



Case Study: Building healthy soil using cover crops



Oats cover crop at peak growth

Ken Nixon farms 1,500 acres near Ilderton in Middlesex County. The cash crop operation consists primarily of a corn, soybean and wheat rotation, but Ken has also grown edible dry beans. Over the past 15 years, Ken's tillage intensity has transitioned from moldboard, chisel, and disk plowing to strip tillage. Currently, strip-tilling is done following wheat harvest, while the remaining crop rotation is no-tilled.

Concerns:

Ken was concerned with nutrient loss from the field following the application of manure. Since the manure is not incorporated, there is a risk of losing nutrients through volatilization (passed off as vapour) or in runoff. Ken also wanted to increase the organic matter in the soil.

Solution:

Ken decided to plant a single-species cover crop following wheat harvest to help in the uptake of nutrients from surface-applied manure and to improve soil health.

Benefits:

Planting cover crops has addressed Ken's concern of losing nutrients from manure. As the cover crop grows, it takes up nutrients from the applied manure. These nutrients are held over the winter and made available to the cash crop planted the following spring.

Other benefits Ken has seen include improved soil health and resiliency, as well as reduced erosion.

- The cover crop's roots improve soil structure, reduce soil compaction, and increase infiltration of excess surface water.
- Cover crops add organic matter to the soil which encourages beneficial soil microbial life. Ken has noticed enhanced decomposition of crop residue due to increased soil microbial activity.
- Quick growing cover crops hold soil in place, reducing surface runoff and soil erosion.
- Cover crops help to conserve soil moisture, making cash crops less stressed during drought conditions. During the dry summer of 2012, Ken estimates that his yield was 30-35 bushels/acre more than neighbouring farms that do not use cover crops.
- Manure odour is reduced and is usually diminished within 24 hours.

Another benefit Ken hopes to gain from cover crops is the sequestration of carbon, an element of soil that Ken believes is most important in crop agriculture. The high organic matter provided by cover crops translates to good soil.

“There is something about a dense green canopy that allows activity [in the soil] to occur. You put a canopy over [the organisms] and they will work.”



Oats as a cover crop provide excellent ground cover and high biomass.

Experimentation:

Ken has used a variety of cover crop species, each providing different functions and benefits to soil health. Below are a few species Ken has tried over the years, along with some characteristics and soil benefits.

Red Clover

- Establishes slowly
- Overwinters but can be terminated by herbicide
- Nitrogen fixer
- Taproot can help alleviate soil compaction
- Weed suppression

Radish

- Establish quickly
- Winterkills
- Nitrogen scavenger
- Deep taproots can help alleviate soil compaction
- Weed suppression
- Nematode suppression

Oats

- Establish quickly
- Winter-kills
- Nitrogen scavenger
- High biomass
- Decrease soil erosion
- Weed suppression

Ken's concerns on using cover crops:

When Ken first started using cover crops, he was concerned about the cost of the seed as well as finding the right seeding rate. It took several tries before Ken found a seeding rate he was comfortable with. Ken was also worried about matching the nutrient release from the cover crop with the timing that best benefits the subsequent main crop.

Multi-species mixes are increasing in popularity. A cover crop species that survives the winter, other than red clover, could potentially take up nutrients in the spring from cover crops terminated the previous fall. Terminating that surviving cover crop in the spring would then provide those nutrients to the main crop. However, a cover crop that survives the winter could become a weed the following spring or host a pest. Both of these potential issues could cost more to deal with than any benefit the cover crop offers. Ken continues to experiment and become more educated on cover crops, in hopes of finding answers to some of these concerns.

Ken's advice on using cover crops:

- Know what goal you are trying to achieve by using a cover crop.
- Talk to someone who has used cover crops to learn from their successes and failures.
- A change of mindset from cash crop to cover crop is essential. A cover crop is not going to grow the same way as a typical cash crop; having low above ground biomass is acceptable for cover crops as root growth is beneficial to the soil.
- There is a learning curve to using cover crops, so do not give up if the first attempt is a failure.
- You may not see a positive return from using a cover crop in the next cash crop rotation, but it may benefit two crop rotations down the road.