



## Northern NY Agricultural Development Program 2020 Project Report

### Maximizing Both Alfalfa and Grass Quality of Mixtures

#### **Project Leader:**

- Debbie J.R. Cherney, 327 Morrison Hall, Department of Animal Science, Cornell University, 607-255-2882, djc6@cornell.edu

#### **Collaborator(s):**

- J.H. Cherney, Soil & Crop Science, Cornell University
- Rink Tacoma-Fogel, Animal Science, Cornell University
- Mike Hunter, Cornell Cooperative Extension, Jefferson/Lewis Counties
- Joe Lawrence, Cornell PRO-DAIRY

#### **Cooperating Producers:**

- Jefferson County: Mike Kiechle, Garden of Eden Farm, Philadelphia, NY
- Lewis County: Tony Paluck, Constableville, NY
- Lewis County: Marc Larabee, Graceway Farm, Lowville, NY
- Lewis County: Garrett Pominville, Pominville Farms, Croghan, NY

#### **Background:**

Almost all alfalfa in northern NY is seeded with a companion cool-season grass, due to less than ideal alfalfa growing conditions. While alfalfa quality is relatively consistent among varieties over regions, grass quality and yield are significantly impacted by region. Fiber digestibility (NDFD) declines over one percentage unit per day in spring growth, and spring harvest may account for up to half of the total forage yield used as forage for lactating cows. As low as 5% grass in an alfalfa-grass mixture will significantly increase the fiber digestibility of a mixture, compared to pure alfalfa.

Mostly through the efforts of European grass breeders, there are new varieties of perennial grasses that have the potential to greatly improve the quality of alfalfa-grass mixtures. There are more than 120 meadow fescue varieties certified in Europe and most of them have not been evaluated for yield or quality in North America.

There is a relatively large acreage of meadow fescue (MF) in Europe and Canada, compared to a very small acreage in the USA. Using meadow fescue in mixture with alfalfa will significantly increase fiber digestibility of the mixture, and increase milk production. Not only are meadow fescues typically higher in fiber digestibility than other grasses, it now appears that there are significant differences in NDFD among meadow fescue varieties.

For growers in northern climates, meadow fescue has the added advantage of being more winter hardy than most cool-season grasses, including tall fescue. Almost all of the meadow fescue varieties in Europe were selected in northern environments, many with more severe winters than northern NY. This research evaluates several meadow fescue variety options for their potential to enhance alfalfa-grass production by Northern New York growers.

### **Methods:**

Meadow fescue seed was collected from a number of European sources for evaluation in mixture with alfalfa. There was a 2-fold range in weight per seed, but the same number of pure live seeds/acre were planted for all meadow fescue varieties. In May, 2018, we planted Ameristand 427TQ alfalfa on the Marc Laribee farm (Graceway Farm) in Lowville, Lewis County, in mixture with 19 meadow fescue varieties and Bariane tall fescue (TF). The average seeding rate for meadow fescue varieties was 2 lbs pure live seed/acre.

On April 25, 2019, at Pominville Farms in Lewis County we planted the same study as on the Laribee farm, with 19 meadow fescue varieties. The 19 meadow fescue varieties were: Tetrax, Liherold, Preval, Pradel, Barvital, Cosmonaut, Driftless, Hidden Valley, Tored, SW Revansch, Pardus, Barika, Barcrypto, Laura, SW Minto, Arni, Jogeva 47, Harlequin, and Hyperbola. Most of these varieties have not been evaluated in North America; selections were based on suggestions by European grass breeders. Many of these varieties were developed in colder environments than Northern NY.

In the spring of 2020, we established two meadow fescue-alfalfa studies in northern NY, at Mike Kiechle's Garden of Eden Farm in Philadelphia, Jefferson County, and at Tony Paluck's farm in Constableville, Lewis County. Nine meadow fescue varieties were selected, along with Bariane tall fescue, to evaluate differences in NDFD and grass percentage in mixtures. This included two new tetraploid varieties: Tetralonia and Schwetra.

All grasses in 2020 were seeded at approximately 1, 2, and 3 lbs/acre with Ameristand 427TQ alfalfa at 15 lbs/a. SW Minto was seeded at exactly 1, 2, and 3 lbs/a, and all other grasses were seeded at the same number of pure live seeds per sq. ft. as Minto. Tetraploid seeds are as much as three times the weight per seed of diploid varieties. Each study has four field replicates.

We also provided seed to Heather Darby, an agronomic and soils specialist at the University of Vermont. She seeded the same study in northern VT for evaluation in 2021. She will generate data that will complement our results for the northern NY region.

Alfalfa and grass were analyzed separately for crude protein (CP), neutral detergent fiber (NDF), invitro true digestibility (IVTD), neutral detergent fiber digestibility (NDFD), Acid Detergent Fiber (ADF), and lignin.

The two primary concerns with alfalfa-grass mixtures are:

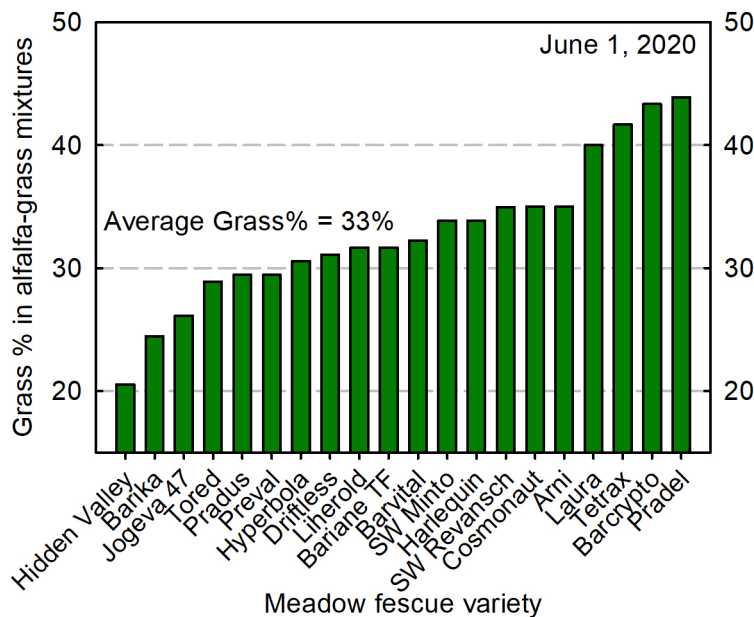
- 1) achieving a 20-30% grass mixture, and
- 2) achieving the highest quality possible for the grass. The experiments established in 2019 and 2020 were established to answer these questions.

**Results:**

**2018/2019 Seedings**

Late spring was cold, with below-average temperatures in April and May. Spring until mid-summer of 2020 was dry, with about 30% less rain than normal and not well distributed during that period.

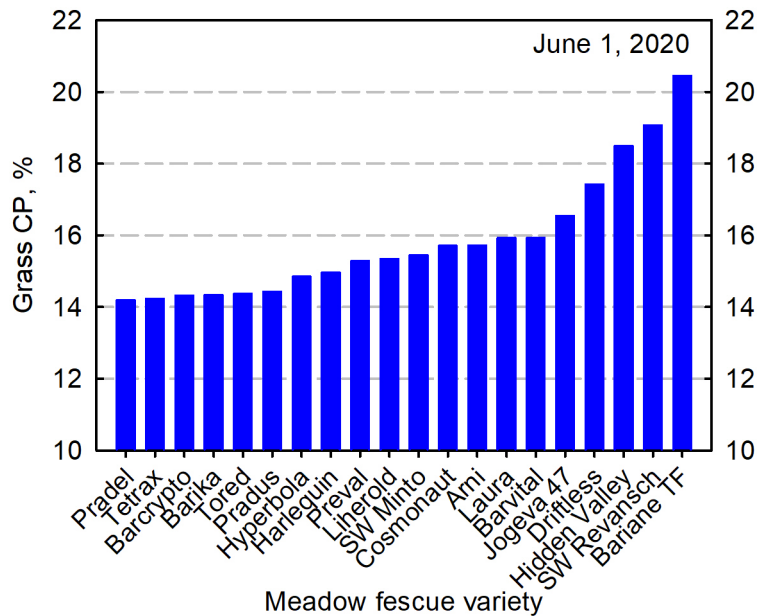
Plots at the Larabee farm were sampled June 1. Grass% averaged 33% across all entries, with a significant range (Fig. 1). Pradel, the most commonly used meadow fescue in the USA, had the highest grass%, over twice as high as Hidden Valley. Hidden Valley is one of the very few meadow fescue varieties developed in North America (Wisconsin).



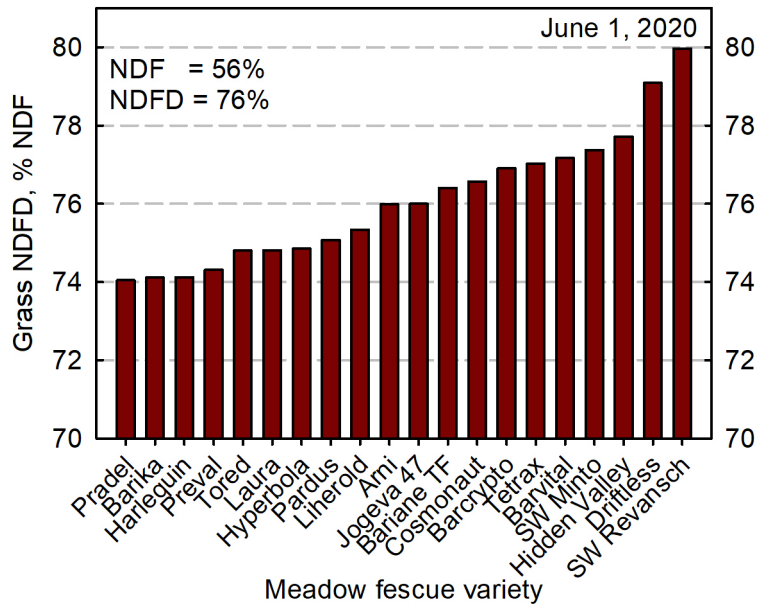
**Figure 1. Grass percentage at the Larabee farm, Lowville, New York, in Spring, 2020. The stand was decimated by ASB in the summer of 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**

Grass CP ranged from 14 to over 20% (Fig. 2), with Pradel having the lowest CP and, surprisingly, Bariane tall fescue was highest in CP. Average NDF was 56% on June 1, with a range of 74 to 80% NDFD (Fig. 3). As with CP, Pradel was lowest in NDFD, with SW Revansch the highest. Hidden Valley and Driftless were also high in NDFD. Driftless was generated by

Barenbrug through modifications of Hidden Valley, so they are often similar in NDFD, although Driftless is always higher in grass%.



**Figure 2. Grass crude protein (CP) at the Laribee farm in Lowville, New York, in Spring, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**



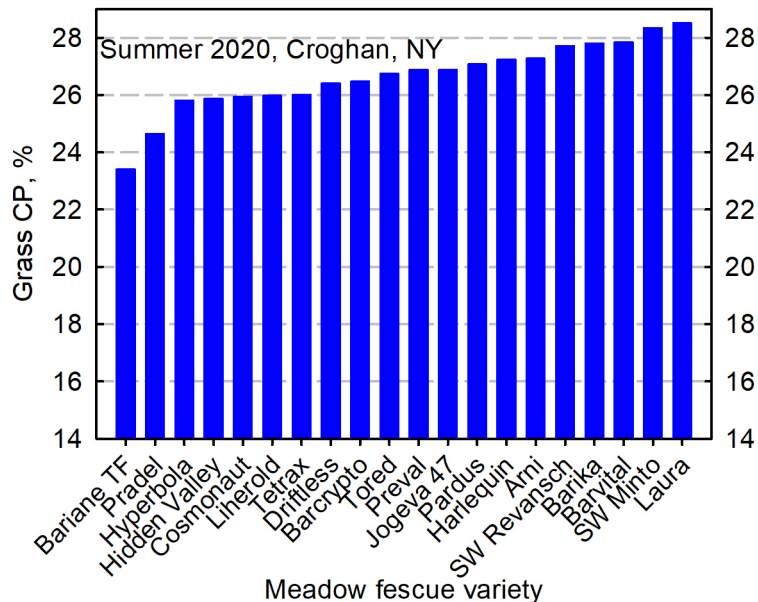
**Figure 3. Grass fiber digestibility (NDFD48h) at the Laribee farm in Lowville, New York, in Spring, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**

The Pominville Farms site has sandy loam soil that is very dry during droughty periods. The field was mowed in the spring before any sampling occurred. We sampled the summer regrowth and resampled in the fall. Summer was very droughty, and any soil variation was clearly visible

in the forage growth. Plant height varied by more than a foot within a given plot, with sharp lines delineating any differences in soil conditions.

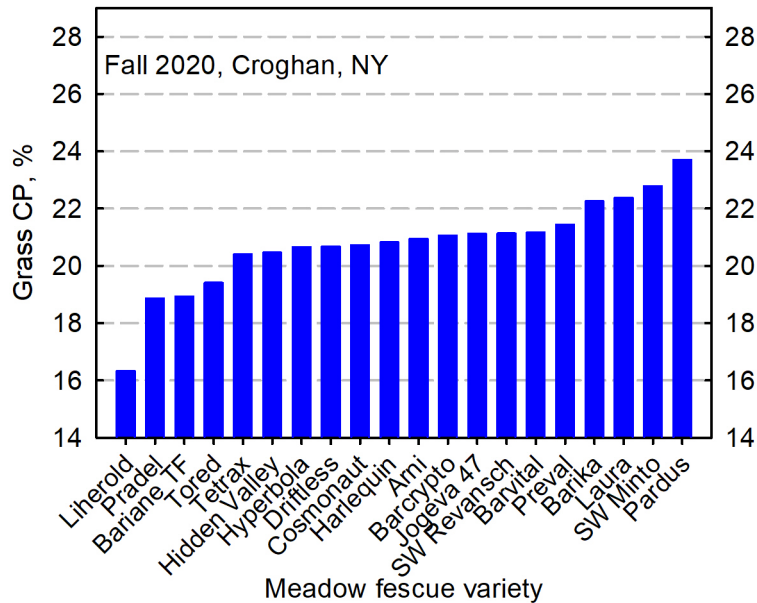
Drought maximizes variability over the soil surface. Tall fescue was visibly much more affected by drought than meadow fescue, with leaves curled into tight cylinders in the summer regrowth. Alfalfa was also stunted by dry conditions, and clovers invaded the study and were more abundant than alfalfa in some plots. This made it difficult to estimate grass% in plots, although all plots were greater than 50% grass.

Crude protein was very high in summer grass regrowth at Pominville Farms (Fig. 4), due to drought-stressed minimum growth. Under these high stress conditions, tall fescue was lower in CP than all the meadow fescues, with Pradel again the meadow fescue with lowest CP. Bariane TF and Pradel MF were again low in CP in fall regrowth (Fig. 5). SW Minto and Laura (certified organic) tended to be high in CP for both cuts.

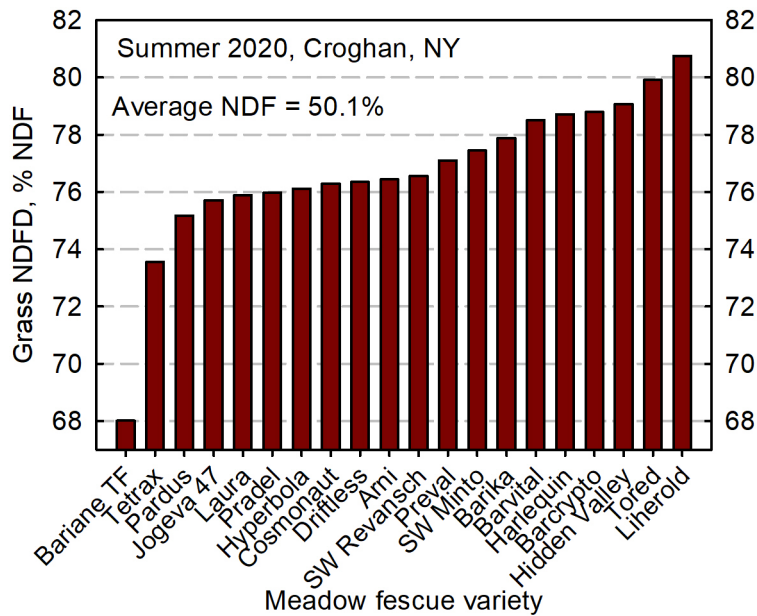


**Figure 4. Grass crude protein (CP) at Pominville Farms, Croghan, New York, in summer, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**

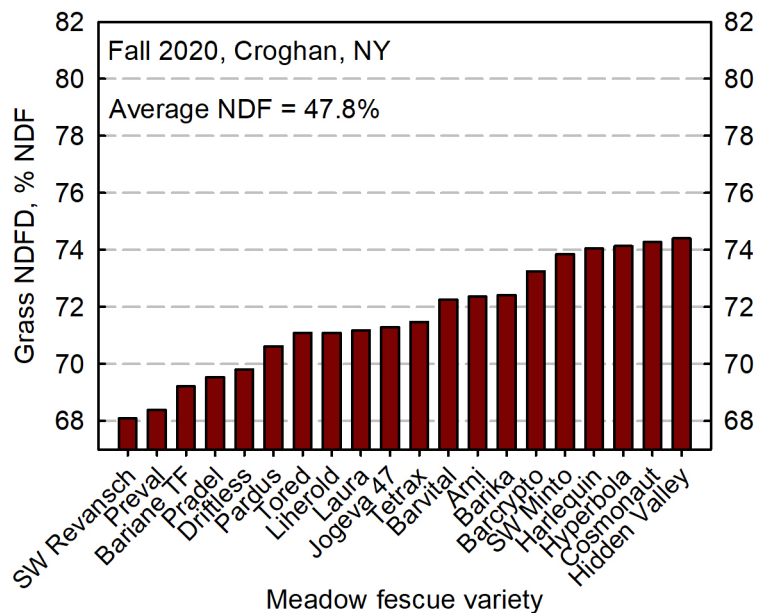
Summer regrowth at Pominville Farms’ site was low in NDF, averaging 50%, and fall regrowth was even lower averaging 49% NDF. Summer regrowth was low NDF, but high NDFD (Fig. 6), while fall regrowth was low NDF, low NDFD (Fig. 7). Fall grass growth is typically low in total fiber but also low in fiber digestibility. Bariane TF was very low in NDFD in the severely-stressed summer regrowth, and relatively low in fall regrowth, compared to meadow fescues. Hidden Valley was consistently higher in NDFD in both summer and fall regrowth.



**Figure 5. Grass crude protein (CP) at Pominville Farms in Croghan, New York, in fall, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**



**Figure 6. Grass fiber digestibility (NDFD48h) at Pominville Farms in Croghan, New York, in summer, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**



**Figure 7. Grass fiber digestibility (NDFD48h) at Pominville Farms in New York, in fall, 2020; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**

### 2020 Seedings

Although 2020 was a stressful year for grass establishment, we had some meadow fescue in stands at the end of the season. The Kiechle farm study was sown in late April, and grass was established before the droughty summer period (Photo 1 at the end of this report). While there is only about 10% grass in the photo, that same area could easily be over 30% grass next spring.

The Paluck farm study was sown on May 6, and had considerable weed pressure as well as a drier soil.

We will not be able to evaluate the success of grass establishment on these farms until spring 2021.

### Conclusions/Outcomes/Impacts:

With a consistently high CP content for alfalfa, the CP content of grasses in mixtures is always going to be sufficiently high enough for lactating dairy cattle. There is a range in CP among varieties, but most of the CP variation is due to a range in grass% in mixtures. The less grass in a mixture, the higher the CP will be in the grass.

Meadow fescues, on average, are considerably higher in NDFD than tall fescue. Pradel, among the most popular of meadow fescues sown in the USA, consistently has a high grass% in mixtures and tends to be among the lowest in NDFD among varieties tested. Hidden Valley consistently has a lower grass% in mixtures and tends to be among the highest in NDFD. Other meadow fescue varieties have not been consistent over sites or cuts within a season.

Multi-year studies are warranted to compare species under a variety of climatic conditions and diverse soils.

### **Outreach:**

This NNYADP-funded alfalfa-grass research was reported at the following meetings and conferences in 2020:

- Jan. 7: Oneida County Crop Congress, Waterville, NY
- Jan. 15: Northeast Pasture Consortium Conference, Fairlee, VT
- Jan. 24: 5-County Winter Crop Meeting, Ithaca, NY
- Oct. 22: Cornell Nutrition Conference, Syracuse, NY, online
- Nov. 6: CCE Inservice, Ithaca, NY, online
- Nov. 10: American Society of Agronomy Annual Conference, online
- Dec. 3: Cornell Field Crop Dealer Meeting, online.

### **Next Steps:**

Our results continue to show that meadow fescue has great potential in mixture with alfalfa, and the combination of meadow fescue and high quality alfalfa should lead to significantly improved forage quality. Results have shown that grass yield or quality is not consistent across environments, highlighting the importance of regional trials. The main issue remains getting a 20-30% grass mixture, which is a function of the grass seeding rate and the grass variety. In 2021, we are focusing on a set of meadow fescue varieties with high fiber digestibility and that are potentially less competitive with alfalfa. We have obtained seed of the three tetraploid varieties from Europe, and have established two research trial sites in northern NY to evaluate these tetraploids and other more promising varieties at three seeding rates with alfalfa.

### **Acknowledgments:**

USDA-NIFA provided funding for evaluation of GMO reduced-lignin alfalfa in pure and mixed stands for a multi-state project (NY, MN, and KY). We have also received funding from the National Alfalfa & Forage Alliance (alfalfa seed checkoff funds) to evaluate forage quality of a wide range of alfalfa varieties in Ithaca. These funding sources plus the NNYADP grant funding support allow us to focus specifically on improving alfalfa-grass production in NY.

### **Reports and/or articles in which results of this project have been published:**

- Cherney, J.H., and D.J. Cherney. 2020. Meadow fescue seeding rate impacts mixtures with alfalfa on marginal sites. *Crop Forage Turfgrass Manage.* <https://doi.org/10.1002/cft2.20046>.
- Cherney, J.H., S.R. Smith, C.C. Sheaffer, and D.J.R. Cherney. 2020. Nutritive value and dry matter yield of reduced-lignin and normal alfalfa cultivars in monoculture and in binary mixtures with perennial grass. *Agron. J.* 112:352–367.
- Cherney, J.H., R.L. Kallenbach, and V. Picasso Risso. 2020. Chapter 20. Forage Systems for Temperate Areas. In (K. Moore et al., ed.) *Forages: The Science of Grassland Agriculture*. Vol. II. 7<sup>th</sup> ed. Wiley-Blackwell.

### **For More Information:**

Debbie J.R. Cherney, Department of Animal Science, Cornell University; [djc6@cornell.edu](mailto:djc6@cornell.edu); 607-255-2882; [www.forages.org](http://www.forages.org).



**PHOTO:**



**April 2020 photo of meadow fescue-alfalfa seeding made in early fall at the Mike Kiechle farm, Philadelphia, New York; Maximizing Both Alfalfa and Grass Quality of Mixture, NNYADP.**