CULTIVATING COLLABORATION
Mid-project Summary for the Grass2Gas Project

April 2024
About C-CHANGE

The Consortium for Cultivating Human And Naturally reGenerative Enterprises (C-CHANGE) is a multi-institutional partnership working to create new value chains on U.S. farms, with emphasis on the generation of nutritious food, renewable energy, sustainable bioproducts, improved rural economic outcomes, and protection of the environment.

About Grass2Gas

A subset of C-CHANGE, Grass2Gas, is advancing research, education, and extension to support development of a new biobased value chain centered on anaerobic digestion as conversion technology. The multi-institutional team is assessing ways in which perennial and winter crops can be used more widely as feedstock for anaerobic digestion. The novelty of the project lies in leveraging a successful business model based on the digestion of manure to encompass new agricultural feedstocks, more diverse products, and increased value throughout the supply chain.
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Collaborating Through Complexity
The Grass2Gas project of the Consortium for Cultivating Human And Naturally reGenerative Enterprises (C-CHANGE) seeks to achieve more sustainable and economically viable agricultural systems. For far too long, agricultural production has been painted as a decision between food and fuel; should we use this land to feed ourselves or to power our lives? C-CHANGE and Grass2Gas reject this notion as a false dichotomy, and instead seek to understand how to make more creative and efficient use of agricultural resources while maintaining current value chains, resulting in a more profitable and environmentally sound agricultural economy.

Our team spent the past three years assessing the feasibility of an agricultural value chain based on the production of biogas, renewable natural gas (RNG), and associated products through the anaerobic digestion of grassy material. As documented in this report, national interest in anaerobic digestion is complex. Understanding and working with this complexity, however, is the very bedrock of our interdisciplinary collaboration.

The deeper our investigation of this space becomes, the more we understand what questions are important to ask; the more solutions we find; and the more excited we become. I am inspired by the diversity of backgrounds, perspectives, experiences, and industries that drive Grass2Gas and the breadth of knowledge we have generated together. All contributions are crucial to our success.

This report arrives at a pivotal moment in our five-year award timeline: with data collected, we can now focus on integrating across disciplines to represent complex contextual factors and relationships between the inputs, processes, and outputs of anaerobic digestion. Our work is improving forecasts of impacts on ecosystems, farm operations, and farmers’ bottom lines while supporting our Extension partners with new and better data.

I sincerely thank the many project participants and our supportive colleagues at the U.S. Department of Agriculture. Collaboration between disciplines and sectors, learning from each other, and daring to think boldly are essential in progressing our vision for a thriving, sustainable, viable agricultural future.

In that spirit of progress, I invite you to review this mid-project summary for Grass2Gas and thank you for your contributions toward fostering a better world for people and the land.

Lisa Schulte Moore
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Introduction

Our current systems of agricultural production are due for a reimagining. Dominant systems of agriculture have demonstrated their impressive capacity to produce high yields efficiently and with increased safety. In the face of several social and environmental crises, however, it’s time to apply past decades’ creativity, resources, and passion to new goals.

In a complex and interconnected world, confronting a seemingly straightforward problem necessarily involves touching many others. One articulation of these global challenges is outlined in the United Nations Sustainable Development Goals, with 17 focal goals ranging from poverty and education to climate action and economic growth. We all have an opportunity to make a difference.

The Grass2Gas project addresses several overlapping goals, including responsible production and consumption, affordable and clean energy, resilient infrastructure, protection of land and water resources, and climate action. In addressing challenges facing US agriculture today, Grass2Gas proposes an integrated solution: we leverage sustained growth of the anaerobic digestion and RNG sectors, and expand them to include herbaceous bioenergy feedstocks, more distributed energy production, and new products and markets.

Funded through a five-year, $10M grant from the US Department of Agriculture National Institute of Food and Agriculture (USDA NIFA), Grass2Gas seeks to leverage anaerobic digestion as a strategy to provide a practical, sustainable income stream for agricultural stakeholders in the US Upper Midwest and Mid-Atlantic regions, where most of the nation’s corn, soybean, hogs, poultry, eggs, biofuels, and large quantities of dairy are produced while helping our agricultural systems meet global sustainability goals.

The project examines ways to enhance traditional inputs of anaerobic digestion, such as manure, with native plants and grasses—herbaceous feedstocks—as a strategy to jumpstart technology deployment at various farm scales across the US. The novelty of this approach is that it can solve multiple pressing challenges at once:
Converting even a small percentage of low-yield acres to the cultivation of native plants results in outsized beneficial impacts on soil. Native plants, with deep perennial root systems, prevent soil runoff into nearby waterways, help retain nutrient-dense topsoil on site, regenerate soil health, and reduce farmers’ dependence on synthetic fertilizers.

Research from Grass2Gas studies clarifies how herbaceous feedstocks enhance anaerobic digestion and generate more biogas than solely traditional feedstocks like manure and food waste.

Anaerobic digestion using herbaceous feedstocks offers additional revenue opportunities for farmers and farm owners while decreasing operating costs. Biogas can be combusted to generate electricity on-site or upgraded to RNG and sold to the energy grid. The nutrient-rich digestate (digested biomass) can also be used as fertilizer, soil amendments, or other co-products.

Finally, cultivating native plants and grasses allows farmers to unlock payments for stacked ecosystem services, such as improved carbon sequestration, water quality, and wildlife habitat.

However, course corrections like these are an expensive venture, and with many farms already operating on narrow margins, the questions of revenue and cost quickly become vital factors to consider. While there has been a significant increase in investment, supportive policy, and project development related to anaerobic digestion in recent years, many questions remain regarding the feasibility of diverse development scenarios.

To help answer those questions, Grass2Gas organized a national team of interdisciplinary partners to gather data and input from stakeholders, assess the on-the-ground challenges of implementing anaerobic digestion, and develop models demonstrating how feedstocks can impact land management and operation and maintenance of digesters. With our dual focus on research and building stakeholder knowledge through Extension activities, we aim to foster communication between farmers, industry partners, and academia.

Ultimately, Grass2Gas is designed around two related goals: First, to research the viability of anaerobic-digested herbaceous feedstocks and manure as a strategy to support rural prosperity through a new agricultural value chain, including the production of biofuels and bioproducts, and monetization of ecosystem services. Second, the project aims to nurture science-based decision making in industry, public policy, and farm operations to increase and diversify revenue streams for farmers.
These two goals inform our long-term vision of a thriving and diverse bioeconomy that supports improved human health, ensures energy security locally and nationally, and regenerates healthy ecosystems and bountiful wildlife—contributing to and restoring life in a prosperous rural America.

The Grass2Gas team while on a field trip visit to Lancaster, Pennsylvania during the summer of 2023.

A diagram outlining the flow of feedstocks within the Grass2Gas method of farming.
Grass2Gas By-The-Numbers

The success of Grass2Gas to date is only possible with the cross-sector and transdisciplinary partnerships driving this collaborative endeavor. The list that follows is a snapshot of the research, outreach, convenings, and publications we have developed over the past three years:

Initial support from USDA NIFA has helped the team attain an additional $106 million through programs like USDA’s Partnership for Climate-Smart Commodities program and grants from Walton Family Foundation and Iowa Soybean Association.
Project Goals and Progress

Anaerobic digestion and RNG markets in the United States are still developing. Numerous questions remain, such as evaluating the best combination of feedstocks and their market opportunities, determining how the technology can be accessible and profitable across various farm types and sizes, and identifying the political and policy conditions necessary to enable broad investment in the technology.

Grass2Gas helps answer these questions by assessing the feasibility of a bioeconomy based on anaerobic digestion of herbaceous feedstock mixed with traditional agricultural byproducts and food waste. We have organized our research team around three distinct goals: bioprocessing, agroecosystems, and human dimensions.

Goal 1, bioprocessing, is working to advance anaerobic digestion of herbaceous feedstocks. This team studies how to enhance the efficiency and effectiveness of converting biomass into biogas, upgrading it to RNG, and producing other valuable co-products.

Goal 2, agroecosystems, is advancing research on novel herbaceous bioenergy feedstocks to facilitate productive, profitable, and sustainable biomass sources. This team investigates crop management practices as well as impacts on farmers’ bottom lines and the environment. Tradeoffs with dominant existing crops and their production practices are being assessed.

Goal 3, human dimensions, investigates stakeholder perspectives on farm-based anaerobic digestion across geographies. This team works to assess the feasibility of agricultural biogas-based electricity and RNG supply chain development, and provide a pathway for stakeholders to guide future growth and investment.

In addition to these three research areas, the project includes education and outreach, partnering with established training resources in Iowa and Pennsylvania to bring principles, practices, and case studies of regenerative agriculture, technology, and supply chain development into pre-college classrooms. We also support Extension teams with publications, field days, curriculum development, and educational resources so they can provide technical assistance to communities of farmers seeking more information to facilitate and reduce risks associated with the expansion of anaerobic digestion, biomass cropping systems, and environmental markets. Underpinning it all, evaluation helps to inform progress and direction at each level of the project.
Goal 1 – Bioprocessing

The Goal 1 team is innovating anaerobic digestion processes and assessing ways to make this technology more profitable for the farms that deploy it. The team has adopted a systems-level approach to examine all the parts and better prime the technology for nationwide uptake. Research has focused on ensuring that digestion processes are more stable, by optimizing gas production to increase revenue and improving the conversion of outputs into chemicals and products that reduce operating costs.

The Grass2Gas team has identified two major challenges over the past three years. The first involves the cost of production: farmers must be adequately compensated for their biomass to dedicate a portion of cropland to produce herbaceous bioenergy crops (e.g., switchgrass or prairie). Based on feedback from industry collaborator Roeslein Alternative Energy, our target is $150/dry tonne of biomass. However, this number is almost three times higher than the price for corn stover biomass for bioenergy production.

The second key challenge—which is also true of most technologies—is that anaerobic digestion systems must achieve a threshold economy of scale to be profitable. A common criticism of anaerobic digestion systems is that they are only feasible for large, concentrated animal feeding operations (CAFOs). Goal 1 is investigating whether co-digesting manure with herbaceous biomass can help operations with smaller numbers of animals be economically viable.

The Goal 1 team investigates and develops bioprocessing strategies to improve anaerobic digestion systems' economic prospects and environmental impacts. Initial life-cycle analyses indicate that RNG’s global warming potential/carbon intensity depends heavily on digestate storage methods and the quantity of co-digested grassy feedstock. Under conditions we believe to be profitable for grassy digesters, the greenhouse gas reduction of RNG is reduced by 70% under the worst digestate storage conditions. Optimizations are being performed on lab-scale solid-state anaerobic digestion to maximize methane yield while decreasing operating costs.
Goal 1 is also conducting experiments on solid-state anaerobic digestion, which utilizes significantly less water than traditional digestion but boasts comparable RNG yields for herbaceous biomass. Preliminary investigations into the relative digestibility of different herbaceous feedstocks of interest show that winter rye biomass offers the highest RNG potential, followed by prairie biomass and switchgrass. For comparison, corn stover is comparable to prairie biomass. Given this insight, the prospects for winter rye as a biogas crop are high.

Importantly, however, much of the Goal 1 research has focused on prairie biomass, given the current policy structure in the Renewable Fuel Standard. Depending on growing/harvest conditions, winter rye biomass may fall just short of the 75% cellulosic content cutoff established by the EPA to qualify for the cellulosic biofuel (D3) renewable identification number. This cutoff is vital because it can make the difference between a financially viable and nonviable project.

**Goal 1 in Focus: Reducing Barriers to Anaerobic Digestion on Smaller Farms**

The Goal 1 team has focused on identifying and lowering the minimum herd size required to make anaerobic digestion profitable at smaller scales. A baseline operation with codigestion requires approximately 5,000 cattle to be economically viable, while under more optimized conditions with two-stage digestion, that number is reduced to approximately 3,300 head. In each case, this is a factor limiting widespread adoption. Since economic viability is heavily dependent on RNG production, the Goal 1 team developed several process models to investigate intensification pathways:

- After experimenting with, evaluating, and implementing a variety of digester parameters, the team determined that codigestion with prairie biomass, despite its high cost and limited RNG potential, can achieve profitable scales with 3,300 beef cattle.
- Goal 1 also evaluated whether pre-treating prairie biomass with hydroxycinnamic acids (HCAs) could improve RNG production. Experimental data showed significant
improvements in RNG production from pretreated prairie biomass and high coproduct yields. Techno-economic analysis showed promising results, as the HCA extraction offers profitability at the lower minimum herd size of 1,250 beef cattle. The profitability can be attributed to the revenue generated through the HCA coproduct and higher RNG production.

There are additional potential tax credits from the U.S. Federal Inflation Reduction Act that could reduce these minimums further, pending ongoing implementation discussions.

The Goal 1 team will continue modeling anaerobic digestion of different feedstocks, including dairy manure and switchgrass. The current target is to achieve economic viability with herd sizes of approximately 800 or less for beef and dairy operations by increasing RNG yield through the digestion of winter rye and optimizing HCA pre-treatments.
Goal 2 – Agroecosystems

Whereas the Goal 1 team is investigating technical strategies to optimize anaerobic digestion systems, Goal 2 focuses on producing and managing biomass crops through in-field observation and modeling. Complimentary field measurements and modeling in Pennsylvania and Iowa to help the team understand the dynamics of the biomass crop value chain. Pennsylvania offers a Mid-Atlantic perspective aligned more closely with dairy production and evaluating perennials such as switchgrass as a feedstock. Iowa provides a context for understanding the proposed value chain with the Corn Belt, with more emphasis on beef and pork producing operations while the perennials of interest are prairie. In both cases, winter crops such as cereal rye are explored as viable harvestable feedstocks.

Some of the most exciting research from the Goal 2 team has concentrated on winter crops and their impacts on summertime agricultural yield, soil health, and water quality. The Goal 2 team has found that winter crops are compatible with anaerobic digestion, with similar or better biomass yields than most crop residues and perennial energy crops. With higher nitrogen levels than perennial energy crops, the co-product digestate has an increased value as a crop fertilizer or potential livestock feed. The Goal 2 team has also determined that cultivating winter crops, especially rye, can increase the annual productivity of the landscape by 25% or more.

Not only is rye a generally strong candidate for winter cropping, but this team’s research has also shown that any potential impact on the yields of summer food/feed crops is more than compensated by the winter crop. Fertilizing harvested winter crops can significantly improve biomass yield while offering similar water quality benefits as an unfertilized cover crop. Additionally, the team has demonstrated that soil carbon and other soil health properties are not significantly affected by harvesting winter crops relative to unharvested cover crops.

In other words, winter crops can be productive while generating our intended positive environmental outcomes of traditional protective cover cropping.
Goal 2 in Focus: Digging Into Unique Geographies

In the Corn Belt, the Goal 2 team assesses changes to cropping systems and crop fields to incorporate biomass crops for anaerobic digestion. Two adjustments are being evaluated through field and lab experimentation, modeling, and farmer engagement.

The first adjustment broadens the typical corn and soybean rotation to include annual rye as a winter biomass crop. In a modeling study, harvesting fertilized winter rye prior to planting soybean crops could provide biomass sufficient to produce 0.21 EJ yr\(^{-1}\) of biogas energy and reduce nitrogen loads to the Gulf of Mexico by 27%.

The second adjustment incorporates prairie vegetation on portions of fields that are either not profitable for corn and soybean production or exceptionally environmentally sensitive. In a model of the Grand River watershed of southern Iowa and northern Missouri, harvesting the prairie every other year for biomass production could improve net income for farmers while also improving watershed water quality and other environmental goals.

At events designed to gather feedback, farmers and farmland owners in Iowa indicated greater receptiveness to integrating prairie on portions of their fields, rather than changing management of their corn and soybean cropping systems.

Goal 2 research in Pennsylvania assesses digestate as a fertilizer source, looking at the effect of changing nutrient management on crop yield, farm economics, and the environment. Field research was conducted on four commercial dairies in Pennsylvania with biodigesters.

In the study, farms using shallow disk injection methods to incorporate liquid digestate and manure reduced ammonia-nitrogen loss and improved corn silage yield. When manure was injected into a growing cover crop in early spring, rather than following cover crop termination, nitrous oxide and ammonia were also reduced, and corn yield was maintained. The team next aims to use these insights in a comparison of multiple tools to assess early season corn nitrogen needs and improve side-dress nitrogen fertilizer recommendations.
Parallel to the field studies, the biogas circular economy of one of the four dairy farms was modeled. The selected operation includes 1,025 cows, two biogas digesters, and accepts food waste as a feedstock. The case study estimated that 66% of the biogas produced is from off-farm food waste sources. The food waste also provides up to 78% of the farm’s crop nitrogen needs, excess phosphorus for crop production, and excess energy, which can be returned to the electric grid. The study also identified where more data is needed to assess how more farms with anaerobic digesters can recycle food waste for farm nutrients and renewable energy under current market incentives.
Goal 3 – Human Dimensions

The Goal 3 team has conducted research and engagement activities to understand better key stakeholders’ perspectives about the potential impacts of the Grass2Gas vision for an on-farm, herbaceous feedstock-based anaerobic digester biogas value chain. The information generated through these stakeholder engagement processes ensures that their diverse perspectives inform the Grass2Gas project’s development trajectory.

From 2021 to 2023, Goal 3 social scientists interviewed 54 individuals from 36 stakeholder entities across the potential value chain, including energy sector groups such as utilities and pipeline operators, environmental policy and advocacy organizations, biogas advocacy trade associations, regulatory entities, farmer organizations, and many others. The interviews shared a scenario, developed collaboratively with Goal 1 and Goal 2 team members, that described a bio-based value chain emphasizing the farm-based generation of biogas for electricity and/or RNG and associated bioproducts.

The main goal of the interview research was to elicit stakeholder perspectives and feedback regarding this scenario’s potential impacts. The interviews, which followed a standard question protocol, systematically documented diverse stakeholder perspectives to prepare for a series of stakeholder virtual workshops in 2023.

Stakeholder perspectives turned out to be even more diverse than anticipated: many groups cited potential benefits, such as reduction of agriculture’s environmental impacts and increased ecosystem services related to herbaceous feedstocks, as well as greenhouse gas reduction through methane capture. Negative perspectives included potential methane leakage, skepticism regarding farmers’ capacity to run digesters, and concerns that the technology and related policy might privilege and promote larger-scale CAFOs. The interviews also allowed stakeholders to voice questions about the Grass2Gas scenario, which Goal 3 brought back to the whole Grass2Gas team for examination.
Goal 3 in Focus: Workshops Lead to Goodwill and Further Stakeholder Engagement

Introducing new technologies into social-ecological systems with diverse stakeholders can be challenging, with adoption, widespread acceptance, and diffusion depending on key stakeholder interests and how those interests align or misalign with technologies’ perceived attributes and potential impacts. This feedback is precisely why we embedded social science evaluation into the Goal 3 team.

The results from the team’s initial analyses of stakeholder interviews formed the basis for three virtual stakeholder workshops in 2023, one each with representatives from Iowa, Pennsylvania, and national-level stakeholder groups. The goals of the workshops were to share what the research team had learned from the stakeholder interviews and to facilitate discussions about the feasibility of agriculturally based RNG supply chain development.

Workshop participants were chosen based on their potential involvement in the hypothetical RNG value chain scenario. They included government organizations, agricultural commodity groups, utilities, biogas and RNG producers, and policy advocacy groups. The perspectives shared by stakeholders provided valuable insights that have informed the research of Goal 1 and Goal 2, and workshop participants expressed positive attitudes regarding the value of the Goal 3 team’s research, as well as an appreciation for our willingness to share results that highlight both positive and negative stakeholder feedback.

As one participant noted, “I think the material that you went over was really, really good. And I think the questions that the stakeholders raised during the interviews are really on point.” Overall, participant feedback indicated that the workshops were valuable and that many are interested in continued engagement as the project progresses.

Based on attendance, the depth and range, and the stakeholders' positive feedback, the Goal 3 team considers the workshops highly successful!
Anaerobic Digestion on the Farm Conference Recap

In November 2023, the C-CHANGE team hosted the conference Anaerobic Digestion on the Farm: Optimizing Environmental and Economic Outcomes for Rural Communities and Beyond. The conference emerged from a partnership between the U.S. EPA Region 7, Iowa State University, and the University of Iowa. It aimed to boost curiosity about anaerobic digestion’s potential in the region and spark further interest around the country.

Attended by more than 300 partners and stakeholders from 15 states, seven countries, and four continents, the conference was a significant opportunity to report our cross-sector knowledge, share our latest research findings, and gather additional input and feedback from farmers interested in establishing anaerobic digestion systems. Many attendees left with new perspectives on anaerobic digestion, acknowledging that, while there remain many questions and hurdles, they are optimistic about its potential.

More information about the conference is available here [bit.ly/3O3UE5W].
Success Metrics and Evaluation

Evaluation is at the core of the Grass2Gas endeavor, and is used to assess the feasibility and impact of the project’s vision and to inform transdisciplinary teamwork. Our measurements of success mirror our long-term vision for an anaerobic digestion value chain. We will know we are moving the needle nationally when we see progress on the following metrics.

In the near term, we will see an increase in bioeconomic content skill sets and knowledge among entrepreneurs, farmers, farm owners, farm advisors, conservation professionals, agricultural businesses, policy leaders, teachers, and students. Additionally, we will identify improvements in biomass conversion efficiencies and support the success of existing on-farm digesters. We will also see more farmers using subfield management practices for profitability.

On our longer-term goals, we expect to see additional investments and public policies to improve new value chains. These investments and policy shifts will be reflected by an increase in the number of on-farm digesters and farmers growing biomass crops, increased value-added biobased products from the value chain, and environmental improvements according to multiple metrics. With more dollars flowing into agricultural businesses, we expect to see existing and new companies flourish, with new, permanent, and technical jobs in demand in rural communities.

Finally, our ultimate signal of success is a national supply of affordable, safe, nutritious, and sustainable agricultural products and a society more educated about and supporting an expanded bioeconomy.

An aerial view of Pennsylvania State University’s anaerobic digester on campus.
Lessons We’re Learning

Continue building partnerships along the value chain:
Federal agencies, such as the USEPA, USDA, and the Department of Energy, are essential partners for developing flexible policies that enable tailored implementation of anaerobic digestion on small- and mid-sized farms. Regarding project financing, we also need to continue exploring public and private partnerships to make anaerobic digestion accessible to farms while reducing upfront costs and risks to farmers. We can also jumpstart partnerships by tapping into existing systems, as we have successfully done with our pre-college education partners in Iowa and Pennsylvania.

Monitor emissions along the value chain:
Anaerobic digestion has become a helpful lens for holistically examining greenhouse gas emissions from the agricultural sector. Since both the digestate and the downstream use of the gas are sources of methane to the atmosphere, we need to provide technical assistance on management strategies to mitigate these sources alongside aid to the technology itself. Similarly to raw manure, digestate can lose ammonia to the atmosphere, so care is needed for digestate handling, both during storage and with field application. We have also found that there needs to be more data tracking nitrous oxide emissions globally.

There are no “one size fits all” solutions – but there are commonalities:
It comes as no shock that agricultural systems are incredibly complicated and need to account for the unique operation of each farm. While that makes implementation more time intensive, some commonalities can shape guidance. For instance, we know it takes time to optimize the operation of digesters and that professional management support is essential for success. Specific policy changes are needed to support profitable adoption on smaller farms, while more extensive operations will require pipeline connections to enable the sale of RNG. Most importantly, given the lack of clear regulation around anaerobic digestion and handling digestate, we are committed to ensuring that stakeholder voices are reflected in future policy while accounting for local conditions variability.

It all comes back to place:
Not only is anaerobic digestion heavily influenced by farm operations, but it is also greatly affected by the human and physical geography of farms. While many of the processes we have developed between our teams translate well across landscapes—data models, lab experiments, and stakeholder engagements, for instance—the land itself is very much a variable. Agriculture is, after all, a place-based enterprise, relying on a region’s climate, water, labor, and market conditions, complicating our ability to generalize and underscoring the need for place-based partnerships toward value-chain development.
Looking Ahead

Coupling digestion of herbaceous biomass and manure can allow farms to achieve economies of scale and diversified revenue currently only available to large livestock operations. It can also provide additional benefits for farmers, such as additional markets, crop flexibility, soil health, and nutrient retention, and to society, with measurable improvements in water quality, wildlife and pollinator habitat, and emissions reduction. Yet, like all great scientific endeavors, for every question we answer through Grass2Gas, new questions follow and send us back into the lab, the field, or the classroom.

For instance, we have heard from farmers and industry partners as to why digesters do not make sense for every farm, so more time and effort are needed to develop and support alternative manure management strategies, either co-digestion of other feedstock streams, centralized or community digesters, or solutions such as composting that avoid producing methane in the first place.

As the Goal 3 team has documented, this requires more than additional investment. The challenges in implementing anaerobic digestion mirror the risks, drawbacks, and trade-offs many farmers have already experienced with centralized and consolidated farming operations. Additionally, while biogas emissions are lower compared to their fossil fuel alternatives on order of magnitude, we also need to recognize that these are greenhouse gasses, and we must continue to innovate to ensure that the production and consumption of biogas-based electricity and/or RNG is a net-neutral or net-negative source of emissions.

Anaerobic digestion is not, nor will it ever be, a miracle cure-all for the enormous and intertwined challenges we face as a society. Miracle cure-alls simply do not exist. But a new value chain centered on the anaerobic digestion of perennial and winter crops can provide a giant leap of progress towards addressing those challenges.

The questions we have yet to answer invite continued collaboration. Suppose we focus on improving water quality and decarbonizing agricultural systems while regenerating soils, ecosystems, and prosperity in rural communities. In that case, the solutions we identify will potentially deliver vastly outsized impacts for community wealth, wellbeing, ecosystems and wildlife, and the planet.

Over the remaining two years of the initial Grass2Gas timeline, we are excited to shift much of our focus to modeling the impacts of anaerobic digestion for interested stakeholders, helping farmers consider the financial and operational risks and decision
makers better understand how this industry can help us achieving larger social, environmental, and economic goals.

Building a bioeconomy is a chance to ensure that no community gets left behind. The knowledge we generate together through Grass2Gas provides a science-based foundation for discussions at an essential intersection of agriculture, energy, and environmental sustainability.

The growth and digestion of herbaceous biomass and manure can allow farms to diversify revenue while providing additional benefits important to farmers, such as crop flexibility, soil health, and nutrient retention. Benefits also accrue to society, including improvements in climate resilience, water quality, and wildlife and pollinator habitat.
Meet The Team

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