

# Agricultural Risk Management in the Caribbean

## Lessons and Experiences

2009-2012



Financed by:

Global Index  
Insurance Facility (GIIF)

All ACP Agricultural  
Commodities Programme



ACP GROUP OF STATES



EUROPEAN COMMISSION



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## Abbreviations and Acronyms

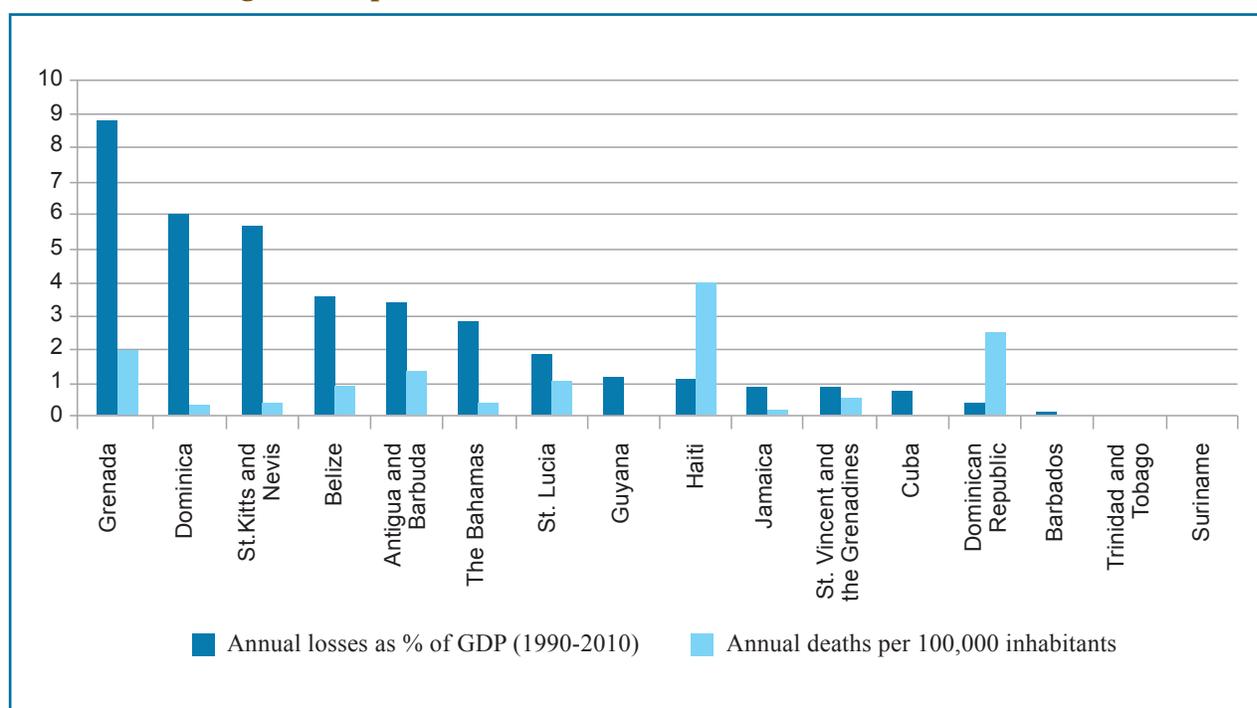
AACP	All Agricultural Commodities Program
ARD	Agriculture and Rural Development Department
CAT	catastrophic (event)
CB	Commodity Board
CCRIF	Caribbean Catastrophe Risk Insurance Facility
EU	European Union
GCMNB	Global Capital Markets Non Banking Institutions Division
FDP	Finance and Private Sector Development
IADB	Inter-American Development Bank
IDA	International Development Association
IDB	International Development Bank
IICA	Inter-American Institute for Cooperation on Agriculture
IFAD	International Foundation for Agricultural Development
JSFD	Japan Social Development Fund
MARNDR	<i>Ministère de l' Agriculture des Ressources Naturelles et du Développement Rural (Haiti)</i>
NLTA	Non-Lending Technical Assistance
TA	Technical Assistance
UWI	University of the West Indies
WB	World Bank



## I. Introduction

**The Caribbean region is highly vulnerable to natural disasters.** Recent studies on the macroeconomic impact of natural disasters show that developing countries suffer more from natural disasters, especially in terms of the number of people and damages, than developed countries. The Caribbean region, located in an area prone to tropical cyclones is highly exposed to hurricanes and weather hazards. The fact that it is mostly comprised of small island nations makes them particularly vulnerable and countries face drastic losses from natural disasters. For example, during Hurricane Ivan in 2004 Grenada lost 200 percent of its GDP<sup>1</sup>. Between 1990 and 2010, Caribbean countries affected by weather hazards had lost, on average, between 1 and 9 percent of their GDP every year (Figure 1) and the human impact of these events was particularly high for Haiti and the Dominican Republic, both presenting the higher numbers of casualties relative to population<sup>2</sup>.

**Figure 1. Impact of Natural Disasters in the Caribbean (1990-2010)**



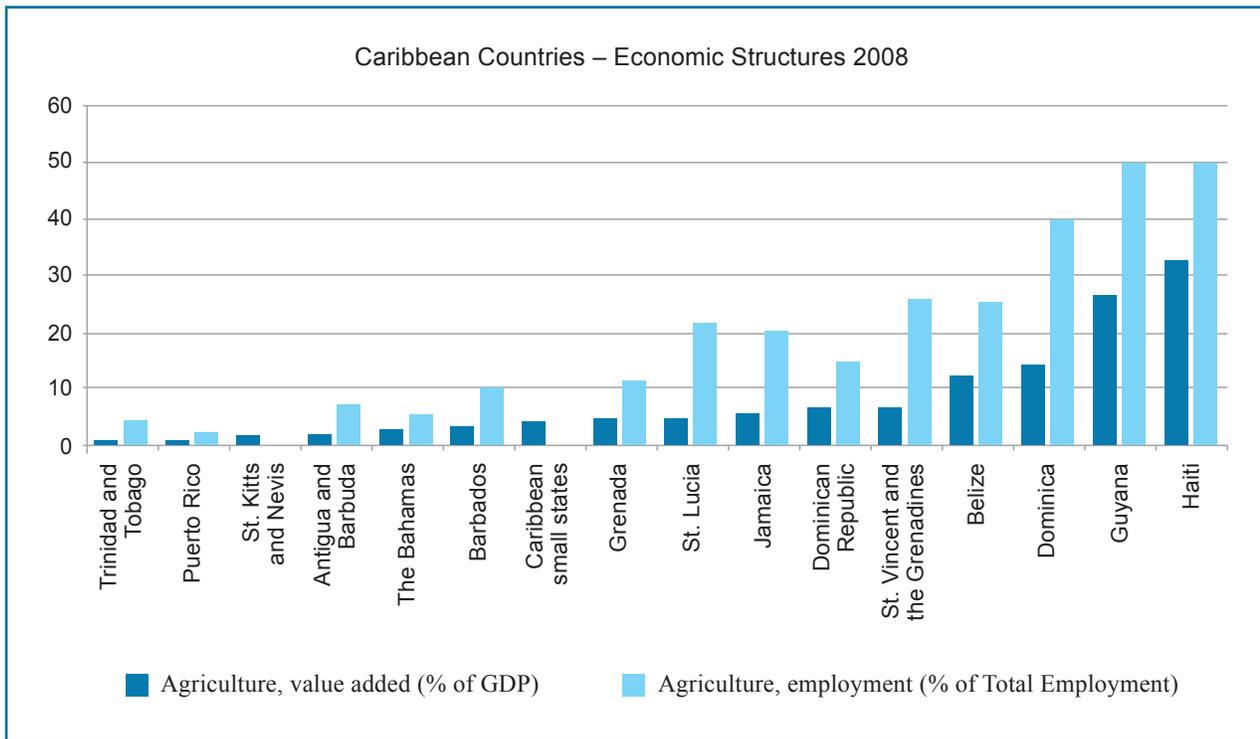
Source: GermanWatch, Global Climate Risk Index (2012). Data from MunichRe.

**Agriculture is one of the most significant sources of income for Caribbean countries and it remains a significant employer in the region.** Agriculture employment represents around 20 percent of total employment in the region, and is particularly high in Haiti and Grenada with 50 percent of employment concentrated in the agricultural sector. However, agriculture's impact on GDP varies depending on the economic structure and the degree of diversification of the particular country (see Figure 2). For example, in Guyana, the agricultural sector is responsible for around 27 percent of GDP, reflecting the importance of sugar and rice production, while in Jamaica's more diversified tourism-driven economy, agriculture only represents 5.4 percent of GDP.

1 World Bank (2006) and Ramussen (2004).

2 World Bank (2012).

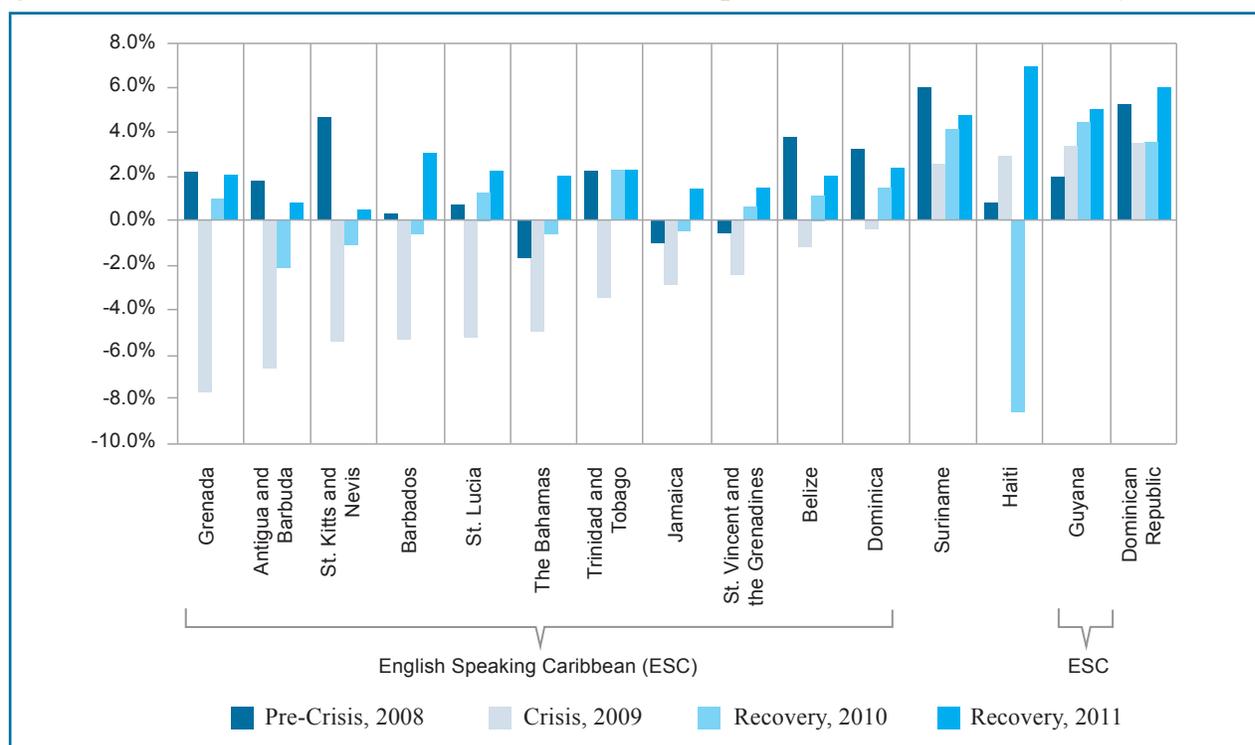
Figure 2. Caribbean Countries Agriculture Share (% of GDP and Employment)



Source: WDI, 2011.

**Other systemic shocks, such as commodity price fluctuations, have also affected Caribbean agricultural sectors.** Caribbean countries have very open economies and are therefore extremely susceptible to international price fluctuations. Agricultural exporters are particularly affected and they are responsible for a large share of total exports. Despite this vulnerability to commodity price fluctuations, only a few products (e.g. coffee, sugar) have hedge instruments available to provide coverage against such price fluctuations. Consequently, most Caribbean countries are defenseless to swings in prices. This results in an unstable macroeconomic performance that improves during upswings and deteriorates during downswings. For example, during the 2008-2009 global financial crisis, the demand for Caribbean exports was severely reduced, which, in turn, had a devastating impact on regional economic growth (Figure 3). In recent years, the agricultural sector in most Caribbean countries has either declined or stagnated, primarily because of the contraction in traditional exports. Sugar, bananas, cocoa and rice have experienced price volatility in commodity markets and suffered from the erosion of European trade preferences.

**Figure 3. Economic Growth in the Caribbean: Estimated Impact from the Crisis and Recovery (2010-2011)<sup>3</sup>**



Source: Based on IMF-WEO estimates and projections as of April 2010.

Note: Countries ranked according to economic growth rate in 2009.

**With a few exceptions (discussed later), the Caribbean agricultural sector does not have access to market-based agricultural insurance and hedge instruments in the case of major shocks. Farmers and those dependent on supply chains must rely on a combination of their own resources, financial support provided by the government, and/or support from international donors.** The region has very limited access to hedging instruments to cover its exposure to international price fluctuations and to insurance instruments, despite being in a highly disaster-prone area<sup>4</sup>. As a result of these limitations, countries have to self-insure through the use of public savings, the development of preventive measures and/or by relying on international support and borrowing.

**In order to overcome some of these limitations the World Bank launched in 2007 the Caribbean Catastrophic Risk Insurance Facility (CCRIF) which helps countries to finance early rehabilitation activities and public sector costs following catastrophic weather events (hurricanes and earthquakes).** The objective of the insurance facility is to enable the government of the participating countries and territories to receive an injection of liquidity in the wake of a hurricane or earthquake that meets specific parameters. It provides a pre-determined indemnity for budget support to rapidly cover liquidity gaps during the first months after a disaster. Claims payments depend on parametric triggers (index-based insurance instruments) that pay claims based on the occurrence of a pre-defined event rather than an assessment of actual losses. This measurement is made remotely by an independent agency, allowing for transparent, low-settlement costs and quick-disbursing contracts.

<sup>3</sup> From Kouame and Reyes (2011).

<sup>4</sup> Ramussen (2004).

**The Bank has also given support to developing countries in the implementation of market-based instruments in the agricultural sector (especially agricultural insurance and price risk management) with several successful experiences in Africa, Asia and Latin America.** For example, the Bank provided support for the design and launch of the first weather index-based insurance instrument targeted to small farmers in India. Initially funded by the Bank, the project has helped to develop the agricultural insurance sector through support to insurance providers, agricultural input providers, and micro finance institutions<sup>5</sup>. The success of this project has prompted the Bank to expand its support to include index-based risk management instruments for small farmers in several other countries. For example, the Bank has helped the governments of Malawi and Mongolia to manage and transfer catastrophic risks through instruments like weather derivatives and contingent credit lines.

**Caribbean countries have recognized the challenges and limitations in implementing insurance in the agricultural sector, in particular for small farmers.** Agricultural insurance for individual farmers is almost non-existent and is very difficult to implement, with few exceptions such as the banana industry in the Eastern Caribbean and a public agricultural insurance company in the Dominican Republic<sup>6</sup>. As a consequence, most of the costs from weather hazards and commodity shocks are absorbed by farmers and/or governments. It is important to emphasize the role of the government given the small size of the average farmer in the region and the fact that the agricultural sector is subject to frequent and intense weather events. Farmers rely on a combination of informal (crop diversification, off-farm income), as well as more formal mechanisms (government support, mutual funds and other forms of risk-sharing through commodity boards), to deal with this type of shocks. Nevertheless, frequent weather hazards and price volatility lower rural income level, increasing rural poverty and reducing economic growth and competitiveness. The difficulties in making affordable insurance available to small farmers have to do with: (i) a multi-cropping structure of smallholder farming, which complicates the evaluation of exposure of different crops to the various production shocks; (ii) the lack of affordable delivery mechanisms for insurance companies to offer insurance to small individual farmers; (iii) the insufficient quality of the available information about the agroclimate to undertake probabilistic analysis at a disaggregated level; (iv) the insufficient capacity to design and administer agricultural insurance contracts; and (v) the provision of ex-post support programs, which reduces farmers' willingness to pay for insurance.

**The purpose of this report is to summarize the main results and lessons learned during the implementation of the World Bank technical assistance (TA), which are valuable to the ongoing discussion on agricultural risk management in the region<sup>7</sup>.** Between 2009 and 2012, the Bank provided advisory services to a total of six countries: Jamaica, Haiti, Guyana, Belize, Grenada, and the Dominican Republic. Given the importance of the agricultural sector and the heterogeneity of its production structure, a country-specific approach was an essential part of the technical assistance.

The report is organized as follows. Section two summarizes the program risk management strategies, including initial objectives and final outcomes. In particular, it describes how these objectives change in order to respond

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5 Currently, ICICI Lombard provides rainfall index-insurance coverage to micro finance institutions that package insurance instruments into their micro-credit operations with small farmers. This type of insurance has also been incorporated into Monsanto's provision of improved seeds sold to farmers in certain regions of India.

6 The Windward Island Crop Insurance (WINCROP) provides insurance for banana growers in the Eastern Caribbean (see Box I in the next section). The other successful experience is located in the Dominican Republic, where a public agricultural insurance company has been able to cover 7 percent of the cultivated area under a multiple-peril insurance scheme.

7 Financing for the program was provided through the support of the European Union's All Agriculture Commodities Program (AACP) Initiative, as well as through contributions from the International Fund for Agriculture Development (IFAD), the Global Index Insurance Facility (GIIF), and the World Bank.

to the countries' particular demands. Section three presents the methodology and basic principles applied in the four stages of the program implementation. Six country cases are summarized in section four with a complete description of final outputs and recommendations. Finally, section five presents the main conclusions and lessons learned.

## II. Objectives and Outcomes

**The primary objective of the technical (TA) provided by the World Bank was to support interested Caribbean countries in the development of a country-specific weather risk management strategy for their agricultural sector.** In order to achieve this objective, the Bank facilitated the design of innovative risk management mechanisms, with a focus on market-based instruments targeted to reducing the vulnerability of small and medium-sized producers. The coordination with the private sector was an important element of the program, in particular for the provision of knowledge services and technical assistance on weather and price risk management mechanisms of key agricultural commodities.

**The proposal to develop an ex-ante contingent financing strategy was well taken by the countries.** In order to develop a risk financing framework, an overall agricultural risk assessment was developed for specific cases and based on the countries' particular demands. For example, a sector-wide (rapid) risk assessment was conducted only in Belize and Grenada. However, in Jamaica, Guyana, Haiti and the Dominican Republic, where the Bank together with the governments have already analyzed overall priorities and risks, the focus was on public sector risk management as well as more specific sectoral assessments.

**The Bank's advisory service was successful in adapting its objectives to respond to an increase in country-specific requests.** Table 1 below compares original objectives agreed in 2009 with actual outputs at the end of 2012. Most of the countries did change the original planned outputs, reflecting a truly client-driven process. The expected outcomes at the launch of the TA were: (i) the design and introduction of innovative agricultural market-based risk management mechanisms in the region; (ii) the increase in the regional capacity to design new instruments by creating alliances among academic institutions, the private sector, and public organizations; and (iii) the overall improvement of government's spending allocated to the agricultural sector in response to systemic weather events. Additional technical capacity needed to accommodate new requests was only possible through an efficient use of available financial resources and by accessing additional trust fund resources. Financial support was mainly provided by the World Bank (Bank Budget), and from a series of Trust Funds, including: (i) the EU AACP Initiative Program; (ii) the Trust Fund for Environmentally and Socially Sustainable Development (TFESSD); (iii) the Global Index Insurance Facility (GIIF); and (iv) co-financing from IFAD.

**Table 1. Planned vs. Actual Outputs**

Country	Originally Planned Outputs (FY 2009)	Actual Outputs by FY 2012	Comments on Difference
Haiti	<ol style="list-style-type: none"> <li>1. A weather risk map for Haiti that would enable decision makers to make decisions regarding prioritizing of public investments and supporting complementary private sector developing activities.</li> <li>2. A report on the supply chain risks of the coffee industry in Haiti, with specific recommendations for improvements by the public sector.</li> </ol>	<ol style="list-style-type: none"> <li>1. Risk maps were developed for different weather hazards by the Bank's Disaster Risk Management Team and which served as input to a Strategy Document on financial management of weather risks in the agriculture sector of Haiti. The final document was prepared, but not yet delivered to the client.</li> <li>2. A supply chain risk assessment of the coffee sector.</li> <li>3. An analysis of rice price transmission and impact of international food price volatility in local markets.</li> </ol>	In Haiti, the originally planned outputs were achieved, and an additional activity was undertaken given the interest of the client and the Bank for reviewing the food commodity price risk and its impact in the most vulnerable populations.

Table 1. (cont.)...

Country	Originally Planned Outputs (FY 2009)	Actual Outputs by FY 2012	Comments on Difference
Guyana	None	<p>1. A supply chain risk assessment of the rice sector was concluded and delivered to the Guyana Rice Development Board (GRDB).</p> <p>2. A pre-feasibility assessment for introducing agriculture insurance was completed and delivered to the Ministry of Agriculture (MoA). However, the Memorandum of Understanding (MoU) to move to the feasibility stage has not been signed due to political problems between the MoA and the Ministry of Finance (MoF).</p> <p>3. A multi-stakeholder workshop on the development of agriculture insurance in Guyana.</p>	Guyana was not originally included as a target for TA, as the country was slow in formally requesting the Bank's support. However, in FY 2010, the Government did finally request the Bank's assistance and was very interested in introducing new agriculture risk management instruments in the country.
Belize	A weather risk map for Belize that would enable decision makers to make decisions regarding prioritizing of public investments and supporting complementary private sector developing activities.	Rapid Agriculture Sector Risk Assessment.	Although Belize was one of the first countries to request the technical assistance of the Bank, the work did not move beyond the rapid agriculture sector risk assessment, as there was a lack of ownership and involvement from the Government; therefore, the risk maps were never developed.
Jamaica	<p>1. A report on the feasibility of introducing a macro or meso-level weather insurance product for coffee farmers in the Blue Mountain region.</p> <p>2. A report on the viability of moving forward with the design of a public sector mechanism to hedge the small farmers' exposure to extreme weather events.</p>	<p>1. A final feasibility report of index insurance in the Blue Mountain region has been prepared and delivered to the client.</p> <p>2. A final pre-feasibility assessment for introducing innovative risk management mechanisms for managing weather risks in St. Elizabeth and Portland Parishes was delivered to the Government (Planning Institute of Jamaica -PIOJ-, MoA, MoF).</p> <p>3. A training session on price risk management (futures/options) was undertaken for the Coffee Industry Board (CIB) as it moves towards exploring other markets and being more exposed to international market price fluctuations.</p>	In Jamaica, the Bank delivered both activities originally planned. An additional training on commodity price risk management was added to respond to the request from the CIB given the change in market demand, from a highly niche product (Japanese market) to more diversified exports subject to international market price volatility.

Table 1. (cont.)...

Country	Originally Planned Outputs (FY 2009)	Actual Outputs by FY 2012	Comments on Difference
Grenada	None	<ol style="list-style-type: none"> <li>1. Rapid Agriculture Sector Risk Assessment.</li> <li>2. Launching of the Japan Social Development Fund (JSDF)-funded small-vulnerability initiative, executed by the Agriculture Disaster Response Committee (ADRC)<sup>8</sup>, who the Bank had been advising in policy and program implementation.</li> </ol>	Grenada was not originally included as a target for TA, but the Government requested Bank support, so a quick risk assessment and a JSDF-supported operation were prepared to help manage disaster risks in the agriculture sector.
Dominican Republic	None	<ol style="list-style-type: none"> <li>1. Provided advice to the Ministry of Agriculture in the establishment of an Agriculture Risk Management Unit within the Ministry to better identify, assess and provide support to farmers and the insurance industry for managing sector risks.</li> <li>2. Feasibility assessment for introducing a macro-level agriculture insurance coverage for the Government against hurricane and excess rainfall.</li> </ol>	The Dominican Republic requested Bank advice on the setting up of an agriculture risk management unit. The Bank also provided technical assistance to this unit in the feasibility assessment of a macro-level coverage for the agriculture sector.
Regional	<ol style="list-style-type: none"> <li>1. A critical mass of faculty and students at the UWI trained in price and weather risk management instruments for agriculture.</li> <li>2. Coordination with the CCRIF.</li> </ol>	<ol style="list-style-type: none"> <li>1. Regional Training events were held in Jamaica and Antigua to respond to the training needs of the region on agriculture risk management.</li> <li>2. Several meetings were held with the CCRIF management to review progress on a rainfall contract (expected in 2013).</li> </ol>	Unfortunately, the UWI was not responsive to the various attempts to partner with them in building capacity, but the Bank did partner with IICA and the Caribbean Agriculture Cooperative Network to undertake various trainings at the Regional level.

Source: Authors.

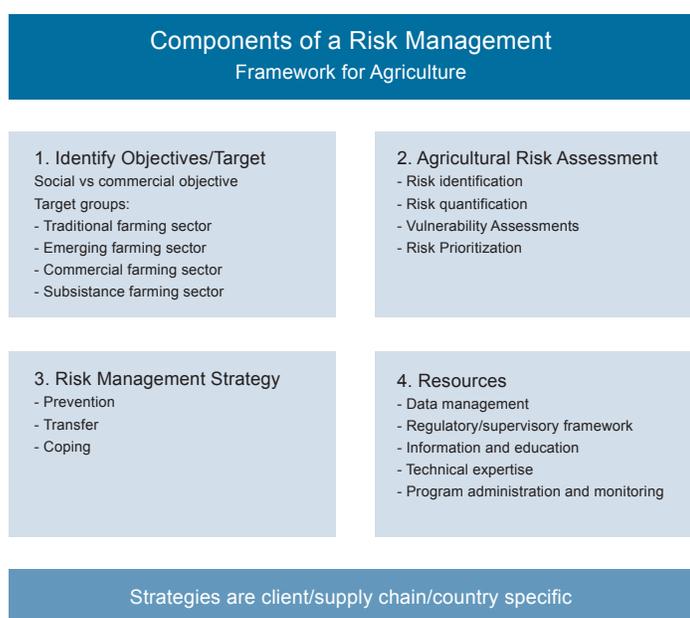
<sup>8</sup> The ADRC had received advice from the World Bank in FY 2009 and FY 2010.

### III. Approach and Methodology

The Bank's approach was based on specific principles in order to ensure the sustainability and impact of the advisory services. The approach included the following basic principles:

- **Multi-sectoral collaboration:** The Bank ensured the participation of a multi-sectoral team that was able to bring an integrated approach including: regional perspectives (Agriculture and Rural Development Unit, LCSAR), financial sector expertise (Capital Markets and Non-Banking Institutions, FPD, GCMNB), and sectoral knowledge (Agriculture Risk Management Team, ARD)
- **Public-Private Partnership:** The Bank worked jointly with the public and the private sectors providing technical assistance to local and link insurance companies, banks, governments and donors to help assess the countries' particular challenges and finding common approaches to design and implement market-based solutions in the agricultural sector.
- **Comprehensive risk management framework:** The Bank's approach used a comprehensive risk management framework in order to assess the countries' agricultural risks. Those risks included vulnerabilities related to short-term weather events as well as long-term hazards. At the same time the framework incorporated the different components (see Figure 4), and phases (mitigation/prevention, transfer, and coping/response) in the risk management spectrum. During the countries' assessments, the possibility of implementing market-based instruments, such as agricultural insurance, was also considered as a first step towards the introduction of additional programs or policies. The final objective was to improve current public sector risk management strategies from reactive responses (ad-hoc or ex-post) to more proactive approaches (ex-ante) to weather events.

**Figure 4. Agriculture Risk Management Framework**



Source: Mahul and Stutley (2010).

- **Demand-driven:** One of the Bank's principles was the implementation of a demand-driven approach. The central purpose was to implement market-based strategies and tools based on countries' demands with the final desirable objective of mainstreaming and scaling up successful experiences. Although most of the work was country-specific, the Non-Lending Technical Assistance (NLTA) also provided capacity building at the regional level, through institutions like IICA and regional fora.
- **Potential for scaling up:** It was important to quickly identify the potential to provide valuable lessons at the regional level. For example, similar projects in Central America proved to be a good channel for further developments in commodity risk management policies (e.g. agricultural technology, micro finance and climate change).

**Country selection was based on the amount of local demand for Bank support<sup>9</sup>.** After a comprehensive country evaluation to identify areas of possible assistance, several countries made specific requests seeking support to address systemic agricultural risks. For example, the governments of Haiti and Jamaica requested an assessment on the public sector role to support small farmers in order to deal with systemic weather events. Commodity price management was also identified as an area of interest for Bank support in Haiti, Grenada, and Belize. Other non-weather systemic risks were also identified, such as animal and plant health issues.

**A total of six countries expressed interest and requested the Bank support<sup>10</sup>. Once countries had expressed their interest, the technical assistance was implemented in four stages.** Stages One and Two were conducted in all six countries, with different degrees of participation, providing as a result an overall evaluation and a public sector strategy for coping with systemic agricultural risks. During Stage Three, a feasibility study was conducted, based on the specific requests from two countries, in order to evaluate the possibility of implementing market-based risk management instruments; finally, Stage Four built on the work done in previous stages by implementing specific pilot projects. Table 2 summarizes the different stages as well as the each country's participation, final reports, and resulting Bank instruments.

**Table 2. Four Stages of the Programmatic NLTA (2009-2012)**

Country	Stage One	Stage Two	Stage Three	Stage Four	Impact WB Portfolio
Haiti	Haiti Coffee Supply Chain Risk Assessment	A Public Strategy for Financial Weather Risk Management in Agriculture	Macro-level Agriculture Insurance Feasibility Study	Discussions with CCRIF	RESEPAG I (GFRP) and RESEPAG II (GAFSP)
Jamaica		Toward a Strategy for Financial Weather Risk Management in Agriculture	Pre-feasibility Assessment for Innovative Agriculture Weather Risk Management Mechanisms for Small Farmers (St. Elizabeth and Portland Parishes)	Coffee Industry Board Index Insurance Pilot  Discussions with CCRIF	Pipeline Project on Agricultural Risk Management

<sup>9</sup> The analysis of specific supply chains (e.g. coffee in Jamaica) was based on different factors. First, and the most important, was the specific demand from the private and public sectors. The second factor was the importance of the sector's share in the agricultural GDP. Finally, another consideration was if the sector under study could implement the Bank's recommendations.

<sup>10</sup> The countries participating in the TA were: Jamaica, Haiti, Guyana, Grenada, Belize and the Dominican Republic.

Table 2. (cont.)...

Country	Stage One	Stage Two	Stage Three	Stage Four	Impact WB Portfolio
Guyana	Guyana Rice Supply Chain Risk Assessment		Agricultural Insurance Component Pre-feasibility Study		
Grenada	Agricultural Risk Management			Emergency Response Program for Small Farmers	JSDF Small Farmers Emergency Grant
Belize	Rapid Assessment of Agricultural Risks				
Dominican Republic			Macro-level Agriculture Insurance Feasibility Study		JSDF Small Farmer Productivity Project

**Stage One: Agricultural risk assessments.** In 2009, during Stage One, a rapid assessment of agricultural risks in Belize and Grenada was conducted comparing expected losses and frequency of events. The initial rapid assessment appraised public and private capacities to manage risks as well as the availability of market-based instruments in the 2 countries. Additional rapid assessments were also conducted for specific supply chains. For example, during 2009, a supply chain risk assessment was conducted in Haiti to evaluate the risks related to the coffee supply chain, and in 2011, a similar report was conducted in Guyana to evaluate the risks of the coffee supply chain.

**Stage Two: Development of public sector strategies for coping with systemic agricultural risks.** During this Stage, the Bank engaged in conversations with the public sector to facilitate the development of a specific strategy to manage systemic risks at the micro, meso and macro-levels. The country-specific strategy focused mainly on weather risks (hurricane, tropical storms, etc.), and the first strategy was conducted in Jamaica, followed by Haiti.

**Stage Three: Feasibility studies for market-based risk management and transfer instruments.** Feasibility studies performed during Stage Three included a modeling exercise for weather risks in order to correlate farm losses with weather variables; it also provided possible trigger variables for the evaluation of index-based insurance contracts, as well as an assessment to evaluate the type of coverage and transfer mechanisms (public/private) to reach farmers. The first feasibility study completed for Jamaica, evaluated the possibility to introduce innovative agricultural weather risk management for small farmers in St. Elizabeth and Portland Parishes, and for coffee farmers in the Blue Mountain region. This work was done building upon existing experiences in the region, such as WINCROP (see Box 1) and other insurance and co-insurance mechanisms used by export commodities groups (commodity boards, EU banana program, farmer associations, etc.). The pre-feasibility studies were done for insurance products in Guyana, Jamaica and the Dominican Republic.

**Box 1. WINCROP in the Eastern Caribbean Countries**

Windward Island Crop Insurance (WINCROP) constitutes an interesting experience in the provision of crop insurance that was instituted by small farmers organizations, with shared capital provided by the Banana Growers Associations in the three participating Windward Islands (Dominica, St. Lucia and St. Vincent), and without additional government support. It was originally established in Dominica in 1987, and was later expanded to St. Vincent and the Grenadines in 1996 and to Grenada in 2000.

WINCROP's central objective is to carry out the business of crop insurance in order to secure re-insurance against any and all risks assumed. It provides statutory insurance and optional contractual insurance against loss of banana holdings by windstorm and volcanic eruptions.

WINCROP has been able to respond to the claims during the devastating effects of the storms and hurricanes that have affected the region since the 1980's. For example, after Hugo in 1989, it was able to approve 8,882 of the 9,937 claims received and paid a total of EC\$8 million to farmers. The best record was registered in 1995, after 17,144 claims were received and 14,905 approved for payment, resulting in total payouts of EC\$15.5 million. Part of this success is explained by the use of On-Call Assessors (OCA) to carry out assessments. For example, during the 1995 storm season, near 204 on-call assessors were employed. Currently, training sessions are being provided by permanent assessors and adjustors on an annual basis to ensure high standards, and assessments of the OCA's are audited by permanent assessors.

Current challenges are related to a reduction in premium income for WINCROP, which has to do with a decrease in population growth, and also to losses experienced in the banana sector. In particular, export losses in the banana sector are explained by lower export levels associated with decreasing export prices paid by the UK market.

*Source: Ministry of Agriculture, Antigua and Barbuda.*

**Stage Four: Implementation of pilot projects for market-based agricultural risk management.** Based on previous feasibility studies, additional support could be provided in order to facilitate the design of market-based instruments or mechanisms on a pilot basis. For example, during 2011 a feasibility study on index-based insurance for the coffee industry was conducted in Jamaica and constitutes the basis for the implementation of a pilot project in that sector.

## IV. Country Experiences

This section summarizes the work and results of the TA conducted in the six Caribbean countries (Jamaica, Haiti, Guyana, Belize, Grenada and the Dominican Republic). It provides a brief description of the agricultural sector structure and the challenges associated with the implementation of market-based agricultural risk management instruments. Finally, a revision of particular activities, recommendations, and outputs is presented based on the methodology described above.

### 4.1. Regional Approaches

**The Caribbean Catastrophic Risk Insurance Facility (CCRIF) was created in 2007 to help Caribbean countries to finance early rehabilitation activities and public sector costs following catastrophic weather events (hurricanes and earthquakes).** Compared to other risk management projects developed by the World Bank (see Annex 1), the CCRIF constitutes a macro-level approach with the objective of providing budget support to Caribbean governments following a pre-specified catastrophic weather event. A similar macro-level project was developed in Malawi to provide budget support to the Government in the case of a severe drought. In contrast, other World Bank micro-level projects provide support to limit government's contingent liabilities (e.g. India, Mongolia and Turkey) or provide resources for disaster relief and reconstruction efforts through meso-level projects with local governments or regions.

**The CCRIF allows participating countries to pool their country-specific risks into a single, better-diversified portfolio.** This diversification results in a substantial reduction in the premium cost of 45 to 50 percent. The objective of the insurance is to enable the governments of the participating countries and territories to receive a rapid injection of liquidity in the wake of a hurricane or earthquake that meets specific parameters. Claims payments depend on parametric triggers (index-based insurance instruments) that pay claims based on the occurrence of a pre-defined event rather than an assessment of actual losses. This measurement is made remotely by an independent agency, allowing for transparent, low-settlement costs and quick-disbursing contracts. This type of instrument has been helpful in financing early rehabilitation activities and to fill the public financing gap in the period where governments are raising additional funding for reconstruction purposes.

**The CCRIF provides limited coverage for agricultural losses.** The CCRIF provides coverage for 1:15 to 1:20 year events, while the agricultural sector usually needs coverage for higher frequency events (e.g. 1:5 to 1:10 year events). Since countries can choose their attachment point, the lowest they can get is 1:15. As a result, countries could use payouts to compensate farmers for losses resulting from a 1:15 or higher, but there is no payout associated with smaller, more frequent events. In addition, the CCRIF only provides direct support to governments in the case of earthquakes and hurricanes; as a result, payouts for agricultural losses might have been provided only indirectly through emergency support. Finally, as measuring stations are usually located in areas where assets are concentrated, mostly urban and tourism centers, losses in the agricultural sector due to wind speed might not be accurately measured<sup>11</sup>.

**The CCRIF has recently developed an excess rainfall product to supplement its earthquake and hurricane policies.** Currently the CCRIF only provides coverage for events triggered by hurricanes and earthquakes; however the agricultural sector's risks are more related to the excess/lack of rain. In response to member's

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<sup>11</sup> In addition, the number of stations currently in used is limited, only one or two for some of the islands. The CCRIF is trying to assess this problem by using a grid for its loss estimation model.

demands, a new framework that includes an excess rainfall product will be operational in 2013 (see Annex 2). Countries that wish to buy insurance against this peril will need to pay a premium that will be higher than current payments for earthquake and/or hurricane events.

## 4.2. Jamaica

### 4.2.1. Brief Description

**Jamaica is among the most affected countries by natural hazards.** Due to its geographic location and topography, Jamaica faces a variety of natural hazards. The country lies in the Atlantic hurricane belt where it is affected by destructive storms and hurricanes. Despite being a small island, its topography ranges from mountains on the east side, valleys and plateaus at the center, and plains located on the coast. Those regions represent distinct agro-ecological conditions which are subject to different degrees of exposure to natural hazards. There are three weather hazards that are the most significant in terms of their impact on the agricultural sector: (i) short-duration extreme winds; (ii) short-duration extreme rain; and (iii) sustained deviations from average rainfall (excess rain and drought). Short-duration extreme rain and wind hazards are predominantly associated with tropical cyclones (hurricanes), while short-duration rain hazards can also be associated with non-cyclonic tropical waves and depressions.

**The characteristics of the agricultural sector present important challenges for market-based commercial agriculture insurance for small farmers.** The agricultural production is based on a high percentage of small farmers under a multi-crop system. While commercial producers are more concentrated around a specific crop, i.e. 73 percent of the agriculture area is used for permanent crops such as sugar, bananas, citrus, and coffee, the remaining 27 percent is a multi-cropping system utilized by small farmers. The overall average farm size is around 1.4 hectare (ha)<sup>12</sup>, and the distribution of the land indicates that 66 percent and 85 percent of the number of production units account for less than 1 ha and 5 ha, respectively; however they only represent between 15 percent and 41 percent of the land. On the other hand, most commercial producers, with only 20 percent of the production units, account for more than 50 percent of the land and they represent 80 percent of the agricultural market output.

**Additional challenges for the development of insurance in the agricultural sector are related to deficiencies in the data infrastructure.** In particular, there is limited research into windstorm or hurricane indices, limited long-term rainfall data and additional problems related to the difficulties in recording extreme weather events. Although wind hazards are easier to model and there is a good historical database in Jamaica, there has been limited research into windstorm or hurricane indices<sup>13</sup>. Since rain-related hazards are generally more difficult to replicate in a model than wind hazards, thus, parameters originated from ground data are usually preferred to predicted rain-related events. However, ground data in Jamaica is insufficient, ground-based radars are limited and flood hazards, except for major drainage basins, are not well-recorded to enable probabilistic hazard mapping.

**Insurance coverage for weather risks has ceased to operate for different reasons.** There are only a few cases where traditional named-peril insurance has worked, such as bananas, coffee and sugar cane. However, since 2005, coffee producers have been experiencing different problems in purchasing insurance due to difficulties

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12 According to the 2007 Agriculture Census, the agriculture sector covers about 326,000 hectares of production, and it includes almost 230,000 farms.

13 With the major exception being the Caribbean Catastrophic Risk Insurance Facility (CCRIF), which was designed with the cooperation of the World Bank.

in the insurance (and re-insurance) industry. Problems began when claims exceeded insured losses and the farmers and insurance companies went to court for several years.

**With some exceptions, there are no risk transfer mechanisms (public or private) readily available to cover weather risks. As a result, most supply chain producers and small farmers are currently self-insured.** The factors behind the lack of insurance are related to deficiencies in the country's reinsurance capacity explained by the high exposure to catastrophic (CAT) events as well as technical difficulties. These difficulties are related to: (i) the design of appropriate insurance products and delivery mechanisms for small farmers; (ii) the possibility to provide a contract for multiple tropical crops in a production unit (multi-cropping systems); and (iii) the design of a model that can associate hurricanes and flood damages to agricultural production (yields).

**During the 1980's there were some efforts to overcome the lack of insurance instruments through the use of different pooling mechanisms.** For example, several Commodity Boards (CBs) were able to provide co-insurance for specific crops through a membership fee or by underwriting "insurance" contracts without reinsurance. However, they have ceased to operate with the exception of the coconut board. The reasons behind the failure of the commodity boards were: (i) lack of clear methods on loss assessments; (ii) considerable moral hazard issues in past transactions; (iii) legal barriers for CBs to act as insurers; (iv) bad experiences related to CBs' delays in processing loss assessment and delivering payments; and (v) inability to transfer risk and, thus, significant financial exposure to CAT events.

**The Ministry of Agriculture (MoA) has recognized the need to implement a new strategy for managing agricultural weather-related risks.** Currently, farmers have to rely on their own savings, selling of livestock, borrowing, government support or international donor assistance when faced with extreme weather events. The MoA usually provides ex-post support to farmers after a natural disaster; however, the Government has recently recognized the need to move towards an ex-ante financial risk management strategy. For example, Table 3 shows Jamaica ex-post government's expenditures for the recovery of the agricultural sector between 2000 and 2010. During this period, direct damage to the agricultural sector was estimated to be around J\$8.7 billion and public resources mobilized for the recovery of the sector were estimated to be around J\$1.5 billion, an average yearly amount of J\$144 million (US\$1.7 million). In particular, donor contributions represented around 70 percent of total public assistance between 2008 and 2010, and an average of nearly 40 percent for the entire period.

**Table 3. Disaster Recovery Funding for the Agricultural Sector, 2000-2010 (J\$ million)**

Year	Disaster	Total Damage to Sector	Government Support	Donor Support	Total Support
2000					
2001	Flood		98.90		98.90
2002	Flood	111.00		322.22	322.22
2003					
2004	Hurricanes Ivan and Charley	2,196.00	220.00	27.40	247.40
2005	Emily, Dennis, Wilma and drought	993.90	545.00		545.00
2006					
2007	Hurricane Dean	3,765.5	225.00	215.80	440.80
2008	Tropical Storm Gustav	1,630.00	47.00	448.80	495.80
2009					
2010	Tropical Storm Nicole	1,360.00	36.00		36.00
<b>TOTAL</b>		<b>8,696.4</b>	<b>1,173.90</b>	<b>1,014.20</b>	<b>1,445.32</b>

Source: Ministry of Agriculture, 2010

### 4.2.2. Bank Support

**Jamaica was the first country in the Caribbean region that requested technical assistance from the Bank.**

In 2009, the MoA, with Bank support, developed an agriculture weather risk management strategy. The result was the preparation of a draft public sector strategy document that laid out an overall approach for coping with systemic climatic risks in the sector. The new strategy, based on input from the public and private sectors as well as from expert consultants, prioritized the need to address macro and meso-level financing support for key agricultural commodities. Given the interest to implement an ex-ante strategy, the Bank support transitioned from Stage One to Stage Two.

**As a response to the country's demands, the Bank provided technical assistance to the MoA and the Coffee Industry Board (CIB).** The management of systemic weather events (rainfall and wind) was the priority identified from the initial dialogue with public officials and the private sector. At the end of the technical assistance in 2011, the Bank produced two pre-feasibility assessments to introduce innovative financial hedging mechanisms in the agricultural sector through two pilot projects. One evaluation was for the parishes of St. Elizabeth and Portland, and a second one was completed in 2011 for coffee farmers.

World Bank TA in Jamaica will have an impact on the following investments:

- **A Bank operation (REDI) focusing on agriculture investments at the community level.** This operation includes investments in risk-reduction works and facilities (greenhouses, improved crop varieties, etc.).
- **The TA will constitute one of the sources for the approval of ongoing loans.** In particular, the NLTA fed inputs into the design of an IBRD loan on agriculture risk management planned for 2014.
- **Additional support from international organizations.** Potential IADB and private sector grants for the development of the agriculture insurance market, and IADB infrastructure investments in irrigation to cope with drought risks.

### 4.2.3. Bank Recommendations and Outputs

The Bank provided technical advice to the public and private sector through various technical missions that resulted in the publication of a public sector strategy. This was followed by two feasibility assessment for index-based insurance: one was an assessment for small farmers in St. Elizabeth and Portland, and the second was for the coffee industry.

These are the conclusions and policy recommendations from the two assessments:

#### **Public Sector Financial Strategy for Managing Agriculture Weather Risks**

**A public coverage for protecting vulnerable farmers against catastrophic weather risks needs to be considered a priority.** The fact that a large segment of small farmers might not have the capacity to pay for commercial insurance creates the need for an ex-ante rule for public interventions in the event of catastrophic weather events. The document lays out the different challenges that the Government needs to consider to develop such a framework. Among them: (i) identifying clear rules for triggering public sector assistance and possibly linking this support to index-based triggers; (ii) implementing more effective and efficient delivery mechanisms for reaching farmers after a catastrophic event; (iii) improving the tools and data infrastructure for

an ex-ante and ex-post targeting of public support; and (iv) improving all sustainable sources of financing (i.e. contingent credit lines, reinsurance, etc.).

**Fostering the development of agricultural insurance markets through capacity building and innovative market-based instruments.** The report emphasizes that index-based insurance mechanisms could overcome some of the problems related to traditional insurance contracts. For example, the use of an ex-ante reference index reduces moral hazard problems related to individual's actions (i.e. indemnity payment does not depend on realized yields); contributes to predictable payouts; and reduces administrative costs related to inspections and underwriting (see Annex 3. Advantages and Challenges of Weather Index Insurance Contracts).

**Developing agricultural insurance markets through private-public partnerships.** Supporting private-public partnerships may help to improve private sector participation and can contribute to the development of new instruments. For example, CBs can work as an insurance aggregator by pooling weather risks for individual farmers. Implementing index-based insurance contracts (see Annex 4. Conditions for Successful Implementation of Index-based Insurance) through the CBs can also overcome some of the problems that affected the operation of the CBs in the past. In particular, the traditional insurance contracts used before did not work well and left a lot of dissatisfaction among farmers due to delays in payouts and moral hazard problems related to indemnity payments. All these issues finally contributed to the lack of insurance instruments available for small farmers and the lack of interest from international reinsurance companies.

**Increase and improve investments in public goods and services, in particular data infrastructure and regulations.** There are a number of short-term steps that can facilitate the development of new agricultural insurance products (by local and international insurers) that are related to data infrastructure and current regulations. For example, the Government can help by investing in: (i) the recovery and cleaning of historical weather records; (ii) the publication of the 2006 agriculture census; (iii) improving yield statistics at the local level; and (iv) expanding the density of weather stations. Also, the regulatory framework for agricultural insurance can be reviewed to help introduce new types of insurance contracts such as index-based insurance.

### **Pre-Feasibility Assessment for St. Elizabeth and Portland Parishes**

**The pre-feasibility assessment conducted for St. Elizabeth and Portland Parishes, presents alternative risks management options to improve small farmer's agricultural practices and coping mechanisms in order to reduce agricultural income volatility.** The report concluded that a micro-level (individual) small farmer insurance system is not viable in the short and medium term due to the complexities of Jamaica's production structure. For example, it is difficult to design insurance instruments for diverse multi-crop systems and very small landholder structures with an average size of 1.4 ha. However, after evaluating the different options for implementing insurance instruments, (see Annex 5), the report concluded that improving the current public sector's disaster payment program would be a feasible option, in particular during extreme weather hazards (i.e. hurricanes).

The report supports the following four options:

#### **Option 1: Improve the public sector farmers' Disaster Assistance Program (DAP)**

Jamaica's disaster assistance to farmers (DAP) can be strengthened by increasing its transparency and by establishing clear payout rules, e.g. through index-based trigger rules (see Annex 6, Figure 1).

#### **Option 2: Improve the risk financing system for the farmers' DAP**

The idea is to strengthen the farmers' DAP through a sustainable financing approach. This approach would help to plan in advance for the different amounts needed based on the frequency of the risk covered (risk layering approach). For example, for lower-exposure and high-frequency events, financing could be provided through reserves, contingent lines of credit, emergency budget allocation, and/or farmers' own savings. For higher-exposure and low-frequency events, the Government could seek financing from private insurance/reinsurance from the local and/or international markets, or through contingent lines/grants (see Annex 6, Figure 2).

**Option 3: Improve the risk financing system for the farmers' DAP through a public-private scheme (with a "top up" option).**

This option involves complementing the public DAP with a "top up" option. This option would provide supplementary coverage through private financial intermediaries that could offer financial products (such as hurricane vouchers) in addition to the basic governmental DAP coverage. This additional "top up" coverage would be developed and underwritten by the private insurance market.

**Option 4: Develop a commercial agricultural insurance market.**

The objective is to strengthen the institutional development of the domestic private insurance market by providing technical assistance and support to different public and private stakeholders like the Meteorological Service of Jamaica (JMS), the Water Resource Authority (WRA) and the Financial Service Commission (FSC), among others.

### Coffee Industry Weather Insurance Feasibility Study

**Despite the fact that the Blue Mountain coffee is cited as a world-class product, after Hurricane Ivan in 2004, no financial instrument has been implemented to cover the coffee sector's risks.** The lack of insurance is explained by a limited technical and financial capacity, together with the fact that coffee is affected by frequent weather hazards. Coffee growers in the Blue Mountain region are subject to different weather hazards, in particular high winds and heavy rains associated with tropical cyclones. Coffee production is also affected by several factors: altitude, magnitude of weather events, period of the year (which determines the vulnerability of the coffee plants), and the level of exposure of cherries (based on harvest season).

**The feasibility study conducted in the Blue Mountain region evaluated the possibility of implementing an index-based insurance contract with payouts based on a model that simulates winds associated with cyclones in the hurricane season.** In this model, payouts are grouped in 16 zones based on district and altitude, with perils covered according to losses from coffee growing on trees. The paper estimates the model through three modules (a hazard module, a vulnerability module and an exposure module).

**Basic risks are still considerable in the proposed insurance scheme.** Advantages associated with wind index-based insurance are lack of moral hazards, absence of field loss assessment, the direct contract to farmers, the expected feasibility of placing part of the risk with international reinsurance companies, and the rapid payout. However, the report considered major disadvantages related to significant basis risks<sup>14</sup> associated with damage caused by rainfall events with limited or no wind.

**The study proposes the implementation of an income compensation scheme not related to actual losses but as a financial mechanism to manage negative events caused by strong winds during the hurricane season.** Despite the fact that the basis risk would be very high, setting an income compensation scheme would

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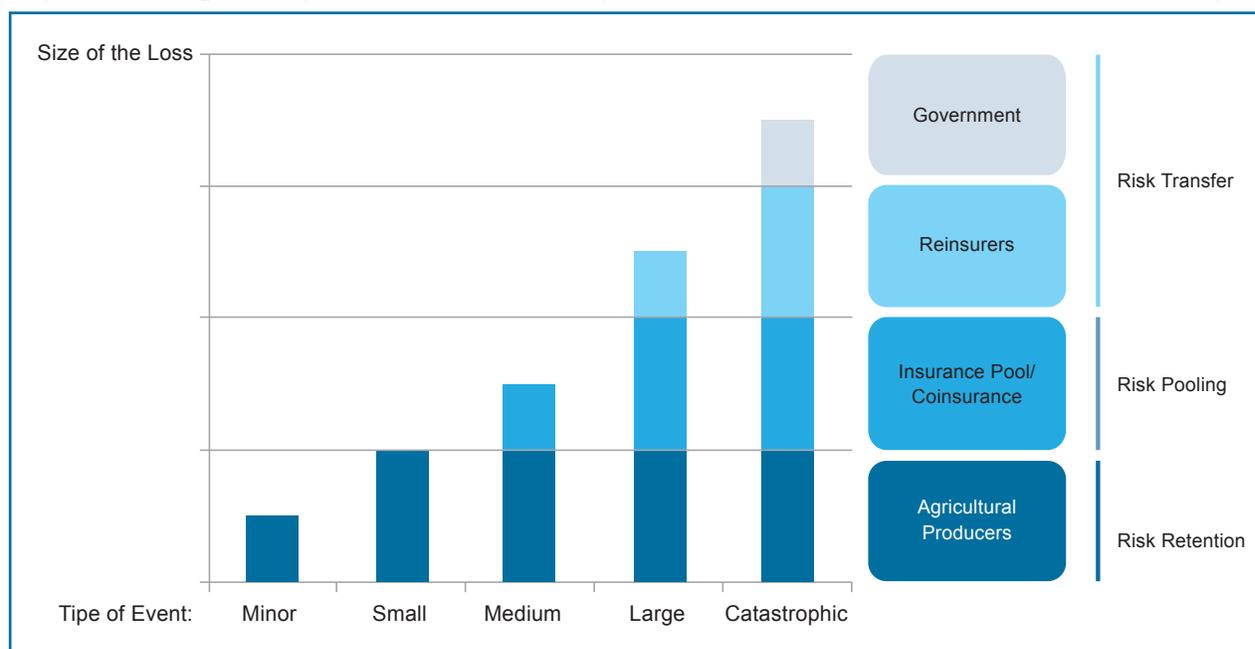
<sup>14</sup> Measured as the variance in payout amounts compared to actual yields.

still be beneficial to farmers. The scheme proposed is an “income supplement” triggered by major wind events instead of a proxy for crop insurance.

**The income compensation scheme could be implemented through a “compulsory basic cover” and an “optional top up cover”.** The proposal is that a basic cover would be paid from a uniform cess, collected on all delivered boxes of cherry coffee, and the “top up” cover would be paid based on differentiated premiums related to the risks for each particular zone.

**A successful implementation of a wind speed index will depend on an efficient risk financing strategy for the different types of risks (risk layering).** In the bottom layer, high-frequency/low-severity events, risks would be financed (retained) by the farmers’ own saving. For intermediate layers, less-frequent but more-severe risks, risks would be covered by private insurance companies. But for the top layer, low-frequency but high risks, the Government would be providing support. Figure 5 below conceptualizes how the risk transfer strategy could work to transfer liabilities arising from the eventual implementation of a wind speed index-based insurance for coffee production.

**Figure 5. Example of Agricultural Risk Layering for Coffee Production in the Blue Mountain Region**



Source: World Bank (2010).

## 4.3. Haiti

### 4.3.1. Brief Description

**Structural constraints to growth in the agricultural sector resulted in a decline of the sector’s share of GDP.** The agricultural sector’s share in total GDP declined from 47 percent to 25 percent between 1969 and 2007. This can be explained by several structural factors including: (i) high frequency of weather hazards; (ii) insufficient investment in rural public infrastructure; (iii) land tenure uncertainties; and (iv) insufficient public services related to data infrastructure and phyto and zoo-sanitary services.

**The Haitian agricultural sector has also been severely affected by natural hazards and weather risk events.** Due to its location in the Caribbean basin, Haiti's agricultural sector is exposed to hurricane and tropical storms. In addition, environmental degradation has contributed to an increase in the impact of natural hazards as well as droughts and floods. For example, the agricultural sector was severely affected during 2008 by four storms – Faye, Gustav, Hanna and Ike – that passed through Haitian territory during the fall of 2008 causing direct damage estimated at around US\$200 million. Also, in January 2010, the country was hit by a 7.0 magnitude earthquake, mostly in urban areas, but with an estimated direct negative impact on the agricultural sector of around US\$31 million.

**The country's geography and land-holding structure impose important challenges for providing financial and technical support to farmers after a disaster.** Haiti is predominantly mountainous with 65 percent of land with slopes greater than 40 percent, uplands representing 15 percent, and plains occupying 20 percent of the remaining land. The average farm size is about 1.5 ha, with a median size of about 1 ha. In 2001, 75 percent of Haiti's farms had less than 2 ha.

**After the 2010 earthquake, the Government of Haiti (GoH) launched the National Agriculture Investment Plan (NAIP) to support agriculture and food security. The NAIP will be financed by the private sector (13 percent), the GoH (14 percent), and international donors at a total cost of US\$709 million.** Under the NAIP, the GoH aims to stimulate local agricultural production by promoting the development of different agro-ecological zones as well as areas directly related to irrigation (watersheds)<sup>15</sup>. The central idea is to intensify the production of crops with high value added such as food crops and export crops<sup>16</sup>. Under the NAIP, additional support for rural infrastructure will be considered, in particular through the rehabilitation of 38 irrigation systems covering 8,200 ha, and 15 new irrigation systems with a total of 5,800 ha that will be built and added to the system. In order to improve the flow of farmers' supplies and food, 600 km of rural roads will also be rehabilitated. Finally, farmers' support will be provided in the form of agricultural equipment and farm supplies as well as capacity building through communal training and research centers.

**There are important challenges in implementing ex-ante strategies for weather risk management in the agricultural sector in Haiti.** Most post-disaster financing is managed in an ad-hoc manner through reallocations of resources from the national budget and ex-post financing from multilateral donors. In addition, available ex-ante strategies for weather risk management, such as the emergency fund (*Fond d'Urgence*) and the Caribbean Catastrophic Risk Insurance Facility (CCRIF)<sup>17</sup> (see Annex 2), are insufficient given the very low level of public and private investment in agricultural infrastructure. For example, lack of watershed protection and deficiencies in irrigation are major causes of floods and droughts in agricultural areas. Finally, the weak fiscal position of the Government restricts the overall level of funding for disaster response and preparedness resulting in large financing gaps for the sector. For example, between 2004 and 2008 direct damages to the agricultural sector were estimated to be around US\$315 million (Table 4); however, post-disaster public funding totaled an estimated amount of US\$64.3 million (US\$13 million per year). An ex-ante risk management strategy would be valuable in order to overcome some of these limitations by providing a more efficient and effective use of Government resources.

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15 These areas include watersheds of the Grande Riviere du Nord, Saint Raphael, Limbe, Maribaroux plain, Quinte, Artibonite, Saint-Mark/Cabaret, Leogane, Cavailon, and Les Cayes plain.

16 Food crops such as rice, bananas, corn, peas, vegetables and tuber crops, and export crops such as coffee, cocoa, and mangoes among others.

17 Post-disaster financing is partly financed through an (ex-ante) emergency fund (*Fonds d'Urgence*), which is not exclusively used for agriculture support. Additional ex-ante financing is also provided by an index-based insurance tool through the CCRIF. The CCRIF is a macro-insurance pool that includes all country members of the Caribbean Community (CARICOM), which was designed with the cooperation of the World Bank at the request of the CARICOM.

**Table 4. Post Disaster Recovery Funding for the Agricultural Sector (2004-2008)**

Year	Disaster	Damage to Agriculture (US\$ million)	Government and Donors Support (US\$ million)
2004	Hurricanes Jeanne and Ivan	37	27.55
2008	Hurricanes Faye, Gustav, Hanna and Ike (FGHI)	197.8	36.75
	<b>TOTAL</b>	<b>314.8</b>	<b>64.40</b>

Source: Assessment mission (CEPAL-UNDP-UN, March 2005), PNDA (2008) and Ministry of Agriculture (MARNDR) (February 2009).

### 4.3.2. Bank Support

The Government requested the Bank assistance to respond to extreme shock events that have been affecting the country since 2008. Four storms hit the country (three hurricanes and one tropical storm) affecting extensive rural areas and poor rural population. Also, after the food crisis in 2008, the GoH implemented a rice price subsidy for three months in order to manage price increases, and reduce social tensions. The Bank, in response to the Government's demand, proposed several new instruments for price and weather risk coverage.

The Bank assisted the Ministry of Economy and the Ministry of Agriculture to develop a work plan for improving the financial management of systemic weather and price risks in the agricultural sector. During the technical assistance provided between 2009 and 2011, the Government received two specific outputs: (i) a coffee supply chain risk assessment identifying specific production constraints in the coffee sector (2010); and (ii) a final strategy document (2011). The Bank also provided training in the execution and development of a work plan. This training was especially tailored for both, the Ministry of Finance and the Ministry of Agriculture, in order to improve the financial management of systemic weather and price risks in the agricultural sector.

The TA will have an impact on the following investments:

- **Two IDA Grants to the MARNDR** which include agriculture risk management investments for institutional capacity building and piloting of innovative instruments.
- **Other international organizations:** Investments financed by the IADB, IFAD and the EU in the area of water management for agriculture including irrigation, drainage, watershed management, and animal and plant sanitation.

### 4.3.3. Bank Recommendations and Outputs

Haiti technical assistance took place under extraordinary conditions after major catastrophic events. The exceptional emergency conditions that surrounded Haiti's technical assistance made it a more hands-on relationship with the Government through an on-going dialogue and capacity training. However, the two documents that resulted at the end of the TA in 2011, constituted key central inputs for the dialogue with the Government in preparation for the Post-Earthquake National Agriculture Investment Plan, and as inputs for the preparation of the Pilot Project for Climate Resilience (PPCR).

These are the conclusions and policy recommendations from the two reports:

### Supply Chain Risk Assessment for Coffee

**The Haitian coffee industry has been constrained by systemic production problems that have contributed to its decline over the years.** These problems are related to the particular structure of the “creole garden”, which contributes to low on-farm coffee productivity and a land tenure system which inhibits long-term investments. Additional factors contributing to its decline are: poor infrastructure, limited access to credit, aging coffee trees and an aging farmer population, waning government interest in the support for the coffee sub-sector, and lack of (international and domestic) promotion of the Haitian coffee industry. Furthermore, environmental degradation, together with an increase in annual infestation rates, have also contributed to the rapid decline in production and yields

**The assessment identifies multiple risks within the Haitian supply chain.** These are classified in four different categories: production, market, political, and other risks; and different levels of risks. Table 5 summarizes these vulnerabilities and Haiti’s ability to manage the different levels of risks<sup>18</sup>. The report also describes the risks affecting the existing supply chain prioritizing the areas requiring attention for risk management, investment, and capacity building. Risks considered are evaluated along five dominant supply chains: (i) artisanal coffee supply chain for domestic consumption (58 percent of total volume); (ii) commercial/industrial coffee supply chain for domestic consumption (6 percent of total volume); (iii) “café pile” supply chain for export (6 percent of total volume); (iv) coffee supply chain for informal trade with the Dominican Republic (28 percent of total volume); and (v) coffee supply chain for export (gourmet coffee, fair trade, etc.) (2 percent of total volume).

**Table 5. Vulnerability to Risky Events Based on Expected Loss + Capacity to Manage Risk**

	----- Capacity to manage risks ----- +				
Expected losses	1	2	3	4	5
High		Scolyte			
Medium	Decline of cross-border trade with the Dominican Republic	Failure to regenerate plantations	Sharp exchange rate appreciation Cooperative failure Hurricanes Political risk Steep increase in banks’ interest rates	Non-cyclone excess rain Transportation blockage due to damaged roads Exporters default on loans	
Low					

Source: World Bank (2010c).

18 See “Haiti Coffee Supply Chain Risk Assessment” (2010) for a detailed description of Haiti’s supply chain risks and possible priority measures for risk management.

*Note:* The effectiveness and capacity for managing risks has been reviewed and rated from 1 to 5, with 5 (high capacity to manage risks), and scale 1 (low capacity to manage risks). The resulting matrix provides 5 sets of vulnerabilities to the identified risks in terms of their priority, from risks with the highest vulnerability in the boxes with the darkest shade, marked as T1 (Tier 1) in the upper left corner, to the risks ranked with the lowest vulnerability shown in the boxes with lighter shades at the right bottom corner of the table, marked as T5 (Tier 5).

The report provides a detailed description of possible measures for risk management based on the diagram above (Table 6). The following is a summary of potential high priority policies:

**Improve management practices to reduce annual infestation rates.** The reduction in yields and quality can be attributed to the increased incidence of diseases and lack of investments. In particular, Scolyte infestation (coffee berry borer) has affected production and yields with annual infestation rates ranging from 20 to 50 percent and production losses between 15 and 20 percent. Programs to eradicate this infestation have been cut over the years, including the government agricultural services. In order to control this type of pest, a consistent program based on a triple action approach is needed. This approach includes 3 types of controls: cultural, biological, and ecological controls. By adopting all three consistently and rigorously, the infection can be greatly reduced.

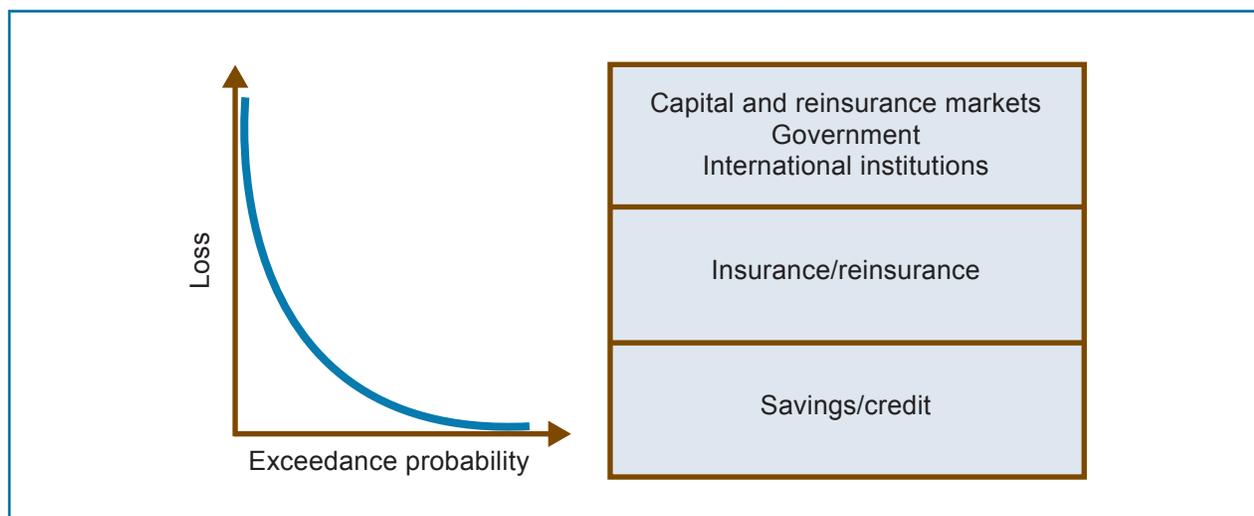
**Additional factors related to managerial problems among exporters can affect trade destinations and production.** Failures of coffee exporting cooperatives due to managerial, operational and financial problems have affected the volume in the cross-border trade with the Dominican Republic. This risk is considered high since current exports to the Dominican Republic represent 28 percent of Haitian total coffee production and Dominican traders help to set the Haitian coffee price (“café pile”). So any decrease in demand from Dominican traders can lead to a decline in prices paid to farmers since they have no alternative markets but to sell domestically at lower prices.

### Public Strategy for Financial Weather Risk Management in Agriculture

**A weather risk mapping exercise is central to identify the typology of farmers, crops and risks in the different geographical areas of the country.** In order to provide an appropriate risk management mechanism, it is important to identify the regions that share homogeneous weather patterns. For example, crops belonging to the same homogeneous regions are likely to face the same type of weather risks. Haiti has different types of agro-ecological areas that can be grouped in four regional levels based on their exposure to prevailing winds (trade winds): dry and semi-humid plains and plateaus, humid and semi-humid plains, irrigated plains, and semi-moist to very humid mountains. Another way to identify homogeneous agro-ecological regions is by watersheds (the country is divided into 30 major river basins). Finally, agricultural exposure based on elevations could be another classification to evaluate weather hazards (i.e. rainfall patterns based on different altitudes).

**The document recommends a more efficient management of disaster funds through a risk layering scheme.** This approach can help to improve the management of government resources in a more efficient way by accessing a wide range of financial instruments and risk transfer mechanisms. By introducing different layers of financing (see Figure 6), the GoH can use new instruments, in addition to fiscal resources, to improve the management of emergency funds. For example, the Government could cope, with its own fiscal savings, to finance low levels of risks. However, for higher losses exceeding the government’s response capacity, the Government could access funds from contingency credit lines available for post-disaster emergency interventions. Finally, for more catastrophic losses, it can rely on insurance and other risk transfer mechanisms to hedge part of the sector’s exposure.

Figure 6. Risk Layering



Source: World Bank (2009).

**It would be important to increase public funds dedicated to the Emergency Fund (*Fonds d'Urgence*).** It would be important to increase the tax base of this fund, which is currently financed through public-sector wages, to all current public administrative expenditures. Another factor that could contribute to the steady increase of the fund is the establishment of a roll-over mechanism; that is, for the years that the fund is not being used, the extra money would continue to accumulate. Finally, in order to achieve transparency, the document emphasizes that predetermined rules for disbursement would be important in order to reduce moral hazard problems in the transfer of money. Additionally, the data of the global agriculture census could register vulnerable farmers, helping to improve the fund's targeting mechanisms.

**Strengthen the agroclimatic data infrastructure.** A good quality and quantity of weather data is central for an early-warning system that can help prevent the effects of weather hazards and constitutes a very important tool for the development of risk management instruments. In particular, increasing the density of weather stations in agricultural zones and in strategically located watersheds can help to improve the availability of weather data as well as improve the research available on weather variables.

**Increase risk mitigation funds in infrastructure.** Insurance premiums increase each year due to the high frequency of catastrophic events and lack of investment in infrastructure, making insurance unaffordable and hampering the future development of insurance markets.

**Improve the legal and regulatory framework.** The document emphasizes that an adequate legal framework is an essential component for the development of market-based instruments for agricultural risk management, and in particular for the development of insurance markets.

## 4.4. Guyana

### 4.4.1. Brief Description

**The agricultural sector is an important source of income for the rural population and represents an important share of the country's GDP.** The agricultural sector represents 50 percent of total employment

and 30 percent of export earnings. Sugar and rice are the most important crops in terms of area, value of production, employment and contribution to export earnings. The Government of Guyana (GoG), within its National Development Strategy of 2001 to 2010, is committed to increasing the rate of growth of agricultural output and, specifically, to diversify Guyana's agricultural exports. Sugar and rice remain the center of the policy measures, in particular to address the challenges of increased competition from declining privileges to access the EU market. For the non-traditional sub-sector, the Government has established rural development centers and cooperatives in order to provide additional support and with the objective of improving agronomic practices, water management, farming systems, market information, and post-harvest technology and agro-processing.

**Guyana, compared to other countries located in the Caribbean, is not exposed to hurricanes, tornadoes, earthquakes or volcanic eruptions, but much of the agricultural area is exposed to rain and flooding, and the country also experiences periodic *El Niño*-related droughts.** Guyana lies to the south of the North Atlantic and Caribbean Tropical Cyclone belt and agriculture is therefore not exposed to tropical storms and hurricanes. Guyana's agriculture is located in the coastal plain, a narrow strip of land that lies below sea level. Between 1988 and 2006, seven natural disasters caused major losses to the economy affecting agricultural production and livestock, of which two correspond to drought events and four to flooding.

**Floods and droughts cause serious damages to crop production in Guyana.** Guyana is influenced by the *El Niño/La Niña*-Southern Oscillation (ENSO) cycle with severe droughts in *El Niño* years and excess rain and flooding in *La Niña* years. Every 10 years, Guyana experiences severe *El Niño*-related events; for example, in 1997 the agricultural areas experienced water shortages and droughts, and again in the period between 2009 and 2010. Since mid-2009, Guyana has experienced abnormally dry conditions and water conservancies are usually dry affecting rice and sugar production. For example, during 2009 dry conditions, the GoG allocated G\$342 million to invest in emergency irrigation in an attempt to save sugar and rice production and was able to reduce an estimated 30,000 acres in drought damages to about only 8,000 acres. Between 2005 and 2009 there were four major flooding events. In 2005, flood losses affected 55 percent of non-traditional agriculture, followed by sugar cane (21 percent), rice (15 percent) and livestock (6 percent).

**Agricultural activities are heavily reliant on the protection provided by a sea wall and an elaborate system of conservancies, pumping stations and drainage canals which were built by the Dutch over a century ago.** The main source of flood exposure is due to excess rain events that cause the overflow of rivers, dams, water reservoirs, and drainage canals, aggravated by the fact that agricultural activities are located in low land along the coastal belt. Flood exposure is therefore highly influenced by the level of maintenance and management of the dams<sup>19</sup>, dykes, sea walls, irrigation, and drainage canals.

**The country has to overcome several challenges in order to be able to develop an insurance market.** Guyana faces a series of key institutional, technical, financial and operational challenges for the development of crop and livestock insurance products. Operational challenges affect the preconditions needed for the development of insurance instruments and are related to the poor agricultural extension services, and the complex management and maintenance issues of the drainage system and dykes. For example, there is no commercial insurance company in Guyana that has underwritten any crop or livestock insurance policy. One of the reasons behind this problem is that agricultural insurance is seen as high-risk. In addition, commercial insurers do not have rural branches to underwrite agricultural producers, increasing the cost of delivering

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<sup>19</sup> In 2005, the reservoir gates in the East Demerara Water Conservancy (EDWC) were opened in order to prevent dam bursts and uncontrolled flooding into Georgetown, but instead it generated more flooded areas in the areas adjacent to the conservancy.

insurance in rural areas. In the absence of any agricultural insurance provision, most farmers have no knowledge or awareness of the potential benefits and constraints of this type of instrument.

Availability of data and information is critical for the development of crop and livestock insurance programs. Guyana has high quality time-series for rice production and yields, but there is no available data for fruits, vegetables, and livestock. In addition there are very few weather stations that comply with data quality requirements. Thus, it is not possible to perform any risk assessment or design any insurance product for these agricultural activities.

#### **4.4.2. Bank Support**

**Guyana was the last country to request Bank support for agricultural risk management in 2009.** After the GoG formally requested the World Bank assistance, a workshop on agricultural insurance and credit challenges was held in December 2009. The Bank also agreed to conduct an agricultural insurance pre-feasibility study for the following sectors: rice, fruit and vegetables, cattle, and aquaculture. In addition, the Bank conducted a supply chain risk assessment for the Guyanese rice sector.

**The two assessments, finalized in 2010 and 2011 respectively, indicate the importance of including prevention and mitigation mechanisms in the country's risk management strategy.** The technical missions conducted in 2010 met with government authorities and the private sector. Mission meetings were held at the Ministry of Agriculture (MoA) and Finance (MoF), the National Bureau of Statistics (NBS), the National Drainage and Irrigation Authority (NDIA), the Guyana Hydro-Meteorological Agency (HYDROMET), the Insurance Commission, private commercial insurance companies, and the Guyanese Rice Producers Association (GRPA). In addition, field visits were conducted in Regions 2, 3, 5 and 6 to meet representatives of the different agricultural sectors. The two reports that resulted from the missions emphasize the need to focus on prevention and mitigation activities such as drainage and irrigation, and animal and plant health among other problems. Also, one of the assessments studied the possibility of introducing agricultural insurance for the rice sector; however, additional feasibility studies are required in order to move forward with this instrument.

#### **4.4.3. Bank Recommendations and Outputs**

Two documents completed after the TA provided a preliminary assessment on Guyana's agricultural risk management challenges. The first document, a pre-feasibility study is currently pending approval by the GoG in order to change its status to final. The second document, the supply chain risk assessment finalized in 2011, evaluates the possibility of introducing agriculture insurance in the rice sector considering the three main actors (farmers, financial institutions, and the public sector), but further studies are needed to evaluate its feasibility before moving forward.

These are the conclusions and policy recommendations from the two reports:

##### **Pre-feasibility study on Guyana Agricultural Insurance**

**Flood is the most significant risks affecting the production of rice, fruit and vegetables, livestock and aquaculture.** Flood is the risk that causes the highest damages. Other major calamities affecting rice production are: droughts, saline intrusion, excess of rain at harvest, and rice pests and diseases. The risks affecting fruit and vegetables are related to specific difficulties in production, marketing, and small-volume trade, than on specific climatic risks. However, during the 2005 and 2006 flood events, major losses took place affecting fruit and vegetables. In the case of livestock, it is difficult to clearly assess what are the specific risk factors since there are no historical records of animal

mortality rates either due to natural causes (flood, accidental death, etc.) or to pests and diseases. Aquaculture risks are also affected by flooding caused by excess rain together with pollution of fresh water. Nevertheless, pests and diseases are not yet a major concern due to current low stocking densities. Finally, risks related to sanitary conditions are contained since the country is free from Foot and Mouth Disease (FMD), but food exports are limited since they lack international food safety standards to certify that exports of meat are disease-free.

### *Agricultural Insurance Options*

**Moral hazard problems related to Guyana's agricultural production affect the provision of insurance in the sector.** Agricultural production is highly dependent on a complex system of irrigation, drainage and dykes that need a high level of investment to maintain its regular operation. Moral hazard problems could arise if the level of investment is inadequate affecting the losses related to floods. Consequently, insurance contracts implemented in the sector might need to include high deductibles and provisions to account for this particular problem. Table 6 presents a summary of agricultural insurance options for Guyana.

**Table 6. Agricultural Insurance Products and Potential Suitability for Guyana**

Type of Agricultural Insurance Product	Basis of Insurance and Indemnity	Suitability for Guyana in Start-up Phase?
<b>a) Traditional Individual Farmer Crop Insurance</b>		
1. Named-peril (e.g. fire, excess rain)	Percentage damaged	Not suitable in the short term
2. Multiple-peril Crop Insurance (MPCI)	Loss of yield	Not suitable
3. Crop Revenue Insurance	Loss of yield/sale price	Not suitable
<b>b) New Index based Agricultural/Livestock Insurance</b>		
4. Area-yield Index	Area-yield loss	Possibly for the rice sector
5. Crop Weather Index Insurance	Weather index payout scale	Not suitable
6. NDVI (Normalized Difference Vegetative Index) Insurance	NDVI index payout scale	Not suitable
7. Livestock Mortality Index Insurance	Livestock mortality index	Not suitable
<b>c) Traditional Livestock Indemnity Insurance</b>		
8. Mortality Cover for individual animals	Animal accident and mortality	Not suitable in the short term
9. Livestock All-Risk Mortality Cover	All-risk mortality/loss of use	Not suitable
10. Livestock Business Interruption Cover	Epidemic diseases in livestock	Not suitable
11. Bloodstock Cover for high value animals	All-risk mortality/loss of use	Not suitable
<b>d) Aquaculture Insurance</b>		
12. Named-peril Cover	Loss of fish-stock	Possibly for fish and shrimps
13. All-risk Cover	Loss of fish-stock	Not suitable

Source: World Bank (2010d)

**Rice area-yield index crop insurance appears to be feasible to implement in the short-term.** It is technically feasible to design and implement area-yield insurance due to data availability and the possibility to introduce minor adjustments to be able to measure zonal average yields. However, the basis risk associated with Guyana's irrigated rice production has to be studied in detail. The current low demand for area-yield insurance coverage

constitutes an additional barrier that makes this product commercially unattractive to local insurers and international reinsurers. However, one micro finance institution is interested in implementing area-yield index insurance and additional support could also be financed through public funds. For example, government support could be used to finance a contingency fund to assist rice producers affected by weather events.

**Aquaculture insurance in Guyana could be developed in the medium term.** Although this industry is in its initial stages and risks are high, the industry has already implemented risk management measures attracting the interest of specialized reinsurers to cover natural perils. But, there are high costs in measuring the specific risks, although these costs can go down once the industry gains more experience in underwriting insurance contracts.

**Multiple-peril crop insurance (MPCI) is not viable in the short term.** Lack of production and yield statistics constitutes the major constraint to design and rate multiple-peril crop insurance in Guyana. Moreover, the country lacks the required trained staff to perform crop inspections and loss adjustments required under any MPCI program.

**Named-peril crop insurance for fruit and vegetables is not technically feasible to implement in the short term.** As is the case for MPCI, named-peril insurance is also affected by the lack of data for vegetable production and yield statistics with which to design and rate insurance instruments. Furthermore, the lack of insurance coverage is partly explained by high price risk exposure of fruit and vegetable producers.

**There are limited opportunities to develop weather index crop insurance for rice producers in the short term.** This, because of two specific reasons: lack of reliable data and the high basis risks attached to irrigated areas. The historical data is incomplete and needs to be reconstructed, there is no homogeneity on rain-gauge instruments, and most of them are in poor physical condition due to the lack of maintenance and lack of field supervision. Furthermore, basis risk problems are aggravated by the lack of a relationship between the amount of rainfall measured by weather stations and the amount of irrigation (in addition to rainfall) received by crops.

**Livestock insurance covering cattle mortality is not feasible to implement in the short term.** Any rating analysis for livestock insurance is not viable in the short term due to the current small-scale and free-grazing characteristics of production. Additional limitations have to do with the lack of a formal livestock mortality database, and the lack of animal identification or registration. Furthermore, the livestock veterinary services are currently underfunded with very limited animal disease pathology and laboratory services.

### *Recommendations*

**Bundling agricultural insurance with credit and other services can overcome some of the financial constraints.** Farmers' demand for agricultural insurance is very low due to financial constraints and limited access to credit. However, based on international experience, when insurance is linked to credit provision it can, in the end, increase bank lending to small and medium farmers. Furthermore, insurance companies lack rural branch networks to deliver insurance to small and medium farmers, thus, delivery mechanisms through banks and rural extension services constitutes an alternative option.

**It is likely that the development of any market-based agricultural insurance product and programs will require the collaboration between the private and public sectors under a private-public partnership (PPP) agreement.** A public partnership with the private sector, at least in the initial implementation stage, is motivated by particular limitations in the commercial insurance sector together with the lack of financial resources and technical knowledge, which prevents the development of insurance programs for small-scale farmers. A government partnership with the private sector is essential to create the necessary institutional framework to support the private sector. The provision

of a legal and regulatory framework, additional investments in data and information infrastructure, and in particular, the provision of training, are possible examples of public support. Under some circumstances specific financing options for reinsurance instruments and/or premium subsidies could also be available through government support. However, it is recommended that any type of subsidy is available for a limited time.

### Supply Chain Risk Assessment of the Rice Sector

**The Guyana Rice Supply Chain Risk Assessment provides a framework for improving current risk-management practices.** Identification of major risks is done by ranking them based on frequency and impact. The assessment also evaluates risks for the three actors in the supply chain: (i) farmers, (ii) processors (millers) and (iii) exporters.

**The number of participants in the supply chain has dropped sharply over the past 30 years due to production consolidations. Currently, the supply chain of rice is primarily geared towards the export markets with approximately 70 percent of the total rice production exported.** The number of farmers has dropped from 12,600 in 1978 to approximately 8,000 that are currently engaged in rice farming. The number of millers declined from 96 in 2000 to 69 in 2009. The two major export markets for rice are the EU and the Caribbean, with 52 percent of total exports going to the EU and 34 percent to the CARICOM countries. However, preferential market access to the EU had gradually declined until 2010, when it was completely suspended. Since then, export destinations have shifted to Jamaica, Trinidad and Tobago, and Haiti, which together currently represent 90 percent of Guyanese rice exports.

The assessment identifies multiple risks within Guyana's supply chain. These are classified into four different categories: production, market, political, and other risks with different levels of risks (high, medium, and low). Table 7 summarizes the final results<sup>20</sup>.

**Table 7. Vulnerability to Risky Events Based on Expected Loss + Capacity to Manage Risk**

	----- Capacity to manage risks ----- +				
Expected losses	1	2	3	4	5
High	Flood risk: 1) due to inadequate drainage infrastructure; 2) due to excessive rainfall; and 3) due to water management issues	T1	T2	Erosion of preferential market access Regulatory risk Blast	T3 T4 T5
Medium	Weed, pest and disease: 1) red rice and 2) paddy borer	T1	Scarcity of water for irrigation	Delayed payment	Price risk Increase in input prices Risk of increase in transportation cost
Low	T2	T3	T4	Accessibility to dam roads	T5

Source: World Bank (2011b).

Note: The resulting matrix classifies vulnerabilities into three groups, from the highest vulnerability (with the darkest boxes in the upper-

<sup>20</sup> See "Guyana Rice Supply Chain Risk Assessment" (2011) for a detailed description of Guyana's supply chain risks and a description of possible priority measures for risk management.

left corner marked as T1), to the lowest (with clear shades towards the right-bottom side of the table marked as T5). There are in between three additional intermediate levels that are in lighter shade. The importance of this matrix is that, through a process of prioritization, it is possible to identify those risks in tiers 1 (T1) and 2 (T2) that are mainly responsible for causing volatility of earnings. Managing these risks will, to a large extent, reduce the vulnerability of the rice industry.

The report provides a detailed description of possible measures for risk management based on the diagram above (Table 7). The following is a summary of potential high priority policies:

- **Greater coordination is needed to support a stronger flood management structure, including additional investments in new infrastructure and in new drainage equipment.** Floods are reported to be one of the main causes for rice paddy crop losses in the country. Paddy production is heavily reliant on the effective operation of drainage systems, which are a complex network of canals and secondary canals, many of which are outdated and require major rehabilitation work. In addition, the country is experiencing an increase in the frequency of severe rainfall events that exceed current capabilities.
- **Additional farm support is needed in order to improve the current status of the water management system.** An adequate water management at the farm level can help to solve two vulnerabilities at the same time. First, it will help to reduce the lack of irrigation during rainfall shortages. During dry periods farmers can pump as much water as they want from the water streams in the irrigation canals and, as a consequence, farmers who are located downstream do not have water for irrigation and the Government does not have any mechanism to solve this problem. Secondly, an adequate water management due to excess rain can help to improve crop yields and the management of pest diseases. Excess rain exposes the crop to pests such as rodents and birds increasing the risks of lodging and grain shattering and affecting the final quality.
- **Effective mapping and targeting of infected regions, in particular for red rice infestations.** The incidence of red rice leads to considerable volume and quality losses, it is estimated that 10 percent infection of red rice weeds reduces yield by 25 percent and crop losses could be as high as 60 percent in heavy field infestation. For example, in 1998 15 and 5 percent of the planted area showed moderate and high infestation, respectively; while 46 percent showed light red rice infestation. Sources of red rice are: contaminated rice seeds, the existence of red rice seeds in soil, and poor weed management.

## 4.5. Belize

### 4.5.1. Brief Description

**The agricultural sector constitutes an important source of income, employment and food security.** Belize's agricultural sector generates around 66 percent of the foreign exchange earnings and employs over 25 percent of the formal labor force. Agricultural production represents 12 percent of the country's GDP.

**The Belizean agricultural sector is concentrated in the export of few commodities.** The sugar, banana, and citrus industries continue to dominate Belize's agricultural exports, with sugar exports declining due to the decline in the price premium offered by the EU to the African, Caribbean, and Pacific block (ACP). This is a serious problem since, for the moment, there are only modest efforts towards export diversification, i.e. papaya, beans, peas and various condiments.

**The production structure is concentrated among small farmers with a small proportion of the land formally owned.** Nationally, 24 percent of the farms have less than 2 ha, rising to 35 percent in Toledo

district region, and farms with less than 8 ha represent 37 percent of landholders. Most of the land is rented or leased, with only 32 percent of the farmland formally owned with a title that can be transferred or used as collateral. For the traditional export industries, banana production is concentrated in only 13 large farms; citrus fruits processing and export involve 525 growers, with only 35 growers concentrating 75 percent of the total production. Sugar cane involves 6,200 producers, with the great majority of which crop less than 5 acres of land.

**The effects of weather events can have a devastating impact on the economy.** Hurricanes losses affecting the country in 2001 and also in 2007, had a lasting effect on the country's agricultural production. Affected agricultural areas presented near 100 percent of yield losses, with more permanent effects related to the loss of 60 percent of trees. The economic impact of weather events (e.g. floods) registered in the country can be amplified by large flat agricultural areas near sea level. Furthermore, high-frequency flood events have contributed to high premium rates charged to farmers.

#### **4.5.2. Bank Support**

**Belize's engagement with the Bank is currently in Stage One.** The Bank's engagement in a dialogue with the Government of Belize started in 2009, and in 2010 the Bank provided its first preliminary technical mission (Rapid Agricultural Sector Risk Assessment, RapAgRisk). However, the Government did not request additional follow up to this preliminary risk assessment. The findings and recommendations originated from the technical assistance were adopted by the IDB's investment programs in the agricultural sector.

#### **4.5.3. Bank Recommendations and Outputs**

**At the request of the Ministry of Agriculture, the World Bank produced a Rapid Assessment of Agricultural Risks (RapAgRisk) identifying possible options for future technical assistance in the area of agricultural risk management.** It constituted an advisory note to the Government in order to identify a policy framework for addressing agricultural risks and for identifying public investments to improve current risk management practices in the sector. The report identified major risks through a ranking based on impact and frequency, offering a framework for improving current risk management practices.

The assessment identifies multiple risks which are classified into 4 different categories: (i) agricultural health risks; (ii) weather-related risks; (iii) price risks; and (iv) policy-based risks. Table 8 summarizes the results for each area of risk<sup>21</sup>.

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21 See "Belize Rapid Assessment of Agricultural Risks" (2009) for a detailed description of Belize's agricultural risks and a description of priority measures for risk management.

**Table 8. Vulnerability to Risky Events Based on Expected Loss + Capacity to Manage Risk**

	----- Capacity to manage risks ----- +				
Expected losses	1	2	3	4	5
High	Hurricanes and tropical storms (banana)	Citrus greening Sugar price shock Hurricane/ Tropical storms (papaya)	Chill periods for banana		
Medium		Hurricane/ Tropical storm (citrus industry) No food crop planting material after major storm Food safety risk from informal cross-border trade	Animal disease threats Fertilizer price volatility Citrus products price volatility	Drought for rain-fed crops	Adverse impact of trade policy change for poultry
Low		Banana price shock Prolonged dry season affecting livestock		Pest/disease risks for papaya, sugar and banana	Cocoa price volatility Adverse impact of trade policy change for rice

Source: World Bank (2011b).

Note: The risks with highest vulnerability are represented by the boxes shaded darkest (upper left corner), and the risks ranked as having a lower vulnerability are shown in the boxes with the clearer shades (towards the right side of the table).

The report provides a detailed description of possible measures for risk management based on the diagram above (Table 8). The following is a summary of potential high priority policies:

- **Prevention in sanitary and phytosanitary risks is central.** The preventive work of the Belize Agricultural Health Authority (BAHA) should be reinforced since it is operating under considerable resource limitations. It is recommended to provide additional support for training in pathology and residue testing in order to avoid delays in testing<sup>22</sup>. Also, additional support is recommended to support the country's agricultural production, in particular the implementation of surveys and surveillance activities for animal and plant pests and diseases. And a similar approach is needed to comply with the sanitary and phytosanitary requirements with trading partners. In brief, the summary of activities considered for potential support are: pest and disease surveys and surveillance, pesticide monitoring, pest and disease diagnosis and testing, import and export inspections and certifications, crop protection, animal health protection, and general animal and plant quarantine.

<sup>22</sup> It took more than three month for samples sent overseas to diagnose the Citrus Greening disease.

- **Establish a weather risk management strategy for the agriculture sector.** Managing weather risks is one of the most urgent priorities. Belize needs to consider the possibility to identify and subscribe risk transfer insurance instruments that are appropriate to the agricultural sector and can improve on existing instruments, e.g. the CCRIF.
- **Hedging with financial instruments to reduce price volatility.** In particular, the risk of input prices, such as fertilizers and urea were at the top of the ranking. In order to reduce volatility, a hedge could be undertaken either by the Belizean fertilizer importer or the Government.

## 4.6. Grenada

### 4.6.1. Brief Description

**Hurricanes Ivan in 2004 and Emily in 2005 had a devastating impact on Grenadian agriculture.** Historically, Grenada is best known as a supplier of spices, mostly nutmeg and mace. However, after Ivan and Emily in 2004 and 2005, the production of spices was severely affected and ninety percent of nutmeg trees were either destroyed or damaged. In addition, banana trees, the majority of cocoa and fruit trees were damaged, arable crops lands were flooded, and significant destruction was also registered among fishing boats. The damage still persists since it takes many years before the harvest of tree crops (e.g. nutmeg) can be recovered. For example, nutmeg production decreased to 1.39 million lbs in 2008, representing one-tenth of its average output for the period between 2002 and 2004.

**Up-to-date data of the agricultural sector is not available.** The Ministry of Agriculture has recently begun to set up a farmer and fisherman registry to overcome this problem. The last agricultural census was in 1995 and recorded 13,000 farmers. Following the two hurricanes, many farms were abandoned and many farmers retired or were displaced, so it is estimated that today there is a population of around 5,000 active farmers. The large majority of farmers have approximately less than 2 ha of land, and between 300 to 500 farmers have holdings larger than 4 ha. There are also around 700 registered fishing boats and 256 entities registered as agro-processors, with a vast majority being small-scale enterprises.

**In 2008, commodity price increases had a moderate impact on the economy.** Since Grenada is a significant importer of food, food price increases registered during 2008 had a significant impact on import prices. However, this problem was overcome by an increase in the consumption of local food production like tuber crops, plantains and fish.

**The economic recovery after two hurricanes, in particular in the traditional dynamic export sector, presents several constraints.** For example, a reduction in the number of farmers is an important restriction, which is driven by an aging population and by the lack of interest from younger generations to work in the agricultural sector. In spite of a government subsidy provided to reduce higher costs of production, there is still a high cost of labor for land clearing and planting. Additional constraints are explained by an increase in tree diseases, lack of planning materials, and by the uncertainty about the economic impact of future extreme weather events.

**Grenada's current government is making a particular effort to improve the constraints and limitations of the agricultural sector.** For example, in 2008 the National Stakeholders Consultation and Strategic Planning Retreat brought together a large number of stakeholders and identified a range of short and long-term initiatives. During these meetings, major policy objectives for the sector were identified such as,

food security, agro-processing/value-addition, replanting/rehabilitation of tree crops, and environmental management.

#### **4.6.2. Bank Support**

**Grenada's engagement with the Bank is in Stage One.** A rapid sector-wide agricultural risk assessment was provided during the initial technical assistance in 2009. Also, initial advice on issues related to the design of agricultural disaster response policies and action plans was also provided to the newly appointed Agricultural Disaster Response Committee (ADRC). The Government did not request additional Bank support after 2009. However, a US\$1 million grant under the JSDF was prepared in order to address local farmers' needs. The objective of the grant was to provide immediate and urgent assistance to at least 1,100 small farmers to cope with various weather hazards and the increase in commodity prices in 2007/2008. This was done through the provision of incentives for purchasing improved agricultural inputs, water management technology, and the adoption of improved livestock practices.

#### **4.6.3. Bank Recommendations and Outputs**

**After the first technical mission and at the request of the Government, the Bank finalized a report to identify possible areas of work to improve current agricultural risk management practices.** The Bank undertook a brief mission in order to explore possible technical needs for Bank assistance. The document provides a preliminary assessment and identifies multiple risks which are classified into 4 different categories: (i) weather risks; (ii) sanitary and phytosanitary risks; (iii) price risks; and (iv) credit risks. Table 9 summarizes the different types of risks and the country's capacities to manage the risks<sup>23</sup>.

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<sup>23</sup> See "Grenada Agricultural Risks Management Assessment" (2010), for a detailed description of Grenada's agricultural risks and a description of possible priority measures for risk management.

**Table 9. Vulnerability to Risky Events Based on Expected Loss + Capacity to Manage Risk**

	----- Capacity to manage risks ----- +				
Expected losses	1	2	3	4	5
High	Hurricane damage in nutmeg	Hurricane damage in bananas		Losing planting material and germplasm in major storms	
Medium	Hurricane damage in cocoa	Extended dry period damaging rain-fed crops Fishing boats/assets damage due to storms	Introduction of contagious animal diseases Entry of pests or diseases through tourist movement and ships	Entry of new pests or diseases through trade in goods	
Low	Hurricane damage in minor spices	Common storm damage to food crop production Common storm damage to export crops Volatility in nutmeg and minor spices prices	Rodent attacks on food and animals Volatility of cocoa prices Volatility in international food/cereal/dairy prices	Disposal of dead animals following a storm	

Source: World Bank (2010e).

Note: Shaded darkest boxes represent highest/extreme vulnerabilities (upper left corner), light grey represent lower levels of exposure (right side of the table).

The report provides a detailed description of possible measures for risk management based on the diagram above (Table 9). The following is a summary of potential high priority policies:

- **Public support to improve agricultural infrastructure and technical capacity to respond to natural hazards (tropical storms, heavy wind and rain/droughts) is urgently needed.** For example, most of farm food storages are agro-processing buildings constructed to withstand relatively mild storms but not severe winds, and there is no organized system for the storage of germs and root/tuber seeds for fast recovery and planting after a major storm. Furthermore, additional investment in irrigation is also required, as recent investments have only grown to 800 acres including in areas experiencing extremes droughts. Another area to consider for possible governmental support is the improvement of the technical capacity to overcome some of the limitations in the provision of insurance. Even tough weather data and weather risk maps are available, local insurers may require additional technical capacity in contract design, monitoring, and to access reinsurance markets.
- **Active surveillance to avoid re-occurrences with various pest diseases seems to be important to avoid increasing costs in production.** In particular, additional surveillance is recommended for various

types of fruit fly, black sigatoka, moko and mealy bugs. Active surveillance at the country entry points to avoid the introduction of new pests is important as well as additional control for tourist visitors.

## 4.7. Dominican Republic

### 4.7.1. Brief Description

**Due to its geographic location in the center of the Antillean archipelago, the Dominican Republic is highly exposed to natural disasters** (hurricanes, tropical storms, earthquakes, landslides, flooding and droughts). Public expenses during Tropical Storms Noel and Olga in 2007, were around 0.6 percent of GDP and during Hurricane Jeanne in 2004, expenses reached 1.6 percent of GDP. The most destructive events occurred in 1998 with Hurricane George and in 1979 with Tropical Storm Federico, which resulted in economic losses equivalent to 16.1 percent of GDP and 18.4 percent of GDP respectively<sup>24</sup>.

**Agricultural production still represents an important share of the total economy.** Agricultural production represents around 11 percent of the GDP and near 15 percent of employment. Agricultural activity is concentrated in the production of rice and sugar cane. Traditional export products have been: sugar, cacao, coffee and tobacco. Small farmers (less than 3.13 ha.) represent 72% of the total number of farmers, but account for only 28% of cultivated area.

### 4.7.2. Bank Support

**The country's engagement with the Bank is in Stage Three.** The country did recently request additional Bank support to design a macro level insurance coverage for transferring hurricane and rainfall risk. With financing from a grant from the Global Index Insurance Facility (GIIF), the Bank is providing technical assistance and capacity building to the public sector and designing a macro-level index insurance product to provide fiscal coverage against hurricane and rainfall risks in the agriculture sector.

**The Bank and the Government are working in improving the institutional mechanisms to improve the ex-post disaster response to small vulnerable farmers.** A US\$2.3 million JSDF grant was approved in 2011 to improve small farmers' productivity in the country. The proposed project includes: (i) supporting local governments in the design of sustainable policies that mitigate the adverse impact of high and volatile food prices on poverty; and (ii) supporting a broad-based growth in productivity and market participation by enhancing domestic food production and marketing responses. The objective of the grant is to increase the productivity and reduce the vulnerability of at least 2,300 small-scale farmers in the poorest area of the Dominican Republic through the provision of incentives for the purchase and adoption of improved technologies.

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24 IDB (2011).

## V. Conclusion: Lessons Learned to Date

**The lessons learned from the 2009-2011 non-lending technical assistance are classified into two broad areas: general regional perspectives and country-specific lessons.** Starting in 1999, the Bank began providing advisory services in the area of agricultural risk management in several regions worldwide by financing pilot projects related to agricultural insurance and commodity price risk management. In 2007, however, a more regional approach to risk transfer of weather events started in the Caribbean with the launch of the CCRIF. Since 2009, technical assistance has also incorporated a more country-specific and comprehensive approach towards agricultural risks based on the countries' particular demands. This TA has taken into account these two approaches: considering a regional approach, but also local country conditions in the implementation of agricultural risk management instruments.

### Regional Perspectives

**Market-based financial agricultural risk management instruments (insurance in particular) are difficult to implement in the Caribbean region on a farm level. This is because of the particular characteristics of the regional agricultural production units and the difficulties in managing extreme risk events.** Agricultural production in the Caribbean has a high proportion of small farmers ranging from 1.4 ha in Haiti and Jamaica to around 2 ha in Belize with a very diverse production structure (some small farmers in Jamaica have up to 15 crops in 1 plot of land). Thus, assessing the particular losses from weather events at the individual level is technically challenging. Furthermore, commercial banks and/or insurance companies usually do not have the infrastructure to reach small farmers in remote areas.

**Farmers in the Caribbean most often use informal risk management approaches.** Apart from the Dominican Republic and the banana producers in the OECS, agricultural insurance is mostly absent in the region. More formal, market-based instruments such as insurance, as well as other public or private risk transfer mechanisms, are not substitutes, but can complement existing informal approaches to cope with these types of risks, remaining very important to overall rural resilience. These approaches include personal savings, household buffer stocks, community savings and non-formalized cooperatives (i.e. commodity boards). A more formal risk management approach implemented by the government involving risk mitigation, risk transfer and risk coping mechanisms would be very beneficial for small farmers. This approach would provide farmers with an additional source of financing to manage both weather and production risks without solely relying on their own savings and farm income.

**The fact that a large segment of small farmers might not have the capacity to cover extreme agricultural losses (and pay insurance premiums) has been the driver for public interventions in past catastrophic weather events.** While the Bank recognizes that these public interventions are crucial, there remains a need to improve them in order to make them more effective and efficient. In particular, disaster payments to farmers can be structured through clear ex-ante rules for triggering and distributing public sector assistance, and a clear process for registering and becoming eligible for such ex-post support should also be considered. In addition, for an adequate financing of the farmer's disaster support system, it is essential to improve the financial structure behind such a program by allowing the government to transfer part of its fiscal exposure to the international market.

**A risk layering approach could be used to finance public interventions in the agricultural sector in respond to systemic weather shocks.** A risk layering approach could be implemented by introducing new

risk financing instruments to provide coverage for different levels and types of risks. For example, low-cost (high-frequency) risks could be financed with reserves and personal savings, while more catastrophic (lower-frequency) risks could be financed with contingent credit lines or insurance instruments. A comprehensive risk management approach was introduced in the region through the implementation of the CCRIF in 2007, and as a result, many governments are interested in applying a risk layering structure to manage agricultural risks. For example, the Bank made a proposal for a specific risk layering allocation for the agricultural sector in Jamaica and Haiti (see Section III). Even if the optimal mix can only be determined through a theoretical model, the particular characteristic of the Caribbean region can help to identify possible risk financing strategies. The fact that these countries are very indebted economies limits their capacity of using additional financing through credit lines<sup>25</sup>. Moreover, if the government needs to develop a risk layering approach for public interventions in the agricultural sector, additional analysis should focus on the development of instruments to cover intermediate and more frequent events (e.g. rainfall and droughts). The CCRIF recent announcement of a new excess rainfall product to supplement its earthquake and hurricane policies (see Annex 2) is a step in the right direction.

**The lack of awareness by the public and private sector on the potential benefits of agricultural insurance products requires extensive awareness programs and training from governments and donors.** An important component of the technical assistance provided in the region consisted of outreach and training. The fact that agricultural insurance instruments are mostly absent in the Caribbean is partly explained by the fact that public sector officials, the financial sector and agribusinesses are not aware of the potential benefits and limitations related to particular insurance instruments. For example, the recommendation to implement index-based insurance contracts for specific cases in Jamaica or Haiti may be ineffective without the specific training and outreach required to ensure that farmers understand the type of coverage and expected payouts of that particular instrument.

**There is a fundamental lack of technical capacity in the region that needs to be built up in the medium and long term.** Currently, the region lacks technical capacity in the public sector and in the insurance and financial sectors, which constrains the development of general insurance instruments. As a consequence, most of the programs implemented and financed by the Bank in the area of agricultural insurance are usually executed as small-scale pilot programs and may take several years before they can move to a larger scale.

## Country Experiences

**The lessons learned during the technical assistance are related to each country's particular challenges.** For example, Jamaica's unique production structure motivated different options, not only to make public interventions more effective (e.g. disaster support payments), but also to improve the participation of the private sector (e.g. public-private partnerships). For countries like Guyana, with its production structure concentrated in the production of only a few crops, the initial evaluation focused on the analysis of the supply chain risks and constraints associated with these crops. This approach was useful in order to identify multiple risks and prioritize possible risk management practices. Finally, income compensation schemes policies in Grenada and the Dominican Republic try to solve structural economic and social problems by improving the delivery channel for governmental ex-post assistance.

**Developing agricultural insurance markets through private-public partnerships.** Supporting private-public partnerships may be a short-term solution, but it constitutes a valuable policy option to improve private

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25 "Most Caribbean nations exhibit high debt levels, which limit their capability of accessing further financing(...) Public debt levels in the region range from 189 percent of GDP in St. Kitts & Nevis to 29 percent in Suriname." Kouame and Reyes (2011).

sector participation and also to contribute to the sustainable development of new market-based instruments. For example, in the case of Jamaica, the fact that a large segment of small farmers does not have the capacity to pay for commercial insurance creates the need for public intervention in the event of catastrophic weather events. The recommendation was to develop a private-public partnership by supplementing the public disaster assistance program (DAP) already in place, with the possible participation of the private sector in the provision of insurance for intermediate risks. Thus, supplementary coverage would be provided by private financial intermediaries through financial products (such as hurricane vouchers) in addition to the basic governmental DAP coverage. This additional “top up” option would be developed and underwritten by the private insurance market.

**The insurance proposal for Jamaica’s coffee sector reflects the country’s microclimate structure.** The simulated model for the Blue Mountain coffee region does not calculate payouts uniformly to all farmers, but instead groups payouts into 16 zones according to district and altitude. Furthermore, an income compensation plan was proposed to overcome some of the problems and limitations of the high basis risk attached to an index-based insurance contract. Income compensation payments, will not be directly linked to actual losses but will constitute a financial mechanism to manage losses to coffee producers caused by strong winds. Therefore, instead of offering an index-based coverage for crop losses, the contract would be offering an income supplement triggered through an index measuring strong winds.

**The supply chain risk management assessment conducted in Haiti and Guyana helped to prioritize public and private investments.** The importance of this framework is that, through a process of prioritization based on expected losses and frequency of the events, risk was categorized into three tiers (low, intermediate and high levels). Thus, managing these risks will, to a large extent, reduce the vulnerability of the sector under study. It also provides a qualitative assessment of priorities based on the public and private capabilities of managing risks as well as the availability of market-based instruments among the actors’ role in the chain (i.e. farmers, processors, millers and exporters). In the case of Haiti, ranking the activities that needed immediate action in a context of limited resources created a valuable framework and became a key input during discussions with the Government in preparation for the Post-Earthquake National Agriculture Investment Plan. Applying this framework during the TA in Guyana and Haiti was done with the intention of identifying and prioritizing areas for future support that could have a substantial impact on the economy. In fact, using this framework on the rice chain of Guyana or on the coffee chain in Haiti may impact the whole economy as both activities represent a large share of the country’s agricultural structure.

**Improving the delivery mechanisms for ex-post income-compensation schemes in Grenada and the Dominican Republic.** This instrument was used where a more complete framework was already in place or where there was no need to design market-based transfer instruments. In the case of the Dominican Republic, the grant provided additional support to improve the farmers’ productivity profile and constituted a complementary support to the Government’s agenda to improve the country’s risk management profile. Furthermore, in 2011, the Bank also began designing a macro level coverage for the Government to mitigate catastrophic weather shocks to its agricultural sector. In the case of Grenada, the risk assessment allowed for the design of delivery mechanisms (through input and technology vouchers) to address local farmers’ needs in response to losses from natural disasters and from market shocks (financial and food crisis).



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## Annex 1. Comparison of Caribbean Countries with other International Experiences on Selected Disaster Risk Management Projects

	Micro-level (Limiting government contingent liabilities)					Meso-level (Provide resources for disaster relief and reconstruction)			Macro-level (Budget support)	
	Turkey	India	Mongolia	Ethiopia	Mexico	Costa Rica	Caribbean	Malawi		
<b>Purpose</b>	Insure Turkish homeowners against the effects of frequent earthquakes.	Insure Indian farmers against the effects of catastrophic drought.	Insure Mongolia's herder households from high livestock mortality rates from extreme winter weather (dzud).	Provide funds for emergency relief to Ethiopian households in case of major drought.	Provide funds to local governments to cover damage to infrastructure (and low-income homeowners) due to natural disasters.	Provide a dedicated vehicle to insure public assets ( and low-income homeowners).	Provide resources for budget support to governments in the Caribbean basin following a pre-specified catastrophic weather event.	Provide resources for budget support to Malawi's government against the risk of severe drought during the critical rainfall season, October 1 –April 30 <sup>th</sup> .		
<b>Insured event</b>	Actual damage caused by earthquake.	Pre-specified shortfall of precipitation.	Pre-specified mortality rate reaching a specified "exhaustion point".	Pre-specified shortfall of precipitation.	Actual damage caused by natural disaster.	Actual damage caused by natural disaster.	Pre-specified natural catastrophe (hurricane and earthquake).	Pre-specified natural catastrophe (specified shortfalls in rainfall during growing season).		
<b>Insurance method</b>	Indemnity-based property insurance.	Weather derivative.	Livestock index.	Weather derivative.	Domestic contingency fund, backed by CAT bond.	Program of risk transfer of catastrophic risks by retaining most of the risk through a guarantee for a contingent line of credit, while ceding excess losses to the international financial markets.	Weather derivative.	Weather derivative.		
<b>Transfer of risk</b>	Risk transferred to local commercial insurer and largely passed on to international reinsurance markets.	Risk transferred to local commercial insurer and passed on to leading international reinsurance company.	Herders retain small losses that do not affect the viability of their business, while larger losses are transferred to the private insurance industry (Base Insurance Product, BIP) and only the final layer of catastrophic losses is borne by the government (Disaster Response Product, DRP).	Risk transferred to commercial insurers or retained by donors.	Risk largely retained within public sector, except for certain layer of risk that is transferred to a leading reinsurer and to international capital markets (with CAT bond).	Risk largely retained within public sector, except for certain layer of risk that will be transferred to the financial markets (instruments to be determined).	Risk pooled among Caribbean countries through creation of a reserve fund consisting of country paid premia and donor resources, partially reinsured with commercial parties.	Risk partially retained within the public sector. GoM pays a premium to the WB. The WB enters into a mirroring agreement in an offsetting transaction with a reinsurance company.		

(cont.)...	Micro-level (Limiting government contingent liabilities)			Meso-level (Provide resources for disaster relief and reconstruction)			Macro-level (Budget support)	
	Turkey	India	Mongolia	Ethiopia	Mexico	Costa Rica	Caribbean	Malawi
<b>Counterparty to risk transfer</b>	Individual Turkish homeowners	Individual Indian farmers	Individual herders	World Food Program	Local governments	Local governments	Governments of affected countries	Government
<b>International organizations involvement</b>	--	World Bank	World Bank	World Food Program and World Bank	--	World Bank	World Bank	World Bank
<b>Donor contribution</b>	--	--	GoM fully covers insured losses beyond the financial capacity of a syndicated pooling arrangement for insurance companies (Livestock Insurance Indemnity Pool, LIIP) through an unlimited stop loss reinsurance treaty. The financing of the Government's potential losses relies on a combination of reserves and IDA contingent credit provided by the World Bank.	Donors either pay the premium price or retain the risk themselves on the same terms as the derivative contract.	--	Donors contribute with a contingency credit line if a disaster takes place.	Donors contribute to a pool of shared contingency resources.	Donors finance premium price
<b>Project status</b>	In effect	In effect		In effect	In effect	In preparation	In effect	In effect

26 The contract was renewed three times, with the most recent coverage season being 2011/12.

## Annex 2. Caribbean Catastrophe Risk Insurance Facility (CCRIF)<sup>27</sup>

### Caribbean Catastrophe Risk Insurance Facility (CCRIF)

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) was established to provide parametric hurricane and earthquake coverage to Caribbean countries and territories. The CCRIF is currently developing an excess rainfall product to supplement its earthquake and hurricane policies in response to member's demands (see below). The CCRIF was established as an independent legal entity managed by a specialized firm under the supervision of a board of directors composed of representatives from the donors and participating countries. This board is supported by the technical advice of a facility supervisor.

The CCRIF is the result of two years of collaborative work between CARICOM governments, key donor partners, and the World Bank Group (WBG). The Facility became operational on June 1, 2007. Sixteen countries are currently participating in this catastrophe insurance program: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, and Haiti. US\$14.2 million IDA special credits were provided to the Governments of four Caribbean island countries (Dominica, Grenada, St. Lucia, and St. Vincent and the Grenadines) to finance their entry fees and the payment of the annual insurance premium during the first years of operations. Similarly, a US\$9 million IDA grant was provided to the Government of Haiti.

Participating countries pay an annual premium commensurate with their own specific risk exposure. Parametric insurance products are priced for each country, based on its individual risk profile. Annual premiums typically vary from US\$200,000 to US\$4 million, for coverage ranging from US\$10 million to US\$50 million. As a self-sustaining entity, the CCRIF relies on its own reserves and reinsurance to finance itself. The donor community contributed to the initial reserves with approximately US\$67 million and the CCRIF participants paid one-time participation fees of US\$22 million. Participating countries paid in 2008 a total premium volume of US\$30 million for an aggregate coverage of US\$560 million. In 2008, the CCRIF successfully placed more than US\$120 million of coverage on the international reinsurance and capital markets.

The CCRIF offers participating countries an efficient and transparent vehicle to access the international reinsurance and capital markets. The reinsurance strategy of the CCRIF is designed to sustain a series of major natural disasters events (with a probability of occurrence lower than 0.1 percent), achieving a higher level of resilience than international standards (usually set up at 0.4 percent). Countries elect their attachment point. The lowest is 1:15 and it goes up from there.

The CCRIF has gained the confidence of major reinsure and has been able to lay off significant part of its risks. For 2011, it obtained US\$125 million in reinsurance, including a US\$30 million capital market swap intermediated by the World Bank Treasury. With this, it has the capacity to withstand a 1 in 1,400 year event, without drawing on more than US\$25 million of its own assets. Its assets in excess of \$25 million are estimated to give the CCRIF the capacity to withstand a 1 in 10,000 year event, although it would require capitalization thereafter.

The large earthquake that struck close to Port-au-Prince, Haiti on January 12, 2010 triggered the full policy limit for Haiti's earthquake coverage. Haiti received just under US\$8 million – approximately 20 times their premium for earthquake coverage. Although shaking was felt in Jamaica, another CCRIF-covered country, it

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<sup>27</sup> Based on Cummings and Mahul (2009), CCRIF Quarterly Report (December 2011) and CCRIF Newsletter (April 2012).

was insufficient to generate any loss as indicated by the CCRIF Parametric Index. CCRIF payouts as of September 2011 totaled US\$32.2 million as shown in Table 1 below:

**Table 1. Caribbean Catastrophe Risk Insurance Facility Payouts as of September 15, 2011**

Event	Date	Affected Country	Amount (US\$)
Earthquake	Nov 29, 2007	Dominica	528,021
Earthquake	Nov 29, 2007	St. Lucia	418,976
Tropical Cyclone Ike	Sep 7, 2008	Turks and Caicos	6,303,913
Earthquake	Jan 12, 2010	Haiti	7,753,579
Tropical Storm Earl	Aug 31, 2010	Anguilla	4,282,733
Tropical Storm Tomas	Oct 31, 2010	Barbados	8,560,247
Tropical Storm Tomas	Oct 31, 2010	St. Lucia	3,241,613
Tropical Storm Tomas	Oct 31, 2010	St. Vincent and the Grenadines	1,090,388

### CCRIF Excess Rainfall Component

The Excess Rainfall product was developed after CCRIF participating countries and stakeholders expressed a strong interest in having available coverage for excess rainfall, both within hurricanes and in non-hurricane systems. The Excess Rainfall product will be launched starting in May/June 2012 although there will be a gradual rollout in order to generate the necessary information on the rainfall index.

The current model was developed by the CCRIF and SwissRe and is based on available NASA-processed satellite data. It constitutes a first iteration and improvements are expected from a synthetic numerical rainfall model that was previously tested and is under revision as a complementary input rain data to the satellite data set.

The CCRIF/SwissRe XSR model uses NASA/JAXA Tropical Rainfall Measurement Mission (TRMM) daily rain data to compile a 5-day running aggregate of rainfall measurements. A rainfall event occurs when the 5-day aggregate exceeds 50 mm and ends on the day before rainfall next falls below 50 mm. The single highest 5-day aggregate rainfall measurement is used to calculate the index loss rate via a vulnerability curve which maps indemnity percentage to rainfall amounts. The indemnity rate for each event is applied to the exposure value of the TRMM grid node, to give the individual index loss for the event at each grid node. To calculate the national index loss, the individual index losses at each grid node are added together each day. National-level events are defined as continuous periods where there is an ongoing event at one or more TRMM grid nodes. Therefore, once an event occurs at one or more of the TRMM grid nodes, a national loss is assigned to it with the date of the last day of the event as the event identifier. National losses are also aggregated on an annual basis, thus allowing coverage to be offered on a per-event or on an annual aggregate basis at the national level.

Once rainfall risk profiles have been developed, the CCRIF will discuss coverage options with each country individually and policies will incept once coverage levels have been agreed. Risk profiles are being produced and coverage will be offered to Guyana and Suriname as well as to other Caribbean countries which are not currently members of the CCRIF.

### Annex 3. Summary of Advantages and Challenges of Weather Index Insurance Contracts

#### Summary of Advantages and Challenges of Weather Index Insurance

Advantages	Challenges
<p><i>Less moral hazard</i></p> <p>The indemnity does not depend on the individual producer's realized yield.</p>	<p><i>Basis Risk (Note 1)</i></p> <p>Without sufficient correlation between the index and actual losses, index insurance is not an effective risk management tool. This is mitigated by self-insurance of smaller basis risk by the farmer; supplemental products underwritten by private insurers; blending index insurance and rural finance; and offering coverage only for extreme events.</p>
<p><i>Less adverse selection</i></p> <p>The indemnity is based on widely available information, so there are few informational asymmetries to be exploited.</p>	<p><i>Precise actuarial modeling</i></p> <p>Insurers must understand the statistical properties of the underlying index.</p>
<p><i>Lower administrative costs</i></p> <p>Does not require underwriting and inspections of individual farms.</p>	<p><i>Education</i></p> <p>Required by users to assess weather index insurance will provide effective risk management.</p>
<p><i>Standardized and transparent structure</i></p> <p>Uniform structure of contracts.</p>	<p><i>Market size</i></p> <p>The market is still in its infancy in developing countries and has some start-up costs.</p>
<p><i>Availability and negotiability</i></p> <p>Standardized and transparent, could be traded in secondary markets.</p>	<p><i>Weather cycles</i></p> <p>Actuarial soundness of the premium could be undermined by weather cycles that change the probability of the insured events (i.e. <i>El Niño</i> events).</p>
<p><i>Reinsurance function</i></p> <p>Index insurance can be used to more easily transfer the risk of widespread correlated agricultural production losses.</p>	<p><i>Microclimates</i></p> <p>Makes rainfall or area-yield index based contracts difficult for more frequent and localized events.</p>
<p><i>Versatility</i></p> <p>Can be easily bundled with other financial services, facilitating basis risk management.</p>	<p><i>Forecasts</i></p> <p>Asymmetric information about the likelihood of an event in the near future will create the potential for intertemporal adverse selection.</p>

Source: World Bank (2005).

*Note 1: Basis Risk:* Since index-insurance indemnities are triggered by exogenous random variables, such as area yields or weather events, an index-insurance policyholder can experience a yield or revenue loss and not receive an indemnity. The policyholder may also experience no yield or revenue loss and still receive an indemnity. The effectiveness of index insurance as a risk management tool depends on how positively correlated farm yield losses are with the underlying index.

## Annex 4. Conditions for Successful Risk Transfer Based on Indices in Agriculture

### Minimal take-off conditions are:

- **Coverage of the right risks:** “Insurance” or risk transfer mechanism for infrequent (one in seven years) for high-impact events that threaten the very basis of livelihoods because assets are so meager (sometimes just an able body that earns wages) or the impact is so large that traditional coping mechanisms fail. Though farmers may be willing to pay reasonable premiums for weather index insurance, they also have to bear the cost of the pure-risk premium. If the probability of the insured event is too large, then the pure-risk cost can become prohibitive in the absence of a subsidy. As a practical rule of thumb, events that occur more frequently than once in seven years may be too costly for most farmers to insure without a subsidy.
- **Index capture of the risk:** The likelihood of a mismatch between payouts and losses needs to be minimal. This mismatch is called “basis risk”.
- **Guaranteed payments:** Contract enforcement needs to be guaranteed by a credible authority.
- **Risk transfer is a catalyst, not a value proposition in itself:** Sometimes the fundamental value proposition (e.g. of contract farming in a value chain) makes economic sense for all involved parties, but the presence of systematic crop-failure risk hinders the deal. In this case, the index-based risk transfer can make the deal happen because it essentially removes the key obstacle of weather risk and shares the costs between the benefiting parties. In other cases, if the fundamental value proposition (e.g. catalyzing a safety net or securing credit for inputs) is not viable (e.g. because of side-selling in a value chain), the index insurance will not in itself make the deal viable.
- **Cost-effectiveness:** The cost of transferring the risk needs to be commensurate with the benefits of transferring the risk for final beneficiaries.
- **Delivery channel:** There needs to be an appropriate and ultimately trustworthy delivery channel (input supplier, local government or public agency, Non Governmental Organization (NGO), commodity board, processors, agricultural banks, etc.) that can reach out to farmers.

### Conditions for sustained scale-up are:

- **Timeliness:** Payouts from the risk-transfer contract to affected people in rural areas must be timely (maximum of forty days after the insured event).
- **Objectivity:** The basis for payouts to people needs to be transparent, verifiable, and understandable. For example, the index needs to be all that, and durable as well: is the index going to be around next year?
- **Full Trust:** The contractual relationship needs to be supported by trust in the provider of the coverage. Trust can be based on the efficient control and enforcement mechanisms around the contract and/or positive experience with the provider as well as the reputation of the provider.
- **Tangibility of coverage:** Farmers need to be able to relate to the expected benefits (payouts in certain cases) of the contractual relationship, and the benefits promised by the contract need to be tangible. This can be achieved either by positive experience with benefits that others enjoyed (e.g. observing insurance payouts to neighbors) or by the nature of the benefit itself. Death, for example, is a certain eventuality; a personal accident is imaginable and therefore tangible.
- **Full understandability of the coverage:** Farmers have a good understanding of their risk exposure. The function and benefits of a risk-transfer instrument (safety net or promotion package) need to be explained in simple language that farmers understand.

*Source: World Bank (2009).*

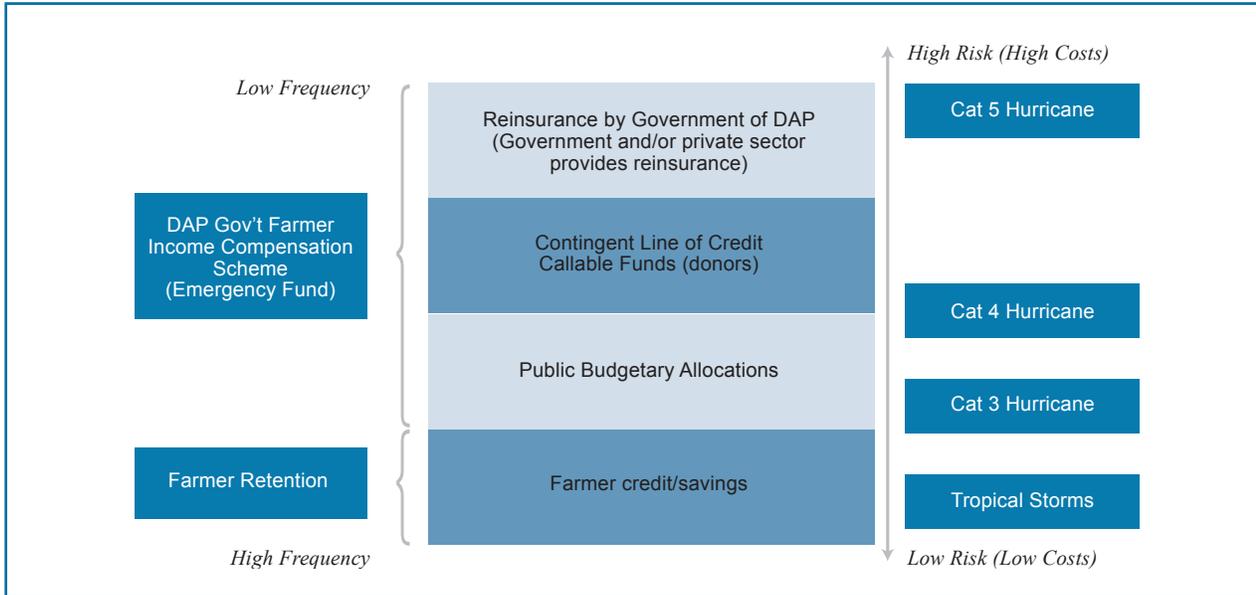
## Annex 5. Jamaica: Options for Implementing Insurance Contracts

Weather Risks	Type of Insurance Contract	Implementation
Flood	Index-based Insurance from satellite imagery/ river gauges (Index payout scale)	<b>Not suitable in the short-term.</b> Further studies are needed to assess the various possible options, such as payouts based on indexed insurance for extreme river flows (possibly at the meso-level). Implementation may be challenging since data on well-mapped rivers will be required before any other action.
Extreme Rainfall (non-cyclonic)	Index-based insurance (Index payout scale)	<b>Not suitable in the short-term.</b> Possible options for the medium term would be based on current studies being undertaken for the Blue Mountain region. Extreme rainfall could potentially be indexed, but indexed-based insurance may not capture localized flood events affecting small farmers, or local landslides as a consequence of excess rainfalls. Nevertheless, at a meso and macro-level, such products could be useful (the CCRIF is in the process of designing this type of coverage for individual governments).
Drought	Index Insurance (Index payout scale)	<b>Possible, but further analysis is needed.</b> <ul style="list-style-type: none"> <li>- For recurrent droughts events, technical considerations about the suitability of drought index insurance is secondary, in particular, since these are recurrent events related to a deficit in the irrigation system.</li> <li>- Extreme drought events are technically able to be covered using index-based insurance. A deficit rainfall (drought) is the most developed hazard for which index insurance has been developed internationally, making this a feasible option. However, implementing this type of insurance for small farmers in Jamaica could be challenging and costly given the difficulty to design insurance payouts for small production structures with a wide variety of short-term crops and without a well defined seasonality.</li> </ul>
Hurricane (wind)	Index Insurance for mortality coverage (Index payout scale)	<b>Possible to implement for high-intensity weather events.</b> This is because the size of the shock outweighs the cost of premiums in the case of systemic high-loss events that affect all farmers. Furthermore, index-based insurance in the case of hurricanes is easier to measure; reducing the possibility that the parametric index chosen (i.e. wind speed) will not match farmers' expected losses (basis risk).

Source: World Bank (2010b).

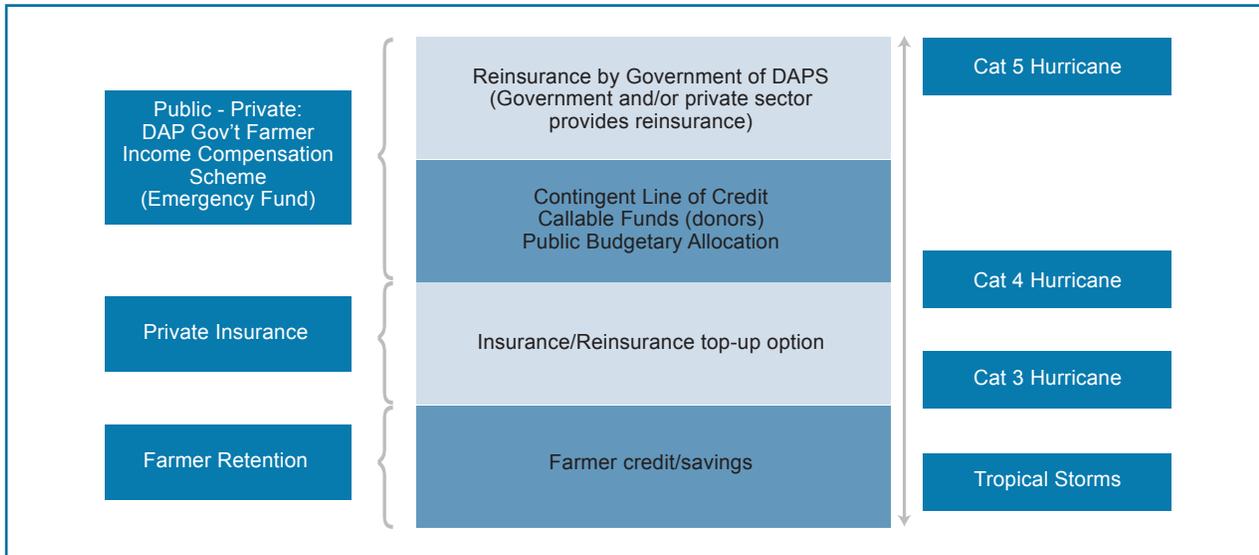
## Annex 6. Examples of Risk Layering

**Figure 1. Jamaica: Example of Risk Layering Hurricane Hazards – Public Funded Scheme**



Source: World Bank (2010b).

**Figure 2. Jamaica: Example of Risk Layering Hurricane Hazards – Public/Private Funded Scheme**



Source: World Bank (2010b).

## Annex 7. Training

### Regional

During June 2010, a Regional Symposium on Agriculture Risk Management was supported by the WB-ARMT team to present the work done in the Caribbean Region for the past few years on agriculture risk management and present the overall framework for governments in the region to use for thinking about introducing new agriculture risk management mechanisms and investments.

#### **Jamaica: Price Risk Management Training for Coffee Industry**

Jamaican coffee is almost globally unique in that it is priced for export without reference to key international coffee market price indicators. This pricing, based upon the perception of exceptional quality in international specialty markets for coffee, has enabled Jamaican coffee producers and exporters to receive significantly higher prices than other coffee producing nations; this has, to date, shielded the industry from global coffee price volatility. Going forward Jamaica will, however, need to start expanding its markets and such expansion will require coffee exporters to better understand how pricing is conducted in the global coffee markets using differentials to global market indicator prices. Training was provided to a number of coffee producers and exporters to provide them with improved knowledge of global coffee market pricing. Attendees were introduced to the concept of differential pricing in contracts and introduced to the concept of price risk exposure, introduced to risk assessment methodologies for identifying and calculating price risk and then shown how price risk can be managed through the use of physical contracts and financial instruments.

#### **Haiti: Price Risk Management and Weather Index Insurance**

A series of training sessions were undertaken during 2010 in Haiti in the form of courses for private and public sector officials in the use of futures and options for agriculture commodities (mainly coffee), as well as in the use and design of index-based agriculture insurance products. Also, a study tour to visit the Nicaraguan Agriculture Commodity Exchange (BAGSA) and visit the pilot project on index-based agriculture insurance (with the local insurance company INISER) was undertaken in 2010. Public and private sector representatives participated in the study tour.

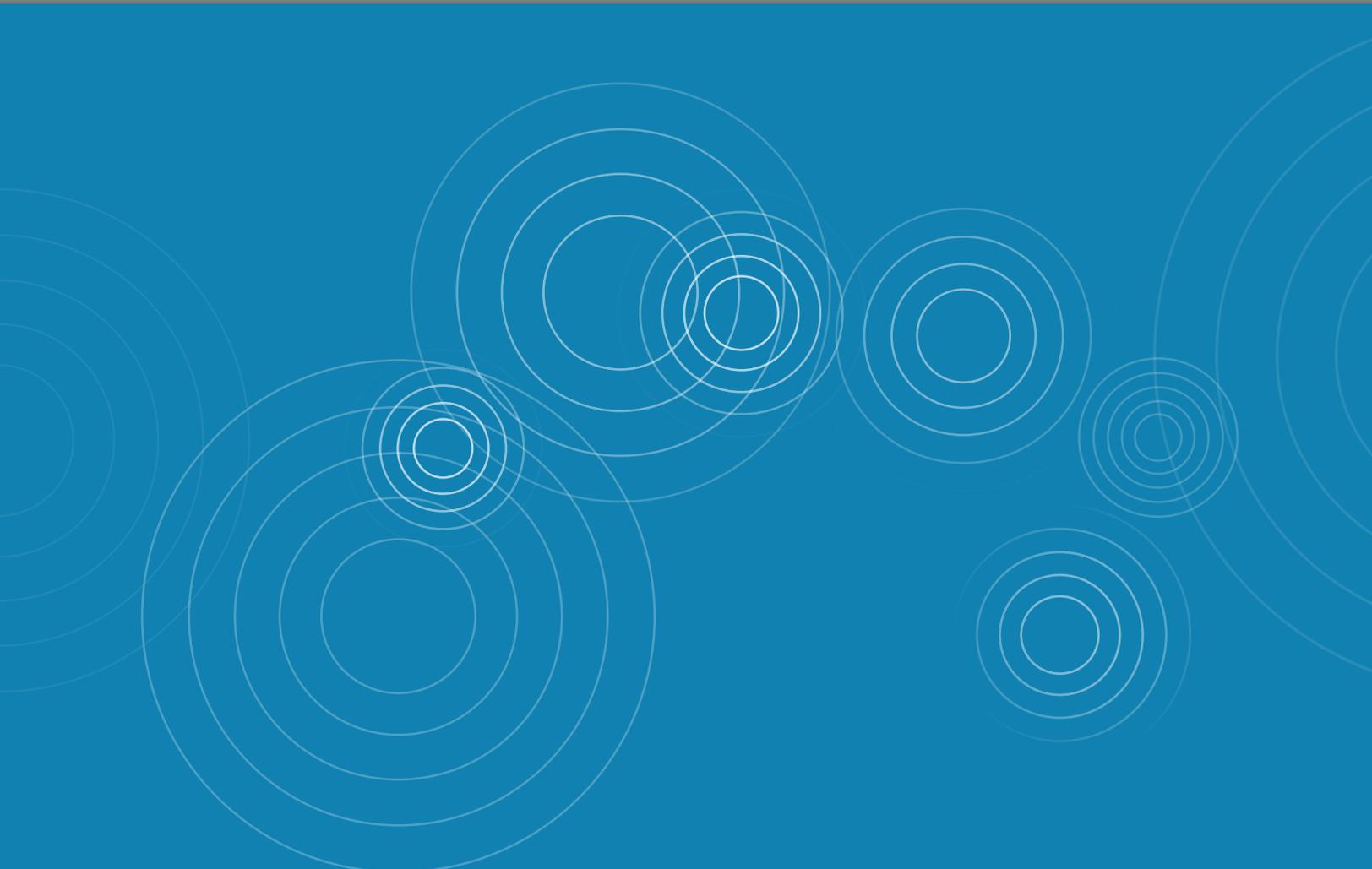






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