Ministry of Agriculture & Fisheries

Government of Jamaica

JAMAICA

TOWARDS A STRATEGY FOR FINANCIAL WEATHER RISK MANAGEMENT IN AGRICULTURE

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I. INTRODUCTION

This report forms part of the technical assistance provided by the World Bank under the Non-lending Technical Assistance Program for the Caribbean "Market Based Agriculture Risk Management in the Caribbean". The program is largely financed by the European Union AAACP Initiative and contributions from the International Fund for Agriculture Development (IFAD) and the World Bank. The findings and analysis in this report are largely based on the work commissioned to a consulting firm with inputs provided by consultants and staff from the Government of Jamaica, the private sector of Jamaica, the World Bank, and participants of a consultation workshop held in Kingston, Jamaica in May 2009.[1]

This document provides technical inputs for designing a national strategy for addressing the financial weather risks facing the agricultural sector of Jamaica. As such, it identifies the various options from current available financial risk transfer instruments for addressing crop weather risks for small farmers (livestock risks are not directly addressed in this report), and identifies the public investments needed for supporting market development of the agricultural insurance[2] market. It is also expected that this document will serve as the basis for creating awareness and consensus among various stakeholders for the need to identify a public-private partnership for addressing financial weather risks in agriculture. The document will also be of interest to the donor community for identifying funding opportunities on this topic.

The report is structured along five sections to facilitate its presentation. The following presents a snap shot of the Jamaican economy, agricultural sector, and current situation of agricultural insurance; the third section addresses a set of key issues for designing a government strategy on agricultural financial weather risk management; section four contains the elements of public policy and investments to support market development for agricultural insurance, and various illustration on how to structure financial weather risk management instruments for the sector. The report concludes with a short section with final remarks and recommendations.

II. BACKGROUND

The Economy - A snapshot

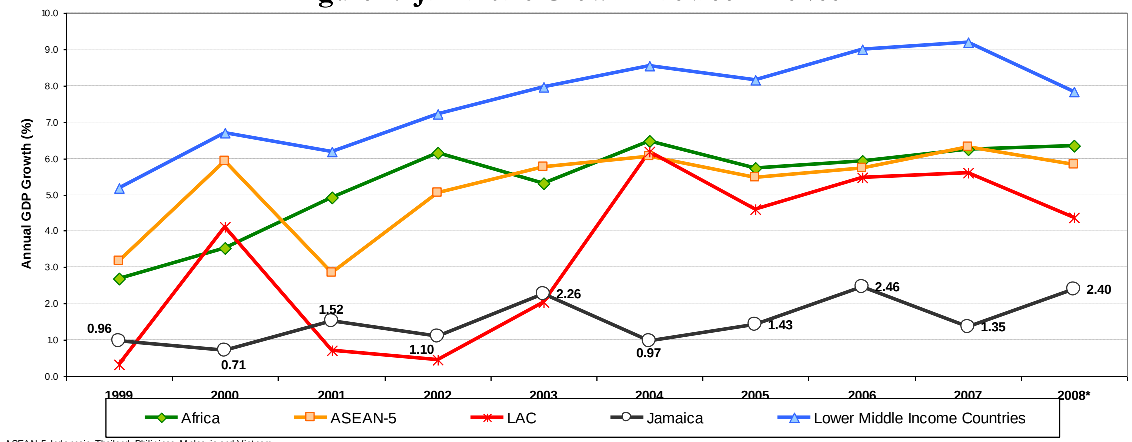
The main strengths of Jamaica's economy are its political stability, endowment of natural resources, and its proximity to its largest trading partners. However**, in the last ten years, Jamaica's growth performance has lagged behind the dynamics of key comparator**

[1] Though the findings of this report are made available by the Government of Jamaica, its content do not necessarily reflect the policies of the World Bank, the European Union, or the International Fund for Agriculture Development.

[2] Although livestock insurance faces similar problems as crop insurance, this report address mainly the public policy and investments regarding financial coverage for crop risks. A special assessment for livestock risk would need to be undertaken.

countries (see Figure 1). Annual economic growth averaged 1.6 percent during 2002-2007. Much of this **weak growth performance is attributed to a combination of oil price shocks, declining export prices, natural disasters, and the financial crisis.**[3]

Figure 1. Jamaica's Growth has been modest



ASEAN-5: Indonesia, Thailand, Philipines, Malasyia and Vietnam.
Source: IMF World Economic Outlook April 2008.

Growth prospects have further weakened over the last two years due to natural disasters and external shocks. During FY07/08, GDP growth decelerated to 0.9 percent from 2.5 percent over the prior year due to the adverse impact of Hurricane Dean in the agricultural sector. GDP is projected to decline by 0.5 percent in FY08/09 due to tightening of international financial conditions, declining US growth, and the lingering impact of high energy and food prices.

Jamaica has made substantial progress in poverty reduction since it began monitoring living conditions in 1988. The poverty rate has fallen from 30.4 percent in 1989 to 16.9 percent in 2004. Poverty declined sharply in the Kingston metropolitan area during 2004-2005 but no further progress has been made in 2006. It fell from 14.3 percent in 2004 to 9.6 percent in 2005. Poverty in rural areas declined from 22 percent in 2004 to 19.8 percent in 2006. **There is a strong correlation between high inflation and increased incidence of poverty, as food expenditures represent a large portion of the budgets of the poor.**[4]

Rural poverty remains a major challenge for Jamaica, with the rural poverty rate twice the level of Kingston. Though the agricultural sector produces only 6 percent of GDP, it employs 20 percent of the labor force. This not only reflects the importance of the agricultural sector as a source of income for a large segment of the population, particularly the rural poor, but also the relatively low level of productivity compared to other sectors. However, there is large potential for rural development, especially through closer linkages with the expanding tourism sector that are yet to be tapped.

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[3] World Bank 2009. World Bank Program in Jamaica. February. Washington. D.C. Processed.

[4] World Bank (2009), *ibid.*

Highlights of Agriculture relevant for Insurance

According to the 1996 Agriculture Census[5], the agriculture sector covers about 407,000 hectares of production, and it involves almost 190,000 farms, indicating an average farm size of two hectares. A land holding structure of this type represents important challenges for the design of a financial risk management program, particularly for identifying an efficient institutional channel for collecting premiums and for distributing payouts. **This type of land ownership structure necessarily calls for some sort of aggregate risk pooling transfer mechanism for the majority of farmers.**

Also relevant for agriculture insurance purposes is the skewed pattern of agricultural production. **The bulk of production is done by the larger commercial producers, with 20 percent of the production units counting for 80 percent of the marketed output.**[6] The distribution of farms according to size indicates that 69 percent of the holdings are less than 1 hectare, controlling 11 percent of the land, while almost 85 percent are less than 5 hectares, controlling 36 percent of the land. Thresholds of 1 or 5 hectare farm sizes for access to insurance products would thus represent between 69 and 85 percent of the holdings and between 11 and 36 percent of the of the farmed land. As a general rule, small holding farming is a particularly important segment for involvement of the public sector to design an aggregate financial weather risk transfer mechanism, particularly for catastrophic coverage. See Table 1.1 for an outline of holdings/farms per parish, and Table 1.2 for the distribution of agricultural land by size of holding and parish.

Table 1.1: Number of farms per parish

Number of Holdings	*Units*
Jamaica	**187,791**
St. Andrew	6,368
St. Thomas	9,462
Portland	6,701
St. Mary	12,645
St. Ann	19,449
Trelawny	9,503
St. James	9,050
Hanover	11,719
Westmoreland	18,489
St. Elizabeth	25,588
Manchester	16,922
Clarendon	24,605
St. Catherine	17,290

Source: Agricultural Census 1996

[5] A 2007 was undertaken but data was not available at the time of the drafting of this report.

[6] Agricultural Census 1996

Table 1.2: Distribution of agricultural land by size of holding and parish

Parish	Total	Under 1 Ha	1 Ha. to under 2 Ha.	2 Ha. to under 5 Ha.	5 Ha. to under 10Ha.	10 Ha. to under 20Ha.	20 Ha. to under 50Ha.	50 Ha. to under 100 Ha	100 Ha. to under 200 Ha	200 Ha.and over
Jamaica	*407,434*	*43,459*	*38,215*	*63,762*	*26,217*	*17,732*	*23,774*	*18,319*	*23,165*	*152,791*
St. Andrew	6,743	1,699	1,408	1,535	611	390	479	286	335	0
St. Thomas	25,134	1,952	2,133	3,922	1,591	1,225	1,776	2,102	1,103	9,330
Portland	18,620	1,374	1,794	3,660	1,834	1,283	1,326	879	1,252	5,218
St. Mary	32,232	2,481	2,694	6,065	2,852	1,788	3,316	2,985	2,883	7,168
St. Ann	53,081	5,045	4,048	6,717	2,808	2,016	3,442	1,192	3,806	24,007
Trelawny	33,208	2,256	1,850	2,207	872	730	1,327	832	1,324	21,810
St. James	16,166	1,932	1,536	2,778	1,267	883	969	1,045	1,294	4,462
Hanover	18,582	2,453	2,051	4,086	1,570	933	1,192	1,324	2,493	2,480
Westmoreland	40,140	3,849	2,606	5,445	2,555	1,748	2,534	1,976	1,994	17,433
St. Elizabeth	38,759	6,842	4,456	5,925	2,458	1,935	1,844	1,411	1,236	12,652
Manchester	23,839	4,279	3,837	6,000	2,312	1,549	1,440	708	421	3,293
Clarendon	58,275	5,638	5,760	8,579	3,021	1,924	2,302	1,731	1,964	27,356
St. Catherine	42,655	3,659	4,042	6,843	2,466	1,328	1,827	1,848	3,060	17,582

Source: Agricultural Census 1996

Another key feature of Jamaican agriculture for insurance purposes is that around **73 percent of the agriculture area is utilized for permanent crops such as sugar, banana, citrus, and coffee.** Twenty seven percent is utilized for crops like vegetables, fruits, and tubers. The risk modeling of hazards for these latter crops presents significant technical challenge for any insurance scheme. Thus, a product by product approach will prove useful in order to disaggregate risks per crop and be more precise with the risk modeling, whenever designing weather insurance with individual contracts for farmers. For the remaining 27 percent, in particular multi-cropping systems by small farmers, the financial risk coverage would need to focus on catastrophic risks and aggregated hedging instruments by regions. This would mean that small farmers would likely continue to depend on the public sector risk management programs (income compensation) for hedging catastrophic climate risk, rather than on commercial agriculture insurance. However, there is ample room for designing tailored-made transfer mechanisms for most of the crops under the Commodity Boards (CBs) as well as a public sector income-compensation program for small farmers.

Table 1.3: Type of products under cultivation by area

Type	Area (Hectares)
Permanent Crops	130,504
Legumes	5,694
Vegetables	9,836
Condiments	2,549
Fruits	2,891
Cereal	2,354
Potato	3,952
Yam	15,983
Other Tubers	4,075
Other crops	1,426

Source: Agricultural Census 1996

History of Agricultural Insurance

The history of agricultural insurance in Jamaica has featured many negative experiences. In part, the lack of sustainable agricultural insurance coverage has been blamed on high catastrophic exposure (and lack of reinsurance capacity), but in reality it has been the result of various factors, including: (i) the technical difficulty of designing appropriate insurance products and delivery mechanisms for small farmers, (ii) the diversity of tropical crops produced in the country (multi-cropping systems), (iii) technical difficulties in modeling (correlating) hurricane and flood damages to agricultural production (yields), and (iv) a generally uninterested local private insurance market (with some exceptions). Only for a few examples has traditional named-peril insurance[7] worked or nearly worked in the island (e.g. bananas[8], coffee and coconuts), plus fire insurance on sugar cane. These agriculture supply chains have apex marketing arrangements or are at an industrial scale. Coffee, a competitive agricultural export commodity for Jamaica, has recently been having substantial problems with insurance and reinsurance arrangements, to the point where today there is no coverage for climate risks.

Current Status

Since 2006, most agriculture insurance products ceased to operate, leaving the sector highly exposed to weather risks. Moreover, given that the vast majority of farmers are smallholders, the GOJ is greatly concerned about protecting them, and is interested in

[7] Traditional named-peril insurance are contracts based on on-farm loss verification, but tied to a specific risk (i.e. wind, fire)

[8] From 1987 to 2002 one major banana producing and exporting company in Jamaica was buying a catastrophe named peril insurance from Lloyd's, and in 2006 purchased catastrophe index insurance.

organizing an efficient distribution channel to support small farmers in the aftermath of a catastrophic hurricane or drought. Currently**, the entire agricultural sector, including large integrated supply chains as well as small farmers, is absorbing all the climate risks, without any risk out-transfer mechanism - - neither publicly nor privately (re) insured.**

In the 1980s some efforts were made to harness whatever limited capacity there was with the local insurance companies, by grouping them in a pooling mechanism to enable entry into the international re-insurance market. There was some success and companies such as Munich Re, offered specific and facultative (project-specific) support capacity to at least three local companies[9] to underwrite agricultural business as a separate line of business. There is reason to believe that this capacity can again be garnered locally, since it will be an area of expansion for the local companies. The challenge is the strengthening of domestic underwriters to objectively and scientifically underwrite agricultural risk.

Up to now there has been very limited research into windstorm or hurricane indexes. The major exception to this is the research undertaken by the Caribbean Catastrophe Risk Insurance Facility (CCRIF), which has been designed with the cooperation of the World Bank at the request of CARICOM[10] and which was launched in September 2006. This facility provides a macro-level earthquake and hurricane index for each country which is designed to finance post-disaster recovery. The payout system is based on the estimated impact of an earthquake or hurricane on each island, using probabilistic catastrophe risk modeling and actual exposures. As such, post-loss payouts are immediate according to the severity of the event and the index indemnity formula, and there is no longer any need for verifying damages to infrastructure, buildings and/or utilities. In the case of hurricane, the index is based on tracking of hurricane location and strength at the closest point of approach, and not on winds measured by meteorological stations.

While the CCRIF initiative provides Jamaica with a macro-level hurricane index protection for hurricanes that occur every 20 years, it is recognized that this product is intended to protect public assets, and it is not designed to protect farm assets, which in fact will need a different product structure. Furthermore, CCRIF is not intended hedge against hazard impact at a localized level. Hurricane Dean alone caused direct damages estimated at US$250 millions to agriculture, but did not trigger CCRIF payments[11].

The Ministry of Agriculture (MOA) provides ex-post ad-hoc support to small farmers after a disaster and is assessing the option to move towards an ex-ante financial instrument for covering vulnerable producers against adverse weather events. Such ex-ante programs could be financed, following a risk layering exercise, by a mix of government funds, contingent lines of credit, weather derivatives and/or reinsurance (directly from private re-insurers or through CCRIF). **A similar approach to CCRIF, adjusted for the particular**

[9] Insurance Company of the West Indies, United General Insurance Company and Dyoll Insurance Company

[10] Caribbean Community

[11] The support is usually provided in the form of subsidized inputs, reconstruction of rural infrastructure, and/or delivery of materials for rebuilding.

catastrophic climate exposure of Jamaica's macro agricultural regions (see Section 3.3) should be assessed as a way of overcoming the historical problems with agriculture insurance, thus protecting the most vulnerable and crowding in the private insurance sector.

Challenges

Insurance is often not the solution for all financial climate risk related problems in agriculture. Agricultural insurance, in particular, generally makes sense for specific hazard events that occur approximately one in every seven years or more and which have a high impact that cannot be cost-effectively prevented by physical risk reduction measures. Farmers can cope with events that occur relatively more frequently, such as every other year or once in three years, through coping mechanisms like savings and other financial products (e.g. short-term credit, remittances) to cover for the bad years. Nevertheless, these mechanisms usually cannot overcome high-impact events that threaten their livelihoods, mainly due to stop-loss clauses or the reduced coverage of insurance contracts due to high premium costs.

Other challenges with the development of agriculture insurance markets arise with a weak/inappropriate regulatory framework. Insurance policies are a commercial transaction between an insurance company and an individual. As such, limitations often arise from problems with: (i) contract enforcement, (ii) the supervision of insurance companies, or (iii) the protection of consumer. Agriculture insurance can also be prohibitively expensive in some cases where there is a lack of competition in the domestic insurance market and/or the risk simply is not insurable due to frequent claims and/or the high costs of administering the contracts (i.e. avoiding fraud). In these cases traditional ex-ante risk reduction, as well as ex-post support (management/response), is important.

Undoubtedly, a parametric approach to agriculture risks (if feasible) would overcome some of the above-mentioned constraints. Nevertheless, the issue of basis risk with index insurance remains a challenge. Box 1 presents the conditions that need to be in place for an index program to be successful. The content of this box largely represents a high degree of consensus among practitioners.

Box 1: Conditions for successful risk transfer based on indices in agriculture[12]

Minimal take-off conditions are:

- Coverage of the right risks: "insurance" or a risk transfer mechanism for infrequent (one in seven years) but 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 great 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 one in seven years may be too costly for most farmers to insure without a subsidy.
- Index captures 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 catalyst, not a value proposition in itself: Sometimes the fundamental value proposition (for example of contract farming in a value chain) makes economic sense for all involved parties, but the presence of systemic crop failure risk hinders the deal from happening. In this case the index based risk transfer can make the deal happen, because it essentially removes the key obstacle weather risk and shares the costs between the benefiting parties. In other cases, if the fundamental value proposition (catalyzing a safety net or securing credit for inputs for example) is not viable (for example 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 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, 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 are timely (maximum 40 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 into 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 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 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) needs to be explained in simple language that farmers understand.

[12] These conditions were recently discussed in a panel of experts in index-based agricultural insurance that met in Rome under the auspices of the World Food Program and IFAD.

III. KEY ISSUES FOR THE DESIGN OF A PUBLIC SECTOR AGRICULTURE WEATHER RISK MANAGEMENT STRATEGY

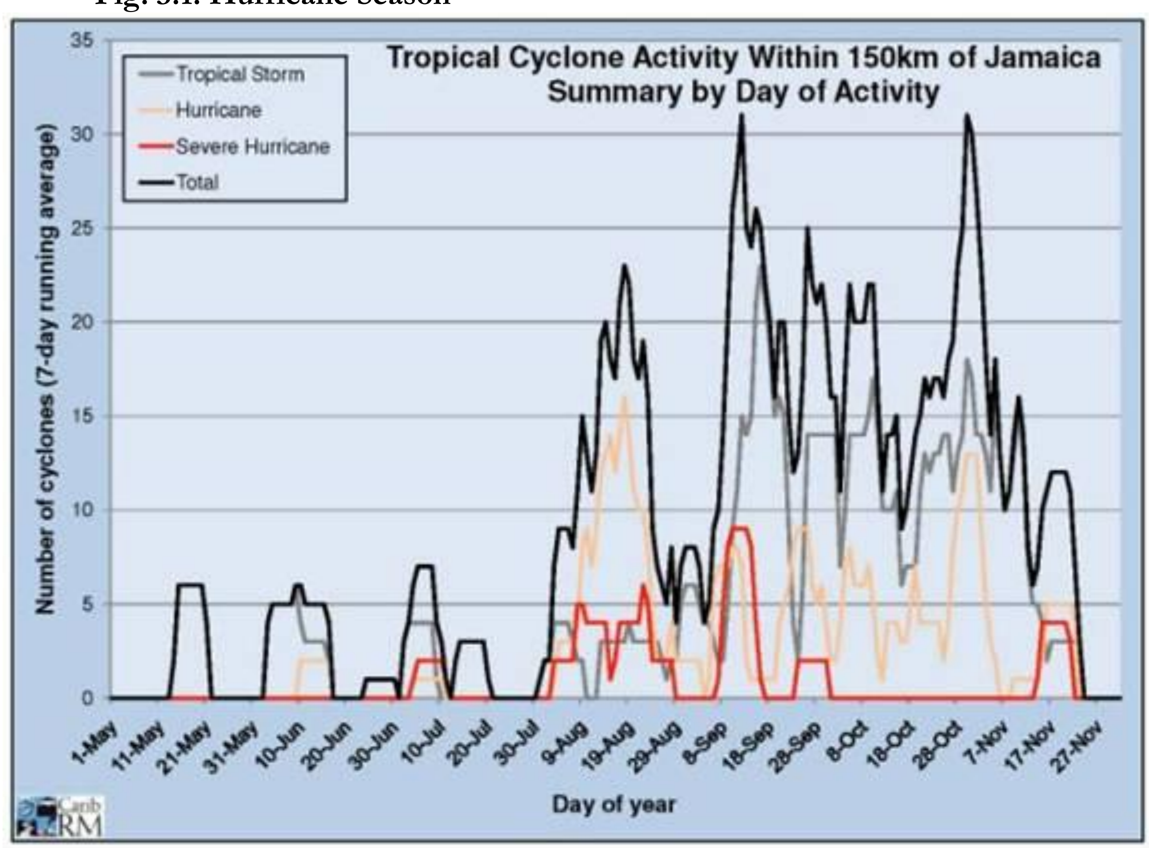
3.1 Weather Risks in Agriculture

Jamaica faces a variety of natural hazards and, on a combined hazard basis, is among the most vulnerable countries in the world. It lies in the centre of the Atlantic hurricane belt, on a complex area of the northern Caribbean Plate margin and is subject to tropical rainfall and erosion processes.

In the specific case of agriculture, these multiple hazards can be reduced to three principal weather hazards in terms of the level of impact: (i) short-duration extreme winds; (ii) short-duration extreme rain; and (iii) longer-term substantial deviations from average rainfall (which includes both excess rain and drought).

Both short-term extreme rain and wind hazards are primarily associated with hurricanes. Short-term rain hazards can also be associated with non-cyclonic tropical waves and depressions, although such systems often trigger hazardous events (floods, landslides) only if occurring after a prolonged period of heavier-than-normal rainfall (not rapid onset).

Fig. 3.1: Hurricane Season



Deviations from normal rainfall can occur on any time scale, but in the context of impact on agriculture, deviations in four distinct periods (two wet seasons, May-June and September-

October and two dry seasons, see Figure 3.1) are useful in terms of formulating a parametric coverage for this hazard. Too much rain dominates over too little in terms of impact on agriculture in Jamaica.

Intense rainfall events tend to occur within tropical cyclone events and are thus generally restricted to the June to November period. However, intense rain events can also occur in non-cyclonic situations, thereby extending the period of interest back an additional month to include May (the first month of the first wet season of the year). As with tropical cyclones, non-cyclonic systems can produce heavy rain outside of these periods.

Earthquakes are a major hazard, particularly in south-eastern Jamaica. However, the vulnerability of agriculture to earthquake damage is relatively low when compared with other forms of industry and infrastructure. Crops in the ground would not generally be significantly impacted. Bananas, plantain and some tree crops may lose some fruit through shaking, but the main impact would be in loss of infrastructure (buildings, processing infrastructure) and potential loss of accessibility, particularly in mountainous areas, where earthquakes often trigger landslides.

3.2 Frequency, Intensity, and Return Periods

Wind

Wind hazards to agriculture are generally restricted to a few crops, most importantly bananas, coconut, and plantain. However, other tree crops may also be severely impacted by strong winds, as can sugar cane and coffee. Extreme rainfall can have a direct effect on agriculture by enhancing the destructive effects of wind; however, most impacts are secondary, including flash flooding, localized flooding, and landslides. Excess or lack of rain affect the normal growing cycle of all crops, though some are more severe than others. Prolonged excess rain can also lead to flooding and landslides, although most flooding and landslide occurrence is ultimately precipitated by a short period of extreme rainfall.

The Atlantic hurricane season lasts from 1 June to 30 November, with a peak for strong-wind storms in early September and another one early November (Figure 3.1.) Tropical cyclones can occur outside of hurricane season, though very few strong-wind events do so. Tropical cyclones generally approach Jamaica from the east or southeast. However, Jamaica's location in the northwestern Caribbean Sea exposes it to storms seeding in the southwestern Caribbean during the early and later parts of the season. These storms tend to approach from the south or southwest and are generally less 'windy' but wetter. Any insurance product for agriculture to hedge against hurricanes will need to be tailored to cover the exposure of particular crops during this window (i.e. exposure of coffee cherries is different in the Blue Mountains than at lower altitudes, because of the differences in reaping times.

Rainfall

This is the best documented agriculture weather risk in Jamaica. Long-term monthly rainfall records and good statistics on those records, are available for a large number of weather stations with good geographical diversity and density. See some examples of monthly mean and min/max data for selected stations in Fig.3.2 and 3.3. At first glance, it seems that both historical records and reliable current records exist or would be recorded for monthly rainfall. However, there is a need to audit the historic weather database as to assess the reliability of daily recordings that allows for sufficiently high spatial resolution to enable parametric policies to be underwritten.

Fig. 3.2: Rainfall Distribution

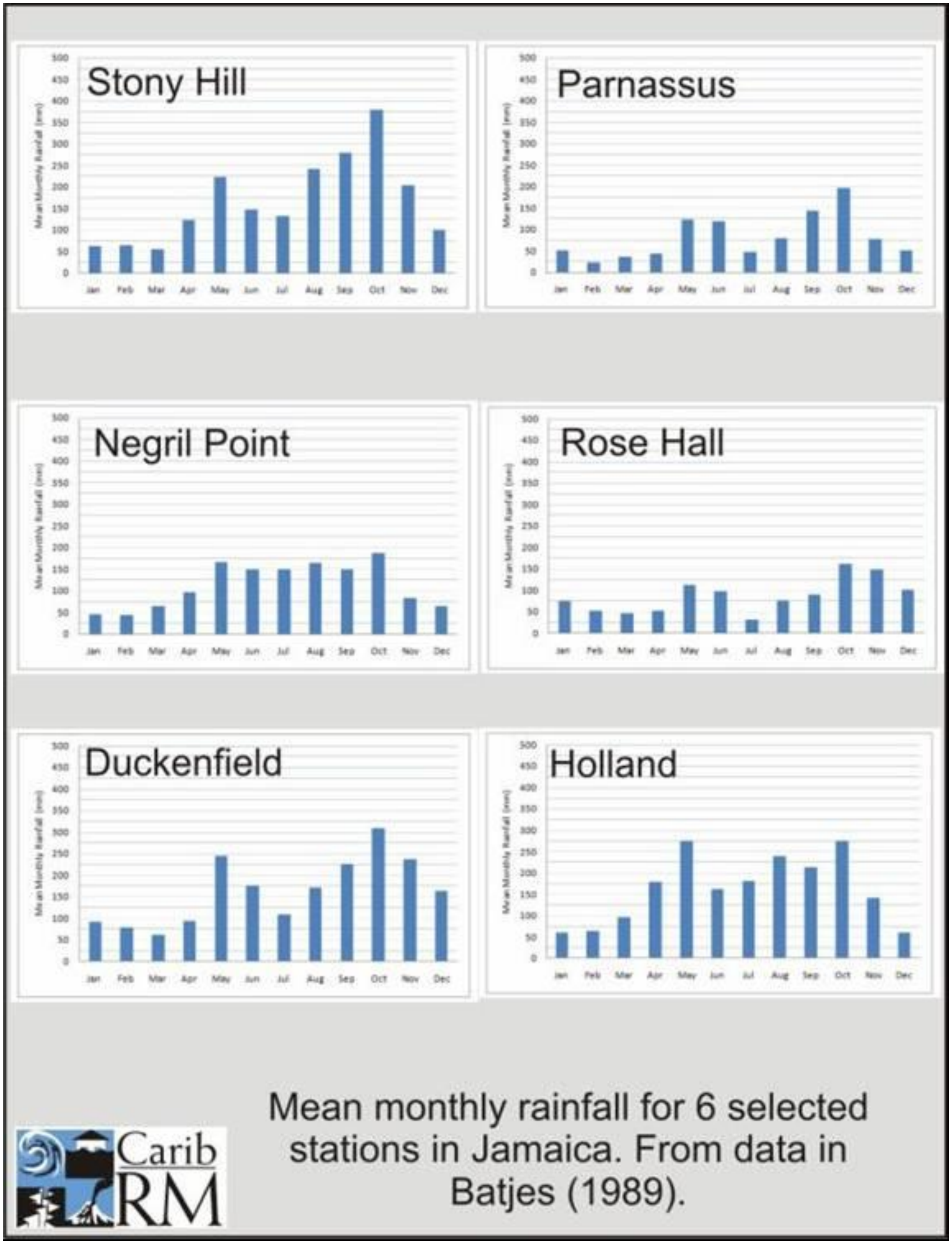
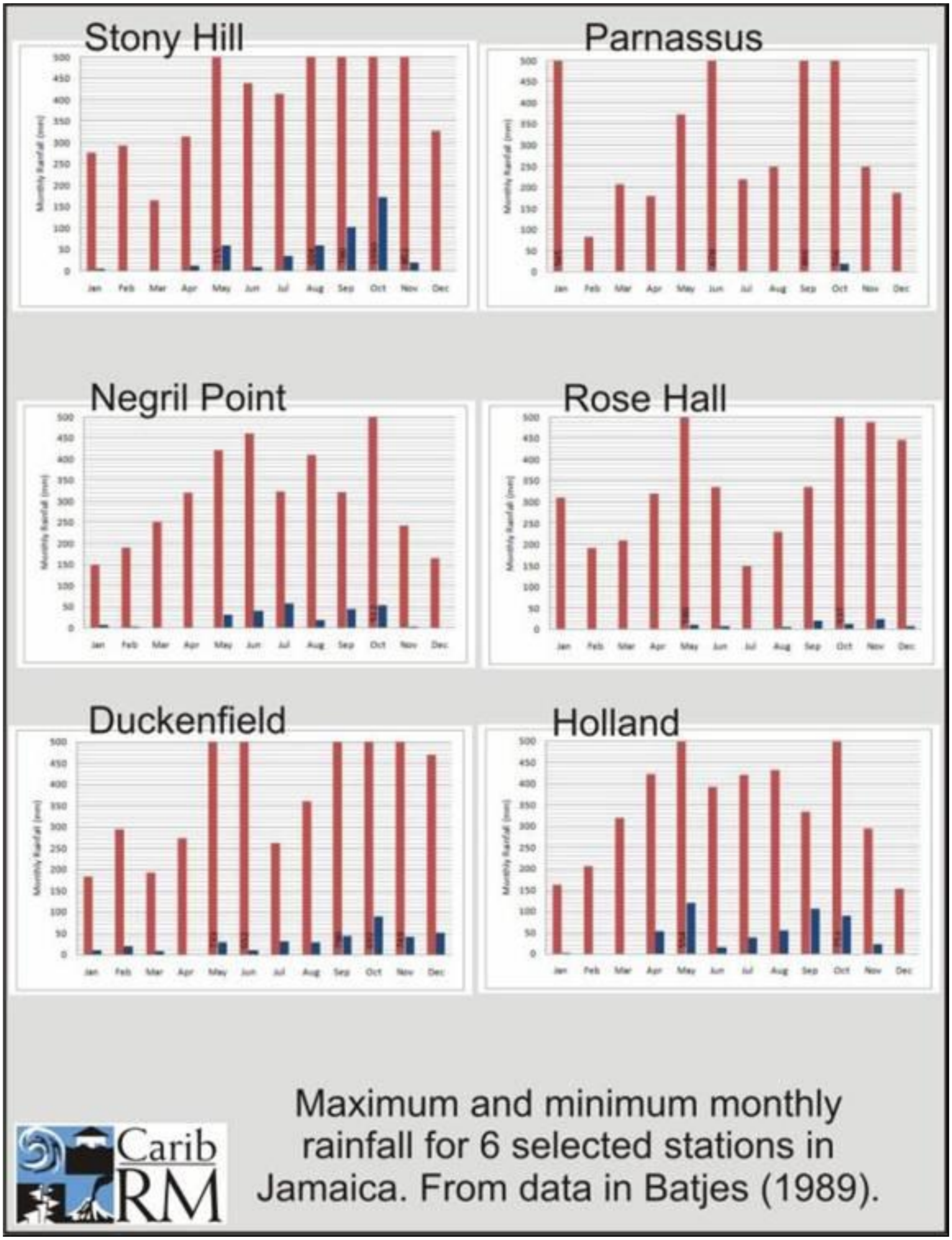
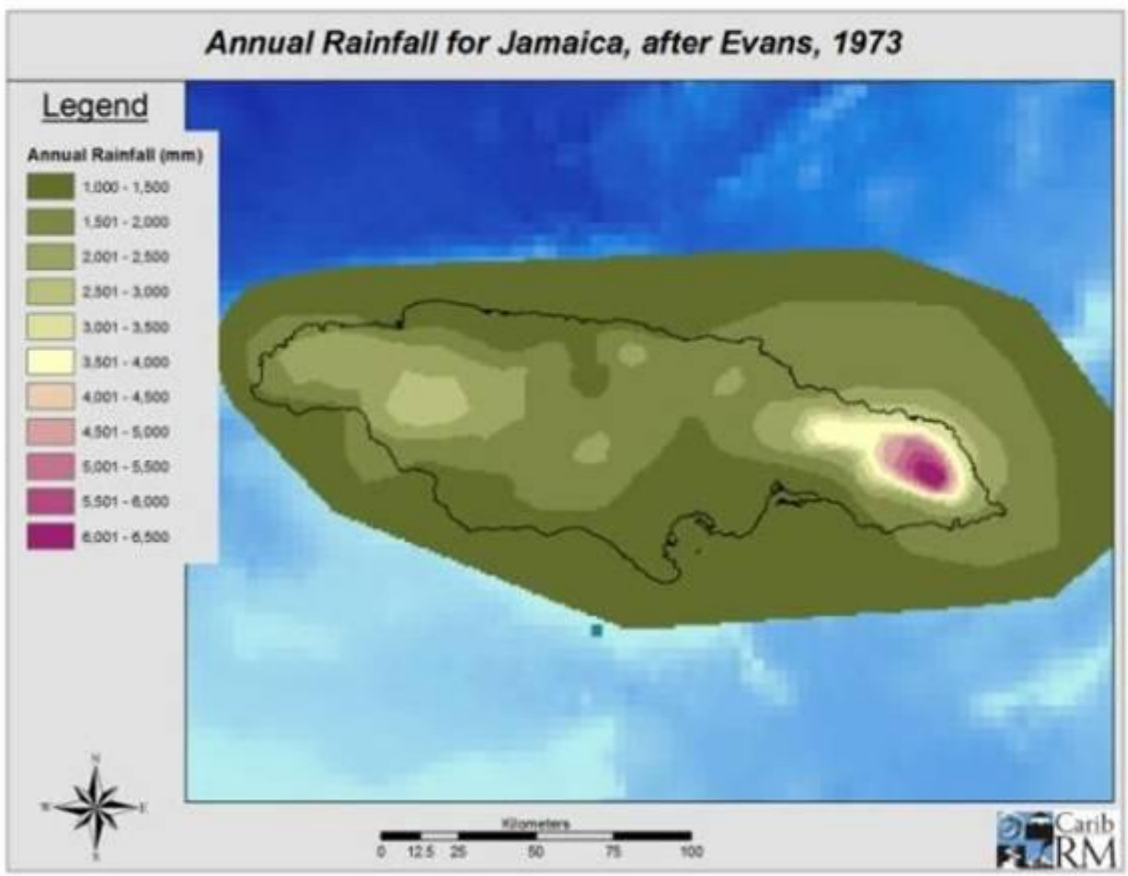


Fig. 3.3: Average Maxima and Minimum monthly Rainfall Distribution



Average annual rainfall amounts are largely governed by topography, with the isohyets map (Figure 3.4) showing the highest rainfall over the John Crow and Blue Mountains in the east. However, there is also an east to west drying trend in the annual data, due to the fact that most of the rain-bearing weather is brought by the trade winds, with the west in the rain shadow of the eastern ranges. This pattern holds in general for the monthly data, although there is some variability induced by the randomness of tropical cyclone impacts, which contribute significantly to rainfall amounts at the monthly level.

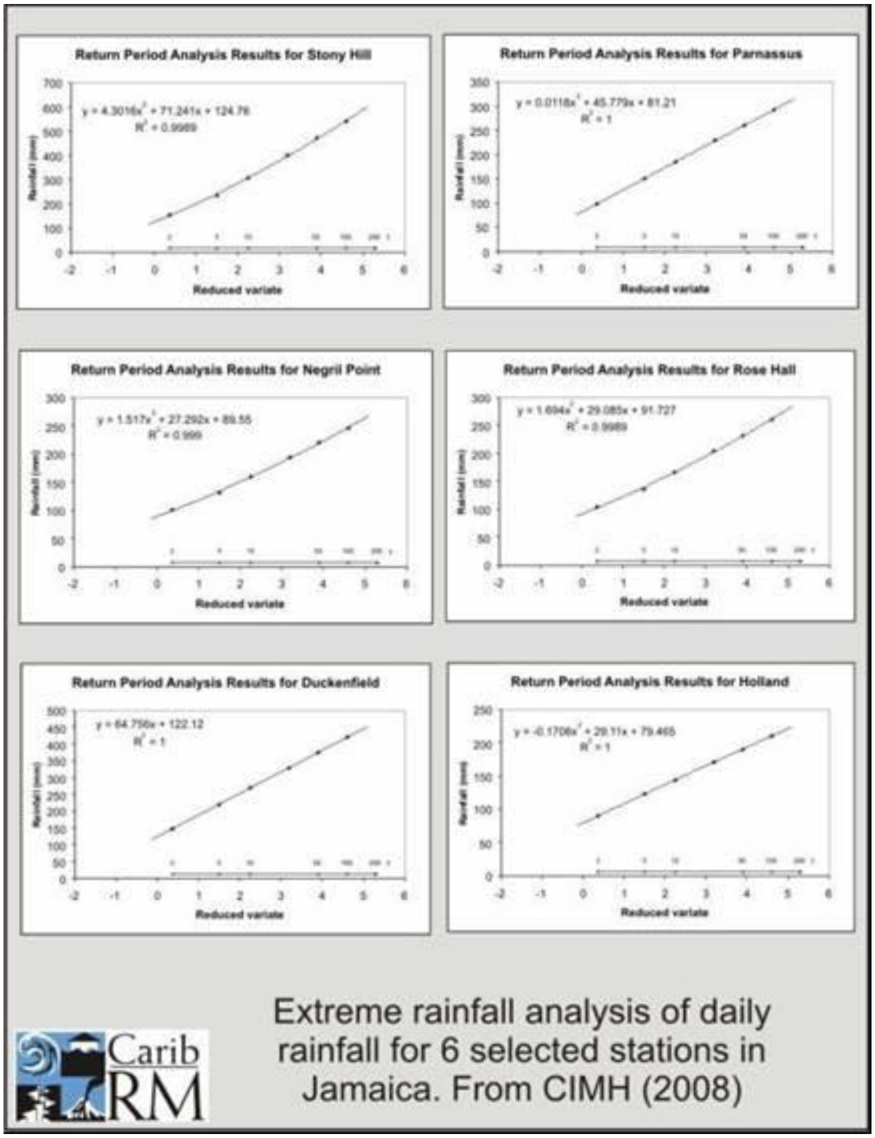
Fig. 3.4 Annual rainfall



Return Periods

Figure 3.5 shows return curves calculated for various locations in Jamaica. The assessment shows that careful attention needs to be placed in choosing the return period that will trigger the insurance payments to farmers in order to obtain premiums at affordable levels.

Fig. 3.5: Return periods for various locations



3.3 Weather Risk Mapping and Macro-regions

For any financial weather risk management strategy in agriculture to become operational, it is important to identify macro regions (and sub-regions) that share homogenous weather patterns, crops, and risks. Subject to confirmation for each of the feasibility studies that will need to be carried out for each crop and agricultural region, it is assumed that most crops that belong to one of those macro regions or sub-regions face the same type of weather risks, be it excess rainfall, droughts, and/or excess wind forces. The variables that can be taken into account in order to divide the agricultural landscape into homogenous weather sub-zones are: (i) the bio-geographic zones, (ii) the watershed basins, (iii) the rainfall distribution, and (iv) the topographic elevation.

Bio-geographic areas in Jamaica have been well identified by Jamaican scholars, as seen in Fig. 3.6. Though, it was not meant for agriculture, the zoning shows large macro areas that are more suitable for specific agricultural and livestock activities. For example, the southern lowlands are dominated by large extensive livestock activity; the North Coast has a high concentration of mostly coconut cultivation; the Blue Mountains are characterized by the exploitation of pine and for coffee farming; sugar cane production is predominant in the Western Lowlands; and there is a wide array of crops on the Manchester Plateau (See Figs.3.6 and 3.7)

Fig. 3.6: Bio-geographic areas

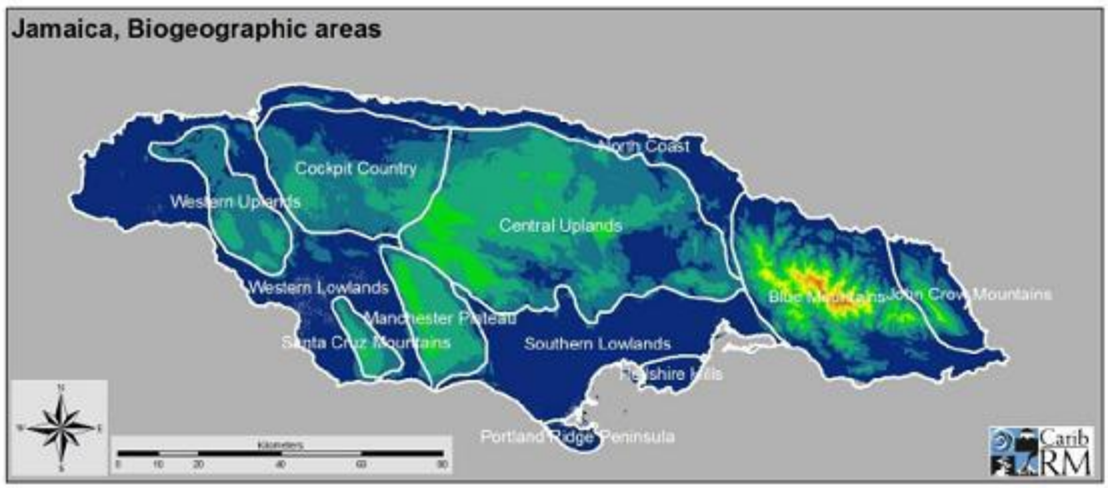
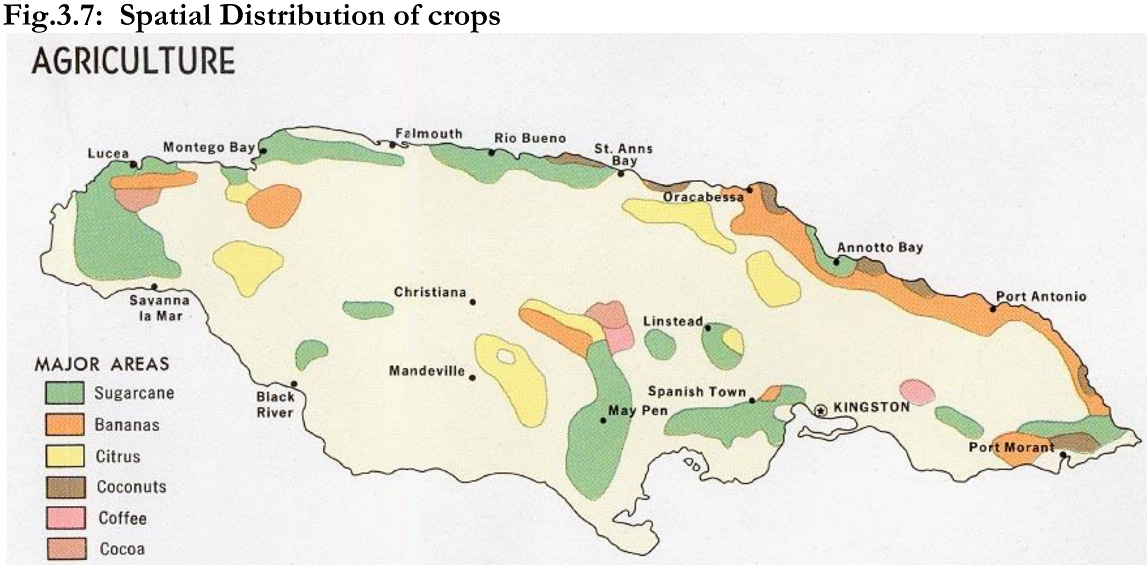


Fig.3.7: Spatial Distribution of crops



Source: University of Texas. Thematic Maps, UT Library Online

Likewise, the Water Resource Agency has already mapped the island into 26 sub-watersheds. These can be useful for planning and designing agricultural insurance for specific crops. For example, the coffee farms that are located in the sub-watersheds along the southern side of the Blue Mountains face different types of frequency and exposure to hurricane wind forces than those farms located in different altitudes along the northern side of the Blue Mountains (See Table 3.1). The exposure of coffee cherries to hurricanes varies according to location (elevation, mountainside location).

Table 3.1. Monthly harvesting schedule – average of 3 years to 2007/08.

		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
Avg.- NBM	Monthly	584.08	7,374.08	26,342.67	33,965.25	10,427.25	1,900.92	255.38	3.00	5.13	-	-	-	80,858
	% of Crop	0.72%	9.12%	32.58%	42.01%	12.90%	2.35%	0.32%	0.00%	0.01%	0.00%	0.00%	0.00%	100%
	% of Crop accum	0.72%	9.84%	42.42%	84.43%	97.32%	99.67%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	
Avg. BM	Monthly	5,724	24,187	71,427	112,828	60,288	37,273	19,265	14,915	11,826	5,236	1,122	657	364,747
	% of Crop	1.57%	6.63%	19.58%	30.93%	16.53%	10.22%	5.28%	4.09%	3.24%	1.44%	0.31%	0.18%	100%
	% of Crop accum	1.57%	8.20%	27.78%	58.72%	75.25%	85.46%	90.75%	94.83%	98.08%	99.51%	99.82%	100.00%	

Source: Coffee Industry Board

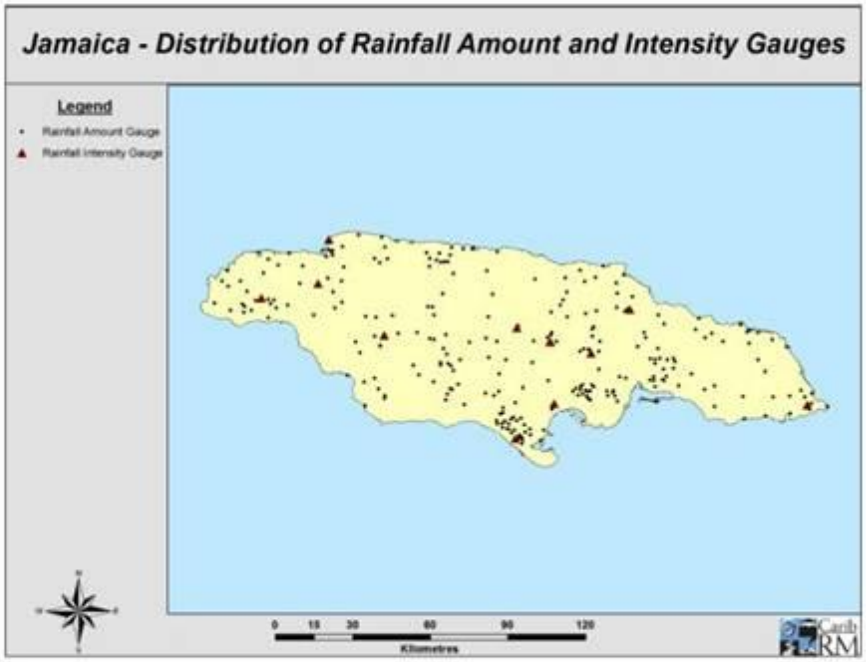
Note: BM= Blue Mountains, NBM= Non Blue Mountains

3.4 Data Infrastructure

The information on weather and agricultural data for insurance purposes needs to be of good quality for insurers and reinsurers. The quality of and access to historic weather information (i.e. rainfall, wind speeds, location of weather stations, modus operandi of weather stations, geographic radius of influence of weather stations, etc.) allows the industry to make probabilistic calculations based on historical frequency and intensity of weather events that cause damages to particular agricultural assets located in specific geographical areas. Likewise, the design of an insurance contract needs agricultural data, such as historic yields, levels of production, production costs, behavior of crops subjected to weather risks under consideration, evo-transpiration, types of soil, and altitude.

According to the Jamaican Meteorological Service (JMS) there are 485 long-term rainfall measurement sites in Jamaica (Figure 3.8). Some sites are no longer active and others may only have recent data. Also, some sites are located very close to one another and are essentially duplicates. For over 400 of the sites, the date for start of records is known, with the oldest records dating from 1860. The measuring frequency of sites is not documented (at least not electronically in the inventory of JMS), although it is likely that the majority of sites have recorded daily (rather than just weekly or monthly) data for most if not all of their history.

Fig. 3.8. Distribution of Rainfall Gauges



The Meteorological Service of Jamaica (JMS) is the nation's weather forecasting and climate data collection agency. It operates as a scientific division within the Ministry of Land and Environment. As with all the Caribbean national meteorological services, investment and recurrent budgeting is a major constraint at JMS, both in terms of capital equipment purchasing, maintenance, and personnel. JMS is supported at the regional level by the Caribbean Meteorological Organization (CMO) and by the CMO's training and research arm, the Caribbean Institute for Meteorology and Hydrology (CIMH) based in Barbados. At the global level, the World Meteorological Office (WMO) also provides technical assistance to JMS.

A significant portion of capital equipment funding comes through individual projects funded either by external (bi- or multi-lateral) aid, usually part of regional projects, or by government departments such as the Ministry of Agriculture and the Ministry of Energy (for wind power generation data). JMS also collaborates with the University of the West Indies (UWI) in certain areas (particularly data logging and telemetry). JMS generally uses Casella equipment, which must meet WMO standards; however, recent testing of much cheaper US-made equipment (which also meets WMO standards) may lead to use of that equipment for further network expansion.

There are continuous datasets for multiple parameters from the two international airports (Norman Manley south of Kingston and Donald Sangster just east of Montego Bay) with records back to 1992, and there are now five automated weather stations operated by JMS which feed data through the GOES weather satellites (operated by US-NOAA). The two airport and five AWS sites are the only ones in the JMS network which measure wind speed.

Data is currently archived twice-monthly by JMS in off-site backups on CD-ROM. Although there is an MoU in place with CIMH for data backup, the flow of information is "sporadic". There are indications from CIMH that there is no operating data backup arrangement between JMS and CIMH and that data exchange is completely ad-hoc.

Availability of Daily Weather Data

The availability of daily and monthly rainfall in Jamaica is generally good. Almost all agricultural areas are within a short distance of a rain gauge with at least a 20-year time series of monthly rainfall averages and often much longer. The spatial distribution of rain gauges and length of records is such that it is possible to produce a set of monthly rainfall data, including mean and variability, at a resolution consistent with the needs of parametric agricultural insurance contracts and with the level of statistical validity required to adequately price the risk in the reinsurance market. However, for short-term excess rainfall a closer assessment needs to be done while designing products for specific crops and regions, given the need for parametric models to rely on accurate historical daily rainfall observations.

Upward of 200 stations likely have sufficient daily rainfall data for this 15-year period to undertake historic statistical analysis for determining the probability of occurrence of weather events. However, the statistical robustness of using 15 years of data as a basis for pricing weather risk decreases at higher return periods (20-25 years), so care will need to be taken in product design to ensure that the risk can be adequately priced on the basis of the available data. The lack of reliable historic weather data, the presence of too many missing observations, and/or larger gaps can push agriculture insurance premiums upwards. Public investments in filling the weather information gaps and cleaning the available weather database are necessary.

Standard methods for filling gaps in historical rain records using data from neighboring stations will be adequate in most situations, but will likely be ineffective for extreme events (because data is likely to be missing at many stations at the same time due to malfunctions caused by the same extreme event). Another issue with extreme weather events is the inefficiency of standard rain gauges in capturing rainfall in the presence of high wind. Research has suggested that uncertainty in point measurements ranges from 5 percent to 15 percent for historical data, but can be up to 75 percent for individual stations in individual storms.

Wind hazards are the most straightforward to model of the main weather hazards facing agriculture in Jamaica, though real-world verification data is very sparse. As peak winds are confined to tropical cyclones, and there exists a good historical database of tropical cyclone activity affecting Jamaica, production of both wind footprint maps for actual events and probabilistic hazard maps and curves for historical analysis is straightforward and can be done at a spatial resolution high enough to serve the required purpose in agriculture insurance.

Recording of Extreme Weather Events

Rain-related hazards, including extreme rainfall, flooding and long term high/low rainfall, are generally more difficult to replicate in a model than wind hazards. For long term high/low rainfall, actual data collected on the ground is a more reliable way of obtaining parameters than modeling. However, extreme rainfall measurement on the ground is insufficient, on its own, to provide temporal or spatial characterization of the historical period or indeed actual events. Satellite-based rainfall measurements are only available for about 10 years in a consistent data set, and even then, spatial resolution is an issue both for that historical data set and for an actual event. Ground-based radar data is very patchy for Jamaica although going forward, radar may be a useful extreme rainfall measuring tool. Rainfall can be modeled but with less certainty than wind. Flood hazards, except for a few of the major drainage basins, are not sufficiently well recorded to enable probabilistic hazard mapping, and characterization of actual events is also not uniform across Jamaica.

Under a regional WMO program, JMS is moving to an improved data archiving system, CLIDATA, which will become the regional standard and should improve data sharing capabilities. CLIDATA has rigid quality control guidelines for data input as well as full inter-operability with ArcGIS.

Extreme event recording is weak within JMS, as it is in many similar agencies in the region. There has long been a dominance of airfield meteorology over long-term climatic and extreme weather data collection at JMS, and this is reflected in data collection methodologies and equipment. In particular, wind measurements in tropical cyclones are almost non-existent, and those measurements that have been made in more recent years by the AWS systems have not captured the most intense parts of storms. For rainfall, extreme events are generally better-recorded, although true rainfall amounts during the peak of a hurricane are not well recorded by traditional rain gauges, and an additional problem is the accessibility of manual rain measurement stations right after a major tropical cyclone or other rain event. Thus in many cases, several days can go by with no daily measurements of rainfall made at many stations, making data extrapolation very difficult. Gauges may also exceed capacity in some circumstances, leading to under-recording of total rain.

3.5 Insurance Delivery Channels

Any insurance program, either public, private or with mixed participation through a public-private partnership, will need to carefully detail the institutional channels to retail the insurance to farmers. The main actors that would play an important role in agricultural insurance in Jamaica are addressed below.

Local Insurance Market

There is currently very limited understanding of agricultural insurance in the Jamaican insurance market. Some insurers even treat agricultural insurance as fire underwriting, basing their risk assumptions on traditional property assessment rather than on crop production. Moreover, domestic general insurers do not enjoy any treaty reinsurance[13] support for agricultural insurance. Indeed agriculture remains a standard exclusion under current treaty/wholesale reinsurance contracts taken out by Jamaican insurers. Major

[13] Treaty reinsurance is the reinsurance of a whole portfolio of risks, providing the insurer with freedom to accept risks within certain limitations set by the reinsurer.

agricultural risk reinsurers[14] in the past have repeatedly expressed the desire to reinsure committed domestic insurance capacity as opposed to 'fronted'[15] agricultural insurance risk for traditional crop insurance, but they offer capacity and will be happy to price most agriculture weather index products. Both local insurers and reinsurers will play an important role in any new attempt to establish an agricultural insurance program, if Jamaica wishes to transfer those risks to the international markets.

Commodity Boards and Producer Organizations

There is significant interest for some form of protection against the risks facing producers of agriculture commodities, as expressed individually and through their Commodity Boards (CBs) and producer organizations. This interest has also been evidenced by the history of past insurance schemes and the creation of several committees to examine the provision of insurance to the sector. There is, however, no appreciation of how this demand is to be met given the actions of government in providing relief to farmers after natural disasters. A number of CBs have insured their crops (current harvests) by making it mandatory to all members or by providing Contract (elective) Insurance which the growers may negotiate. This is the case when the CBs is the primary marketing agency for that commodity (e.g. Banana Board, Coconut Board, Coffee Industry Board, Pimento Board). In the last three years these programs have ceased to exist, except in the case of the Coconut Board. Most CBs have had limited success in attracting the interest of the reinsurance market to transfer their risks, in part because of: (i) lack of clear methodologies on ex-post loss assessment, (ii) considerable moral hazards issues in past transactions, and (iii) legal barriers for CBs in acting as insurers. Likewise, farmers have been losing their trust in CBs after recent experiences (i.e. Hurricane Ivan) whereby the CBs' process for assessing field losses and deliver payments to farmers was not undertaken in a timely manner and produced much discontent. An insurance program will need to have clear, objective, and transparent delivery mechanism, credible to reinsurers and farmers, if it is to be sustainable. The CBs have a large role to play in organizing the farmer registry (insured assets), the pooling of risks, and for collecting farmers' premium payments as well as for facilitating the insurance payouts.

Also, the MOA has been supporting the establishment of producer organizations called Producer Marketing Organizations (PMOs), which seek to organize at a very local level farmer's production decisions and marketing efforts. Such PMOs are in the rapid process of being created throughout the country, and although they do not yet benefit from track record or management capacity, they do present an opportunity for reaching farmers more directly and faster, as well as complementing financial management of systemic agriculture risks with physical mitigation measures to prevent losses.

Rural Agricultural Development Authority (RADA)

The current policy of GoJ is to utilize RADA as the agency for providing rehabilitation and assistance support to farmers affected by natural disasters. All ex-

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[14] Munich Re, Hanover Re, Swiss Re, Partner Re.

[15] Committed capacity is when the domestic insurance company takes on part of the risk being insured, while "fronted" risk means that the company is transferring the entire risk at hand to the international market.

post government and bilateral assistance to the small farmers goes through RADA. This is a reasonable approach given the large number of multi-cropping farming systems, as well as their remote locations. RADA has the largest number of field extension officers (120) and is currently recruiting, training and equipping its staff with up-to-date field equipment to meet the challenges of providing and immediate information to farmers as well as reporting to MOA's Data Management Service. As indicated earlier, most CBs, PMOs, and Co-operatives/Associations have no budgetary provisions or funds to provide assistance to their members in case of systemic climate shocks; hence, they depend increasingly on funds or materials provided by the Ministry of Agriculture through RADA. RADA will undoubtedly play a key role in a future public weather risk management strategy for small farmers, particularly multi-cropping farming and in catastrophic events.

CBs, Associations, PMOs, Societies and farmer co-operatives have indicated their willingness to be more relevant and involved in the recovery process. At the moment there is a perception that they act as agents of RADA, as information gatherers and distributors of relief funds or supplies.

Financial Intermediaries

The financing entities active in agriculture have expressed a desire to have their loans guaranteed by an insurance policy and the proposed products would be a more appropriate instrument in light of the lack of collateral available to farmers. In 1992 the then Agricultural Credit Bank (ACB) examined the feasibility of a portfolio program to cover their loan exposure to the sector. The ACB has since been absorbed into the Development Bank of Jamaica (DBJ), which is now responsible for loans for agriculture. DBJ is a second-tier Bank that channels resources through the P.C. Banks and the commercial banks. Another potential channels for the delivery of agriculture insurance are input suppliers, exporters, food processors, and loan and savings associations lending to agriculture, that could act as risk pooling intermediaries, facilitating premium payments by debiting the premium amounts as part of the credit loan or input prices.

The DBJ would be very interested in insurance products to hedge their agricultural loan portfolio exposure to weather, particularly from major natural catastrophe events which may impact many loan-holders simultaneously. Given the existing relationship with loan-holders, collection of any premium could be undertaken as part of the loan servicing by each DBJ client.

IV. PUBLIC POLICY

Jamaican agriculture is sensitive to hurricanes, floods, and droughts and considerable losses have been reported that have required unplanned ex-post fiscal spending and mobilization of donor financing. The agriculture sector of Jamaica would benefit from establishing and implementing a strategy for managing systemic agricultural climate risks that addresses various risk layers and that seeks to transfer part of those risks to the international market. There are some guiding points to consider an effective and efficient financial agriculture weather risk management strategy, especially given that currently there is no weather risk-transfer mechanism for the sector, neither public nor private. Today, all agriculture climate risks are absorbed within the country, limiting income smoothing, agriculture competitiveness, and restricting consumption smoothing by the rural poor. As a result, the MOA has in place an ex-post weather risk management system that channels resources in an ad-hoc manner after a systemic weather damaging to agricultural assets and producing business disruptions. Table 4.1 shows expenditures of current recovery fund for the last 4 years.

Estimated direct damages to the sector from 2004 to 2008 were a total of $13 billion. The total amount of estimated resources mobilization for helping agriculture with rehabilitation was of $393 million (not including financing after hurricane Ivan) whereby donors have played an important role in such efforts. The Jamaican agricultural sector has received an estimated yearly minimum amount of public resources ranging between US$1.5 – US$2 millions for natural disaster responses. Stakeholders (Government, donors, farmer organizations) have expressed their interest in an ex-ante system that is more efficient in its delivery of aid and more transparent in its structure. The question is: Is there a different and better way to finance and hedge systemic weather risks in the agriculture sector of Jamaica? The answer is yes.

Table 4.1: Disaster Recovery Funding for the Agricultural Sector 2004-2008
(in billions of Jamaican dollars)

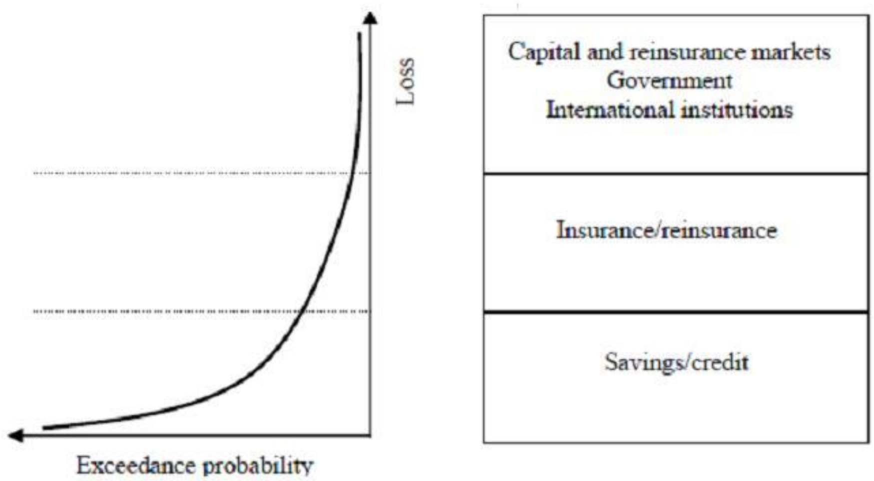
Year	Disaster	Total Damage to the sector (billions)	Government Support (MOA)	Donor Support
2004	Hurricane Ivan	$6.70	Due to system problem, unable to access records	
2005	Hurricanes Emily, Dennis and Tropical Storm Wilma	$0.99		Bilateral: Canada (Hurricane Ivan Reconstruction) C$800,000 / J$44 million
2006	NA	NA	NA	NA
2007	Hurricane Dean	$3.76	$102,099,629.60	-
2008	Tropical Storm Gustav	$1.63	$25,000,000.00	EU's Hurricane Assistance Programme €2.2 million /J$222million
	Totals	$13.08	$127,099,629.60	$266,000,000.00

Source: Ministry of Agriculture, 2009

The agriculture sector of Jamaica has the opportunity to transition from an ex-post unplanned system of responding to natural disasters, towards an ex-ante financial risk management framework that addresses the various risk layers of the agriculture sector in a more efficient and effective manner. Graph 4.1 illustrates a simple framework of risk layering. For those weather events that occur very frequently but do not produce too much losses (the lower level in the left diagram), those risks can be covered by savings of farmers, or by additional credit. Such risks do not place the small farmer in a credit default situation or threaten their livelihoods. However, for those other events that are less frequent, but that cause more damage to agriculture (intermediate level in the left diagram) there is a need to transfer those risks in order not to suffer decapitalization and/or significant consumption changes. A drastic reduction in yields places small farmers in a situation of default and ultimately produces a drastic reduction in their meager incomes. The reinsurance market has shown appetite for this risk layer with index applications given that payments are done automatically when a set of triggers are met, measured in an objective way, and with little or no moral hazard involved.

Fig 4.1: Risk layering

[redacted] [redacted]



The higher layer of aggregated risks (at the top layer of the left diagram) is for events that occur very seldom, but that are very catastrophic when they occur. Farmers might be in a situation where even their livelihoods are threatened. For this type of events, there is an important fiscal risk involved, since the government has an obligation to provide a basic social safety net and therefore need to approve additional unplanned public budgetary resources in moments when it is often difficult to increase taxes for its immediate financing. Faced with the certainty of future natural catastrophes, there is an opportunity to designing and putting in place more efficient and effective risk management instruments to transfer those risks out of the country and obtain the financing in a timely fashion for facing such events.

Such risk layering will need to be developed into a weather risk management framework for agriculture as shown in Table 4.2.

Agricultural insurance provided by the private sector could become an important complementary tool for the MOA in its objective related to agricultural growth, farmers' income stability, and eventually for poverty reduction in rural areas. However, to establish priorities in the design of weather risk transfer instruments it is important to take into account various identified constraints, mainly the presence of a large number of small farmers with little linkage with financial markets, subject to frequent weather hazards, and often in need of government support in face of systemic weather events. Moreover, the restrictive fiscal situation of Jamaica increases the need for a public sector strategy and programs that: (i) encourages and promotes private insurers to design commercially viable (non-subsidized) agriculture insurance contracts, (ii) moves from the current system of ex-post assistance to farmers to an ex-ante financial transfer mechanism to protect small vulnerable farmers against catastrophic events. Below there is a proposed public strategy framework and lines of action for a public insurance program as well as for the development of commercially viable insurance applications.

Table 4.2: Jamaica: Framework for Weather Risk Management in Agriculture

Objectives Agricultural and rural economic growth Poverty Reduction
Constraints Financial sector little penetration in agriculture Unexperienced insurers in agriculture Agricultural sector dominated by small farms Government fiscal limitations Frequent natural disasters
Operational Principles Segment independent versus correlated risks Minimize rent seeking that creates market distortions Risk Layering for Risk Management Risk transfer cost optimization - reduce transaction costs
Policy Instruments Mechanism for transferring catastrophic risk layers Limited government subsidies Contingent fundings for disaster relief & enhanced social safety nets Supporting private insurance market

Proposed key lines of action

The following policy interventions must be part of a public strategy for financially managing systemic climate risks in the agriculture sector in Jamaica: (i) the design and implementation of a market-based public coverage for protecting small vulnerable farmers against catastrophic weather events; (ii) fostering agricultural insurance market development through capacity building and innovation, helping insurers to design insurance products (in particular instruments to protect the portfolio of financial intermediaries); and (iii) increase and improve investments in public goods and services (i.e. weather and agriculture data infrastructure, regulation, etc.) to facilitate the design of insurance products (both by the public and private sectors).

Public coverage of catastrophic weather risks for small farmers

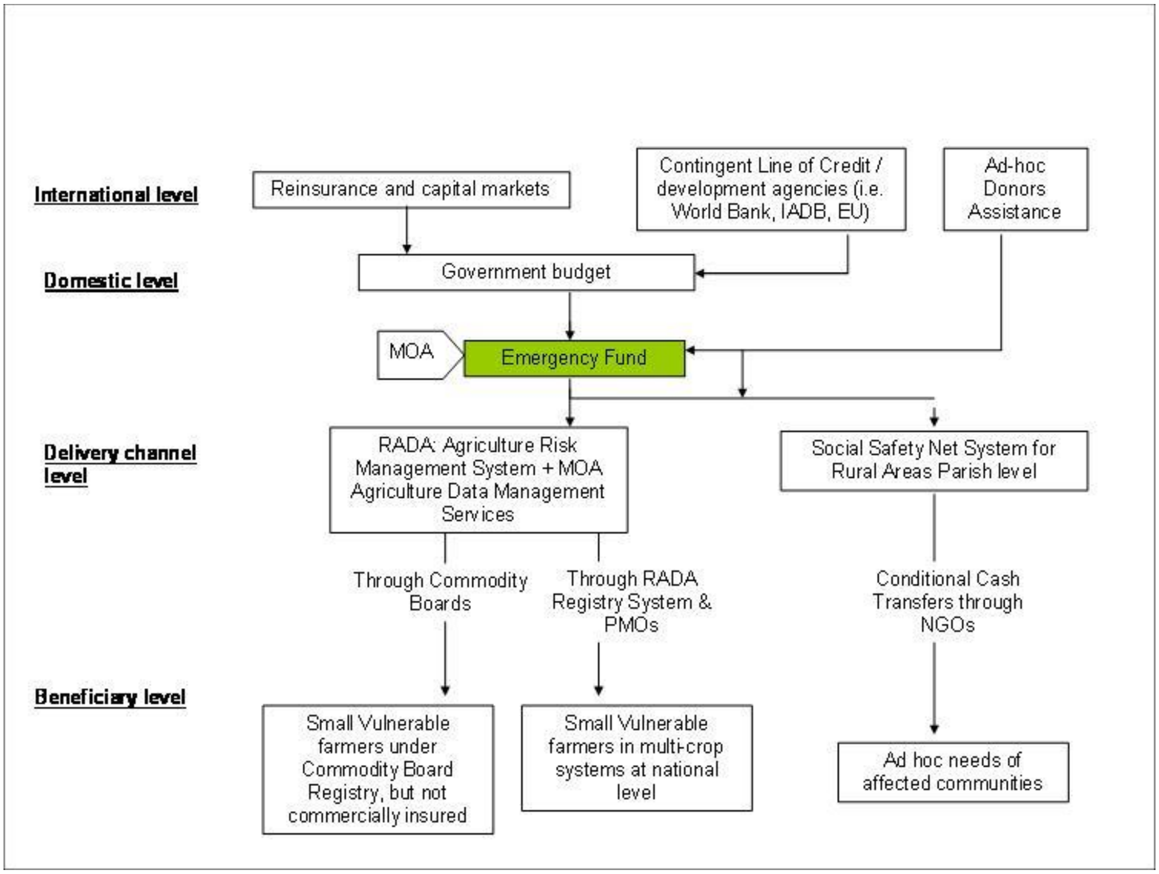
Closer attention needs to be given to weather risk transfer mechanisms based on index triggers, which promise to overcome most of the problems that have made traditional insurance inoperable. Index-based insurance products have fixed payouts contingent on the referenced index reaching certain pre-determined threshold levels (measured at an agreed meteorological station). This means that there has been an ex-ante agreement that correlates that index trigger with damages to crops (i.e. rainfall levels, wind speeds, etc.), and that there is no need for paying against ex-post verifiable losses. This type of indemnity payment based on pre-determined index triggers allows for an objective restructuring of risk analysis based on ex-ante loss assessments, which also results in lower administrative costs and elimination of moral hazard. Its adoption permits a paradigm shift on how to manage and transfer financial weather risks in the agriculture sector to the international markets.

One insurance product cannot aggregate all weather risks faced by the agriculture sector due to the wide differences in risk exposure by crop and location. For example, exposure to weather risks is distinctly different from coffee farmers in the 10,807 hectares in the Blue Mountains than the risks in the 49,845 hectares in multi-crop farming in lower areas, or the 13,884 hectares of coconut farming along the North Coast. For coffee, crop vulnerability and exposure to excess rainfall and/wind forces are different per location, consequently given these technical complexity the private financial sector of Jamaica will need initial capacity building and technical assistance in order to develop commercially viable products. Furthermore, a large segment of small vulnerable farmers might not have the capacity to pay for commercial insurance. There is therefore an opportunity for the GOJ to design and implement a weather risk mechanism to support small farmers with hedging against the most catastrophic weather events.

Working towards the design of ex-ante rules for public intervention in the event of catastrophic weather events in the agriculture sector should be the guiding principle. There are several key issues to be considered: (i) the determination of detailed and clear rules for triggering public sector assistance; (ii) the existence of an efficient and effective institutional delivery mechanism for reaching farmers ex-post; (iii) the necessary tools and data for ex-ante and ex-post targeting of public support; (iv) the sustainable sources of financing for managing and transferring these risks (i.e. public budget, contingent lines of credit, weather derivates, (re)insurance markets, etc.); and (v) whether and how to explicitly link public assistance with an index-based trigger. Figure 4.2 illustrates a possible way to structure an ex-ante market based financial management structure for hedging agriculture climate risk in Jamaica. The proposed structure involves the establishment of an emergency fund administered by the MOA. This fund could be financed by a combination of the following sources: (i) Fiscal resources; (ii) reinsurances or weather derivatives triggered by index contracts; (iii) contingent lines of credit; and/or (iv) any ad-hoc ex post assistance by donors.

The use of the proceeds of these funds demands a transparent and an efficient delivery mechanism. It is thus proposed that agreements be reached with RADA and any other participating agency (i.e. CBs, JAS, PMOs, etc). Similarly, the fund could also finance direct assistance to vulnerable rural households through the already established safety net systems.

Fig. 4.2: Jamaica: Catastrophe Weather Risk Transfer Mechanism for Small Vulnerable Farmers



Protecting vulnerable small farmers against catastrophic weather risks needs to be considered as the most urgent priority. The 2006 Agricultural Census and the on-going registration of farmers in RADA are excellent starting points since it allows for the identification of vulnerable small farmers that could become the target beneficiaries of any government support in the event of an adverse catastrophic weather hazard. The proposed program would work as an income compensation for farmers enabling the public sector to quickly and efficiently reach affected farmers with financial resources for reconstruction/recapitalization. The two most significant systemic weather risks that have been identified are hurricane risks for the entire country, and prolonged droughts in specific areas. The macroeconomic objective of the proposed public program is reducing volatility of public resources (in particular the Government budget), providing financial stability under the pressing need for public interventions and political pressures. The proposed catastrophic risk management structure hereby outlined would need specific and detailed operational manuals to work efficiently and transparently, particularly in the definition of rules and procedures for compensation and/or aid.

Figure 4.3 shows a map with the density of farms in the island that can be used as a starting point in the design of weather index triggers. Additionally, there is already available information on the frequency and return periods for rainfall and wind speeds for sufficient weather stations needed for the design of index-based insurance products. Such information has been used to draw the maps shown in Figure 4.4 below, dividing the country into macro weather regions.

Fig. 4.3: Density of Small Farm by Parish

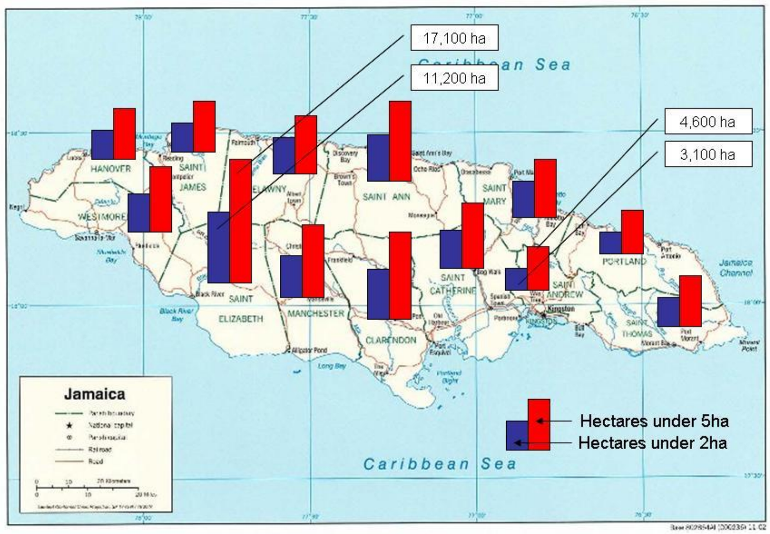
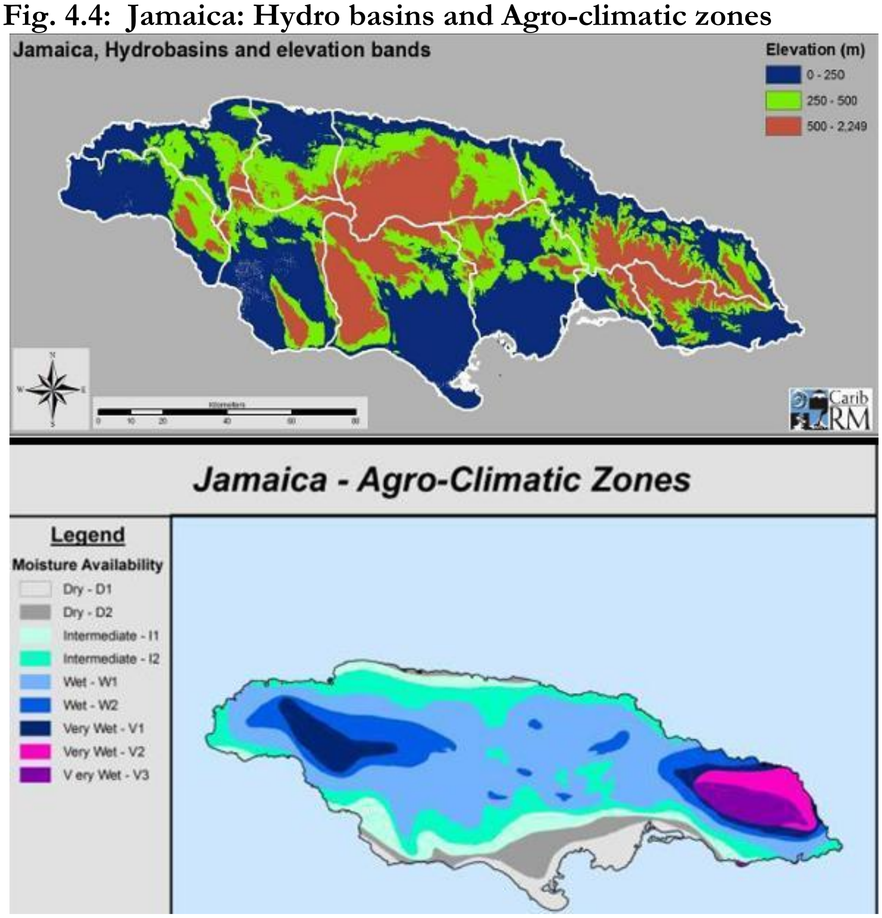


Fig. 4.4: Jamaica: Hydro basins and Agro-climatic zones

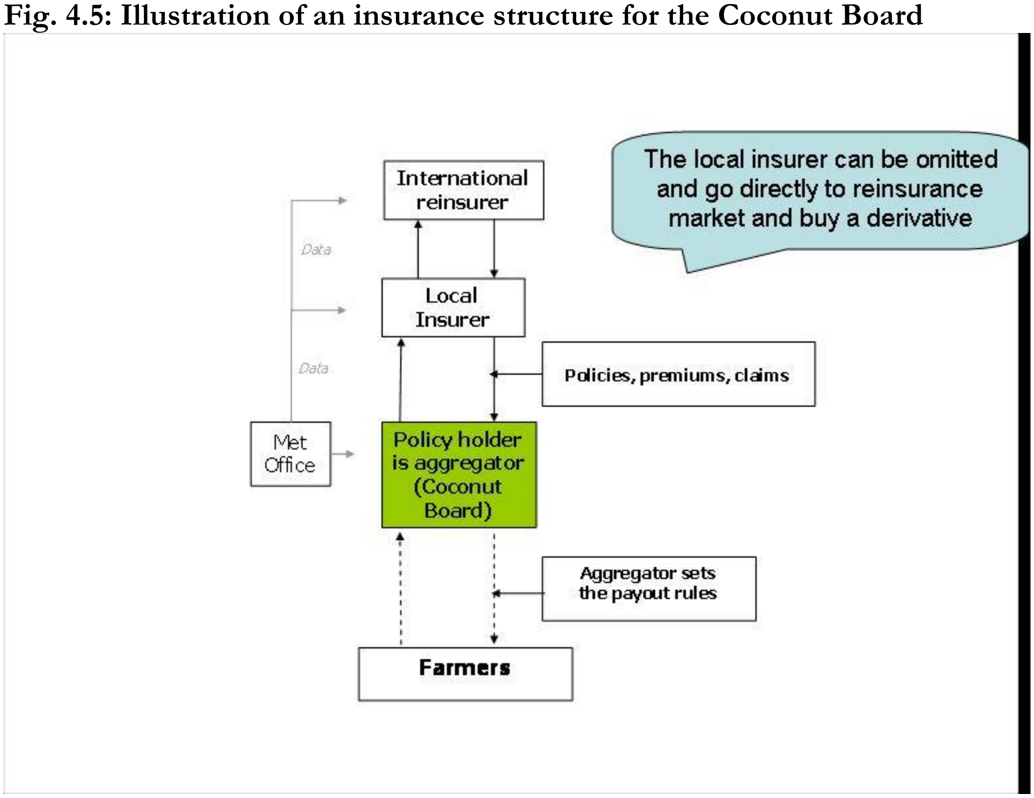


Developing the private sector agriculture insurance market

The sustainability and effectiveness of any program will be enhanced through a private-public partnership, with clear roles for all stakeholders. There is growing interest in public and private sectors alike in finding mechanisms to transfer agriculture weather risks to international markets. Thus, the need for agreeing on a public-private sector work plan with clear roles and responsibilities for each party.

Supporting CBs for designing and accessing the insurance market to protect producers is a complex task, but could yield rapid and significant results. The private sector (financial intermediaries, CBs, farmers associations, and insurers) has expressed its willingness to participate and support an effective and efficient commercial insurance program. Recent history in Jamaica shows that traditional named-peril (or multi-peril) insurance run by CBs has left much dissatisfaction among farmers and it lost the interest of the reinsurance market. Index-based insurance for CBs could be a suitable replacement, since it is simple to administer, transparent, and there is an appetite in the reinsurance market. The challenge for designing specific coverage for the CBs is the modeling of damages (with resolution at farm level) to agricultural assets (trees or crop yields) caused by different intensities of wind forces, droughts, or excess rain, for various return periods. If this technical challenge can be addressed, the insurance market will be able to establish trigger levels and price the index products. An index-based insurance structure that the Coconut CBs has demanded is shown in Figure 4.5 as an illustration.

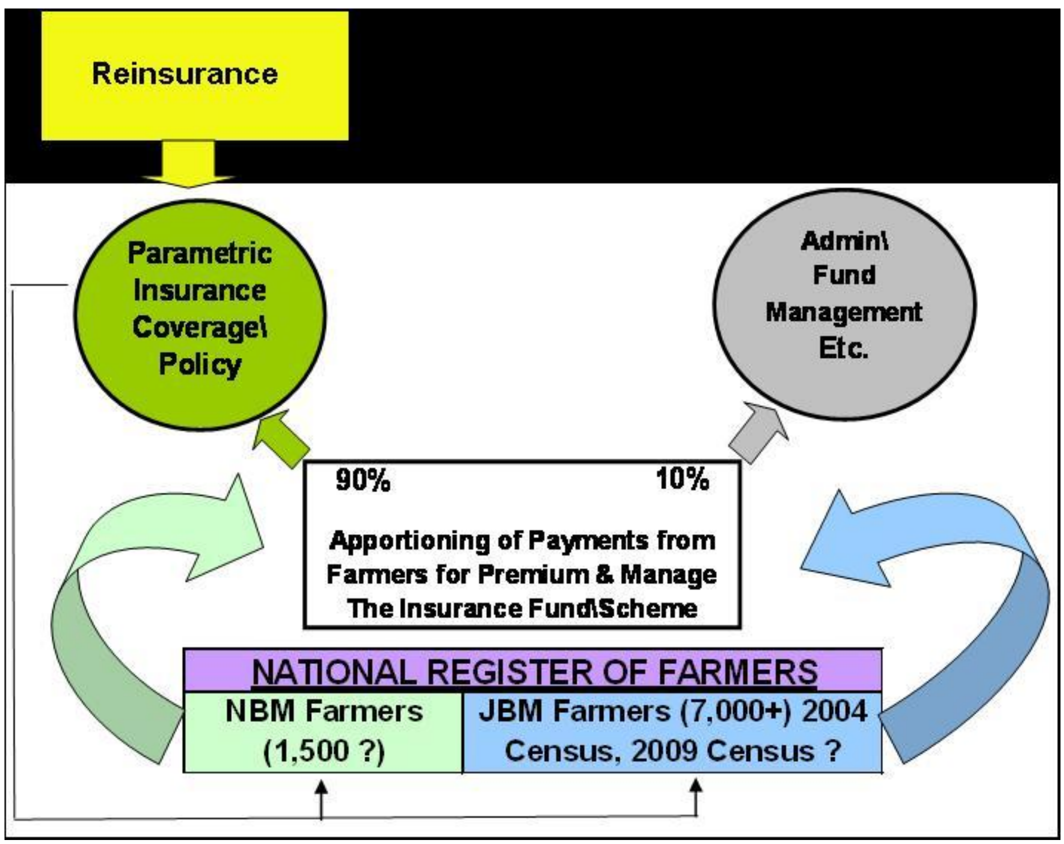
Fig. 4.5: Illustration of an insurance structure for the Coconut Board



In this case, the Coconut Board acts like an aggregator, pooling the weather risks from individual farmers. The CB is also the policy holder, who retails the insurance down to individual farmers under specified premium sharing and payout rules. The JMS administers the weather stations that will be used for triggering the payments. The reinsurance firm would make automatic and immediate payments to the policy holder once the triggers are met. The reinsurance market is willing to offer reinsurance capacity for this type of transactions.

In Figure 4.6 there is another illustration of an index-based insurance structure (different from the aggregated structure for the Coconut Board) for individual farmers. Developing this structure is under consideration by the Coffee Industry Board (CIB). In this structure, there is the presence of a local insurer that issues insurance contracts directly to individual farmers. In this case, the CIB plays a facilitating role as the delivery channel for collecting premiums and for distributing payouts.[16]

Fig. 4.6: Illustration of an Index-Based Insurance Structure for Coffee farmers



Note: percentages are illustrative only. (NBM: Non-Blue Mountain; JBM: Jamaica Blue Mountain).

16 A technical team of the World Bank is already providing technical assistance to the CIB on the preliminary planning for setting up such structure.

Investing in public goods and services

There are various short term steps that would facilitate the design of agricultural insurance products by local insurers and international reinsurers. Such small steps are within the reach of immediate action of the public sector and it could create confidence within the private sector that the government is committed to the sustainable development of the agricultural insurance market in the island. See Box No.2 for a list of such actions.

Box No.2: Short term steps in support of market development

1. Recovery of the historical weather records that were lost in a fire incident in 1992. Those datasets exist in magnetic tape format that cannot be read with current electronic devices. The Government could hire a specialized firm to translate those magnetic recorded historical datasets into electronic spreadsheets.
2. Cleaning existing weather datasets. Current available weather datasets from 1992 up to now show gaps. When a dataset has too many gaps, it is not acceptable to the reinsurance market. However, there are specialized firms that can fill in the missing observations using statistic packages that are acceptable to reinsurers.
3. Investing in expanding the density of weather stations. The higher the density of weather stations the more precise the modeling that can be made, particularly for areas with heterogeneous topography and presence of micro climates. The importance of this is for reducing basis risk in contract design.
4. Review the regulatory framework for agricultural insurance. Index insurance works under a set of assumptions that are different from traditional multi-peril or named-peril crop insurance. Whereas traditional insurance can easily borrow regulatory concepts from property insurance, index-based instruments use different concepts. Some examples: (i) insurable interest is not based on crop losses, but on economic interests; (ii) losses are assessed ex-ante with a model, rather than ex-post at farm level, therefore there is no need to adjust at farm level; (iii) need to deal with basis risk, etc.
5. Make available the 2006 agricultural census data. This is valuable information for the design of any agricultural insurance program, either publicly or privately run. This information allows for designing products for various segments of producers, as well as for market estimations.
6. Improving agricultural yield statistics at local level. Historic reliable yield information is needed for designing contracts, since the insurance indexes need to be tested to see whether there is robust correlation between the triggers used in the models and the yields.
7. Mediating an agreement between insurers and JMS. JMS will play an important role not just in becoming the official entity that supplies weather information for designing contracts and for pricing the products. But equally or more importantly, JMS administers the weather stations and officially provides the records that trigger the contract payments. There is a legal responsibility behind this service.

A roadmap detailing the activities needed for designing the catastrophic index-insurance for vulnerable farmers and for supporting market development needs to be clearly agreed and financially supported. Table 4.3 below shows the structure of such a road map, whereby it is recommended to establish a detailed breakdown of activities and products to be developed and put in place. The activities outlined here are public sector interventions. The financing of transfer of capacity to various stakeholders is particularly important, including local insurers, the Meteorological Service of Jamaica (JMS), Water Resources Authority, Ministry of Agriculture, the National irrigation Commission, the Commodity Boards, Agricultural Development Authority, various farmers associations, PMOs, financial intermediaries, and the Financial Services Commission (FSC).

Table 4.3: Structure of Calendar Activities for Developing Weather Risk Management Strategy for Agriculture

Activities	Year 1	Year 2	Year 3	Year 4	Year 5
Catastrophic weather risk index-insurance (small farmers)	xxxx	xxxx	xxxx		
Public Investments	xxxx	xxxx	xxxx	xxxx	xxxx
- Training and capacity transfer to stakeholders	xxxx	xxxx	xxxx		
- Modernizing weather stations		xxxx	xxxx		
- Improving JMS capacity and efficiency			xxxx		
- Improving farmers information system		xxxx	xxxx		
Integrating ag insurance with other risk management tools	xxxx	xxxx	xxxx	xxxx	xxxx
Commercial index-insurance for coffee		xxxx	xxxx		
Commercial index-insurance for coconut			xxxx	xxxx	
Commercial index-insurance for other commodities				xxxx	xxxx

Whereas activities in table 4.3 are shown at an aggregated level, each heading can be detailed into specific detailed programs with sub-set of activities programmed with responsibilities, calendar, and budget. This workplan can be used to make decisions related to the transition towards a new system to protect agriculture from business interruptions and income volatility caused by systemic adverse weather events.

V. FINAL REMARKS & RECOMMENDATIONS

Given recent experiences with damaging weather events, given the past experiences with ex-post, unplanned, short term public intervention, and given the interest and potential for designing a market-based agriculture weather risk management program, the GOJ is supporting the move towards a transparent and efficient financing of natural disasters in the agriculture sector. The GOJ intends tosupport the development of such a market-based agriculture risk management program through a series of financial instruments such as weather derivatives, contingent lines of credit, contingency funds, and/or reinsurance through new or existing risk transfer structures, such as CCRIF.

The presence of a large number of small farmers with weak or non existing linkages with the formal financial sector and subject to systemic weather risks, calls for strong public sector intervention in securing some type of weather protection. The protection would need to be tailored by macro-region defined by the presence of small farmers, crop type, risks, and availability of weather and agriculture data, and accompanied by development of rules and procedures governing payment of compensation or aid. The decision to change an ex-post system to support small vulnerable farmers towards an ex-ante index-triggered transfer mechanism would be accompanied by structuring a more efficient and transparent delivery mechanism to targeted farmers. Such a system, as described in Fig. 4.2 could be attractive to reinsurers, donors and beneficiaries.

The irregularity of Jamaican topography and constraints on availability of historically relevant weather data, presents technical challenges in the design of index-based climate insurance for agriculture, particularly regarding basis risk. There are however various short-term steps mainly to ease the constraint on weather data availability and access that have been identified in Box No.2 that will greatly facilitate the design of various agriculture insurance products. This is particularly important given the high expectation in Jamaica to have a catastrophic agriculture risk management system in a relatively short term. A communications strategy will be needed to facilitate the understanding and introduction of any new mechanism for agriculture weather risk management.

The recommended next step would be to create consensus among all stakeholders on the design and structure of a public-private partnership under an agreed detailed work plan to develop the different financial products, institutional mechanisms, and delivery channels for transferring financial weather risks out of the Jamaican agriculture sector.