Using triticale and annual ryegrass in cool season perennial grass grazing systems

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ABSTRACT

Winter-growing cereals or other annual grasses complement cool season perennial grass grazing systems. The winter-annual grasses grow later into the fall and resume growth earlier in the spring than do perennial grass pastures in the intermountain region. These annual grasses can be grazed in the fall and spring reducing the duration of costly hay feeding. Trical 102 triticale planted in mid August provides about 2 tons per acre of fall forage by early November. Earlier planting and use of triticale 2700 offers forage in September but will winter kill in the intermountain region. Triticale planted in August and grazed in the fall also produces 2 to 3 tons of forage in April for grazing followed by a hay crop of 6 to 8 tons. Grazing trials with clipping to simulate grazing indicate spring grazing should occur in early April when triticale is 6 to 12 inches tall. One quick grazing is preferred, since multiple grazings and grazing of more mature plants were found to substantially decrease hay yields while only slightly increasing forage for grazing. Planting annual ryegrass as a mixture with triticale did not reduce fall and spring forage yields and the ryegrass continued growing through September. Annual ryegrass varieties Barmultra, Bartissimo and Bison were superior for early spring, September and total forage production. These trials demonstrate production and management of forage systems using Trical 102 triticale and/or mixtures of Trical 102 triticale and annual ryegrass for fall and early spring grazing, complementing cool season perennial irrigated pastures.

Key Words: small grains, cereal forages, ryegrass, grazing, forage systems

INTRODUCTION

Forage to graze is not available for much of the year in the Pacific Northwest and Intermountain Region, and producers are forced to feed costly hay. Hay feeding is one of the most costly inputs in a cattle operation. Most ranchers rely on cool season grass irrigated pasture for grazing. These pastures, predominantly fescue, have a marked seasonality with highest growth rates in early spring and cessation of growth with fall freezes (fig. 1). They are also characterized by a "summer slump" where high temperatures slow their growth.

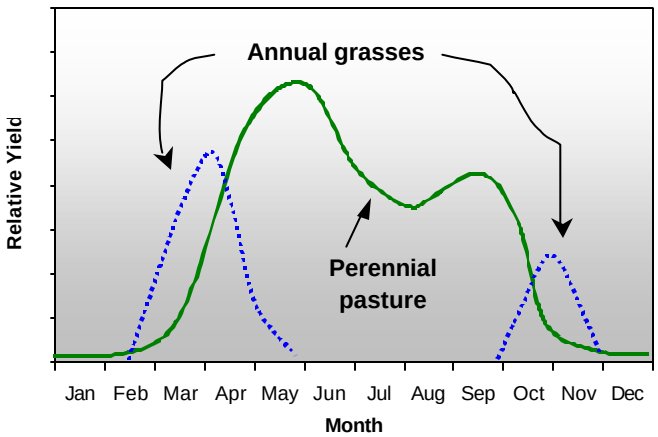

Figure 1. Cool season grasses, such as fescue (solid line) provide good spring growth but have a summer slump. In addition, forage growth is low in the spring and fall.

Grazing of winter-growing cereals or other annual grasses is common in the High Plains of the U.S. and has shown potential in the Intermountain region (Orloff and Drake, 2001;

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Wilson, Forero, Marcum and Lancaster, pers. comm.). The following trials were conducted to further demonstrate and quantify the usefulness of using triticale alone and in combination with ryegrass and to fine-tune production practices for this system.

TRITICALE

When should triticale be planted for fall grazing?

Observations in grower fields suggested a sharp decline in fall forage when triticale is planted in mid September compared to early September or late August. A trial was conducted at the Intermountain Research and Extension Center (IREC) in Tulelake, CA comparing the amount of forage available in early November when triticale was planted at different dates. Five planting dates were used, every two weeks starting with the first planting on July 15. The data for the Tulelake trial shows an August 15 planting date produced nearly as much forage by November 3 as earlier dates, and substantially more than September 1 or September 15 (Fig. 2). Planting dates before August 15 yielded slightly more forage in November, however, more irrigation would be necessary resulting in greater total water use. In addition, a mid July or August first planting date would not allow sufficient time for another crop to precede the triticale. The optimal planting date at the Tulelake location would have to be adjusted slightly for locations with cooler or warmer fall temperature.

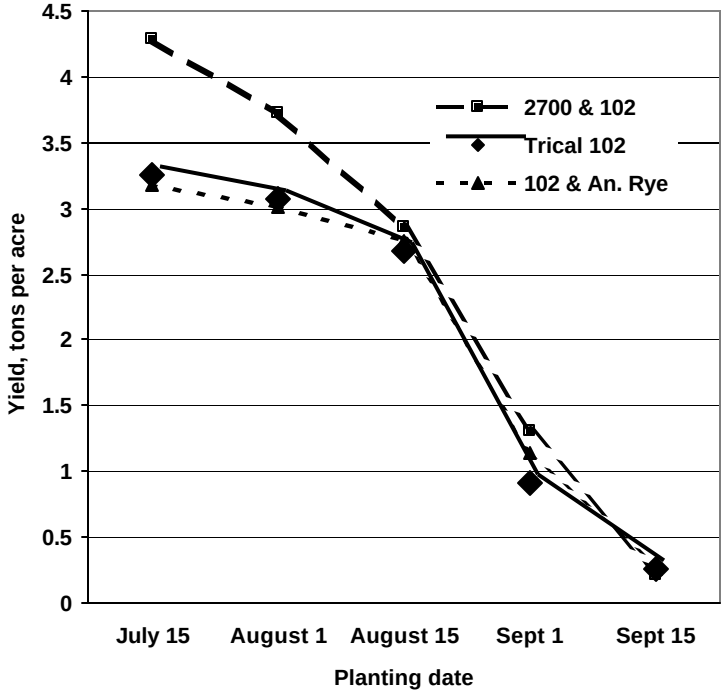


Figure 2. Yield on November 3 declined with later planting dates.

In this trial, a 50:50 mixture of triticale varieties 2700 and 102 yielded more forage in November when planted on July 15 or August 1 than Trical 102 alone (Table 1). However, 2700 planted that early headed out in the fall and subsequent spring production was poor. This variety has also been susceptible to severe winter frost damage. If very early fall feed is important, an early planting date (on or before August 1) could be considered, and in areas warmer than Tulelake a mixture of 2700 and 102 may be preferred. Data from Tulelake shows July 15 planting of triticale produced nearly 2 tons of forage by September 21 (Table 1). Therefore, if grazable forage is needed in mid to late September rather than early November consider planting near July 15th. If grazing is not needed until November, then plant near August 15 or slightly later in warmer locations. If planting by the first of September is not feasible in the Intermountain areas, delay planting until the typical window for planting winter cereals (typically October to early November) and forgo fall grazing.

Table 1. Earlier planting dates of Trical 102 or a 50:50 mixture of 2700 and 102 varieties of triticale produced more forage in September than later planting dates. However, forage in November was similar between triticale planted July 15 through August 15. September planting dates produced little forage in November.

	Harvest Date					
	September 21		**October 9**		**November 3**	
	Variety		*Variety*		*Variety*	
Planting Date	*102*	*2700 & 102*	*102*	*2700 & 102*	*102*	*2700 & 102*
	Tons/acre					
July 15	1.72	2.11	2.42	3.30	2.28	3.88
August 1	1.12	1.40	1.85	2.67	2.18	3.42
August 15	0.91	1.00	1.77	1.86	2.18	2.80
September 1	0	0	0.28	0.30	0.50	0.97
September 15	0	0	0	0	0.17	0.20

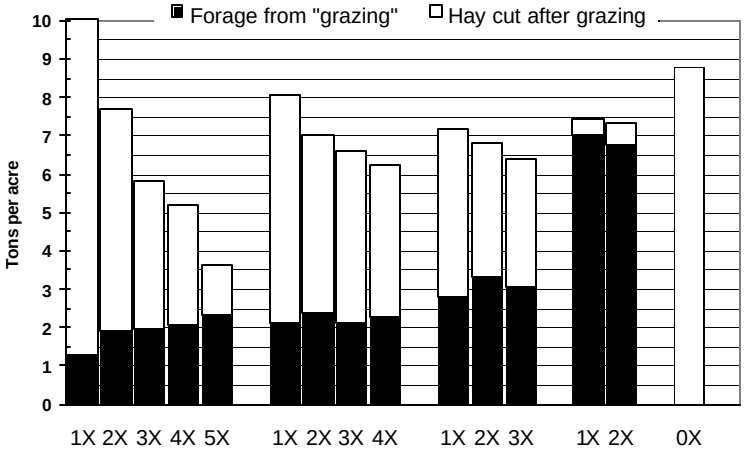
Grazing Trials

Results from several trials with grower cooperators show April forage yields of fall-planted Trical 102 are generally about 2 tons/A, 100 % DM basis. Producers have grazed spring forage in different manners. Management has varied from continuous grazing until the stand dies out, to no grazing, only cutting for hay. Most producers have started grazing sometime in April and tried to remove the cattle by early May. Subsequent re-growth was cut for hay. Observations of fields that were continuously grazed from April to early May (rather than strip grazed) suggested substantial reductions in hay yield. Similar reductions were observed when initiation of grazing was delayed and subsequent removal of cattle occurred later in May. Numerous questions have arisen about the effects of grazing management. *How early can grazing start? When should it stop? Should it be grazed once, or repeatedly? Does spring grazing lower subsequent hay yield? Does spring grazing change hay harvest date, and if so, how much?* The first year of two trials at the IREC in Tulelake, CA has been conducted to learn more about spring grazing management of triticale.

Table 2. Experimental design and dates of simulated grazing and hay harvests (italics).

Initial "Grazing"	**1X grazed**	**2X grazed**	**3X grazed**	**4X grazed**	**5X grazed**	**Not grazed**
6 inch	4/4	4/4 4/18	4/4 4/18 5/3	4/4 4/18 5/3 5/17	4/4 4/18 5/3 5/17 5/30	
Hayed➔	*6/21*	*6/21*	*6/25*	*7/5*	*7/16*	
12 inch	4/12	4/12 4/26	4/12 4/26 5/10	4/12 4/26 5/10 5/23		
Hayed➔	*6/21*	*6/25*	*7/2*	*7/9*		
Jointing	4/25	4/25 5/9	4/25 5/9 5/23			
Hayed➔	*6/27*	*6/27*	*7/5*			
Boot	5/30	5/30 6/14				
Hayed➔	*7/19*	*7/19*				
Not Grazed Hayed➔						*6/21*

In the spring, simulated grazing (by mowing) started at 6 inches, 12 inches, jointing or boot stage (Table 2). (All plots were mowed in the fall to simulate fall grazing.) The total number of harvests (simulated grazing) depended on the initial grazing date *(up to 5 harvests when the initial harvest was at 6 inches, up to 4 harvests when the first harvest was at 12 inches, up to 3 harvest when the first harvest was at jointing, and up to 2 harvests when the first harvest was at boot stage)*. Each subsequent harvest occurred 2 weeks after the previous one. After the last simulated grazing, plots were allowed to re-grow and harvested at the flowering stage for hay. The yield of "grazed" forage and subsequent hay yield were compared between the simulated grazing schemes and harvesting for hay only (no grazing).



Grazing start	6 inches Apr 4	12 inches Apr 12	Jointing Apr 25	Boot May 31	Hay only
Hay cut	6/21 – 7/16	6/21 – 7/9	6/27 – 7/5	7/19	6/21

Figure 3. Grazing one time at 6 inches produced maximum total yields. Multiple grazing resulted in declining total production.

Results suggest the best grazing system depends on the desires of the producer (fig. 3). Maximum combined yields from grazable forage and hay production occurred with only one grazing when the triticale was 6 inches tall followed by a hay harvest (about 10 tons/A combined total forage yield). Hay alone with no grazing was actually slightly less at 8.8 tons/A. If simulated grazing was delayed until the triticale was about 12 inches tall (and still grazed just once), the amount of forage for grazing increased from 1.30 to 2.10 tons/A, but total combined yield decreased by 2.4 tons/A because the hay harvest was significantly less. Waiting until jointing further increased the amount of forage for grazing (2.79 tons/A), but decreased hay production and total yield to a greater degree. These results, while based solely on one year of data, suggest the livestock producer can tailor the start of grazing based on the relative importance of grazable forage versus hay.

We have also investigated different grazing frequencies. That is, longer intervals between grazing (more "rest"). Grazing occurred every 2 weeks in the experiment just discussed (Fig. 3). In a second trial also conducted at IREC in an adjacent field during the same time period the effect of grazing frequency was evaluated. The effects of simulated grazing weekly (6 times total), every 2 weeks (4 times total), 3 weeks (3 times total), or after 6 weeks (1 time total) were compared. The first clipping for all plots that were "grazed" occurred on April 22 just prior to jointing. These two trials confirmed the finding that one early grazing provided about 2 tons of early spring forage and had only a small reduction in subsequent hay yield. The results also showed that regardless of the length of the rest period between grazings, multiple grazings only increased forage for grazing a small amount, but resulted in a large reduction in hay yield.

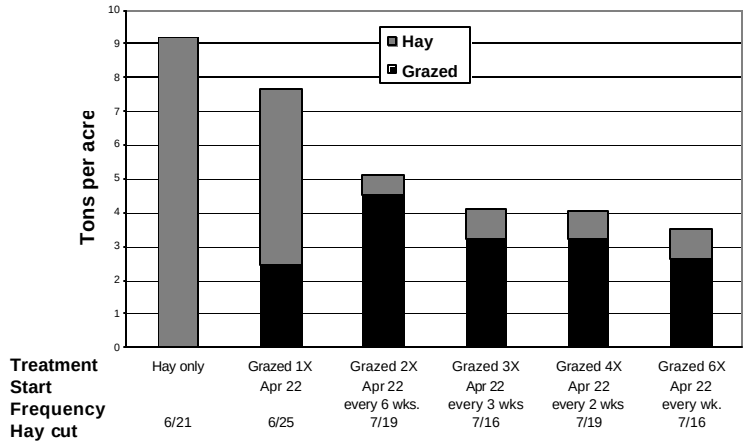


Figure 4. All multiple grazings regardless of frequency, resulted in large reduction in hay yield. All plots were mowed in the fall to simulate fall grazing.

ANNUAL RYEGRASS

While working with triticale as a component of a forage system, annual ryegrass has emerged as another forage grass that shows great promise — either seeded with triticale or by itself. Initially, annual ryegrass was used in test plots with triticale to lessen hoof actions during muddy conditions. Annual ryegrass was planted to help create a better "sod" to resist trampling damage. In addition, annual ryegrass' summer growth pattern may augment reduced production during the "summer slump" experienced with cool season perennial pastures. There is a great deal of diversity in annual ryegrass varieties, suggesting that some varieties might better fit the environment and our forage systems better.

Nine different varieties of annual ryegrass were seeded alone and in combination with Trical 102 triticale at the IREC in August to evaluate yield and persistence. Ryegrass varieties included the diploid annual (Italian) varieties: Ribeye, Surrey, Passerel Plus, Bartissimo, Westerwold; tetraploid annual varieties: Hercules, Major, Barmultra; and tetraploid hybrid (annual x perennial): Bison. Yield was measured on November 6, 2001, May 3, June 11, July 10, August 6 and September 16, 2002.

Fall yield

Fall yield measured in November varied by variety but differences were small. The range in yield was 1.70 to 2.42 tons/A. Mixtures of ryegrass and triticale had larger fall yields (average

for all mixtures 2.28 tons/A) than ryegrass alone (2.02 tons/A), and similar to Trical 102 planted alone (2.32 tons/A).

Spring yield

Forage available for grazing in the spring was estimated by harvest on May 3 (Table 3). Trical 102 planted alone produced more spring forage than either ryegrass planted alone or as a mixture with triticale (averaging across all ryegrass varieties). However, the ryegrass/triticale mixtures (3.41 tons/A) produced far more forage than ryegrass alone (1.50 tons/A) and much closer to the triticale yield (3.82 tons/A). Some mixtures of ryegrass and triticale produced about the same amount of spring forage as triticale alone. In contrast, the highest yielding pure stand of ryegrass was far less than triticale alone. Two ryegrass varieties planted alone produced very little spring forage due at least in part to considerable winter kill (data not shown).

For spring forage, tetraploid varieties planted alone (1.90 tons/A) had slightly higher (not statistically significant) yields than diploids (1.18 tons/A) and tended toward significantly higher yields when planted as mixtures with triticale (3.50 tons/A) compared to diploid varieties mixed with triticale (3.33 tons/A). The tetraploid perennial x annual hybrid Bison, whether planted alone or as a mixture with triticale, produced a significant but small amount more of spring forage than tetraploid annual varieties.

The varieties Bison, Barmultra, and Bartissimo, all planted as mixtures, were very similar in production, they were the highest yielding mixtures and were similar to Trical 102.

September yield

As expected some varieties of annual ryegrass produced forage in September, more than twelve months after planting. Trical 102 completed its life cycle and did not produce after the July 10th harvest. Averages for triticale/annual ryegrass mixtures, despite the loss of triticale to the stand, were excellent. Across all varieties tetraploids were higher producers than diploids whether planted as pure stands or mixtures with triticale.

Growers seeking forage in September, should consider the varieties Barmultra, Bartissimo and Bison, as they were higher yielding than other annual ryegrasses at that time (Table 3).

Total combined yield

The highest yielding ryegrass variety when planted alone produced 12.71 tons/A from the six harvests combined. Several other varieties were similar in total combined yield (Table 3). Planting Trical 102 with ryegrass reduced total yield slightly compared with pure plantings of the highest yielding ryegrass varieties alone. The average total combined yield for all ryegrass varieties planted alone was 10.82 tons/A compared to 10.20 tons/A for the same varieties planted with Trical 102. Both values were larger than Trical 102 planted alone (7.96 tons/A). Tetraploid varieties of ryegrass planted alone or with Trical 102 produced more total forage than diploid varieties. The tetraploid perennial x annual ryegrass cross, Bison, produced similar total forage (an average of 11.34 tons/A for the pure ryegrass and mixed plantings) as the tetraploid annual varieties (11.63 tons/A).

Critical Spring and Fall Feed

As previously described, forage in both May and September is not readily available with perennial cool season irrigated pasture. Combining May and September yield for these treatments provides a convenient method to identify top treatments filling that void when grazable forage is highly desirable. The treatments providing the highest levels of May and September forage plus near the top in total combined yield are: Barmultra, Bartissimo and Bison, all planted as mixtures with Trical 102 (Fig. 5 and Table 3). Producers with more emphasis or need for forage at a specific time may favor different varieties based on production near that specific time of the year.

Summary

These data clearly demonstrate that Trical 102 provides the needed fall and spring forage to complement perrenial cool season irrigated pastures. Mixtures of Trical 102 with annual ryegrass do not significantly reduce fall and spring yields compared to Trical 102 alone while providing additional forage during the "summer slump" period for cool season grasses plus additional high quality September forage. Therefore, the ideal strategy would be to plant ryegrass about August 15 (Barmultra, Bartissimo, or Bison) as a mixture with Trical 102. This forage could be grazed in the fall again in April, then repeatedly throughout the summer with the last grazing in September.

Growers with limited fall and summer irrigation should not use triticale/annual ryegrass mixtures. Instead, they should consider late fall/early winter triticale-only plantings seeding during the typical window for planting winter cereals. They would forgo fall grazing. A spring grazing would be possible with adequate irrigation through June, and a subsequent hay harvest.

Spring grazing management of triticale should focus on a short duration, high intensity grazing. It should occur in early April when forage is about 6 to 12 inches tall and preferably should be grazed once. Use of electric fencing for strip grazing has been successful and would facilitate these goals. Delaying onset of grazing or repeated grazing will result in increased forage for grazing, but also reduce subsequent hay yield.

These trials demonstrate alternative forage systems that complement each other, increasing the amount and seasonal distribution of grazable forage for the Intermountain region (Fig 6). In addition, these alternatives have high water use efficiency, using more winter precipitation. Preliminary quality testing of these forage systems and observations of animal performance indicate highly nutritious plant material. However, additional forage quality and animal performance testing is needed.

Figure 5. Yield, tons/A, 100% dry matter basis, for annual ryegrass, annual ryegrass and trical 102 mixtures and Trical 102 harvested at various times, sorted by combined May and September yield.

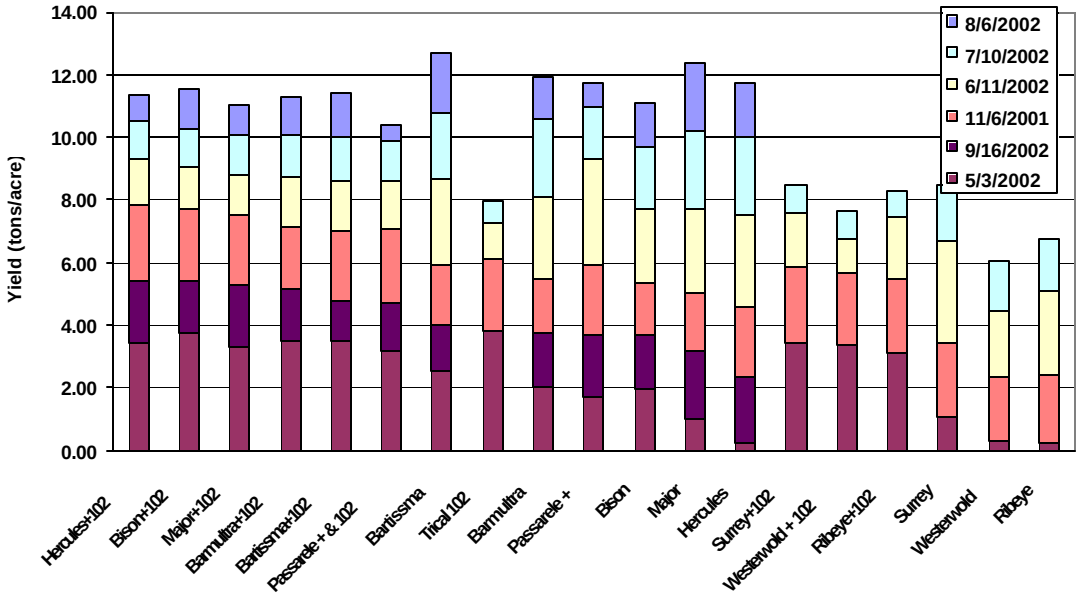


Figure 6. Triticale or triticale/annual ryegrass mixtures complement fescue irrigated pastures to increase forage for grazing. Trial yields demonstrate the seasonal distribution and quantity of forage using these forage systems.

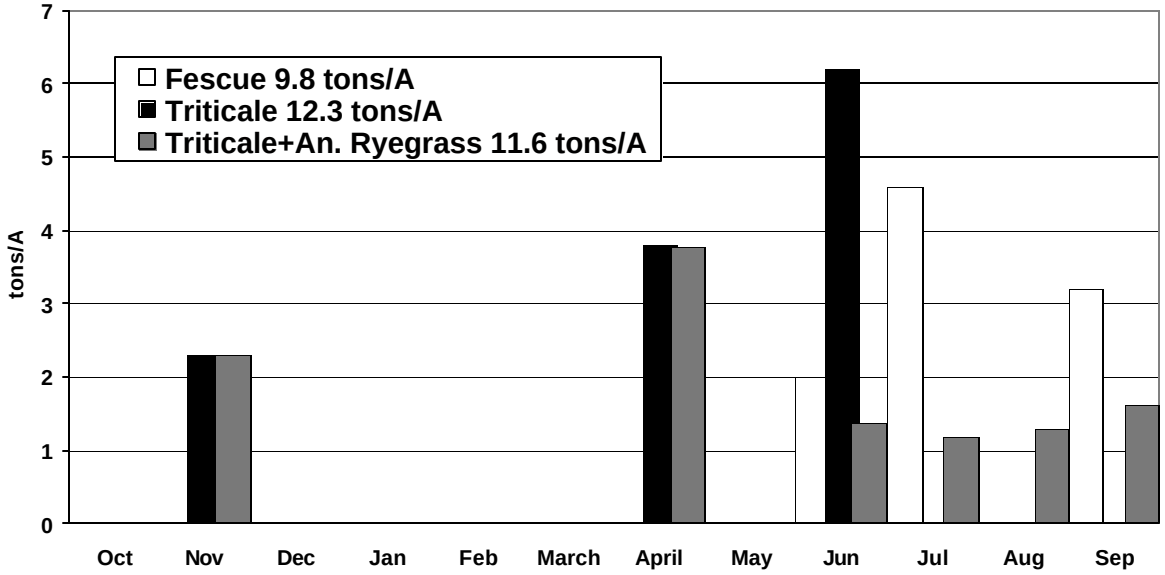


Table 3. Yield, tons/A, 100% dry matter basis, for annual ryegrass, annual ryegrass and trical 102 mixtures and Trical 102 harvested at various times, May and September yields combined, and total overall combined yield.

	Harvest Date							
Variety	**11/6/01**	**5/3/02**	**6/11/02**	**7/10/02**	**8/6/02**	**9/16/02**	**May & September Combined**	**Total**
	Yield (tons/acre)							
Bartissimo	1.93	2.57	2.73	2.15	1.91	1.43	4.00	12.71
Major	1.88	1.02	2.71	2.46	2.18	2.13	2.93	12.39
Barmultra	1.70	2.03	2.67	2.46	1.35	1.73	3.76	11.94
Hercules	2.21	0.26	3.00	2.47	1.74	2.08	2.34	11.77
Passerel plus	2.23	1.73	3.38	1.63	0.75	1.98	3.71	11.71
Bison+102	2.32	3.76	1.37	1.18	1.31	1.63	5.39	11.57
Bartissimo+102	2.19	3.53	1.61	1.42	1.40	1.28	4.80	11.42
Hercules+102	2.42	3.42	1.48	1.18	0.85	2.01	5.43	11.35
Barmultra+102	1.99	3.51	1.56	1.37	1.20	1.66	5.17	11.30
Bison	1.70	1.94	2.33	2.01	1.39	1.74	3.68	11.11
Major+102	2.23	3.31	1.27	1.27	0.97	1.97	5.29	11.04
Passerel + & 102	2.38	3.15	1.53	1.30	0.52	1.54	4.69	10.41
Surrey	2.38	1.09	3.19	1.81	0.64	0.00	1.09	8.48
Surrey+102	2.39	3.46	1.74	0.89	0.13	0.00	3.46	8.47
Ribeye+102	2.38	3.12	1.94	0.84	0.00	0.00	3.12	8.29
Trical 102	2.32	3.82	1.10	0.72	0.00	0.00	3.82	7.96
Westerwold	2.04	0.29	2.14	1.60	0.45	0.00	0.29	6.07
Ribeye	2.16	0.23	2.70	1.69	0.33	0.00	0.23	6.78
Westerwold + 102	2.27	3.39	1.13	0.85	0.00	0.00	3.39	7.64
lsd.05	0.36	0.39	0.76	0.41	0.50	0.54	0.69	1.34

* Hercules, Major and Passarele plus had reduced stands due to winter damage.

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