

# Reducing Agricultural Greenhouse Gas Emissions through “Climate-Smart” Markets, Technical Innovation, and Emissions Credit Trading

Issue Brief 23-10 by **Emily Joiner**, **Suzanne Russo**, and **Michael Toman** — November 2023

## Key Points

- We examine three pathways for reducing agricultural greenhouse gas (ag-GHG) emissions in the United States that complement the Farm Bill’s Title II programs:
  - support for the development of markets for “climate-smart” agricultural products
  - research and development (R&D) support by the public sector for technical innovation that improves capabilities to reduce ag-GHG emissions
  - ag-GHG emissions credits that can be used by other GHG sources to offset a portion of their own emissions-reduction obligations
- Climate-smart agricultural products have lower GHG emissions in their supply chains. In addition to how those reductions are accomplished and validated, a key issue is what demand there will be for such products if their costs exceed those of conventional alternatives.
- Agricultural R&D is supported under Title VII of the Farm Bill and through other means. Key issues are broadening the range of ag-GHG mitigation practices receiving R&D support and ensuring the fruits of agricultural R&D are relevant for and available to a diverse array of producers.
- Ag-GHG emissions credits facilitate lower costs for achieving emissions mitigation, which may also increase ambition for mitigation. To have ag-GHG emissions credits that are both environmentally sound and affordable, several measurement and validation challenges need to be addressed, including establishing that the claimed ag-GHG emissions reductions would not have happened anyway (in other words, they are additional).

## 1. Introduction

Building on the [previous issue brief](#) in this series, which discussed opportunities for the Farm Bill’s Title II programs to reduce agricultural greenhouse gas (ag-GHG) emissions in the United States, this brief addresses three other pathways to reduce ag-GHGs.

The first pathway involves support for the development of markets for climate-smart agricultural products. The term **climate-smart** is defined by the US Department of Agriculture as “any agricultural commodity that is produced using agricultural (farming, ranching, or forestry) practices that reduce greenhouse gas emissions or sequester carbon” (USDA 2023b).

The second pathway is research and development (R&D) support by the public sector (alone or in collaboration with private sector entities) for technical innovation that improves the capabilities of farmers and ranchers to reduce GHG emissions from their operations. While some innovation efforts are directly aimed at reducing emissions, others focus on development and diffusion of methods that can increase economic returns for producers while also reducing GHG emissions.

The third pathway is markets for ag-GHG emissions credits that reward additional emissions reductions in the agricultural sector, relative to emissions that would be expected without the economic incentive. In ag-GHG credit markets, a farm or ranch supplying emissions credits can recoup the costs incurred from the emissions reduction activity via the revenue from credit sales. A purchaser of emissions credits does so to offset a portion of its own emissions, avoiding a higher cost of reducing emissions itself.

Sections 2–4 clarify how these pathways are directly or indirectly connected to USDA programs, including those funded by the Farm Bill, and explain how they can contribute to ag-GHG mitigation. Section 5 addresses equity issues relevant to participation in the pathways, and Section 6 identifies issues related to the three pathways that are relevant to Farm Bill reauthorization.

## 2. Development of Markets for Climate-Smart Agricultural Products

**Partnerships for Climate-Smart Commodities (PCSC)** was initiated in 2022, using funds transferred from the Commodity Credit Corporation (CCC), a federal corporation within the USDA. The aims of PCSC are to further accelerate the adoption of practices supported under Title II of the Farm Bill and to promote the expansion of markets for products produced using climate-smart practices (drawing on extensive USDA experience in agricultural commodity promotion). PCSC has committed \$3.1 billion to 141 projects over two rounds of funding, and significant nonfederal cofunding will be sought as well. The projects cover a wide range of agricultural commodities, as well as forests and energy crops. Analysis of the projects by the National Sustainable Agriculture Coalition (NSAC) indicates a greater focus in the second, smaller round of funding on measurement and verification of emissions reductions and on grants to historically underserved producers (NSAC 2023). Projects focusing on improving measurement and verification of emissions reductions could improve assessment of results for all climate-smart food and fiber production programs.

PCSC is connecting awardees producing the same commodities to encourage collaboration on market development. Demand for climate-smart agricultural commodities will rise if purchasers choose to invest more in reducing GHG emissions **upstream in their supply chains** (an activity referred to as carbon insetting), which

would then establish a higher value and funding stream for climate-smart ag products. If there are significant cost premiums, however, demand for climate-smart commodities will be limited.

Because PCSC is still in its early stages, estimates of its potential impacts on ag-GHG emissions are largely conjectures.<sup>1</sup> While it is uncertain how much PCSC will accelerate uptake of ag-GHG mitigation practices used in Title II programs, it is even more uncertain how demands for climate-smart commodities might grow through market development programs, the outcomes of which will differ by commodity type. Success in scaling up those markets can help reduce the unit costs of producing climate-smart commodities. However, if the unit costs of those commodities exceed those of the conventional alternatives, the initial challenge will be persuading commodity purchasers to choose costlier but lower-GHG products.<sup>2</sup>

## 3. Public Sector Support for Ag-Technology Innovation to Reduce GHGs

Within the USDA, the Agricultural Research Service and the National Institute for Food and Agriculture (largely through its Agriculture and Food Research Initiative) are major sources of federal funding of R&D for ag-GHG reduction. The USDA also funds the Foundation for Food & Agriculture Research, another major source of research for strengthening productivity and environmental performance in the sector. These entities receive partial funding through Title VII of the Farm Bill. In addition, National Science Foundation and Small Business Innovation Research grants have periodically been available for R&D to accelerate ag-GHG reductions and carbon sequestration through soil management practices.

Funding by the United States for scientific research on agricultural practices has not kept pace with comparable R&D spending by other countries (Nelson and Fuglie

1 USDA provides some preliminary estimates on its [FAQ page](#).

2 Cai and Aguilar (2013) offer a meta-analysis of published premiums for environmentally certified forest products, premiums in the reviewed literature range from 1 percent to 39 percent. Knapp et al. (2020) provide evidence on the determinants of customers' willingness to pay a premium for "green electricity."

2022). A report by the Breakthrough Institute on federal funding for ag-GHG mitigation estimates that estimates that R&D funding in the United States for energy-related GHG mitigation is 35 times the size of funding for scientific research into practices that can reduce ag-GHG emissions and increase carbon in agricultural soils (Blaustein-Rejto et al. 2022, 32). The report also notes that most research funding is allocated to practices to increase soil carbon sequestration, with much lower funding for advancing other technologies with considerable potential for ag-GHG mitigation such as feed additives for ruminants and options for reducing nitrous oxide emissions from fertilizer uses. Precision agriculture is important in this context as an approach to more cost-effectively tailor fertilizer use and manage soil quality to reduce GHGs while increasing productivity and reducing input costs (Balafoutis et al. 2017).

Innovation in precision agriculture serves to increase usefulness and reduce costs of the necessary equipment. Funding is also available through NRCS Conservation Innovation Grants (CIGs) for organizations working with producers to accelerate adoption of ag-GHG-reducing technology. For example, in 2023, a subgroup of CIGs known as On-Farm Trials targeted nutrient management, soil health, and animal feeding management for enteric methane reduction. However, the federal allocation for CIG funding is small relative to the need, and as with other NRCS programs that support environmentally sustainable agriculture, challenges in achieving more inclusive producer participation persist (Russell et al. 2021).

## 4. Markets for Emissions Credits from Ag-GHG Mitigation

Because regulatory limits on GHG emissions do not yet exist in most of the United States, credits currently are used mainly to meet voluntary reduction targets.<sup>3</sup> Emissions credits help buyers achieve their targets at a lower cost than if they had to meet these goals entirely through reductions in their own emissions. Note that unlike the previous two pathways, emissions credits do not in themselves reduce total GHGs. Instead, their use reallocates reductions in ways that decrease the cost of those that are achieved. However, given that the cost of GHG mitigation is an often-cited barrier to increased ambition, greater cost-effectiveness through use of emissions credits can indirectly support more aggressive economy-wide mitigation.

Project developers in ag-GHG credit markets work with and pay agricultural producers for the emissions-reducing changes in practices they implement beyond what would be business as usual.<sup>4</sup> Registries have been set up to issue the credits, with verifying entities to attest to their environmental integrity (Plastina 2022).<sup>5</sup>

Development of ag-GHG credit markets received support in the Growing Climate Solutions Act (GCSA), which was passed in December 2022 as part of the **Consolidated Appropriations Act of 2023**. The GCSA authorizes the USDA to establish a means to provide technical assistance for producers interested in ag-GHG mitigation, give official guidance on credit market participation, and in 2024, publish a registry of project developers (Hall 2023).<sup>6</sup>

- 3 California has a mandatory cap-and-trade program for reducing the state's GHG emissions. That program permits a small percentage of covered sources' compliance obligations (4 percent through 2025, 6 percent over 2026–2030, with additional requirements for environmental benefits in the state) through emissions credits from noncovered sources, **including ag-GHG emissions**. California also has several initiatives directed specifically at reducing ag-GHG emissions (Jimenez 2021).
- 4 In voluntary market settings, producers typically are paid for lowering their emissions by the magnitude of carbon (or CO<sub>2</sub>e) sequestered (or reduced). **Bayer** employs an alternative scheme in which it pays producers based on management practices they implement to increase soil carbon and assumes the responsibility for assessing the resulting carbon sequestration (Plastina 2023).
- 5 Registries for agricultural carbon credits include **Verra** and **Climate Action Reserve**, which perform their own verification or work with a third-party verifier such as **SustainCert**. **Grassroots Carbon**, **Indigo Ag**, and **Nori** are all active in soil carbon credit project development.
- 6 The Consolidated Appropriations Act also incorporated the SUSTAINS Act, under which private-sector actors can contribute funding to support particular conservation practices used in Title II programs.

In its initial report on agriculture, forestry, and other environmental credits as part of implementing the GCSA, the USDA focuses on barriers to market participation and inequities that exacerbate those barriers (USDA 2023c). NSAC (2021) has a stronger critique concerning the environmental effectiveness of emissions credits, inequities in access to emissions credit markets, and amplification of longstanding environmental justice concerns through continued operation of facilities causing substantial local pollution in disadvantaged communities. In our view, ag-GHG emission credits can be a useful policy tool within the overall context of scaling-up GHG reductions across the economy, but several significant challenges would need to be overcome.

For ag-GHG emissions credits to be environmentally sound, effective ways to assess the so-called additionality of observed reductions in emissions by credit providers are essential. This requires showing that credit generators have reduced their emissions by more than they would have otherwise. If observed reductions would have occurred anyway (e.g., as a result of changes in the composition of agricultural output or the impacts of Title II programs on GHG emissions, or some other factors), then a credit purchaser is not offsetting its own emissions with reductions beyond business as usual, and use of the credits would result in a net increase in emissions.

Assessing additionality requires a comparison of observed changes in emissions by the credit seller with a hypothetical alternative in which credits are not allowed. Objective modeling and other methodologies can be used to help define a plausible counterfactual, but the assessment will always contain an element of subjectivity. Key to the environmental integrity of ag-GHG emissions credits is strengthening the analytical base for the assessment and trying to limit arbitrariness.

Related to the issue of additionality is the largely unrecognized need to account for anticipated ag-GHG emissions reductions through participation in Title II programs in defining baselines for calculating credits so that reductions financed in part by public funds are not included. Otherwise, emissions would rise on net from the faulty calculation of credits, and public funding would be used de facto to reduce the mitigation costs of

ag-GHG emissions credit buyers. Since ag-GHG credits are traded in privately organized markets, and the USDA has no jurisdiction over them (USDA 2023c), it is up to project developers and registries developing protocols for ag-GHG credits to address this issue.

The importance of improving measurement and modeling tools to provide better estimates of changes in ag-GHGs used to characterize emissions credits also cannot be overstressed. The general challenge is discussed in a [previous brief](#) in this series. Improved monitoring and measurement also need to address the permanence of a credit supplier's claimed emissions reductions to prevent the use of credits no longer backed by real reductions. In addition, current measurement and monitoring capacities are strongest for row crops but should be expanded to other types of crops to support the provision of reliable ag-GHG emissions credits by a more diverse group of agricultural producers.

Ultimately, the success of ag-GHG emissions credits will depend on the scale of demand for them to offset emissions from other sources; the capabilities for measurement, monitoring, and verification to increase confidence in their GHG-reduction potential; and effective efforts to address equity and justice concerns. Regarding the first two conditions, a recent *Ag Economy Barometer* report finds that half of corn and soybean farmers who had been in talks to enter a carbon credit generation contract ultimately declined to do so because the payment per credit (typically \$10 to \$20 per metric ton) was too low (Mintert and Michael 2023). Low credit prices could reflect both skepticism about the measurement and environmental integrity of ag-GHG emissions credits and the low demand for emission credits given the largely voluntary approach to GHG mitigation followed in the United States.

A core environmental justice issue is that GHG emissions credits (from any source, not just agriculture) could be used to extend the operational lives of facilities that have been emitting seriously harmful local pollutants to the detriment of disadvantaged communities over a long period. Requiring instead that those facilities either convert to using clean and low-carbon energy or close would mitigate the local pollution rather than prolonging it. This conundrum arises in the

context of several policy approaches to GHG mitigation, not just emission credits. Although use of credits can increase the aggregate cost-effectiveness of GHG mitigation (i.e., reducing the overall cost of attaining a particular target for aggregate emission reductions), the spatial disparities that prolong environmental injustices have to be addressed.

## 5. Equity and Fairness in Accessing Ag-GHG Mitigation Programs

The USDA's [Equity Commission](#) and [Advisory Committee on Minority Farmers](#) (ACMF) have made a series of informed and actionable recommendations since 2021 that would improve program design and implementation for more equitable access to USDA resources. In its most recent published report, the ACMF strongly urges the USDA to implement programs that significantly expanded outreach to minority and veteran producers regarding all resources available through the agency and the requirements to apply and access these resources. The ACMF observes that the Farm Bill is the primary US policy mechanism to address rural development (Reed 2021). Therefore, achieving the goal of equitable access to USDA resources should be reflected in the Farm Bill. The [Equity Commission Interim 2023 Report](#) to the USDA makes 32 specific recommendations for improving equity, many of which are tied to the Farm Bill, including updating program rules that lead to highly inequitable funding opportunities for underserved producers.<sup>7</sup>

The concerns of the USDA advisory bodies also are relevant to concerns about the distribution of benefits from access to ag-GHG emissions credit markets. Large, GHG-intensive agricultural operations could likely achieve more emissions reductions at a lower unit cost than small producers. Consequently, the economics of ag-GHG credit markets tend to favor larger farms and ranches. Larger operations also can more easily absorb the up-front costs of participation in ag-GHG emissions credit markets, including the time investment

required to understand emissions credits, decide whether participation ultimately would be economically beneficial, determine eligibility, and enroll. Once enrolled, moreover, operations may face a period of adjustment with reductions in yields and profits as land and fertilizer management changes. For smaller producers with lower profit margins and less experience in climate-smart agriculture, the start-up costs and costs of adjusting to changed practices can be a significant barrier.

Historically disadvantaged producers, including producers of color, also can face hurdles in accessing both information about funding opportunities and the financial resources needed to participate in carbon offset markets and USDA-run innovation programs, even if the programs could provide them with more profits over time (Van Sant et al. 2023; Horst and Marion 2019; Taylor et al. 2022). Similar knowledge gaps can arise in the diffusion of knowledge about innovative technologies and opportunities for support in adopting them.

Equity goals may have more impact when incorporated into legislation rather than promulgated through agency actions or special funding initiatives. Strengthening equity goals in the reauthorization of the Farm Bill could increase the opportunity for producers that are small or historically disadvantaged to receive needed support. These producers play a critical role in providing many of the crops that are staples in the US food supply.

---

7 We highly recommend reading the [interim report](#) and the [USDA's response](#) in their entirety for a thorough treatment of inequities in USDA program rules and outreach.



## 6. Some Key Issues in Deliberation over Farm Bill Reauthorization

Of the three pathways discussed, only R&D factors into the Farm Bill reauthorization directly.<sup>8</sup> Emissions credits will not play a role in the bill. The future of the PCSC program could be indirectly affected by changes to the CCC, which provided PCSC with its initial funding. The reauthorization may place restrictions on the future use of CCC funds (Brasher 2023; Grassley 2023). If so, this would require an extension of PCSC to find alternative means of funding.

There is considerable interest among stakeholders in strengthening support for R&D in Title VII of the Farm Bill in the reauthorization, including R&D to increase possibilities for cost-effective ag-GHG mitigation. The Farm Bill will replenish funding for the National Institute for Food and Agriculture, Agricultural Research Service, and Foundation for Food & Agriculture Research, though it will not dictate how those funds are distributed to research topics. One important question is the extent of increases for R&D funding to support research addressing the circumstances of small and disadvantaged producers that are not producing commodity crops at large scale.

Another important issue is the extent of support to close the funding gap for high-risk, high-reward, longer-term ag-GHG mitigation research. The Agricultural Advanced Research and Development Authority, established in the 2018 Farm Bill, could help address this. However, it has received only a fraction of its authorized funding level in the fiscal years since its passage (USDA 2023a). We believe that increased support for such research in the reauthorization of the Farm Bill would provide significant returns.

**Resources for the Future** (RFF) is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. The views expressed here are those of the individual authors and may differ from those of other RFF experts, its officers, or its directors.

**Emily Joiner** is a senior research analyst at RFF. She works on a suite of topics including carbon dioxide removal, agricultural emissions reduction, and wildfire risk impacts and mitigation. She obtained dual BS degrees in sustainability and economics from Arizona State University and an MS degree in agricultural and resource economics from the University of Arizona.

**Suzanne Russo** is a fellow at RFF focusing on equitability in the climate transition. Prior to joining RFF, Russo spent five years as the CEO for Pecan Street Inc.—a nonprofit organization working to advance data and technology solutions for the climate crisis—and held several other roles during her 13-year tenure.

**Michael Toman** returned to RFF as a senior fellow in 2021 after stints at the World Bank Development Research Group, RAND Corporation, and the Inter-American Development Bank. His current research interests include reduction of agricultural greenhouse gas emissions, critical minerals for decarbonization, markets for emission reduction credits, and climate change policies in developing countries.

---

8 Other steps complementary to the Farm Bill would include implementing the provisions of the GCSA and initiating the development of guidelines for incorporating the impacts of Title II program participation in the specification of baselines for assessing ag-GHG emissions credits.

## 7. References

- Balafoutis, Athanasios, Bert Beck, Spyros Fountas, Jurgen Vangeyte, Tamme Wal, Iria Soto, Manuel Gómez-Barbero, Andrew Barnes, and Vera Eory. 2017. "Precision Agriculture Technologies Positively Contributing to GHG Emissions Mitigation, Farm Productivity and Economics." *Sustainability* 9 (8): 1339. <https://doi.org/10.3390/su9081339>.
- Blaustein-Rejto, Dan, Jasmine Yu, Emily Bass, and Guido Nunez-Mujica. 2022. "From Lab to Farm: Assessing Federal R&D Funding for Agricultural Climate Mitigation." Washington, DC: Breakthrough Institute. [https://thebreakthrough.imgix.net/From-lab-to-farm-report/Lab-to-Farm\\_Report\\_v7.pdf](https://thebreakthrough.imgix.net/From-lab-to-farm-report/Lab-to-Farm_Report_v7.pdf).
- Brasher, Phillip. 2023. "Rural Members Join Swing-District Republicans in Rejecting Ag Spending Bill." *Agri-Pulse*, September 29, 2023. <https://www.agri-pulse.com/articles/20027-rural-members-join-swing-district-republicans-in-rejecting-ag-spending-bill>.
- Cai, Zhen, and Francisco X. Aguilar. 2013. "Meta-Analysis of Consumer's Willingness-to-Pay Premiums for Certified Wood Products." *Journal of Forest Economics* 19 (1): 15–31. <https://doi.org/10.1016/j.jfe.2012.06.007>.
- USDA Spending Accountability Act of 2023, S.2244, 118th Congress. <https://www.congress.gov/bill/118th-congress/senate-bill/2244/text>.
- Hall, Peggy Kirk. 2023. "Carbon Credit Market Assistance Program Now in the Hands of USDA." *Farm Office* (blog). Ohio State University Extension, February 7, 2023. <https://farmoffice.osu.edu/blog/tue-02072023-1244pm/carbon-credit-market-assistance-program-now-hands-usda>.
- Horst, Megan, and Amy Marion. 2019. "Racial, Ethnic and Gender Inequities in Farmland Ownership and Farming in the U.S." *Agriculture and Human Values* 36 (1): 1–16. <https://doi.org/10.1007/s10460-018-9883-3>.
- Jimenez, Frank. 2021. "Assessing California's Climate Policies: Agriculture." Sacramento, CA: Legislative Analyst's Office. <https://lao.ca.gov/reports/2021/4483/cal-climate-policies-121521.pdf>.
- Knapp, Lauren, Eric O'Shaughnessy, Jenny Heeter, Sarah Mills, and John M. DeCicco. 2020. "Will Consumers Really Pay for Green Electricity? Comparing Stated and Revealed Preferences for Residential Programs in the United States." *Energy Research & Social Science* 65 (July): 101457. <https://doi.org/10.1016/j.erss.2020.101457>.
- Mintert, James, and Langemeier Michael. 2023. "Farmer Sentiment Dips amid Weaker View of Current Conditions." *Ag Economy Barometer*, September 5, 2023. Purdue Center for Commercial Agriculture. <https://ag.purdue.edu/commercialag/ageconomybarometer/wp-content/uploads/2023/09/August-2023-Ag-Economy-Barometer.pdf>.
- Nelson, Kelly P., and Keith Fuglie. 2022. "Investment in U.S. Public Agricultural Research and Development Has Fallen by a Third over Past Two Decades, Lags Major Trade Competitors." *Amber Waves*, June 6, 2022. US Department of Agriculture. <https://www.ers.usda.gov/amber-waves/2022/june/investment-in-u-s-public-agricultural-research-and-development-has-fallen-by-a-third-over-past-two-decades-lags-major-trade-competitors/>.
- NSAC (National Sustainable Agriculture Coalition). 2021. *Climate Solutions for Farmers: Invest in Proven Federal Programs, Not Carbon Markets*. April 2021. [https://sustainableagriculture.net/wp-content/uploads/2021/06/Climate-Solutions-for-Farmers\\_-\\_Invest-in-Proven-Conservation-Programs-Not-Carbon-Markets-1.pdf](https://sustainableagriculture.net/wp-content/uploads/2021/06/Climate-Solutions-for-Farmers_-_Invest-in-Proven-Conservation-Programs-Not-Carbon-Markets-1.pdf).
- . 2023. "Who Benefits? A Look at the Partnership for Climate Smart Commodities Preliminary Awards." NSAC's blog, June 2, 2023. <https://sustainableagriculture.net/blog/who-benefits-a-look-at-the-partnership-for-climate-smart-commodities-preliminary-awards/>.
- Plastina, Alejandro. 2022. "How Do Data and Payments Flow through Ag Carbon Programs?" *Ag Decision Maker*. File A1-77. Iowa State University Extension and Outreach. <https://www.extension.iastate.edu/agdm/crops/pdf/a1-77.pdf>.
- . 2023. "How to Grow and Sell Carbon Credits in US Agriculture." *Ag Decision Maker*. File A1-76. Iowa State University Extension and Outreach. <https://www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf>.
- Reed, Harvey, III. 2021. "Recommendations Report: Minority Farmers, Ranchers and Veterans Advisory Committee, June 2020–February 2021." US Department of Agriculture. <https://www.usda.gov/sites/default/files/documents/ACMF%20Recommendation%206-2020%20-%202021.pdf>.

- Russell, Kelli, Leslie Hossfeld, and Gina Rico Mendez. 2021. “‘Not a New Pattern’: Black Farmers’ Perspectives on Barriers to Participating in Federal Farm Programs.” *Journal of Agriculture, Food Systems, and Community Development* 10 (4): 195–209. <https://doi.org/10.5304/jafscd.2021.104.007>.
- Taylor, Dorceta E., Lina M. Farias, Lia M. Kahan, Julia Talamo, Alison Surdoval, Ember D. McCoy, and Socorro M. Daupan. 2022. “Understanding the Challenges Faced by Michigan’s Family Farmers: Race/Ethnicity and the Impacts of a Pandemic.” *Agriculture and Human Values* 39 (3): 1077–96. <https://doi.org/10.1007/s10460-022-10305-6>.
- USDA (US Department of Agriculture). 2023a. *AGARDA: Agriculture Advanced Research and Development Authority; A Vision for Disruptive Science to Confront Audacious Challenges*. <https://www.usda.gov/sites/default/files/documents/agarda-strategic-framework.pdf>.
- . 2023b. “Partnerships for Climate-Smart Commodities Project Selection FAQs.” January 30, 2023. <https://www.usda.gov/climate-solutions/climate-smart-commodities/faqs>.
- . 2023c. “A General Assessment of the Role of Agriculture and Forestry in U.S. Carbon Markets: Written in Support of the Greenhouse Gas Technical Assistance Provide and Third-Party Verifier Program.” October 23, 2023. <https://www.usda.gov/sites/default/files/documents/USDA-General-Assessment-of-the-Role-of-Agriculture-and-Forestry-in-US-Carbon-Markets.pdf>.
- Van Sant, Levi, Laura German, and Daniel J. Read. 2023. “A ‘Cultural Transformation’ at the US Department of Agriculture? Examining Racial (In)Equality through Federal Farmland Protection Programs in Georgia.” *Journal of Peasant Studies* 50 (4): 1636–60. <https://doi.org/10.1080/03066150.2022.2043284>.