Irrigation Systems

Center pivot systems

Since center pivots were first introduced in 1947, irrigation uniformity has increased and lower operating pressures have decreased pumping costs. Pivot irrigation of corn offers several advantages over furrow. Generally, growers can improve application efficiency by 20 to 60% by converting to center pivot, saving valuable water and reducing the potential for nitrate leaching. Additionally, growers can more accurately "spoon feed" nitrogen through center pivots during the maximum uptake period, potentially improving yield and nitrogen uptake.

Select sprinkler packages according to slope and soil type to correctly match nozzle application rate to soil intake rate and to reduce runoff. A common misconception about sprinkler packages is that in-canopy (drop nozzles) greatly reduce evaporation, drift loss and water use. However, this water savings is overstated (Table 23) and if not properly designed and managed, in-canopy sprinklers can reduce yield due to poor uniformity and run off. In-canopy sprinkler management includes circular row layout (increasing uniformity) to prevent sprinklers from hanging on plants when crossing rows.

Irregular areas are due to decreased wetted diameter of in-canopy sprinklers. Years of above normal precipitation will mask poor water distribution, but crop yields suffer in years with below normal precipitation.

Top photo J.S. Schneekloth
Bottom photo D. Yonts

Table 23. Water losses of three sprinkler packages, during a single one-inch application from USDA research in Texas*. Major water loss from above-canopy sprinklers was not due to drift or evaporation from sprinklers, but from plant canopy evaporation. However, canopy evaporation can be beneficial by cooling the plant,

	Above canopy	In canopy	LEPA**
	--------------------*water loss in inches*--------------------		
Air evaporation and drift	0.03	0.01	0.00
Net canopy evaporation	0.08	0.03	0.00
Plant interception	0.04	0.03	0.00
Evaporation from soil	Negligible	Negligible	0.02
Total water loss	0.15	0.08	0.02
Percent water delivered onto soil	85%	92%	98%

* Schneider and Howell, 1995
**Low energy precision application

Table 24. Peak application rate and potential runoff for 700 gpm center pivot with silt loam soil* with three wetted diameter sprinkler packages.

	Wetted diameter	Peak Application Rate	Potential Runoff
	feet	inches/hr	%
LEPA	3	40	40
In canopy	6	21	24
Above canopy	50	2.5	0

* Field slope = 0 - 1%. Runoff potential increases with increased slope.

Above-canopy sprinklers have lower application rates than those in the canopy or LEPA (Table 24). Nozzles placed farther into the canopy decrease wetted diameter due to decreasing the water's lateral travel distance and from canopy interference. With greater wetted diameters for above-canopy irrigation, the potential for runoff is less. The intensity of irrigation determines potential runoff as well as nozzle placement. With the increased potential for runoff, producers must incorporate basin tillage to capture and prevent irrigation water from moving. In the canopy, the maximum distance between nozzles should be 5 feet for better application uniformity. If nozzles are further apart, application will be irregular, affecting crop growth and yield (see Figure 30).

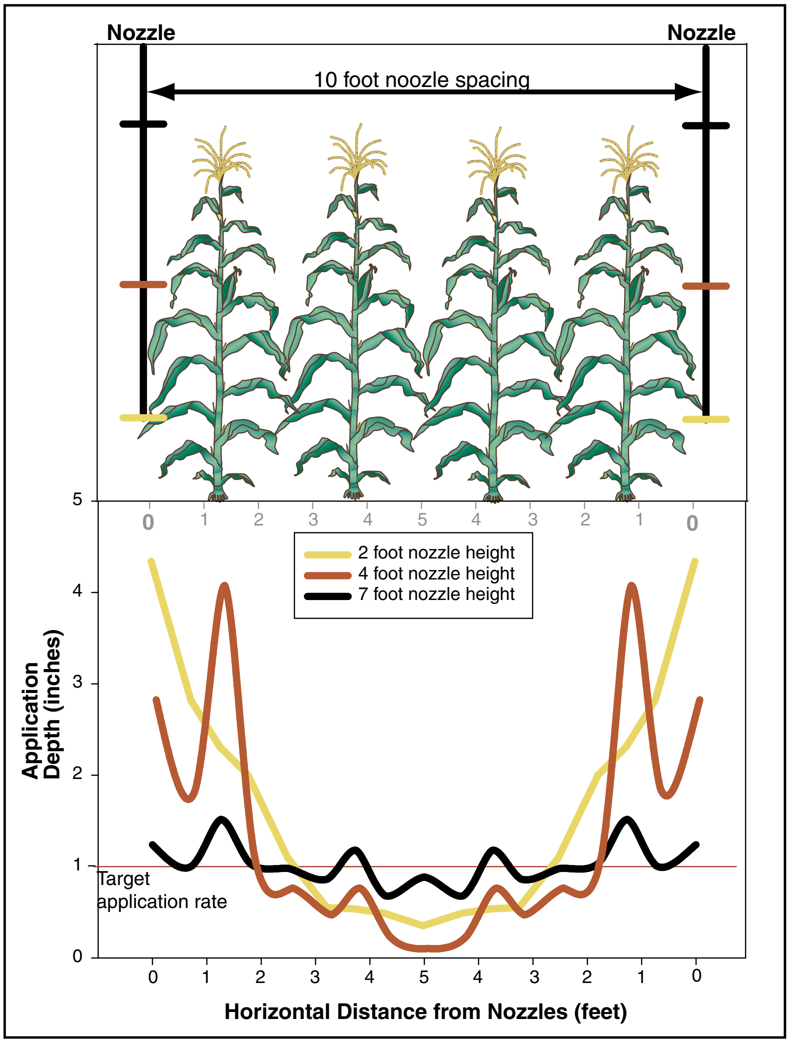

Figure 30. Nozzle placement in the canopy affects the distribution of water*. With nozzles placed four or two feet high, most water falls three feet from the nozzle compared to more uniform distribution with nozzles placed at seven feet.

*Data Source: F.L. Lamm, Kansas State University

BMP

Reduce water application rate to ensure no runoff or deep percolation occurs during chemigation sets and avoid chemigation when additional water is not needed by the crop.

Adjust irrigation schedule to account for water applied during chemigation.

Monitor and inspect chemigation equipment and safety devices regularly to determine proper function.