



## Using Crimson Clover to Supply Nitrogen to a Silage Corn Crop

**Brian Wickline**  
WVU Extension Agent  
Monroe County

**Ed Rayburn**  
WVU Extension Specialist  
Morgantown

December 2008

---

During 2008, fertilizer prices increased drastically due to several contributing factors: fuel prices increased, the American dollar weakened, and the global demand for fertilizers increased. By the spring of 2008, nitrogen cost had risen to \$0.84 per unit, an increase of \$0.50 per unit from the fall of 2007. Phosphorus and potassium saw increases of 100 % during 2008.

Using cover crops to supply nitrogen was a common practice among West Virginia farmers before World War II. This plowing down or incorporating clover cover crops not only gave the next crop a large supply of nitrogen, but also helped increase levels of organic matter. It is estimated that a quality stand of legume cover crop having a height of 16 inches that is incorporated into the soil can supply as much as 120 pounds of available nitrogen to the next crop.

More recently, with cheap nitrogen, producers have chosen not to use legumes as cover crops. Now with the drastic increase in price of nutrients, this is a practice that needs to be evaluated not only from an economic point of view, but also from an organic matter perspective. Comparisons of recent soil samples on fields planted in corn for silage having no cover crops for 20 years with adjacent pasture fields receiving manure applications showed that the pasture fields contained organic matter levels 2% to 3% higher than the cropped silage fields. This again stresses the importance of cover crops.

To test the value of a winter legume cover crop providing nitrogen for corn production, a demonstration was started in 2007. The purposes of this demonstration were to estimate the cost of using crimson clover as a nitrogen source compared with conventional nitrogen products and to see if an economical corn yield could be achieved by using crimson clover as the primary nitrogen source.

On August 15, 2007, crimson clover was broadcast at a rate of 18 pounds per acre onto a 10-acre field previously planted in sorghum/sudangrass. No germination took place until October 25, when 2.67 inches of rain fell. On May 7, 2008, an excellent stand of clover had reached an average height of 17 inches, based on six measurements taken across the

field. On May 8, the stand was incorporated into the soil using a three-point hitch, 7-foot-wide rototiller. Corn was planted on May 26. An application of Atrazine and Princep were applied on May 30 as a pre-emergence herbicide. Also, on May 26, 300 pounds of 10-20-20 per acre were broadcast on the field. The stand was planted at a population of 27,000 seeds per acre using a four-row John Deere 7000 planter. No fertilizer was placed in the row at planting. A yield determination was completed on September 22, using the established USDA/FSA method. The corn yielded  $148 \pm 24$  bushels per acre. The corn was chopped for silage from September 22 to 24. The 2008 production costs and corn yield measured in this crimson clover cover crop demonstration was compared to conventional costs and equal yield of a commercial nitrogen system on a per-acre basis.

### **Economic Impact**

The economic comparison of both methods showed that during 2008 it was more economically viable to incorporate a legume cover crop as a nitrogen source instead of top-dressing large amounts of nitrogen to grow a crop of corn silage, if there was a substantial amount of vegetative growth by the legume during the fall, winter, and early spring. There was an advantage of \$31.90 per acre by plowing under the cover crop as opposed to supplying the crop with an additional 120 pounds per acre of UAN solution as a side-dressing application. Total cost of production per acre using a cover crop for additional nitrogen was \$ 293.40. Expenses without using a cover crop and supplying the additional nitrogen as UAN solution amounted to 325.30/acre. The cost of production difference was the difference in costs between the UAN solution and the expense of clover seed, seeding costs, and rotary tilling versus no-tilling the stand receiving UAN.

Economic Comparison:

10 Acres

	<u>With Clover Cover Crop</u>	<u>Without Clover Cover Crop</u>
Clover Seed Costs	\$ 40.00/Acre	
Clover Broadcast Costs	\$ 5.00/Acre	
Rotary Tilling	\$ 21.00 /Acre	
Herbicide Application Pre-Emerge	\$ 47.70/Acre	\$ 47.70/Acre
Corn Planting (Con-Till/No-Till)	\$ 16.70/Acre	\$ 18.20/Acre
10-20-20 at planting (300 lbs/Acre)	\$108.00/Acre	\$108.00/Acre
Side dress Nitrogen (120 lbs/Acre)		\$ 96.40/Acre
Corn Chopping (1 Row Chopper)	\$ 55.00/Acre	\$ 55.00/Acre
Total	\$293.40/Acre	\$325.30/Acre

This case study shows the value of the historic use of winter annual leguminous cover crops to meet the nitrogen requirements of a summer-grown corn crop. There was a 10-percent saving when the crimson clover cover crop was used rather than the UAN solution. This was not a large difference, but the value of the organic matter supplied by the cover crop was not included in the economic comparison, which should be evaluated in the future. Under dry growing conditions, increased organic matter increases the soil's ability to hold water available to the plant for growth. This may enhance the growth of the following corn crop in dry years compared with soils low in organic matter.

This first year's study found that use of leguminous winter cover crops can maintain the yield of corn for silage, largely replacing the need for purchased nitrogen. When fertilizer prices are high, this management practice can reduce corn silage production costs and should provide an additional benefit of increased soil organic matter. Additional research needs to be done to see how well this practice works in different years and at different locations.

**Acknowledgement:**

I would like to thank the following individuals for making this study possible and helping collect and analyze the results.

Matt Dobbs, Grazing Dairy Producer

Addison Dobbs, Grazing Dairy Producer

Charles Parker, USDA County Executive Director

Ed Rayburn, WVU Extension Specialist



Matt and Addison  
Dobbs in their  
Crimson Clover.  
May 7, 2008





Crimson Clover had an average height of 17 inches.  
May 7, 2008





Very large  
Crimson Clover  
leaf  
  
May 7, 2008



Crimson Clover  
rotary tilled down  
  
Ready to plant  
  
May 8, 2008

Programs and activities offered by the West Virginia University Extension Service are available to all persons without regard to race, color, sex, disability, religion, age, veteran status, political beliefs, sexual orientation, national origin, and marital or family status. Issued in furtherance of Cooperative Extension Work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture.