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Report to Congressional Requesters

January 2023

# CLIMATE CHANGE

# Options to Enhance the Resilience of Agricultural Producers and Reduce Federal Fiscal Exposure

GAO-23-104557

# GAO Highlights

Highlights of GAO-23-104557, a report to congressional requesters

January 17, 2023

CLIMATE CHANGE

# Options to Enhance the Resilience of Agricultural Producers and Reduce Federal Fiscal Exposure

## Why GAO Did This Study

Agricultural production is projected to decline in regions with increased frequency and duration of climate change impacts, according to the *Fourth National Climate Assessment*. Congress has appropriated more than $15 billion in agricultural disaster relief in recent years. Extreme weather events also create fiscal exposure from the federal crop insurance program. In 2021, this program insured over 100 agricultural commodities, with a total program liability of $136.6 billion. In 2013, GAO added *Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks* to its High Risk List. Enhancing climate resilience—acting to reduce potential losses by planning for climate hazards—can help manage risks.

GAO was asked to review federal efforts to enhance the climate resilience of agriculture agricultural producers. This report examines (1) USDA's efforts in this area and (2) potential options to further enhance them. GAO reviewed laws and regulations related to USDA's climate resilience efforts; analyzed literature; interviewed experts and agency officials; and used GAO's 2019 *Disaster Resilience Framework* to evaluate federal climate resilience activities.

## What GAO Recommends

GAO is recommending that USDA further analyze the options and integrate them into its ongoing climate resilience planning, as appropriate. USDA agreed with GAO's recommendation.

View GAO-23-104557. For more information, contact Steve Morris at (202) 512-3841 or morriss@gao.gov.

## What GAO Found

The U.S. Department of Agriculture (USDA) has efforts underway to encourage agricultural producers to enhance their resilience to climate change. Specifically, USDA has taken some steps to develop and disseminate information about climate change to producers and has goals to better integrate climate resilience into agency decision-making through annual updates to its climate adaptation and resilience plan. In addition, some USDA programs may provide indirect incentives for producers to enhance their climate resilience.

Through a review of literature and interviews with experts, GAO identified 13 potential options for USDA to enhance producers' climate resilience (see table). Each option has strengths and limitations. For example, regional climate resilience strategic planning could improve coordination, but achieving consensus across a diverse set of stakeholders could be challenging.

| Potential Options for the U.S. Department of Agriculture (USDA) to Help Enhance Producers' Climate Resilience |
|---|
| **1.** Collect data on practices that enhance climate resilience. |
| **2.** Expand technical assistance to prioritize and promote climate resilience. |
| **3.** Prioritize climate resilience in whole-farm conservation planning. |
| **4.** Expand the capacity and expertise of USDA's Climate Hubs. |
| **5.** Develop an agricultural climate resilience plan that addresses regional needs. |
| **6.** Establish standards for climate-resilient agricultural operations. |
| **7.** Revise the Natural Resources Conservation Service's Conservation Practice Standards to include climate resilience. |
| **8.** Expand conservation program eligibility criteria to include and prioritize climate resilience. |
| **9.** Expand the capacity of USDA's conservation programs. |
| **10.** Research the feasibility of incorporating climate resilience into crop insurance rates. |
| **11.** Require producer adoption of climate-resilient practices to claim crop insurance premium subsidies. |
| **12.** Offer crop insurance premium subsidies for climate-resilient operations. |
| **13.** Require producer adoption of climate-resilient practices to maintain Farm Bill Title I program eligibility. |

Source: GAO analysis. | GAO-23-104557

Implementing multiple options offers the most potential to improve the climate resilience of agricultural producers, according to experts and GAO's analysis using the *Disaster Resilience Framework*. This framework states that integrating strategic resilience goals can help decision makers focus on a wide variety of opportunities to reduce risk. USDA officials said that some of the options could be implemented administratively through resilience planning updates required by executive orders, while others would require additional authority. The appropriate mix of options is a policy choice that requires complex trade-off decisions. By analyzing options and incorporating them, as appropriate, in future climate resilience planning efforts, USDA could help meet its obligations under executive orders and inform legislative efforts to reduce fiscal exposure from the federal crop insurance program and agricultural disaster assistance programs.

# Contents


| | | |
|---|---|---|
| Letter | | 1 |
| | Background | 6 |
| | USDA Has Taken or Planned Several Actions to Enhance the Climate Resilience of Agricultural Producers | 18 |
| | Potential Options to Help Agricultural Producers Enhance Their Climate Resilience Have Strengths and Limitations; Implementing Multiple Options Offers the Most Promise | 23 |
| | Conclusions | 45 |
| | Recommendation for Executive Action | 45 |
| | Agency Comments | 45 |
| Appendix I | Using the *Disaster Resilience Framework* to Analyze Potential Options to Enhance Climate Resilience | 47 |
| Appendix II | Objectives, Scope, and Methodology | 54 |
| Appendix III | GAO Work on Agricultural Risk Management | 59 |
| Appendix IV | Strengths and Limitations of Potential Policy Options to Enhance Agricultural Producers' Climate Resilience | 61 |
| Appendix V | Comments from the U.S. Department of Agriculture | 77 |
| Appendix VI | GAO Contact and Staff Acknowledgments | 80 |
| Tables | | |
| | Table 1: Description of USDA Agencies and Programs with Key Roles in Risk Management | 8 |
| | Table 2: Potential Policy Options for the U.S. Department of Agriculture (USDA) to Help Enhance Producers' Climate | |

Resilience, by Guiding Principle in GAO's *Disaster Resilience Framework* 25
Table 3: Potential Strengths and Limitations of Information Options Available to the U.S. Department of Agriculture (USDA) to Further Enhance Producer Climate Resilience 27
Table 4: Potential Strengths and Limitations of the Integration Option Available to the U.S. Department of Agriculture (USDA) to Further Enhance Producer Resilience 31
Table 5: Potential Strengths and Limitations of Options Creating Additional Conservation Program Incentives to Further Enhance Producer Climate Resilience 33
Table 6: Potential Strengths and Limitations of Options to Further Enhance Producer Climate Resilience Using Additional Crop Insurance and Farm Bill Title I Program Incentives 38
Table 7: Potential Policy Options for the U.S. Department of Agriculture (USDA) to Help Enhance Producers' Climate Resilience, by Guiding Principle in GAO's *Disaster Resilience Framework* 62
Table 8: Description of Option to Collect Resilience Good Practices Data 63
Table 9: Description of Option to Expand Technical Assistance to Producers 64
Table 10: Description of Option to Incorporate Resilience into Whole-Farm Conservation Planning 65
Table 11: Description of Option to Expand Climate Hubs 66
Table 12: Description of Option to Conduct Regional Climate Resilience Strategic Planning 67
Table 13: Description of Option to Create Climate Resilience Standards 69
Table 14: Description of Option to Revise Conservation Practice Standards 70
Table 15: Description of Option to Expand Conservation Program Eligibility 71
Table 16: Description of Option to Expand the Capacity of the U.S. Department of Agriculture's (USDA) Conservation Programs 72
Table 17: Description of Option to Research the Feasibility of Incorporating Climate Resilience into Crop Insurance Rating 73
Table 18: Description of Option to Create Additional Crop Insurance Requirements 74

Table 19: Description of Option to Offer Crop Insurance Premium Subsidies 75
Table 20: Description of Option to Create Additional Title I Conservation Compliance Requirements 76

Figures

Figure 1: GAO's *Disaster Resilience Framework* 15
Figure 2: Potential Policy Options to Further Enhance Climate Resilience by Providing Information to Producers 26
Figure 3: Potential Policy Options to Further Enhance Producer Climate Resilience by Improving Integration 30
Figure 4: Potential Policy Options to Further Enhance Producer Climate Resilience by Providing Conservation Incentives 32
Figure 5: Potential Options to Further Enhance Producer Climate Resilience Using Crop Insurance and Farm Bill Title I Program Incentives 37
Figure 6: Opportunities to Enhance Producers' Climate Resilience Related to the Information Principle in GAO's Disaster Resilience Framework 48
Figure 7: Opportunities to Enhance Producers' Climate Resilience Related to the Information Principle in GAO's Disaster Resilience Framework 49
Figure 8: Opportunities to Enhance Producers' Climate Resilience Related to the Integration Principle in GAO's Disaster Resilience Framework 50
Figure 9: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework 51
Figure 10: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework 52
Figure 11: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework 53

## Abbreviations

| | |
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| ARC | Agricultural Risk Coverage |
| ARS | Agricultural Research Service |
| ERS | Economic Research Service |
| FSA | Farm Service Agency |
| NRCS | Natural Resources Conservation Service |
| PLC | Price Loss Coverage |
| RMA | Risk Management Agency |
| USDA | U.S. Department of Agriculture |

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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January 17, 2023

The Honorable Andy Harris
House of Representatives

The Honorable Chellie Pingree
House of Representatives

Farmers, ranchers, and other agricultural producers are on the front lines of climate change, according to the U. S. Department of Agriculture's (USDA) August 2021 *Action Plan for Climate Adaptation and Resilience*.[1] For example, agriculture and food production—which accounted for almost 20 million jobs and over $1 trillion in gross domestic product in 2020—are projected to decline in regions experiencing increased frequency and duration of drought because of changes in the climate, as reported by the November 2018 *Fourth National Climate Assessment*.[2] Sustainable crop production is also threatened by extreme storm events, which can erode soil, degrade water quality in lakes and streams, and damage crops and farm infrastructure. Further, shifting precipitation patterns, when associated with high temperatures, will intensify wildfires that will damage rangelands; accelerate the depletion of water supplies for irrigation; and expand the distribution and incidence of pests and diseases for crops and livestock, according to the assessment.

In recognition of the federal government's significant stake in managing the impacts of climate change, we have included *Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks* in our High Risk List since 2013.[3] Extreme weather events create

[1]U. S. Department of Agriculture, *Action Plan for Climate Adaptation and Resilience* (Washington, D.C: August 2021).

[2]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment,* vol. II (Washington, D.C.: November 2018). According to USDA's Economic Research Service, the agriculture and food sectors accounted for $1.1 trillion in gross domestic product and 19.7 million full- and part-time jobs in 2020. All dollar figures in this report are reported in nominal terms, that is, without adjusting for inflation.

[3]The High Risk List identifies federal program areas that are at high risk of vulnerabilities to fraud, waste, abuse, or mismanagement or in need of transformation. See GAO, *High Risk Series: An Update,* GAO-13-283 (Washington, D.C.: February 2013); and *High Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas,* GAO-21-119SP (Washington, D.C.: Mar. 2, 2021).

fiscal exposure from the federal crop insurance program. In 2021, the program insured over 100 agricultural commodities with a total liability for the program of $136.6 billion, with premium subsidies totaling $8.6 billion.[4] In 2022, the Office of Management and Budget within the Executive Office of the President identified increased costs of the federal crop insurance program because of climate change as a significant source of fiscal exposure to the federal government.[5] USDA's Economic Research Service (ERS) projected in 2019 that climate change could increase the average annual cost of crop insurance by a range of 3.5 percent to 37 percent by 2080, depending upon assumptions about the severity of climate change, producers' responses to climate change, and other factors.[6]

In addition, the federal government faces fiscal exposure from supplemental disaster relief provided to agricultural producers for production losses caused by natural disasters. Congress appropriated more than $15 billion in such relief because of natural disasters that occurred in 2018 through 2021 alone.[7]

We and others have recommended that the federal government invest in climate resilience to help limit its fiscal exposure to impacts from climate

[4]Executive Office of the President, Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 2023, Analytical Perspectives* (Washington, D.C.: March 2022), ch. 21: Federal Exposure to Climate Risk.

[5]Executive Office of the President, Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 2023, Analytical Perspectives.*

[6]U.S. Department of Agriculture, ERS, *Climate Change and Agricultural Risk Management into the 21st Century*, Report Number 266 (Washington, D.C.: July 2019). The study compares two scenarios representing differing future rates of greenhouse gas emissions and, consequently, differing severities of climate change from 2060 to 2099. Under the moderate emissions scenario, the cost of the federal crop insurance program would be about 3.5 percent higher in 2080 than under a future with a climate similar to that of the recent past. Under the higher emissions scenario, this cost increase is 22 percent. If the study did not include adaptation in its models, the estimates of cost increases would jump to 10 percent and 37 percent, respectively, under the moderate and severe greenhouse gas concentration scenarios.

[7]Economic and market losses related to the COVID-19 pandemic are not considered eligible losses under the USDA disaster assistance programs.

change.[8] Enhancing climate resilience means taking actions to reduce potential future losses by planning and preparing for potential climate hazards such as extreme rainfall, rising sea levels, and drought. Investing in resilience can reduce the need for far more costly steps in the decades to come. We published the *Disaster Resilience Framework* in 2019 to serve as a guide for analysis of federal actions to promote resilience to natural hazards and to address the actual and anticipated effects of climate change.[9]

The Inflation Reduction Act of 2022 appropriated roughly $24.4 billion for agricultural and forest conservation programs. According to a House Action Report Fact Sheet, this funding is to help farmers and foresters adopt conservation practices that improve environmental resilience to climate change, reduce threats from natural hazards such as wildfires, and reduce greenhouse gas emissions.[10] The extent to which the greenhouse gas emissions reductions activities directed by the act will have climate resilience co-benefits for agricultural producers will depend on USDA's implementation.[11]

You asked us to review USDA actions to limit federal fiscal exposure from climate change by enhancing the climate resilience of agricultural producers.[12] This report examines (1) USDA's actions to enhance the climate resilience of agricultural producers and (2) the strengths and

[8]See, for example GAO, *Climate Change: Opportunities to Reduce Federal Fiscal Exposure*, GAO-19-625T (Washington, D.C.: June 11, 2019); *Climate Change: Selected Governments Have Approached Adaptation through Laws and Long-Term Plans,* GAO-16-454 (Washington, D.C.: May 12, 2016); and National Research Council of the National Academies, *America's Climate Choices: Panel on Adapting to the Impacts of Climate Change* (Washington, D.C.: 2010).

[9]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 2019).

[10]Inflation Reduction Act of 2022, Pub. L. No. 117-169, §§ 23001-23003, 136 Stat 1818, 2023-2026; and *Congressional Quarterly*, "House Action Report: Health & Climate Reconciliation Deal," Fact Sheet No. 117-30 (Washington, D.C.: Aug. 11, 2022).

[11]According to USDA officials, funding for agriculture in the Inflation Reduction Act is targeted towards activities that reduce greenhouse gas emissions and sequester carbon. Officials said that some of these activities will have adaptation and resilience co-benefits, but they are not the intended target of IRA funding.

[12]This work was requested by Representative Harris as Acting Ranking Member of the Subcommittee on Agriculture, Rural Development, Food and Drug Administration, House Committee on Appropriations.

limitations of potential options available to USDA to further enhance the climate resilience of agricultural producers. We also provide information in appendix I on how we used GAO's *Disaster Resilience Framework* to evaluate the extent to which each of the options identified in this report could help enhance the climate resilience of agricultural producers.[13]

To address the first objective, we reviewed federal laws and regulations related to climate resilience, and we reviewed documents related to USDA's resilience programs, tools, and policy. For example, we reviewed USDA's *Action Plan for Climate Adaptation and Resilience*, USDA's Adaptation Resources for Agriculture, research conducted by USDA Climate Hubs, and the agency's website for current information on USDA's efforts to research and promote the use of climate-resilient agricultural practices. We also reviewed USDA's departmental regulations and three executive orders issued in 2021 outlining the administration's approach to climate change. To better understand USDA's efforts, we interviewed USDA officials and representatives from academia with experience working with USDA and researching the impacts of climate change on the management of natural resources and agriculture.

To address the second objective, we took several steps, starting with a review of relevant literature. Specifically, we conducted a literature search for (1) reports on agriculture and climate resilience or funding that proposed or described options to enhance producers' climate resilience, such as by integrating climate resilience into federal funding for USDA's conservation programs or the federal crop insurance program; and (2) proposed or enacted legislation that included examples of incentives or requirements to consider resilience for federal funding and assistance to agricultural producers. We identified 54 relevant sources. To identify options from these sources, we recorded and categorized information about the examples of options and then distilled the examples into a preliminary list of 17 high-level options grouped by location in existing USDA funding and program structures. We subsequently consolidated this list to 13 options based on feedback from relevant stakeholder organizations that we interviewed, and subject matter experts within GAO.

Following our literature review, we selected a group of external experts to interview about the options we identified. To select experts, we conducted a network analysis on the citations received by each author in our

[13]GAO-20-100SP

literature review. In this analysis, we identified a group of frequently cited authors. We then examined biographical details and publication details for these authors via web searches, such as their geographic location and the relevance of their publications to our research topic. We identified 14 individuals using this analysis. To add researchers with expertise in agricultural risk management and crop insurance policy, we supplemented this list with six experts who were frequently cited in the relevant research that we identified in the literature review, or experts who had relevant experience with climate change and agricultural risk management policy at the federal level.

To describe the options' strengths and limitations, we conducted semistructured interviews with experts and asked each of them to give us their views on the strengths and limitations of each option for which they had expertise. We then synthesized the information that we gathered during each of these expert interviews to identify relevant insights on the option's strengths and limitations and grouped individual insights into overall themes. We also included USDA statements on the extent to which it could implement these options under its existing authority. Throughout this report, we use modifiers to characterize the views of the 20 experts as follows:

- "some" experts represents two to three experts,
- "several" experts represents four to nine experts, and
- "many" experts represents 10 or more experts.

To identify the extent to which each of these options could enhance producers' climate resilience, we compared the available options with USDA's current efforts to help producers enhance their resilience using our *Disaster Resilience Framework*.[14] This framework can be used to identify opportunities to address gaps in federal efforts by, for example, supporting identification of options to address government-wide challenges that are of a scale and scope not addressed by existing programs. In this report, we used the *Disaster Resilience Framework* to identify the potential positive effects achievable by implementing options to help enhance producers' climate resilience in comparison with current USDA efforts. For additional details on the scope and methodology of our review, see appendix II.

[14]GAO-20-100SP.

We conducted this performance audit from September 2020 to January 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Background

## Climate Resilience as a Risk-Management Strategy to Reduce Federal Fiscal Exposure

We added *Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks* to our High Risk List in 2013, and we most recently updated this list in March 2021. In our High Risk List, we have reported that government-wide action is needed to reduce federal fiscal exposure to climate change in areas including the federal government's roles as (1) insurer of property and crops; (2) provider of disaster aid; (3) owner or operator of infrastructure; (4) leader of a strategic plan to coordinate federal efforts; and (5) provider of data and technical assistance to federal, state, local, and private decision makers.[15]

We have previously found that enhancing climate resilience can help reduce federal fiscal exposure in these areas. Enhancing climate resilience entails a continuous risk-management process, according to the *Fourth National Climate Assessment*.[16] Specifically, individuals and organizations become aware of and assess risks and vulnerabilities from climate and other drivers of change, take actions to reduce those risks, and learn over time.

In December 2016, we reported on a risk-management strategy—enterprise risk management—that can help guide federal climate resilience efforts. Enterprise risk management is a forward-looking approach that can help federal agencies identify, assess, and manage

[15]GAO-21-119SP.

[16]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. II.

risks, such as preparing for and responding to natural disasters.[17] While it will not be possible to eliminate all risks associated with climate change, if the federal government prioritizes activities to manage these risks—such as climate resilience projects—it may be possible to minimize negative impacts associated with climate change.[18]

Some agencies have made efforts to manage climate change risk within existing programs and operations—a concept known as "mainstreaming"—and these efforts may convey climate resilience benefits. For example, an agency planning to build a seawall to protect a coastal facility might build it higher to account for rising sea-level projections. According to the *Fourth National Climate Assessment,* a significant portion of climate risk can be addressed by mainstreaming, which can provide many climate resilience benefits.[19]

## USDA's Role in Helping Agricultural Producers Manage Risk

USDA agencies and programs help agriculture producers manage risk in many ways (see table 1). The USDA agencies and programs with key roles in delivering information and assistance to producers on conservation and agricultural risk management are primarily located in two USDA mission areas: (1) the Research, Education, and Economics mission area, which integrates the department's agricultural data collection, research, and producer education efforts; and (2) the Farm Production and Conservation mission area, which helps producers mitigate the significant risks of farming through its conservation, federal crop insurance, and disaster assistance programs.

[17]We identified six essential elements of enterprise risk management: (1) aligning the enterprise risk management process to goals and objectives, (2) identifying risks, (3) assessing risk, (4) selecting a risk response based on risk appetite, (5) monitoring risks to see whether risk responses are successful, and (6) communicating and reporting on risks. For example, prioritizing the federal response to risk requires considering both the likelihood of the risk and the impact of the risk on an agency's mission.

[18]National Research Council of the National Academies, *America's Climate Choices: Panel on Adapting to the Impacts of Climate Change*.

[19]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. II.

**Table 1: Description of USDA Agencies and Programs with Key Roles in Risk Management**

| Agency or office name | Description |
|---|---|
| **Research, Education, and Economics mission area[a]** | |
| Agricultural Research Service (ARS) | Functions as USDA's principal in-house research agency that does work in various areas, including nutrition, food safety, natural resources, and crop and animal production. Manages facilities across the United States that conduct research on a range of issues, including climate change. |
| Economic Research Service (ERS) | Acts as the primary source of economic information and research at USDA. Publishes research reports, market analysis and outlook reports, economic briefs, and data products. |
| National Institute of Food and Agriculture | Funds external research, including research on climate change, education, and extension programs in the land grant university system and other partner organizations. |
| **Farm Production and Conservation mission area** | |
| Natural Resources Conservation Service (NRCS) | Provides technical and financial assistance to agricultural producers and landowners wanting to make improvements on their land to better conserve natural resources, including soil and water quality, water supply, and wildlife habitat. NRCS also provides incentives to producers and landowners to create long-term easements for the restoration and protection of wetlands, agricultural lands, grasslands, and forests. All of NRCS's conservation programs are voluntary. |
| Farm Service Agency (FSA) | Administers loan programs, along with conservation, disaster, and commodity programs, through a national network of offices. Also oversees farm commodity support programs authorized under Title I of the Farm Bill, which includes marketing assistance loans, Price Loss Coverage, and Agricultural Risk Coverage.[b] |
| Risk Management Agency (RMA) | Administers, regulates, and sets the premium rates for the federal crop insurance program. Producers of insurable crops may purchase subsidized insurance coverage to help manage financial risks associated with crop yield or revenue losses due to natural causes—such as drought, flooding, diseases, and pests—or adverse market conditions.<br><br>RMA conducts performance reviews of the insurance providers that sign standard reinsurance agreements and livestock price reinsurance agreements with the Federal Crop Insurance Corporation. The agency also oversees compliance of Approved Insurance Providers and producers with program rules. |

| Agency or office name | Description |
|---|---|
| Federal Crop Insurance Corporation | Finances the federal crop insurance program. The Federal Crop Insurance Act gives the Federal Crop Insurance Corporation—a government corporation within USDA—broad authority to carry out the purposes of the act. The corporation's board of directors largely delegates administration of the program to RMA.<br><br>The Federal Crop Insurance Corporation has cooperative financial assistance agreements with private insurance companies, known as Approved Insurance Providers. Through these agreements, the corporation shares underwriting gains and losses with the Approved Insurance Providers and pays them to sell and service federal crop insurance policies. |

Source: GAO summary of information from the U.S. Department of Agriculture (USDA) and Congressional Research Service. | GAO-23-104557

[a]The Research, Education, and Economics mission area also includes the Office of the Chief Scientist and the National Agricultural Statistics Service. The Office of the Chief Scientist ensures that USDA-funded research is held to the highest standards of intellectual rigor and scientific integrity. The National Agricultural Statistics Service develops statistical information and services that are often used by farmers, agribusinesses, researchers, policymakers, and government agencies.

[b]Commodity programs have historically been an essential part of U.S. farm policy by virtue of their history of providing various forms of revenue support. Provisions of Title I, the "Commodity Title," of the 2018 Farm Bill, Agricultural Improvement Act of 2018, Pub. L. No. 115-334, 132 Stat. 4490, authorize current commodity revenue support programs for crop years 2019 to 2023. These programs include marketing assistance loans, Price Loss Coverage, and Agricultural Risk Coverage. The marketing assistance loan program provides both a floor price and interim financing for certain commodities. The Price Loss Coverage and the Agricultural Risk Coverage programs provide income support at levels above the price protection offered by marketing assistance loans. In addition, Title I authorizes four programs that provide federal assistance to help farmers recover financially from natural disasters, including drought and floods. These programs are (1) the Livestock Indemnity Program; (2) the Livestock Forage Disaster Program; (3) the Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program; and (4) the Tree Assistance Program.

**Research, Education, and Economics mission area.** The Research, Education, and Economics mission area of USDA has federal leadership responsibility for advancing scientific knowledge related to agriculture. The mission area consists of the Agricultural Research Service (ARS), the Economic Research Service (ERS), the National Agricultural Statistics Service, the National Institute of Food and Agriculture, and the Office of the Chief Scientist. Together these organizations produce scientific research, economic data, statistical analysis, remote sensing data, and scientific guidance to advance agricultural research, extension services, and producer education.

**Farm Production and Conservation mission area**. USDA helps agricultural producers manage risk in four main ways under the farm production and conservation mission area: (1) conservation programs, (2) federal crop insurance, (3) Farm Bill Title I commodity programs, and (4) disaster assistance.

- **Conservation programs.** The Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) currently administer over 20 programs and subprograms to assist agricultural producers and landowners, including nonindustrial private forest landowners, who wish to practice conservation on agricultural lands.[20] Conservation programs are federally funded, voluntary programs that provide financial and technical assistance to agricultural producers and landowners to implement conservation practices on agricultural lands.[21] According to USDA, these programs are designed to protect soil, air, water, wildlife, and other natural resources on privately owned agricultural lands to limit the environmental impacts of production activities, while maintaining or improving agricultural production.[22]
    - NRCS has established conservation practice standards that provide guidance and criteria for applying conservation. These standards are used to address natural resource concerns, such as soil erosion and water quality issues, and to develop unique conservation plans for restoring and protecting those resources at the producer level.
    - NRCS programs, such as the Conservation Stewardship Program and Environmental Quality Incentives Program, and initiatives, such as the Soil Health Initiative, provide agricultural producers with financial and technical assistance to implement conservation practices designed to reduce soil loss, protect water quality, and reduce loss of wildlife habitat, among other things.
    - FSA administers the Conservation Reserve Program. Under this program, farmers receive a yearly rental payment in exchange for agreeing to (1) remove environmentally sensitive land from agricultural production and (2) grow plant species that will improve environmental health and quality. Contracts for land enrolled in the Conservation Reserve Program last from 10 to 15 years.

[20]Congressional Research Service, *Agricultural Conservation: A Guide to Programs*, R40763 (Washington, D.C.: Aug. 19, 2020).

[21]U.S. Department of Agriculture, *Conservation Programs At A Glance* (Washington, D.C.).

[22]According to the Congressional Budget Office's May 2022 baseline projections report, USDA spending on conservation programs for fiscal year 2021 was nearly $5.3 billion, and for fiscal years 2022 to 2026, spending is projected to range from $5.0 billion to $5.9 billion.

- **Federal crop insurance.** The federal crop insurance program offers producers the opportunity to purchase subsidized insurance coverage to protect against financial losses caused by a wide variety of perils, including certain adverse growing and market conditions. The program had more than 1 million policies, insuring more than $132 billion in value, in 2021. It operates through a public-private partnership between the Federal Crop Insurance Corporation and Approved Insurance Providers, which are private-sector entities.
  - At the direction of the Federal Crop Insurance Corporation's Board of Directors, the Risk Management Agency (RMA) oversees and administers the federal crop insurance program. RMA sets premium rates. In 2022, RMA partnered with 13 Approved Insurance Providers that sell and service the individual insurance policies for producers. These companies share a percentage of the risk of loss and opportunity for gain associated with each policy.[23]
  - Under the federal crop insurance program, USDA provides premium subsidies to Approved Insurance Providers on behalf of producers and reimburses insurance providers for operating and administrative expenses. In crop year 2020, the average premium subsidy was about 62 percent of the total premium. According to USDA, from crop years 2011 to 2020, the average annual cost to the federal government for the federal crop insurance program was about $8.1 billion, of which about $5.3 billion went to producers, and about $2.8 billion went to private insurance companies in the form of administrative and operating subsidies (about $1.5 billion) and net underwriting gains (about $1.3 billion).[24] Program costs are expected to average $8.1 billion per

[23]The following private insurance companies partnered with RMA in 2022 to sell and service individual insurance policies for agricultural producers. The names of the companies are as follows: ACE American Insurance Company (Rain and Hail L.L.C.), American Agri-Business Insurance Company (AgriSompo North America, Inc.), American Agricultural Insurance Company (American Farm Bureau Insurance Services, Inc.), Church Mutual Insurance Company (Precision Risk Management, LLC (PRM)), Country Mutual Insurance Company, Farmers Mutual Hail Insurance Company of Iowa, Great American Insurance Company, Hudson Insurance Company (Hudson Crop Insurance Services, Inc.), NAU Country Insurance Company, Producers Agriculture Insurance Company (Pro Ag Management, Inc.), Rural Community Insurance Company, Stratford Insurance Company (Crop Risk Services, Inc.), and XL Reinsurance America, Inc. (Global Ag Insurance Services, LLC).

[24]U.S. Department of Agriculture, RMA, *Crop Year Government Cost of Federal Crop Insurance Program,* Crop Years 2011 to 2020. Summary of RMA business reports as of May 24, 2021.

year for fiscal years 2022 through 2032, according to the Congressional Budget Office.[25]

- Federal law prohibits crop insurance from covering losses due to a farmer's failure to follow good farming practices. Good farming practices are the production methods and practices used to produce a crop such that it is likely to make normal progress toward maturity and produce at least the yield used to determine the production guarantee or amount of insurance. According to RMA guidance, good farming practices can vary by crop and location. Such practices can include actions taken before planting (e.g., choosing appropriate plant varieties for the area and preparing a field properly before planting) and during the growth period (e.g., properly watering and weeding crops).[26]

- **Title I commodity programs.** Title I of the Farm Bill authorizes financial support programs for dairy, sugar, and covered commodities—including major grain, oilseed, and pulse crops—as well as agricultural disaster assistance. Major field-crop programs include the marketing assistance loan program, Price Loss Coverage (PLC), and Agricultural Risk Coverage (ARC). The marketing assistance loan program provides both a floor price and interim financing for certain commodities. A participating producer receives a 9-month loan, valued at a statutory price of the crop, and puts up the harvested loan crop as collateral. PLC makes a payment when the national average market price or the national average loan rate for a marketing assistance loan is less than a statutory reference price. ARC provides revenue protection when either county revenue or actual farm revenue—depending on a selection made by the farmer—falls below revenue guarantees. CRS estimates that payments from Farm Bill Title I programs totaled $3.4 billion in 2021, including $2.1 billion for the PLC program, $120 million for ARC, and less than $10 million for benefits associated with the Marketing Assistance Loan program.[27]

- **Disaster assistance.** USDA also offers several programs authorized through the Farm Bill's Title I to help farmers recover financially from, among other things, natural disasters, adverse weather conditions,

[25]Congressional Budget Office, *Baseline Projections, USDA's Farm Programs* (Washington, D.C.: May 2022).

[26]Congressional Research Service, *Federal Crop Insurance: A Primer* (Washington, D.C.: Feb. 18, 2021).

[27]Congressional Research Service, *U.S. Farm Income Outlook: 2021 Forecast*, R47051 (Washington, D.C.: Mar. 14, 2022).

wildfires, drought, and floods. These include the Noninsured Crop Disaster Assistance Program and four permanently authorized disaster programs for livestock, honey bees, farm-raised fish, and trees. USDA is also authorized to provide producers with low-interest emergency disaster loans through Title III of the Consolidated Farm and Rural Development Act, as amended, when a producer's operation has been substantially affected by a major disaster or emergency declared by the President or a natural disaster declared by the Secretary of Agriculture.[28] In addition to these programs, Congress has authorized ad hoc assistance for production losses because of natural disasters and other specific circumstances.[29] For example:

- FSA administered the Market Facilitation Program, which distributed payments to farmers to offset losses caused by international trade disruptions and tariffs in 2018 and 2019. FSA distributed $23 billion in such payments for those years.[30]
- Congress appropriated billions of dollars in supplemental assistance to support the agricultural sector in response to COVID-19. USDA administered several programs to distribute assistance, including assistance to producers of raw agricultural commodities. One of the largest assistance programs was the Coronavirus Food Assistance Program, which USDA created to provide direct payments to agricultural producers that experienced price declines and increased marketing costs for their commodities. USDA provided $31.0 billion to 965,651 producers in 2020 and 2021.[31]

[28]Pub. L. No. 87-128, § 323, 75 Stat. 294, 311 (1961) (codified as amended at 7 USC 1963).

[29]Following enactment of the 2008 Farm Bill, Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-246, 122 Stat. 1651, Congress appropriated little in the way of supplemental disaster assistance for agriculture. This changed in 2018, when Congress authorized supplemental appropriations for production losses in 2017 not previously covered by crop insurance or the Noninsured Crop Disaster Assistance Program. Congress subsequently appropriated additional supplemental funding for natural disaster-related losses in 2018 through 2021, totaling more than $15 billion.

[30]GAO, *USDA Market Facilitation Program: Oversight of Future Supplemental Assistance to Farmers Could Be Improved*, GAO-22-104259 (Washington D.C.: Jan. 4, 2022).

[31]GAO, *Coronavirus Food Assistance Program: USDA Should Conduct More Rigorous Reviews of Payments to Producers*, GAO-22-104397 (Washington, D.C.: Sept. 8, 2022).

## *GAO's Disaster Resilience Framework*

According to GAO's *Disaster Resilience Framework,* investments in disaster resilience are a promising avenue to address federal fiscal exposure because such investments offer the opportunity to reduce the overall impact of disasters.[32] The framework is organized around three guiding principles—information, integration, and incentives—and a series of questions that can help identify opportunities to enhance federal efforts to promote disaster resilience (see fig. 1). For example, incentives can help make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities. Under this principle, the framework asks to what extent federal efforts could require disaster risk-reduction measures for federally funded projects or could make risk-reduction measures more viable and attractive.

[32]GAO-20-100SP.

**Figure 1: GAO's *Disaster Resilience Framework***

## Principle:

### Information

Accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk-reduction strategies.

**Provide reliable and authoritative information about current and future risk**

To what extent could federal efforts
- enhance the validity and reliability of the disaster risk information produced?
- generate and share additional information that would help decision makers understand their disaster risk?
- reduce the complexity of and translate risk information for nontechnical audiences?
- help leverage and synthesize disaster risk information from other partners across agencies, governments, and sectors?
- promote consensus around the reliability of the sources and methods that produce disaster risk information?

**Improve the ability to assess alternatives to address risk**

To what extent could federal efforts
- help decision makers identify and select among disaster risk-reduction alternatives?
- provide technical assistance to help build capacity of nonfederal partners?
- contribute to an understanding of approaches for estimating returns on investment?
- help decision makers identify and combine available funding sources and innovative methods for meeting disaster risk-reduction needs?

**Strengthen the ability to assess status and report progress**

To what extent could federal efforts
- advance methodologies or processes to measure the current state of nationwide resilience?
- promote monitoring of progress toward resilience on a programmatic basis?

### Integration

Integrated analysis and planning can help decision makers take coherent and coordinated resilience actions.

**Build an overarching strategic vision and goals**

To what extent could federal efforts
- help to establish overarching strategies that guide national resilience efforts?
- ensure that resilience goals are incorporated into relevant national strategies?
- prioritize resilience goals that reflect the most pressing resilience challenges?

**Promote coordination across missions and sectors**

To what extent could federal efforts
- ensure consistent and complementary policies, procedures, and timing across relevant federal funding mechanisms?
- convene stakeholders with different perspectives and interests to create whole systems solutions?
- encourage governance mechanisms that foster coordination and integrated decision-making within and across levels of government?
- engage nongovernment partners in disaster risk reduction?

**Recognize relationships among infrastructure and ecosystems**

To what extent could federal efforts
- promote better understanding and awareness of the interactions among infrastructure components and ecosystems in disaster resilience actions?
- assist decision makers in determining what combination of ecosystem and built infrastructure solutions will best suit their needs within their constraints?
- assist in ensuring that projects undertaken under different programs and by different actors do not conflict?
- facilitate planning across jurisdictions and sectors to avoid or respond to cascading failure?

### Incentives

Incentives can help to make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities.

**Provide financial and nonfinancial incentives**

To what extent could federal efforts
- make risk-reduction measures more viable and attractive?
- incorporate disaster risk-reduction measures in infrastructure and ecosystem management financial assistance?
- require disaster risk-reduction measures for government-owned or -operated infrastructure and for federally funded projects?

**Reduce disincentives**

To what extent could federal efforts
- alleviate unnecessary administrative burden?
- streamline review processes?
- improve program design to motivate risk-reduction actions?

Source: GAO. | GAO-23-104557

The federal government has primarily funded disaster resilience projects in the wake of disasters—when damages have already occurred and opportunities to reduce future risks may conflict with the desire for the immediate restoration of critical infrastructure.[33] However, these principles can be applied to any federal effort—postdisaster, predisaster, and outside the traditional disaster preparedness and recovery domain—to help federal agencies and policymakers consider what kinds of actions to take if they seek to promote and facilitate disaster risk reduction. Users of the *Disaster Resilience Framework* can consider its principles and questions to analyze any type of existing federal effort, identify gaps in existing federal efforts, or consider the federal role. For example, the framework can be used to identify opportunities to address gaps in federal efforts by supporting identification of options to address government-wide challenges that are of a scale and scope not addressed by existing programs.[34] Because not all parts of the framework will be relevant for every effort, users also can adapt the principles to their specific needs.

## Related GAO Work on Agricultural Risk Management

In an October 2013 report on the federal government's long-term fiscal outlook, we concluded that the current fiscal policy is unsustainable over the long term and that addressing future fiscal challenges will require looking at the entire range of federal activities and making difficult choices in setting priorities.[35] With increasing constraints on the federal budget, the cost to the federal government of the federal crop insurance program has come under scrutiny. In the last decade, we have recommended a number of Matters for Congressional Consideration and made recommendations to USDA related to improving administration of the crop insurance program (see app. III).

## Executive Orders Related to Climate Resilience

In 2021, the administration issued three executive orders outlining its approach to climate change:

- **Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad,*** directs agencies, including USDA, to submit climate action

[33]See GAO-20-100SP; and GAO, *Hurricane Sandy: An Investment Strategy Could Help the Federal Government Enhance National Resilience for Future Disasters*, GAO-15-515 (Washington, D.C.: July 30, 2015).

[34]GAO-20-100SP.

[35]GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget*, GAO-14-28 (Washington, D.C.: Oct. 29, 2013).

plans that describe steps that the agency can take with regard to its facilities and operations to bolster adaptation and increase resilience to the impacts of climate change. It also requires them to submit annual progress reports on the plans and to make the plans publicly available.[36]

- **Executive Order 14030*, Climate Related Financial Risk,*** requires agencies to report on actions they are taking to integrate climate-related financial risk into their procurement processes as part of their climate action plans.[37]
- **Executive Order 14057, *Catalyzing Clean Energy Industries and Jobs through Federal Sustainability,*** requires agencies to develop, implement, and update their Climate Adaptation and Resilience Plans required by Executive Order 14008 and to conduct climate adaptation analysis and planning for climate-informed financial and management decisions and program implementation.[38] It also requires federal agencies to reform agency policies and funding programs that are maladaptive to climate change and to decrease the vulnerability of communities, natural or built systems, economic sectors, and natural resources to climate impacts, or related risks. Implementing instructions for Executive Order 14057 were publicly released in August 2022 and specified that Climate Adaptation and Resilience Plans required by Executive Order 14008 are by design "living documents" and require routine updates and improvements to reflect the latest climate science, new agency information, ongoing agency progress toward existing goals and targets from implementation, and emerging strategic priorities.[39]

[36]Exec. Order No. 14,008 of January 27, 2021, 86 Fed. Reg. 7619 (Feb. 1, 2021).

[37]Exec. Order No. 14,030, 86 Fed. Reg. 27,967 (May 25, 2021).

[38]Exec. Order No. 14,057, 86 Fed. Reg. 70,935 (Dec. 13, 2021).

[39]Council on Environmental Quality, Implementing Instructions for Executive Order 14057, *Catalyzing Clean Energy Industries and Jobs through Federal Sustainability* (Aug. 31, 2022). The implementing instructions specified that agencies must annually update and submit a Climate Adaptation and Resilience Plan or progress report to the Council on Environmental Quality and the Office of Management and Budget.

## USDA Has Taken or Planned Several Actions to Enhance the Climate Resilience of Agricultural Producers

To enhance the climate resilience of agricultural producers, USDA has taken and planned actions that can be categorized according to the three principles of *GAO's Disaster Resilience Framework:* (1) Information; (2) Integration; and (3) Incentives. In particular, USDA has developed and disseminated information about how producers can enhance their resilience and has taken some actions to help integrate climate change resilience into the department's planning and activities. In addition, some USDA programs may indirectly incentivize producers to enhance their resilience to climate change.

### USDA Has Provided Climate Resilience Information to Producers and Other Key Stakeholders

USDA has provided information on climate change and climate resilience to agricultural producers and key stakeholders through a number of agencies and programs coordinated through its Climate Change Program Office within the Office of the Chief Economist.[40] USDA's regional Climate Hubs have taken important steps to develop and disseminate such information.[41] For example, in 2015, the Climate Hubs published a series of regional vulnerability assessments for each of their 10 regions to provide their stakeholders with a baseline "snapshot" of climate vulnerabilities.[42] According to the Southeast Climate Hub's vulnerability assessment, for example, climate-related variability in rainfall, temperature, and extreme weather—such as drought, flood, and unseasonal frost—pose significant challenges to working land in the southeastern United States.[43] According to this assessment, anticipated changes in temperature and rainfall patterns could cause many of the

[40]Stakeholders can include public land grant universities, farm groups, the private sector, tribal organizations, and state and local governments, among other entities.

[41]USDA's Climate Hubs are a network of 10 regional hubs that provide technical support to agricultural producers and landowners, assess and monitor production risks, conduct research, and engage with stakeholders regarding the effects of climate change on agriculture and forests. The Climate Hubs are led by ARS and the Forest Service, with contributions from several other USDA agencies and offices.

[42]These vulnerability assessments are also linked to 28 peer-reviewed publications in two special issues of the journal *Climatic Change*: https://www.climatehubs.usda.gov/hubs/topic/vulnerability-assessments-us-agriculture-and-forests-2018.

[43]U.S. Department of Agriculture, S. McNulty et al., *Southeast Regional Climate Hub Assessment of Climate Change Vulnerability and Adaptation and Mitigation Strategies* (Raleigh, N.C.: 2015).

crops grown in the Southeast to face greater pressures from pests and disease.

The assessments also identify specific strategies to increase the resilience of working lands specific to each region. For example, the Southeast Climate Hub's vulnerability assessment identifies ways to improve resilience to pest and disease outbreaks by increasing biodiversity through crop diversification, which can increase the number and types of beneficial organisms that can prey on harmful species, according to the assessment. According to USDA's 2021 *Action Plan for Climate Adaptation and Resilience,* the regional vulnerability assessments will be updated in response to the Fifth National Climate Assessment, which the U.S. Global Change Research Program projects will be completed in 2023.[44]

USDA's Climate Hubs have also developed region-specific tools to help producers enhance their resilience to climate change. For example, in 2016, the Midwest and Northeast Climate Hubs developed an online resource, based on the framework of the Adaptation Workbook, to help agricultural producers, service providers, and educators integrate climate change considerations into conservation plans and on-the-farm decision-making.[45] The workbook is designed to help users identify and assess climate change impacts and select from a menu of farm-level adaptation actions, including actions to enhance producer resilience. Such actions include planting crop varieties that are best suited for regional or local changes in the climate. For example, planting drought- and heat-tolerant crops in regions that are predicted to become drier and hotter.[46]

In addition, the ARS in USDA's Research, Education, and Economics mission area is researching ways to help producers enhance their climate resilience. In particular, scientists at the ARS are conducting experiments to evaluate varieties of wheat to determine their resilience to stressors, such as fungus, that will likely increase as a result of climate change.

[44]U.S. Department of Agriculture, *Action Plan for Climate Adaptation and Resilience*.

[45]U.S. Department of Agriculture, M. Janowiak, et al., *Adaptation Resources for Agriculture: Responding to Climate Variability and Change in the Midwest and Northeast*, Technical Bulletin 1944 (Washington, D.C.: 2016).

[46]According to USDA officials, the department is supporting 22 Climate Hub Fellows, who will strategically extend the capacity of the Climate Hubs to integrate, synthesize, and disseminate regionally relevant research and information.

According to USDA, the findings from this project will also help producers identify farming practices that can enhance the climate resilience of their operations.[47]

## USDA Has Taken Steps to Integrate Climate Resilience into Its Planning and Activities

USDA has taken steps to integrate climate resilience into its planning by implementing executive orders issued by the administration. In January 2021, the administration issued Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad*. In May 2021, in response to that executive order, the Secretary of Agriculture updated Departmental Regulation 1070-001 that directs USDA to integrate climate change adaptation planning, implementing actions, and goals into USDA programs, policies, and operations.[48] This update re-established USDA's Office of the Chief Economist as the lead office responsible for adaptation planning within USDA. The Climate Change Program Office within the Office of Energy and Environmental Policy is tasked with fulfilling the Chief Economist's responsibilities under Departmental Regulation 1070-001.[49] In addition to overseeing the USDA's adaptation planning, the Climate Change Program Office helps coordinate the department's overall response to climate by chairing USDA's interagency Global Change Task Force and represents USDA when coordinating with other federal agencies on climate change.[50]

In October 2021, also in response to Executive Order 14008, USDA released an *Action Plan for Climate Adaptation and Resilience* that identifies actions that the department intends to take to incorporate

[47]According to USDA officials, the National Institute of Food and Agriculture is funding similar research at universities throughout the U. S.

[48]U.S. Department of Agriculture, Office of the Secretary, U.S. Department of Agriculture Policy Statement on Climate Change Adaptation, Departmental Regulation [DR] 1070-001, "U.S. Department of Agriculture (USDA) Policy Statement on Climate Change Adaptation" (Washington, D.C.: May 26, 2021). This policy supersedes DR 1070-001 from June 15, 2015.

[49]U.S. Department of Agriculture, Office of the Secretary, Departmental Regulation 1070-001, "U.S. Department of Agriculture (USDA) Policy Statement on Climate Change Adaptation" (Washington, D.C.: June 3, 2011).

[50]USDA's interagency Global Change Task Force, convened by the Climate Change Program Office, is made up of appointed climate leadership from agencies and mission areas across USDA and meets monthly to ensure communication and coordination on climate change science and policy. The Climate Change Program Office also represents USDA to the interagency U. S. Global Change Research Program.

climate resilience into the department's decision-making.[51] Specifically, this plan identifies and describes five actions that the department intends to implement in its mission, programs, operations, and management, either in anticipation of, or in response to, climate change. These actions include broadening access to, and availability of, climate data at regional and local scales for USDA mission areas, producers, land managers, and other stakeholders. In addition, the plan describes efforts to enhance knowledge about climate change within USDA's workforce to better serve the interests of agricultural producers. In July 2022, in accordance with the department-wide Adaptation Plan, USDA released 13 agency-level adaptation plans.[52] These agency-specific plans detail ways in which the USDA agencies can enhance resilience through their missions and programs.[53]

## Some USDA Programs May Incentivize Producers to Enhance Their Climate Resilience

USDA has a number of programs that may incentivize producers to enhance their resilience to climate change, even though the programs are not designed for that purpose.[54] For example, NRCS provides technical and financial assistance to farmers to help them implement conservation practices through several existing programs and initiatives, such as the Environmental Quality Incentives Program, the Conservation Stewardship Program, and the Soil Health Initiative. These programs are designed to protect soil, air, water, wildlife, and other natural resources. In some cases, the practices these programs promote may also enhance a producer's resilience to climate change.

USDA's *Action Plan for Climate Adaptation and Resilience* identifies the increased use of NRCS programs and practices as a key adaptation

[51]U.S. Department of Agriculture, *Action Plan for Climate Adaptation and Resilience*.

[52]The 13 USDA agencies that released climate change adaptation plans are the Natural Resources Conservation Service, Farm Service Agency, Risk Management Agency, Agricultural Research Service, National Institute of Food and Agriculture, Economic Research Service, National Agricultural Statistics Service, Forest Service, Rural Development, Animal and Plant Health Inspection Service, Foreign Agricultural Service, Agricultural Marketing Service, and the Departmental Staff Office. For additional information, see https://www.usda.gov/oce/energy-and-environment/climate/adaptation#plans.

[53]In accordance with Executive Order 10457, USDA also issued a progress report in 2022 to demonstrate how the department and the agencies are meeting the goals of the action plans.

[54]According to USDA, NRCS does explicitly market the adoption of certain conservation measures as assisting producers with becoming more resilient to the effects of climate change.

strategy for responding to threats to agricultural productivity posed by climate change. According to the action plan, USDA will provide financial and technical assistance through these programs to encourage practices to enhance producers' climate resilience. Such practices include planting cover crops and riparian forest buffers, reducing or eliminating tillage, and improving irrigation systems.[55]

The Infrastructure Investment and Jobs Act, enacted in 2021, and the Inflation Reduction Act of 2022 recently provided billions of dollars in funding to USDA for both climate resilience and emissions reduction efforts.[56] For example, the Infrastructure Investment and Jobs Act provides $918 million for watershed programs that protect and restore wetlands, rehabilitate aging dams, and help communities relieve threats caused by natural disasters that impair a watershed.[57] The Inflation Reduction Act of 2022 appropriated roughly $24.4 billion for agricultural and forest conservation programs to, according to a House Action Report Fact Sheet, help farmers and foresters adopt conservation practices that improve environmental resilience to climate change, reduce threats from natural hazards such as wildfires, and reduce greenhouse gas emissions.[58] Full implementation of these acts will take some time, and the extent to which they will be implemented with co-benefits for the climate resilience of agricultural producers remains to be seen.

In addition, in September 2022, USDA announced a $2.8 billion investment in its Partnerships for Climate-Smart Commodities program.[59] According to USDA, this program is designed to expand markets for commodities that are produced using practices that reduce greenhouse

[55]Riparian forest buffers are areas of trees, shrubs, and herbaceous vegetation established and managed adjacent to streams, lakes, ponds, and wetlands.

[56]According to USDA, funding in the Inflation Reduction Act is directed to go toward mitigation activities and is not prioritized for adaptation and resilience efforts.

[57]The Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, div. J, tit. I, 135 Stat. 1350, 1351 (2021).

[58]Inflation Reduction Act of 2022, Pub. L. No. 117-169, §§ 23001-23003, 136 Stat 1818, 2023-2026; and *Congressional Quarterly*, "House Action Report: Health & Climate Reconciliation Deal," No. 117-30 (Washington, D.C.: Aug. 11, 2022).

[59]According to USDA, the $2.8 billion dollar investment announced in September will fund 70 identified projects to (1) provide technical and financial assistance to producers to implement climate-smart production practices on a voluntary basis on working lands; (2) pilot innovative and cost-effective methods to quantify, monitor, report and verify greenhouse gas benefits; and (3) develop markets and promote the resulting climate-smart commodities.

gas emissions and may have co-benefits, such as building agricultural producers' resilience to climate change.

## Potential Options to Help Agricultural Producers Enhance Their Climate Resilience Have Strengths and Limitations; Implementing Multiple Options Offers the Most Promise

Through our analysis of relevant literature and interviews with experts, we identified 13 potential options for USDA to further aid producers in enhancing their climate resilience (see table 2). Each of these options has strengths and limitations, according to experts and relevant literature. Implementing multiple options could leverage the strengths and address the limitations of the different options. This approach also offers the most promise to improve the climate resilience of agricultural producers, according to experts we interviewed; literature we reviewed; and our analysis of the options, using the information, integration, and incentives principles of our October 2019 *Disaster Resilience Framework* (see app. I).[60] The appropriate mix of options to enhance producers' climate resilience to reduce the fiscal risk to the federal government is a policy choice that requires complex trade-offs. These trade-offs should be made with full information about the strengths and limitations of different options and involvement from stakeholders, including producers, different levels of government, technical assistance providers, and other key stakeholders.

[60]GAO-20-100SP. We used the *Disaster Resilience Framework* to identify the forward-looking positive effects achievable by implementing options to further enhance the climate resilience of agricultural producers in comparison to current USDA efforts. Implementation of the options we identified may provide climate resilience benefits across principles identified in GAO's *Disaster Resilience Framework*. For the purposes of this report, we categorized the options under the principle where they have the most direct link to USDA's organizational and programmatic structure. For example, the option to prioritize climate resilience in whole-farm conservation planning and incentivize it through USDA's conservation programs could provide resilience benefits under the information, integration, and incentives principles of the framework. We categorized the whole-farm conservation planning option under the information principle because NRCS leads USDA's efforts to provide information and technical assistance on whole-farm conservation planning in association with the conservation programs that NRCS administers.

## We Identified 13 Potential Options to Enhance Producers' Climate Resilience, Each of Which Has Strengths and Limitations

The 13 potential options we identified are organized according to our *Disaster Resilience Framework*'s three guiding principles—information, integration, and incentives—as shown in table 2.[61]

[61]The names of the options listed in table 2 reflect those identified through our detailed methodology described in app. II. The options in table 2 are presented in shortened and paraphrased form in subsequent tables, figures, and text to allow for simple graphics and easy comparison throughout the rest of the report. For example, in table 2, option 1 is titled, "collect data on practices that enhance climate resilience." This option is shortened to "resilience good practices data" throughout the rest of the report.

**Table 2: Potential Policy Options for the U.S. Department of Agriculture (USDA) to Help Enhance Producers' Climate Resilience, by Guiding Principle in GAO's *Disaster Resilience Framework***

| |
|---|
| **Information principle**[a] |
| **1.** Collect data on practices that enhance climate resilience. |
| **2.** Expand technical assistance to prioritize and promote practices that enhance climate resilience. |
| **3.** Prioritize climate resilience in whole-farm conservation planning. |
| **4.** Expand the capacity and expertise of USDA's Climate Hubs. |
| **Integration principle**[b] |
| **5.** Develop an agricultural climate resilience plan that addresses regionally specific needs. |
| **Incentives principle**[c] |
| **6.** Establish standards for climate-resilient agricultural operations. |
| **7.** Revise the Natural Resources Conservation Service's Conservation Practice Standards to include practices that enhance climate resilience. |
| **8.** Expand conservation program eligibility to include and prioritize practices that enhance climate resilience. |
| **9.** Expand the capacity of USDA's conservation programs to help producers enhance their climate resilience. |
| **10.** Research the feasibility of incorporating climate resilience into crop insurance rates. |
| **11.** Require the adoption of relevant climate-resilient practices to receive premium subsidies. |
| **12.** Offer crop insurance premium subsidies for agricultural producers who use practices that enhance their climate resilience.[d] |
| **13.** Require that producers adopt practices that enhance climate resilience to be eligible for certain Farm Bill Title I programs. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]Accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk-reduction strategies.

[b]Integrated analysis and planning can help decision makers take coherent and coordinated resilience actions.

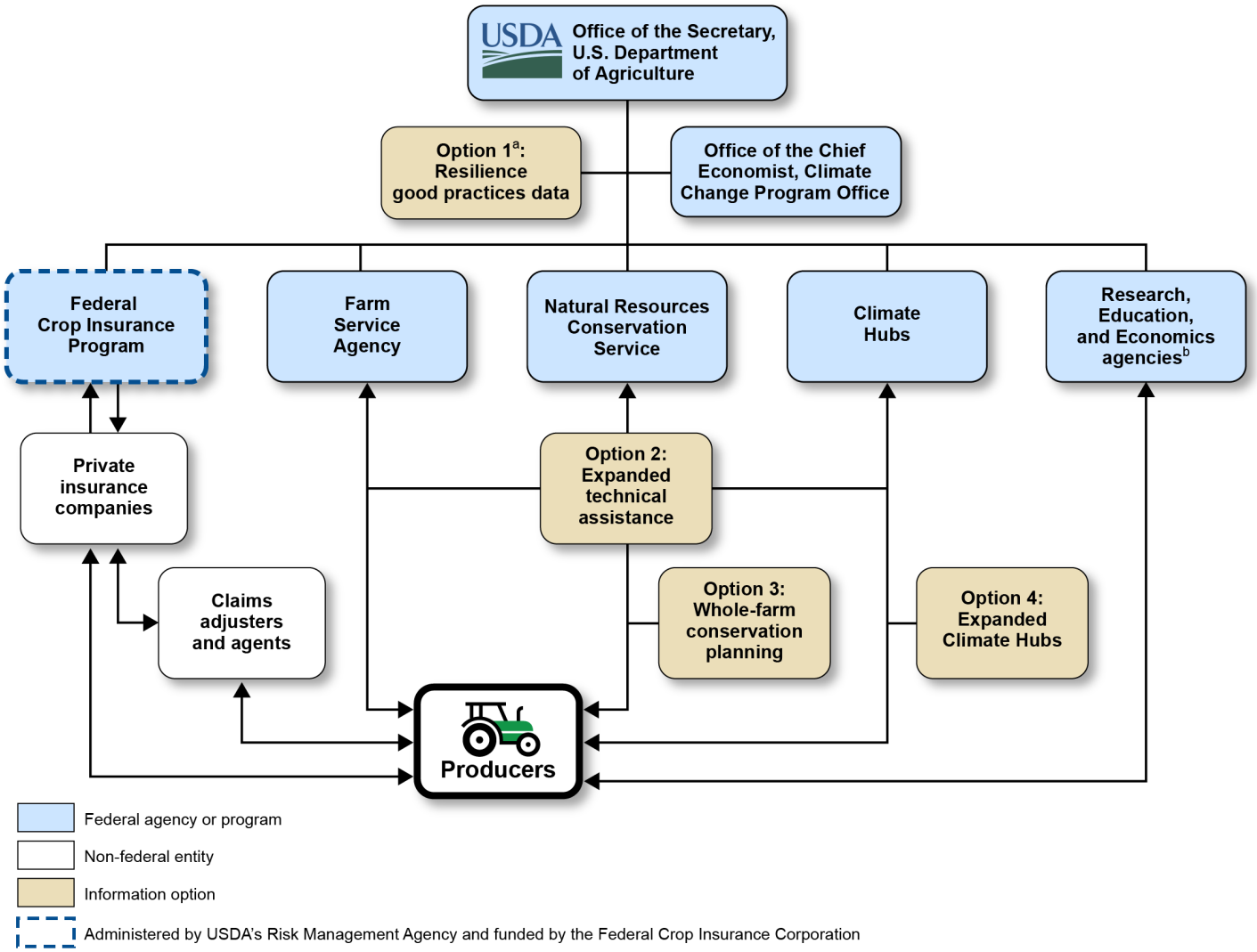
[c]Incentives can help to make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities.

[d]In contrast to this option, GAO's body of work on crop insurance includes Matters for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details.

## Information Options

We identified four potential policy options available to USDA to help producers further enhance their climate resilience by improving producer access to information that is authoritative and understandable. Figure 2 shows the key USDA offices and agencies with activities related to these options and where the options could be implemented.

**Figure 2: Potential Policy Options to Further Enhance Climate Resilience by Providing Information to Producers**




Source: GAO analysis of information provided by U.S. Department of Agriculture (USDA). | GAO-23-104557

[a]According to USDA officials, implementation of Option 1 would require coordination between the Natural Resources Conservation Service and the Research, Education, and Economics agencies, with support from the Office of the Chief Economist's Climate Change Program Office.

[b]The Research, Education, and Economics mission area includes the Agricultural Research Service, the Economic Research Service, the National Agricultural Statistics Service, the National Institute of Food and Agriculture, and the Office of the Chief Scientist.

Table 3 summarizes expert opinion on the strengths and limitations of options to help producers enhance their climate resilience by improving access to information.

**Table 3: Potential Strengths and Limitations of Information Options Available to the U.S. Department of Agriculture (USDA) to Further Enhance Producer Climate Resilience**

| | Strengths | Limitations |
|---|---|---|
| **Option 1: Resilience good practices data** | | |
| Collect data on practices that enhance climate resilience to demonstrate the benefits of those practices and ensure that data are accessible to a variety of stakeholders. | • An important way to identify the most effective practices<br>• Needed to convince producers that practices create environmental benefits and do not decrease farm income | • Collecting data is challenging because of producers' reluctance to share data and federal data privacy rules.<br>• Data are stored in different formats by a variety of agencies within USDA.<br>• Access to data may be affected by agency policy that restricts or prohibits data sharing. |
| **Option 2: Expanded technical assistance** | | |
| Expand the technical assistance provided by USDA and other key partners to prioritize and promote practices that enhance climate resilience. | • Critical for producers to successfully implement climate-resilient practices<br>• Necessary to build the agency's capacity to meet producers' needs and to tailor assistance to regional and local vulnerabilities and preferences | • Effectiveness of the Natural Resources Conservation Service's (NRCS) technical assistance has not been evaluated.<br>• NRCS does not report outcome-based performance measurements.[a]<br>• Private-sector technical assistance does not always focus on environmental benefits. |
| **Option 3: Whole-farm conservation planning** | | |
| Prioritize climate resilience in whole-farm conservation planning, and incentivize it through USDA's conservation programs to enhance producers' climate resilience. | • Could encourage a more comprehensive approach to enhancing climate resilience<br>• Could help producers address multiple, often interrelated, resource issues<br>• Should be relatively easy to incorporate climate resilience into conservation planning | • Resilience benefits of whole-farm conservation planning have not been clearly defined.<br>• Administrative burden and potential costs might discourage producers from participating.<br>• Technical assistance providers may not have sufficient training and expertise. |
| **Option 4: Expanded Climate Hubs** | | |
| Expand the capacity and expertise of USDA's Climate Hubs to help producers make informed decisions on climate resilience. | • Hubs are effective at creating and disseminating information.<br>• Could improve the quality and consistency of information and assistance<br>• Can facilitate collaboration with stakeholders in and outside of the federal government | • Hubs do not have clear climate resilience goals or performance measures.[b]<br>• Not enough producers are aware of the Hubs' research.<br>• Hubs have not always effectively targeted outreach to producers. |

Sources: GAO analysis of information from literature, and interviews with experts. | GAO-23-104557

[a]According to USDA, NRCS has not reported climate-related outcome-based measures; however, according to USDA, these measures will be developed through the implementation of NRCS's Climate Change Adaptation Plan.

[b]USDA's Climate Hubs Strategic Plan 2020-2025 outlines three priority goals, one of which is to enhance working lands resilience and productivity. The Hubs report output metrics, such as the number of workshops hosted, on a quarterly basis to measure administrative progress toward meeting these goals. Outcome measures, such as the effectiveness of the Hub's efforts to enhance

climate resilience of producers, are not included in the strategic plan or in the Hub's quarterly reporting, but are being considered for future versions.

Examples of strengths and limitations identified by experts include:

- **Option 1: Climate resilience good practices data.** Several experts told us that collecting and assessing data on resilience good practices is an important way to help USDA identify the most effective climate-resilient practices. In addition, some experts told us that convincing producers to adopt resilience good practices will require evidence that demonstrates that those practices create environmental benefits, as well as how those practices impact farm income. However, several experts told us that collecting useful data on resilience good practices is challenging because of producers' reluctance to share data and because of federal data privacy rules. [62] Several experts also told us that accessing USDA data is challenging because those data are collected and stored in different formats by several agencies within the department and because access to data may be affected by agency policy that restricts or prohibits data sharing.
- **Option 2: Expanded technical assistance.** Many of the experts told us that expanding access to technical assistance is important for producers to successfully implement practices that will enhance their resilience to climate change. According to several experts, there is demand for technical assistance by producers, but the experts viewed NRCS as understaffed and lacking the expertise to effectively provide that assistance. Several experts told us that this option would allow NRCS to hire and train the staff necessary to build the agency's capacity and meet producers' needs based on their regional circumstances. According to several experts, the effectiveness of NRCS's technical assistance is unclear because there is insufficient research available to demonstrate the benefits of technical assistance. According to some experts, additional research is needed to assess the environmental and economic costs and benefits of using conservation practices to enhance climate resilience to ensure that the technical assistance provided to producers is effective.
- **Option 3: Whole-farm conservation planning.** Many experts told us that incorporating climate resilience into whole-farm conservation

[62]Specifically, the Food Security Act of 1985, Pub. L. No. 99-198, § 1770, 99 Stat. 1354, 1657 (codified as amended at 7 U.S.C. § 2276), prohibits the Secretary of Agriculture and any other officer or employee of the Department of Agriculture or agency from using certain information for a purpose other than developing or reporting aggregate data or from disclosing certain information to the public unless it has been transformed into a statistical or aggregate form.

planning could encourage agricultural producers to take a more comprehensive approach to identifying climate risks and to enhancing their farm's resilience to climate change. For example, one expert told us that using whole-farm conservation planning can help producers address multiple, often interrelated, resource issues, while enhancing a farm's resilience to climate change. Several experts told us that USDA has well-established conservation programs and technical resources that will enable the department to easily incorporate climate resilience into conservation planning. According to several experts, more information is needed to demonstrate that whole-farm conservation planning enhances producers' resilience to climate change before farmers are encouraged to adopt this approach.

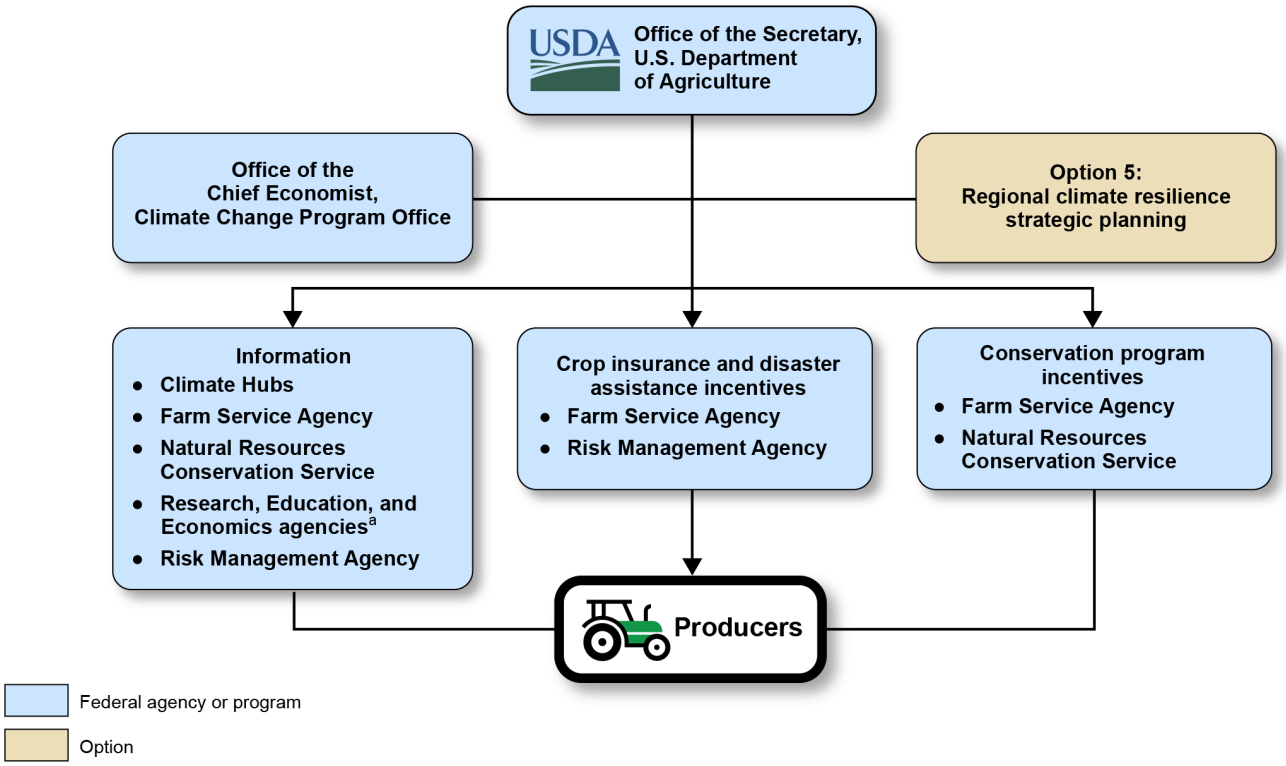
- **Option 4: Expanded Climate Hubs.** Many experts told us that Climate Hubs are effective at creating and disseminating information that helps producers make informed decisions about climate resilience, but several experts said that their effectiveness has been limited because of insufficient and inconsistent funding. According to several experts, this option would allow the Hubs to hire and train additional full-time staff to improve the quality and consistency of information and assistance that they provide across their 10 regional locations. Some experts told us that efforts by the Hubs would be limited because the Hubs do not have clear goals or performance measures. According to one expert, without goals and performance measures it will be difficult for the Hubs to understand their funding and staffing needs or to assess the effectiveness of their efforts to enhance producers' resilience to climate change.

For additional content on the strengths and limitations of these information options and USDA's comments on their implementation, see appendix IV.

## Integration Option

We identified one potential policy option that USDA could use to help producers enhance their climate resilience through integration of agency planning to help decision makers take coherent and coordinated resilience actions. Figure 3 shows the key USDA offices and agencies with activities related to this option and where the option could be implemented.

**Figure 3: Potential Policy Options to Further Enhance Producer Climate Resilience by Improving Integration**




Source: GAO analysis of information provided by U.S. Department of Agriculture. | GAO-23-104557

[a]The Research, Education, and Economics mission area includes the Agricultural Research Service, the Economic Research Service, the National Agricultural Statistics Service, the National Institute of Food and Agriculture, and the Office of the Chief Scientist.

Table 4 summarizes expert opinion on the strengths and limitations of option 5 that focuses on further enhancing producer's climate resilience by increasing the integration of climate change into decision-making and strategic planning.

**Table 4: Potential Strengths and Limitations of the Integration Option Available to the U.S. Department of Agriculture (USDA) to Further Enhance Producer Resilience**

| | Strengths | Limitations |
|---|---|---|
| Option 5: Regional climate resilience strategic planning | | |
| Develop an agricultural climate resilience plan that addresses regionally specific needs by coordinating within USDA, across relevant federal agencies, with producers, and with other key stakeholders. | • Could facilitate producer buy-in to climate resilience policies<br>• Could help establish research and technical assistance priorities<br>• Could improve coordination within and outside the federal government<br>• Could build off of existing federal programs and initiatives | • Achieving consensus across a diverse set of stakeholders could be challenging.<br>• Strategic planning process may overlap with other planning processes that already exist.<br>• Will not be effective without sufficient capacity |

Sources: GAO analysis of information from literature, and interviews with experts. | GAO-23-104557

Examples of strengths and limitations identified by experts include the following:

- **Option 5: Regional climate resilience strategic planning.** Several experts told us that a robust regional strategic planning process that is inclusive could help build consensus and facilitate participant buy-in to climate resilience policies. Several experts also told us that this option could help drive research priorities or technical assistance initiatives to address region-specific vulnerabilities. For example, some experts told us that this option could help identify gaps in available information and on climate resilience good practices, or gaps in the technical assistance available to producers in different regions. However, several experts cautioned that strategic planning would be a slow process and that gaining consensus across a diverse set of experts in different regions would be challenging. For example, some experts said that balancing federal climate resilience priorities with state and local needs would be challenging and would make it difficult to identify and get the buy-in from key participants necessary for the option to be effective.

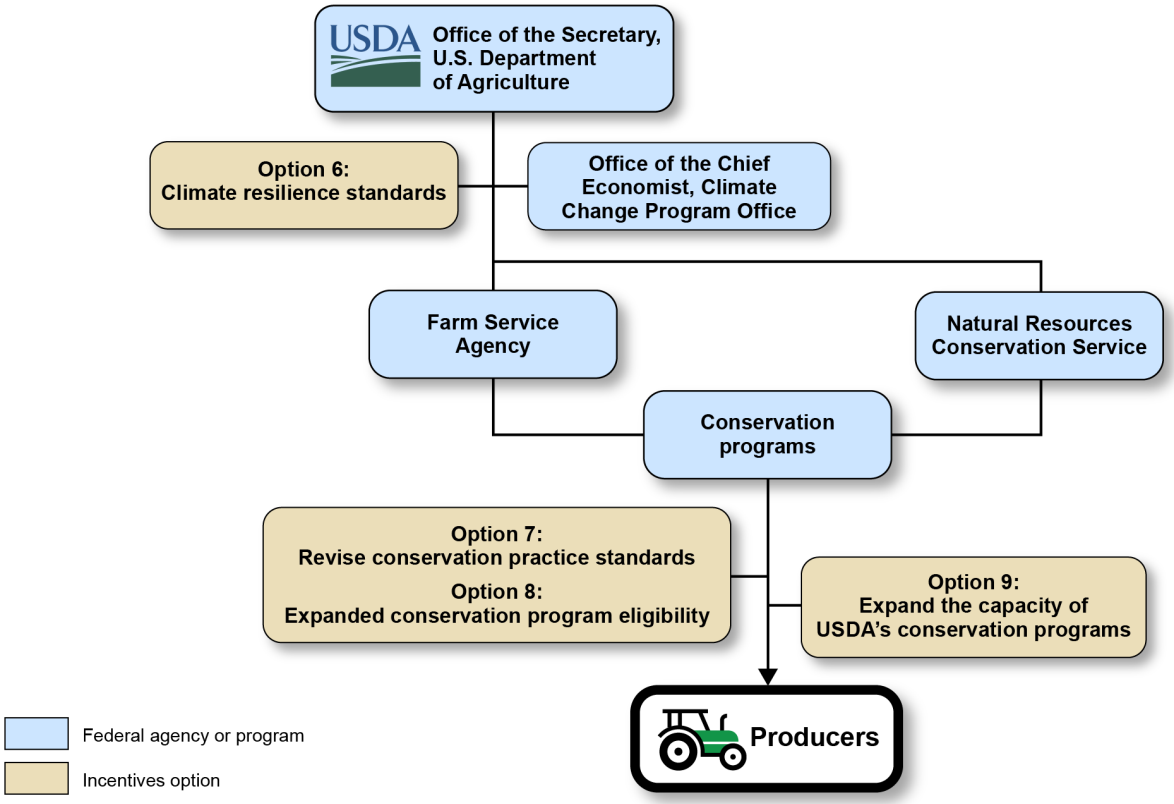
For additional information on the strengths and limitations of this option and USDA's comments on its implementation, please see appendix IV.

## Incentives Options

We identified eight potential policy options available to USDA to help producers enhance their climate resilience by providing additional incentives through the department's agricultural risk management and conservation programs. Four of these options provide additional incentives through the department's conservation programs. The other four options provide incentives through the federal crop insurance and Farm Bill Title I programs. Figure 4 shows the key USDA offices and

agencies with activities related to the options to provide additional incentives through USDA's conservation programs and where the options could be implemented.

**Figure 4: Potential Policy Options to Further Enhance Producer Climate Resilience by Providing Conservation Incentives**




Source: GAO analysis of information provided by U.S. Department of Agriculture. | GAO-23-104557

Table 5 summarizes expert opinion on the strengths and limitations of options to provide additional incentives through USDA's conservation programs.

**Table 5: Potential Strengths and Limitations of Options Creating Additional Conservation Program Incentives to Further Enhance Producer Climate Resilience**

| | Strengths | Limitations |
|---|---|---|
| Option 6: Climate resilience standards | | |
| Establish standards for climate-resilient agricultural operations to help create incentives for practices that enhance climate resilience and improve marketability. | • Such standards could provide clear direction to producers on what practices enhance their climate resilience.<br>• Such standards could create a competitive advantage for producers. | • Developing effective standards would be technically challenging.<br>• The cost of implementation may exceed any climate resilience benefits. |
| **Option 7: Revise conservation practice standards** | | |
| Revise the Natural Resources Conservation Service's (NRCS) Conservation Practice Standards to include the identification and evaluation of existing and new conservation practices that enhance producers' climate resilience. | • Necessary to assessing the costs and benefits of climate-resilient practices<br>• Could promote a more comprehensive approach to implementing climate-resilient practices<br>• Could be implemented relatively easily through NRCS's existing programs | • May not contribute directly to an increased use of those practices<br>• Standards might be developed in a way that is overly prescriptive or inflexible.<br>• Additional technical assistance capacity will be necessary to implement the new standards. |
| **Option 8: Expand conservation program eligibility** | | |
| Expand eligibility to include and prioritize climate-resilient practices in the administration of the U.S. Department of Agriculture's (USDA) conservation programs. | • Could facilitate producer implementation of climate resilience good practices<br>• Could lead to more efficient use of limited federal funds<br>• Could help demonstrate and collect information on the environmental and economic benefits of practices at the regional and local level | • Conservation program contracts may be too short to realize the economic and environmental benefits of climate-resilient practices.<br>• Will require additional staff to verify and monitor producer implementation of climate-resilient practices. |
| **Option 9: Expand the capacity of USDA's conservation programs** | | |
| Expand the capacity of the USDA's conservation programs to prioritize enrollment of acreage that helps producers enhance their resilience to climate change. | • Could be an effective way to encourage producers to use climate-resilient practices<br>• Can be used to hire and train additional staff to more effectively provide technical assistance to producers | • The effectiveness of using conservation practices to enhance climate resilience has not been fully assessed.[a]<br>• Conservation programs do not have a strategy to prioritize practices that most effectively enhance climate resilience.<br>• Conservation programs do not have climate resilience-related performance-based measurements to help program officials effectively guide resources. |

Sources: GAO analysis of information from literature, and interviews with experts. | GAO-23-104557

[a]NRCS's and the Farm Service Agency's recently released Climate Adaptation Plans identify the need to address these gaps, as well as lead offices, time frames, coordination needs, and progress metrics for this work.

Examples of strengths and limitations identified by experts include the following:

- **Option 6: Climate resilience standards.** Several experts told us that standards could effectively provide clear direction to producers on what practices are climate resilient. In addition, some experts said that this option could build off of the lessons learned from USDA's organic certification program, which may make it easier to implement. Several experts said that developing and maintaining standards with verifiable climate resilience benefits would be technically challenging. For example, several experts said that this option would require producer-specific data and research to inform which practices are climate resilient in different regions of the United States before the standards could be established. In addition, some experts said that since climate change is a dynamic process, the methodology for developing the standards would need to be flexible so that it could be regularly updated.
- **Option 7: Revise conservation practice standards.** Many experts told us that evaluating NRCS's conservation practices is necessary to determine the costs and benefits of climate-resilient practices and is a prerequisite for providing technical assistance. According to several experts, a lot is unknown about the effectiveness of conservation practices, so the process of revising the standards would provide an opportunity to conduct additional research before those practices are promoted as climate resilient. Some experts told us that revising the standards could promote a more comprehensive approach to implementing climate-resilient practices that may result in better outcomes. According to some experts, identifying and assessing climate-resilient practices may not contribute directly to an increased use of those practices. One expert told us that it is useful to identify which practices have resilience benefits, but without an incentive, producers may not adopt the practices. In addition, some experts were concerned that conservation practice standards might be developed in a way that is overly prescriptive or inflexible. According to one expert, additional flexibilities may be needed to ensure that

small and disadvantaged producers implement climate-resilient practices.[63]

- **Option 8: Expand conservation program eligibility.** According to some experts, expanding eligibility for conservation program participation to include good practices that enhance resilience could facilitate producer implementation of climate resilience good practices. For example, one expert told us that this option could facilitate adoption of practices with the potential to enhance climate resilience, such as whole-farm conservation planning and crop diversification at the producer level. Similarly, some experts also told us that it would help the conservation programs to demonstrate and collect information on the environmental and economic benefits of practices at the regional and local level necessary for mass adoption by producers. However, several experts told us that there are some structural challenges to the conservation programs that would limit their effectiveness at enhancing climate resilience. For example, according to several experts, the conservation programs tend to benefit larger operations, and the eligibility criteria and application requirements may need to be streamlined to facilitate participation by small and disadvantaged producers. In addition, some experts told us that the length of conservation program contracts with producers may be too short to realize the economic and environmental benefits of implementing climate resilience good practices over the long term.[64] According to some experts, this may create a disincentive for producers to continue implementing climate-resilient practices once their contracts end.
- **Option 9: Expand the capacity of USDA's conservation programs.** According to many experts, providing additional capacity to USDA's conservation programs could be an effective way to encourage the use of climate-resilient practices. Additional capacity could be used to hire and train additional staff to increase enrollment in the conservation programs and to promote the use of other climate-resilient practices, according to several experts. In addition, several

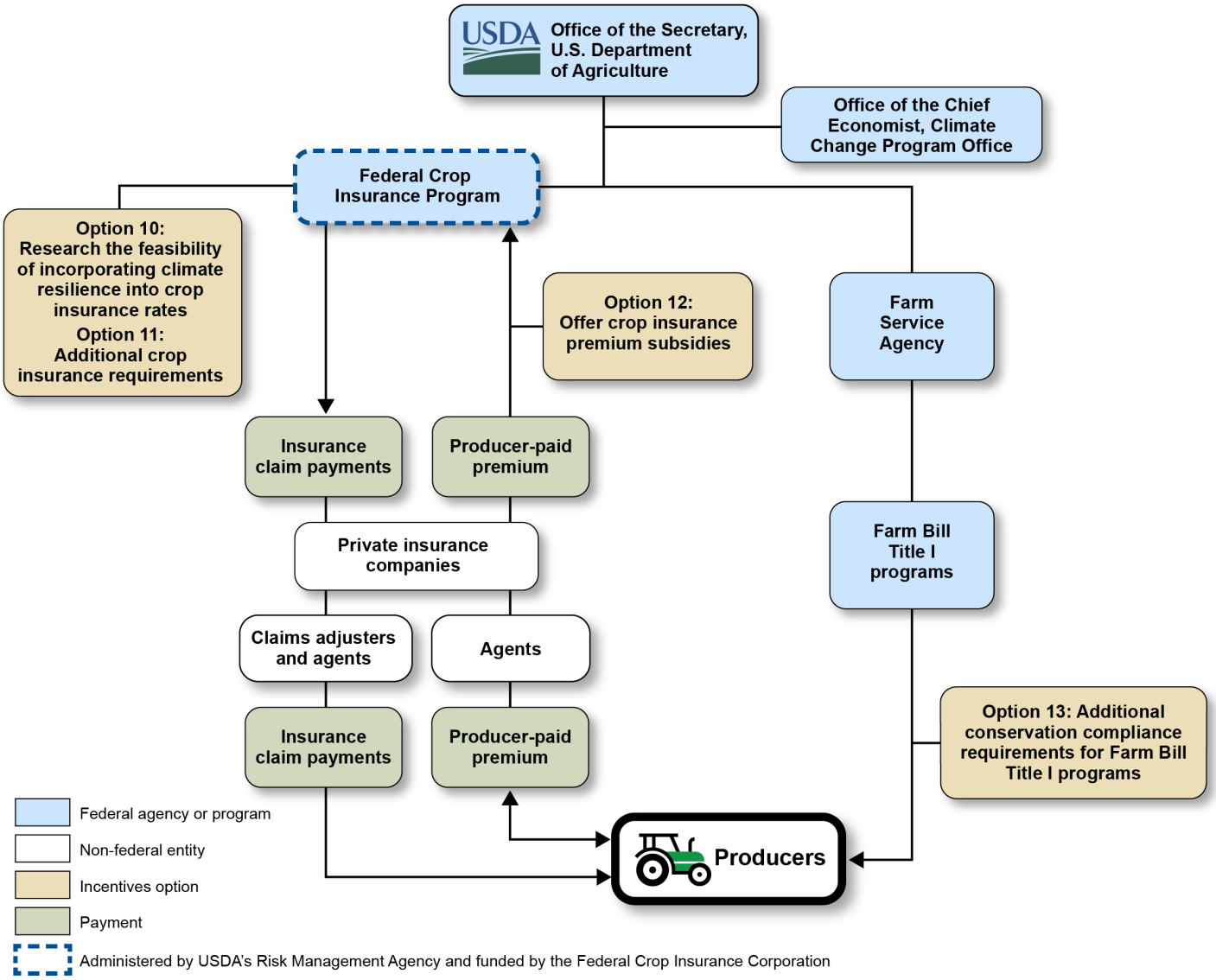
[63]GAO has previously reported on historically underserved farmers and the specific challenges they encounter. See, for example, GAO, *Agricultural Lending: Information on Credit and Outreach to Socially Disadvantaged Farmers and Ranchers Is Limited*, GAO-19-539 (Washington, D.C.: July 11, 2019); *Indian Issues: Agricultural Credit Needs and Barriers to Lending on Tribal Lands*, GAO-19-464 (Washington, D.C.: May 9, 2019); and *U.S. Department of Agriculture: Progress toward Implementing GAO's Civil Rights Recommendations*, GAO-12-976R (Washington, D.C.: Aug. 29, 2012).

[64]For example, contracts for land enrolled in FSA's Conservation Reserve Program are 10 to 15 years in length. The length of contracts for NRCS's Environmental Quality Incentives Program can last up to 10 years.

experts also told us that this option would be relatively easy to implement because USDA's conservation programs already exist, and there is more demand for these programs than USDA is able to fund. Some experts told us that it would be difficult to ensure that providing additional capacity for USDA's conservation programs would enhance a producer's resilience to climate change. According to some experts, that is because additional research is needed to assess the effectiveness of using conservation practices to enhance climate resilience. Some of the experts told us that USDA's conservation programs do not have performance-based measurements to assess the effectiveness of the conservation practices that they promote.

We also identified four potential policy options available to USDA to help producers enhance their climate resilience by providing additional incentives through the federal crop insurance program and Farm Bill Title I programs. Figure 5 describes the key USDA offices and agencies with activities related to these options and the entry points for the policy options.

**Figure 5: Potential Options to Further Enhance Producer Climate Resilience Using Crop Insurance and Farm Bill Title I Program Incentives**




Source: GAO analysis of information provided by U.S. Department of Agriculture (USDA). | GAO-23-104557

Table 6 summarizes expert opinion on the strengths and limitations of options to provide additional incentives through the federal crop insurance program and Farm Bill Title I programs.

**Table 6: Potential Strengths and Limitations of Options to Further Enhance Producer Climate Resilience Using Additional Crop Insurance and Farm Bill Title I Program Incentives**

| Option | Strengths | Limitations |
|---|---|---|
| **Option 10: Research the feasibility of incorporating climate resilience into crop insurance rating** | | |
| Research the feasibility of incorporating data on the projected impacts of climate change on agriculture and data on the effects of climate-resilient practices into crop insurance rates. . | • Could reduce the fiscal risk of the federal crop insurance program to the federal government<br>• Could help set premiums that accurately reflect climate change risks<br>• Could create an incentive for the sustained adoption of climate-resilient practices | • Challenging to collect the data and conduct the research necessary to effectively implement this option<br>• U.S. Department of Agriculture (USDA) may lack the necessary staff and technical capacity to implement this option effectively. |
| **Option 11: Additional crop insurance requirements** | | |
| Require the adoption of relevant climate-resilient practices to receive crop insurance premium subsidies. | • Could create an incentive for the adoption of climate-resilient practices<br>• Could reduce the fiscal risk of the federal crop insurance program to the federal government | • Technically challenging to develop and enforce new requirements<br>• Would require additional capacity to implement effectively<br>• Could be politically challenging to implement<br>• Could impact producer participation in the federal crop insurance program |
| **Option 12: Offer crop insurance premium subsidies** | | |
| Offer crop insurance premium subsidies for producers to incentivize adoption of practices that enhance resilience. | • Could encourage a large portion of producers to adopt climate-resilient practices<br>• Could help producers cover the cost of adopting and sustaining practices that enhance climate resilience | • Crop insurance may work at cross-purposes with efforts to enhance climate resilience.<br>• Would add costs to an already costly program<br>• In contrast to this option, GAO's body of work on crop insurance includes Matters for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details. |
| **Option 13: Additional conservation compliance requirements for Farm Bill Title I programs** | | |
| Expand conservation compliance requirements to include the adoption of certain climate-resilient practices for producers to be eligible for certain Farm Bill Title I programs. | • Could create an effective, straightforward incentive for producers to adopt climate resilience good practices<br>• Could help reduce the fiscal risk to the federal government | • Could be politically challenging to implement<br>• Could be technically challenging to implement and enforce<br>• May disproportionately impact small, disadvantaged, and minority producers.<br>• USDA may lack the expertise necessary to monitor and verify producer compliance with new requirements effectively. |

Sources: GAO analysis of information from literature, and interviews with experts. | GAO-23-104557

Examples of strengths and limitations identified by experts include the following:

- **Option 10: Research the feasibility of incorporating climate resilience into crop insurance rating.** According to several experts,

additional research on incorporating future climate impacts and the effects of climate resilience good practices into the crop insurance rating could help reduce the fiscal risk of the crop insurance program to the federal government. For example, some experts told us that having a clear understanding of the risks of climate change and the resilience benefits of agricultural practices at the regional and local levels will be key to ensuring a fiscally sound, high-performing federal crop insurance program in the future. However, some experts also told us that USDA lacks the staff and expertise necessary to collect, analyze, and update the producer-level information and the data necessary to assess the feasibility of this option. Further, several experts told us that this option would be politically challenging because of the popularity of the program among producers and opposition to making changes to the formula for calculating premium rates, including changes to reflect climate change risks.

- **Option 11: Additional crop insurance requirements.** According to several experts, this option could create a straightforward, effective incentive for producers to adopt climate resilience good practices. For example, one expert told us that federal crop insurance requirements would be very effective at incentivizing producers to adopt climate resilience good practices because operations covered by federal crop insurance account for the majority of agricultural production in the United States. Several experts told us that it would be technically challenging to implement this option. According to some experts, any new requirement for climate-resilient practices would need to be supported by verifiable evidence that the practices reduce climate change risks while limiting impacts on producer yields and profit margins. According to other experts, there is no standardized methodology for measuring climate resilience at the producer level, which makes it difficult to identify effective climate-resilient practices in different regions and localities.
- **Option 12: Offer crop insurance premium subsidies.**[65] Several experts told us that this option has the potential to encourage a large portion of producers to adopt climate-resilient practices because of the popularity of the federal crop insurance program. However, several experts were concerned that such crop insurance may work at cross-purposes with efforts to enhance climate resilience. According to these experts, some practices that can enhance climate resilience do so at the expense of crop yields. These experts said that if the net

[65]In contrast to this option, GAO's body of work on crop insurance includes Matters for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details.

effect of installing a practice lowers crop yields, even temporarily, this could discourage a producer from installing a practice. In addition, several experts noted that additional subsidies would add costs to an already costly program and may not be the most efficient way to incentivize climate-resilient practices. For example, higher subsidies incentivize greater production and, thereby, increase the federal government's fiscal exposure, especially in higher-risk areas that otherwise would not be economically feasible to farm. One expert suggested that it would be more efficient and effective to make the current subsidies contingent on the adoption of climate-resilient practices without increasing the costs to the federal government.

- **Option 13: Additional conservation compliance requirements for Farm Bill Title I programs.** Some experts told us that this option would reduce the fiscal risk to the federal government of climate change impacts. For example, one expert told us that this option could decrease the likelihood that Title I programs will subsidize high-risk agricultural production. According to several experts, this option would be politically difficult to implement. For example, one expert told us that because Title I programs provide financial support to producers to help alleviate the impacts of natural disasters, such as floods or droughts, it may be politically challenging to place additional requirements on funding that producers depend on for the survival of their operations. Some experts also expressed concern that this option may disproportionally impact small, disadvantaged, and minority producers because they may lack the financial and technical capacity to comply with the new requirements. For example, one expert told us that the Title I programs are not inclusive for small, disadvantaged, and minority producers and that those producers would bear the additional cost of compliance if this option were implemented, while receiving a smaller proportion of the program benefits.

For additional information on the strengths and limitations of these options and USDA's comments on their implementation, see appendix IV.

## Implementing Multiple Options Offers the Most Potential to Help Agriculture Producers Enhance Their Climate Resilience

Implementing multiple options could leverage the strengths and address the limitations of the different options; this approach also offers the most potential to improve the climate resilience of agricultural producers according to experts we interviewed and our analysis of the options, using our October 2019 *Disaster Resilience Framework*. Many of the experts we interviewed said that some of the options to further enhance producers' climate resilience are mutually reinforcing, given their relative strengths and limitations, and that these options would work best if more than one were implemented. Similarly, USDA officials stated that a

combination of the options would most likely be the most effective way to best prepare producers for the current and projected impacts of climate change.

Specifically, several experts told us that incorporating climate resilience requirements for subsidies provided under the crop insurance program would be very effective at incentivizing adoption of climate resilience good practices. Other experts told us that options such as new climate resilience requirements for the federal crop insurance program and Title I programs are unlikely to be effective without corresponding efforts to implement other policy options.[66] For example, some experts told us that region-specific information on the environmental and economic effects of climate resilience good practices would be needed to inform the new requirements and expanded technical assistance would be needed to help producers comply.

Several experts also suggested that some of the options may be most effective when implemented sequentially. For example, several experts told us that the climate resilience planning option would be a logical starting point to set implementation priorities for the other policy options that we identified and to get buy-in from key stakeholders.

In instances such as this, our *Disaster Resilience Framework* can be applied to identify opportunities to address gaps in federal climate resilience efforts. The framework states that integrating strategic resilience goals can help decision makers work toward a common vision and help ensure focus on a wide variety of opportunities to reduce risk.[67] Moreover, USDA's fiscal exposure to changes in the climate in the department's existing programs—such as the crop insurance program and agriculture disaster assistance efforts—highlights how funding disaster resilience primarily in reaction to disasters that have already occurred creates and exacerbates fragmentation across federal programs with different timelines and purposes. This lack of proactive and coordinated federal assistance makes it more difficult for nonfederal partners, such as agriculture producers, to pursue whole systems solutions to risk reduction. In light of the seriousness and complexity of

[66]Title I of the Farm Bill authorizes financial support programs for dairy, sugar, and covered commodities—including major grain, oilseed, and pulse crops—as well as agricultural disaster assistance. Major field-crop programs include the marketing assistance loan program, Price Loss Coverage, and Agricultural Risk Coverage.

[67]GAO-20-100SP.

the problem, solutions will be multifaceted and often will require cooperation across agencies, governments, and sectors.

Executive Order 14008 on *Tackling the Climate Crisis at Home and Abroad,* signed in early 2021, states that the administration's policy is to deploy the full capacity of federal agencies to, among other things, combat climate change and implement a government-wide approach that increases climate resilience.[68] The order directs agencies to submit a climate action plan that describes steps that the agency can take with regard to its facilities and operations to bolster adaptation and increase resilience to the impacts of climate change, submit annual progress reports, and make action plans publicly available. In addition, Executive Order 14030 requires agencies to report on actions they are taking to integrate climate-related financial risk into their procurement process, and Executive Order 14057 and its implementing instructions require agencies to develop, implement, and update their climate action plans and to conduct climate adaptation analyses and planning for climate-informed financial and management decisions and program implementation.[69] Executive Order 14057 also requires federal agencies to reform agency policies and funding programs that are maladaptive to climate change and that increase the vulnerability of communities, natural or built systems, economic sectors, and natural resources to climate impacts, or related risks.[70]

USDA has some efforts underway to encourage agricultural producers to enhance their resilience to climate change. For example, in May 2021, the Secretary of Agriculture issued a regulation directing USDA to integrate climate change adaptation planning, implementing actions, and performance metrics into USDA programs, policies and operations.[71] Further, in October 2021, USDA issued a climate action plan to integrate climate adaptation and resilience into its missions and programs. This included plans to increase support for research and development of climate-smart practices and technologies to help producers adapt to a

[68]Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021).

[69]Exec. Order No. 14,030, 86 Fed. Reg. 27,967 (May 25, 2021).

[70]Exec. Order No. 14,057, 86 Fed. Reg. 70,935 (Dec. 13, 2021).

[71]U.S. Department of Agriculture, Office of the Secretary, Departmental Regulation 1070-001, "U.S. Department of Agriculture (USDA) Policy Statement on Climate Change Adaptation" (Washington, D.C.: May 26, 2021).

changing climate and leverage the USDA Climate Hubs to deliver adaptation science, technology, and tools.[72] In July 2022, in accordance with the department-wide Adaptation Plan, USDA released 13 agency-level adaptation plans. These agency-specific plans detail ways in which the agencies can increase resilience through their missions and programs. The May 2021 departmental regulation reestablished USDA's Office of the Chief Economist as the lead office responsible for adaptation planning. Since 2011, the Climate Change Program Office within the Chief Economist's Office of Energy and Environmental Policy has led USDA's adaptation planning efforts and helped coordinate the department's overall response to climate change.[73]

Our comparison of the 13 options to USDA's current efforts using the principles of our *Disaster Resilience Framework* shows how implementing each option could further enhance producers' climate resilience (see app. I). For example, the framework states that federal efforts to provide information can assist decision makers in identifying and selecting among climate and disaster risk-reduction alternatives by providing technical assistance.[74] Using the framework's information principle, we compared the option for USDA to expand the technical assistance that it provides to prioritize and promote practices that enhance climate resilience with USDA's efforts to provide technical assistance through NRCS and the regional Climate Hubs. We found that expanded technical assistance could help agricultural producers further enhance their climate resilience.

## USDA Analysis of Options Could Facilitate Implementation

The appropriate mix of options to enhance producers' climate resilience to reduce the fiscal risk to the federal government is a policy choice that requires complex trade-off decisions. These trade-off decisions should be made with full information about the strengths and limitations of different options and involvement from stakeholders, including producers, different levels of government, technical assistance providers, and other key stakeholders. USDA officials told us that many of the options that we

[72]U.S. Department of Agriculture, *Action Plan for Climate Adaptation and Resilience.*

[73]U.S. Department of Agriculture, Office of the Secretary, Departmental Regulation 1070-001, "U.S. Department of Agriculture (USDA) Policy Statement on Climate Change Adaptation" (Washington, D.C.: June 3, 2011). USDA's interagency Global Change Task Force, convened by the Climate Change Program Office, is made up of appointed climate leadership from agencies and mission areas across USDA and meets monthly to ensure communication and coordination on climate change science and policy. The Climate Change Program Office also represents USDA to the federal interagency Global Change Research Program.

[74]GAO-20-100SP.

identified are consistent with the priorities laid out in the agency's October 2021 Climate Action Plan for Adaptation and Resilience, and that a combination of the options would likely be more effective at helping producers enhance their climate resilience. USDA officials also said that the strategic planning process created to develop the Climate Action Plan could be expanded to address the specific needs of different regions and localities.

In general, USDA officials told us that some of the options could be addressed administratively, while others would require additional statutory authority to be implemented effectively. USDA officials noted that some of the options would have limited effectiveness without additional appropriations to implement them. USDA officials also told us that individual subagencies and programs have goals consistent with some of the policy options identified in this report. In addition, officials told us that USDA could benefit from the development of department-wide goals and priorities for helping producers enhance their resilience, and then integrating those goals and priorities into the department's climate resilience planning.[75] However, USDA officials said that they were unsure, without further analysis, what additional authority they would need from Congress to implement many of the options. They also said that they would need additional direction from Congress on how the options should be prioritized and implemented.

By analyzing options to enhance the climate resilience of agricultural producers and incorporating those options, as appropriate, when prioritizing actions in future climate resilience planning efforts, USDA could help meet its obligations under executive orders and regulations related to climate change. Such orders and regulations include Executive Orders 14008, 14030, and 14057 and USDA Departmental Regulation 1070-001. In addition, a comprehensive analysis of the options that we identified could help USDA determine the appropriate mix of options to help producers enhance their resilience and identify what additional resources and statutory authority would be necessary to implement those options. Further, the analysis would help inform congressional decisions

[75]For example, the climate change adaptation plans issued by RMA and NRCS in June and July 2022 contained goals similar to Options 1 and 10 in this report. Specifically, related to Option 1, NRCS has a goal of improving climate information management, including capturing, organizing, and integrating climate information and relevant research at appropriate scales. Similar to Option 10, RMA has a goal of updating crop insurance premium rates to reflect changes in risk due to climate change. See National Resources Conservation Service, *Climate Change Adaptation Plan* (Washington, D.C.: July 2022); and Risk Management Agency, *Climate Adaptation Plan* (Washington, D.C.: June 2022).

with regard to future legislative efforts to enhance producers' climate resilience and to reduce the fiscal exposure of the federal crop insurance program and agricultural disaster assistance programs.

## Conclusions

USDA has taken steps to encourage agricultural producers to enhance their climate resilience and reduce the fiscal exposure to the federal government—but the department could do more. We identified 13 options for USDA to further enhance the climate resilience of agricultural producers. Each of these options has strengths and limitations. Implementing multiple options could leverage their strengths and address their limitations and offers the most potential to improve the climate resilience of agricultural producers, as we found through an extensive analysis using our *Disaster Resilience Framework*, our review of related literature, and interviews with experts. However, USDA officials said that they were unsure what additional authority they would need from Congress to implement many of the options. The officials also told us that some of the options could not be implemented or would have limited effectiveness without additional appropriations.

To help USDA meet its obligations under executive orders and regulations related to climate change, a comprehensive analysis of the options we identified to enhance the climate resilience of agricultural producers could help the agency identify which options should be prioritized in future climate resilience planning efforts. It would also help USDA identify the additional resources and statutory authority necessary to implement those options effectively to inform congressional decision-making. Doing so could also reduce the fiscal exposure of the federal crop insurance program and agricultural disaster assistance programs.

## Recommendation for Executive Action

The Secretary of Agriculture should ensure that the Climate Change Program Office, located within the Office of the Chief Economist, analyzes the options to enhance the climate resilience of agricultural producers that were identified in this report and integrates them, as appropriate, into USDA's future climate resilience prioritization and planning efforts. Such analysis should include an explanation of USDA's decision to prioritize or not prioritize the options identified in this report and the identification of any additional authority and resources that USDA would need to implement the options. (Recommendation 1)

## Agency Comments

We provided a draft of this report to USDA for review and comment. In its comments, reproduced in appendix V, USDA agreed with our recommendation and identified steps it is taking to implement it. USDA also provided technical comments, which we incorporated as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, the Secretary of Agriculture, and other interested parties. In addition, the report will be available at no charge on the GAO website at https://www.gao.gov.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or morriss@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff members who made major contributions to this report are listed in appendix VI.

Steve D. Morris

Steve Morris
Director, Natural Resources and Environment

# Appendix I: Using the *Disaster Resilience Framework* to Analyze Potential Options to Enhance Climate Resilience

The U.S. Department of Agriculture (USDA) can reduce federal fiscal exposure by pursuing additional climate resilience options, according to our analysis using GAO's *Disaster Resilience Framework*. GAO has identified the rising number of natural disasters and increasing reliance on federal assistance as a significant source of federal fiscal exposure. Investments in disaster resilience are a promising avenue to address the federal fiscal exposure because such investments offer the opportunity to reduce the overall impact of disasters. We compared the options available for further enhancing the climate resilience of agriculture producers with USDA's current climate resilience efforts, using the principles and subprinciples in GAO's *Disaster Resilience Framework*. As stated in the framework, some principles and concepts are likely to be more relevant in the analysis of certain federal efforts than others. It is appropriate to apply portions of the framework to improve the resilience of federal programs, depending upon the specific circumstances. Users of the framework should exercise their professional judgment when determining how best to make the principles and concepts meet their needs. This appendix documents the professional judgment that we applied to the analysis of options available to USDA to help agricultural producers enhance their climate resilience.

Our analysis was organized around the framework's three broad overlapping principles—information, integration, and incentives—and a series of questions that those who provide oversight or management of federal efforts can consider when analyzing opportunities to enhance their contribution to national disaster resilience to reduce federal fiscal exposure. For each option, an analyst made a determination about which USDA efforts and *Disaster Resilience Framework* principles, subprinciples, and analysis questions were relevant. The analyst then made an assessment of and documented whether each option could further enhance the climate resilience of agricultural producers on the basis of a qualitative assessment of each option and USDA's current climate resilience efforts. A second analyst reviewed the first analyst's work to ensure that the conclusions drawn were sound. If the second analyst did not concur with the conclusions drawn, the second analyst documented the rationale. The team also documented in its workpapers how any differences of opinion were resolved before presenting its final analyses in figures 6 through 11.

**Information.** Several of the options to further enhance producers' climate resilience and USDA's current resilience efforts align with the information principle of GAO's *Disaster Resilience Framework*. Comparing these options and efforts with the most relevant subprinciples and questions for

consideration illustrates opportunities to enhance producers' climate resilience and limit federal fiscal exposure (see figs. 6 and 7).

**Figure 6: Opportunities to Enhance Producers' Climate Resilience Related to the Information Principle in GAO's Disaster Resilience Framework**

**Principle:**

**Information**

Accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk-reduction strategies.

**Provide reliable and authoritative information about current and future risk**

To what extent could federal efforts:
- Enhance the validity and reliability of the disaster risk information produced?
- Generate and share additional information that would help decision makers understand their disaster risk?
- Reduce the complexity of and translate risk information for non-technical audiences?
- Help leverage and synthesize disaster risk information from other partners across agencies, governments, and sectors?
- Promote consensus around the reliability of the sources and methods that produce disaster risk information?

**Improve the ability to assess alternatives to address risk**

**To what extent could federal efforts**
- **help decision makers identify and select among disaster risk-reduction alternatives?**
- **provide technical assistance to help build capacity of nonfederal partners?**

- Contribute to an understanding of approaches for estimating returns on investment?
- Help decision makers identify and combine available funding sources and innovative methods for meeting disaster risk-reduction needs?

**Strengthen the ability to assess status and report progress**

To what extent could federal efforts:
- Advance methodologies or processes to measure the current state of nationwide resilience?
- Promote monitoring of progress toward resilience on a programmatic basis?

**Information subprinciple: Improve the ability to assess alternatives to address risk**

| Option to improve the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for consideration:** Could the additional option help decision makers identify and select among disaster risk-reduction alternatives? |
|---|---|---|
| Option 1: Resilience good practices data | Funding resilience research | Yes. Climate Hubs and the Research, Education, and Economics agencies are creating and disseminating research on climate change and climate resilience. Opportunities exist to make government data and research more accessible to agricultural producers and researchers and to improve decision-making on climate resilience good practices. |
| | | **Question for consideration:** Could the additional option provide technical assistance to help build capacity of nonfederal partners? |
| Option 2: Expand technical assistance | Providing technical assistance | Yes. USDA provides technical assistance to producers to help develop conservation plans and adopt conservation practices through several existing programs and initiatives. Some of USDA's conservation practices may help producers enhance their resilience to climate change. Opportunities exist for USDA to provide additional technical assistance to producers to help them enhance their resilience. |
| Option 3: Whole-farm conservation planning | Providing technical assistance | Yes. In the Upper Midwest, the Natural Resouces Conservation Service has collaborated with the University of Iowa to develop region-specific Whole-farm Conservation Planning guidance that identifies numerous ways to help agricultural producers make decisions to improve water quality, soil health, and wildlife habitat on farm land while remaining profitable. Many of these practices may also help producers enhance their resilience. Opportunities exist for USDA to expand the guidance, and develop similar guidance in other regions, to help producers incorporate climate resilience into their conservation planning. |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

**Figure 7: Opportunities to Enhance Producers' Climate Resilience Related to the Information Principle in GAO's Disaster Resilience Framework**

**Information subprinciple: Provide reliable and authoritative information about current and future risk**

| Option to improve the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for consideration:** Could the additional option help leverage and synthesize disaster risk information from other partners across agencies, governments, and sectors? |
|---|---|---|
| Option 4: Expand Climate Hubs | Providing technical assistance and funding resilience research | Yes. Part of the Climate Hubs' mission is to connect USDA research agencies such as the Agricultural Research Service to program agencies such as the Natural Resources Conservation Service. In addition, the Climate Hubs work with a variety of stakeholders, including agricultural producers; public and land grant universities; the private sector; farm groups; federal, state, and local governments; tribal organizations; and nonprofits that provide assistance to landowners. Opportunities exist for Climate Hubs to utilize these relationships to synthesize and share disaster risk information with stakeholders. |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

**Integration.** One of the options to further enhance the climate resilience of current climate resilience efforts aligns with the integration principle of GAO's *Disaster Resilience Framework*. Comparing the option and efforts with the most relevant subprinciple and question in the framework illustrates opportunities to enhance producers' climate resilience and limit federal fiscal exposure (see fig. 8).

**Figure 8: Opportunities to Enhance Producers' Climate Resilience Related to the Integration Principle in GAO's Disaster Resilience Framework**

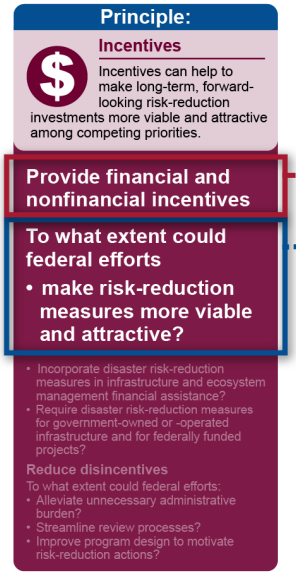
**Integration subprinciple: Promote coordination across missions and sectors**

| Option to improve the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for consideration:** Does the additional option encourage governance mechanisms that foster coordination and integrated decision making within and across levels of government? |
|---|---|---|
| Option 5: Regional climate resilience strategic planning | Strategic planning | Yes. USDA's strategic plans have identified climate change as a risk. In August 2021, USDA released an *Action Plan for Climate Adaptation and Resilience* and followed up in July 2022 with 13 agency-level adaptation plans. These plans identify actions that the department and the agencies intend to take to incorporate climate resilience into their decision-making. Opportunities exist for USDA to integrate region specific climate resilience planning into the department's strategic planning and decision-making process. |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

**Incentives.** Several of the options to further enhance producers' climate resilience and USDA's current climate resilience efforts align with the incentives principle of GAO's *Disaster Resilience Framework*. Comparing the options and efforts with the most relevant subprinciples and questions in the framework illustrates opportunities to enhance producers' climate resilience and limit federal fiscal exposure (see figs. 9, 10, and 11).

**Figure 9: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework**



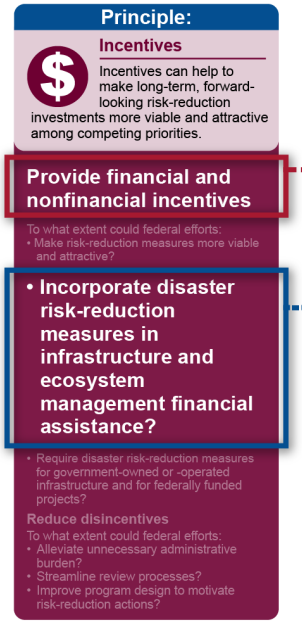

**Incentives subprinciple: Provide financial and nonfinancial incentives**

| Option to enhance the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for consideration:** Could the additional option help to make risk-reduction measures more viable and attractive? |
|---|---|---|
| Option 6: Climate resilience standards | No action taken | Yes. USDA has developed certification standards for specific production or management good practices, including organic farming and fair trade. Opportunities exist for USDA to create certification standards that would incentivize by recognizing producers that implement climate resilience good practices. |
| Option 9: Expand the capacity of USDA's conservation programs | No action taken | Yes. USDA's conservation programs utilize financial incentives to encourage voluntary adoption of conservation practices to address different natural resource concerns, such as preventing soil loss. These practices may incentivize producers to enhance their resilience to climate change. Opportunities exist for USDA to use financial incentives to encourage the adoption of additional practices that can enhance climate resilience of producers. |
| Option 12: Offer crop insurance premium subsidies | No action taken | Yes. Opportunities exist for USDA to use financial incentives through the crop insurance program to encourage the adoption of additional practices that can enhance the climate resilience of producers.[a] |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

[a]In contrast to this option, GAO's body of work on crop insurance includes a Matter for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details.

**Figure 10: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework**




**Incentives subprinciple: Provide financial and nonfinancial incentives**

| Option to enhance the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for consideration:** Could the additional option help to incorporate disaster risk-reduction measures in infrastructure and ecosystem management financial assistance? |
|---|---|---|
| Option 7: Revise conservation practice standards | No action taken | Yes. USDA does periodically review, revise, and make additions to its conservation practice standards. USDA has an opportunity to use this review process to include the identification and evaluation of existing and new conservation practices that are designed specifically to enhance an agricultural producer's resilience to climate change. |
| Option 8: Expand conservation program eligibility | No action taken | Yes. USDA's conservation programs promote good practices that may have climate resilience benefits in certain locations. Opportunities exist for the Natural Resources Conservation Service to expand conservation program eligibility to include and prioritize climate resilient agricultural practices to prevent disaster risk associated with climate change. |
| Option 11: Additional crop insurance requirements | No action taken | Yes. Federal law prohibits the federal crop insurance program from covering losses due to a farmer's failure to follow good farming practices. Good farming practices are the production methods and practices used to produce a crop such that it is likely to make normal progress toward maturity and produce at least the yield used to determine the production guarantee or amount of insurance. According to Risk Management Agency guidance, good farming practices can vary by crop and location. Opportunities exist for USDA to incorporate climate resilience into its list of good practices for the Federal Crop Insurance Program to incentivize producers to enhance the resilience of their operations. |
| Option 13: Additional conservation compliance requirements for Farm Bill Title I programs | No action taken | Yes. USDA requires producers to meet certain conservation compliance requirements to qualify for disaster relief programs under Title I of the Farm Bill. Opportunities exist to incorporate climate resilience into conservation compliance requirements to incentivize producers to enhance their resilience. |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

**Figure 11: Opportunities to Enhance Producers' Climate Resilience Related to the Incentives Principle in GAO's Disaster Resilience Framework**

**Incentives subprinciple: Reduce disincentives**

| Option to enhance the climate resilience of agricultural producers | USDA's climate resilience effort | **Question for Consideration:** Could the additional option improve program design to motivate risk reduction actions? |
|---|---|---|
| Option 10: Research the feasibility of incorporating climate resilience into crop insurance rating | No action taken | Yes. USDA generally uses historical data on claims to determine the rates for the federal crop insurance program, but has not researched how to explicitly incorporate information on climate change risk and climate resilience good practices into crop insurance rates. Opportunities exist for USDA to identify ways to incorporate information on climate change risk and climate resilience good practices into crop insurance rates. |

Sources: GAO's *Disaster Resilience Framework* (GAO-20-100SP) and GAO analysis of U.S. Department of Agriculture (USDA) documents, relevant literature, and interviews with experts. | GAO-23-104557

# Appendix II: Objectives, Scope, and Methodology

This report examines (1) the U.S. Department of Agriculture's (USDA) actions to enhance the climate resilience of agricultural producers and (2) the strengths and limitations of potential options available to USDA to further enhance the climate resilience of agricultural producers. To address these objectives, we reviewed agency documents, reviewed relevant literature, and interviewed agency officials and experts. We also provide information in appendix I on how we used GAO's *Disaster Resilience Framework* to evaluate the extent to which each of the options identified in this report could enhance producers' climate resilience.[1]

## Describing USDA's Climate Resilience Efforts

To describe USDA's actions to enhance the climate resilience of agricultural producers, we reviewed federal laws and regulations related to resilience, and we reviewed documents related to USDA's resilience programs, tools, and policy. For example, we reviewed USDA's *Action Plan for Climate Adaptation and Resilience,* the USDA's Adaptation Resources for Agriculture, the Climate Hubs regional Vulnerability Assessments, and the department's website for current information on USDA's efforts to research and promote the use of climate-resilient agricultural practices. We also reviewed USDA's Departmental Regulation 1070-001 and three executive orders outlining the Biden administration's approach to climate change, including Executive Order 14008 on *Tackling the Climate Crisis at Home and Abroad,* Executive Order 14030 on *Climate-Related Financial Risk,* and Executive Order 14057 on *Catalyzing Clean Energy Industries and Jobs through Federal Sustainability*.

To better understand USDA's efforts, we also interviewed USDA officials and representatives from academia with experience working with USDA and researching the impacts of climate change on the management of natural resources and agriculture. We identified activities that correspond to the principles of our *Disaster Resilience Framework:* (1) Information, (2) Integration, and (3) Incentives.

## Describing the Strengths and Limitations of Options

To identify options to enhance producers' climate resilience and describe the strengths and limitations of these options, we reviewed relevant literature and interviewed experts.

[1]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 2019).

**Review of relevant literature.** First, we used multiple strategies to search for and review potentially relevant literature to find examples of options that could be used to enhance producers' climate resilience.

- To identify reports and legislation that proposed or described potential options, we conducted a literature search for reports published from January 2010 through January 2021 on agriculture and climate resilience or funding that proposed or described options to enhance producers' climate resilience, such as by integrating climate resilience into federal funding for USDA's conservation programs or the federal crop insurance program. We also searched for proposed and enacted legislation that included examples of incentives or requirements to consider resilience for federal funding and assistance to agricultural producers. We supplemented the literature search with referrals from agriculture and climate change analysts whom we coordinated with in the Congressional Research Service.
- To conduct the literature search, we searched databases (e.g., ProQuest, EconLit, and GoRef) using relevant key words (e.g., agriculture, policy options, and incentives); a "snowball" approach using citations in reports we already identified; and preliminary background research. The preliminary searches for background included the Congressional Research Service's report database, the Congressional Budget Office's website, GAO's product page, the USDA Inspector General's website, Congress.gov, and more general internet searches using relevant key words.
- The literature search identified 141 potentially relevant sources—84 reports and 57 pieces of legislation. After a more detailed review of these relevant sources from the literature review and other sources identified later in our research, we determined that 54 sources had relevant examples of options—27 reports and 27 pieces of legislation.

**Identify options.** Second, we distilled examples from relevant literature into a preliminary list of policy options. For our purposes, we focused on options available to USDA to help agricultural producers enhance their climate resilience, such as by further integrating climate resilience into federal funding for USDA's conservation programs. To identify options from literature, we analyzed the content of the 54 relevant sources in greater detail, recorded and categorized information about the examples of options, and then distilled the examples into a preliminary list of 17 high-level options grouped by location in existing USDA funding and program structures. We subsequently consolidated this list to 13 options based on feedback from relevant stakeholder organizations and experts within GAO.

**Identify experts.** Next, we used the results of the literature search to identify a diverse range of prominent experts with knowledge of climate change resilience and the management of agriculture and natural resources. Specifically, we used the results of the literature search mentioned above for peer-reviewed reports published from January 2010 through January 2021 on agriculture and climate resilience, agricultural risk management, or funding that proposed or described options to enhance producers' climate resilience. We selected approximately 59 published, peer-reviewed studies authored by individuals with expertise on agricultural risk management and agricultural climate change resilience policy. We focused our analysis on 39 studies for which bibliography data were available in the Elsevier Scopus database.

To select experts, we conducted a network analysis on the citations received by each author in our literature review. In this analysis, we identified a group of frequently cited authors who, collectively, had been cited by many other distinct authors. We then examined biographical details and publication details for these authors via web searches, such as their geographic location and the relevance of their publications to our research topic. We identified 14 individuals using this analysis. To add researchers with expertise in agricultural risk management and crop insurance policy, we supplemented this list with six experts that were frequently cited in the relevant research that we identified in the literature review or experts that had relevant experience with climate change and agricultural risk management policy at the federal level.

The final list included 20 experts. All 20 agreed to participate in semistructured interviews with GAO. Because we selected a nongeneralizable sample of experts to interview, findings from our analysis of their views cannot be generalized to all experts who might have relevant knowledge and expertise. Rather, these interviews provided us with a range of perspectives from a prominent group of experts on the strengths and limitations of options available to USDA to help enhance producers' climate resilience. In addition, the specific areas of expertise varied among the experts we interviewed, so not all of the experts commented on all of the interview questions we asked.

**Interview experts.** We asked the experts we selected for their perspectives on the strengths and limitations of each of the 13 options mentioned above, any other options that should be considered, and other experts we should interview for this purpose. We also asked experts about how the options could be sequenced or bundled. When interviewing the experts, we asked them to consider the options at a high

level and to describe their strengths and limitations as they relate to limiting the federal government's fiscal exposure to climate change risks.

**Describe options' strengths and limitations.** To describe the options' strengths and limitations, we synthesized perspectives from the 20 semistructured interviews with experts. Specifically, we analyzed the information we gathered during each expert interview to identify relevant insights on the option's strengths and limitations and grouped individual insights into overall themes. We used expert comments that were within the scope of our review and that were explained with sufficient context during our semistructured interviews. In reporting the results of our content analysis, we also provided additional context to expert perspectives from the relevant literature that we reviewed and our prior work, where appropriate. In general, we reported the full range of strengths and limitations identified by experts, but we did not report the full range of detailed responses from specific experts. We also asked USDA to comment on the extent to which it could implement these options under its existing authority.[2] Throughout this report, we defined modifiers to characterize expert views as follows:

- "some" experts represents two to three experts,
- "several" experts represents four to nine experts, and
- "many" experts represents 10 or more experts.

Although our methodology was based on a comprehensive literature search and supplemented with information from interviews with experts, it was not intended to result in an exhaustive list of options but rather an informed menu of potential options with insights on their strengths and limitations. We believe the scope and methodology we used is sufficient for the purpose of providing relevant and useful information to decision makers on the range of options available to USDA to help enhance producers' climate resilience and to inform their choices about an appropriate mix of options, if any, to pursue.

## Identifying Opportunities Using the Disaster Resilience Framework

To illustrate whether each of the options we identified in this report could enhance producers' climate resilience, we compared the identified options with USDA's current climate resilience efforts and the principles

[2]In cases where experts or USDA officials commented on whether the agency had authority to implement an option, we summarized those comments but did not do our own assessment of USDA's authority.

and subprinciples in GAO's *Disaster Resilience Framework*.[3] For each option, USDA effort, and principle or subprinciple included in our analysis, an analyst made a determination about whether each option could enhance the climate resilience of agricultural producers using questions from the framework.[4] A second analyst then reviewed the first analyst's work to ensure that the conclusions drawn were sound. See appendix I for additional information about how we conducted this analysis.

We conducted this performance audit from September 2020 to January 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[3]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 2019).

[4]Implementation of the options we identified may provide climate resilience benefits across principles identified in GAO's *Disaster Resilience Framework*. For the purposes of this report, we categorized the options under the principle where they have the most direct link to USDA's organizational and programmatic structure. For example, the option to prioritize climate resilience in whole-farm conservation planning and incentivize it through USDA"s conservation programs could provide resilience benefits under the information, integration, and incentives principles of the framework. We categorized the whole-farm conservation planning option under the information principle because the Natural Resources Conservation Service (NRCS) leads USDA's efforts to provide information and technical assistance on whole-farm conservation planning in association with the conservation programs that NRCS administers.

# Appendix III: GAO Work on Agricultural Risk Management

In an October 2013 report on the federal government's long-term fiscal outlook, we concluded that the current fiscal policy is unsustainable over the long term and that addressing future fiscal challenges will require looking at the entire range of federal activities and making difficult choices in setting priorities.[1] With increasing constraints on the federal budget, the cost to the federal government of the federal crop insurance program has come under scrutiny.

In the last decade, we have made a number of recommendations to the U.S. Department of Agriculture (USDA) and recommended matters for consideration to Congress related to crop insurance. As of December 2022, the following recommendations and matters on this issue have not been fully implemented:

- In March 2012, we recommended that Congress consider reducing crop insurance costs by limiting the amount of premium subsidies that an individual participant can receive each year, reducing premium subsidy rates for all farmers, or using some combination of limiting and reducing these subsidies.[2]
- In April 2013, we highlighted our March 2012 recommendation in GAO's annual report on fragmentation, overlap, and duplication.[3]
- In August 2014, we recommended that Congress consider reducing the level of federal premium subsidies for revenue crop insurance policies.[4]
- In February 2015, we recommended that the Administrator of the Risk Management Agency (RMA) should, as appropriate, increase its adjustments of premium rates in areas with higher crop production risks by as much as the full 20 percent annually that is allowed by

[1]GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget*, GAO-14-28 (Washington, D.C.: Oct. 29, 2013).

[2]GAO, *Crop Insurance: Savings Would Result from Program Changes and Greater Use of Data Mining*, GAO-12-256 (Washington, D.C.: Mar.13, 2012).

[3]GAO, *2013 Annual Report: Actions Needed to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits*, GAO-13-279SP (Washington, D.C.: Apr. 9, 2013).

[4]GAO, *Crop Insurance: Considerations in Reducing Federal Premium Subsidies*, GAO-14-700 (Washington, D.C.: Aug. 8, 2014).

law.[5] RMA agreed with the recommendation and told us that the agency will continue to revise premium rates in an appropriate, prudent, and actuarially sound manner. As of December 2022, RMA had not implemented this recommendation.

- In July 2017, we recommended that Congress consider repealing the 2014 Farm Bill requirement that any revision to the standard reinsurance agreement not reduce insurance companies' expected underwriting gains and directing RMA to, during the next renegotiation of the agreement, (1) adjust the participating insurance companies' target rate of return to reflect market conditions; and (2) assess the portion of premiums that participating insurance companies retain and, if warranted, adjust it.[6]
- In July 2017, we recommended that the Secretary of Agriculture direct the Administrator of RMA to consider adjusting the administrative and operating expense subsidy calculation method in a way that reduces the effects of changes in premiums caused by changes in crop prices or other factors when it renegotiates the standard reinsurance agreement.[7] RMA stated that it would take steps to implement this recommendation. According to a USDA official, to take action on this recommendation, USDA would need to renegotiate its agreement with insurance companies. As of February 2022, USDA had not taken action to implement this recommendation, and it is unclear when USDA will renegotiate the agreement.

[5]GAO, *Crop Insurance: In Areas with Higher Crop Production Risks, Costs Are Greater and Premiums May Not Cover Expected Losses*, GAO-15-215 (Washington, D.C.: Feb. 9, 2015).

[6]GAO, *Crop Insurance: Opportunities Exist to Improve Program Delivery and Reduce Costs*, GAO-17-501 (Washington, D.C.: July 26, 2017).

[7]GAO-17-501.

# Appendix IV: Strengths and Limitations of Potential Policy Options to Enhance Agricultural Producers' Climate Resilience

We identified 13 potential options to further enhance producers' climate resilience, on the basis of our analysis of relevant literature and interviews with experts (see table 7).[1] These 13 options are presented using our *Disaster Resilience Framework's* three guiding principles— information, integration, and incentives.[2] Four of the options relate to the information principle—accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk-reduction strategies. One of the options relates to the integration principle—integrated analysis and planning can help decision makers take coherent and coordinated resilience actions. Eight of the options relate to the incentives principle—incentives can help to make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities.

[1]The names of the options listed in table 7 reflect those identified through our detailed methodology described in app. II. The options in table 7 are presented in shortened and paraphrased form in subsequent tables, figures, and text to allow for simple graphics and easy comparison throughout the rest of this appendix. For example, in table 7, Option #1 is titled "collect data on practices that enhance climate resilience." This option is shortened to "resilience good practices data" throughout the rest of the report.

[2]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 2019).

**Table 7: Potential Policy Options for the U.S. Department of Agriculture (USDA) to Help Enhance Producers' Climate Resilience, by Guiding Principle in GAO's *Disaster Resilience Framework***

| |
|---|
| **Information principle**[a] |
| **1.** Collect data on practices that enhance climate resilience. |
| **2.** Expand technical assistance to prioritize and promote practices that enhance climate resilience. |
| **3.** Prioritize climate resilience in whole-farm conservation planning. |
| **4.** Expand the capacity and expertise of USDA's Climate Hubs. |
| **Integration principle**[b] |
| **5.** Develop an agricultural climate resilience plan that addresses regionally specific needs. |
| **Incentives principle**[c] |
| **6.** Establish standards for climate-resilient agricultural operations. |
| **7.** Revise the Natural Resources Conservation Service's Conservation Practice Standards to include practices that enhance climate resilience. |
| **8.** Expand conservation program eligibility to include and prioritize practices that enhance climate resilience. |
| **9.** Expand the capacity of USDA's conservation programs to help producers enhance their climate resilience. |
| **10.** Research the feasibility of incorporating climate resilience into crop insurance rates. |
| **11.** Require the adoption of relevant climate-resilient practices to receive crop insurance premium subsidies. |
| 12. Offer crop insurance premium subsidies for agricultural producers who use practices that enhance their climate resilience.[d] |
| 13. Require that producers adopt practices that enhance climate resilience to be eligible for certain Farm Bill Title I programs. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]Accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk reduction strategies.

[b]Integrated analysis and planning can help decision makers take coherent and coordinated resilience actions.

[c]Incentives can help to make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities.

[d]In contrast to this option, GAO's body of work on crop insurance includes Matters for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details.

## Information Options

According to our 2019 *Disaster Resilience Framework,* accessing information that is authoritative and understandable can help decision makers to identify current and future risks because of climate change and the impact of risk-reduction strategies.[3] On the basis of our review of relevant literature, we identified four policy options available to the U.S. Department of Agriculture (USDA) to help producers enhance their climate resilience by improving access to information and technical assistance. Tables 8 through 11 summarize expert opinions on the strengths and weaknesses of the options, as well as comments from USDA officials on the department's ability to implement them.

[3]GAO-20-100SP.

**Table 8: Description of Option to Collect Resilience Good Practices Data**

| Option 1: Resilience good practices data |
|---|
| **Description of option, and examples** |
| The option would facilitate the collection data on practices that enhance climate resilience to demonstrate the benefits of those practices and to ensure that data are accessible to a variety of stakeholders. For example, the U.S. Department of Agriculture (USDA) could develop and provide readily accessible information to producers about the environmental and economic costs and benefits of taking certain actions in response to climate change. |
| **Key potential strengths of option based on experts' comments** |
| Several experts said that collecting more data on resilience good practices is an important way to help USDA promote the most effective practices. According to one expert, collecting and integrating high-resolution data that are continually updated can help USDA analyze ways to build more resilience and to use funding in a more efficient way. According to this expert, USDA could collect these data to demonstrate the impact of climate-resilient practices on crop productivity and on crop insurance coverage, liabilities, and premium rates to identify practices that reduce the risks of climate change and protect farm profitability. According to another expert, convincing producers to adopt resilience good practices will require clear, vetted evidence that those practices work. Producers are specifically interested in information that demonstrates the extent to which practices provide environmental benefits on the farm and how those practices impact farm income, according to some experts. Another expert said that some producers are reluctant to utilize practices that have upfront costs, such as cover crops, but often take a few years of consistent use before the benefits are realized. According to that expert, collecting and analyzing data over the long term will be important to demonstrate the effects of using those practices. |
| **Key potential limitations of option based on experts' comments** |
| According to several experts, collecting useful data on resilience good practices is challenging because of producers' reluctance to share data and because of federal data privacy rules. For data to be useful, they need to be location and producer specific, according to one expert. However, this expert said that some producers are reluctant to provide that level of detail because they are concerned that the data could be used for regulatory purposes or could create a competitive disadvantage for themselves if that information were made public. Data privacy rules also present a challenge for analyzing resilience good practices data. According to federal law, USDA is prohibited from publishing certain data, except in aggregate form. According to one expert, aggregated data are not as useful at showing on-the-farm benefits of climate-resilient practices; as a result, it is difficult for researchers to analyze the effectiveness of resilience good practices.<br><br>Several experts also said that accessing government data that are relevant to climate resilience is challenging because those data are collected and stored by a variety of agencies within USDA. Even when datasets are accessible, they are not always comparable because of the differences in data collection formats, according to one expert. In addition, access to agency data may also be inhibited by agency policy that restricts or prohibits data sharing, according to several experts. These access limitations have made it difficult for farmers, producers, researchers, and technical assistance providers to utilize resilience good practices data, according to several experts. Several experts said that developing a clearinghouse to consolidate good practices data could mitigate some of the challenges of accessing and using data from different sources. |
| **USDA comments on implementation of option** |
| According to USDA officials, this option is consistent with Adaptation Action #4 established in USDA's *Action Plan for Climate Adaptation and Resilience*.[a] In particular, Adaptation Action #4 proposes to increase support for research and development of climate-smart practices and technologies to inform USDA and to help producers and land managers adapt to climate change. USDA officials said that this option would require collaboration and feedback between USDA research and program agencies to ensure that programmatic research questions are addressed and that new information reaches the implementing agencies. USDA officials also said that the resilience benefits of good practices require sustained, long-term implementation before they are realized, and will require a similar long-term commitment to research and data collection for this option to be effective. In addition, USDA officials said that effective implementation of this option would require close collaboration between agency officials in the department's Research, Education, and Economics and Farm Production and Conservation mission areas, with support for the Climate Hubs, to be effective. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]USDA, *Action Plan for Climate Adaptation and Resilience* (Washington, D.C: August 2021).

**Table 9: Description of Option to Expand Technical Assistance to Producers**

| Option 2: Expanded technical assistance |
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| **Description of option, and examples** |
| This option would expand technical assistance provided by the Natural Resources Conservation Service (NRCS) and other key partners to prioritize and to promote practices that enhance climate resilience. For example, this could include providing additional funding to support technical assistance to producers from NRCS, the Climate Hubs, extension programs, and conservation districts. |
| **Key potential strengths of option based on experts' comments** |
| Many of the experts said that expanding access to technical assistance is important for producers to successfully implement practices that will enhance their resilience to climate change. Several experts said that there is a demand for technical assistance from producers but that NRCS is understaffed and lacks the expertise to effectively provide that assistance. In addition, several experts said that the quality and availability of technical assistance varies by region. These experts said that for technical assistance to be effective, it will be necessary to tailor that assistance to regional and local vulnerabilities and preferences. This option would allow NRCS to hire and train the staff necessary to build the agency's capacity and meet producers' needs based on their regional circumstances, according to several experts.<br>Several experts also said that technical assistance is most effective when it is provided in collaboration with a variety of institutions, such as the Climate Hubs, soil and water conservation districts, and land grant universities. According to several experts, Climate Hubs are particularly well positioned to help NRCS provide technical assistance because the Hubs have a well-developed network, are focused on developing and distributing climate resilience information, and are experienced in working with NRCS. |
| **Key potential limitations of option based on experts' comments** |
| According to several experts, the effectiveness of NRCS's technical assistance is unclear because there is insufficient research available to demonstrate the benefits of expanding technical assistance. According to several experts, additional research is needed to assess the environmental and economic costs and benefits of using conservation practices to enhance climate resilience. Some experts said that producers need more information about how long it will take to realize benefits and how practices affect farm income. Specifically, these experts stressed the need for long-term data to help encourage producers to adopt practices that may take a few years to show benefits. According to several experts, producers will be reluctant to use practices that have a net effect of reducing farm income, even if that reduction is short term.<br>In addition, USDA does not report outcome-based performance measurements that indicate how climate resilience has been enhanced as a result of NRCS's technical assistance. According to one expert, without this information, NRCS will not know the extent to which expanding technical assistance would enhance a producer's climate resilience. According to several experts, many producers are now getting their technical assistance from nonfederal providers, such as seed companies and private crop advisers. One expert said that private technical assistance can be helpful to the farmer but may not lead to environmental benefits, such as enhancing a farm's climate resilience. According to this expert, if producers continue to get their technical assistance from nonfederal providers, USDA should find ways to collaborate with or encourage private-sector providers to focus their assistance on environmental benefits. |
| **USDA comments on implementation of option** |
| According to USDA officials, this is a high-priority option for the department and aligns with NRCS's goals of identifying location-specific conservation practices. In addition, USDA officials said that technical service providers will need to be trained in climate resilience options that are relevant in different geographic regions, using different production methods so that they are able to best serve their customers. According to USDA officials, Climate Hubs can play a role in supporting local- and state-level technical assistance by providing regionally relevant climate resilience information. Further, USDA officials told us that the technical assistance provided to producers needs to be scientifically supported and regularly updated to reflect the best-available science on climate resilience and technology. Officials also said that it was critical that the expanded technical assistance is accessible by historically underserved producers and producers that are at a greater risk due to climate change impacts. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

**Table 10: Description of Option to Incorporate Resilience into Whole-Farm Conservation Planning**

| Option 3: Whole-farm conservation planning |
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| **Description of option, and examples** |
| This option would prioritize climate resilience in whole-farm conservation planning and incentivize it through USDA's conservation programs to enhance producers' climate resilience. For example, this could involve requiring comprehensive, whole-farm conservation planning in working lands and easement conservation programs to enhance climate resilience. |
| **Key potential strengths of option based on experts' comments** |
| Many experts said that incorporating climate resilience into whole-farm conservation planning could encourage agricultural producers to take a more comprehensive approach to identifying climate risk and enhancing their farm's resilience to climate change. According to one expert, using whole-farm conservation planning can help producers address multiple, often interrelated resource issues while enhancing a farm's resilience to climate change. For example, according to USDA, a farm susceptible to soil erosion can reduce soil loss, improve water quality, and create resilience through the use of farming practices, such as conservation tillage or cover crops, in some regions of the U.S.<br>Several experts said that USDA has conservation programs and technical resources that will enable the department to easily incorporate climate resilience into conservation planning. Specifically, one expert said that USDA has developed a few technical resources that outline a structured process to assess climate change impacts and to identify potential responses to build producers' climate resilience. According to this expert, USDA can use this resource to help producers integrate climate resilience into the conservation planning process. |
| **Key potential limitations of option based on experts' comments** |
| More information is needed to demonstrate that whole-farm conservation planning enhances producers' resilience to climate change before farmers are encouraged to adopt this approach, according to several experts. Specifically, one expert said that many conservation practices were designed before climate resilience was a consideration, so these practices would need to be reviewed to ensure that they actually enhance climate resilience. Another expert said that more information is needed to show how whole-farm conservation planning will affect crop yield and farm income. According to this expert, producers will be reluctant to use whole-farm conservation planning if the net effect is reduced farm income.<br>Several experts said that whole-farm conservation planning is time-consuming and requires a lot of paperwork for producers. These experts said that the administrative burden of planning for the entire farm might be overwhelming and might discourage producers from participating in this option, especially minority and small and disadvantaged producers. Some experts said that producers may be more willing to utilize this option if they were allowed the flexibility. For example, one expert told us that producers could be allowed to start with one conservation practice and build up to whole-farm conservation planning. In addition, several experts said that USDA would need to provide region-specific training to technical assistance providers on whole-farm conservation planning and the impacts of climate change for this option to be effective. |
| **USDA comments on implementation of option** |
| According to USDA officials, this option will need to be grounded in the department's research on the effectiveness of practices designed to enhance climate resilience. In addition, USDA officials said that technical service providers will need to be trained in climate resilience options that are relevant in different geographic regions, so that they are able to best serve their customers. USDA officials also told us that farm diversification, where one operation manages multiple agricultural enterprises, can make defining the scope of individual whole-farm conservation plans difficult. Further, USDA officials said that whole-farm conservation planning does not always result in successful implementation of the full plan. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

**Table 11: Description of Option to Expand Climate Hubs**

| Option 4: Expanded Climate Hubs |
|---|
| **Description of option, and examples** |
| This option would expand the capacity and expertise for the U.S. Department of Agriculture's (USDA) Climate Hubs to help producers make informed decisions on climate resilience. Established in 2014, USDA's Climate Hubs are an interagency collaboration, with regional offices in 10 locations. The mission of the Climate Hubs is to link USDA research and program agencies by delivering region-specific tools and information to address climate change. According to USDA officials, USDA's Climate Hubs do not receive program funding as a line item in the annual appropriations process; instead, the Hubs receive project-based funding from a variety of sources within USDA. |
| **Key potential strengths of options based on experts' comments** |
| Many experts said that Climate Hubs are effective at creating and disseminating information that helps producers make informed decisions about climate resilience, but several told us that their effectiveness has been limited because of insufficient and inconsistent funding. According to several experts, this option would allow the Hubs to hire and train additional full-time staff to improve the quality and consistency of information and assistance that they provide across their 10 regional locations. Additional staff would be particularly helpful to support regions where farmers are less engaged and in regions where Hubs have less support, according to one expert.<br>Many experts said that the information developed by Climate Hubs is essential in helping producers identify and use practices that address climate vulnerabilities specific to their region and locality. For example, the Midwest, Northeast, and Northern Forests Climate Hubs collaborated to develop a technical bulletin to provide agricultural producers, educators, and service providers with region-specific information to help producers increase their resilience in response to the anticipated effects of climate change. This document outlines a structured process for a producer to assess climate change impacts and to identify potential responses to build climate resilience.<br>Climate Hubs can facilitate collaboration with stakeholders in and outside of the federal government, according to many experts. This can include encouraging information sharing and promoting climate resilience research within USDA and with other federal agencies, according to many experts. Specifically, several experts said that Climate Hubs can play an important role in supporting the Natural Resources Conservation Service's technical assistance by providing regionally focused climate resilience information. Climate Hubs can also partner with stakeholders outside of the federal government, such as land grant universities and soil and water conservation districts, to promote the Hubs' research through technical assistance, according to one expert. |
| **Key potential limitations of option based on experts' comments** |
| Some experts said that Climate Hubs do not have clear goals or performance measures. Without goals and performance measures, it will be difficult for the Hubs to understand their funding and staffing needs or to assess the effectiveness of their efforts to enhance producers' resilience to climate change, according to one expert. For example, a 5-year review published in 2020 by the Hubs reported the number of climate resilience publications and presentations provided during that time frame but did not assess how that information had enhanced producers' resilience to climate change.<br>Several experts said that many producers were not aware of the Climate Hubs. One expert said that Climate Hubs do not reach a lot of producers because it is more common for the Hubs to interact with government officials and the researcher community.<br>Several experts said that producers often prefer to see practices implemented rather than have information provided to them. Some of these experts recommended that more technical assistance and education be provided through demonstration projects; farmer-led training; and other types of peer-to-peer networking events, which are preferred by agricultural producers. |
| **USDA comments on implementation of option** |
| USDA's department-wide *Action Plan for Adaptation and Resilience* recommends that the Climate Hubs take a central role in facilitating climate-smart outreach, education, and implementation.[a] USDA officials said that additional funding would help the Hub's hire and train additional staff to fulfill that role. USDA officials also pointed out that for the Hubs to be most effective, increased funding and expertise would need to be paired with enhanced coordination across the department. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]USDA, *Action Plan for Climate Adaptation and Resilience* (Washington, D.C: August 2021).

## Integration Options

According to our 2019 *Disaster Resilience Framework*, integrated analysis and planning can help decision makers take coherent and coordinated resilience actions.[4] On the basis of our review of relevant literature, we identified one policy option that USDA could use to help producers enhance their climate resilience by better integrating the agency's strategic planning. Table 12 summarizes expert opinion on the strengths and weaknesses of the option and comments from USDA officials on the department's ability to implement it.

**Table 12: Description of Option to Conduct Regional Climate Resilience Strategic Planning**

| **Option 5: Regional climate resilience strategic planning** |
|---|
| **Description of option, and examples** |
| This option involves the development of an agricultural climate resilience plan that addresses regionally specific needs by coordinating within the U.S. Department of Agriculture (USDA), across relevant federal agencies, with producers, and with other key participants. A climate resilience planning process could, for example, facilitate broad adoption of climate-resilient practices, climate resilience demonstration field sites, and training programs for producers and service providers. It could also help set national climate resilience practice goals across a broad set of participants and provide a mechanism for regularly updating those goals. |
| **Key potential strengths of option based on experts' comments** |
| Several experts said that a robust regional strategic planning process that is inclusive could help build consensus and facilitate participant buy-in to climate resilience policies. Several experts also said that this option could help drive research priorities or technical assistance initiatives to address region-specific vulnerabilities. For example, some experts said that this option could help identify gaps in available information and on climate resilience good practices or gaps in the technical assistance available to producers in different regions.<br>Several experts said that this option could help improve coordination between federal agencies and across different levels of government, academia, and the private sector. For example, some experts said that it could help address coordination challenges between federal agencies to help share relevant data and information or to improve coordination with producer groups that have historically been marginalized, such as small, disadvantaged, and minority producers. Several experts also said that this option could build off of existing federal programs and initiatives that provide information and technical assistance on climate resilience. For example, some experts said that the option could build off of the established relationships and expertise that USDA's Regional Climate Hubs have developed in coordinating and collaborating across different levels of government, academia, and nongovernmental organizations on climate resilience research and data collection. |
| **Key potential limitations of option based on experts' comments** |
| Several experts cautioned that strategic planning would be a slow process and that gaining consensus across a diverse set of experts in different regions would be challenging. For example, some experts said that balancing federal climate resilience priorities with state and local needs would make it difficult to identify and get the buy-in from key participants necessary for the option to be effective. Some experts also expressed concern that a new strategic planning process may overlap with other planning processes that already exist or that it may be more effective to build climate resilience planning into an existing planning process, such as the United States Global Research Program's National Climate Assessment. Further, several experts said that sufficient funding and staffing needs to be made available to help develop, implement, and update the regional strategic plans, or they will not be successful. For example, some experts said that sufficient resources need to be in place to ensure that the plan is developed and implemented on a realistic timeline and that it has the ability to measure progress toward meeting milestones established in the strategic plan. |

[4]GAO-20-100SP.

| Option 5: Regional climate resilience strategic planning |
| --- |
| **USDA comments on implementation of option** |
| According to USDA officials, this option could be integrated into USDA's climate adaptation planning process to identify data-sharing needs and to promote collaboration between USDA agencies to help enhance producers' climate resilience. USDA officials also said that climate resilience planning should be actionable and must not be duplicative of existing planning processes. USDA officials also said that expanded assistance through the Climate Hubs would help with regional planning and implementation. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

## Incentives Options

According to our 2019 *Disaster Resilience Framework*, incentives can help to make long-term, forward-looking risk-reduction investments more viable and attractive among competing priorities.[5] On the basis of our review of relevant literature, we identified eight policy options available to USDA to help producers enhance their climate resilience by providing additional incentives through the department's agricultural risk management and conservation programs. Tables 13 through 20 summarize expert opinion on the strengths and weaknesses of the options and comments from USDA officials on the department's ability to implement them.

[5]GAO-20-100SP.

**Table 13: Description of Option to Create Climate Resilience Standards**

| Option 6: Climate resilience standards |
|---|
| **Description of option, and examples** |
| This option would establish standards for climate-resilient farms to help create incentives for practices that enhance climate resilience and to improve marketability. The U.S. Department of Agriculture (USDA) has successfully created certification standards for organic production and other beneficial agricultural practices to help qualifying operations market their products. USDA could, for example, coordinate with key stakeholders to develop meaningful climate resilience standards for producers to enhance their resilience and offer benefits for producers following the climate resilience standards to incentivize their participation. |
| **Key potential strengths of option based on experts' comments** |
| Several experts said that standards could effectively provide clear direction to producers on what practices are climate resilient if, for example, there is a strong scientific foundation and verification process for the standards. In addition, some experts said that this option could build off of the lessons learned from USDA's organic certification program, which may make it easier to implement. Several experts also said that standards could incentivize private investment in climate resilience by creating a competitive advantage for producers that implement climate resilience good practices or by facilitating collaboration between academia and producers to conduct farm-level research on climate resilience good practices. |
| **Key potential limitations of option based on experts' comments** |
| Several experts said that developing and maintaining standards with verifiable climate resilience benefits would be difficult to implement. For example, several experts said that this option would require producer-specific data and research to inform which practices are climate resilient in different regions of the U.S. before the standards could be established. In addition, some experts said that since climate change is a dynamic process, the methodology for developing the standards would need to be flexible so that they could be regularly updated.<br>Several experts also said that the administrative and financial burdens of implementing new standards may exclude small, disadvantaged, and minority producers from participation in the program. As a result, according to some experts, USDA will need to provide additional funding and technical assistance to ensure that all producers have sufficient financial and technical capacity to implement the standards. Further, some experts said that additional funding and staff would also be required to verify that producers were meeting and maintaining the resilience standards. Some experts also said that the additional costs of creating the standards and verifying that producers were meeting them may outweigh any potential climate resilience benefits from producer participation. Finally, some experts said that there may not be sufficient consumer demand for products that are certified as climate resilient and that the politicization of climate change might drive a large portion of consumers to avoid climate-resilient certified products. |
| **USDA comments on implementation of option** |
| USDA officials said that implementation of this option could build off of the department's experience with the "organic" certification program. USDA officials also said that effective implementation would require significant stakeholder engagement to develop a clear vision and purpose for the program. Specifically, officials told us that USDA would have to work with stakeholders to determine how the program would be marketed and regulated, and how producers would be rewarded or recognized for adopting new standards. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

**Table 14: Description of Option to Revise Conservation Practice Standards**

| Option 7: Revise conservation practice standards |
|---|
| **Description of option, and examples** |
| This option would revise the Natural Resources Conservation Service's (NRCS) conservation practice standards to include the identification and evaluation of existing and new conservation practices that enhance producers' climate resilience. For example, the U.S. Department of Agriculture (USDA) could establish a process to proactively investigate and implement conservation practices and technologies that can enhance producer resilience, including those in the existing suite of conservation practices available to producers. |
| **Key potential strengths of option based on experts' comments** |
| Many experts said that evaluating NRCS's conservation practices is necessary in determining the costs and benefits of climate-resilient practices and is a prerequisite for providing technical assistance. According to several experts, revising the standards would provide an opportunity to conduct additional research to verify which practices enhance producer resilience in different regions of the country. Some experts said that revising the standards could promote a more comprehensive approach to implementing climate-resilient practices. For example, one expert said that revising the standards could help identify the effect of practices on the farm and in the broader ecosystem so that producers and technical service providers can consider a more holistic approach to climate resilience in a particular area or region. In addition, several experts said that this option could be implemented relatively easily through NRCS's existing program.<br>According to some experts, expanding conservation practice standards could be done in a way to promote a more holistic way of farming that takes into consideration long-term environmental and economic benefits. According to one expert, conservation standards could be designed to encourage the diversification of commodities grown at the farm level to help enhance a producer's resilience to climate change. For example, one expert said that to make the landscape more resilient, farms should plant a more diverse range of crops instead of just row-cropping corn and soy. According to this expert, promoting a more holistic way of farming could include mixing agriculture and forestry on a farm, utilizing alternative farming methods, or planting perennial crops. |
| **Key potential limitations of option based on experts' comments** |
| Some experts said that identifying and assessing climate-resilient practices may not contribute directly to an increased use of those practices. One expert said that it is useful to identify which practices have resilience benefits, but without an incentive, producers may not adopt the practices. According to some experts, conservation practice standards might be developed in a way that is be overly prescriptive or inflexible. According to one expert, additional flexibilities may be needed to ensure that small, disadvantaged, and minority farmers adopt resilience practices. Some experts said that for this option to be effective, USDA's technical assistance programs will need to be expanded so that the agency has the capacity to implement the new standards. |
| **USDA comments on implementation of option** |
| According to USDA officials, this option aligns with Adaptation Action #1 from USDA's *Action Plan for Climate Adaptation and Resilience*.[a] In particular, this action proposes to build resilience to climate change with investments in soil and forest health. USDA officials said that this option would require collaboration with USDA's research agencies to characterize the environmental and economic impacts and benefits of implementing specific practices. In addition, USDA officials said that increasing the climate literacy of NRCS staff will be critical to evaluating and implementing these practice standards. |

Sources: GAO analysis of literature, and interviews with experts. | GAO 23 104557

[a]USDA, *Action Plan for Climate Adaptation and Resilience* (Washington, D.C: August 2021).

**Table 15: Description of Option to Expand Conservation Program Eligibility**

| Option 8: Expand conservation program eligibility |
|---|
| **Description of option, and examples** |
| This option would involve expanding conservation program eligibility to include and prioritize practices that enhance climate resilience in the administration of the U.S. Department of Agriculture's (USDA) conservation programs. USDA could, for example, prioritize applications for the conservation programs involving practices that build climate resilience; prioritize applications for the conservation programs in areas that have a higher risk of climate change impacts, such as drought-prone areas; or target areas at risk for conversion to nonagricultural uses in conservation programs that provide substantial climate resilience benefits. |
| **Key potential strengths of option based on experts' comments** |
| According to some experts, expanding eligibility for conservation program participation to include conservation practices that enhance resilience could facilitate producer implementation of those practices. For example, one expert said that this option could facilitate adoption of whole-farm conservation planning and crop diversification at the producer level. Similarly, some experts also said that it would help the conservation programs demonstrate and collect information on the environmental and economic benefits of practices at the regional and local level necessary for mass adoption by producers. In addition, several experts said that targeting conservation program funding could lead to more efficient use of limited federal funds. For example, according to some experts, USDA could prioritize conservation program applications that enhance the climate resilience of agricultural operations that are the most vulnerable to climate change impacts. |
| **Key potential limitations of option based on experts' comments** |
| Several experts said that there are some structural challenges to the conservation programs that would limit their effectiveness at enhancing climate resilience. For example, according to several experts, the conservation programs tend to benefit larger operations, and the eligibility criteria and application requirements may need to be streamlined to facilitate participation by small, disadvantaged, and minority producers. In addition, some experts said that the length of conservation program contracts with producers may be too short to realize the economic and environmental benefits of implementing climate resilience good practices. According to some experts, this may create a disincentive for producers to continue implementing climate-resilient practices once their contracts end.<br><br>Some experts also said that this option would not be effective without additional USDA staff and technical expertise at the regional and local level to implement the expanded conservation programs. Specifically, some experts said that USDA would need additional staff to provide technical assistance to producers that lacked the capacity to implement climate-resilient practices. Similarly, some experts said that USDA would need additional staff to effectively monitor and verify sustained implementation of climate resilience good practices by producers. Finally, several experts said that additional region-specific research on climate resilience practices will also be necessary to ensure that program expansion is effective. In particular, some experts said that there is a need for long-term studies on the economic costs and benefits of climate resilience good practices to ensure that federal subsidies to producers will result in sustained climate resilience benefits. |
| **USDA comments on implementation of option** |
| USDA officials said that this option is consistent with the proposed adaptation actions established in USDA's *Action Plan for Climate Adaptation and Resilience*. In particular, Adaptation Action #1 proposes to build resilience to climate change across landscapes with investments in soil and forest health.[a] However, USDA officials also said that regional, state, and local funding priorities for the conservation programs are determined, in part, with input from producers and other key stakeholders, creating a barrier to uniform implementation of this option nationwide. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]USDA, *Action Plan for Climate Adaptation and Resilience* (Washington, D.C: August 2021).

**Table 16: Description of Option to Expand the Capacity of the U.S. Department of Agriculture's (USDA) Conservation Programs**

| Option 9: Expand the capacity of USDA's conservation programs |
|---|
| **Description of option, and examples** |
| This option would provide additional capacity to the U.S. Department of Agriculture's (USDA) conservation programs to prioritize the enrollment of acreage that helps producers enhance their resilience to climate change. |
| **Key potential strengths of option based on experts' comments** |
| According to many experts, providing additional capacity to USDA's conservation programs could be an effective way to encourage the use of climate-resilient practices. Several experts said that USDA's conservation agencies, such as the Natural Resources Conservation Service, are understaffed and lack the expertise to effectively provide technical assistance to enhance producers' resilience to climate change. According to several of these experts, additional program funding can be used to hire and train additional staff to increase enrollment in the conservation programs and to promote the use of other climate-resilient practices. In addition, several experts also said that this option would be relatively easy to implement because USDA's conservation programs already exist, and there is more demand for these programs than USDA is able to fund. |
| **Key potential limitations of option based on experts' comments** |
| Some of the experts said that it would be difficult to ensure that providing additional capacity to USDA's conservation programs would enhance a producer's resilience to climate change. According to some experts, additional research is needed to assess the effectiveness of using conservation practices to enhance climate resilience. Specifically, one expert said that more information will be needed to assess how those practices might impact farm income.<br>Several experts said that conservation programs do not have a strategy to prioritize practices that most effectively create climate resilience. According to one expert, without a clear idea of what the funding is for and criteria to prioritize effective practices, this option could be inefficient. In addition, some of the experts said that USDA's conservation programs do not have performance-based measurements to assess the effectiveness of the conservation practices that they promote. According to one expert, defining, targeting, and quantifying the benefits of the additional funding will be critical to ensure that the program is focused on promoting practices that are effective and do not create perverse incentives. |
| **USDA comments on implementation of option** |
| According to USDA officials, additional conservation program funding and additional financial and technical assistance for producers are essential for effective implementation of this option. USDA officials also said that expansion of the programs to prioritize climate resilience will need to be balanced with the other environmental and economic goals of the programs. In addition, USDA officials said that prioritizing climate resilience practices would be easier to administer than a requirement that a certain percentage of program funding be dedicated to enhancing the climate resilience of producers. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

**Table 17: Description of Option to Research the Feasibility of Incorporating Climate Resilience into Crop Insurance Rating**

| Option 10: Research the feasibility of incorporating climate resilience into crop insurance rating |
|---|
| **Description of option, and examples** |
| This option would involve researching the feasibility of incorporating data on the projected impacts of climate change on agriculture and data on the effects of agricultural practices that enhance climate resilience into federal crop insurance rates. The U.S. Department of Agriculture (USDA) could, for example, collect and incorporate soil data into federal crop insurance rates to incentivize adoption of practices that enhance climate resilience by improving soil health and discouraging production on marginal lands. |
| **Key potential strengths of option based on experts' comments** |
| According to several experts, additional research on incorporating future climate impacts and the effects of climate resilience good practices into federal crop insurance rating could help reduce the fiscal risk of the federal crop insurance program to the federal government. For example, some experts said that having a clear understanding of the risks of climate change and the resilience benefits of agricultural practices at the regional and local level will be key to ensuring a fiscally sound, high-performing federal crop insurance program in the future.<br>In addition, some experts said that this option could help set federal crop insurance premiums that accurately reflected climate change risks faced by individual producers, and it could help offset some of the disincentives that the federal crop insurance program creates through its premium rate subsidies. Specifically, some experts said that federal crop insurance premiums are so heavily subsidized that it may create a disincentive for producers to take action to enhance their resilience to climate change. By shifting some of the costs of climate change risks to producers through higher premiums, producers may be motivated to take action. According to several experts, conducting research and linking the risks of climate change to the crop insurance program could help create a clear incentive for the sustained adoption of climate-resilient practices. |
| **Key potential limitations of option based on experts' comments** |
| Several experts said that it would be challenging to collect the data and conduct the research necessary to effectively incorporate climate resilience into the crop insurance rating. For example, some experts said that the producer-level data on climate change impacts and climate resilience good practices necessary to implement this option are unavailable or not easily accessible.<br>Some experts also said that USDA lacks the staff and expertise necessary to collect, analyze, and update the producer-level information and data necessary to assess the feasibility of this option. Further, several experts said that this option would be politically challenging because of the popularity of the federal crop insurance program among producers and opposition to making changes to the formula for calculating premium rates, including changes to reflect climate change risks. Finally, some experts said that crop insurance premium subsidies are so high that changes in premium rates resulting from this option may not be significant enough to incentivize producers to enhance their resilience. |
| **USDA comments on implementation of option** |
| According to USDA officials, this option may require integration of regionally downscaled climate projections and would also need to account for improvements in technology and farmers' ability to adapt over the same period. Officials also said that dedicated funding may be required to streamline available data and develop the decision support tools necessary to implement this option. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

**Table 18: Description of Option to Create Additional Crop Insurance Requirements**

| Option 11: Additional crop insurance requirements |
|---|
| **Description of option, and examples** |
| This option would require producers to adopt relevant climate-resilient practices to receive crop insurance premium subsidies. To help enhance producer resilience, the U.S. Department of Agriculture (USDA) could, for example, incorporate climate resilience into the Risk Management Agency's good farming practices[a] and align the practices with the Natural Resources Conservation Service's (NRCS) Conservation Practice Standards.[b] |
| **Key potential strengths of option based on experts' comments** |
| According to several experts, this option could create a straightforward, effective incentive for producers to adopt climate resilience good practices. For example, one expert said that crop insurance requirements would be very effective at incentivizing producers to adopt climate resilience good practices because operations covered by federal crop insurance account for almost 90 percent of agricultural production in the U.S. Some experts also said that linking similar types of conservation requirements to the federal crop insurance program have been effective at deterring high-risk agricultural production on highly erodible lands. Finally, some experts said that this option would be a straightforward way to limit the fiscal exposure of the federal crop insurance program by discouraging federal investment in operations that do not take action to limit their climate change vulnerabilities. |
| **Option 11: Additional crop insurance requirements** |
| **Key potential limitations of option based on experts' comments** |
| Several experts said that it would be technically challenging to implement this option. According to some experts, any new requirement for climate-resilient practices would need to be supported by verifiable evidence that the practices reduce climate change risks while limiting impacts on producer yields and profit margins. According to other experts, there is no standardized methodology for measuring climate resilience at the producer level, which makes it difficult to identify effective climate-resilient practices in different regions and localities.<br>Several experts also said that USDA would need additional funding and staff to help ensure compliance with the new requirements. For example, some experts said that this option could not be implemented unless producers have access to the financial resources and technical assistance necessary to comply with the new requirements. In addition, some experts said that USDA would need additional staff and expertise to develop the capacity to effectively monitor compliance with requirements for climate-resilient practices.<br>Finally, many experts said that this option would be politically challenging to implement. For example, some experts said that there may not be sufficient support from producers, the crop insurance industry, and other key stakeholders to implement this option effectively. In addition, some experts said that this option could lead to reduced participation in the federal crop insurance program, thus impacting its ability to remain solvent. |
| **USDA comments on implementation of option** |
| According to USDA officials, while aligning requirements with NRCS's Conservation Practice Standards would ensure consistency in climate resilience good practices across relevant agencies in USDA, producer adherence to new requirements would require additional enforcement mechanisms and staff to be effective and is not consistent with USDA's voluntary and incentive-based approach to helping producers enhance their resilience. USDA officials also said that there would need to be additional coordination across USDA's different mission areas to share data and information on climate resilience good practices to effectively implement this option. Further, USDA officials said that implementation of this option would require additional understanding of the local and regional climate resilience benefits of good practices. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]Good farming practices are the production methods and practices used to produce a crop such that it is likely to make normal progress toward maturity and produce at least the yield used to determine the production guarantee or amount of insurance yields on par with average historical yields for the farm operation. According to Risk Management Agency guidance, good farming practices can vary by crop and location.

[b]NRCS's National Conservation Practice Standards provides guidelines for planning, designing, installing, operating, and maintaining conservation practices. Each conservation practice standard contains information on why and where the practice is applied, and it sets forth the minimum planning

criteria that must be met during the application of that practice in order for it to achieve its intended purpose.

**Table 19: Description of Option to Offer Crop Insurance Premium Subsidies**

| Option 12: Offer crop insurance premium subsidies |
|---|
| **Description of option, and examples** |
| Offering crop insurance premium subsidies for producers who use practices that enhance resilience to incentivize adoption of those practices would have strengths and limitations, according to experts and relevant literature. For example, the U.S. Department of Agriculture (USDA) could offer a premium subsidy for each acre in which a producer adopted practices that reduce risk and build resilience, such as cover crops or reduced tillage, or could offer additional crop insurance premium subsidies to producers that convert their most environmentally sensitive cropland to perennial grass or tree cover to enhance climate resilience. |
| **Key potential strengths of option based on experts' comments** |
| Some experts said that this option has the potential to encourage a large portion of producers to adopt climate-resilient practices because of the popularity of the federal crop insurance program. One expert also said that premium subsidies could help producers cover the cost of adopting and sustaining practices that enhance climate resilience, especially if they are hesitant to implement them. One expert told us that USDA might need to introduce flexibilities in the requirements that favor minority and small and disadvantaged producers to ensure that they have sufficient access to these subsidies. |
| **Key potential limitations of option based on experts' comments** |
| Several experts were concerned that crop insurance may work at cross-purposes with efforts to enhance climate resilience. According to these experts, some practices that can enhance climate resilience do so at the expense of crop yield. These experts said that if the net effect of installing a practice lowers crop yields, even temporarily, this could discourage a producer from installing a practice for three reasons. First, a reduction in yield could potentially reduce farm income. Second, because federal crop insurance payments are made based on a farm's historical average yield, any reduction in crop yield might reduce the amount of federal crop insurance that a producer is eligible to receive. Third, because subsidized crop insurance insulates producers from production and market risks at a low cost relative to the risks, it may reduce incentives to use climate-resilient practices to the extent that producers are insured against production risks.<br><br>Several experts noted that additional subsidies would add costs to an already costly program and may not be the most efficient way to incentivize climate-resilient practices for three reasons. First, crop insurance subsidies are a less direct way to provide a payment for practices than conservation programs, where payments are exclusively tied to the practices. Second, the federal government may ultimately pay part of the additional premium subsidy to private insurance companies as underwriting gains, rather than paying the whole amount directly to the producers using the practices. Third, higher subsidies incentivize greater production and, thereby, increase the federal government's fiscal exposure, especially in higher-risk areas that otherwise would not be economically feasible to farm. One expert suggested that it would be more efficient and effective to make the current subsidies contingent on the adoption of climate-resilient practices to incentivize adoption without increasing costs.[a] |
| **USDA comments on implementation of option** |
| According to USDA officials, this option aligns with the department's voluntary and incentive-based approach to helping producers enhance their resilience. Officials also told us that the Risk Management Agency will need to ensure that the climate-resilient practices they incentivize for adaptation are effective and science based and that there is a reliable data-driven way to identify which producers are eligible for the subsidy. Further, USDA officials said that insurance providers will need additional training to communicate the benefits of climate-resilient practices to producers, and how implementing those practices will impact producers financially. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]In contrast to this option, GAO's body of work on crop insurance includes Matters for Congressional Consideration on reducing the level of federal premium subsidies. See app. III for more details.

**Table 20: Description of Option to Create Additional Title I Conservation Compliance Requirements**

| Option 13: Additional Title I conservation compliance requirements |
|---|
| **Description of option, and examples** |
| This option would involve expanding conservation compliance requirements to include the adoption of certain climate-resilient practices for producers to be eligible for certain Farm Bill Title I programs.[a] Producers are not required to adopt climate-resilient practices to be eligible for Farm Bill Title I commodity specific programs, such as the Agriculture Risk Coverage, Price Loss Coverage, and marketing assistance loan programs. USDA could, for example, incentivize the adoption of climate-resilient practices by requiring producers to implement soil and water management practices that enhance resilience, such as cover crops, to be eligible for Title I program benefits. |
| **Key potential strengths of option based on experts' comments** |
| According to several experts, this option could create a straightforward, effective incentive for producers to adopt climate resilience good practices. For example, one expert said that because the commodities covered by the Title I programs represent a significant proportion of agricultural production in the U.S., this option has the potential to incentivize mass adoption of climate-resilient practices. In addition, some experts said that this option would reduce the fiscal risk to the federal government of climate change impacts. For example, one expert said that if the requirements are effective at enhancing the resilience of producers, this option will decrease the likelihood that Title I programs will subsidize high-risk agricultural production. |
| **Key potential limitations of option based on experts' comments** |
| According to several experts, this option would be politically difficult to implement. For example, one expert said that because Title I programs provide financial support to producers to help alleviate the impacts of natural disasters, such as floods or droughts, it may be politically infeasible to pile additional requirements on funding that producers depend on for the survival of their operations. Some experts also expressed concern that this option may disproportionally impact small, disadvantaged, and minority producers because they may lack the financial and technical capacity to comply with the new requirements. For example, one expert said that the Title I programs are not inclusive to small, disadvantaged, and minority producers and that those producers would bear the additional cost of compliance if this option were implemented, while receiving a smaller proportion of the program benefits.<br>Another expert said that this option would not be an effective way of incentivizing the adoption of climate-resilient practices without a corresponding policy to provide technical and financial assistance to small, disadvantaged, and minority producers to help them comply with the new requirements. Several experts also said that this option would be technically challenging for USDA to implement and enforce. For example, some experts said that USDA would have to have sufficient information about climate vulnerabilities and climate resilience good practices at the regional or local level to inform the development of new requirements. Some experts also said that USDA lacks the staff and technical expertise to monitor and verify producer compliance with new requirements. |
| **USDA comments on implementation of option** |
| According to USDA officials, while tying financial assistance from Title I programs to climate resilience good practices may result in reduced fiscal exposure to taxpayers and the federal government, a compliance mandate would be difficult to enforce, since such practices are not universally applicable. As a result, according to officials, this option would require additional funding and staff to enforce and additional technical and financial assistance to producers to help them comply. USDA officials also said that linking requirements to program eligibility could discourage the adoption of climate-resilient practices and participation in the department's voluntary conservation programs. |

Sources: GAO analysis of literature, and interviews with experts. | GAO-23-104557

[a]The Food Security Act of 1985, as amended, requires producers participating in most programs administered by the Farm Service Agency and the Natural Resources Conservation Service to abide by certain conditions on any land owned or farmed that is highly erodible or that is considered a wetland.

# Appendix V: Comments from the U.S. Department of Agriculture

**United States Department of Agriculture**
Office of the Chief Economist
Room 112-A J.L. Whitten Building
1400 Independence Avenue, SW
Washington, D.C. 20250-3810

January 5, 2023

Mr. Steve Morris
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Morris,

The U.S. Department of Agriculture (USDA) appreciates the opportunity to respond to the U.S. Government Accountability Office (GAO) draft report "CLIMATE CHANGE: Options to Enhance the Resilience of Agricultural Producers and Reduce Federal Fiscal Exposure, GAO-23-104557" dated January 2023.

USDA welcomes this GAO report, which identifies options for USDA to consider that could help agricultural producers become more resilient to the effects of climate change. We would like to provide the following reactions and comments, in addition to technical comments previously provided to GAO by e-mail.

As described in the Fourth National Climate Assessment and referenced in this report, climate adaptation is an iterative risk management process consisting of risk assessment, planning, implementation, and learning. USDA's Department-Wide Action Plan for Climate Adaptation and Resilience, released in October 2021, and its thirteen Agency-level Climate Adaptation Plans, released in July 2022, describe how the Department has adopted this iterative approach in response to the threats that climate change poses to USDA's mission and the priorities outlined in Executive Orders (EO) 14008, 14030, and 14057 and USDA's Departmental Regulation 1070-001.

GAO recommends that USDA's Climate Change Program Office (CCPO) within the Office of the Chief Economist analyze the options presented in this report and integrate them, as appropriate, into future climate resilience prioritization and planning efforts. In response to this recommendation, USDA will incorporate an evaluation of the thirteen options presented in this GAO report, and other options identified by USDA, into the FY2023 update of USDA's Department-wide Climate Adaptation Plan. We will also include an assessment of how some of these options are already being implemented, and how they could be further integrated into ongoing activities within relevant USDA agencies. We are preparing this update in response to

1

Implementing Instructions for EO 14057, which lays out a timeline for producing an Adaptation Plan by September 30, 2023.

Several of the options presented in this GAO report are already being implemented. They align with adaptation actions which were prioritized in the July 2022 Agency-level Climate Adaptation Plans. For example, Option 7: Revise Conservation Practice Standards aligns with Action Area 4 in the Natural Resources Conservation Service's (NRCS) Climate Adaptation Plan, which includes developing a process to consider and review practices to be considered climate-smart, including those that will help producers adapt to the effects of climate change. Similarly, Option 12: Offer Crop Insurance Subsidies aligns with priority actions in the Risk Management Agency's (RMA) Climate Adaptation Plan on the implementation of incentives to encourage cover crop planting, climate-smart water use, and other practices that may enhance the resilience of producers. For example, RMA offered a premium benefit to farmers with existing crop insurance policies that planted cover crops through the Pandemic Cover Crop Program.

USDA agrees with GAO's conclusion that these options are not mutually exclusive. Implementing a combination of the thirteen options could leverage the strengths while addressing the limitations of the individual options. For example, Option 2: Expanded Technical Assistance and Option 4 Expanded Climate Hubs are complementary. USDA's Climate Hubs produce a wide variety of needs-tailored tools and resources but cannot replicate the breadth and scope of on-the-ground Conservation Technical Assistance offered by NRCS and other key partners such as Cooperative Extension. Expanding the capacity of the Climate Hubs, however, could increase their ability to support the Farm Production and Conservation (FPAC) agencies through activities like climate literacy training and development of region-specific climate decision support tools to enable these agencies to better serve producers.

Several of the options highlight the need for regionalized information on agricultural practices that build producer resilience. USDA's Climate Hubs fill this knowledge gap, in part, through their ten regions across the United States, including Hawaii, Alaska, and U.S. Insular Areas. Regional Climate Hubs partner with state FPAC staff to identify staff needs and priorities, build climate literacy, and share place-based climate adaptation approaches. Regionalization of climate adaptation is inherent to the implementation of the Farm Service Agency (FSA), NRCS, and RMA Climate Adaptation Plans, as they work with staff and partners across the United States to identify adaptation and resilience options that address regional climate risks and opportunities.

The need to better understand the costs and benefits of practices that improve the resilience of producers is another common thread through several of the thirteen options. USDA agrees that this information will be important to evaluate and communicate the benefits of these practices and incentivize greater practice adoption.

The list of options in this GAO report to enhance the resilience of agricultural producers is not exhaustive and will be considered and weighed against a wider scope of adaptation actions that USDA can integrate into ongoing programs. A further consideration when weighing each of these options is whether their benefit exceeds the cost of implementation, and in some cases, ensuring that a market exists for the products produced. Many of these options will require enhanced coordination and collaboration between the FPAC and Research, Education, and

2

Economics (REE) agencies, supported by CCPO and the Climate Hubs, to connect research to program implementation and data collection to measurement of outcomes. While many of the options align with ongoing efforts department-wide, some could require additional resources or authorities to implement to the extent envisioned by GAO's evaluation.

Assisting farmers, ranchers, and forest landowners in adapting and building resilience to a changing climate is a priority for USDA that will benefit producers while reducing the fiscal exposure of the Federal government. Thank you for your attention to this critical subject and the thoughtful recommendations. We appreciate the opportunity to review and respond to the GAO report.

Sincerely,

Dr. Seth Meyer
Chief Economist
U.S. Department of Agriculture

3

# Appendix VI: GAO Contact and Staff Acknowledgments

## GAO Contact

Steve Morris, (202)-512-3841 or morriss@gao.gov

## Staff Acknowledgments

In addition to the individual named above, Joe Thompson (Assistant Director), Micah McMillan (Analyst in Charge), Sarah Green, Nira Marte, Isabel Rosa, Dan Royer, and Jason Trentacoste made key contributions to this report. Also contributing to this report were Kevin Bray, Mark Braza, Gary Brown, Colleen Candrl, Tom Cook, David Dornisch, Phil Farah, Kathryn Godfrey, J. Alfredo Gómez, Tim Guinane, Susan Irving, Rob Letzler, Joe Maher, Corinna Nicolaou, Cynthia Norris, Jim Rice, and Kelly Troutman.

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