SKIP irrigation pattern provides greater crop uniformity

Did you know the movement pattern of set-move irrigation systems, like wheel lines and handlines, affects the uniformity of the irrigation and thus the uniformity of the crop?

The SKIP irrigation pattern described below provides higher yields and better crop quality. Understanding movement patterns, system offsets, soil type, and soil water basics can greatly improve the management of a field and provide maximum production.

Striving for uniformity in irrigation water is a huge piece of the puzzle in creating uniform crops, which ensures maximum production from all areas of the field. However, many beginning irrigators do not realize that adjusting how the system moves down the field affects irrigation uniformity. Managing the movement pattern of the irrigation system and utilizing offsets ensures that the crop is neither overwatered nor under-watered in different parts of the field.

Movement patterns

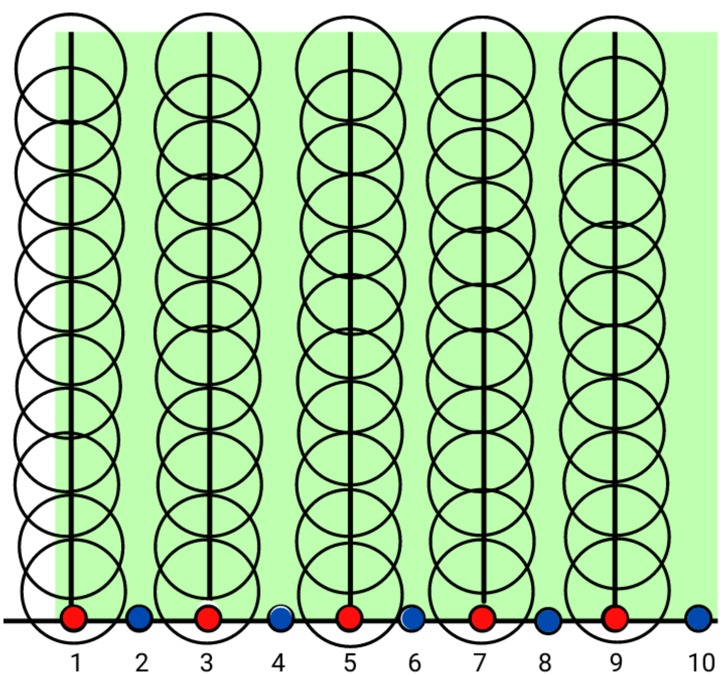
TAXI, WIPE, and SKIP are typical movement patterns used with wheel lines and handlines. The TAXI pattern irrigates every riser down the field (risers 1–10 sequentially). Next, the system is walked empty back to the beginning of the field and the cycle starts over. This is a viable pattern; however, it is unfavorable because of the time needed to walk the system back across the field to start over, especially a handline that is typically loaded and unloaded on a trailer.

The WIPE pattern irrigates every riser down the field (risers 1–10 sequentially); after a 12- to 24-hour delay the irrigation begins the opposite direction (risers 10–1 sequentially). This system addresses the labor issue of the TAXI pattern but results in too much water at the end of the field when the system is turned around and water-stressed

plants on the opposite end because of the long interval time between irrigations. This option is not recommended because of overwatering and yield loss due to water stress.

Unlike the other patterns, the SKIP pattern balances labor needs with uniform irrigation application. The SKIP pattern irrigates every other riser on the way down the field (odd risers), then irrigates the missed risers on the way back (even risers). This pattern results in more frequent irrigations with smaller amounts of water in the overlap areas and ends, resulting in uniform coverage in a timely manner and less likelihood of overwatering an area or water-stressing the crop. The SKIP pattern provides higher yields and better crop quality when compared to TAXI and WIPE. Numbering or color coding the risers can make this pattern easier to implement in a field.

The movement pattern evenly distributes the water across an entire field; however, it does not entirely account for the imperfect application of water from the sprinklers. To improve application uniformity, the irrigation can be offset, which is when the wheel line or handline is offset from the riser. The offset is typically 20 to 30 feet to the right or left of the riser. This offset is maintained for the duration of the irrigation cycle, which is one entire irrigation pass on the field (all risers). The next irrigation cycle should be set at the riser or offset to the opposite side of the riser.



SKIP movement patterns for wheel lines and handlines.

Irrigation offsets

An offset's shifted position averages application depths to an entire field, increasing application uniformity. This management technique is particularly important for systems running on the lower side of operation pressure (40 psi) or constant day/night diurnal wind patterns. Extreme diurnal wind patterns can also be compensated for by changing the start time by 12 hours. For example, instead of starting the first riser at 6 a.m., delay the start time until 6 p.m.

The next factor is determining irrigation set times, which is the duration of the irrigation per location. Typically, 12- or 24-hour set times are desired to minimize the labor to move sets. An 8-hour set time is another option but is not as common because of the additional set in a day. Set times are often determined on an irrigator's time availability or personal choice.

Determining irrigation sets

Matching the irrigation set to the type of soil and its water holding capacity (available water) is the ideal way to select an irrigation set. Different soil types have different water holding capacities (Table 1). A basic summary is that sand does not hold as much water as clay or silt.

Water holding capacity is the difference between field capacity and permanent wilting point. One must know the basics of soil water to understand this range. Water, either from precipitation or irrigation, is held within the pore spaces between soil particles. These pore spaces fill with water until they reach saturation (mud); the excess water drains out over time.

After the excess water is drained, the soil holds a certain amount of water against gravity's downward pull. This amount is called field capacity. The opposite end of field capacity is permanent wilting point, which is when the soil has dried to the point where the suction of the soil on the water is greater than a plant's ability to absorb it; this is also the point where plants will not recover regardless of the amount of water applied.

The available water (water holding capacity) needs to be maintained at a certain percentage to prevent significant yield loss. For example, pasture grass needs 50 percent or more of the available water to prevent yield loss. The rooting depth of the crop is another factor in considering available water. Deeper rooted crops have access to more water than shallowly rooted crops.

Soil Texture	Available Water in/ft
Coarse sand	0.2–0.8
Fine sand	0.7–1.0
Loamy sand	.08–1.3
Fine sandy	1.1–1.6
Loam	1.2–2.0
Silty loam	1.8–2.5
Silty clay loam	1.6–1.9
Silty clay	1.5–2.0
Clay	1.3–1.8
Peat mucks	1.9–2.93

Table 1. *Typical water holding capacity ranges for various soil textures.*

Keep in mind that plants require the same amount of water and nutrients regardless of the soil type. The same amount of water is required for lighter soils as for heavier soils. The difference is that lighter soils need to be irrigated more often and in smaller amounts.

To estimate your water holding capacity, identify your soil type in Table 1, then multiply that by the rooting depth of the crop. For instance, pasture grass with a rooting depth of 3 feet, grown on silty loam, would be 1.8 in/ft × 3ft, or 5.4 inches of available water. The crop needs 50 percent or more of that water maintained. Thus, 2.7 inches of water can be depleted before irrigation is needed.

The last step is measuring how much water is applied during a set. Take a straight sidewall can or bucket (like a coffee can) and place under the sprinkler path for the duration of the set (8, 12, or 24 hours). Calculate the amount captured in inches and compare to the depletion number. If a 12-hour set applies 1.5 inches, this irrigation will not completely fill the soil capacity. In this example, a 24-hour set may be better.

Now is the time

Managing the move pattern, irrigation offsets, and irrigation set selection for your soil helps maximize the production of a field. There is no time better than now to adjust your technique to achieve more uniform irrigation and better production. For more information on irrigation, visit bit.ly/BBWYwater.

Jeremiah Vardiman is a University of Wyoming Extension educator in Park County and can be reached at (307) 754-8836 or jvardima@uwyo.edu.