SUSTAINABLE STANFORD

Living Lab Fellowship Program for Sustainability AY 23-24

Project Overview: Electrification of Stanford's O'Donohue Family Educational Farm

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Living Lab Fellowship Program for Sustainability:

Offered in partnership with the Stanford Office of Sustainability and the Bill Lane Center for the American West, the Living Laboratory Fellowship Program provides Stanford students real-world sustainability leadership and project management opportunities that meaningfully advance Stanford's operational sustainability goals. Successful student applicants will be matched with a pre-identified campus sustainability project, mentored by operational experts in the project field, and paid to work up to 10 hours per week over the course of an academic year on their project.

Project Background:

Small farms - those with a land area of 5 hectares or smaller - play a crucial role in global food production, contributing to over 30% of the world's food supply. These farms often leverage appropriately scaled mechanization for operational efficiency. With recent advancements in battery and electric vehicle technologies, a promising opportunity has emerged for small farms to transition from fossil fuel reliance to a fully renewable electric energy framework.

The Stanford Educational Farm currently employs a range of electric tools, including landscaping equipment, two electric carts, and a specialized secondary cultivating tractor known as the Amiga, developed by farm-ng. While the farm has integrated some electric technologies, its core tillage and power-intensive operations continue to rely on a 33HP diesel Kubota tractor, essential for primary tillage and PTO-driven tools. For its energy supply, the farm draws electricity from the PG&E grid, and - unlike most academic facilities on campus - is billed by PG&E every month. These costs could be redirected to supporting increased student employment opportunities and expanded educational initiatives if the farm were to independently generate its own electricity.

Project Description:

The project to "Electrify Stanford's O'Donohue Family Educational Farm" seeks to enhance sustainability performance and reduce carbon emissions within the agricultural operations of the farm. The project entails an in-depth energy audit to assess current energy consumption patterns and forecast future energy needs, and includes considerations for deployment of electric primary cultivating tractors, electric vehicle charging stations, welder/shop tools, and supplementary electric landscaping equipment. The endeavor will also involve an examination of financial incentives, notably the California Air Resources Board FARMER Program, to facilitate the transition to electric tractors. Additionally, the project will evaluate the feasibility and associated costs of integrating solar panels onto the barn's rooftop, thereby leveraging renewable energy sources, as well as a comparative analysis of the economic and ecological advantages of integrating barn-mounted solar panels with the electric grid versus employing on-farm battery storage. The outcome will culminate in a comprehensive report, complete with findings and a slide deck tailored to facilitate stakeholder engagement and community buy-in, and to facilitate the acquisition

of the proposed solar electric system and electric machinery. Furthermore, this initiative seeks to develop a replicable and transferable model, ensuring its potential adoption by other practitioners within the agricultural sector. A strategy for engaging internal and external stakeholders will be established, including key stakeholders, decision-makers, and potential project supporters. While optimizing for the Stanford Farm, the project seeks to provide a model and example for similar scale farm decarbonization/electrification efforts around the world, facilitating broader application of the approach and maximizing impact.

Desired Project Outcomes & Deliverables:

- Holistic strategy for electrification of the Stanford Farm to facilitate:
    - Generation of at least the equivalent amount of electricity the farm uses each year (or assessment on feasibility of maximum generation)
    - Conversion of all farm tools and machinery to electric power, eliminating fossil fuels on the farm
    - Complete cost and emissions assessment of strategies.
    - Becoming a national model and demonstration site for sustainable electric farms
- Slide deck and materials to present findings to key stakeholders
- Process summary that can inspire and guide similar endeavors world-wide

Collaborating Departments:

Stanford Doerr School of Sustainability
LBRE

Living Lab Fellow

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