ECO-E PROPOSAL: BIOQUEST

Proposers: Anthony Luna, anthonyluna@bren.ucsb.edu
Allison Bailey, allisonbailey@bren.ucsb.edu
Kazia Mermel, kdmermel@bren.ucsb.edu

ECO-E OPPORTUNITY

Global emissions of carbon dioxide are reaching the highest levels on record, sparking international concern on how to curb emissions while maintaining economic growth [1]. While global emissions soar, the agricultural industry is causing soil degradation en masse [2, p. 37], which threatens our ability to feed an exponentially growing global population [3, Sec. 2.3]. BioQuest believes there are economic co-benefits through the facilitation of partnerships between agricultural proprietors and commercial emitters to incentivize carbon sequestration and emission reduction activities. Through this reciprocity, commercial emitters will have the opportunity to reach sustainability goals, while agricultural proprietors reciprocally receive carbon offset funds and increased land asset value.

OBJECTIVE AND RESEARCH ACTIVITIES

The objective of this project is to develop innovative solutions to evaluate and offset customer greenhouse gas emissions through agricultural land assets. This objective will be achieved through the following targeted research activities:

How can agricultural carbon sequestration project planning and verification be improved?

Project planning and verification of additional carbon sequestered, referred to as additionality, are common issues in implementation. There are vast repositories of implemented projects aimed at sequestering carbon that are publicly available (See section 'Available Data'). By analyzing existing projects and synthesizing strategies found in successful projects, we hope to make progress in developing solutions for this confounding issue.

How can existing carbon offset markets best be leveraged for facilitating partnerships?

Preliminary market research provided a high-level understanding of carbon markets to this group; however, the underlying mechanisms of these markets need to be fully explored. Carbon markets have a tumultuous history [4], and understanding this history and the current state of these markets is critical for success in developing effective partnerships.

What customer segments would receive the most co-benefits and are willing to pay for carbon offsets?

Success of partnership building depends on effective segmentation. Identifying the key customer segments and their relative strengths and weaknesses will allow us to develop strategies for stakeholder engagement and communicate value to prospective customers.

Can geographic assessment of indirect emissions be used to build environmental justice into partnerships?

In the United States, disadvantaged communities are disproportionately affected by poor air quality [5]. Many of these communities reside in urban settings, where sequestering carbon is difficult due to high GHG emissions combined with minimal land use assets [6]. Our chosen environmental problem space and hypothesized solution may fall short of supporting environmental justice in communities with the direst need for air quality remediation. To address this shortcoming, BioQuest will research strategies that can tie Scope 3 Emissions reduction plans into carbon sequestration partnerships.

Background and Significance

Commercial emitters - Hundreds of corporate entities have established science-based targets to drive emission reduction initiatives, opening doors for others to follow [7]. For example, Microsoft has pledged to be carbon negative by 2030 with a portion of this coming from offset programs [8], and Lyft currently offsets the carbon emissions from each of its rides through a carbon offsets program [9]. Companies can strengthen investor and customer confidence by reducing GHG emissions [10]. Despite the documented value of corporate sustainability efforts, we hypothesize that many smaller companies do not have access to the technology or resources to offset GHG emissions. If validated, the inclusion of small-medium businesses in existing carbon markets presents a significant opportunity to combat GHG emissions and allow a new class of business to develop credible sustainability.

In the U.S., "[small] businesses created $5.9 trillion, or 43.5%, of the $13.6 trillion private, non-farm, U.S. economy in 2014" [12]. These small businesses may suffer customer loss if they do not keep up with the GHG offset and reduction initiatives of larger companies [10]. One area where small businesses may have an advantage over large corporations is in the credibility of offset and reduction initiatives. Carbon markets are opaque to consumers due to the regional dispersion of the authorities that allocate funds. Small businesses can create opportunity for community engagement in GHG initiatives due to their regional recognition; however, participation of small businesses in voluntary markets is limited. Based on this, we hypothesize that the potential purchasing power of small businesses in the voluntary carbon market is underestimated.

Agriculture Proprietors - Conventional practices in the agricultural industry have direct negative impacts on the environment including high freshwater resource demand, increases in atmospheric greenhouse gas concentrations, reduction of ecological integrity, and nutrient depletion in soils [13]–[15]. Improving soil health by increasing soil organic carbon (SOC) allows for stronger plant rooting, boosted irrigation and fertilizer efficiency, and enhanced beneficial microbial activity. Therefore, increasing SOC can address many of the direct negative impacts observed [17, Fig. 3.1]. Despite the benefits of preserving SOC, myriad conventional agricultural practices have resulted in the reduction of SOC in arable soils by an estimated 30%-50% in the last century [17, Ch. 8], [18, Ch. 11].

Companies, such as General Mills [19] and Patagonia [20], are now raising awareness in agricultural communities of the detrimental issues associated with the loss of SOC stock in the soil. Although the information on SOC is becoming accessible, agriculture proprietors often have slim profit margins that do not allow for financial risk in adopting new soil management practices. Shifting to agricultural methods that optimize carbon sequestration often requires a significant initial investment and an increase in long-term costs. To encourage this upfront investment, the California Department of Food and Agriculture (CDFA) initiated The Healthy Soils Incentive Program. This program is designed to provide the initial investment capital needed for agricultural proprietors to shift to sustainable agricultural practices; however, this program has struggled to procure widespread adoption.[1] We hypothesize that short term leasing of land and insufficient incentives have slowed adoption of ideal practices.[2] While there have been some significant advances toward improving access [21]–[24], there is still a wide gap between sustainable agricultural practices and current methods used in the sector [25, p. 2].

Available Data

In addition to citations provided, the following resources may prove valuable in this project.

[1] Supporting evidence documented in 8 interviews

[2] Supporting evidence documented in 6 interviews

USDA Web Soil Survey (Database) – The USDA Web Soil Survey provides soil data that covers nearly all of the nation's counties. The site is maintained as the single authoritative source of soil survey information.

Healthy Soils Incentive Program Guidelines (Text) - The Healthy Soils Incentive Program provides financial incentives to California growers and ranchers to implement eligible 'climate smart agriculture' practices.

California Climate Investments (Text, Database) - CCI provides a list of early action offset projects that have been approved. This page is updated periodically to reflect additional projects that have been approved for listing or issuance of ARB offset credits to a project.

Climate Action Reserve (Text, Database) – Climate Action Reserve establishes high quality standards for carbon offset projects, oversees independent third-party verification bodies, issues carbon credits generated from projects, tracks the transaction of credits over time, and provides transparent disclosures of these activities.

California Office of Health Hazard Assessment (Text, Database) - OEHHA supports environmental justice by identifying communities with high pollution burden, identifying sensitive populations within these communities, and informing the public of chemicals that can cause harm.

Carbon Sequestration Modelling (Models) – There exist numerous models to project SOC changes following practice implementation [3, pp. 95–96]. A brief review of these models will be required in order to determine which will best fit the needs of this project. These attributes include breadth of modelled practices, accuracy of models, and open source status of code base.

POSSIBLE APPROACHES

Customer interviews – Of the interviews performed thus far, five were agricultural proprietors and five were agricultural service providers. In order to deepen our understanding of the dynamics of project implementation, we aim to interview a diverse set of stakeholders in the agricultural industry including farm workers, farm managers, farm owners, agricultural conglomerates, agronomists, and agricultural service providers. For commercial emitters, we have identified two key customer segments - large corporations and small to medium regional businesses. Further segmentation by industry and location would allow for analysis of willingness to participate. To start, segments could be narrowed down based on reported GHG Reduction initiatives of Forbes 500 companies. See Figure 1 in the Appendix for more details. In order to balance regional stakeholder engagement and environmental justice, our customer discovery will also focus on segments whose emissions can be traced to areas located near land assets eligible for carbon sequestration activities.

GHG Inventory Track and Trace – Accounting GHG emissions of commercial emitters and agricultural proprietors will be critical in determining the scope of partnerships. Given our proposed focus on small and medium sized businesses, a high volume of customers may be required to capture sustainable economic value. By developing efficient GHG accounting based on consequential life cycle assessment principles, we can help customers understand their carbon footprint and provide reduction and offset strategies that benefit the impacted communities. To achieve this aim, the tool would need to effectively track primary, secondary, and tertiary scope emissions of partners and trace these emissions to their point sources. Additionally, this tool could facilitate verification of additionality of carbon sequestration activities performed by agricultural proprietors.

Cost-Benefit Analysis – A cost-benefit analysis would provide reporting on costs to partners, environmental and financial benefits to partners, and a detailed strategy for implementing emission offsets and reductions projects. Agricultural proprietors will also receive reporting on the agronomic impacts associated with the new practices. Development of this analysis can be performed using mock companies with attributes based on industry standards. This process of mock testing will also further inform our customer discovery process by culling out target segments that would not show enough benefit or too high of cost.

APPENDIX

CITATIONS

[1] M. Allen *et al.*, *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. In Press: IPCC, 2018.

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[14] D. Tilman, K. G. Cassman, P. A. Matson, R. Naylor, and S. Polasky, "Agricultural sustainability and intensive production practices," *Nature*, vol. 418, no. 6898, pp. 671–677, Aug. 2002, doi: 10.1038/nature01014.

[15] T. Harter *et al.*, "Addressing Nitrate in California's Drinking Water With a Focus on Tulare Lake Basin and Salinas Valley Groundwater," Center for Watershed Sciences, University of California, Davis, Davis, Report for the State Water Resources Control Board Report to the Legislature, 2012.

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Selected Interviews

Subject Matter Expert Interviews

- Juan Rshaid, Synthetic Fertilizer Expert, OCI Chemical, 10/25/20
- Jake Levine, Agricultural Startup Advisor, Organic Matters (MESM17), 11/11/19
- Mark Kram, Founder, Groundswell Technologies, 11/20/19
- Andre Biscaro, Crop Advisor, UCANR, 1/17/20
- Ben Faber, Crop Advisor, UCANR, 11/1/19
- Minos Athanassiadis, Business Director, Harvest Mark, 1/22/20
- Jamie Whiteford, District Scientist, NRDC, 1/24/20

Customer and Client Interviews

- Heather Agosta, Co-owners, Jasmine Pearl Tea Co, 01/28/20
- Chuck Baumann, Co-owners, Jasmine Pearl Tea Co, 01/28/20
- Chris Sayer, Owner, Petty Ranch, 12/03/19
- Tessa Salzman, Manager, Food Hub, 11/22/19
- Oriana Franklin, Co-owner, Hope Farms, 01/13/20
- Mike Mobley, President, Progressive Land Management & United Water, 01/24/20
- Gary Bailey, Cattle Rancher, Columbia River Ranch & Country Natural Beef, 02/02/20

FIGURES

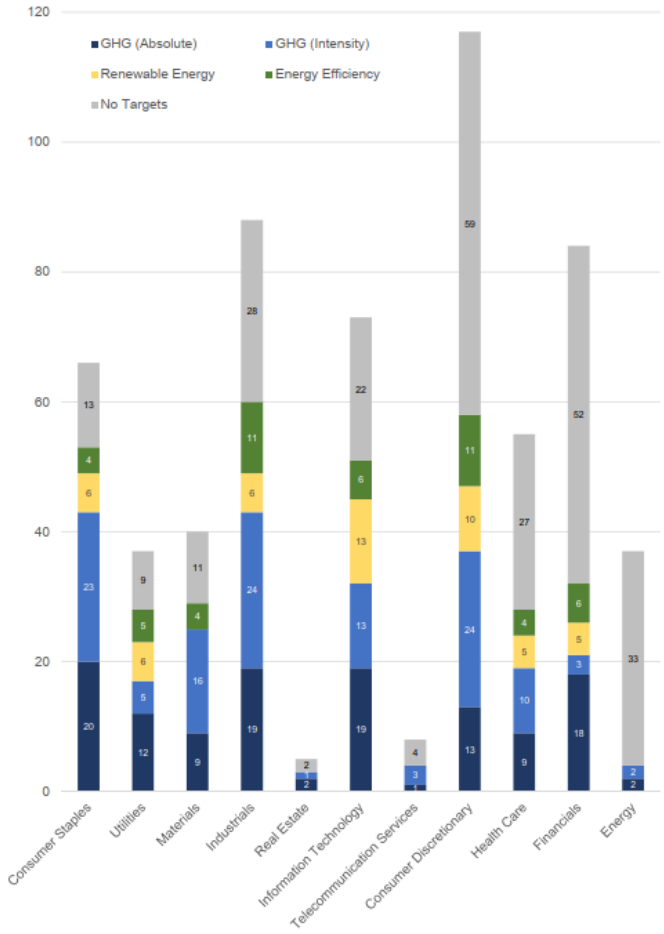

Figure 1 Fortune 500: Target Type Among Sectors [7]