

**AG INSTRUMENTATION**  
Two-Part Workshop  
Fridays, January 15 and January 22, 2021

**WESTERN SARE**  
Sustainable Agriculture Research & Education

A train-the-trainer instrumentation workshop, including:

- **soil probes** (for soil sampling)
- **hay testing probes** (for hay sampling)
- **pH meters** (tests pH for soil, water)
- **tensiometers** (measures soil water content)
- **PAR meters** (measures light transmission for greenhouse film)
- **smart flow meters** (tests irrigation systems)

**Dates:** Friday Jan 15 & 22, 2021  
**Time:** 9:00 am – 11 am PST  
**Location:** Zoom Webinar  
**Cost:** FREE!

[Click here to register](#)

Co-sponsored by:

University of Idaho Extension  
CULTIVATING SUCCESS  
SUSTAINABLE AGRICULTURE EDUCATION  
USDA  
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National Institute of Food and Agriculture

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## Soil pH

- pH is a measure of active soil hydrogen
- H<sup>+</sup> increases, soil becomes more acidic
- H<sup>+</sup> concentration decreases, soil becomes more alkaline
- pH 7 = neutral
- below 7 = acid
- above 7 = alkaline or basic

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Icons: Soil probe, Leaf, Tractor, Fertilizer bag, Water drop

**Using Hanna  
pH/EC Meters to test  
soil and water samples**

**Ariel Agenbroad**  
Area Extension Educator  
Community Food Systems and Small Farms  
Southern District

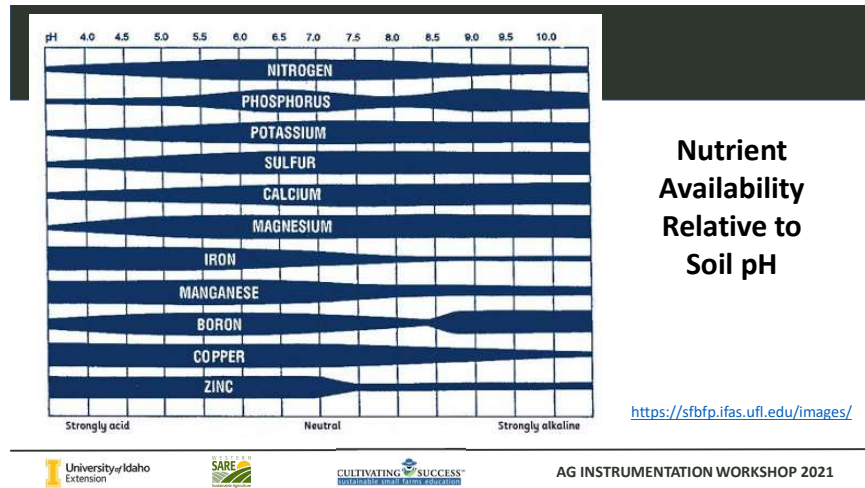
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AG INSTRUMENTATION WORKSHOP 2021

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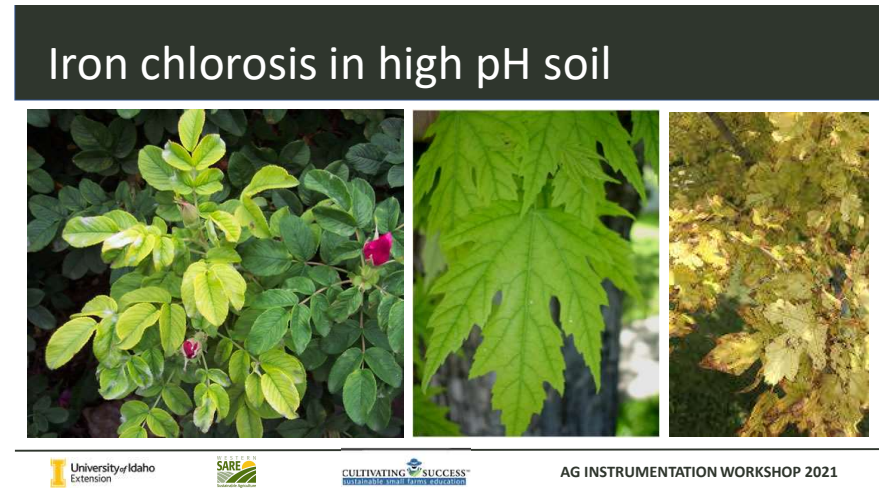
## The importance of Soil pH

- Plant species have various adaptations to specific acidic, neutral, or alkaline soil conditions.
- Relative availability of nutrients is affected by soil pH
- When plants fail to thrive, it may be an indication that there is a pH problem.
- Knowing soil pH can be an important tool to understanding a soil, especially when other tests are unavailable or cost prohibitive

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## Electroconductivity in soil/solution

- **EC value** is the salt concentration in a substrate or nutrient solution.
- Soils containing excess salts occur naturally in arid and semiarid climates, and salt levels can increase as a result of cropping, irrigation, and land management.
- Measured in deciSiemen per meter (dS/m) or mS/cm (milliSiemens per centimeter).
- At salinity above 2 mS/cm seedling germination starts to be inhibited and roots of larger plants may have difficulty accessing nutrients and water. Above 4 mS/cm roots are physically damaged and may die.

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## How will you use your new meter?

- Estimate soil pH and EC in your research projects
- Use as a demonstration tool in soils, ag and hort classes
- Estimate soil pH and/or electroconductivity for clients and/or the public



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## Let's get unpacked!



## Using the meter

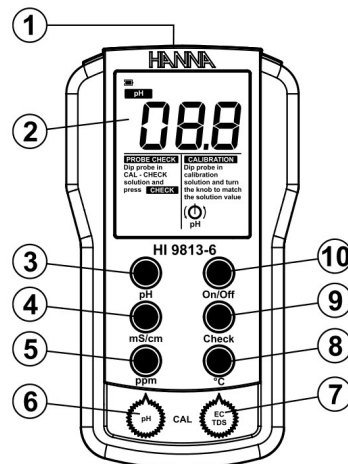
HI9813-5 & **HI9813-6**  
Portable  
pH/EC/TDS/°C Meters

• [https://cdn2.hubspot.net/hubfs/2134380/product-manuals/MAN9813\\_06\\_18.pdf](https://cdn2.hubspot.net/hubfs/2134380/product-manuals/MAN9813_06_18.pdf)

• This is included in your kit and will be emailed to you as well!



- 1) 8-pin DIN connector for probe
- 2) Liquid Crystal Display
- 3) pH range selection key
- 4) mS/cm (EC) range selection key
- 5) ppm (TDS) range selection key
- 6) pH offset calibration knob
- 7) EC/TDS calibration knob
- 8) °C (Temperature) selection key
- 9) Check key
- 10) On/Off key



## INITIAL PREPARATION

- Each meter is supplied complete with a 9V battery. Remove the battery compartment cover on the back of the meter and install the battery.
- Connect the probe to the DIN socket on the top of the meter by aligning the pins with the socket and pushing in the plug.
- Always remove the probe protective cap before taking any measurements or calibrating and stir briefly the electrode in tap water to remove the storage solution.
- Turn the meter on by pressing the On/Off key

## pH CALIBRATION

- For greatest accuracy, frequent calibration of the instrument is recommended.
- Recalibrate for pH:
  - Whenever the electrode is replaced.
  - At least once a month.
  - After testing aggressive chemicals.
  - Where extreme accuracy is required.
  - **Whenever the CAL CHECK test fails (HI9813-6 only).**

## CAL Check™ FEATURE / CLEAN & CAL PROCEDURE

- Rinse the probe with water.
- Immerse the probe in the HI50021 check solution.
- Press the Check key.
- If the meter is calibrated "Probe is OK" message is displayed.
- If cleaning is needed "Clean Probe and Calibrate" message is displayed:
  1. Immerse the probe in the cleaning solution for 5 minutes, then rinse it with tap water.
  2. Immerse again in the check solution and press the CHECK key.
  3. If "Probe is OK" is displayed, no calibration needed.
  4. If "Clean Probe and Calibrate" is displayed again, calibrate.

## PREPARATION FOR CALIBRATION

- Pour small quantities of pH7.01 (HI7007) or pH4.01 (HI7004) or pH10.01 (HI7010) solution into a clean beaker.
- Use pH7.01 (HI7007) if you are going to measure neutral or close to neutral samples
- Use pH4.01 (HI7004) for acidic samples
- Use pH10.01 (HI7010) for alkaline measurements.

## CALIBRATION PROCEDURE

- Connect the probe and switch the meter on, then press the pH key to display pH measurement.
- Remove the protective cap from the probe, rinse and immerse it in the buffer and stir gently. Wait for reading to stabilize.
- Take the temperature of the buffer solution.
- Adjust the pH calibration knob until the LCD shows the pH value at the current temperature (on the following chart).
- The pH calibration is now complete

## pH VALUES AT VARIOUS TEMPERATURES

TEMP		pH VALUES				
°C	°F	4.01	6.86	7.01	9.18	10.01
0	32	4.01	6.98	7.13	9.46	10.32
5	41	4.00	6.95	7.10	9.39	10.24
10	50	4.00	6.92	7.07	9.33	10.18
15	59	4.00	6.90	7.05	9.27	10.12
20	68	4.00	6.88	7.03	9.22	10.06
25	77	4.01	6.86	7.01	9.18	10.01
30	86	4.02	6.85	7.00	9.14	9.96
35	95	4.03	6.84	6.99	9.11	9.92
40	104	4.04	6.84	6.98	9.07	9.88
45	113	4.05	6.83	6.98	9.04	9.85
50	122	4.06	6.83	6.98	9.01	9.82
55	131	4.08	6.84	6.98	8.99	9.79
60	140	4.09	6.84	6.98	8.97	9.77
65	149	4.11	6.84	6.99	8.95	9.76
70	158	4.12	6.85	6.99	8.93	9.75

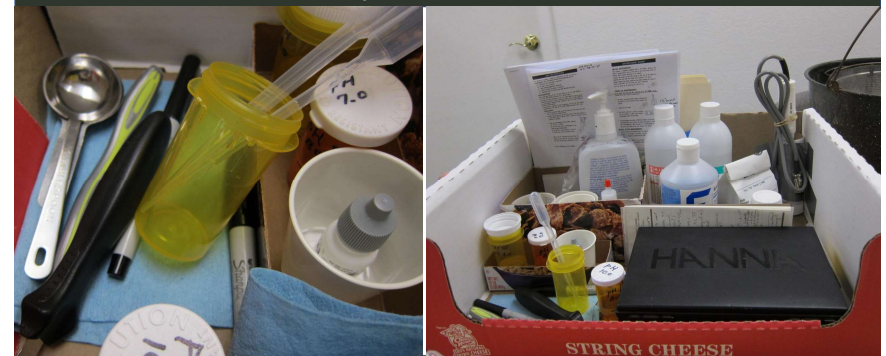
## TAKING pH MEASUREMENTS

- Prepare sample.
- If the probe has been left dry, soak the tip in HI70300 storage solution for 30 minutes to reactivate it.
- Submerge the tip (1½") of the probe into the sample.
- Select the pH mode.
- Stir briefly and wait a couple of minutes for the reading to adjust and stabilize. The display shows the pH value.
- Rinse (clean) the probe thoroughly to eliminate cross-contamination between samples.



<https://www.youtube.com/watch?v=GB5HLqmJzVs>

## What else do you need?







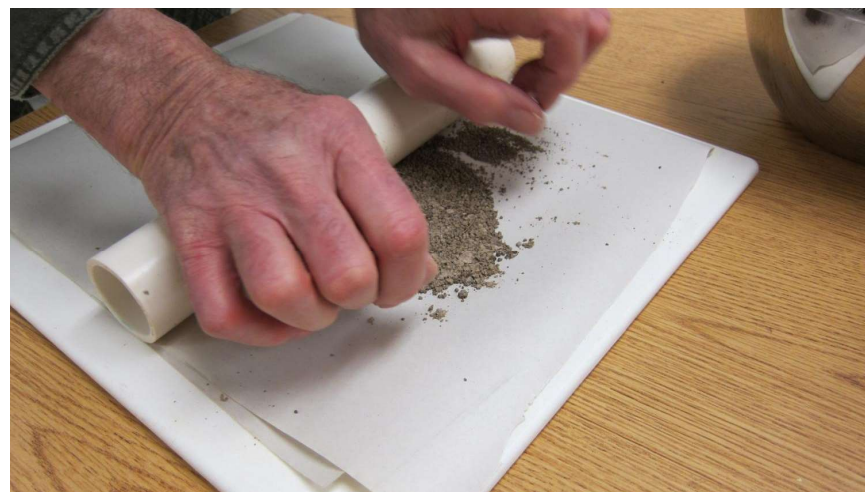
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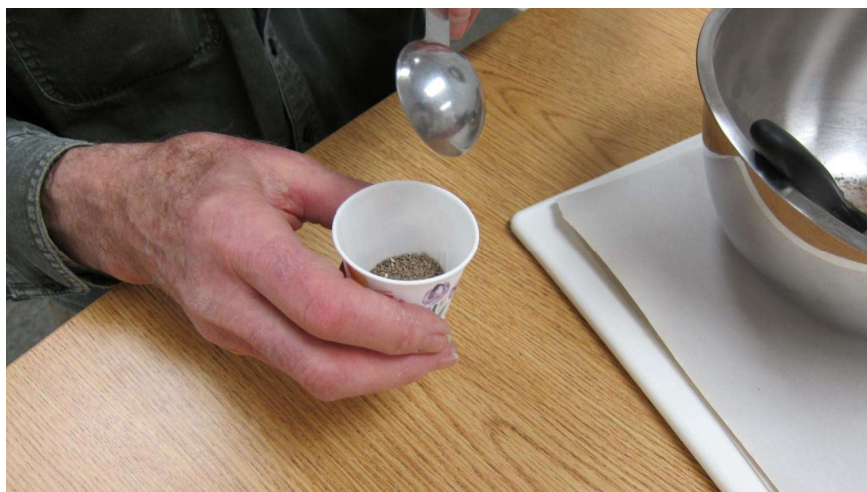
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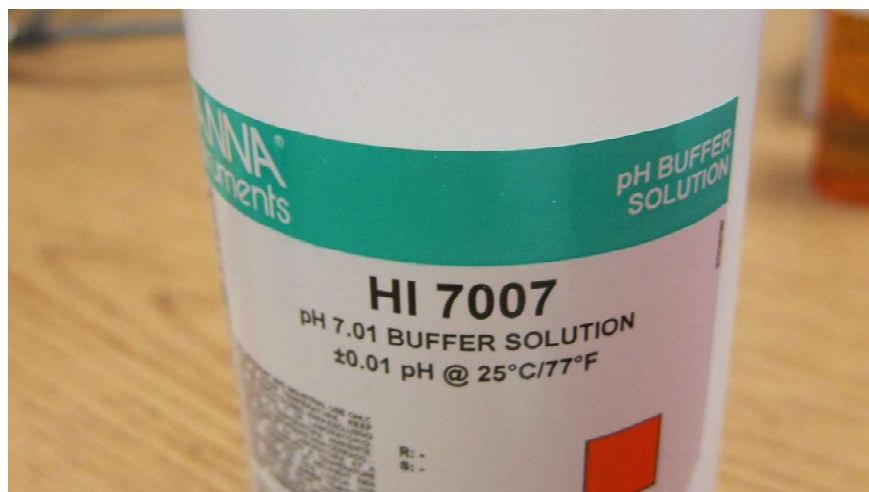




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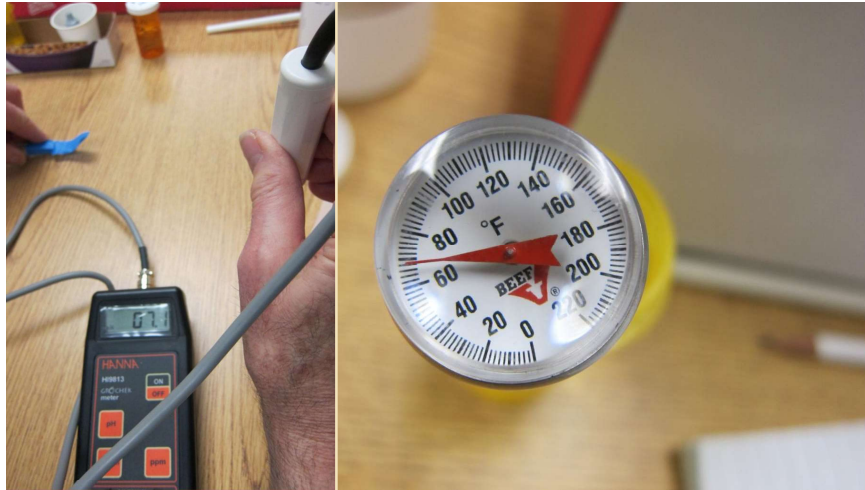


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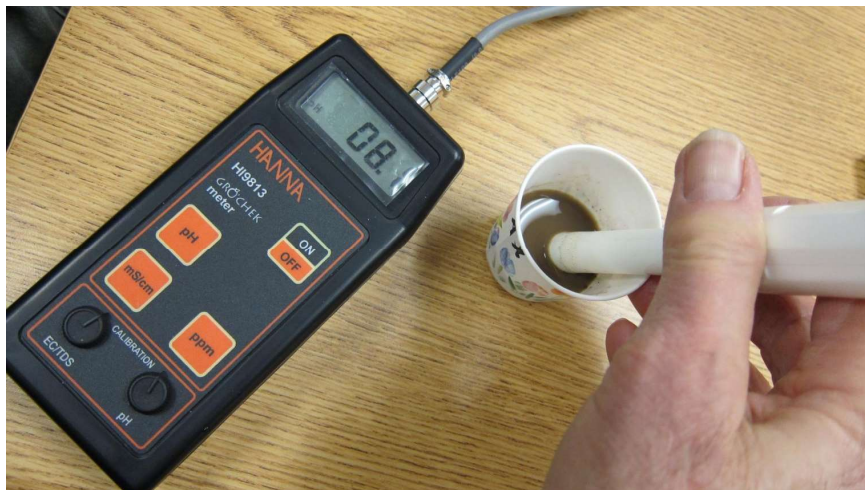




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## TAKING EC/TDS MEASUREMENTS

- Immerse the tip of the probe (4cm/1½") into the sample to be tested. If possible, use plastic beakers or containers to minimize any EMC interference.
- Tap the probe lightly on the bottom of the beaker to remove any air bubbles which may be trapped inside the tip.
- Select the EC measurement range
- Wait for a couple of minutes for the temperature sensor to reach thermal equilibrium.

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## PERIODIC PROBE MAINTENANCE

- Inspect the probe and cable.
- The cable used for the connection to the meter must be intact and there must be no points of broken insulation on the cable or cracks on the probe stem or bulb.
- Connector must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode.
- Rinse off any salt deposits with water.

