U.S. Department of Agriculture
Natural Resources Conservation Service

NOTICE OF GRANT AND AGREEMENT AWARD

1. Award Identifying Number	2. Amendment Number	3. Award /Project Period	4. Type of award instrument:
NR233A750004G108		Date of final signature - 09/30/2028	Grant Agreement

5. Agency (Name and Address)	6. Recipient Organization (Name and Address)
USDA Partnerships for Climate-Smart Commodities c/o FPAC-BC Grants and Agreements Division 1400 Independence Ave SW, Room 3236 Washington, DC 20250 Direct all correspondence to FPAC.BC.GAD@usda.gov	UNIVERSITY OF MARYLAND EASTERN SHORE SCD BUILDING SUITE 1160 PRINCESS ANNE MD 21853-1299 UEI Number / DUNS Number: LNUBJQ26R2M5 / 082611302 EIN:

7. NRCS Program Contact	8. NRCS Administrative Contact	9. Recipient Program Contact	10. Recipient Administrative Contact
Name: LOREN MULDOWNEY	Name: CHARLENE WINTERS	Name: KATE TULLY	Name: JONATHAN CUMMING
(b)(6)			

11. CFDA	12. Authority	13. Type of Action	14. Program Director
10.937	15 USC 714 et seq	New Agreement	Name: JONATHAN CUMMING (b)(6)

15. Project Title/ Description: Expands markets for climate-smart grass and corn in the Eastern Shore region of MD and VA and supports farmer implementation and monitoring of climate-smart practices.

16. Entity Type: T = Historically Black Colleges and Universities

17. Select Funding Type

Select funding type:	☒ Federal	☒ Non-Federal
Original funds total	$4,999,999.00	$326,463.00
Additional funds total	$0.00	$0.00
Grand total	$4,999,999.00	$326,463.00

18. Approved Budget

Personnel	$1,297,869.00	Fringe Benefits	$427,297.00
Travel	$21,730.00	Equipment	$161,497.00
Supplies	$276,917.00	Contractual	$46,150.00
Construction	$0.00	Other	$2,768,539.00
Total Direct Cost	$4,353,062.00	Total Indirect Cost	$646,937.00
		Total Non-Federal Funds	$326,463.00
		Total Federal Funds Awarded	$4,999,999.00
		Total Approved Budget	$5,326,462.00

This agreement is subject to applicable USDA NRCS statutory provisions and Financial Assistance Regulations. In accepting this award or amendment and any payments made pursuant thereto, the undersigned represents that he or she is duly authorized to act on behalf of the awardee organization, agrees that the award is subject to the applicable provisions of this agreement (and all attachments), and agrees that acceptance of any payments constitutes an agreement by the payee that the amounts, if any, found by NRCS to have been overpaid, will be refunded or credited in full to NRCS.

Name and Title of Authorized Government Representative	Signature	Date
KATINA HANSON Acting Senior Advisor for Climate-Smart Commodities	KATINA HANSON Digitally signed by KATINA HANSON Date: 2023.09.26 15:10:39 -05'00'	
Name and Title of Authorized Recipient Representative JOSEPH PITULA Director of Research	Signature Joseph Pitula	Date 09 / 26 / 2023

NONDISCRIMINATION STATEMENT

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW., Washington, DC 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

PRIVACY ACT STATEMENT

The above statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. Section 522a).

Statement of Work

Purpose

The purpose of this agreement, between the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) and University of Maryland Eastern Shore (Recipient), is to build markets for climate-smart commodities and invest in America's climate-smart producers to strengthen U.S. rural and agricultural communities.

Objectives

The objectives of this project are to support the production and marketing of climate-smart commodities by providing voluntary incentives to producers and landowners, including early adopters, to implement climate-smart agricultural production practices, activities, and systems on working lands; measure/quantify, monitor and verify the carbon and greenhouse gas (GHG) benefits associated with those practices; and develop markets and promote the resulting climate-smart commodities.

Budget Narrative

The official budget summarized below and described in the attached Budget Narrative will be considered the total budget as last approved by the Federal awarding agency for this award.

Amounts included in this budget narrative are estimates. Reimbursement or advance liquidations will be based on actual expenditures, not to exceed the amount obligated.

TOTAL BUDGET $5,326,462

TOTAL FEDERAL FUNDS $4,999,999
PERSONNEL $811,168
FRINGE BENEFITS $267,061
TRAVEL $21,730
EQUIPMENT $161,497
SUPPLIES $276,917
CONTRACTUAL $46,150
CONSTRUCTION $0
OTHER $2,768,539 (includes PRODUCER INCENTIVES $384,335)
TOTAL DIRECT COSTS $4,353,062
INDIRECT COSTS $646,937

TOTAL NON-FEDERAL FUNDS $326,463
PERSONNEL $0
FRINGE BENEFITS $0
TRAVEL $0
EQUIPMENT $0
SUPPLIES $0
CONTRACTUAL $0
CONSTRUCTION $0
OTHER $326,463 (includes PRODUCER INCENTIVES $0)
TOTAL DIRECT COSTS $0
INDIRECT COSTS $0

Recipient has an approved Negotiated Indirect Cost Rate Agreement (NICRA) with a rate of 60 percent and a base of direct salary and wages including all fringe benefits ($1,078,229).

When equipment is purchased with Federal funds it must be used until no longer needed as described in the General Terms and Conditions and 2 CFR 200. If the residual value of the equipment is $5,000 or more at the time it is no longer needed, the recipient must request disposition instructions. The disposition instructions may direct the recipient to: 1) sell the equipment and return a proportionate share of the proceeds to the Federal agency; 2) transfer title to another eligible entity identified by the Federal agency; or 3) keep the equipment if desired and compensate the Federal agency for its proportionate share of the value.

Responsibilities of the Parties:

If inconsistencies arise between the language in this Statement of Work (SOW) and the General Terms and Conditions attached to the agreement, the language in this SOW takes precedence.

RECIPIENT RESPONSIBILITIES

Perform the work and produce the deliverables as outlined in this Statement of Work and attachments.

Ensure Paperwork Reduction Act (PRA) clearance is obtained prior to conducting data collection from producers or other project participants, including data collection performed by subrecipients.

Comply with the applicable version of the General Terms and Conditions.

Submit reports and payment requests to the ezFedGrants system as outlined in the applicable version of the General Terms and Conditions. Reporting frequency is as follows:

Performance Reports: Quarterly

SF425 Financial Reports: Quarterly

Detailed Progress Report: Quarterly
(The detailed progress report is in addition to the performance and financial reports referenced above and described in the general terms and conditions)

Expected Accomplishments and Deliverables

See attached Benchmarks Table and associated Project Narrative.

Resources Required

See attached Benchmarks Table and associated Project Narrative.

Milestones

See attached Benchmarks Table and associated Project Narrative.

GENERAL TERMS AND CONDITIONS

Please reference the below link(s) for the General Terms and Conditions pertaining to this award:
https://www.fpacbc.usda.gov/about/grants-and-agreements/award-terms-and-conditions/index.html

Attachments:
Budget Narrative
Project Narrative
Benchmarks Table
Climate-Smart Practices List and Limitations
Data Dictionary
Climate-Smart Specific Terms and Conditions

Page 006

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 007

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 008

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 009

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 010

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 011

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 012

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 013

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 014

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 015

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 016

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 017

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 018

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 019

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 020

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 021

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 022

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

Page 023

Withheld pursuant to exemption

(b)(4)

of the Freedom of Information and Privacy Act

a. PROJECT NARRATIVE: Bioenergy crop utilization to boost anaerobic digestion, transform chicken litter, enhance soil health, and create climate-smart commodity pathways for small farms on the Delmarva Peninsula

i. Executive Summary

A. Contact Information

Principle Investigator:	Dr. Jonathan Cumming
	Chair & Professor
Physical Address:	Department of Natural Sciences
	University of Maryland Eastern Shore
	George Washington Carver Science Building, Room 1103
	Princess Anne, MD 21853
Email:	jrcumming@umes.edu
Phone:	(410) 651-6013

B. List of Project Partners

University of Maryland Eastern Shore (UMES), Lead
University of Maryland College Park (UMD), Subaward
Planet Found Energy Development, LLC (PFED), Subaward
Millennium Farm Partnership, Farmer Partner

C. List of Underserved/Minority-Focused Project Partners

University of Maryland Eastern Shore, HBCU
2020 Farmers' Cooperative (2020 Co-op)

D. Compelling Need for the Project

The Delmarva Peninsula is Home to a Large, Underserved Farming Population. The Delmarva Peninsula (Delaware, Maryland & Virginia) makes up the Eastern Shore of the Chesapeake Bay. It is predominantly rural and, especially from mid-Delaware south, heavily dependent on agriculture, which dominates the region's economy. The area is also economically distressed and home to a large, historically underserved minority population comprising 31% of the region's population in Delaware, 34% in Maryland and 42% in Virginia[1]. It is an area in need of support and implementation of new approaches to sustain and diversify agroeconomic production.

The Regional Poultry Industry is Large and Presents Farmer and Environmental Challenges. The Delmarva is home to several large agro-industrial sectors that drive a significant portion of the area's economic growth and constitute much of the Delmarva Peninsula's identity. The largest of these – the poultry industry – generates $4.2 billion per year in revenues while supporting farmers, producers, processors, wholesalers, retailers, and numerous secondary markets within the region[3]. However, while these industries do much to underpin the culture and economy on the Delmarva, they are not without their problems.

A first concern is that the scale of the poultry industry and the agroeconomy supporting it are largely structured to support an increasingly small number of farmers who own an increasingly large amount of the land in production. Regional minority and historically underserved farmers find themselves increasingly squeezed out of these markets. With decreasing acreage, minority farmers in the region are transitioning to non-traditional cash crops, which need dependable commodities and markets.

Secondly, the regional poultry industry generates around 850,000 short tons of poultry litter annually[3,5]. Poultry litter is the combination of spent bedding and manure resulting from poultry production, and it is high in nitrogen (N), phosphorus (P) and potassium (K). Due to its nutrient value, it has historically been field-applied to crops, sometimes in excess, resulting in substantial nutrient additions to the landscape and leaching into the surrounding Chesapeake Bay, resulting in eutrophication. In spite of several regulatory measures, including the Phosphorus Management Tool (PMT) and the Manure Transport Program[6], the production of litter remains a challenge.

Solutions to the Poultry Litter Challenge are Opportunities for New Commodities and Climate Mitigation. Industries such as the bioenergy sector – including anaerobic digestion (AD) and pyrolysis – hold promise in the region to provide economically viable solutions to the problem of excess litter. PFED is currently in the permitting phase for the construction of a commercial AD facility in Princess Anne, MD, in collaboration with Chesapeake Utility Corporation. This project opens the opportunity to create new commodities (corn and grass) and markets easily accessible to underserved farmers by creating demand for bioenergy crops to be integrated into the AD process. Bioenergy crops (ryegrass and switchgrass) will serve as new commodities, sustainably produced on small farms, that will also reduce greenhouse gas (GHG) production from Producers' soils, sequester carbon (C) in soils, and reduce nutrient leaching from soils to regional watersheds.

Climate-Smart Conservation Practice Standards (CSPs) to Mitigate Climate Change. Our program will develop the winter **cover crop (CPS 340)** ryegrass and **pasture and hay planting (CPS 512**) with switchgrass as commodities for underserved Producers. **Soil carbon amendment (CPS 336)** with chicken litter or Element Soil™ will enhance soil C sequestration while enhancing **nutrient management (CPS 590)** on Producer farms. We will evaluate the CSAF outcomes of implementing these CPSs through direct measurements and modelling.

Bioenergy Feedstock Production to Bolster Minority and Underserved Farmers. To expand our region's typical farming practices from the use of cover crops solely as a soil conservation practice to their growth as a feedstock commodity used by the expanding bioenergy sector, we will partner with the 2020 Farmers Cooperative and the University of Maryland Eastern Shore Extension to create a community of underserved farmers who can provide the foundation for a new CSAF bioeconomy. These farmers will receive financial compensation to incorporate bioenergy crops into their existing rotation and experiment with the production of a native, perennial bioenergy crop, switchgrass. We will then explore the positive impact that the high C content provided by these feedstocks will have on the AD of poultry litter to biogas and the AD digestate bi-production of Element Soil™, a soil conditioner that has horticultural and agricultural applications and will serve to reduce soil GHG production, sequester C in soil, and limit soil nutrient leaching.

Monitor CSAF Practice Implementation, Commodity Production, Environmental Measures, and Farmer Benefits to Assess Program Success. Throughout the implementation of these new practices, we will conduct background research and analysis on GHG emissions, soil C storage, nutrient-related ecosystem services, and the economics associated with each phase of production, including: bioenergy crop growth, harvest, transportation, and preparation as feedstock; poultry litter transport and storage; the co-digestion of poultry litter with cover/bioenergy crop feedstocks; the post-AD storage and transport of digestate; and the reapplication of digestate onto agricultural fields. We will use life cycle analysis to track GHG, C, nutrients, and energy flows from the field to the final digestion products using the GREET model[7] and model anticipated GHG benefits using the COMET model[8]. We will also conduct ongoing outreach through UMES Extension, the NRCS, and the 2020 Farmers Cooperative to engage in dialogue with underserved producers to ensure

economic and environmental justice in the implementation of these new strategies. By doing so, we seek to highlight the socio-economic, GHG, and ecosystem-related merits of bioenergy feedstocks[9,10], facilitate the growth of CSAF practices, and empower producers to drive the growth and diversity of the resulting markets on the Delmarva.

Create Partnerships to Facilitate CSAF Implementation. **PFED**, one of our main partners, is committed to sustainability and our Producers have a small, but developing, market for their bioenergy feedstock commodities. The company was founded on the principles of generating renewable natural gas (RNG) while consuming agricultural waste on the Delmarva. **Chesapeake Energy**'s acquisition of PFED brings RNG and its environmental benefits to the Delmarva to tackle the challenges of chicken litter outlined in this proposal. Chesapeake, its shareholders, and its customers want innovative energy options that reduce greenhouse gas emissions and lower the region's carbon footprint. We will work with Chesapeake Energy through this proposal to ensure that bioenergy feedstocks from climate-smart production practices can be integrated into RNG generation, thus supporting feedstock production by our Producers using climate-smart practices.

We will further liaise with the **Delmarva Chicken Association**, an entity representing the five chicken producers on the Delmarva, to explore options to create pipelines for climate-smart commodities (corn) into the supply chain. We will approach **Perdue Farms**, whose corporate headquarters is in Salisbury, MD, 11 miles from UMES, to discuss their supply chain and potential incorporating corn (and in the long-term soybean and sorghum) generated using climate-smart agronomic practices as a way to create a CS™ chicken brand. Perdue recently released its organic line, and a climate-smart brand could potentially create a new market for farmer commodities.

In addition, the project team has the support of the **Delmarva Land and Litter Collaborative**, a regional organization that brings together representatives from chicken companies, farming, regulatory agencies, academia, and environmental groups to address the impacts of poultry-litter. The Collaborative will promote the project through its networks, and as appropriate, work with project partners to

Together, the planned activities outlined in this Partnerships for Climate-Smart Commodities project will:

- Create new commodities and expand producer opportunities on the Delmarva;
- Increase adoption of CSAF practices and create new commodity systems that reduce agricultural greenhouse gas emissions (GHG) and increase carbon (C) sequestration in farm soils on the Delmarva;
- Intensely and accurately measure/quantify farm-level GHG benefits stemming from CSAF practices with the new commodities, including elucidating double counting;
- Evaluate and trace these GHG benefits by assessing C budgets and costs through our commodity supply chain;
- Improve understanding and communication of the economic and adaptation benefits of CSAF practices and their environmental benefits;
- Implement equitable administration of the CSAF activities to include small and underserved producers through the 2020 Farmers Cooperative as well as an early adopter, Millennium Farms;
- Establish a new public-private partnership with Planet Found Energy Development/ Chesapeake Energy and create additional partnerships with the Delmarva Chicken Association, Perdue Farms, and the Delmarva Land and Litter Collaborative to foster CSAF practice implementation and create Climate-Smart markets.

E. Approach to Minimize Transaction Costs Associated with Project Activities

The following represent points within the project's CSAF commodity production and supply chain in which transaction costs can be incurred: (1) Production of the cover/bioenergy crop commodity (i.e., planting, litter (fertilizer) application, harvest, transport to AD facility, ensiling, and storage); (2) Acquisition of poultry litter commodity (i.e., transport & storage); (3) Delivery of digestate commodity to market (i.e., storage, transport, and marketing); and (4) Reapplication of litter onto fields.

In an effort to reduce impacts and costs to the project's bioenergy crop producer-partners, we will financially compensate them for their participation to establish their CSAF systems. We will provide annual Producer stipends ($5,000) for participation, PI-Producer collaboration, property access for soil sampling, and for the costs associated with seed purchase and planting. We will additionally provide Producers $150/acre to cover their planting costs and provide financial return on their ryegrass bioenergy crops. We will provide an additional $400/acre placed into switchgrass to offset the foregone corn cash crop as Producers plant switchgrass as a sustainable bioenergy crop. The project will also provide farmers with funds to purchase chicken litter and Element Soil™ field amendment to serve as starter fertilizer for corn production if desired and appropriate within the farm's nutrient management plan. Finally, we will provide a cover crop harvester and transport system to collect silage produced by our partner producers, as these new CSAF systems will require equipment outside the range of that used on small farms.

The strategy to minimize the transaction costs associated with the delivery of poultry litter to the AD facility are similar to those employed for the delivery of the cover/bioenergy crop feedstocks. PFED has an ongoing agreement with Millennium Farm to supply its farm-scale AD system with poultry litter from a pre-existing manure storage shed immediately adjacent to the AD facility. We will compensate Millennium Farm for poultry litter feedstock used in the farm-scale AD system as long as that price is competitive in the market. The transaction costs tied to digestate storage, transport and marketing will be offset via multiple approaches. Product storage will be provided as an in-kind contribution by PFED, whose operations already include a storage facility at the farm-scale AD site. Element Soil product transport costs will be provided as an in-kind contribution in keeping with PFED's existing operations and overhead, while new approaches to marketing these climate-smart products will be generated by our project team.

To bring the process full circle, as mentioned above, cover crop Producers will be compensated for their purchase of PFED's Element Soil™ field amendment, while transport costs will be offset by leveraging the MDA's Manure Transport Program, which currently provides up to $28/short ton for the hauling of litter away from Maryland's Eastern Shore[6].

F. Approach to Reducing Barriers to CSAF Practice Implementation Practices

A well-respected needs assessment of Black farmers on the Delmarva Peninsula was conducted in 2016 by The Common Market, Inc., a Pennsylvania non-profit. It documented the following challenges facing these producers: (1) An aging and declining minority farmer population; (2) Necessity of on-the-ground outreach; (3) Privacy in relationships; (4) Distrust of the government; and (5) Moving beyond conventional crops[12]. In response, we have enlisted the faculty at UMES (an Historically Black College and University) and partnered with the 2020 Farmers' Cooperative, who specialize in organizing and educating small land-holding minority farmers, to overcome these barriers. Our collaborators have existing relationships with underserved producers, and we will leverage these ties to onboard farmers with interest in our proposed CSAF practices and the opportunities that new, non-conventional, and climate-smart commodities may afford them. We will facilitate all activities associated with new commodity

production to allow our partners to establish a foothold in the new market without incurring capital expenditures that are barriers to entry[12]. Each feedstock producer will be integrated into the small but established market for AD feedstocks and will receive compensation and any necessary guidance for their participation via project funds, ensuring a dependable and viable market within which they can gain confidence in the new practices.

G. Geographic Focus

The Delmarva Peninsula is unique to the mid-Atlantic region. While much of the Eastern Seaboard has become increasingly developed, the Eastern Shore of the Chesapeake Bay remains overwhelmingly rural. Of the Delmarva's roughly 3.5 million acres, nearly 44% is in agricultural production[4] and the region still displays many characteristics of its past. This includes the shadow of slavery, which was prevalent in Delmarva and has led to many of the legacy effects on demographics and landholding still seen today. Developing new markets and commodities that will help to address these lingering inequities is a chief goal of this project.

Forming the western boundary of the Delmarva Peninsula is the Chesapeake Bay, a valuable natural resource that shapes the culture and economy of the region. Although the Delmarva comprises only 7% of the total watershed area, it contributes a disproportionately large amount of excess nutrients to the bay through the delivery of agriculturally-applied nutrients to groundwater, streams, and tidal marshes[13–15]. Reducing these impacts with CSAF practices outlined in this project will contribute to nutrient mitigation in the region.

Chicken production in the region is a significant enterprise, and agricultural producers support the industry by supplying grain for feed and wood chips and grasses for bedding. The wastes generated by the poultry industry present human health and environmental nutrient management challenges and represent a growing problem in the region. Poultry litter has become an attractive feedstock for AD operators representing an opportunity to mitigate these challenges. This project seeks to leverage these new economic developments by simultaneously assessing, informing, and adding value to the economic decisions being considered by underserved agricultural producers and AD facility operators as they explore the development of these new climate-smart markets.

H. Project Management Capacity of Partners

We have assembled a partnership team that will trial and evaluate the potential of new agronomic production systems for annual and perennial grass bioenergy feedstock commodities that will form the foundations for a circular, CSAF production system for chicken feed, chicken, and chicken litter waste generated by the substantial broiler industry on the Delmarva Peninsula. We will implement agronomic practices and activities for two new commodities, measure and quantify their impacts on GHG and nutrient management budgets, assess and verify benefits to underserved producers, and develop and promote these new systems to create new climate-smart commodities to mitigate climate change and benefit small farm economies in the region. Our management team includes:

Dr. Jonathan Cumming (University of Maryland Eastern Shore, UMES), the project's Principal Investigator, is a broadly-trained environmental scientist with expertise in plant-soil interactions, nutrient cycling, and soil C sequestration processes in forested and agroecosystems[18–20]. He will coordinate activities across the entire project and implement field-scale quantification of soil C and nutrient changes, which will be used in the verification of GHG benefits and impacts of NRCS Conservation Practice Standards (CPSs) central to climate-smart production. Dr. Cumming will ensure that data streams inform outreach to our Producers through University of Maryland Eastern Shore Extension efforts.

Dr. Kate Tully (University of Maryland, UMD), the project's co-PI, leads sustainable agricultural practices related to climate change and agricultural management strategies that increase soil organic carbon (SOC) and ecosystem services[21–24]. She is also very familiar with the Lower Eastern Shore and the potential for emerging markets and alternative farming practices in the face of climate change[25–27]. Dr. Tully will lead the field-scale GHG measurement and monitoring efforts, which will be used in the verification of GHG benefits. She will also provide technical assistance to promote the CSAF practices and commodities through University of Maryland Extension efforts and the Soil Conservation District Office (see letter of support).

Mr. Andrew Moss has extensive experience in the anaerobic digestion (AD) industry and is currently an independent contractor for Chesapeake Utilities Corporation. Most recently he was the owner and Technical Director at Planet Found Energy Development (PFED), where he oversaw design, construction, and operation of agricultural poultry litter AD systems at the pilot and farm-scale while also guiding the company's R&D programs. Mr. Moss will oversee the integration of grass feedstocks into existing poultry litter anaerobic digestion operations at the lab and pilot scales, and will facilitate Drs. Hassanein and Lansing's work assessing GHG emissions from AD processes.

Dr. Mohammad Ali (UMES) is a food and resource economist with a specialization in agricultural marketing and trade. Together with Dr. Brown (below), he will conduct economic analyses of the project's commodities, cost-benefit analyses of market demand and pricing based on user surveys and/or expert opinions and develop marketing strategies for the climate-smart commodities developed under this project.

Dr. Kate Brown (UMES) has broad experience in financial management and analysis. She will work with Dr. Ali to develop the economic analysis based on the costs and benefits of incorporating cover crops into the AD process. She will also contribute to develop the marketing plan for the climate-smart commodities based on the results of the cost/benefit analysis.

Dr. Jennifer Timmons (UMES) has extensive experience working with the region's broiler's industry and has a strong relationship with the broiler industry on Delmarva, which allows her to conduct valuable applied research and provide extension programming to benefit broiler chicken producers. She will serve as liaison between the project and industry-associated groups and grain and chicken producers during stakeholder meetings and focus groups.

Dr. Amro Hassanein (UMD) is research scientist with UMD's anaerobic digestion extension unit and has vast experience with life-cycle assessment and anaerobic digestion[28–30] at the lab and field-scale. He will lead measurement and monitoring GHG emissions from the AD, which will be used in GHG and economic modeling efforts central to establishing climate-smart commodities.

Dr. Marccus Hendricks (UMD) is an expert in environmental justice in Maryland who uses a combined social vulnerability and environmental justice framework to ensure that low-income and communities of color are planned and accounted for in environmental projects. For this project, he will gather information needed to assess the barriers and opportunities for implementing bioenergy feedstock adoption among minority growers on the Delmarva.

Dr. Stephanie Lansing (UMD) is an expert in manure management technologies, including anaerobic digestion[31,32], gasification, composting, digestate, biochar utilization[33,34], and cover crops and manure co-digestion[35,36] who has long-standing associations with USDA, the Maryland Department of Agriculture, and the Maryland Energy Administration. Dr. Lansing will coordinate the economic analyses integrating AD and climate-smart feedstocks and life cycle assessments of the climate-smart supply chain, including GHG emissions from AD gasification.

Planet Found Energy Development, LLC has owned and operated a farm-scale poultry litter AD and nutrient recovery (NR) facility in Pocomoke City, MD, since 2017, and has operated AD lab facilities since 2013. The company regularly works with farmers, universities, and state entities to explore new AD-related processes and commodities, and has established new facilities, processes, and technologies in the poultry litter AD sector and on the Delmarva Peninsula. It is currently developing a farm-scale renewable natural gas upgrade to its existing AD facility, where it currently generates renewable energy and its soil conditioner, Element Soil™, from poultry litter feedstocks.

Millennium Farms is owned by Mr. Jason Lambertson, a third-generation poultry grower. The Producer has participated in numerous environmental stewardship projects, such as protective buffers and easements, and holds certification as a Maryland Agriculture Land Preservation site. ***Millennium Farms is an early adopter and innovator in the implementation of CSAF practices,*** making the farm an ideal testbed for this project.

The 2020 Farmers Cooperative is a national organization that ***promotes fair and equitable agricultural opportunities for Black and socially disadvantaged farmers***. The 2020 Co-op promotes training and best practices, farmer advocacy, and collective economics to empower farmers who have historically been disenfranchised. Ms. Sharon Mallory (see letter of support) will partner with our team to provide outreach, technical assistance, and training to historically underserved farmers, implement CSAF strategies on historically underserved farms, and help track, monitor, and document improvements in utilizing CSAF practices.

ii. Implementation of CSAF Practices by Underserved Farmers on the Delmarva

A. Using CSAF Practices to Reduce GHG Emissions and Sequester C in Soils

We will augment the existing regional production system, which generates corn fertilized with poultry litter and synthetic fertilizers, with two new production commodities: an **annual ryegrass mix** grown as a winter cover crop to supplement the existing corn rotation and **perennial switchgrass** grown as a dedicated bioenergy crop. Both will support the emerging bioenergy sector within our region by providing feedstocks for AD facilities. We will deploy CSAF practices leveraging multiple pathways to reduce soil GHG emissions, sequester C in soils, reduce soil nutrient leaching losses (**Figure 1**). In addition, **corn** will also become a climate-smart commodity in that new agronomic practice (explained below) that will serve to increase soil C storage and reduce nutrient losses (**Figure 1**). Chicken may be the ultimate salable/marketable commodity (e.g., Climate-Smart branded chicken in grocery stores), but it is beyond the scope of this project to measure output or GHG emission balance changes incorporating chicken production. However, *our commodities and approaches lay a strong foundation for establishing a market in CS™ Chicken that could contribute to climate mitigation and generate greater income streams to farmers throughout the region due to the higher revenue from climate-smart feed and new feedstock production.*

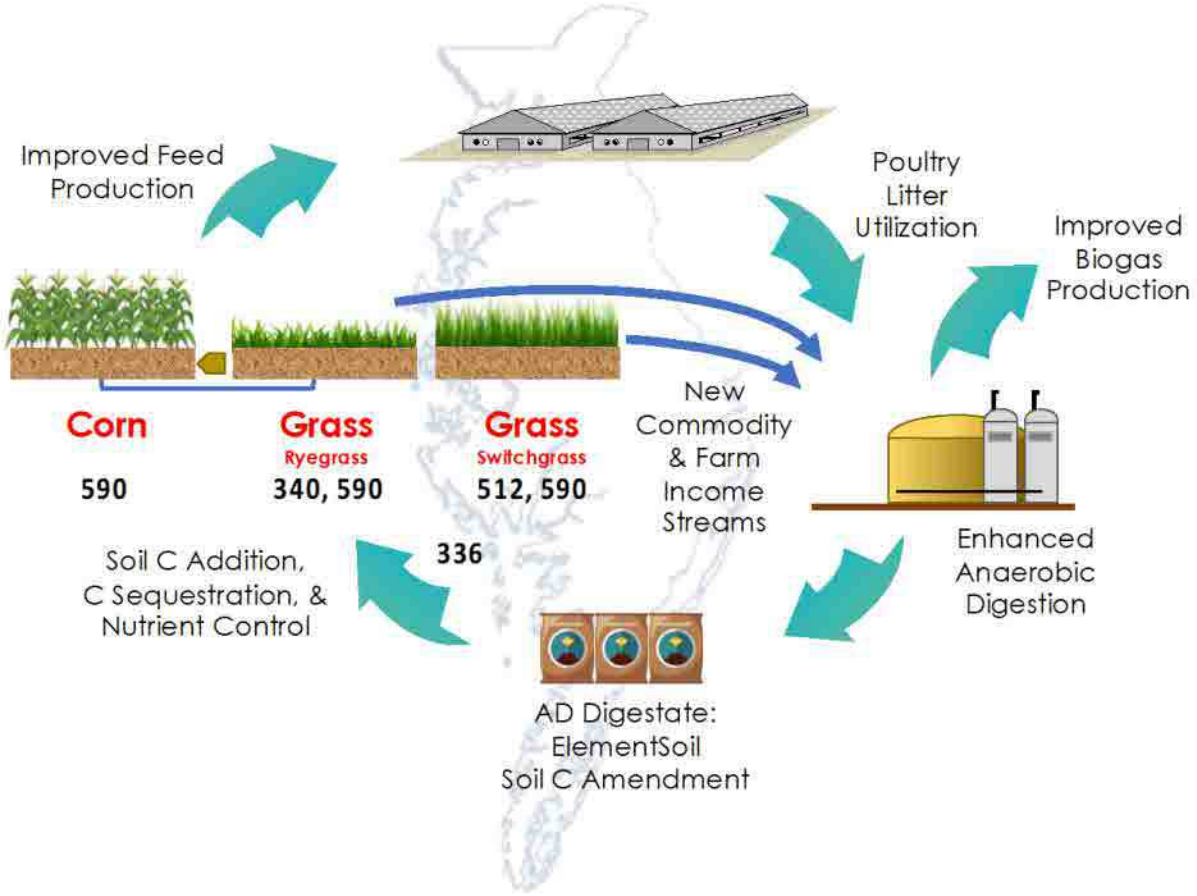

Figure 1. Commodities (red) and CSAF practices (CSP numbers, black) in the cycling (teal arrows) of feed and waste/biogas production in the poultry industry on the Delmarva Peninsula. Grass includes annual ryegrass (existing, as winter cover crop for corn) and perennial switchgrass (new) as commodities that involve the NRCS Conservation Practice Standards (CPS) **Soil Carbon Amendment** (litter, digestate) (**336**), **Cover Crop** (ryegrass) (**340**), **Hay and Forage Planting** (switchgrass) (**512**), and **Nutrient Management** (**590**, all cases). New practices, harvesting ryegrass and planting and harvesting switchgrass, create new commodities and income streams (blue lines) for underserved Producers. The blending of ryegrass and switchgrass feedstocks will enhance poultry litter waste treatment and gasification in the anaerobic digester. The resulting digestate will serve as a soil amendment for the corn and grass commodities, which should sequester soil C and reduce nutrient leaching while boosting production.

Our CSAF practices for biomass production will explore the potential for reduced GHG emissions from the land, increased soil C sequestration, and nutrient retention, while providing the opportunity for increased revenue via multiple (2–3) harvests each year to our Producers. Multiple harvests have the added benefit of decreasing AD infrastructure costs by decreasing capital expenditures necessary for storage in our production cycle. ***The proposed activities involve the following commodities and CPSs:***

- An **annual grass**, a ryegrass mix (*Lolium multiflorum/Lolium × hybridum/Lolium perenne*), as well as a **perennial grass**, switchgrass (*Panicum virgatum*), will both be commodified as additives to poultry litter AD processes, creating new potential revenue streams to underserved farmers while increasing renewable energy production. The annual ryegrass will fit seamlessly into existing farming and soil conservation practices on the Delmarva Peninsula, serving as a winter cover crop (**CPS 340**) but grown now as an additional cash crop. The high productivity and perennial nature of switchgrass (**CPS 512**) will enhance soil C sequestration and nutrient retention (**CSP 590**) through its high productivity and deep rooting, representing a sustainable new feedstock for AD. The production of both of these commodities includes soil carbon amendment (**CSP 336**) with chicken litter (standard) or Element Soil™ (new practice) from which we will assess GHG emissions and soil C accretion.
- **Corn**, a standard rotational crop in the region associated with chicken production, is the third commodity influenced by this proposal. Standard practice on the Delmarva is to rotate an annual cover crop (fall/winter) with corn, alternating with soybean. For purposes of this project, we will only practice cover cropping of the annual, winter bioenergy crop (ryegrass) with corn using soil carbon amendment (**CSP 336**) alternatives, comparing no addition, chicken litter, or the addition of Element Soil™ as soil C amendments during rotation. Element Soil™ is a complex mixture of organic nutrients and carbon that provides organic/stable carbon residues and recalcitrant organic N and P as nutrients to the soil (**CSP 590**).

Two other end products of our proposed system (**Figure 1**) will have significant economic and environmental impacts. First, through PFED's AD process, chicken litter is converted into low-odor, nutrient-rich agricultural field amendments and horticultural soil conditioners that are currently sold as **Element Soil™**. The digestate will be evaluated as a soil C amendment in this proposed project to boost cover crop and corn productivity[10]. Our research on GHG emissions and ecosystem services from all aspects of the production process will aid in evaluating its climate impacts and marketing the commodities tied to it. Second, incorporating bioenergy feedstocks into the poultry litter AD process will boost the production of **biogas**, which represents a climate-smart energy source that has the ability to offset fossil-fuel based electric and gas and reduce net GHG emissions.

B. New Commodities will be Produced by Underserved Farmers

The new commodities, especially switchgrass, is ideally suited for production by small farms on the Delmarva. It is a perennial requiring single installation, has high per acre productivity, has low nutrient requirements, and is resilient to environmental stress, critical on the marginal lands often owned by the region's underserved farmers.

i. Plan to Enroll Underserved Farmers

We will work closely with the 2020 Co-op to identify and enroll regional farmers into the proposed activities (see letter of support). Ms. Sharon Mallory will be the lead on this activity, and will provide outreach, technical assistance, and training to project participants in conjunction with UMES in order to ensure sustained participation. Over the course of the project, we will enroll at least 20 producers in annual and perennial cover crop production and will target 75 acres for production (**Table 1**).

Table 1. *Anticipated number of Producers and acres reached through the project's activities.*

Practice Implementation	**Number of Producers (all years)***	**Cumulative Acreage Yr 1, Yr 2, Yr 3, Yr 4, Yr 5**
Bioenergy crop planting + harvest (ryegrass)	20	25, 25, 50, 75, 100
Bioenergy crop planting + harvest (perennial)	5	5, 10, 10, 10, 10, 10

*These may be the same or different individuals (e.g., there may be 15 producing annual ryegrass and 5 producing perennial switchgrass or it may be 20 producing both).

ii. Plan to Provide Technical Assistance to Implement CSAF Practices

The focus groups and surveys will specifically address technical assistance gaps and barriers to adoption of the climate-smart commodity system we are developing with underserved farmers. Data garnered will be used to generate targeted educational and outreach materials.

- Experimental trials at LESREC and field trials established at Millennium Farm will be used as demonstration sites for cover crops.
- We have budgeted for bioenergy crop harvesting and transportation equipment, and we will be present at Producer farms at harvest to facilitate mowing and provide technical guidance.
- Each year, we will participate in targeted outreach activities, including the Delmarva Crop School and the UMES Small Farm Conference, which will provide us with platforms to present our data and provide information to producer stakeholders.
- We have budgeted for a Capstone Symposium in year 5, in which we will hold a field trip to Millennium Farms and PFED and will present results to all our stakeholders (e.g., producers, extension agents, and policy makers).
- We will develop factsheets and extension articles to be posted through the University of Maryland Extension (UME) system and available online with hard copies available at Soil Conservation District Offices throughout the state of Maryland. Dr. Tully will collaborate with UME to generate a Budget Sheet for our climate smart commodity system, which will help producers understand costs associated with the adoption of new practices.
- The PIs will present data and progress to reports to the Soil Health Advisory Committee for the Maryland Department of Agriculture (MDA) to ensure that our project and its deliverables are in concert with the MDA water quality goals.

iii. Plan to Provide Financial Assistance to Implement CSAF Practices

Participating farmers will be compensated for their collaboration and participation in implementing several CSAF practices (**Table 2**) through several approaches to ensure participation and success:

- A $100 stipend to participate in surveys related to cover crops, bioenergy, and social justice designed to investigate potential social impediments to bioenergy crop adoption.
- An annual stipend ($5,000) will be provided for participation, PI-Producer collaboration, property access for soil sampling, and for the costs associated with seed purchase and planting.
- A $150/acre/year purchase agreement for growing ryegrass between the fall and spring for research purposes. This payment rate is $70 more per acre than the maximum payment they can receive through the Maryland Cover Crop Program[39]. Since we are harvesting the cover

crop, Producers will not be able to participate in the State program and our program will compensate them for this lost revenue.

- A $400/acre/year purchase agreement for growing perennial switchgrass instead of standard cover crop rotated with a cash crop. This amount is estimated to cover the foregone income made from a corn silage cash crop of low to moderate yield[40].
- Funds ($20/ton) will be provided for Producers to purchase chicken litter as needed to use in their rotations if this is within their nutrient management plans.
- The project will also provide Producers with funds for Element Soil™ field amendment to serve as starter fertilizer for corn production if desired and appropriate within the farm's nutrient management plan. This will be a direct payment to participating Producers.
- Producer meetings will be held annually to foster communication and knowledge sharing in our Climate-Smart Producer community (travel and food costs).
- Focus meetings throughout the first 4 years will bring together potential Producers and other stakeholders to discuss Climate-Smart production systems and attitudes towards implementation on the Delmarva (travel and food costs).
- Finally, we will provide a cover crop harvester and transport system to collect silage produced by our partner producers, as these new CSAF systems will require equipment outside the range of that used on small farms. This will be an in-kind payment to participating Producers and is not used in compensation calculations.

Table 2. *Breakdown of financial assistance provided to farmers.*

Item	**Producers or Acres Each Year**	**Unit Cost**	**Total**
Producer survey participation	20 all years	$100	**$10,000**
Producer stipends	5, 7, 12, 17, 20	$5,000	**$305,000**
Ryegrass planting/harvest	25, 25, 50, 75, 100 acres	$150	**$41,250**
Switchgrass planting/harvest	5, 10, 10, 10, 10 acres	$400	**$18,000**
Poultry litter feedstock cost	30, 30, 50, 75, 100 acres	$20*	**$6,056**
Element Soil cost	25 acres all years	$30*	**$3,982**
Producer meetings	5, 10, 15, 20, 25	$98	**$6,860**
Focus group meetings	4, 4, 4, 4, 0 per year	$1,180	**$18,880**
	Total Producer Assistance		**$410,028**

*Starting price, 3% incremental increases applied to offset inflation.

Importantly, we will also focus on the environmental justice factors inherent to the implementation of any new agricultural practice or technology. To do this, we will build on a project currently funded by MDA (and led by Dr. Lansing) in which Drs. Hendricks and Lansing

are conducting a comprehensive evaluation of waste-to-energy technology from an environmental justice perspective for all manure types generated in the State of Maryland (not just litter). In that work, the aforementioned researchers conduct focus groups, interviews, and surveys with farmers, industry, government officials, and those living near waste-to-energy sites (current or planned) to identify the concerns and opportunities associated with these facilities, explore areas for improved community planning, and understand existing barriers to development. In work conducted under this proposal, we will apply the methods from our state-wide effort and focus on the dynamics of the Eastern Shore, the poultry industry, and potential bioenergy crop farmers. Additionally, we will work through the 2020 Co-op to incorporate those underserved farmers enrolled (or contemplating enrollment) in this project's cover crop program. We will host at least four focus groups per year in years 1–4. We will also distribute paper and online surveys to stakeholders and other relevant groups, and we will coordinate with the 2020 Co-op to reach out to groups who may be underrepresented in online surveys and interviews, conducting door-to-door interviews with iPads and setting up booths at relevant meetings in order to field additional feedback.

iii. Measurement/Quantification, Monitoring, Reporting and Verification Plan (see also supplemental MMRV document)

A. Approach to GHG Benefit Quantification

1. GHG reductions from AD. The renewable energy produced (biogas, including methane content) will be quantified using a mass balance approach, with the energy output based on the mass of poultry litter and cover crop inputs. All energy outputs will be based on 1 ton of substrate processed in the AD system, with energy inputs (pumps, electricity use, and heating) quantified as well as any flared gas. CarbOn Management Evaluation Tool[8] will be used to monitor carbon flows into and out of the system, including fugitive gas emissions.

To account for any fugitive gas emissions from the AD system and subsequent storage, a tracer gas dispersion method will be used[41]. Methane (CH_4) emission rates from the AD system will be quantified using a tracer acetylene gas (C_2H_2), which will be released into the AD system over a 24-hour period. Concentrations of CH_4 and C_2H_2 will be measured while traversing the CH_4/C_2H_2 plume at distances up to 2 km away and measured using a high-precision Piccaro Dual Carbon Isotope Analyzer (Model G2201-i), with samples collected and analyzed in Yrs 2–4, with measurement of $\delta^{13}C$ to identify the origin of CH_4 emissions[41–43].

2. GHG measurements from litter storage, silage, and back-end storage. We will measure CH_4, carbon dioxide (CO_2), and ammonia (NH_3) from litter silage, silage, and back-end product storage using a GEM 5000 Series Landtec. The CH_4, CO_2, and NH_3 samples will be collected from static chambers, and injected into the Landtec to determine concentrations. Nitrogen oxides (NO_x) and nitrous oxide (N_2O) will be measured using methods described in section 5.b.

3. AD monitoring. To test the efficiency of the digestion process, samples will be collected monthly from the AD influent (liquids from solid-liquid separator), AD effluent, and inside the digester and analyzed in triplicate, for total solids, volatile solids, C:N, ammonium (NH_4), and pH, as described in our previous publications[44,45].

4. Litter nutrient measurements. Undigested and digested poultry litter will be analyzed for moisture, C:N, and mineral N and P content to calculate application rates. Moisture will be measured gravimetrically. Total C and N will be measured in dried litter samples using a FlashSmart CNS Analyzer (Thermo Scientific, USA). Total P will be measured by ICP-MS (Thermo Scientific iCAP) following digestion of samples in nitric acid. Samples will be extracted with potassium chloride for mineral N and Mehlich 3 for bioavailable P determination. Mineral N

(nitrate [NO_3^-] and NH_4^+) and phosphate (PO_4^{3-}) will be measured colorimetrically using a Gallery Discrete Analyzer (Thermo Scientific).

5. **Field trial (Years 1–4).** To quantify the effect of post-fermentation-bioproducts to reduce GHG emissions, reduce nutrient applications to grain production fields, improve soil health, and increase C sequestration, we will establish a randomized complete block field experiment at the Lower Eastern Shore Research and Education Center (LESREC) in Quantico, MD. In order to quantify the impacts of a new cropping system that integrates cover crops and anaerobic digestates, we will examine both a typical cover crop (terminated with herbicide) before planting no-till corn and a cover crop that has been harvested for anaerobic digestion feedstock prior to termination. The field experiment will consist of six treatments replicated in 4 blocks as outlined in Table 3.

Table 3. *In-field treatments of cover crop, poultry litter, and mineral fertilizer management. To ensure that all treatments receive the same amount of starter N from litter, we will calculate plant available N (PAN) as 50% of total N in dry poultry litter.*

Trt name	Crop	Harvest	Litter	
CCMIN (BAU)	Ryegrass mix	Terminated with herbicide before planting corn	none	UAN starter: 30 kg N/ha topdressing: 130 kg/ha
hCCPL	Ryegrass mix	Harvested, terminated with herbicide before planting corn	undigested (starter) 9 kg PAN/ha/yr	UAN topdressing: 130 kg N/ha
hCCDPL	Ryegrass mix	Harvested, terminated with herbicide before planting corn	digested (starter) 9 kg PAN/ha/yr	UAN topdressing: 130 kg N/ha
SwMIN	Switchgrass	Harvested 2x per year	none	none
SwDPL2	Switchgrass	Harvested 2x per year	digested litter 130 kg N/ha/yr	none
SwDPL3	Switchgrass	Harvested 3x per year	digested litter 130 kg N/ha/yr	none

a. Project Year 1 (experiment establishment with minimal measurements). We will analyze baseline soils from each block at four depths (0–10, 10–20, 20–30, and 30–60 cm) for bulk density, texture, total C, N, inorganic N, and bioavailable-P. Switchgrass plots will be seeded in June 2023; ryegrass cover crop will be planted in the fall of 2023. Three days prior to termination of the ryegrass (mid-May 2024), we will collect cover crop biomass using a 0.5 m^2 quadrat (three replicates per plot) from all bioenergy crop plots. Samples will be dried for dry-weight equivalent (DWE) and scaled to the plot-level. Subsamples will be ground to a powder and analyzed for total C and N. The same day as biomass collection, we will use a forage harvester (Case IHFHX300) with a silage chopper to remove the cover crop biomass from the plots. Corn will be planted using a no-till drill into all rotation plots along with the starter fertilizers indicated in **Table 3.** At corn harvest, we will collect annual yields using a Massey-Ferguson 8XP small-plot combine. Sub-samples of corn grain from each plot will be collected, dried, ground, and analyzed for total C and N. Following corn harvest and before cover crop planting (in Yr 2), we will again collect soil samples at the plot-level (0–60 cm) and analyze for available N and P as above.

b. Project Years 2 to 4. Ryegrass will be planted in the fall as in Yr 1. In Yr 2, all plots will be instrumented for measuring GHG emissions, soil porewater chemistry, and root production following cover crop planting. We will use a static chamber approach to measure GHG emissions from plots with one chamber installed per plot. Ammonia will be measured using the passive diffusion method followed by extraction for NH_4[47–49]. Sampling for GHG will occur at least every 2 weeks over the cover crop growing season. CO_2, CH_4, N_2O will be measured on a SRI gas chromatograph fitted with an electron capture detector, and NO_x using a 2BTechnologies Model 405 nm NO_2/NO/NO_x Monitor. We will collect GHG emissions and NH_3 diffusion for 3 days following harvesting and three days following cover crop termination. To collect porewater, we will install 2 rhizon pairs per plot at 20 and 40 cm depth (n = 4 per plot) 5 m apart to capture within-plot variability. Rhizons will be sampled periodically throughout the fall and spring following rain events of over 20 mm over 2 days. Porewater will be analyzed for NO_3^-, NH_4^+ on a Gallery Discrete Analyzer, dissolved organic carbon and total N on a TOC-L (Shimadzu), and dissolved organic N (by difference). Porewater will be collected following a rainfall event (at least 20 mm over 2 days) as close to these field activities as possible as to ensure a good collection and analyzed as described above. Soil coring (2.5-cm, two per plot) conducted monthly will be used to assess root biomass at intervals from 0-60 cm depths. Roots and fungal hyphae will be monitored using minirhizotrons (CI-602, CID Biosciences). Images will be captured biweekly. An improved method combining measurements of soil cores and minirhizotrons developed by Li et al. (2020)[50] will be used to quantify root production and mortality.

Prior to corn planting, all instrumentation will be removed from the field. Cover crop biomass will be collected and analyzed as in Yr 1. Chambers will be reinstalled following corn planting. Gas sampling and NH_3 diffusion will be conducted at least five times during the 7 days following fertilizer applications and at least weekly for the following 4 weeks. Rhizons will be reinstalled following corn planting and samples will be collected following the first rainfall event after planting and topdressing and collected every 2-3 weeks throughout the corn growing season following sufficient rainfall events. Rhizotrons will be reinstalled following corn planting and images and cores collected on schedule noted above. Corn will be harvested, and grain analyzed as described in Yr 1. At the end of the study (Yr 4) we will measure SOC in all plots at 0–10, 10–20, 20–30, 30–60 cm depths.

6. Life cycle assessment (LCA). All the data measured from cover crops, litter, silage, AD, and back-end Element Soil™ storage will be used to conduct the LCA. The LCA of the nutrients, energy, GHG, and C flows will be performed using the 2022 version of the GREET Model[7] to evaluate the effectiveness of the technology in reducing the environmental impacts, with inputs based on COMET[8], where applicable. The LCA impact categories will include GHG emissions, energy consumption and production, eutrophication, and human toxicity. The scope of the project will be "from cradle to grave," specifically from the manufacture of the waste technology materials to the disposal of the systems. The functional unit will be 1 metric ton of substrate (poultry litter plus cover crops) added to the system. ***Through the LCA, differences in GHG emissions, energy consumed/produced, and nutrient transformations will be quantified, and the validity of the new production cycles as producing climate-smart commodities will be verified.***

B. Approach to Monitoring of Practice Implementation

Monitoring implementation. In Yrs 1–5, we will work with Producers to test different cover crop species for use as feedstock for anaerobic digestion (**attached Benchmarks document**). We will work with Millennium Farms to specifically test the efficacy of multiple cuts of the ryegrass mixture for use as feedstock[51] and will partner with 20 Producers to explore the viability of annual ryegrass and perennial switchgrass as climate-smart AD feedstock commodities. We will collect bioenergy crop biomass using 0.5 m^2 quadrats prior to harvest and/or termination. Biomass sub-samples will be weighed wet in the field and then oven-dried to calculate the DWE. Plant material will be analyzed for C and N as described above and for biomethane production potential to evaluate its potential as a digestion feedstock[51]. We will quantify a suite of metrics that will allow us to capture the potential C storage and ecosystem services provisioning of different harvested cover crops using LCA.

While we have control over the intensive monitoring plots at LESREC and are confident of implementation at Millennium Farm due to our historical relationship, implementation and compliance of planting and management CPSs by our Producers is less certain. We will foster relationships with them through the 2020 Co-op and through onsite visits by the PIs and NRCS field operatives. Onsite visits in the spring for planting and harvest (using project equipment) and data acquisition and sharing will maintain field production.

Plan for non-compliance. We will be adding Producers each year to ensure that we hit our target acreage throughout the study. We will work with the Somerset County NRCS office to ensure that all of our Producers are following conservation practice standards for hay and forage planting (CPS 512) and cover crops (CPS 340). We will enter discussion with farmers not in compliance to ascertain whether increased technical assistance is required or if interest in participation has waned. New partners will be sought as needed.

C. Approach to Reporting and Tracking of GHG Benefits

The LCA of the nutrients, energy, GHG, and carbon flows will be performed using the 2022 version of the GREET Model to evaluate the effectiveness of the different treatment approaches in reducing the environmental impacts of poultry litter applications and benefits of cover crop production. In parallel, soil C sequestration will be modeled by comparing COMET outcomes for the different field-based treatments implemented in this project (**Table 2**). Variable inputs to the model include: (1) cropping sequence and planting and harvest date for cover crop and corn crop; (2) type of tillage system; (3) rate, timing, type and application method for fertilizer and litter applications; and (4) residue management.

Starting at the farm scale, we will measure changes in cover crop and grain productivity and soil C sequestration resulting from the treatments that will enhance GHG mitigation due to

increased plant productivity resulting from litter/digested litter application. Measured values for soil C sequestration will be compared to modeled C sequestration predicted by COMET. We will then model these benefits with increasing acreage allocated to the various cover crop treatments (Table 3) and then to aspiration application of our production system to determine the larger potential greenhouse gas mitigation from the cover crop utilization on the Delmarva Peninsula. Finally, these benefits will be normalized to acreage in cover crop production, Element Soil™ units produced, and the producer incentives to establish the GHG benefits of our climate-smart commodities and the dollar investments in the approach.

D. Approach to Verification of Greenhouse Gas Benefits

All energy inputs and outputs from the digester operation to cover crops, field application, and soil sequestration will be quantified. The COMET online management tool will be used for estimating changes in soil C sequestration, fuel, and fertilizer use resulting from changes in land management. The COMET results will be used with GREET life cycle assessment modeling to ensure that the C from the agricultural inputs and outputs are properly assessed in the GREET tools, which has been used for digestion GHG modeling and adopted by the California Air Resources Board[7]. The integration of these two platforms will ensure that the carbon offsets are accounted for (and not double-counted) based on agronomic data and C mass balance of the AD process, while also accounting for other energy inputs/outputs that affect GHG benefit calculations throughout the supply chain. Specifically, this entails using the GHG emissions reductions from COMET for cover cropping, soil conservation practices, and other innovative practices used at each partner farm, with the GHG emissions from manure and/or cover cropping storage that occurs prior to composting or digestion. The emission reductions from composting and digestion will be assessed based on reductions from background emissions in storage as well as reductions in emissions from the renewable energy production.

For example, our prior work has shown the presents GHG emissions and energy production of three types of livestock waste (dairy manure, poultry litter, and swine manure). Swine manure had the highest annual GHG emissions (153.7 $MtCO_{2e}$), followed by dairy manure (70.4 $MtCO_{2e}$), and poultry litter (12.6 $MtCO_{2e}$). Adding an anaerobic digester resulted in 102% reductions in GHG emissions (–13.3 $MtCO_{2e}$) for poultry litter. Composting poultry litter results in only 1.6 $MtCO_{2e}$ in GHG emissions. Composting dairy manure reduces GHG emissions by 66.7% compared to the baseline scenario, while digestion reduces GHG emissions by 106%. Similarly, composting poultry litter reduces GHG emissions by 84.1% compared to the baseline scenario, while digestion reduces it by 206% and thermal conversion reduces it by almost 100%. This highlights the effectiveness of composting and digestion in reducing GHG emissions and sequestrating carbon beyond the baseline GHG emission values from storage. We have not evaluated poultry litter emissions in conjunction with cover crop growth, digestion, and composting. This novel work will be conducted as part of this effort. Nor have we compared the work from COMET with the prior LCA work done using GREET and the EPA AgSTAR Digester Screening tool with the COMET tool from USDA and understood key differences and ensured that the system is evaluated from seed through harvest, storage, and digestion to ensure that GHG emissions factors are accounted for properly at each step in the process for both cover crops and poultry litter production.

E. Agreement to Participate in the "Partnerships Network"

We agree, and we have included the necessary travel funds in our budget. We look forward to networking with like-minded projects and sharing lessons learned, CSAF implementation strategies, and thoughts on using the current work as a springboard for future opportunities.

iv. Plan to Develop and Expand Markets for Climate-Smart Commodities

A. Partnerships Designed to Market Climate-Smart Commodities

Partnerships. **PFED**, one of our main partners, is committed to sustainability and our Producers have a small, but developing, market for their bioenergy feedstock commodities. The company was founded on the principles of generating renewable natural gas (RNG) while consuming agricultural waste on the Delmarva. **Chesapeake Energy**'s acquisition of PFED brings RNG and its environmental benefits to the Delmarva to tackle the challenges of chicken litter outlined in this proposal. Chesapeake, its shareholders, and its customers want innovative energy options that reduce greenhouse gas emissions and lower the region's carbon footprint. We will work with Chesapeake Energy through this proposal to ensure that bioenergy feedstocks from climate-smart production practices can be integrated into RNG generation, thus supporting feedstock production by our Producers using climate-smart practices.

We will further liaise with the **Delmarva Chicken Association** (DCA), an entity representing the five chicken producers on the Delmarva, to explore options to create pipelines for climate-smart commodities (corn) into the supply chain. In particular, we will approach **Perdue Farms**, whose corporate headquarters is in Salisbury, MD, 11 miles from UMES, to discuss their supply chain and potential incorporating corn (and in the long-term soybean and sorghum) generated using climate-smart agronomic practices as a way to create a CS™ chicken brand. Perdue recently released its organic line, and a climate-smart brand could potentially create a new market for farmer commodities.

In addition, the project team has the support of the **Delmarva Land and Litter Collaborative**, a regional organization that brings together representatives from chicken companies, farming, regulatory agencies, academia, and environmental groups to address the impacts of poultry-litter. The Collaborative will promote the project through its networks, and as appropriate, work with project partners to ensure the proposal's practice implementation and marketing objectives are achieved.

Outreach. To elevate the larger impacts selecting climate-smart commodities, we will develop a marketing portfolio to include a **Climate-Smart website** extolling the process of creating and benefits of climate-smart commodities, and **flyers** and **informational pages** for public events. In addition, our website will highlight our specific project goals, approaches, and activities and serve as an additional conduit (other than NRCS and Extension) for information to growers and other interested parties.

Branding. It is our thinking that the Partnerships Network formed by NRCS will spearhead the **Climate-Smart™** branding for products produced using climate-smart agronomic practices. As a group, the generation of a **logo**, **wordmark**, **Network website**, and other materials will unify the climate-smart activities and provide an avenue for highlighting the benefits of utilizing climate-smart commodities in the numerous supply chains in the agricultural and consumer sectors.

B. Plan to Track Climate-Smart Commodities Through the Supply Chain

The climate-smart commodities generated in this project will be integrated into both new (ryegrass and switchgrass to AD-RNG production) and existing (corn to chicken feed) supply chains.

Ryegrass and Switchgrass. The growing, harvesting, ensilage, and incorporation of the ryegrass and switchgrass commodities into the AD process will be tracked throughout the process with the metrics for the divergent agronomic practices outlined in **Table 4**.

Corn. Poultry feed is a complex combination of corn, soybean meal, and various cereals. In an ideal iteration, we would be able to use the corn commodity produced by our Producers using the new CSAF practices as a feedstock for poultry feed production and follow it through this supply chain. However, the scope of our corn production will be minimal and insufficient to integrate into existing production supply chains on the Delmarva Peninsula. However, data produced through this project (corn production under different agronomic inputs [kg/acre], nutritive content, cost, etc.) will be used to assess the potential scalability of climate-smart corn production to generate a CS™ consumer chicken line.

C. Estimated Economic Benefits for Participating Producers

The adoption of annual and perennial bioenergy grass commodities as feedstock additives for poultry litter AD is intended to create a new circular economy within the Delmarva Peninsula. In it, producers will generate new revenue either by the production of traditional crops in winter months (annual ryegrass mixes) or by the production of perennial switchgrass, which may be most impactful on under-producing, marginal acreage.

Table 4. *Metrics to be used to track commodities through supply chains.*

	Biomass Production	**Biomass Ensiling**	**Biomass Feed**	**AD (RNG Production)**	**Digestate Reapplication**
Grass Biomass	kg/acre	kg total	kg total (conversion efficiency)	kg converted to CH_4	kg to ag & horticulture
Commodity GHG Emissions	kg CO_2 equiv.	kg CO_2 equiv. (includes transport)	kg CO_2 equiv.	kg CO_2 equiv. (includes facility contribution)	kg CO_2 equiv. (includes transport)
Commodity Ecosystem Services	kg/acre C-sequestration; kg/acre N & P uptake	N/A	N/A	N/A	kg/acre C-sequestration; kg/acre N & P uptake
Commodity Social Services	acres brought into production; # jobs created	N/A	N/A	# jobs created	acres/county odor & vector reduction
Economic Services	$/metric ton ($/acre)	N/A	N/A	$/therm RNG	$/ton

In the case of annual grasses, we estimate that AD facilities are likely to pay between $75-90/ac for harvested grass biomass generated in a single cut. For reference, the State of Maryland subsidizes cover crop planting through the Maryland Agriculture Water Quality Cost-Share program (MACS) where, depending on the practices implemented, producers can receive up to $80/ac in incentive payments[39]. This price per acre would essentially allow winter grass crops, which also provide services commensurate with NRCS 340, to "pay for themselves," making them more economically sustainable and allowing for increased cover crop adoption in states beyond Maryland. We note that our project does not seek to undermine the MACS program as AD facilities could not absorb all of the cover crops produced in the state. Rather, our project aims to provide evidence that cover crops are a viable climate-smart commodity that can provide multiple agroecosystem services.

In the case of perennial switchgrass, we estimate that AD facilities are likely to pay the same $75-90/ac, although subsequent cuts may yield additional revenue. Importantly for the economic evaluation of this commodity, crop maintenance costs (e.g., fertilization, weed kill, irrigation) would be effectively zero after the first year of production, providing an attractive return, especially on previously sub-optimal land.

D. Post-Project Potential

The implementation of cover crop production and AD treatment have significant environmental benefits, including the reduction of erosion, eutrophication, and GHG emissions. Historically, the environmental impacts of production have been unvalued externalities that contributed to social and environmental injustices and global climate change. While Maryland has been a leader in addressing these externalities due to its proximity to and importance of the Chesapeake Bay to the state's economy and identity, the programs it has implemented have come at a high cost to the state's residents; developing new CSAF practices incorporating emerging industries such as poultry litter AD represents an approach to shift this burden away from the tax system and into the marketplace.

We anticipate that our work will increase the adoption of cover crop farming and biomass-to-energy projects (including poultry litter AD) across the region and possibly across the U.S. This has the potential to directly benefit underserved producers through the generation of new markets demanding new, climate-smart commodities. Pairing a low C:N feedstock like poultry litter with a high C:N, climate-smart cover crop commodity will improve renewable energy production from AD facilities. This has the potential to increase demand for both feedstocks, directly benefiting producers by way of increased revenues (a new cash crop for farmers who typically forego cover crop planting, and an end-user market for poultry litter producers) and/or reduced volatility in the manure marketplace. Meanwhile, our environmental justice, GHG and ecosystem service-related research into poultry litter and cover crops has the potential to beneficially inform general biomass-to-energy industry expansion, including the creation of new climate-smart commodity markets that support it. Our work will leave a legacy of information that serves both the industries exploring new commercial opportunities as well as the communities that face the choice of accepting them. Ultimately, we mean for our work to inform the USDA and the farming community at large as to the ability of agricultural waste-to-bioenergy approaches paired with adaptive cover crop production systems to simultaneously reincorporate America's historically underserved farmers into emerging markets and combat climate change.

b. References

1. U.S. Census Bureau. U.S. Census Bureau QuickFacts: United States. https://www.census.gov/quickfacts/fact/table/US/PST045221 (2022).
2. U.S. Department of Treasury. NMTC Public Viewer. *Community Development Financial Institutions Fund* https://cimsprodprep.cdfifund.gov/CIMS4/apps/pn-nmtc/index.aspx#?center=-98.475672,38.724&level=4&tool=layers&visible=OPPORTUNITYZONE (2022).
3. Delmarva Chicken Association. DCA Facts & Figures | Delmarva Chicken Association. https://www.dcachicken.com/facts/facts-figures.cfm (2022).
4. USDA National Agricultural Statistics Service. Census of Agriculture. *USDA/NASS QuickStats* https://quickstats.nass.usda.gov/ (2017).
5. Mark Dubin & Jim Glancey. *Estimating Poultry Litter Populations, Litter Nutrient Content, and Generation*. (2013).
6. Maryland Department of Agriculture. Manure Transport Program. *Maryland.gov* https://mda.maryland.gov/resource_conservation/Pages/default.aspx (2022).
7. Argonne National Laboratory. *CA-GREET3.0 Model*. (California Air Resources Board, 2019).
8. USDA NRCS. COMET-Farm. *COMET Farm* https://comet-farm.com/ (2022).
9. Blanco-Canqui, H. *et al.* Cover Crops and Ecosystem Services: Insights from Studies in Temperate Soils. *Agronomy Journal* **107**, 2449–2474 (2015).
10. Szerencsits, M. *et al.* Biogas from Cover Crops and Field Residues: Effects on Soil, Water, Climate and Ecological Footprint. *World Academy of Science, Engineering and Technology, International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* **9**, 413–416 (2016).
11. Maryland Department of Agriculture. Cover Crop Program. *Maryland.gov* https://mda.maryland.gov/resource_conservation/Pages/default.aspx (2022).
12. King, H. J. *Needs Assessment of Black Farmers on the Delmarva Peninsula: New Research to Recommend Intervention Priorities*. https://www.thecommonmarket.org/assets/uploads/reports/Needs-assessment-of-black-farmers-on-the-delmarva-peninsula-screen-publication.pdf (2016).
13. Böhlke, J. K. & Denver, J. M. Combined use of groundwater dating, chemical, and isotopic analyses to resolve the history and fate of nitrate contamination in two agricultural watersheds, Atlantic coastal plain, Maryland. *Water Resources Research* vol. 31 23192339 (1995).
14. Denver, J. M. *et al.* Nitrate fate and transport through current and former depressional wetlands in an agricultural landscape, Choptank Watershed, Maryland, United States. *Journal of Soil and Water Conservation* **69**, 1–16 (2014).
15. Debrewer, L. M., Ator, S. W. & Denver, J. M. Temporal Trends in Nitrate and Selected Pesticides in Mid-Atlantic Ground Water. *Journal of Environmental Quality* **37**, S-296-S-308 (2008).
16. Staver, K. W. & Brinsfield, R. B. Agriculture and Water Quality on the Maryland Eastern Shore: Where Do We Go from Here? *BioScience* **51**, 859–859 (2001).
17. Maryland Department of Agriculture. Animal Waste Technology Fund. *Maryland.gov* https://mda.maryland.gov/resource_conservation/Pages/default.aspx (2022).

18. Henderson, A. N., Crim, P. M., Cumming, J. R. & Hawkins, J. S. Phenotypic and physiological responses to salt exposure in Sorghum reveal diversity among domesticated landraces. *American Journal of Botany* **107**, 983–992 (2020).
19. Kelly, C. N., Schwaner, G. W., Cumming, J. R. & Driscoll, T. P. Metagenomic reconstruction of nitrogen and carbon cycling pathways in forest soil: Influence by different hardwood tree species. *bioRxiv* 2020.06.23.167700 (2020) doi:10.1101/2020.06.23.167700.
20. Kristy, B. *et al.* Chronic drought differentially alters the belowground microbiome of drought tolerant and drought susceptible genotypes of Populus trichocarpa. *Phytobiomes Journal* (In Press).
21. Tully, K. L. & McAskill, C. Promoting soil health in organically managed systems: a review. *Organic Agriculture* **10**, 339–358 (2020).
22. Basche, A. *et al.* Evaluating the Untapped Potential of U.S. Conservation Investments to Improve Soil and Environmental Health. *Frontiers in Sustainable Food Systems* **4**, (2020).
23. Crystal-Ornelas, R., Thapa, R. & Tully, K. L. Soil organic carbon is affected by organic amendments, conservation tillage, and cover cropping in organic farming systems: A meta-analysis. *Agriculture, Ecosystems & Environment* **312**, 107356 (2021).
24. de la Reguera, E. & Tully, K. L. Farming carbon: The link between saltwater intrusion and carbon storage in coastal agricultural fields. *Agriculture, Ecosystems & Environment* **314**, 107416 (2021).
25. Tully, K. *et al.* The Invisible Flood: The Chemistry, Ecology, and Social Implications of Coastal Saltwater Intrusion. *BioScience* **69**, 368–378 (2019).
26. Tully, K. L., Weissman, D., Wyner, W. J., Miller, J. & Jordan, T. Soils in transition: saltwater intrusion alters soil chemistry in agricultural fields. *Biogeochemistry* **142**, 339–356 (2019).
27. de la Reguera, E., Veatch, J., Gedan, K. & Tully, K. L. The effects of saltwater intrusion on germination success of standard and alternative crops. *Environmental and Experimental Botany* **180**, 104254 (2020).
28. Hassanein, A., Naresh Kumar, A. & Lansing, S. Impact of electro-conductive nanoparticles additives on anaerobic digestion performance - A review. *Bioresource Technology* **342**, 126023 (2021).
29. Hassanein, A., Witarsa, F., Lansing, S., Qiu, L. & Liang, Y. Bio-Electrochemical Enhancement of Hydrogen and Methane Production in a Combined Anaerobic Digester (AD) and Microbial Electrolysis Cell (MEC) from Dairy Manure. *Sustainability* **12**, (2020).
30. Hassanein, A., Lansing, S. & Tikekar, R. Impact of metal nanoparticles on biogas production from poultry litter. *Bioresource Technology* **275**, 200–206 (2019).
31. Lansing, S. *et al.* Food waste co-digestion in Germany and the United States: From lab to full-scale systems. *Resources, Conservation and Recycling* **148**, 104–113 (2019).
32. Witarsa, F., Lupitskyy, R., Moss, A., Kulow, A. & Lansing, S. Ammonia capture with biogas purification from anaerobically digested poultry litter. *Journal of Chemical Technology & Biotechnology* **96**, 431–438 (2021).
33. Choudhury, A., Felton, G., Moyle, J. & Lansing, S. Fluidized bed combustion of poultry litter at farm-scale: Environmental impacts using a life cycle approach. *Journal of Cleaner Production* **276**, 124231 (2020).

34. Choudhury, A. & Lansing, S. Adsorption of hydrogen sulfide in biogas using a novel iron-impregnated biochar scrubbing system. *Journal of Environmental Chemical Engineering* **9**, 104837 (2021).
35. Belle, A. J., Lansing, S., Mulbry, W. & Weil, R. R. Anaerobic co-digestion of forage radish and dairy manure in complete mix digesters. *Bioresource Technology* **178**, 230–237 (2015).
36. Belle, A. J., Lansing, S., Mulbry, W. & Weil, R. R. Methane and hydrogen sulfide production during co-digestion of forage radish and dairy manure. *Biomass and Bioenergy* **80**, 44–51 (2015).
37. Klavon, K. H., Lansing, S. A., Mulbry, W., Moss, A. R. & Felton, G. Economic analysis of small-scale agricultural digesters in the United States. *Biomass and Bioenergy* **54**, 36–45 (2013).
38. Saer, A., Lansing, S., Davitt, N. H. & Graves, R. E. Life cycle assessment of a food waste composting system: environmental impact hotspots. *Journal of Cleaner Production* **52**, 234–244 (2013).
39. Maryland Department of Agriculture. *2021/2022 Winter Cover Crop for Nutrient Management Program Requirements and Agreement*. https://mda.maryland.gov/resource_conservation/counties/CC_2021-22_Requirements_and_Agreement.pdf (2021).
40. Edwards, W. & Hart, C. *Pricing Forage in the Field | Ag Decision Maker*. https://www.extension.iastate.edu/agdm/crops/html/a1-65.html (2018).
41. Scheutz, C. & Fredenslund, A. M. Total methane emission rates and losses from 23 biogas plants. *Waste Management* **97**, 38–46 (2019).
42. Fredenslund, A. M., Hinge, J., Holmgren, M. A., Rasmussen, S. G. & Scheutz, C. On-site and ground-based remote sensing measurements of methane emissions from four biogas plants: A comparison study. *Bioresource Technology* **270**, 88–95 (2018).
43. Mønster, J. G., Samuelsson, J., Kjeldsen, P., Rella, C. W. & Scheutz, C. Quantifying methane emission from fugitive sources by combining tracer release and downwind measurements – A sensitivity analysis based on multiple field surveys. *Waste Management* **34**, 1416–1428 (2014).
44. Achi, C. G., Hassanein, A. & Lansing, S. Enhanced Biogas Production of Cassava Wastewater Using Zeolite and Biochar Additives and Manure Co-Digestion. *Energies* **13**, (2020).
45. Nachod, B., Keller, E., Hassanein, A. & Lansing, S. Assessment of Petroleum-Based Plastic and Bioplastics Degradation Using Anaerobic Digestion. *Sustainability* **13**, (2021).
46. Davis, B. W., Mirsky, S. B., Needelman, B. A., Cavigelli, M. A. & Yarwood, S. A. Nitrous oxide emissions increase exponentially with organic N rate from cover crops and applied poultry litter. *Agriculture, Ecosystems & Environment* **272**, 165–174 (2019).
47. Svensson, L. & Ferm, M. Mass Transfer Coefficient and Equilibrium Concentration as Key Factors in a New Approach to Estimate Ammonia Emission from Livestock Manure. *Journal of Agricultural Engineering Research* **56**, 1–11 (1993).
48. Powell, J. M., Jokela, W. E. & Misselbrook, T. H. Dairy Slurry Application Method Impacts Ammonia Emission and Nitrate Leaching in No-Till Corn Silage. *Journal of Environmental Quality* **40**, 383–392 (2011).
49. Fukae, K. & Takenaka, N. Application of Passive Sampler for Ammonia Gas in Soil. *Water, Air, & Soil Pollution* **229**, 145 (2018).

50. Li, X. *et al.* An improved method for quantifying total fine root decomposition in plantation forests combining measurements of soil coring and minirhizotrons with a mass balance model. *Tree Physiology* **40**, 1466–1473 (2020).
51. Herrmann, C. *et al.* Methane production potential of various crop species grown in energy crop rotations. *Landtechnik* **71**, 194–208 (2016).
52. Planet Found Energy Development. Element Soil. *Element Soil* https://elementsoil.com (2022).
53. Möller, K. & Müller, T. Effects of anaerobic digestion on digestate nutrient availability and crop growth: A review. *Engineering in Life Sciences* **12**, 242–257 (2012).

	Year 1				Year 2				Year 3				Year 4				Year 5			
Month	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun
Calendar Year	2023		2024				2025				2026				2027				2028	
Quarter	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Producers																				
Producers planting ryegrass (count)	1	4				7				12				17				20		
Producers planting switchgrass (count)	1		2				3													
Underserved producers (count)		3	2			5	2			10				13				15		
Dollars provided to producers for planting ryegrass ($)		$3,750				$3,750				$7,500				$11,250				$15,000		
Dollars provided to producers for planting switchgrass ($)			$2,000				$4,000				$4,000				$4,000				$4,000	
Stipend provided to producers for participating in project ($)	$5,000	$20,000				$35,000				$60,000				$85,000				$100,000		
Acres receiving poultry litter application (acres)		25	5			25	5			50				75				100		
Dollars provided to producers for purchasing poultry litter ($)		$500	$100			$515	$103			$1,061				$1,639				$113		
Dollars provided to producers for purchasing Element Soil ($)			$750				$773			$796				$820				$844		
Number of acres planted in ryegrass (acres)		25				25				50				75				100		
Number of acres planted in switchgrass (acres)			5				10 acres for the rest of the project (perennial pasture and hay)													
Measurement tools																				
Soil total C and N analyzed (acres)		10.4				10.4				10.4				10.4				10.4		10.4
Soil inorganic nitrogen analyzed (acres)		10.4				10.4				10.4				10.4				10.4		10.4
Soil available phosphorus analyzed (acres)		10.4				10.4				10.4				10.4				10.4		10.4
CO2, CH4, N2O measured in fields (acres)						1 acre instrumented for the rest of the project														
NH3 gas in fields (acres)						1 acre instrumented for the rest of the project														
Porewater measured in field (acres)						1 acre instrumented for the rest of the project														
Root profile at depth measured in field (acres)						1				1				1				1		1
GHG collection @ litter storage (sensors)					1 storage facility instrumented for the rest of the project															
GHG collection @ pilot silage storage (sensors)					1 pilot silage storage instrumented for the rest of the project															
GHG collection @ farm silage storage (sensors)							1 farm silage storage instrumented for the rest of the project													
Marketing channels																				
Number of new marketing channels established	1	7				1	7			1	7			1	7			1	7	
Number of new marketing channels expanded													1			1			1	
Marketing research and opportunity analysis					Start															
Marketing pricing strategy					Start															
Promotion and publicity													Start							
Break-even analysis													Start							
Outreach, technical assistance, engagement																				
Extension factsheets (count)			1				1				1				1				1	
Mid Atlantic Crop School (presentation)			1				1				1				1				1	
UMES Annual Small Farm Conference (presentation)		1				1				1				1				1		
Outreach video (count)																1 video in production				
Producer meetings (count)			1				1				1				1				1	
Focus groups (count)			4				4				4				4				4	
Capstone Symposium (count)																			1	
Climate smart																				
Anaerobic digestion GHG benefits (metric tons of CO2e reduced)				13.3				13.3				13.3				13.3				13.3
Carbon amendment GHG benefits (metric tons of CO2e sequestered)*	12	2.4				12	2.4			24				36				48		
Ryegrass GHG benefits (metrics tons of CO2e sequestered)*				12.25				12.25				24.5				36.75				49
Switchgrass GHG benefits (metric tons of CO2e sequestered)*					16.25				32.5				32.5				32.5			
MMRV supply chain traceability attributes																				
Farm-gate analysis			Start farm-gate - continues throughout the project with every harvest																	
Mass balance														Start						
GREET model														Start						
COMET model														Start						

* See CO2e tab for calculations and citations

	metric tons CO2e/acre		Calculation notes	doi
Cover crops	0.491	Bolinder et al, 2020	331 kg C/ha * 3.67 * 0.0004046 (convert kg/ha to Mt/ac)	https://doi.org/10.1007/s11027-020-09916-3
Manure (type not specified)	0.607	Bolinder et al, 2020	409 kg C/ha * 3.67 * 0.0004046 (convert kg/ha to Mt/ac)	https://doi.org/10.1007/s11027-020-09916-3
Cover crops	0.832	Jian et al. 2020	0.56 Mt C/ha * 3.67 * 0.4046 (convert Mt/ha to Mt/ac)	https://doi.org/10.1016/j.soilbio.2020.107735
Poultry Manure	0.480	Yang et al. 2019	1000 tons/ac * 2241 (convert to kg/ha) * 0.41 (percent not lost as CO2) *3.67 * 0.0004046 (convert kg/ha to Mt/ac)	https://doi-org.proxy-um.researchport.umd.edu/10.1016/j.jclepro.2018.10.251
Switchgrass	1.8	Michigan state extension		https://www.canr.msu.edu/news/carbon_sequestration_potential_of_switchgrass_as_a_bio_energy_crop
Switchgrass	4.7	Michigan state extension		

*3.67 is conversion factor from atomic mass of C to molecular mass of CO2

Climate-Smart Practices and Limitations

Climate-Smart practices under this grant shall be limited to the following practices:

NRCS Practice Code	Practice Name
336	Soil Carbon Amendment
340	Cover Crop
512	Pasture and Hay Planting
590	Nutrient Management

All practices applied under this grant will follow NRCS practice standards unless noted below:

N/A

Partnerships for Climate-Smart Commodities Data Dictionary for Recipients

February 2023

Version 1.0

USDA Partnerships for Climate-Smart Commodities Data Dictionary for Recipients
February 2023

Table of Contents

Overview of Reporting Requirements

Grant recipients are required to submit reports to document their performance under the *Partnerships for Climate-Smart Commodity* funding opportunity. These submissions will be required to use the Microsoft Excel workbook templates provided by USDA. The workbooks contain a series of worksheets that collect data in a standardized format to ensure data quality and allow for aggregation and summary of this information. The entire workbook must be submitted quarterly, with updates to all applicable worksheets. This guide is divided into three sections. The *Overview of Reporting Requirements* section summarizes the layout of the reporting workbook and presents the data elements included in each worksheet. It also describes additional documents that must be submitted to supplement the performance reports. The *Data Definitions* section provides descriptions and allowable response options for each data element. The guide also indicates whether each data element is required, applicable at times, or optional; as well as how frequently each data element must be updated. Finally, the *Appendices* contain practice and commodity lists that will be used for these reports. Reporting is necessary for USDA oversight of this effort. The data elements required for inclusion in the quarterly performance reports allow USDA to conduct selected audits to review whether producers are receiving federal funds from multiple sources for the same purpose; to determine whether GHG benefits from implementation of climate-smart agriculture and forestry (CSAF) practices are being estimated accurately; and for other purposes deemed appropriate by USDA.

The reporting worksheets collect information at four levels: project, partner, producer, and field. Descriptions of each level:

> **Project level**: Information about activities and impacts at a whole project/aggregate level (i.e., reflecting all activities under the grant agreement). Some project-level reporting is further subdivided by commodity type or a combination of commodity and CSAF practice(s) (commodity x practice).
> **Partner level:** Information about activities related to a single organization (recipient, subrecipient, contractor, or other partner) within a project.
> **Producer level**: Information about individual producers who have one or more farms enrolled in a project.
> **Field level**: Information about individual fields enrolled in a project.

Certain data elements are required to be reported for each producer and field enrolled in a project. In order to minimize the burden associated with data collection and to enable USDA to match data to existing records, these producer- and field-specific records must use the producer's established FSA Farm, Tract and Field IDs, and report the State and County associated with the Farm ID. Associated data entered in conjunction with these data elements, such as Producer Name, must match the data contained in the customer's Business Partner record, and the Farm Operating Plan in Business File for that Farm ID. Disclosure of this information is protected under Section 1619 of the Food, Conservation, and Energy Act of 2008 (PL 110- 246), 7 U.S.C. 8791. Additionally, Departmental Regulation 4370-001 provides USDA's policies for collecting demographic data, including race, ethnicity and gender. Providing demographic information is voluntary and at the discretion of the customer. Demographic information is used by USDA for statistical purposes only and will not be used to determine an applicant's eligibility for programs or services for which they apply.

Note: For purposes of this guide, "farm" refers to the operation from which climate-smart commodities are produced and may represent farms, ranches, forests or other operations. Similarly, "field" refers to the individual land units at which climate-smart practices are being implemented to produce climate-smart commodities and may represent lots, farmsteads or other units, depending on the type of operation and commodity. The use of "Farm", "Tract" and "Field" align with the FSA definitions; for example, "A field is a part of a farm that is separated from the balance of the farm by a permanent boundary, such as; fences, permanent waterways, woodlands, croplines in cases where farming practices make it probable that this cropline is not subject to change, and other similar features."

The following tables list the data elements included in each reporting worksheet, along with a brief description of each item.

Project Summary

These data will be collected about each project. Cumulative results are reported each quarter. Report last quarter's entry if there has been no change in this quarter.

Table 1. Project Summary elements

Data element name	Description	Frequency
Commodity type	Type of commodity(ies) incentivized by the project	Quarterly
Commodity sales	Indicates sales of the commodity(ies) related to the project occurred this quarter	Quarterly
Farms enrolled	Indicates enrollment activities occurred this quarter	Quarterly
GHG calculation methods	Methods used to calculate greenhouse gas (GHG) benefits	Quarterly
GHG cumulative calculation	Method used to calculate cumulative GHG benefits	Quarterly
Cumulative GHG benefits	Whole project estimate of total GHG (CO2e) emission reductions	Quarterly
Cumulative carbon stock	Whole project estimate of total carbon sequestration	Quarterly
Cumulative CO2 benefit	Whole project estimate of total CO2 emission reductions	Quarterly
Cumulative CH4 benefit	Whole project estimate of total CH4 emission reductions	Quarterly
Cumulative N2O benefit	Whole project estimate of total N2O emission reductions	Quarterly
Offsets produced	Amount of carbon offsets produced by project	Quarterly
Offsets sale	Name of marketplace where carbon offsets were sold	Quarterly
Offsets price	Price of carbon in offset sales	Quarterly
Insets produced	Amount of carbon insets produced by project	Quarterly
Cost of on-farm TA	Cost of on-farm technical assistance (TA) provided to producers	Quarterly
MMRV cost	Cost of measurement, monitoring, reporting, and verification (MMRV) activities	Quarterly
GHG monitoring method	Methods used by project to monitor GHG benefits (up to 5)	Quarterly
GHG reporting method	Methods used by project to report on GHG benefits (up to 5)	Quarterly
GHG verification method	Methods used to verify GHG benefits (up to 5)	Quarterly

Partner Activities

These data will be collected at the project level. Each row in this worksheet will represent one organization involved in the project, including the recipient and all contributing partners. A partner is any organization that is receiving project funds or providing matching contributions (funds or in-kind contributions) to the project. While the recipient must complete one row for their own organization, not all data elements apply to the recipient. These exceptions are noted in the detailed descriptions of the specific elements in the *Data Definitions* section of this guide. Data are reported cumulatively each quarter. Report last quarter's entry if there has been no change in this quarter.

Table 2. Partner Activities elements

Data element name	Description	Frequency
Partner ID	Unique ID for each partner	One-time
Partner name	Name of partner organization	One-time
Partner type	Type of organization	One-time
Partner POC	Partner point of contact name	As applicable
Partner POC email	Partner point of contact email	As applicable
Partnership start date	Start of partnership on project	One-time
Partnership end date	End of partnership on project	As applicable
New partnership	Indicator for partner organizations that have no prior work with the recipient	As applicable
Partner total requested	Total amount requested to date by partner from recipient	Quarterly
Total match contribution	Total amount of match contribution by partner to date	Quarterly
Total match incentives	Total amount of match contribution by partner for incentives	Quarterly
Match type	Top 3 types of match contribution by partner, other than incentives	Quarterly
Match amount	Value of match contributions by type	Quarterly
Training provided	Top 3 types of training provided to the partner through project	Quarterly
Activity by partner	Top 3 types of activities provided by this partner to producers or other partners	Quarterly
Activity cost	Approximate cost per activity type provided by partner to producers or other partners	Quarterly
Products supplied	Names of products supplied to producers as part of project activities or incentives	Quarterly
Product source	Supplier or source of products supplied to producers as part of project activities or incentives	Quarterly

Marketing Activities

These data will be collected at the project level. Each row in this worksheet will correspond to one commodity for which the project enrolls fields and one marketing channel used to sell that commodity by the project or producers enrolled in the project. Data are reported for the current quarter and are not cumulative. If no sales of the commodity were reported during a quarter, do not complete this worksheet for that quarter.

Table 3. Marketing Activities elements

Data element name	Description	Frequency
Commodity type	Type of commodity incentivized by the project	Quarterly
Marketing channel type	Type of marketing channels used	Quarterly
Number of buyers	Number of buyers per marketing channel	Quarterly
Names of buyers	Names of buyers in the marketing channel	Quarterly
Marketing channel geography	Geography of marketing channel	Quarterly
Value sold	Value of commodity sold by marketing channel	Quarterly
Volume sold	Volume of commodity sold by marketing channel	Quarterly
Price premium	Price premium of commodity by marketing channel	Quarterly
Price premium to producer	Percent of price premium that goes to the producer	Quarterly
Product differentiation method	Top 3 types of product differentiation methods used	Quarterly
Marketing method	Top 3 types of marketing methods used	Quarterly
Marketing channel identification method	Top 3 ways marketing channel was identified	Quarterly
Traceability method	Top 3 types of supply chain traceability methods used	Quarterly

Producer Enrollment

These data will be collected at the producer level about each farm enrolled in the project. In this worksheet, each row will correspond to one farm that has at least one field enrolled in the project. Data are reported when a producer first enrolls one or more fields in the project. If a producer is enrolled in the project for multiple years, review the farm characteristics each time a new contract is signed and provide any necessary updates. The quarterly submission should contain information about each farm initially enrolled in the project during that quarter and for updates to farms that have re-enrolled during that quarter, as applicable. If no farms are enrolled during that quarter, do not complete this worksheet for that quarter.

Table 4. Producer Enrollment elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
State or territory	State name (must match FSA farm enrollment data)	
County of residence	County name (must match FSA farm enrollment data)	
Producer data change	Indicator that producer data was updated at re-enrollment	As applicable
Producer start date	Contract start date	Enrollment
Producer name	Name of primary operator	Enrollment
Underserved status	Indicator the primary operator is considered underserved and/or a small producer	Enrollment
Total area	Total area of enrolled operation	Annual
Total crop area	Total crop area in enrolled operation enrolled	Annual
Total livestock area	Total livestock confinement, pasture and rangeland in enrolled operation	Annual
Total forest area	Total forest area in enrolled operation	Annual
Livestock type	Top 3 types of livestock on enrolled operation	Annual
Livestock head	Total livestock currently managed (by type)	Annual
Organic farm	Indicator that part of the farm is certified or transitioning organic	Annual
Organic fields	Indicator that any of the enrolled fields are certified or transitioning organic	Annual
Producer motivation	Motivation for participation	Annual
Producer outreach	Top 3 types of outreach provided to producer	Annual
CSAF experience	Indicator of prior implementation of CSAF practices at this farm	Annual
CSAF federal funds	Indicator of prior receipt of federal funds for CSAF practices	Annual
CSAF state or local funds	Indicator of prior receipt of state funds for CSAF practices	Annual
CSAF nonprofit funds	Indicator of prior receipt of nonprofit funds for CSAF practices	Annual
CSAF market incentives	Indicator of prior receipt of market incentives for CSAF practices	Annual

Field Enrollment

These data will be collected about each field enrolled in the project. In this worksheet, each row corresponds to one field x commodity combination enrolled in the project. Generally, data are reported once for each field, at its initial enrollment. The quarterly submission should contain information about each field initially enrolled in the project during that quarter. If no fields are enrolled during that quarter, do not complete this worksheet for that quarter. If a field is enrolled for multiple years, any relevant changes, such as a new ID number or changes to the commodity or practice combinations should be entered in this worksheet during the quarter it is re-enrolled, or as applicable.

Table 5. Field Enrollment elements

Data element name	Description
Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name
Physical County of field	Physical county name must match FSA farm records
Prior Field ID	Previous Field ID when reconstitution of farm results in new Field IDs
Field data change	Indicator that field data has changed from initial enrollment
Contract start date	Start date of contract
Total field area	Size of enrolled field
Commodity category	Category of commodity(ies) produced
Commodity type	Type of commodity(ies) produced
Baseline yield	Average yield of commodity in 3 years prior to enrollment
Baseline yield location	Location for which baseline yield is provided
Field land use	Most common land use in field in past 3 years
Field irrigated	Most common irrigation type in field in past 3 years
Field tillage	Most common tillage in field in past 3 years
Practice past extent - farm	Extent of operation that implemented this practice prior to project enrollment
Field any CSAF practice	Indicator for prior CSAF practices in this field in past 3 years
Practice past use - this field	Indicator of prior use of this practice in this field in the past 3 years
Practice type	CSAF practice(s) that will be implemented in enrolled field (up to 7)
Practice standard	Organization that developed CSAF practice standard implemented in field
Planned practice implementation year	Year that practice is planned to be implemented
Practice extent	Area or number of animals for which practice is implemented
Follow-on questions	Follow-on questions by practice type (see Table 11)

Farm Summary

These data will be collected about each farm enrolled in the project. In this worksheet, each row will correspond to one farm that has at least one field enrolled in the project. The quarterly submission should contain updates to any data elements that have changed for each farm enrolled in the project during that quarter. If there are no changes from the previous quarter, do not complete this worksheet for that quarter. Data are not cumulative.

Table 6. Farm Summary elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
State or territory	State name	
County of residence	County name	
Producer TA received	Type of technical assistance provided to producer	Quarterly
Producer incentive amount	Total financial incentive provided to the producer	Quarterly
Incentive reason	Top 4 reason(s) for financial incentives provided to producer	Quarterly
Incentive structure	Top 4 units on which financial incentives are structured	Quarterly
Incentive type	Top 4 type(s) of financial incentives provided to producer	Quarterly
Payment on enrollment	Extent of payment provided to producer upon enrollment	Quarterly
Payment on implementation	Extent of payment provided to producer upon implementation of CSAF practices	Quarterly
Payment on harvest	Extent of payment provided to producer upon harvest or slaughter	Quarterly
Payment on MMRV	Extent of payment provided to producer upon reporting or verification	Quarterly
Payment on sale	Extent of payment provided to producer upon sale of commodity	Quarterly

Field Summary

These data will be collected about each field enrolled in the project for a commodity x practice(s) combination. In this worksheet, each row will correspond to one field x commodity x practice(s) combination enrolled in the project. Data for each field will be reported quarterly and are not cumulative. Report data for any elements that have an update in that quarter. Greenhouse gas benefit estimates must be entered upon practice completion or annually, as appropriate. If there are no changes from the previous quarter, do not complete this worksheet for that quarter. This worksheet includes a section to report the "official" estimate of GHG benefits – amounts of greenhouse gas emissions reduced and carbon sequestered – for the field. These quantities refer to the estimates that are used to calculate the project's aggregate impact (reported in Table 1). Tables 8 and 9 are used to report alternate estimates of the field-level GHG benefits when additional methods are used to model (Table 8) or measure (Table 9) these impacts. Any field that can use COMET-Planner must submit those results, either as the official or alternate model.

Table 7. Field Summary elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
Tract ID	Unique Tract ID assigned by FSA	
Field ID	Unique Field ID assigned by FSA	
State or territory of field	State name	
County of field	County name	
Commodity type	Type of commodity produced from field	Quarterly
Practice type	Type of practice(s) incentivized in field (up to seven)	Quarterly
Date practice complete	Date that practice implementation is certified complete	Quarterly
Contract end date	End date of contract	Quarterly
MMRV assistance provided	Indicator that MMRV assistance is provided to field	Quarterly
Marketing assistance provided	Indicator that marketing assistance provided for commodity from field	Quarterly
Incentive per acre or head	Indicator that a per acre/head incentives is provided for the CSAF practice(s) on this field	Quarterly
Field commodity value	Value of commodity produced from field	Quarterly
Field commodity volume	Volume of commodity produced from field	Quarterly
Cost of implementation	Total cost of practice implementation in field	Quarterly
Cost coverage	Percent of total cost of implementation of practice covered by project incentives	Quarterly
Field GHG monitoring	Methods used to monitor GHG benefits in field (up to 3)	Quarterly
Field GHG reporting	Methods used to report on GHG benefits for field (up to 3)	Quarterly
Field GHG verification	Methods used to verify GHG benefits for field (up to 3)	Quarterly
Field GHG calculations	Methods used to calculate GHG benefits for field	Quarterly
Field official GHG calculation	Method used to calculate official GHG benefits for field	Quarterly
Field official GHG ER	Official estimate of total GHG emission reductions for field	Quarterly
Field official carbon stock	Official estimate of total carbon sequestration for field	Quarterly
Field official CO2 ER	Official estimate of total CO2 emission reductions for field	Quarterly
Field official CH4 ER	Official estimate of total CH4 emission reductions for field	Quarterly
Field official N2O ER	Official estimate of total N2O emission reductions for field	Quarterly
Field offsets produced	Amount of carbon offsets produced in field	Quarterly
Field insets produced	Amount of carbon insets produced in field	Quarterly
Other field measurements	Indicator that field data was collected for reasons other than GHG benefit estimation	Quarterly

GHG Benefits - Alternate Modeled

If greenhouse gas benefits are modeled for the same field using multiple methods, the results for the alternate models are reported in this worksheet. The "alternate" models refer to those model results that were not used in the calculation of the project's aggregate impact (as reported in Table 1). Any field that can use COMET-Planner must submit those results, either as the official or alternate model. These data will be collected about the modeled GHG benefits for each field x commodity x practice(s) combination. In this worksheet, each row will correspond to one field enrolled in the project. Data are not cumulative. Each quarterly submission should include information for all fields that have new modeled data. Greenhouse gas benefit estimates must be entered upon practice completion or annually, as appropriate.

Table 8. GHG Benefits – Alternate Modeled elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
Tract ID	Unique Tract ID assigned by FSA	
Field ID	Unique Field ID assigned by FSA	
State or territory of field	State name	
County of field	County name	
Commodity type	Type of commodity(ies) produced from the field (up to 6)	Annual
Practice type	Type of practice(s) incentivized in field (up to 7)	Annual
GHG model	Model used to calculate GHG benefits	Annual
Model start date	Start date of model run	Annual
Model end date	End date of model run	Annual
Total GHG benefits estimated	Estimate of total GHG benefits for field	Annual
Total carbon stock estimated	Estimate of total change in carbon stock for field	Annual
Total CO2 estimated	Estimate of total CO2 emission reductions for field	Annual
Total CH4 estimated	Estimate of total CH4 emission reductions for field	Annual
Total N2O estimated	Estimate of total N2O emission reductions for field	Annual

GHG Benefits - Measured

Projects must report the results of any carbon stock or greenhouse gas emission measurements in this worksheet. These data will be collected at the field level. Each row will represent a separate measurement method used to calculate GHG benefits for a given field. Data are reported once per year of measurement and are not cumulative. Each quarterly submission should include information for any field for which there are new soil samples or new calculations of annual GHG benefits based on actual measurements.

Table 9. GHG Benefits - Measured data elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
Tract ID	Unique Tract ID assigned by FSA	
Field ID	Unique Field ID assigned by FSA	
State	State name	
County	County name	
GHG measurement method	Method of measurement	Annual
Lab name	Entity that conducted analysis	Annual
Measurement start date	Start date of measurements	Annual
Measurement end date	End date of measurements	Annual
Total CO2 reduction calculated	Calculation of total CO2 reduction	Annual
Total carbon stock change calculated	Calculation of change in carbon stock	Annual
Total CH4 reduction calculated	Calculation of total CH4 reduction	Annual
Total N2O reduction calculated	Calculation of total N2O reduction	Annual
Soil sample result	Numeric result from soil sample	Annual
Measurement type	Type of analysis conducted	Annual

Additional Environmental Benefits

Projects that track additional environmental benefits (e.g., water quality improvements) from enrolled fields report results in this worksheet. These data will be collected about each field. Each row in this worksheet will correspond to an enrolled field. Data are not cumulative. Estimates of environmental benefits must be entered upon practice completion or annually, as appropriate.

Table 10. Additional Environmental Benefits elements

Data element name	Description	Frequency
Farm ID	Unique Farm ID assigned by FSA	
Tract ID	Unique Tract ID assigned by FSA	
Field ID	Unique Field ID assigned by FSA	
State	State name	
County	County name	
Environmental benefits	Indicator that project tracks other environmental benefits	Annual
Reduction in nitrogen loss	Indicator that project tracks reductions in nitrogen loss	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Reduction in phosphorus loss	Indicator that project tracks reductions in phosphorus loss	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Other water quality	Indicator that project tracks other water quality improvements	Annual
Type	Type of water quality metric being tracked	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Water quantity	Indicator that project tracks reduced water use	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Reduced erosion	Indicator that project tracks reductions in soil erosion	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Reduced energy use	Indicator that project tracks reductions in energy use	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Avoided land conversion	Indicator that project tracks reductions in land conversion	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual
Improved wildlife habitat	Indicator that project tracks improvements in wildlife habitat	Annual
Amount	Amount	Annual
Purpose	Purpose of tracking those co-benefits	Annual

Supplemental Data Submission

Project MMRV Plan

Definition of MMRV elements:

Measurement: Quantification of the greenhouse gas benefits (reduction or capture) using mathematical models and/or direct physical measurements in the field

Monitoring: Ongoing review and confirmation that the climate-smart practice has been implemented according to the agreed upon standard and documentation of any changes in the site, implementation, or GHG emissions impacts over time

Reporting: Documenting and sharing monitoring and measurement results with project partners, the recipient, and any third-party verification organization

Verification: Independent confirmation that measurement, monitoring and reporting information are complete, accurate and reliable.

Projects must submit an MMRV plan that includes details about how each of the following are addressed:

- Quantification approach, including:
  - GHG models used
  - GHG measurement plan (if applicable)
  - Approach to quantifying additional environmental benefits, if applicable (e.g., water quality, habitat)
- Verification approach:
  - Compliance criteria
  - Verification plan/methodology
- Approach to ensuring:
  - Additionality
  - Permanence
  - Leakage
  - Impacts of weather
- Plan for non-compliance

If the project is using a specific MMRV methodology or approach developed by the recipient, a project partner, or an outside organization, the project can submit documentation associated with the methodology as long as the documentation addresses each of the above categories.

If the project is tracking other environmental benefits (as reported in the *Additional Environmental Benefits* worksheet), include a description of the methodology and tools used to track and report on these benefits.

Field modeled GHG benefit reports

Results from any models besides COMET-Planner used to estimate GHG benefits must also be submitted as a separate report. This includes projects running COMET-Farm. The full results of any model can be submitted in the native/standard format generated by the modeling tool and must include the following Unique IDs in the report or in the file name: State, County, Farm ID, Tract ID, Field ID.

Field direct measurement results

For any direct physical measurements in the field, measurement results must be submitted as a separate report and must include the following Unique IDs in the report or in the file name: State, County, Farm ID, Tract ID, Field ID. Measurement results reports must include the name of the equipment used for sampling or data collection, the name of the lab that analyzed the data, and the analytical method used.

Sample report types include soil analysis reports, summarized results of portable emissions analyzers or flux towers, water quality analyses, and plant species counts. These could be collected for the purposes of determining GHG emission reductions or carbon sequestration amounts, for calibration of tools or models, for tracking other environmental benefits, or for other reasons.

Data Descriptions

This section provides descriptions and allowable response options for each data element. The guide also indicates whether each data element is required, applicable at times, or optional; as well as how frequently each data element must be updated.

Unique IDs

Project ID: Unique ID at the project level – "Award Identifying Number" shown on award documentation
Partner ID: Unique ID at the partner level – use EIN; if no EIN, a unique ID will be assigned for use in these reports
State or territory of operation: State or territory name
County of operation: Physical county name
Farm ID: Unique ID at the operation level assigned by Farm Service Agency (FSA)
Tract ID: Unique ID at the tract level assigned by FSA
Field ID: Unique ID at the field level assigned by FSA

Project Summary

Commodity type

Data element name: Commodity type

Reporting question: What climate-smart commodity types are produced by this project?

Description: Type of commodity incentivized by the project. These commodities include those for whom farmers are directly receiving incentives or other types of marketing support. See full list of commodity options in Appendix B. List one commodity per row.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values: FSA commodity list

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Commodity sales

Data element name: Commodity sales

Reporting question: Did project activities result in sales this quarter of the commodity(ies) produced by this project?

Description: Indicator of sales of commodity(ies) related to project activities. If sales are reported, complete the *Marketing Activities* worksheet (Table 3) as part of the quarterly performance report.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Farms enrolled

Data element name: Farms enrolled

Reporting question: Did the project enroll any producers or fields this quarter?

Description: Indicator that the project enrolled producers or fields. If enrollment activities occurred this quarter, complete the *Producer Enrollment* and *Field Enrollment* worksheets (Tables 4 and 5) as part of the quarterly performance report.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

GHG calculation methods

Data element name: GHG calculation methods

Reporting question: What methods is the project using to calculate GHG benefits?

Description: List the way(s) that GHG benefits are being measured and calculated by the project this quarter.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Models
- Direct field measurements
- Both

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

GHG cumulative calculation

Data element name: GHG cumulative calculation

Reporting question: What method(s) was used to calculate the total cumulative GHG benefits reported here?

Description: List the method(s) that was used to calculate the total cumulative GHG benefits reported by the project this quarter.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:
- Models
- Direct field measurements
- Both

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cumulative GHG benefits

Data element name: Cumulative GHG benefits

Reporting question: What are the project's estimated total GHG emission reductions (CO2eq) to date?

Description: Total cumulative estimated greenhouse gas emission reductions from practice implementation. This is updated quarterly. If there are no changes, enter the same number as the previous quarter.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cumulative carbon stock

Data element name: Cumulative carbon stock

Reporting question: How much carbon has the project sequestered to date?

Description: Estimated total cumulative change in carbon stock based on practice implementation. This is updated quarterly. If there are no changes, enter the same numbers as the previous quarter. Conversion rate is one ton of carbon = 3.67 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cumulative CO2 benefit

Data element name: Cumulative CO2 benefit

Reporting question: What are the project's estimated total cumulative CO2 emission reductions to date?

Description: Estimated total cumulative carbon dioxide emission reductions based on practice implementation. This is updated quarterly. If there are no changes, enter the same number as the previous quarter.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cumulative CH4 benefit

Data element name: Cumulative CH4 benefit

Reporting question: What are the project's estimated total CH4 emission reductions to date?

Description: Estimated total cumulative methane reduction based on practice implementation. This is updated quarterly. If there are no changes, enter the same numbers as the previous quarter. Conversion rate is one ton of CH_4 = 25 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CH4 reduced in CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cumulative N20 benefit

Data element name: Cumulative N2O benefit

Reporting question: What are the project's estimated total N2O emission reductions to date?

Description: Estimated total cumulative nitrous oxide reduction based on practice implementation. This is updated quarterly. If there are no updated numbers enter the same number as the previous quarter. Conversion rate is one ton of N_2O = 298 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons N2O reduced in CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Offsets produced

Data element name: Offsets produced

Reporting question: How many carbon offsets have been produced in the project?

Description: Total carbon offsets produced by enrolled project fields during the quarter. Offsets are defined as having been verified and certified using an accepted standard and sold into the carbon marketplace.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Offsets sale

Data element name: Offsets sale

Reporting question: To what marketplace(s) were carbon offsets sold?

Description: Marketplaces to which carbon offsets produced by enrolled project fields were sold. Offsets are defined as having been verified and certified using an accepted standard and sold into the carbon marketplace. List each marketplace name. Separate names with commas.

Data type: Text

Select multiple values: NA

Measurement unit: Name

Allowed values: Text

Logic: Respond if >0 to 'Offsets produced'

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Offsets price

Data element name: Offsets price

Reporting question: What was the average price of carbon received for offsets?

Description: Average price per metric ton paid for carbon offsets produced by enrolled project fields. Offsets are defined as having been verified and certified using an accepted standard and sold into the carbon marketplace.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars per metric ton

Allowed values: 0-500

Logic: Respond if >0 to 'Offsets produced'

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Insets produced

Data element name: Insets produced

Reporting question: How many carbon insets have been produced in the project?

Description: Total carbon insets produced by enrolled fields during the quarter. Insets are defined as having been verified and certified using an accepted standard and accounted for within Scope 3 emissions for a firm.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Cost of on-farm TA

Data element name: Cost of on-farm TA

Reporting question: What is the total amount that has been spent to provide on-farm TA?

Description: Total cost of any field- or practice-specific technical assistance provided by the project (by recipient or partners) to any producers. This is updated quarterly. If there are no changes, enter the same number as the previous quarter.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $0-$50,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

MMRV cost

Data element name: MMRV cost

Reporting question: What is the total amount that has been spent on MMRV activities?

Description: Total cost of all MMRV activities paid for by the project (recipient or partners). MMRV components are defined as measurement (calculations or estimations of GHG emissions), monitoring (ongoing review and confirmation that the climate-smart practices have been implemented according to the agreed upon standard and documentation of any changes in the site, implementation, or GHG emissions impacts over time), reporting (documenting and sharing monitoring and measurement results with project partners, the recipient, and any third-party verification organization), and verification (independent confirmation that measurement, monitoring and reporting information are complete, accurate and reliable). This is updated quarterly. If there are no changes, enter the same number as the previous quarter.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $0-$50,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

GHG monitoring method

Data element name: GHG monitoring 1-5

Reporting question: How did the project monitor GHG benefits?

Description: Up to the five most common forms of monitoring GHG benefits used this quarter as part of MMRV requirements. Monitoring is defined as ongoing review and confirmation that the climate-smart practice has been implemented according to the agreed upon standard and documentation of any changes in the site, implementation, or GHG emissions impacts over time. Include up to 5 methods, based on which methods are most commonly used for this project. The worksheet provides five columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 5 GHG monitoring methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG monitoring methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Drones
- Ground-level photos and videos
- On-farm visit
- Plot-based sampling
- Producer records or attestation
- Satellite monitoring or remote sensing
- Soil metagenomics
- Soil sensors
- Water sensors
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

GHG reporting method

Data element name: GHG reporting 1-5

Reporting question: How did the project track and report implementation of practices to reduce GHG emissions?

Description: Up to the five most common forms of tracking and reporting on practice implementation used this year as part of MMRV requirements. Reporting is defined as documenting and sharing monitoring and measurement results with project partners, the recipient, and any third-party verification organization. Include up to 5 methods, based on which methods are most commonly used for this project. The worksheet provides five columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 5 GHG reporting methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG reporting methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Automated devices
- Email
- Mobile app
- Paper
- Third-party actors
- Website
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

GHG verification method

Data element name: GHG verification method 1-5

Reporting question: How did the project verify implementation of practices to reduce GHG emissions?

Description: Up to the five most common forms of verifying practice implementation used this year as part of MMRV requirements. Verification is defined as independent confirmation that measurement, monitoring and reporting information are complete, accurate and reliable. Include up to 5 methods, based on which methods are most commonly used for this project. The worksheet provides five columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 5 GHG verification methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG verification methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Artificial intelligence
- Audit by recipient
- Computer modeling
- Photos
- Record audit
- Satellite imagery
- Site or field visit
- Third-party audit
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Partner Activities

Unique IDs	
Partner ID	Unique Project ID for each partner

Partner name	
Data element name: Name of partner organization	**Reporting question:** What is the official name of the recipient or partner organization?
Description: Legal name of recipient or partner organization	
Data type: Text	**Select multiple values**: NA
Measurement unit: NA	**Allowed values:** Text
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Partnership initiation

Partner type	
Data element name: Type of partner organization	**Reporting question:** What type of organization is this?
Description: Legal/financial structure of recipient or partner organization	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Commodity groups (501c5) • For-profit • Individual • Nonprofit • State or local agency • Tribal agency • University
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Partnership initiation

Partner POC	
Data element name: Partner POC	**Reporting question:** Who is the point of contact for this project at the recipient or partner organization?
Description: Name of a point of contact for the recipient or partner organization	
Data type: Text	**Select multiple values**: NA
Measurement unit: NA	**Allowed values:** Text
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Partnership initiation; update as necessary

Partner POC email	
Data element name: Partner POC email	**Reporting question:** What is the point of contact's email address?
Description: Email of the point of contact for the recipient or partner organization	
Data type: Text	**Select multiple values**: NA
Measurement unit: NA	**Allowed values:** Text
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Partnership initiation; update as necessary

Partnership start date

Data element name: Partnership start date | **Reporting question:** When did the partnership start?

Description: Date that the partner organization and the recipient began formally partnering on the project

Data type: Date | **Select multiple values**: NA

Measurement unit: MM/DD/YYYY | **Allowed values:** 01/01/2023 – 12/31/2030

Logic: No response for recipient | **Required:** Yes

Data collection level: Partner | **Data collection frequency:** Partnership initiation

Partnership end date

Data element name: Partnership end date | **Reporting question:** When did the partnership end?

Description: Date that the partner organization and the recipient stopped formally partnering on the project

Data type: Date | **Select multiple values**: NA

Measurement unit: MM/DD/YYYY | **Allowed values:** 01/01/2023 – 12/31/2030

Logic: No response for recipient | **Required:** Yes

Data collection level: Partner | **Data collection frequency:** Partnership end quarter

New partnership

Data element name: New partnership | **Reporting question:** Is this a new partnership?

Description: A new partnership means that the recipient and the partner organization have not had a formal working relationship (under contract or on a grant) prior to the start of the project.

Data type: List | **Select multiple values**: No

Measurement unit: Category | **Allowed values:**

- Yes
- No
- I don't know

Logic: No response for recipient | **Required:** Yes

Data collection level: Partner | **Data collection frequency:** Partnership initiation

Partner total requested

Data element name: Partner total requested | **Reporting question:** What is the total amount of funding the partner has requested to date from this project?

Description: Cumulative (total) amount of funds that the partner has requested reimbursement for from the recipient from the start of the partnership to the end of the reporting quarter. For each quarter's data entry, the value must be the sum of all previous entries plus the amount of funds requested in the reporting quarter. If there are no changes, report the value from the previous quarter.

Data type: Decimal | **Select multiple values**: NA

Measurement unit: Dollars | **Allowed values:** $0-$100,000,000

Logic: No response for recipient | **Required:** Yes

Data collection level: Partner | **Data collection frequency:** Quarterly

Total match contribution

Data element name: Total match contribution

Reporting question: What is the total match value the organization has contributed to the project to date?

Description: Cumulative (total) value of funds and in-kind contributions (e.g., staff time, inputs, equipment rental, marketing support) that the partner has provided as a project match contribution from the start of the partnership to the end of the reporting quarter. For each quarter's data entry, the value must be the sum of all previous entries plus match contributions in the reporting quarter. If there are no changes, report the value from the previous quarter.

Data type: Decimal

Select multiple values: NA

Measurement unit: Dollars

Allowed values: $0-$100,000,000

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Total match incentives

Data element name: Total match incentives

Reporting question: What is the total value of match provided by this organization for producer incentives?

Description: Cumulative (total) value of funds for incentive payments directly to producers that the partner has provided as a project match contribution from the start of the partnership to the end of the reporting quarter. For each quarter's data entry, the value must be the sum of all previous entries plus match incentives in the reporting quarter. If there are no changes, report the value from the previous quarter.

Data type: Decimal

Select multiple values: NA

Measurement unit: Dollars

Allowed values: $0-$100,000,000

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Match type

Data element name: Match type 1-3

Reporting question: What types of match contributions has the organization provided to the project?

Description: Types of match contributions *other than incentives* provided directly to producers by the organization from the start of the partnership to the end of the reporting quarter. Enter up to the top three (in dollar value) types of match contributions provided. In-kind staff time could be used for technical assistance, marketing assistance, or other support to producers. Production inputs include seed, fertilizer, pesticides, equipment and other inputs for use in the field. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 match types are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other match types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Equipment rental or use
- In-kind staff time
- Production inputs (reduced cost or free)
- Program income
- Software
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Match amount

Data element name: Match amount 1-3

Reporting question: What is the value of the match contributions the organization provided to the project?

Description: Cumulative (total) value of funds for each match type that the organization has provided as a project match contribution from the start of the partnership to the end of the reporting quarter. Enter amounts for up to the top three (in dollar value) match types. The worksheet provides three columns for this data element. Enter one value for each column. If fewer than 3 match types are used, leave unnecessary columns blank.

Data type: Decimal

Select multiple values: NA

Measurement unit: Dollars

Allowed values: $0-$100,000,000

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Training type provided

Data element name: Training type 1-3 provided

Reporting question: What types of training has the organization provided to project partners?

Description: Types of training provided to the project partner as a result of participating in the project during the past quarter. Training can come from the recipient, a project partner organization (including other divisions of their own organization, or an outside organization. Enter up to the top three (in dollar value) types of partner training provided. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 training types are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other training types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Data collection
- Grant reporting
- Marketing opportunities
- Providing financial assistance
- Providing technical assistance
- Writing producer contracts
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Activity by partner

Data element name: Activity 1-3 by partner

Reporting question: What types of activities has the organization provided to the project?

Description: Types of activities that the recipient or partner organization has provided during the reporting quarter. Enter up to the top three (in dollar value) types of activities undertaken. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 activity types are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other activity types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Marketing support
- MMRV support
- Producer outreach for enrollment
- Technical assistance to producers
- Training to other partner organizations
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Partner

Data collection frequency: Quarterly

Activity cost

Data element name: Activity cost 1-3	**Reporting question:** What is the value of the activities this organization has provided to the project?
Description: Cumulative (total) cost of each activity type that the organization has undertaken or offered from the start of the partnership to the end of the reporting quarter. Enter amounts for up to the top three (in dollar value) activity types. The worksheet provides three columns for this data element. Enter one value for each column. If fewer than 3 activity types are provided, leave unnecessary columns blank.	
Data type: Decimal	**Select multiple values**: NA
Measurement unit: Dollars	**Allowed values:** $0-$100,000,000
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Quarterly

Products supplied

Data element name: Products supplied	**Reporting question:** What products or supplies were provided to enrolled fields?
Description: Name(s) of products supplied to enrolled producers as incentives or matching contributions. Enter the name of each product, including its brand. Separate each product name with a comma. If no products or supplies were provided by the organization, leave the column blank.	
Data type: Text	**Select multiple values**: NA
Measurement unit: Name	**Allowed values:** Text
Logic: None – all respond	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Quarterly

Product source

Data element name: Product source	**Reporting question:** Which companies provided the supplies?
Description: Name of firm or company from which supplies were obtained.	
Data type: Text	**Select multiple values**: NA
Measurement unit: Name	**Allowed values:** Text
Logic: Respond if text entered for 'Products supplied'	**Required:** Yes
Data collection level: Partner	**Data collection frequency:** Quarterly

Marketing Activities

Commodity type	
Data element name: Commodity type	**Reporting question:** What type of commodity is produced by the farmers enrolled in this project?
Description: List a single commodity produced or marketed through incentives from this project. If multiple commodities are produced by the project, use additional rows of the worksheet to report each commodity. Use the FSA commodity list in Appendix B and choose the commodity from the list.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** FSA commodity list
Logic: None – all respond	**Required:** Yes
Data collection level: Project	**Data collection frequency:** Quarterly

Marketing channel type	
Data element name: Marketing channel type	**Reporting question:** What type of marketing channel is used to sell this commodity?
Description: List a single type of marketing channel used to sell the commodity produced by farmers enrolled in the project. If a single commodity is marketed through multiple channels, use additional rows of the worksheet to report each combination of commodity and marketing channel. If "other" is chosen, use the additional column to enter the other marketing channel type(s) as free text.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Agricultural marketing board • Biorefinery • Commodity broker • Direct to consumer • Direct to institution • Direct to restaurant • Distributor (including grain elevators) • Food hub or cooperative • Food processor • Non-food byproducts processor • Retailer • USDA • Other (specify)
Logic: None – all respond	**Required:** Yes
Data collection level: Project	**Data collection frequency:** Quarterly

Number of buyers	
Data element name: Number of buyers	**Reporting question:** How many buyers are there in this marketing channel?
Description: List the number of individual firms or buyers in this marketing channel.	
Data type: Integer	**Select multiple values**: No
Measurement unit: Count	**Allowed values:** 1-500
Logic: None – all respond	**Required:** Yes
Data collection level: Project	**Data collection frequency:** Quarterly

Names of buyers

Data element name: Names of buyers

Reporting question: What are the names of all of the buyers in this marketing channel?

Description: Provide the names of all buyers in this marketing channel. Separate each name with a comma.

Data type: Text

Select multiple values: NA

Measurement unit: Name

Allowed values: Text

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Marketing channel geography

Data element name: Marketing channel geography

Reporting question: What is the primary geography of the marketing channel?

Description: The primary geography of the type of marketing channel. Primary geography means the scale at which most of the activity of buying and selling happens. Local means within a single state or directly neighboring states. Regional means within a five-to-ten state area. National means across the United States. International means specific locations outside of the United States. Global means across the world or not to a specific international location.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Local
- Regional
- National
- Global

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Value sold

Data element name: Value sold

Reporting question: What is the value of the commodity sold in this marketing channel?

Description: The dollar value of the commodity sold in this marketing channel this quarter (non-cumulative).

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $1-$100,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Volume sold

Data element name: Volume sold

Reporting question: What is the volume of the commodity sold in this marketing channel?

Description: The volume of the commodity sold in this marketing channel this quarter (non-cumulative).

Data type: Decimal

Select multiple values: No

Measurement unit: Number

Allowed values: 1-100,000,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Volume sold unit

Data element name: Volume sold unit

Reporting question: What is the unit of volume?

Description: The unit associated with the volume of the commodity sold in the marketing channel. If "other" is chosen, use the additional column to enter the appropriate unit as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Bales (500 pounds)
- Bushels
- Carcass pounds
- Gallons
- Kilograms
- Linear board feet
- Liveweight pounds
- Metric tons
- Pounds
- Short tons
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Price premium

Data element name: Price premium

Reporting question: What price premium is received for the commodity sold in this marketing channel?

Description: The price premium received for the commodity sold in this marketing channel this quarter. Price premium is the amount received above a 'business as usual' price.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $0.01-$10,000

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Price premium unit

Data element name: Price premium unit

Reporting question: What is the unit for the price premium?

Description: The unit associated with the price premium for the commodity sold in the marketing channel. If "other" is chosen, use the additional column to enter the appropriate unit as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Per bale (500 pounds)
- Per bushel
- Per carcass pound
- Per gallon
- Per kilogram
- Per linear board foot
- Per live pound
- Per metric ton
- Per ounce
- Per short ton
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Price premium to producer

Data element name: Price premium to producer

Reporting question: What percent of the price premium is provided to the producer for the commodity sold in this marketing channel?

Description: The percent of the price premium provided to the producer for the commodity sold in this marketing channel this quarter. Price premium is the amount received above a 'business as usual' price.

Data type: Decimal

Select multiple values: No

Measurement unit: Percent

Allowed values: 0-100

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Product differentiation method

Data element name: Product differentiation method 1-3

Reporting question: What methods are used to differentiate climate-smart commodities in this marketing channel?

Description: Provide the methods used to differentiate the climate-smart commodity in this market channel. Product differentiation methods are ways to distinguish or differentiate the climate-smart commodity in the marketplace. Include up to 3 methods, based on which methods are most commonly used for this project. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 product differentiation methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other product differentiation methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Certification/verification for internal insetting
- Farm certification
- Label or badge used on packaging or marketing
- Third party certification/verification
- Trademark
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Marketing method

Data element name: Marketing method 1-3

Reporting question: What methods are used to market climate-smart commodities in this marketing channel?

Description: Provide the method(s) used to market this commodity in this market channel. Marketing method is the way that potential buyers of the climate-smart commodity are engaged by the project partners as the sellers or facilitators of sale. Include up to 3 methods, based on which methods are most commonly used for this project. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 marketing methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other marketing methods as free text

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Label or badge used on packaging or marketing materials
- Marketing partnership (e.g., promotion by buyer)
- Print marketing campaign
- Social media and digital marketing campaign
- Verbal marketing campaign (e.g., radio, word of mouth)
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Marketing channel identification method

Data element name: Marketing channel identification method 1-3

Reporting question: What methods are used to generate interest in climate-smart commodities in this marketing channel?

Description: Provide the marketing channel identification method(s) used for this commodity in this market channel. Market channel identification methods are the ways that producers and project partners generate interest in purchasing the climate-smart commodity. Include up to 3 methods, based on which methods are most commonly used for this project. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 marketing channel identification methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other marketing channel identification methods as free text

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Educational tours for buyers
- In-person lead generation
- Negotiated contracts with buyers
- Partnership network or project partner
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Traceability method

Data element name: Traceability method 1-3

Reporting question: What traceability methods are used for climate-smart commodities in this channel?

Description: Provide the traceability method(s) used for the climate-smart commodity in this market channel. Traceability methods are ways to trace the climate-smart commodity or the climate-smart claims through the supply chain. Include up to 3 methods, based on which methods are most commonly used for this project. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 traceability methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other traceability methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Barcode or unique ID
- Blockchain
- Book and claim
- Chain of custody
- Mass balance
- Recordkeeping
- Registry with certification
- Segregation
- Supply shed
- Volume proxy
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Project

Data collection frequency: Quarterly

Producer Enrollment

Unique IDs	
Farm ID	Unique Farm ID assigned by FSA
State or territory	State name (must match FSA farm enrollment data)
County of residence	County name (must match FSA farm enrollment data)

Producer data change

Data element name: Producer data change

Reporting question: Is there new/updated information for a producer who is re-enrolling in the project?

Description: Indicates that there is new or updated information for a producer who had previously enrolled in the project and is re-enrolling.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:
- Yes
- No

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Re-enrollment

Producer start date

Data element name: Producer start date

Reporting question: When did the producer enroll in the project?

Description: Date that the producer enrolled in the project by signing their first contract.

Data type: Date

Select multiple values: NA

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023 – 12/31/2030

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

Producer name

Data element name: Producer name

Reporting question: What is the name of producer enrolled in the project?

Description: Name of the producer enrolled in the project; the name must match the name contained in the customer's Business Partner record and the Farm Operating Plan in FSA Business File for that Farm ID.

Data type: Text

Select multiple values: NA

Measurement unit: NA

Allowed values: Text

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

Underserved status

Data element name: Underserved status

Reporting question: Is this producer considered an underserved and/or a small producer?

Description: Underserved status of the primary operator of the enrolled operation. Underserved producers generally include beginning farmers, socially disadvantaged farmers, veteran farmers, and limited resource farmers; women farmers and producers growing specialty crops are generally also included in these categories. Small farms are generally those with less than $350,000 in annual gross cash farm income. Indicate whether this producer is considered underserved, a small producer, or both underserved and a small producer. Use "I don't know" if the producer declines to answer. Departmental Regulation 4370-001 provides USDA's policies for collecting demographic data, including race, ethnicity and gender. Providing demographic information is voluntary and at the discretion of the customer. Demographic information is used by USDA for statistical purposes only and will not be used to determine an applicant's eligibility for programs or services for which they apply.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes, underserved
- Yes, small producer
- Yes, underserved and small producer
- No
- I don't know

Logic: None – all respond

Required: No

Data collection level: Producer

Data collection frequency: Initial enrollment

Total area

Data element name: Total area

Reporting question: What is the total area of the farm?

Description: Total area of the farm associated with the Farm ID. Report total area of the farm, even if only a portion of the farm is enrolled in the project. If a producer is enrolled in the project for multiple years, review the total area each time a new contract is signed and provide any necessary updates.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Less than 1 acre
- 1 to 9 acres
- 10 to 49 acres
- 50 to 69 acres
- 70 to 99 acres
- 100 to 139 acres
- 140 to 179 acres
- 180 to 219 acres
- 220 to 259 acres
- 260 to 499 acres
- 500 to 999 acres
- 1,000 to 1,999 acres
- 2,000 to 4,999 acres
- 5,000 or more acres

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment and subsequent enrollment(s), if applicable

Total crop area

Data element name: Total crop area	**Reporting question:** What percent of the current operation is cropland?
Description: Area of the total farm that is currently used as cropland. If a producer is enrolled in the project for multiple years, review the total crop area each time a new contract is signed and provide any necessary updates.	
Data type: Integer	**Select multiple values:** No
Measurement unit: Acres	**Allowed values:** 0-100,000
Logic: None – all respond	**Required:** Yes
Data collection level: Producer	**Data collection frequency:** Initial enrollment and subsequent enrollment(s), if applicable

Total livestock area

Data element name: Total livestock area	**Reporting question:** What amount of the current operation is used for livestock (by area)?
Description: Area of the total farm that is currently used for pasture, grazing, rangeland; or animal housing, feeding or milking. If a producer is enrolled in the project for multiple years, review the total livestock area each time a new contract is signed and provide any necessary updates.	
Data type: Integer	**Select multiple values:** No
Measurement unit: Acres	**Allowed values:** 0-100,000
Logic: None – all respond	**Required:** Yes
Data collection level: Producer	**Data collection frequency:** Initial enrollment and subsequent enrollment(s), if applicable

Total forest area

Data element name: Total forest area	**Reporting question:** What amount of the current operation is forested (by area)?
Description: Area of the total farm that is currently considered forest land use. Forest land use means that at least 10% of the land area is covered in trees that will be at least 13 feet tall when mature. If a producer is enrolled in the project for multiple years, review the total forest area each time a new contract is signed and provide any necessary updates.	
Data type: Integer	**Select multiple values:** No
Measurement unit: Acres	**Allowed values:** 0-100,000
Logic: None – all respond	**Required:** Yes
Data collection level: Producer	**Data collection frequency:** Initial enrollment and subsequent enrollment(s), if applicable

Livestock type

Data element name: Livestock type 1-3

Reporting question: What types of livestock are raised on the farm?

Description: Up to top three types of livestock (by head count) on the farm. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 3 livestock types, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other livestock types as free text. If a producer is enrolled in the project for multiple years, review the livestock type each time a new contract is signed and provide any necessary updates.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Alpacas
- Beef cows
- Beefalo
- Buffalo or bison
- Chickens (broilers)
- Chickens (layers)
- Dairy cows
- Deer
- Ducks
- Elk
- Emus
- Equine
- Geese
- Goats
- Honeybees
- Llamas
- Reindeer
- Sheep
- Swine
- Turkeys
- Other (specify)

Logic: Respond if 'Total livestock area' >0

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment and subsequent enrollment(s), if applicable

Livestock head

Data element name: Livestock head 1-3

Reporting question: How many livestock (by type) are on this operation?

Description: Average annual head count for each type of livestock. Enter amounts for up to the top three livestock types by number. The worksheet provides three columns for this data element. Enter one value for each column. If there are fewer than 3 livestock types, leave unnecessary columns blank. If a producer is enrolled in the project for multiple years, review the average annual head count each time a new contract is signed and provide any necessary updates.

Data type: Integer

Select multiple values: NA

Measurement unit: Head count

Allowed values: 1-10,000,000

Logic: Respond if 'Total livestock area' >0

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment and subsequent enrollment(s), if applicable

Organic farm

Data element name: Organic farm

Reporting question: Is any part of the farm currently USDA-certified organic or transitioning to USDA-certified organic?

Description: USDA-certified organic means that the farm has been certified by an accredited organic certifying agent or is transitioning to USDA-certified organic by not using any of the prohibited substances. Yes means that some or all of the farm is certified organic or transitioning to certified organic. No means that no part of the farm is certified organic or transitioning to certified organic. If a producer is enrolled in the project for multiple years, review the organic certification status of the farm each time a new contract is signed and provide any necessary updates.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: No

Data collection level: Producer

Data collection frequency: Initial enrollment and subsequent enrollment(s), if applicable

Organic fields

Data element name: Organic fields

Reporting question: Are any of the fields enrolled in the project currently USDA-certified organic or transitioning to USDA-certified organic?

Description: USDA-certified organic means that the operation has been certified by an accredited organic certifying agent or is transitioning to USDA-certified organic by not using any of the prohibited substances. Yes means that some or all of the fields enrolled in the project are certified organic or transitioning to certified organic. No means that no part of the fields enrolled in the project are certified organic or transitioning to certified organic. If a producer is enrolled in the project for multiple years, review the organic certification status of the enrolled fields each time a new contract is signed and provide any necessary updates.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Organic operation'

Required: No

Data collection level: Producer

Data collection frequency: Initial enrollment and subsequent enrollment(s), if applicable

Producer motivation

Data element name: Producer motivation

Reporting question: Which of the following was the primary reason the producer enrolled in this project?

Description: Primary operator's motivation for enrolling in the project.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Financial benefit
- Environmental benefit
- New market opportunity
- Partnerships or networks
- Other

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

Producer outreach

Data element name: Producer outreach 1-3

Reporting question: What types of outreach were provided to producers?

Description: Up to three most common types of outreach provided to producer prior to enrollment. Outreach activities are those focused on identifying and enrolling producers in the project. Outreach can come from the recipient or project partners. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 3 outreach types, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other outreach types as free text.

Data type: List

Select multiple values: Yes

Measurement unit: Category

Allowed values:

- Commodity organizations
- Conferences
- Cooperative extension
- Digital communications and resources
- Education workshops, field days, and town halls
- Existing partner networks
- Farm visits and one-on-one meetings
- General advertising
- Peer referrals and producer groups
- Phone calls
- Print communications and resources
- Retailers
- State agencies
- Targeted messaging using proprietary data
- Technical service providers
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

CSAF experience

Data element name: CSAF experience

Reporting question: Has the primary operator implemented CSAF practices in the last ten years anywhere on the farm?

Description: Has this farm implemented climate-smart agriculture or forestry (CSAF) practices anywhere on the farm in the past 10 years or since the current primary operator took control (whichever time period is shorter)? CSAF practices are included in a list in Appendix A.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

CSAF federal funds

Data element name: CSAF federal funds

Reporting question: Were prior CSAF practices supported by federal funds?

Description: If this farm (under the primary operator) has implemented CSAF practices in the last ten years, was implementation supported by federal funds? Federal funds are defined as being from programs including, but not limited to, those from the Natural Resources Conservation Service ((NRCS), including through Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), Regional Conservation Partnership Program (RCPP), or related programs), the Farm Service Agency Conservation Reserve Program (CRP), as well as funds from other USDA programs or other federal agencies.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don’t know

Logic: Respond if yes to 'CSAF experience'

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

CSAF state or local funds

Data element name: CSAF state or local funds

Reporting question: Were prior CSAF practices supported by state or local funds?

Description: If this farm (under the primary operator) has implemented CSAF practices in the last ten years, was implementation supported by state funds? State or local funds are those from state departments of agriculture or other state agencies, local water quality districts and other local agencies.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don’t know

Logic: Respond if yes to 'CSAF experience'

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

CSAF nonprofit funds

Data element name: CSAF nonprofit funds

Reporting question: Were CSAF practices supported by nonprofit funds?

Description: If this farm (under the primary operator) has implemented CSAF practices in the last ten years, was implementation supported by nonprofit funds? Nonprofit funds are those offered directly from a nonprofit organization to a producer.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don’t know

Logic: Respond if yes to 'CSAF experience'

Required: Yes

Data collection level: Producer

Data collection frequency: Initial enrollment

CSAF market incentives

Data element name: CSAF market incentives	**Reporting question:** Were CSAF practices supported by market incentives?
Description: If this farm (under the primary operator) has implemented CSAF practices in the last ten years, was implementation supported by market incentives? Market incentives include premiums paid by a commodity buyer or by a consumer based on branding or labeling as a climate-smart commodity.	
Data type: List	**Select multiple values:** No
Measurement unit: Category	**Allowed values:** • Yes • No • I don't know
Logic: Respond if yes to 'CSAF experience'	**Required:** Yes
Data collection level: Producer	**Data collection frequency:** Initial enrollment

Field Enrollment

Unique IDs

Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name (must match FSA farm enrollment data)
County of field	County name (must match FSA farm enrollment data)
Prior Field ID, if applicable	Prior Field ID assigned by FSA if there has been reconstitution of the farm resulting in a new Field ID during the field's enrollment in the project

Field data change

Data element name: Field data change

Reporting question: Has the information previously reported for this field changed?

Description: Indicator that this entry is being used to report any relevant changes, such as a new Field ID number or changes to the commodity or practice combinations, for a field that has previously been enrolled in the project.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Re-enrollment

Contract start date

Data element name: Contract start date

Reporting question: What is the start date of the contract with the producer that includes this field?

Description: Start date listed on the contract that enrolls the field in the project.

Data type: Date

Select multiple values: NA

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023 – 12/31/2030

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Total field area

Data element name: Total field area

Reporting question: What is the total size of the enrolled field?

Description: Total size of the field enrolled with the project.

Data type: Decimal

Select multiple values: No

Measurement unit: Acres

Allowed values: .01-500

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Commodity category

Data element name: Commodity category

Reporting question: What category of commodity(ies) is (are) produced from this field?

Description: Category of commodity(ies) produced in field enrolled in the project

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Crops
- Livestock
- Trees
- Crops and livestock
- Crops and trees
- Livestock and trees
- Crops, livestock and trees

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Commodity type

Data element name: Commodity type

Reporting question: What type of commodity is produced from this field?

Description: Type of commodity produced in field enrolled in the project. See full list in Appendix B. The worksheet provides a drop-down list of the allowed values. Choose the appropriate value. Enter additional commodities in subsequent rows.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values: FSA commodity list

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Baseline yield

Data element name: Baseline yield

Reporting question: What is the baseline yield of this field?

Description: Average annual yield of commodity in 3 years prior to enrollment. Provide yield for the enrolled field if possible. If not at field level, provide average annual yield for the specific commodity for the operation.

Data type: Decimal

Select multiple values: No

Measurement unit: Production per acre or animal

Allowed values: .01-100,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Baseline yield unit

Data element name: Baseline yield unit

Reporting question: Baseline yield unit

Description: Unit of average annual yield of commodity in enrolled field in 3 years prior to enrollment. The worksheet provides a drop-down list of choices for this data element. If "other" is chosen, use the additional column to enter the appropriate yield unit as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Animal units per acre
- Bushels per acre
- Carcass pounds per animal
- Head per acre
- Hundred-weights (or pounds) per head
- Linear feet per acre
- Liveweight pounds per animal
- Pounds per acre
- Tons per acre
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Baseline yield location

Data element name: Baseline yield location

Reporting question: For what portion of the operation is the baseline yield being reported?

Description: Location of the reported average annual yield of commodity in 3 years prior to enrollment. If "other" is chosen, use the additional column to enter the appropriate location as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Enrolled field
- Whole operation
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Field land use

Data element name: Field land use

Reporting question: What is this field's land use history?

Description: Prior to enrollment, what was the most common land use for this field in the past 3 years?

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Crop land
- Forest land
- Non-agriculture
- Other agricultural land
- Pasture
- Range

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Field irrigated

Data element name: Field irrigated	**Reporting question:** What is this field's irrigation history?
Description: Prior to enrollment, what was the most common irrigation practice on this field the past 3 years?	
Data type: List	**Select multiple values:** No
Measurement unit: Category	**Allowed values:** • No irrigation • Center pivot • Drip-subsurface • Drip-surface • Flood/border • Furrow/ditch • Lateral/linear sprinklers • Micro-sprinklers • Seepage • Side roll • Solid set sprinklers • Supplemental • Surface • Traveling gun/towline • Wheel Line • Other
Logic: None – all respond	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Initial enrollment

Field tillage

Data element name: Field tillage	**Reporting question:** What is this field's tillage history?
Description: Prior to enrollment, what was the most common tillage approach during the past 3 years?	
Data type: List	**Select multiple values:** No
Measurement unit: Category	**Allowed values:** • None • Conventional, inversion • Conventional, vertical • No-till, direct seed • Reduced till, inversion • Reduced till, vertical • Strip till • Other
Logic: None – all respond	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Initial enrollment

Practice past extent - farm

Data element name: Practice past extent - farm

Reporting question: What percent of the farm has implemented this CSAF practice (combination) previously?

Description: Prior to enrollment, on what portion of the whole farm had this (these) CSAF practice(s) ever been used by the primary operator? If multiple practices are planned to be implemented in this field, enter the value that best corresponds to the farm's prior experience with the planned set of practices.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Never used
- Used on less than 25% of operation
- Used on 25-50% of operation
- Used on 51-75% of operation
- Used on more than 75% of operation

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Field any CSAF practice

Data element name: Field any CSAF practice

Reporting question: What is this field's prior experience with CSAF practices?

Description: Prior to enrollment, have any CSAF practice or practices been used in this field in the past 3 years? CSAF practices are included in a list in Appendix A.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Practice past use - this field

Data element name: Practice past use - this field

Reporting question: Have this CSAF practice (combination) been implemented previously in this field?

Description: Prior to enrollment, had this (these) CSAF practice(s) been used in this field in the in the past 3 years? Enter yes if all of the practices had been used previously in this field; enter some if multiple practices are being implemented and one or more, but not all of the practices had been used previously in this field; and enter no if none of the practices had been used previously in this field.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- Some
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Practice type

Data element name: Practice type 1-7

Reporting question: What CSAF practice is being implemented in this field through the project?

Description: Which CSAF practice or practices will be implemented on this field as part of enrollment in the project? CSAF practices are included in a list in Appendix A. The worksheet provides seven columns for this data element. Enter one value for each column. If there are fewer than 7 practices being implemented on this field through enrollment in the project, leave unnecessary columns blank.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values: See list in Appendix A

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Practice standard

Data element name: Practice standard 1-7

Reporting question: What standard does the CSAF practice follow?

Description: Is the CSAF practice being implemented on the field as part of enrollment in the project following a defined practice standard? The worksheet provides seven columns for this data element. Enter one value for each column, corresponding to the practice types entered in the previous columns. If there are fewer than 7 practices being implemented on this field through enrollment in the project, leave unnecessary columns blank.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- NRCS
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Planned practice implementation year

Data element name: Practice 1-7 implementation year

Reporting question: What year is the CSAF practice planned to be implemented?

Description: Year that the CSAF practice is planned to be implemented on the field. Use 2022 for early adopters, defined as fields that have the practice actively implemented in 2022 (prior to contract being signed for this project). The worksheet provides seven columns for this data element. Enter one value for each column, corresponding to the practice types entered in the previous columns. If there are fewer than 7 practices being implemented on this field through enrollment in the project, leave unnecessary columns blank.

Data type: Integer

Select multiple values: No

Measurement unit: Year

Allowed values: 2022-2030

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Practice extent

Data element name: Practice 1-7 extent

Reporting question: To what extent is the practice implemented?

Description: Total area, length, or head where the practice is being implemented in the field specified by the contract.

Data type: Decimal

Select multiple values: No

Measurement unit: Extent

Allowed values: .01-100,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Initial enrollment

Practice extent unit	
Data element name: Practice 1-7 extent unit	**Reporting question:** Unit for extent of practice implementation
Description: Unit for extent of practice implementation on the field specified by the contract. If "other" is chosen, use the additional column to enter the appropriate unit.	
Data type: List	**Select multiple values:** No
Measurement unit: Category	**Allowed values:** • Acres • Head of livestock • Linear feet • Square feet • Other (specify)
Logic: None – all respond	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Initial enrollment

CSAF Practice Sub-questions

For certain practices, additional questions are asked that provide information necessary to estimate greenhouse gas benefits from implementation of the practice. See Table 11 in the *CSAF Practice Sub-questions* section for descriptions of individual questions to be answered depending on the CSAF practices selected.

Farm Summary

Unique IDs

Farm ID	Unique Farm ID assigned by FSA
State or territory	State name (must match FSA farm enrollment data)
County of residence	County name (must match FSA farm enrollment data)

Producer TA received

Data element name: Producer TA received 1-3

Reporting question: What types of technical assistance were provided to this producer?

Description: Did the recipient or any partner provide technical assistance (TA) to the producer this year? Technical assistance is any training, education, capacity building or other support provided by any project partner(s) directly to producers enrolled in the project. List up to the top three most common types of TA provided to this producer. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 3 TA types, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other TA types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Demonstration plots
- Equipment demonstrations
- Group field days or in-person field workshops
- Hotline
- One-on-one enrollment assistance
- One-on-one field visits
- One-on-one producer mentorship
- Producer networks and peer-to-peer groups
- Retailer consultation
- Social media/digital tools
- Train-the-trainer opportunities
- Virtual meetings or field days
- Webinars and videos
- Written materials
- None
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Producer incentive amount

Data element name: Producer incentive amount

Reporting question: What is the total value of financial incentives provided to this producer?

Description: Total incentive payment received by the producer from USDA project funds for the year (non-cumulative). Do not include incentive payments made with partner match funds.

Data type: Decimal

Select multiple values: NA

Measurement unit: Dollars

Allowed values: $0-$5,000,000

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Incentive reason

Data element name: Incentive reason 1-4

Reporting question: Why were incentives provided to this producer?

Description: List up to four reasons for producer incentive payments. List the top 4 based on total value of the incentive for each reason. The worksheet provides four columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 4 reasons, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other reasons as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Avoided conversion
- Conference or training attendance
- Demographics/equity payment
- Enrollment
- Foregone revenue
- Historic data collection
- Identity preservation (supply chain tracing)
- Implementation of practices
- MMRV (e.g., data collection, reporting)
- Passing audit
- Price premium on output
- Yield change
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Incentive structure

Data element name: Incentive structure 1-4

Reporting question: What are the units for the financial incentives provided to this producer?

Description: List the structures (units) corresponding to the top 4 (by dollar value) incentive payments to producers. Production unit is weight or volume (bushel, kilogram, ton). The worksheet provides four columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 4 structure types, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other structure types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Flat rate
- Per animal head
- Per area
- Per length
- Per production unit
- Per ton GHG
- Per tree
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Incentive type

Data element name: Incentive type 1-4

Reporting question: What type of incentives were provided to each producer?

Description: List the top 4 types of incentive payments to producers (based on dollar value). The worksheet provides four columns with a drop-down list of the allowed values. Choose one value for each column. If there are fewer than 4 incentive types, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other incentive types as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Cash payment
- Equipment loan
- Guaranteed commodity premium payment
- Inputs and supplies
- Land rental
- Loan
- Paid labor
- Post-harvest transportation
- Tuition or fees for training
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Payment on enrollment

Data element name: Payment on enrollment

Reporting question: What portion of the financial incentive is provided to the producer upon enrollment in the project?

Description: Any incentive payment provided to the producer upon enrollment/signing a contract, and not related to any implementation, MMRV or sales activities. Full payment means the full incentive amount for any contract held by the producer is paid upon enrollment. Partial payment means that only part of the full incentive amount for any contract held by the producer is paid upon enrollment. No payment means that none of the full incentive amount for any contract held by the producer is paid upon enrollment.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Full payment
- Partial payment
- No payment

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Payment on implementation

Data element name: Payment on implementation

Reporting question: What portion of the financial incentive is provided to the producer upon implementation of the practices?

Description: Any incentive payment provided to the producer upon implementing the practices included in the contract. Full payment means the full incentive amount for any contract held by the producer is paid upon implementation. Partial payment means that only part of the full incentive amount for any contract held by the producer is paid upon implementation. No payment means that none of the full incentive amount for any contract held by the producer is paid upon implementation.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Full payment
- Partial payment
- No payment

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Payment on harvest

Data element name: Payment on harvest

Reporting question: What portion of the financial incentive is provided to the producer upon harvest of the commodity?

Description: Any incentive payment provided to the producer upon harvesting or slaughtering the commodity included in the contract. Full payment means the full incentive amount for any contract held by the producer is paid upon harvest. Partial payment means that only part of the full incentive amount for any contract held by the producer is paid upon harvest. No payment means that none of the full incentive amount for any contract held by the producer is paid upon harvest.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Full payment
- Partial payment
- No payment

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Payment on MMRV

Data element name: Payment on MMRV

Reporting question: What portion of the financial incentive is provided to the producer upon completing MMRV requirements?

Description: Any incentive payment provided to the producer upon completing the annual MMRV requirements included in the contract. Full payment means the full incentive amount for any contract held by the producer is paid upon MMRV being complete. Partial payment means that only part of the full incentive amount for any contract held by the producer is paid upon MMRV being complete. No payment means that none of the full incentive amount for any contract held by the producer is paid upon MMRV being complete.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Full payment
- Partial payment
- No payment

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Payment on sale

Data element name: Payment on sale

Reporting question: What portion of the financial incentive is provided to producer upon sale of the commodity?

Description: Any incentive payment provided to the producer upon sale of the commodity included in the contract. Full payment means the full incentive amount for any contract held by the producer is paid upon sale. Partial payment means that only part of the full incentive amount for any contract held by the producer is paid upon sale. No payment means that none of the full incentive amount for any contract held by the producer is paid upon sale.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Full payment
- Partial payment
- No payment

Logic: None – all respond

Required: Yes

Data collection level: Producer

Data collection frequency: Quarterly

Field Summary

Unique IDs

Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name (must match FSA farm enrollment data)
County of field	County name (must match FSA farm enrollment data)

Commodity type

Data element name: Commodity type

Reporting question: What type of commodity is produced from this field?

Description: Type of commodity produced in field enrolled in the project. See full list in Appendix B. The worksheet provides multiple columns with a drop-down list of the allowed values. Choose one value for each column. Leave unnecessary columns blank.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values: FSA commodity list

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Practice type

Data element name: Field practice type 1-7

Reporting question: What CSAF practice is being implemented in this field through the project?

Description: Which climate-smart agriculture or forestry (CSAF) practice or practices are being implemented in this project? CSAF practices are included in a list in Appendix A. The worksheet provides seven columns for this data element. Enter one value for each column. If there are fewer than 7 practices being implemented on this field through enrollment in the project, leave unnecessary columns blank.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values: See list in Appendix A

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Date practice complete

Data element name: Date practice complete

Reporting question: When did the project certify CSAF practice implementation as complete?

Description: Date that the project certifies that implementation of the CSAF practice is complete on the field. Use January of the year prior to contract year for early adopters, defined as fields that have the practice actively implemented in the year prior to a contract associated with this project is signed). The worksheet provides seven columns for this data element. Enter one value for each column, corresponding to the practice types entered in the previous columns. If there are fewer than 7 practices being implemented on this field through enrollment in the project, leave unnecessary columns blank.

Data type: Date

Select multiple values: No

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023 – 12/31/2030

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Contract end date

Data element name: Contract end date

Reporting question: Contract end date

Description: End date listed on the contract that enrolls the field in the project. If contract end date changes, submit updated end date during the next quarter's reporting.

Data type: Date

Select multiple values: No

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023 – 12/31/2030

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

MMRV assistance provided

Data element name: MMRV assistance provided

Reporting question: Was MMRV assistance provided?

Description: Was any MMRV assistance provided to the primary operator for this field? MMRV assistance includes in-field support for the use of technologies, consultation on data collection and input, and other support related to MMRV. MMRV is defined a measurement (calculations or estimations of GHG emissions), monitoring (ongoing review and confirmation that the climate-smart practice has been implemented according to the agreed upon standard and documentation of any changes in the site, implementation, or GHG emissions impacts over time), reporting (documenting and sharing monitoring and measurement results with project partners, the recipient, and any third-party verification organization), and verification (independent confirmation that measurement, monitoring and reporting information are complete, accurate and reliable).

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Marketing assistance provided

Data element name: Marketing assistance provided

Reporting question: Was marketing assistance provided?

Description: Was any marketing assistance provided to the primary operator for the commodity(ies) produced from this field? Marketing assistance includes guaranteeing the sale of the commodity(ies), providing a platform for the sale of the commodity(ies), providing a label, branding, or other support related to marketing.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Incentive per acre or head

Data element name: Incentive per acre or head

Reporting question: Is this field receiving a per-acre or per-head incentive?

Description: Is this field receiving an incentive payment to implement a specific CSAF practice or set of practices on a per-acre or per-head (livestock) basis?

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field commodity value

Data element name: Field commodity value

Reporting question: What is the value of the commodity produced on the enrolled field?

Description: The dollar value of the commodity produced on the enrolled field.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $1-$10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field commodity volume

Data element name: Field commodity volume

Reporting question: What is the volume of commodity produced on the enrolled field?

Description: The volume of the commodity produced on the enrolled field

Data type: Decimal

Select multiple values: No

Measurement unit: Number

Allowed values: 1-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field commodity volume unit

Data element name: Field commodity volume unit

Reporting question: What is the unit of volume?

Description: The unit associated with the volume of the commodity produced on the enrolled field. If "other" is chosen, enter the appropriate value in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Bushels
- Carcass weight pounds
- Gallons
- Head
- Linear feet
- Liveweight pounds
- Pounds
- Tons
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Cost of implementation

Data element name: Cost of implementation

Reporting question: What is the cost of practice implementation in the field?

Description: Total annual estimated cost per unit of implementing the practice(s) in the enrolled field.

Data type: Decimal

Select multiple values: No

Measurement unit: Dollars

Allowed values: $1-$10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Cost unit

Data element name: Cost unit

Reporting question: What is the unit for cost?

Description: The unit associated with the cost of implementing CSAF practices in the field. If "other" is chosen, enter the appropriate value in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Per acre
- Per bushel
- Per head
- Per linear foot
- Per pound
- Per ton
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Cost coverage

Data element name: Cost coverage

Reporting question: What percent of the practice cost is covered by the incentive?

Description: Estimated proportion of total annual cost of implementing the practice(s) that is covered by project incentives.

Data type: Integer

Select multiple values: No

Measurement unit: Percent

Allowed values: 0-100

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field GHG monitoring

Data element name: Field GHG monitoring 1-3

Reporting question: How were GHG impacts monitored in this field?

Description: Up to the top three forms of monitoring GHG benefits as part of MMRV requirements. Monitoring is defined as ongoing review and confirmation that the climate-smart practice has been implemented according to the agreed upon standard and documentation of any changes in the site, implementation, or GHG emissions impacts over time. Include up to 3 methods, based on which methods are most commonly used for this field. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 GHG monitoring methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG monitoring methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Drones
- Ground-level photos and videos
- On-farm inspection
- Plot-based sampling (e.g., soil, water)
- Producer records or attestation
- Satellite monitoring or remote sensing
- Soil metagenomics
- Soil sensors
- Water sensors
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field GHG reporting

Data element name: Field GHG reporting 1-3

Reporting question: How were GHG benefits reported for this field?

Description: Up to the top three forms of reporting on GHG benefits as part of MMRV requirements. Reporting is defined as documenting and sharing monitoring and measurement results with project partners, the recipient, and any third-party verification organization. Include up to 3 methods, based on which methods are most commonly used for this field. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 GHG reporting methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG reporting methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Automated devices
- Email
- Mobile app
- Paper
- Third-party actors
- Website
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field GHG verification

Data element name: Field GHG verification 1-3

Reporting question: How was implementation of practices to reduce GHG emissions verified for this field?

Description: Up to the top three of verification of GHG benefits as part of MMRV requirements. Verification is defined as independent confirmation that measurement, monitoring and reporting information are complete, accurate and reliable. Include up to 3 methods, based on which methods are most commonly used for this field. The worksheet provides three columns with a drop-down list of the allowed values. Choose one value for each column. If fewer than 3 GHG verification methods are used, leave unnecessary columns blank. If "other" is chosen, use the additional column to enter other GHG verification methods as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Artificial intelligence
- Computer modeling
- Recipient audit
- Photos
- Record audit
- Satellite imagery
- Site or field visit
- Third-party audit
- Other (specify)

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field GHG calculations

Data element name: Field GHG calculations

Reporting question: What methods are used to calculate GHG benefits in this field?

Description: List the method(s) used to calculate GHG benefits in this field. If yes to direct physical measurements, submit result reports (see *Supplemental Data Submission – Field direct GHG measurement results*).

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:
- Models
- Direct field measurements
- Both

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official GHG calculation

Data element name: Field official GHG calculation

Reporting question: What method was used to calculate the official GHG benefits in this field?

Description: List the method used to calculate the official GHG benefits in this field that are reported as part of the project's aggregate impact.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:
- Models
- Direct field measurements

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official GHG ER

Data element name: Field official GHG emission reductions

Reporting question: What are the estimated total GHG emission reductions (CO2eq) in this field?

Description: Estimated greenhouse gas emission reductions from practice implementation in this field that are reported as part of the project's aggregate impact. This data element must be entered upon practice completion or annually, as appropriate.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official carbon stock

Data element name: Field official carbon stock

Reporting question: How much carbon has been sequestered in this field?

Description: Estimated total change in carbon stock based on practice implementation in this field. This data element can be reported in any quarter and is cumulative for the year. Conversion rate is one ton of carbon = 3.67 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official CO2 ER

Data element name: Field official CO2 emission reductions

Reporting question: What are the estimated total CO2 emission reductions in this field?

Description: Estimated total carbon dioxide emission reductions based on practice implementation in this field that are reported as part of the project's aggregate impact. This data element must be entered upon practice completion or annually, as appropriate.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official CH4 ER

Data element name: Field official CH4 emission reductions

Reporting question: What are the estimated total CH4 emission reductions in this field?

Description: Estimated total methane emission reductions based on practice implementation in this field that are reported as part of the project's aggregate impact. This data element must be entered upon practice completion or annually, as appropriate. Conversion rate is one ton of CH_4 = 25 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CH4 reduced in CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field official N20 ER

Data element name: Field official N2O emission reductions

Reporting question: What are the estimated total N2O emission reductions in this field?

Description: Estimated total nitrous oxide emission reductions based on practice implementation in this field that are reported as part of the project's aggregate impact. This data element must be entered upon practice completion or annually, as appropriate. Conversion rate is one ton of N_2O = 298 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons N2O reduced in CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field offsets produced

Data element name: Field offsets produced

Reporting question: How many carbon offsets have been produced in this field?

Description: Total carbon offsets produced in the field during the quarter (not cumulative). Offsets are defined as having been verified and certified using an accepted standard and sold into the carbon marketplace.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Quarterly

Field insets produced

Data element name: Field insets produced	**Reporting question:** How many carbon insets have been produced in this field?
Description: Total carbon insets produced in the field during the quarter (not cumulative). Insets are defined as having been verified and certified using an accepted standard and accounted for within Scope 3 emissions for a firm.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Quarterly

Other field measurement

Data element name: Other field measurement	**Reporting question:** Were data collected from the field for reasons other than GHG benefit estimation?
Description: Direct physical measurements or data collection taken in the field for any reason other than GHG benefits estimation. These reasons could include calibration of GHG estimation tools or models, tracking other environmental benefits (see Field environmental benefits report), and other reasons. If yes, submit corresponding reports (see *Supplemental data submission - Field direct measurement results*).	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Yes • No • I don't know
Logic: None – all respond	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Quarterly

GHG Benefits - Alternate Modeled

Unique IDs	
Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name (must match FSA farm enrollment data)
County of field	County name (must match FSA farm enrollment data)

Commodity type

Data element name: Commodity type 1-6 **Reporting question:** What type of commodity(ies) is produced from this field?

Description: Type of commodity(ies) produced in field enrolled in the project. See full list of commodity options in Appendix B. The worksheet provides multiple columns with drop-down lists of the allowed values. Choose one value for each column. Leave unnecessary columns blank

Data type: List **Select multiple values**: No

Measurement unit: Category **Allowed values:** FSA commodity list

Logic: None – all respond **Required:** If project calculates GHG benefits using multiple methods

Data collection level: Field **Data collection frequency:** Annual

Practice type

Data element name: Practice type 1-7 **Reporting question:** What CSAF practice is being implemented by this project?

Description: Which CSAF practice or practices are being implemented in this project? CSAF practices are included in a list in Appendix A. The worksheet provides seven columns for this data element. Enter one value for each column. If there are fewer than 7 practices being implemented by the project, leave unnecessary columns blank.

Data type: List **Select multiple values:** No

Measurement unit: Category **Allowed values:** See list in Appendix A

Logic: None – all respond **Required:** If project calculates GHG benefits using multiple methods

Data collection level: Field **Data collection frequency:** Annual

GHG model

Data element name: GHG model

Reporting question: What model was used for alternate calculation of GHG benefits?

Description: Select the model used for the alternate calculation of the field's GHG benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- ACC Calculator
- Agriculture, Forestry and Other Land Use (AFOLU) Carbon Calculator
- AIRES
- APEX
- Bowen Ratio Energy Balance
- Carat-Calculator
- CArPE
- CDFA web-based calculator
- COMET-Farm
- COMET-Planner
- CoolFarm
- Cover Crop Explore
- CropTrak
- CultivateAI's FMIS
- DayCent-CR
- DNDC
- DSSAT
- Earth Optics
- EcoPractices
- EPIC
- Extrapolation based on literature
- FieldPrint
- Granular
- GREET
- gTIR
- IFSM
- IPCC default emissions factors & models
- itree
- Nitrogen Balance
- Nutrient Tracking Tool (NTT)
- RCD Project Tracker
- Revised Universal Soil Loss equation 2 (RUSLE2)
- RuFaS
- SAFE-Link
- SALUS (CIBO)
- SNAPGRAZE
- SquareRoots
- SWAT-C
- SYMFONI
- Truterra Sustainability Tool
- Verra
- WEPP
- YardStick
- Other (specify)

Logic: None – all respond

Required: If project calculates GHG benefits using multiple methods

Data collection level: Field

Data collection frequency: Annual

Model start date

Data element name: Model start date	**Reporting question:** For what time period are the GHG benefits modeled (model start date)?
Description: Date that the model parameters begin.	
Data type: Date	**Select multiple values**: NA
Measurement unit: MM/DD/YYYY	**Allowed values:** 01/01/1950 – 12/31/2030
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Model end date

Data element name: Model end date	**Reporting question:** For what time period are the GHG benefits modeled (model end date)?
Description: Date that the model parameters end.	
Data type: Date	**Select multiple values**: NA
Measurement unit: MM/DD/YYYY	**Allowed values:** 01/01/2023– 12/31/2030
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Total GHG benefits estimated

Data element name: Total GHG benefits estimated	**Reporting question:** What is the alternate estimate of the field's total GHG emission reductions?
Description: Total greenhouse gas emission reductions from practice implementation in the field estimated using an alternate model.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Total carbon stock estimated

Data element name: Total carbon stock estimated	**Reporting question:** What is the alternate estimate of how much carbon has the field has sequestered?
Description: Total change in carbon stock based on practice implementation in the field estimated using an alternate model. Conversion rate is one ton of carbon = 3.67 tons of CO_2eq.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Total CO2 estimated

Data element name: Total CO2 estimated	**Reporting question:** What is the alternate estimate of the field's total CO2 emission reductions?
Description: Total carbon dioxide emission reductions based on practice implementation in the field estimated using an alternate model.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CO_2	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Total CH4 estimated

Data element name: Total CH4 estimated	**Reporting question:** What is the alternate estimate of the field's total CH4 emission reductions?
Description: Total methane emission reductions based on practice implementation in the field estimated using an alternate model. Conversion rate is one ton of CH_4 = 25 tons of CO_2eq.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CH4 reduced in CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

Total field N20 estimated

Data element name: Total N2O estimated	**Reporting question:** What is the alternate estimate of the field's total N2O emission reductions?
Description: Total nitrous oxide emission reductions based on practice implementation in the field estimated using an alternate method. Conversion rate is one ton of N_2O = 298 tons of CO_2eq.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons N2O reduced in CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If project calculates GHG benefits using multiple methods
Data collection level: Field	**Data collection frequency:** Annual

GHG Benefits - Measured

Unique IDs

Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name (must match FSA farm enrollment data)
County of field	County name (must match FSA farm enrollment data)

GHG measurement method

Data element name: GHG measurement method

Reporting question: What measurement method is used to calculate GHG benefits?

Description: Field-based measurement method used to calculate GHG benefits. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Emissions measurement unit
- Flux towers
- Litterbags
- Plant measurements
- Portable emissions analyzers
- Soil flux chambers
- Soil samples
- Soil sensors
- Vehicle-mounted sensors
- Other (specify)

Logic: None – all respond

Required: If a project conducts soil samples or takes carbon stock or greenhouse gas emission measurements in this field

Data collection level: Field

Data collection frequency: Annual

Lab name

Data element name: Lab name

Reporting question: What is the name of the lab that processed the measurement samples?

Description: Name of entity that received data and conducted analysis of samples.

Data type: Text

Select multiple values: No

Measurement unit: NA

Allowed values: Free text

Logic: None – all respond

Required: If applicable

Data collection level: Field

Data collection frequency: Annual

Measurement start date

Data element name: Measurement start date

Reporting question: On what date did the measurement start?

Description: Date that the measurements began. If it was a single point in time, use the same date for start date and end date. If multiple measurements took place over a time period, use the date that the measurements first began.

Data type: Date

Select multiple values: No

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023 – 12/31/2030

Logic: None – all respond

Required: If a project conducts soil samples or takes carbon stock or greenhouse gas emission measurements in this field

Data collection level: Field

Data collection frequency: Annual

Measurement end date

Data element name: Measurement end date

Reporting question: On what date did the measurement end?

Description: Date that the measurements began. If it was a single point in time, use the same date for start date and end date. If multiple measurements took place over a time period, use the date that the measurements were completed.

Data type: Date

Select multiple values: No

Measurement unit: MM/DD/YYYY

Allowed values: 01/01/2023– 12/31/2030

Logic: None – all respond

Required: If a project conducts soil samples or takes carbon stock or greenhouse gas emission measurements in this field

Data collection level: Field

Data collection frequency: Annual

Total CO2 reduction calculated

Data element name: Total CO2 reduction calculated

Reporting question: What are the total measured CO2 emission reductions?

Description: Total annual CO2 emission reductions based on practice implementation in the field calculated from in-field measurements.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2

Allowed values: 0-10,000,000

Logic: None – all respond

Required: If a project takes carbon stock or greenhouse gas emission measurements in this field

Data collection level: Field

Data collection frequency: Annual

Total field carbon stock measured

Data element name: Total field carbon stock measured

Reporting question: What is the total amount of carbon sequestered based on repeat measurements in this field?

Description: Change in carbon stock based on practice implementation in the field calculated from repeat soil sampling in this field. (Results for initial field soil samples should be reported in the 'Soil sample result' and 'Measurement type" columns.) Conversion rate is one ton of carbon = 3.67 tons of CO_2eq.

Data type: Decimal

Select multiple values: No

Measurement unit: Metric tons CO_2eq

Allowed values: 0-10,000,000

Logic: None – all respond

Required: If a project conducts soil samples or takes carbon stock measurements in this field

Data collection level: Field

Data collection frequency: Annual

Total CH4 reduction calculated

Data element name: Total CH4 reduction calculated	**Reporting question:** What are the total measured CH4 emission reductions?
Description: Total annual methane emission reductions based on practice implementation in the field calculated from in-field measurements. Conversion rate is one ton of CH_4 = 25 tons of CO_2eq.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons CH4 reduced in CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If a project conducts soil samples or takes carbon stock or greenhouse gas emission measurements in this field
Data collection level: Field	**Data collection frequency:** Annual

Total N20 reduction calculated

Data element name: Total N2O reduction calculated	**Reporting question:** What are the total measured N2O emission reductions?
Description: Total annual nitrous oxide emission reductions based on practice implementation in the field calculated from in-field measurements. Conversion rate is one ton of N_2O = 298 tons of CO_2eq.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Metric tons N2O reduced in CO_2eq	**Allowed values:** 0-10,000,000
Logic: None – all respond	**Required:** If a project conducts soil samples or takes carbon stock or greenhouse gas emission measurements in this field
Data collection level: Field	**Data collection frequency:** Annual

Soil sample result

Data element name: Soil sample result	**Reporting question:** What is the numeric result from this soil sample?
Description: Results of measurement(s) taken to determine the carbon stock of a soil (the tons of carbon found in a specified volume of soil).	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Amount	**Allowed values:** .00001-100,000
Logic: None – all respond	**Required:** If a project conducts soil samples in this field
Data collection level: Field	**Data collection frequency:** Annual

Soil sample result unit

Data element name: Soil sample result unit

Reporting question: What is unit for the soil sample result?

Description: Unit for the corresponding soil sample result. The worksheet provides a drop-down list of choices for this data element. If "other" is chosen, use the additional column to enter the appropriate yield unit as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Percent
- Ppm
- Grams
- Grams per cubic centimeter
- Other (specify)

Logic: None – all respond

Required: If a project conducts soil samples in this field

Data collection level: Field

Data collection frequency: Annual

Measurement type

Data element name: Measurement type

Reporting question: What type of analysis was conducted for this soil sample?

Description: Type of soil analysis conducted. The worksheet provides a drop-down list of choices for this data element. If "other" is chosen, use the additional column to enter the appropriate yield unit as free text.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Organic matter
- Total organic carbon
- Bulk density
- Other (specify)

Logic: None – all respond

Required: If a project conducts soil samples in this field

Data collection level: Field

Data collection frequency: Annual

Additional Environmental Benefits

Unique IDs	
Farm ID	Unique Farm ID assigned by FSA
Tract ID	Unique Tract ID assigned by FSA
Field ID	Unique Field ID assigned by FSA
State or territory of field	State name (must match FSA farm enrollment data)
County of field	County name (must match FSA farm enrollment data)

Environmental benefits

Data element name: Environmental benefits

Reporting question: Are environmental benefits other than GHGs being tracked in the field?

Description: Tracking of environmental benefits other than greenhouse gas emission reductions and carbon sequestration in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: None – all respond

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduction in nitrogen loss

Data element name: Reduction in nitrogen loss

Reporting question: Are reductions in nitrogen losses being tracked in the field?

Description: Tracking reductions in nitrogen losses in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Environmental benefits'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduction in nitrogen loss amount

Data element name: Reduction in nitrogen loss amount

Reporting question: How much reduction in nitrogen losses have been measured in the field?

Description: Total amount of reduction in nitrogen losses that is measured and reported in the enrolled field.

Data type: Decimal

Select multiple values: No

Measurement unit: Amount

Allowed values: 0-1,000,000

Logic: Respond if yes to 'Reduction in nitrogen loss'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduction in nitrogen loss amount unit

Data element name: Reduction in nitrogen loss amount unit	**Reporting question:** What is the unit for how much reduction in nitrogen losses have been measured in the field?
Description: Unit for the total amount of reduction in nitrogen losses that is measured and reported in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Kilograms • Metric tons • Pounds • Other (specify)
Logic: Respond if yes to 'Reduction in nitrogen loss'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduction in nitrogen loss purpose

Data element name: Reduction in nitrogen loss purpose	**Reporting question:** What is the purpose of tracking reduction in nitrogen losses?
Description: Purpose of tracking reduction in nitrogen losses in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Commodity marketing • Producing insets • Producing offsets • I don't know • Other (specify)
Logic: Respond if yes to 'Reduction in nitrogen loss'	**Required:** Yes
Data collection level: Project	**Data collection frequency:** Annual

Reduction in phosphorus loss

Data element name: Reduction in phosphorus loss	**Reporting question:** Are reductions in phosphorus losses being tracked in the field?
Description: Tracking of reductions in phosphorus losses in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Yes • No • I don't know
Logic: Respond if yes to 'Environmental benefits'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduction in phosphorus loss amount

Data element name: Reduction in phosphorus loss amount	**Reporting question:** How much reduction in phosphorus losses have been measured in the field?
Description: Total amount of reduction in phosphorus losses that is measured in the field.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Amount	**Allowed values:** 0-1,000,000
Logic: Respond if yes to 'Reduction in phosphorus loss'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduction in phosphorus loss amount unit

Data element name: Reduction in phosphorus loss amount unit	**Reporting question:** What is the unit for the reduction in phosphorus losses measured in the field?
Description: Unit for the total amount of reduction in phosphorus losses that is measured in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Kilograms • Metric tons • Pounds • Other (specify)
Logic: Respond if yes to 'Reduction in phosphorus loss'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduction in phosphorus loss purpose

Data element name: Reduction in phosphorus loss purpose	**Reporting question:** What is the purpose of tracking reductions in phosphorus losses?
Description: Purpose of tracking reduction in phosphorus losses in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Commodity marketing • Producing insets • Producing offsets • I don't know • Other (specify)
Logic: Respond if yes to 'Reduction in phosphorus loss'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Other water quality

Data element name: Other water quality	**Reporting question:** Are other water quality metrics being tracked in the field?
Description: Project tracking of other water quality metrics in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Yes • No • I don't know
Logic: Respond if yes to 'Environmental benefits'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Other water quality type

Data element name: Other water quality type	**Reporting question:** What type of other water quality metric have been measured in the field?
Description: Type of other water quality metric (besides nitrogen loss and phosphorus loss reductions) that is measured in the field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Sediment load reduction • Temperature • Other (specify)
Logic: Respond if yes to 'Other water quality'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Other water quality amount

Data element name: Other water quality amount	**Reporting question:** How much reduction in other water quality metrics have been measured in the field?
Description: Total amount of reduction in other water quality metrics that is measured in the enrolled field.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Amount	**Allowed values:** 0-1,000,000
Logic: Respond if yes to 'Other water quality'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Other water quality amount unit

Data element name: Other water quality amount unit	**Reporting question:** What is the unit for the reduction in other water quality metrics measured in the field?
Description: Unit for the total amount of reduction in other water quality metrics that is measured in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Degrees F • Kilograms • Kilograms per liter • Metric tons • Pounds • Other (specify)
Logic: Respond if yes to 'Other water quality'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Other water quality purpose

Data element name: Other water quality purpose

Reporting question: What is the purpose of tracking other water quality benefits?

Description: Purpose of tracking other water quality benefits in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Commodity marketing
- Producing insets
- Producing offsets
- I don't know
- Other (specify)

Logic: Respond if yes to 'Other water quality'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Water quantity

Data element name: Water quantity

Reporting question: Is water conservation being tracked in the field?

Description: Tracking of water conservation or reduction in use in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Environmental benefits'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Water quantity amount

Data element name: Water quantity amount

Reporting question: How much water conservation has been measured in the field?

Description: Total amount of water conservation or reduction that is measured in the field.

Data type: Decimal

Select multiple values: No

Measurement unit: Amount

Allowed values: 0-1,000,000

Logic: Respond if yes to 'Water quantity'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Water quantity amount unit

Data element name: Water quantity amount unit

Reporting question: What is the unit for the amount of water conservation measured in the field?

Description: Unit for the total amount of water conservation or reduced use that is measured and reported in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Acre-feet
- Cubic feet
- Other (specify)

Logic: Respond if yes to 'Water quantity'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Water quantity purpose

Data element name: Water quantity purpose

Reporting question: What is the purpose of tracking water conservation?

Description: Purpose of tracking water conservation or reductions in water use in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Commodity marketing
- Producing insets
- Producing offsets
- I don't know
- Other (specify)

Logic: Respond if yes to 'Water quantity'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduced erosion

Data element name: Reduced erosion

Reporting question: Is reduced soil erosion being tracked in the field?

Description: Tracking of reduced soil erosion in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Environmental benefits'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduced erosion amount

Data element name: Reduced erosion amount

Reporting question: How much erosion reduction has been measured in the field?

Description: Total amount of erosion reduction that is measured in the enrolled field.

Data type: Decimal

Select multiple values: No

Measurement unit: Amount

Allowed values: 0-1,000,000

Logic: Respond if yes to 'Reduced erosion'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduced erosion amount unit

Data element name: Reduced erosion unit

Reporting question: What is the unit for the amount of erosion reduction measured?

Description: Unit for the total amount of erosion reduction from enrolled fields that is measured and reported by the project. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Tons
- Other (specify)

Logic: Respond if yes to 'Reduced erosion'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Reduced erosion purpose

Data element name: Reduced erosion purpose	**Reporting question:** What is the purpose of tracking reduced erosion in the field?
Description: Purpose of tracking reduced erosion the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Commodity marketing • Producing insets • Producing offsets • I don't know • Other (specify)
Logic: Respond if yes to 'Reduced erosion'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduced energy use

Data element name: Reduced energy use	**Reporting question:** Is reduced energy use being tracked in the field?
Description: Tracking of reduced energy use in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Yes • No • I don't know
Logic: Respond if yes to 'Environmental benefits'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduced energy use amount

Data element name: Reduced energy use amount	**Reporting question:** How much energy use reduction has been measured in the field?
Description: Total amount of energy use reduction that is measured in the enrolled field.	
Data type: Decimal	**Select multiple values**: No
Measurement unit: Amount	**Allowed values:** 0-1,000,000
Logic: Respond if yes to 'Reduced energy use'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduced energy use amount unit

Data element name: Reduced energy use unit	**Reporting question:** What is the unit for the energy use reduction measured in the field?
Description: Unit for the total amount of energy use reduction that is measured in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Kilowatt hours • Other (specify)
Logic: Respond if yes to 'Reduced energy use'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

Reduced energy use purpose

Data element name: Reduced energy use purpose

Reporting question: What is the purpose of tracking reduced energy use in the field?

Description: Purpose of tracking reduced energy use in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Commodity marketing
- Producing insets
- Producing offsets
- I don't know
- Other (specify)

Logic: Respond if yes to 'Reduced energy use'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Avoided land conversion

Data element name: Avoided land conversion

Reporting question: Is avoided land conversion being tracked in the field?

Description: Tracking of avoided land conversion in the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits. Land conservation means land use changing from agricultural uses to non-agricultural uses.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Environmental benefits'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Avoided land conversion amount

Data element name: Avoided land conversion amount

Reporting question: How much avoided land conversion has been measured in the field?

Description: Total amount of avoided land conversion that is measured in the enrolled field.

Data type: Decimal

Select multiple values: No

Measurement unit: Amount

Allowed values: 0-1,000,000

Logic: Respond if yes to 'Avoided land conversion'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Avoided land conversion amount unit

Data element name: Avoided land conversion unit

Reporting question: What is the unit for the amount of avoided land conversion measured in the field?

Description: Unit for the total amount of avoided land conversion that is measured in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Acres
- Other (specify)

Logic: Respond if yes to 'Avoided land conversion'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Avoided land conversion purpose

Data element name: Avoided land conversion purpose

Reporting question: What is the purpose of tracking avoided land conversion in the field?

Description: Purpose of tracking avoided land conversion in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Commodity marketing
- Producing insets
- Producing offsets
- I don't know
- Other (specify)

Logic: Respond if yes to 'Avoided land conversion'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Improved wildlife habitat

Data element name: Improved wildlife habitat

Reporting question: Are improvements to wildlife habitat being tracked in the field?

Description: Tracking of improvements to wildlife in and around the enrolled field. Tracking means at a minimum using some form of monitoring and reporting that can quantify benefits.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Yes
- No
- I don't know

Logic: Respond if yes to 'Environmental benefits'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Improved wildlife habitat amount

Data element name: Improved wildlife habitat amount

Reporting question: How much improved wildlife habitat has been measured in the field?

Description: Total amount of improved wildlife habitat that is measured in and around the enrolled fields.

Data type: Decimal

Select multiple values: No

Measurement unit: Amount

Allowed values: 0-1,000,000

Logic: Respond if yes to 'Improved wildlife habitat'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Improved wildlife habitat amount unit

Data element name: Improved wildlife habitat unit

Reporting question: What is the unit for the amount of improved wildlife habitat measured in the field?

Description: Unit for the total amount of improved wildlife habitat that is measured in and around enrolled fields. If "other" is chosen, enter the appropriate value as free text in the additional column.

Data type: List

Select multiple values: No

Measurement unit: Category

Allowed values:

- Acres
- Linear feet
- Other (specify)

Logic: Respond if yes to 'Improved wildlife habitat'

Required: Yes

Data collection level: Field

Data collection frequency: Annual

Improved wildlife habitat purpose	
Data element name: Improved wildlife habitat purpose	**Reporting question:** What is the purpose of tracking improved wildlife habitat in the field?
Description: Purpose of tracking improved wildlife habitat in the enrolled field. If "other" is chosen, enter the appropriate value as free text in the additional column.	
Data type: List	**Select multiple values**: No
Measurement unit: Category	**Allowed values:** • Commodity marketing • Producing insets • Producing offsets • I don't know • Other (specify)
Logic: Respond if yes to 'Improved wildlife habitat'	**Required:** Yes
Data collection level: Field	**Data collection frequency:** Annual

CSAF Practice Sub-questions

For some CSAF practices, there is an additional set of questions that are unique to each practice. Responses to these questions are needed to verify estimated GHG benefits of these practices. If a field is implementing a CSAF practice with an NRCS CPS code in Table 11, answer the follow-up questions listed next to the relevant practice name in the table. Use the *Supplemental Reporting Workbook – CSAF Practice Sub-questions* to report the required information.

Table 11. Follow-on questions for select CSAF practices

Practice name and code	Follow-up question	Options (select one)
Alley Cropping (CPS 311)	Species category (select most common/extensive type if using more than one)	Coniferous trees Deciduous trees Shrubs
	Species density (number of trees planted per acre)	1-10,000
Anaerobic Digester (CPS 366)	Waste storage system prior to installing anaerobic digester	Aerobic lagoon Anaerobic digester (complex mix) with energy generation Anaerobic digester (plug flow) with energy generation Anaerobic lagoon Composting Covered lagoon (no energy generation or flaring) Covered lagoon with energy generation Covered lagoon with flaring Daily spread Deep bedding pack Deep pit Dry lot Dry stacking/solid storage Pasture/range/paddock Poultry with bedding Poultry without bedding (e.g., high rise) Slurry tank/basin
	Digester type	Covered lagoon with energy generation Covered lagoon with flaring Covered lagoon (no energy generation or flaring) Complex mix with energy generation Plug flow with energy generation Other (specify)
	Additional feedstock source (select most common if using more than one)	Food waste Straw or bedding Wastewater Other (specify)

Combustion System Improvement (CPS 372)	Fuel type before installation	Coal Diesel Electricity Gasoline Kerosene Liquified petroleum gas (LPG) Natural gas Propane Wood Other (specify)
	Fuel amount before installation	0-1,000,000
	Fuel amount unit before installation	Cubic feet (natural gas) Gallons (diesel, gasoline, propane, LPG, kerosene) Kilowatt-hours (electricity) Pounds (wood, coal) Other (specify)
	Fuel type after installation	Coal Diesel Electricity Gasoline Kerosene Liquified petroleum gas (LPG) Natural gas Propane Wood Other (specify)
	Fuel amount after installation	0-1,000,000
	Fuel amount unit after installation	Cubic feet (natural gas) Gallons (diesel, gasoline, propane, LPG, kerosene) Kilowatt-hours (electricity) Pounds (wood, coal) Other (specify)
Conservation Cover (CPS 327)	Species category (select most common/extensive type if using more than one)	Brassicas Grasses Legumes Non-legume broadleaves Shrubs

Conservation Crop Rotation (CPS 328)	Conservation crop type	Brassica Broadleaf Cool season Grass Legume Warm season
	Change implemented	Added perennial crop Reduced fallow period Both
	Conservation crop rotation tillage type	Conventional (plow, chisel, disk) No-till, direct seed Reduced till Strip till None Other (specify)
	Total conservation crop rotation length in days	1-120
Contour Buffer Strips (CPS 332)	Strip width (feet)	1-100
	Species category	Grasses Forbs Mix
Cover Crop (CPS 340)	Species category (select most common/extensive type if using more than one)	Brassicas Forbs Grasses Legume Non-legume broadleaves
	Cover crop planned management	Grazing Haying Termination
	Cover crop termination method	Burning Herbicide application Incorporation Mowing Rolling/crimping Winter kill/frost
Critical Area Planting (CPS 342)	Species category (select most common/extensive type if using more than one)	Grass Grass legume/forb mix Herbaceous woody mix Perennial or reseeding Shrubs Trees
Feed Management (CPS 592)	Crude protein (percent)	0-100
	Fat (percent)	0-100
	Feed additives/supplements	Chemical Edible oils/fats Seaweed/kelp Other (specify)
Field Border (CPS 386)	Species category (select most common/extensive type if using more than one)	Forbs Grasses Mix Shrubs

Filter Strip (CPS 393)	Strip width (feet)	20-1,000
	Species category (select most common/extensive type if using more than one)	Forbs Grasses Mix Shrubs
Forest Farming (CPS 379)	Land use in previous year	Forest Multi-story cropping Pasture/grazing land Row crops Other agroforestry
Forest Stand Improvement (CPS 666)	Purpose for implementation	Maintain or improve forest carbon stocks Maintain or improve forest health and productivity Maintain or improve forest structure and composition Maintain or improve wildlife, fish, and pollinator habitat Manage natural precipitation more efficiently Reduce forest pest pressure Reduce forest wildfire hazard
Grassed Waterway (CPS 412)	Species category (select most common/extensive type if using more than one)	Flowering Plants Forbs Grasses
Hedgerow Planting (CPS 422)	Species category (select most common/extensive type if using more than one)	Grasses Shrubs Trees
	Species density (number of trees planted per acre)	1-10,000
Herbaceous Wind Barriers (CPS 603)	Species category (select most common/extensive type if using more than one)	Forbs Grasses Mix Shrubs
	Barrier width (feet)	1-1,000
	Number of rows	1-100
Mulching (CPS 484)	Mulch type	Gravel Natural Synthetic Wood
	Mulch cover (percent of field)	0-100

Nutrient management (CPS 590)	Nutrient type with CPS 590	Biosolids Commercial fertilizers Compost EEF (nitrification inhibitor) EEF (slow or controlled release) EEF (urease inhibitor) Green manure Liquid animal manure Organic by-products Organic residues or materials Solid/semi-solid animal manure Wastewater
	Nutrient application method with CPS 590	Banded Broadcast Injection Irrigation Surface application Surface application with tillage Variable rate
	Nutrient application method in the previous year	Banded Broadcast Injection Irrigation Surface application Surface application with tillage Variable rate
	Nutrient application timing with CPS 590	Single pre-planting Single post-planting Split pre- and post-planting Split post-planting
	Nutrient application timing in the previous year	Single pre-planting Single post-planting Split pre- and post-planting Split post-planting
	Nutrient application rate with CPS 590	0-20,000
	Nutrient application rate unit with CPS 590	Gallons per acre Pounds per acre
	Nutrient application rate change	Decrease compared to previous year Increase compared to previous year No change
Pasture and Hay Planting (CPS 512)	Species category (select most common/extensive type if using more than one)	Cool-season broadleaf Cool-season grass Warm-season broadleaf Warm-season grass
	Termination process	Grazing Haying (i.e., cutting and baling) Other (specify)
Prescribed Grazing (CPS 528)	Grazing type	Cell grazing Deferred rotational Management intensive Rest-rotation

Range Planting (CPS 550)	Species category (select most common/extensive type if using more than one)	Forbs Grasses Legumes Shrubs Trees
Residue and Tillage Management – No-till (CPS 329)	Surface disturbance	None Seed row only
Residue and Tillage Management – Reduced Till (CPS 345)	Surface disturbance	None Seed row/ridge tillage for planting Shallow across most of the soil surface Vertical/mulch
Riparian Forest Buffer (CPS 391)	Species category (select most common/extensive type if using more than one)	Coniferous trees Deciduous trees Shrubs
	Species density (number of trees planted per acre)	1-10,000
Riparian Herbaceous Cover (CPS 390)	Species category (select most common/extensive type if using more than one)	Ferns Forbs Grasses Legumes Rushes Sedges
Roofs and Covers (CPS 367)	Roof/cover type	Concrete Flexible geomembrane Metal Timber Other (specify)
Silvopasture (CPS 381)	Species category (select most common/extensive type if using more than one)	Coniferous trees Deciduous trees Forage Shrubs
	Species density (number of trees planted per acre)	1-10,000
Stripcropping (CPS 585)	Strip width (feet)	1-1,000
	Crop category (select most common/extensive type if using more than one)	Erosion resistant crops Fallow Sediment trapping crops
	Number of strips	2-100
Tree/Shrub Establishment (CPS 612)	Species category (select most common/extensive type if using more than one)	Coniferous trees Deciduous trees Shrubs
	Species density (number of trees planted per acre)	1-10,000
Vegetative Barrier (CPS 601)	Species category (select most common/extensive type if using more than one)	Grasses Grass forb mix Grass legume mix
	Barrier width (feet)	3-1,000

Waste Separation Facility (CPS 632)	Separation type	Chemical (e.g., salts, polymers) Mechanical (e.g., screens, presses) Settling basin
	Most common use of solids	Bedding Field applied Other (specify)
Waste Storage Facility (CPS 313)	Waste storage system prior to installing your waste storage facility	Aerobic lagoon Anaerobic digester (complex mix) with energy generation Anaerobic digester (plug flow) with energy generation Anaerobic lagoon Composting Covered lagoon (no energy generation or flaring) Covered lagoon with energy generation Covered lagoon with flaring Daily spread Deep bedding pack Deep pit Dry lot Dry stacking/solid storage Pasture/range/paddock Poultry with bedding Poultry without bedding (e.g., high rise) Slurry tank/basin
Waste Treatment (CPS 629)	Treatment type	Biological Chemical Mechanical
Waste Treatment Lagoon (CPS 359)	Waste storage system prior to installing waste treatment lagoon	Aerobic lagoon Anaerobic digester (complex mix) with energy generation Anaerobic digester (plug flow) with energy generation Anaerobic lagoon Composting Covered lagoon (no energy generation or flaring) Covered lagoon with energy generation Covered lagoon with flaring Daily spread Deep bedding pack Deep pit Dry lot Dry stacking/solid storage Pasture/Range/Paddock Poultry with bedding Poultry without bedding (e.g., high rise) Slurry tank/basin
	Is there a lagoon cover/crust?	Yes No
	Is there lagoon aeration?	Yes No

Windbreak/Shelterbelt Establishment and Renovation (CPS 380)	Species category (select most common/extensive type if using more than one)	Coniferous trees Deciduous trees Shrubs
	Species density (number of trees planted per acre)	1-10,000

Appendix A: Climate-smart Agriculture and Forestry Practices

All NRCS Practice Standards (not limited to climate-smart practices)

309, Agrichemical Handling Facility
311, Alley Cropping
313, Waste Storage Facility
314, Brush Management
315, Herbaceous Weed Treatment
316, Animal Mortality Facility
317, Composting Facility
318, Short Term Storage of Animal Waste and By-Products
319, On-Farm Secondary Containment Facility
320, Irrigation Canal or Lateral
324, Deep Tillage
325, High Tunnel System
326, Clearing and Snagging
327, Conservation Cover
328, Conservation Crop Rotation
329, Residue and Tillage Management, No Till
330, Contour Farming
331, Contour Orchard and Other Perennial Crops
332, Contour Buffer Strips
333, Amending Soil Properties with Gypsum Products
334, Controlled Traffic Farming
336, Soil Carbon Amendment
338, Prescribed Burning
340, Cover Crop
342, Critical Area Planting
345, Residue and Tillage Management, Reduced Till
348, Dam, Diversion
350, Sediment Basin
351, Well Decommissioning
353, Monitoring Well
355, Groundwater Testing
356, Dike and Levee
359, Waste Treatment Lagoon
360, Waste Facility Closure
362, Diversion
366, Anaerobic Digester
367, Roofs and Covers
368, Emergency Animal Mortality Management
371, Air Filtration and Scrubbing
372, Combustion System Improvement
373, Dust Control on Unpaved Roads and Surfaces
374, Energy Efficient Agricultural Operation
375, Dust Management for Pen Surfaces
376, Field Operations Emissions Reduction
378, Pond
379, Forest Farming
380, Windbreak/Shelterbelt Establishment and Renovation
381, Silvopasture
382, Fence
383, Fuel Break
384, Woody Residue Treatment
386, Field Border
388, Irrigation Field Ditch
390, Riparian Herbaceous Cover
391, Riparian Forest Buffer
393, Filter Strip
394, Firebreak
395, Stream Habitat Improvement and Management
396, Aquatic Organism Passage
397, Aquaculture Pond
398, Fish Raceway or Tank
399, Fishpond Management
400, Bivalve Aquaculture Gear and Biofouling Control
402, Dam
410, Grade Stabilization Structure
412, Grassed Waterway
420, Wildlife Habitat Planting
422, Hedgerow Planting
423, Hillside Ditch
428, Irrigation Ditch Lining
428A, Irrigation Water Conveyance, Ditch and Canal Lining, Plain Concrete
428B, Irrigation Water Conveyance, Ditch and Canal Lining, Flexible Membrane
428C, Irrigation Water Conveyance, Ditch and Canal Lining, Galvanized Steel
430, Irrigation Pipeline
432, Dry Hydrant
436, Irrigation Reservoir
441, Irrigation System, Microirrigation
442, Sprinkler System
443, Irrigation System, Surface and Subsurface
447, Irrigation and Drainage Tailwater Recovery
449, Irrigation Water Management
450, Anionic Polyacrylamide (PAM) Application
453, Land Reclamation, Landslide Treatment
455, Land Reclamation, Toxic Discharge Control
457, Mine Shaft and Adit Closing
460, Land Clearing
462, Precision Land Forming and Smoothing
464, Irrigation Land Leveling
466, Land Smoothing
468, Lined Waterway or Outlet
472, Access Control
484, Mulching
490, Tree/Shrub Site Preparation
500, Obstruction Removal
511, Forage Harvest Management
512, Pasture and Hay Planting
516, Livestock Pipeline
520, Pond Sealing or Lining, Compacted Soil Treatment
521, Pond Sealing or Lining, Geomembrane or Geosynthetic Clay Liner
521A, Pond Sealing or Lining, Flexible Membrane
521B, Pond Sealing or Lining, Soil Dispersant
521C, Pond Sealing or Lining, Bentonite Sealant

521D, Pond Sealing or Lining, Compacted Clay Treatment
522, Pond Sealing or Lining - Concrete
527, Sinkhole Treatment
528, Prescribed Grazing
533, Pumping Plant
543, Land Reclamation, Abandoned Mined Land
544, Land Reclamation, Currently Mined Land
548, Grazing Land Mechanical Treatment
550, Range Planting
554, Drainage Water Management
555, Rock Wall Terrace
557, Row Arrangement
558, Roof Runoff Structure
560, Access Road
561, Heavy Use Area Protection
562, Recreation Area Improvement
566, Recreation Land Improvement and Protection
570, Stormwater Runoff Control
572, Spoil Disposal
574, Spring Development
575, Trails and Walkways
576, Livestock Shelter Structure
578, Stream Crossing
580, Streambank and Shoreline Protection
582, Open Channel
584, Channel Bed Stabilization
585, Stripcropping
587, Structure for Water Control
588, Crosswind Ridges
589, Cross Wind Trap Strips
590, Nutrient Management
591, Amendments for Treatment of Agricultural Waste
592, Feed Management
595, Pest Management Conservation System
600, Terrace
601, Vegetative Barrier
602, Equitable Relief
603, Herbaceous Wind Barriers
604, Saturated Buffer
605, Denitrifying Bioreactor
606, Subsurface Drain
607, Surface Drain, Field Ditch
608, Surface Drain, Main or Lateral
609, Surface Roughening
610, Salinity and Sodic Soil Management
612, Tree/Shrub Establishment
614, Watering Facility
620, Underground Outlet
629, Waste Treatment
630, Vertical Drain
632, Waste Separation Facility
633, Waste Recycling
634, Waste Transfer
635, Vegetated Treatment Area
636, Water Harvesting Catchment
638, Water and Sediment Control Basin
640, Waterspreading
642, Water Well
643, Restoration of Rare or Declining Natural Communities
644, Wetland Wildlife Habitat Management
645, Upland Wildlife Habitat Management
646, Shallow Water Development and Management
647, Early Successional Habitat Development-Mgt
649, Structures for Wildlife
650, Windbreak/Shelterbelt Renovation
654, Road/Trail/Landing Closure and Treatment
655, Forest Trails and Landings
656, Constructed Wetland
657, Wetland Restoration
658, Wetland Creation
659, Wetland Enhancement
660, Tree-Shrub Pruning
666, Forest Stand Improvement
670, Energy Efficient Lighting System
672, Energy Efficient Building Envelope
736, Crop By-Product Transfer, interim
724, Water Treatment Facility, interim
735, Waste Gasification Facility, interim
737, Reduced Water and Energy Coffee Conveyance System, interim
740, Pond Sealing and Lining, Soil Cement, interim
751, Individual Terrace, interim
753, Infiltration Ditch, interim
755, Well Plugging, interim
770, Livestock Confinement Facility, interim
775, Drainage Ditch Covering, interim
782, Phosphorus Removal System, interim
800, Controlling Existing Flowing Wells, interim
803, Water Well Disinfection, interim
805, Amending Soil Properties with Lime, interim
808, Soil Carbon Amendment, interim
809, Conservation Harvest Management, interim
810, Annual Forages for Grazing Systems, interim
812, Raised Beds, interim
815, Groundwater Recharge Basin or Trench, interim
817, On-Farm Recharge, interim
818, Water Conservation System, interim
821, Low Tunnel Systems, interim
823, Organic Management, interim

Other CSAF Practices
Traditional or cultural practices
Microbial products
Solar power generation
Grain bin construction
Pre-season drainage

Appendix B: Commodity List

CROPS
ALFALFA
ALMONDS
AMARANTH GRAIN
APPLES
APRICOTS
ARONIA (CHOKEBERRY)
ARTICHOKES
ASPARAGUS
ATEMOYA
AVOCADOS
BAMBOO SHOOTS
BANANAS
BARLEY
BEANS
BEETS
BIRDSFOOT/TREFOIL
BLUEBERRIES
BREADFRUIT
BROCCOFLOWER
BROCCOLI
BROCCOLINI
BRUSSEL SPROUTS
BUCKWHEAT
CABBAGE
CACAO
CACTUS
CAIMITO
CALABAZA MELON
CALALOO
CAMELINA
CANARY MELON
CANARY SEED
CANEBERRIES
CANISTEL
CANOLA
CANTALOUPES
CARAMBOLA (STAR FRUIT)
CARROTS
CASHEW
CASSAVA
CAULIFLOWER
CELERIAC
CELERY
CHERIMOYA
CHERRIES
CHESTNUTS
CHICORY/RADICCHIO
CHINESE BITTER MELON
CHRISTMAS TREES
CHUFAS
CINNAMON
CLOVER
COCONUTS
COFFEE
CORN
COTTON ELS
COTTON UPLAND
CRANBERRIES
CRENSHAW MELON
CRUSTACEAN
CUCUMBERS
CURRANTS
DASHEEN
DATES
DURIAN
EGGPLANT
EINKORN
ELDERBERRIES
EMMER
FIGS
FINFISH
FLAX
FLOWERS
FORAGE SOYBEAN/SORGHUM
GAILON
GARLIC
GENIP
GINGER
GINSENG
GOOSEBERRIES
GOURDS
GRAPEFRUIT
GRAPES
GRASS
GREENS
GROUND CHERRY
GUAMABANA/SOURSOP
GUAR
GUAVA
GUAVABERRY
GUAYULE
HAZEL NUTS
HEMP
HERBS
HESPERALOE
HONEY
HONEYBERRIES
HONEYDEW
HOPS
HORSERADISH
HUCKLEBERRIES
HYBRID POPLAR TREES
IDLE
INDIGO
ISRAEL MELONS
JACK FRUIT
JERUSALEM ARTICHOKES
JICAMA
JOJOBA
JUJUBE
JUNEBERRIES
KENAF
KHORASAN
KIWIBERRY
KIWIFRUIT
KOCHIA (PROSTRATA)
KOHLRABI
KOREAN GOLDEN MELON
KUMQUATS
LAMBS EAR
LEEKS
LEMONS
LENTILS
LESPEDEZA
LETTUCE
LIMES
LONGAN
LOQUATS
LYCHEE
MANGOS
MANGOSTEEN
MAPLE SAP
MAYHAW BERRIES
MEADOWFOAM
MILKWEED
MILLET
MIXED FORAGE
MOHAIR
MOLLUSK
MORINGA
MULBERRIES
MUSHROOMS
MUSTARD
NECTARINES
NIGER SEED
NONI
OATS
OKRA
OLIVES
ONIONS
ORANGES
PAPAYA

PARSNIP
PASSION FRUITS
PAWPAW
PEACHES
PEANUTS
PEARS
PEAS
PECANS
PENNYCRESS
PEPPERS
PERENNIAL PEANUTS
PERIQUE TOBACCO
PERSIMMONS
PINE NUTS
PINEAPPLE
PISTACHIOS
PITAYA/DRAGONFRUIT
PLANTAIN
PLUMCOTS
PLUMS
POMEGRANATES
POTATOES
POTATOES SWEET
PRUNES
PSYLLIUM
PUMMELO
PUMPKINS
QUINCES
QUINOA
RADISHES
RAISINS
RAMBUTAN
RAPESEED
RHUBARB
RICE
RICE SWEET
RICE WILD
RUTABAGA
RYE
SAFFLOWER
SAPODILLA
SAPOTE
SCALLIONS
SESAME
SHALLOTS
SORGHUM
SORGHUM DUAL PURPOSE
SORGHUM FORAGE
SOYBEANS
SPELT
SQUASH
STAR GOOSEBERRY
STRAWBERRIES
SUGAR BEETS
SUGARCANE
SUNFLOWERS
SUNN HEMP
TANGELOS
TANGERINES
TANGORS
TANGOS
TANNIER
TARO
TEA
TEFF
TI
TOBACCO CIGAR WRAPPER
TOBACCO BURLEY
TOBACCO BURLEY 31V
TOBACCO CIGAR BINDER
TOBACCO CIGAR FILLER
TOBACCO CIGAR FILLER BINDER
TOBACCO DARK AIR CURED
TOBACCO FIRE CURED
TOBACCO FLUE CURED
TOBACCO MARYLAND
TOBACCO VIRGINIA FIRE CURED
TOMATILLOS
TOMATOES
TREES TIMBER
TRITICALE
TRUFFLES
TURNIPS
VETCH
WALNUTS
WAMPEE
WASABI
WATERMELON
WAX JAMBOO FRUIT
WHEAT
WILLOW SHRUB
WINTER MELON
WOLFBERRY/GOJI
YAM

LIVESTOCK
ALPACAS
BEEF COWS
BEEFALO
BUFFALO OR BISON
CHICKENS (BROILERS)
CHICKENS (LAYERS)
DAIRY COWS
DEER
DUCKS
ELK
EMUS
EQUINE
GEESE
GOATS
HONEYBEES
LLAMAS
REINDEER
SHEEP
SWINE
TURKEYS

Partnerships for Climate-Smart Commodities Additional Specific Terms and Conditions February 2023

I. Overarching Statement

The following award terms and conditions are applicable to Partnerships for Climate-Smart Commodities agreements and are in addition to the USDA FPAC General Terms and Conditions. The award recipient must abide by all terms of this grant including, but not limited to, the General Terms and Conditions, the terms in the Funding Opportunity and associated Frequently Asked Questions, and this addendum. The recipient must also deliver on the planned objectives in the project narrative and budget narrative associated with this grant.

II. Eligibility and Highly Erodible Lands and Wetlands Compliance

In order to be eligible for an incentive payment as a part of the Partnerships for Climate-Smart Commodities, a producer must:

- Establish Farm Records with the Farm Service Agency (FSA) (have farm, tract, and field numbers in place);
- Complete an AD-2047 (Customer Data Worksheet to facilitate the collection of customer data for Business Partner Record);
- Certify highly erodible land conservation (HEL) and wetland conservation (WC) compliance via Form AD-1026, Highly Erodible Land Conservation (HELC) and Wetland Conservation (WC) Certification; and
- Certify that they are not a foreign person or entity.

Farm, tract, and field numbers are required for the producer, and ultimately the Partnerships for Climate-Smart Commodities recipient, to report climate-smart practice implementation to USDA, as well as to certify and maintain HELC/WC compliance. This will require that some producers who do not already have these numbers, like perennial crop growers or feedlots, establish these records with USDA's FSA. Farm, tract, field numbers, producer name, and Core Customer I.D. (CCID) will be provided by the recipient to the National Program Officer as a part of routine grant reporting. Recipients must ensure that producers receiving financial assistance or incentives through this project use the same name as is included in the relevant FSA Business File for that Farm ID in any contracts or similar documentation kept by the recipient.

Producers are not bound by the payment limitations and the adjusted gross income (AGI) limitations that are in place for other USDA programs.

In order to demonstrate HELC/WC compliance for Partnerships for Climate-Smart Commodities incentive payments, producers will need to request a copy of their subsidiary print from their

USDA FSA field office. The Subsidiary Print includes print year specific eligibility related information about a selected producer. The producer will then provide this documentation to the Partnerships for Climate-Smart Commodities recipients as proof of compliance. A current year subsidiary print will be required for each crop year that the producer receives a payment, and HELC/WC eligibility information is provided under the AD-1026 and Conservation Compliance sections of subsidiary (determined by year, which can change at any time during the year or in a subsequent year). As is the case already, field offices will not be expected to provide documentation to anyone besides the producer themselves (and must always comply with Section 1619 limitations if they ever do provide documentation to third parties). Producers must have control of the land for the term of their beneficiary contract.

Recipients are responsible for determining producer eligibility within the funding opportunity requirements. Recipients must inform producers of eligibility requirements and direct them to local USDA offices for requested information as necessary, including but not limited to, farm and tract establishment and Highly Erodible Land and Wetland Compliance determinations. Privacy of producers is a priority throughout this process, and recipients are responsible for maintaining producer privacy in the process.

At minimum, the recipient will collect and review subsidiary reports from participating producers. They will ensure that the producer is listed as "compliant" in all sections of the conservation compliance portion of subsidiary and "certified" for AD-1026 before an incentive payment is made. If payments to a producer span more than one Federal fiscal year, the recipient will review an updated subsidiary print each fiscal year to ensure that the status is still compliant.

III. Other Environmental and Cultural Resources Reviews

A Finding of No Significant Impact (FONSI) was signed by USDA NRCS on August 26, 2022. A copy of the Programmatic Environmental Assessment for Partnerships for Climate-Smart Commodities is available at www.usda.gov/climate-smart-commodities . USDA may determine that additional environmental and cultural resources review is needed for any particular action under Partnerships for Climate-Smart Commodities. The recipient must not execute any beneficiary contracts under this grant agreement prior to receipt of a letter from USDA that specifically details:

1) further procedures deemed appropriate by the Agency to ensure a completed National Environmental Policy Act (NEPA) review and all appropriate consultation requirements are met, and
2) additional instructions for any unanticipated discoveries or conditions.

A resolution of support is required for projects on Tribal lands from the governing body of the Tribe with jurisdiction over that land, if the applicant is not the Tribe nor an entity owned or

operated by that Tribe. USDA may approve alternative documentation for resolutions when USDA deems necessary and legally sufficient.

IV. Producer Benefits

USDA encourages the recipient to disclose to participating producers the manner and amount for which any market premiums derived from the development of the relevant climate-smart commodity will be shared between participating parties, including producers. USDA will be monitoring producer benefits, in particular those to small and underserved producers, throughout the grant period. Recipients agree that their project(s) will implement a plan for engaging small and underserved producers as laid out in this agreement.

V. Producer Data Protection and Disclosure

Recipients must ensure each producer has convenient access to any data collected from that producer or the producer's land and any associated modeling as part of the project. The recipient must provide each producer applying for benefits under this grant a description in writing of how their information, including but not limited to data about their farm and commodities, will be utilized, protected and shared as applicable.

VI. Other Data and Reporting Requirements

In addition to the reporting information provided in the statement of work and General Terms and Conditions, USDA will provide a template for the Detailed Progress Report, also known as the Partnerships for Climate-Smart Commodities (PSCS) Project Reporting Workbook. Within 30 calendar days of execution of this grant, a copy of this workbook will be posted at www.usda.gov/climate-smart-commodities or an alternative location provided to the recipient by the National Program Officer. USDA may provide updates to the PCSC Project Reporting Workbook or submission methods to streamline the data collection process and/or reduce the burden on the recipient throughout the grant period. Generally, these updates will be provided at least 3 months in advance of any required changes. The recipient must not transfer any data to foreign governments or foreign entities without prior approval from USDA.

USDA will provide a Technical Contact for this grant. The Technical Contact will have the responsibility of technical oversight for USDA for the project. The recipient is responsible for providing the technical assistance required to successfully implement and complete the project. The recipient must comply with any requests for information from the Technical Contact. The Technical Contact for this award is the National Program Officer assigned to this grant.

Prior to execution of this grant, the recipient must provide a shapefile depicting the project boundary for enrollment under this grant. Producer enrollment may not occur outside this boundary without modification of this grant.

Within 30 calendar days of execution of this grant, the recipient must provide to the National Program Officer a website address where enrollment information will be posted for producers for the project associated with this grant. Recipients will be responsible for the following reports:

- Submit quarterly performance reports that include a written progress report, as well as additional reporting on specific data elements contained in the most up-to-date version of the Partnerships for Climate-Smart Commodities Project Reporting Workbook. Additional information about each reported element is described in the Data Dictionary.
- Submit supplemental reports required to validate greenhouse gas (GHG) benefit data, including: (1) an initial project MMRV plan, (2) field-modeled GHG benefit reports, and (3) field-direct GHG measurement results, as applicable. Additional information about these reports is in included in the Data Dictionary.
- Submit copies of project outputs and deliverables (e.g., fact sheets, reports) as attachments in ezFedGrants along with quarterly performance reports.
- Report the version of COMET-Planner used to estimate GHG benefits of the project within each quarterly performance report. As COMET-Planner is updated, recipients must adopt the latest version of the tool as directed by USDA for use in performance reports.

Recipients must designate an individual as a member of the USDA Partnerships for Climate-Smart Commodities Learning Network (Partnerships Network); this representative should be identified in the Project Narrative for this grant. Each project includes a plan for up to two Partnerships Network virtual meetings and two in-person meetings a year during the project duration. Dates and other details on events will be posted at www.usda.gov/climate-smart-commodities or an alternative location provided to the recipient by the National Program Officer.

The Partnerships Network will be co-chaired by representative from the USDA Office of the Chief Economist and the Farm Production and Conservation Mission Area. The Partnerships Network will inform synthesis reports to be assembled by USDA on a range of topics related to the implementation of Partnerships for Climate-Smart Commodities projects, including:

- Lessons-learned as projects are implemented;
- Options for providing technical assistance;
- Procedures for measurement/quantification, monitoring, reporting, and verifying GHG benefits;
- Options for tracing climate-smart commodities through the supply chain;
- Mechanisms for reducing costs of implementation;
- A forum for discussion and learning regarding approaches to climate-smart agriculture and forestry implementation (including but not limited to deployment and

measurement/quantification, monitoring, reporting, tracking, and verification of associated greenhouse gas benefits and marketing of climate-smart commodities).
- Synthesis of outcomes; and
- Opportunities for USDA and others to inform future approaches to generating new and expanded markets for climate-smart commodities.

The Partnerships Network topics to be discussed will cover at minimum the areas described in previous FAQs and will evolve with USDA's ongoing project data analysis efforts and with input from the project recipients on the kinds of sessions that will be most helpful to them in building the diverse climate-smart markets associated with their projects. Participation may include at least one interview a year and include questions related to the following areas:

- Technical assistance approaches, methods, and successes and/or challenges
- Producer outreach approaches, methods, and successes and/or challenges
- Monitoring, measurement, reporting, and verification (MMRV) approaches, methods, and successes and/or challenges
- Marketing approaches, methods, and successes and/or challenges
- Partnership approaches, methods, and successes and/or challenges
- Data collection and storage approaches, methods, and successes and/or challenges
- Supply chain approaches, methods and successes and/or challenges, including approaches to traceability
- Supply chain benefits and demand for climate-smart commodities
- Perspectives on program design, climate-smart commodity definitions, and future approaches or opportunities
- Project successes and stories

USDA may also request producer exit reports at a later date. Additional marketing and branding-related requirements may be provided by USDA, including signage related to Partnerships for Climate-Smart Commodities.

VII. Competition and Anti-Competitive Practices

In connection with this grant, recipients may not prohibit or otherwise limit a producer from changing the provider of other services or materials not included as part of this grant. Recipients may not condition, limit, steer, or discriminate in their provision or sale of non-project business functions or products to producers based on their participation or non-participation in or use of any services provided as part of this grant. Additionally, funds in this agreement shall not be used for purposes or activities related to mergers or acquisitions.

VIII. Suspension and Disbarment

The provisions governing Suspension and Disbarment in subsection 1.a.8 shall also apply to fraud, embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false statements, or violations of the Federal civil antitrust or unfair trade practice laws.

IX. Special provisions for awards to for-profit entities as recipients

This section contains provisions that apply to awards to for-profit entities. These provisions are in addition to other applicable provisions of these terms and conditions, or they make exceptions from other provisions of the terms and conditions for awards to for-profit entities. For-profit entities that receive awards have two options regarding audits:

1) A financial related audit of a particular award in accordance with Generally Accepted Government Auditing Standards issued by the Comptroller General of the United States, in those cases where the for-profit entity receives awards under only one USDA program; or, if awards are received under multiple USDA programs, a financial related audit of all awards in accordance with Generally Accepted Government Auditing Standards issued by the Comptroller General of the United States; or

2) An audit that meets the requirements contained in 2 CFR 200 subpart F.

For-profit entities that receive annual awards totaling less than the audit requirement threshold in 2 CFR 200 subpart F are exempt from USDA audit requirements for that year, but records must be available for review by appropriate officials of Federal agencies or the Government Accountability Office.

X. Non-Disparagement

Recipients may not engage in any advertising deemed by USDA as disparaging to another agricultural commodity or competing product, or in violation of the prohibition against false and misleading advertising. Disparagement is defined as anything that depicts other commodities in a negative or unpleasant light via overt or subjective video, photography, or statements. Comparative advertising is allowable, provided the presentation of facts is truthful, objective, not misleading, and supported by a reasonable basis.