

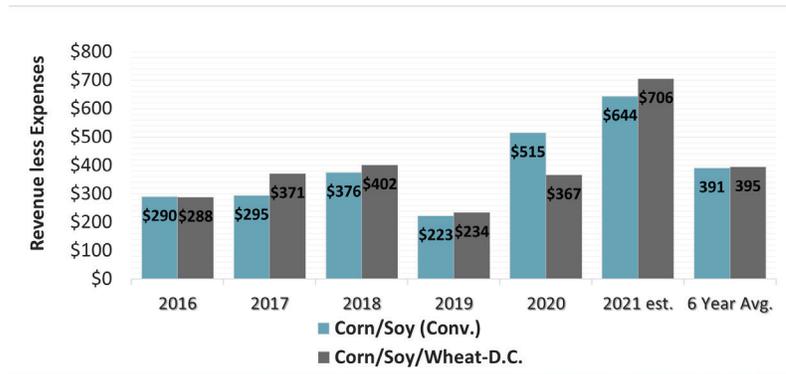
May 2022 Investment Insight

Evaluating agronomic systems for yield and tile nitrate loss – what we’ve learned

With support from NREC over the past six years, Eric Miller, Lowell Gentry, and Dan Schaefer have transformed Eric Miller’s working farm in Piatt County into a comprehensive agricultural research site. One of their goals is to better understand the effect of soil carbon management on tile nitrate loss. To provide a gradient of carbon inputs to the soil, they developed four agronomic systems to evaluate crop yields, carbon inputs, and tile nitrate loss. These systems are 1) C-S-W, corn-soybean-wheat rotation with double crop soybean after wheat and cereal rye after corn; 2) C-S, corn-soybean rotation conventionally managed; 3) C-C, continuous corn, and 4) C-Ccr, continuous corn with cereal rye. Note: only C-S receives full width tillage and fall N application, while all other systems either receive strip-till for corn or no-till for wheat and soybean.

A lesson learned early in the study is that the agronomic system can have a dramatic and immediate impact on tile nitrate loss; but now after accumulating six years of data, Eric Miller has conducted a one-of-kind economic evaluation across the systems. In the

figure below, Eric demonstrated that the 3-year rotation (with double crop soybean after winter wheat and cereal rye after corn) can compete financially with the conventionally managed corn and soybean rotation.

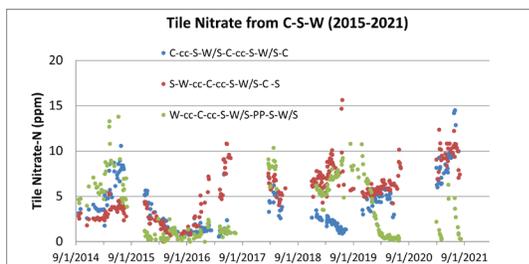


Economic evaluation for conventionally managed 2-year rotation ((Corn/Soy (Conv.)) versus the 3-year rotation of corn-soybean-wheat/double crop soybean (Corn/Soy/Wheat-D.C).

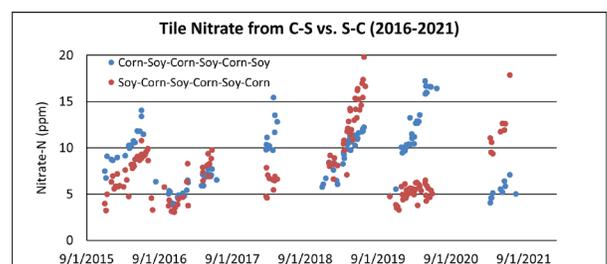
Tile monitoring during this same time period showed that the 3-year rotation reduced tile nitrate by 33% compared with the 2-year rotation. Cereal rye ahead of soybean provided the best opportunity to add carbon to the system and reduce tile nitrate loss (See figures below to compare tile nitrate from C-S-W vs. C-S).

In 2021, crop yields were excellent for both C-S-W and C-S. Crop yields in C-S-W were greater than in C-S for corn (241 vs. 228 bu/A) and soybean (84 vs. 80 bu/A). Overall, winter

wheat with double crop soybean was the most productive system (wheat = 106 bu/A and soybean = 53 bu/A) and produced the greatest net return of any phase of the rotation in 2021. Yields have been similar between C-C and C-Ccr; however, there was a 5 bu/A advantage with cereal rye this year (236 vs. 231 bu/A). In addition, cereal rye reduced tile nitrate in continuous corn by 10% in 2021 (data not shown).



Tile nitrate concentrations from each cropping sequence within the C-S-W rotation from the fall of 2014 through the 2021 drainage season (three fields represented with blue, red and green dots).



Tile nitrate concentrations from both cropping sequences within the C-S rotation from the fall of 2015 through the 2021 drainage season (two fields represented with blue dots and red dots).

