

## Double Cropping: Spring Wheat Followed by a Legume

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**C**an cover crops planted after wheat harvest benefit a producer by adding nitrogen credits, take up moisture, and provide cover for wildlife? This was a question posed by Clark Lemley, former member of the CREC advisory board and participant in the North Dakota Natural Resources Trust Conservation Agriculture project. Clark was one of four farmers from the Drift Prairie Region engaged in an effort to forge out a better working relationship between the environmental interests and agriculture. The slogan for the project is “Farm the best; alternatives on the rest.” To help Clark find alternatives he was assigned a team of seven technical professionals - Barnes County Extension Agent Randy Greenwich, NRCS District Conservationist Brent Gustafson, Agvise Soil scientist Bob Deutsch, CREC research agronomist Steve Zwinger, James Valley Technical School Adult Farm Management instructor Virgil Dagman, the Trust’s wildlife biologist Arnold Kruse and the pastor of Grace Free Lutheran Church in Cooperstown Rev. Charles Johnson.

The Resource Analysis Team did some brainstorming and helped Clark develop a planned demonstration which he submitted to the Sustainable Agriculture Research and Education (SARE) for a farmer grant and he was selected to test his concept. Clark wrote in his grant application. “I would like to use an annual legume cover crop within my no-till system to increase residue, cover and to provide nitrogen credits for the next crop. I also want to reduce the expense of inputs on my farm. No-till management will reduce the number of field operations; legume cover crops will increase organic matter, reduce weed competition, and provide nitrogen credits toward the next crop. My hope is to find a legume cover crop that can be used effectively within the growing season. Nitrogen costs are increasing and added to that my local anhydrous supplier has quit business and I have to go 12 miles one way to my nearest supplier. Growing at least a portion of my own fertilizer is important to me and to other producers as well. I don’t feel that I can rent farmland for \$40 an acre and set-aside a year for green fallow. It will be more economical to me if I can raise the cover crop within the current crop to take advantage of the after harvest growing conditions. Growing a cover crop will also accelerate the development of my no-till system.”

A field of hard red spring wheat that Clark seeded during the spring was the test field in 2005. He subdivided the field to allow establishing four treatments that were replicated four times. One treatment was common red clover which was broadcast seeded on August 1 during the last fungicide application. The practice of broadcast seeding with the scheduled fungicide application eliminates the added cost from another field operation. Other cover crop treatments were the planting of black lentils or field peas with a double disk opener drill on August 12. Field biomass samples were taken by CREC staff on October 3, dried, weighed, and the Nitrogen (N) content estimated based upon historical data. Clark Lemley’s Adult Farm Management instructor compiled the economic data presented.

### Results and Discussion

The performance of the cover crops, estimated N accumulations, and costs of the practice are shown in table 1. North Dakota had unusually warm fall temperatures this year that allowed the legume crops to continue growth through mid November. Normally these legumes would not have survived killing frosts expected by October 3<sup>rd</sup>. The 1313 pounds of dry matter produced by field pea represents significant late season productivity. One intriguing observation was that the volunteer wheat appeared stunted by the field pea crop, but this effect was not observed in the stands of red clover or black lentils. On the basis of actual costs for the demonstration and only placing an economic value on the N accumulation, the red clover and the lentils showed a negative balance while the peas showed an economic gain of nearly \$3/ac.

**Table 1. No-till cover crop legumes following spring wheat. Clark Lemley Farm NW 1/4 Sec.19.**

Treatment	Legume Height cm	Legume biomass Yield @ dry basis lbs acre <sup>-1</sup>	Est N in aboveground biomass lbs acre <sup>-1</sup>	Estimated total plant N* lbs acre <sup>-1</sup>	Value of N from legume** \$ acre <sup>-1</sup>	Cover crop seed cost*** \$ acre <sup>-1</sup>	Cover crop expenses**** \$ acre <sup>-1</sup>	Return \$ acre <sup>-1</sup>
Control	na	na	na	na	na	na	na	na
Lentil	19.0	714	17.7	21.2	\$7.42	\$11.70	\$16.70	(\$9.28)
Field Pea	67.3	1313	40.4	48.5	\$16.98	\$9.00	\$14.00	\$2.98
Red Clover	14.8	313	8.6	10.3	\$3.61	\$13.20	\$13.20	(\$9.59)
Mean	33.7	780						
C.V.%	6.0	30.2						
LSD.05	3.5	407						
# Reps	4	4						
* Literature suggests that an additional 20% N may be added due to the contribution of N in roots.								
** N costs assumed at \$0.35/lb based on anhydrous at \$0.31/lb and urea at \$0.38/lb.								
*** Clark's cover crop seed costs: lentil, 30 lbs. at \$.39/lb.; pea, 60 lbs. at \$.15/lb.; r.clover, 8 lbs. at \$1.65/lb.								
**** Cover crop expenses include seed and crop establishment, but not inoculation.								

No one really knows what will happen to the cost of N for 2006 or beyond. In 2005, costs for N were nearly double those for 2004. The N gains or accumulations observed in field pea would look even better in the event that N costs do continue to rise. The legumes used in this demonstration were special ordered as they are not typically raised in this part of North Dakota and this resulted in higher costs than expected. The price for bin-run pea seed is currently around \$0.05/lb. This pea seed cost is ten cents less than the that used in the demonstration. The success of legume cover crop growth in this demonstration was in part due to the fact that the wheat crop could be harvested in a timely manner. This allowed the aftermath legume crop to be planted timely and significant growth to be achieved. This was not the case in 2003 or 2004.

There have been no economic credits or benefits applied to the assessment of this demonstration that may be associated with other characteristics of having a cover crop after a spring wheat crop. These credits or benefits would include utilizing excess field moisture that would otherwise allow leaching N to deeper depths of the soil and hampering field operations. The cover crop also provides benefits related to protecting the soil from erosion, adding some organic matter, and providing cover for wildlife. The biomass produced from these legume cover crops may also improve soil quality and certainly create opportunities for potential livestock grazing. n