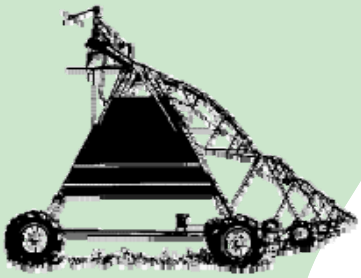

Reducing and Evaluating Irrigation Runoff

MICHIGAN STATE UNIVERSITY EXTENSION

PURDUE UNIVERSITY

Instantaneous irrigation application rates compared to soil infiltration rates

Irrigation Fact Sheet #7

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Infiltration rate is the quantity of water that can enter the soil in a specified time interval. Heavier soils such as clay and clay loam take water in at a slower rate than sands and sandy loams. Tillage method and surface compaction affect infiltration rate. Conservation tillage and no-till result in the highest infiltration rates while disc and moldboard tillage result in the lowest rates, particularly after several wetting events. Michigan soils have infiltration rates from as slow as one-half inch per hour to as fast as three inches per hour. Estimates for water infiltration rates are included in the *Physical and Chemical Properties of Soils* section of the soil survey for each county.

Increasing the amount of water entering the soil in a given time period. Residue cover and a rough soil surface increase infiltration rate. Compaction of the soil surface, lack of residue and poor tillage practices will decrease infiltration rate. Steeper slopes, wheel tracks and rows that run up and down hillsides increase runoff rate if the water does not infiltrate.

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

Determining the irrigation application rate is part of the planning process for new irrigation systems. It is measured by the average irrigation application rate from a particular point along the machine and is expressed as inches per hour. To determine application rate divide the amount of water applied by the elapsed time (from the first drop of water landing at a point in the field to the last drop hitting the point).

The irrigation application rate will vary throughout the length of a center pivot irrigation system, with the highest instantaneous application rate 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 rate. Evaluation of the irrigation application rate compared to soil infiltration rate on existing irrigation systems can be done by observation, taking into account all 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 typically used (timer setting, system speed, run time) 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-foot increments along that line to identify observation points, or identify three equally spaced observation points under each span. **Solid set or travelers**—Start at one edge of the wetted area and progress to the opposite side, pace or measure 50-foot increments along that line to identify observation points.
5. Record observations at each observation point. 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 (four to five) 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—50 ft.

Record system settings		Notes	Acres covered by swath	Total acres
Distance from center	Observation			
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

Observation column key

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

Greater than 10 percent of the total acres represented by observation exhibiting runoff indicates need for improvement.

See instructions for completing the Evaluating Potential Irrigation Runoff Form to complete this form.

Evaluating Potential Irrigation Runoff Form—by Span

Record system settings		Notes	Acres covered by swath	Total acres
Observation number	Observation			
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
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950			6.67	65.06
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1050			7.39	79.47
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1400			9.91	141.29
1450			10.27	151.56
1500			10.63	162.19

Observation column key

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

Greater than 10 percent of the total acres represented by observation exhibiting runoff indicates need for improvement.

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