

# FARMERS ON THE FRONT LINES: AGRICULTURE'S ROLE IN FIGHTING CLIMATE CHANGE

FEBRUARY 2021



FARMJOURNAL  
FOUNDATION



# CLIMATE CHANGE IS AN EXISTENTIAL THREAT TO EVERYONE AROUND THE WORLD, ESPECIALLY FARMERS, WHOSE OPERATIONS ARE UNIQUELY VULNERABLE TO UNPREDICTABLE CHANGES IN TEMPERATURE AND PRECIPITATION.

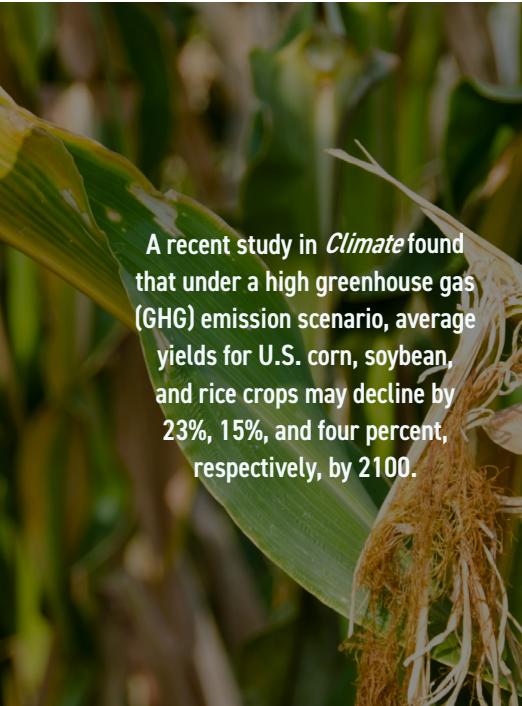


In April 2020, a study in *Science* found that 2000-2018 was the worst multi-decade drought in southwestern North America since 800 A.D.

In August 2020, a once in a lifetime massive inland thunderstorm (called a derecho) careened across Iowa and Illinois. The National Oceanic and Atmospheric Administration (NOAA) estimated the cost of damages from the storm at \$11 billion, with some agricultural impacts not fully included in the total.

While it is reassuring to see the incoming Biden Administration's plans to create the new positions of Special Envoy for Climate and White House Climate Coordinator to focus on the international and domestic aspects of climate change policy respectively, the U.S. government's and the public's attention continues to focus primarily on reducing the use of fossil fuel-based energy to solve the climate crisis. We believe that the potential role of the agriculture and the food system in mitigating climate change should not be forgotten.

The reality is that climate change is already wreaking havoc on agriculture and food security globally – for many farmers this impact comes in the form of reductions in productivity, profitability, and resilience – with serious implications for consumers in terms of the affordability, nutritional content, and diversity of the food they rely on. Climate change is causing more frequent and extreme droughts and floods, severe pest and disease outbreaks among crops and livestock, and lower nutritional content in fruits and vegetables – all of these stresses will severely impact production. Severe weather events amplified by climate change are already occurring across the planet, and research indicates that climate change will seriously impact average crop yields by the end of the century.



A recent study in *Climate* found that under a high greenhouse gas (GHG) emission scenario, average yields for U.S. corn, soybean, and rice crops may decline by 23%, 15%, and four percent, respectively, by 2100.



Additionally, agriculture and food production will face challenges from other flanks, including a growing global population and increased frequency of global pandemics – amplifying the effects of climate change.

The emergence of the novel coronavirus pandemic (COVID-19) is already exposing the vulnerabilities in our food and agriculture systems and further underlining the need to forge a path forward that focuses on resilience and sustainability.

Climate change is not just a U.S. problem. Beyond our borders, climate change is hurting the livelihoods of small-scale farmers in developing economies who already live on the brink of vulnerability. These farmers are expected to suffer significant harm in terms of lower crop yields and income as a result of the changing climate. In Southern Africa between 1961-2000, an increasing frequency of long-term dry spells has been accompanied by a higher intensity in daily rainfall – both of which adversely affect rainfed-agriculture, which accounts for more than 90% of cultivated area across Africa. Since global investment in agricultural innovation is not keeping pace, many small-scale farmers, especially in Africa, lack access to existing technologies that would help them be more resilient in the face of climate shocks. For example, as of 2020, only 20% of West African farmers were utilizing improved seed for their crop production. Several studies in Africa also indicate relatively low adoption rates for integrated pest management (IPM), a set of sustainable farming practices that would help farmers address increasing risks from invasive insects, weeds, and crop diseases as the climate changes. As a consequence, developing countries will likely experience greater rates of hunger and malnutrition due to reduced food supplies and/or higher prices.

## IT IS NOT TOO LATE TO TAKE ACTION.

The U.S. faced food shortages even among the most affluent communities in 2020 due to the pandemic. Even now, almost a year later, food bank lines continue to break records. While the pandemic highlighted the inflexibility of our food system to respond to an acute crisis, it also showed how critical this system and our farmers are to ensuring stability in our communities, from the local to the regional level. COVID-19 will not be the last pandemic the U.S. faces, and we will continue to feel the consequences of increasing natural disasters as the climate changes. The U.S. must begin to tackle this issue immediately, and the solutions are right in front of us. Bold investments in innovation, research, and capacity-building through extension services that help farmers, both here and around the world, adapt their production practices to a changing climate are critical. Additionally, agriculture is one of the few sectors with the ability to sequester significant amounts of carbon and ultimately become a net sink.



INNOVATION



CAPACITY-BUILDING



RESEARCH

# Recommendations

## DOMESTIC POLICY RECOMMENDATIONS

Domestically, farmers will need new tools like drought- or salt-tolerant crop varieties and methane-reducing livestock feed ingredients to fight climate change. Ample resources for privately funded research for corn and soybeans have enabled U.S. producers of those crops to maintain overall production levels even during years where farmers experience extreme weather. However, we need similar tools for other important crops in our food supply like wheat, pulses, specialty crops, and others that rely on innovations generated primarily by publicly funded research. Properly prioritized, this research will help fortify all farmers against a changing climate, address the need for improved human nutritional content, and also improve soil health (a key driver of productivity and climate resilience).

Additionally, strong collaboration between the public and private sectors is instrumental to help farmers adapt. Public-private partnerships leverage resources and bring in the private sector early to ensure that the research will meet market demands and be adopted on a timely basis.

## With this context in mind, we offer the following policy recommendations:

→ **Congress should make a significant financial commitment to public-private partnerships** through institutions like the Foundation for Food and Agriculture Research (FFAR). FFAR, a nonprofit grantmaking foundation that requires non-federal matching funds for projects, should also be reauthorized in the next farm bill. Such efforts will leverage resources and scientific expertise to scale market-driven scientific solutions.

→ **Congress should make a renewed, bold commitment to funding basic and applied research, extension, and infrastructure** where the U.S. government has long excelled. Additional resources would help accelerate innovations for all crops, including those neglected by the private sector. More funding should be directed to the U.S. Department of Agriculture research, education, and economics agencies, including the Agricultural Research Service, Economic Research Service, National Agricultural Statistics Service, and the National Institute for Food and Agriculture. Additionally, programs such as the Sustainable Agriculture Research and Education program (SARE) should include carve-outs that support research conducted at historically Black colleges and universities (HBCUs) and at the 1994 land-grant universities with the specific intent to support research and outreach that benefits minority communities.

→ **The Administration – through coordination at the White House Office of Science and Technology Policy – should incorporate the research recommendations in the SoAR Foundation's paper, [Developing Global Priorities for Plant Research](#).** The paper outlines a number of shovel-ready research projects with the potential to advance progress to achieving net-zero carbon emissions by 2050 through enhancement of climate models for biological data, as well as the development of approaches to increase carbon sequestration in soils. The research agenda promotes the transition to agricultural sustainability through reduced application of chemical fertilizers and the development of new crops that better withstand stresses from climate-related shocks.

**The U.S. should also double down on building government capacity and resources to support farmers and the agriculture sector through this period of upheaval. This can be achieved in the following ways:**

→ **USDA should implement the Climate 21 Project plan** to leverage existing resources and authorities to sequester carbon and reduce emissions. The plan reflects recommendations from a vast network of former high-level government officials and will help the incoming Secretary of Agriculture hit the ground running.

→ **The Administration should empower the National Science and Technology Council (NSTC) Committee on Science (CoS) in the Executive Office of the President** to work closely with the domestic climate czar to better coordinate and align agricultural research investments across the climate-agricultural research nexus. With the recent encouraging news that the new director of the Office of Science and Technology Policy (OSTP) will be a cabinet-level position, this role will be even more critical to build out whole-of-government climate-agricultural research agenda to help achieve net-zero carbon emissions from the U.S. economy by 2050.

→ **The Administration should invest in recruiting and training young agricultural scientists and farmers in both the U.S. and abroad** to ensure continuation of the crucial innovation pipeline in the face of the climate crisis and other future challenges. Continued and amplified engagement through land-grant universities is essential to engage youth for a robust future workforce. Current programs such as the Borlaug and Cochran fellowships and AgriCorps should receive fully authorized appropriations levels and tie future work to the climate challenge.

→ **Congress should encourage USDA, in coordination with local universities and the private sector, to create a pilot program to provide for the inclusion of a private-sector mentorship program.** Most jobs in the emerging agri-food industry will be in the private sector. Private-sector research plays an irreplaceable role, and career paths into research and other innovation careers in the private sector are needed to keep the field robust. Using the model of FFAR's fellowship program, a program should be created to reflect the rising need for business and private-sector knowledge by the agriculture community. The program should identify rising young stars in agriculture sciences at prominent universities in developing countries and match them with U.S. private-sector companies to form a yearlong distance mentorship program.

# Recommendations

## INTERNATIONAL POLICY RECOMMENDATIONS

Internationally, the role of research, innovation, and dissemination of technologies and expertise is critical to helping small-scale farmers adapt to a changing climate and downward pressure on their production and resilience.

**We offer the following recommendations to equip global farmers to tackle climate change and prevent future food security crises:**

**USAID should bolster funding for collaborative agricultural research through CGIAR**, the largest international agricultural research system in the world. CGIAR predominantly works in developing economies and is funded by many countries and donor entities, including USAID under the authority of the Global Food Security Act. CGIAR research institutions will be critical in developing and adapting specific tools for agriculture in developing economies, using their significant footprint on the ground. A recent study found that CGIAR research generates a 10:1 benefit-cost ratio in terms of reducing hunger and poverty and agriculture's environmental footprint. Their work is instrumental in efforts to strengthen local food systems and achieve global food and nutrition security in a sustainable way, helping governments develop their agriculture sectors and overall economies. Their gene banks house seed varieties accounting for 10% of the world's genetic diversity and could be sequenced to identify traits that would be useful to farmers globally in combatting the effects of climate change, including in the U.S.

**USAID should expand the number of Feed the Future Innovation labs and have more of that work reside at Historically Black Colleges and Universities (HBCUs) and Tribal Colleges and Universities (TCUs).**

New innovation Labs should focus on 1) specialty crops: researching on how to allow agricultural production to meet both a changing climate and universal nutritional needs; 2) emerging zoonoses surveillance: given the global impact of new zoonotic diseases (diseases that can jump from animals to humans) and the expanding geography of where they can thrive, more research is critical to address future zoonoses and the nexus of human and livestock health.

**Congress should expand the USAID-created and -operated FEWS NET to include an early warning surveillance system that tracks the global spread of dangerous plant pests and diseases.** The Famine Early Warning Systems Network (FEWS NET) was established in 1985 by USAID to provide early warnings about potential famines to policymakers around the world. Climate change is expected to accelerate the worldwide spread of pests and disease that can threaten international and domestic food systems.

**The Administration should re-establish USAID's PREDICT or make public the strategy to implement a successor program.** PREDICT, a project of USAID's Emerging Pandemic Threats (EPT) program, was initiated in 2009 to strengthen global capacity for detection and discovery of zoonotic pathogens with pandemic potential such as COVID-19.

College of Agriculture and Life Sciences, Virginia Tech, 2020. "Global Agricultural Productivity Report: Productivity in a Time of Pandemic."

Accessible at:

[https://globalagriculturalproductivity.org/wp-content/uploads/2019/01/2020-GAP\\_Report\\_Exec-Summary-1.pdf](https://globalagriculturalproductivity.org/wp-content/uploads/2019/01/2020-GAP_Report_Exec-Summary-1.pdf)

Cooper PJM, Cappiello S, Vermeulen SJ, Campbell BM, Zougmoré R, Kinyangi J. 2013. "Large-scale implementation of adaptation and mitigation actions in agriculture." CCAFS Working Paper No. 50. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Henson, Bob, 2020. "Iowa Derecho in August was most costly thunderstorm disaster in U.S. history." Washington Post, October 17.

Accessible at: <https://www.washingtonpost.com/weather/2020/10/17/iowa-derecho-damage-cost/>

Jahn, Molly, 2020. "New Solutions for a Changing Climate." Paper commissioned by the Chicago Council on Global Affairs. August.

Accessible at: [https://www.thechicagocouncil.org/sites/default/files/2020-12/report\\_new-solutions-for-changing-climate\\_0.pdf](https://www.thechicagocouncil.org/sites/default/files/2020-12/report_new-solutions-for-changing-climate_0.pdf)

Peterson, Lillian K., 2019. "Impact of Climate Change on Twenty-First Century Crop Yields in the U.S." Climate 7(3).

Reilly, John, and Stephanie Mercier, 2021. "How U.S. Agriculture Can Be Part of the Climate Change Solution: Opportunities and Incentives for Farmers to Reduce Their Emissions and Turn the Industry into a Net Carbon Sink." Policy brief commissioned by the Farm Journal Foundation, forthcoming.

## Further Reading

Shah, Tushaar, Regassa Namara, and Abishek Rajan, 2020. "Accelerating Irrigation Expansion in Sub-Saharan Africa." World Bank.

Accessible at:

<https://www.iwmi.cgiar.org/Publications/Other/Reports/accelerating-irrigation-expansion-in-sub-saharan-africa.pdf>

Williams, A. Park, et al., 2020. "Large Contribution from Anthropogenic Warming to an emerging North American megadrought." Science Volume 368, Issue 6488.

Accessible at:

<https://science.sciencemag.org/content/368/6488/314>