

# RECOMMENDATIONS – SENSOR INTERPRETATIONS



**Management** — IRROMETER instruments and WATERMARK sensors measure soil moisture status in centibars (cb) or kilopascals (kPa) of soil water tension. This value represents the energy a plant's root system uses to draw water from the soil. The key element in proper soil moisture measurement is the operator. Taking the time to interpret your sensor readings will give you a vivid picture of what is happening with the soil moisture in the root system of your crop. Usually 2-3 readings between irrigations are sufficient. Charting your readings will show exactly how quickly (or slowly) your soil moisture is being depleted. Automatic data collection equipment, such as the WATERMARK Monitor, can also provide a graphical display of the data.

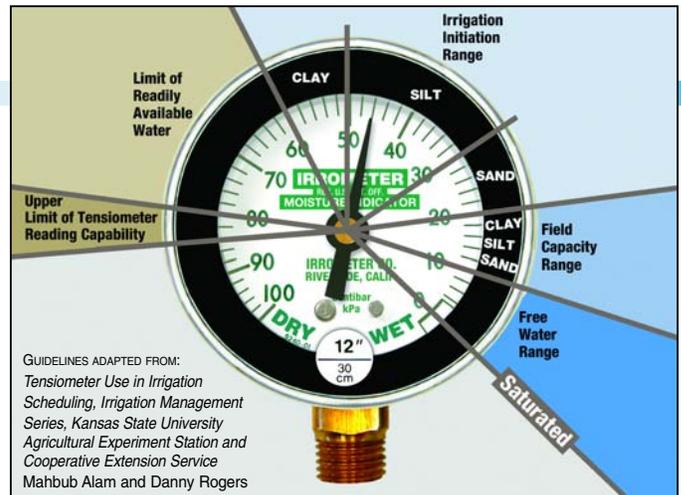
**Use the following readings as a general guideline:**

- 0-10 cb (kPa) = Saturated soil
- 10-30 cb (kPa) = Soil is adequately wet (except coarse sands, which are beginning to lose water)
- 30-60 cb (kPa) = Usual range for irrigation (most soils)
- 60-100 cb (kPa)\* = Usual range for irrigation in heavy clay
- 100-200 cb (kPa)\* = Soil is becoming dangerously dry for maximum production. Proceed with caution!

\*IRROMETER instrument limitation is approximately 85 cb (kPa), WATERMARK sensors read up to 200 cb (kPa).

Your own situation may be unique because of differences in crops, soils and climate.

Perhaps the most important soil moisture reading is the difference between today's reading and that of 3-5 days ago. That is to say, how quickly is the reading going up? A slow increase means the soil is drying out slowly. But a big jump means the soil is losing water very rapidly. A faster rate or increase means the crop is beginning to work harder to extract water from the soil and may start to

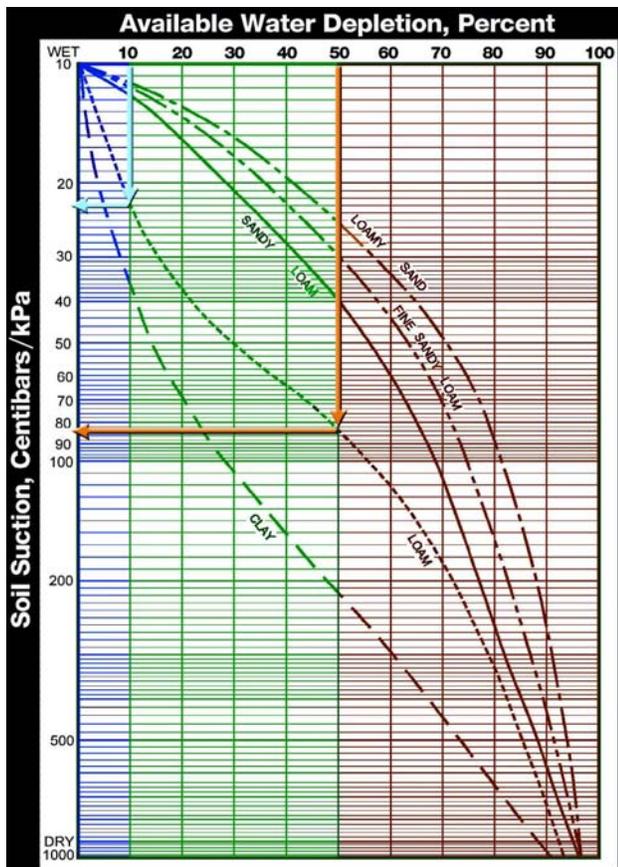


GUIDELINES ADAPTED FROM:  
Tensiometer Use in Irrigation  
Scheduling, Irrigation Management  
Series, Kansas State University  
Agricultural Experiment Station and  
Cooperative Extension Service  
Mahbub Alam and Danny Rogers

stress. By analyzing such trends in the readings, you will determine **WHEN** to irrigate. Displaying the readings on a graph makes it easier to see the trends, thereby making interpretation simpler.

By using sensors at two or more depths in the root system, you can determine **HOW MUCH** water to apply. If the shallow sensor shows a rapidly increasing reading, but the deep sensor shows adequate moisture, you can run a short irrigation cycle as you only need to replenish the shallow root profile. If the deep sensor also shows a dry condition, then a longer irrigation cycle is needed to fully re-wet the entire root zone. The readings you take after an irrigation or rainfall event will show you exactly how effective that water application was.

Your own experience and management will soon point you in the proper direction. You will be practicing "irrigation to need" with the positive results that come from any good management program.



**Moisture Thresholds** — This graph is provided to *assist you in creating* reference points for your own site and application. These identify the "boundaries" within which you want to manage moisture availability for your crop. How wet and how dry the soil should depend on soil type, crop, the plant's stage of development and cultural practices for managing the field. The chart is offered as a reference guide to assist you in selecting appropriate threshold levels. There is no substitute for experience and agronomic knowledge to provide the best recommendations. Please consult a crop consultant, farm adviser, NRCS agent or extension agent for more specific advice on proper soil moisture management. A list of crop consultants that specialize in irrigation management can be found on our website at:

<http://www.IRROMETER.com/consults.html>

- First, select the soil type(s) that most closely resembles that in your field.
- Then, draw a vertical line from 10% available water depletion (represented by the blue/green boundary) down to the curve for your soil type and then horizontally over to the left axis labeled soil suction to obtain the reference WET value. This will determine the lower (wetter) threshold value.
- Use this centibar / kPa value as the wet threshold. For example, for a loam soil, this value would be 23 (as indicated by the blue arrow).
- Next, draw a vertical line from 50% available water depletion (represented by the green/brown boundary) down to the curve for your soil type and then horizontally over to the left axis labeled soil suction to obtain the reference DRY value. This will determine the higher (drier) threshold value.
- Use this centibar / kPa value as the dry threshold. For example, for a loam soil, this value would be 84 (as indicated by the brown arrow).

GRAPH ADAPTED FROM:  
Agronomy No. 11, figure 30-2  
Irrigation of Agricultural Lands  
American Society of Agronomy  
R.M. Hagan, H.R. Haise, T.W. Edminster, editors.

## Suggested placement depths for **IRROMETER** and **WATERMARK SENSORS**

The following are suggested placement depths for various crops based on deep, well drained soils. In lighter or shallow soils, place instrument accordingly or set them at an angle. With drip or trickle irrigation 12" and 24" depths are recommended, with an added 36" instrument for deeply rooted crops.

| <b>CROP</b>                       | <b>SHALLOW INSTRUMENT (INCHES)</b> | <b>DEEP INSTRUMENT (INCHES)</b> | <b>FOR EXTRA DEPTH, SET AT (INCHES)</b> | <b>CROP</b>          | <b>SHALLOW INSTRUMENT (INCHES)</b> | <b>DEEP INSTRUMENT (INCHES)</b> | <b>FOR EXTRA DEPTH, SET AT (INCHES)</b> |
|-----------------------------------|------------------------------------|---------------------------------|---|----------------------|------------------------------------|---------------------------------|---|
| ALFALFA                           | 18-24                              | 36-48                           | 60-70                                   | MELONS               | 18                                 | 36                              |   |
| ALMONDS                           | 24                                 | 48                              | 72                                      | MILO                 | 24                                 | 48                              |   |
| APPLES                            | 20                                 | 40                              | 60                                      | MINT                 | 12                                 | 24                              |   |
| APRICOTS                          | 24                                 | 48                              | 72                                      | MONTEREY PINES, FIRS | 12                                 | 24                              |   |
| ARTICHOKES                        | 18                                 | 36                              |   | MUMS                 | 4-6                                |                                 |   |
| ASPARAGUS                         | 18-24                              | 36-48                           |   | MUSTARD              | 18                                 | 36                              |   |
| AVOCADOS                          | 12                                 | 24                              | 36                                      | NECTARINES           | 18                                 | 36                              |   |
| BANANAS                           | 12                                 | 24                              |   | OATS                 | 18                                 | 36                              |   |
| BARLEY                            | 18                                 | 36                              |   | OKRA                 | 18                                 | 36                              |   |
| BEANS (bush)                      | 10                                 |                                 | 18                                      | OLIVES               | 24                                 | 48                              | 60                                      |
| BEANS (Lima)                      | 18                                 | 36                              |   | ONIONS               | 12                                 |                                 |   |
| BEANS (Pole)                      | 18                                 | 36                              |   | PAPAYA               | 12                                 | 24                              |   |
| BEETS (sugar)                     | 18                                 | 36                              |   | PARSNIPS             | 18                                 | 36                              |   |
| BEETS (table)                     | 12-18                              | 24-36                           |   | PEACHES              | 18                                 | 36                              | 60                                      |
| BLUEBERRIES                       | 12                                 | 24                              |   | PEANUTS              | 12                                 | 24                              |   |
| BROCCOLI                          | 12                                 | 20                              |   | PEARS                | 18                                 | 36                              | 48                                      |
| CABBAGE                           | 12                                 | 20                              |   | PEAS                 | 18                                 | 36                              |   |
| CANAIGRE                          | 18                                 | 36                              | 48                                      | PECANS               | 18                                 | 36                              | 48                                      |
| CANTALOUPE                        | 18                                 | 36                              |   | PEPPERS              | 15                                 | 30                              |   |
| CARNATIONS                        | 4-6                                |                                 |   | PERMANENT PASTURES   | 8-15                               |                                 | 24-30                                   |
| CARROTS                           | 12                                 | 24                              |   | PERSIMMONS           | 18                                 | 36                              |   |
| CAULIFLOWER                       | 12                                 | 24                              |   | PINEAPPLE            | 15                                 | 30                              |   |
| CELERY                            | 10                                 | 20                              |   | PISTACHIO NUTS       | 24                                 | 48                              | 60                                      |
| CHARD                             | 12                                 | 24                              |   | POMEGRANATES         | 18                                 | 36                              |   |
| CHERRIES                          | 24                                 | 48                              |   | POTATOES (Irish)     | 8-10                               | 18                              |   |
| CHRISTMAS TREE                    | 12                                 | 24                              |   | POTATOES (sweet)     | 18                                 | 36                              |   |
| CITRUS: Orange, Lemon, Grapefruit | 18                                 | 36                              |   | PLUMS                | 24                                 | 48                              | 72                                      |
| COFFEE                            | 18-24                              | 36-48                           |   | PRUNES               | 24                                 | 48                              | 72                                      |
| CORN (sweet)                      | 12                                 | 30                              |   | PUMPKIN              | 18                                 | 36                              | 48                                      |
| CORN (field)                      | 18                                 | 36                              |   | RADISHES             | 12                                 |                                 |   |
| COTTON                            | 18                                 | 36                              | 48                                      | RASPBERRIES          | 18                                 | 36                              |   |
| CRANBERRIES                       | 18                                 | 36                              |   | SORGHUM              | 18                                 | 36                              |   |
| CUCUMBERS                         | 18                                 | 36                              |   | SOY BEANS            | 18                                 | 36                              | 60                                      |
| DATE PALM                         | 24                                 | 48                              | 60                                      | SPINACH              | 12                                 | 24                              |   |
| EGGPLANT                          | 12                                 | 24                              |   | SQUASH (Summer)      | 15                                 | 30                              |   |
| FIGS                              | 18                                 | 36                              |   | STRAWBERRIES         | 6                                  | 12                              |   |
| GARLIC                            | 12                                 | 24                              |   | SUDAN GRASS          | 18-24                              | 36-48                           |   |
| GRAIN and FLAX                    | 18                                 | 36                              |   | SUGAR CANE           | 18                                 | 36                              |   |
| GRAPES                            | 24                                 | 48                              | 60                                      | SUNFLOWERS           | 24                                 | 48                              | 60                                      |
| HOPS                              | 24                                 | 48                              | 60                                      | TEA                  | 12                                 | 24                              |   |
| JOJOBA                            | 18                                 | 36                              |   | TOBACCO              | 8-15                               | 30                              |   |
| KIWI                              | 18                                 | 36                              | 48                                      | TOMATOES             | 18                                 | 36                              |   |
| LADINO CLOVER                     | 10                                 | 20                              |   | TURNIPS              | 18                                 | 36                              |   |
| LETTUCE                           | 12                                 |                                 |   | WALNUTS              | 24                                 | 48                              | 72                                      |
| MACADAMIAS                        | 12                                 | 24                              | 36                                      | WATERMELON           | 18                                 | 36                              | 48                                      |
| MAIZE                             | 18                                 | 36                              |   | WHEAT, HAY           | 18                                 | 36                              |   |

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