



Northern NY Agricultural Development Program 2013-14 Project Report

Meadow Fescue-Alfalfa Mixtures for Improved Forage Quality

Project Leader:

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Collaborator(s):

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Background:

There is virtually no interest in evaluating factors impacting alfalfa-grass mixtures outside the Northeast, because the typical seeding in most of the northern US outside of the Northeast is pure alfalfa. Most alfalfa in northern NY (over 95%), however, is sown with a companion perennial grass.

Several decades ago, approximately 90% of alfalfa-grass seedings in NYS used timothy as the grass in the mixture. The majority of alfalfa-grass seedings in NYS still utilize timothy as the grass of choice.

Timothy is well adapted to the Northeast, seed is relatively inexpensive with a low seeding rate, and it is very easy to establish. Timothy also is relatively noncompetitive with alfalfa, which is a desirable trait. On the negative side, timothy has two major flaws. Timothy regrowth heads out following each cutting, unlike most other cool-season grasses. This makes timothy undesirable from a forage quality standpoint. More importantly, timothy is consistently about 2 percentage units lower in crude protein at the same stage of growth, compared to most other cool-season grasses. Given the high price of protein supplements, timothy is no longer a good option.

Reed canarygrass is not excessively competitive with alfalfa, but is generally difficult to establish. In addition, in 2013 the New York State Department of Environmental Conservation proposed declaring reed canarygrass an invasive species, banning any seed sales in the state (NYS Agriculture & Markets has prevented this, to-date). Four states, two in the Northeast, have already officially declared reed canarygrass to be invasive.

Smooth bromegrass was sown with alfalfa in the past, but this grass typically does not persist under early, more frequent mowing management for high quality.

Two cool-season grasses well adapted to the Northeast, **orchardgrass and tall fescue**, tend to be excessively competitive with alfalfa. Even a very low grass seeding rate can result in grass dominating the stands very quickly. A less competitive grass that is persistent in our climate would be more desirable for mixtures. One possible option is meadow fescue. **Meadow fescue** is very winter hardy and commonly sown in Canada in pure stands or with other perennial grasses. Two new cultivars were recently developed in Wisconsin, and are being promoted for grazing. The primary reason meadow fescue has not been promoted in the Northeast in the past is because it is lower yielding than other grasses.

Methods:

Experiments were established in Northern New York at both Chazy and Willsboro sites in 2013, representing light vs. more heavy textured soils. Due to the multiple issues that need to be resolved, initial experiments with meadow fescue are more appropriate as small plot experiments on more controlled experimental sites. Early and late maturing meadow fescue (MF) and tall fescue (TF) cultivars were sown with PLH-resistant alfalfa at grass seeding rates of 2, 4 and 8 lbs/acre. Grass cultivars also were sown in pure seedings, to evaluate yield potential of all available meadow fescue cultivars, in comparison with early and late maturing tall fescue cultivars.

Grass cultivars sown with alfalfa (2, 4, and 8 lb/a grass rates):

- Liherold MF (early)
- Pradel MF (late)
- Atlas II TF (early)
- Bariane TF (late).

Grass cultivars sown in pure stands:

- Atlas II TF
- Bariane TF
- Liherold MF
- Pradel MF
- Preval MF
- Laura MF
- Hidden Valley MF
- Azov MF.

Six replicates of alfalfa-grass treatments were sown per site, and five replicates of pure grass plots were sown. The Willsboro site was provided with some irrigation initially to ensure establishment. The alfalfa in the alfalfa-grass portion of the Willsboro seeding winterkilled during the 2013-2014 winter, primarily due to ice-sheeting. Pure grass plots at Willsboro and Chazy were fertilized with 115 lbs N/acre in the spring of 2014 and with 100 lbs N/acre after first harvest.

Pure grass plots were harvested 3 times in 2014, on May 29, July 9, and October 9 at both Chazy and Willsboro. At first harvest at Chazy, all alfalfa-grass plots will be sampled and hand-separated, to determine the grass percentage for each plot. Due to winter damage, alfalfa-grass plots at Chazy did not sufficiently recover following spring harvest, with little regrowth, and additional harvests were not taken. By the fall of 2014, however, the alfalfa-grass plots at Chazy appeared to be recovering, and may be suitable for 2015 harvest. All samples were analyzed for CP, NDF, ADF, NDFD48h and Ash.

Results:

Spring Alfalfa-Grass Harvest at Chazy

Heading dates for fescues did not vary greatly, even though the range in potential heading date for both fescues was represented (Table 1). Liherold is an early meadow fescue and did head somewhat earlier than other varieties. Atlas II and Bariane tall fescue are supposed to be early and late maturing, but did not differ much in spring heading date.

Although alfalfa plants were present in sufficient numbers throughout the Chazy experiment, they were in a weakened state. This resulted in a relatively high grass proportion in the mixture (Fig. 1), even at a low grass seeding rate, for the first production year. Winter damage was not even across the field, with a portion of the area much weaker in alfalfa. As a result the averages for the 6 field replicates were significantly different, ranging from 47% grass to 66% grass.

Meadow fescue clearly was more resistant to these stressful conditions than tall fescue. Grass % in meadow fescue-alfalfa averaged 68%, while grass % in tall fescue-alfalfa averaged 47%. This is the opposite of what we were expecting. Meadow fescue is very well adapted to northern NY climates, and considered more winter hardy than tall fescue. Tall fescue is normally expected to outyield meadow fescue, when environmental conditions are adequate for tall fescue.

Alfalfa-grass yields for cut 1 at Chazy were very low. Alfalfa quality was not affected by grass variety or grass seeding rate, averaging 27.3% NDF, 56.2% NDFD48h, and 22.3% CP. This is very low NDF for alfalfa at the end of May, reflecting setback from winter damage. On the other hand, grass averaged 57.3% NDF, relatively normal for the end of May. Fiber digestibility of grass, however, was high, averaging 80.8%, while CP was low, averaging 14.6%. In general, both alfalfa and grass were abnormal in quality and yield, and regrowth was minimal, so no additional harvests were collected in 2014.

The alfalfa-grass area at Chazy was mowed off twice more during the season, and the stand did appear to recover by the end of the season. Grass forage growing with alfalfa did significantly decrease in NDF and CP with increasing grass seeding rate. This may be due to the increasing amount of grass in the mixture as the grass seeding rate increased.

Pure Grass at Chazy

Three harvests of pure grass at Chazy averaged 4.3 tons/a overall (Table 2). Variety yields were not greatly different, with the exception of lower yields for the organic variety Laura. Grass forage quality dropped significantly from Cut 1 to Cut 3, with low

NDF and very high NDFD at spring harvest (Table 4). Meadow fescue was somewhat higher in NDF at Cut 1, but also somewhat higher in NDFD. Meadow fescue was considerably higher in NDFD than tall fescue for the 2nd and 3rd cuts. Crude protein was exceptionally high for Cut 1, normal for Cut 2 and very low for Cut 3.

Pure Grass at Willsboro

Three harvests of pure grass at Willsboro averaged 4.4 tons/a overall (Table 3). There was more range in yield among varieties than at Chazy, and once again Laura meadow fescue was lower yielding than all others. As it did at Chazy, forage quality dropped significantly after spring harvest (Table 5). Meadow fescue was considerably higher in NDFD compared to tall fescue. As with Chazy, CP was exceptionally high for Cut 1, normal for Cut 2, and low for Cut 3.

Conclusions/Outcomes/Impacts:

Meadow fescue tends to be more winter hardy than tall fescue, and this was probably the reason why there was more meadow fescue than tall fescue in spring alfalfa-grass mixtures at Chazy, following a stressful winter. The same results were found in a western NY trial. We expected to see more tall fescue than meadow fescue in mixtures with alfalfa. As was found in Wisconsin, meadow fescue tended to have significantly higher fiber digestibility than tall fescue, particularly in regrowth cuttings. Meadow fescue looks very promising in mixtures with alfalfa.

Outreach:

We have conducted a survey of alfalfa acreage, and determined that about 97% of alfalfa in northern NY is sown with a perennial grass, demonstrating how important this mixed crop is to the region. We are preparing two publications on the benefits of alfalfa-grass that will appear in a summer 2015 issue of Progressive Forage Grower magazine. This information will also be placed on our website: www.forages.org.

Next steps:

A second year of data needs to be collected to confirm results. A study was established at Chazy to see if a new sparse-heading orchardgrass might result in less orchardgrass in mixtures with alfalfa.

Two new developments that could also improve forage quality of alfalfa-grass mixtures are a new very late maturing orchardgrass from Canada, and several new low-lignin alfalfa varieties. It may be possible to come up with a combination of new alfalfa and new grass that has much higher fiber digestibility than current mixtures.

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Table 1. Chazy Spring Grass Heading Dates, 2014.

2014 Spring Heading Dates for Grasses, Chazy		
<u>Variety</u>	<u>Species</u>	<u>Heading</u>
Atlas II (early)	Tall fescue	2-Jun
Bariane (late)	Tall fescue	5-Jun
Liherold (early)	Meadow fescue	28-May
Pradel (late)	Meadow fescue	2-Jun
Preval	Meadow fescue	2-Jun
Laura	Meadow fescue	2-Jun
Hidden Valley	Meadow fescue	5-Jun
Azov	Meadow fescue	2-Jun

Table 2. Chazy Pure Grass Yield, 3 cuts, 2014.

<u>Variety</u>	<u>Species</u>	<u>tons/acre</u>	<u>Sig.</u>
Atlas II	Tall fescue	4.26	ab
Bariane	Tall fescue	4.37	a
Liherold	Meadow fescue	4.34	a
Pradel	Meadow fescue	4.59	a
Preval	Meadow fescue	4.16	ab
Laura	Meadow fescue	3.92	b
Hidden Valley	Meadow fescue	4.51	a
Azov	Meadow fescue	4.42	a
	Average	4.32	

Table 3. Willsboro Pure Grass Yield, 3 cuts, 2014.

<u>Variety</u>	<u>Species</u>	<u>tons/acre</u>	<u>Sig.</u>
Atlas II	Tall fescue	4.78	a
Bariane	Tall fescue	4.72	a
Liherold	Meadow fescue	4.19	bc
Pradel	Meadow fescue	4.54	ab
Preval	Meadow fescue	4.41	abc
Laura	Meadow fescue	3.93	c
Hidden Valley	Meadow fescue	4.77	a
Azov	Meadow fescue	4.40	abc
	Average	4.37	

Table 4. Pure Grass Forage Quality, Chazy, 2014.

			NDF	
Variety	Species	Cut 1	Cut 2	Cut 3
Atlas II	Tall fescue	43.8	55.8	62.5
Bariane	Tall fescue	45.2	55.1	63.5
Liherold	Meadow fescue	49.7	57.0	59.8
Pradel	Meadow fescue	48.0	56.3	61.2
Preval	Meadow fescue	46.2	58.0	60.5
Laura	Meadow fescue	48.2	56.0	62.5
Hidden Valley	Meadow fescue	48.8	57.7	61.7
Azov	Meadow fescue	51.5	60.0	62.2
	Average	48.7	57.5	61.3
			NDFD48h	
Atlas II	Tall fescue	85.2	62.6	56.7
Bariane	Tall fescue	85.3	61.4	54.3
Liherold	Meadow fescue	86.7	71.2	64.6
Pradel	Meadow fescue	86.3	71.6	62.9
Preval	Meadow fescue	87.2	70.2	63.5
Laura	Meadow fescue	86.6	69.9	55.4
Hidden Valley	Meadow fescue	86.8	68.8	60.0
Azov	Meadow fescue	85.2	68.1	60.3
	Average	86.5	70.0	61.1
			CP	
Atlas II	Tall fescue	27.4	16.3	9.0
Bariane	Tall fescue	26.6	14.5	9.1
Liherold	Meadow fescue	25.5	15.6	9.7
Pradel	Meadow fescue	25.3	16.4	9.5
Preval	Meadow fescue	26.8	14.8	9.7
Laura	Meadow fescue	26.2	16.7	11.4
Hidden Valley	Meadow fescue	25.6	15.4	8.7
Azov	Meadow fescue	25.1	14.4	8.6
	Average	25.8	15.5	9.6

Table 5. Pure Grass Forage Quality, Willsboro, 2014.

			NDF	
Variety	Species	Cut 1	Cut 2	Cut 3
Atlas II	Tall fescue	50.1	59.5	62.3
Bariane	Tall fescue	45.8	60.0	63.6
Liherold	Meadow fescue	51.9	61.4	59.3
Pradel	Meadow fescue	50.6	61.7	60.5
Preval	Meadow fescue	49.2	61.3	60.3
Laura	Meadow fescue	50.3	61.5	60.4
Hidden Valley	Meadow fescue	49.4	62.5	61.3
Azov	Meadow fescue	51.3	62.7	62.2
	Average	50.5	61.8	60.6
			NDFD48h	
Atlas II	Tall fescue	81.0	60.5	54.7
Bariane	Tall fescue	81.7	57.0	49.6
Liherold	Meadow fescue	84.0	66.2	61.5
Pradel	Meadow fescue	84.4	66.1	59.3
Preval	Meadow fescue	83.7	64.5	55.5
Laura	Meadow fescue	85.0	61.3	55.0
Hidden Valley	Meadow fescue	84.9	63.4	54.8
Azov	Meadow fescue	83.6	65.4	60.3
	Average	84.3	64.5	57.7
			CP	
Atlas II	Tall fescue	23.7	17.0	9.3
Bariane	Tall fescue	24.9	17.3	9.8
Liherold	Meadow fescue	24.6	18.7	10.3
Pradel	Meadow fescue	24.1	17.7	10.4
Preval	Meadow fescue	25.1	19.2	11.4
Laura	Meadow fescue	25.1	20.2	12.9
Hidden Valley	Meadow fescue	25.7	16.5	10.2
Azov	Meadow fescue	23.9	17.1	10.4
	Average	24.7	18.2	10.9

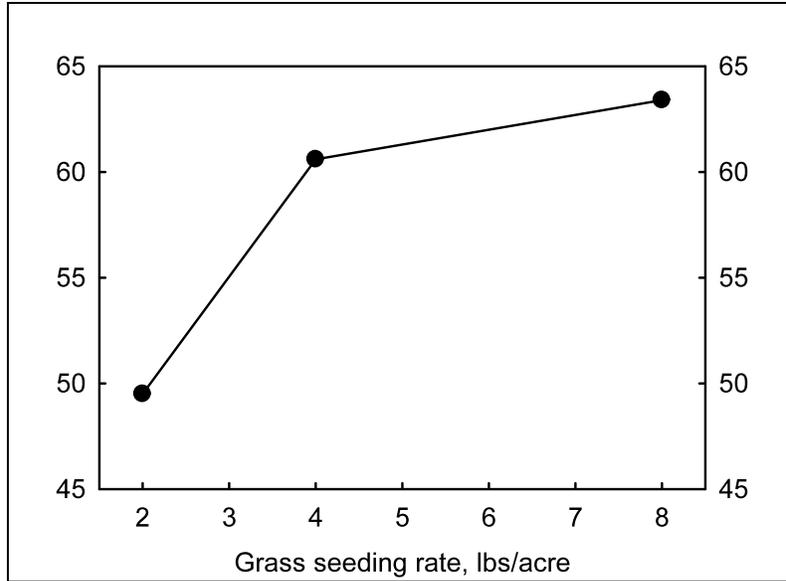


Figure 1. Spring grass component of alfalfa-grass mixtures at Chazy, 2014.