Case Study ~ Transition to Cover Crop for a Beginning Farmer
Russell Hedrick, Owner, JRH Grain Farms LLC, Hickory, North Carolina

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June 23, 2014

Russell Hedrick, Summer 2013

Beginning farmer Russell Hedrick performed his own on-farm test for cover crops. His question: Could he see a difference between the cover cropped acres and the acres with no cover crop? Would cover crops reduce erosion and weeds on his farm?

In this photo, Mr. Hedrick is standing in a field which contained both the "check strip", an area with no cover crops, and the cover cropped area. The check strip is on the right side and has large bare spots, while the left side is the cover cropped area. Mr. Hedrick is holding two soybean plants randomly plucked from these fields in mid-July 2013. They are the same soybean variety and were planted the same time on the same day. The larger plant is from the cover cropped area, the smaller is from the check strip.

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ACKNOWLEDGMENTS

We, in the USDA Natural Resources Conservation Service (NRCS) East National Technology Support Center, would like to thank Mr. Russell Hedrick, our case study farmer, for his time and attention to detail. His patience with details made this case study possible. Mr. Hedrick has contributed to helping farmers in their transitions to conservation. We also greatly appreciate the help we received from Lee Holcomb, District Conservationist, Newton Field Office, North Carolina. He was the essential bridge of communication between us and Mr. Hedrick. Mr. Hedrick and Mr. Holcomb checked factual accuracy of this report through many drafts.

It also Takes a Village:
Steve Boetger, Agronomist, NRCS ENTSC helped me decide whether or not Mr. Hedrick's experiences would be a good case study. Steve helped me find soils data and interpreted Mr. Hedrick's soil test results into English for a description of the initial soil conditions.
Dr. Ramona Garner, Plant Materials Specialist, NRCS ENTSC helped me think about another way a farmer could design a one-year field test comparing cover crop with no cover crop on a small acreage farm. She also discussed the farmer's first-year cover crop mix and seeding rates.
Dr. Charles Kome, Soil Scientist, NRCS World Soil Resources helped me understand how soil rich in organic matter might respond to cover crop within one year and produce higher yields even in the first year.
Jay Ham, NRCS MLRA Soil Survey Leader, explained the appropriate use of SSURGO data and how that data can be used to evaluate the on-farm field test Mr. Hedrick conducted.
David Lamm, acting National Soil Health Team Leader, NRCS ENTSC, reviewed the calculation methods used in the Excel workbook which generated the tables in this document.
Kale Gullet, Fisheries Biologist, provided excellent editorial comments.

The economics methods in the Excel workbook and/or the draft paper were reviewed by:

Dr. Sophia Glenn, NRCS State Economist, Oregon;
David Faulkner, NRCS State Economist, Virginia;
Lynn Knight, Economist, ENTSC;
Dr. Maria Bowman, Natural Resources Defense Council.

Executive Summary: With no prior farming experience, twenty-eight year old Russell Hedrick leased the Rocky Ford Farm and began farming in the spring of 2012. His first use of cover crops was in the fall of 2012 with the goals of reducing water erosion and weeds. He requires any change to his farm to at least pay for itself over a period of time, saying "If cover crops pay for themselves 6 out of 10 years then they were worth the time and effort." Mr. Hedrick's meticulous documentation through notes, photos, and records, made this detailed case study possible.

The intended audience for this case study is NRCS conservation planners and partners, farmers who want an example of the costs and benefits of transitioning to cover crops, and researchers who are interested in the types of information farmers might use when deciding to try cover crops.

The goal of this case study was to provide specific information about one farmer's transition and a framework other farmers can use when thinking about trying cover crops. An important element of this framework is the significant amount of individual learning that has to occur before buying the cover crop seed especially in areas where there are no local farmer-mentors to speed the learning process. Learning was 39% of the first year costs. As Russell put it, "If I had not done all that reading and learning, I would have panicked when I saw the *huge* cover crop biomass."

Mr. Hedrick successfully used cover crops in the first year experiencing cost savings for herbicide and nitrogen applications made to the cash crops, observing significantly reduced water erosion and weeds. Surprisingly, he even experienced increased cash crop yields. In fact, the cover crops more than paid for themselves in the first year because: (1) he is an excellent student and manager, (2) his initial soil conditions were good, and (3) he received complete and timely technical assistance from the NRCS Field Office, the East National Technology Support Center (ENTSC), and others.

The success of this farmer in the first year points to the importance of NRCS Field Office Technical Assistance. Because there were no farmer-mentors, Mr. Hedrick had only the NRCS District Conservationist (DC) and other technical professionals as mentors. The DC was the primary mentor directing Russell to reliable websites, interpreting lab analyses and other information, relating general information to local conditions, and visiting the farm to design the cover crop mix. In addition, the DC returned to the farm during the cover crop growth, when the cover crop was terminated, and when the cash crops were planted into the cover crop biomass. Russell does not hesitate to say "If it wasn't for the District Conservationist, I would not have tried cover crops."

Mr. Hedrick designed his own one-year, on-farm test comparing fields using cover crops with fields having no cover crops. While not a strictly scientific study, his tests provided him with something he could not have found in the literature; namely, a side-by-side comparison in his fields, under his climatic conditions, and put in place using his own available equipment. Russell shared, "The research is useful, but I wanted to see for myself."

Finally, if you are interested in learning more about this case please view the webinar entitled "Cover Crops: Why grow a crop you don't sell?". The replay features the farmer and the DC and is available at http://www.forestrywebinars.net/webinars/cover-crops-why-grow-a-crop-you-dont-sell/?searchterm=None

The Farm, Rocky Ford Farm: Figure 1 shows the Rocky Ford Farm is a small-acreage farm in North Carolina. The land was purchased by Mr. Hedrick's Grandfather in 2000.The red polygon in the location map shows the farm is in Catawba County in the western part of the state. The farm has 7 Farm Service Agency (FSA) fields, four of which are cropped and are identified in Figure 1. In 2013, the first cover crop year, Fields 1, 2, and 3 grew soybeans for a total of 22.1 acres, Field 5 (which the farmer broke into two sections for soil testing purposes) grew 18.25 acres of corn, and the remaining fields were forestland (47 acres) and headquarters (3.5 acres).

History of the Fields:

As Figure 1 shows, there are four fields of interest in this case study: Fields 1, 2, 3, and 5. Fields 1, 2, and 3 have the same history and are discussed together. Field 5 is a new crop field and its history is discussed separately.

Fields 1, 2, and 3 (together are 22.1 acres): These fields have a long history of farming. However, the previous owners had not farmed these fields for several years prior to 2000. Therefore, when purchased in 2000 these fields were mostly weeds which had been bush hogged once a year for several years. These fields have not been irrigated since 2000 and probably were not irrigated by the previous owners.

2000 Spring: These fields were disked, and cleared of sticks and rocks.

2000 Summer: The fields were planted to winter wheat using conventional tillage.

2001 Autumn: Winter wheat did not do well and was turned under using conventional tillage.

2001 Spring: Corn was planted using conventional tillage.

2002 – 2011: Continuous, no-till corn. Winter weeds were the cover crops.

2012: Mr. Hedrick leased the farm from his family and no-tilled corn.

2012 Autumn: Mr. Hedrick drilled the first cover crop: radishes, oats, crimson clover, cereal rye, and triticale. Purple top turnips were volunteers. This mix addressed three soil health concerns: biomass (cereal rye, triticale, and oats), nitrogen (clover), and compaction (radish).

2013 Spring: Sprayed and rolled cover crop and drilled soybeans. This is the crop shown in Figure 1.

Field 5 (18.25 acres): This field had been forestland for many years but was cleared between 2011 and 2012 and prepared for crops. In autumn 2012, the first cover crop mix of radishes, ryegrass (although not recommended), crimson clover, and cereal rye was planted by a seed drill. In the spring of 2013, Field 5 was sprayed with herbicide, cover crops were rolled, and no-till corn was planted.

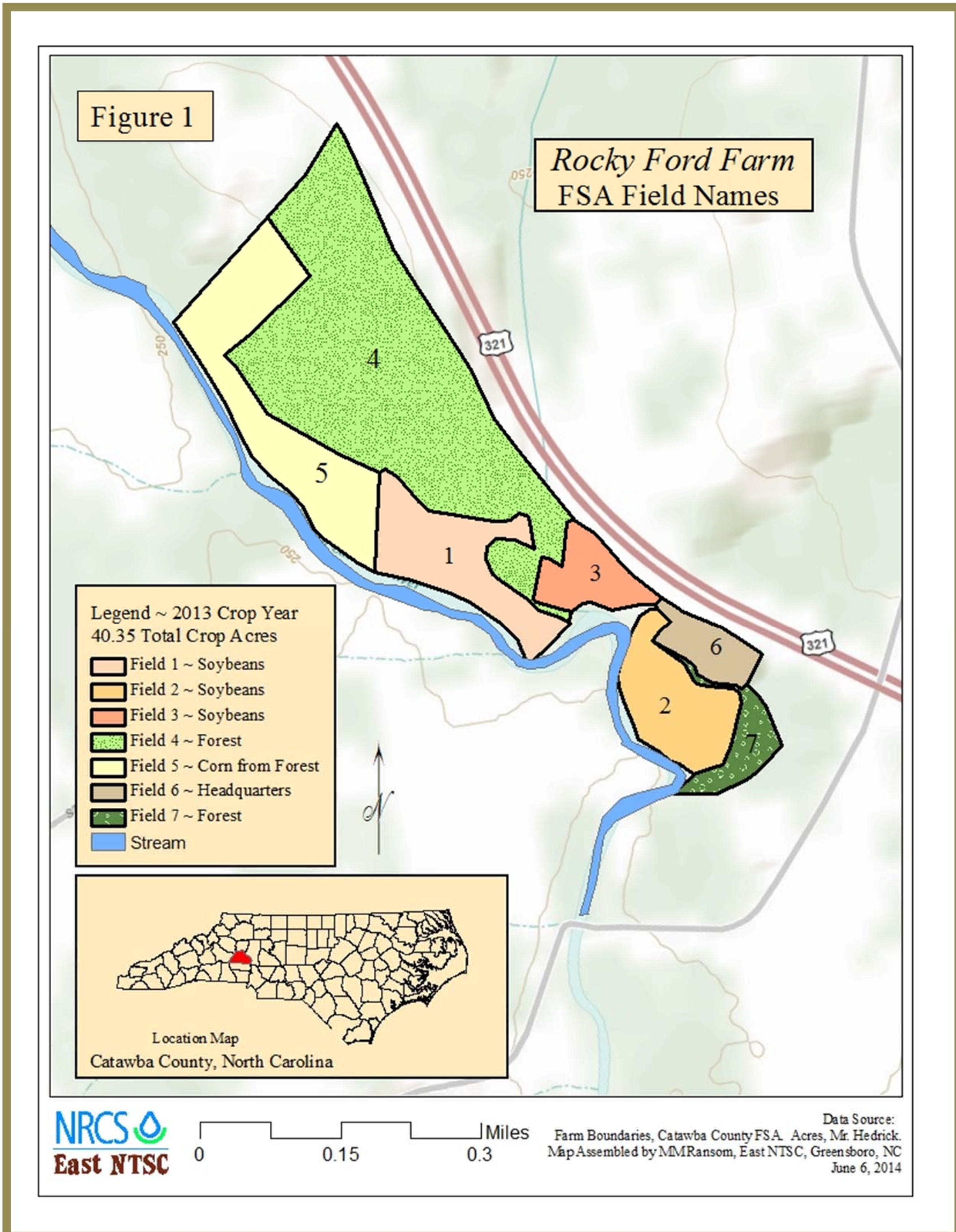

Figure 1
Rocky Ford Farm
FSA Field Names
Legend ~ 2013 Crop Year
40.35 Total Crop Acres
Field 1 ~ Soybeans
Field 2 ~ Soybeans
Field 3 ~ Soybeans
Field 4 ~ Forest
Field 5 ~ Corn from Forest
Field 6 ~ Headquarters
Field 7 ~ Forest
Stream
1
2
3
4
5
6
7
321
250
N
Location Map
Catawba County, North Carolina
NRCS
East NTSC
0
0.15
0.3
Miles
Data Source:
Farm Boundaries, Catawba County FSA. Acres, Mr. Hedrick.
Map Assembled by MMRansom, East NTSC, Greensboro, NC
June 6, 2014

Initial Soil Conditions: Because soil biology responds very quickly to farm operations, it is essential to understand the initial soil conditions for two reasons. First, the higher the soil organic matter the larger the microbial population in the soil. The larger the microbial population the more responsive the soil is to cover crops. A cover crop mix containing inoculated legumes provides nutrients to the resident soil microorganisms which respond quickly. Second, the initial soil conditions provide the base for monitoring soil response to cover crop over time. Mr. Hedrick sampled his soils twice (December 2011 and then again in October 2012) before he planted his first cover crops in October 2012.

Table 1 identifies, for each field, the dominant soil, the October 2012 soil test results, and the county average for three characteristics: percent organic matter (OM %), cation exchange capacity (CEC), and soil acidity (pH). Table 1 shows that all fields had OM % higher than the county average. Some fields were much higher than the county average.

Table 1: Initial Soil Conditions, before first cover crop was planted

		OM %		CEC		pH	
	Dominant Soil (1)	2012 October (2)	Soil Survey (1)	2012 October (2)	Soil Survey (1)	2012 October (2)	Soil Survey (1)
Field 1	Congaree	4.32	2.5	10.2	10	6.6	5.9
Field 2	Congaree	4.82	2.5	9.8	10	6	5.9
Field 3	Pacolet, Congaree	3.56	1.5	8.5	7.2	6	5.7
Field 5 Back Hill	Lloyd	No Sample	1.25	No Sample	8.3	No Sample	5.9
Field 5 Bottoms	Congaree	No Sample	2.5	No Sample	10	No Sample	5.9

(1) USDA, NRCS, Custom Soil Resource Report for Catawba County, North Carolina, Aug 28, 2013.

(2) Waters Agricultural Laboratories, Inc., Owensboro, KY, Soil Analysis processed 10/19/2012. First cover crop was planted late October 2012.

Recall that Fields 1, 2, and 3 had a 10-year history of no-till corn and Field 5 was converted to cropland from forestland in 2011. Thus, these fields could be expected to have relatively high OM %. Mr. Hedrick limed Fields 1, 2, and 3 in 2012 which contributed to pH levels higher than one would expect for the amount of organic material in those fields. In summary, the Rocky Ford Farm soil test results showed that all fields had a potential for a sharp increase in biological activity after only one year of cover crops.

Cover Crop Mixes: Table 2 presents the cover crop mixes Mr. Hedrick used and the application rate, Lbs/Ac, for each species. Notice that the planting rates for cereal rye, crimson clover, and radishes differ between corn and soybeans. Mr. Hedrick increased the clover to provide more nitrogen for the corn on Field 5. Because the corn acres on Field 5 Back Hill are more sloped than the other acres, Mr. Hedrick doubled the cereal rye and added ryegrass for additional erosion control. The radish seeding rate was a result of the mix he purchased for corn. The total for cover crop on corn was 48.25 lbs/ac, 18% more than the total for cover crop on soybeans.

Table 2: Cover Crop Mixes, Lbs/Ac

Mix for Corn

Cereal Rye	20
Crimson Clover, pre-inoculated	7
Radishes	6.25
Rye Grass	15
Total Cover Crop Seed on Corn Fields	48.25

Mix for Soybeans

Cereal Rye	10
Crimson Clover, pre-inoculated	5
Radishes	6
Oats	10
Triticale, Soybeans only	10
Total Cover Crop Seed on Soybean Fields	41

Cover Crop Timelines, First Year and Expected Second Year:

In an agricultural community which asks “Why plant something [cover crops] you don’t sell?”, Mr. Hedrick wanted to be very sure that cover crops would solve his erosion and weed problems. His way of being sure was to devote significant resources to learning and monitoring as shown in the timeline in Table 3.

Table 3: Timeline for Cover Crop, First Year

June 2012	Mr. Hedrick went to a Farm Field Day and first heard about cover crops and soil health. June 6, 2012 Mr. Hedrick met Lee Holcomb, District Conservationist, Newton Field office.
June, July, August 2012	Mr. Hedrick visited the NRCS Field Office to learn more about cover crops. The NRCS District Conservationist gave the farmer a list of websites to view. The farmer spent hours on the internet learning about various cover crops, seed mixes, soil health, soil testing to indicate soil health, seed costs, field operations, and, most importantly, how to terminate the huge cover crop biomass before planting the cash crop. There were repeated visits to the Field Office with questions. July 30, 2012, the District Conservationist first visited the farm to discuss the optimal cover crop seed mix and the basic strategy for introducing cover crops into his operation without having to purchase additional equipment.
August 28, 2012	Purchased the cover crop seed.
September, 2012	Received cover crop seed.
October 2012	Tested the soils. Sent samples to two labs: North Carolina Agricultural Extension, and Waters Agricultural Laboratory. (The Waters Lab Test results are in Table 1.)
	The District Conservationist discussed cover crop planting. Drilled Cover Crop Seed on 36.35 acres. Reserved approximately 4 acres for the no cover crop "check" acres. Monitored cover crop twice a week.
Nov 2012 thru April 2013	Monitored cover crop once a week. Walked the fields learning how the various species were doing. In March, the District Conservationist visited the farm to discuss the cover crop progress.
early-April 2013	Sprayed herbicide to terminate cover crops on all fields.
mid-April 2013	Sprayed herbicide a second time on ryegrass in Field 5.
end of April 2013	Rolled cover crop on Field 5 from 48 inches down to 2 inches of cover crop mat. No-tilled corn.
mid-May 2013	Rolled Fields 1, 2, 3 from 48 inches down to 2 inches. No-tilled soybeans.

Table 4 presents the second-year timeline showing significantly less time for learning and monitoring because the second year of cover crop looks simpler to a farmer who has experience.

Table 4: Timeline, Expected Second Year	
Fall 2013 - Spring 2014	Plant cover crop on all acres. Monitor once a month to be sure there are no problems.
mid-April 2014	Spray Herbicide on Cover Crop.
May 2014	Roll all cover crop acres. Plant cash crops.

Cover Crop Costs, First Year: The timeline given in Table 3 suggested significant learning costs in the first year accounting for 39% of the first year total cover crop costs. Table 5 is a summary of the *increased* farm costs for 36.35 acres which received cover crops in the first year. Thus, Table 5 does not include any cash crop (corn or soybeans) production costs such as seed, planting, harvesting, which were incurred separately from cover crops. Table 5 presents the whole farm cover crop costs in the first year. This gives a farmer insight into the impact the fixed costs of learning make on the whole farm. A fixed cost remains the same regardless of the number of acres. The learning costs are only fixed cover crop costs for this farmer because he used existing equipment for all of the cover crop operations.

Table 5: Summary of Increased Costs due to Cover Crops in the FIRST Year
These are the total costs for 36.35 cover crop acres for corn + soybean cover crops.
Per acre costs are given in Table 7.

			% of Total Cost
1	Learning Costs	$2,438.00	39%
2	Soil Tests	$300.00	5%
3	Cover crop Seed Costs, materials only	$1,781.76	29%
4	Drill Cover Crop Seed	$514.80	8%
5	Additional Fertilizer	$0.00	0%
6	Field Monitoring	$390.00	6%
7	Terminate Cover Crop	$536.74	9%
8	Additional Costs to Plant Cash Crop	$267.50	4%
9	Additional Harvest & Post-harvest Costs	$0.00	0%
10	**Total Farm** Cost Increase, First Year Cover Crop	$6,228.80	100%

Source: MM Ransom, Economist, East National Technology Support Center, 2014.

Line 1 of Table 5 presents the first-year learning costs. For Mr. Hedrick these are mostly time costs, charging $20 per hour for 109 hours (9 hours/week for 3 months) of the farmer's time reading and interviewing technical professionals. In this case, there were no workshop, book, or magazine costs, however there was $18 for postage to mail soil samples to ARS. The samples were mailed in order to learn about "soil health" testing.

Note about Farmer's Time Cost: Mr. Hedrick does more than 90% of the work on his farm. This work includes (1) gathering information about best farm practices, best prices, best services; (2) making decisions about which inputs to purchase and which contracts to sign; (3) doing equipment modifications, maintenance and repair; (4) performing field operations such as planting, cover crop termination, cash crop harvesting, and delivering the harvest to the elevator; and (5) marketing his cash crops. If Mr. Hedrick were to hire others to do these various jobs, we estimated he would pay at least $20/hour as an average over the various tasks. The USDA Economic Research Service (ERS) shows an average hourly wage for a first-line supervisor is approximately $22/hour, equipment operators earn approximately $13/hour, farmworkers earn approximately $12/hour, and all other agricultural workers earn an average of approximately $14/hour. Because so much of Mr. Hedrick's time was spent managing, $20/hour seemed to be an appropriate average hourly wage applied to any activity he performed.

Line 2 of Table 5 gives the soil test costs, most of which were paid to a private vendor. The soil tests were classified as cover crop costs because these were used to design the cover crop mixes.

Line 3 of Table 5 shows the cover crop seed costs. It shows that seed materials were 29% of the total first year cover crop costs. Table 6 below provides the specific seed costs.

Line 4 of Table 5 shows a small drilling cost because Mr. Hedrick had been planting no-till corn and did not have to purchase additional equipment or learn how to operate a drill. Thus, in this case the drilling costs were the operating cost plus the farmer's labor at $20 per hour.

Line 5 shows a zero additional fertilizer cost. Although some farmers might add fertilizer to the cover crop, this farmer did not think he needed to do that. Mr. Hedrick anticipated that the clover in his cover crop mix would deliver sufficient nitrogen to the other species of the cover crop given the soil test results.

Line 6 indicates $390 for field monitoring in the first year. As the timeline in Table 3 showed, this farmer spent significant time monitoring the cover crop. How was the cover crop doing? What should he do if things did not look good? What does "good" look like? More than 2/3 of the cost was labor time examining the fields and amounted to $270, $20/hour * 13.5 hours. The remaining $120 of the monitoring cost was the fuel for the truck. Russell would not have monitored his fields through the winter if he had not grown cover crops. He would have just let the winter weeds grow.

Line 7 gives the termination cost of $537. Because Mr. Hedrick would have sprayed weeds anyway, we did not include the initial herbicide costs. The termination costs given here are mostly due to rolling. The cover crop was 48 inches tall before rolling and rolled down to approximately 2 inches using an 8-foot cultipacker. The cultipacker did not crimp the stalks but did break them. In addition to the rolling, Mr. Hedrick had to re-spray the ryegrass on the corn acreage at an additional cost of $244. The second spraying was counted.

Line 8 gives the additional cash crop planting cost due to cover crop as $268. Most of this cost, $228, was due to the additional fertilizer he applied to corn because of the higher C:N of the cover crop. The remaining $40 was due to increased cash crop planting and drilling times. Because of the large amount of cover crop biomass, it took Mr. Hedrick a few minutes longer per acre to plant or drill through the rolled cover crop residue on the cover cropped acres. He estimated that he spent an additional 2 hours planting/drilling the cash crop on all of the cover cropped acres. Thus, the labor cost was $40 = 2 hours * $20/hour.

Line 9 shows no additional harvest and post-harvest costs due to cover crop.

The final dollar figure in Table 5 shows the total farm cost increase due to cover crops in the first year. This cost gives a farmer an idea of the total amount of resources needed in the first year. If cover crops are to pay for themselves in the first year, they must produce benefits worth at least $6,229 in our case.

Table 6 provides more detail about cover crop seed costs. Lines 1-4 and 7-11 present the individual seed costs for each mix. Lines 5, 12, and 14 indicate that Mr. Hedrick paid approximately $11/acre for mixing, bagging, and shipping. Lines 16 and 17 show that the corn cover crop mix was 33% more expensive than the soybean cover crop mix.

Table 6: Cover Crop Seed Costs, First Year (only the seeds + handling + shipping)

		$/Lb	Lb/Ac	Cost/Acre	Cost/Farm
Corn Cover Crop Mix, 16.25 acres					
1	Cereal Rye	$0.28	20	$5.60	$91.00
2	Crimson Clover, pre-inoculated	$1.50	7	$10.50	$170.63
3	Radishes	$2.55	6.25	$15.94	$258.98
4	Ryegrass	$0.85	15	$12.75	$207.19
5	Mixing & Bagging	$0.10	48.25	$4.83	$78.41
6	Subtotal excluding Shipping			$49.61	$806.20
Soybean Cover Crop Mix, 20.10 acres					
7	Cereal Rye	$0.28	10	$2.80	$56.28
8	Crimson Clover, pre-inoculated	$1.50	5	$7.50	$150.75
9	Radishes	$2.55	6	$15.30	$307.53
10	Oats	$0.25	10	$2.50	$50.25
11	Triticale	$0.34	10	$3.40	$68.34
12	Mixing & Bagging	$0.10	41	$4.10	$82.41
13	Subtotal excluding Shipping			$35.60	$715.56
Shipping, 36.35 acres		**$/Delivery**	**# Deliveries**	**Cost/Acre**	**Cost/Farm**
14	Shipping	$260.00	1	$7.15	$260.00
Total Cover Crop Seeds Costs, First Year					
15	Total Cover Crop Seed Cost FOR WHOLE FARM				$1,781.76
16	Per Acre Cover Crop Seed Cost including Shipping, Corn				$56.77
17	Per Acre Cover Crop Seed Cost including Shipping, Soybeans				$42.75

Table 7 expresses the Table 5 costs on a per acre basis for the 36.35 cover crop acres. The fixed costs of Learning ($2,438) were distributed over the 36.35 acres. Had the farm been larger, the same fixed costs would have been distributed over more acres resulting in a lower per acre cost. Not distributing this fixed cost over the case study acres would have dropped this important transition cost from consideration. Thus, the fixed learning cost is expressed on a per acre basis.

Table 7 also identifies those costs which differed between corn and soybeans. The corn cover crop seed costs were higher due to the more expensive ryegrass seed and higher seeding rates of three species (Table 2). The corn cover crop termination costs were higher because of the second herbicide spraying for ryegrass. As discussed above, the additional costs to plant corn were higher because of the additional nitrogen added to corn to compensate for the higher C:N ratio legacy from the cover crop. Based on this per acre analysis, the corn cover crop cost $43.01 more per acre than did the soybean cover crop (Line 12).

Table 7: Per Acre Cover Crop Costs in the FIRST Year			
		Cover Crop for **Corn** Per Acre	Cover Crop for **Soybeans** Per Acre
1	Learning Costs (FIXED spread over 36.35 acres)	$67.07	$67.07
2	Soil Tests	$8.25	$8.25
3	Cover crop Seed Costs, materials only	$56.77	$42.75
4	Drill Cover Crop Seed	$14.16	$14.16
5	Additional Fertilizer	$0.00	$0.00
6	Field Monitoring	$10.73	$10.73
7	Terminate Cover Crop	$23.06	$8.06
8	Additional Costs to Plant & Drill Cash Crop	$15.10	$1.10
9	Additional Harvest & Post-harvest Costs	$0.00	$0.00
10	**Total** Cover Crop per Acre Cost, First Year	$195.14	$152.13
11	Average Cover Crop per Acre Cost, First Year	$171.36	
12	Corn Cover Crop Higher Cost	$43.01	

Source: MM Ransom, Economist, East National Technology Support Center, 2014.

Mr. Hedrick developed rough estimates for the second year in which both the corn and soybean fields will receive the same cover crop mix. As Table 8 illustrates, several costs decline significantly: Learning Costs, Seed Materials, Field Monitoring, Termination, and Additional Costs to Plant Cash & Drill Cash Crop. The three most important costs are likely to be Seed, Drilling, and Termination. (Note: The seed costs given here are actual and were updated after the March 2014 webinar mentioned in the Executive Summary.)

Table 8: Per Acre Expected Cover Crop Costs in the SECOND Year
The same cover crop mix is used for corn and soybeans in the second year.

		Per Acre	% Cost Change
1	Learning Costs	$0.00	-100%
2	Soil Tests	$8.25	No Change
3	Cover Crop Seed Costs, materials only	$36.96	-35%
4	Drill Cover Crop Seed	$14.16	No Change
5	Additional Fertilizer	$0.00	No Change
6	Field Monitoring	$2.20	-79%
7	Terminate Cover Crop	$8.06	-65%
8	Additional Costs to Plant & Drill Cash Crop	$1.10	-93%
9	Additional Harvest & Post-harvest Costs	$0.00	No Change
10	Total Cover Crop Cost per Acre	$70.74	-59%

Source: MM Ransom, Economist, East National Technology Support Center, 2014.

Yields:

Mr. Hedrick did not expect a cash crop yield increase in the first year of cover crops. However, when we visited the farm during the cash crop growing season, we could easily identify the cover crop corn and soybeans because the plants were larger than those on the no cover crop acres. In mid-summer 2013, Mr. Hedrick did some simple yield estimates using methods published by agricultural extension. He randomly grabbed ears of corn from the cover crop and no cover crop acres, counted kernels, and observed the cover cropped plants produced more and larger kernels. For soybeans, he randomly grabbed plants, counted pods and the number of beans in each pod, and noticed the size of the beans. The cover crop soybean plants had more and larger beans. These simple, practical tests were surprising and led him to expect higher cover crop corn and soybean yields. Not only was he getting reduced soil erosion and weed control, but it appeared that he would also experience a yield bonus for both corn and soybeans. It was at this point that he decided to measure the yields from the cover crop and no cover crop areas. The yield results are presented first, the on-farm test method follows.

The County Typical Yields in Table 9 for Catawba County are estimates of a 5-year (2008-2012) average from the USDA National Agricultural Statistics Service (NASS). Because 2007 was a very dry year with county corn yield of 59 bu/ac and soybean yield of 9 bu/ac, we chose 2007 as a break point for the purposes of averaging. In contrast, 2013 was a wet year receiving approximately twice the average rainfall. However, the 2013 yield data were not yet available from NASS and, therefore, came from an expert interview. The 2013 yields in the county were higher than the 5-year area average for both corn and soybeans. Table 9 shows that Mr. Hedrick's 2013 yield for the no cover crop fields was higher than the county average. One reason Mr. Hedrick's no cover crop soybean yield was approximately 22% higher than the county average is that he planted full season soybeans when most of the county double cropped winter wheat and soybeans. The Hedrick no cover crop corn yield was approximately 22% higher than the 2013 county average because of his attention to the fields such as "split applications" of nitrogen. The applications were split into a pre-plant application of chicken litter, some nitrogen at planting, and nitrogen when the corn was 36 inches high getting ready for the high nitrogen demand at tassling. Finally, as Table 1 showed, Mr. Hedrick's soils were somewhat better than the county averages.

However, our interest is the yield differences between no cover crop and cover crop on the Rocky Ford Farm. Table 9 shows that in the first year of cover crop, Mr. Hedrick's measurements showed that corn yield was 9% higher and soybean yield was 35% higher on the cover crop acres. The initial soil conditions previously discussed help explain the one-year yield response Mr. Hedrick experienced.

Before interpreting the Table 9 yield increases as being due solely to cover crop, we must consider Mr. Hedrick's field operations. After planting the cash crops, Mr. Hedrick treated all acres the same. Mr. Hedrick wanted to test the weed control from cover crops. Thus, he did not spray herbicide for weeds on the cover crop acres. In order to treat all acres the same, he did not spray herbicide on the no cover crop acres.

The lack of herbicide likely did not reduce yield on the no cover crop acres because the 2013 production year was so wet so often that farmers in the county had a very difficult time getting into the fields to apply herbicide in a timely manner. Given that his no cover crop yields were significantly higher than the expected

2013 country yields, it seems unlikely that his withdrawal of herbicide significantly affected his no cover crop yields. Thus, we believe the yields which Mr. Hedrick measured are appropriate to estimate the benefits of cover crops in the first year.

Table 9: Corn & Soybean Yields (rounded), Summer 2013, bu/ac

	County Typical Yield (1)	County Expected 2013 Yield (2)	Hedrick Yield No Cover Crop (3)	Hedrick Yield Cover Crop (3)	Hedrick Yield Change = Cover minus No Cover	% Increase
Corn	110	130	158	173	15	9%
Soybeans	34	37	51	69	18	35%

(1) Five year (2008-2012) average (rounded) from NASS Quick Stats.

(2) Interview 1/8/2014, Stephen Gibson, Field Crop Extension Agent (ret), North Carolina State University. These are average yields for 2013, a very wet year. Plants were not stressed thus county yields are expected to be higher than for an average year.

(3) These were from Mr. Hedrick based on elevator tickets and the area calculated using a measuring wheel. Mr. Hedrick harvested the no cover crop acres separately from the cover crop and delivered them separately to the elevator. See Table 10 for details about his method.

On-Farm Test: Mr. Hedrick allowed only one year to compare cover crop with no cover crop. He understood that the test would likely produce different results in different years (weather, seed quality, seed selection, etc.). However, the one-year test provided him a systematic way to look at what cover crops could do on his farm. His test was not a research project, it was a farmer's effort to gather information about his farm. Mr. Hedrick consulted the North Carolina State University Corn Yield and Soybean Yield Contest Rules and Regulations for guidance about how to measure yield.

Mr. Hedrick risked the major part of his fields, 36.35 acres, to cover crop, keeping approximately four acres for the no cover crop production. See Figure 2. Before planting the cover crop Mr. Hedrick marked the no cover crop plots with yellow flags. Because the no cover crop acres were adjacent, Mr. Hedrick had approximately four contiguous acres to avoid while drilling his cover crops, thereby simplifying his field operations. Mr. Hedrick chose these plots because they all had the "same lay of the land". Figure 2 shows that cover crops were planted on 16.25 acres with the corn cover crop mix and 20.1 acres with the soybean cover crop mix, and includes a photo insert showing what the plots looked like in autumn 2012, when the cover crops were still small. After he terminated the cover crops, Mr. Hedrick planted the corn across both cover crop and no cover crop acres on the same day. He drilled the soybeans across both the cover crop and no cover crop acres two weeks later on the same day.

As stated above, Mr. Hedrick did not spray post herbicide (herbicide sprayed after cover crop termination) on any of the acres. Thus, the no cover crop area had more weeds than it would have had under normal field operations and normal weather. However, because the summer of 2013 was so wet and farmers could not get into their fields to spray weed herbicide in a timely manner, it seems likely that Mr. Hedrick's decision to

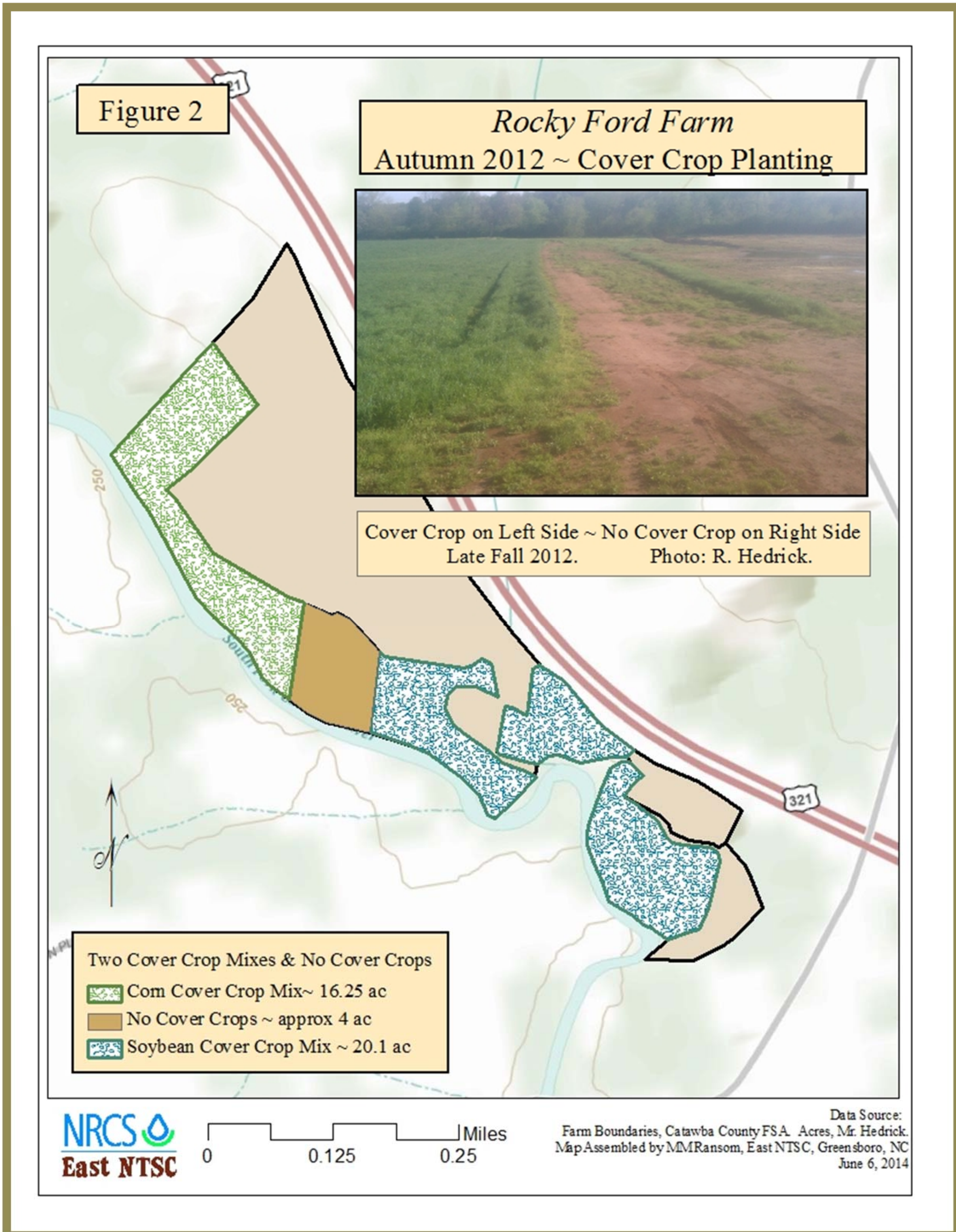
Figure 2
Rocky Ford Farm
Autumn 2012 ~ Cover Crop Planting
Cover Crop on Left Side ~ No Cover Crop on Right Side
Late Fall 2012. Photo: R. Hedrick.
321
250
Two Cover Crop Mixes & No Cover Crops
Corn Cover Crop Mix~ 16.25 ac
No Cover Crops ~ approx 4 ac
Soybean Cover Crop Mix ~ 20.1 ac
N
NRCS
East NTSC
0
0.125
0.25
Miles
Data Source:
Farm Boundaries, Catawba County FSA. Acres, Mr. Hedrick.
Map Assembled by MMRansom, East NTSC, Greensboro, NC
June 6, 2014

not spray post herbicide did not impact cash crop yield. The dominant weeds were red root pig weed, morning glories, and cocklebur.

The very wet summer of 2013 produced heavy rain storms which flooded some of the cover cropped soybean acres. Although approximately 50% of the cover crop residue was washed away, soil erosion did not occur. It was interesting to see that the soybean plants on the storm-damaged, cover cropped areas were larger with more beans than on the undamaged, no cover crop areas. This yield was not measured.

Yields, Measuring & Comparing: Figure 3 illustrates the four plots whose harvests produced the Hedrick Yields in Table 9: Corn with Cover Crop, Corn without Cover Crop, Soybeans without Cover Crop, and Soybeans with Cover Crop. The map illustrates that the plots were within the cover crop and no cover crop areas. The blown up image illustrates that the no cover crop cash crop harvest occurred within the largest rectangles possible in the no cover crop areas. None of the test plots was storm-damaged.

Mr. Hedrick has a Ford 8000 dump truck, which holds approximately 300 bushels of grain. His method was to go to a test plot, marked with yellow flags, and harvested the largest rectangle within the plot. After harvesting all that he could from the plot, he measured the harvested area with an engineering measuring wheel. He took the truck to the grain elevator which then measured the number of bushels in the truck, and converting the measured square feet to acres for that truck load, he calculated the bushels per acre. Table 10 presents Mr. Hedrick's calculations for each of his harvest/elevator trips: (1) Corn, No Cover Crop; (2) Corn, Cover Crop; (3) Soybeans, No Cover Crop; and (4) Soybeans, Cover Crop. The yields in the last column of Table 10 are the yields in Table 9. Harvesting the test plots increased harvesting costs because two of the truck loads were not full and each load took approximately 2 hours for each elevator round trip. Most of the elevator time was waiting in line. We did not include these test costs in the first year costs because we assumed most farmers would not perform an on-farm test.

Table 10: Yield Calculations, 2013 Harvest

	Measured Length, ft. (1)	Measured Width, ft. (1)	Sq Ft	Acres (2)	Truck Load, Bushels (3)	Bu/Ac (rounded)
Corn, no CC	460	175	80,500	1.85	291.79	158
Corn, CC	460	172	79,120	1.82	314.29	173
Soybeans, no CC	486	179	86,994	2	101.18	51
Soybeans, CC	335	346	115,910	2.66	182.6	69

(1) Data from Mr. Hedrick interview. Used to calculate the acres on the elevator tickets.

(2) Acres as hand-written on the elevator tickets.

(3) Data from elevator tickets which state the number of bushels in each truck load.

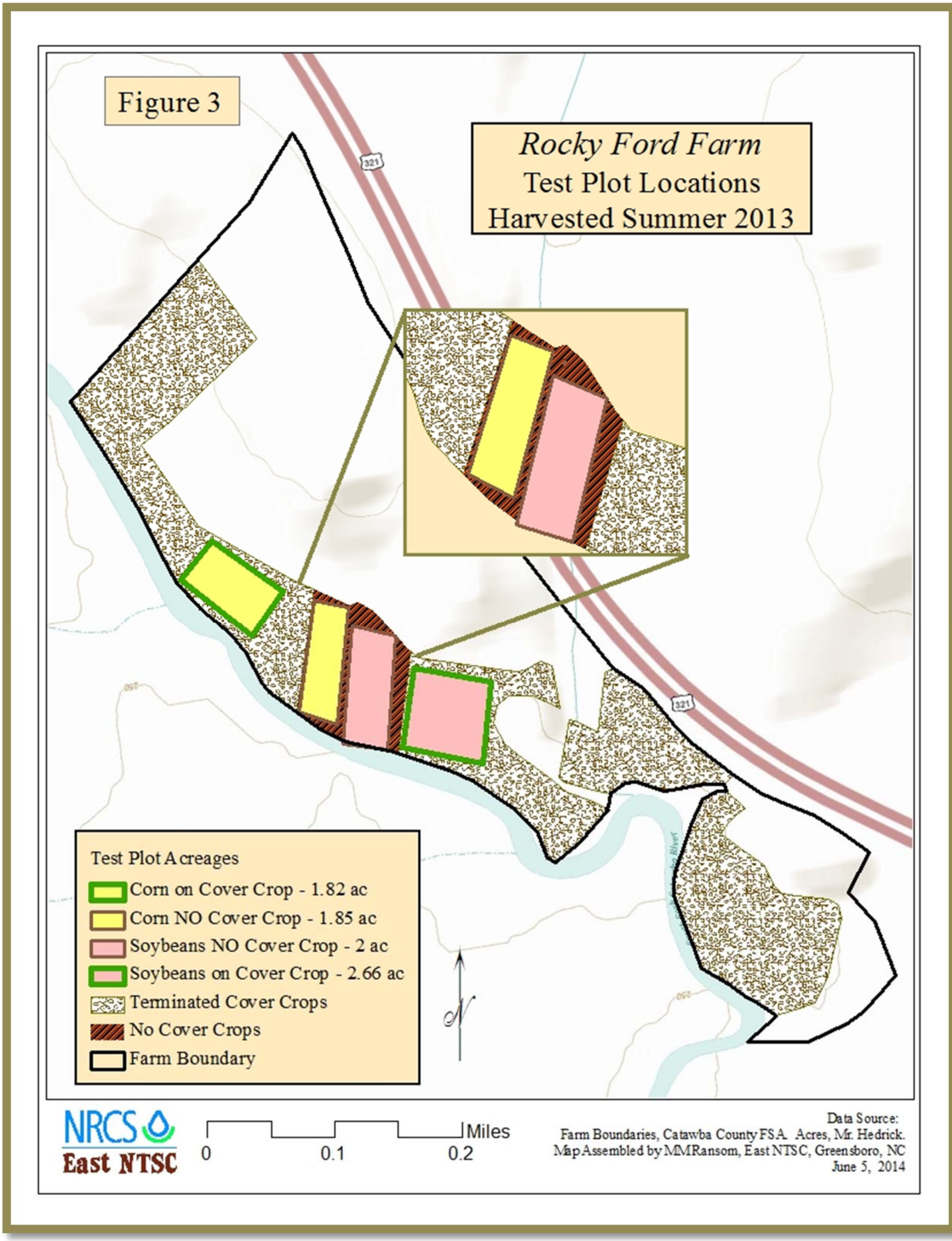
Figure 3
Rocky Ford Farm
Test Plot Locations
Harvested Summer 2013
321
Test Plot Acreages
Corn on Cover Crop - 1.82 ac
Corn NO Cover Crop - 1.85 ac
Soybeans NO Cover Crop - 2 ac
Soybeans on Cover Crop - 2.66 ac
Terminated Cover Crops
No Cover Crops
Farm Boundary
N
NRCS
East NTSC
0
0.1
0.2
Miles
Data Source:
Farm Boundaries, Catawba County FSA. Acres, Mr. Hedrick.
Map Assembled by MMRansom, East NTSC, Greensboro, NC
June 5, 2014

Soil Types on Test Plots: All four test plots have the same soil type. See Figure 4. When Mr. Hedrick chose the test plots based on the "lay of the land", he inadvertently chose areas which have the same soil type. The four test plots were on Congaree loam (CoA) which is approximately 87% of the CoA map unit. Congaree occurs on flood plains and in valleys where slopes are from 0 to 2%. Depth to a root restrictive layer is greater than 60 inches, the soil is moderately well drained, and water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high, shrink-swell potential is low, and although this soil is frequently flooded, it does not pond. Organic matter content in the surface horizon is about 3%. It is classified as Prime Farmland when not frequently flooded during the growing season.

The insert in Figure 4 also shows why care must be taken when using soils data. Notice that the map indicates that the Corn Cover Crop test plot contains two soil types, CoA and LcE, Leveled Clayey land. From field observations, we know the four test plots are all Congaree soil. The Congaree is flat but the LcE is abruptly more steep. If the Figure 4 Soil Survey Geographic (SSURGO) boundaries were accurate at this scale, then the yield calculations for Corn Cover Crop would be coming from two different soil types for that test plot and would not be comparable with the other test plots. However, we know the farmer did not farm on a slope in this area of the farm (see inset photo, Figure 2). So, what happened? The SSURGO data boundaries are not accurate at this scale. In fact, when one retrieves data from the Web Soil Survey and zooms down to this small geographic extent, one receives a warning that the data lines are no longer accurate. Thus, scale is important when drawing conclusions from the soils data. However, SSURGO is useful for displaying the big picture which is that test plots were on a soil type named Congaree and were, therefore comparable for crop yield purposes.

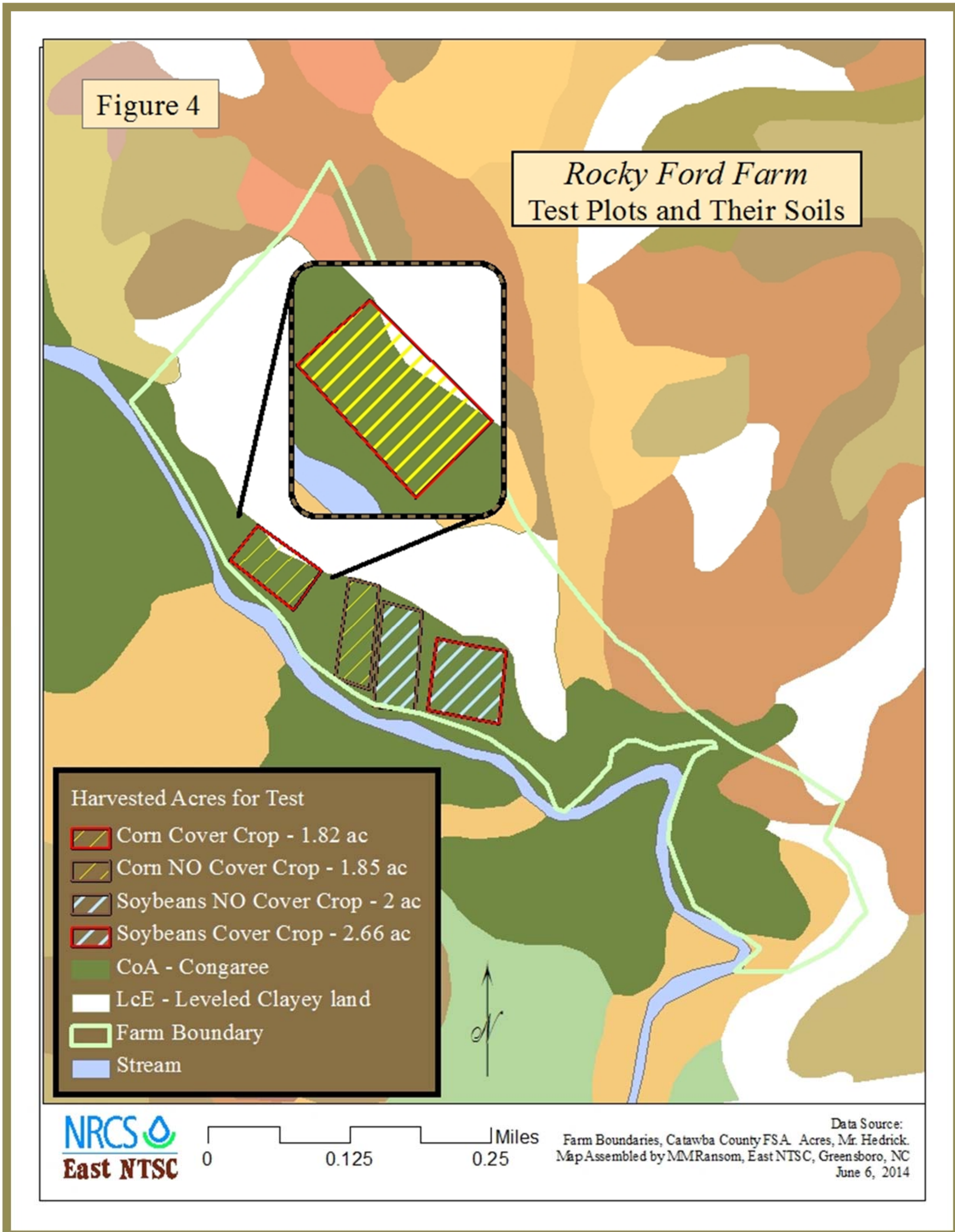

Figure 4
Rocky Ford Farm
Test Plots and Their Soils
Harvested Acres for Test
Corn Cover Crop - 1.82 ac
Corn NO Cover Crop - 1.85 ac
Soybeans NO Cover Crop - 2 ac
Soybeans Cover Crop - 2.66 ac
CoA - Congaree
LcE - Leveled Clayey land
Farm Boundary
Stream
N
NRCS
East NTSC
0
0.125
0.25
Miles
Data Source:
Farm Boundaries, Catawba County FSA. Acres, Mr. Hedrick.
Map Assembled by MMRansom, East NTSC, Greensboro, NC
June 6, 2014

Benefits due to Cover Crops: In this case study, benefits due to cover crops are defined to be the additional on-farm benefits, the additional direct benefits to the farmer. There are two sources of on-farm benefits: increased gross revenues due to increased yields, and decreased cash crop production costs.

Because Mr. Hedrick's corn and soybean prices were fixed contract prices, the increased gross revenue was due only to the increased yield. Previously, Table 9 showed the yield increases calculated by the farmer. Table 11 uses these to calculate the increased gross revenue.

Table 11: Additional Benefits Due To Cover Crop = Gross Revenue Increase + Production Cost Savings

Corn on Cover Crops, 16.25 acres			
1	Total Benefit, Whole Farm (gross revenue increase + production cost savings), $	$2,823.44	
2	Total Benefit Per Acre (gross revenue increase + production cost savings), $/ac	$173.75	
	Corn Benefit Breakdown		
3	Gross Revenue Increase per Acre, $/ac	$99.75	
4	Yield INCREASE due to cover crop, bu/ac		15
5	Price Received for corn, $/bu (at 15.5% moisture)		$6.65
6	Cash Crop Production Cost Savings	$74.00	
7	Reduced Nitrogen (100 units/ac @ 46 cents/unit), $/ac		$46.00
8	Reduced Herbicide, $/ac		$28.00
Soybeans on Cover Crops, 20.1 acres			
9	Total Benefit, Whole Farm (gross revenue increase + production cost savings), $	$5,638.05	
10	Total Benefit Per Acre (gross revenue increase + production cost savings), $/ac	$280.50	
	Soybean Benefit Breakdown		
11	Gross Revenue Increase per Acre, $/ac	$229.50	
12	Yield INCREASE due to cover crop, bu/ac		18
13	Price Received for soybeans, $/bu (at 13.5% moisture)		$12.75
14	Cash Crop Production Cost Savings	$51.00	
15	Reduced Nitrogen (50 units/ac @ 46 cents/unit), $/ac		$23.00
16	Reduced Herbicide, $/ac		$28.00
Corn + Soybeans, 36.35 acres			
17	Total Farm Benefits, Corn + Soybeans, $	$8,461.49	
18	Per Cover Cropped Acre Average Benefits, Corn + Soybeans	$232.78	

The total additional benefit from the cover crop on 16.25 acres of corn was $2,823.44 (Line 1). On a per acre basis, the additional benefit was $173.75 (Line 2), 57% of which was due to the increased yield (Line 3) and 43% was due to reduced corn productions inputs (Line 6). For soybeans, the additional benefit was $280.50/acre (Line 10), 82%, was due to the increased gross revenue (Line 11) and 18% was due to reduced soybean production inputs (Line 14). Rocky Ford Farm experienced a total benefit increase due to cover crops of $8,461.49 (Line 17), which averaged to $232.78/acre (Line 18).

Net Benefits due to Cover Crop: These are the additional net benefits due to cover crops. For the farmer, this is the additional profit, the additional money to keep after all of the cover crop costs are paid. Table 12 presents the net benefits for the first year of cover crop for the Rocky Ford Farm. Corn lost $21.39/acre profits in the first year (Line 1). Details about this are given later. In contrast, soybeans increased profits by $128.37/acre (Line 4). Line 10 shows the average farm net benefits from cover crop, averaged over corn and soybean acreages, in the first year was $61.42 per cover cropped acre. Thus, Table 12 shows that cover crops, on the average, more than paid for themselves in the first year.

Table 12: Additional Net Benefits from Cover Crop
Rocky Ford Farm, First Year of Cover Crop
Net Benefits from Cover Crop = Benefits from cover crops - Costs due to cover crops

1	**Corn Net Benefits** due to Cover Crop, $/ac:	-$21.39
2	Total Cover Crop **Benefit** (Table 11, Line 2), $/ac	$173.75
3	Total **Cost** per Corn Cover Crop Acre (Table 7, Line 10 for Corn), $/ac	$195.14
4	**Soybean Net Benefits** due to Cover Crop, $/ac:	$128.37
5	Total Cover Crop **Benefit** (Table 11, Line 10), $/ac	$280.50
6	Total **Cost** per Soybean Cover Crop Acre (Table 7, Line 10 for Soybeans), $/ac	$152.13
7	**Total Farm Net Benefits** from Cover Crops (**Corn + Soybean**), $	$2,232.68
8	**Corn:** Total Farm Net Benefits, $ (Line 1 * 16.25 ac)	-$347.59
9	**Soybeans:** Total Farm Net Benefits, $ (Line 4 * 20.1 ac)	$2,580.28
10	**Average Farm Net Benefits, $/ac:** Average of corn and soybean net benefits.	$61.42

Corn: There were two reasons why cover crop on corn reduced profits by $21/acre. First, costs for cover crop and corn planting were higher than they were for soybeans. Table 13.1 below presents details. Second, the yield increase for corn was 9%, whereas soybean was 35% (Table 9). Table 13.2 below shows the corn breakeven yield increase which would have resulted in corn cover crop paying for itself.

Table 13.1 presents the details of the corn cover crop costs which exceeded the soybean costs. Corn received higher seeding rates for three species (Line 2), and the higher seeding rates created higher handling and shipping costs (Line 3). Ryegrass, an expensive seed, was applied to corn but not soybeans (Line 4). The ryegrass in the corn cover crop required another herbicide treatment (Line 5). Finally, nitrogen was added to the corn planting because of the higher C:N of the cover crop residue (Line 6). Line 7 shows the total cover crop cost increase for corn amounted to $43.01. This type of information helps a farmer think about next year's cover crop species and seeding rates in the mix.

Although the cover crop on corn cost $43.01/acre more than soybeans, some of this cost was covered by the benefits, thus the loss was less than the cost increase.

Table 13.1: Why did Cover Crop for Corn lose in the First Year? Higher Costs due to Cover Crop Choices for corn.		
1	Net Benefit from Cover Crop Corn (Table 12, Line 1), $/ac	-$21.39
2	Higher Corn Cover Crop Cost due to Different Seeding Rates of Same Species (Table 2), $/ac	$6.44
3	Higher Seed Cost due to Higher Mixing & Bagging Costs (Table 6, Lines 5 & 12), $/ac	$0.73
4	Higher Corn Cover Crop Cost due to Ryegrass (Table 6, Lines 1 & 4), $/ac	$6.85
5	Higher Corn Cover Crop Termination Cost on Ryegrass (Table 7, Line 7), $/ac	$15.00
6	Higher Corn Planting Cost, additional N due to higher residue (Table 7, Line 8 for corn), $/ac	$14.00
7	Total Higher Corn Cover Crop Costs (Recall Table 7, Line 12), $/ac	$43.01

Table 13.2 illustrates the second reason corn lost, the yield increase did not cover the cost increase. This table shows that if the corn with cover crops had produced an additional 29 bu/ac, rather than the 15 bu/ac, then the corn cover crop would have broken even without reducing costs. The 29 bu/ac increase would have been a 28% yield increase, more in the neighborhood of the 35% soybean yield increase.

Table 13.2: Why did Cover Crop for Corn lose in the First Year? Yield Increase less than Cost Increase.		
1	Yield Increase due to Cover Crop (Table 9 for Corn), bu/ac	15
2	First Year Corn Cover Crop Costs actually incurred (Table 7, Line 10 for Corn), $/ac	$195.14
3	Price Received for Corn (Table 11, Line 5), $/bu	$6.65
4	Yield Increase Needed to Breakeven (Line 2 / Line 3), bu/ac	29

How good was the on-farm test? From a researcher's point of view, the on-farm test lacked (1) repetition of plots (Mr. Hedrick had only one plot for each of the four crop scenarios), (2) repetition of years (Mr. Hedrick tested for only one year), and (3) system comparison (the no cover crop acres should have received weed herbicide treatment when needed).

From Mr. Hedrick's point of view, his on-farm test was good enough to compare the field and plant dynamics throughout the crop year. The no cover crop acres reminded him of what he was considering to change. His test helped him compare the methods for preparing the fields for the cash crop; namely, bush hogging weeds versus terminating cover crop. He could compare the cash crop planting experience; no-till into dead weeds versus no-till into 2 inches of flattened biomass. Mr. Hedrick spent a lot of time in the fields during the cash crop season and he saw how cover crop protected the plants. After the heavy rains he could see the erosion from the no cover crop acres and saw very little soil erosion on even the cover crop areas with 50% residue carried away by a local flood. In general, Mr. Hedrick could observe cover crops and their effects by using the no cover crop acres as a benchmark to remind him what no cover crop production was like. Mr. Hedrick's on-farm test gave him a framework for observing differences throughout the cover crop and cash crop seasons. His on-farm test was good enough to give him the information he needed to be convinced that cover crops were good for erosion and weed control in his climate and his soil. And, according to his measurements, cover crops more than paid for themselves in the most expensive first year.

Partial Budget: Because this report is written for non-economists, it is important to explain "partial budgets" in order to correctly use this case study data. A partial budget looks at part of a larger budget. In this case study the partial budget looked at the cover crop part of the cash crop budget. The tables of costs and benefits presented thus far have shown the changes due to cover crop, the changes in cost *due to cover crops* and the changes in benefits *due to cover crops*. Table 14 shows how the cover crop partial budget fits into the soybean crop budget. This new budget is the "Enterprise Budget for No-Till Soybeans, Dryland with Cover Crop, First Year".

The total cost of growing soybeans with cover crop, first year, is $457/acre (Line 1). Of this, $152/acre is the first year cover crop cost (Line 2). The remaining production costs which are represented amount to $275/acre in variable costs (Line 3) and $30/acre fixed costs (Line 4). The production costs (Lines 3 & 4) are adapted from the University of Kentucky, Department of Agricultural Economics, "Corn and Soybean Budgets 2013". The Kentucky costs were in the ballpark of Mr. Hedrick's costs and were adapted to allow Mr. Hedrick's variable costs impacted by cover crops to be identified. The fixed costs were modified to represent equipment which is old and has been significantly depreciated.

The total benefits of growing soybeans with cover crop, first year, are $924/acre (Line 5). Of this, $281/acre is the first year benefit due to cover crops (Line 6). The remaining benefits are those Mr. Hedrick experienced from his no cover crop soybean acres (Line 7).

The net benefit of growing soybeans with cover crops was $467/acre (Line 8), of which $128/acre, 27%, was due to cover crops (Line 9) and the net benefits of $339/acre came from the no cover crop data (Line 10).

The important observation of Table 14 is to see how cover crops in this case study fit into to the total soybean production story. Table 14 shows that we need to clearly state how cover crops add value to pre-existing value. For example, in this case, rather than incorrectly saying "Cover crops earned $128 per acre", we would correctly say "Cover crops added $128 per acre to the existing profits of $339 per acre".

Table 14: Enterprise Budget for No-Till Soybeans, Dryland with Cover Crop, First Year

1	Costs, First Year	$457
2	Cover Crop Costs (Table 7, Line 10), $/ac	$152
	Learning, Soil Tests, Seeds, Drill, Monitoring, etc.	
3	No-Till Variable Costs, no rent *, $/ac	$275
	Nitrogen, bump start for Soybeans, $/ac	$23
	Herbicide, $/ac	$27
	Rest of the Variable Costs, $/ac	$225
4	Fixed Costs (equipment, taxes, insurance, other) *, $/ac	$30
5	Benefits, First Year	$924
6	Benefits due to Cover Crops (Table 11, Line 10), $/ac	$281
	Increased Yield, No Nitrogen, No Herbicide, Less Compost.	
7	Benefits w/o Cover Crop, $/ac	$644
	Soybean Yield, No Cover Crop (Table 10), bu/ac	50.5
	Soybean Price (Table 11, Line 13), $/bu	$12.75
8	Net Benefits (Line 5 - Line 1), $/ac	$467
9	Net Benefits due to Cover Crop (Line 6 - Line 2), $/ac	$128
10	Net Benefits w/o Cover Crops (Line 7 - Line 3 - Line 4), $/ac	$339

Source

* Adapted for this case study from University of Kentucky, Department of Agricultural Economics, "Corn and Soybean Budgets 2013", Greg Halich, Assistant Extension Professor.

Closing Thoughts about this Case Study:

NRCS Technical Assistance reduces the cost of cover crop transitions and increases the probability of success.

Conservationists can help farmers understand the importance of learning before buying the first cover crop seed. Technical professionals can show farmers useful learning tools, but the farmers must put time into learning. This case study demonstrates that learning and planning require significant costs in the first year but the farmer's money and time are wisely spent and the probability of success, even in the first year, is higher. Learning helps the first-time farmer understand what s/he observes in their fields and keeps the farmer from panicking when things do not "look right"; that is, do not look like what farmers think is normal.

When there are no local farmers successfully using cover crops, the first-time cover croppers must reach out to the technical professionals in USDA NRCS, ARS, and university agricultural extension for guidance about reliable information sources. When learning from technical professionals, farmers must learn their technical terms. There are no short-cuts. When there are no farmer-mentors, it takes longer to learn.

Although Mr. Hedrick's on-farm testing does not meet research standards, his test is what he needed to check-out what the experts say. How do the YouTube videos, the webinars, and the research results relate to his farm? He devised a way to check out the idea of cover crops for himself.

Mr. Hedrick put the major part of the Rocky Ford Farm in first year cover crop. Some professionals have observed that putting the new conservation practice on a large portion of the farm increases the probability of success because those acres cannot be ignored. Those acres must be taken seriously because they are an important part of the farm profitability. This is what Mr. Hedrick did. He risked most of the Rocky Ford Farm to cover crops and reserved small acreage for the benchmark no cover crop.

Finally, Mr. Hedrick's experiences in his first year of cover crops are summarized in the Appendix as a checklist other farmers, who are thinking about trying cover crops, can use in order to get a sense of the preparation which paid off for Mr. Hedrick.

Appendix

First Year Check List: This check list was derived from the experiences Mr. Hedrick had. These are steps Mr. Hedrick would recommend to someone thinking about cover crops, especially if they farm in a community which does not use cover crops. The check list has two parts: A - Before Buying the Cover Crop Seed, and B - After Buying the Cover Crop Seed. For the first year, the check list in A is a big one which involves learning and planning. The check list in B is short, one line.

A - Before Buying the Cover Crop Seed in the first year:

1 - **Seek** Technical Information: The local NRCS office can help you find reliable learning resources such as websites, YouTube videos, magazines, and books.

2 - **Find** a Mentor: A mentor is someone who will quickly answer your questions and make time to walk your fields to help you interpret what's going on. You want to find problems as early as possible.

3 - **Test** Soils: If you have never tested your soils, learn the soil sampling method. Sample your soils and send the samples to the laboratory local folks recommend.

4 - **Plan** Reading Time: Especially if you do not have a farmer mentor, plan to spend 10 hours/week for 12 weeks reading the recommended materials and finding answers to your questions.

5 - **Read** and understand all of the recommended materials. Keep asking questions as they arise from your readings.

6 - **Plan** Cover Crop Dates: Plan your cover crop planting and termination dates, plus/minus a few days, to be sure neither conflicts with your other activities.

7 - **Plan** Monitoring Time: Plan time to check your cover crops twice a week in the first month and once a week in the remaining cover crop months. This will enable you to find problems early and request a mentor field visit.

8 - **Plan** Termination Method: Make sure you have a specific cover crop termination plan before you buy the cover crop seed. This includes the herbicide and the equipment you will use.

9 - **Plan** Cash Crop Planting: Make sure you have the equipment for and understand planting through at least 2 inches of cover crop biomass.

10 - **Choose** Cover Crop Mix: Use the soil test results, your technical advisors, your intended cash crop, and your budget to choose the cover crop mix and the seeding rate for each species.

11 - **Purchase** Cover Crop Seed: Find a cover crop seed supplier who sells high quality seeds at the best prices. Make sure you know all of the charges: the seeds and the mixing/handling/shipping charges.

B - After buying the cover crop seeds proceed with your cover crop plan. There is nothing more to say because everything has been thought-out and planned in part A. You know your calendar, plus/minus a few days, you know your cover crop mix, you have the equipment figured out, you know how to terminate, and you know how you will plant into the cover crop biomass. You are prepared for the surprises that weather and equipment will bring because you have a strong knowledge base and have made a support network.

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