Ministry of
Agriculture & Fisheries

Government of Jamaica

Jamaica

Introducing Innovative Agriculture Weather Risk Management Mechanisms for Small Farmers

Pre-feasibility Assessment for St. Elizabeth and Portland Parishes

World Bank LAC

opportunities for all

Financed by:

All ACP Agricultural Commodities Programme

ACP GROUP OF STATES

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Executive Summary

1. **Poverty in rural areas remains a major challenge for Jamaica, with the rural poverty rate twice as high as that of Kingston. Jamaica has made substantial progress in poverty reduction.** Poverty declined sharply, particularly in the Kingston metropolitan area from 14.3% in 2004, to 9.6% in 2006. However, poverty in rural areas did not show the same trend and only declined from 22% to 19.8% for the same period (2004-2006). The poverty rate at the national level in 2007 was 9.9%; however in 2008-2009 there was an increase in the rate to 12.3% and 16.5% respectively. In the Kingston metropolitan area (KMA) in 2007 the poverty rate was 6.2% and 15.3% in the rural areas. In 2008-2009 the poverty rate in the KMA and rural areas increased to 7% and 17% and 12.8% and 22.5% respectively.

2. **The agricultural sector is an important source of income for the rural population, despite the fact that this sector represents a small share of the country's GDP.** The agricultural sector produces only 6% of the country's GDP but it employs 20% of the total labor force. This disparity 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.

3. **Jamaican agriculture is sensitive to hurricanes, floods, and droughts. Considerable losses have been reported requiring unplanned ex-post fiscal spending and mobilization of donor financing.** Jamaica faces a variety of natural hazards due to its geographic location and topography. The country lies in the Atlantic hurricane belt where it is affected by destructive storms and hurricanes. Between 1990 and 2000 damages from natural disasters cost 12.6% of GDP, and losses from Hurricane Ivan in 2003 alone represented near 8%. Between 2000 and 2010 the agricultural sector experienced weather-related losses of around J$8.7 billion (US$100 million). This had a strong impact on the rural population and in particular the rural poor, whose income depends on agricultural production.

4. **The Ministry of Agriculture (MOA) has recognized the need to implement a new strategy for managing all agricultural weather-related risks.** Currently, agricultural weather hazards are managed by farmers resorting to individual savings, selling of livestock, borrowing, and through additional funding from the government and international donors. There are no readily available risk financing instruments, such as contingent line of credit or insurance, which farmers or the government can access when faced with extreme weather events. As a result, the Government of Jamaica (GOJ) is currently in the process of designing a new framework to move from an ex-post unplanned system of managing risks to an ex-ante financial risk management strategy. The MOA is proposing a new framework that will address the different categories of weather hazards (and their associated risk levels) with specific financial instruments and government policies. The new strategy can be a valuable tool for improving current agricultural risk management practices and reduce future losses associated with weather events.

5. **This document provides an initial assessment for improving and introducing innovative weather risk management mechanisms for small farmers in St. Elizabeth and Portland[1].** The purpose of this study is to evaluate and identify weather risk management mechanisms, both new financial instruments as well as possible improvements to public sector policies and programs that provide support to farmers. This

1 The 2 parishes were selected by the Ministry of Agriculture as pilot areas.

includes options for government support in light of natural disasters and introducing financial risk transfer instruments, such as insurance, for addressing systemic weather risks for small farmers in the two parishes.

6. **This pre-feasibility assessment is 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"**, which is financed by the European Union's All ACP[2] Agriculture Commodities Program (AAACP) and the World Bank. The findings and analysis in this report are based largely on work undertaken by the World Bank and the Ministry of Agriculture of Jamaica during 2009-2010, as well as on interviews with various stakeholders at the national and parish levels, including farmer focus groups.

7. **This report draws heavily on international experience.** International experience on agricultural insurance is large, as agricultural insurance is currently being implemented in more than 100 countries around the world[3]. This study benefits from this international experience, which is tailored to the local economic and social context of Jamaica.

8. **In this context, the study sets forth the following conclusions and policy recommendations** for the MOA with regards to the development of weather risk management mechanisms for small farmers in St. Elizabeth and Portland.

Conclusions:

9. The main production risks faced by small farmers are wind, extreme rainfall, flood, and drought. However, there are many other constraints to production (such as limited access to formal credit), which need to be considered in conjunction with the management of weather risks.

10. A micro-level (individual) small farmer insurance system is not considered a realistic option in the short- and medium-term. This is because of the complexities related to the design of an insurance instrument for diverse farming systems (multi-crops), subject to highly intense and frequent weather events, and for a small average farm size (1.4 ha) implying high transaction costs to administer.

11. At an aggregate and catastrophic level, there is an opportunity to improve current public sector's disaster payment mechanisms for small farmers through clearer and transparent pay-out rules.

12. The risk transfer pay-outs - was considered in this assessment and it was found that there is possibility it could be done through insurance (and particularly index-insurance), in particular for hurricanes hazards[4]. Some of the considerations are shown in the Table below.

2 African – Caribbean –Pacific.

3 For more information on international experiences in this area, please refer to the following web page: **www.worldbank.org/agrm**

4 Parametric insurance payouts are not determined by individual losses but according to the measurement of a highly correlated index. By definition, the index used is a proxy for the real loss and may slightly underestimate (overestimate) actual losses. Basis risk emerges when the insurance payout does not exactly match actual losses. Therefore, the terms and conditions of the parametric insurance policy are critical to minimize this basis risk.

Weather Risks	Type of Insurance Contract	Implementation
Flood	Index-based Insurance from satellite imagery/ river gauges (Index payout scale)	**Not suitable in the short-term.** 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)	**Not suitable in the short-term.** 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 (CCRIF is in the process of designing this type of coverage for individual governments).
Drought	Index Insurance (Index payout scale)	**Possible, but further analysis is needed.** - 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. - Extreme drought events are technically able to be implemented 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 for the impossibility to design insurance payouts for small production structures with a wide variety of short-term crops and without a well defined seasonality.
Hurricane (wind)	Index Insurance for mortality coverage (Index payout scale)	**Possible to implement for high intensity weather events.** 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).

Recommendations:

The present pre-feasibility assessment yielded several recommendations in the form of mutually non-exclusive options that could be implemented in parallel. However, Option 1 would not necessarily require additional fiscal funding, while the rest of the options do require technical and financial support to design and implement.

1. **Option 1: Improve the public sector farmers' Disaster Assistance Program (DAP).**
   - In the short-term it is important to strengthen the existing system of farmer assistance by improving the distribution of vouchers and general support to small farmers after a natural disaster: The current system of disaster assistance to farmers (DAP) can be strengthened by increasing its transparency and by establishing objective pay-out rules. At present, there are no clear rules governing the circumstances under which farmers are entitled to assistance. Consequently, the Rural Agricultural Development Authority (RADA)'s unpredictable service causes frustration and is not delivering efficient assistance.

2. **Option 2: Improve the risk financing system for the farmers' DAP.**
   - A sustainable financing of the DAP will strengthen the overall risk management framework where it is linked to proper rules and procedures, proper risk assessments, and proper budgeting of expected assistance payments.

   - The recommendation is to strengthen the financing of the DAP through an ex-ante financing structure. This approach will help to plan for the different frequency and amounts of payments needed ("risk layering"). A risk layering approach can be financed through a public-private scheme.

   - Improving the existing DAP scheme could involve the direct supply of additional coverage for extreme weather events that could be financed through innovative instruments such as index insurance and/or contingent lines of credit/grants. For lower exposure and high frequency events, financing could be provided through reserves, contingent lines of credit, emergency budget allocations, and/or through farmers' own savings. For the higher exposure and low frequency events, the Government could seek private insurance/reinsurance from the local and/or international markets to make the financing structure of the DAP program sustainable.

3. **Option 3: Improve the risk financing system for the farmers' DAP through a public-private scheme.**
   - This option involves complementing the public DAP with a "top up" option that would provide supplementary coverage through private financial intermediaries that can offer complementary financial products (such as hurricane vouchers) in addition to the basic governmental DAP coverage. This additional "top up" would be developed and underwritten by the private insurance market.

   - A purely private-public scheme would be recommended, but is complex to implement because the rural insurance market, and expertise in this type of product, are not well developed in Jamaica. A public-only scheme improving the DAP on a pilot basis could be a first initial step to encourage and eventually crowd-in the private insurance sector by moving eventually to a private-public scheme.

   - The distribution of funds (in the form of vouchers, insurance payouts or hurricane coupons) can reach small farmers directly through public agencies such as RADA, or through public and private financial institutions operating as intermediaries in rural areas (NPCB bank, Credit Unions, local banks etc.).

4. **Option 4: Development of the commercial agricultural insurance market and fostering agriculture risk management innovation.**
   - This objective of this option is to strengthen the institutional development of the domestic private insurance market. This support would help to improve the capacities to assess and manage agricultural risk, both through insurance and other forms of risk mitigation and adaptation, at different organizational levels of the public and private sector. A list of differentiated technical assistance is recommended for the support of several public and private stakeholders including: the Meteorological Service of Jamaica (JMS), the Water Resources Authority (WRA), the Ministry of Agriculture (MOA), the National Irrigation Commission (NIC), the Commodity Boards, the Agricultural Development Authority, the Financial Services Commission (FSC), the Producers Market Organizations (PMOs), various farmers associations, local insurers, and financial intermediaries.

   - Improvement of the data and statistics available for the agricultural sector is a policy objective immediately achievable and constitutes an important step that can help to improve the design of agricultural insurance products.

I. Introduction and Objective of the Study

Jamaica faces a variety of natural hazards due to its geographic location and topography. The country lies in the Atlantic hurricane belt where it is affected by destructive storms and hurricanes. Between 1990 and 2000 damages from natural disasters cost 12.6% of GDP and losses from Hurricane Ivan in 2003 alone represented near 8%[5].

The agricultural sector has been among the sectors most affected by natural hazards, particularly by hurricanes, floods and droughts. Between 2004 and 2007 the agricultural sector experienced weather-related losses of around J$13.47 billion (US$202 million). This had a strong impact on the rural population and in particular the rural poor, whose income depends on agricultural production.

Losses to the agriculture sector are financed through farmers' savings and assets, ex-post fiscal spending, and donor assistance. Currently, agricultural weather-related risks are financed through individual savings, selling of livestock, borrowing, and through additional funding from the government and international donors. There is no readily available financial risk transfer instrument, such as insurance, that the farmers or the government can access when faced with extreme weather events.

The Government of Jamaica (GOJ) is currently in the process of designing a new framework to move from an ex-post unplanned system to an ex-ante financial risk management strategy for the agricultural sector. The Ministry of Agriculture (MOA) is proposing a new framework that will address the different categories of weather hazards (and their associated risk levels) with specific financial instruments and government policies. The new financial risk management strategy can be a valuable tool to improve current agricultural risk management practice and reduce future losses associated with catastrophic weather events.

This document provides a pre- feasibility assessment for improving and introducing innovative weather-related risk management mechanisms for small farmers in Jamaica. The purpose of this study is to evaluate and identify both new weather risk management mechanisms, as well as possible improvements to existing public sector policies and programs that help small farmers manage weather risks. The Ministry of Agriculture selected two parishes, St. Elizabeth and Portland, as pilot areas for the initial assessment.

This pre-feasibility assessment is 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", which is financed by the European Union's AAACP Initiative and the World Bank. The findings and analysis in this report are based largely on work undertaken by the World Bank and the Ministry of Agriculture of Jamaica during 2009-2010, as well as based on interviews with various stakeholders at the national and parish levels, including farmer focus groups (see Annex 2).

The report is structured in five sections. The first section presents an overview of the production structure, policies, and farmer typology. The next section presents an initial assessment of the hazards and vulnerabilities affecting the agriculture sector in Jamaica and in the two parishes. The third section presents the institutional framework for managing agriculture weather risks followed by a fourth section on options and next steps. The final sections present options, the main conclusions and recommendations.

5 ECLAC, UNDP, PIOJ (2004).

II. Characteristics of the Agricultural Sector in Jamaica

General Trends

In spite of some reduction in the overall poverty rate, poverty in rural areas remains a major challenge for Jamaica, with the rural poverty rate twice as high as that of Kingston. Jamaica has made substantial progress in poverty reduction since it began monitoring living conditions in 1988. The poverty rate has fallen at the national level from 30.4% in 1989 to 16.9% in 2004. After that year, poverty declined sharply, particularly in the Kingston metropolitan area, from 14.3% in 2004, to 9.6% in 2006. In contrast, poverty in rural areas did not show the same trend and only declined from 22% to 19.8% for the same period (2004-2006). The poverty rate at the national level in 2007 was 9.9%; however in 2008-2009 there was an increase in the rate to 12.3% and 16.5% respectively. In 2007 the poverty rate was 6.2% in the Kingston metropolitan area (KMA) and 15.3% in the rural areas. In 2008-2009 the poverty rate in the KMA and rural areas increased to 7% and 17% and 12.8% and 22.5% respectively.

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[6]. A decrease in inflation from 51% to around 20% between 1990 and 2004, helped reduce the headcount poverty rate for two reasons. First, increases in inflation tax the income of the poor more than the middle and upper quartiles; therefore, a reduction in the inflation rate during this period helped to reduce its burden on the poor. At the same time, since food expenditures represent a large percentage of the budgets of the poor, a decrease in the relative price of food between 1999 and 2003 may have further contributed to a reduction in poverty.

The agricultural sector is an important source of income for the rural population, despite the fact that this sector represents a small share of the country's GDP. The agricultural sector produces only 6% of the country's GDP but it employs 20% of the total labor force. This disparity 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.

Agricultural production is based on a high percentage of small farmers. According to the 2007 Agriculture Census, the agriculture sector covers about 326,000 hectares of production, and it includes almost 230,000 farms, indicating an average farm size of one hectare. The distribution of farms indicates that 66% of the holdings are less than 1.4 hectare (ha) and represent only 15% of the land, while almost 85% are less than 5 hectares and control 41% of the land. However, commercial producers, with only 20% of the production units, represent 80% of the marketed output (see Table 1 and Table 2).

6 World Bank (2009).

Table 1. Number of Farms per Parish

Parish of Location	Total Farms
All Jamaica	**228,683**
St. Andrew	10,772
St. Thomas	12,033
Portland	8,968
St. Mary	13,421
St. Ann	20,240
Trelawny	10,963
St. James	8,512
Hanover	9,085
Westmoreland	21,031
St. Elizabeth	34,440
Manchester	24,190
Clarendon	32,003
St. Catherine	23,025

Source: Agricultural Census 2007

Table 2. Area in Farms (in hectares) by Size Group and Parish of Location

Parish of Location	Total Hectares	SIZE GROUP IN HECTARES							
		Under 1 ha	1 to under 5 ha	5 to under 10 ha	10 to under 25 ha	25 to under 50 ha	50 to under 100 ha	100 to under 200 ha	200+ ha
All Jamaica	**325,810**	**47,712**	**86,011**	**19,721**	**19,166**	**11,896**	**11,742**	**13,707**	**115,854**
St. Andrew	8,354	2,629	4,000	598	460	175	218	274	0
St. Thomas	22,257	2,301	6,673	1,721	1,400	825	429	420	8,488
Portland	16,201	1,802	6,132	1,733	1,909	1,302	888	1,017	1,418
St. Mary	20,890	2,586	7,422	2,183	2,072	1,226	998	1,333	3,070
St. Ann	37,099	4,972	7,678	1,462	1,620	941	990	2,388	17,048
Trelawny	24,803	2,656	3,428	440	619	562	539	295	16,263
St. James	13,893	1,670	3,121	617	851	878	1,335	837	4,583
Hanover	9,751	1,634	2,896	627	754	261	732	724	2,123
Westmoreland	35,241	3,652	5,165	1,789	2,212	1,600	1,768	2,573	16,483
St. Elizabeth	30,022	6,995	6,251	1,212	1,865	1,116	1,104	1,393	10,087
Manchester	24,521	5,800	8,654	1,746	1,420	931	462	438	5,069
Clarendon	44,856	6,462	15,284	3,607	2,642	1,311	1,668	1,182	12,699
St. Catherine	37,922	4,553	9,307	1,986	1,342	768	611	833	18,523

Source: Agricultural Census 2007

There has been a reduction of the average farm size between 1996 and 2007 from 2.4 to 1.6 hectares with a differentiated impact at the top and the bottom of the distribution. This reduction in the total average was the result of a reduction in the cultivated area from 407,000 hectares in 1996 to 326,000 hectares in 2007 and, at the same, time an increase in the total number of holdings from 190,000 to 230,000. However, these two effects had a differentiated impact at the top and the bottom of the distribution, with smaller farmers getting smaller and bigger farmers getting bigger[7] (see Table 3).

Table 3. Area in Farms and Average Size by Size Group (1996 and 2007)

Group of Farms	Total Ha in		Average Size in Ha	
	2007	1996	2007	1996
Under 1 ha	47,712	43,459	0.3	0.4
1 to under 5 ha	86,011	101,977	1.9	2.0
5 to under 50 ha	50,783	67,723	11.2	11.2
50 to under 200 ha	25,449	41,484	94.3	97.2
200 + ha	115,854	152,791	827.5	414.1
All Farms	**325,809**	**407,434**	**1.6**	**2.4**

Source: Agricultural Census 1996 and 2007

Perennial crops predominate in most of the cultivated area. Around 73% of the agriculture area is utilized for perennial crops such as sugar, banana, citrus, and coffee. 27% is utilized for crops like vegetables, fruits, and tubers (see Table 4).

Table 4. 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 2007

7 The average size in hectares for holdings of less than one hectare went slightly up; this was the result of a smaller increase in hectares (while total cultivated area went down) than the increase in holdings. In contrast, the average size in hectares for holdings of more than 200 ha increased (doubled), however, this effect was the result of two negative impacts: a reduction in the number of holdings (while the total number of holdings was increasing) that was bigger than the reduction in hectares.

Table 5. Type of Products under Cultivation (percent)

	Crop Area (Hectares)	Percent
Vegetables	12,106	6.8
Condiments	4,099	2.3
Legumes and Nuts	4,169	2.3
Roots and Tubers	27,486	15.4
Fruits	3,867	2.2
Permanent Crops	123,330	69.0
Other Crops	3,708	2.1
Total	**178,765**	**100.0**

Source: Agricultural Census 2007

Production Constraints

High interest rates for short-term credit may be placing constraints on agricultural production. Interest rates, though declining, continue to be high. High lending rates for commercial banks declined from 50% in 2000 to about 20% in the last two years. Among other things, high interest rates might explain both the lack of credit from commercial banks to the agricultural sector as well as the recent expansion of credit lines towards the agriculture sector from the Development Bank of Jamaica (DBJ) (see Annex 7).

Only a small and stable segment of all agricultural products has been produced by increasing competitive operations. Products like citrus, papayas, yellow yams, and black yams have shown gains in competitiveness based on a select group of indicators[8]. The rest of the products—beef, cocoa, contract poultry, Irish potatoes, milk, onions, peanuts, pork sausages, red peas, and sugar—did not make gains in competitiveness. This further indicates that the business environment has not successfully promoted changes in the production structure.

Additional domestic constraints are hampering the attempts of small producers to move from import-substitution agriculture toward an export-oriented strategy. Around 90% of nontraditional production comes from small farmers, who have been slow in meeting quality regulations and market requirements. This lack of integration limits the ability, particularly for small holders, to access financing, new technology and marketing services that could improve their position in the market[9].

Agro-processing companies are affected by constraints in the agricultural production structure as well as by business conditions in Jamaica[10]. Agro-processing companies, with the exception of larger companies, are affected by the irregular and poor supply of agricultural production. Additional constraints affecting the

8 Hertford's analysis used the following indicators: (1) trends in commodity yields, (2) comparison of yields with those of Jamaica's neighbors, (3) trends in production, (4) trade trends and foreign market participation, (5) short-term profits, and (6) nominal rates of protection.

9 The Jamaican Exporters Association has identified these structural constraints as additional forces working against competitiveness and efficient allocation of resources, which results in the lower productivity of nontraditional agriculture. For example, the tourism sector, agro-processing plants, and agricultural exporters all demand product standardization, classification, and certification—requirements that small producers have not been able to meet.

10 High transaction costs adversely affect business conditions in Jamaica. The high cost of utilities, imported packaging material, labor and security are all factors mentioned by the business community as constraints against achieving profitability. Poot and van Riel (2002).

profitability of these companies come from the high cost of utilities and labor, and the inefficient use of new technologies, which is further aggravated by the lack of innovation in management practices and products and the need for qualified technical staff.

Agricultural Structure in St. Elizabeth and Portland

The majority of land holdings in St. Elizabeth and Portland are small (around 2 hectares). St. Elizabeth reports a total of 30,022 hectares of land which represents 9.2% of the national agricultural area, whereas Portland reports 16,201 hectares, representing only 5%[11]. However, about 88.9% and 61% of agricultural holdings in St. Elizabeth and Portland respectively, are less than 2 hectares.

Table 6. Total Area of Holdings (acres)

Portland			St. Elizabeth		
Acres	Freq.	Percent	Acres	Freq.	Percent
0	837	9.29	0	6043	17.6
0.1-1	3,234	35.91	0.1-1	20,386	59.3
1.1-2	1,447	16.07	1.1-2	4,123	12.0
2.1-3	944	10.48	2.1-3	1,547	4.5
3.1 -5	1,140	12.66	3.1 -5	1,148	3.3
5.1-10	835	9.27	5.1-10	747	2.2
10.1-50	493	5.47	10.1-50	326	0.9
51->	75	0.83	51->	44	0.1
Total	**9,005**	**100.00**	**Total**	**34,364**	**100.00**

Source: Agricultural Census 2007

In both parishes, over 80% of farmers are growing crops for commercial purposes rather than for home consumption. Only 17.8% of farmers in Portland and 13.1% in St. Elizabeth farm for the purpose of food consumption (Table 7).

Table 7. Purpose of Production

Portland			St. Elizabeth		
	Freq.	Percent		Freq.	Percent
0	30	0.3	0	223	0.7
Home consumption	1,603	17.8	Home consumption	4,508	13.1
Sale	7,302	81.1	Sale	29,584	86.0
Other	41	0.5	Other	28	0.1
Not stated	29	0.3	Not stated	72	0.2
Total	**9,005**	**100.00**	**Total**	**34,415**	**100.00**

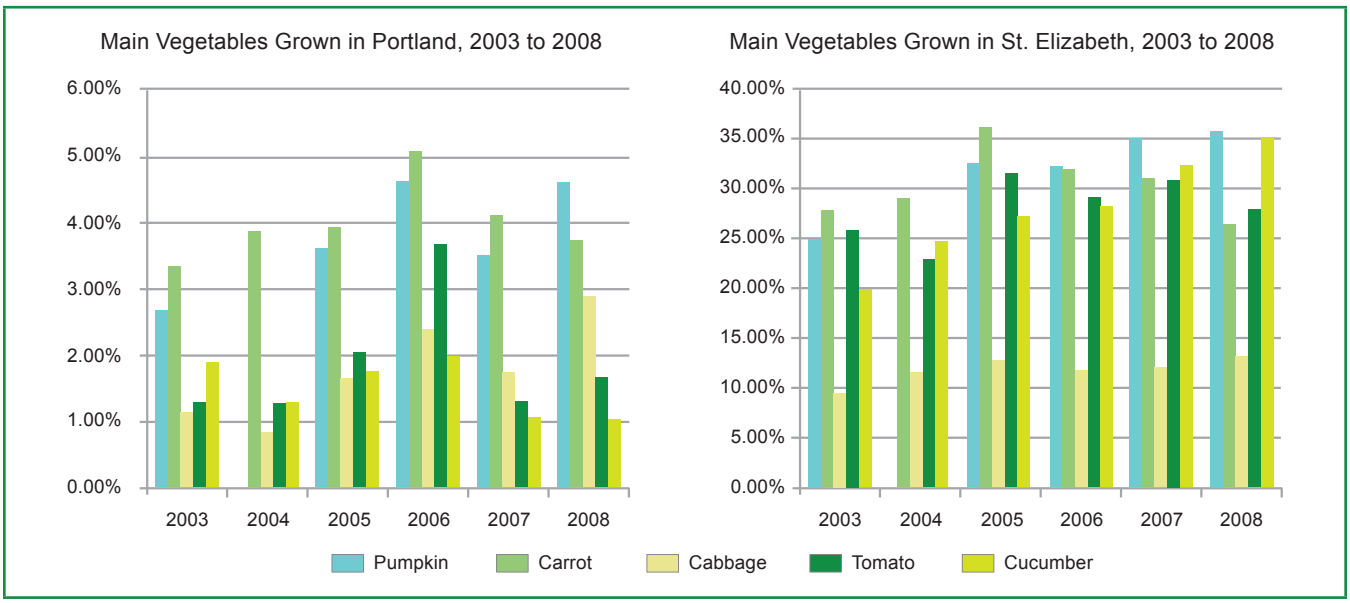
Note: "0" means that the response was illegible; while "not stated" means that the question was not answered.
Source: Question 3.1, Agricultural Census 2006

Vegetables crops account for 35% of all domestic crops that are grown in Jamaica and nearly 31% of the total cultivated area. Some crops pertaining to this group are Pumpkin (*Cucurbita moschata*), Carrots (*Daucus carota sativus*), Cabbage (*Brassica oleracea*), Tomato (*Lycopersicon esculentum*) and Cucumber (*Cucumis sativa*),

11 Census of Agriculture 2007. Preliminary Report.

and they are the most important crops in terms of cultivated land and production (see Figure 1). The use of irrigation systems on these more profitable crops (i.e. tomato and carrot), and the introduction of new disease-resistant and better yielding varieties have increased both production and productivity in the past ten years. However, local production variability may be caused mainly by the negative effects of adverse weather events.

Figure 1. Percentage of Cultivated Area for Five Vegetables in St. Elizabeth and Portland, 2003 to 2008



Source: Ministry of Agriculture

On average, a farmer will need to invest over J$423,000 and J$294,000 per hectare for vegetable production in St. Elizabeth and Portland, respectively. Production cost varies across parishes and crops depending on the type of crop, the location, and the technology used. For example, cabbage production in St. Elizabeth requires the largest investment, whereas it requires only slightly more than half the same investment in Portland. Table 8 presents these cost variations per hectare. St. Elizabeth has higher average costs, which could be explained by limited economies of scale due to smaller production plot size and additional costs incurred in managing risks, such as recurrent droughts.

Table 8. Average Estimated Cost of Production (J$/ha)[12] for Existing Farmers for Main Vegetable Crops in St. Elizabeth and Portland Parishes, 2008

Crops	St. Elizabeth	Portland
Carrot	323,280.33	320,616.00
Pumpkin	306,605.03	215,498.00
Cabbage	615,605.86	345,301.00
Callaloo	ND	241,345.00
Tomato	449,612.90	350,322.00
Cucumber	ND	ND

Source: Farm Management Section, Economic Planning Division, Ministry of Agriculture, 2008

12 The estimated cost of production does not include other costs, such as contingencies, land charges and supervision costs.

There is a greater diversity of crops in St. Elizabeth than in Portland. Greater diversity in St. Elizabeth is explained by having more suitable agro-ecological conditions for growing short cycle crops, such as carrots, tomatoes, other vegetables, and condiments (such as scallions, hot peppers and onions) (see Annex 1). According to the Agricultural Census of 2007, farmers from Portland indicated that more than 71% of the total area under cultivation (9,508.07 ha) was used for perennial crops, such as bananas (18.56%), coconuts (14.7%), coffee (23.5%) and plantains (14.5%). On the other hand, farmers from St. Elizabeth indicated that sugar cane (24.6%) and peanuts (9.3%) were the crops using the greatest amount of cultivated land.

Crop diversification is widespread and is a cornerstone of farmers' risk management strategy. There are a total of 41 crops reported by the Agricultural Census of 2007. Portland shows that 71% of its total area is dedicated to perennial crops, whereas St. Elizabeth only dedicates 13% of its land to perennial farming. The most important perennial crops in Portland are plantains and bananas, cocoa, coconuts, and coffee. Whereas St. Elizabeth's most important crops are yams, bananas, cassava, tomatoes, peanuts and sweet potatoes, with the majority of these being short-term annual crops. The annual crops are tubers, vegetables, fruits, and cereals.

The use of irrigation is higher in St. Elizabeth where 6% of farmers use some type of irrigation, whereas this percentage is just 1.7% in Portland. The presence of frequent droughts in St. Elizabeth suggests that crop irrigation in small plots using mostly drinking water is the result of some type of risk management strategy to adapt to dry conditions. However, it might not be the most efficient or cost effective practice, especially considering the high cost of using drinking water as an irrigation method.

Livestock and savings play a central role in household's agricultural risk management strategies (see Annex 2). The great majority of farmers in both parishes recognize in focus groups that livestock production is as important as agriculture, especially goats; however, very few farmers recognized the need to lower consumption after a natural disaster takes place. Farmers admitted in interviews that in both parishes, they are in a position to make use of assets, savings, and informal credit from family and friends to finance part of the recovery.

The age and education distribution of farmers is fairly similar in both parishes. Approximately 80% of producers are under 65 years old and around 45% of farmers have completed secondary education. In particular, illiteracy affects only 1.3% of farmers in Portland and 0.7% in St. Elizabeth.

Table 9. Age of Farmers in Portland and St. Elizabeth

Portland		
Age	Freq.	Percent
< - 16	22	0.3
17 - 30	954	11.8
31 - 50	3,542	43.7
51 - 65	2,122	26.2
66 - 80	1,260	15.5
81 - >	207	2.6
Total	**8,107**	**100.00**

St. Elizabeth		
Age	Freq.	Percent
< - 16	148	0.4
17 - 30	5,929	17.9
31 - 50	14,483	43.8
51 - 65	7,657	23.2
66 - 80	4,065	12.3
81 - >	774	2.3
Total	**33,074**	**100.00**

Source: Question 2.4, Agricultural Census 2007

Table 10. Education of Farmers in Portland and St. Elizabeth

Portland			
	Freq.	Percent	Cum.
0	281	1.2	1.2
None	301	1.3	2.4
Primary	10,312	43.3	45.7
Secondary	10,252	43.0	88.8
University	742	3.1	91.9
Other tertiary	268	1.1	93.0
Other	46	0.2	93.2
Not stated	1,618	6.8	100.0
Total	**23,820**	**100.00**	

St. Elizabeth			
	Freq.	Percent	Cum.
0	99	0.3	0.3
None	247	0.7	1.0
Primary	14,760	44.2	45.2
Secondary	15,917	47.7	92.9
University	631	1.9	94.8
Other tertiary	165	0.5	95.3
Other	31	0.1	95.4
Not stated	1,544	4.6	100.0
Total	**33,394**	**100.00**	

Note: "0" means that the response was illegible; while "not stated" means that the question was not answered.

Source: Question 2.6, Agricultural Census 2007

III. Hazard, Vulnerability and Exposure Assessment of the Agricultural Sector

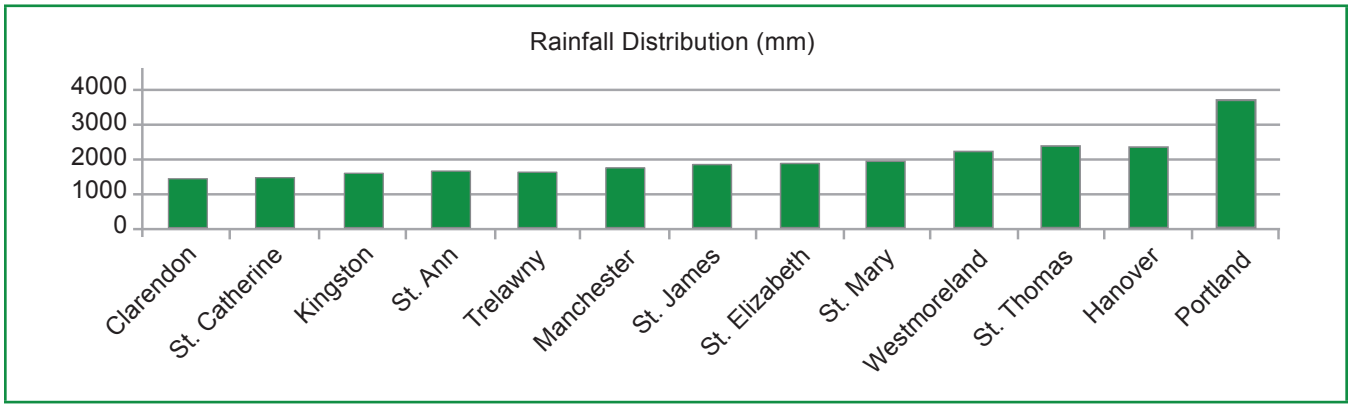
Due to its geographic location and topography Jamaica faces a variety of natural hazards[13]. The country lies in the Atlantic hurricane belt where it is affected by destructive storms and hurricanes. Jamaica topography can be divided in three main landform regions: the eastern mountains, the central valleys and plateaus, and the coastal plains. Despite being a small island, those regions represent distinct agro-ecological conditions and are subject to different degrees of exposure to natural hazards.

Jamaica is among the most affected countries by natural hazards. There are three weather hazards that are the most important in terms of 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). Both short duration extreme rain and wind hazards are predominantly associated with tropical cyclones (see Annex 8). On the other hand, short duration rain hazards can also be associated with non-cyclonic tropical waves and depressions.

Extreme Rainfall

In Jamaica, precipitations vary spatially and seasonally. The northern coast of the island receives much more rain than most of the southern coast. The average annual rainfall is around 1,981 mm, with the heaviest rainfall recorded over the Blue Mountains (5,080 mm annually); and the lowest recorded in Kingston (762 mm, annually). Figure 2 shows the annual rainfall distribution per parish in Jamaica between 1951 and 1980. The eastern parish of Portland receives near 3,320 mm of rainfall per year because of the presence of nearby mountains. In contrast, the average rainfall in St. Elizabeth could be less than 1,270 mm annually. The heaviest rainfall is usually recorded between May and October, while the least amount of rainfall generally occurs between February and March[14].

Figure 2. Spatial Distribution of Average Annual Rainfall in Jamaica, 1951 to 1980



Source: Meteorological Service of Jamaica

During the Atlantic hurricane season, which runs from June to November, extreme rainfall occurs. This extreme rainfall is usually combined with high winds, resulting in flooding and coastal storm surges. Between

13 Based on the natural disaster hotspot study by the World Bank, Jamaica ranks number three in the world among countries at high risk from multiple hazards.

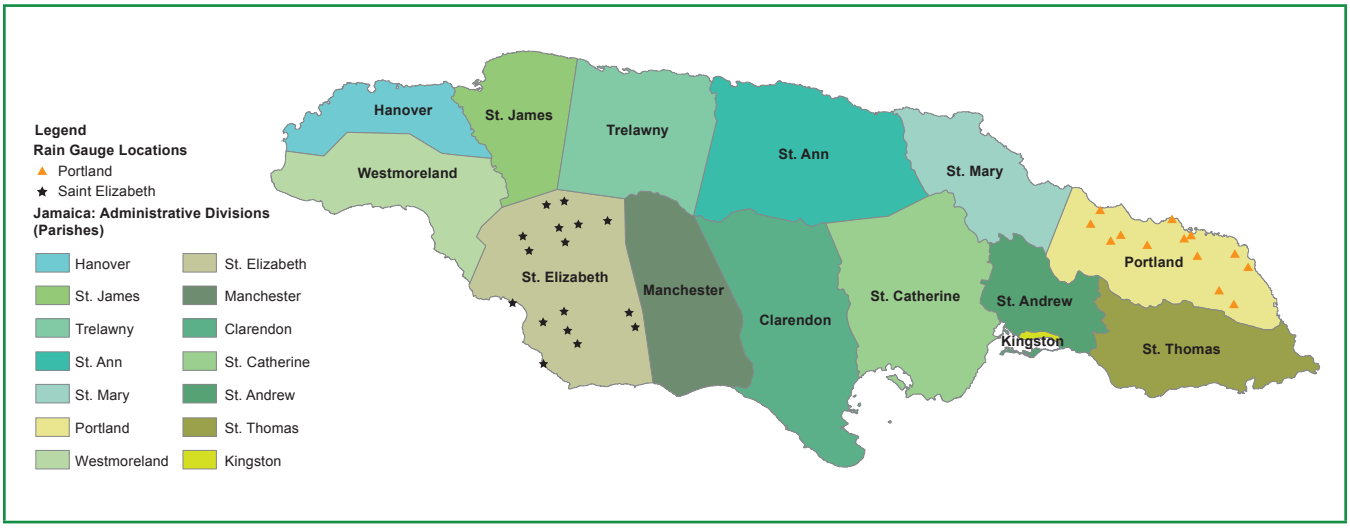
14 Water Resources Assessment of Jamaica, 2001.

1850 and 2007, 44 storms have affected the country, 60% of which were recorded between August and September, with nearly 14% recorded as category 3 storms[15]. Most of those storms events hit St. Elizabeth given its southern location on the island. However, severe rainfalls can also occur outside the hurricane season due to non-cyclonic systems when a deviation from normal rainfall takes place.

There are several limitations to the quality of the historical records and additional work will be needed to reconstruct, clean up, and use the available weather data sets. This will be particularly important if there is an intention to implement weather insurance in any of the parishes. Historical daily rainfall records were obtained for 163 weather stations in Jamaica. An initial analysis shows that it is difficult to use some of the records in a practical way since there is no clear difference between missing values and values recorded as zero rainfall. For example, the Bybrook weather station in Portland recorded no rainfall values (zero) in two consecutive years, 2001 and 2002, and no rainfall was either recorded in Casa Marantha's weather station between 2001 and 2008. Moreover, due to the lack of an official catalog describing active or inactive stations, it was not possible to determine whether the 30 stations located in both parishes were in operation or not. Furthermore, it was not possible to compare the information provided by the weather stations with other alternative sources, given that some weather stations changed names several times (i.e. Appleton Climo vs. Appleton 1, Appleton 2 or Appleton 3).

At a national level, Jamaica posses a good density of weather stations, however there is heterogeneity per parish in the station's spatial distribution. This heterogeneity in the stations' density in some parishes, together with quality problems regarding rainfall records, may restrict the possibility to conduct an adequate risk assessment for some agriculture areas. Nevertheless, with respect to long-term monthly rainfall records, there is a large number of weather stations with good spatial distribution from which weather records could be obtained. Based on the location of 260 weather stations across Jamaica, 17 are currently located in St. Elizabeth and 13 in Portland (Figure 3). The three parishes with the highest density of weather stations are St. Andrew (including Kingston), Clarendon and St. Catherine with 21.6, 27.2, and 28.4 square kilometers per weather station, respectively. In contrast, Portland (62.6 km^2), St. Elizabeth (71.3 km^2), and St. Ann (93.2 km^2) all account for the lowest density of weather stations.

Figure 3. Rain Gauges Locations in St. Elizabeth and Portland Parishes



Source: Authors' map, data obtained from the Meteorological Service of Jamaica

15 Agricultural Disaster Risk Management Plan, 2009.

Extreme rainfall can often be localized, but the associated indirect and direct risk in specific areas and for specific crops has not been formally studied, either for cyclonic or non-cyclonic related events. For example, for coffee plants, rainfall directly impacts ripe berries on coffee trees, or at flowering. Indirect effects of extreme rainfall on coffee production could be landslide or flood events that disrupt roads, transport and markets. In particular, it was very difficult to assess rainfall risks for food crops. Multiple cropping systems and crop seasons, present a complex pattern of vulnerability to extreme rains, especially at farm-level, and thus a correlation between rainfall and overall losses at the farm level is difficult to calculate.

Moderate excess rainfall was not considered a priority risk in the two parishes. Excess rainfall was not considered a priority risk in St. Elizabeth and Portland, both parishes suffer from drought as their primary concern. In the short-term, given the high frequency of droughts in the area, a group of farmers from dry areas of St. Elizabeth emphasized the *positive* value of extreme rainfall to increase soil moisture.

Extreme rainfall appears only as a secondary priority, in particular when considering cyclonic events. The fact that extreme rainfall may not be perceived as a priority problem comes from the fact that damages from a cyclone[16] are frequently caused by both wind speed and extreme rainfall. As a result, extreme rainfall associated with cyclonic events may not be the only culprit of damage, and thus, not considered a priority problem at the farm level. Nevertheless, it is important to emphasize that extreme rainfalls can also occur from very distant cyclones (e.g. Hurricanes Michelle and Dean), without recording high wind levels on the island itself.

Heavy Winds

The primary concern for major (high severity) wind events are those arising from hurricanes and tropical storms ("cyclone events"). These events carry short duration high wind speeds leading to major damage to fruit trees, plants, livestock, and on-farm and off-farm infrastructure and equipment over widespread areas. The main risks during hurricane season are flooding and strong winds as they affect directly plant growth, fruit tree harvest and animal health/mortality. However, there are localized places in which strong winds could be a persistent constraint for agricultural production even outside the hurricane season (i.e. Santa Cruz). It would be useful to determine the use of agricultural management practices used to counteract the negative effects of strong winds.

There is not enough density of weather station networks to measure wind speeds; as a consequence, satellite based observations could be an alternative method for assessing this risk. Only seven weather stations measure wind speed on the island. In particular, many stations were dismantled when hurricanes approached the island in the past, limiting data availability for extreme wind events. As a result, there are no records on wind speeds for specific areas, or the possibility to determine how local winds are affected by topography, slope aspects or other factors.

However, wind modelling is a well developed technology. For example, the HURDAT database, which is based on over 100 years of Atlantic basin cyclone events, could be used as an alternative data source. Also, models widely used in the property insurance industry could be used to estimate expected losses for agricultural production. Such models simulate wind fields over digitalized topography in order to map property exposure

16 Public sector officials, financial institutions, and agribusinesses point out to cyclonic events as the ones presenting major disruptions for the agriculture sector. Furthermore, the lack of awareness for these types of event have resulted in ad-hoc ex-post responses, in particular from the public sector, by using different financing methods such as voucher distribution in the parishes.

and estimate losses after a natural disaster. Remote sense risk modelling is currently being developed and used by the private sector in Jamaica. A firm, for example, is trying to assess what would be the coffee crop damage in the Blue Mountains and to test the feasibility of developing an index-based[17] insurance scheme to protect coffee cherries from extreme wind and rainfall risks.

Vulnerability functions (damage versus wind speeds) are not easy to develop for multi-cropping farming systems. Assessing the impact of natural hazards on different crops in one plot of land, for specific periods of the year can become very challenging and prohibitive in terms of data analysis. Furthermore, for example, in the case of coffee, the lack of station-based wind data and the difficulties of carrying out field loss assessment for small scale coffee growers, adds to the problem by preventing the use of models to estimate possible losses after a hurricane.

Given data constraints, remote sense modelling —restricted to cyclonic events— constitute a potential option for assessing the impact of winds on agriculture production in Jamaica. It is technically challenging to assess specific crops' vulnerabilities using field wind gauges due to the lack of field records and the complexities related to the loss assessment of farms with multiple crops. Given the current data constraints, remote sense modelling can be a feasible option as it provides estimates of the potential impact of winds based on estimated agriculture production losses.

Floods

Due to its high frequency, flooding is the most common natural disaster affecting life, property and assets. According to the Water Resources Authority (WRA)[18], every four years there is at least one devastating flood that affects urban and rural areas. Low-lying plains and closed limestone valleys are the areas that are most vulnerable and exposed to floods. October has the largest number of flooding events, followed by May, September and November.

The most common flood events are: flash flooding, riverine flooding, and tidal flooding[19]. The hurricane season is where most flood events occur. The WRA monitors stream flow at 133 river gauging stations throughout the island. Those gauges could also be used to design an early warning system especially targeted to agriculture, allowing farmers to cut losses and save livestock from drowning and illness due to prolonged excessive humid exposure.

Flood risks have a significant impact on vegetable production in St. Elizabeth and Portland. According to the Ministry of Finance (MOF) and the Rural Agricultural Development Authority (RADA), flood impact estimations in 2001 for Portland, St. Elizabeth, Manchester and Trelawny –the parishes that concentrate most of Jamaica's vegetables— were around J$118. 6 million, representing near 23.4% of the total losses registered during that year. In 2002, flood rains during May and June affected agricultural and livestock production in St. Elizabeth, with a preliminary estimation indicating that approximately 1,107 ha of crops valued at J$80 billion were lost together with livestock losses of around J$15 billion. From the total crop losses, around 63% came from legumes (12.6%), vegetables (26.7%) and condiments (24.2%) (Table 11).

17 Index-based insurance will only trigger payouts based on a pre-agreed scale of hurricane (rain or wind speed) affecting the region.

18 Douglas, E. 2003. Water Resources Authority of Jamaica. Flood Hazard Management, Mapping and Early Warning Systems in Jamaica.

19 Flash flooding results from intense precipitation of short duration concentrated in a particular area; riverine flooding occurs in the valleys and flood plains when rainfall lasts many hours; and tidal flooding usually occurs during the path of hurricanes.

Table 11. Estimate Flood Loss Damage in St. Elizabeth to Crop Production, 2002

Crops	Total Value (J$)	Hectare Damage	% Total Damage
Fruit	25,209,000.00	162	31.59
Vegetables	21,305,000.00	300	26.70
Condiments	19,285,000.00	245	24.61
Pulses	10,080,000.00	288	12.63
Ground Provn	3,778,000.00	87	4.73
Cereal	150,000.00	25	0.19
Total	**79,807,000.00**	**1,107**	**100.00**

Source: Rural Agricultural Development Authority, 2002

During Hurricane Ivan, extreme flooding associated with rainfall was registered in September 2004. For the stations in Kingston (Stoney Hill) and Clarendon (Grimmets), rainfall return periods of 170 and 223 years were estimated, correspondingly. In terms of crop estimated loss area in Portland, 85.4% of the total estimated losses corresponded to ground provision crops[20] (12.0%), plantain (13.0%), banana (12.6%) and tree crops (47.9%). In contrast, 86.7% of the total crop estimated loss area in St. Elizabeth was registered on ground provision crops (21.8%), vegetables (20.2%), fruits (17.6%), legumes (16.8%) and condiments (20.2%).

Stream flow data exists for the two parishes and could provide a basis for a probabilistic risk assessment. However, information on major hazard events and the definition of the areas damaged are difficult to determine, especially at the micro (farmer) level. Modelling the impact of floods on agriculture production is extremely challenging relative to other agriculture perils. Rainfall measured in catchment stations, or stream flow measurements could be used as a proxy for major flood events, but modelling of the damage is very difficult to assess. Furthermore, flood risks are more localized than other weather hazards; therefore, the use of satellite imagery as an alternative technology has been proved to be a useful tool[21].

Drought

In 2002, above 95% of agricultural production in the island was estimated to be rain-fed[22]. Agriculture in Jamaica, like the rest of the West Indies, depends greatly on the seasonal rainfall. Changes in normal levels of rainfall and consequently the increase in daily temperatures, has a direct impact on the cultivation of specific crops, i.e. staple crops, which can become unviable for some regions of the country. Moreover, in the past decades a significant portion of the Caribbean region has had a reduction in the total annual rainfall between April and June, which coincides with the traditional planting season for many annual crops. The annual rainfall tendency (see Figure 4) shows a decrease in volatility and a downward trend in the early 1960's and more recently between 1994 and 1998, a reduction in rainfall tendency of at least 200 mm (from 1,700 to 1,500 mm). Even though, the Blue Mountains rainfall average exceeds these values, there is a similar trend in the rest of the country[23].

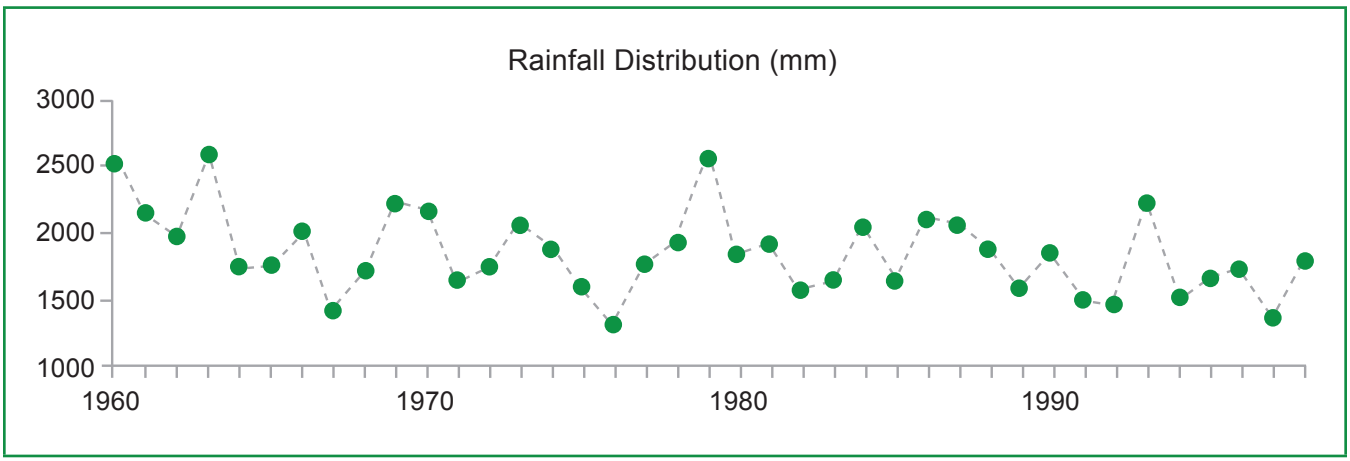
20 Ground provision crops may include cassava, sweet potatoes, eddoes, yam, tania/dasheen, plantains, bananas, breadfruit, and various herbs, used as a spice.

21 This technology can be linked to farmer information in a GIS linked database, and also provide objective identification of affected farmers.

22 Boken, et al, 2005. Monitoring and predicting agricultural drought: a global study Oxford University Press, New York.

23 Centre for Developing Areas Research (CEDAR), 2007.

Figure 4. Jamaican Average Rainfall from 1960 to 1998



Source: Meteorological Service of Jamaica (CEDAR, 2007)

When the "El Niño"[24] natural phenomenon occurs, drier conditions than normal take place in Jamaica during the later months of the rainfall season between October and November. El Niño is a natural phenomenon associated with disruptions of the seasonal rainfall cycle that reappears every few years. According to the Meteorological Service of Jamaica, since 1960, the island has gone through many meteorological droughts[25]: in 1965, 1969, 1972, 1974, 1982-1983, 1991 and 1997. The 1997 El Niño diminished approximately 14.6% of agricultural output and caused economic losses due to poor crop yields, crop failure, and livestock fatalities. The parishes that had drought conditions during the 1997 El Niño event were St. Thomas, Kingston/St. Andrew and St. Catherine. The worst drought conditions that Jamaica has ever experienced are those that occurred in 1976 and 1991, when the island received respectively 72% and 73% of normal total annual rainfall.

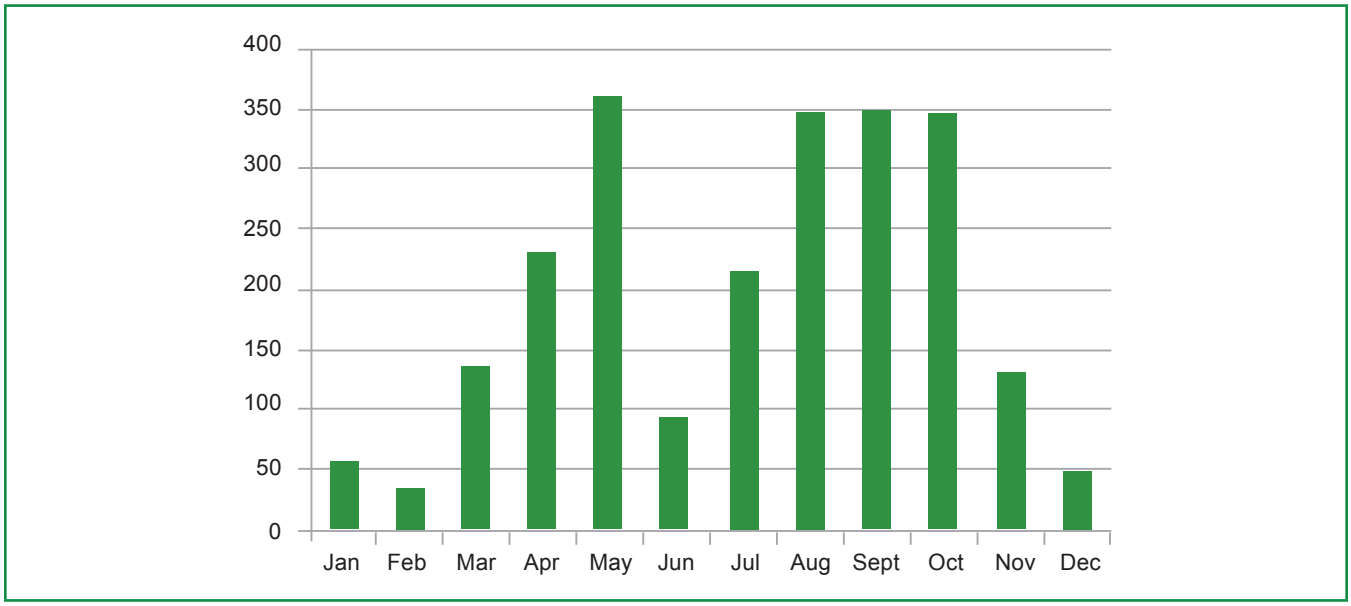
St. Elizabeth, as the rest of the country, has two periods of high rainfall (see Figure 5), but water deficits in the low rainfall periods makes crop production extremely difficult, with the exception of the farmers who were able to adopt irrigation systems. In particular, farmers of short-cycle crops suffer the most from recurrent drought periods (i.e. tomato, watermelon, cabbage, carrots, thyme, scallion, cantaloupe and cucumber). Many of them have developed water conservation practices such as mulch, which is a mixture of layers of straw or leafs covering the soil to conserve moisture. These practices have helped farmers to cope with the region's semi-arid conditions; however, extremely dry conditions can affect even those crops that are drought resistant such as cassava[26].

24 El Niño Southern Oscillation (ENSO) is the primary phenomenon associated with disruptions of the seasonal rainfall cycle and is the ocean-atmosphere process that includes El Niño and La Niña, both phases oscillate between 3 to 4 years.

25 Countries may experience meteorological droughts but these will not necessarily mean a reduction in crop production. In this regard, the difference with Figure 4 in terms of extreme years is attributed to the area being analyzed.

26 During focus group consultations, farmers indicated that during droughts, production costs increase dramatically as they are forced to buy water from distributors in order to ensure production.

Figure 5. Average Annual Rainfall at Appleton 1 Weather Station, St. Elizabeth, 2003 to 2007



Source: Authors, with information edited from the Meteorological Service of Jamaica

Drought is undoubtedly the main concern of farmers interviewed in the focus groups in St. Elizabeth and Portland. Drought is frequent and endemic in both parishes and the impact of this type of event indicates that there are substantial issues to be addressed in terms of farming practices and drought mitigation. In particular:

- Drought is associated with growing (mainly vegetable) crops in the dry season.
- In most years, the parishes are fundamentally drought-prone in the dry season.
- Drought is a progressive hazard, as negative water balance intensifies over weeks and months.
- There is limited forward planning of planting even when known risks from El Niño events are considered.
- There is limited irrigation as well as limited irrigation infrastructure (wells, pipes, drip irrigation lines, local schemes, etc). As a consequence farmers have to rely on ad hoc methods such as imported, high-quality and high-cost water.
- Mitigating measures are important (e.g. mulching).

Landslides

Between October 27 and November 5, 2001, intense rains produced landslides on the eastern shore of Jamaica. Portland and St. Mary were the parishes most affected by this event. According to estimates of the Economic Commission of Latin America and the Caribbean (ECLAC) conducted in 2002, the value of total damage to physical and social infrastructure and crops following the 2001 event was around US$51 million (0.7% of GDP); however most of the damage was concentrated in agriculture and infrastructure[27]. Landslides are a gravity-induced natural erosion process triggered by both earthquakes and rainfall. The eastern region, a steep zone of Jamaica, is the most vulnerable area to landslides during the hurricane season. As it was mentioned before, extreme rainfall can have a direct effect on agriculture by enhancing the destructive effects of wind; however, flash flooding, localized flooding, and landslides have secondary or no major effects on agriculture.

27 Several landslides were triggered in the eastern Jamaica due to heavy rains of 27 October to 5 November 2001, 22 May to 2 June 2002, 17 to 24 September (Isidore) 2002; and 27 to 30 September (Lili) 2002.

Crop Susceptibility to Weather Risks

The small land holdings, the irregularity of the sowing period for the majority of the crops, the heterogeneity of types and varieties of crops, and the complex cropping pattern, all place challenges in understanding crops vulnerability to natural hazards. Domestic agriculture in Jamaica consists of 56 crops which are categorized as vegetables, yams, legumes, condiments, fruits, cereals, plantains, potatoes, and other tubers. In 2008, the largest cultivated area by category of crop in Jamaica was: vegetables (30.9%), yams (21.7%), legumes (11.1%) and condiments (7.9%). These crops greatly differ in terms of sowing dates, pest, disease, and vulnerability to weather events (i.e. drought, excess of rainfall, high wind speed) (Table 12).

Table 12. Percentage of Cultivated Area and Risks by Crop (2008)

	Drought			Floods			Wind		Excess		Landslides		Drought		
2008	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual		
	1st Quarter			2nd Quarter			3rd Quarter			4rd Quarter			%	Ha	
Vegetables	31.43%			35.43%			30.37%			26.59%			30.49%	9,528.00	
Yams	22.51%			16.24%			20.39%			27.25%			21.66%	6,672.00	
Legumes	15.03%			7.71%			9.81%			11.21%			11.11%	3,422.00	
Condiments	7.49%			9.18%			7.83%			7.19%			7.90%	2,432.00	
Fruits	5.66%			10.53%			9.44%			4.49%			7.45%	2,293.00	
Potatoes	5.06%			6.82%			6.03%			6.05%			5.95%	1,832.00	
Other Tubers	5.20%			5.77%			5.58%			6.47%			5.73%	1,765.00	
Cereals	4.22%			4.96%			5.31%			5.27%			4.92%	1,513.00	
Plantains	1.43%			2.88%			4.75%			2.49%			2.84%	875.00	
Sorrel	1.98%			0.47%			0.50%			3.00%			1.51%	465.00	
	100.00%			100.00%			100.00%			100.00%			100.00%	30,797.80	

Source: Edited from Data Bank information, Ministry of Agriculture, 2008

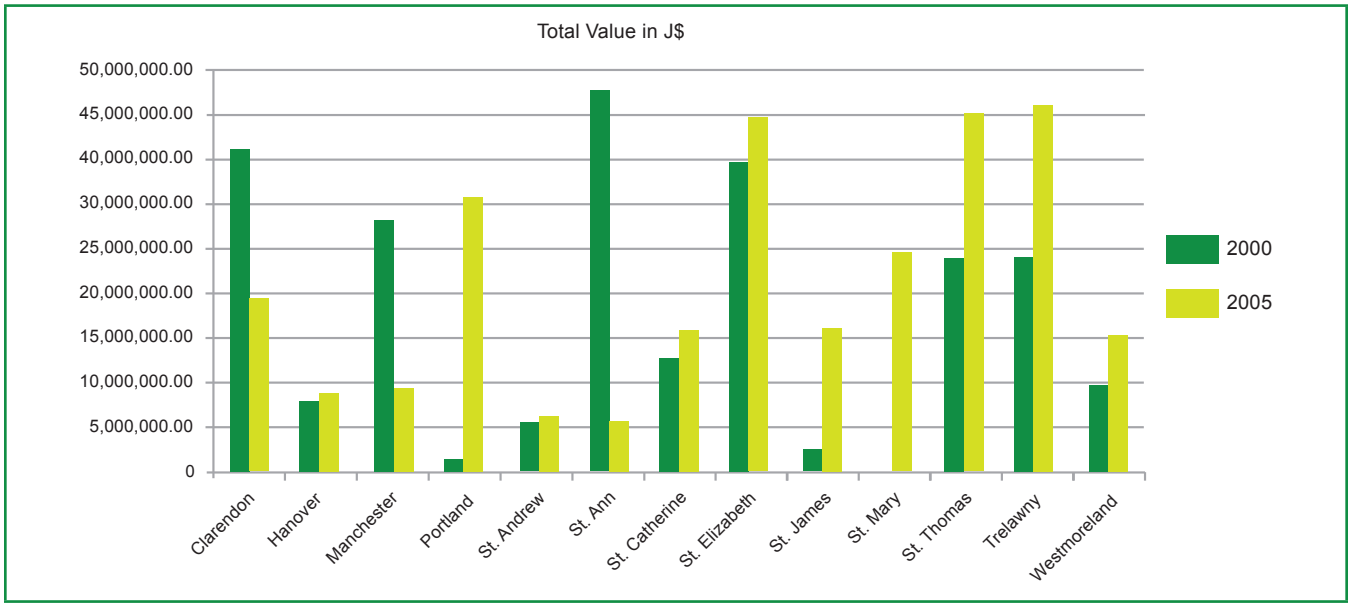
While both vegetables and legumes are affected by droughts in the two parishes, vegetable in St. Elizabeth have been particularly affected. The farming of vegetable crops is intensive because of its multiple harvests, year-round cultivation, and irrigation needs. Despite its short crop cycle (about 3 months) and the fact that annual average precipitation across the island (1,981 mm) would satisfy water requirements for the majority of vegetables, most vegetables suffer because they need to be irrigated during drought periods too. Various groups of farmers in St. Elizabeth stated that irrigation is a key constraint for these types of crops as the availability of water can reduce their vulnerability during drought periods. Farmers from both St. Elizabeth and Portland indicated that due to the last El Niño phenomenon (2009), legumes were seriously affected by extended dry periods, representing near 30% of total losses.

Estimated Crop Losses Due to Weather Phenomena

Crop losses due to drought in 2000 and 2005 have affected St. Elizabeth more than Portland, but the relative increase in drought losses was more drastic for Portland. To illustrate, in 2000, 2,779 ha of crops were loss due to drought, 1,261 ha of these crops were loss in St. Elizabeth (45%), and 15 ha of these were loss in Portland (0.5%). In 2005, St. Elizabeth's losses fell to 880 ha, whereas Portland increased by more than 3 times to 50.6 ha. The estimated value of losses for both parishes was about J$75 million, with an estimate loss of around J$45 million in St. Elizabeth and J$30 million in Portland[28].

28 Later the same year, Hurricanes Dennis and Emily and later Tropical Storm Wilma affected crops production on the island as well.

Figure 6. Crops and Livestock Estimated Losses due to Drought Conditions in 2000 and 2005



Source: Rural Agricultural Development Authority

Crop damages related to floods in 2002 were initially estimated at around J$79 million, while losses due to 2003 floods only amounted to around J$35 million. During 2002, peanuts were the most damaged crop, accounting for 241 ha (21.8%). One year later in 2003, nine parishes reported losses due to flood rains, which affected 2,804 farmers (Portland, St. Elizabeth, Westmoreland, Clarendon and St. Thomas were the most affected parishes). During 2003, the Portland parish office reported losses of 138.9 ha, with a value of J$18 million and St. Elizabeth reported a loss of 93.5 hectares, valued at J$3 million (Table 13).

Table 13. Crops and Livestock Estimated Losses due to Floods Damages, 2003

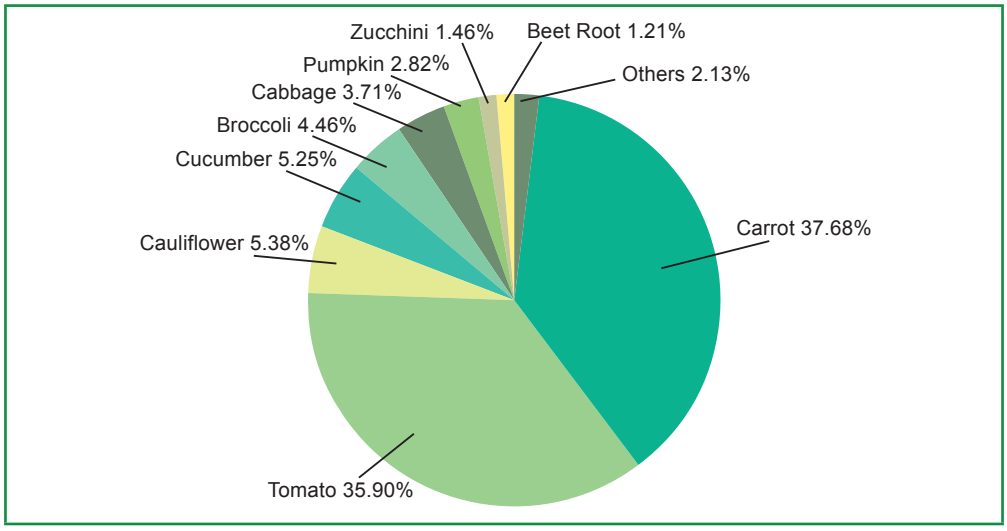
Parish	Total Crop Value Losses (J$ Million)	Livestock Total Losses (J$ Million)
Portland	18.41	0.29
St. Thomas	1.13	1.35
Clarendon	7.65	0.51
St. Elizabeth	3.63	0.33
Manchester	0.78	-
Trelawny	1.10	-
Hanover	1.32	0.31
St. James	1.64	0.01
Westmoreland	3.38	-
Total	**39.03**	**2.79**

Source: Rural Agricultural Development Authority

In August 2004, Hurricane Charley affected crop production in St. Elizabeth with RADA reporting losses of around J$21 million (276 ha) (Figure 7). Carrots, tomatoes and cauliflowers were the most affected crops. A month later, Hurricane Ivan had an impact on all parishes causing serious damages to crops and livestock and reaching losses of around J$6.7 billion. The southern parishes were the most affected areas with winds

speeds of approximately 270 km/hr; and St. Catherine, Portland, Clarendon, Manchester, St. James, Hanover and St. Mary were the parishes which experienced the greatest damages. Due to extreme precipitation, flooding also destroyed 1,900 ha of vegetables crops. 31% of farmers from St. Elizabeth declared in a survey that it took them more than a year to recover from the effects of Hurricane Ivan.

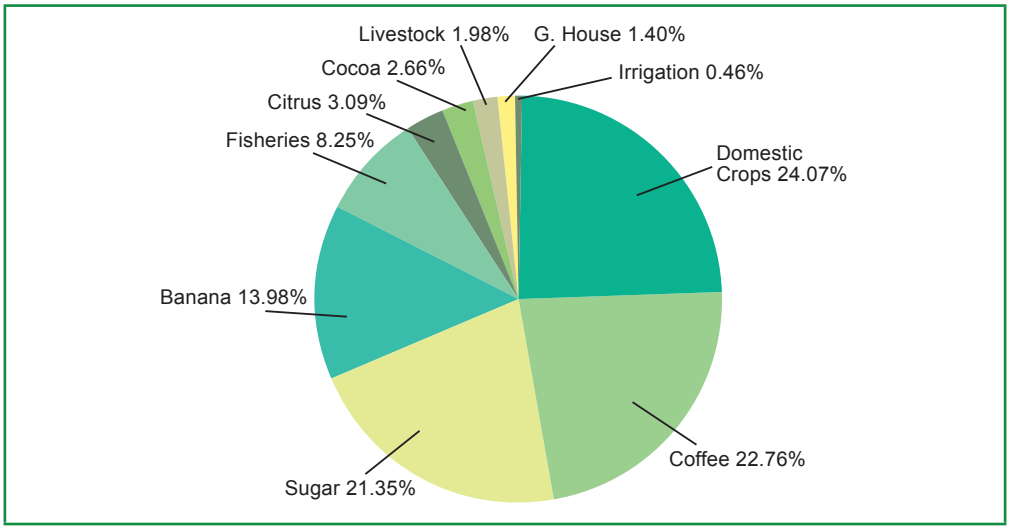
Figure 7. Preliminary Estimates of Crop Losses in St. Elizabeth due to Hurricane Charley, 2004 (percentage of J$21,055,340)



Source: Rural Agricultural Development Authority

During the hurricane season of 2007, Hurricane Dean had an impact on Jamaica's eastern and southern parishes of Portland, St. Thomas, St. Andrew, Clarendon, Manchester and St. Elizabeth. The main trigger for crops and livestock damages was the effects of high winds (over 100 miles/hr). Preliminary estimates of the agricultural and livestock losses from Hurricane Dean reached a total amount of J$1 billion, with Portland and St. Elizabeth representing 18% of those losses.

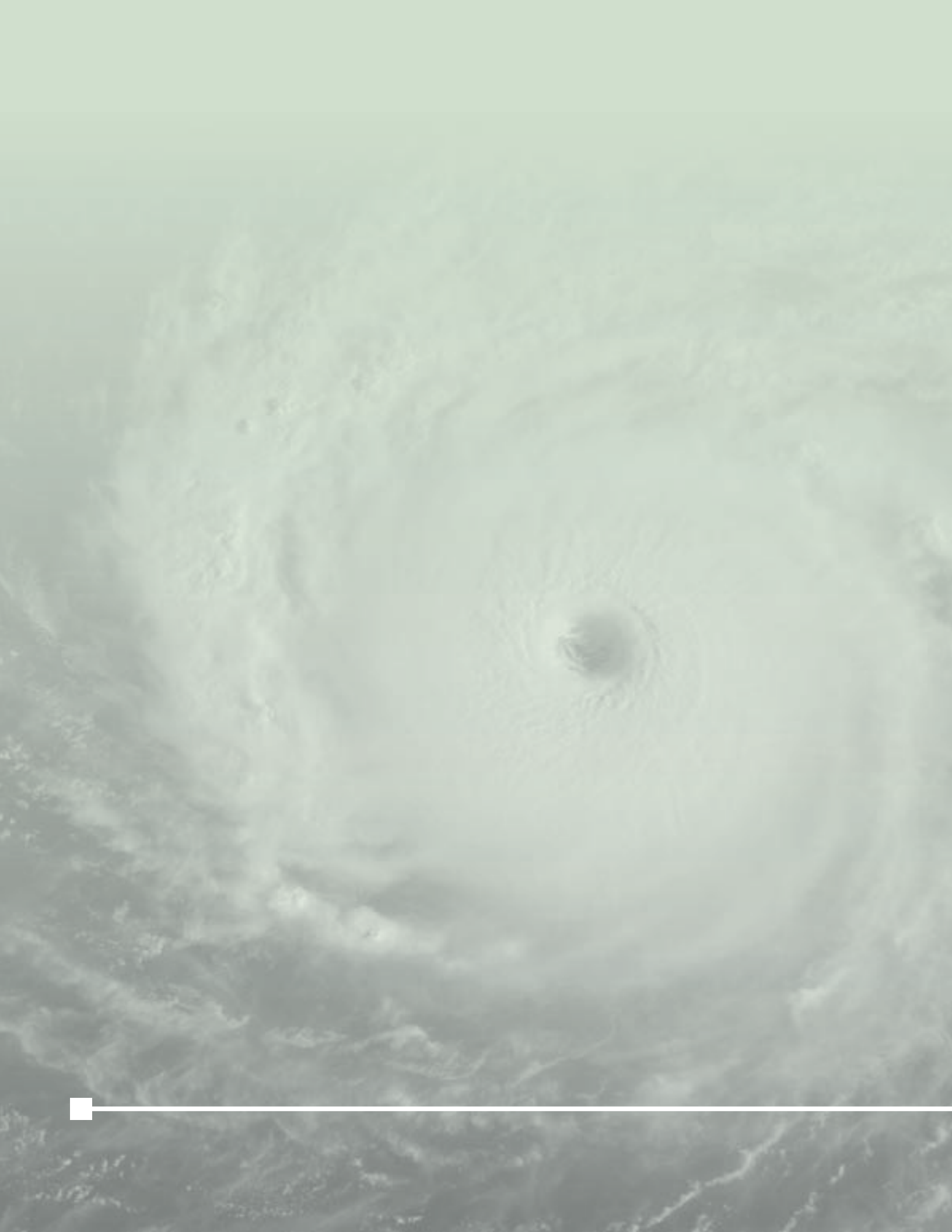
Figure 8. Hurricane Dean Estimated Damages to the Agricultural Sector, 2007



Source: Rural Agricultural Development Authority

The possibility to gather information on cyclonic and drought events in Jamaica can be a valuable tool. Coffee, bananas and domestic crops present good opportunities for the public sector to support agricultural risk management practices and improve current mechanisms to respond to systemic weather events. Furthermore, although data from field visits and focus groups indicates that there is a willingness among a few farmers to pay for instruments, such as insurance, that can allow them to transfer some of the systemic risks, challenges still persist in terms of the development of such instruments at an individual farmer level (see Section V below). This was a clear result of the focus groups conducted in both parishes, where the prevailing majority of farmers are producing for commercial purposes, have a diversified agricultural production, and diversified (non-farm) income sources.

Producer typology and production structure suggests that there is a possibility of introducing (or improving) the management of agriculture risks at a more catastrophic level that would address losses for most farmers. The education levels of farmers, the holding of savings accounts and their integration to agricultural markets demonstrates that farmers could understand and discuss catastrophic risk transfer mechanisms. Furthermore, risk modeling for hurricanes and drought could address most farmers' needs related to natural disasters. The focus groups conducted in both parishes confirmed that most farmers would be willing to consider some type of payments for insurance-type instruments in the event of a disaster.



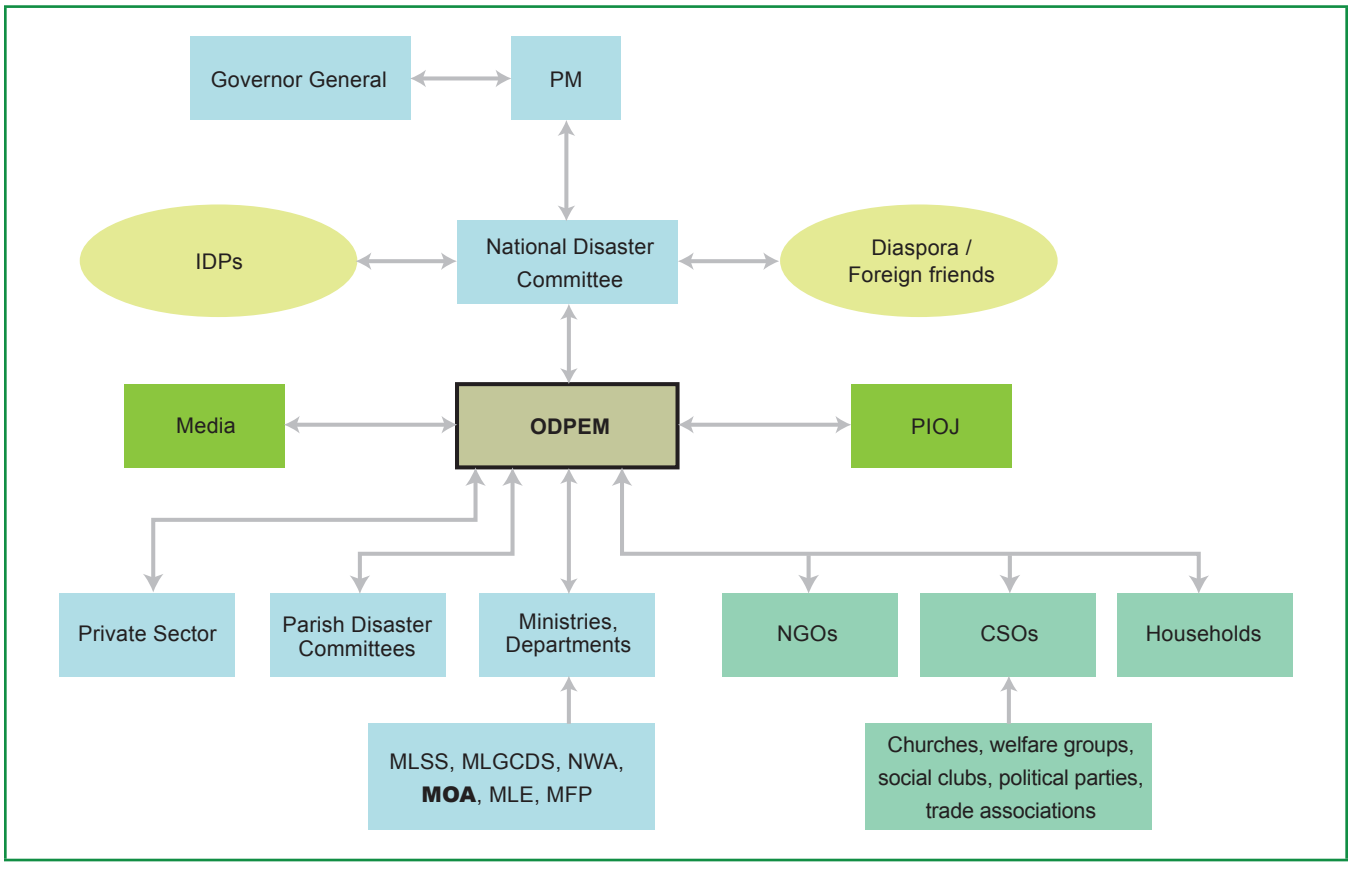
IV. Institutional Structure for Managing Weather Risks in the Agricultural Sector

This section analyzes the policies and instruments available for small farmers to manage agricultural risks associated with natural hazards. Government disaster response mechanisms are summarized together with farmers financing options and a brief description of the insurance market.

The Government and the Disaster Response System

In Jamaica, the institutional framework for disaster preparedness and emergency response consists of one pivotal agency: the Office of Disaster Preparedness and Emergency Management (ODPEM), which works in conjunction with the National Disaster Committee (NDC). These two agencies work through a committee system, which includes, public education, health, finance, and disaster relief (see Figure 9 below). ODPEM is an agency of the Ministry of Land and Environment (MLE), established by the Disaster Preparedness and Emergency Management Act 15 of 1993. ODPEM's headquarters are in Kingston, but are also decentralized at the parish level in the Parish Disaster Committees (PDCs). Therefore, requests for financing to ODPEM flow upwards not only from the Ministries, but also from the parishes' PDCs (which are also multi-sectoral bodies).

Figure 9. The Institutional Framework for Disaster Management



Note: ONR is not shown in the diagram as it was created in 2004 after Ivan. It works in parallel with ODPEM.
Source: Duku Osei (2005)

The Office of National Reconstruction (ONR) was created in 2004 after Hurricane Ivan and works in parallel with ODPEM to facilitate disaster relief and reconstruction on the island. This office has a direct link to the Planning Institute of Jamaica (PIOJ) and all the Ministries, including the MOF, but it does not have a direct link to the PDCs or other private sector organizations. For example, financing provided to the Agricultural sector after Ivan in 2004, did not solely come through the Ministry of Agriculture (MOA) but the ONR also provided direct farmer support.

After a natural disaster takes place, public response to the agricultural sector begins with the Rural Agricultural Development Authority (RADA) conducting an assessment of farmers' needs at the parish level. The needs assessment report is compiled by RADA supervisors ("extension officers"), analyzed by the MOA, and then submitted to the ODPEM for funding. Resources usually arrive 2 to 3 month later. Not all farmers are eligible for assistance and the criteria to be included on the list do not appear to be objective and transparent. The lack of objectivity together with delays in receiving critical support (especially considering that most crops in St. Elizabeth and Portland are short-term), limits the availability of funds for emergency use or for new investments after a disaster.

New Public Program

In 2007, The Ministry of Agriculture (MOA) published the Vision 2030 Agriculture Plan, which seeks to improve the sector's main constraints. Some of the goals that the MOA is planning to achieve are:

- Efficient competitive diversified value-added agricultural production
- Strong marketing systems for domestic export markets
- Competent and adequate human resources
- Enabling and facilitating framework, infrastructure and support services
- Contributor to long-term rural development
- An environmentally sustainable sector
- National food security

In particular, there are several constraints that can be identified in the government's Disaster Assistance Program (DAP) that can be summarized as follows:

- There are few or no formal rules or definitions to identify the farmers who should be entitled to RADA/ government assistance after a disaster.
- RADA, and its supervisors ("extension officers"), are in a difficult situation as intermediaries between the farmers and the central government, and therefore exposed to lobbying and political interventions to channel the available funds.
- There is no planning and no objective rules to meet the financial costs of disaster assistance. The only response from the Government is through a reactive (ex-post) approach.
- Donor assistance places an important part in disaster relief. However, funds are provided after the disaster takes place and not necessarily in accordance with basic needs.

The MOA is in the process of reforming its financing framework, moving from ex-post public assistance towards a new ex-ante risk management scheme, in which RADA plays a central role. RADA plays an important role in the public sector's support for small farmers; it has 120 field "extension officers" across the country and is currently recruiting, training and equipping its staff with up-to-date field equipment. This will

allow RADA to meet the challenges of providing immediate information to farmers as well as reporting to the MOA's Data Management Service.

RADA has recently undertaken a very important task of establishing a farmer registry. Although many farmers have not yet been registered[29], current estimates show that only about 60% of farmers have already been included (See Annex 4 showing the registration form that each farmer filled out). This database constitutes the initial step for building an efficient and effective public sector program to respond to agricultural risks. The possibility of being able to target affected farmers, and to monitor and evaluate the provided support, are essential for a transparent public sector management strategy. Currently, the methodology for preparing these lists is not public and seems to have significant political weight.

Producer Marketing Organizations (PMOs) are starting to effectively undertake extension services, however many farmers are not yet part of these organizations[30]. PMOs are relatively new organizations developed recently with the support of the Government to fill a gap servicing non-traditional agricultural producers who did not have access to representation in the past. The PMOs 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 MOA through RADA. Given the limited budget[31] of RADA's extension officers, PMOs serve as a channel to "train trainers" in different agricultural extension related activities. Recently, RADA has provided laptop computers to PMOs in order to directly incorporate information from their members into the farmers' registry system. This direct link to small farmers' activities and conditions can be crucial in a public sector response program for managing agricultural risks related to weather events.

Public Financing

Jamaican agriculture is sensitive to hurricanes, floods, and droughts. Considerable losses have been reported requiring ex-post fiscal spending and mobilization of donor financing. Estimated direct damage to the agricultural sector between 2000 and 2008 was around J$8.7 billion. Table 14 shows government expenditures for the recovery of the agricultural sector from 2000 to 2010. The total amount of estimated resources mobilized was at least J$1.5 billion. In particular, donor contributions have played an important role representing an average of nearly 40% of total funding for the entire period (2001-2010), but between 2008 and 2010, that contribution was especially substantial, representing around 70% of public assistance. Between 2000 and 2010 the Jamaican agricultural sector has received an average yearly amount of J$144 million (US$1.7 million) in public resources. This amount is a conservative estimate since it only includes resources allocated through the MOA and does not include other public disaster programs that support farmers.

29 The main reason given by farmers for not registering with RADA is that they fear to be taxed. Currently, agriculture income is tax-exempted; and farmers are afraid that by providing information about their activities, this would be an initial step to eventually tax them.

30 The reason given by farmers for not joining the PMOs, is that they do not want to be politically associated with the government, as these organizations are supported by the political party currently in office.

31 For example, each "extension agent" has resources for travelling 500 km per month, which is not enough to reach the 1000 to 2000 farmers in a given district.

Table 14. Disaster Recovery Funding for the Agricultural Sector, 2000-2010 (J$ Million)

Year	Disaster	Total Damage to Sector	GOJ Support	Donor Support	Total Support
2000					
2001	Flood		98.90		98.90
2002	Flood	111.00		322.22	322.22
2003					
2004	Hurricanes Ivan & Charley	2,196.00	220.00	27.40	247.40
2005	Emily, Dennis, Wilma & 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
TOTAL		**8,696.4**	**1,173.90**	**1,014.20**	**1,445.32**

Source: Ministry of Agriculture, 2010

Systemic weather events related to agriculture production have been also financed through farmers' own savings. Farmers have to rely on coping strategies such as using their own savings and borrowing from neighbors and informal networks. Systemic weather events such as hurricanes and El Niño, can endanger the ability of an entire community to recover from a catastrophic event. This negatively impacts the competitiveness and formal lending to the sector as well as affecting the main source of income for the rural poor.

Limited public information is available regarding disaster financing to farmers at the parish level. Information available for St. Elizabeth and Portland was obtained through RADA, which provides direct farmer support through agricultural supplies and subsidies (such as fertilizer and vouchers) after hurricanes. In St. Elizabeth, vouchers were not distributed among all the farmers who needed them. A total voucher value of J$5,000 (US$60) was distributed among farmers and only represented 1% of production costs per hectare planted in yams. Nevertheless, if these vouchers had been distributed to 2,000 farmers located in the Southern portion of St. Elizabeth, which was the number of affected farmers during Ivan, this would have represented a fiscal outlay of at least US$120,000 (J$10 million). This amount is less than 5% of the total government support for that year, which was around J$220 million in 2004 (Table 14).

Insurance Market

Formal credit and financial instruments are seldom accessed by small farmers in St. Elizabeth and Portland, based on the volume of lending reported by local banks and credit unions, as well as on farmers' responses. Despite this lack of access, almost 100% of farmers who participated in the focus groups had a Bank account. In addition, some financial institutions, like the National People's Cooperative Bank (NPCB), have traditionally had a strong client base in the agricultural sector (see Annex 7 for a detailed description of the agricultural lending portfolio).

Farmers (in particular small farmers in St. Elizabeth) depend mostly on informal sources of lending, such as families, friends, or store credit. Only a few farmers have access to microfinance institutions (MFI), Credit Unions (CU), or the People's Cooperative Bank (NPCB). The lack of formal sources of credit is due in

part to the high systemic risk of the sector but also, is related to the difficulties that financial institutions have in assessing farmers' individual risk. The fact that farmers rely mostly on informal agents to access credit has to do with the fact that these types of agents have more oversight on farmers' creditworthiness and individual risks compared to other formal financial institutions. See Box 1 for a brief history of agriculture insurance in Jamaica.

Box 1. History of Agricultural Insurance in Jamaica

The lack of an agricultural insurance coverage, in particular for small farmers, 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 (correlated) hurricane and flood damages relation with agricultural production yields, and (iv) a generally uninterested local private insurance market (with some exceptions). There are few examples where traditional insurance was available for small farmers, e.g. bananas, coffee and coconuts), 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.

In the 1980's some efforts were made to harness whatever limited capacity available with the local insurance companies, by grouping them into pooling arrangements that can help them to gain access to 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 to underwrite agricultural business as a separate line of business.

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 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, do not have access to any risk transfer mechanism for weather related risks, -- neither publicly nor privately (re) insured.

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 the CARICOM. The CCRIF was launched in September 2006 in order to provide earthquake and hurricane index-based insurance for individual countries in the Caribbean region. The facility was designed to finance post-disaster recovery after xxx events. The payout system of the facility is based on the estimated impact of an earthquake or hurricane on each island by using probabilistic catastrophe risk modeling and actual exposures. Post-loss payouts are received immediately by the countries affected in accordance to the severity of the event as measured by the index indemnity formula with no need to verify actual damages. In the case of hurricane events, the index formula is based on hurricane location and strength at the closest point of approach, and not on winds measured by meteorological stations.

Despite the lack of formal private sources of lending, the government is filling the gap through subsidized lending. The NPCB offers more financial products to farmers and in rural areas in general, with less requirements and more favorable conditions. During interviews, this institution seemed to be the most knowledgeable about the sector and the one with the most interest in introducing agricultural insurance products. Based on information registered in Portland, however, the NPCB's large agriculture credit portfolio is mostly in default.

Although formal lending for small farmers of domestic crops is not incorporated into the current strategies of formal financial institutions in St. Elizabeth and Portland, opportunities do exist to help them improve

their overall agriculture lending portfolio. For example, in Portland, formal financial institutions have been providing loans, mostly with the Development Bank of Jamaica (DBJ) support, to small farmers of traditional crops (such as coffee). Even this agricultural credit has been drastically reduced due to recent systemic weather events. Moreover, financial institutions in St. Elizabeth and Portland do not offer any type of insurance or risk management instrument to provide coverage for production risks[32].

However, the credit unions in Jamaica do have a risk management and transfer mechanism to deal with catastrophic events. Credit unions in Jamaica are grouped at the national level in the Credit Union League which, among other services, has several instruments to support its members and their respective clients in the case of a catastrophic event. These instruments include:

- An Emergency Relief Fund which is activated after a disaster and is financed through donations coming from credit unions' yearly surplus profits.
- Extraordinary emergency funds provided to the credit unions by the League itself in the form of grants.
- Emergency Loans by the League is financed through the membership (credit unions).

These instruments are a form of mutual insurance mechanism. Some of these funds are budgeted ex-ante (such as the extraordinary emergency fund), but most of them are funds allocated ex-post by non-affected members. The Credit Union League does not have the ability to access the international financial market in order to transfer any of these risks out of the country.

It is important to note that financial institutions in St. Elizabeth and Portland do have agreements with insurance companies. Most of these companies provide insurance related to medical coverage, life insurance, and car insurance among others, but no insurance for the agricultural sector (the credit union has an in-house insurance company that serves all credit unions in the country). Moreover, no credit officers were exclusively dedicated to managing the agricultural portfolio. Usually, the credit officer working on Small and Medium Enterprise (SME)'s loan portfolio was also in charge of the agricultural portfolio; this could be a result of the low level of formal lending to the sector.

32 These financial institutions also did not have any hedging mechanism against increased default rates, other than existing securities and collaterals for each individual loan.

V. Opportunities for Introducing and Improving Innovative Weather Risk Management Mechanisms for Small Farmers

This section evaluates the potential for improving and introducing innovative agricultural weather risk management mechanisms for small farmers in St. Elizabeth and Portland. First, it summarizes several key considerations related to the sector's structure and constraints that need to be considered in order to improve agricultural weather risk management. Then, based on the initial pre-feasibility assessment, alternative options for weather risk management mechanisms are analyzed. Finally, specific options are proposed for the improving and building upon existing weather risk management practices.

Key Considerations

Possible improvements to current agricultural risk management practices are directly linked to the sector's production structure and constraints. As described in previous sections, the main characteristics of St. Elizabeth and Portland's agricultural sectors can be summarized as follows:

- Farmers are diversified with a multi-crop production structure.
- Farmers operate at a small scale (2 ha average).
- Farmers grow crops and livestock for sale and consumption (semi-commercialized).
- Crops for the majority of (but not all) farmers are short-cycle, meaning that production can potentially be resumed within 3 months.
- Farmers rely on household savings and the support of family and community after being affected by a natural disaster. Limited access to formal credit and low levels of income mean that they cannot easily manage the risk associated with major shocks.
- Farmers receive in-kind assistance and vouchers from the government via RADA at the parish level.
- Key hazards affecting farmers include short-term wind and rain associated with hurricanes, cyclones tropical storms, heavy rains, floods, and droughts.

The key weather hazards affecting small farmers are hydro-meteorological, which are winds, rainfall, droughts, and floods (all associated with hurricanes or tropical storms). Since all four hazards are frequent and often severe, a careful risk layering must be undertaken to identify potential government support to small farmers and structure any public financed disaster response. High-intensity/high cost events, in particular hurricanes, have been historically a candidate hazard for Government support to small farmers because the size of the shock produces systemic high losses that affect all farmers, reducing the possibility of small farmers to recover fast. For lower/intermediate intensity weather events, alternative options are available to farmers, such as risk mitigation and prevention, loans and reserves. These measures would need to be executed by small farmers before any type of Government support program is implemented (as described by Spence (2009)).

Given the routine nature of annual events such as droughts in St. Elizabeth, an improvement in agricultural planning methods will be required for all-year production crops, particularly in areas with high risk of water deficits. Furthermore, in areas with high and more frequent drought risks, alternative irrigation sources will need to be properly investigated in association with crop yields.

The lack of access to formal credit by small farmers needs to be improved from the opportunities currently offered by formal financial institutions. The following areas have been identified as needing additional public sector support at the parish level: (i) building up the technical expertise of credit officers in order to

assess agricultural risks and thereby improving and/or expanding the availability of lending; and (ii) integrating agriculture risk hedging instruments (such as insurance or micro-insurance) in agriculture lending in order to reduce default rates and expand credit coverage for small and medium size producers.

Given the small holder and multi-cropping structure of St. Elizabeth and Portland, individual agriculture insurance contracts would be costly and complex to design. The affordability of insurance for small farmers will depend on rates of insurance premiums. The level of income available to pay premiums is limited, especially for small scale, semi-commercialized farmers. These farmers can easily find that premiums become unaffordable based on the frequency/severity of shocks, or when the level of the deductible or trigger parameter (index-based insurance) is set low.

The Disaster Assistance Program (DAP) of the Ministry of Agriculture constitutes and important source of support for small farmers after a disaster. Small farmers have difficulty accessing informal or formal financing after a disaster given the systemic losses faced by the agriculture sector. Thus, government support is requested (and sometimes given) through the existing DAP which distributes vouchers (mainly to purchase fertilizers) through RADA.

There is an opportunity to respond to hurricane-related weather events as a viable option for improving and implementing an innovative Disaster Assistance Program (DAP) in the short-term. Given that the history of disaster payouts for small farmers in Jamaica has traditionally been after a hurricane, and given the availability of data and wind-related transfer instruments (such as CCRIF insurance), the assessment pointed out to the opportunity of improving the current disaster payment system (DAP) of delivering vouchers to farmers, through: (i) making the pay-out rules explicit and efficient; (ii) making the process of farmer registration and selection clear; (iii) improving the financial structure of the DAP by funding the different risk layers with appropriate financial instruments; and (iv) introducing risk transfer instruments (such as insurance) to expand the DAP and eventually crowd-in private insurers.

The current DAP does not have a sound financial structure. The Government of Jamaica and donors provide emergency funding (non-allocated) to support the recovery of small farmers after a hurricane, but this funding is often not enough, reaching a small percentage of affected farmers, as well as un-timely, arriving months later. However, the Government of Jamaica now has access to risk transfer instruments, such as the hurricane insurance coverage for public sector assets from CCRIF, that could be expanded to cover for the DAP of the MOA.

Beyond hurricane coverage, other catastrophic weather events are more challenging to address with risk transfer mechanisms. Table 15 below summarizes the list of possible insurance options for the Government of Jamaica (as well as for organizations involved in the agriculture sector such as the DBJ) based on weather events and their associated insurance instruments based on the analysis conducted in Section II. In particular, given the existence of reliable wind-related insurance (i.e. CCRIF), hurricane insurance for the agricultural sector would be possible to implement in the short-term. All other weather hazards (non-cyclonic excess rainfall, floods, and droughts) require further research.

Table 15. Weather-Related Risks and Insurance Coverage Options for the DAP scheme for Small Farmers in Jamaica

Weather Risks	Type of Insurance Contract	Implementation
Flood	Index-based insurance from satellite imagery/ river gauges (Index payout scale)	**Not suitable in the short-term.** 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)	**Not suitable in the short-term.** 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 (CCRIF is in the process of designing this type of coverage for individual governments).
Drought	Index Insurance (Index payout scale)	**Possible, but further analysis is needed.** - 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. - Extreme drought events are technically able to be implemented 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 for the impossibility to design insurance payouts for small production structures with a wide variety of short-term crops and without a well defined seasonality.
Hurricane (wind)	Index Insurance for mortality coverage (Index payout scale)	**Possible to implement for high intensity weather events.** 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).

Beyond the improvements to the DAP, there are opportunities for directly reaching small farmers in the two parishes through a "meso-level"[33] aggregate intermediary. A meso-level intermediary could be an agency that organizes and pre-establish the distribution of financial instruments to small farmers, such as the DBJ, the Cooperative Banks, Credit Unions, etc. Such agencies have the potential for structuring risk transfer instruments, serving as an "aggregator" of risks to the farmers. In such case, if the agency gets an insurance policy (against hurricane coverage for example), the aggregator (the agency) would be the policy holder and could choose (depending on the arrangements) to either retail or share the risks with the farmers, who in

33 Micro-level refers to the level of individual farmers/households. The meso-level refers to organizations such as farmer groups and financial institutions that serve farmers. The macro-level refers to Government and second tier institutions (such as DBJ) that has a national coverage and do not deal directly with farmers.

turn may or may not pay premiums and receive payouts. The "aggregator," or intermediate agency, pays the premium to insurers (Annex 6 presents a summary review of the organizational options for micro and meso-level agricultural insurance) and sets the payout rules, which should be set by prior agreement with the farmers.

VI. Options and Next Steps

This section provides different options to improve the current disaster assistance program (DAP) for small farmers in St. Elizabeth and Portland. The options presented here show different degrees of improving the existing risk management mechanisms and introducing innovative instruments such as insurance. All options are non-exclusive and can be highly complementary if implemented in parallel.

Option 1: Improving the public sector farmer Disaster Assistance Program - DAP

An objective system for declaring emergencies, identifying beneficiaries and implementing known payout rules is needed in order to strengthen the transparency of the system. A more objective system will help the MOA to declare an emergency in specific districts within any given parish, which will automatically trigger vouchers for eligible farmers. The declaration of emergencies can be based on hard triggers[34] that would be preferable to soft triggers[35] (policy decisions). Such a system would start to overcome the current shortcomings in the DAP, which are identified as follows:

- There are few or no formal rules or definitions as to the circumstances under which farmers should expect to be entitled to assistance from RADA/government. Hence, farmers speculatively report any loss or damage, in the "hope" that there may be some financial or in-kind payouts.
- There is a poor perception by farmers of the system, due to the lack of clarity.
- RADA, and its extension officers, are put in an invidious position as intermediaries between farmers in their area, and central government, resulting in lobbying and political interventions in the process.

The Farmer Registry provides a strong base for the improvement of the DAP, by defining those farmers who are eligible to receive payments when events occur which are triggered under the payout rules. The Registry can be improved to ensure that there are no mistakes and that the information is updated regularly. Farmers will be motivated to register through the local PMO or RADA offices in order to ensure their eligibility to receive disaster payments. Eligibility criteria could additionally include: (i) having a maximum amount of hectares; (ii) producing specific crops/livestock; (iii) location; and/or (iv) having attended technical assistance and training sessions with RADA on input use or other aspects related to the assistance to be received.

DAP payments to farmers could be delivered though a modification and strengthening of the current voucher system used for purchasing inputs. According to the focus groups and interviews in St. Elizabeth and Portland, the voucher system has been perceived as more efficient than the physical distribution of inputs. This system of vouchers reduces the pressure from farmers on RADA extension officers because it gives farmers a degree of freedom to choose their own suppliers as well as agricultural inputs. To accomplish this, however, the government will need to modify the current ad-hoc system of voucher issuance and improve the current farmers' registry[36] (see Annex 5 for details).

Improving the DAP in the short-term would not necessarily involve additional public sector resources and would be directly dependent on changes in the efficiency of the current system as well as on the

34 A hard trigger could be a specific pre-determined parameter such as the category of a hurricane or a specified amount of rain. A feasibility study would be needed to develop specific triggers (either station-based or satellite-based) according to technical estimates of wind or rainfall. Hurricane strength is used for illustrative purposes to describe the event severity.

35 A soft trigger is usually the simple declaration of emergency by a public sector authority.

36 It is highly recommended that a qualified task force of information technology experts be appointed to oversee the security issues with the information system to ensure there is no manipulation of the names on the list of beneficiaries.

possibility to introduce adequate provisions in the budget. Fiscal provisions for emergency purposes should be considered ex-ante and through a budgetary process. The need for additional public sector resources –even in the short-term- will depend on the level of coverage (trigger levels), farmer eligibility criteria, the value of the vouchers, and the ability to target the most affected farmers. Fiscal provisions backing a strengthened DAP, would ensure both reliable and rapid support to farmers. The proposed approach of formalizing the rules under which assistance will, *and will not*, be provided to farmers can be considered a substantial improvement from the current system. More importantly, this approach will require advanced planning to finance assistance (based on an improvement in the understanding of risks).

Option 2: Improving the risk financing system for the farmers' DAP

In order to implement a sustainable DAP, it is necessary to have a strong financing structure. This option includes actions recommended under Option 1 above, but it also requires that rules are set clearly and that the cost of meeting assistance payouts is evaluated on a technical basis (i.e. analysis of the expected frequency and cost of the weather events). Setting such rules requires a transparent profiling of eligible farmers and hazards covered.

Currently no financial projections are made on the potential frequency and amount of expected RADA payouts in the two parishes (risk assessment). The lack of pre-agreed valuation of the likely needs of the farmers affects the ability to budget for financial sustainability of the DAP. In order to implement a sustainable disaster assistance scheme, it is necessary to improve the current financing structure. Normally RADA's assistance is based on the necessary production costs which would enable farmers to get back into production (i.e. rehabilitation and replanting).

Box 2. Calculating the Cost of Funding Payouts

Under an insurance program, premium rates are developed with at least the following components. A similar calculation would also be necessary in order to estimate annual contribution requirements to an "Emergency Fund":

Premium = Expected Annual Loss Cost + Risk Margin + Expense Load

The **Expected Annual Loss Cost** is the average payout which is estimated for the insurance scheme. It is a function of the *frequency and severity of loss*, and the *sums insured*. *Frequency* of loss is clearly determined by the return period of the insured event, but with the payout frequency determined by the trigger level or deductible incorporated in the scheme design. *Severity* of loss is represented by the percentage of the sum insured which is paid out per event, on average. The *sum insured* is the value represented by the *number of farmers, and average sum insured (voucher value) per farmer*. The total of all individual farmer sums insured is the maximum which could be paid out in any one event.

The **Risk Margin** is the profit margin required by the insurer (and reinsurer(s) backing the insurer) to expose their capital within an insurance scheme. In the marketplace, this is determined by supply and demand and a tendering process. However, the risk margin required is dependent on several factors relevant to the insurer: the degree of "uncertainty" inherent in the product design and rating: the data available, opportunities for selection (if any); and the transparency of claims process itself, and other factors. (Index insurance aims to minimise the uncertainty, reducing the risk margin required relative to traditional insurance – see Annex 3). Risk margins tend to be higher for schemes which expect highly infrequent but very large payouts (high level catastrophe insurance), which would not be the case for a high frequency payout programme such as inevitable in Jamaica.

(cont.)...

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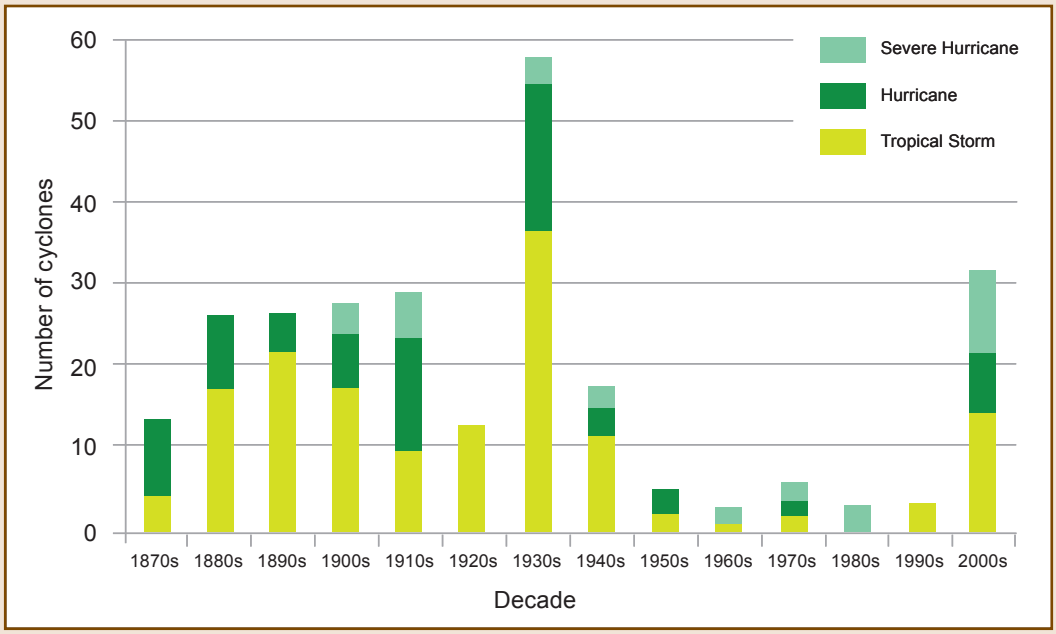
Tropical Cyclone Activity within 150 km of Jamaica, Summary by Decade (2000s incomplete)



Source: *Jamaica: Weather Risk Management in the Agricultural Sector: Pre-feasibility Study Report to the World Bank*, **Gallagher, 2009**

The above points demonstrate that the setting of trigger levels and the possible *incremental scale of payouts according to event severity* (for example strength of hurricanes) is critical. Further, in order to reflect, as accurately as possible, that payouts are minimized by restricting them to those areas worst affected (i.e. by high wind speeds), it is apparent that *risk modelling* needs to be employed. Risk modelling, as with the CIB feasibility study, aims to define the wind field zones for payout purposes. Even with modelled payouts, if payout levels (sums insured, or voucher values) are be high enough to be meaningful to farmer in terms of rehabilitation needs, it is clear that the extremely short return interval for severe events gives rise to major challenges of how to fund the needed "premiums" (or fund contributions) required to meet the average annual payouts. It is also necessary to use modelling to calculate expected payouts by zones within Jamaica, and to price the risk.

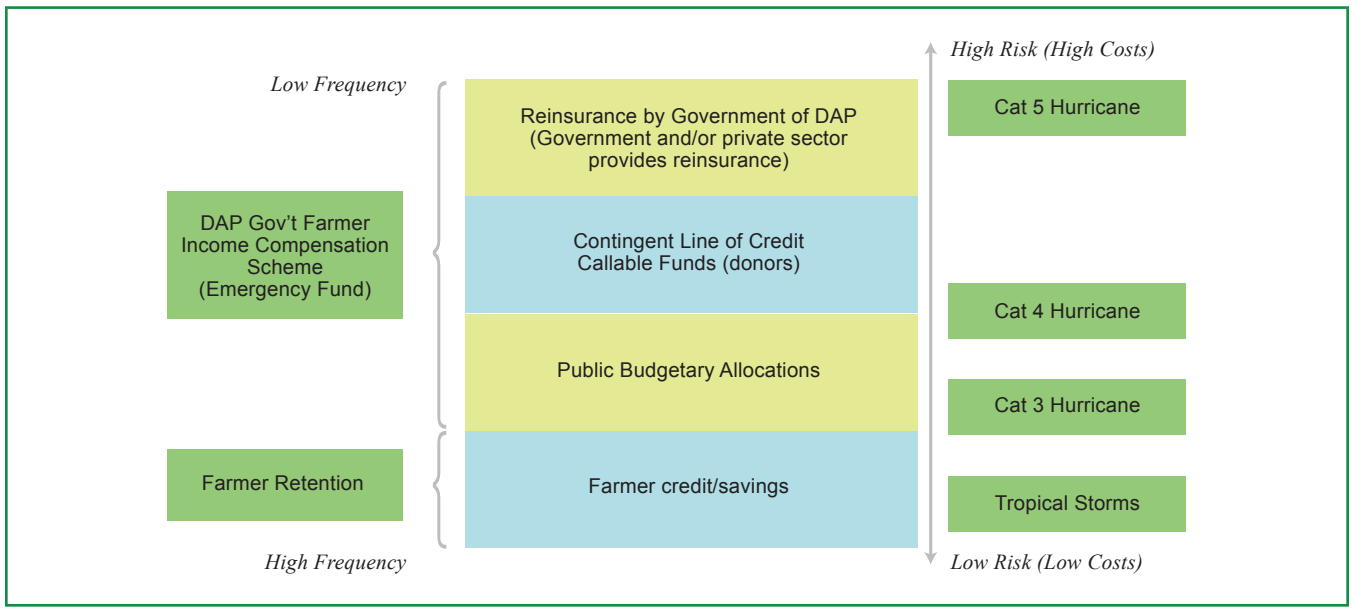
Budget provisions are an important element of an ex-ante risk management strategy in order to have adequate financial assistance ready for emergencies. Ex-ante budgetary allocations and planning combined with an objective mechanism for the release of funds will significantly improve the current system of assessing losses, and requesting funds. The following hypothetical situation can illustrate the importance and magnitude of a possible ex-ante financing scheme: for example, if the MOA wants to issue support in the form of US$100 vouchers per farmer in any given district of St. Elizabeth under the hypothesis that wind speed reaches a category 3 of wind force or above, then the Government would need to be ready to provide assistance once every 3 years (based on Box 2). Using this example and assuming that a maximum of half the farmers in St. Elizabeth would be affected in any given cyclonic event, then a total of at least 8,000 farmers would be affected once every 3 years. Under a full (voucher) payout, then budgetary reserves for full coverage would need to be around US$800,000 (J$72 million) for St. Elizabeth's Parish alone. This translates into an expected average yearly payment of US$267,000 for St. Elizabeth, compared to the approximate US$1.7 million estimated minimum yearly average of past government expenditures at the national level.

Given the country's fiscal constraints for financing disaster assistance, a sound financial strategy to regulate costs of extreme catastrophic events within a given annual budget is necessary. The government can finance different layers of risks through different instruments (i.e. reserves, borrowing, and emergency budget funds). However, in an example where we anticipate a worst-case scenario and exceptional maximum losses affect all farmers in St. Elizabeth during the program's first year, estimated maximum payments would be around US$2 million. This amount can go beyond the average fiscal provision for any given year. An option would be to arrange a specific insurance/reinsurance policy or weather derivative that can provide immediate coverage for exceptional catastrophic losses. Alternatively, exceptional additional financing can be obtained from public (or donor) funds, through a contingent credit line.

A comprehensive approach for an ex-ante management of weather events is necessary for the Government of Jamaica to finance the different level of risks with their associated costs of assistance ("risk layering"). The weather risks vary from lower risk events (more frequent events) that are less costly and can be anticipated and budgeted in advanced, to higher risk events (unanticipated and less frequent events) that are more costly but can be financed through reinsurance/donor assistance. Figure 10 below illustrates the structure of this risk layering of emergency support based on the example illustrated before on a hurricane (wind speed) trigger. The lower "layer" (generally high frequency but lower intensity risk), identifies the circumstances under which farmers do not expect to receive any type of coverage. This example assumes that farmers could pay out-of-pocket for any damages lower than a catastrophic (Cat) level 3 and manage the risk through their own savings (risk retention). The upper layer of risk is the Government funded risk layer, managed through the Government providing financial protection to DAPS. This layer of risk is held by the public sector, and funded and protected by a series of potential instruments, such as:

- Budget allocation for disaster assistance
- Budget for insurance or reinsurance premiums (i.e. under a meso-level scheme the government is the policyholder and transfers the risk through an insurance contract to the reinsurance market)
- Donor funding
- Special contingent loans for catastrophe risks, with government or international financial institutions

Figure 10. Example of Risk Layering Hurricane Hazards - Public Funded Scheme

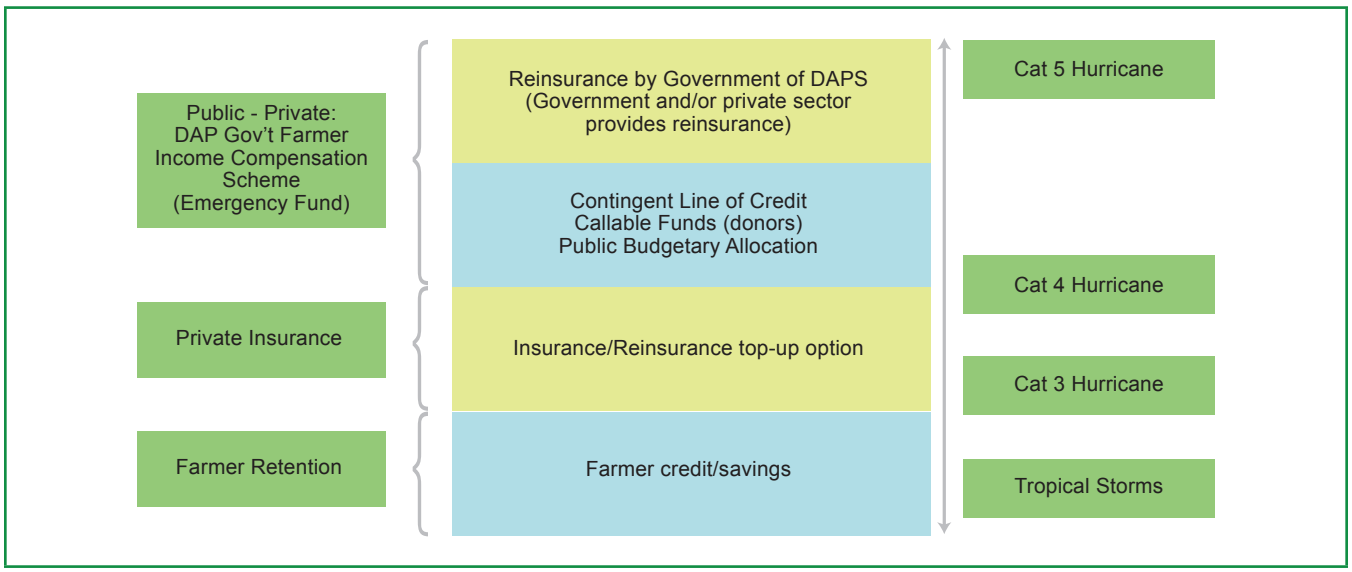


Option 3: Public-Private Financing Scheme (Top-up Option)

Designing a comprehensive public-private agricultural risk management program for small farmers is ideal but complex. Crowding-in the private insurance companies in offering coverage to small farmers is an option for consideration, but is complex to implement because the rural insurance market is not well developed in Jamaica. As a result, government involvement would be required at the beginning to coordinate the different stakeholders (private sector, farmers, and the Government). This Option 3 is highly complementary to Option 2.

The private insurance market could contribute with additional expertise in claims management processes, statistical analysis, and pricing. Furthermore, they could provide additional financing to complement the government supported DAP. In order to illustrate what a public-private scheme would look like, we use the previous example of Option 2, where the Government DAP payment could be set to trigger above a Cat 3 hurricane for a maximum payout of US$100 per farmer in the form of a voucher. However, if a farmer would like to modify this coverage (receiving more money under the existing trigger, or reducing the trigger from a Cat 3 to Cat 2, or including additional hazards such as excess or lack of rainfall), they could have access to a "top up" offered by a private insurer. This "top up" could be offered at a market price (not subsidized) in coordination with the DAP product. Such an arrangement would almost certainly require that there were "hard triggers" within the DAP payout rules. Figure 11 shows an example of additional private sector coverage below the Government triggered payment (Cat 3). Note that the private sector could be involved in either (a) layered reinsurance of DAP; and/or (b) "Top Up" (as here shown provision of additional lower "layer" of cover for lesser severity events).

Figure 11. Example of Risk Layering Hurricane Hazards – Public/Private Funded Scheme



Private insurers have been sensitive to the potential development of agricultural insurance products in Jamaica[37]. International experience shows that insurance markets, which are extremely reluctant to be involved in traditional agricultural insurance, are more interested in the prospects of index insurance for the agricultural sector in Jamaica. This interest arises due to the possibility to expand to the rural sector by reducing the costs and

37 Potential development of agriculture insurance products is being evaluated through the IADB work on legal and regulatory issues, the knowledge of the CIB/WB project, among others.

incentive problems (moral hazard and adverse selection) associated with traditional indemnity contracts. The adoption of an index is a faster, more transparent and objective trigger for payouts than field loss assessment. A further important advantage to insurers is that reinsurers are more willing to provide financial protection for index based products in the agriculture sector of Jamaica. Given the systemic (catastrophic) nature of weather risks, the involvement of reinsurers is vital to any agricultural insurance.

It is important to assess the capacity of the private insurance sector in Jamaica. A stand-alone micro product for individual farmers, even if considered feasible, would present insurers with challenges such as the need to set up a sales network, the need for significant development of technical expertise in contract design and local adaptation (according to local weather stations, or development of a payout based on modelled wind and rainfall), arrangements for training, farmer education and capacity building. Furthermore, the vast majority of farmers are small and are engaged in multi-cropping, meaning that basis risk[38] can be quite high, and farmers may be less attractive to purchase coverage for lower levels of catastrophic events. Even if well explained, products carrying basis risk can give rise to farmer dissatisfaction, and reputational risk for insurers. Given the very low penetration of insurers into the rural market, this is another reason for channelling payouts through existing institutions such as banks, credit unions, and/or RADA. This does not preclude later development of micro solutions; in fact it can help starts the capacity building process which is needed for such future development.

Option 4: Development of Innovative Agricultural Risk Management Mechanisms and Commercial Agricultural Insurance

This option involves a long-term engagement and support of the private and public sector capacity for developing agriculture insurance, and will require a longer time capacity building from government organizations as well as private financial institutions. A long-term process will also require technical assistance and public investments in order to develop risk management capacities. This process will facilitate the development of the agriculture insurance market by setting the institutional framework for a sustainable agriculture insurance market.

There are various immediate steps in this approach that can also facilitate the improvement of the data and statistics available for the agricultural sector. Information available from weather records as well as agricultural statistics can help to improve the design of agricultural insurance products by local insurers and international reinsurers. Such small steps are immediately achievable by the public sector and can contribute to the private sector the confidence that the government is committed to a sustainable development of the agricultural insurance market on the island (see Box 3 for a list of such actions).

38 See footnote 4.

Box 3. Short-term Steps in Support for Further Market Development

1. **Recovery of the historical weather records which were lost in a fire in 1992.** Those datasets exist in magnetic tape format and cannot be read with current electronic devices. Those magnetic records should be transferred to an electronic format.
2. **Fixing existing weather datasets.** Weather datasets from 1992 to now are incomplete and cannot be used by the insurance market for modeling parametric indexes. It is possible to fill in the missing observations using statistics packages.
3. **Investing in expanding the density of weather stations.** The higher the density of weather stations, the more precise the weather modeling, particularly for areas with heterogeneous topography and presence of micro climates (the importance of this is for reducing basis risk in contract design).
4. **Improving agricultural yield statistics at the local level.** Historic and reliable yield information is needed to design index-based contracts. This is because historical data is required to build risk models to estimate the losses and the parameters.
5. **Mediating an agreement between insurers and the Meteorological Service of Jamaica (JMS).** JMS will play an important role in becoming the official entity that supplies weather information since JMS administers the weather stations and is the organization that officially provides the records that trigger the contract payments. There is a legal responsibility behind these services.

This option supports the institutional development of the private insurance market. This support would help to improve the capacities to assess and manage agricultural risk at different organizational levels. A list of differentiated technical assistance is recommended for the support of several public and private stakeholders including: the Financial Services Commission (FSC), the Meteorological Service of Jamaica (JMS), the Water Resources Authority (WRA), the Ministry of Agriculture (MOA), the National Irrigation Commission (NIC), the Commodity Boards, the Agricultural Development Authority, the Producers Market Organizations (PMOs), various farmers associations, local insurers, and financial intermediaries.

a. **The Financial Service Commission (FSC):** Revision of laws, regulations, and decisions that govern the activities of agricultural insurance companies in Jamaica; technical assistance could be provided to FSC to understand new products, be able to regulate them, and implement recommendations that can help develop the private agricultural insurance sector. Draft decrees and/or administrative decisions could be drawn up to make the development of the agricultural insurance market more efficient, especially in relation to the adoption of innovative instruments for managing and transferring risks.

b. **The Meteorological Service (JMS) and the Water Management Authority (WMA):** This technical assistance and public support will seek to enable the design and implementation of an information platform that will encourage the development of new and additional agricultural insurance instruments, and to define the public-private mechanisms for their implementation and sustainability. The activities anticipated are the design and implementation of an information services platform for Jamaica for agricultural sector risk analysis, supervision, and management, with access to both the insurance companies and other rural financial institutions. The design would include: (i) defining the mechanism of supply and feedback of information between the public sector (meteorological service, ministry of agriculture, statistics institutes, etc.) and the private sector (financial institutions, insurance companies, general public); and (ii) analysis of the institutional and financial (fiscal) viability of the platform. The starting point for defining the scope and characteristics of the platform will be the current information required by the public sector for improving the emergency farmer compensation scheme, as well as the needs of the insurance companies (and other financial institutions).

c. **The MOA:** This would entail building the agriculture risk mapping and risk assessment capacity of the public sector to monitor agriculture risk management activities both from the public and the private sector. The MOA has already a team working on the data bank that could incorporate GIS technology and agro-meteorology to produce information for public policy decisions.

d. **Insurance companies:** It would be important to support private insurance firms in the design, implementation, and evaluation of both index-based and traditional agricultural insurance instruments. Pilot projects could be selected through a bidding process financed from public grants for the design and implementation of innovative instruments that can help farmers to manage and transfer agricultural production risks. A technical assistance agreement could be signed with insurance or private companies for each pilot project. The project would include the following elements (as a minimum): (i) innovation either in product or delivery; (ii) the potential for reaching small and medium-sized producers; (iii) reduction in the transaction costs of supplying insurance; (iv) replicability; and (v) type of production. The benefits of designing and implementing those innovative instruments are: (i) the demonstration effect for developing the agricultural insurance market; (ii) the expanded coverage of risks in rural areas, especially to small and medium-sized agricultural producers; and (iii) capacity building for using agriculture risk modeling tools.

e. **Banks and other financial institutions:** it would be important to undertake a specific capacity building program for agriculture credit officers and rural financial institutions to promote the use of innovative agricultural insurance instruments. Promotion and training activities will seek to adapt the use of different instruments in agricultural risk management to the needs of financial institutions. The activities would seek the promotion and dissemination campaigns aimed at the clients of rural financial institutions and credit officers and on the benefits of using innovative agricultural insurance instruments.

VII. Final Remarks and Recommendations

The MOA currently has the opportunity to make the transition from an ex-post to an ex-ante management of weather risks in the agriculture sector. The MOA has taken the initial steps to move from an unplanned system of responding to natural disasters, to an ex-ante financial risk management framework that addresses the various risk layers of the agriculture sector in a more efficient and effective manner. For extreme catastrophic events, there is an important fiscal risk involved associated with the provision of basic social support to farmers. This support has usually been approved from additional unplanned budgetary resources in moments when it is often difficult to increase taxes. Since Jamaica is a high weather risk country, the need for additional disaster payments (higher than resources available) will require careful rules, triggers, and targeting.

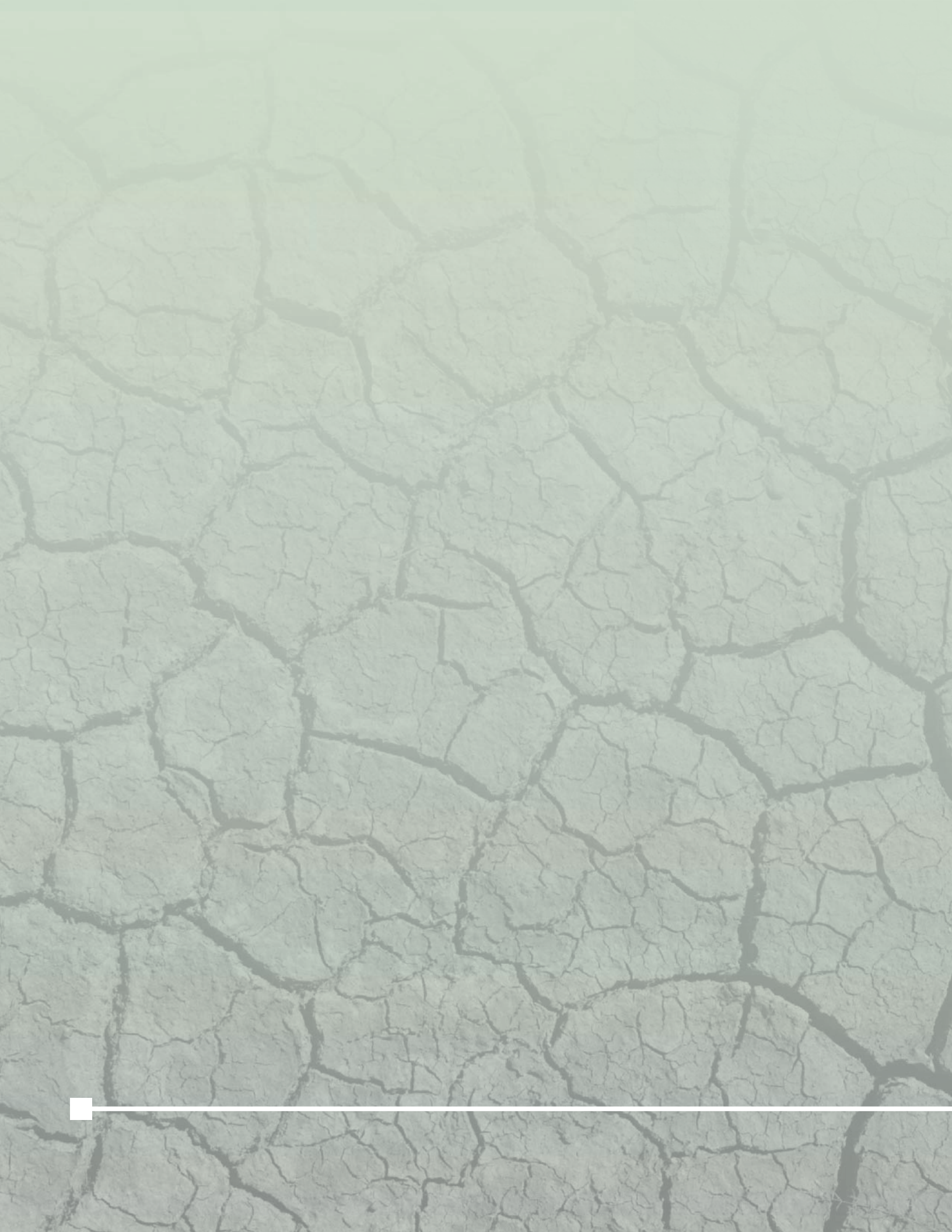
The findings of this pre-feasibility assessment present possible options for introducing alternative risk management mechanisms to improve agriculture risk mitigation practices and coping mechanisms to small farmers to reduce volatility of agricultural incomes in St. Elizabeth and Portland. The assessment has found that lower levels of risk (i.e. frequent droughts) can be covered by savings, farming practices, and assets of farmers, through additional credit, or through risk mitigation measures. However, for higher risk levels (i.e. hurricanes or severe droughts that are less frequent) that have caused more damage to the agricultural sector, the MOA, through RADA, has stepped in the past, and supported farmers in a non-effective way. As a consequence of this, the four options considered in this report suggest: improving the existing DAP for the provision of disaster assistance, strengthening the risk financing of the DAP, and finally, crowding-in and supporting the development of commercial insurance market.

It is important to note that the options are not mutually exclusive; however, implementing all of them in parallel would involve additional fiscal resources and outside technical expertise to support government efforts. Table 16 below suggest possible timing based on short-term, medium-term, and long-term objectives.

Table 16. Approximate Costs and Timing of Developing Options

	Feasibility		Implementation	
	Timing	Cost (US$)	Timing	Implementation/Set-up[39] Costs (US$)
1. Improving the Disaster Assistance Program (DAP)	4-6 months	200,000.-	1-2 years	1 million
2. Improving the risk financing system for the DAP (Public Scheme)	6-8 months	300,000.-	1-2 years	1-2 million (*depends on thresholds for public support)
3. Complementing the DAP with a Public/Private Scheme	10-12 months	200,000.- to 500,000.-	2-3 years	100,000.-
4. Development of innovative risk management and agriculture insurance market	3-4 months	200,000.-	3-5 years	1 million

39 Excludes recurrent costs (once the system is operating). The assessment on recurrent costs will be done in the feasibility stage.



Annex 1. Area Under Cultivation at Census Day in Portland and St. Elizabeth Parishes, 2007

Table 17. Area Under Cultivation, 2007

		Portland		St. Elizabeth	
ID	Crops	Total Ha	%	Total Ha	%
1	Cabbage	30.03	0.32	116.47	0.82
2	Carrot	56.74	0.60	530.87	3.72
3	Pumpkin	90.93	0.96	420.63	2.95
4	Tomato	35.53	0.37	453.45	3.18
5	Other vegetables	83.12	0.87	502.38	3.52
6	Hot Pepper	77.94	0.82	225.29	1.58
7	Sweet Pepper	20.56	0.22	338.40	2.37
8	Scallion	1.05	0.01	451.35	3.16
9	Thyme	1.42	0.01	47.23	0.33
10	Red Peas	14.16	0.15	106.43	0.75
11	Gungo Peas	14.61	0.15	241.68	1.69
12	Peanuts	4.25	0.04	1320.33	9.26
13	Potted Plants	6.92	0.07	34.68	0.24
14	Orchids	13.76	0.14	63.58	0.45
15	Other Blooms	1.25	0.01	8.98	0.06
16	Other Horticulture	5.30	0.06	50.18	0.35
17	Grass for Hay/Mulch	3.08	0.03	502.54	3.52
18	Coco	258.76	2.72	174.82	1.23
19	Irish Potato	0.61	0.01	26.63	0.19
20	Sweet Potato	72.64	0.76	450.05	3.16
21	Cassava	70.05	0.74	622.20	4.36
22	Dasheen	358.19	3.77	175.23	1.23
23	Yam	462.60	4.87	774.73	5.43
24	Cereals (Incl. Corn)	43.14	0.45	253.94	1.78
25	Pineapple	90.57	0.95	436.98	3.06
26	Watermelon	6.96	0.07	445.68	3.13
27	PawPaw	18.70	0.20	77.94	0.55
28	Other Fruits	48.32	0.51	62.12	0.44
29	Ackee	35.01	0.37	99.35	0.70
30	Banana	1765.16	18.56	470.16	3.30
31	Breadfruit	84.82	0.89	17.60	0.12
32	Cocoa	77.94	0.82	9.96	0.07
33	Coconut	1401.99	14.75	116.02	0.81
34	Citrus	98.66	1.04	183.24	1.28
35	Coffee	2232.69	23.84	97.69	0.69
36	Mango	32.94	0.35	58.36	0.41
37	Pimento	242.00	2.55	240.99	1.69
38	Plantain	1382.00	14.54	213.47	1.50
39	Sugar Cane	122.13	1.28	3503.84	24.57
40	Other Perm. Crops	42.90	0.45	99.63	0.70
41	Sorrel	8.90	0.09	34.16	0.24
42	All Other Crops	89.76	0.94	201.37	1.41
	Total	**9508.07**		**14260.61**	

Annex 2. Jamaica Pre-feasibility Study, Synthesized Focus Group Data, January, 2010

I. PRODUCTION (CASH CROPS, FOOD SECURITY, DIVERSITY ON TYPES OF CROPS)

St. Elizabeth:

a) Stanmore Farmers´ Group

i. Within the high variety of crops that are grown by farmers, cassava and yam are resistant to water deficits.
ii. Cassava, yams and potatoes are the main cash crops and also play an important role in farmers' diet.
iii. Farmers grow their crops on disperse plots of land.
iv. Drinking water is used in agriculture.

b) Pepper Farmers´ Group

i. Legumes, vegetables and condiments are the main crops.
ii. The group is well organized.
iii. Farmers grow their crops on disperse small plots of land.
iv. Drinking water is used in agriculture.

c) Comma Pen Farmers´ Group

i. Short crops (legumes, vegetables and condiments) are mainly grown by these farmers. Scallion is the most important commercial crop.
ii. Farmers grow their crops on disperse small plots of land.
iii. Drinking water is used in agriculture.

d) Big Woods Farmers´ Group

i. The great majority of farmers raise livestock.
ii. Farmers said they received assistance from RADA on marketing.
iii. Farmers grow their crops on disperse small plots of land.
iv. There is a very high diversity of commercial crops, but two main food crops (cassava and sweet potato).
v. The great majority of farmers have a savings account.

Portland:

a) Windsor Castle Farmers´ Group

i. It seems a very well organized group. Farmers received assistance from RADA.
ii. Carrot is the main cash crop within the group. They have specialized facilities for their preparation and storage.

b) Chopstowe Farmers´ Group

i. Coffee is the main crop; banana/plantain crops are used on coffee plantations. Farmers mentioned that these crops were affected last year (2009) because of lack of water.
ii. Staple crops are the major crops used for food.

II. INCOME & RESOURCES (AGRICULTURE AND LIVESTOCK IMPORTANCE)

St. Elizabeth:

a) Stanmore Farmers´ Group

i. Animals (goats) are used by farmers in order to finance crops´ production costs and on extreme events (weather events).

b) Pepper Farmers´ Group

i. None of the farmers from this group borrow for agriculture; they sell their products (crops) and animals to finance agriculture.
ii. The great majority of farmers have a savings account.
iii. Livestock production is as important as agriculture.

c) Comma Pen Farmers´ Group

i. Livestock production is as important as agriculture.

d) Big Woods Farmers´ Group

i. The great majority of farmers have a savings account.
ii. Livestock production is as important as agriculture.

Portland:

a) Windsor Castle Farmers´ Group

i. Some of the farmers borrow for agriculture.
ii. The great majority of farmers have a savings account.
iii. Livestock production is as important as agriculture.

b) Chopstowe Farmers´ Group

i. Almost none of the farmers borrow for agriculture.
ii. The great majority of farmers have a savings account. It could be explained because they have better prices on the market for coffee production.
iii. Livestock is still important in spite of coffee specialization.

III. RISKS IDENTIFICATION

St. Elizabeth:

a) Stanmore Farmers´ Group

i. Farmers are vulnerable during extreme drought events. The majority of farmers identified drought as their main risk.
ii. Strong winds are related with hurricanes and an important risk for them.
iii. Peas, carrots, peppers and tomatoes are the most sensitive crops.

b) Pepper Farmers´ Group

i. Farmers are vulnerable during extreme drought events. The majority of farmers identified drought as their main risk.
ii. Rats seem to be a great risk for farmers.
iii. During the last El Niño phenomenon, all of them got affected by dry conditions.
iv. Livestock (goats) is prone to theft.
v. Pest and disease and rats are also risks.

c) Comma Pen Farmers´ Group

i. Farmers could reduce their risks if there was any irrigation system they could use for agriculture.
ii. Farmers need assistance in marketing their products. Price was cited as an important risk.
iii. Hurricanes are considered potentially valuable as they bring moisture to a very dry region.

d) Big Woods Farmers´ Group

i. It seems that strong winds affect crops production regularly (localized).
ii. Pests and diseases are as important as drought.

Portland:

a) Windsor Castle Farmers´ Group

i. The most important risk is drought. The majority of farmers identified excess rainfall and flooding as main second risks.
ii. Livestock theft is a disincentive to keeping animals.

b) Chopstowe Farmers´ Group

i. Drought affects greatly coffee production and quality of beans.
ii. Rats and theft were identified by farmers as important risks for agriculture.
iii. A farmer mentioned that almost all years she suffers from weather events.

IV. VULNERABILITY AND CAPACITY TO MANAGE RISKS (COPING STRATEGY)

St. Elizabeth:

a) Stanmore Farmers´ Group

i. Before getting in debt, farmers prefer to use their savings and sell their assets first.

b) Pepper Farmers´ Group

i. Before getting in debt, farmers prefer to use their savings and sell their assets first.
ii. A small loan group is established in this PMO and is helping 4 farmers.

c) Comma Pen Farmers´ Group

d) Big Woods Farmers´ Group

i. After a major event, farmers use their savings to cope, followed by assets sales and lower consumption.

Portland:

a) Windsor Castle Farmers´ Group

i. Farmers will use their savings, look for help from a family member and sell their assets after a loss.
ii. Farmers only sow carrots on Oct-Dec and may be one year until new production.

b) Chopstowe Farmers´ Group

i. Farmers will use their savings, look for help from a family member and sell their assets after a loss.

V. EXPERIENCE AFTER A LOSS (TYPE OF ASSISTANCE FARMERS HAVE RECEIVED, FARMERS´ PRIORITIES)

St. Elizabeth:

a) Stanmore Farmers´ Group

i. Irrigation could stabilize crop yields; especially during drought events (El Niño) and/or during the drought season (Dec-Mar).
ii. After the occurrence of a great event they would prefer to be provided with medicine, helped to repair their homes and kids´schools and replant later.
iii. After Hurricane Dean they did not get any help from the Government.

iv. Farmers said that fertilizers, animals (chicken), planting materials/seeds and tools are used by the Government to help farmers after a loss. However, that help is always insufficient for them to get back to business.
v. There is no availability of loans for agriculture.

b) Pepper Farmers´ Group

i. Irrigation could stabilize crop yields; especially during drought events (El Niño) and/or during the drought season (Dec-Mar).
ii. Almost none on this group has received help from the government/institution after an event.

c) Comma Pen Farmers´ Group

i. Some of the farmers have received fertilizers and vouchers after a loss.

d) Big Woods Farmers´ Group

i. The great majority of farmers has received some help from the government/NGO with seeds and fertilizers for agriculture.

Portland:

a) Windsor Castle Farmers´ Group

i. The great majority of farmers has received some help from the government/NGO with seeds and fertilizers for agriculture.

b) Chopstowe Farmers´ Group

i. Some of the farmers have received help from the government/NGO after a loss. It seems those farmers were not aware of the insurance scheme that was promoted by CIB in the past.
ii. The great majority of farmers have received some help from the government/NGO with seeds and fertilizers for agriculture.

VI. OPEN QUESTIONS (WILLING TO PURCHASE INSURANCE CONTRACTS)

St. Elizabeth:

a) Stanmore Farmers´ Group

i. There is a moderate interest in purchasing insurance contracts. Due to lack of funding, farmers will probably prefer not to increase their production costs by purchasing an insurance contract.
ii. The group considers itself as quite isolated and distant from government assistance.
iii. Irrigation is a key constraint for them. They use drinking water at high expense as there are no local water resources.

b) Pepper Farmers´ Group

i. Farmers have great interest in purchasing insurance contracts.
ii. Irrigation could allow most farmers to grow short crops (get revenue after 3 months) after the loss.
iii. Irrigation was stated as a better solution to drought than insurance.

c) Comma Pen Farmers´ Group

i. The group is realistic that drought mitigation is a priority rather than insurance, as it affects them every year in the dry season.
ii. One farmer listed their key needs as water, loans, and marketing support. They would like to dig wells to allow drip irrigation.

d) Big Woods Farmers´ Group

i. Depending on the type of coverage that insurance could provide, some of the farmers would be willing to purchase insurance contracts.
ii. Irrigation could allow most farmers to grow short crops (get revenue after 3 months) after a loss.

Portland:

a) Windsor Castle Farmers´ Group

i. A main concern of farmers is the marketing of crops. They are getting assistance from RADA.
ii. Access to finance is difficult; the group is well informed on financing issues and need to become better organized (e.g. keeping records).

b) Chopstowe Farmers´ Group

i. There is a moderate interest on the purchase of insurance contracts.
ii. It seems it is not a very well organized group. The communication between RADA officers and this group seems not to be efficient.

Annex 3. Summary Features of Key Agriculture Insurance Products

Table 18. Summary Features of Key Agriculture Insurance Products

	Product	Summary	Perils	Benefits	Challenges
TRADITIONAL PRODUCTS	Named Peril Crop Insurance	✓ Specific perils ✓ Damage based policy ✓ Measure percent damage in field ✓ Agreed sums insured ✓ Operated in private sector ✓ Generally unsubsidized ✓ Experience in private sector	✓ Main perils: hail, fire ✓ Other: frost, freeze, wind ✓ Suited to localized, independently occurring sudden-acting perils ✓ May include quality loss	✓ Simple policy ✓ Limited farmer details needed at point of sale ✓ Transparent loss assessment ✓ Product experience ✓ Manageable adverse selection & moral hazard (esp. for hail)	✓ Individual farmer loss assessment ✓ Loss assessment cost in small farmer systems ✓ Not suited for complex perils especially drought and pest
	Multiple Peril Crop Insurance (MPCI)	✓ All perils, few exclusions ✓ Yield based policy ✓ Measure harvested yield ✓ Compare to a percent of average yield ✓ High cost - often requires subsidy ✓ Problematic for small farms ✓ Concentrated in a few countries (USA, Canada, RSA) ✓ Many failed attempts	✓ A wide list of perils ✓ Difficult to exclude perils as causes of loss cannot be identified ✓ Includes management influences ✓ May include quality loss ✓ Occasionally includes some price risk	✓ More easily made into a "universal" product type ✓ Limited technical adaptation required for different crops ✓ Guarantees farmer production/income ✓ Attractive concept ✓ Indemnifies each farmer according to yield	✓ Individual farmer loss assessment; major loss adjustment task; impartial loss adjustment difficult ✓ Adverse selection (worst farmers benefit) ✓ Moral hazard (exploitation of policy) ✓ Major work to set up yield history for each farmer, poor data ✓ High premium and admin cost ✓ Not suited where farms are small
INDEX BASED PRODUCTS	Area Yield Index Insurance	✓ Farmers grouped into assigned areas (e.g. district, county) ✓ MPCI but on area average yield ✓ All farmers in area treated equally ✓ Effective where similar exposures affect whole districts ✓ Largest program is NAIS (India)	✓ As MPCI	✓ No adverse selection, moral hazard, individual farmer loss adjustment ✓ Low admin costs ✓ Can address catastrophe perils affecting group ✓ Enrollment of farmers is easy ✓ Captures all causes of yield loss	✓ Local perils (e.g. hail) will not result in payout ✓ Yield history at local district level often not available or reliable ✓ Basis risk at local level depending on district area and peril
	Weather Index Insurance	✓ Payouts based on weather station measurement ✓ Index trigger, exit, increments set to expected loss of yield ✓ Can be complex to design ✓ Limited experience to date	✓ Main: rainfall deficit and excess; high, low, or prolonged temperatures ✓ Other: High wind, sun ✓ Combinations of above ✓ Basis risk minimized for gradual events	✓ No adverse selection, moral hazard, individual farmer loss adjustment ✓ Can address catastrophe perils affecting group ✓ Transparent/objective Met data ✓ Easier to reinsure	✓ Basis risk is key challenge ✓ Setting up the index parameters ✓ Need good meteorological data, agronomic data & crop modeling ✓ Difficult to correlate damage for sudden-impact weather

Source: CRMG Training material

Annex 4. RADA Farmer Registration Form

Stakeholder Info			
Company Name (If Any):			
First Name:	Middle Name:	Last Name:	Alias:
Residential Address Street:	**Business Address** Street:	ID Type:	ID #:
District:	District:	Gender: Male Female	Date of Birth:
Post Office:	Post Office:	TRN:	
Parish:	Parish:	Cell Phone:	Fax:
Telephone:	Telephone:	E-mail:	

Profile				
Respondent:	Manager:	Live on farm (Y/N):	Livelihood:	Education Level:
Main-Occupation:	Agri-Institution:	Qualification:	Agri-Training (Y/N):	
Training Method:	Main Agri-Activity:	Nearest Police Station:	JAS Branch/Farmers Group:	
Holding Start Year:	Farmer Type:	Remarks:		

Main Information Sources (Top 3-5)

Property												
Property ID	Extension	District	Tenure	Status	Size		Usage		Volume	Folio	Distance from Road	Remarks
					Area	Units	Area	Units				
01												
02												
03												
04												

Crop										
Property ID	Crop & Variety	Area	Unit	Crop Count	Planting Date	Major Market & % Sold		Minor Market & % Sold		Remarks

Crop Practice						
Crop	Land Preparation/ Husbandry	Crop Care/ Manage	Nutrient (Fertilizer/ Manure)	Water/ Irrigation	Post Harvest	Remarks

Livestock							
Property ID	Livestock Breed & Stage of Life	Count/ Colonies	Capacity	Major Market & % Sold		Minor Market & % Sold	Remarks

Livestock Practice						
Livestock	Husbandry	Livestock Care/ Manage	Nutrient	Water	Post Harvest	Remarks

ID Type
01. Passport
04. National ID
05. Drivers License

Respondent
01. Holder
02. Spouse
03. Child
04. Relative
05. Manager
99. Other

Manager
01. Holder
02. Hired Manager

Livelihood
01. Farming

Occupation
01. Armed Forces
02. Legislators, Senior Officials and Managers
03. Professional
04. Technicians and Associated Professionals
05. Clerks
06. Service Workers, Shop, Market Sales Workers
07. Farmer
08. Skilled Agricultural and Fishery Workers
09. Craft and Related Trade Workers
10. Plant and machine Operators and Assemblers
11. Elementary Occupations
12. Never Worked
99. Other

Education
01. None
02. Primary/Preparatory
03. Secondary
04. Tertiary (Excluding University)
05. University
99. Other

Training Method
01. Demonstration/Field Day
02. Institution
03. None
99. Other

Agri-Institution
01. Farmers Training Centre
02. Eltham Training Centre
03. Montpelier Training Centre
04. Knockalva Agricultural School
05. Dinthill Training Centre
06. Holmwood Training Centre
07. Ebony Park Training Centre
08. Sydney Pagan High School
09. Jamaica School of Agriculture
10. C.A.S.E.
11. UWI-St. Augustine, Trinidad
12. Overseas College/University
99. Other

Qualifications
01. None
02. Certificate
03. Diploma
04. Degree
05. Associate Degree
99. Other

Main Agri-Activity
01. Traditional Export Crops
02. Non-Traditional Export Crops
03. Pig Farming
04. Beef Cattle
05. Dairy Cattle
06. Poultry Farming
07. Fish Farming
08. Horticulture
11. Rabbit/Small stock
12. Goat Rearing
13. Sheep Rearing
14. Small Ruminants (Goat & Sheep)
15. Ornamental Fish
16. Freshwater Fish
17. Apiculture
18. Nursery
99. Other

Farmer Type
01. Regular
02. Organic Farming Only
03. Green House Farming Only
04. Mixed (Regular, Organic & Green)

Information Source
01. Agri Ext. Officer- RADA
02. Agri Ext. Officer-Commodity Assoc.
03. Radio
04. Television
05. Newspapers & Magazines
06. Other Farmers
07. J.A.S.
08. McDonald Almanac
09. Farm Store
99. Other

Tenure
01. Owned – Registered Title
02. Owned – Other
03. Rented (From Others)
04. Leased
05. Squatting – Government Lands
06. Squatting – Private Lands
07. Rent Free – Family Land
08. Rent Free – Other
99. Other (specify)

Status
01. Active
02. Inactive

Area Units
Sq. Square
A. Acre
Ha. Hectare

Market
01. Higgler
02. Hotel
03. Supermarket
04. Parochial Market
05. Wayside Market
06. Agro-Processor
07. Exporter
08. Home Consumption
11. Guest House
12. Restaurant
14. Farm Store
15. Cottage Industry
16. Shut in Institution
17. Middleman
18. Householder
19. Schools
21. Domestic
22. Green Grocery
23. Municipal Market
24. Butcher
99. Other

Crop & Livestock Type Usage
01. None
02. Sub-Optimal
03. Optimal

Annex 5. Operational Considerations Regarding a Voucher Delivery Scheme

a. Printing of Vouchers

The cost of printing a voucher varies a lot with the security elements to be considered and the design of the voucher (colors, stamps, etc.). This in turn depends on whether the voucher is to be liquid like money (no names, signatures, addresses) or is similar to a check or certificate with the name of the beneficiary, address, ID code, etc. It is much easier (faster) to distribute a liquid voucher than a certificate but it is much more costly due to the necessary security measures.

b. Distribution of Vouchers

Distributing vouchers is a complex and time consuming task. Several alternatives including RADA's extensionists, PMO's representatives, financial agencies, or post office distribution could be considered. If a reasonable price can be agreed upon with financial agencies or the Post Office, this can be the best way. Financial agencies, like credit unions or PC Bank can take advantage of providing such services of voucher distribution to offer other financial instruments and products to farmers.

c. Redemption of Vouchers

For the success of the program, it is required that vouchers can be paid very quickly (3-4 days). Otherwise input suppliers will not accept vouchers or discount them according to expected time delays and inflation and foreign exchange risk producing a loss in voucher value to the beneficiary. Concerns about delays will be key to have suppliers accept vouchers on a regular basis. It is important to keep in mind that some fraud may occur and diversion to consumption of non-allowed items may occur. A way to reduce these risks is by being very clear about beneficiary responsibilities and penalties in case of misbehavior and put in place a system for random checking of voucher use by beneficiaries. It is very important to require that beneficiaries keep invoices and that those be ready for presentation when required by agricultural authorities up to a specified period of time. Some RADA staff should be appointed to undertake these activities. To ease the policing aspect of this activity, RADA can complement (and probably announce) these activities as a program involving a heavy dose of technical assistance to farmers.

There will probably also be attempts of issuing fraudulent invoices, especially if vouchers are not very liquid, and beneficiaries want some cash. This will not be easy to control. Again, one way is by establishing very clearly the operation rules and responsibilities and the penalties for fraudulent behavior accompanied by a random check of invoices (against beneficiaries purchases). Also, a strict control of payments of the VAT by suppliers will be very helpful.

Proposed Actions

- Appoint a task force with specific written responsibilities for the design and implementation of an improved disaster management program for farmers based on distribution of vouchers to farmers after a natural disaster is declared in the district.

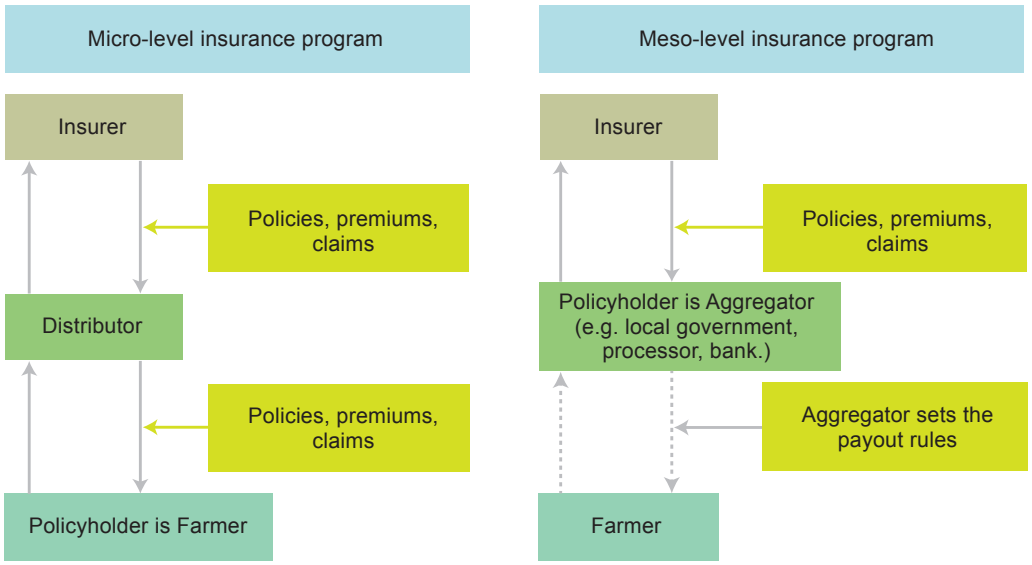
- Risk Assessment (hazards, vulnerability, and exposure profile) within districts of each parish, to determine the most appropriate triggers that respond to farmer needs, diminish basis risks and moral hazard, and

are realistic with fiscal constraints. This will require risk modeling, starting with hurricane and associated rainfall.

- Among the task force initial activities will be to arrange ex-ante budgetary allocations to finance the program.
- Determine clearly defined farmer selection criteria and rules for registering, and calculations of number of beneficiaries and vouchers.
- Design vouchers to be used (security elements, colors, etc.).
- Produce detailed estimates of additional administrative cost of the program.

Annex 6. Organization of Micro-level or Meso-level Insurance

Figure 12. Micro and Meso-level Insurance Programs



Micro-level Organization

In Jamaica, findings of the fieldwork and interviews with farmers and RADA suggest that a micro-level insurance scheme would be highly challenging from an organizational standpoint, even for a weather index insurance product. Organizationally, the following considerations apply:

Channels for product distribution and premium collection:

- Registration (enrolment) for insurance purposes, in advance of the crop season, is needed, in order to issue the insurance policy to a named insured individual; similar considerations to identify bona fide farmers apply to registration for disaster compensation, and would exist for an insurer.
- Insurance distribution channels to farmers are poorly developed or non-existent. Insurance supply to rural areas is highly limited, and insurers do not count farmers as a significant client group.
- Formal agricultural credit is limited for small farmers. Credit linkage can form a distribution channel for insurance, using the financial institution.
- There are no rural organizations with universal linkages for insurance product distribution; however, there may be specific exceptions, for example contract farming or similar marketing arrangements.
- The average economic size of farmers is small. Even with a highly simplified system of insurance certificate (or "coupon" for weather index insurance), dealing with a large number of individual farmers is challenging.
- PMG's do not currently operate any financial services, although do act as a valuable focal point for grouping farmers.
- Collection of premium under a micro-level scheme would be highly challenging, even for a highly simplified product.
- Affordability of the product is critical.

Claims management:

- Claims management for traditional indemnity insurance products (involving field loss measurement) is not considered feasible; however weather index insurance payments could be made relatively easily, provided farmers were properly enrolled. Many farmers have bank accounts, and coupon (voucher) payout systems can be developed. The possibility of making transparent payouts, without field assessment, is one of the most important advantages of weather index insurance, whilst noting that technical considerations (section 4.3) make design of a micro-level product challenging.
- JAS represents farmers as a lobby group, but does not operate or intermediate financial services for farmers; they also act in reporting to damages to RADA to lobby for government relief; they would not have an obvious role in claims management.
- RADA has an advisory rather than business intermediary function for farmers (but is responsible for administering field level support for government assistance); comments are provided on RADA's role in a meso -level proposal.

Education and extension:

- There is limited experience of insurance by farmers, which means that any future insurance scheme would require high educational efforts, including distributors, supervisors, and farmers. The relationship between the insurance and the disaster relief system would need careful explanation.
- Introduction of *any* type of insurance should be accompanied by improvements in the transparency and setting of operational rules for disaster relief.

The international experience in organization of weather index insurance is that selling the product as a "stand-alone" (voluntary) proposition results in little demand from farmers. Farmers purchase insurance if there is a value proposition beyond conventional insurance, such as unlocking access to credit.

Meso-level Organization

A meso-level structure is a potential viable option for consideration. In the presence of restrictions regarding the depth of agriculture credit for small farmers and the linkage to processing or value chains (as noted above), there are several options presented in this assessment. Some of them could be explored in parallel; however the main focus would be in moving forward with a feasibility assessment of one of the options where the public sector would act as an "aggregator" of catastrophic agriculture risks.

A risk transfer instrument for farmers would necessarily need to be complimentary to the public sector's response program in case of a natural disaster. As this report has shown, the public sector has an important role in supporting farmers in St. Elizabeth and Portland, in particular after a natural disaster. The assessment shows that the Government should seek to improve its existing system of supporting farmers after a natural disaster as a necessary condition before moving forward with the feasibility, design and implementation of any new mechanism.

In particular, the institutional infrastructure RADA offers through its extension services and Farmer Registry is an excellent basis to improve support to farmers in an ex-ante and ex-post fashion. In particular, the findings show that there is significant room for using the existing voucher system as a means of ensuring that farmers affected by a natural disaster will be receiving a minimum income compensation to allow them to get back on their feet and back to business in the next cropping cycle (usually no longer than 3 months).

Annex 7. Agriculture Lending in Jamaica

As can be seen in Table 19 below, NPCBs portfolio in Portland is currently invested largely in the agriculture sector in terms of number and value of current loans. Current agriculture loans amount to 877, and considering that the estimated number of farmers in Portland are 8,000, this could potentially mean that at least 10% of farmers in this parish have loans with NPCB. We observe that default rates in the agriculture sector (below 365 days) is comparable (and often better) than other sectors. In part this could be due to the lack of significant natural disasters during 2009.

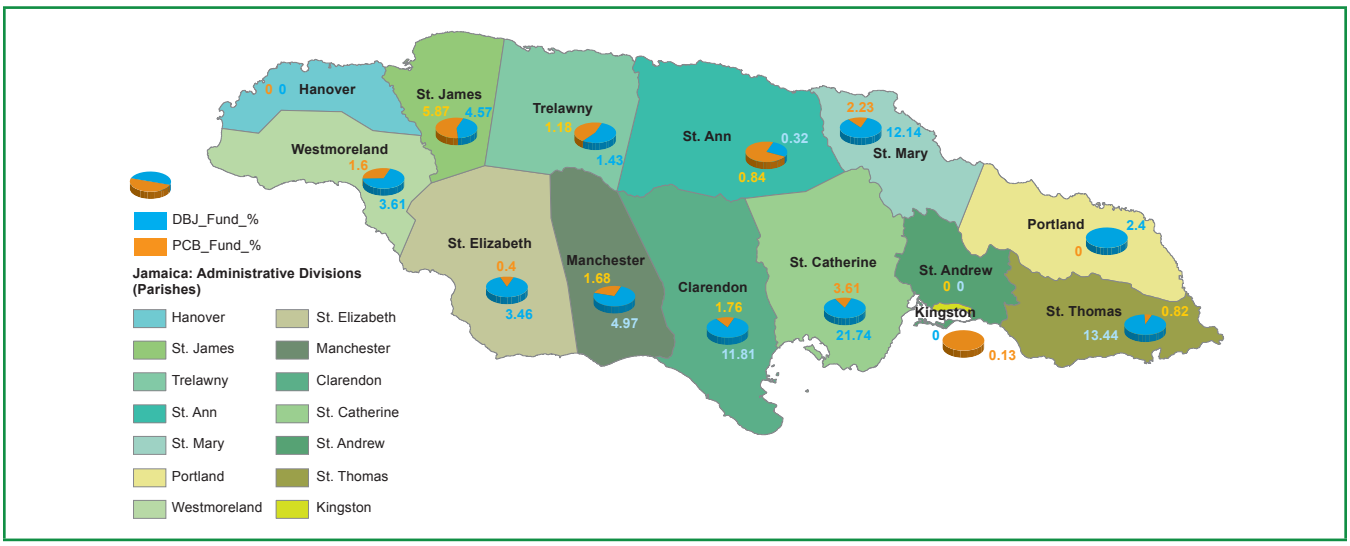
Table 19. National Peoples' Cooperative Bank Portfolio in Portland (2009)

Delayed payments (% of portfolio)	Agriculture	Manufacturing	Services
1-29 days	10%	12%	20%
30-59 days	7%	7%	8%
60-89 days	4%	2%	3%
90+ days	4%	1%	2%
Less than 365 days	25%	22%	34%
Number of Loans (% of total portfolio)	43%	13%	44%
Value of Loans (% of total portfolio)	64%	8%	28%

Source: NPCB (2009)

However, looking at NPCB's longer term default rates for outstanding loans above 365 days, the agriculture sector has 67% of the overall bad debt portfolio, with a total of 2,000 farmers in default with NPCB. This represents 25% of farmers of Portland currently in default. Nation-wide (see Figure 13 below), the bad debt varies across parishes. It is important to note that approximately 80% of the total bad debt portfolio of NPCB comes from credit lines from the Development Bank of Jamaica (DBJ), which has been promoting credit to the sector by extending low interest rate loans with certain guarantees to the on-lending agency. Local financial institutions such as NPCB provide loans that range from J$100,000 (US$125) to J$10 million (US$12,500), but these loans are securitized through collateral such as land and/or equipment. The main agriculture products currently being financed by NPCB in Portland include coffee, poultry and to a lesser degree mixed crops such as pineapples.

Figure 13. 2009 Assessment of Bad Debts from NPCB



In St. Elizabeth, given its different production structure (no coffee production and a large number of small farmers), the situation of the formal credit is significantly lower in relative terms. The St. Elizabeth Cooperative Union recorded 169 loans for 2008, which although represented 30% of the total number of productive loans[40] given that year and a 50% increase compared to 2007, is still less than 1% of farmers in the parish and less than 2% of the total value of the loans provided by that credit union in 2008. Other financial institutions in St. Elizabeth also viewed farming as too risky to lend without significant collateral. Land, property and/or cash were needed in order to secure loans with most financial institutions in the parish.

At the national level, we observed that agriculture lending has been decreasing, not only in terms of levels, but also as a percent of overall lending. Furthermore, we observe that while average loan amounts have increased for all sectors, for the agriculture sector average loans amounts have tended to decrease (see Table 20). This is a sign that not only access to formal finance (credit) is increasingly restricted in the agriculture sector, but that those farmers that can access formal credit, cannot access the level of resources that they could access before.

Table 20. Overall Lending in Jamaica (US$)

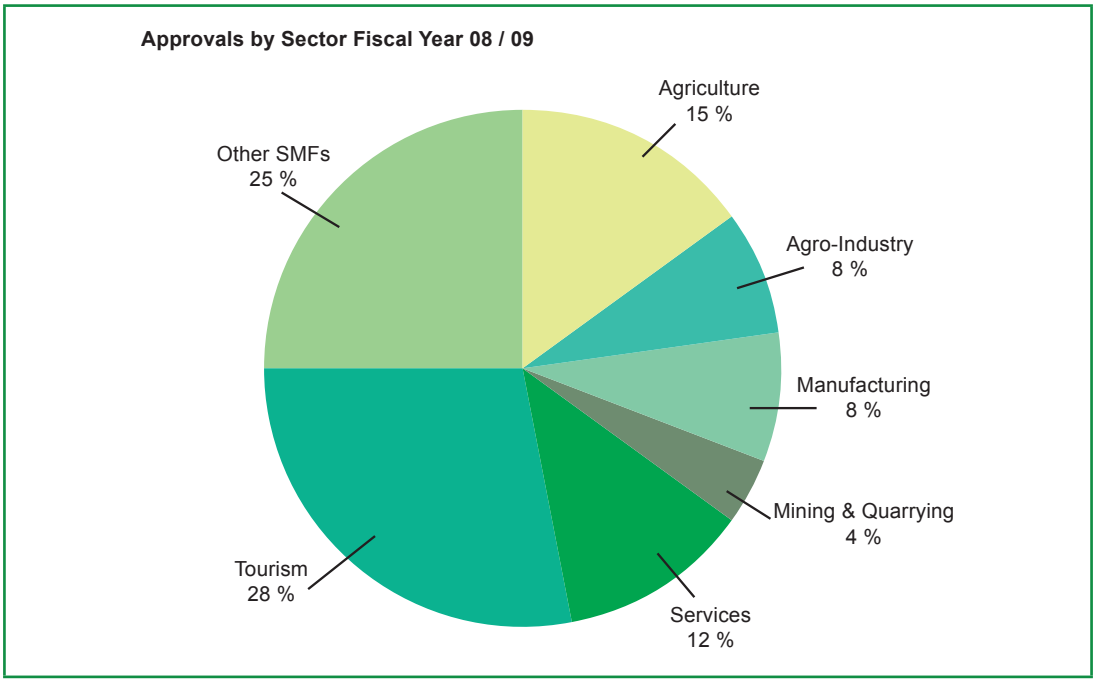
Year	Loans All Sectors	Loans Agriculture	Percent	Avg Loan Size	Avg Loan Size (Agriculture)
2002	18,278,400.00	4,012,164.80	21.95	82,331.20	41,798.40
2003	33,992,000.00	2,950,472.00	8.68	196,481.60	30,732.80
2004	13,921,600.00	2,625,414.40	18.86	108,763.20	25,491.20
2005	27,944,000.00	2,922,640.00	10.46	216,619.20	51,273.60
2006	14,034,462.40	1,643,208.00	11.71	173,264.00	30,430.40

Source: Ministry of Agriculture, 2009

40 "Productive loans" is used in this report to define the loans for productive activities, vs. consumer loans (housing, cars, appliances, etc.).

However, at a national level, the DBJ is *on-lending* significant amount of resources to the agriculture and agribusiness sector. In 2008, a total of US$835,000 were given in credit to financial institutions to on-lend to the agriculture sector, which represented 23% of the total portfolio approved that year (see Figure 14). That is probably for commodity exports, but not for the vegetable farmers in St. Elizabeth.

Figure 14. Loans by the Development Bank of Jamaica (DBJ)



Annex 8. Maps of Hurricane Paths in Jamaica

Figure 15. Cyclones tracking during the 1970´s

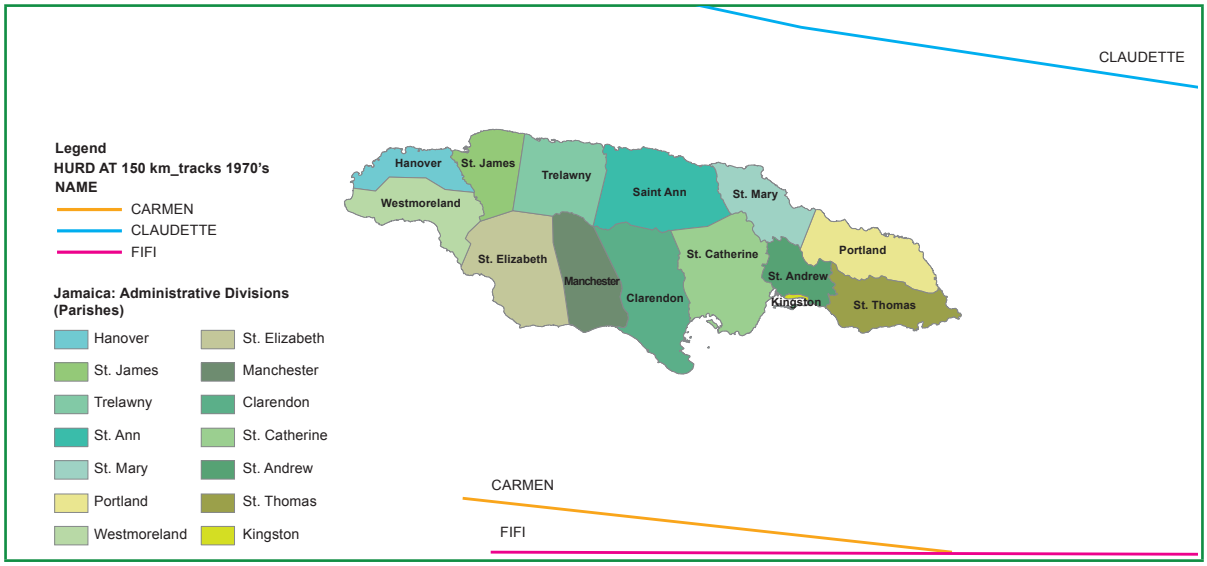


Figure 16. Cyclones tracking during the 1980´s

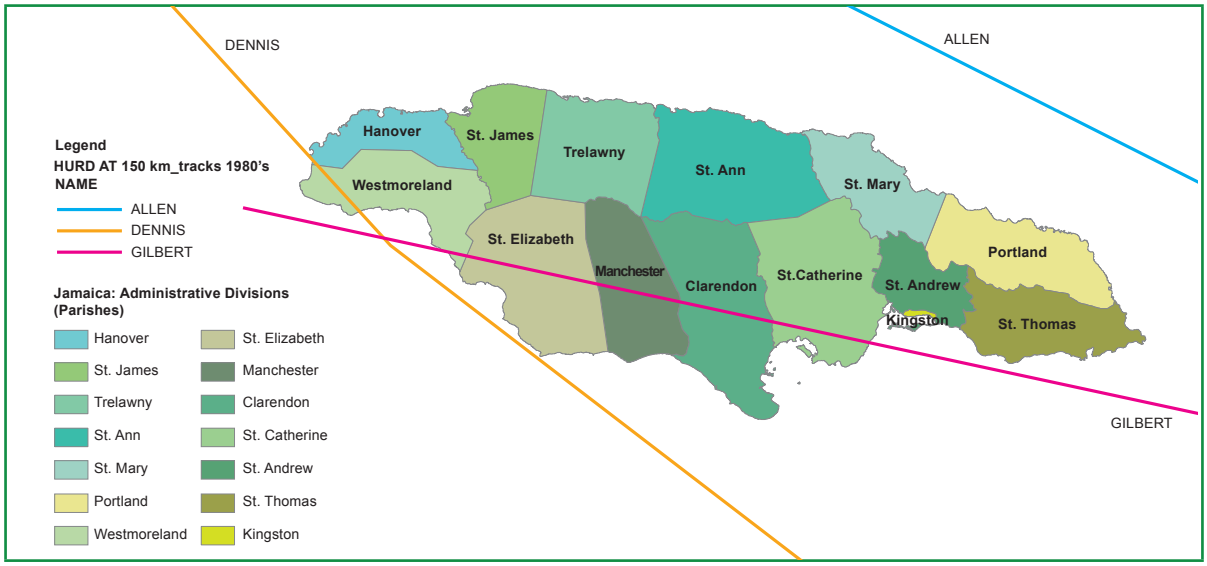


Figure 17. Cyclones tracking during the 1990´s

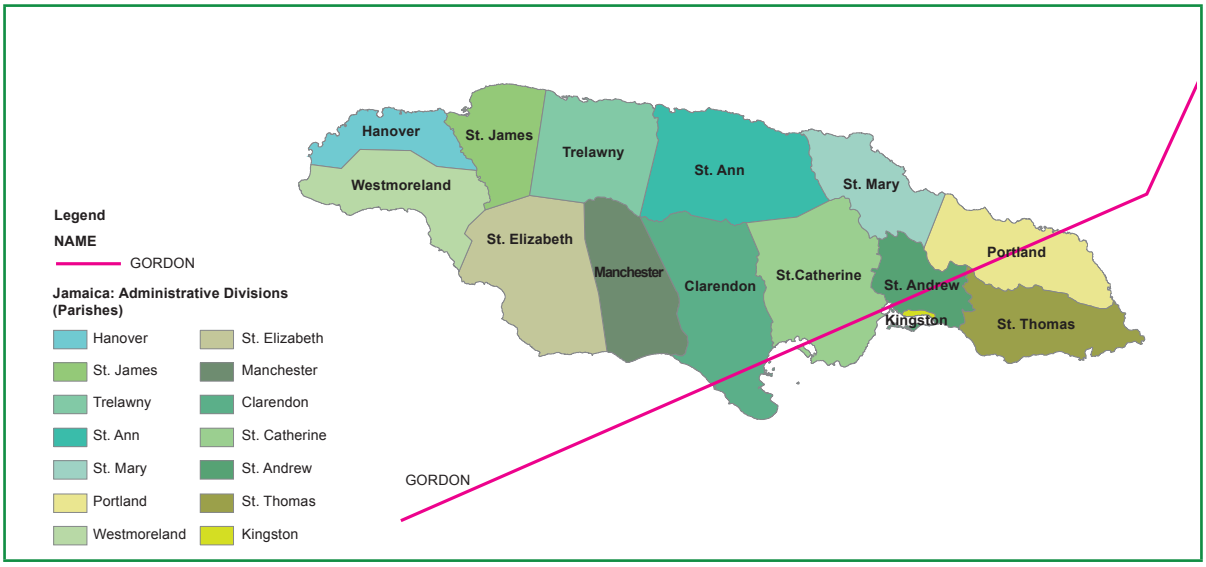
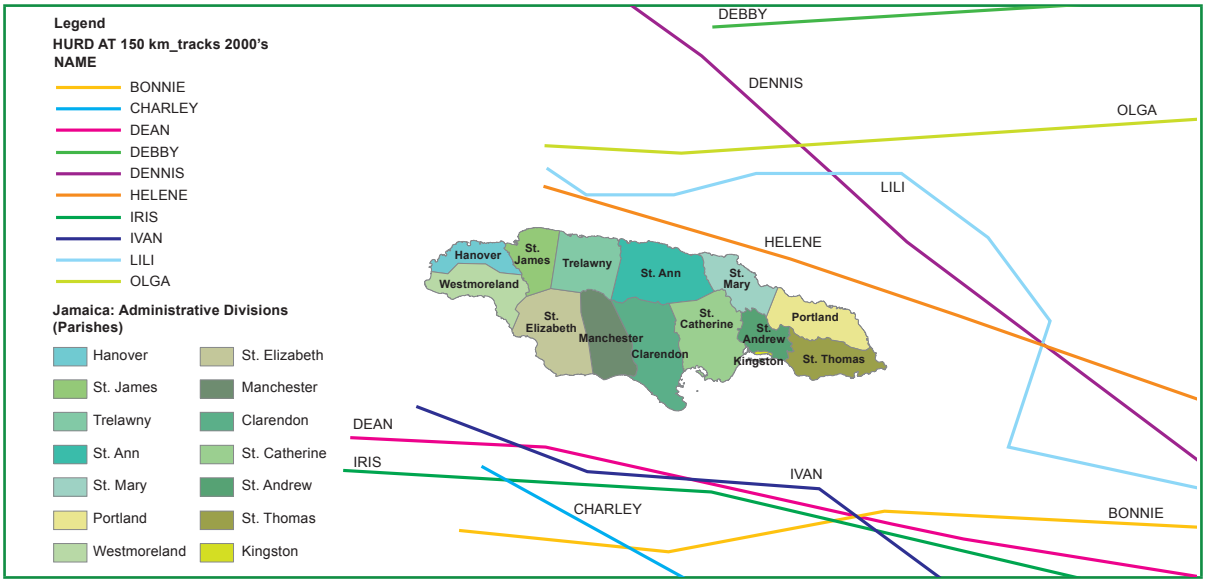


Figure 18. Cyclones tracking during the 2000´s



Annex 9. Differences between Disaster Assistance and Insurance

Risk transfer options for farmers in Jamaica could include both "assistance and compensation" and "insurance" within a broader context of an Agricultural Risk Management Strategy. Disaster assistance and insurance are not mutually exclusive (in fact could be highly complementary), but must be part of the basic elements of a disaster risk management (DRM) and disaster risk reduction (DRR) strategy (see comprehensive proposals in Spence, 2009)[41]. The Table below summarizes the main differences between "disaster assistance" and "insurance" in agriculture, based on international experience.

Table 21. Differences Between Disaster Assistance and Insurance for Farmers

Item	Disaster Assistance	Insurance
Contractual basis	Non-contractual	Legal contract exists between insurer and insured
Enrolment	Varies, but normally farmers need to be registered in advance	Farmers are always enrolled in advance
Compensation or payout rules	General principles may be stated, but rarely specific procedures	Stated in the insurance policy
Implementing agency	Typically Ministry of Agriculture, or National/Local Government disaster agency	Insurance company (and appointed agents or adjusters)
Funding	Examples: national disaster fund, funds diverted for the emergency, or donor funds. Farmer contribution is rare.	Insurer/reinsurer, through premiums collected (sometimes including premium subsidy)
Application of the assistance	- Humanitarian relief (in kind) - Rehabilitation of public goods - Assistance to farmers (in kind or cash/vouchers) - Other (food for work, contingent cash payments)	- Compensation for crop loss or damage; livestock loss, etc. (in traditional indemnity insurance) - Pre-agreed payout related to an index measurement (in index insurance)

Source: Spence, 2009

41 Spence, B (2009). *Agricultural Disaster Risk Management Plan – Jamaica*. Final Draft, May 2009. Applied Disaster and Emergency Studies Department, Brandon University, Canada.

opportunities for all