Not as Easy as Rye:
Alternative Strategies to Increase Cover Cropping in Vermont

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INTRODUCTION

As dairymen across Vermont expand herd size, more corn silage is being grown to meet forage needs. Although the integration of corn silage into cropping systems has increased productivity and efficiency, lack of rotation out of corn has led to a number of potentially detrimental economic and environmental consequences, ranging from increased use of pesticides, increased cost of production, decreased yields, rapid erosion of topsoil, and reduced soil health all of these factors contributing to lowered water quality. Integrating winter cover crops into the corn silage production scheme would reduce movement of P to surface waters by minimizing soil erosion and ultimately improve water quality. Unfortunately "it is not as easy as rye", as farmer acceptance of this practice in Vermont has been marginal.

The main objective of this demonstration/research project was to develop and validate new winter rye cover crop strategies to increase farmer acceptance and implementation of this practice. In conjunction with The Farmer's Watershed Alliance the following cover cropping strategies were evaluated:

1) Determine cover crop planting dates that produce sufficient ground cover (>30%)
2) Determine how much corn yield is lost by planting an earlier maturing corn
3) Determine cover crop establishment success when incorporated with various tools
4) Determine cost and benefits from cover cropping .

MATERIALS & METHODS

The cover crop strategies were implemented in the fall of 2007 in Vermont.

1). The "cover crop planting date" trial was established as replicated strips at one site to compare winter rye establishment and growth at 5 different seeding dates. The percent ground cover was measured in the spring after snow melt.

2). The "corn maturity date" trial was established as replicated strips at one site comparing corn yields and quality. Six maturities (92- 105 RM) of corn were established in the spring and harvested for silage at 65% moisture.

3). The "cover crop establishment" demonstration trial was established at one field site. Winter rye was broadcast seeded and incorporated using 7 methods. The percent ground cover, biomass, and nitrogen uptake were measured in the spring .

4) In addition, farm collaborators collected cost and benefit information at each of the projects. This included fuel use, fertilizer requirements, and corn yields.

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RESULTS

Of the five planting dates tested the mid-September to mid-October planting dates resulted in the greatest amount of soil coverage. In July, cover crop seed was interseeded into the corn fields and still provided effective cover in the corn fields. Overall, the late October seeding did not provide adequate soil coverage. Some of the cover crop stand did not survive the winter. Most corn silage is harvested by mid-October allowing sufficient time for cover crop establishment before winter.

Fig. 1. Impact of cover crop planting date on percent soil coverage (n=3).

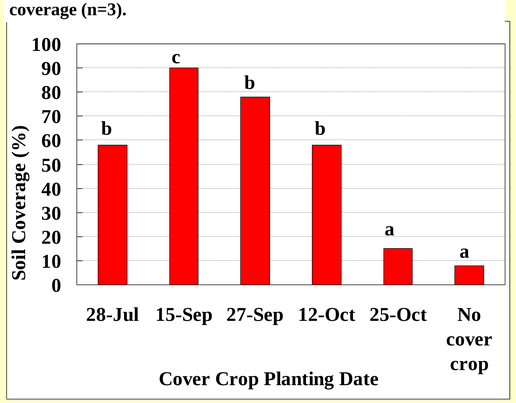
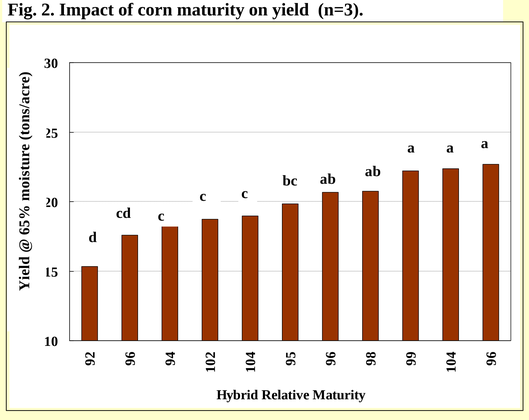


Fig. 2. Impact of corn maturity on yield (n=3).



There was no relationship between corn relative maturity and yield. The top yielding varieties were more dependent on genetics than maturity. The shorter day hybrids (92-98 RM) were harvested 1-3 weeks earlier than the late day hybrids (104-108 RM). This lead to a difference in cover crop planting date from late September to late October. Planting short day corn would enable a farm to establish an effective cover crop in the fall.

Most of the cover crop seeding methods resulted in soil coverage greater than 90%. The least effective methods was moldboard plow followed by broadcast seeding. However, this methods still resulted in soil coverage over 50%. The amount of biomass produced by the cover crop and the nitrogen retained was significantly impacted by the seeding methods. Shallow incorporation was the most effective methods for obtaining high levels of dry matter accumulation. The more dry matter the more nitrogen per acre retained.

Table 1. Impact of cover crop seed incorporation method on nitrogen retention and soil coverage (n=3).

Treatment	Dry matter tons/acre	Nitrogen lbs/acre	Soil Cover %
Plow & Seed	0.66b	43b	54b
Groom & Seed	0.90c	59c	94c
Groom & Seed & Aerway	1.10c	71c	95c
Seed & Aerway	1.44d	96d	98c
Groom & Aerway & Seed	2.50e	200e	95c
Aerway & Seed	2.50e	200e	97c
Chisel & Seed	2.50e	200e	97c
No Cover Crop	0.00a	0a	3a

COST & BENEFITS

Every farm is unique and the practices and results were variable.

COSTS:

The average cost of cover crop seeding was $50.00 per acre. This includes a seed cost of $34.00 per acre, $5.00 per acre for seeding, and incorporation cost of $11.00 per acre. We documented that cover cropping could cost as little as $37.00 and as much as $100 per acre depending on practices.

Additional costs for spring incorporation averaged $11.00 per acre. Several farms documented increased costs due to additional tillage needed to incorporate the cover crop in the spring.

BENEFITS:

The cover crops retained 30 to 200 lbs of nitrogen per acre. This has an approximate value of $18.00 - $120.00 per acre.

The cover crops reduced fuel usage. The cover crops improved soil tilth and resulted in less fuel use when tilling in cover crops in the spring. Farmers predicted that this could be a $4.00 per acre fuel savings.

The cover crops increased corn silage on average by 2 tons per acre. At the current price of corn silage that has a value of $100 per acre.

It is difficult to put a price on environmental benefits such as reduced erosion and improved soil quality. However, these benefits are sometimes indirectly related to crop yields.

Cost of Cover Cropping: $37.00 - $100 per acre

Seed: $34.00 - $70.00 (includes legumes) per acre
Seeding costs: $3.00 - $10.00 per acre
Seed incorporation costs: $10.00 - $15.00 per acre
Additional incorporation costs in spring: $10.00 - $20.00 per acre

Benefit of Cover Cropping: $0 - $234 per acre

Yields: 2 tons of feed per acre = $0.00 to $100
Fuel Savings = $0.00 to $4.00 per acre
Nitrogen Fertilizer Savings = $0.00 to $120

It is definitely possible for cover crops to be of major economic benefit to the farmer. However, it is obvious from this project that proper cover cropping practices must be implemented to reap these benefits to the maximum potential.

Many farmers are excited about the potential nitrogen retention value that cover crops might offer to the next crop. This area needs to be further studied to help farmers better predict nitrogen credits from cover crop stands. This will help encourage farmers to implement cover cropping on their farms.