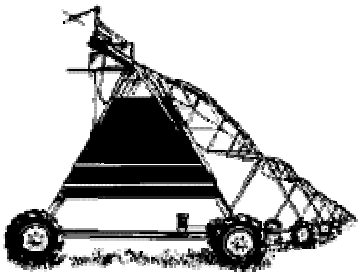

Reducing and Evaluating Irrigation Runoff

MICHIGAN STATE UNIVERSITY EXTENSION

PURDUE UNIVERSITY

Irrigation Fact Sheet #13

Instantaneous Irrigation Application Rates, Compared to Soil Infiltration Rates

The infiltration rate is the rate water can enter the soil surface. Michigan soils have infiltration rates from a high of 1 inch/2 hour to, as little as 20 minutes per inch. Heavier soils such as clay and clay loam will take water in at a slower rate than sands and sandy loams. Tillage method and surface compaction since a tillage operation affects infiltration rate. Conservation tillage and no-till result in the highest infiltration rate while disc and moldboard tillage result in the lowest rates, particularly after several wetting events. Estimates for water infiltration rates are included in the "physical and chemical properties of soils" section of the soil survey for your county.

Increasing the amount of water that may enter the soil in a given period of time

Residue cover and a rough soil surface will increase the infiltration rate. Compaction of the soil surface, lack of residue and poor choice of tillage practice will decrease infiltration. Steeper slopes, wheel tracks, and rows run up and down hillsides increase runoff rates if the water dies not infiltrate.

Infiltration rate decreases with increased time of wetting. Therefore, the amount of water applied each irrigation will affect the fraction of the water that enters the soil and the fraction that will runoff. Small pockets and depressions in the soil surface will hold a volume of water at that location, until the soil surface can receive the water. Midseason cultivation or in-row soil surface modification (i.e. dammer/diker) will increase the surface storage .

Determining the irrigation application rate is part of the planning process for new irrigation systems. The average irrigation application rate at a point along the machine is the amount of water applied divided by the elapsed time from the first drop of water landing at a point in the field, to the last water hitting the point typically expressed as inches per hour.

The irrigation application rate will vary throughout the length of a center pivot irrigation system, with the highest instantaneous application rates at the end of the system furthest from the pivot point. Irrigation application rate will be uniform for solid set and large gun hose traveler irrigation systems as long as application time or forward travel of system is unchanged.

Existing irrigation system application rate compared to soil infiltration rates. Evaluation of the irrigation application rate compared to soil infiltration rates on existing irrigation systems can be done by observation, taking into account all of the factors that affect the situation.

Instructions for completing the *Evaluating Potential Irrigation Runoff* form

1. Identify the areas of the irrigated field that have the lowest infiltration rates and/or greatest runoff potential. (heavy soils, slopes, surface compaction).
2. Select a radial transect line (for center pivots) or a transect line representing the watering pattern (for solid set or traveler systems) through the identified lowest infiltration/highest runoff potential area of the field identified above.
3. Set the machine for an irrigation amount (timer setting, system speed or run time) typically used and run the machine across the identified area. Record the system settings.
4. **Center Pivots** - Starting at the pivot point and progressing to the furthest reaches of the machine, pace or measure 50 feet increments along that line to identify observation points, or identify three equally space observation points under each span. **Solid set or travelers** - Starting at one edge of the wetted area and progressing to opposite side, pace or measure 50 feet increments along that line to identify observation points.
5. At each observation point record observations, Observation should be made when the observation points is in the second half of the wetted area as the system moves away from the site. Look at several (4-5) areas representing the row contour and differences in row traffic of the location. Record any specific concerns that may affect the application (drips or leaks) or affect the soil's ability to take in water (compaction, row contours, etc.)

Evaluating Potential Irrigation Runoff Form

Record system settings -				
Distance from center	***Observation***	***Notes***	***Acres covered by swath***	***Total acres***
50			0.18	0.18
100			0.54	0.72
150			0.90	1.62
200			1.26	2.88
250			1.62	4.51
300			1.98	6.49
350			2.34	8.83
400			2.70	11.53
450			3.06	14.60
500			3.42	18.02
550			3.78	21.81
600			4.14	25.95
650			4.51	30.46
700			4.87	35.32
750			5.23	40.55
800			5.59	46.13
850			5.95	52.08
900			6.31	58.39
950			6.67	65.06
1000			7.03	72.08
1050			7.39	79.47
1100			7.75	87.22
1150			8.11	95.33
1200			8.47	103.80
1250			8.83	112.63
1300			9.19	121.82
1350			9.55	131.37
1400			9.91	141.29
1450			10.27	151.56
1500			10.63	162.19

Key for *Observation* column

A—no observed puddling, ponding or sheen between rows
B—puddling, ponding or sheen between rows identified, but no observed runoff or flow of water
C—observed runoff or flow of water

>10% of the total of acres represented by observations exhibiting runoff indicates need for improvements