WHITE PAPER

Innovative resilience and adaptation finance approaches for the Caribbean

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ABOUT SCALE FOR RESILIENCE

Scale for Resilience is an innovative initiative dedicated to enhancing climate resilience and driving sustainable growth across the Caribbean, Latin America and regions of Africa. A partnership between the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), YAPU Solutions, and GAWA Capital, the initiative seeks to make 3 million farmers more resilient to climate change by 2035.

Through knowledge creation, capacity building, and expanded access to finance, Scale for Resilience empowers financial institutions, including Microfinance Institutions and Credit Unions, to integrate climate risk management tools and provide tailored financial products that support climate adaptation and resilience.

In collaboration with partners like IDB Lab and Global Affairs Canada, Scale for Resilience is currently rolling an initiative in the Caribbean, EcoMicro x Scale for Resilience, which works to enhance the resilience finance ecosystem and network in the region. The goal is to create a collaborative network and community of practice among EcoMicro Caribbean partner financial institutions (PFIs). For more information about Scale for Resilience and its work to advance climate resilience in the Caribbean, visit: https://www.scaleforresilience.global/

ABOUT ECOMICRO PROGRAM

The EcoMicro program is a pioneering initiative designed to enhance the resilience of micro, small, and medium-sized enterprises (MSMEs) and low-income households to climate change through innovative financial solutions. Tailored specifically to the Caribbean context, the program focuses on integrating climate resilience into the financial products and services of local institutions. By addressing the region's unique vulnerabilities EcoMicro has supported the development of tailored microfinance products, green loans, and insurance schemes to enable end-clients to adopt sustainable practices and technologies. The program also prioritizes capacity building for financial institutions, equipping them to assess climate risks and implement environmentally sustainable lending practices.

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EXECUTIVE SUMMARY

The Caribbean region is affected by climate change, with climate phenomena reflecting this change due to rising sea levels, intensified hurricanes, flooding, strong tropical storms, droughts, salinity and erratic rainfall. These pose challenges for the region due to this climate vulnerability. The impacts of climate change affect agricultural practices, water sources, the economy and infrastructure.

These environmental phenomena have been generated with a historical advantage. Since 1900, the global sea level has risen 20 cm, and the rates have accelerated in recent decades, putting low-lying areas, ecosystems and critical infrastructure at risk. An example of these is the devastation of Hurricane Maria in 2017, which caused damages of 91 billion dollars, affecting the northwestern Caribbean, specifically: Dominica, Puerto Rico, the Dominican Republic, the Bahamas and others.

Projections from the Caribbean Development Bank (2021) suggest that without targeted interventions, climate-related damages could surpass 10% of GDP annually by 2100, exposing vulnerable populations, smallholder farmers, and micro, small, and medium enterprises (MSMEs) to significant economic instability. Addressing these growing challenges necessitates significant and strategic investments in resilience and adaptation solutions. This entails reducing exposure to climate risks and enhancing the adaptive capacity of communities, ecosystems, and economies.

This report covers innovative financial approaches to financing resilience and adaptation. It is understood that efforts to address this issue must include participatory and inclusive approaches directed towards resilience and adaptation. Therefore, effective resilience and adaptation solutions, innovative financial approaches and financial mechanisms contextualized in the Caribbean are presented through case studies of projects from the EcoMicro x Scale for Resilience program. The case studies include transformative initiatives from the perspective of three financial institution: Central Finance Facility (CFF) in Trinidad and Tobago, the National Development Foundation of Dominica (NDFD), and the Development Finance Corporation (DFC) in Belize.

Each institution stands out for having financial products with innovative financial approaches to address climate risks, not only from the financial area, but also with socio-economic, environmental and social dimensions. CFF's CU Green program facilitated over $3 million in green investments within its first year, empowering households and MSMEs to adopt renewable energy solutions, reduce energy costs, and diversify economic activities. NDFD's "Agric-Women Chq N Grow" initiative targeted women farmers, reducing operational costs by up to 75% through green technologies, while DFC's Special Education Program enabled vulnerable students to pursue higher education with $40,000 collateral-free loans, fostering long-term socioeconomic stability.

The impacts of these initiatives are profound. Beneficiaries have seen improved economic resilience and diversified income sources. For example, a Dominica fisherman cut fuel consumption by 60% by integrating sustainable practices, while smallholder farmers adopting agroforestry and intercropping systems have stabilized incomes and enriched ecosystems. These examples of combined strategies not only minimize climate risks but also align with the Sustainable Development Goals (SDGs) such as No Poverty (1), Quality Education (4), Gender Equality (5), Decent Work and Economic Growth (8), Industry, Innovation and Infrastructure (9), and Climate Action (13). Moreover, financial innovations highlight the scalability and replicability of such mechanisms and cases across the Caribbean through partnerships and knowledge sharing.

However, despite these successes, challenges remain in mainstreaming resilience financing. Structural vulnerabilities such as reliance on tourism, high import costs, and limited access to credit exacerbate the impacts of climate change in the Caribbean. As a result, there was a need to scale up alternative and innovative financial approaches (blended finance, green and resilience bonds, insurance mechanisms, ecosystem- and community-based adaptation, among others) and build regional partnerships to enhance capacity to adopt priority, context-specific practices, technologies, and solutions. Strengthening local financial institutions and fostering cross-sectoral collaboration are critical to aligning national and regional policies with sustainable investments.

This report highlights the transformative potential of innovative financing in climate change mitigation in the Caribbean. By leveraging different examples of tools and approaches around practical examples, the region can turn its vulnerabilities into opportunities for sustainable growth. Investing in resilience not only protects communities and ecosystems, but also lays the foundation for a more inclusive, equitable and climate-resilient future.

SECTION 2

INTRODUCTION

Context and Rationale

The Caribbean is among the most climate-vulnerable regions globally, grappling with a combination of acute and chronic climate risks. Countries within the region are especially susceptible to rising sea levels, intensified hurricanes, and prolonged droughts. The Intergovernmental Panel on Climate Change (IPCC) reports that global sea levels have risen by approximately 20 cm since 1900, with an accelerating pace, posing severe risks to low-lying coastal communities and critical infrastructure (IPCC, 2023).

Extreme weather events, such as hurricanes, impose significant economic and social costs. For instance, Hurricane Maria in 2017 caused an estimated $91 billion in damages, disproportionately affecting vulnerable populations and small businesses with limited resources for recovery (International Center for Tropical Agriculture [CIAT] and World Bank, 2018). Additionally, slow-onset phenomena, such as prolonged droughts and rising temperatures, threaten agricultural productivity and water security, undermining livelihoods and food systems.

These climate impacts exacerbate existing socioeconomic challenges, including high debt levels, dependence on tourism, and pervasive inequality, making adaptation and resilience-building urgent priorities. Without targeted interventions, annual climate-related damages in the Caribbean are projected to exceed 10% of GDP by 2100 (Caribbean Development Bank, 2021).

Investing in **resilience and adaptation** is essential for minimizing these risks and ensuring sustainable development. Building resilience reduces exposure and vulnerability to climate impacts, while adaptation strengthens the capacity of communities and ecosystems to function effectively under changing conditions. Critical measures include integrating nature-based and Climate-Smart solutions, diversifying income streams, and developing climate-resilient infrastructure.

Purpose

This publication aims to identify and showcase effective resilience and adaptation solutions tailored to the unique climate challenges of the Caribbean region. It highlights the critical role of innovative financial approaches in scaling resilience efforts, addressing funding gaps, and empowering vulnerable populations to adapt effectively. By focusing on these financial mechanisms, the document seeks to bridge the gap between solution development and practical implementation, ensuring these strategies benefit those who need them most-especially vulnerable communities and small businesses on the frontlines of climate impacts. Prioritizing resilience and adaptation enable the Caribbean to pursue a sustainable future, safeguarding the well-being of its people and ecosystems.

Approach and Scope

Drawing on scientific research and previous initiatives, this publication addresses innovative solutions encompassing nature-based, climate-smart, agroecological, and disaster risk reduction approaches, delivering sustainable benefits to both communities and ecosystems. By integrating insights from EcoMicro program partners, it highlights a diverse array of practical strategies for embedding climate resilience into financial products and services. Through case studies, it offers concrete examples to inform stakeholders in scaling impactful actions across the region.

This publication provides a comprehensive resource for policymakers, financial institutions, and development practitioners, offering actionable insights and tools to enhance climate resilience and adaptation efforts. Ultimately, it aims to foster collaboration among stakeholders to build a sustainable and climate-resilient Caribbean, safeguarding livelihoods, economies, and ecosystems.

Resilience refers to the capacity of social, economic, and environmental systems to cope with hazardous events or disturbances, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (IPCC, 2018).

Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2018).

SECTION 3

RESILIENCE AND ADAPTATION SOLUTIONS ACROSS THE CARIBBEAN FOOD SYSTEM

The Caribbean region's agricultural systems face significant challenges from climate change, including extreme weather events. These factors threaten agroecosystems by causing soil erosion, water scarcity, biodiversity loss, reduced yields, and socio-economic issues such as rural exodus and labor shortages. This section offers a snapshot of the range of options focused on on-farm practices and technologies recognized in the region to enhance resilience of the agricultural sector. It also highlights complementary enabling solutions from educational, technical, and policy-institutional perspectives viable for support through financial mechanisms to achieve multidimensional resilience and ensure sustainability through integrated agricultural approaches.

The Caribbean region is highly vulnerable to the impacts of climate change posing significant risks to agricultural production systems. Agriculture is a critical sector for the economies and for food and nutritional security of Caribbean nations, it contributes from 3–5% to the Gross Domestic Product across Caribbean Community (CARICOM) countries and most important, occupies 10 to 25 % of the labor force being essential for the region's livelihoods (Hutchinson et al., 2013, The Commonwealth, 2024).

Practice: Water pump

The agricultural sector is heavily influenced and negatively impacted by climatic conditions. Major risks affecting the region include: increasing in frequency and duration of tropical storms and hurricanes (Tylor et al., 2012), rising in air temperature -by 0.28°C per decade in daily minimum temperature (Stephenson et al., 2014)- relative sea-level rise -ranging from 2.5 to 5 mm –1 in East and West/North Caribbean (Becker et al., 2019)- and disruption of rainfall patterns -with unclear trends and additional uncertainty due to the large-scale fluctuations between dry and wet periods in the Eastern Caribbean (Taylor et al., 2012; Jones et al., 2015- among others (Mycoo et al., 2022, IPPC AR6 WG2; Karmalkar et al., 2013). These phenomena entail current and projected climatic hazards to island and in-land agroecosystems, such as extreme drought and flooding events that trigger soil/coastal erosion and saltwater intrusion processes affecting freshwater systems (in estuaries, aquifers, rivers etc.) and marine/terrestrial biodiversity (habitat and species loss and displacement). This in turn negatively impacts ecosystems services that sustain agricultural production, causing low yield, crops/livestock losses, outbreak of pests and diseases, infrastructure damage along the value chain, and from the socio-economic perspective, aging of rural population, farm labor shortage, and rural exodus (Mycoo et al., 2022).

Climate-related extreme events pose significant challenges to the Caribbean agrifood system. To address these complex issues and ensure long-term sustainability, restoration, and regeneration of agroecosystems and ecosystems, it is necessary to implement adaptation strategies that integrate socio-economic and environmental perspectives, linking rural communities with decision-makers in the prioritization and co-design processes of bundles of adaptation and resilience solutions such as climate-smart, agroecological, and nature-based practices, technologies, and services. This in coherence with national and regional sectorial policy frameworks, creating and putting in place context-specific incentives ranging from strategic and effective plans for land-use regulation -considering resilient agricultural production and market connectivity- access to innovative financial mechanisms for the implementation of such solutions across the agricultural value chains and networks, and capacity building and knowledge-sharing mechanisms for farmers communities and associations and for the extension services stakeholders, among others (Eitzinger et al., 2022; Mohammadi et al., 2022; Makara, 2021).

Based on a global Climate-smart Agriculture (CSA) Country-Profile database (Nyakundi et al., 2020) and literature review of CSA-related documents available with a relative homogenous base of information for countries in the region (Sova et al., 2018; CIAT and World Bank, 2018; CIAT and World

Bank 2018b; Lizarazo et al., 2021; Navarrete-Frias et al., 2021; Eitzinger et al., 2022b), this analysis identifies key themes and practices for agriculture in a small set of CARICOM member countries with contrasting agroecosystem conditions - Belize, Cuba, Grenada, Guyana, and Jamaica (initially). While the analysis offers valuable insights, there is ample scope for further research to fully capture diversity and complexity of the region. This entails expanding the focus along the value chain, complementing the production stage, and integrating more examples on the input supply, processing, packaging, distribution, marketing and consumption stages, highlighting solutions compatible with financial mechanisms to enhance resilience in the food system

Across the countries analyzed, water management practices emerge as the most prevalent adaptation strategy, reflecting regional challenges with erratic rainfall, prolonged droughts, and flooding. Countries like Guyana, Cuba, Jamaica, and Belize have implemented measures such as drip irrigation, water harvesting, and drainage improvements to address these issues. In parallel, crop breeding programms for the development of stress-tolerant varieties is significant, particularly in Belize and Guyana, as farmers respond to rising temperatures and salinization in coastal regions. Intercropping also plays a key role in diversifying agricultural systems, promoting soil fertility, and providing additional income streams, with widespread recognition as priority across Jamaica, Belize, Cuba, and Grenada.

Integrated soil management, sustainable forestry, and tree management practices further highlight efforts to combat soil erosion, land degradation, and deforestation. Countries like Jamaica focus on soil conservation, while Cuba recognizes sustainable forest management. Additionally, protected cultivation in controlled environments, such as greenhouses, is gaining traction in the region to counteract extreme weather events. Other notable practices include integrated pest management to reduce synthetic pesticide use and integrate organic inputs that minimize the risk to biodiversity. In livestock diet and disease management frequency is limited but impactful initiatives to increase productivity while reducing greenhouse gas emissions (see figure 1).

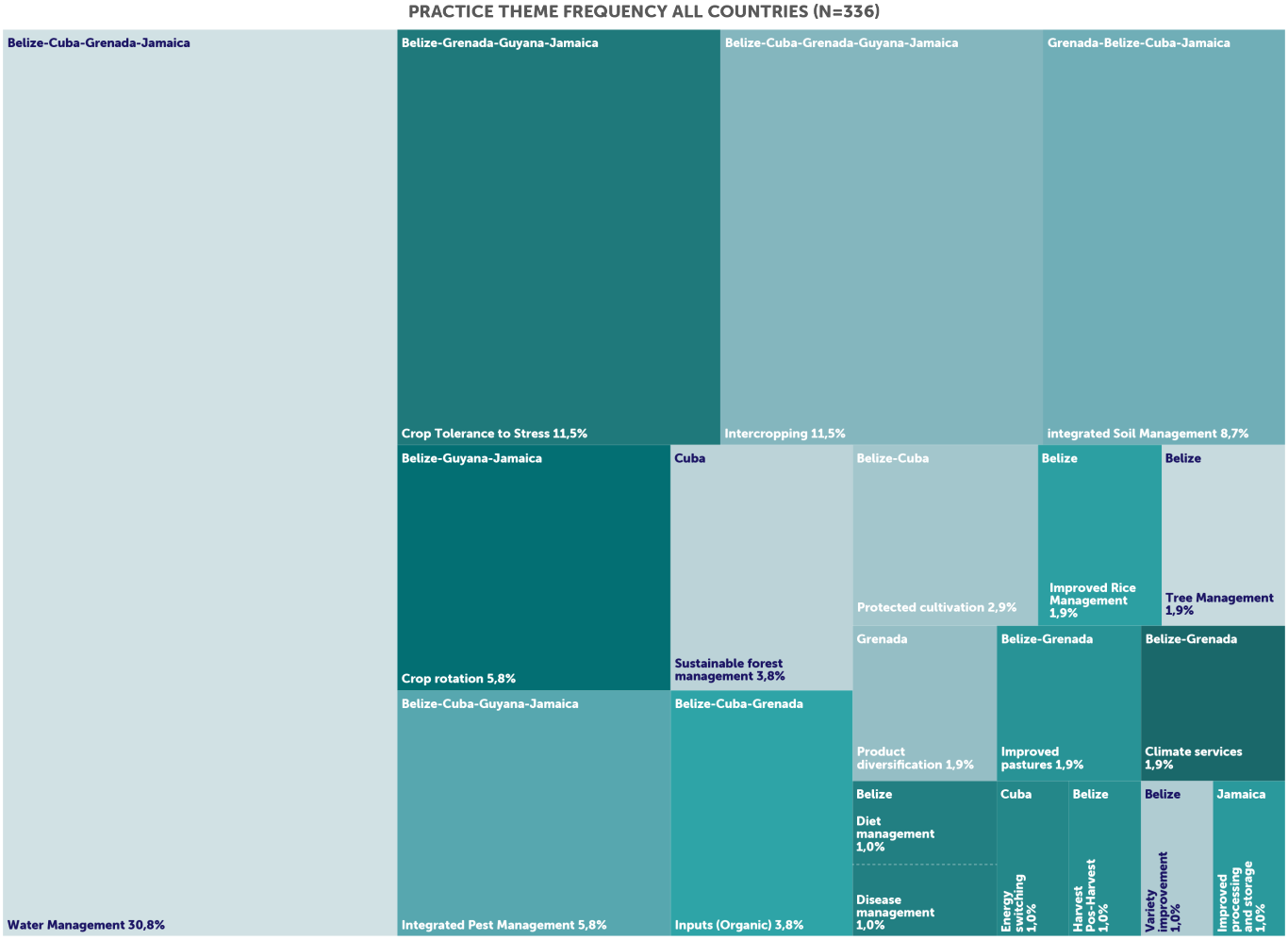


Figure 1. Frequency of practice's theme identified across countries for crop and livestock systems

The diversity of recognized themes/topics, highlight a broad spectrum of resilient / adaptive strategies and sustainable agricultural practices and technologies tailored to various production systems, from staple crops such as beans, maize, and root crops to livestock, fruits, and even multi-crop systems (see Annex 1).


Practice: Water reservoir

The emphasis on water management highlights its critical role in addressing both water scarcity and excess across agricultural systems. For instance, the use of drip irrigation and drainage systems has been adopted for crops like vegetables (cauliflower, tomato), fruits (banana), root crops (cassava, sweet potato), ensuring water-efficient production and reducing flooding risk. Similarly, crop rotation, exemplified by alternating crops like sweet potato and peanuts, enriches soil fertility while disrupting pest cycles, benefiting systems like cassava and maize. Intercropping strategies, such as integrating perennial species in agroforestry systems (e.g., mahogany with cacao) or planting root crops, further enhance biodiversity and resource use efficiency, especially in fruit and vegetable systems.

The region's commitment to sustainability is evident in the transition process to use or produce alternative/ organic inputs for integrated soil fertility and pest and diseases management. For example, biofertilization using microorganisms or nitrogen-fixing plants supports banana and multi-crop systems, while IPM approaches like intercropping with market-oriented species and biological controls enhance resilience in crops such as pumpkins and rice. Soil health remains a priority, with practices like minimum tillage for sugarcane and conservation agriculture for multi-crops, reducing erosion and boosting organic matter and carbon sequestration.

Innovative harvest and post-harvest practices also demonstrate opportunities to expand investment options for value added products and services. For bananas, the use of biodegradable bags for premature bagging minimizes produce damage and improves marketability. In pumpkins/vegetables, shared or community processing facilities streamline storage and distribution. Meanwhile, protected cultivation, through cover structures for vegetables or barns for livestock, provides controlled environments that minimize climate risks and improve productivity.

Livestock systems are not overlooked, with strategies such as improved pastures using high-quality forages, cut-and-carry fodder systems, biodigesters and solar-powered equipment denotes efficiency and diversification opportunities in terms of produce and energy sources. Forestry practices such as sustainable forest management, including reforestation with native species, have potential for further integrating ecological principles in livestock systems to support both socio-economic and environmental objectives.

To combat climate variability —from farm to national level— climate information and services play a crucial role, where practices such as early warning systems, weather-based index insurance, and adjusting planting dates for crops contribute to align with rainfall patterns or project climate extremes, improving yield reliability. Similarly, practices targeting crop tolerance to stress, such as drought-resistant varieties /heat tolerant cattle breeds, planting high-yielding among others, are prominent across cultivated species and livestock.


Practice: Water tank

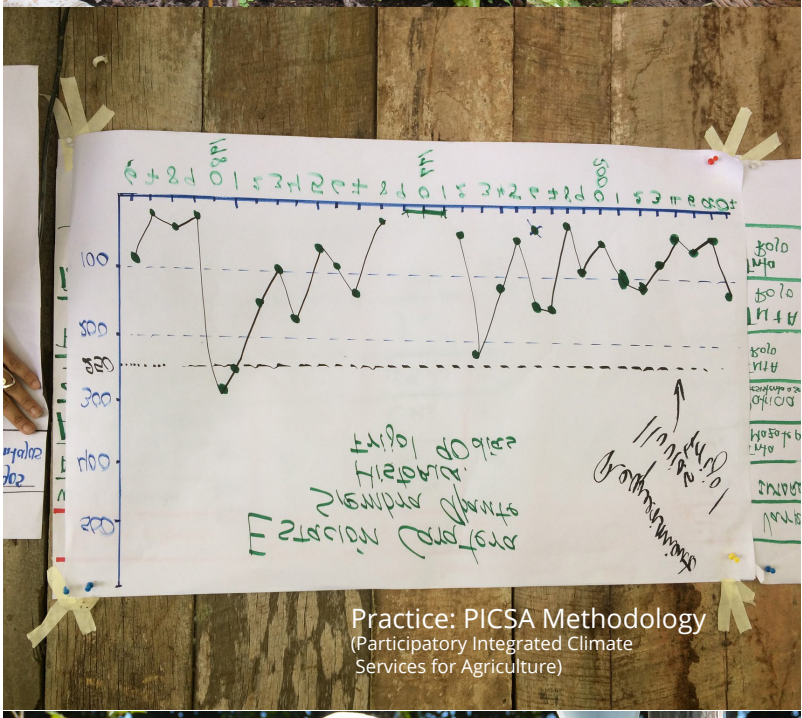
Despite most of the practices and technologies recognized represent positive solutions for building resilience / adaptation capacity with mitigation co-benefits. The emphasis on water and soil management, and diversification highlights adaptive strategies that aim for the integration of traditional knowledge with innovative solutions. These priorities not only enhance agricultural resilience but also promote environmental sustainability by transitioning from conventional production models, conserving resources, and leveraging ecosystem services such as pollination and even landscape conservation that boost agrotourism and similar sustainable initiatives are essential for the region's economy.

In a regional scope, justice, equity, and inclusivity is fundamental, involvement of local communities and knowledge is core to achieve effective adoption of context-specific solutions (Lincoln et al., 2021). However, crosscutting social challenges such as unemployment, gender inequality, and food insecurity are also prevalent and linked to structural limitations such as small economies, dependence on tourism, and high import costs which are exacerbated by existing environmental challenges (Morris et al., 2020). Therefore, recognizing the region's vulnerability to climate extremes and their cascading impacts on agriculture, the integration of innovative financial mechanisms with sustainable agricultural practices, technologies, and solutions across the value chain— as well as in other sectors (Ram and Kaidou-Jeffrey, 2020)— offers actionable pathways to support their implementation, enhancing resilience in Caribbean agrifood systems (Marsters et al., 2021; Navarrete-Frias et al., 2021).

For example, the deployment of green and resilience bonds could fund water management projects, such as drip irrigation or rainwater harvesting, adapting to the effects of erratic rainfall and prolonged droughts on staple crops and high-value fruits. Similarly, blended finance mechanisms can de-risk investments in agroforestry and intercropping systems, which enhance soil fertility and biodiversity while diversifying farmer income streams. Parametric insurances, tailored to address the specific climate hazards of the region, can offer critical support to crop and livestock producers facing increasing risks from hurricanes and extreme weather. At the same time, NbS/CSA/Agroecology financing could catalyze efforts like reforestation with native species, which contribute to sustainable forestry and livestock system integration. Scaling community-based adaptation finance can empower local actors building capacities to adopt time or resource- intensive practices e.g., IPM or solar-powered processing facilities for post-harvest operations (Wright et al., 2017; Marsters et al., 2021; Mejía-Escobar et al., 2021; Charles, 2023; Mohan, 2023).

To maximize the transformative potential of these interventions, cross-sectoral collaboration and policy coherence are essential. Innovative financial tools and mechanisms must align with national and regional frameworks to prioritize context-specific solutions, linking smallholder farmers, education/extension services, and institutional investors. By bridging financial gaps and fostering inclusivity, these mechanisms can accelerate the transition toward resilient and sustainable agricultural systems across the Caribbean.


Practice: Drip irrigation


Practice: PICSA Methodology
(Participatory Integrated Climate Services for Agriculture)


Practice: Rain gauge

SECTION 4

RESILIENCE AND ADAPTATION FINANCE APPROACHES FOR THE CARIBBEAN

The global urgency to address climate change and its impacts has necessitated the development of innovative financial strategies to support resilience and adaptation, especially in vulnerable regions like the Caribbean. Resilience and adaptation finance approaches refer to financial strategies and investment mechanisms designed to strengthen the capacity of communities, ecosystems, and economic sectors to withstand and adapt to climate change (Monasterolo, 2020). These approaches encompass resource allocation, the development of adaptive infrastructure, and targeted project financing (Agrawal et al., 2023). By mobilizing financial resources toward these goals, resilience and adaptation finance aims to reduce vulnerabilities, foster sustainable development, and promote long-term economic and social stability and inclusion (Organization for Economic Co-operation and Development [OECD], 2018; United Nations Environment Programme [UNEP], 2024).

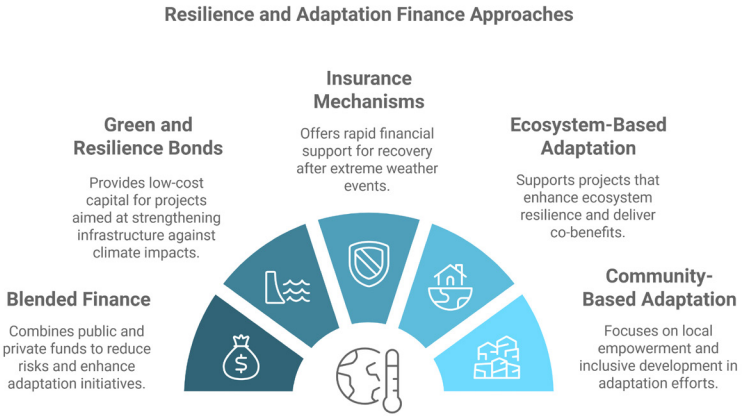
These approaches are essential to align financial flows between pathways toward reducing greenhouse gas emissions (mitigation goals) and building climate-resilience (Adaptation goals), as outlined in the Paris Agreement during the COP21 meeting in 2015 (Monasterolo, 2020, p. 300). Moreover, the introduction of the United Nations' 2030 Agenda for Sustainable Development and the European Union's EU2030 agenda underscored the need for financial systems to address the systemic risks posed by climate change while fostering sustainable development.

Contextualizing Climate Finance and Risks

Since 2015, financial risks related to climate change have been increasingly recognized as critical concerns. These risks encompass damage to physical assets, natural capital, and human lives, resulting in losses of productive capacity, Gross Domestic Product (GDP), and broader economic disruptions. Notably, climate phenomena such as rising sea levels, extreme weather events, and prolonged droughts— among others recognized in the region— have demonstrated the nonlinear and unpredictable nature of climate shocks (Holdschlag and Ratter, 2016); Monasterolo, 2020, p. 302). Traditional financial frameworks have struggled to account for these complexities. Cost-benefit analyses and risk assessments often rely on historical data, equilibrium assumptions, and linear projections, failing to address the uncertainties and forward-looking nature of climate impacts. To bridge this gap, innovative financial tools and methodologies at different scales are being developed to better integrate climate risks into investment decisions and economic planning (Monasterolo, 2020, p. 307; Haughton and Keane, 2020; Economic Commission for Latin America and the Caribbean [CEPAL], 2021).

Key Approaches to Resilience and Adaptation Finance

Effectively financing resilience and adaptation requires a diverse set of tools and strategies to address the varied challenges posed by climate change. These approaches aim to mobilize resources, reduce risks, and enable sustainable development while ensuring that vulnerable communities and ecosystems can adapt to evolving climatic conditions. By combining public, private, and community-driven efforts, these mechanisms provide a blueprint for building resilience and addressing climate vulnerabilities. The following are some of the key approaches that have proven effective globally:



- Blended Finance for Adaptation: Blended finance combines public or philanthropic funds with private sector investments to reduce the risks associated with climate projects. This model enhances the attractiveness of adaptation initiatives by lowering the cost of capital and improving financial returns. Public institutions often provide concessional loans, guarantees, or grants, while private partners contribute funds for scaling impactful projects. For instance, the Caribbean Development Bank (CDB) has implemented blended finance strategies to address vulnerabilities in infrastructure, agriculture, and energy sectors (OECD, 2018).

- Green Bonds and Resilience Bonds: These financial instruments provide low-cost capital for projects that deliver environmental benefits, including those aimed at climate adaptation and mitigation. Resilience bonds, specifically, address the need to strengthen infrastructure against extreme weather and natural disasters. In Antigua and Barbuda, green bonds under the Sustainable Island Resource Fund (SIRF) have been utilized to pool international funds for community resilience and vulnerability reduction projects (Ujala et al., 2021).

- Insurance Mechanisms: Climate risk insurance provides rapid financial support following extreme weather events, enabling governments and communities to recover quickly. Parametric insurance, which triggers payouts based on pre-defined metrics such as wind speed or rainfall levels, is increasingly popular, climate information, services and digital tools are essential in these mechanisms to facilitate data generation and analysis in an accurate and accessible manner (Born et al., 2021; Ouedraogo et al., 2023). The Caribbean Catastrophe Risk Insurance Facility (CCRIF) offers financial protection to member states, minimizing the economic impacts of natural disasters and accelerating recovery efforts (CCRIF SPC, 2023).

- Ecosystem-Based Adaptation (EbA) Financing: EbA financing supports projects that enhance ecosystem resilience, such as mangrove restoration, watershed management, and reforestation. These nature-based solutions reduce vulnerability to climate impacts while delivering co-benefits in biodiversity conservation and improved livelihoods. EbA integrates solutions from landscapes/ecosystems perspective including practices and technologies compatible with Agroecology, CSA, and NbS approaches. A notable example is the CityAdapt Project in Xalapa, Mexico, which used a combination of municipal funds and voluntary tariffs to fund watershed management and rainwater harvesting (UNEP, 2024).

- Community-Based Adaptation Finance: This approach empowers local communities by involving them in adaptation planning and implementation. Community-based financing ensures that resources are directed toward the most vulnerable populations, enabling inclusive development. For instance, Mexico's DECOFOS project leveraged co-financing to support sustainable forestry and ecotourism enterprises, improving community resilience through agroforestry and resource management (Lipper et al., 2021).

Resilience and adaptation finance encompass a diverse array of mechanisms, ranging from approaches like blended finance and green bonds to region-specific strategies designed to address the Caribbean's unique challenges. By integrating global best practices with locally driven innovation, the region has materialized the transformative potential of climate finance in enhancing adaptive capacity, reducing vulnerabilities, and promoting sustainable development. Regional collaboration is a cornerstone of these efforts, exemplified by initiatives such as the Caribbean Climate-Smart Accelerator. This initiative fosters knowledge sharing, capacity building, and resource mobilization across the region, aligning financial strategies with local priorities to ensure a holistic approach to resilience (Caribbean Climate-Smart Accelerator, 2022).

Nevertheless, scaling these successes requires sustained investment that is aligned with the productive cycles of the food system, better adapting investment and project timelines to the productive contexts of each country. This can be achieved through the use of modeling and financial and climate analysis to provide more and better information for decision-making. Additionally, cross-sectoral integration and deeper regional collaboration are needed to establish robust innovation and knowledge networks where solutions are co-designed based on demand, and governance structures are diversified and strengthened to integrate sustainability dimensions and facilitate the effective adoption of not only practices and technologies but also financial mechanisms. By engaging both public and private sectors and tailoring solutions to the Caribbean's specific context, the region can build on its achievements to ensure a climate-resilient future. These collaborative efforts underscore the importance of aligning financial mechanisms with regional goals, demonstrating that resilience and adaptation finance can be a powerful driver of sustainable development when implemented strategically and inclusively.

SECTION 5

RESILIENCE AND ADAPTATION FINANCE APPROACHES FROM ECOMICRO CARIBBEAN PROGRAM

This section highlights financial institutions participating in the EcoMicro x Scale for Resilience program that have successfully integrated resilience and adaptation-focused financial mechanisms into their portfolios. These case studies serve as practical examples of how financial institutions in the Caribbean are addressing climate challenges through innovative solutions, offering valuable insights for scaling similar initiatives across the region.

Methodology

The study employed a qualitative methodology, utilizing tools such as interviews and structured forms to gather detailed information from participating institutions. The process began with the compilation of profiles for five Caribbean financial institutions involved in the EcoMicro program. These institutions were selected based on their innovative approaches to financing resilience and climate adaptation, which were organized into a comprehensive database.

Selection Criteria

The institutions were evaluated against specific criteria to ensure relevance and representation:

- Integration of financial mechanisms for climate adaptation.
- Availability of financial products aimed at building climate resilience.
- Geographic diversity and operational focus within the Caribbean.

Based on these criteria, three institutions submitted detailed case studies for further analysis. These institutions stand out for their proactive efforts to embed resilience and adaptation into their financial portfolios. The institutions are:

1. Central Finance Facility (CFF) – Trinidad and Tobago
2. National Development Foundation of Dominica (NDFD) Ltd – Dominica
3. Development Finance Corporation (DFC) – Belize

Significance of the Case Studies

These financial institutions have demonstrated leadership in tailoring financial products and services to address the unique challenges posed by climate change in the Caribbean. By embedding resilience and adaptation mechanisms into their operations, they provide actionable examples of innovation in climate finance. Their initiatives highlight the potential for scaling up similar programs across the region to strengthen climate resilience in vulnerable communities.

The findings from these case studies not only underscore the importance of financial institutions in fostering climate resilience but also aim to inspire other institutions to adopt similar strategies, contributing to the broader goals of sustainable development and climate adaptation in the Caribbean.

Intercropping: Maize and beans

CASE STUDY 1

CENTRAL FINANCE FACILITY (CFF) OF TRINIDAD AND TOBAGO

Introduction

The Central Finance Facility Cooperative Society (CFF), established in 2002, serves the credit union movement in Trinidad and Tobago. CFF facilitates cooperative financing, innovation, and capacity building for its 41 member credit unions and their members. Its initiatives address climate challenges such as flooding and land degradation while empowering women, youth, and micro-enterprises to contribute positively to national development.

Highlighted Financial Product

CU Green is CFF's flagship program, designed to develop a green economy ecosystem. This program provides financing for green projects through direct investment, syndicated loans, or partnerships with third-party funders. By targeting projects that promote green innovation, CU Green aims to enhance environmental sustainability and economic diversification.

Impact on Resilience

The CU Green program has the potential to drive significant impacts, including reductions in energy costs, increased renewable energy adoption, and the creation of green enterprises. Projects under the program have already facilitated the acquisition of eco-friendly technologies, amounting to over $3 million in investments in its first year. These initiatives create income-generating opportunities for vulnerable groups and improve resilience to climate-related risks.

Lessons Learned

Challenges include insufficient entrepreneurial skills among beneficiaries and reluctance to adopt equity financing. CFF addresses these by providing mentorship, training, and customized financing solutions. Opportunities for scaling include partnerships with innovation-focused organizations and exploring procurement opportunities from public sector entities.

Conclusion

CFF's CU Green program positions the cooperative movement as a leader in climate resilience financing in Trinidad and Tobago. By supporting SDGs 1 (No Poverty), 9 (Industry, Innovation, and Infrastructure), and 13 (Climate Action), CFF aims to expand its impact through a strengthened green economy ecosystem, fostering resilience and sustainability for its members.

CASE STUDY 2

NATIONAL DEVELOPMENT FOUNDATION OF DOMINICA (NDFD)

Introduction

The National Development Foundation of Dominica (NDFD), a not-for-profit organization established in 1981, provides credit, training, and advisory services to micro and small businesses in Dominica. With a mission to reduce poverty and foster human resource development, NDFD serves 2,500 clients, many of whom are vulnerable to economic shocks and climate risks. Its initiatives focus on empowering women, youth, and indigenous communities, providing them with tools to build resilience against socio-economic and environmental challenges.

Highlighted Financial Product

The Agric-Women Chq N Grow program is a flagship initiative aimed at supporting women in agriculture and agro-processing. This unique financing mechanism includes a loan with 10% of the value provided as a grant and incorporates micro-insurance. Targeting Kalinago women and those in three parishes, the program offers loans at an interest rate of 2%. It aims to reduce operating costs, increase productivity, and support recovery from climate disruptions.

Impact on Resilience

The Agric-Women Chq N Grow program has achieved notable impacts. For instance, a female farmer who installed a solar energy system through the program reduced her electricity costs by 75%, while a young fisher improved profitability by cutting fuel consumption by 60%. These outcomes demonstrate how the program enhances resilience by reducing operating costs, stabilizing income, and improving efficiency.

Lessons Learned

Key challenges included the high upfront costs of green technologies and supply chain issues related to importing equipment. NDFD addressed these by educating clients on the long-term benefits and providing tailored financing options. Opportunities for scaling include raising awareness about adaptation technologies and expanding the program to other sectors.

Conclusion

NDFD's programs, such as Agric-Women Chq N Grow, contribute significantly to building resilience in vulnerable populations. By aligning with SDGs 1 (No Poverty), 5 (Gender Equality), and 13 (Climate Action), NDFD continues to empower communities to adapt to climate challenges while fostering sustainable economic development.

CASE STUDY 2

DEVELOPMENT FINANCE CORPORATION (DFC) OF BELIZE

Introduction

The Development Finance Corporation (DFC) is Belize's national development finance institution, established in 1963 and wholly owned by the Government of Belize. With a mission to provide innovative financial solutions that contribute to the resilient and equitable growth of Belize, DFC has a national footprint and serves over 5,000 clients, including women, youth, small farmers, and rural communities. DFC operates in a context marked by socio-economic and climate risks, emphasizing financial resilience for vulnerable groups.

Highlighted Financial Product

One of DFC's key initiatives is the Special Education Program, a student loan facility designed to enhance access to education for low-income families and at-risk groups. The program offers loans at a fixed interest rate of 6.5% with no collateral requirement for loans up to $40,000. It covers all costs related to education, including interest and insurance during the grace period. By removing financial barriers, the program enables students to pursue higher education, addressing the challenge of equitable access to academic opportunities.

Impact on Resilience

The Special Education Program has demonstrated significant impacts on beneficiaries. For example, a recipient who earned a degree in civil engineering –a crucial knowledge base to implement EbA and NbS at scale— through the program now supports his family of four siblings and parents with a stable income. This financial stability highlights how the program enhances the resilience of vulnerable populations by improving their ability to face economic hardships. By investing in education, the initiative strengthens long-term economic stability for individuals and their families.

Lessons Learned

Challenges include reaching the intended target market, which DFC addresses through persistent marketing by its relationship managers. Opportunities exist to scale the product and replicate its success in other segments, such as home loans, ensuring wider benefits for Belize's vulnerable populations. Here, it is crucial to promote agriculture, economy and environmental sciences as strategic knowledge areas to generate and sustain economic and environmental prosperity. These fields are now gaining momentum, attracting more people and strengthening the country's and the region's capacity for adaptation and innovation.

Conclusion

DFC remains committed to supporting vulnerable communities through initiatives like the Special Education Program. By prioritizing education, the institution aligns its efforts with Sustainable Development Goals (SDGs) 4 (Quality Education) and 8 (Decent Work and Economic Growth), fostering an empowered and resilient workforce in Belize.

SECTION 7

CONCLUSIONS

This document highlights the transformative potential of innovative resilience and adaptation finance approaches to address the Caribbean's unique climate challenges. The vulnerability of the region to climate change necessitates urgent action to strengthen resilience capacity in communities and ecosystems to adapt to climatic and economic shocks. By adopting participatory, multi-disciplinary and multi-dimensional approaches the region can mitigate climate risks while unlocking new opportunities to leverage current and potential financial mechanisms for sustainable socioeconomic well-being and environmental health. To this end, actionable entry points can be considered:

- Integrative approaches through CSA, NbS, EbA, Agroecology, among others. From water and soil management to agroforestry and sustainable biodiversity management and conservation, the Caribbean showcases a wealth of climate-smart practices and technologies tailored to its agricultural systems. These interventions not only safeguard food and nutritional security but also preserve the ecological integrity of agroecosystems. By leveraging traditional/indigenous knowledge alongside scientific knowledge, the region can participatory create robust solutions and the mechanisms for their implementation and adoption.

- Innovative and accessible financial mechanisms. The development and access to financial tools such as green bonds, blended finance, and community-based adaptation funds etc., underscores the need for alternative and tailored solutions to complex crises and the critical role of finance in resilience-building. These mechanisms provide pathways to bridge funding gaps, de-risk investments, and empower vulnerable populations. The integration of financial innovation with accessible and context-specific solutions ensures the widespread adoption of resilience strategies and aligns financial flows with local to regional resilience goals.

- Inclusive development and equity. Successful adaptation and resilience initiatives rely on inclusivity and co-design. Case studies exemplify the importance of empowering women, youth, and marginalized groups. These targeted interventions enhance socio-economic stability and ensure that the benefits of resilience-building are equitably distributed. Achieving this, however, requires investing in capacity building for stakeholders, equipping them with the technical expertise and resources needed to implement and sustain innovative solutions.

- Cross-sectoral collaboration and policy coherence. The Caribbean's advancement toward resilience depends on collective and planned action. Partnerships between financial institutions, governments, and local communities are vital to scaling successful initiatives. By aligning innovative financial tools with national and regional frameworks, resilience efforts can be tailored to specific contexts, ensuring efficiency and impact. Furthermore, collaboration among Caribbean nations through existing knowledge-sharing platforms and coordinated policy initiatives enhances effectiveness and amplifies the impact of resilience measures.

Practice: Stress-tolerant beans varieties

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ANNEX 1

Country code	Practice Level	Practice name	Practice Theme	Production system (PS)	Commodity	Commodity group
Belize	Climate services	Adjusted planting date to match rainfall pattern	Risk management	Beans	Pulses	Pulses
	Crop rotation	Crop rotation (e.g. corn, soybean)	Agronomy	Beans	Pulses	Pulses
	Crop rotation	Crop rotation with beans	Agronomy	Corn	Maize	Maize
	Crop Tolerance to Stress	Planting high-yielding varieties	Agronomy	Beans	Pulses	Pulses
	Crop Tolerance to Stress	Use of certified planting material	Agronomy	Citrus (Orange)	Fruit	Fruit
	Crop Tolerance to Stress	Use of high-quality certified planting material	Agronomy	Coconut	Coconut	Perennial crops
	Crop Tolerance to Stress	Planting high-yielding varieties	Agronomy	Rice	Rice	Rice
	Crop Tolerance to Stress	Use of disease-tolerant varieties	Agronomy	Vegetables	Vegetables	Vegetables
	Diet Management	Use of hay and silage	Livestock	Cattle (meat)	Meat	Livestock
	Disease Management	Use of improved breeds (e.g. Brangus)	Livestock	Cattle (meat)	Meat	Livestock
	Harvest/Post-harvest	Premature bagging (when no hand is yet visible and using biodegradable bags)	Agronomy	Banana	Fruit	Fruit
	Improved pastures	Use of improved pastures (e.g. Mombasa)	Livestock	Cattle (meat)	Meat	Livestock
	Improved Rice Management	Plant density management	Agronomy	Corn	Maize	Maize
	Improved Rice Management	Water-efficient irrigation (Alternate Wetting and Drying)	Agronomy	Rice	Rice	Rice
	Inputs(Organic)	Biofertilization (ground cover with Nitrogen-fixing leguminous plants)	Agronomy	Banana	Fruit	Fruit
	Integrated Pest Management	Integrated Pest Management (biological control, thresholds)	Agronomy	Coconut	Coconut	Perennial crops
	Integrated Soil Management	Soil and land management (Minimun tillage)	Agronomy	Sugarcane	Sugarcane	Sugarcane
	Intercropping	Agroforestry (e.g. mahogany, salmwood, plantain)	Agronomy	Cacao	Cocoa	Perennial crops
	Intercropping	Intercropping (e.g coconut, pineapple, soursop, plantain)	Agronomy	Citrus (Orange)	Fruit	Fruit
	Intercropping	Intercropping (e.g. soursop, lime, pineapples)	Agronomy	Coconut	Coconut	Perennial crops
	Protected cultivation	Cover structures (e.g. bubble house)	Agronomy	Vegetables	Vegetables	Vegetables
	Crop Tolerance to Stress	Planting of high sugar content varieties	Agronomy	Sugarcane	Sugarcane	Sugarcane
	Tree management	Grafting techniques	Agroforestry	Cacao	Cocoa	Perennial crops

	Tree management		Agronomy	Cacao	Cocoa	Perennial crops
	Water management	Water-efficient management (Drainage[canals] and irrigation [drip])	Agronomy	Banana	Fruit	Fruit
	Water management	Improved drainage (e.g. raised beds)	Agronomy	Citrus (Orange)	Fruit	Fruit
	Water management	Water-efficient irrigation (e.g. sprinkler)	Agronomy	Corn	Maize	Maize
	Water management	Water harvesting (e.g. ponds)	Agronomy	Rice	Rice	Rice
	Water management	Water-efficient Management (e.g. vinasse for irrigation)	Agronomy	Sugarcane	Sugarcane	Sugarcane
	Water management	Drip Irrigation (Fertigation)	Agronomy	Vegetables	Vegetables	Vegetables
Cuba	Energy switching	Solar-powered equipment	Livestock	Livestock	Livestock	Livestock
	Inputs(Organic)	Organic fertilizers	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Integrated Pest Management	Integrated Pest Management (IPM)	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Integrated Soil Management	Conservation Agriculture	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Intercropping	Live fences	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Protected cultivation	Protected agriculture	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Protected cultivation	Barn construction	Livestock	Livestock	Livestock	Livestock
	Water management	Sprinkler irrigation	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Water management	Micro-irrigation	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Water management	Watering troughs	Livestock	Livestock	Livestock	Livestock
	Water management	Rainwater harvesting	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Water management	Agricultural drainage	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Water management	Efficient water management and protection of water sources	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Sustainable forest management	Reforestation and revegetation with native species under ecological principles	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Sustainable forest management	Maintenance or establishment of forest plantations	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Sustainable forest management	Sustainable forest management	Agronomy	Multi-crop	Multi-crop	Multi-crop

	Sustainable forest management	Forest roads	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Water management	Reservoirs or dams	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Intercropping	Windbreaks	Agronomy	Multi-crop	Multi-crop	Multi-crop
Grenada	Climate services	Risk management (climate monitoring, forecasting, Early Warning Systems)	Risk management	Multi-crop	Multi-crop	Multi-crop
	Conservation Agriculture	Developing sustainable land management capacity	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Crop Tolerance to Stress	Drought resistant varieties	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Improved pastures	Stabled dairy goatswith cut-and-carry fodder and compost production from droppings	Livestock	Livestock	Meat	Livestock
	Inputs(Organic)	Organic mixed plantations	Agronomy	Cocoa	Cocoa	Perennial crops
	Inputs(Organic)	Organic agriculture	Agronomy	Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Integrated Soil Management	No burn agriculture, with shredding, composting, mulching	Agronomy	Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Intercropping	Production of root crops	Agronomy	Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Intercropping	Inter-cropping (fruit trees + vegetables)	Agronomy	Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Product diversification	Beekeeping	Livestock	Livestock	Meat	Livestock
	Product diversification	Manufacture of cane juice, use of organic by-products		Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Water management	Drip-feed irrigation (solar powered) with mulching	Agronomy	Fruit, vegetables, and root crops	Multi-crop	Multi-crop
	Water management	Water capture and protection of water sources	Agronomy	Multi-crop	Multi-crop	Multi-crop
	Restoration	Rehabilitation of hurricane-damaged nutmeg fields		Nutmeg	Spices	Spices
Guyana	Crop rotation	Crop rotation	Agronomy	Cassava	Root Crops	Multicrops
	Crop Tolerance to Stress	Diversification of varieties: Tall + Dwarf	Agronomy	Coconut	Coconut	Perennial crops
	Crop Tolerance to Stress	Use of climate-resilient varieties	Agronomy	Pineapple	Multicrops	Multicrops
	Crop Tolerance to Stress	Production and use of clean seeds	Agronomy	Rice	Rice	Rice

	Crop Tolerance to Stress	Use of climate-resilient varieties	Agronomy	Sweet potato	Tubers	Multicrops
	Integrated Pest Management	Integrated Pest Management - Monitoring	Agronomy	Rice	Rice	Rice
	Integrated Pest Management	Time of planting	Agronomy	Rice	Rice	Rice
	Intercropping	Intercropping	Agronomy	Plantain	Multicrops	Multicrops
	Water management	Improved drainage systems	Agronomy	Cassava	Root Crops	Multicrops
	Water management	Water efficient irrigation - Sprinkler irrigation	Agronomy	Cassava	Root Crops	Multicrops
	Water management	Improved drainage systems	Agronomy	Cassava	Root Crops	Multicrops
	Water management	Improved drainage systems	Agronomy	Coconut	Coconut	Perennial crops
	Water management	Water reservoir and irrigation+ pump	Agronomy	Pineapple	Multicrops	Multicrops
	Water management	Improved drainage system	Agronomy	Plantain	Multicrops	Multicrops
	Water management	Water efficient irrigation - Sprinkler irrigation	Agronomy	Plantain	Multicrops	Multicrops
	Water management	Improved drainage system	Agronomy	Plantain	Multicrops	Multicrops
	Water management	Improved drainage system	Agronomy	Rice	Rice	Rice
	Water management	Improved drainage system	Agronomy	Sweet potato	Tubers	Multicrops
Jamaica	Crop rotation	Crop Rotation (with sweet potato)	Agronomy	Peanut	Peanut	Peanut
	Crop rotation	Crop rotation with cover crops with string bean	Agronomy	Sweet potato	Tubers	Multicrops
	Crop rotation	Crop rotation (with tomato)	Agronomy	Watermelon	Multicrops	Multicrops
	Crop Tolerance to Stress	Use of drought-tolerant varieties	Agronomy	Peanut	Peanut	Peanut
	Crop Tolerance to Stress	Use of drought-tolerant crops	Agronomy	Watermelon	Multicrops	Multicrops
	Improved processing and storage	Pack Houses (Shared facilities: cutting, washing, storage)	Agronomy	Pumpkin	Multicrops	Multicrops
	Integrated Pest Management	IPM (Intercropping with marigold, traps, and scouting)	Agronomy	Pumpkin	Multicrops	Multicrops
	Integrated Pest Management	IPM (Traps and clean planting material)	Agronomy	Sweet potato	Tubers	Multicrops
	Integrated soil management	Minimum tillage	Agronomy	Cauliflower	Multicrops	Multicrops
	Integrated soil management	Raised beds	Agronomy	Irish potato	Tubers	Multicrops
	Integrated soil management	Minimum tillage	Agronomy	Scallion	Multicrops	Multicrops

	Integrated soil management	Mulching	Agronomy	Scallion	Multicrops	Multicrops
	Integrated soil management	Raised beds	Agronomy	Scotch bonnet pepper	Spices	Spices
	Intercropping	Crop rotation (with maize)	Agronomy	Pumpkin	Multicrops	Multicrops
	Intercropping	Crop rotation (with maize)	Agronomy	Scotch bonnet pepper	Spices	Spices
	Intercropping	Crop rotation (with pumpkin)	Agronomy	Sweet potato	Tubers	Multicrops
	Intercropping	Crop rotation (wit hot pepper)	Agronomy	Watermelon	Multicrops	Multicrops
	Water management	Rainwater harvesting systems	Agronomy	Cauliflower	Multicrops	Multicrops
	Water management	Drip Irrigation	Agronomy	Irish potato	Tubers	Multicrops
	Water management	Drip Irrigation	Agronomy	Pumpkin	Multicrops	Multicrops
	Water management	Drip Irrigation	Agronomy	Scotch bonnet pepper	Spices	Spices
	Water management	Drip Irrigation	Agronomy	Scotch bonnet pepper	Spices	Spices
	Water management	Drip Irrigation	Agronomy	Sweet potato	Tubers	Multicrops
	Water management	Drip Irrigation	Agronomy	Watermelon	Multicrops	Multicrops

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