

# ACS Farmer-Driven Research Agro-Culture Liquid Fertilizer in Alfalfa Trial Results

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**Final Report**  
*January 13, 2014*



## Summary

Crop production advances require tools that can help plants optimize access to nutritional resources during development. Greater resources access enables plants to reach genetic potential in multiple environmental conditions. In 2013, farm managers in New York were introduced to a plant nutritional supplement that claimed to improve crop performance by providing liquid Nitrogen, Phosphorus, Potassium, and micro nutrient packages after each cutting of alfalfa during the growing season. Agro-Culture Liquid Fertilizers is a foliar-applied liquid fertility program that is distributed in New York by Finger Lakes Agronomics. The product has showed promise at their Michigan research facility trials and has a following as a fertilizer treatment for crop in central New York. Independent crop consultants from Agricultural Consulting Services (ACS) organized with Fessenden Dairy to collaboratively design and implement a fully replicated trial that would quantify the impact of Agro-Culture Liquid Fertilizer (AgroLiquids) use on the 2013 alfalfa forage crop. The results of the 2013 Agro-Culture test plots in alfalfa did not identify a yield or quality response to the foliar applied treatment when it was applied between cuttings. The alfalfa plots treated with Agro-Culture alone averaged 3.7 Dry Tons, while the Agro-Culture plus Potash treatment averaged 3.6 Dry Tons. Plots treated with Potash alone averaged 3.7 Dry Tons for second through fourth cuttings cumulative yields.



*Figure 1: Logo for Ago-Culture Liquid Fertilizers*

## Introduction

Crop production advances require tools that can help plants optimize their access to resources under variable growing conditions. Greater access to resources under variable scenarios enables plants to reach genetic potential in multiple environmental conditions. Crop production teams are introduced to new products and management techniques every year. Impartial research is hard to find, and managers are faced with making a decision to invest in the product based on company trial reports, trial and error, or simple check-strip comparison trials. Recent adoption of precision monitoring equipment in agriculture has reduced the cost of implementing statistically sound, replicated research at a field scale. Fessenden Dairy decided to conduct research trials after being introduced to Agro-Culture Liquid Fertilizers, with applications of material being done by Jim Saik of Finger Lakes Agronomics and ACS collecting the data. AgroLiquids are applied to the growing alfalfa plant seven days after cutting, starting after first cutting and continuing after second and third cuttings. AgroLiquids are marketed as a foliar-applied fertilizer consisting of N, P, K, and micronutrients. The names of materials and fertilizer analysis of the AgroLiquids used in this trial were: 4 Gallons Sure K 2-1-6, 1 Gallon Pro-Germ 9-24-3, 2 Quarts eNhanse 8.70% Sulfur + .07% Manganese and .07% Zinc, 1 Quart Micro 500, and 8 oz. of 1% Molybdenum. This report compiles the results of Agro-Culture Liquid Fertilizers product research trials implemented in an alfalfa fields at Fessenden Dairy during the 2013 growing season.

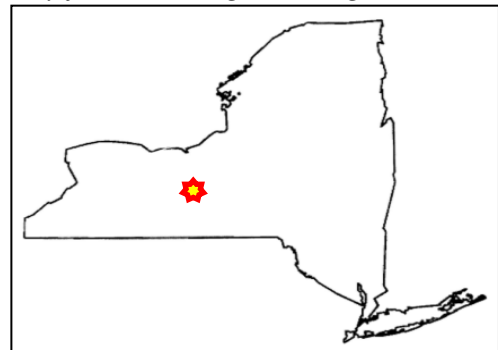


*Figure 2: Alfalfa hand sampling tools and samples ready for recording wet weight*

## Materials and Methods

### Research plot location

 ACS Farmer-Driven Research Program



The 2013 Agro-Culture alfalfa trials were led by Fessenden Dairy, located in King Ferry, New York. The plots were planted in Southern Cayuga County.

### **Treatments on Alfalfa**

For investigating the use of AgroLiquids on alfalfa, the research program was designed to identify a response to the Agro-Culture product on alfalfa yields and alfalfa forage quality. The Agro-Culture tank mix to be applied was recommended by Dr. Jerry Wilhm of Agro-Culture and applied by Jim Saik from Finger Lakes Agronomics. The control treatment of Muriate of Potash was recommended by Tim Fessenden as a standard cultural practice and applied by Helena Chemical Company in Genoa, NY. The third treatment is a combined application of AgroLiquids and Potash.

The 2013 trials on alfalfa forage investigated 3 treatments:

- (1) Control treatment with 300 lbs Muriate of Potash broadcast applied after first cutting only,
- (2) A foliar application of AgroLiquids on 4- 6" tall alfalfa approximately 7 days after each cutting, starting after first cutting,
- (3) A foliar application of AgoLiquids 7 days after each cutting starting after first cutting and a onetime broadcast application of 300 lbs Muriate of Potash following first cutting.

ACS staff was onsite for every application of material during the project to ensure fertilizers were applied as planned.

There are 4 replications of each treatment for a total of 12 test plots in the research trial. Following first cutting, Muriate of Potash treatments 1 and 3 were applied before any significant re growth of alfalfa had occurred. Liquid treatments 2 and 3 were applied at 6 inches of regrowth following first, second and third cuttings. The field is a 20-acre third year alfalfa/grass with greater than 90% alfalfa composition in the stand.

At harvest, hand sampling was completed within each plot at three random locations and initial weights were recorded. Samples were dried and remeasured coming out of the oven as the dry weight. A combined grab sample was pulled from each plot and sent to Dairy One in Ithaca, N.Y. for forage analysis.

- (1) **Control:** One treatment with 300 lbs of Muriate of Potash.
- (2) **Foliar Application** Treatment with Agro-Culture fertilizer at rates referenced above.
- (3) **Combined:** Treatment with 300 lbs Muriate of Potash and Agro-Culture fertilizer at the rates referenced above.



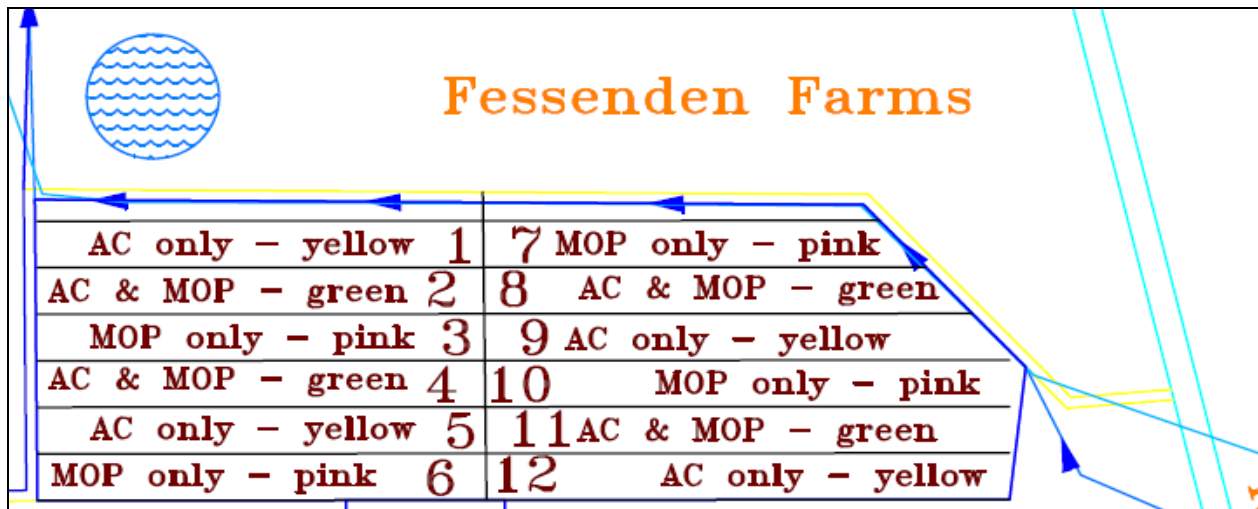


Figure 3: Field test plot layout for 2013

MOP only	= Muriate of Potash applied at 300 pounds per acre after 1st cutting.
AC only	= Agro-Culture after 1st, 2nd and 3rd cuttings.
AC & MOP	= Agro- Culture after 1st, 2nd and 3rd cutting plus 300 pounds of Muriate of Potash after 1 <sup>st</sup> cutting.

### Field characteristics for alfalfa plots

Fessenden alfalfa plots predominately cover moderately well-drained Lima soil types (LtA & LtB) with somewhat poorly drained Kendaia (KiA) soils to the Northwest of the field.

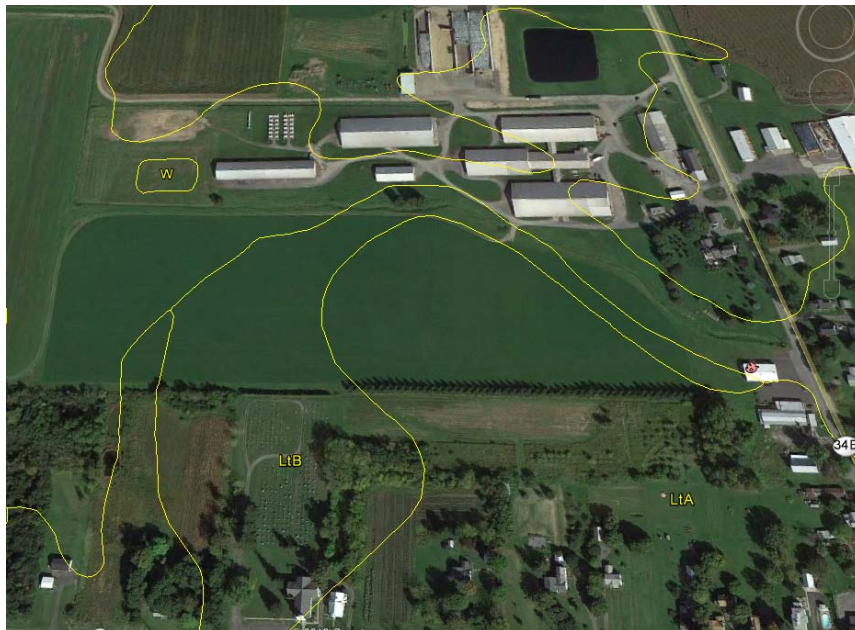


Figure 4: Aerial map of Fessenden Dairy test plot field soil types.

## Weather Conditions and Implications

The 2013 season was characterized by extremely high rainfall throughout the season (Figure 5). The above-average rainfall caused flooding of corn fields and delays in the timely cutting of alfalfa fields.

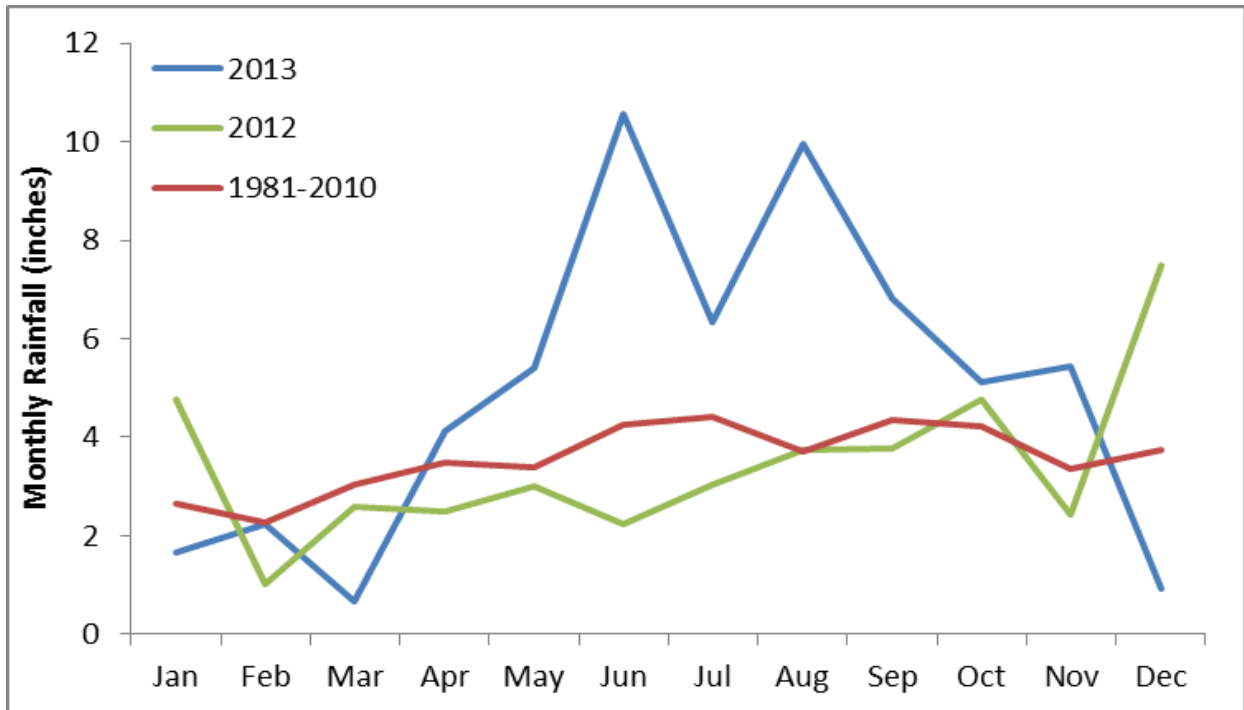


Figure 5: Rainfall for the 2013 season was characterized by frequent, high-intensity rain events that accumulated more than average rainfall amounts.

## Plot Measurements

Plots were hand-harvested as close as possible to the planned cutting date. ACS was responsible for the hand harvest of test plots, recording plot wet and dry weights, and submitting forage analysis to Dairy One.

Forage quality was measured based on 1-gallon grab samples of silage taken from the 12 plots after their dry weights were recorded. Each forage sample was analyzed by Dairy One for a basic forage sample that included percent moisture, crude protein (CP), acid detergent fiber, neutral detergent fiber (NDF), phosphorus (P), Potassium (K), IVTD<sub>24hrs</sub>, and NDF digestibility. These parameters were used to indicate forage quality.

All plots were measured for each parameter and analyzed for statistical differences by Cornell University Statistical Consulting Unit. A mixed model was used for analysis with ‘field’ and ‘treatment’ as fixed effects and ‘block-within-field’ as a random effect.

### **On-Farm Field Day**

A field day was conducted in September to demonstrate to farms how the research was being conducted and to raise awareness about the research and the project. The Agro-Culture product was discussed and the field day provided an opportunity to share experiences and information among farm management teams on all aspects of on-farm research in general.

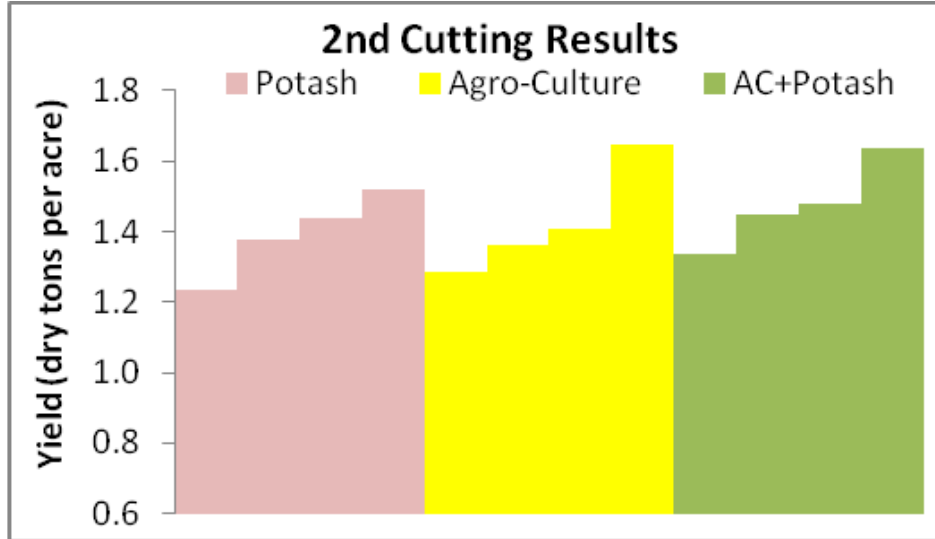


*Figure 6: On-Farm field day at Fessenden Dairy.*

## Results & Discussion

### Yield analysis 2013

Yield was measured across 12 plots. There was no significant difference in yield or forage quality between forage with any of the treatments.



	Average	StDev
Potash	1.4	0.12
Agro-Culture	1.42	0.16
AC + Potash	1.47	0.05

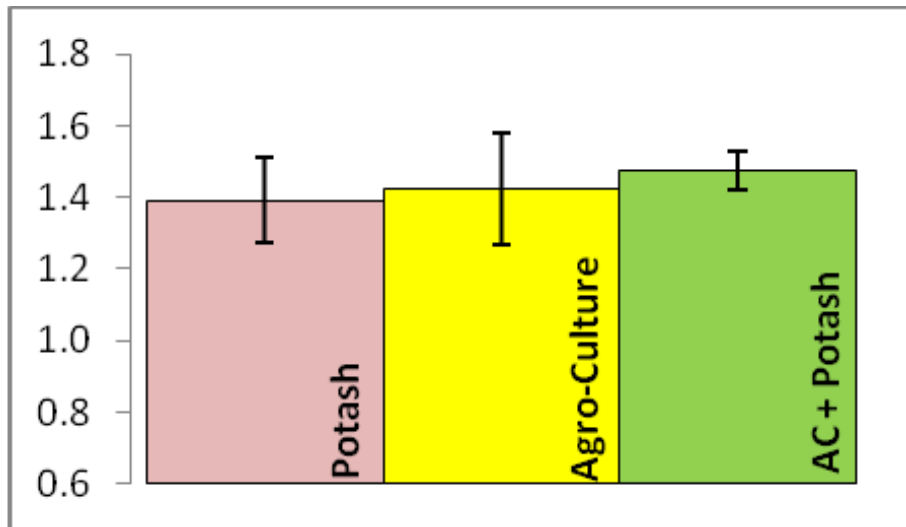
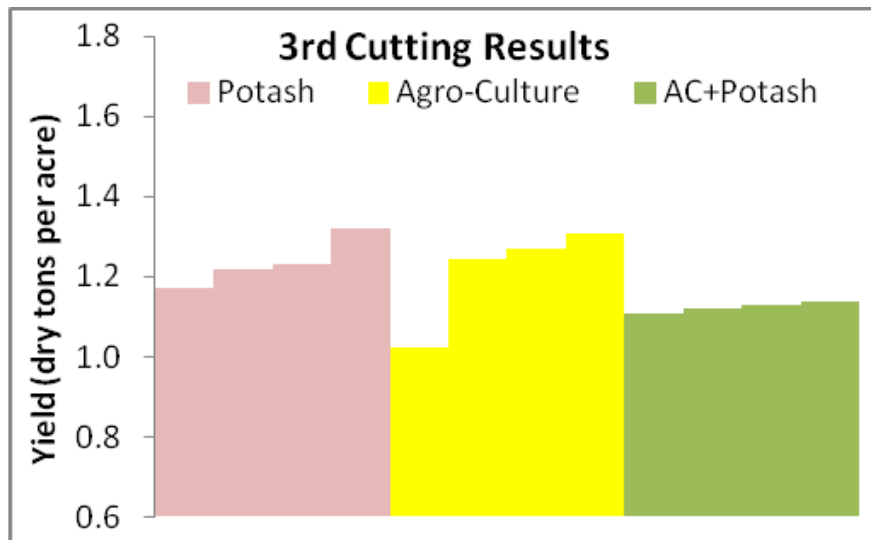


Figure 7: Second cutting yield analysis





	Average	StDev
Potash	1.2	0.060
Agro-Culture	1.2	0.128
Potash+AC	1.1	0.013

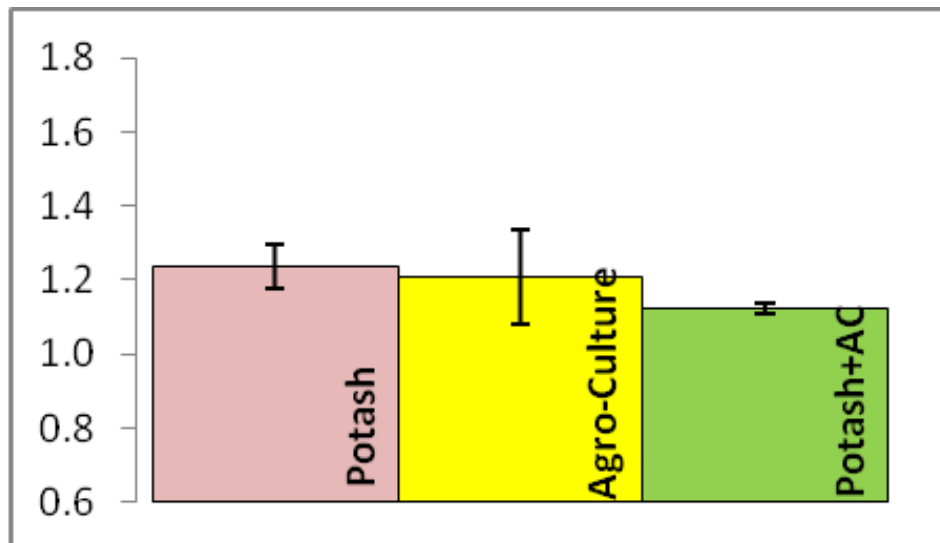
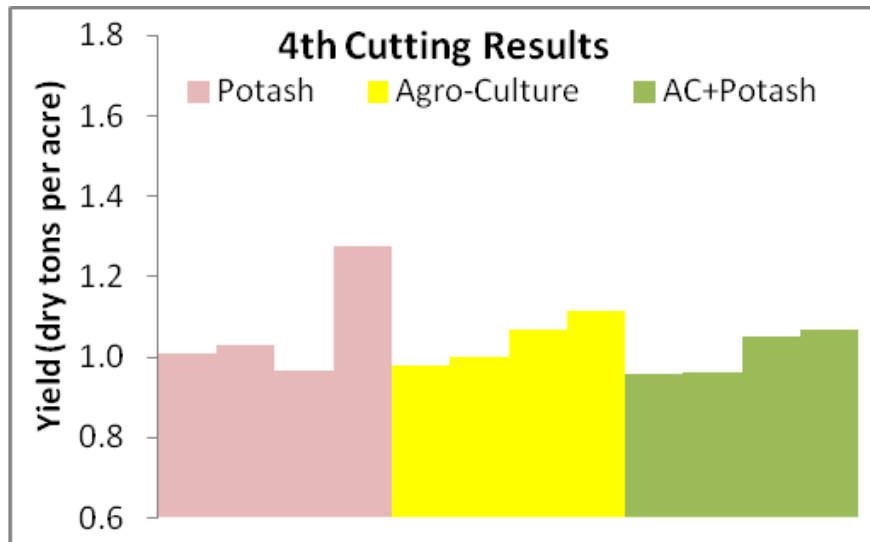


Figure 8: Third cutting yield analysis



	Average	StDev
Potash	1.1	0.139
Agro-Culture	1.0	0.061
Potash+AC	1.0	0.057

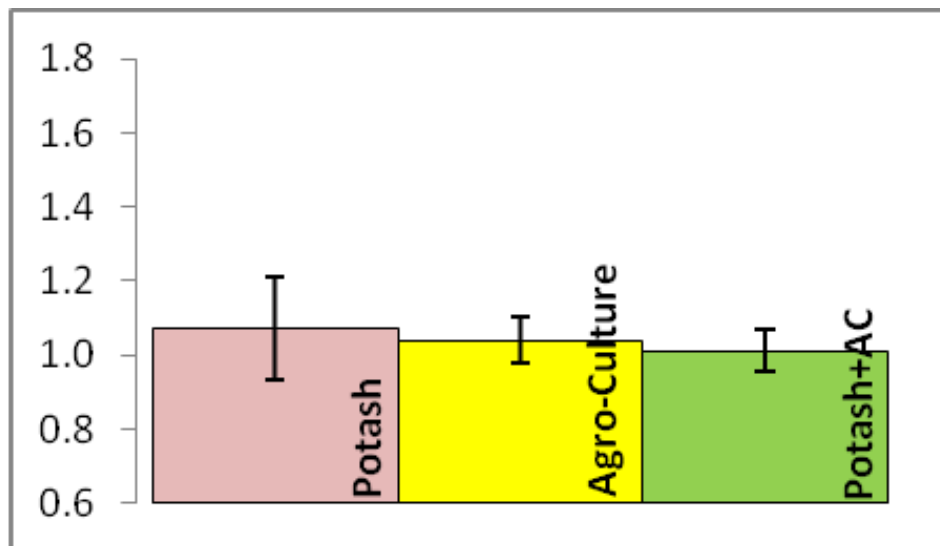


Figure 9: Fourth cutting yield analysis

A cumulative average of all plots for each of the cuttings:

	Rep 1	Rep 2	Rep 3	Rep 4	Farm Average
	Total Dry Yield for Cuttings 2-4 (tons/acre)				
Potash	4.0	3.7	3.7	3.4	3.7
Agro-Culture	3.5	4.0	3.5	3.7	3.7
AC+Potash	3.7	3.4	3.5	3.8	3.6

Figure 10: Yield averages for the year on the test plots

### Forage Quality – 2013 Analysis

Each forage sample was analyzed by Dairy One for 7 qualities, including percent moisture, crude protein (CP), acid detergent fiber, neutral detergent fiber (NDF), phosphorus (P), Potassium (K), IVTD<sub>24hrs</sub>, and NDFD digestibility. None of the quality parameters showed a statistically significant change based on treatment in trials conducted in 2013.

SITE/Plot	Treatment	Cut	Crude Protein	Acid Detergent Fiber	Neutral Detergent Fiber	Phosphorus %	Potassium	In-Vitro True Digestibility	NDF Digestibility	Dry Yield (ton/acre)
AGRO FES 1	Agro-Culture	2	21.3	36.1	43.3	0.35	2.95	72	35	1.3
AGRO FES 2	AC+Potash	2	21.8	33.5	39.9	0.34	2.76	75	36	1.5
AGRO FES 3	Potash	2	19.9	39.3	45.3	0.27	2.64	70	34	1.4

AGRO FES 4	AC+Potash	2	20.4	39	43.7	0.3	2.93	72	35	1.3
AGRO FES 5	Agro-Culture	2	24.2	35.6	46.3	0.41	4.38	75	45	1.6
AGRO FES 6	Potash	2	22.1	34.2	40.1	0.38	2.92	75	37	1.5
AGRO FES 7	Potash	2	24.2	33.9	39.8	0.32	3.21	75	38	1.4
AGRO FES 8	AC+Potash	2	21.6	38	44.3	0.34	2.89	73	39	1.4
AGRO FES 9	Agro-Culture	2	24.8	36.8	40.7	0.34	3.18	76	40	1.4
AGRO FES 10	Potash	2	22.7	38.7	41.2	0.3	2.78	72	33	1.2
AGRO FES 11	AC+Potash	2	20.6	39.8	46.1	0.31	3.2	71	38	1.6
AGRO FES 12	Agro-Culture	2	20	41.2	47.9	0.37	3.21	68	33	1.4
AGRO FES 1	Agro-Culture	3	23	34.2	39.5	0.28	3.13	77	40	1.2
AGRO FES 2	AC+Potash	3	24.5	28.8	35	0.39	3.31	79	39	1.1
AGRO FES 3	Potash	3	23.6	29.4	36.4	0.45	3.63	80	44	1.3
AGRO FES 4	AC+Potash	3	20.8	34.2	40.7	0.32	3.23	74	35	1.1
AGRO FES 5	Agro-Culture	3	22.3	29.4	34.3	0.41	3.66	79	38	1.3
AGRO FES 6	Potash	3	23.8	29.8	34.3	0.4	3.79	79	38	1.2
AGRO FES 7	Potash	3	24.3	29.1	34	0.38	3.42	78	35	1.2
AGRO FES 8	AC+Potash	3	28.9	24.3	28.7	0.39	3.23	84	44	1.1

AGRO FES 9	Agro-Culture	3	27.5	23.3	27.4	0.4	3.75	84	43	1.0
AGRO FES 10	Potash	3	25.6	27.4	32.7	0.42	3.74	79	37	1.2
AGRO FES 11	AC+Potash	3	26.7	26.3	30.9	0.38	3.75	82	42	1.1
AGRO FES 12	Agro-Culture	3	22.7	29.3	34.6	0.38	3.52	78	36	1.3
AGRO FES 1	Agro-Culture	4	20.3	36.1	42.6	0.26	2.37	71	33	1.0
AGRO FES 2	AC+Potash	4	22	34.6	39.5	0.26	2.74	74	33	1.1
AGRO FES 3	Potash	4	20.7	34.9	40.6	0.29	2.53	74	35	1.3
AGRO FES 4	AC+Potash	4	20.9	34.4	40.9	0.27	2.55	74	35	1.0
AGRO FES 5	Agro-Culture	4	21.4	34.1	40.9	0.27	2.56	75	39	1.1
AGRO FES 6	Potash	4	20.1	35.5	44.1	0.28	2.62	72	36	1.0
AGRO FES 7	Potash	4	21	35.7	43.2	0.27	2.16	74	39	1.0
AGRO FES 8	AC+Potash	4	22.3	34.6	41.3	0.27	2.28	73	34	1.0
AGRO FES 9	Agro-Culture	4	21.5	34.3	40.1	0.28	2.36	73	33	1.1
AGRO FES 10	Potash	4	21.1	36.2	42.3	0.26	2.2	73	37	1.0
AGRO FES 11	AC+Potash	4	22.5	32.3	38.3	0.22	2.75	76	37	1.1
AGRO FES 12	Agro-Culture	4	20	34.5	42.5	0.29	2.66	73	37	1.0



## Preliminary Conclusions

- The 2013 Agro-Culture Liquid Fertilizer Farmer Driven Research results in alfalfa in Central New York did not show statistically significant treatment differences.
- Agronomic research standards are 3 years of research in yield trials. At least 2 more years of research are needed in alfalfa to draw final conclusion about the impact of AgroLiquids as a foliar treatment for alfalfa fields in New York.
- Treatment of alfalfa fields with both AgroLiquids and Muriate of Potash (Treatment 3) resulted in an unexplainable, however not significant yield drag in two of three harvests.
- The cost of Agro-Culture Liquid Fertilizer was \$49.56 per acre plus \$10.00 per acre for the application cost (Treatment 2). Total cost for 3 applications of Agro Liquids was \$178.68 per acre.
- The cost of the 300 lbs. of Muriate of Potash was \$76.50 per acre plus \$8.50 per acre for the application cost (Treatment 1). Total cost for the one application was \$85 per acre.

## Future Work

Additional work in alfalfa would follow the same protocol as used in 2013.

Summary of requirements a farm would need to participate in the 2014 Farmer Driven Research plots:

- An eagerness to participate in farmer-driven research to explore improved crop yields and forage quality.
- A commitment to getting the best data possible from the research trials put on the farm.
- A commitment to communicating with ACS research managers, farm personnel, product representatives, and ag retailers to gather good results from the research.
- Access to a spray rig for application of AgroLiquids.