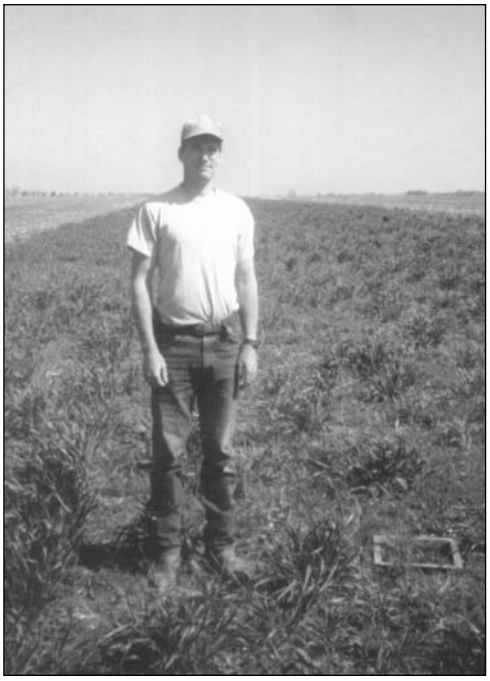
Rodney Rice
Brown County

Resource Conserving Crop Rotation



Cooperator:
Rodney Rice
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Horton, Ks. 66439

Watershed:
Delaware

Water Quality Concerns
Run-off of herbicides and fertilizer, and soil from cropland

Demonstration:
* Implement a legume based crop rotation to reduce or eliminate fertilizer and herbicides used.

After returning home in 1994 upon completing a degree in Agriculture Technology Management at Kansas State University, Rodney joined the farming partnership of his father and uncle, Terry and Dean Rice. Rodney and his wife, Jonette, both grew up on farms, enjoyed the work and challenge of farming, and wanted to continue their family's agricultural tradition.

The family partnership provided a good opportunity to pursue these goals. And as a diversified operation, it provided an opportunity to experiment and explore changes in adapting to a rapidly changing agriculture. One of the challenges that the Rice's recognized was that of protecting water quality.

The Rice partnership farms about 2,000 acres, consisting of about 1,500 crop acres and 500 acres of pasture. In addition they maintain a beef cow herd of about 120 cows, and they operate a beef finishing enterprise, feeding about 115 head annually.

The Rices like to have substantial amounts of alfalfa in their crop rotation because of its soil conservation and soil building aspects, along with the relatively high rate of profitability of alfalfa enterprises in well managed cropping systems. Both the cow herd and beef finishing enterprizes complement the Rice's cropping system by utilizing substantial amounts of alfalfa forages.

The Rice's operation had always included a diversified cropping mix and crop rotation. They also had always made manure management and utilization a priority in order to take advantage of the manure as the valuable resource that it is.

Another simple test run at the Rice's was to collect biomass samples to determine how much was produced per acre. Dry weather seriously hampered growth.

Rodney's goal for his family's farming partnership was to see that the operation protected water quality while also remaining economically viable.

The Rices were integrating both more no-till and niche marketing activities into their operation. Rodney was interested in the possibililty of price premiums associated with organic grain production. He also understood that the use of cover crops and legume based crop rotations characteristic of organic cropping systems should also work well in no-till systems.

Rodney developed a Clean Water Farms Project proposal to develop and implement a resource conserving crop rotation plan on 107 acres to explore the systematic use of legume cover crops and manure applications to reduce fertilizer and chemical materials and costs in their conventional and no-till systems.

He developed a written, five year crop rotation plan consisting of corn or milo, soybeans, wheat/red clover, corn, soybeans/hairy vetch. Legume cover crops occur two years in the rotation, and manure applications are scheduled for two years of the rotation. In practice the fields in this plan did not receive fertilizer and chemical applications so that they could qualify for certified organic production.

The Rices use a minimum till system in their conventional cropping operation. The goals of their organic crop rotation trial was to (1) see what they could learn from it in terms of legume cover crops, systematic manure applications, and non-chemical weed control, that they could apply to their conventional cropping system for the purpose of reducing purchased chemical and fertilizer inputs, and (2) test the organic niche market as a viable alternative market.

Rodney also conducted a simple cover crop/manure/fertilizer trial on an adjoining field not in the rotation plan (he used a different field because of its gradient and soil type uniformity). In this trial Rodney seeded two of three strips to a cover crop of wheat/ hairy vetch. In the spring, he tested and applied manure at a rate of 5 T./acre. The first strip had no fertility inputs subsequent to the previous soybean crop. The second strip had only the wheat/hairy vetch cover crop. The third strip had the wheat/ hairy vetch crop along with 5 tons manure.

The wheat/hairy vetch cover crop did not produce well in the spring of 2000 due to a late planting (early October 1999) and because of unusually dry spring weather. Biomass production as of April 23, 2000, was 1,045 pounds of dry matter per acre, and the majority of the material was wheat. Five tons of manure was applied on April 23, 2000, and corn was planted the next day. A manure test for nutrient analysis reported the major nutrients as N- 30#/ton, P- 15#/ton, and K- 35#/ton. At five tons per acre, the Rices were applying 150# of N, 75# of P, and 175# of K .

Yield Results of Cover Crop/Manure Trial

Strip #1	No Cover Crop or Manure	72.8 bu./ac.
Strip #2	Cover Crop Only	78.6 bu./ac.
Strip #3	Cover Crop/Manure	122.2 bu./ac

The corn was harvested in mid-September at 11.1 % moisture with yeilds shown in the table above. The overall farm average corn yield for the Rices' was 125 bu./acre, thus the cover crop/manured strip yielded comparably to corn getting the usual purchased fertilizer application.

Rodney's observations from the trial are: (1) cover crops need to seeded earlier (August or early September) and spring rains are necessary to get a sufficient hairy vetch cover growth for substantial nitrogen production; he also observed that a variety that begins spring growth earlier than the common hairy vetch variety would be helpful; (2) manure applications may be easier to manage than cover crops, although there needs to be sufficient manure quanitities and timely application needs to be a priority; but (3) a cover crop and manure used together can complement one another, in that a cover crop will generally do well in a wet spring when timely manure applications are more difficult (and more prone to run-off) while in a dry spring when cover crops do not do well, timely manure applications are done more easily. In the northeast corner of the state where the Rice farm is located and rainfall averages 34 inches/year, most of it from April-June, this combined approach could be valuable for water quality protection.

Rice Crop Rotation Summary

107 acres in demonstration

Yr. in Rotation	1	2	3	4	5
Basic Rotation	Corn 0r Milo	Soybeans	Wheat/Red Clover	Milo	Beans/Hairy Vetch
Yield Goal	90 bu.	35 bu.	35 bu.	90 bu.	35 bu.
Seeding Rate	Milo- 75,000 Corn-	Row- 150,000 Drill -200,000	Wheat- 2 bu. Red Clover- 3#	75,000	Soy- 200,000 Vetch - 20#
Tillage	No-till or Field Cult. -1	Chisel - 1 Disc - 1 Field Cult. - 1	No-till	Chisel - 1 Field Cult. - 2	Disc - 2 Field Cult. 1
Fertility	Soybean & Vetch N: 5 T. beef lot manure	None added	Legume N; fertilizer per soil test	Legume N; beef lot manure	None added
Weed Control	Crop Rotation, Pre-plant tillage or Herbicide, Cultivate - 1	Crop Rotation, Pre-plant tillage, Herbicides, cult. if necessary	Cut hay	Crop Rotation, Pre-plant tillage, Herbicides, Cult. if necessary	
Cover Crop	Stubble	Wheat	Red Clover	Stubble	Hairy Vetch
Other Practices	Graze Cattle Fall and Winter				

And finally, Rodney thought he could effectively shred the cover crop just prior to planting instead of using a burn-down herbicide application.

Although Rodney is still experimenting with his organic crop rotation plan, he hopes the lessons learned with this rotation can be carried over to the conventional side of the operation.

So far, he notes, they have made progress in reducing purchased fertilizer and herbicide inputs in their overall farm operation to lower production costs and protect water quality. It has been easier, he notes, to reduce fertilizer inputs than herbicides. Systematic use of legumes and manure allowed them to reduce fertilizers. They eliminated chemical inputs on 107 acres, but that is only a small part of their operation. They have been able to reduce chemical inputs overall by implementing a more diversified crop rotation including crops not so dependent on chemicals, such as red clover, wheat and alfalfa. Their livestock enterprise is a critical link to the cropping system in terms of utilizing the forage legumes and manure production.

The Rice's crop and livestock operation is a good example of a modern family farm utilizing diversification and technology to maintain economic viability, adaptability and to work toward greater sustainability, including the protection of water quality.

They have increased their diversification not only in production, but also in marketing, by selling finished beef into a premium natural beef market and some organic grain into a premium organic market. Plus, they are establishing the next generation in the farming operation. The Rices' goals are common to most family farms.

Rice Farm Characteristics

Farm Size: 2000 acres total. 1500 acres in crops, 500 acres pasture. 107 acres in this demonstration.
Crops: Corn, soybeans, milo, wheat, oats, alfalfa, red clover.
Livestock: 120 beef cow herd. Finish about 115 head annually of their own feeder calves.
Equipment: Minimum tillage, planting and cultivating equipment. Conventional grain, hay and silage harvesting equipment.
Labor and Management: Provided by family partnership members consisting of three families.
Crop Management: Minimum and no-till on most of cropland. For the CWF project they coverted 100 acres to organic to try rotations and cover crops.
Livestock Management: Conventional grazing beef cow herd. Grain finish all their own feeders.
Weed Management: Experimenting with non-chemical weed control on 100 acres. Use conventional chemical practices on balance of cropland.
Insect Management: Crop rotation. Control alfalfa weevil when it is a problem with early harvest or winter grazing. Use chemicals as a last resort on conventional cropland.
Disease Managment: Crop rotation. Use chemicals as last resort on conventional cropland.
Soil Fertility: Periodic soil testing. Include alfalfa and some annual legume crops in crop rotations. Credit legumes and manure per manure tests. Other fertilizer as needed.
Water Quality Management: Use best management practices with fertilizers and chemicals. Beef finishing lot located far away from water sources. Applying manure to cropland is priority.
Crop Yields: Corn 110 bu/acre; soybeans 35 bu./acre; wheat 50 bu./acre
Profit Strategy: Balance good yields ad low production costs. Market cheap grain and forages through finished beef. Testing organic marketing niche.