



## Irrigation Toolbox Chapter 6

### Soil Moisture Measurement

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## SOIL MOISTURE MEASUREMENT

### Introduction

- The material provided in this section is intended to serve as a framework for soil moisture measurement training.
- Trainers should modify the training material referenced as necessary to achieve the planned skill level for the trainees.
- Trainers are encouraged to include locally developed training materials to complement and/or supplement the referenced material.
- As new training materials are developed by trainers, they are encouraged to furnish copies to the Irrigation ToolBox Manager for inclusion in future versions of the assembled material.

### Suggested Objectives

1. Determine appropriate method of soil moisture measurement for given specific site conditions.
2. Specify methods and procedures to obtain accurate measurements.
3. Perform soil measurement using applicable procedures and tools.

# SOIL MOISTURE MEASUREMENT

## **Suggested Outline**

1. "Feel" Method.
2. Tensiometers.
3. Electrical Resistivity.
4. Laboratory (Gravimetric) Method.
5. Neutron Gauge
6. Dielectric Constant Method. (Time Domain Reflectometry).

***Note: Note all copies of documents that were contained in the original Irrigation Training Toolbox are available electronically.***

***If you are unable to find a hard copy of a document in your state, you may be able to borrow a copy from the Water Management Engineer at your regional National Technology Support Center.***

# SOIL MOISTURE MEASUREMENT

## 1. "Feel" Method

### Reference Material

- NEH Part 652: National Irrigation Guide, Chapter 9: Irrigation Water Management.
- National Engineering Handbook Part 623-Chapter 2 Soil Plant Water Relationships.

### Toolbox Material

- Publication "Estimating Soil Moisture By Feel and Appearance", NRCS. PA 1619.
- Publication "Soil Water Measurements: An Aid to Irrigation Water Management", Irrigation Management Series, Kansas State University, Cooperative Extension Service.
- Publication "The Montana Irrigators' Pocket Guide", Montana Department of Environmental Quality, MT.
- Video "Reflections: Soil Moisture Monitoring", NRCS, NM

### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

### Evaluation

- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.

# SOIL MOISTURE MEASUREMENT

## 2. Tensiometers

### Reference Material

- NEH Part 652: National Irrigation Guide, Chapter 9: Irrigation Water Management.
- National Engineering Handbook Part 623-Chapter 2 Soil Plant Water Relationships.


### Toolbox Material

- Publication: *Soil Water Measurements: An Aid to Irrigation Water Management*, Irrigation Management Series, Kansas State University, Cooperative Extension Service, KS.
- Publication "Tensiometer Use in Scheduling Irrigation", Irrigation Management Series, Kansas State University, Cooperative Extension Service.
- Publication "The Montana Irrigators' Pocket Guide", Montana Department of Environmental Quality, MT.
- Publication "Tensiometers: A Gauge for Measuring Soil Moisture", Water Management Note, High Plains Underground Water Conservation District No. 1
- Video "Agricultural Irrigation Scheduling, The Irrrometer Story", Irrrometer Company.
- Video "Reflections: Soil Moisture Monitoring", NRCS, NM.

### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

### Evaluation

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- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.

# SOIL MOISTURE MEASUREMENT

## 3. Electrical Resistivity

### Reference Material

- NEH Part 652: *National Irrigation Guide*, Chapter 9: Irrigation Water Management.
- National Engineering Handbook Part 623-Chapter 2 Soil Plant Water Relationships.

### Toolbox Material

- Publication "Irrigating By The Block: Soil Moisture Blocks and Resistance Meters", Water Management Note, High Plains Underground Water Conservation District No. 1.
- Publication "Soil Water Measurements: An Aid to Irrigation Water Management", Irrigation Management Series, Kansas State University, Cooperative Extension Service.
- Publication "The Montana Irrigators' Pocket Guide", Montana Department of Environmental Quality, MT.
- Video "Agricultural Irrigation Scheduling, The Irrrometer Story", Irrrometer Company.
- Video "Reflections: Soil Moisture Monitoring", NRCS, NM.

### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

### Evaluation

- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.

## • SOIL MOISTURE MEASUREMENT

### 4. Laboratory (Gravimetric) Method of Soil Moisture Measurement

#### Reference Material

- NEH Part 652: National Irrigation Guide, Chapter 9: Irrigation Water Management.
- National Engineering Handbook Part 623-Chapter 2 Soil Plant Water Relationships.

#### Toolbox Material

- Publication "The Montana Irrigators' Pocket Guide", Montana Department of Environmental Quality, MT.
- Publication "Soil Water Measurements: An Aid to Irrigation Water Management", Irrigation Management Series, Kansas State University, Cooperative Extension Service.

#### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

#### Evaluation

- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.

# SOIL MOISTURE MEASUREMENT

## 5. Neutron Gauge

### Reference Material

- NEH Part 652: *National Irrigation Guide*, Chapter 9: Irrigation Water Management.
- National Engineering Handbook Part 623-Chapter 2 Soil Plant Water Relationships.
- Michigan NRCS Neutron Software and User's Guide (Campbell-Pacific only).
- NRCS "Neutron Gauge Training Session".

### Toolbox Material

- Publication "Soil Water Measurements: An Aid to Irrigation Water Management", *Irrigation Management Series*, Kansas State University, Cooperative Extension Service.
- Publication "The Montana Irrigators' Pocket Guide", Montana Department of Environmental Quality, MT.

### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

### Evaluation

- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.



# SOIL MOISTURE MEASUREMENT

## 7. Dielectric Constant Method (Time Domain Reflectometry)

### Reference Material

- NEH Part 652: National Irrigation Guide, Chapter 9: Irrigation Water Management.

### Toolbox Material

- None

### Facilitation Options

- Self-paced,
- Facilitator guided, or
- Formal classroom training.

### Evaluation

- Each state should develop an evaluation procedure which addresses the level of competence desired before and after training is provided.

# SOIL MOISTURE MEASUREMENT

## Overview

### Contents of Toolbox Packets

- Publication "Estimating Soil Moisture By Feel and Appearance", NRCS. PA 1619.
- Publication "Irrigating By The Block: Soil Moisture Blocks and Resistance Meters", Water Management Note, High Plains Underground Water Conservation District No. 1
- Publication "Soil Moisture Monitoring: Overview of Monitoring Methods and Devices", Water Management Note, High Plains Underground Water Conservation District No. 1
- Publication "Tensiometers: A Gauge For Measuring Soil Moisture", Water Management Note, High Plains Underground Water Conservation District No. 1
- Publication "Tensiometer Use in Scheduling Irrigation", Irrigation Management Series, Kansas State University, Cooperative Extension Service
- Publication "Soil Water Measurements: An Aid to Irrigation Water Management", Irrigation Management Series, Kansas State University, Cooperative Extension Service
- Publication "The Montana Irrigator's Pocket Guide", MT Dept. of Environmental Quality
- Video "REFLECTIONS - Soil Moisture Monitoring", NRCS, NM
- Video "Agricultural Irrigation Scheduling - The Irrrometer Story", Irrrometer Company