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G. C. A. Morin

W. F. Kroutil

P. E. Fischbach

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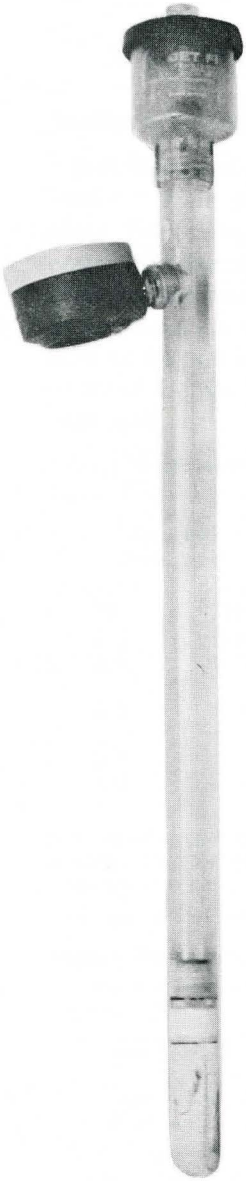


Irrigation Scheduling Using Tensiometers and Evapotranspiration on Deep Sandy Soils

Extension work in "Agriculture, Home Economics and subjects relating thereto," The Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, Cooperating with the Counties and the U.S. Department of Agriculture
Leo E. Lucas, Director

Irrigation Scheduling Using Tensiometers and Evapotranspiration on Deep Sandy Soils

G.C.A. Morin, W.F. Kroutil, P. E. Fischbach and D. Wilson*

Available Soil Moisture Using Tensiometers

Soil Moisture—The soil profile is similar to a reservoir or tank. It will hold a certain amount of moisture and is the source of water for the plant. The capacity of this reservoir depends upon the soil's available water holding capacity and the depth of root development of the crop. The root depths by stage of growth and available water holding capacity of several soils are listed in *Tables 1* and *2.* Fine sands or loamy sands hold about one inch (25 mm) of available moisture per foot (0.30 meter), or three inches (76 mm) of available water in a three-foot (0.9 meter) root zone.

Table 1. Root Depth on Deep Soils versus Stage of Growth

Assumed Root Depth		**Stage of Crop Development**		
		Corn	*Grain Sorghum*	*Soybeans*
feet	(meters)			
2.0	(0.61)	12 leaf		Early bloom
2.5	(0.76)	Early Tassel - 16 leaf	Flag leaf	Full bloom
3.0	(0.91)	Silking	Boot	Pod Development
3.5	(1.07)	Blister	Bloom	
4.0	(1.22)	Beginning Dent	Dough	Full Seed Fill (Green bean)

Root development may be restricted to a depth less than assumed due to compaction or limiting layers. Established alfalfa has a root zone greater than 4 feet (1.22 meters) unless root development is restricted.

Table 2. Range in total available water holding capacity for selected sandy soil textures.

Soil Texture	*Total Available water holding capacity (TAWHC) inches/foot (mm/m)*
Loamy fine sand	1.1 - 1.2 (92-100)
Fine sand	0.7 - 1.0 (58-83)

*G.C.A. Morin and W. F. Kroutil are District Extension Specialists (Irrigation), P.E. Fischbach is Extension Irrigationist, and D. Wilson is Research Associate, Dept. of Agricultural Engineering.

FIELD CAPACITY is the moisture content of a soil at the upper limit of its total available water holding capacity.

PERMANENT WILTING POINT is the moisture content of a soil at the lower limit of its total available water holding capacity.

SOIL MOISTURE DEFICIT is the amount of water below "field capacity" that has been removed from the soil by the crop's roots. If the soil moisture deficit is too great, stress on the plant can occur due to lack of water available for transpiration.

ALLOWABLE SOIL MOISTURE DEFICIT is the maximum deficit that can occur before water needs to be added to the soil reservoir to prevent crop stress. The water can be replaced by rainfall or irrigation. Since the available soil water reservoir increases as the roots grow deeper, the allowable soil moisture deficit *becomes greater* as the *season progresses.*

AVAILABLE SOIL MOISTURE is the amount of soil moisture available to plants in the root zone. It can be calculated by subtracting the soil moisture deficit from the total available water holding capacity.

MINIMUM AVAILABLE MOISTURE is the minimum amount of water allowed before water must be added to prevent crop stress. This can be calculated by subtracting the allowable soil moisture deficit from the total available water holding capacity. The values in the second half of *Table 3* represent the minimum available moisture for a 50 percent removal of available soil moisture in the top three feet (0.91 meters) of the soil profile, except for alfalfa. For alfalfa, the values are for a four foot (1.22 meter) root zone. *Table 3* can be used as a guide on *deep* sandy soils to determine when water should be applied to prevent stress on crops.

Tensiometers — Tensiometers can be used as a guide to determine when the minimum available moisture is being approached and thus when to irrigate. However, it is important that the tensiometers are put in the right location, prepared properly, and installed in the correct manner.

Location of Tensiometer Stations — A minimum of four stations will often be needed for each field. For set type sprinkler systems, such as tow lines, traveling guns and booms, place one station in the upper portion and one in the lower portion of the first and last sets. The stations should be placed far enough from the ends of the sets so that a complete watering pattern takes place. For center pivots, place stations 1 and 3 eighty-five percent, and stations 2 and 4 fifteen percent, of length of center pivot system from the pivot point. Place the stations far enough away from park position to insure that water does not reach the stations when the center pivot is in park position. Stations 2 and 4 could be placed in the opposite side of the field as stations 1 and 3. *Figures 1* and *2*

Table 3. Allowable soil moisture deficit and minimum available moisture for selected root depths on sandy soils.

Soil Texture	*Loamy fine sand*				*Fine sand*							
	in./ft	(mm/m)	in./ft	(mm/m)	in./ft	(mm/m)	in./ft	(mm/m)	in./ft	(mm/m)	in./ft	(mm/m)
TAWHC[1/] inches/foot (mm/m)	1.1	(92)	1.2	(100)	0.7	(58)	0.8	(67)	0.9	(75)	1.0	(83)
Root Depth feet (meters)	*Allowable Soil Moisture Deficit Inches (mm)[2/]*											
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
1.5 (0.46)	0.8	(20)	0.9	(23)	0.5	(13)	0.6	(15)	0.7	(18)	0.8	(20)
2.0 (0.61)	1.1	(28)	1.2	(30)	0.7	(18)	0.8	(20)	0.9	(23)	1.0	(25)
2.5 (0.76)	1.4	(36)	1.5	(38)	0.9	(23)	1.0	(25)	1.1	(28)	1.2	(30)
3.0 (0.91)	1.6	(42)	1.8	(46)	1.0	(25)	1.2	(30)	1.3	(33)	1.5	(38)
Alfalfa	2.2	(56)	2.4	(61)	1.4	(36)	1.6	(42)	1.8	(46)	2.0	(51)
	Minimum Available Moisture Inches (mm)											
1.5 (0.46)	2.5	(64)	2.7	(69)	1.6	(42)	1.8	(46)	2.0	(51)	2.2	(56)
2.0 (0.61)	2.2	(56)	2.4	(61)	1.4	(36)	1.6	(42)	1.8	(46)	2.0	(51)
2.5 (0.76)	1.9	(48)	2.1	(53)	1.2	(30)	1.4	(36)	1.6	(42)	1.8	(46)
3.0 (0.91)	1.6	(42)	1.8	(46)	1.0	(25)	1.2	(30)	1.3	(33)	1.5	(38)
Alfalfa	2.2	(56)	2.4	(61)	1.4	(36)	1.6	(42)	1.8	(46)	2.0	(51)

[1] Total available water holding capacity.

[2] After the dough stage the allowable soil moisture deficit may be increased by 50%. Remember to adjust the minimum available moisture.

can be used as a guide in locating tensiometer stations. Refer to a soil map if available.

Some general guidelines for locating each station are:

1. Place tensiometers in the crop row.
2. Locate the stations in representative areas of the field. Don't place the tensiometers in low spots in the field, or on excessively steep or flat slopes.
3. Select a station where the plant population is representative of the field. (*Caution!* Don't destroy crop near tensiometer station.)
4. Make sure the tensiometers are located so they will not be damaged when the sprinkler system is moved.

Figure 1. Suggested location of tensiometer station for set-type sprinkler systems such as tow lines, traveling guns and booms.

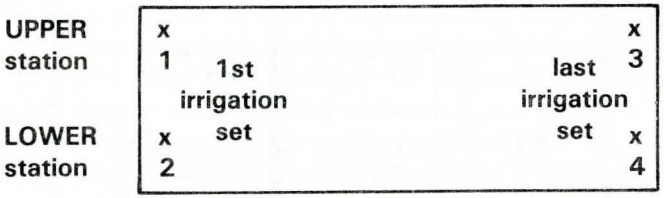
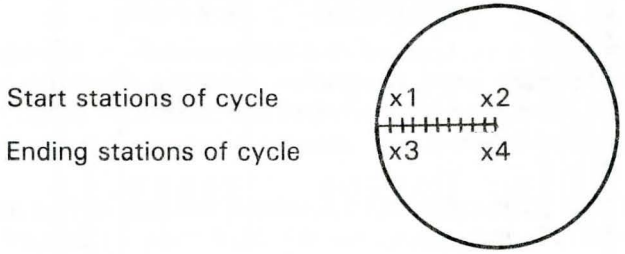


Figure 2. Suggested location of tensiometer stations for center pivot systems.



Depth of Installations—To estimate when you are approaching the minimum available moisture level, use *three* depths at each station. These three tensiometers should be placed at 1.0 (0.30), 2.0 (0.61) and 3.0 feet (0.91 meters). These depths would be *relative to level ground surface at planting time* (after cultivation or listing). For established alfalfa, an additional tensiometer at 4.0 feet (1.22 meters) is recommended.

The tensiometers only measure soil tension in the small zone around the tip and the reading should not be thought of as being representative of a one-foot (0.3 meter) layer extending from six inches (150 mm) above to six inches (150 mm) below the tip. The tips for a series of tensiometers will indicate the water extraction pattern during periods between irrigation or precipitation. They will also trace the pattern of the wetting front if the applied water actually reaches them.

Preparing Tensiometers—At the present time, there are two different makes of tensiometers which are suitable for irrigation scheduling purposes. In both cases the tensiometer consists of a water-filled tube equipped with a vacuum gauge on the upper end and a porous ceramic tip on the lower end. However, the tensiometer from the two manufacturers are different in the details of construction. Both manufacturers sell a preparation kit which is suitable only for their instrument. As a result, it is recommended that you read the instructions prepared by the manufacturer on how to fill and adjust your type of instrument.

A vertical tensiometer filled according to instructions will not read zero prior to insertion in the soil. This is due to the fact that the tip of the tube is below the gauge. The longer the tube, the greater the pressure difference. For each 12 inches (0.30 meters) of tube length, the gauge should register 3 centibars less gravity potential with the porous tip immersed in a cup of water. The tip in the cup is of zero pressure. Since the gauges of "Jet Fill!" tensiometers are adjustable, it is possible to reset them to zero if desired. The gauge of an "Irrometer" tensiometer is not currently adjustable.

Installation of tensiometers—

Equipment needed:

- Soil probe
- Metal rod, minimum of four feet (1.2 m) long with one end rounded in the same shape as a tensiometer tip.
- Sledge hammer (small)
- Flags
- Water and bucket
- Filling bottle with tube
- Algae prevention fluid
- Tensiometers (9-12 per field)

Pre-Field Procedure

1. Check all tensiometer components, including tubes, seals, gauges and tips, to make sure they are in good condition. Repair or replace components if necessary.
2. Read manufacturer's tensiometer assembly instructions and assemble required number of tensiometers.

3. Fill tube with water-algae prevention combination (cooled boiled water will require less work during next stage).
4. Evacuate all air from tube and gauge.
5. Complete assembly and liquid filling procedures.
6. Place assembled tensiometer in container filled with water (tip must remain under water until installed).
7. Adjust gauge dial to zero with tensiometer held in a vertical position and with water to the top of the porous cup (optional).

Field Procedure

1. Bring filled tensiometers to the field in the bucket of water.
2. Use the soil probe to make a hole in the crop row for the tensiometer. Each hole should terminate about four to six inches (0.10 to 0.15 meters) shallower than the desired final depth.
3. Finish the hole using the round tipped metal rod and small sledge hammer. Remember, the rounded end should be at the bottom of the hole.
4. Place tensiometer in hole and push to the bottom of the small diameter portion made with the metal rod. Make sure the tip fits snugly in the hole or erratic readings will occur.
5. Pack the soil around the tube all the way from top to bottom, and make sure the soil surface at the tube is slightly elevated above the surrounding areas.
6. Identify each tensiometer in some manner so that you can tell the tube length. Waterproof tags work well. Some tensiometers are premarked. Stations should also be identified.
7. Use flags so that tensiometer stations can be found easily.
8. Be sure to properly mark the row in which the tensiometers are placed. Install the tensiometers early, before the lay-by stage for row crops if possible (but no later than a few days after lay-by), to allow time for the plant roots to grow around the tip. If the tensiometers are installed late in the growing season with all the crop roots in place, it may create problems in procuring representative tension readings.
9. Tensiometers may break suction at about 50 centibars on units with adjusted gauges. This condition can be identified since the liquid level will be lowered. If tension is broken for a gauge reading below 50 centibars (adjusted), check the unit for a bad "O" ring or tip which is allowing air into the system. To put a tensiometer back into service, refill the liquid column and evacuate all air in the tube. Use the method outlined by the manufacturer.

10. If the liquid level in the tube becomes lower than the gauge, care must be taken to insure that all air is removed from the gauge or faulty readings will result.

Estimating Available Soil Moisture

Tensiometers can be used to determine soil moisture tension for a soil between approximate field capacity and some minimum available moisture. However, unless a supplemental method of estimating soil moisture is also used, you must make daily observations. The simplest method available at this time operates in a manner similar to your bank account in that moisture withdrawals are subtracted and moisture deposits added. The current balance is the item of concern, and when it drops below a specified minimum, you know it is time to make a deposit (i.e., irrigate). The checkbook procedure can be used to determine how much water to apply while the tensiometers are used to tell you when to irrigate.

This method also allows an additional calculation for predicting the date when future deposits are required to maintain a minimum deposit. This accounting procedure must be updated daily in order to insure that the soil moisture content will not drop below the desired minimum balance.

Beginning Balance—This is the amount of available soil moisture at the beginning of the accounting period. This value will normally be the ending balance from the previous period, except the beginning balance for the initial period of the year will have to come from a field moisture measurement. In addition, occasional field checks should be made to determine the accuracy of this balance.

Subtract Withdrawals—Withdrawals are the crop water use values for the accounting period. All computed crop water use values are based upon weather factors. Many Natural Resource Districts and County Agents are publishing values based upon temperature, relative humidity, average wind speed and available sunlight. If this information is available for your area, i.e. you are within 30-50 miles (50-80 km) of the weather station, you should use these values. If this information is not available, you can use a simpler method which is based upon average daily temperature and the length of the day as an index of crop water usage. Tables are available for both row and pasture crops The AGNET system has a routine called ETTABLE which will construct a table for you. *Table 4* shows values for row and pasture crops at 41.5° N latitude for the months of April through October. Average temperature is in the left-hand column and crop water use as a function of average temperature is given in the remaining columns. In order to use these tables, you will

Table 4. Crop Water Use at 41.5° N. Latitude Versus Average Temperature and Month

Average Temperature		April		May		June & July		August		September		October	
		Row Crop Water Use inches/day (mm/day)											
°F	°C	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
50	(10)			.02	(0.5)	.03	(0.8)	.01	(0.3)	.00	(0.0)		
55	(13)			.06	(1.5)	.08	(2.0)	.06	(1.5)	.02	(0.5)		
60	(16)			.10	(2.5)	.12	(3.1)	.10	(2.5)	.05	(1.3)		
65	(18)			.14	(3.6)	.17	(4.3)	.14	(3.6)	.09	(2.3)		
70	(21)			.18	(4.6)	.21	(5.3)	.18	(4.6)	.13	(3.3)		
75	(24)			.23	(5.8)	.25	(6.4)	.22	(5.6)	.17	(4.3)		
80	(27)			.27	(6.9)	.30	(7.6)	.26	(6.6)	.21	(5.3)		
85	(29)			.31	(7.9)	.34	(8.6)	.30	(7.6)	.24	(6.1)		
90	(32)			.35	(8.9)	.39	(9.9)	.34	(8.6)	.28	(7.1)		
95	(35)			.40	(10.2)	.43	(10.9)	.38	(9.7)	.32	(8.1)		
100	(38)			.44	(11.2)	.47	(11.9)	.43	(10.9)	.36	(9.1)		
		Pasture Crop Water Use inches/day (mm/day)											
50	(10)	.13	(3.3)	.14	(3.6)	.14	(3.6)	.14	(3.6)	.12	(3.1)	.10	(2.5)
55	(13)	.14	(3.6)	.16	(4.1)	.16	(4.1)	.15	(3.8)	.13	(3.3)	.11	(2.8)
60	(16)	.16	(4.1)	.17	(4.3)	.18	(4.6)	.17	(4.3)	.15	(3.8)	.12	(3.1)
65	(18)	.17	(4.3)	.19	(4.8)	.20	(5.1)	.18	(4.6)	.16	(4.1)	.14	(3.6)
70	(21)	.19	(4.8)	.20	(5.1)	.22	(5.6)	.20	(5.1)	.18	(4.6)	.15	(3.8)
75	(24)	.21	(5.3)	.22	(4.6)	.24	(6.1)	.22	(5.6)	.19	(4.8)	.16	(4.1)
80	(27)	.22	(5.6)	.24	(6.1)	.26	(6.6)	.24	(6.1)	.21	(5.3)	.18	(4.6)
85	(29)	.24	(6.1)	.26	(6.6)	.27	(6.9)	.25	(6.4)	.23	(5.8)	.20	(5.1)
90	(32)	.25	(6.4)	.28	(7.1)	.29	(7.4)	.27	(6.9)	.24	(6.1)	.21	(5.3)
95	(35)	.27	(6.9)	.30	(7.6)	.31	(7.9)	.29	(7.4)	.26	(6.6)	.21	(5.3)
100	(38)	.29	(7.4)	.32	(8.1)	.33	(8.4)	.31	(7.9)	.27	(6.9)	.22	(5.6)

have to place a maximum-minimum temperature thermometer near your field and take daily readings. The thermometer must be placed in a location which is shaded at all times.

Tensiometers will trace out the crop moisture extraction pattern between irrigations and can be used as a check against the bookkeeping method.

Add Deposits—Deposits result from either irrigation or precipitation which reach the crop root zone. No benefit will result from over irrigation or an irrigation immediately prior to a large rainfall event. Remember that precipitation totals less than 0.1 inch (2.5 mm) should be assumed ineffective and those over 1.0 inch (25 mm) may be run-off. Remember also to take into consideration the efficiency of your irrigation distribution system (*Table 5*). Because these factors may be difficult to state exactly, you should check soil moisture periodically.

Table 5. Estimated irrigation efficiencies for selected sprinkler systems, based on proper irrigation management and design.

	Suggested	*Range*
Center Pivot	80%	70-85
Skid Tow	75%	65-80
Solid Set	75%	65-80
Big Gun	75%	65-80

Tensiometers can be used to estimate the actual effective precipitation or irrigation. This information is especially helpful if runoff occurs and estimates are difficult to make. A drop in tension readings at any depth shows the effective depth of water application.

For sandy soils, the rainfall allowance or the unfilled portion of the soil profile after an irrigation must remain small. The recommended maximum value for sandy soils such as the Valentine Sand is always less than .5 inch (13 mm).

SCHEDULING USING TENSIOMETERS AND THE CHECK BOOK FORM ON DEEP SANDY SOILS

1. When the checkbook form indicates that you should irrigate within two days, check all the tensiometers. You should read and record tensiometer values at least every other day.
2. Only one tensiometer reading should be allowed to exceed the "1/2-full" value. The amount of water to apply by irrigation should be the present deficit as determined from the CHECKBOOK form. Except during the pollination state for row crops, you will normally have to irrigate only once a week.
3. After irrigation, if the deepest tensiometer has a smaller reading than the "full" value, water has moved down below the tensiometer and may be lost to deep percolation.

Tensiometer Readings in Centibars at Field Capacity and One-half of Field Capacity for Several Types of Sandy Soils

	"Full"		"1/2 Full"	
	Fine Sand[A]	Loamy Fine Sand	Fine Sand	Loamy Fine Sand
Adjusted "Jet Fill"	<10[B]	<11[B]	25[B]	30[B]
Unadjusted 12" (.30 meter) tube	13	14	28	33
Unadjusted 24" (.61 meter) tube	16	17	31	36
Unadjusted 36" (.91 meter) tube	19	20	34	39
Unadjusted 48" (1.22 meter) tube	22	23	37	42

A/ Sample Soils: Fine sand - Valentine fine sand and similar soils. Loamy fine sand -Valentine loamy fine sand and similar soils.

B/ Unadjusted readings based upon adjusted reading for each column.

Predicting Irrigation Timing Based on Available Soil Moisture and Crop Water Use

The maximum number of days before the next irrigation is equal to present available soil moisture minus the minimum available soil moisture, divided by the estimated daily crop water use.

For Example: Corn/Blister, Valentine Sand

Root Depth = 3.5 feet (1.07 meters)	Table 1.
Total Available Water Capacity = 2.7" (69 mm) in top 3 feet (0.91 meters)	Table 2.
Minimum Available Moisture = 1.3" (33 mm)	Table 3.
Present Available Moisture = 2.6" (66 mm)	Checkbook Form.
Water Use Rate = 0.26"/day (6.6 mm/day)	Table 5.

$$\frac{2.6\ (66) - 1.3\ (33)}{0.26\ (6.6)} = 5 \text{ days}$$

Predicted daily water use for various crops can be based on what occurred during the previous week. This information may be available from other sources. If not, the normal water use as presented in *Table 5* by stage of growth can be used.

Water should be added to the soil profile on or before the minimum available moisture occurs, as presented in the bottom half of *Table 3.* If the minimum available moisture condition occurs, then the maximum gross amount of irrigation water you should apply is the allowable deficit as shown for the top half of *Table 3.* For our previous example, the minimum available moisture should be 1.3 inches (33 mm). Thus, the maximum deficit is 1.3 inches (33 mm). This 1.3 inches (33 mm) is the

maximum that should be applied. The irrigation system efficiency will give a rainfall allowance. Therefore the calculated deficit is the gross amount of water to apply.

For calculating water application amounts from water meter readings, see NebGuide G78-393.

Table 6. Crop water use rates for an average year by stage of growth for various crops.

Water Use Rate					
in/day	*(mm/day)*	*Corn*	*Sorghum*	*Soybeans*	*Alfalfa*
0.18	(4.6)				
0.20	(5.1)			Full Bloom	
0.24	(6.1)	12 Leaf			
0.26	(6.6)		Flag Leaf	Beginning Pod	
0.28	(7.1)	Early Tassel	Boot		June 15
0.30	(7.6)	Silking	Half Bloom	Full Pod	
				Development	July 1
0.28	(7.1)				August 1
0.26	(6.6)	Blister Kernel	Soft Dough		
0.24	(6.1)	Milk		Full Seed Fill	August 15
0.22	(5.6)				September 1
0.20	(5.1)	Beginning Dent			
0.18	(4.6)	Full Dent	Hard Dough		

Alfalfa water use rates should be multiplied by 0.50 during first ten days following cutting and .75% from the tenth to twentieth days following cutting.

CHECKBOOK IRRIGATION SCHEDULING FOR SANDY SOILS

PERIOD: 7/28 to 8/3
LATITUDE: 41.5 °N
IRRIGATION SYSTEM: Pivot
SYSTEM EFFICIENCY: 80 %
SOIL: Valentine Fine Sand
ROOT ZONE: 3.5 FT.
MINIMUM AVAILABLE MOISTURE ALLOWED: 1.3 IN. (MAM ALLOWED)
RAINFALL ALLOWANCE — IN.

FIELD I.D.: Your Number
CROP/STAGE: Corn / Blister
ALLOWABLE DEPLETION: 50 %
AVAILABLE MOISTURE/FT.: 0.9 IN. (AM/FT.)
ALLOWABLE DEFICIT: 1.3 IN.
BEGINNING AM: 1.75 IN. (IN TOP 3 FEET*)
*4 FEET FOR ALFALFA

DATE	7/28	29	30	7/31	8/1	2	8/3
MAXIMUM TEMPERATURE	94	92	88	91	89	89	93
MINIMUM TEMPERATURE	70	68	68	62	74	65	69
AVERAGE TEMPERATURE	82	80	78	77	82	77	81
CROP WATER USE (IN.)	.30	.28	.26	.24	.28	.24	.28
NET IRRIGATION (IN.)		1.04					
PRECIPITATION (IN.)			.65				
AM (IN.—IN TOP 3 FEET*)	1.45	2.21	2.60	2.36	2.08	1.84	1.56
ND (DAYS)	.6	3.1	4.8	4.1	3.0	2.2	1.0

AVERAGE CONSUMPTIVE USE: _____ IN/DAY (ACU)
NUMBER OF DAYS TO NEXT IRRIGATION (ND) = (AM—MAM)/ACU
ND = (_____ IN — _____ IN)/ _____ IN/DAY = _____ DAYS

TENSIOMETER READINGS Type: Jet Fill (Adj)

DATE	7/28				7/29				8/2			
DEPTH (ft)	1	2	3	4	1	2	3	4	1	2	3	4
STATION 1	22	27	16		8	10	14		18	17	15	
STATION 2	27	25	15		8	9	15		18	20	16	
STATION 3	16	12	15		18	16	16		12	10	17	
STATION 4	15	12	17		19	17	18		12	12	19	
WATER METER READING	25,003,100				25,099,100				29,698,000			

CHECKBOOK IRRIGATION SCHEDULING FOR SANDY SOILS

PERIOD: _____ to _____
LATITUDE: _____ °N
IRRIGATION SYSTEM: _____
SYSTEM EFFICIENCY: _____ %
SOIL: _____
ROOT ZONE: _____ FT.
MINIMUM AVAILABLE MOISTURE ALLOWED: _____ IN. (MAM ALLOWED)
RAINFALL ALLOWANCE _____ IN.

FIELD I.D.: _____
CROP/STAGE: _____
ALLOWABLE DEPLETION: _____ %
AVAILABLE MOISTURE/FT.: _____ IN. (AM/FT.)
ALLOWABLE DEFICIT: _____ IN.
BEGINNING AM: _____ IN. (IN TOP 3 FEET*)
*4 FEET FOR ALFALFA

DATE							
MAXIMUM TEMPERATURE							
MINIMUM TEMPERATURE							
AVERAGE TEMPERATURE							
CROP WATER USE (IN.)							
NET IRRIGATION (IN.)							
PRECIPITATION (IN.)							
AM (IN.—IN TOP 3 FEET*)							
ND (DAYS)							

AVERAGE CONSUMPTIVE USE: _____ IN/DAY (ACU)
NUMBER OF DAYS TO NEXT IRRIGATION (ND) = (AM—MAM)/ACU
ND = (_____ IN — _____ IN)/ _____ IN/DAY = _____ DAYS

TENSIOMETER READINGS Type: _____

DATE												
DEPTH (ft)	1	2	3	4	1	2	3	4	1	2	3	4
STATION 1												
STATION 2												
STATION 3												
STATION 4												
WATER METER READING												

CHECKBOOK IRRIGATION SCHEDULING FOR SANDY SOILS

PERIOD: _____ to _____
LATITUDE: _____ °N
IRRIGATION SYSTEM: _____
SYSTEM EFFICIENCY: _____ %
SOIL: _____
ROOT ZONE: _____ FT.
MINIMUM AVAILABLE MOISTURE ALLOWED: _____ IN. (MAM ALLOWED)
RAINFALL ALLOWANCE _____ IN.

FIELD I.D.: _____
CROP/STAGE: _____
ALLOWABLE DEPLETION: _____ %
AVAILABLE MOISTURE/FT.: _____ IN. (AM/FT.)
ALLOWABLE DEFICIT: _____ IN.
BEGINNING AM: _____ IN. (IN TOP 3 FEET*)
*4 FEET FOR ALFALFA

DATE							
MAXIMUM TEMPERATURE							
MINIMUM TEMPERATURE							
AVERAGE TEMPERATURE							
CROP WATER USE (IN.)							
NET IRRIGATION (IN.)							
PRECIPITATION (IN.)							
AM (IN.—IN TOP 3 FEET*)							
ND (DAYS)							

AVERAGE CONSUMPTIVE USE: _____ IN/DAY (ACU)
NUMBER OF DAYS TO NEXT IRRIGATION (ND) = (AM—MAM)/ACU
ND = (_____ IN — _____ IN)/ _____ IN/DAY = _____ DAYS

TENSIOMETER READINGS

Type: _____

DATE												
DEPTH (ft)	1	2	3	4	1	2	3	4	1	2	3	4
STATION 1												
STATION 2												
STATION 3												
STATION 4												
WATER METER READING												

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color or national origin.