# EC89-723 Irrigation Scheduling Using Soil Moisture Blocks in Silty Soils

William L. Kranz
*University of Nebraska - Lincoln*, wkranz1@unl.edu

Dean E. Eisenhauer
*University of Nebraska - Lincoln*, deisenhauer1@unl.edu

Nebraska Cooperative Extension EC89-723

# Irrigation Scheduling Using Soil Moisture Blocks in Silty Soils

William L. Kranz and Dean E. Eisenhauer

Irrigation takes some risk out of crop production by providing a reliable source of water that allows the producer to manage soil water. Monitoring soil water is fundamental to determining how much irrigation water should be applied, and when the soil is able to store the amount of water to be applied.

Establishing when and how much water should be applied is often referred to as irrigation scheduling. The goal of irrigation scheduling is to maximize the effectiveness of irrigation by keeping the soil water level above the point where crop stress could occur (minimum balance), but below the point that some water will be lost to deep percolation (field capacity).

Soil moisture blocks are recommended for use in monitoring soil water in fine textured soils such as silt loam, loam, silty clay loam and sandy clay loam. Soil water estimation using other procedures is presented in NebGuides G85-753, *Irrigation Scheduling Using Crop Water Use Data,* and G83-690, *Estimating Soil Moisture By Appearance and Feel,* and in Extension Circular EC89-724, *Irrigation Scheduling Using Tensiometers in Sandy Soils.*

This publication describes how to use soil moisture blocks to schedule irrigations on fine textured soils.

## Soil Moisture Concepts

### *Field Capacity*

Water is held in soil pores that exist between the soil particles. Like a sponge, the soil can hold only so much water.

If water is applied to a soil until it is saturated, then left undisturbed, the excess water will drain out of the larger pores until the soil's attraction for the water is strong enough to hold the remaining water against the pull of gravity. The soil water content at this point is known as field capacity. Field capacity generally will be reached three to five days after irrigation or rainfall, depending on the soil type.

### *Permanent Wilting Point*

Water is withdrawn from the soil by transpiration from the growing crop or evaporation from the soil surface. As a soil gets drier, the attraction between soil water and the soil particles increases, and it becomes more difficult for the plant to remove water from the soil.

When water extraction continues without replenishment, plants show wilting in the late morning and afternoon, but recover at night. Eventually, the soil becomes so dry the plant cannot remove additional water from the soil. The soil water content when the plant is unable to recover is known as the permanent wilting point.

### *Available Water Capacity*

The water contained in the soil between field capacity and the permanent wilting point is available to the plant. The available water capacities per foot of soil depth are listed for several soils in *Table I.* The total available water in the active root zone is determined by multiplying the root zone depth by the available water capacity per foot.

**Table I. Available water capacity and minimum allowable balance for soil textural classes where moisture blocks are recommended**

| | | | Minimum allowable balance | | |
|---|---|---|---|---|---|
| *Soil textural classification* | *Soil Texture Number* | *Available water capacity* | *Potatoes* | *Dry beans, corn, sorghum, soybeans small grains, or sugarbeets* | *Pasture, alfalfa* |
| | | Inches/ft* | | | |
| Sandy clay loam | 1 | 2.0 | 1.3 | 1.0 | 1.2 |
| Silty clay loam | 2 | 1.8 | 1.2 | 0.9 | 1.1 |
| Clay loam | 3 | 1.8 | 1.2 | 0.9 | 1.1 |
| Loam, very fine sandy loam, or silt loam w/silty clay subsoil | 4 | 2.0 | 1.3 | 1.0 | 1.2 |
| Loam, very fine sandy loam, or silt loam w/silt loam or sandy loam subsoil | 5 | 2.5 | 1.6 | 1.3 | 1.5 |

*Inches of water per foot of active root zone

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

### *Soil Water Balance*

Soil water balance is similar to a checking account balance. The current soil water balance is the water remaining in the soil.

Soil water balance is expressed as a percentage of the available water capacity in inches per foot of soil depth. At field capacity, the soil water balance is 100 percent of the available water, and at the permanent wilting point the soil water balance is 0 percent.

### *Minimum Allowable Balance*

As the plant extracts water from the soil, the amount of water remaining in the soil decreases until it is refilled by rainfall or irrigation. When the plant begins to come under water stress, the available soil water has been reduced to the minimum allowable balance. If the water used by the plant is replaced, plant growth is seldom affected. However, if soil water extraction continues, the resulting plant stress will become more severe, and quite often leads to yield reductions.

Research shows that for most crops, the minimum allowable balance is 50 percent of the total available water capacity during critical growth stages. The total available water can be lowered to 40 percent during noncritical stages or at the end of the season.

The numbers listed in *Table I* represent the minimum allowable balance for each soil texture. The minimum allowable balance for the entire crop root zone is determined by multiplying the minimum allowable balance per foot by the active rooting depth.

## Soil Moisture Blocks

Soil moisture blocks respond to soil water conditions by measuring electrical resistance between two circles of wire mesh imbedded in gypsum material *(Figure 1)*. Moisture blocks work well in silty soils because the soil particle size is similar to the particle size of the moisture block material. Since sandy soils have much larger-sized particles, soil moisture blocks are not recommended for use in sandy soils.

When the soil water content increases, water enters the moisture block, allowing more gypsum to go into solution. This causes the electrical resistance to decrease between the circles of wire mesh and a corresponding change in the meter reading.

When the soil water content decreases, water is extracted from the gypsum material. This causes some of the gypsum to go out of solution. The result is an increase in electrical resistance between the circles of wire mesh which is reflected by the meter reading.

A lead wire is connected to each of the wire mesh circles so readings can be made with a hand-held meter at the soil surface. To take a reading, the wire leads are inserted into two small holes on the top of the meter *(Figure 1)*, and the button on the left side of the meter is depressed. A high reading indicates moist soil and a low reading indicates dry soil.

The meter is equipped with a Wheatstone Bridge. The Wheatstone Bridge causes the readings for the greatest electrical resistance to read low on the meter's dial, and the lowest electrical resistance to read high on the meter's dial. This allows the readings to reflect soil water conditions. However, for the same meter reading, soils will have different amounts of available water.

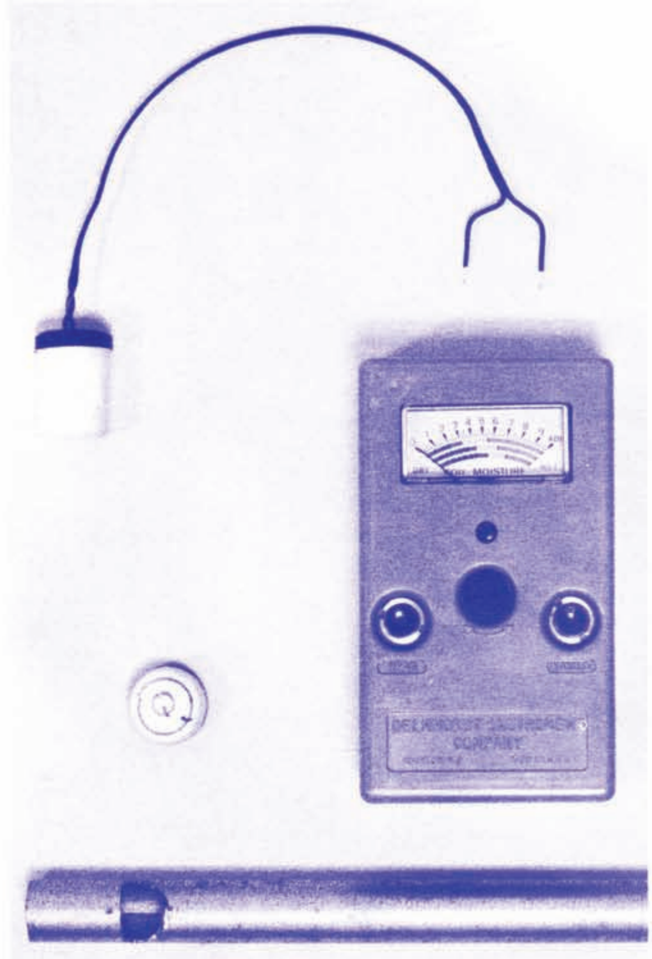


**Figure 1. This photo shows (top and clockwise) the moisture block, meter, and 1/2" metal conduit pipe with the cut slot to thread the moisture block wire through for field installation. The small white circle is a cutaway of the moisture block, showing the circles of wire mesh embedded in the gypsum material.**

### Preparing Soil Moisture Blocks

Soil moisture blocks should be soaked in a bucket of water for one to two hours, and then allowed to air dry for 24 hours. This cycle (soak one to two hours, air dry for 24 hours) should be repeated two to three more times prior to installing the blocks in the soil. Cycling the moisture blocks through different water contents removes air from the block which ensures accurate readings of soil water.

### Location of Moisture Block Stations

Moisture block stations should be located in four parts of each field. For furrow irrigated fields set type sprinkler systems, such as tow lines, and traveling guns or booms, place one station near each end of the first and last irrigation set. Place the stations far enough from the ends of the set so that a complete watering pattern takes place over the stations *(Figure 2a)*.

For center pivots *(Figures 2b through 2d),* place Stations One and Three 200-250 feet from the outer end of the pivot, and Stations Two and Four 200-250 feet from pivot center point. Be sure to place the stations far enough away from the park position to ensure water does not reach them when the center pivot is in park position.

Locations shown in *Figure 2b* should be used when the entire pivot is planted to the same crop, and where the soil is uniform. The advantage of this arrangement is that the stations are located close to the pivot access road and, therefore, easy to read. The disadvantage of this placement occurs when the system is operated continuously. Since the monitoring locations are within one day's coverage time of the water pattern, a decision to start irrigating after a rainfall is difficult if water application has just been completed over both moisture block stations.

If the field is planted to two separate crops or if large differences in soil types exist, a different arrangement *(Figure 2c)* is appropriate. The disadvantage of this arrangement is that an access road through the entire field is beneficial, or the labor required to walk to the remote locations encourages non-use during busy periods.

Station locations shown in *Figure 2d* are recommended on part-circle pivots. This arrangement indicates soil water content several days before the pivot can reach that point of the field. In such cases consider a complete cycle as both sweeps of the system (forward and back).

Soil moisture blocks should be installed at three depths in the soil at each station. Moisture blocks installed at the midpoint of each 1 foot increment of soil provide an average reading of available water per foot. Thus, moisture blocks should be installed at 6 inches, 18 inches and 30 inches below the soil surface.

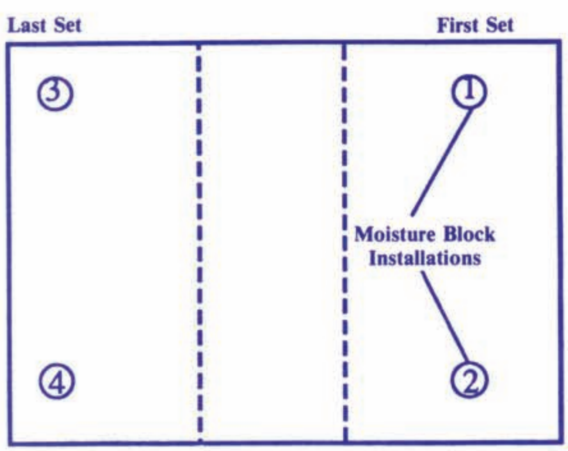



**Figure 2a. Furrow and set type sprinkler systems**

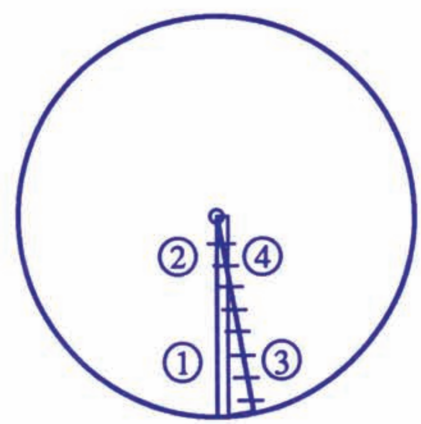



**Figure 2b. Normal station arrangement**

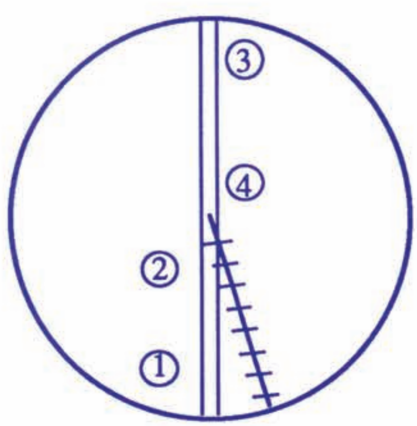



**Figure 2c. Two crops or different soil types**

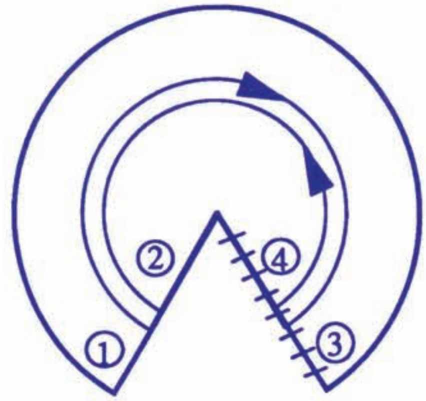



**Figure 2d. Part circle system**

### Moisture Block Installation Procedures

**Equipment needed:**

3/4 inch diameter soil probe
1/2 inch diameter metal conduit, minimum of 4 feet long with a slot cut 1 inch from one end *(Figure 1)*
Lath
Flags
Water and bucket
Block meter
3/8 inch diameter dowel pin 4 feet long
Moisture blocks (12 per field)

**Field Procedure**

1. Soak soil moisture blocks for approximately one to two hours prior to installation. This should be done after following the wetting and drying cycle procedure used to prepare moisture blocks for field installation. Adjust the meter to the adjust point on the dial (labeled "ADJ" on the right side of the dial) while pressing the adjust button on the right side of the meter *(Figure 1)*. Check each block by inserting the wire leads into the meter. Each block should read 10.0 when operating properly. Discard blocks that do not read close to 10.0.
2. Use the soil probe to make a hole in the crop row. The hole should be made to the depth the moisture block will be installed (6 inches, 18 inches or 30 inches deep).
3. Pour a small amount of water through the conduit to wet the soil in the bottom of the hole.
4. Thread the lead wires through the slot in the 0.5 inch conduit *(Figure 1)*. Using the conduit, press the moisture block firmly into the moist soil at the bottom of the hole. **Good contact between the soil and the moisture block is critical to receiving the accurate readings.**
5. Fill the hole 3-4 inches at a time with fine, moist soil, tamping the soil firmly with the dowel as the hole is filled. Make sure the hole is filled with firmly packed soil.
6. Install the blocks for each station approximately 12 inches apart in the crop row.
7. Place the lath midway between the blocks and run lead wires to the lath. Rap the lead wires around the lath at a distance above the surface corresponding to its depth in the soil (6 inch lead wires at the top and 30 inch lead wires at the bottom). This allows the block depth to be easily identified. Another alternative is to tie a different number of knots in the wire (one knot - 6 inch block, three knots - 30 inch block).
8. Install the moisture blocks early, no later than a few days after lay-by, to allow time for the plant roots to grow around the block. If the moisture blocks are installed too late, representative readings may not be registered on the meter.
9. Check operation of moisture blocks immediately after installation by placing the lead wires into the openings on the meter. The meter should still read close to 10.0. If the blocks do not read close to 10.0 the lead wires or block may have been damaged during the installation process. Install a new block to replace the defective one.
10. On the perimeter of the field mark the row containing the blocks so the row can be found easily after the crop has grown taller.

### Irrigation Scheduling Using Moisture Blocks in Silty Soils

Irrigation scheduling using moisture blocks is similar to balancing your checkbook. Soil is the bank account. Rainfall or irrigation are the deposits, and the water used by the crop or evaporated from the soil surface is the withdrawal. Irrigation scheduling monitors the account so deposits are made whenever necessary to maintain soil water above a minimum balance.

To carry the checkbook analogy one step further, moisture blocks provide an opportunity to monitor the soil water balance periodically to ensure the current water balance remains above the minimum allowable balance. The procedure is outlined on the worksheet using a step-by-step process.

Tables accompanying the worksheet allow moisture block readings to be interpreted to determine the current soil water balance in terms of inches of water. This allows calculation of the amount of water remaining in the root zone available for crop use — the current balance.

If the current balance is *less* than the minimum allowable balance, irrigation must begin immediately or stress will occur. If the current balance is *more* than the minimum allowable balance, the final step is to estimate how many days it will take the crop to use the remaining water.

The *no-later-than* date is the day you must irrigate to ensure crop stress will not occur. The *no-sooner-than* date is the first day irrigation can occur without overfilling the root zone. Irrigating prior to the no-sooner-than date can result in deep percolation of some of the water applied.

### How to Use the Worksheet

**Example:**

Assume moisture block readings were taken July 30 when corn was silking. The field is furrow-irrigated which covers 80 acres and has a system capacity of 850 gpm. The irrigator usually applies 3 inches of water per irrigation. Each irrigation takes 5.5 days. The soil is Holdrege silt loam in texture and the moisture blocks are installed as shown in *Figure 2a*. Since the root zone has fully developed, the manager wishes to reserve 1 inch for rainfall in the soil profile.

**Field Information**

1. Fill in the field information at the top of the sheet.
2. Find the estimated root zone depth from *Table II* that matches the stage of crop development. If the estimated root zone depth is at a half foot mark, increase the root zone depth to the next largest whole foot. (Example: The estimated root zone depth for corn at the 12 leaf stage is 2.5 feet from *Table II*. The root zone should be increased to 3 feet for scheduling purposes, because each moisture block

**Table II. Estimated root depth versus stage of growth**

| *Assumed root depth (ft.)* | *Corn(3)** | *Grain Sorghum(3)* | *Soy-beans(3)* | *Alfalfa(4)* | *Dry-beans(2.5)* | *Sugar Beets(3)* | *Spring grains(3.5)* | *Pota-toes(2)* | *Pasture(3)* | *Winter wheat(4)* |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 4 leaf | Vegetative | Vegetative | | Vegetative | | | Seeding | | |
| 1.5 | | | | | Initial flowering pod set | | | Bloom | | |
| 2.0 | 8 leaf | | Early bloom | | | June 1 | | | | Fall growth |
| 2.5 | 12 leaf | Flag leaf | Full bloom | | Beginning pod fill | | Joint | Maturity | | |
| 3.0 | Early tassel 16 leaf | Boot | Pod elongation | | Full seed fill | July 7 | | | | Spring growth |
| 3.5 | | Silking | Bloom | | | | | Boot | | |
| 4.0 | Blister | Dough | Full seed fill | | | Aug. 1 | Flowering | | Estab-lished stand | Joint |
| 5.0 | | | | | | | Dough | | | Boot |
| 6.0 | | | | Established stand | | | | | | |

*Maximum crop root depth for irrigation management

provides an estimate of soil water content in 1 foot of soil.) Calculating the soil water balance is much easier if 1 foot increments are used. A 3 foot root zone is used for the example on the worksheet as *Table II* indicates 3 feet is the maximum root zone depth for irrigation management (indicated by the number in parentheses at the top of the column.)

3. Find the soil texture number most representative of the moisture block station locations in *Table I.*
4. Calculate the total available water capacity by multiplying the available water capacity *(Table I)* by the estimated root zone depth *(Table II).*
5. Record the moisture block readings for each depth and station on the data sheet.
6. Convert each moisture block reading to available water in inches/foot *(Table III).*
7. Calculate the present average available water for the two positions.

**Water Management**

1. Find the minimum allowable balance for the estimated root zone depth *(Table I).*
2. Transfer the present available water from Step 7 above.
3. Calculate the remaining usable water by subtracting the minimum soil water balance from the present available water (Step 2-Step 1).
4. Calculate the amount of water removed from the soil by subtracting the present available water from the total available water capacity (Step 4 above-Step 2).
5. Reserve water-holding capacity in the root zone for rainfall which will not be replaced by irrigation water. When the root zone is fully developed, 1 inch can be reserved for rainfall on silty soils.
6. Find the estimated average daily water-use rate in *Table IV* or use current predictions issued by Nebraska Cooperative Extension, NRD, radio, newspaper, or hotline.
7. Record the net depth of water applied during the irrigation event.
8. The first day to irrigate at that field position without overfilling the root zone (no-sooner-than date) is calculated by adding the net irrigation application depth (Step 7) and the rainfall reserve (Step 5), subtracting the amount of water removed (Step 4) and dividing by the daily water-use rate (Step 6).
9. The no-later-than date for that field position without stressing the crop is calculated by dividing the remaining usable water (Step 3) by the daily water-use rate (Step 6).

Note that in Steps 8 and 9 you calculated the range of dates acceptable for irrigating each field position. The time required to cover the area from the present irrigation position must be included in the decision of when to start or stop the irrigation system.

**Table III. Available soil water (in/ft) vs. block readings (Delmhorst blocks)**

| *Soil Texture Number** | | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|---|
| *Block Readings* | | *Available Soil Water Inches per Foot of Soil* | | | | |
| *New Scale* | *Old Scale* | | | | | |
| 10.0 | 200 | 2.0 | 1.8 | 1.8 | 2.0 | 2.5 |
| 9.5 | 190 | 2.0 | 1.8 | 1.7 | 2.0 | 2.5 |
| 9.0 | 180 | 2.0 | 1.8 | 1.7 | 2.0 | 2.5 |
| 8.5 | 170 | 1.9 | 1.7 | 1.6 | 1.9 | 2.3 |
| 8.0 | 160 | 1.7 | 1.6 | 1.5 | 1.8 | 2.2 |
| 7.5 | 150 | 1.6 | 1.5 | 1.4 | 1.8 | 2.1 |
| 7.0 | 140 | 1.5 | 1.4 | 1.3 | 1.7 | 2.0 |
| 6.5 | 130 | 1.4 | 1.3 | 1.3 | 1.6 | 1.9 |
| 6.0 | 120 | 1.3 | 1.2 | 1.2 | 1.5 | 1.8 |
| 5.5 | 110 | 1.2 | 1.2 | 1.2 | 1.5 | 1.8 |
| 5.0 | 100 | 1.1 | 1.1 | 1.1 | 1.4 | 1.7 |
| 4.5 | 90 | 1.0 | 1.0 | 1.1 | 1.3 | 1.6 |
| 4.0 | 80 | 0.9 | 0.9 | 1.0 | 1.2 | 1.5 |
| 3.5 | 70 | 0.8 | 0.9 | 0.9 | 1.1 | 1.4 |
| 3.0 | 60 | 0.7 | 0.7 | 0.9 | 1.0 | 1.2 |
| 2.5 | 50 | 0.6 | 0.5 | 0.7 | 0.9 | 1.0 |
| 2.0 | 40 | 0.5 | 0.3 | 0.5 | 0.7 | 0.8 |
| 1.5 | 30 | 0.3 | 0.2 | 0.4 | 0.4 | 0.5 |
| 1.0 | 20 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 |
| 0.5 | 10 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

*See *Table II* for soil texture numbers

Early in the season when the plant and root zone are developing, light stress is tolerable without adverse effects on yield. Avoid stress during the reproductive stage.

**Important items in this example are:**

1. Soil water is somewhat uneven at position one. This could be due to:
   a) Moisture blocks at Station Two located in low area.
   b) End of row blocked, not allowing runoff.
   c) Faulty 6 inch moisture block at Station Two.
   d) Soil type different at Station Two.
2. The no-sooner-than date should not be used in this example. With a 3 inch average application and allowing 1 inch for rainfall, the soil water content must be lower than the 50 percent of available level before irrigation should take place. In this example, if irrigation begins prior to the no-sooner-than date, the room reserved for rainfall will not be used and the extra water could be lost due to deep percolation. With a lower application amount (1 inch for example) the no-sooner-than date can be used effectively.
3. Since it will take 5.5 days to finish irrigating the field, irrigation should begin within one day to prevent stress from occurring in the last set.

## Summary

Irrigation management is more than just calculating an irrigation schedule. Before deciding when to start or stop the irrigation system, the manager must weigh the relative risks involved based on knowledge of the soil water condition, crop factors, and a knowledge of the capacity and reliability of the irrigation system. However, until the soil water balance has been used to determine an irrigation schedule, no further managerial refinements are possible.

## Authors

William L. Kranz, Extension Irrigation Specialist, Northeast Research and Extension Center, University of Nebraska.

Dean E. Eisenhauer, Associate Professor, Agricultural Engineering Department, University of Nebraska-Lincoln.

## Credits

Taken from the Extension Bulletin 84:723.

**Table IV. Approximate water use rates by stage of growth for various crops**

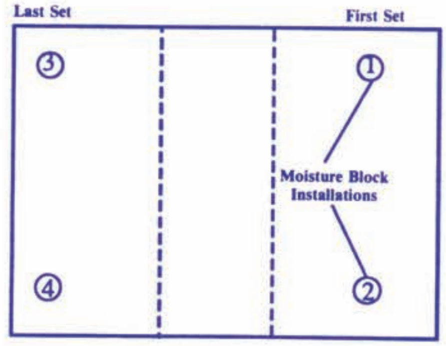
| *Water Use Rate (in/day)* | *Corn(3)** | *Grain Sorghum(3)* | *Soybeans(3)* | *Dry Beans(2.5)* | *Sugarbeets(3)* | *Winter Wheat(4) & Spring Grains* | *Alfalfa(5)*[1] | *Potatoes(2)*[2] |
|---|---|---|---|---|---|---|---|---|
| 0.19 | | | | | June 15 | Spring growth | | May 20 |
| 0.23 | 8 leaf | | | | | | | June 5 |
| 0.26 | | | Full bloom | | July 1 | | | July 5 |
| 0.29 | 12 Leaf | | | Rapid vegetative growth | | Joint | | |
| 0.32 | | Flag leaf | Begin pod | | | | | |
| 0.35 | Early tassel | Boot | | | | | June 15 | |
| 0.35 | Silking | Half bloom | Full pod | Flowering and pod development | July 15 | Boot | July 1 | |
| 0.35 | Blister kernel | | | | | | Aug. 1 | |
| 0.32 | Milk | Soft dough | | | August 1 | | | |
| 0.27 | | | Bean fill | | | | Aug. 15 | |
| 0.24 | Begin dent | | | | | Dough | Sept. 1 | Aug. 15 |
| 0.22 | Full dent | | | | | | | |
| 0.19 | | Hard dough | | Pod fill and maturation | | | | Sept. 10 |

[1]Alfalfa water use rates should be multiplied by 0.50 during the first 10 days following cutting and by 0.75 from the 10th to 20th following cutting.
[2]Taken from: Wright, J.L., J.C. Sturk. (In Press) Irrigation of Potatoes. In American Society of Agronomy Monograph: "Irrigation of Agricultural Crops" Section VII, Chapter 29.
*Numbers in parentheses are estimates for the maximum crop root depth for irrigation management.

# Scheduling Data Sheet

## Field Information

Field Identification NW Quarter Date 7/30
Crop corn Stage of growth SILKING
Soil Texture number 4 *(Table I)*
Available water capacity (AWC) 2.0 *(Table I)*
Estimated root zone depth 3.5 *(Table II)*
Total available water capacity (TAWC) 6.0
(available water capacity x root zone depth)




## Soil Water Measurements

| SENSOR DEPTH (inches) | Position 1 | | | | Position 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | STATION 1 | | STATION 2 | | STATION 3 | | STATION 4 | |
| | Reading | Available Water (inches) | Reading | Available Water (inches) | Reading | Available Water (inches) | Reading | Available Water (inches) |
| 6 | 1.5 | 0.5 | 5.0 | 1.4 | 6.0 | 1.5 | 6.5 | 1.6 |
| 18 | 3.5 | 1.1 | 2.5 | 1.0 | 3.5 | 1.1 | 4.0 | 1.2 |
| 30 | 10.0 | 2.0 | 10.0 | 2.0 | 10.0 | 2.0 | 10.0 | 2.0 |
| Total Water (inches) | Station #1 | 3.6 | Station #2 | 4.4 | Station #3 | 4.6 | Station #4 | 4.8 |

**Average Available Water**

(3.6+4.4)/2 **Position 1** 4.0 **(inches)**

(4.6+4.8)/2 **Position 2** 4.7 **(inches)**

### Water Management Data

| | Position 1 | Position 2 |
|---|---|---|
| 1. Minimum allowable balance in root zone *(Table I)* (6.0x.50) | 3.0 | 3.0 |
| 2. Present available water (from above) | 4.0 | 4.7 |
| 3. Remaining usable water (#2 - #1) (4-3.0) (4.7-3.0) | 1.0 | 1.7 |
| 4. Water removed from root zone (TAWC - #2) (6-4.0) (6-4.7) | 2.0 | 1.3 |
| 5. Soil capacity reserved for rainfall | 1.0 | 1.0 |
| 6. Estimated daily crop water use rate *(Table IV)* | 0.35 | 0.35 |
| 7. Irrigation application depth | 3.0 | 3.0 |
| 8. Irrigate no-sooner-than date (#7 + #5 - #4)/#6 (3.0+1.0-2.0)/0.35 | (5.7) 6.0 days | (7.7) 8.0 days |
| 9. Irrigate no-later-than date (#3/#6) 1.0/0.35 | (2.9) 3 days | (4.9) 5 days |