



ADVANCED AG SYSTEMS'

# Crop Soil News

<http://www.advancedagsys.com/>

August 2020

"It is the crops that feed the cows that make the milk which creates the money."

## New Old Crop: The rest of the story

The June newsletter covered the use of the old crop, red clover, under modern management, to achieve profitable high yields on less than ideal drained soils utilizing short rotations. We covered the yield and harvest. What about the feed quality and management to get that quality that is critical to supporting the greater than 70% forage diets that farmers are switching to in order to profit under limited milk quota?



The **New York Farm Viability Institute** supported our research that looked at this in detail. Earlier work out of Wisconsin showed that clover maintained high digestibility much later than alfalfa and so could be harvested much later for the same quality – at least on paper. Discussing this with a university dairy nutritionist he stated that the cow's *production dropped precipitously* when they fed this *later harvested forage*. This research found why. With the help of Extension, ProDairy, and Cornell staff, we established in four locations, Delaware, Columbia, Lewis and Essex counties, identical varieties of alfalfa and red clover. They were planted in replicated strips (see photo above). One site (Essex) the alfalfa did not establish; while at the Lewis site the stand was thin and so quality samples were valid but not yield. The second year after planting we harvested samples of the alfalfa and clover twice a week over an eight-week period. Four replications were taken from each crop at each date and immediately frozen. They were maintained in the **fresh-frozen state** when delivered to Cumberland Valley Analytical Services and analyzed with wet chemistry. The results for each harvest date were entered into Cornell Net Carbohydrate and Protein Systems model 6.5 by Professor Emeritus **Dr. Larry Chase** of Cornell University.

In June I said hairy clover is naturally protected from potato leafhopper. The Columbia research site this year had protected, dark green red clover and yellow alfalfa that was hammered by hoppers. Hairy clover saves the cost and time of spraying as an organic control.

Target harvest of 40 NDF, the target established for alfalfa harvest, was used for the red clover. At the warm site Columbia, clover 40 NDF **was the same time as the alfalfa** (alfalfa 6/5; red clover 6/6). For the cooler, higher elevation site Delaware, the red clover was at 40 NDF June 16, **a week EARLIER than alfalfa** which did not hit that point until June 24. At the Lewis site the alfalfa was only 3 days earlier than the red clover. The Lewis and Columbia site showed that the clover is ready almost at the same time as alfalfa. If grown with grass companion, the harvest date would be much earlier than straight alfalfa. With farmers traditionally harvesting clover/grass well after alfalfa, it would explain why it does not (cannot) support high milk production – it was cut to late.

When all sites together were analyzed, the Growing Degree Days to 40 NDF were nearly identical to alfalfa (alfalfa 901, clover 923) with the  $R^2$  respectively 88.3 and 85.9.

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This was much later than the established 750 GDD for harvesting alfalfa. It may have been an artifact of a multi-week cold spell after alfalfa broke dormancy. Using the common technique of height of the alfalfa as a predictor of NDF; the mean of all the sites was **35 inches for alfalfa** and **33 inches for the red clover**. It was a more cloudy season that apparently affects alfalfa more than clover. As we passed 40 NDF date both crops lodged and lost most of the lower leaves.

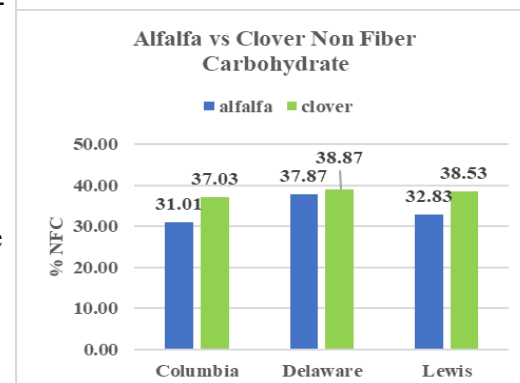
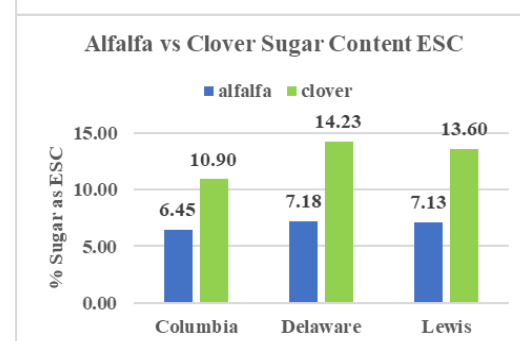
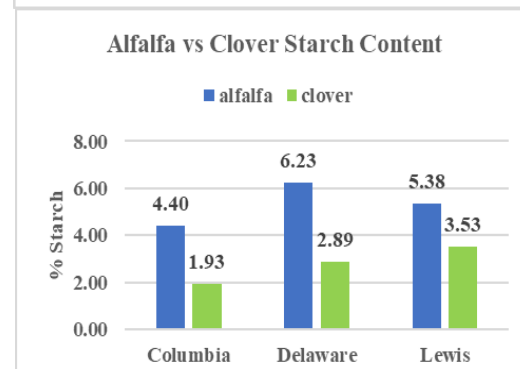
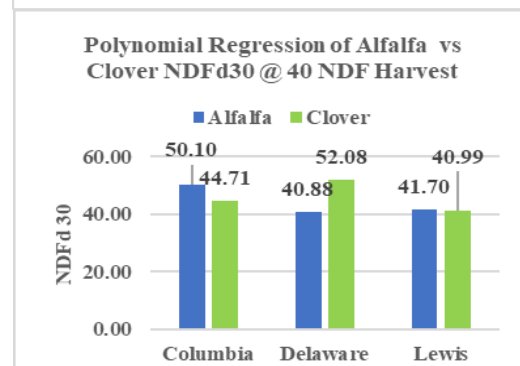
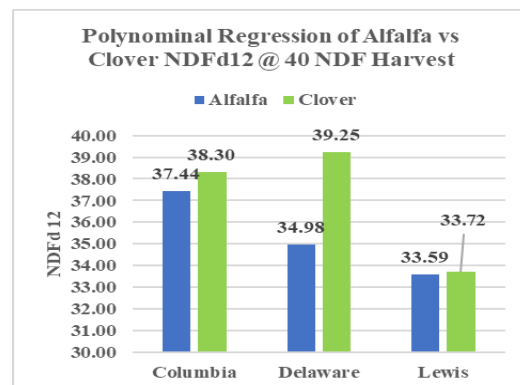
The feed quality analysis revealed some keys that are critical for maximizing dry matter intake and milk production. The first is the digestibility. This drives forage intake and milk production. **Dr. Cherney**, Forage Extension Professor at Cornell has done extensive work with legumes and found most of the digestion is in the first 12 hours. As you can see by the top graph at the right, when alfalfa and clover were harvested at their respective dates of 40 NDF, the red clover equal or exceeded the alfalfa in digestibility (NDFd 12) especially in the higher or cooler elevations. This allows for rapid release of nutrients for sustaining high milk production. Nutritionists still use NDFd30 to compare most forages. As the 2nd graph down at right shows, in the warmer lower elevations, when each reached their 40 NDF harvest date, the alfalfa had higher digestibility at 30 hours than clover. At higher/cooler locations the reverse was true or they were nearly equal.

A critical finding was the partitioning of energy produced by photosynthesis. In alfalfa, energy is stored in cellular starch. Starch is composed of 2,000 to 200,000 sugar molecules. Alfalfa had 92% more starch than clover (3rd graph down on right).

Clover on the other hand has much higher sugar than alfalfa – 87% more (4th graph down on right). This has two implications. First, with a proper inoculant, it provides a substrate for very rapid fermentation. Second, it is even more critical to utilize wide swath same-day haylage with clover to preserve that sugar energy to the mouth of the cow. We hypothesize that the occasional reports of cows not wanting to eat red clover may be due to narrow row, multi-day drying systems that respire most, if not all the readily available sugar in the plant. But clover also stores considerable energy in pectin. There is not a direct test for pectin but it shows as non-fiber carbohydrate levels. Clover consistently had higher NFC (13%) than alfalfa (bottom graph at right).

The uNDF240m was lower for the clover compared to alfalfa across all harvest sites. The alfalfa averaged 20.29 while the clover averaged 17.45. At uNDF30, they were nearly equal.

Clover has slightly less crude protein (17.07) than alfalfa (19.02). Total amount is only part of the story. Clover has compounds that inhibit hyper-ammonia rumen bacteria (Dr. Flythe, ARS) from breaking protein to inefficiently utilized ammonia, increasing the metabolizable energy for milk. They also found that clover contains polyphenol oxidase enzymes that inhibit protein breakdown for more bypass protein (25-35%) than alfalfa (15-25%) thus, enabling lower cost rations as they have less added very expensive bypass protein. If



it is not rumen degraded, then it is by pass protein. Alfalfa had 72% rumen degraded while the clover was 68% (**alfalfa by-pass 28%, clover by-pass 32%** -remember these were fresh samples).

Milk Potential CNCPS 6.5 Dr. Larry Chase analysis	ME with Corn Silage		MP with Corn Silage	
<b>Columbia</b> Alfalfa @40 NDF on June 5 Clover @40 NDF on June 6 Potential Milk Difference <b>Alfalfa vs Clover</b>	alfalfa 84	clover 85.3 <b>+1.3</b>	alfalfa 84.1	clover 80.3 <b>-3.8</b>
<b>Delaware</b> Alfalfa @40 NDF on June 24 Clover @40 NDF on June 16 Potential Milk Difference <b>Alfalfa vs Clover</b>	alfalfa 82.0	clover 86.4 <b>+4.4</b>	alfalfa 82.7	clover 84.5 <b>+1.8</b>
<b>Lewis</b> Alfalfa @40 NDF on June 24 Clover @40 NDF on June 27 Potential Milk Difference <b>Alfalfa vs Clover</b>	alfalfa 83.3	clover 83.2 <b>-0.1</b>	alfalfa 82.3	clover 81.5 <b>-0.8</b>

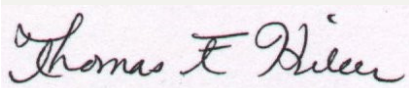
The bottom line is the milk that can be potentially produced. We utilized the points for each site when clover and alfalfa were harvested at their **respective 40 NDF date** (polynomial regression derived). Utilizing a diet of 65% forage of which 60% was corn silage and 40% either red clover or alfalfa; the **metabolizable energy ME** and **metabolizable protein MP** milk supported was determined at each harvest date.

In the Columbia site analysis (warmer, earliest site), there was a 1.3 pound increase in the amount of milk energy ME, supported by the clover compared to alfalfa. For metabolizable protein MP, there was a 3.8 pounds of milk reduction when clover was substituted for alfalfa silage. This is expected as discussed on prior page, the clover had 3.4% less crude protein than the alfalfa. In the cooler, later, Delaware site the differences shifted significantly in favor of the clover. The metabolizable energy ME milk production was 4.4 lbs. higher for the clover than for the alfalfa when they were substituted for each other. For metabolizable protein MP, in the corn silage diet, there was a 1.8 pounds of potential milk increase when clover was substituted for alfalfa in the same diet. At the more northern, cool, possibly lake effect site in Lewis county, the clover and alfalfa were nearly the same in ME milk supported with clover only 0.1 less. MP was similar in that the clover was only 0.8 less. Keep in mind that this site the clover averaged **3.93 tons of dry matter** in just the first cut.

Clover can be a superior forage on farms that are affected by the cloudy cool conditions downwind from the Great Lakes and in high cool elevations and any less than ideal drained soil. A critical key is to use modern red clover varieties as in this trial, not some cheap Variety Not Stated VNS junk with no disease resistance or improved productivity.

For sorghum sp. harvest suggested management click here ([Sorghum Harvest](#))

Sincerely,



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