



Economic Research Service
U.S. DEPARTMENT OF AGRICULTURE

ERS Climate Adaptation Implementation Plan

2022 Edition



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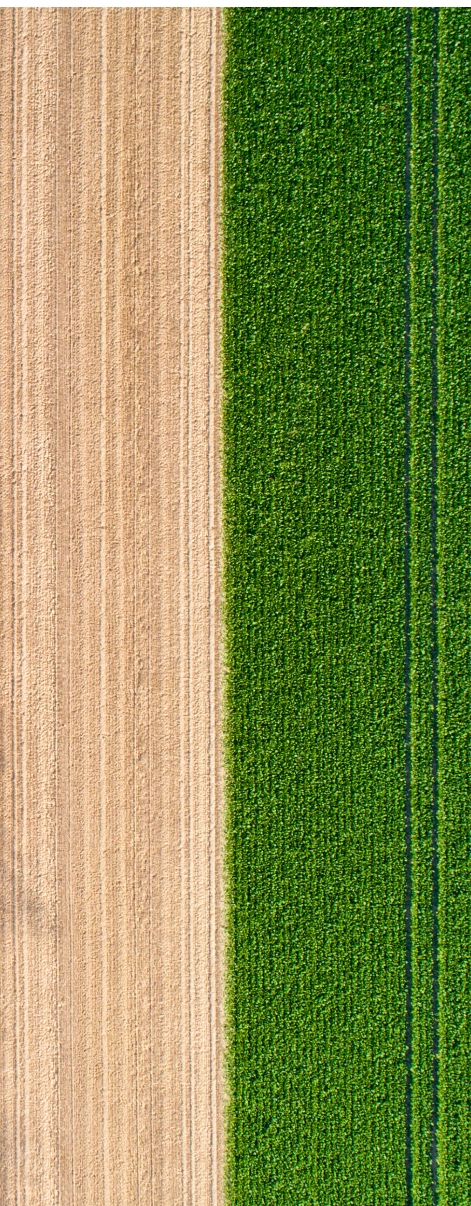
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I. ERS Mission, Goals, and Objectives



The mission of USDA's Economic Research Service (ERS) is to anticipate trends and emerging issues in agriculture, food, the environment, and rural America; and to conduct high-quality, objective, economic research to inform and enhance public and private decision-making. As one of the Federal Government's principal statistical agencies, ERS is responsible for ensuring the quality, objectivity, and transparency of the statistical information and analyses it provides. The agency anticipates and responds to decision-makers' needs. ERS provides research and data to a wide range of stakeholders and decision-makers on issues related to climate adaptation, risk, resilience, and mitigation.

Agriculture accounted for 11.2 percent of U.S. greenhouse gas emissions in 2020, including carbon dioxide emissions associated with agriculture electricity consumption. In addition, an ERS study found that 18.1 percent of total U.S. greenhouse gas emissions were linked to U.S. domestic food consumption. As such, agriculture and food play a significant role in affecting U.S. goals

addressing climate change. Agriculture is also one of the sectors most heavily affected by climate change.

The ERS Climate Adaptation Implementation Plan identifies how

ERS research contributes to understanding and assessing the risks, effects, adaptation, and mitigation of climate change on agriculture, food, and rural America.

II. Climate Change Effects and Vulnerabilities: Impacts on the ERS mission, priorities, stakeholders, and USDA programs and operations

ERS serves many stakeholders, including farmers, ranchers, rural communities, and the general public. In addition, ERS provides analyses to other governmental organizations and to key decision-makers who help create climate change policy. Consistent with the ERS mission, the agency provides research, data, and analysis to inform stakeholders and the public and to support decision-making processes.

Impact on ERS Mission

ERS devotes significant resources to the study of climate change and

climate change effects. As climate change effects become more pronounced and the need for policy analysis and strategies increases, ERS may need additional resources to meet the demand for information. As the agency engages in additional modeling and analysis, there will be a need for additional expertise and technology capacities.

ERS identified five broad categories of climate effects where research and data can inform the intersection of climate change and the agricultural sector.



Sustainability of the Agri-food Supply Chain

Climate change can adversely affect domestic and international agri-food supply chains. These impacts can limit farmers' access to export markets, as well as food acquisition markets, such as food stores, other retail establishments, restaurants and home kitchens. Climate change also can influence food choices through relative price impacts across different agri-food commodity markets.

Markets and Trade

Climate change can affect agricultural markets and trade flows, through climate-induced supply shocks on agricultural production and disruptions to transportation networks. For example, trade agreements and other policies can affect incentives to reduce greenhouse emissions in agri-

cultural and food systems. Climate change can also affect the demand for crop insurance and other risk insurance policies.

Drought Resiliency and Water Quality

Changing climatic conditions affect the quantity and quality of water available for agriculture and other purposes, such as drinking water. The institutions, policies, and economic incentives created by irrigation markets affect the sustainability of shared water resources and the resiliency of the agricultural sector.





Agricultural Productivity

Agricultural productivity increases are necessary to meet the food and fiber needs of a growing population. ERS developed and regularly updates metrics of agricultural total factor productivity for U.S. and international agriculture. These metrics show the impacts of technical and environmental change on agricultural production. Climate change can impact all aspects of agricultural productivity.

Rural Communities

Factors that can impact rural resilience to climate change include individual measures (e.g., income, poverty, health), natural factors (e.g., ecosystem type, location), built capital (e.g., broadband, energy system, healthcare system), and social capital (e.g., networks, trust). Climate change can influence places of residence, work, and recreation,

as well as the relationship between rural communities and energy development, particularly renewable energy development.



III. Climate Adaptation Actions: Identify and evaluate actions and implementation strategies that assess climate change risks

There are specific research initiatives that are designed to identify and assess the risks associated with the intersection of climate change and agriculture. ERS routinely and continuously engages with a wide range of stakeholders to inform and rank the ERS research portfolio. Consistent with the ERS mission to anticipate trends and emerging topics, ERS participates in many Department-wide initiatives and workgroups to ensure research informs policy decisions and actions. Often, the agency must pivot quickly to emerging issues (e.g., COVID-19 pandemic), while also maintaining its core research program. The following topics combine core research (e.g., USDA Baseline) and emerging issues (e.g., drought resiliency).

Climate Change and Productivity Impacts

ERS has a strong research program related to measuring domestic and international agricultural productivity. New research explores how U.S. historical crop production and agricultural productivity were affected by climate variability and climate change, taking into





consideration factors such as domestic needs for food, feed, and fiber; international trade; commodity prices; and government policies. ERS is also examining the relationship between weather and climate information and total factor productivity across selected countries.

In addition, research and development (R&D) investment can impact agricultural productivity growth. For example, R&D can identify land with high carbon sequestration potential or the conversion of land across uses to meet climate goals. ERS uses a model of the global agri-food economy to conduct policy simulations and examine implications for global agricultural output, food prices, land use, greenhouse gas emissions, and food security.

Conservation Practices and Cropland

USDA's Agricultural Resources Management Survey (ARMS) has been a critical tool for tracking conservation practice adoption for major commodities since 1996. These data can be used to estimate the use of different conservation practices that improve soil health or the ability to increase soil carbon sequestration, and new questions are continually considered to identify major climate smart practices and other management decisions with implications for net greenhouse gas emissions. This information can be used to better understand cover crop adoption, rotational grazing, rice irrigation methods, the use of enhanced efficiency fertilizers, and more.

In addition, ERS is exploring the payment levels and other aspects of conservation contracts needed to

encourage more farmers to begin planting cover crops and continue planting them. Understanding how farmers respond to different payment levels for cover crops is a critical first step in predicting levels of soil carbon storage and other environmental outcomes associated with current and future programs, policies, and markets that encourage cover crop planting.

Finally, ERS is developing a spatially detailed analysis of marginal agricultural and pastureland in the United States. The spatial analysis will examine how different policies affect forest management incentives to increase carbon sequestration.

Bioenergy and Renewable Fuels

ERS tracks U.S. ethanol and biodiesel production, consumption, and trade, and monitors and analyzes U.S. bioenergy policy and events that affect the domestic and international biofuel and feedstock markets. ERS continues to update the U.S. Bioenergy Statistics quarterly to present a picture of the renewable energy industry and its relationship to agriculture.

Underlying the growth in renew-

able fuels is a set of policies at the national and State level that encourage production. Understanding the magnitude of renewable diesel capacity growth over the near term and implications for major feedstock markets is important to evaluate the impacts of these policies on climate change.

Modeling Impacts and Outcomes

The ERS annual USDA Agricultural Projections (also known as the “Baseline”) provides USDA's domestic 10-year projections for the food and agriculture sector covering major agricultural commodities, agricultural trade, and aggregate indicators, such as farm income. The Baseline projections are a significant Department-wide activity conducted in conjunction with the World Agricultural Supply and Demand Estimates (WASDE) report. ERS is exploring how to integrate different climate conditions into the Baseline by examining how growing conditions can affect production and ultimately long-term agricultural plantings.

In addition, ERS has expertise in two global general equilibrium

models used to simulate alternative energy and climate policies through 2050. The Future Agricultural Resources Model (FARM) and the Global Trade Analysis Project (GTAP) enable ERS to examine a wide range of climate-related effects on the agricultural sector, such as the impact of trade shocks and global shifts in production.

ERS is also investing in models to simulate drivers that affect global and U.S. agriculture: population, income, agricultural productivity growth, climate change effects on agriculture, and climate change mitigation to provide an advanced economic modeling framework that links global level change to economic impacts in the U.S. through international trade.

Markets and Climate Change. ERS is examining the effects of climate change on domestic and international agri-food markets, in the aggregate and at various stages of the supply chain. This research includes examining the impact of water available for agriculture and food production; assessing future climate-induced grain and milk

supply chain location needs and cost implications; and measuring primary energy and freshwater use throughout the U.S. food system.

In addition, ERS is exploring the potential of animal production markets to participate in carbon operations, including assessments of greenhouse gas emissions for current animal production systems; technologies with carbon footprint reducing potential; production and market implications of such technologies; potential revenue streams including through carbon markets to producers implementing strategies to reduce their carbon footprint; and consumer preferences for products with reduced carbon footprints.

Drought Resilience of Irrigated Agriculture

ERS and the National Agricultural Statistical Service (NASS) conducted the 2019 Survey of Irrigation Organizations (SIO) as the first nationally representative, federal data collection effort focused on irrigation organizations since the 1978 Census of Irrigation. These data are being used to provide information on

irrigated agriculture and the institutional structure, including work on drought planning and irrigation infrastructure (e.g., canals, reservoirs); groundwater management organizations; water deliveries; governance; and water pricing. These data also allow researchers to examine trends in on-farm water management and characteristics of irrigation water supply organizations.

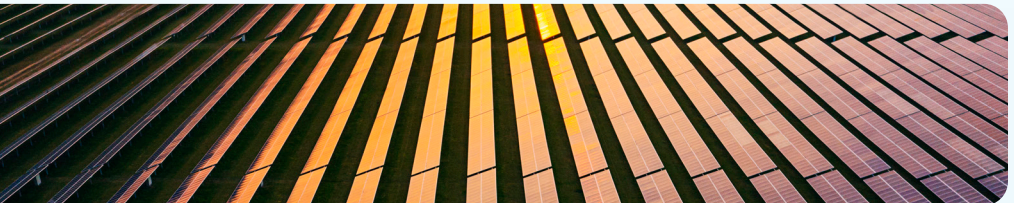
Rural Communities

ERS has ongoing research programs measuring persistent poverty, income, and health measures of rural people. Emerging research includes assessing broadband programs, energy systems and natural amenities of rural places.

IV. Monitoring Progress

ERS has multiple ways to monitor progress and ensure successful completion of research projects, including the necessary peer and inter-agency review steps that are implemented prior to the public release of research reports and data products. The details of these processes are outlined in the Administrative Report, *Publishing@ERS* (2017), which includes dis-

cussion of the directives and regulations governing ERS as a principal federal statistical agency to ensure the research is authoritative, timely, and policy neutral. ERS also measures the dissemination and use of ERS research by stakeholders by examining and tracking publication metrics, web usage statistics, briefing requests, webinars attendance, and staff analysis requests.



V. Special Topics

Environmental Justice

ERS research related to racial and social equity primarily occurs in two major program areas: (1) food access, food security, and nutrition assistance and (2) rural and farm income and wealth. Specific to the intersection between climate and equity, ERS conducts research in several areas related to rural resilience, such as an understanding of the factors around broadband access and heirs' property topics. ERS anticipates funding a climate equity workshop to discuss and advance the science around the intersection of climate, agriculture, and equity. Finally, ERS researchers are collaborating with others outside the agency to investigate how individuals respond to impaired water quality and how these effects vary across different demographic groups. Differences in the ability to access adequate supplies of clean water suggests that the damages of impaired water quality may fall disproportionately on low-income communities without the financial resources to avoid the use of contaminated water.

Workforce Climate Literacy

ERS is both a provider of climate change information and a consumer. ERS provides information by sharing the monthly USDA climate science webinar series with all staff and encourages wide participation. ERS has a representative on USDA's Agriculture, Forests, and Climate Science working group, which produces the webinar series. Topics for 2022 include climate effects and adaptation in crops, animal agriculture, and forests; climate extremes; greenhouse gas mitigation options in agriculture and forests; food systems and food security; and climate justice.

ERS has an on-going need for climate change data as well as the ability to generate new information as conditions evolve. ERS researchers must stay current in the field of climate change. ERS devotes resources to collaborative research and cooperative agreements, recruitment, conferences, and training.



Engagement with the Climate Hubs

ERS has a collaborative research investment with the Southwest and California Climate Hubs to catalogue and analyze water scarcity adaptation efforts in the Western United States. Under the agreement, funds are provided to develop the Water Adaptation Techniques Resource (WATR)-a geospatial tool to catalogue current water scarcity adaptation activities in the West. WATR helps share knowledge among the region's water managers, irrigation districts, State and local governments, and producers with irrigated lands. ERS researchers work with Climate Hubs staff and two postdoctoral researchers funded by the project to develop WATR. Additionally, ERS researchers work with the postdoctoral researchers to model the water conservation impacts for

a subset of the catalogued adaptation activities. These in-depth case studies will complement WATR's breadth of information while also advancing policymakers' and the research community's understanding of the water conservation benefits of differing water scarcity adaptation strategies. ERS is exploring additional ways to engage with other Climate Hubs to collaborate on economic analysis and expertise related to Hubs' initiatives.