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How and When to Plant No-till

Planting no-till can be tricky and scary! Successful no-till depends on having fully functioning healthy soils and efficient nitrogen (N) recycling. Fully functioning soils have higher soil organic matter (SOM) especially the active carbon, sugars, and root exudates from live roots that allows the soil to crumble. This leads to good soil structure, improved drainage, increases water infiltration, and higher soil gas exchange. This aerobic (more oxygen) environment plus the food source (live cover crop (CC) roots) changes the microbial community from one dominated by bacteria (conventional soils, often anaerobic (no oxygen)) to a balanced system with beneficial fungi (mycorrhizal), good nematodes, healthy aerobic bacteria, and protozoa. The "no-till time line" or transition period is often 3-7 years depending upon how fast and aggressive cover crops, continuous no-till, and manure have been used to promote a fully functioning healthy soil.

Soybeans are hardy, easy, and most simple crop to no-till. Since they are legumes and make their own N, nitrogen is not a problem. Planting green into a CC (most likely cereal rye or radish) may increase yields 5-7 bushel. Cereal rye and radish have an allelopathic (weed killing) effect. Radishes die in the winter and improve soil structure. Cereal rye has fast spring growth, dries out the soil (.25 to .33 inches/day), reduces *Phytophthora* and *Rhizoctonia*, and reduces soybean cyst nematodes. Planting green into cereal rye (boot stage) has been very effective. Let the soybeans grow several inches and then terminate (crimping or spray). If the soil starts to dry out and get hard, terminate CC immediately.

Some farmers like to kill the CC first. Kill the CC at least 2-3 weeks early, because cereal rye that is half dead will hair pin, bind, and wrap; causing planter problems. The worst-case scenario is killing the cereal rye first when it is tall, then getting a rainy spell that forms a mat which reduces soil drying. Plant green and then terminate CC later OR kill CC really early for successful no-till soybean planting.

No-till corn requires more management. The 4R's to no-till corn planting is right time (early N at planting), right rate (40-60# actual N), right form (mainly ammonium or urea), and right place (below the soil surface, 2"X2" or 2"X4"). Corn yield is determined in the first 10-15 days and

highly dependent on good N management. Typical soils release 1-3% N from SOM yearly. With 1,000# N per 1% SOM, a 2% SOM soil releases about 20# N (2,000# N * 1%). A healthy soil with 4% SOM may release 80-100# N (4,000# N @ 2 to 2.5%). Most of this N release occurs later in the growing season with increased soil temperature and moisture.

For no-till corn, planting green into a legume (winter pea, hairy vetch, Balansa or crimson clover) or radish with sharp disc blade openers is the easiest and the safest. The extra legume N at planting improves corn growth and the roots improve soil structure. Most no-till corn issues occur due to poor soil structure and non-functioning soils, depending on the 3-7 year no-till soil transition timeline. Planting corn green into a grass cover crop can be risky, due to the lack of N. Each .1 to .15 increase in SOM from decomposing CC requires 100-150# of additional N to feed the microbes and decompose the residue, so corn can turn yellow (lack of N) because it is competing for N. Healthy fully functioning soils have higher SOM and faster N turnover (healthy microbes) and fewer issues.

The “green bridge” is another issue with corn. When a CC is killed, the soil microbial levels increase rapidly. When these microbes run out of food, they look for other substrates to consume. A young lush emerging corn seedling can become a target, especially if anaerobic (lack of oxygen) and saturated soil conditions occur when the soil is not yet fully functioning. Killing the cover crop at least 2-3 weeks early or planting green into a cover crop and terminating the CC after the corn to emerges (after V2-V3), allows corn seedlings to avoid or reduce this issue. Worst-case scenario is killing the cover crop 2-7 days before or 1-2 days after planting in wet or saturated soils, promoting both pathogens and planting issues (hair pinning). Veteran no-tillers have few planting issues once they have fully functioning healthy soils.