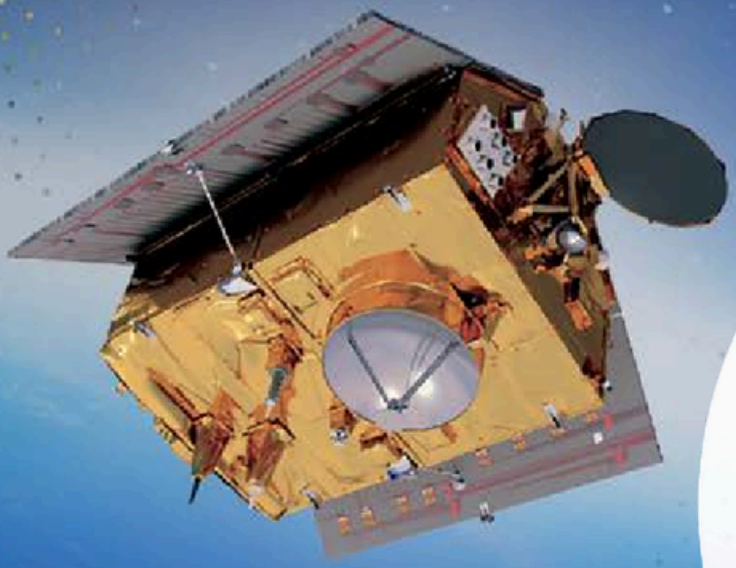
The Intra-ACP Climate Services and Related Applications Programme

Brief for Agriculture Sector Policymakers

Climate Services for Agriculture: Exploring Partnership and Investment Options









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INTRA-ACP CLIMATE SERVICES AND RELATED APPLICATIONS PROGRAMME
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Summary

Key Messages & Recommendations

Summary

This Brief

- Summarises the major impacts of climate on agricultural productivity in the Caribbean;
- Discusses key issues in building resilience, particularly through early warning of the impacts of extreme weather and climate events in the agricultural sector in the Caribbean;
- Highlights the suite of products and services produced by the Caribbean Regional Climate Centre (RCC), hosted by the Caribbean Institute for Meteorology and Hydrology (CIMH); and
- How the products and services can support effective decision-making and policymaking in the sector.

Key Messages

1. Climate and weather events continue to result in considerable losses and damages within the Caribbean agricultural sector. Impacts are expected to increase in a changing climate with increasing variability and extremes.

2. Sector access to and application of freely available climate early warning information developed by the Caribbean RCC and its partners from the regional National Meteorological and Hydrological Services (NMHS) is critical to making climate smart decisions that better manage climate risks. This embraces the Early Warning for All (EW4All) initiative as led by the UNDRR with the support of the WMO.

3. Agricultural Extension Officers, farmers, and researchers require support to increase and enhance their use of climate products and services emanating from the region.

4. There is an opportunity to partner with the Caribbean RCC and its network of NMHSs to upgrade and expand the suite of climate early warning information tools for the agriculture sector; as well as mainstream their use in agricultural decision-making.







Key Recommendations

Invest in the development and mainstreaming of climate early warning information for agriculture at national and regional levels. Two specific investment areas include:

1. *Improving the provision of climate information for agriculture*
   - Support the enhancement and expansion of the meteorological observation network for targeted agricultural areas; and
   - Support foundational research and development (R&D) for a new generation of climate early warning information products tailored for agriculture.
2. Supporting agricultural practitioners' application of climate information
   - Support the development and/or strengthening of national coordination mechanisms that facilitate closer working relationships between agricultural practitioners and the NMHS;
   - Support the development and/or enhancement of National Agricultural Disaster Risk Management Plans to include climate-related information such as drought and excessive rainfall and heat; and
   - Build capacity amongst the farming and wider agricultural community, including agriculture extension, through the enhancement and expansion of Farmers Forums and mainstreaming agricultural climate services such as the Participatory Integrated Climate Services for Agriculture (PICSA) approach at the national level.

The Caribbean RCC and its network of NMHS invites agricultural policymakers to partner with us to support the advancement of climate services for Caribbean agriculture.



Climate Impacts on Caribbean Agriculture

Climate Impacts on Caribbean Agriculture

Agriculture contributes significantly to the development of Caribbean economies in several ways, ensuring food security, supplying raw materials to non-agricultural sectors creating employment opportunities, and generating foreign exchange through the export of agricultural products.

However, the sector remains highly vulnerable to climate and weather extremes such as droughts, dry spells, floods, strong winds and heatwaves, which often result in considerable losses and damages for Caribbean agriculture:

DROUGHTS

As a result of the 2009-2010 drought, 25% of onion production and 30% of the tomato crop were lost in Antigua and Barbuda in 2010 while in Guyana's Region 2, the desperation for water by some rice farmers resulted in them pumping saline water to about 150 acres of rice lands despite the potentially grave long term consequences of such actions (Farrell et al, 2010). The 2014-2016 drought resulted in decreased agricultural production and increased food prices in at least 10 Caribbean territories (Trotman et al., 2018). Since then, in 2019, Belize suffered an estimated USD 25 million in crop losses due to drought (The San Pedro Sun, 2019) and, similarly, in Jamaica an estimated 5,600 farmers were affected with losses of approximately 500 hectares of crops (The Jamaica Observer, 2019).

In October 2022 Jamaica recorded a significant decline in rainfall, with this continuing for the rest of 2022 and into 2023, with 33% less rainfall in December 2022, 68% less rainfall in January 2023, and 72% less rainfall in February 2023, which resulted in low crop yields, loss of crops and/or livestock and a significant drop in income (Jamaica Gleaner 6 June, 2023). By March 2024, Suriname experienced its worst drought in 25 years with little rainfall for eight months, leading to widespread reductions in crop yields, particularly in the northern districts of Para and Saramacca where crop yields decreased by more than 25 percent (CGTN News, March 2024).



FLOODS

In 2011, 2143 farms in Guyana were affected by widespread floods (CDEMA, 2011); while in 2018, approximately 75% of local farmers in Trinidad were severely affected through the loss of crops and livestock. In 2012, the parish of St. Mary in Jamaica suffered about USD 1.67 million in overall damages, occurring on 415 hectares of farmland and affecting about 5,500 farmers due to flooding flooding and land slippage as a result of excessive rainfall (Fontes de Meira & Phillips, 2019). The President of Guyana announced that, apart from 25,000 homes being impacted, thousands of farms had been severely impacted and livelihoods lost due to a major rainfall event in May 2021 (Floodlist, 2021).

More recently, in November 2024, severe weather adversely affected the agricultural sector in Saint Vincent and the Grenadines, with more than 200 vegetable farmers reporting damage from heavy rainfall and associated flooding, raising concerns over agricultural production and produce supply (Ministry of Agriculture Saint Vincent and the Grenadines, November 2024).

In May 2025, severe flooding resulting from heavy rainfall affected sections of Johanna and Yakusari in Guyana, impacting residents and causing significant losses to cash crops (Ministry of Agriculture Guyana, May 2025).

In November 2025, a surface-to-low-level trough triggered nationwide flooding in Barbados. Over nine inches of rainfall were recorded in some areas, resulting in severe flooding, substantial crop and livestock losses, and one fatality (Barbados Today, November 2025; The Daily Herald, November 2025).

In April 2026, a trough system brought extreme rainfall to Dominica, with as much as 26 inches recorded at one rainfall station. The event caused widespread disruption across the island, including damage to infrastructure and loss of access to agricultural lands and farms (Dominica News Online, April 2026).

HEATWAVES

In September 2019, the Barbados Agricultural Society reported increased mortality of broilers and layers, as well as, disruption in the breeding cycle of some animals including dairy cows due to excessive heat (Brathwaite, 2019). In September 2023, after weeks of intense heat, the Minister of Agriculture of St. Vincent and the Grenadines identified significant negative impacts on vegetable production just ahead of the Christmas period (St. Vincent Times 2023). By May 2024, significant heat in conjunction with dry conditions and strong winds and the presence of sulphur in the volcanic island of Grenada increased bush fires (Ifrc.org 2024).

HURRICANES

In 2004, Hurricane Ivan destroyed Grenada's nutmeg industry; while in 2017, the agricultural sector of Dominica sustained USD 380.2 million in losses (ACAPS 2018) as Hurricane Maria caused severe damage to farm housing, irrigation, infrastructure, feeder roads, forest reserves, coastal fisheries and widespread loss of poultry (CARDI, 2017). In July 2024 in Barbados, about 75% of the active fishing fleet was damaged with 88 boats totally destroyed, due to Hurricane Beryl (BBC 29 December 2024). Hurricane Rafael, the joint strongest November tropical cyclone in the Gulf of Mexico on record with Hurricane Kate in 1985 caused significant losses in Cuba's agriculture, worsening food shortages (Reuters, November 20, 2024).

In 2025, Hurricane Melissa, a Category 5 hurricane with wind speeds of up to 185 mph, delivered a devastating blow to Jamaica's farmers and fishers, who were still recovering from the impacts of Hurricane Beryl just 15 months earlier. Hurricane Melissa affected more than 70,000 farmers and disrupted operations across 41,390 hectares of farmland. Approximately 1,251,410 animals, including small ruminants, poultry, and cattle, were lost (Centre for Disaster Philanthropy, 2025; AP News, 2 November 2025; Ministry of Agriculture Jamaica, 14 November 2025).







Climate Early Warning Information for Caribbean Agriculture

In a study of the economic impact of the seasonal drought information service in Jamaica, Rahman et al. (2016) highlighted the benefits of the provision and use of timely climate information services to over 300 farmers during times of drought. The study showed that when farmers were faced with uncertainty of limited available water during the 2014-2016 drought, the provision of information about water availability improved their decision-making. Farmers utilizing drought early warning information systems experienced reduced losses in agricultural production compared to those who did not.

CIMH, the World Meteorological Organization-designated RCC for the Caribbean, produces a range of climate information products and tools that help the agriculture sector to better manage the potential climate hazards or opportunities. For example, climate monitoring products document significant recent past weather and climatic conditions allowing agriculturalist to relate the recent climate conditions to current crop and livestock statuses. The climate forecast products also systematically assess the relative chance of a particular climate-related event occurring 3 to 6 months in advance. With this information, farmers could use early warning to prepare for adverse operating conditions in the coming months or use the opportunity to take advantage of favourable conditions. Recently, the Caribbean RCC developed a methodology to provide sub-seasonal (weekly) forecasts for the probability of a day of excessive rainfall during the week, as well as the number of dry days and the number of days of excessive heat. These will provide another layer of actionable information to the sector at this shorter more imminent timescale, once operational.

Rainfall Deficits/Availability

The Caribbean region includes several of the world's most water-stressed countries (WRI, 2013). With the exception of the Guianas, the region experiences a distinct seasonal climate – one dry season and one wet season annually – with the wet season typically coinciding with the June to November Atlantic hurricane season. As most agricultural systems in the Caribbean still rely heavily on rainfall, the sector remains particularly vulnerable to fluctuations in precipitation patterns.

Climate-Related Risks and Opportunities from Excessive Rainfall and Rainfall Deficits in the Caribbean

RISKS ASSOCIATED WITH EXCESSIVE RAINFALL AND RAINFALL DEFICITS

1. Prolonged and intense rainfall in the Caribbean can cause significant challenges for agriculture, including soil erosion, waterlogging, and landslides. On sloped lands, heavy rains often lead to topsoil loss, reducing soil fertility and long-term productivity while increasing sedimentation in waterways (FAO, 2021). Waterlogged soils hinder root respiration and nutrient uptake, stunting crop growth and affecting sensitive crops such as cassava, tomatoes, and onions (CARDI, 2020). In mountainous areas, excessive rainfall can also trigger landslides that damage cropland, irrigation infrastructure, and rural roads, further disrupting production and market access (IPCC, 2022).

2. Excess moisture in the Caribbean creates warm, humid conditions that are ideal for the development and spread of pests and diseases affecting both crops and livestock. Fungal infections such as anthracnose, bacterial leaf spot, and pests like slugs and weevils thrive under these conditions (UWI, 2020). Additionally, prolonged rainfall disrupts harvesting and drying of crops such as maize, legumes, and cocoa, leading to post-harvest losses and reduced farmer income (FAO, 2016).

3. Excess moisture also affects pollinator activity and pollen viability, particularly in fruit crops such as soursop, mango, and citrus (Caribbean Development Bank, 2022).

4. Limited rainfall and extended dry spells have severe implications for agriculture. Reduced photosynthesis and impaired nutrient uptake lead to poor flowering and fruit set, ultimately lowering yields. Water scarcity also reduces streamflow and groundwater recharge, restricting irrigation for high-value crops. Livestock production is similarly impacted, as both forage availability and access to drinking water decline, particularly affecting small ruminants and dairy cattle (CARDI, 2019).

5. Prolonged droughts contribute to soil degradation, including crusting, reduced microbial activity, and the risk of desertification, especially on marginal lands (IPCC, 2022). Dry conditions also increase the likelihood of wildfires, which can devastate pastures, tree crops, and ecologically sensitive areas.

OPPORTUNITIES FROM CLIMATE EXTREMES

While mostly negative, some climate extremes can provide certain opportunities:

1. Drier conditions reduce humidity and can lead to lower incidence of pests and diseases, decreasing the need for chemical inputs. Additionally, short dry spells before harvest can enhance the quality of certain crops, such as increasing sugar concentration in sugarcane.

2. Flooding in low-lying areas can sometimes deposit nutrient-rich silt, temporarily enhancing soil fertility and improving yields in subsequent planting cycles (FAO, 2017). Meanwhile, growing water scarcity is fostering innovation across the region, leading to the adoption of efficient irrigation systems, rainwater harvesting techniques, and drought-tolerant crop varieties.

Caribbean RCC products and tools that may help farmers manage precipitation extremes include:

CLIMATE EVENTS	MONITORING	OUTLOOKS/ FORECAST	BULLETINS	ONLINE PORTAL
Drought Dry Spell	SPI Monitor SPEI Monitor	The CariCOF Climate Outlook Newsletter Atlantic Hurricane Season Outlook The CariCOF Drought Outlook The CariCOF Dry Spells Outlook The CariCOF Wet Spells Outlook CariCOF Flash Flood Potential Outlook	The Caribbean Drought Bulletin The Caribbean Agro-Climatic Bulletin	CARISAM Portal
Wet Spell Flood				

Heat Stress

The Caribbean Heat Season refers to the period of the year characterized by a sustained increase in the frequency and intensity of extremely hot days and nights, as well as the occurrence of heatwaves. Since around 1995, there has been a significant rise in the number of hot days and heatwaves across the region, attributed to ongoing climate change and rising global temperatures. (CIMH, 2021; IPCC, 2021). Historically, the heat season was mostly confined to the months of August to October. However, recent observations indicate that it has effectively doubled in duration, now typically spanning from May to October, with extreme heat events occasionally occurring as early as March and as late as November (CIMH, 2021). This extension significantly increases the period during which populations, ecosystems, and agricultural systems are at heightened risk of heat stress, with the peak threat occurring during the core heat season months.

IMPACT OF HEAT STRESS ON AGRICULTURE

1. Heat stress affects water availability, crop performance, livestock health, and farmer wellbeing. During heatwaves, farmers face limited access to water resources, impacting both crop irrigation and drinking water for livestock and poultry.
2. In crops, high temperatures accelerate evapotranspiration, leading to greater water demand and moisture deficits. Elevated respiration rates under heat stress causes cellular damage and reduces photosynthetic efficiency, while critical temperature thresholds during reproductive stages can result in pollen sterility, thereby reducing yields in heat-sensitive crops (IPCC, 2022; FAO, 2021).

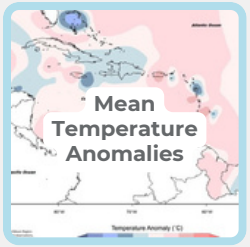
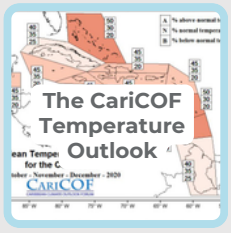
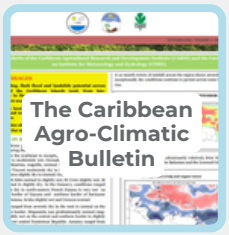
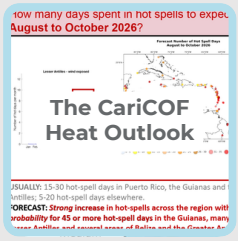
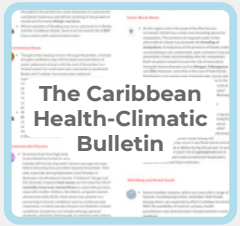




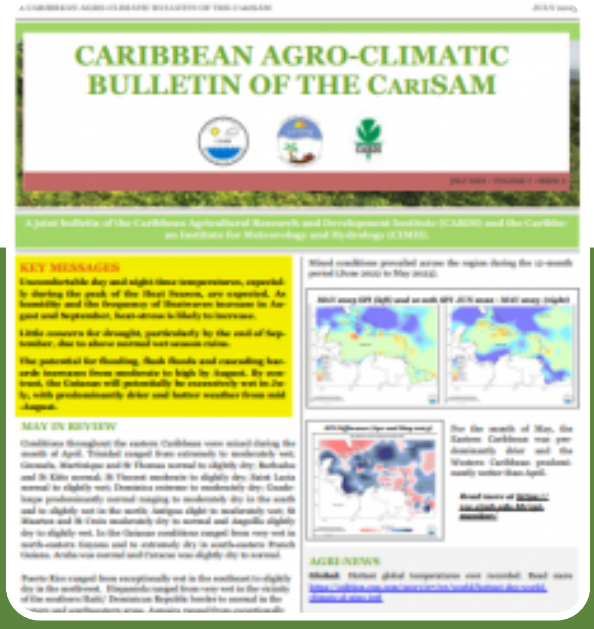
3. Livestock and poultry are similarly vulnerable to heat stress, which is becoming more frequent and severe in tropical regions like the Caribbean. Heat stress impairs feed intake, growth rates, and reproductive performance, while also weakening the immune response and reducing red blood cell counts, increasing susceptibility to infectious diseases (IPCC, 2022).

In addition to impacts on crops and animals, heat exposure poses direct risks to farmers themselves. Prolonged outdoor work during extreme heat events increases the risk of heat exhaustion, dehydration, and reduced labour productivity, which can further compromise agricultural output and livelihoods (CIMH, 2021).

Caribbean RCC products and tools that may help farmers manage heat exposure to their animals and crops, as well as themselves, include:

CLIMATE EVENTS	MONITORING	OUTLOOKS/ FORECAST	BULLETINS	ONLINE PORTAL
Prolonged Number of Hot days				
Heat Waves				

The suite of operational climate monitoring and forecast products cover all countries in the geographic Caribbean and are updated monthly by a team of regional and national level climate experts. Other products such as the monthly Caribbean Agro-Climatic Bulletin are coproduced in close association with key agriculture partners such as the Caribbean Agricultural Research and Development Institute (CARDI).



The Caribbean Agro-Climatic Bulletin of the Caribbean Society for Agro-Meteorology

This bulletin forms an integral part of the work of the Caribbean Society for Agricultural Meteorology, providing an important link between agricultural practitioners and climate scientists. The new and improved platform is scheduled to be relaunched in November 2026, further strengthening access to relevant climate and agricultural information.

- Presents an overview of the status of agricultural production, including forestry and livestock.
- Helps agricultural practitioners understand significant recent past weather and climatic conditions essential to agriculture at regional and national levels.
- Is a source for forecasted agro-climatic conditions.

The new and improved platform is scheduled to be relaunched in November 2026, further strengthening access to relevant climate and agricultural information.

All products are freely available on the Caribbean RCC website at http://rcc.cimh.edu.bb.

More broadly, the CIMH also provides services to support near real-time monitoring of the hydrological environment, impact-based forecasting and early warning. A key tool in this regard is the Caribbean Dewetra Platform. – an online spatio-temporal data fusion decision making platform hosted and maintained by CIMH. The platform can be used to support impact-based forecasting and early warning for the agriculture sector. For example, hydro-meteorological observations are published on the platform to monitor in near real-time the status of the hydrological environment. Further, Common Alerting Protocol (CAP) workflows are supported for dissemination of warnings. Access to the Caribbean Dewetra Platform is freely available to Member States of the Caribbean Meteorological Organisation (CMO).

Improving the Provision of Climate Information for Agriculture

In the past, both farmers and Agricultural Extension Officers have identified the challenge of a paucity of weather and climate information for targeted agricultural areas, which would be more applicable to their operations (CIMH, 2013). Higher resolution data would provide more relevant output but would require a denser network of meteorological instruments and greater allocation of resources to cover the many agro-climatic zones. In recent times, CIMH has supported a number of initiatives that have increased the density of weather stations with output in digital formats. The Caribbean RCC is also actively investigating how data from the network of meteorological instruments can be supplemented by satellite data, further increasing the resolution of input weather and climate data.

The Caribbean RCC continues to improve the range and quality of climate information to the benefit of Caribbean agriculture through foundational R&D activities. Currently, the Caribbean RCC is testing and implementing a series of experimental products applicable to agriculture, including seasonal heatwave frequency outlooks (up to 6 months), seasonal dry spell frequency outlooks (3 months), seasonal rainfall exceedance outlooks for crop water demand (3 months) and drought monitoring Standardized Precipitation Index(SPI) and Standardized Precipitation Evapotranspiration Index (SPEI) change maps.

Moreover, CIMH maintains close working relationships with key agricultural partners including CARDI and the Agricultural Alliance of the Caribbean (AACARI) for the express purpose of developing new specialised and integrated (ie. climate and agriculture) products and services. Moreover, CIMH has partnered with the Food and Agriculture Organization of the United Nations (FAO) on key projects and tools benefitting the agriculture sector. Ongoing and future work includes the development of temperature humidity indices for small ruminants; the identification of country-specific drought thresholds for national Agricultural Disaster Risk Management (ADRM) plans; calibrating a crop water productivity model to simulate crop water and irrigation requirements; and developing forecasting systems for pests and diseases like Black Sigatoka and whitefly.

CIMH is also working towards updating climate information products on temperature and rainfall at a sub-seasonal (up to weeks 3 and 4 ahead) timescale – better helping the sector to make important decisions.



Supporting Agriculture Practitioners' Application of Climate Information

Supporting Agriculture Practitioners' Application of Climate Information

In an era of changing climate and increased weather and climate risk, having reliable advice on the timing and intensity of climate events is becoming increasingly important.

Agricultural practitioners will soon have access to the fully functional portal of the Caribbean Society for Agro-Meteorological (CariSAM) coordinated by the Caribbean RCC.



The CariSAM Portal

The portal of the Caribbean Society for Agro-Meteorology (CariSAM) is an interactive online platform designed to enhance collaboration and dialogue in the agriculture community. It is also a hub for providing weather and climate information, as well as applied research in agro-meteorology and related sciences both from the region and around the world. Importantly, the portal has the potential to build the capacity of agricultural practitioners to use climate information. The Portal serves as:

1. A weather and climate information resource to the Caribbean agriculture and food security sector.

2. A platform that supports meteorologists and climatologists to better provide tailored climate information products and services for the sector. These include national and regional agro-meteorological bulletins, climate outlooks and weather forecasts.

3. A publication hub showcasing state-of-the-art applied research in agro-meteorology and related sciences from the region and around the world.

In addition, CIMH offers countries technical training and support in climate-smart approaches for agriculture. One internationally recognised approach already adopted by the Caribbean RCC and its partners in Guyana, Dominica, Jamaica and Belize, is the Participatory Integrated Climate Services for Agriculture (PICSA). This approach aims to enable farmers to make informed decisions based on location specific, climate and weather information, locally relevant crop, livestock and livelihood options, with the use of participatory tools to aid decision making. The information provided guides Agriculture Extension Officers to advise farmers on what type of crops and livestock to invest in by determining which crops are resilient or suitable, and possible options to reduce their vulnerability to potential climate shocks for the upcoming season. Only a few Caribbean countries have benefitted from the PICSA approach to date.

Another important interface platform are Farmer's Forums – an interface platform designed to give farmers the opportunity to interface with meteorologists/climatologists from the National Met Services, researchers, extension officers and other agriculturists from national and regional bodies; such as CARDI. These forums provide the opportunity to discuss pertinent issues that help farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms. Such forums can be conducted virtually through the typical online platforms, but is also possible through the CARISAM platform.

Newer coordination and interface platforms such as the National Committees for Climate Services provide a space for regular interaction and intersectoral planning between the NMHS and all climate-sensitive sectors, including agriculture. Where National Committees for climate-related activities or disaster management already exist, the re-formulation and/or strengthening of these Committees to incorporate climate services governance into their mandate is increasingly important in mounting a coherent response to climate extremes, variability and change.

Moreover, National Agricultural Disaster Risk Management (ADRM) Plans can be an important tool for providing a roadmap for sectoral action on climate. However, more work is needed to expand the development and/or enhancement of national ADRM plans to include climate-related information such as drought and heat stress.

Agriculture and climate are strongly interlinked, making climate risk management crucial to the sustainable development of Caribbean agriculture. Climate risk management in agriculture can be enhanced by tailored early warning information, as well as plans, coordination mechanisms and interface platforms that support climate-informed management decisions of agricultural practitioners. The Caribbean RCC invites agricultural policymakers to partner with us to support the advancement of climate services for Caribbean agriculture.

This publication was jointly produced by the Caribbean Institute for Meteorology and Hydrology (CIMH)), and the Caribbean Agricultural Research and Development Institute (CARDI) under the Intra-ACP Climate Services and Related Applications (ClimSA) Programme, with support from the European Union.

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The Caribbean Regional Climate Centre (Caribbean RCC)

Regional Climate Centres (RCCs) designated by the World Meteorological Organization (WMO) are centres of excellence dedicated to providing regional climate products and services. Their mission is to enhance the capacity of national meteorological services in each region, enabling them to deliver high quality climate information and prediction products to national users. RCCs produce mandatory regional products, including climate data sets, climate monitoring tools and long-range forecasts, which serve as critical regional inputs for National Meteorological and Hydrological Services (NMHS) climate operations. RCCs also deliver training and capacity building for the NMHSs in their region.

The Caribbean RCC at the CIMH leads the development and distribution of the operational climate products, services and programmes delivered by CIMH including but not limited to long range (seasonal) forecasts, regional climate monitoring, the Caribbean Climate Outlook Forum (CariCOF), the Caribbean Drought and Precipitation Monitoring Network (CDPMN), and sectoral focused climate bulletins co-produced with regional sector agencies. The RCC also provides training on the development and delivery of climate products and services to national level providers of climate information, as well as offer training to national and regional stakeholders on how to effectively interpret climate information and integrate it in their planning and decision-making activities.



About the Intra-ACP ClimSA Programme

The Intra-ACP Climate Services and Related Applications (ClimSA) Programme is a four-year initiative funded by the European Union (EU) through the 11th European Development Fund (EDF) and implemented in the Caribbean by the Caribbean Institute for Meteorology and Hydrology (CIMH). It forms part of a global effort led by the Organisation of African, Caribbean and Pacific States (OACPS) to strengthen the provision and use of climate information services across ACP regions.

In the Caribbean, the programme seeks to enhance the entire climate services value chain through technical and financial assistance, infrastructure development, and capacity building. The programme's goal is to improve access to and application of climate information to support informed decision-making at all levels, enabling more effective adaptation measures and fostering a climate-resilient Caribbean.

Sixteen OACPS Member States benefit from this initiative through regional capacity building, institutional strengthening at CIMH, and the sharing of lessons and results from three pilot sectors:

- Agriculture and Food Security Sector in Guyana
- Water Sector in Jamaica
- Health Sector in Dominica

Main Objectives

- Strengthen interaction between users, researchers, and climate service providers in the Caribbean.
- Ensure effective provision of climate services at regional and national levels.
- Improve access to climate information and enhance regional capacity to generate and apply climate data.
- Mainstream climate-informed decision-making into regional and national policy processes.
- Build resilience in key socio-economic sectors affected by climate variability and change.

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Brief for Agriculture Sector Policymakers

Climate Services and Agriculture: Exploring Partnership and Investment Options







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