PROGRESS UPDATE 2021-2023

Dairy Soil & Water Regeneration

Checking in on the six-year project assessing how farming practices affect soil health, greenhouse gases and water quality in dairy feed production.

DSWR OVERVIEW

DSWR is a key undertaking within the U.S. Dairy Net Zero Initiative (NZI), an essential first phase focusing on farm and in-field actions to achieve industrywide 2050 environmental stewardship goals developed through the Innovation Center for U.S. Dairy. Researchers in major dairy states are studying the impacts of soil health and manure management practices on greenhouse gas emissions, water quality outcomes and agronomic factors such as forage yield and quality. Conducted on working dairies and research farms, the project is studying the baseline soil health and carbon storage on dairy farms, alongside extensive field trials. The goal of this project is to empower farmers with science-based information to facilitate their journey toward sustainability.

Preparing to measure soil greenhouse gas emissions in New York (Image courtesy of Dr. Quirine Ketterings)

PROJECT FRAMEWORK

Most of the data collected thus far originates from the various DSWR research partners, who are extensively engaged in field trials.

TASK 1:	TASK 2:	TASK 3:
Baseline data collection on soil health in dairy regions 2022-2024	Field trials at research sites 2021-2026/2027	Outreach and modeling work
90% Complete	50% Complete	Ongoing

PARTNERS

DSWR was initiated by Dairy Management Inc. (DMI) in collaboration with the Soil Health Institute and researchers at eight institutions. The project is largely supported by the Foundation for Food & Agriculture Research, which awarded $10 million toward this work, and matching funds from companies like Nestlé, Newtrient and Starbucks.

BY THE NUMBERS

17 research trials

100 farms engaged

798 soil health samples

22,059 soil greenhouse gas measurements

PROGRESS FROM ACROSS THE COUNTRY

PRELIMINARY FINDINGS

CALIFORNIA

Studies: At a dairy, studies are being conducted in a forage sorghum-triticale rotation to assess crop productivity, soil health and soil carbon changes through treatments comparing various soil health management practices to commonly used field practices. These treatments compare tillage practices and nutrient sources from liquid dairy manure, dried manure solids and composted manure. Researchers are also measuring greenhouse gas emissions across these treatments to evaluate the potential of soil health management practices to mitigate soil greenhouse gas emissions. Additionally, in an almond orchard, researchers are examining greenhouse gas emissions, yield and soil health differences between plots treated with urea-ammonium nitrate fertilizer and those treated with composted dairy manure.

Findings: At the orchard, the application of manure compost has had a significant mitigating effect on the release of nitrous oxide emitted from the soil compared to non-compost treatments. In addition, increased soil microbial respiration and dissolved organic carbon suggest that compost treatments boost microbial activity. When assessing soil health management practices, the dairy farm has yet to see significant differences in crop outcomes between commonly used field practices and soil health management systems.

IDAHO

Studies: On a research farm, a study is investigating the impact of novel manure products (i.e. evaporated solids and flocculated solids) and a control on soil greenhouse gas emissions in corn and alfalfa. A nitrogen replacement study is planned for 2024 and 2025.

Findings: Researchers have found that when employing novel manure products, cumulative nitrous oxide emissions were greater using the evaporated solids than the flocculated solids and control.

NEW YORK

Studies: Two field studies on working farms are evaluating greenhouse gas emissions, soil health and soil carbon among commonly used field practices and soil health management systems in corn silage and alfalfa. In a nitrogen replacement study, researchers are evaluating the impact of manure products on yield and commercial fertilizer offsets in a rainfed climate. They are also comparing the timing and amount of nitrogen released from evaporated and flocculated solids compared to unprocessed dairy manure and composted dairy solids using lab incubation studies.

Findings: In the first two years, the soil health management systems show slightly lower yields than commonly used field practices but there was less of a yield reduction in higher-yielding zones. Also, commonly used field practices had higher nitrous oxide emissions than soil health management systems.

TEXAS

Studies: In a region facing declining water quantity, researchers are focusing on finding agronomic options to improve water use efficiency in forage production. On a research farm, the variances amid commonly used field practices and soil health management systems in forage sorghum are being investigated across five nutrient treatments: evaporated solids, injected manure slurry, broadcast manure slurry, synthetic fertilizer and a control.

Findings: Due to a need to move to another site, researchers have only a one-year dataset, therefore preliminary findings are yet to come.

VERMONT

Studies: Research is centered on edge-of-field and water quality outcomes in corn and alfalfa. At one dairy, differences in water quality, yield and soil health are being analyzed among commonly used field practices and soil health management systems. On another farm, water quality, yield, greenhouse gas emissions and soil health are being examined between commonly used field practices and soil health management systems.

Findings: The first year of water quality research is complete, and initial observations should be available in 2025.

WISCONSIN

Studies: Three field studies are investigating how field and manure management systems affect yields, soil greenhouse gas emissions and soil health properties amid commonly used field practices and soil health management systems in corn silage. On a research dairy, commonly used field practices and soil health management systems are being compared in their effects of water quality, run-off, yield, greenhouse gases and soil health in corn. Also, researchers are quantifying the amount of fertilizer nitrogen that can be offset by novel manure products.

Findings: In the field and manure management study, researchers have seen no differences in soil water infiltration rates between commonly used field practices and soil health management systems. The plots with commonly used practices are seeing more runoff, resulting in higher erosion rates and nutrient loading. On the research dairy, during a year with adequate rainfall, higher water infiltration rates have been found in the plots with the no-till soil health management system. The manure nitrogen offset study has illustrated that while applied manure-based products did not have the lowest nitrous oxide emissions per hectare, they had the lowest relative emissions to the total amount of nitrogen applied, suggesting potential greater nitrogen use efficiency.

The content and information on this page have been reviewed and approved by the associated institutions

For further information on site-specific projects, visit the DSWR website.
Thank you to partners, funders and other supporters for contributing to U.S. dairy sustainability!