A Cereal Intercrop System for Silage and Pasture

J. Johnston, M. Bowman, M. Lenover, S. Burnett, S. Slaght and B. Garner

Making silage from a cereal or cereal-pea nurse crop is fairly common in Ontario. However, the use of cereal silage as a stand-alone forage crop (instead of as a nurse crop for a new forage seeding) is difficult to justify economically, especially if conventional tillage is used. In long-season areas, double-cropping can be done, whereby a crop such as soybeans can be planted following cereal silage harvest. In much of Ontario the season is too short for this technique. Another approach is to seed two crops together in the spring (intercropping) by selecting crops that can utilize different parts of the growing season.

A cereal intercrop can be created by using a spring cereal like oats in mixture with a fall cereal like fall rye or fall triticale. The oat crop is very aggressive following emergence and outcompetes the fall cereal early in the growing season. The spring cereal is cut for silage at the normal time (usually at or shortly after heading), after which the fall cereal grows rapidly in the absence of competition from the spring cereal. This crop is then grazed later in the summer or in the fall. Very few stems or heads are present on the fall cereal and the resulting pasture is very leafy. Instead of fall cereals, annual ryegrass can be used as the pasture portion of the intercrop.

Methods:

Two trials were conducting, a replicated small plot trial and a field-scale strip trial where the intercrop regrowth was grazed by lambs. The small plot trial had pure seedings of each annual pasture crop plus intercrops of oats with each annual pasture crop (Table 1). The field trial had three strips; one each of oats-annual ryegrass, oats-fall rye, and oats-fall triticale. In both trials the oats were cut for silage about 15 days after heading. On the plot trial, the "pasture" crop was harvested six weeks after the silage crop was harvested.

Table 1. Crops used in cereal intercrop trial in 1999.

Crop	Variety	Seeding Rate (kg/ha)	Source of Seed
Oats	AC Rigodon	70 pure 55 mixed with below	Labonte Seed, NewLiskeard, ON
Fall Rye	common	70 pure 55 mixed with oats	Norfolk Co-op, Waterford, ON
Winter Triticale	Pika	75 pure 60 mixed with oats	Progressive Seeds, Lacombe, AB
Annual Ryegrass (Westerwold type)	Aubade	25 pure 20 mixed with oats	Speare Seeds, Harriston, ON
Annual Ryegrass (Italian type)	Maris Ledger	25 pure 20 mixed with oats	AgriBioTech Canada, Bowmanville, ON

Results:

The small plot trial consisted of pure seeded annual pasture crops and mixtures of the annual pasture crops with oats. The first cut was taken when the oats had been headed for approximately 15 days. All intercrop plots yielded equal to pure oats at the first cut (Table 2), with yields ranging from 5100 kg/ha to 6000 kg/ha. The pure seeded annual pasture crops (fall rye, fall triticale, Italian ryegrass and westerwold ryegrass) were all lower in yield at the first cut and ranged in yield from 1500 to 2100 kg/ha. At the second cut, both types of ryegrass in pure stands outyielded all other pure seeded and intercrop treatments. All other treatments were similar in yield at second cut, with yields ranging from 2100 to 2700 kg/ha. Total yields were generally highest for the intercrop treatments, along with pure oats and pure ryegrass. Pure seedings of fall rye and fall triticale were significantly lower in total yield than the other treatments.

Table 2. Yield (kg/ha) of pure seeded and intercropped treatments at New Liskeard.

Crop	Cut 1 Yield (July 20)	Cut 2 Yield (Sept 02)	Total Yield
Pure Seeded			
Oats	6,007a[1]	2,419b	8,427ab
Winter rye	1,631b	2,387b	4,018c
Winter triticale	1,516b	3,047b	4,563c
Italian ryegrass	2,142b	4,569a	6,711b
Westerwold ryegrass	2,039b	5,397a	7,436ab
Intercrop with Oats			
Oats + Fall Rye	5,589a	2,123b	7,713ab
Oats + Fall Triticale	5,817a	2,341b	8,158ab
Oats + Rye + Triticale	5,116a	2,121b	7,237ab
Oats + Italian Ryegrass	6,045a	2,431b	8,477ab
Oats + Westerwold Ryegrass	5,986a	2,790b	8,775a
Average	4,189	2,963	7,151
LSD (0.05)	1,235	930	1,837
CV (%)	20.3	21.6	17.7

1. Within a column, averages followed by the same letter are not different *(p=0.05)*

In the field scale study, first cut oat yields were similar to those measured in the small plot trial (Table 3). There appeared to be sufficient regrowth on the annual ryegrass that a second cut of silage was taken on September 02. This was relatively low yielding and perhaps should have been grazed instead of mechanically harvested. The other two annual grazing crops (rye and triticale) were not cut for silage after the initial cut of oats. Grazing of the intercrop regrowth began on September 10 and continued for two weeks. The yield of the grazing crops was equal between fall rye and fall triticale which were each about 55% higher yielding than the annual ryegrass. If the silage harvest had not been made from the annual ryegrass, it would likely have

had about double the yield during the grazing period.

It appears that the ryegrass regrew extremely fast between September 02 and the pasture harvests which began on September 10 (Table 2), but part of this is due to sampling method. The silage harvest left a stubble of about 5 cm on the field whereas the pasture yields were estimated by clipping quadrats to ground level, thus some material left unharvested during the silage harvest was collected in the hand samples taken before grazing.

Table 3. Yield (kg/ha) of silage and grazing crops from field scale intercrop trial at New Liskeard.

Harvest	Oats-Annual Ryegrass	Oats-Fall Rye	Oats-Winter Triticale
Cut 1 Silage (July 27/99)	Whole field cut together - yield 5800 kg/ha DM		
Cut 2 Silage (Sept.02/99)	1,195 kg/ha DM	not cut	not cut
Grazing (Sept.10-22)	1,477 kg/ha	2,297 kg/ha	2,372 kg/ha
Season Total	8,472 kg/ha	8,097 kg/ha	8,172 kg/ha

Summary and Interpretation

Oats that are headed out have consistently provided between 5 and 6 t/ha of silage, regardless of what intercrop combination was sown with the oats. In small plots, the yield among the annual grazing crops was very similar and was also similar to the yield of fall rye and fall triticale in the field scale trial.

Visually, it appeared that the triticale was less competitive and lower in yield than the fall rye but there was a competitive oat regrowth which inflated the pasture yield of the triticale. Similarly, the pure oat plots in the small plot trial had enough oat regrowth to record a yield of almost 2500 kg/ha at the second harvest. It should be noted that regrowth on spring cereals is not reliable and varies with species of cereal (good for oats, poor for barley), cereal maturity at first cut (regrowth declines as first cut maturity increases), cutting height (less regrowth from short stubble height) and rainfall after the first cut.

Animal performance data were not collected but some observations were made regarding grazing preference. The lambs seemed to prefer the annual ryegrass and the fall triticale over the fall rye. Some leaf disease was present on the fall rye which may have affected palatability. The fall triticale and annual ryegrass were free of leaf diseases.

Given our results to date, there are not great differences in the yield of the grazing component

within the intercrop mixtures. In years with ample moisture, oat regrowth will fill in the stands if the annual grazing crop does not perform well. However, grazing oat regrowth will not likely produce as high a quality pasture as a winter cereal due to the differences in leaf:stem ratio between the spring and winter crops. In the field trial, annual ryegrass performed well and is worthy of much more attention. Data on animal performance and carrying capacity are needed to assess the economics of the intercrop system. The benefit of the intercrop system over other annual forages is that the same tillage and seeding pass are providing two to three harvests per year as compared to one pass with other annuals like stubble turnips, grazing corn or forage soybeans. However, if overall performance is no different from a pure seeded annual (like pure annual ryegrass), then the simpler monoculture may be the better method to use. This trial is being continued on a larger field setting as well as on 2 or 3 commercial farms in Ontario during 2000.