

Cover Crop Conundrum

A Decision Case Study

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“We’ve got a problem, Dirk,” stated farm hand Al Detert. “The corn in the south field is just not germinating. In some spots, not only is the plant not there, but I can’t find the seed, either. That field has been a pain all spring. First it was the cover crop not dying and now the corn’s not growing. What are we going to do?”*

Dirk Peterson’s south central Minnesota family farm was established in 1872. Over the years, the farm had been managed by various family members and had seen numerous crop rotations and livestock operations come and go. When Dirk himself began farming the land in 1988, he raised conventional corn and soybean and also feeder pigs. The 1990s were less than ideal, however. In 1999, a farm auction was held and, in 2001, Dirk made the decision to stop farming and rented the farm to a neighbor for alfalfa production.

Even though he was no longer farming, Dirk continued with agriculture. He began working for an independent corn and soybean seed testing program, which took him throughout the western portion of the Corn Belt. He continued to keep an eye on the family farm and started taking a closer look at organic production. Even though much of Dirk’s time was focused on hybrid and variety seed plots, he still made time to learn what he could about organic production by attending events, such as the University of Minnesota Southwest Research and Outreach Center’s

** While these cases describe actual situations, names have been changed.*

Annual Organic Crops Day. He also made a point to talk to experienced organic farmers from around Minnesota.

As time went on, Dirk began to miss farming. He soon realized that his work with the seed testing program could help to finance the transition to organic crop production on his farm and that the current crop of alfalfa being raised there by his neighbor offered an ideal opportunity to transition. In 2004, Dirk harvested the first transitioning organic acres on his family farm. As the organic transition process slowly unfolded, Dirk was seeing organic corn yields averaging 165 to 185 bushels per acre in the first few years after the alfalfa.

By 2014, Dirk Peterson was a seasoned organic farmer with 360 acres of certified organic land, 280 of which he owned and 80 that he rented. He raised organic corn, soybean, oats, winter wheat, and canning peas. Corn averaged around 145 bushels per acre and made up the majority of Dirk’s crops. Since 2008, he had also been the owner and manager of an independent seed-testing program in Minnesota. One full-time employee, Al Detert, joined him at that time and became his “right-hand man.”

Emerging Challenges

As time went by, Dirk Peterson saw his organic corn yields drop and weed pressure increase in certain areas of the farm, particularly from foxtail. He'd seen soybean aphids hinder his organic soybean production and had done his best to get contracts for early harvested crops like oats or canning peas. He'd learned the ins and outs of the National Organic Program (NOP), particularly when it came to inputs and rotation (see *EXHIBIT A: USDA'S National Organic Program*). And, he'd also done what he could to learn about cover crops (see *EXHIBIT B: Cover Crop Resources*); Dirk initially became interested in them as a way to increase fertility and decrease weed pressure.

Cover crops have the potential, when managed correctly, to be quite beneficial when included in a crop rotation, whether conventional or organic. Depending on the species or mixture chosen, cover crops can decrease erosion, weed pressure, nutrient loss, and compaction; increase organic matter, water infiltration, and nutrient cycling; and serve as alternative forage. The use of cover crops can be risky, especially during wet springs or droughty falls. Crop insurance also has specific rules regarding summer/fall establishment and spring termination.

Dirk and Al first started using cover crops in 2009. Hairy vetch was planted after organic winter wheat in late summer of that year. Spring of 2010 found the hairy vetch coming through its winter dormancy in such a vigorous way it made the use of tillage as the termination method a bit tricky. Spring termination went moderately well, but the hairy vetch roots had a tendency to ball up around the field cultivator. There was still

quite a lot of residue later in the spring and Dirk felt that this inhibited some of the corn germination and made row cultivation for weed management difficult.

Trials with Cover Crops

In fall of 2010, Dirk joined a bi-state cover crop program administered by two non-profits and managed by an Extension Educator from the University of Minnesota. That year he used a cover crop of mostly oil seed radish planted in mid-August after organic oats. Annual ryegrass was also mixed in with the oil seed radish on the headlands and there was one strip of Austrian winter pea and one strip of hairy vetch. Very little of the annual ryegrass or hairy vetch overwintered that year; therefore, little termination was needed in the spring of 2011.

Unfortunately, the crop season of 2011 ended poorly. The area of south central Minnesota where Dirk's farm is located experienced torrential rains in late September. Massive flooding ensued; his hometown was cut off from the rest of the area for a few days. The result was a much needed clean-up and a delayed harvest. A cover crop was not planted that fall because of the adverse weather.

Dirk and Al's experiences with cover crops continued into the spring of 2012. Warm early-spring weather that year permitted farmers to plant spring grains quite early. Dirk took this

"I want to love cover crops. I want to love winter cereal rye, in theory, but wet springs make it tough"...

opportunity to plant a spring cover crop of oats on all of his acres. He eventually terminated the oats with tillage and planted his cash crops.

The growing season of 2012 also provided Dirk with the opportunity for a fourth trial of cover crops. He and Al planted winter cereal rye after organic corn in the fall. Though late in the year and dry, the rye germinated and it went into winter looking fairly well.

Unfortunately, the spring of 2013 made management and termination of the winter cereal rye difficult. The snowy and then rainy spring of 2013 not only made termination of the previous season's cover crop difficult, but it also made the establishment of the 2013 cash crop nearly impossible. So, Dirk's fifth experience with cover crops was to establish them on prevent plant acres. The cover crop species that year consisted of a mixture of winter cereal rye, hairy vetch, and oil seed radish, but, since the opportunity presented itself, Dirk also planted a demonstration plot that consisted of two planting dates and multiple cover crop species that would winter kill. Winter took its toll on the cover crop plot and the oil seed radish as planned; while the winter cereal rye and the hairy vetch broke dormancy in the spring of 2014, again, as planned. Unfortunately, they began growing right about the time that the rains started, delaying cover crop termination once again.

The spring of 2014 once again found the winter cereal rye cover crop difficult to kill.

Rains didn't allow for timely or simple termination. The result was that the ground was worked twice before canning peas and four times before corn. As the germination of the corn finally began, it was clear that something had gone wrong. The stand was less than ideal and the reason was difficult to determine. Was it compaction from the tillage? Or the new starter fertilizer? Could it have been the planting depth? Or might it have been competition or allelopathy from the winter cereal rye?

"I want to love cover crops. I want to love winter cereal rye, in theory, but wet springs make it tough" admitted Dirk. And, looking back on the past several springs, one could readily understand what Dirk meant (see *EXHIBIT C: Cover Crop Timeline*). Should he continue to use cover crops? If so, should he continue to use winter cereal rye for weed suppression and ease of establishment in Minnesota? Should he switch to cover crop species that don't overwinter? Should he return to including alfalfa in the rotation? Or perhaps clover? An answer was needed soon since the cover crop planting date was only weeks away. What should Dirk do?

Exhibit A. USDA'S National Organic Program

The Organic Foods Production Act was passed by the United States Congress as part of the 1990 Farm Bill. To bring about a uniform United States organic agriculture production and marketing system, and to ensure integrity within that system, the United States Department of Agriculture (USDA) developed the National Organic Program (NOP). The NOP administers the USDA organic regulations.



The NOP organic standards and regulations describe the specific requirements necessary before a farm and its products can be certified and labeled USDA organic. USDA organic certification for crops verifies that synthetic fertilizers, certain prohibited pesticides, genetically modified organisms, irradiation and sewage sludge were not used in their production. Information about organic regulations can be found in the Electronic Code of Federal Regulations. One example of USDA organic regulations is the following:

Title 7 – Subtitle B – Chapter 1 – Subchapter M – Part 205 National Organic Program
 §205.205 Crop rotation practice standard.

The producer must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provide the following functions that are applicable to the operation:

- (a) Maintain or improve soil organic matter content;
- (b) Provide for pest management in annual and perennial crops;
- (c) Manage deficient or excess plant nutrients; and
- (d) Provide erosion control.

For additional information about the United States Department of Agriculture's National Organic Program, visit the following website: <http://www.ams.usda.gov/AMSv1.0/nop>.

Exhibit B. Cover Crop Resources

The farmer in this decision case study began serious cover crop resource collection with the assistance of a University of Minnesota Extension Educator. This specific Extension Educator had a focus in cover crops and was able to share experiences and suggest reliable resources.

The following is a short list of the most commonly used resources for the farmer and the Extension Educator:

United States Department of Agriculture Sustainable Agriculture Research and Education (SARE), which focuses sustainable agriculture efforts in grants, education, and outreach.

- *“SARE's mission is to advance—to the whole of American agriculture—innovations that improve profitability, stewardship and quality of life by investing in groundbreaking research and education.”*
- USDA SARE “Managing Cover Crop Profitably, 3rd Edition”
 - The 3rd Edition was published in 2007 and contains detailed information about cover crop management, potential benefits, and species.
 - <http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition>

The Midwest Cover Crop Council (MCCC)

- The Midwest Cover Crops Council was developed in the late 2000’s and seeks to increase the amount of continuous living cover in the Upper Midwest. Both agricultural and ecological benefits, such as increased soil health and improved water quality, can be obtained with this practice. It is a regional collaboration that includes multiple Midwestern states and one Canadian province and people from all aspects of agriculture and academia.
- Minnesota Cover Crop Decision Tool
 - The *Cover Crop Decision Tool* is an initiative by MCCC to consolidate cover crop information by state, county, and individual field. Information for Minnesota’s tool was developed by a team of cover crop experts including university researchers, Extension educators, agency personnel, and farmers. With the help of MCCC representatives, the team reviewed and refined information from the Sustainable Agriculture Research and Education (SARE) publication “Managing Cover Crops Profitably, 3rd edition.”
 - Minnesota’s Cover Crop Decision Tool team was chaired by the Extension Educator that assisted our farmer.
 - <http://mcccdev.anr.msu.edu/VertIndex.php>

Exhibit C. Cover Crop Timeline

Season	Cover Crop	Cold Tolerance	Outcome
Late Summer 2009 to Spring 2010	Hairy vetch cover crop planted after winter wheat cash crop.	Hairy vetch usually overwinters in MN.	Hairy vetch cover crop overwintered. Spring termination of the cover crop using tillage was difficult and interfered with planting the cash crop.
Late Summer 2010 to Spring 2011	Oilseed radish/annual ryegrass cover crop mixture planted after oats; one strip each of Austrian winter pea and hairy vetch also planted after oats.	Radish and winter pea do not usually overwinter in MN. Annual ryegrass usually does not overwinter in MN when fall planted. Hairy vetch usually overwinters in MN.	Barely any annual ryegrass or hairy vetch cover crops overwintered. Spring tillage was used to terminate what did make it through winter.
Summer 2011 to Spring 2012	None	n/a	No cover crop was planted due to flooding in fall 2011.
Spring 2012	Oat cover crop planted before cash crops.	Oats are tolerant to cool spring temperatures.	A cover crop of oats was planted spring 2012 since a cover crop was not able to be planted fall 2011. The cover crop was terminated by tillage after 4-6 weeks of growth.
Fall 2012 to Spring 2013	Winter rye planted after corn.	Winter rye overwinters in MN.	The winter rye overwintered well. Termination using tillage was difficult that spring. No cash crop was planted due to rain.
Late Summer 2013 to Spring 2014	Due to wet conditions, no cash crops were planted. Instead, a cover crop mix of winter rye/hairy vetch/oilseed radish was used. A few rows of mixes that included oats/radish/turnip were also planted.	Winter rye and hairy vetch overwinter in MN. Radish, turnip, and oat do not overwinter in MN.	Some hairy vetch and all winter rye overwintered. There were difficulties in terminating the cover crop with tillage due to rain. The cash crop was negatively affected.

Teaching Notes:

Case Objectives:

- Understand the USDA National Organic Program guidelines regarding rotation and cover crops.
- Become familiar with the potential benefits and risks of using cover crops in a farm system.
- Understand the production and economic risks of using cover crops.
- Determine a valid reason for either continuing or discontinuing the use of cover crops.

Use of the Case:

This case is developed for use by extension educators, post-secondary instructors, state agency personnel, and others interested in increasing understanding of the organic transition process.

Materials Needed:

- Copies of the decision case study/ies on which to make notes as participants read.
- A laptop and projector to show slides of the farm, the markets, and the farm family. It could also be used to project discussion questions, certification requirements, or other materials of interest.
- A “U” or horseshoe-shaped seating arrangement for maximum participation among participants and the facilitator.

Dealing with Controversy:

Often in the discussion of a decision case study, participants will disagree about certain issues. While this is a mark of an effective case, the facilitator should keep the discussion from becoming argumentative and unproductive. Participants should be reminded that there are many points of view and to keep the discussion atmosphere constructive and nonthreatening. If desired, techniques such as role-playing or role reversal can help participants discuss the issues in a less personal way.

Use the following strategies to facilitate a productive, healthy discussion where controversy may be involved:

- Establish ground rules. These may include: allowing only one person at a time to speak; no one should speak twice before everyone has had a chance to speak once; no criticizing of others’ comments, etc.
- Encourage participants to use “I” messages when stating their viewpoint. Avoid using “you” or blaming statements.
- Ask clarifying questions such as, “Why do you think that?” A major communication problem is misunderstanding what was said.
- Ask participants to try to imagine the situation from the other person’s point of view. (Role-playing can also help with this.)
- Encourage participants to focus on what they want in the future or where they would like to go, rather than where they have come from or what has happened in the past.

Lesson Outline:

Discussion of this decision case study can last from 20 to 60 minutes, depending on the degree of preparation by the participants and the desired depth of the discussion. The outline below is one example of the way a facilitator might structure the discussion. In general, a decision case study discussion is a forum where participants talk to each other in addition to the facilitator. The format described here is useful when advanced preparation of the participants is not possible. If desired, the facilitator can include additional information on local crop production and social issues to enhance discussion and create a broader understanding of those topics.

- Introduction
- Facilitator introduces the case study and describes the goals and approach to be used
- Focus on a real situation
- Practice problem solving
- No single right answer – each person and situation is unique
- The Decision Case Study
- Facilitator introduces the decision case study.
- Participants read or reread the narrative of the decision case study
- Facilitator divides the participants into small groups of 2-4 people and asks them to discuss questions.
- Participants return to large group and share key points of their discussion
- Facilitator guides a group discussion on the remaining questions
- Conclusion
- Group members may select a preferred option or facilitator may have participants write individually and describe their decision in response to the dilemma and the rationale for the response
- Closing comments

Discussion Questions:

Below are examples of the kinds of questions the decision case study facilitator can use to stimulate discussion of the issues in this case. Participants may discuss some of these questions in groups of two to four and some questions as a large group. The questions used can vary depending on your time limit and the issues you wish to discuss. Other questions may be added as needed and appropriate to the situation.

1. What are Mr. Peterson's objectives in including cover crops in his crop rotation?
2. What are Mr. Peterson's options for cover crops in his current rotation?
3. How does the management of cover crops that winterkill and cover crops that overwinter differ?
4. What are the benefits for Mr. Peterson's crop rotation if successful use of cover crops occur?
5. What are the risks for Mr. Peterson regarding use of cover crops in his rotation?
6. Do you think Mr. Peterson should continue using cover crops in his rotation? Why or why not?
7. If Mr. Peterson decides to no longer continue using cover crops in his crop rotation, what other options does he have to meet his objectives? How do those outcomes compare to the outcomes from using cover crops in rotation?



The following resolution to the case study, along with an analysis, is offered for the benefit of the instructor in preparing for leading a discussion of the decision case study. The information it contains and the final resolution of the decision case study may or may not be disclosed to discussion participants, at the instructor's discretion. Should the resolution be shared with participants after the discussion takes place, the authors suggest debriefing the epilogue and final decision with the students.

Epilogue:

As a farmer that was formerly using conventional methods to grow corn and soybean and as a manager for a conventional seed-testing company, Dirk Peterson had to drastically change his personal farm management when he transitioned to organic production. New crops, new pest management, new equipment, and the addition of cover crops are just some of the challenges he faced. This particular decision case study, however, focused on cover crops and the difficulties Dirk was having.

For multiple years, weather was not a friend to Dirk. The reliance on tillage as the cover crop termination method coupled with wet, sometimes saturated, soils made spring cover crop termination difficult. In 2014, Dirk and his agronomist came to the conclusion that the poor germination of his organic corn was the result of the combination of weather conditions and seed corn maggot pressure. There was a slightly higher seedling count in the winterkilled cover crop plots, but the stand was still poor. The result was that basically the entire field had to be replanted which pushed the corn planting

date well into June. Another disappointing year, to say the least.

What could Dirk Peterson do? The National Organic Program has specific rules about a certified organic farm's rotation and the use of cover crops. On top of that, Dirk personally does not want to altogether abandon cover crops. At the time of this publication, the farmer was looking into a few different alternatives to his cover crop conundrum. First, he was contemplating putting alfalfa back into the rotation. However, this would require that he market the alfalfa forage to other farmers since he did not have livestock. A second option was to still utilize cover crops, but to plant cover crop species that would winterkill, such as oats, radish, and field peas. This could possibly require the addition of early-harvested cash crops such as the canning peas and small grains that Dirk grew before. A third option discussed was keeping a winter cereal grain in the cover crop mix, but instead of winter cereal rye, use winter triticale or winter wheat. These two species tend to be less aggressive in the spring and are not quite as winter hardy.