Irrigation Management for Corn
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Irrigation Management for Corn

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Proper management of irrigation water is very important to maximize profits and make efficient use of water and energy. The main objective here is to answer some of the most frequently asked questions about managing irrigation water.

When to Start Irrigating?

Start irrigating corn when the soil moisture content of the upper two feet of the root zone approaches 50% of the available water holding capacity. For corn on sandy soils, this condition usually begins when the corn is 3 to 4 ft. tall. Corn leaves begin to curl because of water stress when about 20% of the available water remains. Although damage to the crop at this point is still minimal, **do not** delay irrigation any longer, because of the time required to irrigate all of the field or land. Soil moisture meters are available for measuring soil moisture content. However, most of the good instruments are often too sophisticated for most irrigation operators. The "feel" method may work for some, however, each individual will need to develop his own sense of feel for soil moisture before this procedure can be accurately used. Table 1 should give the inexperienced irrigation operator some idea of the available moisture content of various soils and the relationship between its soil properties.

Another procedure is use a water balance sheet, as discussed later, and start irrigating when the available moisture in the soil profile is one-half of the total available water holding capacity in the profile.

How Much Water in One Irrigation?

How much water you apply in one irrigation depends greatly on the soil type and the design of the irrigation system. A properly designed system will take into account the soil type. Fine textured soils require a slower rate of application than sandy soils, but hold more water and therefore may be irrigated less frequently. Sandy soils require more frequent applications because of their low water holding capacities. Table 2 gives the inches of available water per foot of depth for various soil types. Some of Michigan's deep sandy soils hold only 2 in. of available water in a 4 ft. profile. Sandy soils with a heavy textured subsoil react more like sandy loam soils and may hold up to 4 in. of available water to a depth of 4 ft. *As a general rule, the amount of water applied in one application should not exceed one-half of the total water holding capacity.* Larger applications increase the potential for downward movement of nitrogen fertilizers and inefficient use of water, should rainfall occur shortly after irrigation.

How Often to Irrigate?

The frequency of irrigation depends on how much evaporation from the soil and transpiration from the plants occurs between each irrigation. In Michigan, evapotranspiration losses in June usually average less than 0.2 in. per day. During July and August, losses are generally between 0.2 and 0.3 in. per day. For normal weather conditions, use of 0.2 in. per day. On dry, hot, windy days with temperatures above 90°F, use 0.3 in. per day. Thus, during July and August it is possible to lose from 1.4 to 2.1 in. of available moisture from a cornfield in one week by the process of evapotranspiration. On sandy soils where there is little reserve moisture, 1.5 to 2 in. must be replaced each week by rainfall or irrigation to keep the plants at optimum condition. Use the water balance sheet as a guide for determining the best starting time, rate of application and frequency of application.

TABLE 1 — How to estimate moisture by the feel of the soil.

Percentage of available remaining moisture	Feel and Appearance of Various Soil Textures			
	COARSE	LIGHT	MEDIUM	HEAVY
0% (Dry)	Dry, loose, single-grained, flows through fingers	Dry, loose, flows through fingers	Powder-dry; sometimes slightly crusted but easily breaks down into powdery condition	Hard, baked, cracked; sometime has loose crumbs on surface
50% or less (low)	Still appears to be dry; will not form a ball with pressure*	Still appears to be dry; will not form a ball*	Somewhat crumbly, but will hold together from pressure	Somewhat pliable, will ball under pressure*
50% to 100% (Good to Excellent)	Tends to stick together slightly, sometimes forms a very weak ball under pressure	Forms weak ball, breaks easily, will not slick	Forms a ball and is very pliable; slicks readily if relatively high in clay	Easily ribbons out between fingers; has a slick feeling
Above-field-capacity (Over-irrigated)	Free water appears when soil is bounced in hand	Free water will be released with kneading	Can squeeze out free water	Puddles and free water forms on surface

*Ball is formed by squeezing a handful of soil very firmly in the palm of the hand.

TABLE 2 — Available soil moisture for various soils.

Soil Type	In. of Avail. Water/Ft. of Depth
Sands	0.5
Loamy Sands	1.0
Sandy Loams	1.5
Loams	2.0
Silt and Clay Loams	2.5

The water balance sheet should be started sometime in May when the soil profile is full of water, or estimate the percent moisture at that time. Use 0.1 in. of evapotranspiration loss per day in May and 0.15 in. in June. When the balance sheet shows the profile only half full of water, start irrigating.

When to Stop Irrigating?

Stop irrigating when the soil profile approaches 80 to 90% of the maximum available water holding capacity to prevent nitrate-nitrogen leaching in the event a heavy rainstorm should occur. For corn, it is most desirable to maintain the soil moisture content between 50 and 80% of the maximum available moisture. A good practice is to stop irrigating for one day each time you get one-half inch of rain, *unless* the soil moisture in the profile is less than one-half of the total water holding capacity.

The tasseling, pollination period is very critical in terms of moisture stress. The soil profile should have a good supply of available moisture at this time.

Corn requires an ample supply of water until it reaches the dent stage of maturity. You may be able to stop irrigating, however, when corn reaches the early dough stage if the soil profile contains adequate moisture to carry it to the dent stage.

SAMPLE WATER BALANCE SHEET FOR CORN

Figures shown are examples—Record your own on balance sheet below.

Field No. 1
Soil Type Sandy loam

Available Water Holding Capacity	1.5	inches per foot
Total Available Profile Moisture	4.5	inches per rooting zone[1]
Total Available Profile Moisture Today (estimate on date of first recorded entry)	4.0	inches for rooting zone

Date	Weekly[2] Evapotranspiration	Weekly[3] Rainfall	Weekly Irrigation	Rainfall and Irrigation Minus Evapotranspiration	Profile Moisture
5/20	--	--	--	--	4.0
5/27	0.7	1.5	0	+0.8	4.5
6/2	0.8	0.8	0	0	4.5[5]
6/9	1.0	0	0	-1.0	3.5
6/16	1.0	0.5	0	-0.5	3.0
6/23	1.1	1.0	0	-0.1	2.9
6/30	1.2	0.5	0	-0.7	2.2[4]
7/7	1.4	0	1.0	-0.4	1.9
7/21	1.4	0	2.0	+0.5	2.4

[1] Effective rooting zone is usually 3 to 4 feet.

[2] Use 0.1 inches evapotranspiration loss per day in May. 0.15 inches in June and 0.2-0.3 in July and August depending on temperature conditions. Multiply these values by 7 to get weekly loss.

[3] A rain gauge out in the open is needed. Summer rainfall is so variable over an area that you need your own gauge.

[4] Begin irrigating when soil profile is one-half of the total. (2.25 inches for this soil.)

[5] This soil has a maximum of 4.5 inches of available water, therefore the excess (0.3 inches) rainfall is leached out of the root zone.

WATER BALANCE SHEET FOR CORN

Record your own figures in space provided.

Field No. _____
Soil Type _____

Available Water Holding Capacity	_____	inches per foot
Total Available Profile Moisture	_____	inches per rooting zone[1]
Total Available Profile Moisture Today (estimate on date of first recorded entry)	_____	inches for rooting zone

Date	Weekly[2] Evapotranspiration	Weekly[3] Rainfall	Weekly Irrigation	Rainfall and Irrigation Minus Evapotranspiration	Profile Moisture
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

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