UT Extension
W 311-A

Row Crop Sustainability

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A popular topic in the media and among consumers in our culture right now, agricultural sustainability has many misnomers surrounding it. Sustainable agriculture does not necessarily mean organically grown or locally sourced or non-GMO. **Sustainable agriculture at its simplest means to be able to produce the food and fiber we currently need while allowing future generations that same opportunity.** This means efficiently managing our natural resources such that we don't deplete or otherwise negatively impact soil quality, water quality and water quantity. Sustainability not only includes environmental goals, but should be economically and socially sound as well.

This means that an unprofitable management practice that is environmentally beneficial is not necessarily sustainable, nor is a profitable management practice that negatively impacts the environment. This fact sheet, the first in a series, will introduce general concepts and practices that are essential to sustainable row crop production. Subsequent fact sheets will provide in-depth, localized information on each of the management practices introduced here.

Sustainable Practices for Conventional Agriculture

There are many management practices that can enable producers to reduce or more efficiently use their crop inputs while maintaining or increasing productivity, leading to economic as well as environmental benefits. These practices include, but are not limited to, the following:

1. No-Till

No-till management is a cropping practice that minimizes soil disturbance and maintains crop residues on the soil surface as cover.

According to the National Agricultural Statistics Service, approximately 80 percent of Tennessee's production acres are no-till. This practice has substantially decreased the amount of soil loss occurring in our state.

The University of Tennessee Institute of Agriculture

2. Soil Sampling

The most basic, yet beneficial, tool for row crop nutrient management is soil testing. Soil tests help you determine which nutrients need to be applied, how much of the nutrients should be applied, and, on multiple scales, where in the field to apply the nutrients. Soil tests also inform you if lime needs to be applied to achieve an optimum soil pH. Nutrient availability and crop growth are greatly affected by soil pH. See Extension publication "PB 1061: Soil Testing,"[1] for more detailed information on soil sampling techniques.

Often, a blanket rate application leads to overapplication of crop fertilizers in some areas of the field and underapplication in others. Site-specific soil sampling, utilizing either grid or zone sampling techniques, in combination with variable rate application (VRA) of fertilizers is a beneficial and effective tool for row crop producers to manage natural soil fertility variability. By targeting fertilizer inputs to specific areas of the field, row crop producers can maximize profitability and reduce the risk of nutrient runoff or leaching. See Extension publication "W 306-A: Site-Specific Soil Sampling,"[2] for more detailed information on precision soil sampling techniques.

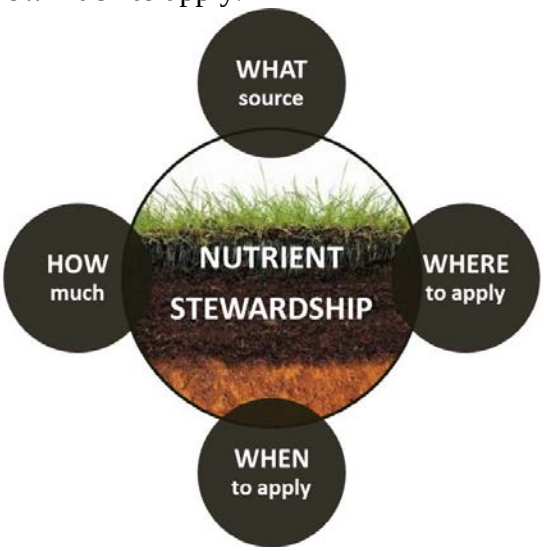
3. Cover Crops

Cover crops are grasses, legumes or small grains planted in the fall and terminated before planting of the row crop in the spring. Cover crops are known to have many beneficial effects on cropping systems, such as improvements in soil health and function, erosion control and nutrient management. Cover crops improve soil quality by increasing organic matter, and, thus, microbial activity; increasing aggregate stability; and promoting infiltration. Additionally, cover crops promote nutrient cycling and provide other soil fertility benefits. Legume species have the potential to fix atmospheric nitrogen and can provide a substantial amount of nitrogen for the subsequent row crop to utilize.

More recently, cover crops have been used for early-season weed suppression, which has the potential to further reduce chemical inputs and relieve some of the pressures of herbicide-resistant weeds.

4. Nutrient Stewardship

Nutrient stewardship consists of proper nutrient management practices that can not only increase row crop production efficiency, but also ease the environmental stresses related to fertilizer application and diminished water quality. The basis of this concept is to precisely manage nutrients on the farm by considering **what** source to apply, **when** to apply, **where** to apply and **how** much to apply.

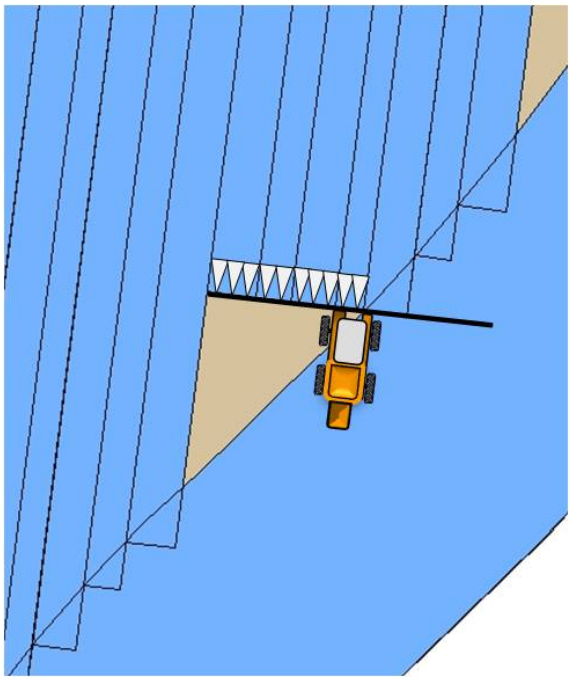


A fertility program should be based on all of these aspects; for example, when selecting what source to apply, the timing, placement and rate also should be considered. There is no one-size-fits-all management strategy, and the nutrient management decisions are specific not only to individual producers, but also to individual fields.

5. Precision Agriculture Technologies

Precision agriculture technologies dispense or apply desired amounts of crop inputs such as seeds, pesticides and fertilizers in specific areas of an agricultural field in order to maximize productivity. There are several technologies commercially available to monitor and apply these production inputs based on the Global Positioning System (GPS)/Global Navigation Satellite System (GNSS) location of farm equipment in the field and on application maps.

One example of this technology is Automatic Section Control (ASC) for row crop planters and sprayers. As the planter or sprayer travels across the field, the controller continually checks to see if sections are passing over previously planted or sprayed areas or areas that have been mapped as no coverage zones. When a planter or sprayer section passes into these areas, it is turned off automatically and turned back on when it passes back into unplanted or unsprayed areas. Reducing off-target chemical application errors with sprayer equipped ASC can improve profitability by reducing chemical costs and losses to the environment.



Variable rate application of fertilizer allows the right rate of nutrients to be put in the right location. This technology has the potential to reduce nutrient inputs and increase nutrient use efficiency. In turn, the use of VRA may reduce the amount of nutrients that could ultimately pollute nearby streams, rivers and reservoirs.

6. Improving Water Use Efficiency

Irrigation scheduling tools can significantly improve water use efficiency by supplying water when the crop needs it and not overapplying. Soil moisture sensors can signal you about when the soil profile is low in available water, and scheduling tools such as UT's MOIST[3] (Management of Irrigation Systems in Tennessee) program can help you make decisions about when to turn your irrigation system on. MOIST uses a water balance approach, which keeps track of how much water exits a crop's root zone via plant transpiration/surface evaporation and how much enters by rainfall and irrigation. This scheduling approach enables you to efficiently maintain soil water in a range that will optimize yield.

Importance

Sustainability is not an end-goal; it should be a continuous effort among all agricultural sectors. There are many practices that can reduce environmental impacts while maintaining or improving farm profitability. Producers should consider adopting practices that can work on their farms, focusing on the well-being of our environment as well as the overall profitability of their farming operation.

References

1. Savoy, H. and D. Joines. Soil Testing. UT Extension PB 1061. https://utextension.tennessee.edu/publications/Documents/PB1061.pdf
2. Buschermohle, M., L. Duncan, and H. Savoy. Site-Specific Soil Sampling. UT Extension Publication W 306-A.
3. Leib, B. Management of Irrigation Systems in Tennessee (MOIST). http://www.utcrops.com/irrigation/irr_mgmt_moist_intro.htm

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