

# Developing Local Carbon Offset Projects

## Simran Kaur

### University of California Carbon Neutrality Initiative Fellowship



## Introduction

The focus of my internship is developing and implementing local carbon offset projects. A carbon offset is a reduction or removal of greenhouse gas emissions off-site that is required in terms of credits, which compensates for greenhouse gas emission occurring on-site. In carbon accounting, carbon offsets counteract carbon emissions, which reduces net carbon emissions.

Therefore, carbon offsets can be a valuable tool in helping the University of California achieve its goal of being carbon neutral by 2025. The projects I am developing will not produce offsets for the UC. However, by developing and providing resources for these projects, our institution can gain greater insight on how to create an effective local carbon offset project that can shape future projects that will provide offsets.

I am primarily working on two projects: a silvopasture project and an anaerobic digestion project. Both projects focus on reducing the net carbon emissions of agricultural practices. Therefore, they have significant potential for adoption and expansion within California's large agricultural sector.

Additionally, both projects are local, so they produce numerous co-benefits for the Santa Barbara community.

## Silvopasture

We intend to work with undergraduate researchers to collect and analyze the data. Our team is currently developing a summer research program that will provide undergraduate students the opportunity to participate in soil research at the silvopasture site. Under the mentorship of Dr. Trugman and Dr. Leander, students will collect and study soil samples from Ted Chamberlin Ranch. During this six-week program, students will have the opportunity to develop valuable research skills and build relations with faculty. This program will allow us to incorporate students and student-led research into our offset project.

Ultimately, the data we gather will allow us to more accurately quantify the carbon offsets produced by silvopasture sites. This will assist in the development of a more detailed methodology for estimating the ecosystem services and carbon sequestration carried out by silvopasture systems.

The creation of such a methodology would make it easier for silvopasture carbon offset projects to be certified by carbon registries; therefore, we anticipate that this project will serve as a catalyst for future silvopasture projects.

## Anaerobic Digestion

Another co-benefit of this project is that it will help mitigate nitrogen pollution in local streams. Currently, pipes outside the pig pens carry manure from the pigs to the manure pond. However, these pipes often leak small amounts of manure as they carry it to the pond, and when it rains, the manure washes into streams located near the farm. The manure increases the nitrogen levels of the streams.

This project would replace the existing pipes with a more sealed piping system to ensure that the maximum amount of methane gets captured. This would reduce the amount of manure that gets leaked and washed into local streams.

I am working with the UCSB chapter of Engineers Without Borders to develop this project. Engineers Without Borders will design and build the anaerobic digestion mechanism that will be implemented at the swine farm. I will assist them with their research during the design process, and I will work to secure funding for the project. The scale of this project makes it a good fit for Engineers Without Borders. Furthermore, collaborating with this student group promotes student engagement with the Carbon Neutrality Initiative.

## Future Goals

### Silvopasture Project

Land Life had planned to begin planting trees at Ted Chamberlin Ranch this spring. However, due to the ongoing coronavirus pandemic, the planting of trees has been halted. Similarly, our team had intended to implement our undergraduate summer research program this summer; however, we have had to postpone it to next summer.

Nevertheless, we are continuing to plan and develop the research program. Currently, I am exploring potential sources of funding for the program. We require funding for research supplies and soil sample processing, as well as for the compensation of the undergraduate researchers. Therefore, I am seeking out and applying for grants. I am currently applying to the UCSB Coastal Fund Major Grant, which funds projects that protect and enhance the coastal environment of the Santa Barbara region. I am also continuing to explore additional sources of funding. Our goal is to secure sufficient funding before we begin the process of recruiting undergraduate researchers in Spring 2021.

## Silvopasture

Silvopasture is an agroforestry practice that intentionally integrates trees, forage crops, and livestock into a functional natural system for optimization of agronomic and ecosystem benefits.

The integration of trees, forage crops, and livestock through silvopasture is accompanied by a number of co-benefits, including:

- Diversification of income streams
- Shorter forest rotations
- Improved plant nutrition uptake
- Cooler environment for livestock in the summer

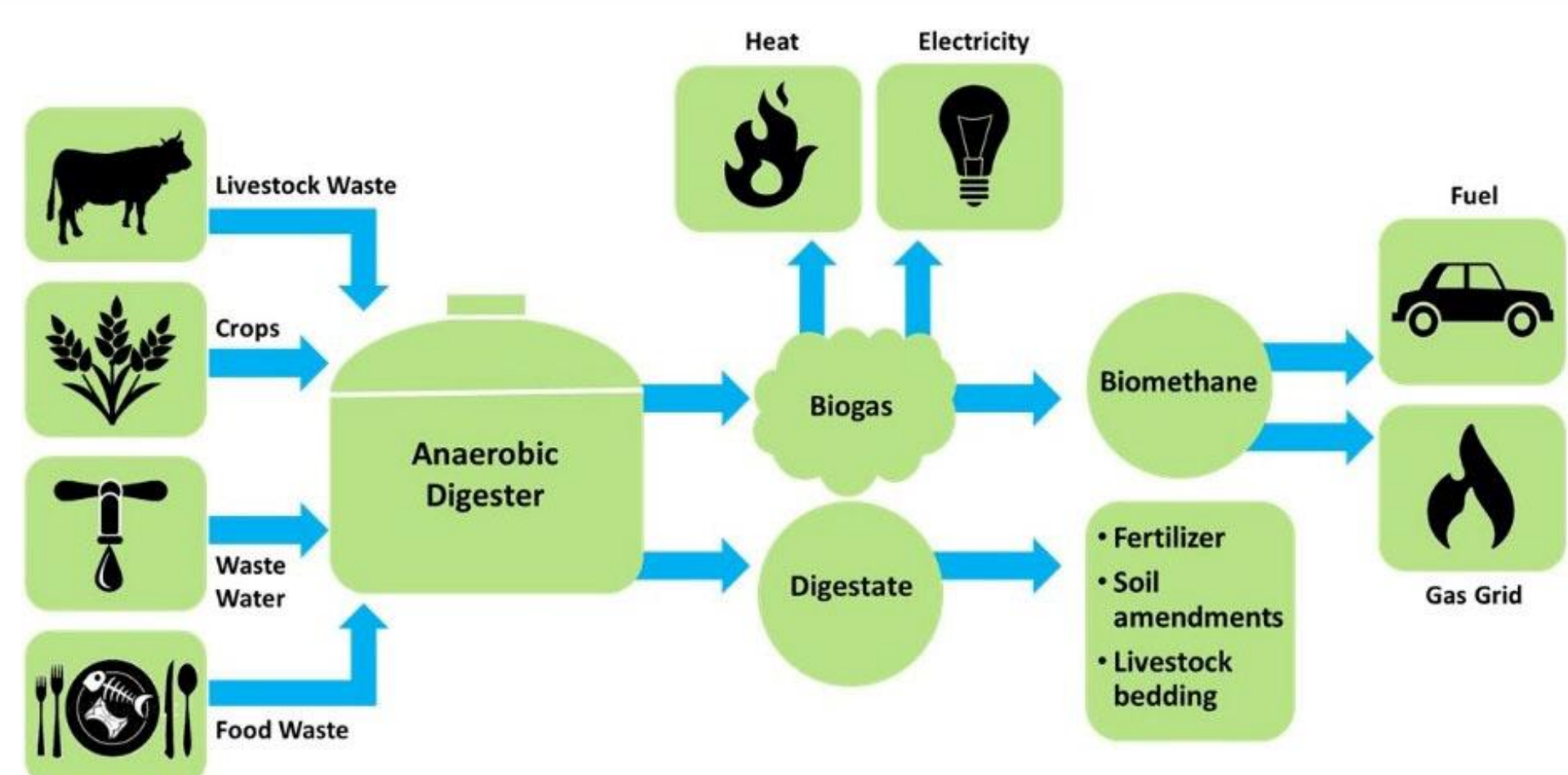


I have been working with the Community Environmental Council of Santa Barbara, as well as Dr. Anna Trugman and Dr. Leander Anderegg of the UCSB Department of Geography, to develop a silvopasture site at Ted Chamberlin Ranch located in Los Olivos, CA.

The trees will be planted by a global carbon offset company called Land Life. Land Life will also claim the carbon offsets produced by this project.

Although UCSB will not receive the carbon offset credits produced by this project, the project will generate significant educational and research benefits. Currently, there is no specific methodology for accurately measuring the carbon offsets produced by silvopasture sites. The lack of a well-researched methodology makes it difficult to get silvopasture projects certified by carbon registries, which verify and award carbon offset credits. This project will allow our team to gather and analyze data on carbon retention in soil, which will aid in the creation of an accurate methodology for measuring the carbon offsets produced by silvopasture sites.

## Anaerobic Digestion



Anaerobic digestion refers to the natural process through which microorganisms break down organic materials to produce biogas. In a built anaerobic digestion system, organic materials, such as animal manure or food scraps, are put into an anaerobic digester. There is no oxygen in the anaerobic digester, which allows for anaerobic digestion to occur.

This process produces two products: biogas and digestate. Biogas, which is a renewable energy source, can be used to provide heat or electricity. Alternatively, biogas can be refined into biomethane by removing or reducing non-methane elements. In its purest forms, biomethane can be used to fuel vehicles and replace pipeline-quality gas. Digestate is the material that is left over following the anaerobic digestion process. It can be used to produce fertilizer, soil amendments, and livestock bedding.

The second carbon offset project I am working on focuses on implementing anaerobic digestion at Pork Palace, a local swine farm. Pig manure will be processed through an anaerobic digester to produce biogas and digestate. The biogas will be used to power heat lamps or an industrial refrigerator at the farm.

The primary co-benefit of anaerobic digestion at swine farms is odor reduction. The anaerobic digestion mechanism will reduce the odor produced by the manure pond that currently collects and holds the animal waste.



### Swine Farm Project

Our plans for the swine farm carbon offset project were also derailed by the coronavirus pandemic. Prior to the closure of our campus, I was planning a site visit to the Pork Palace, which was eventually cancelled. Although our team could not visit the farm, my supervisor Katie Maynard travelled to the farm in April and obtained measurements of the manure pond. Using the information obtained by Katie, our team is beginning the design process for the anaerobic digestion system. We hope to have a design completed by the middle of the summer, so we can start putting together a detailed budget for the project.

## Acknowledgements

I would like to thank my supervisor Katie Maynard for her support and guidance.