springs 5/1/97	5	62	613
Burn after harvest 8/1/96	42	59	398
[1]Burn after harvest 8/1/96+ Roundup strip	53	58	416
Bale off straw after harvest - 7/20/96	37	57	401
No treatment	0	59	440
LSD 5% level	34	4	130

Experimental Design: RCB w/3 reps
[1] 8" Roundup strip every 20" - 8/23/96

Table 22. Dry weights of kura and weed herbage and seed yield of 'Rhizo' kura clover seeded under three base treatments and 2 seeding rate regimes on the Baumgartner farm May 29, 1992 and May 26, 1996. 1993 data from '92 seeding, 1997 data from 1996.

Base Treatment	Seeding[a] rate	Herbage dry wt. (Tons/Acre) 1993 kura	1997 kura	1993 weeds	1997 weeds	Seed Yield (lb/A) 1993	1997	2 yr. Ave.
Flax	1	.09	.31	.21	.69	8	0	4
Flax	2	.18	.27	.22	.68	62	0	31
None	1	.42	.48	.20	1.11	49	102	75
None	2	.60	.88	.13	1.13	102	91	99
Treflan[1]	1	1.38	1.36	.11	.61	304	289	296
Treflan	2	1.38	1.38	.10	.63	324	343	333
Wheat	1	.06	.09	.14	1.08	1	0	1
Wheat	2	.12	.56	.26	.91	7	0	4
LSD at 5% level		.76	.57	.18	.89	188	91	109

[a] 1=12" rows @ 1.25 lb/A.
2=12" rows @ 1.25 lb/A + cross seeded at .74 lb/A.
[1]Treflan applied 3/4 lb/A/ai PPI.

Table 23. Fertility trial on Endure Kura Clover. Cenex farm - 1997 data.

Fertility level	Seed Yield (#/AC)
0	578
50+0+0	580
0+0+80	640
0+0+240	575
0+40+80+10 sulfur	526
50+40+80+10 sulfur	584
LSD at 5% level	151 (N.S.)

Experimental Design: RCB w/reps

[1]Fertilizer applied 5/29/97
Soil Test 9/96: K_20 - 24 #/AC
P_20_5 - 200 #/AC
Ph - 8.0
SO_4-S - 40 #/AC

Table 24. Herbicides applied to 'Endure' Kura Clover. Cenex farm. 1997 yield data.

Herbicide	Seed Yield (#/AC)
Pursuit 6/13/97	586
Pursuit Prowl 5/21/97	568
Sencor 5/21/97	398
No treatment	344
LSD at 5% level	219

Experimental Design: RCB w/4 reps

3 oz. Pursuit (.047# Ai/Ac. Imazethapyr)
3 pts. Prowl (1.25# Ai/Ac. Pendimethalin)
1.2# Sencor (1# Ai/Ac. Metribuzin)

Table 25. Postemergent herbicides were applied to eight grass species on July 7, 1996. Annual grass weed were 8"-12" high at this time and broadleaf weeds were 8"-16" high. The species were seeded in a randomized complete block design with three replicates on May 31, 1996. Each plot had three 12" inch rows and is seven feet wide per species. Application was made with a CO_2 backpack sprayer at 12.5 GPA and 25 PSI. The temperature was 70^{0}F with N wind at 0-5 mph. Stands were fair to good on all species. Clip plots were mowed on July 17 and all plots except the no treatment were clipped and the residue removed on August 26. Weed control ratings were taken on August 23 and crop injury was visually rated on Sept. 19. Weed competition may have reduced stands in some areas. No treatment plots too weedy to visually rate. ½ pt 2,4-D + ½ pt Banvel applied to all plots, Sept. 10, 1996. 50+25+25 applied Oct. 1996. Herbicide treatments are as follows:

Treatment Number	Common Name	Trade Name	Product Acre	#/Acre Active	Pints/Acre Additives
1	---	No treatment	None	---	
2	Bromoxynil + MCPA	Bronate	1 pint	0.5	
3	Fenoxyprop-P	Option II	½ pint	0.04	
4	ac299,263	Raptor	6 oz.	0.047	.25 non-ionic + 1-28% N
5	Metsulfuron	Ally	.0025 lbs.	0.0015	
6	ac263,222	Contend	1/4 pint	0.063	.25 non-ionic + 1-28% N
7	Thifensulfuron + Tribenuron	Harmony Extra	.02 lbs.	0.024	
8	Fluazifop	Fusilade 2000	1 pint	0.125	1 crop oil concentrate
9	Clip	none	---	---	
10	Diclofop	Hoelon	2 pints	0.75	
11	2,4-D amine	Weedar 64	½ pints	0.25	
12	Picloram	Tordon	2 pints	0.5	
13	Primisulfuron	Beacon	.02 lbs.	0.025	

Table 25. The effect of postemergence herbicides applied to seedling grasses.

Species	Variety	Herbicide Treatment 1*	2	3	4	5	6	7	8	9	10	11	12	13	LSD 5%
		seed yield - 1997													
[2]Perennial ryegrass	NK-200	558	656	901	892	165	547	807	754	767	348	731	789	888	368
[2]Perennial ryegrass	Bett #1	446	852	927	772	865	758	736	825	816	535	660	879	861	272
Timothy	Heidemij	428	577	488	151	544	0	562	0	657	0	591	627	303	291
[2]Creeping red fescue	Boreal	236	466	571	214	477	446	558	580	593	455	270	156	85	367
Kentucky bluegrass	Park	12	131	107	83	100	58	171	0	169	0	44	28	29	134
Reed canarygrass	Palaton	269	287	166	60	101	0	153	0	299	0	143	64	22	224

[1]0 = no injury; 10 severe injury
[2] = only 2 reps harvested

Table 25. The effect of postemergence herbicides applied to seedling grasses -1996

Species	Variety	Herbicide Treatment 2	3	4	5	6	7	8	9	10	11	12	13
		Average injury rating[1]											
Perennial ryegrass	NK-200	3.0	4.7	8	10	9	5.3	8.7	0	9.7	4.3	4.7	8.0
Perennial ryegrass	Bett #1	1.7	3.3	4	4.3	7.0	3.3	2.7	0	2.3	3	3.3	6.3
Timothy	Heidemij	3.7	7.3	9.3	7.7	10	5	10	1.0	10	6	5.3	9.7
Creeping red fescue	Boreal	4.7	3	9	5.3	8.3	4.7	2.3	2	4.7	6.3	6.7	7
Kentucky bluegrass	Park	3	6	8.7	7.3	8.3	5.3	10	1.7	10	7	6.3	8.3
Switchgrass	Dacotah	3	5	4	8	8	7	10	2	9	7	8	7.5
Quackgrass	Common	2.3	4	7.7	6	5.7	6	9.7	1.3	4.7	5.7	7	8.7
Reed canarygrass	Palaton	2	5.7	8.7	6	10	4.3	10	0	9.7	4	5	6.7

[1]injury rating - 0 = none, 10 = dead