

# Comparing Alfalfa and Red Clover as Economical Dairy Cow Forage

## Final Report for FNC04-505

Project Type: Farmer/Rancher

Funds awarded in 2004: \$2,197.00

Projected End Date: 12/31/2005

Matching Non-Federal Funds: \$2,850.00

Region: North Central

State: Michigan

Project Coordinator:

[Mike Iho](#)

## Project Information

### Summary:

#### PROJECT BACKGROUND

M-T Acres Farm is operated by Mike and Treasa Iho in Trenary, Michigan. We milk 45-55 Jersey cattle on 440 acres of owned land and 110 acres of rented land. The herd is on a seasonal calving/rotational grazing program. Crops produced include pasture, grass/legume hay, barley, and oats, and a combination of no-till and conventional tillage systems are used. Our small, on-farm cheese-making plant is in its third year of operation, producing "juustoa", a Finnish fresh cheese product twice a week. Mike and Treasa are full-time farmers and have two children, Alan and Carrie, neither of which are working on the farm.

Prior to acquiring our Jersey herd, we ran a cow/calf and sheep operation consisting of approximately 80 beef cows and 300 ewes. We used a rotational grazing program to best utilize our pasture resources. In addition, we developed a careful crop rotation to maximize production of other feed crops, including barley, corn, and oats. We also developed a conservation plan with assistance from local NRCS staff. These practices were in place for 18 years before receiving our first (2002) SARE producer grant to explore and demonstrate pasture renovation techniques (FNC02-401, Pasture Improvement Trial). An extension was provided in 2003 to continue collecting information from this set of large plots.

#### PROJECT DESCRIPTION

Problem: Even though we lime our soils according to university recommendations, the soil pH does not reach the desired level. Alfalfa has established well, but doesn't produce well for very long. Clover grows better in lower pH soils, but doesn't have the yield potential or longevity of alfalfa. We don't know if the main issue is soil pH, soil nutrient levels, or other soil quality issues. We need to determine if clover is a more practical crop than alfalfa for our soil conditions.

A recent article in "Hoard's Dairyman" magazine (March 10, 2004) states that clover silage preserves 65-80% of its protein as "true protein," while much of the protein in ensiled alfalfa breaks down into non-protein nitrogen. The article also states that

clover contains a large amount of polyphenoloxidase (PPO), which helps preserve the true protein. Alfalfa contains very little PPO. This nutritional difference may also make clover a more attractive choice.

Project goals were to:

- Compare the economics and performance of growing red clover versus alfalfa as the legume component of hay grown for stored feed.
- Use results to understand what factors are limiting the success of alfalfa seeding on our farm and other farms in the area.
- Use results to help us decide whether red clover makes an acceptable alternative to alfalfa.

Project Activities: We set up the project on an 11-acre section of field. The field received 2 tons of lime per acre and was worked up in October 2003 and was seeded on May 31, 2004. Half of the acreage was seeded with alfalfa/timothy and the other half with clover/timothy.

The entire project site was seeded conventionally and no herbicide was used.

Seeding: 80 lbs Ogle oats were included as a nurse crop, 8-10 lbs of certified 'Duration' red clover and 2 lbs 'Permesse' timothy were seeded on the clover side, 18 lbs uncertified 'Vernal' alfalfa and 2 lbs 'Permesse' timothy were seeded on the alfalfa side. The project consisted of approximately 5 acres of clover/timothy. The entire seeding received 7 tons dairy manure and 200 lbs 19-19-19 fertilizer per acre before seeding. The area was topdressed on October 23, 2004 with 200 lbs 0-0-60 fertilizer.

A sampling grid consisting of 4 sampling sites per acre was established using GPS technology. Composite soil samples consisting of 4 cores, 7 inches deep were taken in a radius of 2 feet around each of the 40 grid points (20 sampling points in the alfalfa plot, 20 sampling points in the clover plot) on October 21, 2004 and again on October 28, 2005 to establish differences in pH and nutrient levels between sites and over 12 months of time.

Yield samples consisting of 18 inch x 18 inch clipped areas were collected from each of the forty grid points before each of the two harvest events during 2005.

Composite forage samples from the 5-acre clover plot and 5-acre alfalfa plot were submitted for feed quality analysis after each harvest event.

Results of the soil testing grid were compared with yield samples to identify relationships between yield, soil test pH and nutrient levels.

Yield and forage quality results were used for a simple economic comparison of clover and alfalfa-based production systems.

People: Jim Isleib, Alger County Extension Director, Michigan State University Extension. Jim helped develop the project concept, assisted with completing grant application, collecting soil samples, reporting, evaluating results, and planning and promoting the field day.

Dr. Doo-Hong Min, Upper Peninsula Forage Crops Specialist, Michigan State University Extension. Dr. Min assisted with project design, collecting soil samples, evaluating data, and as a resource person at the field day.

Dr. Ben Bartlett, Upper Peninsula Dairy and Livestock Area of Expertise Agent, Michigan State University Extension. Dr. Bartlett served as a resource person during the field day.

Christian Kapp, Research Technician, MSU Upper Peninsula Agricultural Experiment Station, Chathan, MI. Mr. Kapp assisted with sample drying and weighing.

Mitch Hall, hired summer worker. Mitch collected and processed yield and forage quality samples.

## RESULTS & DISCUSSION

A) Soil testing results vs. yield sampling results. High and low-yielding sample points were scattered throughout both the alfalfa and clover areas. There is variability in soil fertility between sampling points.

The five highest yielding and five lowest yielding 2005 sampling points from the alfalfa/timothy and clover/timothy areas were identified and average yields calculated.

The alfalfa/timothy tables show that pH, lime index, magnesium and calcium levels were higher in high-yield averaged sampling points than in the low yield. Potassium, phosphorus and CEC levels were not. [Editor's note: For copies of the tables referenced in this report, please contact NCR-SARE at: ncrsare@umn.edu or 612-626-3132.

The clover/timothy tables show that pH appeared adequate for both low and high-yielding sampling points, with high-yielding points actually showing lower pH and lime index. There do not appear to be any real differences in magnesium and calcium levels between low and high-yielding sampling points. Higher phosphorus, CEC, and possible potassium levels may relate to higher yields.

In general, it appears that pH may have limited the alfalfa/timothy performance, but not impacted clover/timothy. This is as I would expect. In our area, lime delivery and application is very expensive, about \$25 per ton. If the superior clover/timothy performance compared to alfalfa/timothy is closely associated with soil pH, then the cost of liming for alfalfa is likely to exceed the expected value in improved yield. This must all be balanced against the need for more frequent re-seeding of clover versus the expected longer stand life of alfalfa. A very inexpensive, non-certified 'Vernal' alfalfa seed was used for this project because that is my normal practice. An improved and more expensive alfalfa seed variety may result in better yield and persistence, which would impact comparison with an improved clover seed variety, such as 'Duration'.

B) Economic comparison of alfalfa/timothy vs. clover/timothy

Using the averaged grid sampling yield information, the alfalfa/timothy area yielded 2.4 tons dry matter per acre compared to the clover/timothy yield of 3.3 tons dry matter per acre.

The difference in forage quality between the two types of hay was not great. The first cutting of alfalfa/timothy had 10.9% crude protein and NDF of 56.1 compared to the first cutting of clover/timothy at 12.1 % crude protein and NDF of 57.3. The second cutting of alfalfa/timothy had 15.5% CP and 45.5 NDF, with second cutting of clover/timothy at 15.9% CP and 48.5 NDF. There is little difference in crude protein, NDF or other quality parameters. Protein solubility was higher in the first cutting of alfalfa/timothy compared to the first cutting of clover/timothy.

The principle difference in performance between the two seedings was yield. All seeding expenses were equal except seed cost;

Non-certified 'Vernal' alfalfa @ \$1.38/lb X 18lbs/acre = \$24.84/acre

'Duration' red clover @ \$2.18/lb X 9 lbs/acre = \$19.62/acre

It cost \$5.22 more per acre to seed the 'Vernal' alfalfa.

Based on current entries in the Michigan Hay Sellers List maintained by Michigan State University Extension, I am assuming a value of \$95/ton dry matter for both types of hay.

Alfalfa/timothy: 2.4 tons DM/a X \$95 = \$228.00 hay value per acre

Clover/timothy: 3.3 tons DM/a X \$95 = \$313.50 hay value per acre

Clover/timothy produced \$85.50 more hay value

In conclusion, the seed cost difference of \$5.22 added to the difference in hay value of \$85.50 shows that the clover/timothy seeding resulted in increased economic value of \$90.72 per acre for 2005, the second year following seeding. It must be kept in mind that the clover is likely to disappear before the alfalfa, resulting in the need for more frequent clover reseeding, and that better performing and more expensive alfalfa varieties may outperform 'Vernal'. These factors would probably change the very positive economic benefit seen under our conditions and inputs this year. Also, the yields estimated based on actual harvest of ensiled, large round bales are somewhat lower than those calculated from yield sample averages, resulting in a lower but still positive economic benefit from the clover/timothy seed mix. Yield from these two area will be monitored in 2006 and the legume stand evaluated to see how this comparison may change over time.

#### OUTREACH

The project was shared with others through a field day held on September 21, 2005 that was promoted by mailings from the local MSU Extension office and notices in the regional MSU Extension U.P. Ag Connections newsletter (reaching about 1,200 farm and industry people). The field day was attended by a total of 12 people. The project will also be summarized for one of the monthly winter issues of the U.P. Ag Connections.

#### PROGRAM EVALUATION

We appreciate the support we have received from the NCR SARE Producer Grant Program. This on-farm project, along with the SARE project we had in 2002-2003, have helped the local farming community learn more about establishing and renovating pasture and hay ground suitable for our area. It has also provided an opportunity for much discussion and learning among local farmers, extension and other support people.

## Research

### Participation Summary

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE.



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