

November 22, 2019

The Honorable Kathy Castor
Chair, House Select Committee on the Climate Crisis
H2-359, Ford Building
(202) 225-1106

Dear Representative Castor:

We appreciate this opportunity to respond to the House Select Committee on the Climate Crisis' Request for Information.¹ Specifically, we respond to questions six—regarding policies to reduce carbon pollution and other greenhouse gas emissions and maximize carbon storage in agriculture—and seven—policies to help farmers, ranchers, and natural resource managers adapt to the impacts of climate change.

The Farm Bill Law Enterprise brings together faculty, staff, and students from programs at seven law schools with expertise in agriculture, nutrition, and the environment. Our mission is to work toward a farm bill that reflects a thoughtful consideration of the long-term needs of our society, including economic opportunity and stability, public health and nutrition, public resources stewardship, and fair access and equal protection. We accomplish this mission through joint research, analysis, and advocacy and by drawing on the experience of our members, collaboratively building deeper knowledge, and equipping the next generation of legal practitioners to engage with the farm bill.

Many of the recommendations included herein are adapted from our published reports, available on the FBLE website www.farmbilllaw.org.² Though the reports predate the most recent farm bill, they still offer additional background, data, and support for many of the recommendations included below. We hope the Select Committee finds these resources helpful as it develops its recommendations to Congress.

A. Introduction

As the Select Committee has learned over the past few months of its investigations, agriculture in the United States has both exacerbated the climate crisis and served as a canary in the coal mine with respect to its most acute impacts. The EPA estimates that agriculture was responsible for up

¹ These Recommendations were prepared with the assistance of Brianna Johnson-King, Harvard Law School J.D. 2021, and Gabriella L. Farago, Vermont Law School J.D. 2020. Most of the Recommendations come from FBLE reports that were written by various FBLE member-institution faculty and students. *See Our Reports*, FARM BILL LAW ENTERPRISE, <http://www.farmbilllaw.org/reports/>. Recommendation 2, which specifically addresses agroforestry, was written by, and based on the research of, Andrew Currie, Cambridge Judge Business School M.St. 2020, Yale School of Forestry and Environmental Studies M.F. 2021; Lingxi Chenyang, Yale Law School J.D. 2020, University of Michigan Ph.D. 2022; Hannah M. Darrin, Yale School of Forestry and Environmental Studies M.E.M. 2020; and Nathan Rosenberg, Visiting Scholar, Harvard Law School Food Law and Policy Clinic.

² *See, e.g.*, FARM BILL LAW ENTERPRISE, PRODUCTIVITY AND RISK MANAGEMENT (2018), http://www.farmbilllaw.org/wp-content/uploads/2018/03/FBLE_Productivity-and-Risk-Management_Final.pdf.

to 9 percent of the United States' greenhouse gas emissions in 2017, or 582.2 million metric tons of carbon dioxide-equivalent.³ These numbers reflect methane, nitrous oxide, and carbon dioxide emissions from soil management practices, enteric fermentation (animal digestion), manure management, and rice cultivation, among other practices.⁴ Agricultural soil management practices (e.g. application of fertilizers) made up 73.9 percent of total U.S. nitrous oxide emissions and were “the largest anthropogenic source of [nitrous oxide] emissions” in 2017.⁵ In that same year, U.S. farms faced sixteen devastating weather and climate-related disasters, to which Congress and USDA responded with \$2.36 billion in disaster relief.⁶ Farmers impacted by natural disasters in 2018 and 2019 have been granted similar relief through the Wildfire and Hurricane Indemnity Program Plus.⁷ As the frequency and intensity of disasters continue to rise, adapting to and mitigating climate change in the agricultural sector becomes even more imperative.

The United States' agricultural policies, reflected in the farm bill, have unrealized potential in combatting climate change. The federal government has long intervened in the agricultural sector and had a large impact on farming livelihoods. First enacted during the Great Depression and since reauthorized every five to seven years, the farm bill has grown to include twelve sections with primary allocations of funding supporting commodity crops (via direct payments and subsidized crop insurance), conservation programs, and nutrition. The most recent farm bill, passed in 2018, is projected to cost \$428 billion in the five years following enactment (2019-2023), of which \$102 billion is designated for spending on agricultural programs.⁸ Ad hoc disaster relief and trade aid packages approved outside of the farm bill increase this spending further.⁹ The United States thus invests billions of dollars each year in the long term health and viability of the agricultural sector and the environment.

With the right programs, it is possible to use the farm bill to align the goals of reducing emissions and sequestering carbon with improvements to farms' long-term productivity and profitability. With these recommendations, we hope to highlight the significant opportunities to reform agriculture through the farm bill and its programs. First, we encourage Congress to set the course for widespread adoption of perennial agricultural systems, and agroforestry in particular, which present some of the most promising contributions agriculture can make to mitigating climate change. We next turn to specific elements of the farm bill and recommend ways that conservation compliance, voluntary conservation programs, and crop insurance, respectively, can be used to develop and incentivize adoption of climate-friendly farming practices. Lastly, we

³ U.S. ENVTL. PROT. AGENCY, U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2017 2-25 (2019), <https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-main-text.pdf>.

⁴ *Id.* at 5-1.

⁵ *Id.* at 2-18.

⁶ *USDA Implements up to 2.36 Billion to Help Agricultural Producers Recover after 2017 Wildfires*, FARM SERV. AGENCY, https://www.fsa.usda.gov/state-offices/California/news-releases/2018/stnr_ca_20180406_rel001.

⁷ *USDA Resources Available for Farmers Hurt by 2018, 2019 Disasters*, U.S. DEP'T OF AGRIC. (Sep. 9, 2019), <https://www.usda.gov/media/press-releases/2019/09/09/usda-resources-available-farmers-hurt-2018-2019-disasters>.

⁸ CONG. RESEARCH SERV., BUDGET ISSUES THAT SHAPED THE 2018 FARM BILL 19 (2019), <https://fas.org/sgp/crs/misc/R45425.pdf>.

⁹ In 2019, President Trump authorized USDA to spend up to \$14.5 billion in direct payments to farmers through the Market Facilitation Program. FARM SERV. AGENCY, MARKET FACILITATION PROGRAM FACT SHEET (2019), https://www.farmers.gov/sites/default/files/documents/Market_Facilitation_Program-Fact_Sheet-Sept.pdf.

outline some specific opportunities for additional research that can further increase agriculture's role in climate change mitigation and adaptation.

The recommendations that follow should not be regarded as a single, comprehensive policy proposal. While we cross-reference between sections where appropriate, each recommendation stands on its own as a worthwhile endeavor. Some recommendations offer greater potential for impact than others. The inclusion of some moderate proposals alongside transformative ones reflects our recognition that meaningful reform can be, and often is, achieved in degrees. However, as climate change has already reached crisis level, we hope Congress will launch a proportionate response that leverages a broad range of strategies to stem the tide.

B. Congress Should Shift the United States' Agricultural Economy from Reliance on Annual Crops to Perennial Agricultural Systems, with a Focus on Agroforestry.

Background on Annual versus Perennial Crops

Congress should make a long-term investment in the development and adoption of perennial agriculture. The main commodity crops grown by farmers in the United States today are annuals. Annual crops must be replanted every year, which requires regular soil disturbance and means that farmers must continually purchase new seeds. In addition, farmers must suppress or kill weeds that compete with crop seedlings. Whether carried out by mechanical tillage or chemical herbicides, such suppression can result in a variety of adverse environmental effects. Transitioning to perennial agricultural systems offers an opportunity for U.S. agriculture to transform from a net emitter to a carbon sink.

Recommendation 1: Invest in Opportunities for Perennial Agriculture Systems.

Perennial crops offer significant environmental and climate benefits compared to the annual plants that dominate agriculture today.¹⁰ These crops are alive year-round and are harvested multiple times before dying. They generally have deeper roots and longer growing seasons and therefore capture and retain more rainfall, are more productive, reduce erosion, store more soil carbon, demand less fertilizer and herbicide, and require less tillage.¹¹ For example, one study found significant differences in soil moisture, nitrate leaching, and soil labile carbon (carbon that easily volatilizes into the atmosphere) in fields planted with the perennial grain Kernza compared to fields planted with winter wheat.¹² Perennial crops not only have negative net values for global warming potential, but also demonstrate much higher resilience to variable climate conditions than annual crops.¹³

¹⁰ Some common crops, such as "fruit trees, alfalfa, grapes, asparagus, and olive trees," are perennials. *Perennial Crops: New Hardware for Agriculture*, THE LAND INST., <https://landinstitute.org/our-work/perennial-crops/> (last visited Nov. 15, 2019). Grains, legumes, and oilseeds, however, are virtually all annuals.

¹¹ J.D. Glover, et al., *Increased Food and Ecosystem Security via Perennial Grains*, 328 *SCIENCE* 1638, 1638 (2010); see also Thomas S. Cox, et al., *Prospects for Developing Perennial Grain Crops*, 56 *BIOSCIENCE* 649, 649 (2006).

¹² Steve W. Culman, et al., *Soil and Water Quality Rapidly Responds to the Perennial Grain Kernza Wheatgrass*, 105 *AGRONOMY J.* 735 (2013).

¹³ Cox, et al., *supra* note 11, at 650.

Perennial grains and oilseeds face an uphill battle for development and commercialization, thus requiring additional support to achieve their promise. Specifically, perennial crops have lower yields per acre and grain sizes than annual crops. Increasing seed size is key to increasing the overall yield of the plant. The challenges of breeding perennial crops that can compete with their higher-yielding annual cousins can be overcome. The yields and grain sizes of perennial crops are similar to those of some wild progenitors of annual crops,¹⁴ and it is estimated that with sufficient support, commercially viable perennial grain crops could be available within the next 10 to 20 years.¹⁵ Congress should seize the opportunity to accelerate the development of new perennial crops by providing additional research funding—either through the farm bill’s Title VII: Research, Extension, and Related Matters, or through separate legislation and funding—to support plant breeders and geneticists, as well as agricultural scientists to develop agricultural systems that rely on perennial crops.

Recommendation 2: Support Widespread Adoption of Agroforestry, Which Offers Unparalleled Potential for Carbon Sequestration.

While policymakers will likely be familiar with “healthy soils” approaches to carbon-neutral agriculture—including conventional no-till farming and the use of cover crops—these practices offer only a fraction of the potential climate benefits of agroforestry.¹⁶ Experts estimate that agroforestry systems, implemented nationwide, could sequester 530 million metric tons of carbon dioxide-equivalent a year.¹⁷ This would offset 33 percent of domestic fossil fuel emissions.¹⁸ The agroforestry practices of “silvopasture,” the incorporation of trees in pastures,¹⁹ and “alley cropping,”²⁰ the side-by-side cultivation of rows of trees with rows of non-woody plants like cereal crops or vegetables, show particular promise.²¹ Farmers could use these two practices alone to sequester more than 516 million metric tons of carbon dioxide-equivalent per year.²²

Unlike annual crops that need to be replaced each year, trees grow elaborate, durable root and branch systems that allow them to not only sequester more carbon, but also prevent surface-water spillage and soil erosion, decrease nutrient and chemical runoff, curtail the need for fertilizer and pesticides, improve soil health, and contribute to more diverse and supportive

¹⁴ *Id.* at 650–51.

¹⁵ Glover, et al., *supra* note 11, at 1639.

¹⁶ See, e.g., ERIC TOENSMEIER, *THE CARBON FARMING SOLUTION: A GLOBAL TOOLKIT OF PERENNIAL CROPS AND REGENERATIVE AGRICULTURE PRACTICES FOR CLIMATE CHANGE MITIGATION AND FOOD SECURITY* (2016).

¹⁷ Ranjith P. Udawatta & Shibu Jose, *Agroforestry Strategies to Sequester Carbon in Temperate North America*, 86 *AGROFORESTRY SYSTEMS* 225, 239 (2012).

¹⁸ *Id.* at 239.

¹⁹ Philip K. Thornton & Mario Herrero, *Potential for reduced methane and carbon dioxide emissions from livestock and pasture management in the tropics*, 107 *PNAS* 19667 (2010), <https://doi.org/10.1073/pnas.0912890107>; S.H. SHARROW, ET AL., *NORTH AMERICAN AGROFORESTRY: AN INTEGRATED SCIENCE AND PRACTICE 2ND EDITION* 105–31 (H.E. Garrett 2nd ed. 2009), <https://doi.org/10.2134/2009.northamericanagroforestry.2ed.c6>.

²⁰ H.E. GARRETT, ET AL., *NORTH AMERICAN AGROFORESTRY: AN INTEGRATED SCIENCE AND PRACTICE 2ND EDITION* 133–62 (H.E. Garrett 2nd ed. 2009), <https://doi.org/10.2134/2009.northamericanagroforestry.2ed.c7>.

²¹ P.K.R. Nair, *Climate Change Mitigation: A Low-Hanging Fruit of Agroforestry*, in *AGROFORESTRY—THE FUTURE OF GLOBAL LAND USE* 31–67 (P.K. Ramachandran Nair & D. Garrity eds., 2012), https://doi.org/10.1007/978-94-007-4676-3_7.

²² Udawatta & Jose, *supra* note 17.

habitats for insects and wildlife.²³ These properties make agroforestry systems more resilient to extreme climate conditions. A 2015 study compared the yields of soybeans grown in an alley cropping system to those grown alone and found that, after season-long droughts, the alley-cropped soybeans showed no decline in yields while the monoculture soybean crop yields plummeted by 40 percent.²⁴

While silvopasture and alley cropping²⁵ are shovel-ready and economically viable in many parts of the country, these projects are stymied by an antiquated federal farm system. A recent study found that alley cropping is more profitable than maize-soybean rotations for almost a quarter of the cropland in four Midwestern states.²⁶ But outdated federal farm crop insurance, credit, and subsidy programs—many of which were designed decades ago—continue to support annual commodity crops rather than perennials, which are better for the climate but require longer-term planning and support.

Congress should support a broad transition to agroforestry systems through several available avenues. Congress should begin by funding regional agroforestry centers throughout the country to conduct research, train extension agents, and provide assistance to agroforestry producers. It should also create a funding pool within Environmental Quality Incentives Program (EQIP, discussed further in Part D) to support agroforestry producers and producers transitioning to agroforestry; the EQIP Organic Initiative provides a useful model.²⁷ New, targeted programs should also include a publicly-administered crop insurance program for agroforestry and a microloan program for agroforestry producers for loans below \$100,000. Congress should adopt a multipronged approach that incorporate several of these suggestions to have the greatest impact.

C. Congress Should Reform the Conservation Compliance Requirement to Fight Climate Change.

Background on Conservation Compliance in the Farm Bill

The United States' farm sector includes field crops, livestock, poultry, fruits, tree nuts, and vegetables.²⁸ The commodity segment—a group of field crops that are traded—produces the vast

²³ E.g., Peter Lehner & Nathan Rosenberg, *Chapter 30: Agriculture*, in, LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES 783 (Michael B. Gerrard & John Dernbach, eds., 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3361393; J.J. MILLSPAUGH, ET AL., NORTH AMERICAN AGROFORESTRY: AN INTEGRATED SCIENCE AND PRACTICE 2ND EDITION 105–31, 257-86 (H.E. Garrett 2nd ed. 2009), <https://doi.org/10.2134/2009.northamericanagroforestry.2ed.c10>.

²⁴ Josuha Nasielki et al., *Agroforestry Promotes Soybean Yield Stability and N₂-Fixation Under Water Stress*, 35 AGRONOMY & SUSTAINABLE DEV. 1541, 1547 (2015).

²⁵ Kevin J. Wolz et al., *Frontiers in alley cropping: Transformative solutions for temperate agriculture*, 24 GLOBAL CHANGE BIOLOGY 1, 1-12 (2017), <https://doi.org/10.1111/gcb.13986>.

²⁶ Kevin J. Wolz & Evan H. DeLucia, *Black Walnut Alley Cropping Is Economically Competitive with Row Crops in the Midwest USA*, 29 ECOLOGICAL APPLICATIONS 1, 7 (2019).

²⁷ See *EQIP Organic Initiative*, U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/eqip/?cid=nrcs143_008224 (last visited Nov. 18, 2019).

²⁸ *Agricultural Production and Prices*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV., <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/agricultural-production-and-prices/> (last visited Nov. 3, 2019).

majority of our nation's agricultural products.²⁹ Soybeans and corn are the two largest commercial crops in the United States, comprising more than 178 million acres combined in 2018.³⁰ The farm bill supports this large production of commodity crops by providing assistance to farmers when revenue levels fall below certain market thresholds. The main assistance programs are Price Loss Coverage (PLC), Agriculture Risk Coverage (ARC) (both included in Title I of the 2018 Farm Bill), and Crop Insurance (Title XI of the 2018 Farm Bill). Crop insurance is also available for about 80 types of specialty crops (fruits, vegetables, nuts, and nursery crops).³¹ Congress allocates large amounts of funding to support these programs every year. For example, the U.S. government is projected to spend \$64.8 billion on these three programs in 2019-2023.³²

The farm bill requires producers to adhere to certain conservation measures in order to receive payments through these programs.³³ This “conservation compliance” requirement was first created in the 1985 Food Security Act (the 1985 Farm Bill).³⁴ In 2014, Congress extended the requirement as a condition for federal crop insurance premium subsidies.³⁵ Set forth in the Conservation Title, conservation compliance requires that producers do not “[p]lant or produce an agricultural commodity on highly erodible land without following an NRCS [(Natural Resources Conservation Service)] approved conservation plan or system,” and do not convert or plant on wetlands.³⁶ Each year, a producer must submit a two-page form, which certifies they fulfilled the conservation compliance requirements. When a producer does not comply, he or she “may be required to” return the received payments for that year and may not be eligible for future program participation.³⁷ However, if USDA finds the producer “acted in good faith and without the intent to violate,” the producer is not required to refund payments and can continue participating in programs.³⁸

The minimal requirements set by this standard do not mitigate climate change nor equip farms to adapt to its impacts. For example, the conservation compliance requirement sets soil erosion rates at a level that permits a net loss of soils, which undermines the goal of stopping soil erosion and depleting a farmer's cropland.³⁹ Soil erosion reduces the land's fertility, increases pollution

²⁹ *Id.*

³⁰ CONG. RESEARCH SERV., R45697, U.S. FARM INCOME OUTLOOK FOR 2019 6 (2019), <https://fas.org/sgp/crs/misc/R45117.pdf>.

³¹ CONG. RESEARCH SERV., R45459, FEDERAL CROP INSURANCE: SPECIALTY CROPS (2019), <https://fas.org/sgp/crs/misc/R45459.pdf>.

³² CONG. RESEARCH SERV., BUDGET ISSUES THAT SHAPED THE 2018 FARM BILL, *supra* note 8, at 21.

³³ *2018 Farm Bill- Conservation Compliance Changes*, U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/farmbill/?cid=stelprdb1257899> (last visited Nov. 3, 2019).

³⁴ *Conservation Compliance in the Crop Insurance Era*, U.S. DEP'T OF AGRIC., ECON. RESEARCH SERV. (JULY 27, 2017), <https://www.ers.usda.gov/amber-waves/2017/july/conservation-compliance-in-the-crop-insurance-era/>.

³⁵ MEGAN STUBBS, CONG. RESEARCH SERV., R42459, CONSERVATION COMPLIANCE AND U.S. FARM POLICY (2016), <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R42459.pdf>.

³⁶ *2018 Farm Bill- Conservation Compliance Changes*, *supra* note 33.

³⁷ U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., CONSERVATION FACT SHEET 2–3 (2014), https://www.fsa.usda.gov/Internet/FSA_File/wetland_compliance_july2014.pdf [hereinafter CONSERVATION FACT SHEET].

³⁸ *Id.*

³⁹ *Erosion*, U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/crops/erosion> (last visited Nov. 6, 2019).

in nearby waterways, and further exacerbates climate change.⁴⁰ Furthermore, conservation compliance requirements do not reach all farms, just those with land considered to be highly erodible or a wetland.⁴¹ Producers who do not own or operate such lands have no affirmative obligation to adopt conservation measures as a condition of receiving federal subsidies.

The large number of acres enrolled in commodity support and crop insurance programs creates great potential for quick and widespread adoption of climate-focused practices on farms. In 2018, there were 94.6 million acres enrolled in PLC and ARC and 313 million acres enrolled in federal crop insurance.⁴² In order to engage more farms as partners in the fight against climate change, Congress should expand conservation compliance to require adoption of climate-friendly practices on all farms participating in federal programs, or otherwise receiving aid (i.e. trade aid).⁴³ To ensure successful implementation, Congress should also improve the technical assistance provided to farmers, compliance monitoring, and compliance enforcement mechanisms.

Recommendation 3: Expand Conservation Compliance to Require Climate-Friendly Farming Practices on All Farms Receiving Government Support.

All farms receiving government support to operate—whether through Title I programs, Title XI crop insurance, disaster relief, or trade aid packages—should be required to implement climate-friendly farming practices to receive such aid. Congress can achieve this by requiring a significantly enhanced version of conservation compliance⁴⁴ that requires action on *all* farms participating in these programs, not only those with highly erodible land or a wetland. In order to receive support, farmers could be required to implement a number of practices from a list of verified climate mitigation practices tailored to that producer’s crops and region. Practices could include cover cropping, perennial crops, buffer zones, agroforestry, conservation tillage, and/or drip irrigation. Adding cover crops, for example, such as legumes or grasses, into crop rotation during fallow periods increases soil carbon, reduces soil erosion, and increases crop yield.⁴⁵ Beyond mitigation, many of these practices make farms more resilient and aid farmers’ adaptation to climate change.⁴⁶ NRCS would be charged with creating these tailored lists based on its own or peer-reviewed research. NRCS has historically partnered with farmers, governments, and federal agencies to work toward “healthy and productive working

⁴⁰ *Id.*; see generally U.N ENVTL. PROGRAMME, UNEP Yearbook 2012: Emerging issues in our global environment (2012).

⁴¹ CONSERVATION FACT SHEET, *supra* note 37 at 1.

⁴² CONG. BUDGET OFFICE, USDA’S MANDATORY FARM PROGRAMS—CBO’S APRIL 2018 BASELINE 10 (2018), <https://www.cbo.gov/system/files/2018-06/51317-2018-04-usda.pdf>.

⁴³ See, MARKET FACILITATION PROGRAM FACT SHEET, *supra* note 9.

⁴⁴ If Congress adopts this recommendation, it should consider renaming the compliance system to better reflect the breadth of practices involved. Here, we continue to refer to it as conservation compliance to avoid confusion.

⁴⁵ NRDC, COVERING CROPS: HOW FEDERAL CROP INSURANCE PROGRAM REFORMS CAN REDUCE COSTS, EMPOWER FARMERS, AND PROTECT NATURAL RESOURCES 3 (2017), <https://www.nrdc.org/sites/default/files/federal-crop-insurance-program-reforms-ip.pdf> [hereinafter NRDC COVERING CROPS].

⁴⁶ ALEXANDRA BOT & JOSÉ BENITES, FOOD & AGRIC. ORG. OF THE UNITED NATIONS, THE IMPORTANCE OF SOIL ORGANIC MATTER: KEY TO DROUGHT-RESISTANT SOIL AND SUSTAINED FOOD AND PRODUCTION 19 (2005), <http://www.fao.org/3/a-a0100e.pdf>.

landscapes.”⁴⁷ As NRCS is USDA’s “principal agency for providing conservation technical assistance,”⁴⁸ it is thus the appropriate steward for this expanded program.

There are a number of ways the list of practices could be used to precipitate change. For instance, Congress could require that farmers choose five practices, from a list of ten, to incorporate on their farm. This model would provide flexibility for farmers to adapt to the new requirements and make choices that resonate with their existing infrastructure, desired investments, and future plans. As different practices will impact emissions and carbon storage differently, Congress could grant NRCS discretion to accord some practices greater weight than others to account for distinct benefits—i.e., particularly beneficial practices could count for two of the five. Where farmers seek to carry out a more comprehensive overhaul, like transitioning to an agroforestry system, NRCS might create an alternative track that breaks the conversion down into incremental steps through which the farmer must proceed in order to remain in compliance.

Because receipt of government aid would be conditioned on implementation of climate-friendly practices, expanding conservation compliance offers the most cost-effective and wide-reaching mechanism for shifting production practices to mitigate, and adapt to, climate change.

Recommendation 4: Fund Improvements to Existing Conservation Technical Assistance and Increase Capacity to Provide Technical Assistance for New Climate-Friendly Practice Requirements.

Currently, NRCS provides conservation technical assistance to “private landowners, conservation districts, tribes, and other organizations.”⁴⁹ Local NRCS offices or local conservation districts provide this assistance, which—though varied—often includes one-on-one assistance, educational materials, and connections to other trained professionals.⁵⁰ Lack of technical assistance can be a barrier to enrollment in federal conservation programs and it is thus essential to increase assistance so that this conservation requirement can be expanded in an equitable and effective way.⁵¹

Congress should enable NRCS to recommit to its mission as technical assistance provider in service to improving natural resource outcomes on working lands. Even when producers are eager to comply with conservation compliance standards, they are often left without guidance on how to do so.⁵² This is only one consequence of a larger deficit within NRCS, which must be

⁴⁷ *History of NRCS*, U.S. DEP’T OF AGRIC., NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/about/history/>.

⁴⁸ *Technical Assistance*, U.S. DEP’T OF AGRIC., NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/> (last visited Nov. 6, 2019).

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ MEGAN STUBBS, CONG. RES. SERV., RL34069, TECHNICAL ASSISTANCE FOR AGRICULTURE CONSERVATION (2010), <http://www.nationalaglawcenter.org/wp-content/uploads/assets/crs/RL34069.pdf> [hereinafter TECHNICAL ASSISTANCE FOR AGRICULTURE CONSERVATION].

⁵² U.S. DEP’T OF AGRIC., OFFICE OF INSPECTOR GENERAL, AUDIT REP. 50601-0005-31, USDA MONITORING OF HIGHLY ERODIBLE LAND AND WETLAND CONSERVATION VIOLATIONS (2016), <https://www.usda.gov/oig/webdocs/50601-0005-31.pdf> [hereinafter USDA MONITORING].

given the financial resources to rebuild its technical assistance capacity.⁵³ NRCS's ability to provide producers with the necessary technical assistance capacity has seriously eroded as the number of financial assistance programs it administers has ballooned and resources have shifted to meet program administration needs.⁵⁴ In fiscal year 2018 alone, NRCS administered nearly 43,000 Environmental Quality Incentive Program contracts⁵⁵ and over 10,500 active Conservation Stewardship Program contracts⁵⁶ (also discussed in Part D, below). As administrative duties have risen, the government has not made a concurrent investment in NRCS technical staff, such as scientists, engineers, and planners. NRCS has admitted that it has struggled to administer its programs in a manner that allows its agents to adequately respond to producers' needs for assistance.⁵⁷ Congress should fund a rejuvenated technical assistance capacity within NRCS so that the agency is capable of providing the technical support required for universal compliance with conservation standards.

As producers incorporate new climate-friendly practices on their land, it will be even more important to support their understanding, proper implementation, and maintenance of such practices to ensure high yields and maximum climate change mitigation. NRCS must issue guides outlining how to implement the practices, while establishing clear compliance standards for each.⁵⁸ Agents across the various states and counties must know how to implement and enforce standards for these practices so farmers can anticipate consistent enforcement and learn best practices.⁵⁹

Recommendation 5: Improve Monitoring and Enforcement of Compliance Requirements and Raise Penalties.

NRCS must implement effective monitoring to ensure that conservation compliance achieves the desired environmental outcomes, whether the expansion recommended above (see Rec. 3) is enacted or not. NRCS has grappled with ineffective monitoring for a number of years. A 2003 audit of NRCS's conservation compliance implementation found that almost half of the NRCS field offices were not implementing the provisions as required due to lack of staff, lack of training, de-emphasis by management, and/or discomfort with enforcement, all compounded by weak NRCS oversight and guidance.⁶⁰ USDA's Office of Inspector General (OIG) reached similar findings in 2016, noting "inadequate guidance [from NRCS] for consistently applying standards in conducting compliance and quality control reviews" of highly erodible lands and

⁵³ SOIL & WATER CONSERVATION SOCIETY & ENVTL. DEFENSE, AN ASSESSMENT OF TECHNICAL ASSISTANCE FOR FARM BILL CONSERVATION PROGRAMS (2007).

⁵⁴ Laurie Ristino & Gabriela Steier, *Losing Ground: A Clarion Call for Farm Bill Reform to Ensure a Food Secure Future*, 42 COLUM. J. ENVTL. L. 1, 109–10 (2016)

⁵⁵ NRCS Conservation Programs: Environmental Quality Incentives Program (EQIP), U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/fb08_cp_eqip.html#contracts (last visited Nov. 19, 2019) (Table: EQIP Contract Data by State and Fiscal Year).

⁵⁶ *Id.*

⁵⁷ See generally, TECHNICAL ASSISTANCE FOR AGRICULTURE CONSERVATION, *supra* note 51.

⁵⁸ USDA MONITORING, *supra* note 52.

⁵⁹ *Id.* at 5.

⁶⁰ U.S. GEN. ACCOUNTING OFFICE, GAO-03-418, AGRICULTURE CONSERVATION: NEEDS TO BETTER ENSURE PROTECTION OF HIGHLY ERODIBLE CROPLAND AND WETLANDS 23–24 (2003), <https://www.gao.gov/assets/240/237878.pdf>.

“inconsistent approaches” in reviewing wetland conservation compliance.⁶¹ As a result, NRCS state offices had issued inconsistent guidance on interpreting compliance requirements such that a violation in one state might not count as noncompliance in a neighboring state.⁶² The 2016 report also found that employees conducting compliance reviews of farmland did not always review the entire tract of land, even when violations had been found in the areas reviewed.⁶³ These deficiencies in NRCS monitoring must be corrected for conservation compliance requirements to be effective.

On top of inadequate monitoring, the current conservation compliance enforcement scheme creates little deterrence to noncompliance. Conservation compliance reporting is limited to a self-certification process in which farmers submit a two-page form and merely check boxes to indicate they are compliant.⁶⁴ The minimal effort required to mark oneself as compliant is not a great barrier. Then, unless already on NRCS’s radar for enforcement (due to, e.g., a complaint), a tract will only receive a compliance review if selected as part of a random sample, which NRCS has also struggled to do properly.⁶⁵ If NRCS determines that a farmer did not comply, yet certified compliance, the farmer is just considered ineligible for payments in that year.⁶⁶ This system effectively sets the penalty level at a return of any payments received, which may not be high enough to disincentivize false certifications.

Furthermore, even farmers whose noncompliance is detected may not have to actually return the benefits. First, farmers are given a one-year grace period to become compliant.⁶⁷ Second, unintentional conservation compliance violations do not have a penalty.⁶⁸ Between 1993 and 2005, 83 percent of NRCS’s noncompliance determinations were waived and funding restored due to a subsequent “good-faith” determination.⁶⁹ This leniency coupled with low penalties instills little confidence in the existing system’s efficacy.

To remedy this broken enforcement scheme, Congress should allocate funds for effective conservation compliance monitoring and require issuance of clear guidance. Congress should add a monetary penalty for noncompliance (on top of ineligibility for the year) to more strongly incentivize farmers to implement the conservation compliance measures fully.

⁶¹ See USDA MONITORING, *supra* note 52.

⁶² *Id.* at 6.

⁶³ *Id.* at 10–11.

⁶⁴ U.S. DEP’T OF AGRIC., CONSERVATION FACT SHEET: CONSERVATION COMPLIANCE AND CROP INSURANCE 1 (2015), https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdfiles/FactSheets/2015/conserv_compli_insure_apr2015.pdf (requiring “provisions, producers and affiliated persons [to] fill-out and sign form AD-1026 certifying they will not” violate the compliance requirements).

⁶⁵ See USDA MONITORING, *supra* note 52.

⁶⁶ U.S. DEP’T OF AGRIC., NAT. RES. CONSERVATION SERV., CONSERVATION FACT SHEET 2–3 (2014), https://www.fsa.usda.gov/Internet/FSA_File/wetland_compliance_july2014.pdf.

⁶⁷ *Id.* at 2–3.

⁶⁸ *Id.* at 2–3.

⁶⁹ USDA MONITORING, *supra* note 52.

D. Congress Should Expand the Farm Bill's Conservation Programs to Help Farmers Mitigate and Adapt to Climate Change.

Background on Conservation Programs in the Farm Bill

Farmers and ranchers must balance two important, and often countervailing, aims: first, to supply food, feed and fiber to the nation; and second, to steward their land and the nation's natural resources. Because many environmental laws and regulations exempt agricultural activities from rules that apply to other industries,⁷⁰ farm bill policy is critical in helping farmers manage and prioritize these two goals. In this vein, the Conservation Title serves as the first line of environmental protection in the U.S. agriculture sector.

In addition to the conservation compliance provisions that farmers *must* comply with to receive funding, the farm bill's Conservation Title authorizes a suite of voluntary conservation programs.⁷¹ Land retirement programs, including the Conservation Reserve Program (CRP),⁷² offer financial incentives to take land out of production for periods of 10-15 years while restoring environmentally sensitive land.⁷³ Providing incentives to take land out of production helps soil sequestration, which increases carbon storage and decreases overall greenhouse gas emissions.

Working lands programs, in contrast, keep land in production and pay producers to adopt resource-conserving practices.⁷⁴ The two most significant working lands programs are the Conservation Stewardship Program (CSP)⁷⁵ and the Environmental Quality Incentives Program (EQIP).⁷⁶ Both CSP and EQIP provide financial and technical assistance in exchange for the implementation of a variety of conservation practices.⁷⁷ CSP focuses on the improvement of existing conservation activities and systems across the operation, with payments conditioned on performance throughout a five-year contract term.⁷⁸ EQIP incentivizes the adoption of conservation practices and capital investments, carried out in accordance with a farmer-developed EQIP plan, through cost-share payments.⁷⁹

⁷⁰ See generally, J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 *ECOLOGY L.Q.* 263, 293–316 (2000).

⁷¹ There are also agricultural conservation programs outside the farm bill. See MEGAN STUBBS, CONG. RESEARCH SERV., R43504, *CONSERVATION PROGRAMS IN THE 2014 FARM BILL* (P.L. 113-79) 5 (2014), <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R43504.pdf> (identifying technical assistance programs, emergency programs, and watershed programs as non-farm bill conservation programs) [hereinafter *CONSERVATION PROGRAMS IN THE 2014 FARM BILL*].

⁷² 16 U.S.C. § 3831 (2019).

⁷³ *CONSERVATION PROGRAMS IN THE 2014 FARM BILL*, *supra* note 71.

⁷⁴ *Id.* at 3 (2014).

⁷⁵ 16 U.S.C. § 3838aa-22 (2019).

⁷⁶ 16 U.S.C. § 3839aa-2 (2019).

⁷⁷ *CONSERVATION PROGRAMS IN THE 2014 FARM BILL*, *supra* note 71.

⁷⁸ *Id.* at 8.

⁷⁹ *Id.*; *Environmental Quality Incentives Program*, U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/> (last visited Mar. 18, 2018).

While the Conservation Title funds a number of conservation activities, we focus on these three core programs—CRP, CSP, and EQIP—which offer the greatest opportunity to make farms more responsive to the climate crisis

Recommendation 6: Transition CRP Acres to Permanent Easements, Increase Acreage Caps, and Expand the Number of Acres Entering CRP.

Some land should avoid production. The role of retirement programs, like CRP, is to enable producers to keep the most environmentally sensitive land out of production for a period of years. Unfortunately, when CRP contracts expire and land re-enters production, conservation benefits such as improved water quality and carbon sequestration are lost.⁸⁰ Between 2006 and 2014, sixteen million acres exited the program and most of those acres re-entered production.⁸¹

Congress should reform CRP to encourage longer-term participation. Currently, most conservation benefits are lost at the end of the contract's 10-15 year duration because farmers are free to put their land back into production or farmers may not qualify for new CRP practices.⁸² If crop prices rise, farmers have less economic incentive to re-enroll their land in the program at the expiration of their contract.⁸³ Congress should transition the program away from 10-15 year CRP contracts toward permanent conservation easements, especially on the most environmentally sensitive and marginal acres. Permanent conservation easements would significantly reduce greenhouse gas emissions and maximize carbon storage through increased soil sequestration. Congress could implement this recommendation by creating a separate acreage cap for permanent conservation easements (i.e. not in direct competition for general CRP acres) and providing mandatory funding for those easements, either within or separate from CRP.

Congress should also expand the reach of CRP more broadly. The 2018 Farm Bill increased the acreage cap from 24 million to 27 million, but this number is still far below 2009 level of 40 million acres.⁸⁴ Additionally, the 2018 expansion in enrollment by number of acres was offset by a reduction in payment rates per acre.⁸⁵ The cap on acres combined with reduced payments disincentivizes farmers from applying for a CRP contract and encourages keeping land in

⁸⁰ Peter Lehner & Nathan A. Rosenberg, *Legal Pathways to Carbon-Neutral Agriculture*, 47 ENVTL. L. REP. NEWS & ANALYSIS 10845, 10864 (2017), citing Soren Rundquist & Craig Cox, ENVTL. WORKING GRP., FOOLING OURSELVES: EXECUTIVE SUMMARY (2016) [hereinafter *Legal Pathways to Carbon-Neutral Agriculture*]; Tyler Lark et al., *Cropland Expansion Outpaces Agricultural and Biofuel Policies in the United States*, 10 ENVTL. RES. LETTERS 9 (2015) (finding that up to 42% of all land converted to cropland came from land exiting the CRP).

⁸¹ See ANNE WEIR SCHECHINGER & CRAIG COX, ENVTL. WORKING GRP., 'RETIRED' SENSITIVE CROPLAND: HERE TODAY, GONE TOMORROW? 3 (2017), https://cdn3.ewg.org/sites/default/files/u352/EWG_ParadiseLostReport_C03.pdf?_ga=2.50975019.347754171.1516926949-371085394.1516926948; Ronald A. Wirtz, *Conservation Reserve Program seeing steep decline*, FEDERAL RESERVE BANK OF MINNEAPOLIS (2018), <https://www.minneapolisfed.org/publications/fedgazette/conservation-reserve-program-seeing-steep-decline>.

⁸² SCHECHINGER & COX, *supra* note 81, at 3; *USDA Offers Producers Options to Re-enroll or Extend Expiring CRP Contracts*, U.S. DEP'T OF AGRIC., FARM SERV. AGENCY (2019), <https://www.fsa.usda.gov/news-room/news-releases/2019/usda-offers-producers-options-to-re-enroll-or-extend-expiring-crp-contracts>.

⁸³ ANNE WEIR SCHECHINGER, *supra* note 82.

⁸⁴ 16 U.S.C. § 3831(d)(1) (2019).

⁸⁵ 16 U.S.C. § 3834 (2019).

production. To fully realize the carbon sequestration potential CRP has to offer, Congress should increase the acreage cap to at least 2009 levels, if not more.

Finally, Congress should increase the number of acres entering CRP through continuous enrollment, which focuses on environmentally sensitive land and high-impact practices. Continuous CRP now accounts for approximately 25 percent of total CRP acres,⁸⁶ including land enrolled in the Conservation Reserve Enhancement Program and the Farmable Wetlands Program, special initiatives within CRP.⁸⁷ In contrast to general CRP signup, continuous enrollees are not subject to a competitive process but instead must meet eligibility requirements tied to priority natural resource concerns and land sensitivity.⁸⁸ Because participation is contingent on implementing practices chosen through an adaptive management approach, continuous enrollment programs can help maximize the impact of CRP spending.⁸⁹ Congress should reward the success of continuous enrollment in employing a more targeted and less invasive approach to conserving both farm and wild lands by setting aside up to half of CRP acres for continuous enrollment.

Recommendation 7: Increase CSP Funding to Further Support Resource Conserving Crop Rotations and Other Climate-Friendly Practices.

Working lands conservation programs, such as CSP, pay producers for providing additional public benefits while building their own soil health and producing a marketable crop. CSP is used on over 70 million farmed acres to provide technical and financial assistance in order to maintain existing conservation practices and implement new conservation techniques.⁹⁰

Congress has recently made some positive changes to CSP that support adoption of more climate-friendly practices. Within CSP, the 2008 Farm Bill first authorized—and the 2018 Farm Bill extended—supplemental payment rates for producers who adopt or continue resource-conserving crop rotations.⁹¹ The value of resource-conserving crop rotations is difficult to overstate. Such rotations contribute to soil health, increase biomass in the soil, and reduce soil erosion.⁹² As a result, they help sequester carbon and decrease greenhouse gas emissions. Because they conserve resources and build soils, such crop rotations also improve producers' long-term productivity and risk management outlooks. Finally, as CRP contracts expire and marginal acres re-enter production,⁹³ payments for resource-conserving crop rotations can

⁸⁶ Daniel M. Hellerstein, *The US Conservation Reserve Program: The evolution of an enrollment mechanism*, 63 LAND USE POL'Y 608 (2017).

⁸⁷ MEGAN STUBBS, CONG. RESEARCH SERV., R42783, CONSERVATION RESERVE PROGRAM: STATUS AND ISSUES 15 (2014), <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R42783.pdf>.

⁸⁸ *Id.*

⁸⁹ Daniel M. Hellerstein, *The US Conservation Reserve Program: The evolution of an enrollment mechanism*, 63 LAND USE POL'Y 608 (2017).

⁹⁰ U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., CONSERVATION STEWARDSHIP PROGRAM 1 (2016), https://www.nrcs.usda.gov/wps/PA_NRCSCConsumption/download?cid=nrcseprd1288534&ext=pdf.

⁹¹ 16 U.S.C. § 3839aa-24 (2019).

⁹² See DANIEL KANE, NAT'L SUSTAINABLE AG. COAL., CARBON SEQUESTRATION POTENTIAL ON AGRICULTURAL LANDS: A REVIEW OF CURRENT SCIENCE AND AVAILABLE PRACTICES 14–15 (2015), http://sustainableagriculture.net/wp-content/uploads/2015/12/Soil_C_review_Kane_Dec_4-final-v4.pdf.

⁹³ *Path to the 2018 Farm Bill: Conservation*, NAT'L SUSTAINABLE AG. COAL., NSAC'S BLOG (Mar. 14, 2017), <http://sustainableagriculture.net/blog/path-to-2018-farm-bill-conservation/>; see also NAT'L SUSTAINABLE AG.

provide a reliable source of income to producers in exchange for ensuring that loss of the CRP's conservation benefits are minimized. The 2018 Farm Bill increased supplemental payments for such crop rotations to 150 percent of the annual payment rate (the rate USDA sets and pays producers based on the conservation activities' costs and benefits), and added supplemental payments for cover crop activities (125 percent) and advanced grazing management (150 percent).⁹⁴ These are positive changes and model one way Congress could continue incentivizing implementation of climate-friendly practices and systems.

However, funding allocations in the 2018 Farm Bill reflect a serious undervaluation of CSP's importance in advancing climate change mitigation. While increases in supplemental funding for certain practices is a positive development, a new funding cap on total CSP spending limits the scale of impact.⁹⁵ The cap on spending is \$700 million in 2019—down from the \$1.4 billion in spending in 2018—increasing up to \$1 billion in 2023.⁹⁶ Over the next ten years, the program is anticipated to reduce by over \$12.4 billion from what it would have cost had it been reenacted without change.⁹⁷ Of the two working lands programs, CSP offers the more comprehensive and holistic approach to supporting conservation activities on farms, yet it lost funds compared to EQIP.⁹⁸ Congress should increase support for CSP so that all qualifying farms can enroll and receive supplemental benefits for employing the beneficial practices described above.

Recommendation 8: Reform EQIP to Cut Subsidies to CAFOs and Only Support Practices with Demonstrated Benefits.

EQIP originated in the 1996 Farm Bill to help producers implement conservation initiatives through technical and financial assistance.⁹⁹ EQIP provides cost-share funds through contracts with producers who “plan and install structural, vegetative, and land management practices . . . to alleviate natural resource problems.”¹⁰⁰

Although EQIP commands considerable funding, the program's target audience has shifted since its inception. Over time, contract limits have increased and USDA has gained authority to waive the adjusted gross income cap that applies to most conservation and commodities programs, including EQIP, with no limitations on how often they can do so.¹⁰¹ Allowing the highest-

COAL., ANALYSIS OF CCRP'S RECORD BREAKING ENROLLMENT (2017), <http://sustainableagriculture.net/wp-content/uploads/2017/03/CCRP-SPECIAL-REPORT.pdf>.

⁹⁴ 16 U.S.C. § 3839aa-24 (2019).

⁹⁵ See 16 U.S.C. § 3841 (a)(3)(B).

⁹⁶ MEGAN STUBBS, CONG. RESEARCH SERV., R45698, AGRICULTURAL CONSERVATION IN THE 2018 FARM BILL 6 (2019), <https://fas.org/sgp/crs/misc/R45698.pdf>.

⁹⁷ *Id.*

⁹⁸ *A Closer Look at the 2018 Farm Bill: Working Lands Conservation Programs*, NAT'L SUSTAINABLE AG. COAL., NSAC'S BLOG (Jan. 14, 2019), <https://sustainableagriculture.net/blog/a-closer-look-at-the-2018-farm-bill-working-lands-conservation-programs/>.

⁹⁹ Federal Agriculture Improvement and Reform Act of 1996, Pub. L. No. 104-127, § 334; ELANOR STARMER, CAMPAIGN FOR FAMILY FARMS AND THE ENV'T, INDUSTRIAL LIVESTOCK AT THE TAXPAYER TROUGH: HOW LARGE HOG AND DAIRY OPERATIONS ARE SUBSIDIZED BY THE ENVIRONMENTAL QUALITY INCENTIVES PROGRAM 1–22 (2008), http://inmotionmagazine.com/ra08/EQIP_report_1208.pdf.

¹⁰⁰ CONSERVATION PROGRAMS IN THE 2014 FARM BILL, *supra* note 71.

¹⁰¹ 16 U.S.C. § 3839aa-7 (2019); MEGAN STUBBS, CONG. RESEARCH SERV., R40197, ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP): STATUS AND ISSUES 8–9 (2010), <http://www.nationalaglawcenter.org/wp-content/uploads/assets/crs/R40197.pdf>.

grossing operations to receive EQIP cost-share funding reduces available funding and undermines the ability of smaller producers with less capital to access the program. In FY 2016 only 27 percent of EQIP applications received funding.¹⁰²

EQIP also subsidizes large concentrated animal feeding operations (CAFOs).¹⁰³ Though initially barred from the program at the time of its inception,¹⁰⁴ CAFOs became eligible for EQIP dollars in the 2002 Farm Bill.¹⁰⁵ Congress sets aside 50 percent of EQIP funding for livestock production.¹⁰⁶ In 2016, of that set-aside—which was 60 percent prior to the 2018 Farm Bill—about \$113 million of went to CAFOs (11 percent of total EQIP dollars).¹⁰⁷ Funds primarily supported waste management, including waste storage facilities, waste facility covers, animal mortality facilities, and manure transfer.¹⁰⁸ EQIP’s cost-share payments have contributed to the expansion of CAFOs by reducing the cost of such infrastructure.¹⁰⁹

Congress should eliminate subsidies for CAFOs, which are notorious for degrading the environment and contributing to climate change. Animals raised in CAFOs produce 3 to 20 times more manure than people, yet no sewage treatment infrastructure exists for their waste.¹¹⁰ Manure handling systems release greenhouse gases, pollute the air, emit odors, and attract insects.¹¹¹ Emissions from livestock production operations—primarily, CAFOs¹¹²—amount to nearly half of agriculture’s total contribution to U.S. greenhouse gas emissions.¹¹³ Livestock operations emit both methane and nitrous oxide, which are 25 and 298 times more potent as greenhouse gases than carbon dioxide, respectively.¹¹⁴ Manure management is the fourth largest methane emitter of all U.S. sources, while enteric fermentation (animal digestion) is the first.¹¹⁵ Together they comprise over 36 percent of methane emissions from all anthropogenic activities

¹⁰² CONG. RESEARCH SERV., FARM BILL PRIMER: THE CONSERVATION TITLE 2 (2017), <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/IF10679.pdf>.

¹⁰³ Large CAFOs are animal production facilities that confine and feed, for at least 45 days a year, over 1,000 “animal units” (e.g. 1,000 veal calves or 125,000 broiler chickens) in a space that does not support “crops, vegetation or forage growth.” 40 C.F.R. § 122.23.

¹⁰⁴ Federal Agriculture Improvement and Reform Act of 1996, Pub. L. No. 104-127, ch. 4, § 1240B(e)(1)(b).

¹⁰⁵ Farm Security and Rural Investment Act of 2002, Pub. L. No. 107-171, sec. 2301, §§ 1240–1240I.

¹⁰⁶ 16 U.S.C. § 3839aa-2(f)(1) (2019).

¹⁰⁷ *Cover Crops and CAFOs: An Analysis of 2016 EQIP Spending*, NAT’L SUSTAINABLE AGRIC. COAL., NSAC’S BLOG (Jan. 12, 2017), <http://sustainableagriculture.net/blog/eqip-fy2016-analysis/>.

¹⁰⁸ *Id.*

¹⁰⁹ Tara Ritter, *Conservation, Climate, and CAFOs*, INST. FOR AGRIC. & TRADE POL’Y (Feb. 12, 2015) <https://www.iatp.org/blog/201502/conservation-climate-and-cafos>.

¹¹⁰ CARRIE HRIBAR, NAT. ASS. OF LOCAL BOARDS OF HEALTH, UNDERSTANDING CONCENTRATED ANIMAL FEEDING OPERATIONS AND THEIR IMPACT ON COMMUNITIES 2 (2010), https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf; *see also* D. LEE MILLER & GREGORY MUREN, NRDC, CAFOS: WHAT WE DON’T KNOW IS HURTING US (2019), <https://www.nrdc.org/sites/default/files/cafos-dont-know-hurting-us-report.pdf>.

¹¹¹ D. LEE MILLER & GREGORY MUREN, NRDC, CAFOS: WHAT WE DON’T KNOW IS HURTING US (2019).

¹¹² *See* Lehner & Rosenberg, *Chapter 30: Agriculture*, *supra* note 23, at 775. It is difficult to isolate CAFOs’ contributions to these numbers due to an extreme lack of data on the number of CAFOs operating in the United States and their size, type, location, pollution controls, waste storage and disposals practices, etc. *See* D. LEE MILLER & GREGORY MUREN, NRDC, CAFOS: WHAT WE DON’T KNOW IS HURTING US (2019).

¹¹³ HRIBAR, *supra* note 110, at 7.

¹¹⁴ U.S. ENVTL. PROT. AGENCY, *supra* note 3, at ES-2–3, 5-1.

¹¹⁵ *Id.* at ES-7.

in the United States.¹¹⁶ These numbers do not even account for emissions released in the production of animal feed, to which approximately half of U.S. cropland is devoted.¹¹⁷ Given the huge contribution these operations make to U.S. greenhouse gas emissions—as well as other pollution—the government should not be subsidizing their further expansion and operation.

To, instead, maximize EQIP’s environmental benefits, Congress should direct NRCS to conduct an in-depth environmental review of each of the near-200 funded conservation practices and defund the practices that do not further environmental objectives. EQIP dollars are scarce—approximately 75 percent of eligible participants are turned away from the program,¹¹⁸ and there is evidence that the current allocation of funds fails to optimize environmental benefits.¹¹⁹ Poorly targeted subsidies diminish conservation gains and environmental benefits, all while diverting funds from smaller operations that seek to implement sustainable management practices.¹²⁰

Congress must ensure EQIP actually furthers the United States’ environmental and climate mitigation goals. Providing contract opportunities for more producers, eliminating CAFO subsidies, and limiting EQIP’s range of conservation practices to those with meaningful environmental and climate change benefits will together strengthen the program’s impact.

E. Congress Should Use Crop Insurance to Incentivize Climate Change Mitigation and Adaptation.

Background on Crop Insurance in the Farm Bill

Congress established the Federal Crop Insurance Corporation (FCIC) in 1938 to “insure, or provide reinsurance for insurers of, producers of agricultural commodities grown in the United States under one or more plans of insurance determined by the Corporation to be adapted to the agricultural commodity concerned.”¹²¹ Today, USDA’s Risk Management Agency (RMA) administers FCIC programs by paying premium subsidies and working directly with private insurance companies to provide federal crop insurance to producers.¹²² Policies are either yield-based (covering losses below historical yield) or revenue-based (triggering payment when revenue falls below a certain threshold), with revenue-based policies comprising the vast majority.¹²³ Producers pay a portion of the policy’s premium and RMA pays the remainder (the “premium subsidy”), which, on average, amounts to about 62 percent.¹²⁴ RMA and FCIC set these insurance premium subsidy rates and develop the specific contracts to be used by private

¹¹⁶ *Id.* at 5-9–10.

¹¹⁷ Lehner & Rosenberg, *Chapter 30: Agriculture*, *supra* note 23, at 775.

¹¹⁸ *Final Environmental Cost-Share Rule Fails to Incorporate Sustainability Recommendations*, NAT’L SUSTAINABLE AGRIC. COAL., NSAC’S BLOG, (May 12, 2016), <http://sustainableagriculture.net/blog/eqip-final-rule/>.

¹¹⁹ See U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-17-225, USDA’S ENVIRONMENTAL QUALITY INCENTIVES PROGRAM COULD BE IMPROVED TO OPTIMIZE BENEFITS (2017), <https://www.gao.gov/assets/690/684073.pdf>.

¹²⁰ See Danielle Wolfson, Note, *Come Hell or No Water: The Need to Reform the Farm Bill’s Water Conservation Subsidies*, 45 TEX. ENVTL. L.J. 245, 249–51 (2015); Erik Lichtenberg, *Conservation, the Farm Bill, and U.S. Agricultural Policy*, CHOICES 29(3) (2014).

¹²¹ 7 U.S.C. §1508(a)(1) (2019).

¹²² DENNIS A. SHIELDS, CONG. RESEARCH SERV., R40532, FEDERAL CROP INSURANCE: BACKGROUND 3 (2015), <https://fas.org/sgp/crs/misc/R40532.pdf> [hereinafter FEDERAL CROP INSURANCE: BACKGROUND].

¹²³ *Id.* at 6-7.

¹²⁴ *Id.* at 2.

insurers.¹²⁵ Additionally, RMA reinsures the insurance companies during times of high payouts and pays overhead and administrative costs for companies that sell and service RMA policies.¹²⁶ As a result, crop insurance companies historically receive above-market returns on their federal crop insurance policies and farmers themselves pay very little of the insurance premium.¹²⁷

As of 2017, federal crop insurance policies covered over 312 million eligible acres¹²⁸ and 122 different crops,¹²⁹ which include fruits and vegetables (“specialty crops”) and commodity crops such as corn, soy, wheat, and cotton.¹³⁰ Over 1.12 million individual federal policies—with some producers purchasing multiple policies—were issued in 2017 alone.¹³¹ In contrast to the Title I commodities programs, there are no income caps barring receipt of federal crop insurance subsidies.¹³²

A crop insurance system that fails to address the growing risks of climate change will continue to incentivize unsustainable practices. Current schemes encourage farmers to maximize yields, even when that means planting on marginal lands or choosing not to implement practices or crops that would mitigate risk long term.¹³³ Despite the availability of Whole Farm Revenue Protection for diversified farms, crop insurance continues to be much more attainable for monoculture cropping.¹³⁴ Congress should redesign crop insurance to account for—rather than ignore—the fact of climate change and use it as a tool to encourage mitigative and adaptive practices.

Recommendation 9: Introduce Pilot Programs that Incorporate Climate-Friendly Practices and Soil Quality in Premium Rates and Subsidies.

A growing body of research suggests that many of the farming practices noted in these recommendations, which are not in widespread use, can significantly improve long-term productivity and conservation outcomes. These practices include no-tillage or conservation tillage, cover cropping, diversified crop rotations, the use of riparian buffers, and agroforestry. Research connects these practices to significant increases in soil health, reductions in erosion, retention of soil moisture, better drought resistance, reductions in greenhouse gas emissions, and increased carbon sequestration.¹³⁵ Of particular significance to the federal crop insurance

¹²⁵ *History of the Crop Insurance Program*, RISK MGMT. AGENCY, U.S. DEP’T OF AGRIC., <http://www.rma.usda.gov/aboutrma/what/history.html> (last visited Sept. 19, 2017).

¹²⁶ *Id.*

¹²⁷ LAND STEWARDSHIP PROJECT, CROP INSURANCE—THE CORPORATE CONNECTION, http://landstewardshipproject.org/repository/1/1390/white_paper_1.pdf (average rate of return of 17 percent between 1989 and 2009—including 29 percent in 2009—when “reasonable” rate is 13 percent).

¹²⁸ ISABEL ROSA, CONG. RESEARCH SERV., IF10980, FARM BILL PRIMER: FEDERAL CROP INSURANCE 1 (2018), <https://fas.org/sgp/crs/misc/IF10980.pdf>.

¹²⁹ U.S. DEP’T OF AGRIC., AUDIT REPORT 05401-0010-11, FEDERAL CROP INSURANCE CORPORATION/RISK MANAGEMENT AGENCY FINANCIAL STATEMENTS FOR FISCAL YEARS 2018 AND 2017, Exhibit C 17 (2018) [hereinafter USDA AUDIT REPORT].

¹³⁰ RANDY SCHNEPF, CONG. RESEARCH SERV., IF11163, 2018 FARM BILL PRIMER: THE FARM SAFETY NET 2 (2019).

¹³¹ USDA AUDIT REPORT, *supra* note 129, at Exhibit C 16.

¹³² FEDERAL CROP INSURANCE: BACKGROUND, *supra* note 122, at 10.

¹³³ *See* NRDC COVERING CROPS, *supra* note 45.

¹³⁴ *See id.* at 4.

¹³⁵ *See, e.g.*, DANIEL KANE, NAT’L SUSTAINABLE AG. COAL., CARBON SEQUESTRATION POTENTIAL ON AGRICULTURAL LANDS: A REVIEW OF CURRENT SCIENCE AND AVAILABLE PRACTICES 11 (2015), http://sustainableagriculture.net/wp-content/uploads/2015/12/Soil_C_review_Kane_Dec_4-final-v4.pdf.

program, there is evidence that these practices also can, at least in the long run, reduce the frequency and magnitude of indemnity payments to farmers.¹³⁶

Congress should support climate-friendly practices by tying insurance premiums to actual planting risk, based in part on farmer planting practices and soil conditions. Producers who plant on the most fragile soils should pay the highest premiums.¹³⁷ Adjustments in the premium also could reward best management practices that increase soil resilience, offer demonstrated climate change mitigation benefits, and adapt to shifting conditions due to climate change. Under this system, premiums would reflect the balance between actual risk and risk management strategies. Farmers failing to take steps to mitigate and adapt to climate change would pay higher premiums to reflect their greater assumption of, and contribution to, risk.

Congress should start this transition by directing USDA to create a pilot program that links premiums to implementation of climate-friendly practices. Such a program would help producers overcome the FCIC's complex administrative requirements and incentive structure that typically slow adoption of ecologically desirable practices.¹³⁸ The system could be tested through section 1523(d) of the Federal Crop Insurance Act, which allows the FCIC to pilot premium rate reductions.¹³⁹ Existing data limitations have slowed the empirical identification of practices that reduce risk,¹⁴⁰ so USDA should partner with insurers and agricultural researchers to identify farming practices that protect against yield loss while also benefiting the climate. The results could then be used to develop a pilot program that increases premium subsidies or discounts premiums for producers who implement evidence-based management practices. Soil quality data could also be incorporated into the pilot to test ways soil health outcomes might be integrated into the system. A successful pilot program would help create tiered payment rates that adjust premiums and provide a more equitable return on the public's investment. Rewarding climate-friendly practices with reduced premiums would pay for itself via fewer indemnity payouts.¹⁴¹

¹³⁶ For example, "in 2010, corn farmers who used no-till were 30 percent less likely than their conventional-tilling peers to receive an indemnity payment under the federal crop insurance program" and in the 2012 drought, corn farmers who used cover crops harvested on average 79 percent of typical yields, compared to 68 percent for farmers who did not have cover crops. CLAIRE O'CONNOR, NAT. RES. DEF. COUNCIL, SOIL MATTERS 10 (2013), <https://www.nrdc.org/sites/default/files/soil-matters-IP.pdf>; see also Mahdi M. Al-Kaisi et al., *Drought Impact on Crop Production and the Soil Environment: 2012 Experiences from Iowa*, 68 J. SOIL & WATER CONSERVATION 19A, 20A (2013).

¹³⁷ See, e.g., Joshua D. Woodard, *Integrating High Resolution Soil Data into Federal Crop Insurance Policy*, 66 ENVTL. SCI. & POL'Y 93, 94 (2016); Joshua D. Woodard, *Soil, Conservation, and Federal Crop Insurance*, in AGREE, FOUR PAPERS ON THE U.S. FEDERAL CROP INSURANCE PROGRAM 1-1, 6 (2016).

¹³⁸ Kristin Ohlson, *This Kansas Farmer Fought a Government Program to Keep His Farm Sustainable*, ENSIA (2016) <https://ensia.com/features/sustainable-farm-crop-insurance/>; see Francis Annan & Wolfram Schlenker, *Federal Crop Insurance and the Disincentive to Adapt to Extreme Heat*, 105 AM. ECON. REV.: PAPERS & PROC. 262, 264-66 (2015); Joshua D. Woodard, et al., *Government Insurance Program Design, Incentive Effects, and Technology Adoption: The Case of Skip-Row Crop Insurance*, 94 AM. J. AGRIC. ECON. 823 (2012).

¹³⁹ 7 U.S.C. §1523(d) (2019).

¹⁴⁰ Jacqui Fatka, *Making crop insurance conservation-friendly: Part two in a series*, FARM FUTURES (2016) <http://www.farmfutures.com/story-making-crop-insurance-conservation-friendly-part-two-series-17-139131>.

¹⁴¹ In 2010, corn farmers practicing no-till farming were 30% less likely to receive federal crop insurance program indemnities. If all farmers had done so, around \$224 million in indemnities could have been avoided. CLAIRE O'CONNOR, NAT. RES. DEF. COUNCIL, SOIL MATTERS 10 n.74, 75 (2013), <https://www.nrdc.org/sites/default/files/soil-matters-IP.pdf>,

Recommendation 10: Revise “Good Farming Practices” to Include Recognized Climate-Friendly Practices.

Congress should require RMA to encourage climate-friendly practices and diversification through its influence over crop insurance contracts. Such practices conserve resources and improve resiliency, a proven risk management strategy that farmers can use to adapt to climate change challenges. Yet some of these practices do not align with the terms of crop insurance contracts that require farmers to follow “good farming practices.”¹⁴² These standards can interfere with a farmer’s ability to use conservation and climate-friendly practices like alley cropping, cover cropping, and integrated crop-livestock systems.¹⁴³ As a first step, RMA recently updated its Good Farming Practice Determination Standards Handbook to recognize NRCS conservation activities.¹⁴⁴ More recently, the 2019 Handbook includes cover cropping as a good farming practice.¹⁴⁵ However, insurance companies still retain the power to proscribe certain practices in their policies’ terms and conditions.¹⁴⁶ Insurers have a narrow interest in dictating practices that maximize intra-year yields, rather than practices that offer long-term conservation and risk management benefits. Although adding cover crops to the list of good farming practices is a step in the right direction, more practices should be included. Thus, RMA should update the handbook to ensure that any NRCS-approved conservation activity shall qualify as a “good farming practice” and prohibit private insurance companies from undermining this determination.

Recommendation 11: Increase Whole Farm Revenue Protection’s Accessibility and Promote its Expansion.

Diversified farms historically struggle to access insurance products that protect their livelihoods when bad weather or other mishaps threaten their production or marketability. The system has historically focused on single-commodity policies and lacked coverage opportunities for many fruits and vegetable crops.¹⁴⁷ Whole-farm insurance policies allow farmers to avoid applying for coverage separately for each crop they plant, which can be logistically difficult and still leave portions of a farmer’s harvest uninsured.¹⁴⁸ Under whole-farm policies, farms can purchase subsidized insurance for their total farm revenue regardless of what they produce.¹⁴⁹

¹⁴² Gabrielle Roesch-McNally, et al., *The trouble with cover crops: Farmers’ experiences with overcoming barriers to adoption*, 33 RENEWABLE AGRIC. AND FOOD SYSTEMS 322, 330 (2017).

¹⁴³ *Legal Pathways to Carbon-Neutral Agriculture*, *supra* note 80, at 10862.

¹⁴⁴ U.S. DEP’T OF AGRIC., FED. CROP INSURANCE CORP., RISK MGMT. AGENCY, GOOD FARMING PRACTICE DETERMINATION STANDARDS HANDBOOK 33 (2015), <https://www.rma.usda.gov/handbooks/14000/2017/14060.pdf>.

¹⁴⁵ *Id.* at 13; *see also* U.S. DEP’T OF AGRIC., NRCS COVER CROP TERMINATION GUIDELINES VERSION 4: JUNE 2019 1 (2019), https://sustainableagriculture.net/wp-content/uploads/2019/07/Termination_Guidelines_Designed_6.28_10.24am_002-2.pdf.

¹⁴⁶ *See Legal Pathways to Carbon-Neutral Agriculture*, *supra* note 80, at 10876 n. 223.

¹⁴⁷ U.S. DEP’T OF AGRIC., PRESS RELEASE NO. 0100.14, NEW PILOT PROGRAM OFFERS COVERAGE FOR FRUITS AND VEGETABLES, ORGANIC AND DIVERSIFIED FARMS (May 21, 2014), <http://www.usda.gov/wps/portal/usda/usdahome?contentid=2014/05/0100.xml>.

¹⁴⁸ FEDERAL CROP INSURANCE: BACKGROUND, *supra* note 122, at 10; *Whole Farm Revenue Protection for Diversified Farms*, NAT’L SUSTAINABLE AGRIC. COAL., <http://sustainableagriculture.net/publications/grassrootsguide/credit-crop-insurance/whole-farm-revenue-protection-for-diversified-farms/> (last visited Mar. 8, 2018).

¹⁴⁹ FEDERAL CROP INSURANCE: BACKGROUND, *supra* note 122, at 10.

Whole Farm Revenue Protection (WFRP) has important implications for supporting diversified production systems that enhance natural resources. Diversified production systems improve resilience by using a variety of crops to reduce vulnerability to risk.¹⁵⁰ The system boosts environmental sustainability by using the biology of different crops and livestock to reduce erosion, keep nutrients in the soil, and reduce the need for ecologically damaging inputs like pesticides and fertilizers.¹⁵¹ Improving resiliency is crucial to help farmers combat an array of possible challenges resulting from climate change. Congress should encourage and provide more support for diversified farms because they offer much greater climate mitigation and adaptation benefits than single-crop farms and monoculture.

While Congress has already recognized the importance of WFRP by supporting the program in the 2014 and 2018 Farm Bills, it must also ensure WFRP is accessible. Paperwork, recordkeeping, and particular accounting requirements prevent broader participation in WFRP.¹⁵² Congress should require RMA to study these barriers and take immediate steps to ameliorate them.¹⁵³ These hurdles are particularly acute for small and mid-sized farms, and beginning farmers, that need the comprehensive and affordable risk management most.¹⁵⁴ Congress should require RMA to develop a simplified WFRP policy for small and mid-sized farms, which USDA defines as farms with under \$1 million in annual revenue.¹⁵⁵ Congress should also direct RMA to further relax the production and revenue history requirement for beginning farmers and ranchers.¹⁵⁶ RMA should find better ways to predict new farms' revenues rather than offering benefits exclusively to those with revenue history.

¹⁵⁰ P. A. Matson et al., *Agricultural Intensification and Ecosystem Properties*, 277 *SCIENCE* 504, 506–07 (1997); Lauren Ponisio & Paul Ehrlich, *Diversification, Yield and a New Agricultural Revolution: Problems and Prospects*, 8 *SUSTAINABILITY* 1118 (2016); Brenda Lin, *Resilience in Agriculture through Crop Diversification: Adaptive Management for Environmental Change*, 61 *BIOSCIENCE* 183, 184–88 (2011); OLIVIER DE SCHUTTER, REPORT SUBMITTED BY THE SPECIAL RAPPORTEUR ON THE RIGHT TO FOOD, U.N. HUMAN RIGHTS COUNCIL, U.N. DOC A/HRC/16/49 1, 6 (2010), <https://www2.ohchr.org/english/issues/food/docs/a-hrc-16-49.pdf>.

¹⁵¹ Matson et al., *supra* note 150, at 505; *see* Lin, *supra* note 150, at 184–88; DE SCHUTTER, *supra* note 150, at 1, 6.

¹⁵² *See* CARA FRAVER, SCOTT MARLOW, & JONATHAN COPPESS, AGREE, SPECIALTY CROP RISK MANAGEMENT: AN INSSUE PAPER ON THE NONINSURED CROP DISASTER ASSISTANCE PROGRAM AND WHOLE FARM REVENUE PROTECTION INSURANCE 9 (2019), <https://www.youngfarmers.org/wp-content/uploads/2019/08/Issue-Paper-Specialty-Crop-Risk-Management.pdf> (identifying accrual accounting, in place of cash accounting, as a barrier); ANNA JOHNSON & GLEN READY, CTR. FOR RURAL AFFAIRS, NEW OPTION FOR RISK MANAGEMENT: WHOLE FARM REVENUE PROTECTION USAGE IN NEBRASKA 10 (2017), <https://www.cfra.org/sites/www.cfra.org/files/publications/WFRP%20Report.pdf>.

¹⁵³ Congress has already encouraged RMA to take these steps, but more affirmative direction may be necessary. Committee of Conference, 115th Cong., Agriculture Improvement Act of 2018, H.R. 2, Joint Explanatory Statement of the Committee of Conference 199–200 (“[T]he Managers expect RMA to solicit input from the diverse group of producers participating in WFRP and take appropriate steps to streamline, add flexibility or tailor program rules to diverse producers’ needs and circumstances.”).

¹⁵⁴ HOSSEIN AYAZI & ELSADIG ELSHEIKH, HAAS INST. FOR A FAIR AND INCLUSIVE SOC. AT UNIV. OF CAL., BERKELEY, THE U.S. FARM BILL: CORPORATE POWER AND STRUCTURAL RACIALIZATION IN THE U.S. FOOD SYSTEM 57 (2015), http://haasinstitute.berkeley.edu/sites/default/files/haasinstitutefarmbillreport_publish_0.pdf.

¹⁵⁵ *Distribution of farms and value of production varies by farm type*, U.S. DEP’T OF AGRIC., ECON. RESEARCH SERV. <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58288> (last visited Feb. 16, 2018).

¹⁵⁶ *See Whole-Farm Revenue Protection Plan*, U.S. DEP’T OF AGRIC., RISK MGMT. AGENCY, <https://www.rma.usda.gov/en/News-Room/Frequently-Asked-Questions/Whole-Farm-Revenue-Protection-Plan-2020> (last visited Nov. 20, 2019) (“Is WFRP available to Beginning Farmers and Ranchers?”).

Additionally, surveys have demonstrated a lack of familiarity with WFRP among producers and insurance agents.¹⁵⁷ Congress should direct additional funding to RMA's Risk Management Education Partnerships (RMEP) and Risk Management Education in Targeted States (RMETS) programs to provide these users with information about WFRP, its advantages for producers with diversified farms, and how to combat the risks associated with climate change.¹⁵⁸ As a final alternative, Congress could create a publicly funded and administered WFRP to overcome the perceived administrative burden that may be discouraging insurers from promoting the program.

F. Congress Should Invest in Additional Monitoring, Research, and Assistance to Farmers.

Background on Research Supports in the Farm Bill

Research and pilot initiatives are investments in the future, building the knowledge and experience that allows for innovative policy to scale and adapt across time and geographies. The farm bill can authorize research and pilot programs to improve long-term productivity and risk management within United States agriculture, with a focus on investments in soil health, resilient agronomic systems and natural resources conservation. Research and pilot programs best address situations where there is evidence that certain farming practices further goals or lead to desired outcomes, but uncertainties remain about the nature or magnitude of these benefits. Pilot programs are also called for when more work is required to identify the best policy mechanism to promote those practices.

Increasing funding for research on climate change mitigation and adaptation practices, which could be housed in Title VII, the farm bill's Research title, could solidify and expand USDA's ability to administer and scale outreach efforts and technical support across all regions of the country. Other titles also provide mechanisms for funding pilot programs, such as the Conservation Innovation Grants program, which is authorized and funded through EQIP in the Conservation Title.¹⁵⁹

Addressing the climate crisis through agriculture is an undertaking worthy of significant investment and should not be curtailed by the farm bill's budgeting process. Historically, new research and pilot programs receive very little funding because the farm bill budget process is treated as a zero-sum game.¹⁶⁰ Congress should therefore provide outlays beyond the budget baseline to address the climate crisis or introduce some of these programs through new, separate legislation. To mitigate costs, Congress could explore new taxes on sales of fertilizers or other

¹⁵⁷ *RAFI Producer Survey on Whole Farm Revenue Protection*, RURAL ADVANCEMENT FOUND. INT'L, <http://rafiusa.org/blog/rafiproducer-survey-on-whole-farm-revenue-protection/> (last visited Mar. 8, 2018)

¹⁵⁸ See 7 U.S.C. § 1522 (2019); see also *Risk Management Education Partnership Program*, U.S. DEP'T OF AGRIC., RISK MGMT. AGENCY, <https://www.rma.usda.gov/aboutrma/agreements/awards/2017/2017partnerships.html> (last visited Mar. 8, 2018).

¹⁵⁹ 16 U.S.C. § 3939aa-8 (2019); 7 C.F.R. § 1466.27. With the exception of air quality funding (for which Congress specifically authorizes separate funds), the overall level of CIG funding is within the discretion of the USDA.

¹⁶⁰ See generally Jonathan Coppess, et al., *Reviewing CBO Baseline for Farm Bill Program Spending*, 7 FARMDOC DAILY (2017), <https://farmdocdaily.illinois.edu/2017/03/reviewing-cbo-baseline-for-farm-bill-spending.html>.

climate-harming products to fund research on the various climate-friendly practices discussed in these recommendations.¹⁶¹

Recommendation 12: Fund Continuous Monitoring Technology for Nitrous Oxide Emissions.

Nitrous oxide is a powerful greenhouse gas, with a global warming potential approximately 300 times that of carbon dioxide. The agriculture sector is the largest source of nitrous oxide emissions in the United States and is responsible for about 82 percent of total United States nitrous oxide emissions.¹⁶² The primary agricultural sources of nitrous oxide emissions are soil management—particularly the addition of nitrogen fertilizers (74 percent)—and manure management, which produces nitrous oxide emissions occurring from the breakdown of nitrogen in livestock manure and urine, in addition to the potent greenhouse gas, methane.¹⁶³ Yet, soil management-related emissions can be difficult to track. For one thing, nitrous oxide emissions tend to be episodic rather than steady; periodic air sampling can therefore miss pulses of emissions.¹⁶⁴ For example, one study found that emissions were two orders of magnitude greater in the weeks immediately after the application of fertilizer than in the rest of the year.¹⁶⁵ In addition, atmospheric concentrations of nitrous oxide are very low compared to carbon dioxide, making them difficult to detect through many common analytical techniques.¹⁶⁶ However, given the warming potential of nitrous oxide relative to carbon dioxide, even “low” concentrations make significant contributions to climate change.

A variety of technologies are being developed that could allow the continuous monitoring of nitrous oxide emissions on farms.¹⁶⁷ Congress should provide funding for the study of continuous monitoring technologies to identify best practices that can be used to incorporate nitrous oxide monitoring from farms into the nationwide monitoring system for emissions.

Recommendation 13: Pilot Cooperative Biogas Production.

Anaerobic digestion—the generation of renewable energy (biogas) from organic waste—is a productive and efficient way to dispose of manure and thereby reduce certain harmful emissions

¹⁶¹ As an example, the 1987 Iowa Groundwater Protection Act has raised millions of dollars for research on sustainable agricultural practices through a 75-cent fee on fertilizer vendors per ton of anhydrous ammonia—less than 0.2 percent of the average price paid by individual farmers. Lehner & Rosenberg, *Chapter 30: Agriculture*, *supra* note 23, at 797.

¹⁶² U.S. ENVTL. PROT. AGENCY, *supra* note 3, at ES-7.

¹⁶³ *Id.*

¹⁶⁴ Trevor D. Rapson & Helen Dacres, *Analytical Techniques for Measuring Nitrous Oxide*, 54 TRAC TRENDS IN ANALYTICAL CHEMISTRY 64–74 (2014).

¹⁶⁵ Ü. Rannik, et al., *Intercomparison of Fast Response Commercial Gas Analysers for Nitrous Oxide Flux Measurements Under Field Conditions*, 12 BIOGEOSCIENCES 415 (2015).

¹⁶⁶ Trevor D. Rapson, *supra* note 164.

¹⁶⁷ See, e.g., Araceli D. Larios, et al., *Challenges in the Measurement of Emissions of Nitrous Oxide and Methane from Livestock Sector*, 15 REVIEWS IN ENVTL. SCI. & BIO/TECH. 285 (2016); Shu Kee Lam, et al., *Measurement and Mitigation of Nitrous Oxide Emissions from a High Nitrogen Input Vegetable System*, 5 SCIENTIFIC REPORTS, ARTICLE NUMBER: 8208 (2015); Ü. Rannik, et al., *Intercomparison of Fast Response Commercial Gas Analysers for Nitrous Oxide Flux Measurements Under Field Conditions*, 12 BIOGEOSCIENCES 415 (2015); Trevor D. Rapson, *supra* note 164; Joel J. Fassbender, et al., *Automated, Low-Power Chamber System for Measuring Nitrous Oxide Emissions*, 42 J. ENVTL. QUALITY 606 (2013).

of methane and other air and water pollutants. Digestion also produces useful products like biogas and nutrient-filled digestate.¹⁶⁸ Direct benefits to producers and the community include energy production for on-site uses like heat, electricity, and farm operations; profits from selling excess electricity; avoidance of manure spills from storage lagoons nearing capacity; and reduced odor.¹⁶⁹ However, the anaerobic digesters needed to produce biogas are expensive,¹⁷⁰ and often can only be afforded by the largest farms.¹⁷¹ This obstacle prevents smaller producers from reaping the many benefits of anaerobic digestion.

Congress should direct USDA to adopt a pilot project that will help small- and midsize producers realize the potential for biogas generation by pooling resources through cooperative ownership structures. Such an approach would help producers overcome capital barriers by spreading installation, operating, and maintenance costs across many operators, increasing their bargaining power when negotiating with utilities, increasing energy and by-product sales, and allowing them to remain focused on agricultural production.¹⁷²

¹⁶⁸ See *Environmental Benefits of Anaerobic Digestion (AD)*, U.S. ENVTL. PROT. AGENCY <https://www.epa.gov/anaerobic-digestion/environmental-benefits-anaerobic-digestion-ad> (last visited Mar. 18, 2018); *The Benefits of Biogas Recovery*, U.S. ENVTL. PROT. AGENCY, AGSTAR <https://www.epa.gov/agstar/benefits-biogas-recovery> (last visited Mar. 18, 2018); U.S. DEP'T OF AGRIC., U.S. ENVTL. PROT. AGENCY, U.S. DEP'T OF ENERGY, BIOGAS OPPORTUNITIES ROADMAP 9–15 (2014), https://www.usda.gov/oce/reports/energy/Biogas_Opportunities_Roadmap_8-1-14.pdf; CAROLYN B. LIEBRAND & CHARLES LING, U.S. DEP'T OF AGRIC., RURAL DEV., RESEARCH REPORT 217, COOPERATIVE APPROACHES FOR IMPLEMENTATION OF DAIRY MANURE DIGESTERS 6–10 (2009), <http://large.stanford.edu/publications/coal/references/docs/RR217.pdf>.

¹⁶⁹ See *Environmental Benefits of Anaerobic Digestion (AD)*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/anaerobic-digestion/environmental-benefits-anaerobic-digestion-ad> (last visited Mar. 18, 2018); *The Benefits of Biogas Recovery*, U.S. ENVTL. PROT. AGENCY, AGSTAR, <https://www.epa.gov/agstar/benefits-biogas-recovery> (last visited Mar. 18, 2018); U.S. DEP'T OF AGRIC., U.S. ENVTL. PROT. AGENCY, U.S. DEP'T OF ENERGY, BIOGAS OPPORTUNITIES ROADMAP 9–15 (2014), https://www.usda.gov/oce/reports/energy/Biogas_Opportunities_Roadmap_8-1-14.pdf; CAROLYN B. LIEBRAND & CHARLES LING, U.S. DEP'T OF AGRIC., RURAL DEV., RESEARCH REPORT 217, COOPERATIVE APPROACHES FOR IMPLEMENTATION OF DAIRY MANURE DIGESTERS 5, 8, 13 (2009), <http://large.stanford.edu/publications/coal/references/docs/RR217.pdf>.

¹⁷⁰ See CAROLYN B. LIEBRAND & CHARLES LING, U.S. DEP'T OF AGRIC., RURAL DEV., RESEARCH REPORT 217, COOPERATIVE APPROACHES FOR IMPLEMENTATION OF DAIRY MANURE DIGESTERS 6 (2009) (“The capital cost of plug flow digesters on 10 U.S. dairy operations averaged \$285,404 for the digester alone ... The [per-cow] capital cost ranged from \$194 to \$1,557 and averaged \$536 per cow”).

¹⁷¹ See *id.* at v, 10 (noting that barriers to using anaerobic digesters include high costs, difficulties in obtaining financing, and the additional time and skill required to manage them).

¹⁷² *Id.* at 12.

Cooperative models for biogas generation have proven effective both domestically¹⁷³ and abroad.¹⁷⁴ This program should provide funding, in the form of grants or loan guarantees to producers who apply to participate, to support the construction of several pilot plants to start. The purpose of the pilot program would be to assess the feasibility of such an approach, with a focus on identifying ways to overcome potential barriers such as how best to transport manure to a central location,¹⁷⁵ determining the best legal structure for plant ownership, and standardizing terms for power purchase agreements with electrical utilities.

Recommendation 14: Coordinate a Robust USDA Response to Climate Change.

The USDA Climate Hubs, a collaboration of USDA sub-agencies established in 2014, play a vital role in the federal government’s broad effort to support producers and other stakeholders in making climate-informed decisions.¹⁷⁶ Climate Hubs provide numerous services in pursuit of their mission, which is strengthening agricultural production, natural resource management, and rural economic development under increasing climate variability.¹⁷⁷ Among their key activities is facilitating coordination between stakeholders and government institutions, acting as a principal point of contact between agency services and the constituencies they are meant to serve.¹⁷⁸ This coordination also extends to other entities including land grant universities, the private sector, non-profits, and regional climate experts.¹⁷⁹ This role helps ensure that producers can connect to

¹⁷³ See *Agricultural Uses for Anaerobic Digestion*, MASS EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, <http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/program/agricultural-uses-for-anaerobic-digestion.html> (last visited Mar. 18, 2018) (five farms in Massachusetts with anaerobic digester technology with combined heat and power conversion units, whose feedstock includes organic waste trucked in from elsewhere in the state); Linda Tufano, *CR&R to build new \$100M anaerobic digestion plant in California*, INDUSTRYDIVE (Aug. 31, 2015), <http://www.wastedive.com/news/crr-to-build-new-100m-anaerobic-digestion-plant-in-california/404806/> (\$100 million anaerobic digester complex that will take in organic waste from numerous California cities); Karen Lee, *Digester meets the needs of a community*, PROGRESSIVE DAIRYMAN (May 20, 2013), <http://www.progressivedairy.com/topics/manure/digester-meets-the-needs-of-a-community> (a public-private partnership between three farms and Clear Horizons, LLC, made possible by pooling available resources to help finance it and spread the risk); *Haverhill, Mass. Farm Powered Anaerobic Digester*, VANGUARD RENEWABLES, <http://vanguardrenewables.com/haverhillmassfarmpoweredanaerobicdigester/> (last visited Mar. 18, 2018) (a “cooperative farm venture” between two farms in Massachusetts).

¹⁷⁴ For example, this approach has been used successfully in Denmark. See Rob Raven & K. H. Gregersen, *Biogas Plants in Denmark: Successes and Setbacks*, RENEWABLE & SUSTAINABLE ENERGY REV. 1–18 (2005); see also GLOBAL METHANE INITIATIVE, SUCCESSFUL APPLICATIONS OF ANAEROBIC DIGESTION FROM ACROSS THE WORLD (2013), <https://www.globalmethane.org/documents/GMI%20Benefits%20Report.pdf> (describing successful applications in Brazil, Beijing, and Peru).

¹⁷⁵ Farms within a cooperative may be strategically located in order to efficiently transport biogas between them and a central gas conditioning and compressing plant, see GLOBAL METHANE INITIATIVE, SUCCESSFUL APPLICATIONS OF ANAEROBIC DIGESTION FROM ACROSS THE WORLD 12 (2013), <https://www.globalmethane.org/documents/GMI%20Benefits%20Report.pdf>, an idea which may be applied to the transportation of feedstock (manure and other organic waste) between farms.

¹⁷⁶ Climate Hubs are a part of a broader federal effort to address climate variability. Counterpart programs in other agencies include Regional Climate Centers (National Oceanic and Atmospheric Administration), Climate Science Centers and Landscape Conservation Cooperatives (Department of the Interior), the Climate and Environmental Sciences Division (Department of Energy), and the Air, Climate and Energy Research Program (EPA).

¹⁷⁷ U.S. DEP’T OF AGRIC., USDA REGIONAL CLIMATE HUBS FACTSHEET (2016), <https://www.climatehubs.oce.usda.gov/sites/default/files/USDA%20Regional%20Climate%20Hubs%20Factsheet%202016.pdf>.

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

the appropriate network to find the science and technical support they need to adapt to climate-related challenges.

Additionally, the Hubs themselves provide a host of informational services that can be used to manage climate-related risks and opportunities. They translate climate projections into impacts on the agriculture sector, conduct regional vulnerability assessments, sift through and maintain a database of peer-reviewed journal articles, and provide newsletters and workshops.¹⁸⁰ They also provide a variety of land management tools, including special calculators, maps, models, and datasets that are used to estimate anything from crop production to seasonal drought outlooks.¹⁸¹

In the coming years, the Climate Hubs can provide important assistance to farmers by disseminating information on drought-resistant crops and more generally on the crops and livestock breeds appropriate to the changing climate in a particular region. The disruptive potential of climate change requires that Congress preserve existing programs and strengthen ongoing efforts to both adapt to and mitigate climate change within the agricultural sector.

Given the crucial role of Climate Hubs, Congress should ensure their continued operation. Mandatory funding will guarantee that the critical functions of the Hubs can continue. At the moment, the Hubs are not explicitly authorized in the farm bill and instead rely exclusively on discretionary and therefore unpredictable funding. There is increasing resistance in Congress to appropriate funds for ongoing programs that are not included in authorizing legislation;¹⁸² therefore, Congress should include explicit authorization for the Climate Hubs, in combination with mandatory funding.

Recommendation 15: Invest in Infrastructure and Incentives to Reduce Food Waste.

Agriculture and the food system have a role to play in another major contributor to climate change: food waste. Billions of dollars are invested in producing food each year, yet 40 percent of that food goes to waste.¹⁸³ Nearly one-fifth of U.S. cropland, fertilizers, and agricultural water are wasted producing food that is never eaten.¹⁸⁴ Globally, food loss and waste contribute up to 10 percent of total anthropogenic greenhouse gas emissions.¹⁸⁵ Project Drawdown ranks “Reduced Food Waste” as its third top solution for carbon reduction impacts.¹⁸⁶

¹⁸⁰ See U.S. DEP’T OF AGRIC., USDA CLIMATE HUBS QUARTERLY REPORT FY 2017, <https://www.climatehubs.oce.usda.gov/sites/default/files/Climate%20Hubs%20Update%20-%20April%202015.pdf> (last visited Mar. 18, 2018).

¹⁸¹ These tools include the Climate Tool Shed, which allows users to search over 100 web tools; the Climate Resilience Toolkit, which includes various climate data and tools, adaption guidelines, and references to other resources; and AgroClimate.org, which includes tools and data on climate and crops.

¹⁸² See, e.g., Christine Harbin, *Congress Should Rein in Unauthorized Appropriations*, WASH. EXAMINER (Jun. 15, 2016), <http://www.washingtonexaminer.com/congress-should-rein-in-unauthorized-appropriations/article/2593912>.

¹⁸³ See NAT. RES. CONSERVATION SERV., WASTED: HOW AMERICAN IS LOSING UP TO 40 PERCENT OF ITS FOOD FROM FARM TO FORK TO LANDFILL (2017), <https://www.nrdc.org/sites/default/files/wasted-2017-report.pdf>.

¹⁸⁴ *Id.* at 5.

¹⁸⁵ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE AND LAND 26 (2019), https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf.

¹⁸⁶ *Solutions*, PROJECT DRAWDOWN, <https://www.drawdown.org/solutions> (last visited Nov. 20, 2019).

There are a variety of opportunities for policy change to address food loss during production and along the entire supply chain. Strategies like connecting farmers to food recovery programs, investing in packaging technologies that prolong shelf life, supporting and clarifying the rules for food donations, and limiting the amount of food that can be disposed in landfills, among others, can decrease the volume of wasted food.¹⁸⁷ Farms can also provide an end use for food that will otherwise go unconsumed, recycling organic waste as nutrient-dense compost.¹⁸⁸ The 2018 Farm Bill was the first farm bill to provide dedicated programming, resources, and efforts to reduce food loss and waste, and included eight separate provisions and programs that aim to address food waste.¹⁸⁹ However, most of these provisions are still subject to decisions in appropriations and advocacy to secure their implementation is ongoing. Congress should build on these positive first steps by providing guaranteed funding for these food waste initiatives and recovering whatever food can be donated or used in other ways. The Select Committee should further refer to the Harvard Law School Food Law and Policy Clinic's Recommendations on Federal Food Waste Policy (submitted by email in response to the RFI) for additional affirmative action Congress should take.¹⁹⁰

G. Conclusion

Thank you for the opportunity to provide our recommendations on the pivotal role agriculture can play in responding to climate change. Incorporating climate-friendly practices in farming is critical to reducing net emissions, protecting our lands, and equipping the industry to adapt to the changing climate.

Please let us know if we can provide any additional information or resources as you continue your investigation into this incredibly important matter.

Sincerely,

The Farm Bill Law Enterprise
farmbilllaw.org

Food Law and Policy Clinic, Emmett Environmental Law and Policy Clinic, Health Law and Policy Clinic | Harvard Law School
Environmental Law and Policy Clinic | Duke University School of Law
Food Law Initiative | Elisabeth Haub School of Law at Pace University
Resnick Center for Food Law and Policy | University of California, Los Angeles School of Law
Center for Agriculture and Food Systems | Vermont Law School
Environmental Protection Clinic | Yale Law School
Joshua Galperin Visiting Associate Professor at University of Pittsburgh School of Law

¹⁸⁷ See e.g., EMILY BROAD LEIB, ET AL., HARVARD LAW SCH. FOOD LAW & POLICY CLINIC, OPPORTUNITIES TO REDUCE FOOD WASTE IN THE 2018 FARM BILL (2017), http://www.chlpi.org/wp-content/uploads/2013/12/Opportunities-to-Reduce-Food-Waste-in-the-2018-Farm-Bill_May-2017.pdf; HARVARD LAW SCH. FOOD LAW & POLICY CLINIC & NRDC, DON'T WASTE, DONATE (2017), http://www.chlpi.org/wp-content/uploads/2013/12/Dont-Waste-Donate_-March-2017.pdf;

¹⁸⁸ See EMILY BROAD LEIB, ET AL., *supra* note 188, at 20.

¹⁸⁹ See Agriculture Improvement Act of 2018 (2018).

¹⁹⁰ The HLS Food Law and Policy Clinic is a member institution of the Farm Bill Law Enterprise.