



# ONE USDA WORKSHOPS:

TOOLS FOR DROUGHT ADAPTATION IN  
AGRICULTURE AND FORESTRY

THURSDAY, SEPTEMBER 26, 2019  
AGRICULTURAL EXPERIMENT STATION  
UNIVERSITY OF PUERTO RICO-MAYAGÜEZ  
JUANA DÍAZ, PUERTO RICO

THURSDAY, OCTOBER 24, 2019  
UNIVERSITY OF PUERTO RICO-UTUADO  
UTUADO, PUERTO RICO

THURSDAY, DECEMBER 12, 2019  
PUERTO RICO SCIENCE, TECHNOLOGY &  
RESEARCH TRUST  
SAN JUAN, PUERTO RICO

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GOULD, W. A.



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# INTRODUCTION

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## **“ONE USDA WORKSHOPS: TOOLS FOR DROUGHT ADAPTATION IN AGRICULTURE”, LED BY USDA CARIBBEAN CLIMATE HUB**

The USDA Caribbean Climate Hub, in collaboration with the Puerto Rico Science, Technology & Research Trust's Recuperación Agrícola program, developed a series of One USDA drought adaptation workshops to increase farmer capacity to face challenges caused by droughts, extreme events, and climate change. The workshop series also highlighted the initiative of “One USDA” which strengthens collaboration among USDA agencies to better serve land managers across the U.S. and affiliated territories. The Hub invited USDA agencies to collaborate in the workshops by providing information about practices and assistance programs relevant to climate change and drought. Various representatives from USDA agencies, such as Natural Resources Conservation Services (NRCS), Farm Service Agency (FSA), and Rural Development (RD), collaborated in each workshop. These workshops highlighted the topic of drought as it is one of the most frequent extreme events faced by Puerto Rican farmers.

The workshops focused on delivering tools and information to prepare for and respond to drought and climate change in general. Farmers were introduced to various resources including: USDA assistance programs, the US Drought Monitor, the Drought Impact Reporter, the CoCoRaHS citizen science network of weather stations, the NRCS Web Soil Survey, and the Puerto Rico Agricultural Statistics and Farm Planning Tools developed by the Caribbean Climate Hub. In total, 70 small-scale farmers had the opportunity for one-on-one conversations with USDA agency representatives and to explore the digital tools. The newly developed Agricultural Statistics Tool and the Farm Planning Tool from the Hub were debuted during these workshops. In addition, meteorologists from the National Weather Services participated in the workshop presenting information about drought monitoring and opportunities for farmers to report rainfall on their farms. Additional collaborators joined in from the University of Puerto Rico, Utuado campus, the Juana Díaz UPR-Agricultural Experiment Station, as well as the Utuado and Mayagüez Agricultural Extension Services.



## THE RECUPERACIÓN AGRÍCOLA PROGRAM



*Recuperación Agrícola* (Agricultural Recovery) is a collaborative initiative between the American Red Cross and the Puerto Rico Science, Technology and Research Trust. The objective of the *Recuperación Agrícola* program, which concluded at the end of 2019, was to provide assistance and resources that support the recovery of farms affected by Hurricanes Irma and María. The *Recuperación Agrícola* program included a series of activities that aimed to improve farmer capacity for success while facing climate change, natural disasters, and economic challenges. The program components include a workshop series, land clearing, recovery efforts, financial assistance, tools and equipment, capacity building, and technical assistance and services. The *Recuperación Agrícola* workshop series were led by several partnering entities, including the *Semilla Fine Cacao Experts*, *Agroinnova*, *El Josco Bravo*, and the USDA Caribbean Climate Hub.

To learn more, visit:

<https://prsciencetrust.org/recuperacionagricola/>



# Workshop Objectives:

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- 1** Share simple information on conservation practices to mitigate the effects of drought and climate change in agriculture.
- 2** Provide information and facilitate communication between federal agencies on assistance programs related to climate change.
- 3** Demonstrate digital tools for drought reporting, soil and land farm characteristics.

## General Agenda:

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### 9:00 am - 9:25 am

Welcome by Bárbara Rivera Chinae, *Recuperación Agrícola* Program Director.

**One USDA, the Caribbean Climate Hub and Climate Change** by Eva Holupchinski, Hub Coordinator.

Holupchinski provided a brief summary of USDA agencies and the Caribbean Climate Hub and an overview of climate change projections for the Caribbean.

### 9:25 am - 10:25 am

**Drought and Agriculture** by Dr. Nora Álvarez-Berríos, Caribbean Climate Hub Fellow and Odalys Martínez, National Weather Service Meteorologist.



Álvarez-Berríos presented information about drought in Puerto Rico and its effects on agriculture. Martínez explained the Drought Monitor and the CoCoRaHS program with a demonstration of how to use a pluviometer.

## Drought-focused presenters:

**Thursday, September 26, 2019**  
**Agricultural Experiment Station,  
Juana Díaz**

- Nora Álvarez-Berríos, Caribbean Climate Hub Fellow
- Odalys Martínez, Meteorologist, NWS
- Manuel Matos, Soil Scientist, NRCS
- Gabriel González, Public Affairs Specialist, RD



**Thursday, October 24, 2019**  
**University of Puerto Rico, Utuado  
Campus**

- Nora Álvarez-Berríos, Caribbean Climate Hub Fellow
- Rosalina Vázquez, Meteorologist, NWS

**Thursday, December 12, 2019**  
**Puerto Rico Science, Technology &  
Research Trust, San Juan**

- Nora Álvarez-Berríos, Caribbean Climate Hub Fellow
- Odalys Martínez, Meteorologist, NWS



## 10:35 am - 11:15 am

**Discussion panel about programs and practices for drought adaptation and mitigation** facilitated by Bárbara Rivera Chinae, Recuperación Agrícola Director. The panelists included representatives from Natural Resources Conservation Service, Farm Service Agency, Rural Development, and Agricultural Extension Service. Panelists discussed adaptation practices that can be implemented to attend drought, climate change, which programs provide disaster assistance and support and how the different agencies and organizations can support farmers to implement these practices. The panelists then answered questions from workshop participants.

## Panelist and presenters:

### Thursday, September 26, 2019 Agricultural Experiment Station, Juana Díaz

- Manuel Matos,  
Soil Scientist, NRCS
- Gabriel González,  
Public Affairs, RD
- Nicis Vega and Aníbal Velázquez,  
NRCS

### Thursday, October 24, 2019 University of Puerto Rico, Utuado Campus

- José M. Santiago,  
District Conservationist, NRCS
- Vivan Vera,  
Soil Conservationist Technician, NRCS
- Pedro Pérez, FSA
- Gabriel González,  
Public Affairs Specialist, RD

### Thursday, December 12, 2019 Puerto Rico Science, Technology & Research Trust, San Juan

- Norberto Valentín,  
District Conservationist, NRCS
- Dr. Jaime Curbelo,  
Dairy Cattle Specialist,  
UPR-M Agricultural Extension Services
- Dr. Daniel Bair Gallegos,  
Soil Specialist, UPR-M Agricultural  
Extension Services
- Lesly Colón, FSA



## 11:15 am - 12:15 pm

**Informative Session:** A variety of information tables were available for farmers to seek information about assistance programs, agricultural conservation practices, and digital tools for their farms. Government agencies and university groups were available for one-on-one conversations. Farmers could also explore digital tools such as the NRCS Web Soil Survey, the National Drought Mitigation Center (NDMC) Drought Impact Reporter, and the Hub's newly revealed Agricultural Statistics and Farm Planning Tools.

- Natural Resources Conservation Service (NRCS)
- Farm Service Agency (FSA)
- Farm Planning Tool (CCH)
- Agricultural Statistics Tool (CCH)
- Caribbean Climate Hub Story Maps and Resources
- Web Soil Survey from NRCS
- Rural Development (RD)
- Drought Impact Reporter / Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) - NOAA
- Puerto Rico Science, Technology and Research Trust
- UPR - Agricultural Extension Services

# Presentations Snapshots:

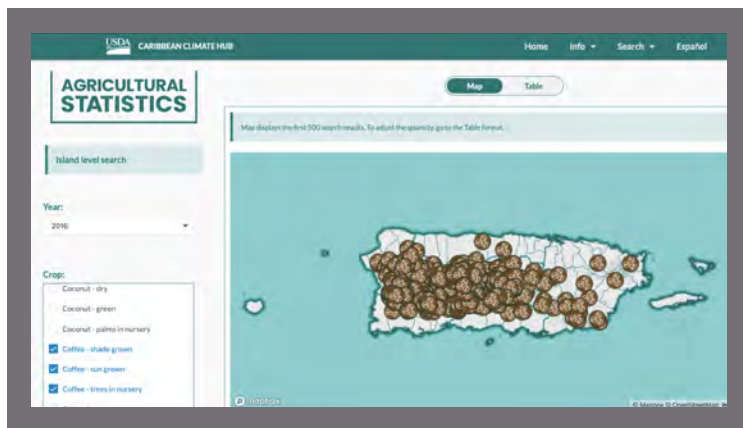
## ONE USDA, THE CARIBBEAN CLIMATE HUB AND CLIMATE CHANGE EVA HOLUPCHINSKI, CARIBBEAN CLIMATE HUB COORDINATOR

Agencies work within a wide variety of programs to help farmers build capacity, conserve resources, adapt to the effects of climate change, and recover from extreme events. These agencies work together to serve farmers under the guiding concept of One USDA. While there are many agencies operating under One USDA, some interact with farmers more directly, providing key financial and technical assistance to support successful agricultural production. Among these key agencies are Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), and Rural Development (RD).



The USDA Caribbean Climate Hub helps farmers and land managers increase resilience in the face of climate variability and change. The Hub provides support through the analysis and synthesis of science, outreach and education, technology transfer, and the development of digital support tools. During the workshop series, the Hub shared their story map resource on the missions of USDA agencies in the US Caribbean. A story map on USDA assistance programs and office locations was also available for workshop participants. During these workshops, the Hub took the opportunity to introduce two new digital tools: *Agricultural Statistics* and the *Farm Planning Tool*.

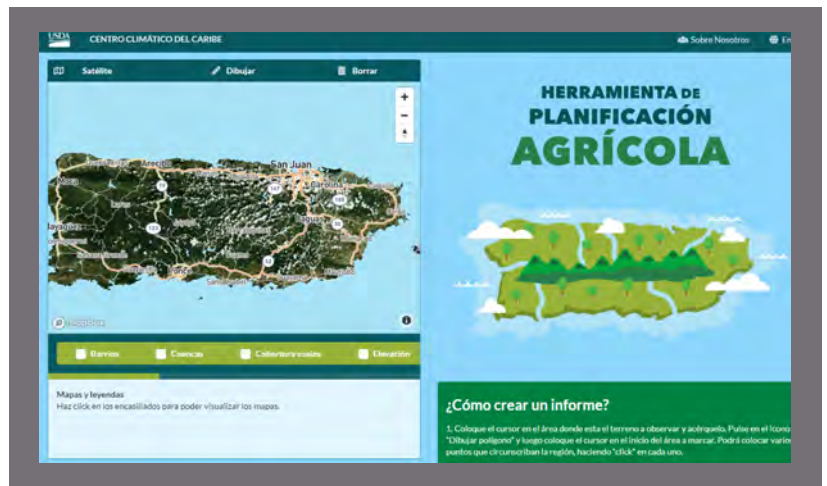
*Agricultural Statistics* is a tool that allows you to view and download data on the agricultural products of Puerto Rico. *Agricultural Statistics* was developed to provide accessible information on crop production in Puerto Rico. The tool contains data from the Office of Agricultural Statistics of the Puerto Rico Department of Agriculture (PRDA). Data values come from production estimates reported by farmers participating in the agricultural surveys of the PRDA Office of Agricultural Statistics. The data is summarized by neighborhood and grouped by year. Information can be displayed in map or table format at the island, agricultural region, municipality, or neighborhood level.



**Agricultural Statistics Tool**



The Farm Planning Tool allows users to select a land area and generate an instant report on the site's soils, climate, hydrology, and topography. While the Farm Planning Tool is useful for the general public, one of the primary intentions of the tool is for land managers and farmers to use the information to plan the use and management of lands.



**Farm Planning Tool**

While agriculture is experiencing a comeback among young Puerto Rican farmers, climate projections signal challenges for the region. Future climate scenarios in the Caribbean predict increasing temperature, rising sea level, shifting rainfall patterns, and more intense tropical storms and hurricanes (Hayhoe 2013). Puerto Rico is expected to warm faster than the global average, with an increase in both mean and extreme temperatures, including more days over 95°F and nights warmer than 85°F (Hayhoe 2013). Rainfall is expected to decrease, particularly in the wet season, with more frequent dry days (Gould, W.A., et al 2018). The frequency of moderate precipitation is likely to decrease, while more extreme precipitation (over 3 inches of rain in a day) is expected to be more common (Hayhoe 2013). Drought conditions are predicted to increase in frequency and intensity (Gould, W.A., et al 2018).



Taking these projections into account, farmers can consider adapting their land for wet and dry extremes by implementing resource conservation practices such as the installation of a water storage pond that captures runoff during heavy rain events and stores water for dry conditions. Since drought is predicted to increase and is one of the most frequent extreme event affecting Puerto Rican producers, it is important for farmers to learn about drought and the steps they can take to mitigate its effects.

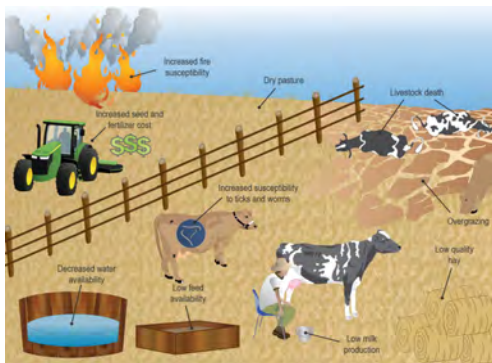
## DROUGHT IN PUERTO RICO

### DR. NORA ÁLVAREZ-BERRÍOS

#### CARIBBEAN CLIMATE HUB RESEARCH FELLOW



Drought is a reduction in precipitation over a prolonged period. Drought conditions can be exacerbated by high temperatures, high winds, and low relative humidity. The extent of the effects of a drought can be challenging to understand, in part because the beginning and end of a drought can be difficult to define. Unlike a flood or tornado, the effects of drought do not cause infrastructural damage and often stretch over a large geographic area (Wilhite 2000).



#### Drought effects on livestock

Figure source:

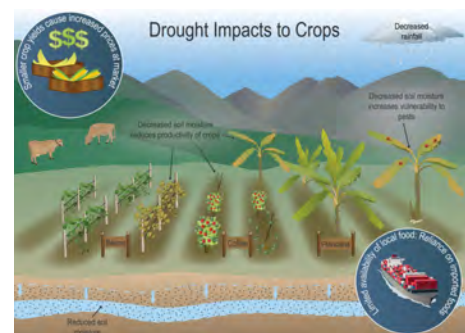
[https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH\\_USGS\\_DroughtImpactsonLivestock\\_2019.pdf](https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH_USGS_DroughtImpactsonLivestock_2019.pdf)

There are three main types of drought: meteorological, agricultural, and hydrological. Agricultural drought occurs when a decrease in rainfall leads to a reduction in soil moisture, decreasing production in crops and rangelands. Drought conditions cause a reduction in crop yield and an increased vulnerability to pests, which often result in elevated prices for local products (Caribbean Climate Hub and Climate Adaptation Science Center 2019). For dairy and cattle farmers, dry conditions can result in an increase in wildfires in rangelands, a lack of livestock feed, low milk production, an increase in livestock vulnerability to pests and disease, and elevated operational costs due to a greater need for items such as seeds and fertilizers (Caribbean Climate Hub and Climate Adaptation Science Center 2019).

## MITIGATING AND MONITORING DROUGHT CONDITIONS

Many conservation practices can help to mitigate the effects of future drought events. NRCS provides farmers with technical assistance for the implementation of conservation practices. Some of these practices include multi-story cropping, contour farming, crop rotation, irrigation reservoirs, cover crops, and vegetative barriers.

Producers can stay informed about drought conditions in their region by referring to the weekly maps published by the US Drought Monitor. Farmers can also help ensure that the US Drought Monitor maps are as accurate as possible by reporting drought effects on their land to the Drought Impact Reporter or enrolling in the CoCoRaHS program to report daily rainfall. This information will be taken into account as the authors of the US Drought Monitor maps create the weekly drought map, as described in more detail by Odalys Martínez.



#### Drought effects on crops

Figure source:

[https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH\\_USGS\\_DroughtImpactsonCrops\\_2019.pdf](https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH_USGS_DroughtImpactsonCrops_2019.pdf)



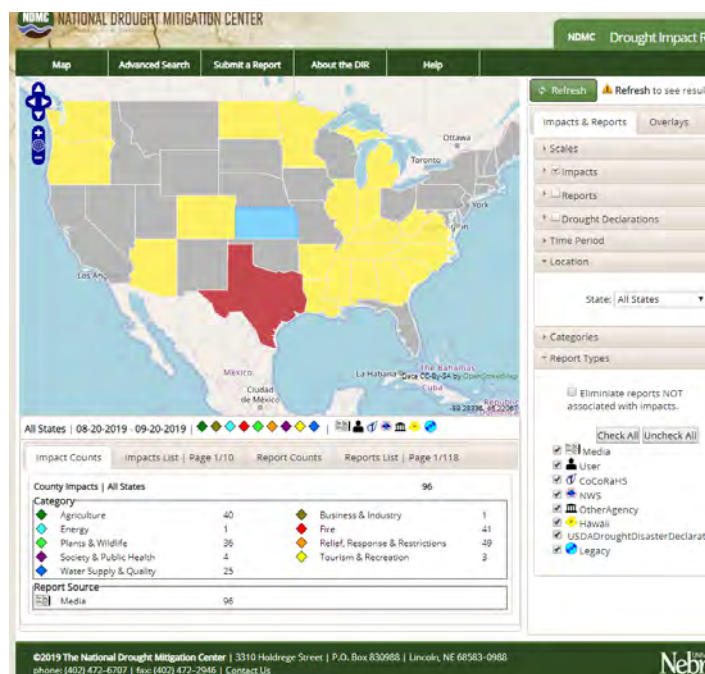
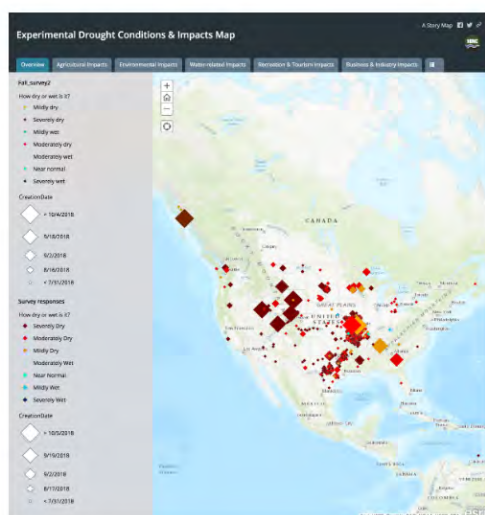
## REPORTING DROUGHT CONDITIONS

**ODALYS MARTÍNEZ, METEOROLOGIST,  
NATIONAL WEATHER SERVICE**

The National Weather Service, National Drought Mitigation Center, the National Integrated Drought Information System, and the USDA Climate Hubs are working with communities to collect information from the public about the effects of drought in their area. The Drought Impact Reporter is an online platform that allows the general public to submit reports on the local drought conditions. The submitted information is available for viewing in a map.

### WHY IS THE DROUGHT IMPACT REPORTER IMPORTANT?

#### Submit and view observations



As authors of the US Drought Monitor work to create weekly maps of drought conditions in the US and affiliated territories, the reports on drought conditions in the Drought Impact Reporter help authors compile the most accurate representation of current drought conditions as possible. Authors will use the public reports from the Drought Impact Reporter to validate and reconcile conflicting data. The accuracy of the weekly drought maps is important for farmers, as several USDA programs use the maps to determine the locations that are eligible for disaster assistance. Producers in areas with declared drought may have easier access to FSA's Livestock Indemnity Program, Livestock Forage Program, and Noninsured Crop Disaster Assistance Program. By allowing farmers and the general public to report drought conditions in their area, they are more likely to receive the drought-related assistance when they need it the most. As more accurate information is incorporated into the USDM map, more reference information is available to inform the need for federal disaster programs that trigger aid for the regions in need.

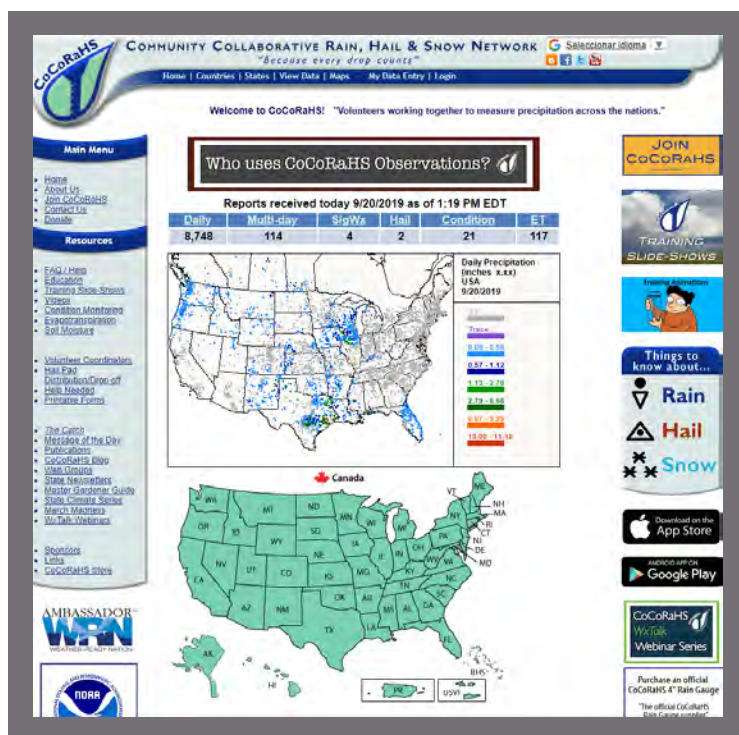




## MONITORING RAINFALL IN YOUR FARM WITH THE COMMUNITY COLLABORATIVE RAIN, HAIL AND SNOW NETWORK (COCORAHS)

Another great tool for citizen scientists is the CoCoRaHS program, a network of volunteer meteorological observers who measure and report precipitation on a daily basis. The network uses low-cost measurement tools, capacity training, climate education, and an interactive webpage where volunteers report data that is made available to the public in a map.

By monitoring and reporting drought conditions with the Drought Impact Reporter and by measuring precipitation with CoCoRaHS, citizen scientists play a crucial role that contributes to more accurate weekly drought maps from the US Drought Monitor, that in turn help USDA agencies to offer drought assistance where it is needed the most.





## NATURAL RESOURCES CONSERVATION SERVICE

Natural Resources Conservation Service (NRCS) is the agency in charge of providing technical and economic assistance to farmers and ranchers for the implementation of conservation practices on their farms. NRCS administers an array of programs that promote the conservation of soils and other natural resources that are present on farms. Some of the water conservation practices supported by NRCS to help mitigate drought are: irrigation canals (such as Key Line), irrigation ditch lining, sprinkler systems, row arrangements, roof runoff structures, forest stand improvements, as well as water and sediment control basins.

## FARM SERVICE AGENCY

Farm Service Agency (FSA) is responsible for facilitating farmer and rancher access to agricultural loans and financial assistance that ease the effects of market fluctuations and natural disasters. If a farmer or landowner wants to apply to USDA relief and aid programs, they first need to register with FSA.

## AGRICULTURAL EXPERIMENTAL STATION

AES is a research program in tropical agriculture from the University of Puerto Rico, that safeguards the sustainability of food production and environmental conservation in Puerto Rico and the Caribbean by improving the quality of life and conservation of natural resources.

## PHOTO OVERVIEW



# Workshop Impact:

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**70**

small-scale farmers attended the workshops and learned about the projected effects of climate change in the region, potential impacts to agriculture and were introduced to digital tools to support their operations.

**21**

farmers signed up as CoCoRaHS volunteer citizen scientists during the workshop series! The new CoCoRaHS stations, which are well-distributed across Puerto Rico, will help US Drought Monitor accurately represent drought conditions in the weekly drought maps.

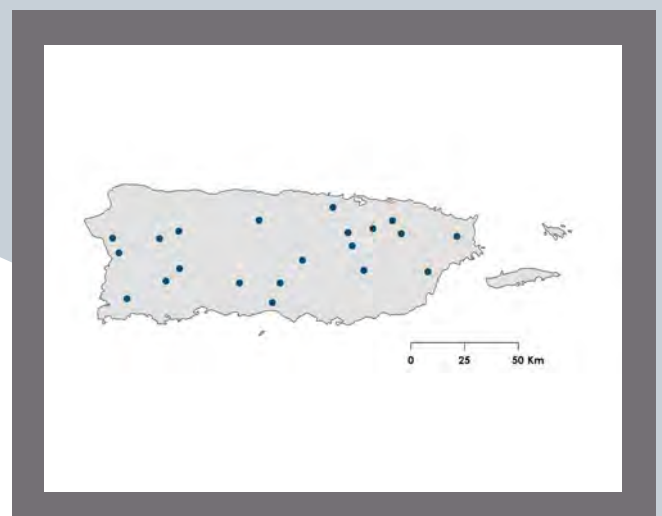
**20**

representatives from collaborating entities, including USDA agencies, NOAA and Agricultural Extension Service had the opportunity to connect with farmers.

**10**

municipalities with new CoCoRaHS stations across Puerto Rico.

New CoCoRaHS participants from Finca NOA, Toa Baja



New CoCoRaHS participants map

# Appendix:



To learn more about Recuperación Agrícola, visit:  
<https://prsciencetrust.org/recuperacionagricola/>



Agricultural Statistics Tool Link:

<https://caribbeanclimatehub.org/tools-apps/agricultural-statistics/>

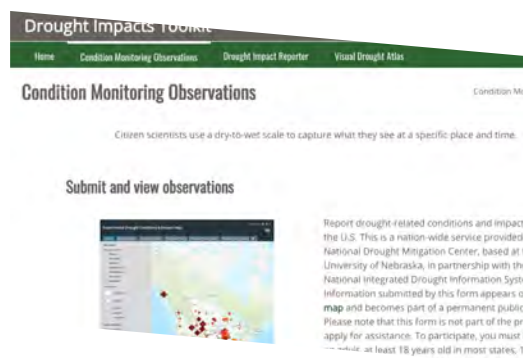


CoCoRAHS Link:

<https://www.cocorahs.org/state.aspx?state=pr>

Web Soil Survey Link:

<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>



Drought Impact Reporter Link:

<https://droughtimpacts.unl.edu/ConditionMonitoringObservations.aspx>



DIGITAL TOOLS FOR AGRICULTURAL RESILIENCY  
FACT SHEET:

For more information on drought condition reporting in the US Caribbean and new digital tools from the USDA Caribbean Climate Hub, check out our reference sheet here:



### Herramientas digitales para la resiliencia agrícola

El Centro Climático del Caribe es uno de los diez centros regionales distribuidos por Estados Unidos y el Caribe, los cuales proveen apoyo técnico e información científica a agricultores (as), ganaderos (as) y manejadores (as) forestales para fortalecer su capacidad de mitigación y adaptación al cambio climático. En este ahinco el Hub colaboradora con distintas agencias y organizaciones para apoyar el desarrollo agrícola y forestal de las islas por medio de herramientas digitales, investigación climática y capacitación práctica. A continuación, compartimos varias de las herramientas digitales que pueden ayudar a la planificación de su finca tomando en cuenta información geoespacial y climática:

#### Herramienta de Planificación Agrícola/ Farm Planning Tool:

La Herramienta de Planificación Agrícola provee un resumen de las características espaciales sobre suelos, clima, hidrología y relieve de cualquier área en Puerto Rico. Esta información podrá ayudarte a planificar tu producción según la información presentada por cada capa de información.



Accede a: [www.caribbeanclimatehub.org/farmtool](http://www.caribbeanclimatehub.org/farmtool)

#### Herramienta de Estadísticas Agrícolas/ Agricultural Statistics Tool:

La Herramienta de Estadísticas Agrícolas proporciona información sobre la producción de los diferentes cultivos en Puerto Rico utilizando los datos recopilados por el Departamento de Agricultura de Puerto Rico (DAPR). Podrás desplegar los datos a modo de tabla o mapa y hacer tu búsqueda por año de producción, tipo de cultivo y por municipio.



Accede a: [www.caribbeanclimatehub.org/estadisticasagricolas](http://www.caribbeanclimatehub.org/estadisticasagricolas)



### Reporte de las condiciones e impacto de la sequía/ Drought Impact Recorder:

El Centro Nacional de Mitigación de Sequía, el Sistema Nacional Integrado de Información de Sequía y los Centros Climáticos del USDA, están trabajando con comunidades para recopilar información de condiciones e impacto de sequía. La herramienta permite que el público en general someta informes de las condiciones locales de sequía y las visualice a modo de mapa. Los informes ayudan a validar y conciliar datos en conflicto que el autor semanal del Monitor de Sequía de EE. UU. puede utilizar para actualizar el mapa del Monitor. Los datos proyectados en el mapa, desencadenan respuestas de programas federales de alivio económico por desastres.



Acceda a: <http://droughtreporter.unl.edu/submitreport>

### CoCoRaHS:

CoCoRaHS es una red de observadores meteorológicos voluntarios (as), que trabajan juntos para medir y visualizar geográficamente la precipitación. La red utiliza herramientas de medición de bajo costo, capacitación de uso, educación climática y una página web interactiva para recopilar los datos. El propósito es poder recopilar la información de más alta calidad para el uso práctico en investigaciones, recursos naturales y educación.



Acceda a: [www.cocorahs.org](http://www.cocorahs.org)

### Información de ayudas por desastres del USDA:

<http://caribbeanclimatehub.org/herramientas-apps/story-maps/?lang=es>

Contáctenos:

Web: [www.caribbeanclimatehub.org](http://www.caribbeanclimatehub.org)  
T. 787-764-7116/7172  
E. [caribbeanclimatehub@gmail.com](mailto:caribbeanclimatehub@gmail.com)

Búsquenos en las redes sociales:

Facebook: @CaribbeanClimateHub  
Twitter: @Caribehub  
Youtube: Caribbean Climate Hub

El desarrollo del sitio web fue financiado por el Departamento de Agricultura de los Estados Unidos (USDA) a través del Centro Nacional de Mitigación de Sequía y el Sistema Nacional Integrado de Información de Sequía.



DETAILED LIST OF NEW COCORAHs PARTICIPANTS!

County	Station Name
Lares	Lares 2.0 NNE
Añasco	Añasco NNE
Ponce	Ponce 8.1 N
Maricao	Maricao 7.6 ESE
Sabana Grande	Sabana Grande 3.5 NE
Fajardo	Fajardo 3.5 W
Lajas	Lajas 1.9 WSW
Juana Díaz	Juana Díaz 3.0 SE
Mavaoúez	Mavaoúez 2.4 NE
Barranquitas	Barranquitas 2.8 WNW
Humacao	Finca Aponte
Toa Baja	Campanilla 1.1E
San Juan	San Juan 5.2 S
Villalba	Villalba 3.0 SE
Cayey	Cayey 5.4 ENE
Bavamón	Bavamón 4.4 S
San Sebastián	San Sebastián 4.3 SE
Carolina	Carolina 2.9 SSE
San Juan	Campo Rico 3.1 SW
Aguas Buenas	Aguas Buenas 2.4 W
Arecibo	



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Caribbean Climate Hub and Climate Adaptation Science Center. (2019) *Drought in the U.S. Caribbean: Impacts on Livestock* [Fact sheet]. U.S. Department of Agriculture and U.S. Geological Survey. [https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH\\_USGS\\_DroughtImpactsonLivestock\\_2019.pdf](https://www.climatehubs.usda.gov/sites/default/files/USDA-CCH_USGS_DroughtImpactsonLivestock_2019.pdf)

Gould, W.A., E.L. Díaz, (co-leads), N.L. Álvarez-Berríos, F. Aponte-González, W. Archibald, J.H. Bowden, L. Carrubba, W. Crespo, S.J. Fain, G. González, A. Goulbourne, E. Harmsen, E. Holupchinski, A.H. Khalyani, J. Kossin, A.J. Leinberger, V.I. Marrero-Santiago, O. Martínez-Sánchez, K. McGinley, P. Méndez-Lázaro, J. Morell, M.M. Oyola, I.K. Parés-Ramos, R. Pulwarty, W.V. Sweet, A. Terando, and S. Torres-González (2018). *U.S. Caribbean. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 809–871. doi: 10.7930/NCA4.2018.CH20

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