



## Conclusions from the 2017 alfalfa and grass forage trials

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The alfalfa trials were expanded this year to include grass and alfalfa-grass mixtures. Overall the results confirmed the 2016 results - that AgroLiquid products foliar applied significantly increase yield and even more importantly they increase the quality and fiber digestibility of the forage - which means dairy and beef cattle will perform significantly better eating AgroLiquid treated hay or ensilage. The geographic area of the trials was greatly expanded, from Ontario to Kansas. Likely due to weather extremes the results were more variable this year, ranging from mind-blowing success to a few puzzling losses. Where we lost the difference was small, and we won most of the time.

There were a few trials I did not report. The Wardin farm trials near St. Johns, MI was not reported due to an estimated 40% defoliation from mosaic virus. A Wisconsin trial on the Fly-By Acres farm was not reported due to sample miss-identification. I had a corn silage contract research trial, but incessant rain delayed planting excessively and the yields were too low to mean anything. The NCRS trials are included in this report, but as you will see the dry fertilizer treatment came out on top, but not by much. Why? It may have been due to the stand being at least 5 years old, and it was thinner as a result. Based on the 2015 Dairyland Seed alfalfa variety trials and the differences in response between the 9 varieties we observed there is likely a varietal influence in the response a grower will see from AgroLiquid foliar fertilization. It is possible that the alfalfa used for the NCRS trials was a less-responsive variety.

Based on my 3 year trial experience now, and after analyzing the results from nearly 150 trials plus observations and experiences reported to me by others in the field, I have drawn the following conclusions:

1. You can expect a positive yield and quality response from AgroLiquid foliar treatments across the board. It doesn't matter if you are in New England, Canada, the Great Lakes region, the Central Plains, or the northwest.
2. AgroLiquid foliar treatments increase yield and significantly increase the palatability, protein, sugars, and energy content (more digestible fiber) of the forage regardless of AgroLiquid being a dry fertilizer replacement or the AgroLiquid foliar treatments were applied as an over-lay supplement to a dry fertilizer program. In fact some of the most spectacular results have been when the AgroLiquid foliar treatments were on top of a dry fertilizer program.
3. Grasses will respond by producing more sugar – sometimes a lot more sugar. Alfalfa will respond by increasing NDFD fiber digestibility. Protein tends to increase in both.
4. Foliar uptake by the AgroLiquid products is important versus a soil only application. For example, one alfalfa grower who could not achieve dairy quality after years of applying ProGerminator on stubble after cutting immediately achieved dairy quality on all cuttings by simply waiting to spray until there was 4" to 6" regrowth.
5. While the AgroLiquid foliar treatments usually reduced the lignin content – sometimes by a lot, there is not consistent correlation between lignin content and NDFD fiber digestibility. We will likely see similar quality improvement on the new "low-lignin" varieties as we see on the conventional varieties.
6. Products that you can apply foliar include ProGerminator, Sure K, fertiRain, AccesS, S-Calate, Micro 500, Micro 600, MicroLink Manganese and Boron, Liberate, High NRG-N (rates and timing restrictions), eNhance, NResponse, and the PrimAgro line-up. Contact me for rates and timing guidance in your situation.



## AgroLiquid Alfalfa and Forage Trials 2017

### Dan Olson contract research

All results are on a dry matter basis

Producer	Dan Olson research farm			
Location	Lena, WI, located in NE Wisconsin			
Crop	Second year pure alfalfa			
Cutting	1st, cut on May 30th			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	29.32	26.54	2.78	10.5%
ADF	26.37	30.94	4.57	17.3%
aNDF	33.62	38.33	4.71	14.0%
RFV	189	157	32	20.4%
RFQ	247	187	60	32.1%
NDFD 48hr	68.71	64.62	4.09	6.3%
Dynamic NDF kd	5.98	5.52	0.46	8.3%
TDN	67.95	60.59	7.36	12.1%
TTNDFD	49.14	44.04	5.10	11.6%
Lignin	3.97	4.48	0.51	12.8%
NEL Mcal/lb	0.700	0.633	0.067	10.6%
NEg	0.482	0.364	0.118	32.4%
NEm	0.759	0.627	0.132	21.1%
Total sugars (WSC)	7.210	5.840	1.370	23.5%
Milk/ton	3332	2831	501	17.7%
Tons/acre dry	0.94	1.12	-0.18	-16.1%
Milk/acre	3132	3171	-38.64	-1.2%
Ash	9.84	12.24	-2.40	-19.6%
Ca	1.28	1.31	-0.03	-2.3%
P	0.40	0.36	0.04	10.0%
K	2.72	2.48	0.24	8.8%
AgroLiquid treatment: None, this 1st cutting was tested to determine any carry-over effect from the previous year's applications.				
Control treatment: None, this 1st cutting was tested to determine any carry-over effect from the previous year's applications.				
<p>This is the second year for this trial, using the same treatments on the same plots as last season. As is standard practice in the Great Lake states, alfalfa is normally not fertilized in the spring, as is the case here on this trial. What stands out, however, is the very significant positive carry-over effect from the previous summer's AgroLiquid treatments versus the dry fertilizer treatments. While the dry matter tonnage is less for the AgroLiquid, the forage quality increase versus the dry is off the charts big. Some highlights: Nearly a 13% drop in Lignin, 32% high Relative Forage Quality (RFQ), 17% lower undigestible fiber (ADF), 10.5% higher protein, and huge increase in Net Energy values.</p>				



## AgroLiquid Alfalfa and Forage Trials 2017

Dan Olson contract research

All results are on a dry matter basis

Producer	Dan Olson research farm
Location	Lena, WI, located in NE Wisconsin
Crop	Second year pure alfalfa
Cutting	2nd, cut on July 1st.

Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	28.90	25.84	3.06	11.8%
ADF	27.08	30.18	3.10	11.4%
aNDF	35.68	38.91	3.23	9.1%
RFV	177	156	21	13.5%
RFQ	253	179	74	41.3%
NDFD 48hr	76.04	63.48	12.56	19.8%
Dynamic NDF kd	6.40	5.62	0.78	13.9%
TDN	69.76	59.96	9.80	16.3%
TTNDFD	53.90	45.64	8.26	18.1%
Lignin	3.87	4.65	0.78	20.2%
NEL Mcal/lb	0.698	0.621	0.077	12.4%
NEg	0.509	0.353	0.156	44.2%
NEm	0.790	0.615	0.175	28.5%
Total sugars (WSC)	6.910	5.890	1.020	17.3%
Milk/ton	3385	2764	621	22.5%
Tons/acre dry	1.23	1.32	-0.09	-6.8%
Milk/acre	4164	3648	515.07	14.1%
Ash	9.87	12.79	-2.92	-22.8%
Ca	1.07	1.16	-0.09	-8.4%
P	0.41	0.35	0.06	14.6%
K	3.05	2.43	0.62	20.3%

AgroLiquid treatment: 2 g ProGerminator + 6 g Sure K + 1 g S-Calate + 1 g FertiRain + 24 ox each of Mn, B, and Micro 500 applied at 6" growth.

Control treatment: 175 lbs 5-14-42 + 12 lbs 90% S + 3 lbs each ZnSO<sub>4</sub>, MnSO<sub>4</sub>, and 20% B applied on the stubble after 1st cutting.

This is the second year for this trial, using the same treatments on the same plots as last year. On this cutting the AgroLiquid treatment resulted in slightly less dry matter yield, but registered huge increases in the forage quality parameters - which matters a lot to dairymen. Look at the very large increases in the Net Energy values (NEL, NEg, NEm). AgroLiquid reduced the lignin (non-digestible hard fiber) by an astonishing 20.2%. A hugely important number is the nearly 20% more Neutral Detergent Fiber Digestibility 48 hr. This would result in over 6 lbs more milk per cow per day (if fed only this forage)!!! The economics of that cannot be overstated.



## AgroLiquid Alfalfa and Forage Trials 2017

### Dan Olson contract research

All results are on a dry matter basis

Producer	Dan Olson research farm			
Location	Lena, WI, located in NE Wisconsin			
Crop	Second year pure alfalfa			
Cutting	3rd, cut on July 29			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	26.02	27.26	-1.24	-4.5%
ADF	30.27	30.74	0.47	1.6%
aNDF	39.03	37.58	-1.45	-3.7%
RFV	156	161	-5	-3.1%
RFQ	196	196	0	0.0%
NDFD 48hr	69.66	67.78	1.88	2.8%
Dynamic NDF kd	6.08	6.19	-0.11	-1.8%
TDN	62.93	61.71	1.22	2.0%
TTNDFD	49.42	47.99	1.43	3.0%
Lignin	3.55	3.98	0.43	12.1%
NEL Mcal/lb	0.639	0.632	0.007	1.1%
NEg	0.402	0.382	0.020	5.2%
NEm	0.669	0.647	0.022	3.4%
Total sugars (WSC)	6.890	5.910	0.980	16.6%
Milk/ton	2939	2870	69	2.4%
Tons/acre dry	1.14	0.98	0.16	16.3%
Milk/acre	3350	2813	537.86	19.1%
Ash	12.57	13.02	-0.45	-3.5%
Ca	1.24	1.22	0.02	1.6%
P	0.36	0.38	-0.02	-5.6%
K	2.64	2.79	-0.15	-5.7%
<p>AgroLiquid treatment: 2 g ProGerminator + 6 g Sure K + 1 g S-Calate + 1 g FertiRain + 24 ox each of Mn, B, and Micro 500 applied at 6" growth.</p>				
<p>Control treatment: 175 lbs 5-14-42 + 12 lbs 90% S + 3 lbs each ZnSO<sub>4</sub>, MnSO<sub>4</sub>, and 20% B applied on the stubble after 2nd cutting.</p>				
<p>This is the second year for this trial, using the same treatments on the same plots as last year. On this cutting note the increase in total sugars, the dry matter yield, and the milk/acre resulting from the AgroLiquid treatment compared to the dry fertilizer.</p>				



## AgroLiquid Alfalfa and Forage Trials 2017

**Dan Olson contract research**

All results are on a dry matter basis

Producer	Dan Olson research farm			
Location	Lena, WI, located in NE Wisconsin			
Crop	Alfalfa - meadow fescue mix			
Cutting	2nd, cut on July 1st			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	24.69	22.45	2.24	10.0%
ADF	31.70	33.21	1.51	4.8%
aNDF	39.95	41.98	2.03	5.1%
RFV	150	140	10	7.1%
RFQ	202	170	32	18.8%
NDFD 48hr	68.69	64.84	3.85	5.9%
Dynamic NDF kd	5.58	6.54	-0.96	-14.7%
TDN	62.70	59.92	2.78	4.6%
TTNDFD	47.96	47.75	0.21	0.4%
Lignin	4.53	4.89	0.36	7.9%
NEL Mcal/lb	0.628	0.618	0.010	1.6%
NEg	0.398	0.352	0.046	13.1%
NEm	0.665	0.614	0.051	8.3%
Total sugars (WSC)	8.090	8.670	-0.580	-6.7%
Milk/ton	2864	2755	109	4.0%
Tons/acre dry	1.42	1.23	0.19	15.4%
Milk/acre	4067	3389	678.23	20.0%
Ash	12.14	11.84	0.30	2.5%
Ca	1.09	1.04	0.05	4.6%
P	0.36	0.36	0.00	0.0%
K	2.71	2.64	0.07	2.6%
<b>AgroLiquid treatment: 2 gal ProGerminator + 6 gal Sure K + 1 gal S-Calate + 1 gal fertiRain + 8 gal High NRG-N + 2 gal NResponse + 24 oz each Micro 500, Mn, B at 6"</b>				
<b>Control treatment: 175 lbs 5-14-42 + 12 lbs 90% S + 3 lbs each ZnSO<sub>4</sub>, Ganubor, MnSO<sub>4</sub> + 75 lbs AMS + 75 lbs Urea as a topdress after 1st cutting.</b>				
<p>This was a complete AgroLiquid program compared to a complete dry fertilizer program. The results prove a large advantage to the AgroLiquid treatment. Despite the high number of gallons/acre applied foliar there was no leaf burn. The yield and quality improvement is impressive, notably the milk/acre, net energy gain, 10% higher protein, and and 18.8% increase in overall Relative Forage Quality.</p>				



## AgroLiquid Alfalfa and Forage Trials 2017

### Dan Olson contract research

All results are on a dry matter basis

Producer	Dan Olson research farm			
Location	Lena, WI, located in NE Wisconsin			
Crop	Alfalfa - meadow fescue mix			
Cutting	3rd, cut on July 29			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	23.56	24.32	-0.76	-3.1%
ADF	30.83	30.74	-0.09	-0.3%
aNDF	41.48	39.58	-1.90	-4.6%
RFV	146	153	-7	-4.6%
RFQ	208	205	3	1.5%
NDFD 48hr	72.30	68.34	3.96	5.8%
Dynamic NDF kd	6.39	6.31	0.08	1.3%
TDN	65.52	63.70	1.82	2.9%
TTNDFD	52.64	47.93	4.71	9.8%
Lignin	3.80	4.24	0.44	11.6%
NEL Mcal/lb	0.646	0.641	0.005	0.8%
NEg	0.443	0.414	0.029	7.0%
NEm	0.716	0.683	0.033	4.8%
Total sugars (WSC)	9.410	9.040	0.370	4.1%
Milk/ton	3022	2947	75	2.5%
Tons/acre dry	1.21	1.13	0.08	7.1%
Milk/acre	3657	3330	326.51	9.8%
Ash	10.95	11.46	-0.51	-4.5%
Ca	0.93	1.10	-0.17	-18.3%
P	0.39	0.37	0.02	5.1%
K	2.77	2.62	0.15	5.4%
<b>AgroLiquid treatment: 2 gal ProGerminator + 6 gal Sure K + 1 gal S-Calate + 1 gal fertiRain + 8 gal High NRG-N + 2 gal NResponse + 24 oz each Micro 500, Mn, B at 6"</b>				
<b>Control treatment: 175 lbs 5-14-42 + 12 lbs 90% S + 3 lbs each ZnSO<sub>4</sub>, Ganubor, MnSO<sub>4</sub> + 75 lbs AMS + 75 lbs Urea as a topdress after 2nd cutting.</b>				
<p>This was a complete AgroLiquid program compared to a complete dry fertilizer program, and these treatments are the same as on the 2nd cutting but repeated on this the 3rd cutting. Despite the high number of gallons/acre applied foliar there was no leaf burn. The yield and quality improvement is significant, although not nearly as high as it was on the second cutting. Note the drop in lignin content for the AgroLiquid treatment. This is a common result on AgroLiquid treatments vs dry.</p>				



## AgroLiquid Alfalfa and Forage Trials 2017

Dan Olson contract research

All results are on a dry matter basis

Producer	Dan Olson research farm
Location	Lena, WI, located in NE Wisconsin
Crop	Alfalfa - meadow fescue mix
Cutting	4th, cut on Sept 4th

Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	22.01	21.81	0.20	0.9%
ADF	32.76	33.42	0.66	2.0%
aNDF	42.30	40.99	-1.31	-3.1%
RFV	139	143	-4	-2.8%
RFQ	169	184	-15	-8.2%
NDFD 48hr	65.56	63.53	2.03	3.2%
Dynamic NDF kd	6.03	6.07	-0.04	-0.7%
TDN	59.51	60.97	-1.46	-2.4%
TTNDFD	46.57	44.53	2.04	4.6%
Lignin	3.99	4.90	0.91	22.8%
NEL Mcal/lb	0.610	0.617	-0.007	-1.1%
NEg	0.346	0.370	-0.024	-6.5%
NEm	0.607	0.634	-0.027	-4.3%
Total sugars (WSC)	9.180	9.720	-0.540	-5.6%
Milk/ton	2709	2760	-51	-1.8%
Tons/acre dry	1.61	1.34	0.27	20.1%
Milk/acre	4361	3698	663.09	17.9%
Ash	12.20	11.79	0.41	3.5%
Ca	1.00	1.15	-0.15	-15.0%
P	0.35	0.34	0.01	2.9%
K	2.47	2.35	0.12	4.9%

AgroLiquid treatment: None, shows carry over effect from 2nd and 3rd cut applications.

Control treatment: None, carry over effect from 2nd and 3rd cut applications.

Although there were no additional dry or liquid treatments on this cutting, it does demonstrate a strongly positive carry-over effect from the AgroLiquid treatments applied to the 2nd and 3rd cuttings, notably the increased yield and milk per acre. Note also the large drop in lignin content as a result of the previous AgroLiquid foliar treatments.



## AgroLiquid Alfalfa and Forage Trials 2017

Brent Macklin, Kiehl Farm bromegrass

All results are on a dry matter basis

Producer	Kiehl Farm			
Location	Williamsburg, Kansas			
Crop	Pure stand Bromegrass			
Cutting	1st			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	9.80	8.10	1.70	21.0%
ADF	38.10	39.90	1.80	4.7%
aNDF	63.00	65.70	2.70	4.3%
RFV	87	82	5	6.1%
RFQ	123	101	22	21.8%
NDFD 48hr	50.00	46.00	4.00	8.7%
IVTDMD 48 hr*	67.50	65.20	2.30	3.5%
TDN	59.10	57.10	2.00	3.5%
Lignin	4.49	4.41	-0.08	-1.8%
NEL Mcal/lb	0.6039	0.5813	0.0226	3.9%
NEg	0.3229	0.2945	0.0284	9.6%
NEm	0.5819	0.5510	0.0309	5.6%
Water soluble carbohydrates	10.800	9.700	1.100	11.3%
Non-fiber carbohydrates	24.000	21.700	2.300	10.6%
Ash	2.64	4.07	1.430	35.1%
Ca	0.40	0.40	0.00	0.0%
P	0.16	0.14	0.02	12.5%
K	0.86	1.39	-0.53	-61.6%
* IVTDMD = in-vitro digestibility				
AgroLiquid treatment: 12 gal High NRG-N + 2 gal ProGerminator + 1 gal Sure K applied at spring green-up. Equivalency of a 60-20-13-6S application rate.				
Control treatment: Blend of urea, MAP, and potash for a 70-30-20 application rate.				
This trial is on a beef cow-calf operation in eastern Kansas. These results show a marked advantage to the AgroLiquid treatment versus the dry fertilizer control. With 21% more protein, substantially more digestible carbohydrates, significantly better fiber digestibility as shown in the NDFD 48 hr test (this test replicates 48 hours in rumen fluid) and a cumulative 19.1% more energy available to the cow or calf, we know that this forage is significantly more valuable to the producer than the comparable dry fertilizer treated bromegrass hay. Cow condition will be better, daily rate of gain for the calves will be higher, and the producer will be able to reduce his protein and grain purchases for the ration. The producer reports that the AgroLiquid treated brome hay was sought after by the cows and they ignored the dry fertilizer bales until the AgroLiquid treated bales were consumed - clearly better palatability.				





## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Starlyte Dairy			
Location	Watford, ON			
Crop	Mixed alfalfa and grass. <b>Field 1</b>			
Cutting	1st			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	18.40	17.50	0.90	5.1%
ADF	28.40	29.60	1.20	4.2%
aNDF	41.20	43.00	1.80	4.4%
RFV	136	125	11	8.8%
NDFD (%NDF)	36.64	35.87	0.77	2.1%
TDN	61.85	61.40	0.45	0.7%
Lignin	5.50	5.60	0.10	1.8%
NEL Mcal/kg	1.390	1.390	0.000	0.0%
Total sugars	9.200	8.610	0.590	6.9%
Yield comparison	25992.00	24272.00	1720.00	7.1%
Ash	8.60	8.40	0.20	2.3%
Ca	1.34	1.09	0.25	18.7%
P	0.33	0.34	-0.01	-3.0%
K	1.76	2.03	-0.27	-15.3%
AgroLiquid treatment: 4 Gal Sure K + 34 oz Mn + 34 oz B applied early spring.				
Control treatment: 0-0-60 applied early spring, rate is unknown.				
This trial in eastern Canada showed modest but significant quality and yield improvement from the AgroLiquid treatment versus the dry potash application. Undigestible fiber is lowered by over 4%, plant sugars (increases palatability as well as energy) are increased by about 7%, and the yield is improved by 7%. Yield is from the whole sample size, not per acre.				



## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Starlyte Dairy
Location	Watford, ON
Crop	Mixed alfalfa and grass. <b>Field 2</b>
Cutting	1st

Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	18.20	16.20	2.00	12.3%
ADF	28.90	29.70	0.80	2.8%
aNDF	40.40	43.40	3.00	7.4%
RFV	134	124	10	8.1%
NDFD (%NDF)	37.15	35.27	1.88	5.3%
TDN	62.00	60.45	1.55	2.6%
Lignin	5.70	6.60	0.90	15.8%
NEL Mcal/kg	1.400	1.360	0.040	2.9%
Total sugars	9.150	8.950	0.200	2.2%
Yield comparison	24934.00	24691.00	243.00	1.0%
Ash	8.40	8.60	0.20	2.3%
Ca	1.34	1.03	0.31	23.1%
P	0.34	0.31	0.03	8.8%
K	1.70	2.03	-0.33	-19.4%

AgroLiquid treatment: 4 gal Sure K + 32 oz each Mn and B applied early spring.

Control treatment: 0-0-60 applied early spring.

This is the second field on the Starlyte Dairy in eastern Canada. The yield comparison is the total weight for each treatment, not per acre. These results show modest but significant results from the AgroLiquid treatment versus the potash. Protein is over 12% higher (important in dairy rations), undigestible fiber is lower (cow can eat more), and fiber digestibility is improved (more energy from the forage). Yet another of routine successes for AgroLiquid applications on forage crops.



## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis.

Producer	Ellefson Hay and Straw			
Location	Ulen, MN			
Crop	Alfalfa			
Cutting	3rd			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	26.93	21.80	5.13	23.5%
ADF	24.90	31.80	6.90	27.7%
aNDF	31.07	39.00	7.93	25.5%
RFV	209	153	56	36.3%
TDN	72.03	61.00	11.03	18.1%
Lignin	7.79	6.70	-1.09	-14.0%
NEL Mcal/lb	0.750	0.640	0.110	17.2%
NEg	0.490	0.330	0.160	48.5%
NEm	0.770	0.600	0.170	28.3%
Ash	13.44	9.79	3.65	37.3%
Ca	1.99	1.62	0.37	18.6%
P	0.26	0.23	0.03	11.5%
K	2.06	2.12	-0.06	-2.9%
AgroLiquid treatment: 3 gal Sure K + 1 gal S-Calate + 1 gal FertiRain + 1 qt Liberate Ca 1 qt Mn + 1 pt B applied foliar at 6".				
Control: Grower standard dry P and K applied topdress after 1st cutting.				
This trial shows an astonishing increase in forage quality parameters resulting from the AgroLiquid foliar treatment as a foliar supplement over the dry broadcast fertilizer. Notably the protein and net energy showed very large increases, and the indigestible fiber dropped to a large degree as well. With the Relative Feed Value increasing by over 36% and huge increases in net energy, this alfalfa hay will produce a highly significant increase in milk per cow per day.				



## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Majestic Crossing dairy farm			
Location	Plymouth, WI			
Crop	Alfalfa			
Cutting	2nd			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	23.57	20.77	2.80	13.5%
ADF	26.25	26.14	-0.11	-0.4%
aNDF	32.02	32.84	0.82	2.6%
RFV	199	194	5	2.6%
RFQ	259	242	17	7.0%
NDFD	67.74	63.67	4.07	6.4%
Dynamic NDF kd	7.23	7.03	0.20	2.8%
TDN	68.27	67.27	1.00	1.5%
TTNDFD	53.40	51.91	1.49	2.9%
Lignin	5.33	5.36	0.03	0.6%
NEL Mcal/lb	0.712	0.704	0.008	1.1%
NEg	0.487	0.471	0.016	3.4%
NEm	0.764	0.747	0.017	2.3%
Total sugars (ESC)	9.600	9.260	0.340	3.7%
Milk/ton	3388	3320	68	2.0%
Tons/acre dry				
Milk/acre				
Ash	8.62	8.54	0.08	0.9%
Ca	1.13	1.18	-0.05	-4.4%
P	0.35	0.35	0.00	0.0%
K	3.11	2.90	0.21	6.8%
AgroLiquid treatment: 4 gal Sure K + 3 qts S-Calate + 1 pt Micro 500 + 1 pt B applied at 14" growth as an over-lay supplement to dry potash.				
Control treatment: 150 lbs potash topdress 2X on entire field.				
The AgroLiquid foliar supplement over the dry potash was applied only 14 days pre-harvest. This was due to a tight weather window in a period of near incessant rains. The rush to get it cut and chopped, again in a tight window of time, did not allow the scales to be used for yield measurement. Despite the late application, there are still measureable improvements in quality from the AgroLiquid foliar application.				



## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Majestic Crossing dairy farm
Location	Plymouth, WI
Crop	Alfalfa
Cutting	3rd

Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	22.36	21.97	0.39	1.8%
ADF	28.86	28.24	-0.62	-2.1%
aNDF	38.28	38.70	0.42	1.1%
RFV	161	161	0	0.0%
RFQ	200	191	9	4.7%
NDFD 48hr	63.17	60.52	2.65	4.4%
Dynamic NDF kd	6.83	5.28	1.55	29.4%
TDN	64.26	61.34	2.92	4.8%
TTNDFD	53.37	45.90	7.47	16.3%
Lignin	4.91	5.23	0.32	6.5%
NEL Mcal/lb	0.650	0.635	0.015	2.4%
NEg	0.424	0.376	0.048	12.8%
NEm	0.693	0.640	0.053	8.3%
Total sugars (ESC)	7.690	6.380	1.310	20.5%
Milk/ton	3001	2844	157	5.5%
Tons/acre dry				
Milk/acre				
Ash	9.86	9.87	-0.01	-0.1%
Ca	1.18	1.32	-0.14	-11.9%
P	0.30	0.28	0.02	6.7%
K	2.76	2.67	0.09	3.3%

AgroLiquid treatment: 4 gal Sure K + 3 qts S-Calate + 1 pt Micro 500 + 1 pt B applied at 6" growth as an over-lay supplement to dry potash.

Control treatment: 150 lbs potash topdress 2X on entire field

Although again no yield data was obtained (could not get the portable scales in time) this cutting again shows improvements in several important forage quality parameters resulting from the foliar supplement over the dry potash. Notable, the rate of digestion is markedly increased, meaning that cows will be able to eat more feed per day (that means more milk). Overall net energy is higher, and the fiber digestibility is significantly increased (as measured by the TTNDFD - Total Tract Neutral Detergent Fiber Digestibility test). Note also that the AgroLiquid treatment lowered the lignin by 6.5%.



**AgroLiquid Alfalfa and Forage Trials 2017**  
**Dan Olson contract research**

All results are on a dry matter basis

Producer	Dan Olson research farm
Location	Lena, WI, located in NE Wisconsin
Crop	Tall fescue, established stand
Cutting	1st, cut on May 30th

Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	17.21	17.11	0.10	0.6%
ADF	30.94	36.24	5.30	17.1%
aNDF	46.27	53.63	7.36	15.9%
RFV	130	105	25	23.8%
RFQ	163	144	19	13.2%
NDFD 48hr	66.28	76.04	-9.76	-12.8%
Dynamic NDF kd	5.74	5.58	0.16	2.9%
TDN	62.74	57.05	5.69	10.0%
TTNDFD	49.98	54.08	-4.10	-7.6%
Lignin	2.97	3.17	0.20	6.7%
NEL Mcal/lb	0.636	0.593	0.043	7.3%
NEg	0.399	0.304	0.095	31.3%
NEm	0.666	0.561	0.105	18.7%
Total sugars (WSC)	13.090	7.210	5.880	81.6%
Milk/ton	2917	2621	296	11.3%
Tons/acre dry	1.38	1.19	0.19	16.0%
Milk/acre	4025	3119	906.47	29.1%
Ash	9.58	12.59	-3.01	-23.9%
Ca	0.75	0.38	0.37	49.3%
P	0.31	0.34	-0.03	-9.7%
K	2.03	3.01	-0.98	-48.3%

AgroLiquid treatment: 20 g Hi-N + 4 g PG + 6 g Sure-K + 3 g AccesS at green-up.

Control treatment: Dry blend = 75-20-75-6S at green-up.

On this 1st cutting of tall fescue the AgroLiquid treatment had a tremendous response versus the dry blend treatment. Notably the raw yield in tons dry matter and the even higher milk produced per acre, reflecting the better fiber digestibility for the AgroLiquid treatment. Note that for grasses the NDFD test is not as accurate as it is on alfalfa, so the reduction in non-digestible fiber (lower lignin and ADF) is probably a better predictor. That said, the Net Energy extractable (NEL, NEg, NEm) is markedly higher with the AgroLiquid treatment.



## AgroLiquid Alfalfa and Forage Trials 2017

**Dan Olson contract research**

All results are on a dry matter basis

Producer	Dan Olson research farm			
Location	Lena, WI, located in NE Wisconsin			
Crop	Tall fescue, established stand			
Cutting	Overall average across the season's 4 cuttings.			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	16.58	18.82	-2.24	-11.9%
ADF	33.44	33.92	0.48	1.4%
aNDF	49.18	50.12	0.95	1.9%
RFV	119.00	116.25	3	2.4%
RFQ	168.25	163.00	5	3.2%
NDFD 48hr	74.85	77.84	-3.00	-3.9%
Dynamic NDF kd	5.45	5.75	-0.30	-5.2%
TDN	61.96	59.67	2.29	3.8%
TTNDFD	52.35	55.70	-3.36	-6.0%
Lignin	2.27	2.94	0.67	29.4%
NEL Mcal/lb	0.62	0.61	0.006	1.1%
NEg	0.39	0.35	0.037	10.6%
NEm	0.65	0.61	0.041	6.7%
Total sugars (WSC)	11.48	7.63	3.858	50.6%
Milk/ton	2813	2749	64	2.3%
Tons/acre dry	1.24	1.22	0.02	1.6%
Milk/acre	3527	3366	161	4.8%
Ash	11.53	12.62	-1.09	-8.6%
Ca	0.57	0.52	0.06	9.6%
P	0.32	0.35	-0.03	-9.4%
K	2.44	3.08	-0.64	-26.3%
AgroLiquid treatment: 20 g Hi-N + 4 g PG + 6 g Sure-K + 3 g AccesS at green-up and again after 1st cutting.				
Control treatment: Dry blend = 75-20-75-6S at green-up and again after 1st cutting.				
<p>These are the averages across all 4 cuttings and 12 replications for the season. One standout result is the doubling of plant sugar content for the AgroLiquid treatment. We have heard accounts from Central Plains beef cow-calf operations for years that AgroLiquid treated grass hays are much preferred by the cows. This could be a major part of the reason. Sugar content is directly correlated to palatability, and this demonstrates that AgroLiquid fertilizer strongly increases sugar content in the grass. Another notable effect is the large reduction in lignin. This lignin reduction also increases palatability and the net energy extractable by the cow.</p>				



## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Berlyn Acres dairy farm			
Location	St. Johns, MI			
Crop	Alfalfa			
Cutting	2nd. Sampled 6/30/17			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	23.74	25.43	-1.69	-6.6%
ADF	30.78	29.70	-1.08	-3.5%
aNDF	40.77	39.83	-0.94	-2.3%
RFV	148	154	-6	-3.9%
RFQ	181	194	-13	-6.7%
NDFD 48hr	60.04	64.17	-4.13	-6.4%
Dynamic NDF kd	7.29	7.17	0.12	1.7%
TDN	62.84	64.95	-2.11	-3.2%
TTNDFD	47.99	50.23	-2.24	-4.5%
Lignin	6.16	5.84	-0.32	-5.2%
NEL Mcal/lb	0.638	0.647	-0.009	-1.4%
NEg	0.401	0.434	-0.033	-7.6%
NEm	0.668	0.706	-0.038	-5.4%
Total sugars (ESC)	6.760	6.210	0.550	8.9%
Milk/ton	2904	3007	-103	-3.4%
Tons/acre dry	2.90	3.41	-0.51	-15.0%
Milk/acre	8422	10254	-1832.27	-17.9%
Ash	8.91	9.81	-0.90	-9.2%
Ca	1.39	1.40	-0.01	-0.7%
P	0.28	0.31	-0.03	-10.7%
K	2.14	2.16	-0.02	-0.9%
AgroLiquid treatment: 2 gal Sure K + 1 gal fertiRain + 1 gal S-Calate + 1 pint				
Control treatment: 428 lbs potash topdress				
There was no advantage to the AgroLiquid foliar potassium treatment on this cutting. However, the 2nd cutting typically is where we observe the least effect for foliar nutrition in alfalfa.				





## AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer	Berlyn Acres dairy farm			
Location	St. Johns, MI			
Crop	Alfalfa			
Cutting	3rd. Sampled 7/27/17. Hand harvest 15'x15'			
Parameter	AgroLiquid	Control treatment	AgroLiquid Difference	% AgroLiquid Advantage
Crude Protein	22.38	22.23	0.15	0.7%
ADF	33.12	35.95	2.83	8.5%
aNDF	43.12	47.07	3.95	9.2%
RFV	136	120	16	13.3%
RFQ	180	148	32	21.6%
NDFD 48hr	67.37	60.91	6.46	10.6%
Dynamic NDF kd	4.47	5.24	-0.77	-14.7%
TDN	61.54	59.01	2.53	4.3%
TTNDFD	39.47	39.39	0.08	0.2%
Lignin	6.92	7.82	0.90	13.0%
NEL Mcal/lb	0.592	0.562	0.030	5.3%
NEg	0.379	0.337	0.042	12.5%
NEm	0.644	0.598	0.046	7.7%
Total sugars (ESC)	4.200	3.350	0.850	25.4%
Milk/ton	2667	2457	210	8.5%
Tons/acre dry	3.74	3.38	0.36	10.7%
Milk/acre	9975	8305	1669.92	20.1%
Ash	12.95	12.76	0.19	1.5%
Ca	1.14	1.22	-0.08	-7.0%
P	0.38	0.36	0.02	5.3%
K	3.07	2.98	0.09	2.9%
AgroLiquid treatment: 2 gal Sure K + 1 gal fertiRain + 1 gal S-Calate + 1 pint Boron @ 6"				
Control treatment: 428 lbs potash topdress				
<p>This 3rd cutting result shows the typical large quality and yield response we normally see on 3rd cuttings from AgroLiquid foliar nutrition. Note the large gains in net energy, the tons/acre yield, and the milk per ton - which takes into account the quality improvement. In particular, note the 10.6% gain in the NDFD 48 hour - a key test showing significantly better fiber digestibility, and the 21.6% improvement in RFQ.</p>				



### AgroLiquid Alfalfa and Forage Trials 2017

All results are on a dry matter basis

Producer AgroLiquid Research  
Location St. Johns, MI  
Crop Alfalfa.  
Treatment numbers. Each column is the season average across the replications and all 3 cuttings.

Parameter	1	2	3	4	5	6 dry	7 untreated
Crude Protein	23.31	23.18	23.10	23.15	22.54	22.13	22.94
ADF	33.44	33.95	34.01	34.05	34.89	35.58	34.36
aNDF	43.64	44.97	45.23	44.17	45.73	46.26	45.14
RFV	135.33	130.67	129.00	132.33	126.33	123.67	129.00
RFQ	149.67	142.33	145.00	146.00	139.00	138.67	146.67
NDFD 48hr	55.64	54.72	57.14	55.60	55.67	55.28	55.87
Dynamic NDF kd	6.04	6.14	5.77	6.76	6.60	6.72	6.21
TDN	57.60	56.37	56.29	56.24	55.04	55.73	57.33
TTNDFD	40.18	39.13	39.75	41.22	41.82	41.85	40.16
Lignin	7.15	7.41	7.26	7.31	7.36	7.96	8.04
NEL Mcal/lb	0.57	0.56	0.55	0.56	0.54	0.55	0.57
NEg	0.31	0.29	0.29	0.29	0.27	0.28	0.31
NEm	0.57	0.55	0.55	0.55	0.52	0.54	0.56
Total sugars (ESC)	4.93	4.41	4.38	4.65	4.18	4.12	4.57
Milk/ton	2528	2315	2335	2371	2262	2334	2465
Tons/acre dry	2.12	2.13	2.22	2.17	2.32	2.44	2.10
Milk/acre	5382	4823	5240	5107	5283	5600	5215
Ash	12.50	12.44	13.03	12.81	13.31	12.10	11.35
Ca	1.38	1.42	1.40	1.35	1.28	1.25	1.43
P	0.31	0.29	0.29	0.30	0.29	0.30	0.29
K	2.08	1.89	2.02	2.24	2.43	2.53	2.04
Dan's Ranking:	2	7	4	6	3	1	5
Treatment information is included on a separate sheet.							

The results from these multiple trials at the NCRS were not typical of the results we normally have observed from AgroLiquid foliar nutrients. The reason may center on the fact that it was an old and thinner stand (5 years) with quite a lot of dandelions, low soil fertility, and an abnormally dry summer.

# AgroLiquid

## NCRS Experiment Plot Plan

**Location:** Farm 5 14 Irrigated Alfalfa

**Experiment:** Fertilization of alfalfa in a low P and K soil test soil

**Plot size/ reps:** 15' x 30' / 3

**Hybrid/Variety:** \_\_\_\_\_

#	Treatment	Rate/A	placement
1	Pro-Germinator + Sure-K + M500 + B	2 gal + 3 gal + 1 qt + 1 pt	foliar 7d after 1st, 2nd 3rd harvest
2	Pro-Germinator + Sure-K + M500 + B + ferti-Rain + S-Calate	2 gal + 3 gal + 1 qt + 1 pt + 1 gal + 1 gal	foliar 7d after 1st, 2nd 3rd harvest
3	Pro-Germinator + Sure-K + M500 + B + ferti-Rain + S-Calate	1 gal + 1.5 gal + 1 pt + 8 oz + 2 qts + 2 qts	foliar 7d and 17d after 1st, 2nd 3rd harvest
4	MAP + 0-0-62 + zinc sulfate + 14% Boron Sure-K + Micro 500 + B	150 lb + 200 lb + 15 lb + 20 lb 2 + 1 pt + 1 pt	b'cast after 1st harvest
5	MAP + 0-0-62 + zinc sulfate + 14% Boron Pro-Germinator + Sure-K + M500 + B + ferti-Rain + S-Calate	150 lb + 200 lb + 15 lb + 20 lb 2 gal + 3 gal + 1 qt + 1 pt + 1 gal + 1 gal	b'cast after 1st harvest foliar 7d after ?
6	MAP + 0-0-62 + zinc sulfate + 14% Boron	150 lb + 200 lb + 15 lb + 20 lb	b'cast after 1st harvest 1st harvest only
7	Unfertilized check		

Treatment explanation:

- 1 Base rate without enhancements
- 2 Base rate
- 3 Split application of trt 2
- 4 Dry + base rate
- 5 Dry only
- 6 No fertilizer



## Forage quality trials glossary of terms

Term	What it means
CP, Crude Protein	Measures the raw protein. The higher the better.
ADF	Acid detergent fiber. An estimate of the undigestible fiber. Lower is better.
aNDF	Neutral detergent fiber. An estimate of digestible fiber, lower is better.
RFV	Relative Feed Value. Obsolete test based off of NDF. The higher the better.
RFQ	Relative Forage Quality. Replaces RFV and is a better estimate of feed value.
NDFD	Neutral detergent fiber digestibility. Usually reported as 30hr or 48hr. The most important number of the report. Measures how much of the fiber is actually digestible.
Dynamic NDF kd	Estimates how fast the forage will be digested. The faster the better.
TDN	Total Digestible Nutrients. A poor estimate of total energy. Nutritionists don't use this.
TTNDFD	A new version of NDFD with even better accuracy. The higher the better.
Lignin	The fiber fraction that cannot be digested no matter how long in the rumen. Lower is better.
NEL, NEg, NEm	Important numbers measuring Net Energy available for lactation, gain, and maintenance.
Total sugars	Reported as either ESC or WSC. I like WSC, Water Soluble Carbohydrates. Higher is better.
Milk per ton	Uses the "Milk 2006" formula developed by Wisconsin. Estimates the milk production of the forage per acre. The higher the better, and it translates into rate of gain for beef.
Milk per acre	Yield in tons/acre X milk per ton = Milk per acre.
Ash	The mineral fraction of the forage + the dirt picked up by harvesting equipment.