

## The Benefits of Shorter Rotations which Include Alfalfa

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It's no secret that the key to crop profitability is production per acre. Since fixed costs remain the same and variable costs increase just slightly, when you aim for higher yield, then it's clear – the higher the yield, the higher the profit. Given the high cost of fertilizer the last several years and the volatility of fertilizer prices, it is especially important to review your cropping practices to ensure you maximize profitability by maintaining high yield and making best use of nitrogen units. In this article we will look at the benefits of including forages in a rotation and how shorter rotations seem to produce the greatest yield benefit.

The benefits of alfalfa in a rotation are clear. First there is a simple 'rotation effect' which is the improvement in yield due simply to having a legume mix in the rotation (not doing continuous cropping). This can be worth 10-15% more yield. Then there is the benefit of the residual nitrogen that a forage crop which includes legumes can return to the soil to benefit the following crop and reduce your cost of production.



Plowing down a good stand of alfalfa can provide 160lb of N-credit, which is most of what next year's corn crop needs. Alfalfa and other forage crops have a particularly beneficial effect on improving soil structure by adding organic matter, by penetrating the soil deeply with taproots (in the case of alfalfa) which improves drainage, and by improving soil aggregation and tilth. Having alfalfa based forage in the rotation will break disease and insect cycles (corn rootworm or soy cyst nematode for instance). Alfalfa is deeprooted and will scavenge deep nitrogen and reducing nitrate loss which might otherwise occur with more shallowrooted crops like cereals or corn. Dan Undersander (University of Wisconsin) points out that "perennial crops reduce erosion from cropping systems due to their providing continual ground cover".

Not even no-till checks erosion like having a perennial crop in the rotation. A hay crop in rotation can also help control weeds, especially now when we see lots of use of RR crops. Horsetail (*Equisetum arvense*, maretail) can be a problem in corn/soy rotations, but add alfalfa to the plan, cut 2-4 times a year and the horsetail is gone. Undersander also mentions that "a couple years of forage in a six-year rotation creates "stability" in the system. Income is more consistent year to year with forage in your system". Numerous studies also point out that forages will

improve soil water holding capacity and therefore make subsequent crops more able to tolerate dry conditions.

The advantage of a shorter rotation (seeding year plus 2-3 production years) is that yield of alfalfa and of corn (whether grain or silage) is kept as high as possible and so is forage quality. It has been shown that average first production year yield of alfalfa can be 10.5 t/ha while second production year yield can be 10 t/ha (an average of 10.25 t/ha). Third & fourth production years average 8.9 t/ha yield, a drop of 1.35 t/ha or 13% less yield. You wouldn't plant a corn variety you knew yielded 10-15% less than what you know you can get, so why settle for 10-15% lower alfalfa yield? The younger stand also produces more N credit, which in turn cuts cost and boosts corn yield.

So the advantages of rotations are many, and the advantages of short rotations are higher hay yields, higher forage quality, higher corn yield, reduced pesticide use and better N credits. Younger stands are also more likely to overwinter well. It is true that shorter rotations mean that you will be seeding more often, but a University of Wisconsin study on rotations shows that "spending a little additional may cause a larger increase of income and result in greater profit" (D. Undersander).