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NebGuide

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G 73-20

Fertilizing Through Center Pivots

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There are two decisions and three sources of information that are needed before applying fertilizer solutions through a center-pivot sprinkler system.

DECISIONS NEEDED:

1. The amount of nitrogen to be applied per acre through center-pivot sprinkler system.

a. The total amount of nitrogen to be applied per acre is usually determined by yield goals, information on the amount of nitrate nitrogen stored in the top 3 feet of soil from soil tests and past history of cropping and fertilization.

b. The total amount of nitrogen required by a crop may be split into several applications at various stages of growth and/or times of the growing season. (See NebGuides for fertilizing various crops)

As an example (not a recommendation) a nitrogen fertilizer program may suggest a total application of 200 pounds of nitrogen per acre for corn. Of the total amount to be applied, 10 pounds may be applied in the starter fertilizer at planting time, 100 pounds as a sidedress or preplant, and 90 pounds through the irrigation system (split into 3 irrigations at the rate of 30 pounds per irrigation).

On very sandy soils some operators omit the sidedress and/or preplant applications.

A nitrogen program for irrigated grass pastures and other crops would be entirely different than corn. (See NebGuides for fertilization of other crops).

2. The kind of fertilizer solution to be applied, Table 1.

a. Combinations of urea and ammonium nitrate solutions work the best through all sprinkler systems. Aqua ammonia and anhydrous ammonia cause problems in that the ammonia precipitates the salts in the irrigation water, causing the sprinkler nozzles to plug; even small amounts of ammonia in the fertilizer solution may cause this problem in some irrigation waters.

The problem may be partially or completely taken care of by the addition of approximately 5 pounds (1 gallon) per 10 million gallons of water of crystalline sodium hexametaphosphate, injected into the irrigation water just ahead of the fertilizer solution.

INFORMATION NEEDED:

1. The number of acres that will be irrigated in one revolution of the center-pivot sprinkler. That is, the area irrigated with the system in one circle, Table 2.

2. Amount of time required to make one revolution of the center-pivot sprinkler system. See Manufacturers Operator's Manual for your system. The time will vary from 18 to 120 hours for a revolution, depending on the capacity of irrigation system, water holding capacity of the soil, and crop irrigated.

3. The rate at which your proportioning pump can inject a fertilizer solution into the irrigation system. See Manufacturers Operator's Manual for proportioning pumps settings (adjustments) for various flow rates.

Table 1. Amount of various nitrogen fertilizers required to give 20, 30 and 40 pounds of available nitrogen per acre.

Kind of fertilizer solutions	% Nit.	Wt. per gal. at 60° F. (lb)	Rate of N per acre, lb.		
			20	30	40
Urea-Ammonium Nitrate	28	10.65	6.7	10.0	13.4
Urea-Ammonium Nitrate	32	11.06	5.7	8.6	11.4
Ammonium Nitrate	21	10.73	8.9	12.4	17.8

Table 2. Computing number of acres irrigated per revolution of center-pivot sprinklers with various length systems.

Length (radius) Center-Pivot Sprinkler ft.	Acres/irrigated/revolution		
	End Sprinkler OFF all the time	End sprinkler ON in corners	End sprinkler ON all the time
400	12	14	16
500	18	20	23
600	26	31	33
700	35	41	43
800	46	52	55
900	58	65	69
1000	72	80	83
1100	87	95	100
1200	104	114	117
1300 ^{a/}	122	130	136
1400	141	153	157
1500	162	175	180
1600	185	195	200
1700	208	221	227
1800	234	247	253
1900	260	275	282

^{a/} One-fourth section size - Circle inside of 160 acres

CALCULATION STEPS:

- Step 1 - Decide on amount of nitrogen fertilizer you want to apply per acre.
- Step 2 - Decide on the kind of nitrogen fertilizer you want to apply (Table 1).
- Step 3 - Determine the number of gallons of fertilizer solution needed per acre (Table 1).
- Step 4 - Determine the number of acres irrigated per revolution of center pivot (Table 2).
- Step 5 - Multiply gal/acre of fertilizer solution times acres irrigated per revolution (Step 3 times Step 4).
- Step 6 - Determine the amount of time for the center-pivot sprinkler to make one revolution. (See center-pivot Manufacturers Operator's Manual and recommendation for your soil and crop).
- Step 7 - Calculate the rate of flow of fertilizer solution into the irrigation system. Divide gallons of fertilizer solution needed per revolution (Step 5) by total time in hours per revolution (Step 6).
- Step 8 - See Operator's Manual of Manufacturers proportioning pump for the setting on the pump.

Example	Your Field
30 lbs of N/ac	_____
sol. 32% N	_____
8.6 gal/ac.	_____
130 ac.	_____
1.118 gal/rev	_____
84 hours	_____
13.3 gal/hr	_____

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