IRRIGATION WATER MANAGEMENT TO PROTECT AG RESOURCES

CONSERVATION MANAGEMENT SHEET AGRONOMY SERIES July 1997

Natural Resources Conservation Service

Michigan

Hybrid Seed corn under sprinkler irrigation in St. Joseph County

What is Irrigation Water Management?

Irrigation water management is determining and controlling the rate, amount, and timing of irrigation water in a planned and efficient manner.

How does Irrigation Water Management Work?

Properly applied irrigation water is utilized by the crop and does not create runoff, water induced erosion, ponding, or leaching of pesticides and nutrients. Soils vary in the rate of water they absorb and the amount of water that can be stored in the root zone. Fine-textured (clay) soils have a slower infiltration rate than coarse-textured (sand) soils. For example, a five foot deep Plainfield sand absorbs water faster than a Boyer sandy loam.

Timing of irrigation and soil moisture availability also varies by crop. Plants require soil moisture during flowering and rapid periods of growth. Crops also vary in their need for water. For example, alfalfa needs more water than corn.

Where Does Irrigation Water Management Apply?

Irrigation water management applies to all areas that are suitable for irrigation and have a water supply of sufficient quality and quantity. In Michigan, irrigatioin is used to supplement water in addition to rainfall. Irrigation can also be used for frost protection and application of chemicals (pesticides and fertilizer) for the crop. Animal waste effluent is applied by irrigation equipment. Corn, potatoes, tomatoes, soybeans, dry beans, hay, sod, fruit and vegetable crops may be irrigated throughout the growing season.

Where to Get More Assistance

Additional local assistance may be obtained from the local office of a Michigan Conservation District or the USDA Natural Resources Conservation Service (NRCS) office at:_____

_____

_____

_____

Design Criteria

1. Crop to be irrigated_____

2. Estimated water applied _____
per the average irrigation *(inches/ application)*

3. Soil type selected to determine irrigation needs:
Predominate_____
Other _____
Special Soil Conditions
[ ] droughtiness [ ] salts
[ ] slope [ ] drainage
[ ] erosion hazard [ ] aquifer protection
[ ] depth to bedrock
**obtained from county soil survey or on site*

4. Percent slope range for soil_____

5. From table below, determine maximum application rate in inches per hour for sprinkler irrigation based on average soil, slope, and profile characteristics *circle choice*

Suggested maximum application rates with sprinklers for average soil, slope and tilth

	Slope			
Soil texture and profile	**0-5%**	**5-8%**	**8-12%**	**12-16%**
	in/hr			
1. Coarse sandy soil to 6 ft	2.0	1.5	1.0	0.50
2. Coarse sandy soils over more compact soil	1.5	1.0	0.75	0.40
3. Light sandy loams to 6 feet or light sandy loams over more compact loams	1.0	0.80	0.60	0.40
4. Silt loams to 6 ft.	0.50	0.40	0.30	0.20
5. Silt loams over more compact soils	0.30	0.25	0.15	0.10
6. Heavy textured clays or clay loams	0.15	0.10	0.08	0.06

Irrigation rate adjustment factors with corn residue left on the surface at planting:
% cover at planting
60-75% (3,000-4,000 lb.) multiply by 1.4
50-60% (2,000-3,000 lb.) multiply by 1.3
30-50% (1,000-2,000 lb.) multiply by 1.2
20-30% (500-1,000 lb.) multiply by 1.1

6. Adjusted maximum rate by the Residue Management Adjustment Factor_____

7. Adjusted Application Rate = Maximum application rate (5) x the Residue Management Adjustment Factor (6).

Example calculation, maximum application rate
1. Predominate soil: Oshtemo sandy loam

2. Per cent slope range: 2-6%. Average slope 4%.

3. Soil texture and profile: Light sandy loam to 6 feet

4. Maximum sprinkler application rate: 1.0 in/hr

5. Corn Residue on the soil surface : 2,500 lb (55%)
Residue management adjustment factor is 1.3.

6. Adjusted maximum sprinkler application rate is:
1.3 inches per hour. (1.0 x 1.3)

NOTE: ***A maximum application rate of 1 in/hr is recommended to prevent runoff, ponding and erosion even though the table indicates more than this may be applied in some situations.***

Considerations

A system evaluation to determine application rate of each nozzle may be needed to prevent rill erosion or excess ponding and runoff. **Over application of water and inefficiency can be observed in the field by one of the following:**

Excess ponding of water

Runoff during irrigation which carry sediment

Rills caused by irrigation water rather than rain

Yellowing of plants due to lack of oxygen or Nitrogen deficiency in soil from excessive wetness

Plant stand loss from ponding or runoff

Sediment at the bottom of slopes (part of deposition)

Offsite sediment damage to wetland, streams and neighboring fields

Irrigation rate adjustment factors with soybean, wheat , alfalfa, or rye residue left on the surface at planting:

% cover at planting

80-90% (3,000-4,000 lb.) multiply by 1.4
60-80% (2,000-3,000 lb.) multiply by 1.3
40-60% (1,000-2,000 lb.) multiply by 1.2
30-40% (500-1,000 lb.) multiply by 1.1

Other Considerations

A number of effects to environmental conditions will occur from cultural operations used on fields where Irrigation Water Management is applied. A consideration of these effects will allow for incorporation of companion planning elements to achieve an ecosystem-wide conservation plan for the area in which water management is practiced. Effects which may be considered include: less sheet and rill erosion, less wind erosion, fewer ephemeral gullies, improved tilth, more biomass, less crusting, improved organic matter maintenance, proper waste application, reduced irrigation-induced erosion, reduced deep percolation of groundwater contaminants, less pesticides in surface water, reduced nutrients and organics in surface water, less sediment, improved dissolved oxygen in streams, reduced salt, fewer pathogens in surface water, improved air quality with reduced airborne sediment, improved plant productivity with less water stress, better plant health and vigor and site conditions for plants, improved food and water for wildlife, better farm financial conditions with assured cash flow, improved long-term financial sustainability in the community.

Natural Resource area(s) expected to be addressed by the use/application of this conservation sheet:

[x] Soil, [x] Water, [x] Air, [x] Plants,
[x] Animals, [x] Human Socio-economics.

For More Information

Additional information about the application and use of irrigation and water management may be obtained from the World Wide Web (www.mi.nrcs.usda.gov).

This Conservation Information Sheet

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Reference/File Indexes

Topic Application:
[ ] Construction
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Resource Series:
[X] Agronomy
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[ ] Pastureland
[ ] Recreation
[ ] _____

References:
USDA-NRCS MI Irrigation Guide
Christiansen, J. E. 1942. Irrigation by Sprinkling University of California. Bull. No. 670
USDA-NRCS RUSLE Manual , Ag Handbook 703

USDA NRCS (MI) Conservation Practice/Model Associations:
(449) Irrigation Water Management
Irrigation Scheduler Program

USDA NRCS (MI) Associated Conservation Sheets:
Line Transect Residue and Cover Estimates

FOCS (MI) Reference Number:
CS _____