DIGITAL TOOLS TO IMPROVE SUSTAINABLE AGRICULTURE PRACTICES

Robert Flynn*, Jim Walworth, Joan Davenport, Dan Bloedel, Jeanne Gleason, April Ulery
Extension Specialist, NMSU Extension Plant Sciences; Soil, Water, and Environmental Science, UA; Soil Scientist, WSU; Resource Conservationist, NM NRCS; NMSU CES Media Production; Soil Scientist, NMSU Plant and environmental Sciences
rflynn@nmsu.edu

ABSTRACT

Visualizations have been shown to promote learning and understanding and to aid in analysis and problem solving. Many concepts in agriculture are well suited to demonstrations that are used in classroom settings or part of training events. However, many demonstrations are difficult to seed in a large setting, or take more time than can be allotted. A series of demonstrations were either filmed or created in animation to provide a digital means by which trainers could more easily train their students, employees, or clientele. Demonstrations created include visualizing soil particle size, water infiltration, how ground cover prevents erosion, impact of different soil surface covers, soil aggregation, how gypsum works in sodic soils, soil sampling demonstrations, and what a saturated paste is. Animations were created to promote the Olsen Phosphorus test for western alkaline soils, what the sodium adsorption ratio means, and how plants compete with salt for soil water. The videos and animations can be viewed at westernsoil.nmsu.edu. Downloading the animation and video files are possible through Google Drive by contact rflynn@nmsu.edu. Preliminary reviews have been favorable. Completing the short survey from the website allows for improvements and additional ideas for future animations or demonstrations.

INTRODUCTION

Farmers and farm advisers can select from a host of private and public soil testing laboratories to test their soil for its crop production potential. However, it is critically important that they request the correct analyses and then interpret the results correctly if they hope to develop wise and sustainable management practices.

Incorrect diagnosis of soil properties leads to incorrect management practices for phosphorus fertility, leaching, and amendment choices to reclaim sodic soils. Regional and state workshops often focus on correctly identifying limitations to sustainable production by incorporating demonstrations that illustrate the science behind the practice. However, these demonstrations can take more time than meeting schedules allow for communicating key concepts. Cooperative Extension and NRCS training professionals need shorter, easier-to-use tools to educate and help students, consultants, farmers and ranchers understand key concepts of western soils.

Sometimes clientele that practicing agronomists work with need a little help to understand key concepts related to soil testing and soil properties. Extension specialists and educators often rely on demonstrations to help others understand key soil concepts like infiltration, texture, and SAR. Extension educators might want to reach a large audience, but the demonstration is too

difficult to see from the back of the room or is too laborious to set up in the time allotted or it doesn't work as it was intended to. When demonstrations are appropriate, the venue may not be conducive to setting up a demonstration for a large audience or the weather could prohibit the demonstration from being viewed.

METHODS

As part of an education grant from USDA WSARE, Extension Specialists from the western region provided ideas and experience that could be captured on film. Many of the demonstrations are often difficult to set up or explain to a large audience that may not be able to see the "hands on" demonstration.

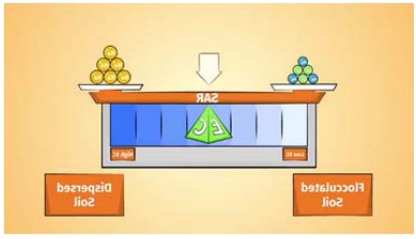
In order to capture other aspects of soils like defining SAR and how it changes or why the Olsen phosphorus test is ideal for most western conditions it was decided to capture those topics using animations. Professional filming, animation, and sound recording were used to provide online modules that can be viewed on YouTube or at westernsoil.nmsu.edu.

The videos and animations can also be downloaded for truly remote training events by downloading from a secure website.

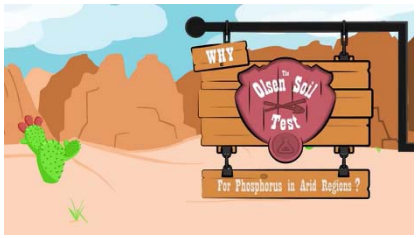
The online videos and animations were also developed to be evaluated by the end-user. A brief (15 seconds max) survey is requested from all those that watch the animations and videos. The authors really want feedback in order to meet the needs of all of our clientele.

RESULTS

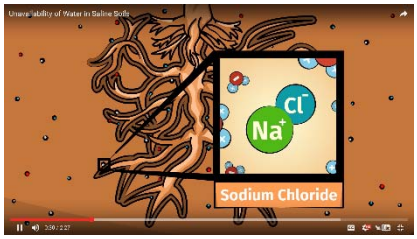
Properties of Soils Animations



"Understanding the Sodium Adsorption Ratio (SAR)"
How do salinity, calcium, magnesium, and sodium affect soil water infiltration and management decisions? This is an advanced animation for instructors, teachers, or other professionals. It explains the effects of the three ions of concern along with the salinity of the soil.



"The Olsen Test for Phosphorus"
This animation makes the case for why soils with alkaline pH should be tested for plant-available phosphorus using the Olsen method. This should be a commonly used procedure in most western soils.



"Unavailability of Water in Saline Soils."
Salts in the soil provide nutrients to plants. However, an excess of salt can interfere with water uptake. This animation demonstrates how sodium chloride in soil binds with water and impedes roots from taking up water.

Properties of Soils: There are three property of soils videos that cover particle size, how gypsum can help sodic soils, and what dispersion and flocculation mean.

"Particle Size"
The naked eye cannot see the spaces and different sized fractions that exist in soil. In this video, a glass jar, beads of various sizes, and a golf ball or two illuminate size fraction differences as well as air spaces and water.

"Dispersion and Flocculation"
This demonstration shows the effect of calcium (from gypsum) on bringing dispersed soil part This demonstration shows the effect of calcium (from gypsum) on bringing dispersed soil particles together as aggregates to aid in reclaiming soils with high levels of sodium.

"Gypsum and sodic soils"
Water movement through a sodium-affected soil is improved by the addition of calcium from gypsum. Water that is applied enters into the soil and continues to wet the profile in the presence of calcium.

Soil Sampling Videos

Getting started: Purpose of soil sampling, tools, preparation to sample, sampling depth, representative sample, volume to submit, sample container, and labeling.

Probe versus shovel: Procedures for sampling soil with a shovel versus a probe.

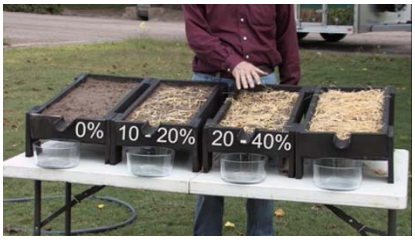
Random sampling a small field with hammer probe: How to prepare the collected soil for shipment or delivery to a lab, including how much to send.

Random sampling across a large field with hammer probe: Demonstrates mixing, preparation, and volume for shipment.

Soil variability: Soil maps can be useful for planning ahead when sampling soil. Answers the question of what to do when soil texture changes abruptly in a field.

Runoff and Infiltration Videos

Water infiltration: Illustrates how water moves through soil and the forces that control its movement. Terms covered include *infiltration*, *matric potential*, *gravitational water*, *saturation*, *drainage*, *field capacity*, *wilting point*, and *runoff*.



Ground cover: Protecting the soil surface with mulch helps reduce soil erosion and increase water infiltration. In this video, four soil boxes with increasing amounts of surface cover from plant material illustrate how ground cover reduces sediment and water loss from the soil surface when water is applied as rain or irrigation.

Runoff and infiltration: Using a rainfall simulator, this video illustrates differences in how water runs off the soil and infiltrates into the soil as a function of soil cover.

Surface cover and runoff: Soil from bare ground is compared to soil with a living cover of pasture grass to illustrate the effect that plants have at reducing soil loss to runoff and increasing the amount of water that can infiltrate into the ground.

CONCLUSIONS

Initial reviews have been very good. The use of time-lapse photography, animation, and professional equipment and narrators were critical to the project. While there are a multitude of resources on the world wide web be believe that these training projects a step above many of those on the web today. The products that have been produced cover a wide range of topics and a range of concepts that can be used for different audiences.

SPONSOR: WSARE Professional Development Grant