

Section 7 Example: Estimating Crop Nutrient Requirements and Credits

Crops Grown: Corn, Soybeans, Alfalfa

$$\text{Corn Nitrogen Need (lb/ac)} = 35 + (1.2 \times \text{EY}) - (8 \times \text{NO}_3\text{-N ppm}) - (0.14 \times \text{EY} \times \text{OM}) - \text{other N credits} \quad (1)$$

$$\text{Corn Phosphorus Need (lb/ac)} = \text{Removal Rate} \times \text{EY} \times \text{Years} - \text{P Credits} \quad (2)$$

EY = expected yield (bu/ac) = most recent 3-year yield average x 1.05 (3)

NO₃-N ppm = average nitrate-nitrogen concentration in the root zone (2 to 4 ft. depth) in parts per million,

OM = percent organic matter.

Years = Number of years crop P needs to be met by a single manure application

Other N credits = Legume Credits + Past Manure Credits + Commercial Fertilizer Credit + irrigation water. (4)

Other P credits = Past Manure Credits + Commercial Fertilizer Credit. (5)

Removal Rates	Units	N	P ₂ O ₅
Corn	lbs/bu	---	0.31

Nutrient need for legume crops (pounds). Assumes 60% of legume fixed N is from manure.

$$\text{Legume Manure N Need (lb/ac)} = 0.6 \times \text{Removal Rate} \times \text{EY} - \text{Other Credits} \quad (6a)$$

$$\text{Legume Manure P Need (lb/ac)} = \text{Removal Rate} \times \text{EY} \times \text{Years} - \text{Other Credits} \quad (6b)$$

Removal Rates	Units	N	P ₂ O ₅
Soybean	lbs/bu	3.5	0.79
Alfalfa	Lbs/T.	46.2	9.3

Commercial Fertilizer Credit (N and P): All commercial fertilizers applied are credited at rates equal to the full N and P values.

Irrigation Water Nitrate Credit:

$$\text{Irrigation credit (lbs. N/ac.)} = \text{Inches applied} \times \text{ppm Nitrate-N} \times 0.227 \quad (7)$$

Legume Nutrient Credit (N only):

Previous Crop	Nitrogen Fertilizer Credits (lbs./acre)	
	Medium/Fine Soils	Sandy Soils
Soybeans	45	45
Soybeans < 30 bu./ac. due to season-long stress	1.0 lb./bu.	1.0 lb./bu.
Sugar beet tops, followed by dry beans	100	100
Alfalfa (70-100% stand, >4 plants/ft ²)	150	100
Alfalfa (30-69% stand, 1.5 to 4 plants/ft ²)	120	70
Alfalfa (0-29% stand, <1.5 plants/ft ²)	90	40

Past Manure Application Credit (N only):

$$\text{Organic N Credit} = \text{Manure Application Rate} \times \text{Organic-N content} \times \text{Factor} \quad (8)$$

Factor for Next Year: 0.15

Factor for 2 Years From Now: 0.07

Factor for 3 Years From Now: 0.04