

Acquisition of a Truck-Mounted Hydraulic Soil Probe for Subsampling Soil

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Summary

The Department of Agronomy, Horticulture & Plant Science (AHPS) includes faculty with specialties in nutrient and carbon cycling, pedology, soil environmental management, soil fertility, soil microbiology, soil water and irrigation management, soils/land formation, and precision agriculture. Our subsurface soil sampling equipment is limited to one truck-mounted hydraulic soil probe that is over 20 years-old and no longer safe to operate. This severely limits the AHPS faculty's ability to accomplish quality research that optimizes crop yield while protecting water quality because subsurface soil sampling is required in these types of projects. Acquisition of a hydraulic soil probe will facilitate rapid subsurface sampling by researchers which will increase our competitiveness for receiving research funds from state and federal sources in our areas of expertise. The truck-mounted hydraulic soil probe is desired due to its quality and reliability in obtaining deep soil samples along with the ease of transporting the probe to fields across the state. The total budget requested for acquisition of a truck-mounted probe and all necessary tools is \$30,050.57.

Goal and Objectives

This request is designed to provide AHPS faculty with a truck-mounted hydraulic soil probe that will improve our ability to complete nutrient management research that optimizes crop yield and protects water quality. A new hydraulic probe will be utilized in currently funded NREC projects and will also make AHPS faculty more competitive for future NREC and externally (i.e. federal and commodity groups) funded projects.

Results

- A truck was obtained from South Dakota Fleet Services to hold the hydraulic soil probe.
- A Giddings truck-mounted hydraulic soil probe was purchased and picked up on May 1st.
- Service Center was created with Jason Clark as the supervisor: Enables department to charge individual researchers for truck mileage and hydraulic probe use. Fees will go to maintain and repair probe and pay for truck mileage.
- Hydraulic soil probe has been used to collect soil samples from several research projects at multiple sites thus far.

Products/Impacts

- Procurement of a hydraulic soil sampling probe
- Enables researchers to obtain deep soil samples (0-rock/bedrock layer) and install water sampling equipment (i.e. lysimeters) more precisely and efficiently that all faculty can use in soil management research and extension activities.
- Improves the competitiveness of SDSU researchers in procuring externally (i.e. federal and commodity groups) funded projects.

- Aid in updating best management practices that optimize yield, fertilizer use efficiency (N, P, K, and others), and protect water quality by:
 - Increases understanding of the effect of weather, soil characteristics, and manure and fertilizer (rate, application timing, source, and placement) and field management practices (tillage type, rotation, cover crops) on the downward movement of fertilizers from the beginning to the end of the growing season as determined from soil samples of three feet and greater obtained with the hydraulic probe.
 - Improves understanding of the soil profile characteristics (texture, organic matter, carbon, total nitrogen, pH, salts, etc.) by depth increment or horizon on optimal fertilizer rate, timing, source, and placement practices within and among fields as determined by obtaining fully intact, four-foot soil samples throughout the research area with the hydraulic probe.
 - Increases knowledge on the effect of tillage practices and crop roots on long-term carbon storage from the full soil profile from deep soil samples obtained by the hydraulic probe.

Timeline

Table 1. Timeline for purchase and use of hydraulic soil probe during 2019.

| Activity | (Jan-Feb) | (Mar-June) | (July-Aug) | (Sept-Nov) |
|---|------------------|-------------------|-------------------|-------------------|
| Purchase and Installation of Soil Probe | X | | | |
| Spring Soil Sampling | | X | | |
| Fall Soil Sampling | | | | X |

Project Budget (As of November 1st)

| Budget Category | Budget | Total Expenses | Available Balance |
|--------------------------|---------------|-----------------------|--------------------------|
| Capital Equipment | 30,050.00 | 29,656.07 | 393.93 |
| Total | 30,050.00 | 29,656.07 | 393.93 |