

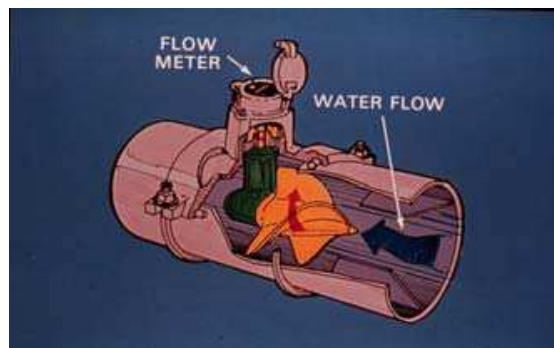
# Irrigation Water Management

Irrigation Water Management (IWM) is the practice of monitoring and managing the rate, volume, and timing of water application according to the seasonal crop needs, giving consideration to the soil intake and water holding capacities. Soil moisture should be managed to obtain optimum yields, without deep percolation losses or runoff.

Irrigation water management will help irrigators determine the effectiveness of irrigation practices, make good water management decisions, and justify making irrigation adjustment in existing systems.

Tools are available to assist the irrigator with irrigation water management:

- “Checkbook” method to monitor and balance soil moisture in irrigated cropland.
- Flow meters to record instantaneous flow rates and total volume usage.
- Soil moisture meters and sensors to monitor soil water deficit.
- Soil moisture data loggers to record soil moisture history throughout the growing season.



**Propeller Type Flow Meter**

## Irrigation Water Management levels

The producer can contract one of three IWM levels.

Level 1 – Producer would monitor and report irrigation and precipitation amounts to a checkbook accountant on a regular basis during the growing season. The checkbook accountant would track the daily balance of soil moisture in the field. The producer would participate in a year-end feedback session with the MACD checkbook accountant and NRCS staff to review the effective management of soil moisture through the

growing season, and discuss the potential for water and energy savings and agronomic recommendations.

Level 2 – Same as Level 1. In addition, the producer would install 1 set of soil moisture sensors per 20 acres, maximum 3 sets. The producer would monitor and report soil moisture deficit readings to the checkbook accountant along with irrigation and precipitation amounts. These readings would allow the checkbook accountant to reconcile the balance of soil moisture on a regular basis for more accurate feedback.

Level 3 – Same as Level 2. However, the soil moisture sensors would include a wireless transmitters. The producer would monitor and record the daily soil moisture deficit using a wireless data logger. In addition to the year-end feedback session, the producer would participate in regular feedback sessions with the checkbook accountant to assess the timing of irrigations. The producer would actively manage soil moisture between field capacity and the maximum allowable depletion (MAD) level for their specific soils and crop.

## Checkbook Method

The “checkbook method” is a tool to record the daily withdrawals and deposits of soil moisture in order to properly schedule irrigations.

The electronic version of the checkbook method can be run in Excel® 2007 or earlier version.

The checkbook method tracks the consumptive use of the crop and soil moisture deficit. The soil moisture deficit (created by evapotranspiration) is based on crop growth stage and maximum daily temperature. Depending on the contracted IWM Level, the producer will monitor and report their irrigations, flow meter readings, precipitation amounts, and soil moisture deficits to the checkbook accountant. Daily temperatures will be accessed from the internet for different locations in Montana. A typical internet site is located at this web address:

<http://www.accuweather.com/us-city-list.asp?zipcode=&state=MT>

The checkbook balance is used to determine if soil moisture is properly managed between field capacity and the maximum allowable depletion (MAD) level.

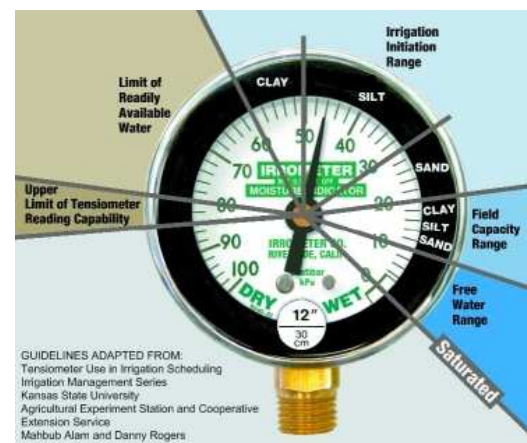
At the end of the irrigation season, the checkbook accountant will print out the soil moisture balance sheet, recommended irrigation schedule, graphed presentation of water use, potential energy savings, and technical certification sheet. The technical certification sheet can be signed by the producer and accountant and given to the NRCS for release of EQIP payments for proper IWM.



**Tensiometer**

**Gypsum Block**

The producer can install tensiometers or gypsum blocks to measure soil moisture deficit levels in the field.



**Tensiometer Dial**



**Soil Moisture Meter**

A soil moisture meter is a solid-state, resistance meter for reading gypsum block sensors. The meter can be calibrated for soil temperature variations. One meter can be used to read an unlimited number of sensors, one at a

time. Meter readings can be acquired by connecting two leads to the gypsum block and selecting the “read” button. The meter reads units in centibars and range from 0 cb (wet) to 199 cb (very dry).

## Wireless Soil Moisture Transmitter and Data Logger

A wireless soil moisture data logger is similar to the soil moisture meter described above, but it allows for a wireless connection to transmitters at soil moisture sensor locations. A transmitter can read and transmit data from 4 connected sensors. The data logger records the soil moisture data from as many as 16 transmitters, or 64 sensors. Data is stored on the logger and can be downloaded to a laptop, PDA, or 900 MHz radio telemetry device.



**Soil Moisture Transmitter**



**Wireless Soil Moisture Data Logger**



#### Data Logger Downloading to a Laptop

A wireless soil moisture data logger features:

- 1500 ft. line of site range between receiver and each transmitter.
- 4 sensors on each transmitter.
- In-field display of current soil moisture deficit readings to adjust irrigation applications.
- Download history to a computer for graphical display.
- A tipping rain bucket gauge also can be read by the data logger.

#### Installation

For IWM Level 2 and 3, there shall be a minimum of 6 tensiometers or gypsum blocks (soil moisture sensors) installed per field. Three locations shall each have two sensors nested together at different depths within the root zone. Shallow sensors are set at approx. 25% of the crop rooting depth. Deep sensors are set at approximately 75% of the crop rooting depth.

The MACD IWM Service can be used in conjunction with the NRCS EQIP Program. Under the EQIP Program, IWM must be contracted on a per field basis for three years with cost-share on Sprinklers, Gated Pipe, or Land Leveling. Producers have the flexibility to contract IWM at one of three management levels based on their interest and resources. EQIP payments for IWM increase with more intensive and effective soil moisture management.

The MACD will staff checkbook accountants at centralized locations in Montana to assist producers with the maintenance of soil moisture records and provide feedback on the application of water and energy.

Producers will be responsible for monitoring and reporting water applications and soil moisture readings to the checkbook accountants.

The enrollment period for the MACD IWM service will be open from July 1 through August 15, 2011. This service is available to all Montana irrigators starting with the 2012 irrigation season. FY 2011 EQIP contracts should schedule IWM for three years starting in 2012. Registration forms are available on the MACD website at [www.macdnet.org](http://www.macdnet.org). The producer must fill out a one-time registration form and mail it with the first annual payment to:

MACD  
IWM Service  
790 Colleen Street  
Helena, Montana 59601-9713

Checks should be made payable to: Soil and Water Conservation Districts of Montana, Inc., (SWCDMI). Remit annual payments in the amount of \$187.50 per field for IWM Level I and II, and \$305.00 per field for IWM Level III. Specific enrollment questions can be addressed to Jeff Tiberi, MACD Executive Director, at (406) 443-5711.

MACD checkbook accountants will contact producers for field-specific information prior to the 2012 irrigation season. They will also provide instructions on how to report water applications and soil moisture readings. Flow meters and soil moisture sensors must be installed prior to the irrigation season. The NRCS is available for technical assistance in the application of these devices.



## Irrigation Water Management Service

