GUEST COLUMN

Born Into Royalty – How Midwest Cropping Rotations Can Benefit from the Queen of Forages

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Alfalfa has long been known as the "Queen of Forages" due to the many characteristics loved about the crop – high forage quality, high yield, stand persistence, nitrogen fixation, the list goes on. Ask a farmer what they love about alfalfa and they will likely reel off a similar list of key crop qualities alfalfa encompasses. But they may forget about one of alfalfa's advantages desirable in modern agricultural cropping systems – **sustainability**. The perennial life cycle of alfalfa makes it a great candidate to extend a Midwestern crop rotation and improve soils degraded by uninterrupted annual crop rotations, such as corn-soybeans. When it comes to improving soils through farming, alfalfa boasts its royalty status in this realm as well.

Although not a novel conversation, sustainability in agriculture has undeniably gained traction in recent times. There are many ways a farmer can transition to more sustainable agronomic practices, but adding alfalfa to the crop rotation is a good place to start for building soils. Management strategies of soils are highly correlated to their quality and health. Based on a survey of Wisconsin farmers conducted by The Sustainable Corn Project, soil organic matter rated as the top contributing factor to soil quality. To maintain and improve soil organic matter, alfalfa should be a priority crop in a rotation.

What makes alfalfa a great choice? Alfalfa rooting systems are massive facilities of soil improvement. According to Jackson et al., root biomass and root exudates are up to 5x more likely to become soil organic matter than aboveground plant biomass due to their location in the soil and their instantaneous contact with soil microbes when they die. The deep extensive rooting systems found beneath alfalfa are much more likely to be converted to larger amounts of soil organic matter than crops like corn and soybeans. The substantial below-ground biomass accompanying alfalfa gives an advantage over other crops simply due to the larger volume of roots. Decomposition rates found at the depths alfalfa roots extend to are slower than near the surface, giving microbes more time to process dead roots and convert them into soil organic matter, which also means a sustained release of organic matter over time. Continuous maintenance of living roots in soils provides an uninterrupted regenerative flow of carbon in the soil, sustains soil microbial populations, and reduces erosion so important soil improvement work remains in the field. The perennial nature of alfalfa eliminates the requirement of annual tillage, which prevents carbon losses from soil oxidation, reduces nutrient losses, and helps improve soil aggregation.

Common two-year crop rotations such as corn-soybean allow frequent fallowing of soils and often decrease soil organic carbon content. Long-term research has found that in predominantly continuous corn or corn-soybean rotations, there is usually a net zero accumulation of carbon, or even carbon losses. However, the same research has found that when alfalfa is included in these rotations for at least 3-4 years at a time, a significant amount of carbon is stored. This positive carbon storage is even continued when there are years of annual cropping, as the large net positive accumulation of carbon from the alfalfa offsets the carbon lost during those years of annual crop cultivation. Extending the crop rotation with a perennial forage like alfalfa can increase the organic carbon content of soils and improve soil health. Improving the carbon flow back into soils can make them more productive, more biologically active, and most importantly, successful for the next generations of farmers.

The benefits derived from alfalfa are not constrained strictly to the environment and cultivated soils. Although alfalfa is not viewed as a cash powerhouse like corn and soybeans, alfalfa can still be quite profitable for many farmers, while responsibly improving the land for the next set of cash crops. So, we should ask ourselves, is the "Queen of Forages" also the "Queen of Sustainability?"

Resource: csanr.wsu.edu/soil-biology-and-soil-organic-matter/