

Nitrogen Credit Contribution by Alfalfa to Corn

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Alfalfa is well known for enhancing yield of grass crops like corn that follow it in rotation. Alfalfa benefits are due not only to the addition of biologically fixed nitrogen (N), but also to rotation effects including reduced disease and weed pressure and increased soil organic matter and aggregation. Taking advantage of alfalfa's rotational benefits reduces fertilizer and pesticide costs and boosts yields.

Nitrogen fixation. As with all legumes, alfalfa has the ability to "fix" atmospheric N₂ into forms usable for its growth. Biological N₂ fixation occurs through an association of alfalfa with a soil bacterium that causes growth of nodules on lateral roots. The alfalfa plant supplies energy and nutrients to the nodule, and in turn, the bacterium reduces gaseous N₂ from the soil atmosphere into N compounds and ultimately into amino acids useful for protein syntheses in the alfalfa plant. On average, alfalfa fixes 150 to 200 lb/N/yr. This process provides much of the N needed for alfalfa growth, and incorporation of an alfalfa crop often supplies all the N needs of a subsequent non-legume. Because alfalfa will also take up soil N in lieu of fixation, alfalfa N fixation is usually greatest on low N soils such as sands.

Alfalfa N credits. Alfalfa can provide a significant amount of N to subsequent crops in rotation and can replace the application of synthetic N fertilizer. This means reduced fertilizer cost and reduced fossil fuel consumption to produce the fertilizer. Based on experimental results, the University of Minnesota provides the following N credit recommendations for alfalfa. These recommendations are for alfalfa harvested by early September with an average amount of fall regrowth. With greater amounts of fall herbage regrowth, N incorporation will be greater.

It is important to note that reduced N contribution occurs with less stand density because of less herbage, root, and crown yield. Younger stands (1-2 years old) with greater density have the potential for greater N contribution than older stands. N credits and recommendations vary within a region so consult your state's recommendations.

Nitrogen credits for first and second year corn following incorporation of alfalfa last harvested in early September. (Nitrogen credits should be subtracted from the N fertilizer rates normally applied to corn)

Alfalfa stand density Plants/ft ²	N Credit	
	1st Year	2nd Year
	----- lb/acre -----	
≥ 4	150	75
2 - 3	100	50
≤ 1	40	0

Source: Rehm, Schmitt, Lamb, and Eliason. 2001. Minnesota Extension Service BU-06240.