A PUBLIC STRATEGY FOR FINANCIAL WEATHER RISK MANAGEMENT IN AGRICULTURE
HAITI

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I – INTRODUCTION

Due to its geological features and its geographic location in the Atlantic hurricane belt, Haiti is exposed to many natural and weather risks that cause significant damage to the Haitian economy, especially to its agricultural sector. A consequence of the devastation of the 2008 Hurricane season (Faye, Gustav, Hannah and Ike) was the heightened awareness of Haiti's fragility to weather events by the Haitian government and the donor community.

Besides immediate measures that were taken to provide relief to the population in the affected areas, the Ministries of Agriculture (MARNDR) and Economy and Finance (MEF) decided to strengthen weather risk management in order to reduce the financial impacts of weather hazards on the agricultural sector and the haitian economy as a whole. By improving the management of agriculture weather risks, the agriculture sector would be in a better position to grow in a sustainable manner preventing farmers from dropping back into poverty after systemic weather shocks. This report is part of the World Bank technical assistance to the Government of Haiti (GoH), particularly the Ministries of Agriculture (MARNDR) and Economy and Finance (MEF), for the design of a Public Sector strategy for financial management of weather risks in the agriculture sector.

This report presents basics information and analysis for developing a financial strategy for managing agriculture risks. The aim is to support the GOH in making the agriculture sector more resilient to weather hazards and to make post-disaster investments more sustainable to allow for a rapid recovery.

This document is structured in four sections. The first section presents a brief background of the Haitian economy and the agricultural sector. Section two addresses key issues in weather risk management policy in Haiti. Section three extends the preceding by analyzing public policies to improve financial weather risk management in agriculture. The last section presents some concluding remarks and recommendations for improving the public sector financing of catastrophic weather risk.

II – BACKGROUND

2.1 The Haitian Economy

In 2009, Haiti had a population estimated at 9.5 million people, with approximately 5 million living in rural areas (52%). According to the results of the Household Living Conditions Survey (HLCS, Haiti, 2001), 56% of the total population can be considered as extremely poor, 77% as poor. The structure of this poverty is very unequal. Poverty affects more strongly the rural areas where 88% of people live below the poverty line. Moreover, the rural poor are more vulnerable to adverse shocks due to the lack of physical, natural and social capital.

With a per capita GDP less than $800 (2009), Haiti is the poorest Country in the Western Hemisphere. Recent efforts for strengthening macroeconomic performance led to the establishment of a medium-term economic policy framework for the 2007-2011 period aimed at improving various growth, human development, and governance indicators. Although macroeconomic management was improving since 2005, Haiti remained a fragile country.

Recently, major disasters have exposed the vulnerability of Haiti's economy, and its agricultural sector in particular to weather hazards. The passage of four storms[1] within a one-month period in the fall of 2008 constituted a major setback for the country. Following two years of significant improvement in the economic situation, with a positive GDP growth rate in real terms of 2.3 percent in 2006 and 3.4 percent in 2007, the growth rate fell to 1.3 percent in FY 2007-2008.

On January 12th 2010, Haiti was hit by a 7.0 magnitude earthquake that devastated Port-au-Prince, Leogane, and Jacmel. Losses from this earthquake are estimated to be around 150 percent of GDP and the official death toll is approximately 230,000.00 people. This earthquake is the most catastrophic event in Haiti's history, its impact on the economy's productive capacity is expected to be severe and long-lasting. Although the agricultural areas have been affected only slightly, the Ministry of Agriculture of Haiti estimated the direct negative impact of the earthquake on the agricultural sector at more than $31 million (MARNDR, Plan National d'Investissement Agricole, Mai 2010).

2.2 Agriculture in Haiti

[1] Faye, Gustav, Hanna and Ike (FGHI)

In Haiti, the agricultural sector contributes more than 25 percent of total GDP. This contribution has been declining from 47% to 25% over the 1960-2007 period. Today, agricultural exports represent 5% of the total exports while food needs occupy three quarters of imports. However, agriculture remains the most important employer of the Haitian labor force providing 70 percent of employment in rural areas and 50 percent of employment in the economy as a whole. This reflects not only 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 low level of productivity relative to other sectors.

To a total area of 27,500 sq (square kilometers), Haiti is predominantly mountainous with 65% of the land possessing slopes greater than 40 percent. Plains occupy 20% of total land area with 550,000 Ha and uplands around 15%. According to the Household Living Conditions Survey data (HLCS, IHSI, Haiti, 2001), the agricultural sector compounds about 800,000 farmers with an average size of 1.5 Ha and a median size of 1 Ha. In 2001, 75% of Haiti's farms had less than 2 Ha., 48% of farms count one parcel and 32% two parcels would count and only 6% of farms are divided among four plots and more. A land-holding structure of this type represents important challenges for providing financial and technical support to farmers after a disaster.

Growth in Haiti's agricultural sector is constrained by several fundamental problems including: (i) the lack of sufficient investment in rural public infrastructure, (ii) the insecurity of land tenure, (iii) the insufficient public services like agriculture statistics, research and development, and phyto-sanitary and zoo-sanitary services, (iv) high frequency of systemic weather hazards.

2.3 Current Public Financing of the agriculture sector

The National Growth and Poverty Reduction Strategy Paper (2008-2010) considered Agriculture and rural development as a vector of Growth. But, Meeting this objective requires provision of adequate resources to the agriculture sector reflecting the priority in GOH choices. Analysis of the Public Budget indicates that, the share of the global Public Investment Program (PIP)[2] allocated the agriculture sector has increased from 4.28% for the FY2007/2008 to 9.96% for the FY2009/2010, with a surge of 13.24% for the FY2008/2009 due to expenditures incurred for rehabilitating agricultural infrastructures damaged by the passage of four storms in 2008. Moreover, Agriculture Public Investment Program is mainly financed by external donors, which accounted for 80-90 percent of total allocations on over FY2007–10 (see **table 1**).

Table 1: Public Investment Program (PIP), yearly allocations to the MARNDR
(In HTG and %)

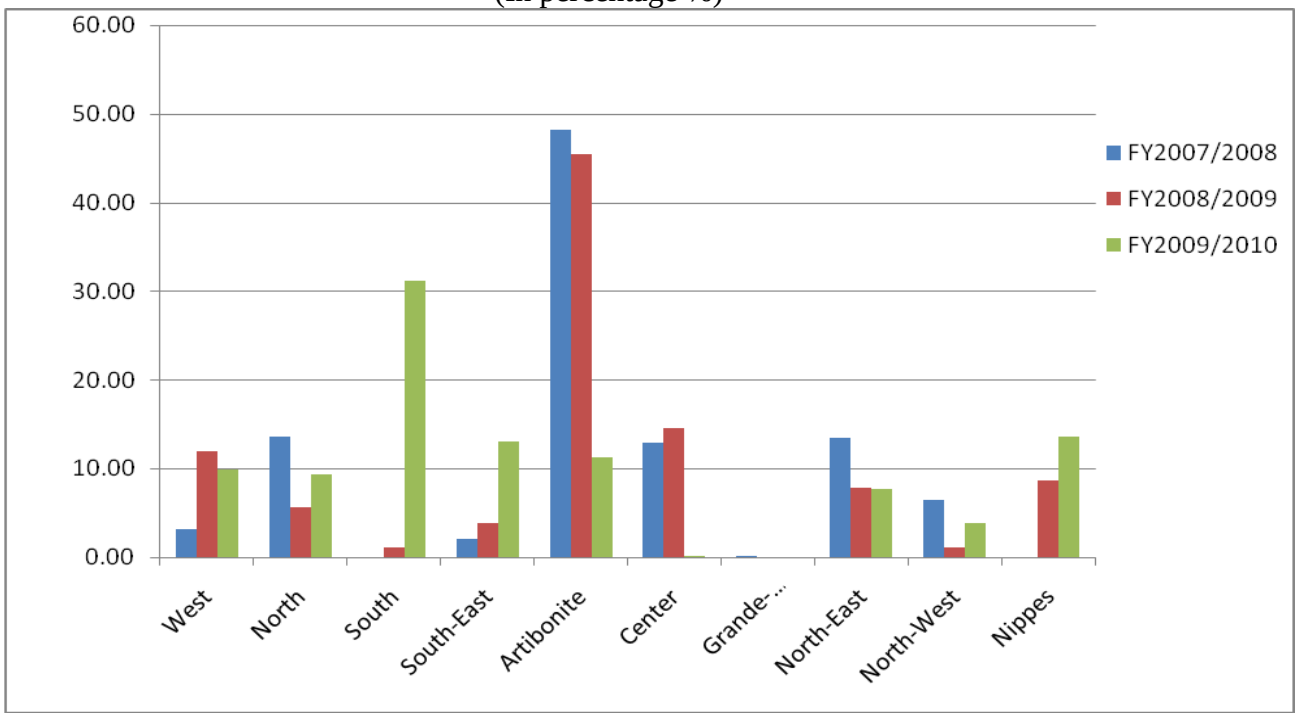
Sources	FY2007/2008	FY 2008/2009	FY 2009/2010
Treasury	241 218 316.00	117 042 855.00	1 052 016 252.00
External	1 809 993 620.00	5 843 060 111.00	4 577 775 111.00
MARNDR PIP	**2 051 211 936.00**	**5 960 102 966.00**	**5 629 791 363.00**
Treasury (%)	12%	2%	19%
External (%)	88%	98%	81%
Total (%)	100%	100%	100%
GLOBAL PIP	47 963 723 803	45 031 448 460,30	56 497 819 615,94
% of MARNDR PIP	4.28	13.24	9.96

Source: MEF, Haiti National Budget

Agriculture PIP geographic allocation reveals concentration of public investments. For the FY2007/2010 about 60 percent of the PIP (Agriculture sector) was allocated to the central government while only 40 percent was granted to the 10 departments. Besides, the PIP distribution between departments reflect the GOH and donors geographical priorities (**figure 1**). Thus, the Department of Artibonite received more investment expenditures than all the 9 other Departments .The bulk of investments in agriculture sector consist of donors financed projects and programs including rehabilitation of irrigation systems and rural roads in agricultural areas. One of these projects is the US $ 42 million IDB project for rehabilitating about 18 000 irrigated areas in the Artibonite valley.

[2] Given MARNDR's Operating Budget is mainly concentrated on wages and salaries payment (82% for FY2005–07), the Investment Budget is more relevant.

Figure 1 :MARNDR Public Investment Program by geographical allocations
(In percentage %)



Source: MEF, Haiti National Budget

Analysis public spending by crop in 2005 (**estimated by fiscal transfers from taxpayers to producers**) reveals that rice production[3] was the most supported crop, followed by corn, coffe and yam (**table 2**). Fiscal transfers for rice production was US$18 million, accounting for 62% of total fiscal transfers to the agriculture sector for 2005. Rice production supports related mainly to projects in the Artibonite valley, which seek improving irrigation efficiency for rice yields, as well as inputs subsidy programs for seed multiplication, seed improvement, rice processing, commercialization and fertilizers. This relative high support for rice producers results from the GOH willingness to promote crop production, given the importance of rice in the households consumption basket. Indeed, annual rice consumption per capita, which was about 25 kg in the 80's is now superior to 50kg. Rice has become the largest single food imports and local production counts for only the sixth of national consumption in 2005. For that year, more than 350 000 metric tons of rice were imported on 420 800 MT of Domestic consumtion.

Table 2: Producer Support Estimated by commodity, 2005

[3] Although, Cassava, Bananas, corn and yam are more important in terms of production volume

	Banana	Beef	Corn	Coffee	Yam	Cassava	Rice	Bean	Sorghum	Total
Producer Support Estimate (PSE) million	**20**	**30**	**19**	**5**	**3**	**24**	**44**	**15**	**21**	**243**
Market Price Support (MPS)	20	30	16	4	1	23	26	14	20	214
As a % of PSE	97%	100%	83%	67%	39%	94%	58%	93%	95%	88%
Total Fiscal Transfers	1	0	3	2	2	1	18	1	1	29
Percentage PSE	15%	28%	25%	9%	3%	26%	48%	37%	71%	36.7%
PSE(per hectare/head)	$ 1,065	$ 20	$ 67	$ 53	$ 141	$ 576	$ 735	$ 122	$ 212	$ 321
PSE (per farmer)	$ 406	$ 60	$ 64	$ 26	na	na	$ 339	$ 61	$ 106	$ 149

Source : Arias et al. (2008)

2.4 Post-Earthquake agriculture strategy :National Agriculture Investment Plan (NAIP)

In the aftermath of the January 12, 2010 earthquake, the Government of Haiti (GOH), in consultation with the Haitian civil society, the donor community and other international non-governmental organizations has defined a set of programs to support agriculture and food security through an Investment Plan for Agriculture. This plan, called National Agriculture Investment Plan (NAIP), was formally endorsed by stakeholders and other development partners at the high-level meeting held on June 2, 2010 in Punta Cana, Dominican Republic. The NAIP is organized around three strategic axes: 1) developing rural areas/infrastructure including watersheds protection and irrigation; 2) production and developing competitive value chains; and 3) strengthening agricultural services and institutions.

Under the NAIP strategic axes, the GOP aims at stimulating local agricultural production by promoting integrated development in different high potential agro-ecological zones and in watersheds directly related to irrigation. These areas include watersheds of the Grande Riviere du Nord, Saint Raphael, Limbé, Maribaroux plain, Quinte, Artibonite, Saint-Marc/Cabaret, Leogane, Cavaillon and Les Cayes plain (**figure 2**: *map of priorities areas*). In such zones, sustained efforts will be made in various field to intensify production of crops with high added value like **food crops** (rice, bananas, corn, peas, vegetables, tuber crops) and **export crops** (coffee, cocoa, mangoes).

Regarding rural infrastructures, 38 irrigation systems covering 8 200 ha (including twelve (12) irrigation systems serving 3 500 ha in the departments of West, Sout-East and Nippes,

damaged by the january 12 earthquake) will be rehabilitated and 15 new irrigation systems serving 5,800 ha will be constructed (North and North-East departments); about 600 km of rural roads will be rehabilitated in order to improve the food flow from irrigated areas to consumption areas and to better supply farmers with agricultural inputs and manufactured goods. Moreover, for increasing farms productivity, emphasis is put on regular inputs supply (seeds, improved seeds, fertilizers,…) and agricultural equipment at affordable prices and on capacity building support and agricultural extension to farmers by communal training and research centers.

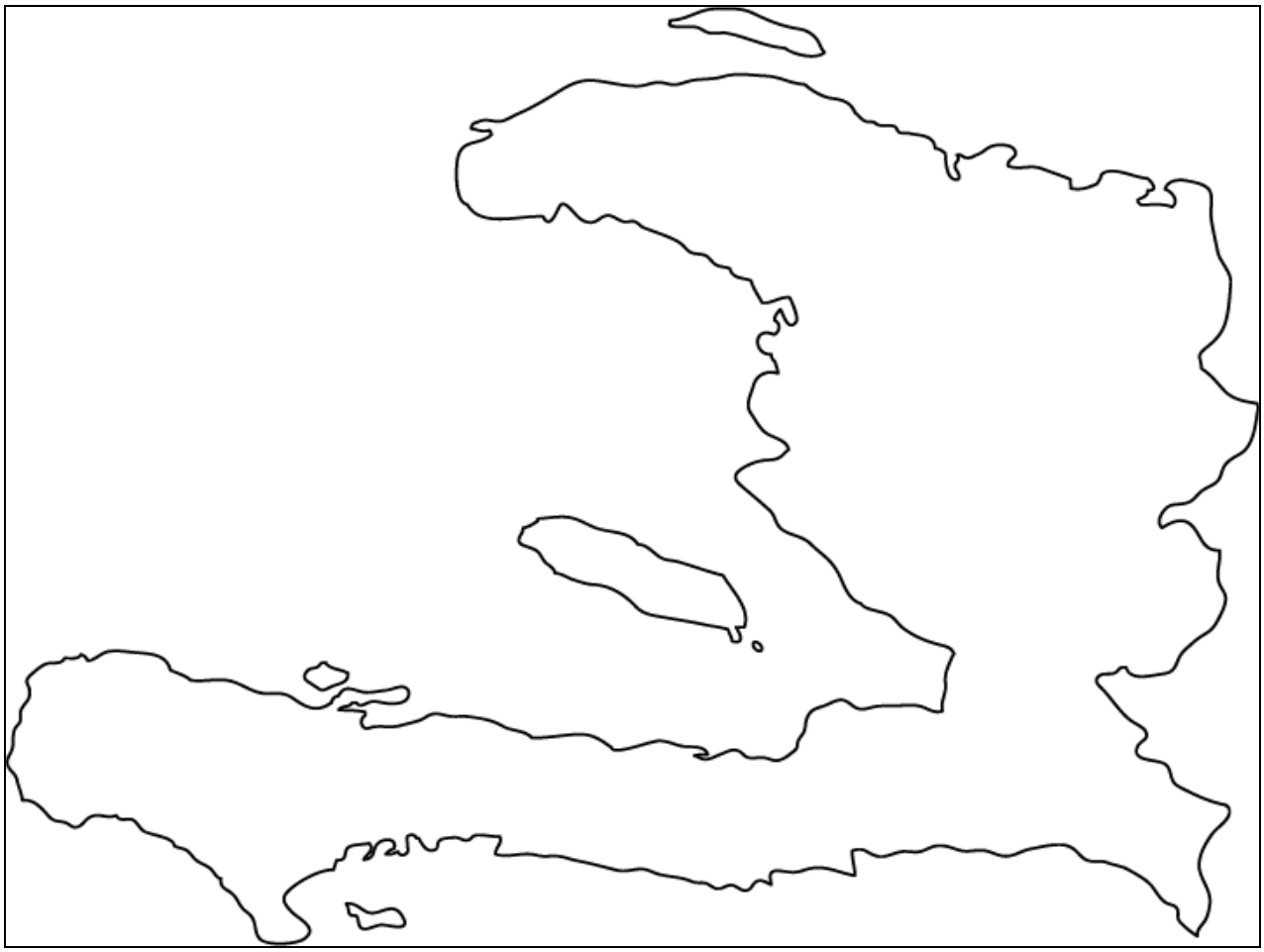
The total cost of the NAIP amounts to around US $790 million (**Table 3**). In view of the proposed contributions of stakeholders, the GOH has committed to US $ 110.5 million (14%) and the private sector will bring a support of US $ 105 million (13%). The initial initial financing gap of US $578.5 million which represents 73% of total funding will be provided by international donors.

Table 3: Required resources for the National Investment Plan

Interventions	Required funding (In Thousands US $)		
	Short-Term	Medium & Long Term	Total
1.-Developing infrastructures in rural areas	120,140	240,650	360,790
2.-Production and value chain development	89,780	275,200	364,980
3.-Agricultural Services and Institutional Support	14,200	51,000	65,200
Total	**224,120**	**566,850**	**790,970**

Source: Haiti, National Agriculture Investment Plan, May 2010

Figure 2: map of priorities areas



Source:

III – KEY ISSUES FOR A FINANCIAL WEATHER RISK MANAGEMENT STRATEGY

3.1 Weather risk in Agriculture

Haiti's agriculture sector is exposed to many systemic weather risks such as hurricanes, droughts and floods. From 1954 to 2005, Haiti has faced 50 disasters caused by climatic events (**see table 4**). Environmental degradation causes natural disasters have become more frequent and their impact on the economy more severe in Haiti.

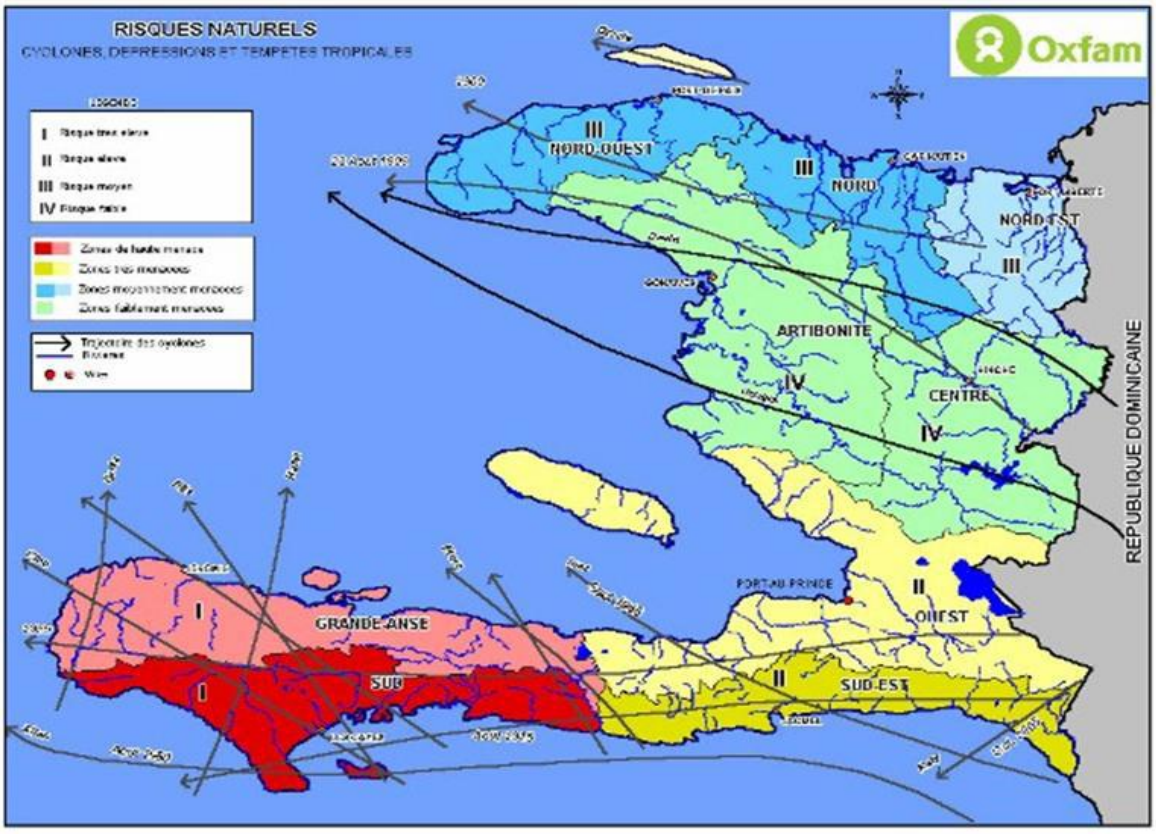
Table 4: Evolution of Natural Disasters in Haiti

Period	***Hurricane***	***Flood***	***Drought***	***Total # of Disasters***	***Annual Average***	***Affected persons (Total)***	***Average annual number of affected persons***
1954/1974 ***20 years***	4	4	2	10	0.48	1,157,822	55,134
1977/1996 ***19 years***	6	14	4	24	1.20	4,528,876	226,444
1998/2003 ***5 years***	3	7	1	11	1.8	219,690	36,615
2004/2005 ***2 years***	2	2	1	5	2.5	310,000	155,000
Total 51 years	**15**	**27**	**8**	**50**	**1**	**6,216,338**	**121,890**

Source: Etude des Risques, de la Vulnérabilité et des Capacités de réponse en Haïti – Mathieu, Philippe et al., 2002

Hurricane and Tropical storms remain a major threat in Haiti, due to its location in the Caribbean basin (**figure 3**, Hurricanes trajectory). For the last years, the passage of hurricanes, windstorms and tropical depressions have killed thousands of people and caused extensive economic damages. According to ECLAC data (PDNA, 2005), the passage of Hurricane Jeanne in 2004 has wiped out the majority of crops (e.g. sorghum, banana, beans, maize) on 7,767 ha in the Haut Artibonite and the Eastern North West areas exploited by about 12,900 farm households and has badly damaged agricultural infrastructures. The global damages to the agricultural sector amounted to US $ 37 million (PDNA, 2005). In fall 2008, the passage of four storms (FGHI) within a one-month period caused damages to the agricultural sector estimated to around US $ 200 million.

Figure 3. Hurricane Trajectories Across Haiti



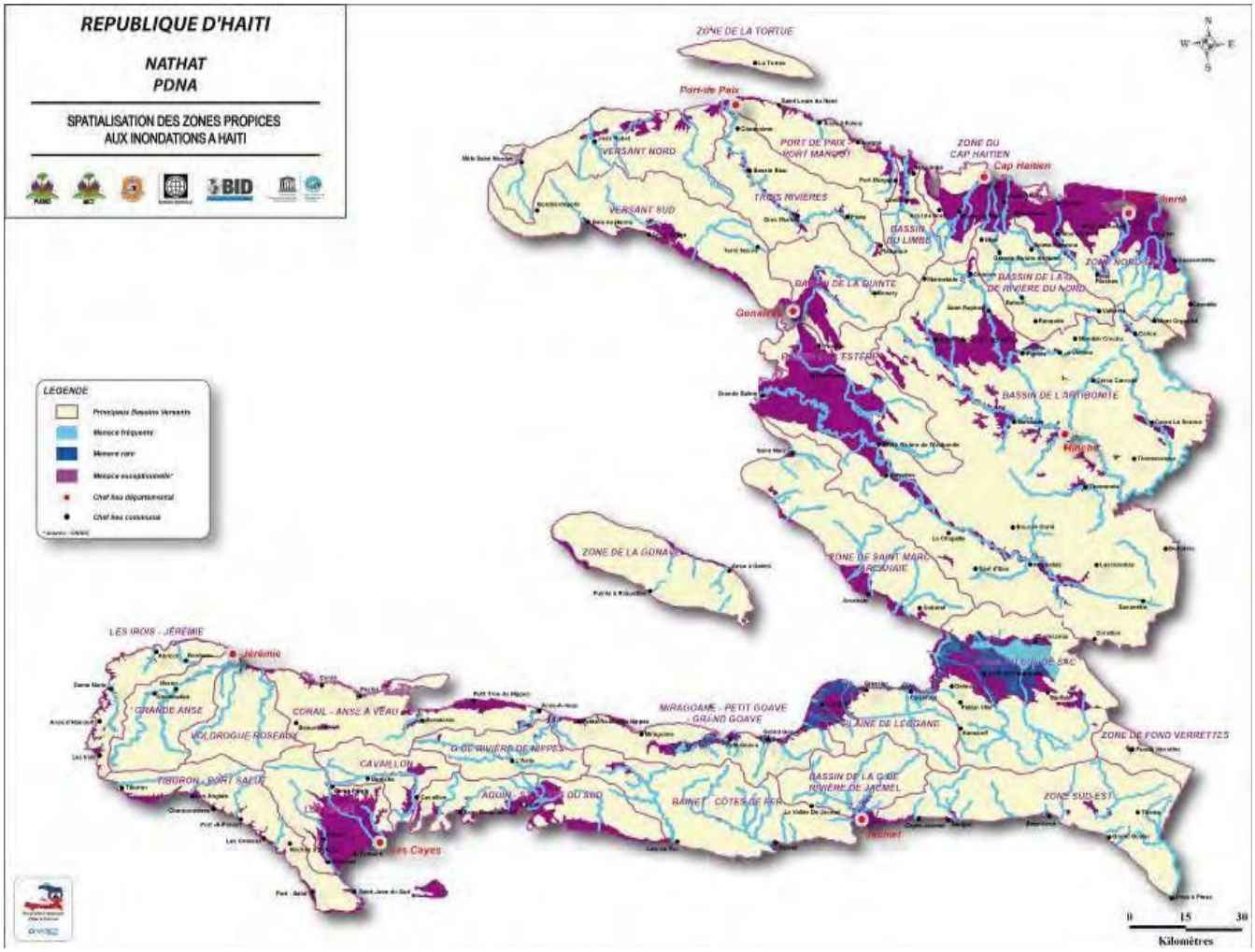
Source: Mathieu *et al*., 2002

Strong Wind risks in agriculture often associated with tropical cyclone events are mainly relevant to few crops including coffee especially cultivated in Humid mountains zones (South Peninsula, South-East and North), bananas and plantains cultivated in Humid or Irrigated plains (Arcahaie Plain).

Drought is not a major issue in Haiti's agricultural sector since 70% of the territory ha a rainfall exceeding 1500mm per year, but more and more areas are now prone to drought because of the environment degradation and the lack of irrigation systems in many agricultural zones. The area hit by droughts is usually limited to some regions (the North-West and Center Regions) causing periodical damages to crops. Agriculture is predominantly rain fed so that many farmers are highly dependant on rainfall for growing their crops as less than 5% of cultivated areas have regular irrigation (over 1,500 000 ha of cultivated areas only 80 000 ha are irrigated).

Flood, the main risk factor in Haitian agriculture, is caused by accumulated rainfall over several days during a relatively short period associated **to cyclonic** or **non-cyclonic** weather events. In Haiti, devastating impacts of flooding on economic infrastructures (roads, irrigation systems) and on crops have been historically exacerbated as a result of soil erosion and inadequate land use systems. The risk of flooding is high in most of the coastal plains and in low altitude areas of Haiti (Artibonite, South, North-West and North) (**Figure 4**).

Figure 4. Map of river floods hazards in Haiti



Source: Analysis of multiple natural hazards in Haiti, February-march 2010

3.2 Haiti, Agricultural Weather risk Mapping

In order to provide appropriate risk management mechanisms, there is a need to identify macro regions or subregions that share homogenous weather patterns, crops and risks. Crops belonging to the same homogenous regions are likely to face the same type of weather risk, such as floods, excess wind forces, droughts and excess rainfall. This identification can be based on variables like: agro-ecological zones, watershed or river basins and topographic elevation.

Because of its latitude, its exposure to prevailing winds (trade winds) and its relief, Haiti has a multiplicity of agro-ecological areas (**figure 5**). It's possible to group these agro-ecological areas into three (3) major categories at a regional level: (1) dry and semi-humids areas (plains and plateaus), (2) humid and semi-humid plains, (3) irrigated plains, (4) semi-moist to very humid Mountains. This diversity of agro-ecological environments allows a wide range of crops **(Table 5,** summarizing the agro-ecological areas by crops).

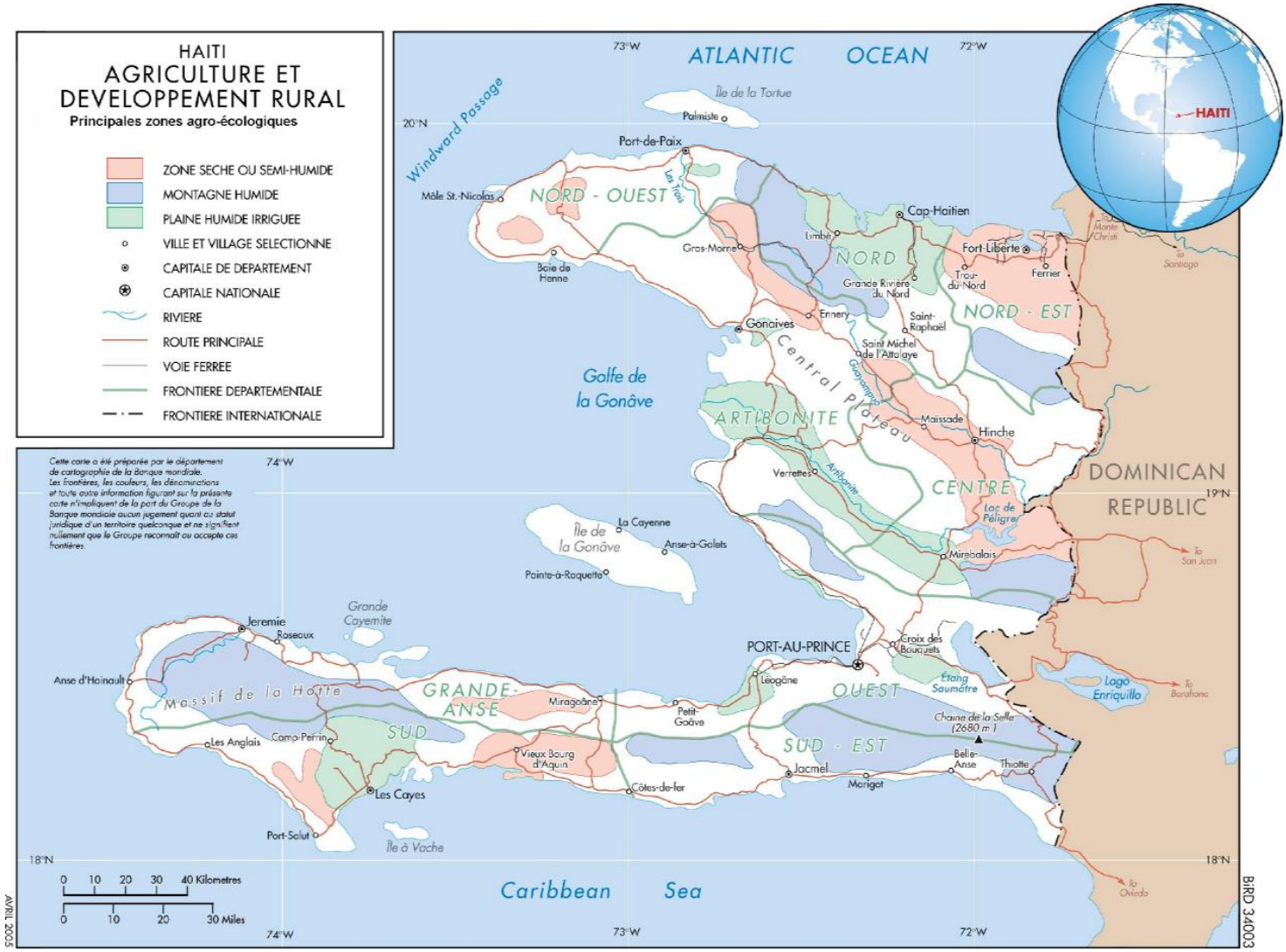
dry and semi-humids areas are mainly located in Center (Central Plateau), North-East and in upper Artibonite. The dominant culture is the association sorghum-corn-peas-sugarcane-cassava and Plantain cultivated in association with corn and sweet potato. The cultivated areas also include fruit trees like mangoes, coconut, breadfruit and tamarind. **Humid and Irrigated plains** are mainly in the departments of Artibonite, North and South. The characteristic crop association of Humid and irrigated plains consists of Cereals like rice (Artibonite valley and Cayes plain), corn and sorghum in a less extent, plantains (irrigated Arcahaie plain) and a wide range of Food crops. **Humid mountains** are especially represented in the South Peninsula (massif de la Hotte) and in South-East (massif de la Selle) and North departments. The cropping systems of those humid areas are mainly based on a mix of coffee- fruit trees and food crops (bean, potato, banana, yams..).

Table 5: Haiti, Crops systems by agro-ecological areas

Agro-ecological areas	Crops
dry and semi-humid areas	-Food crops (Sorghum, corn, peas,…) ; -Tamarind, mangoes, cane,
Humid and Irrigated plains	-Cereals(rice, corn) ; Potatoes; Beans -Plantain ; Bananas
Humid mountains	-Garden-coffee(fruit-trees, avocados, bananas,coffee,cocoa) ; Vegetables; -Food crops (Beans, yams, patatoes,...)

Source: niches channels in the rural agriculture,MARNDR, BID, Haiti, 2006

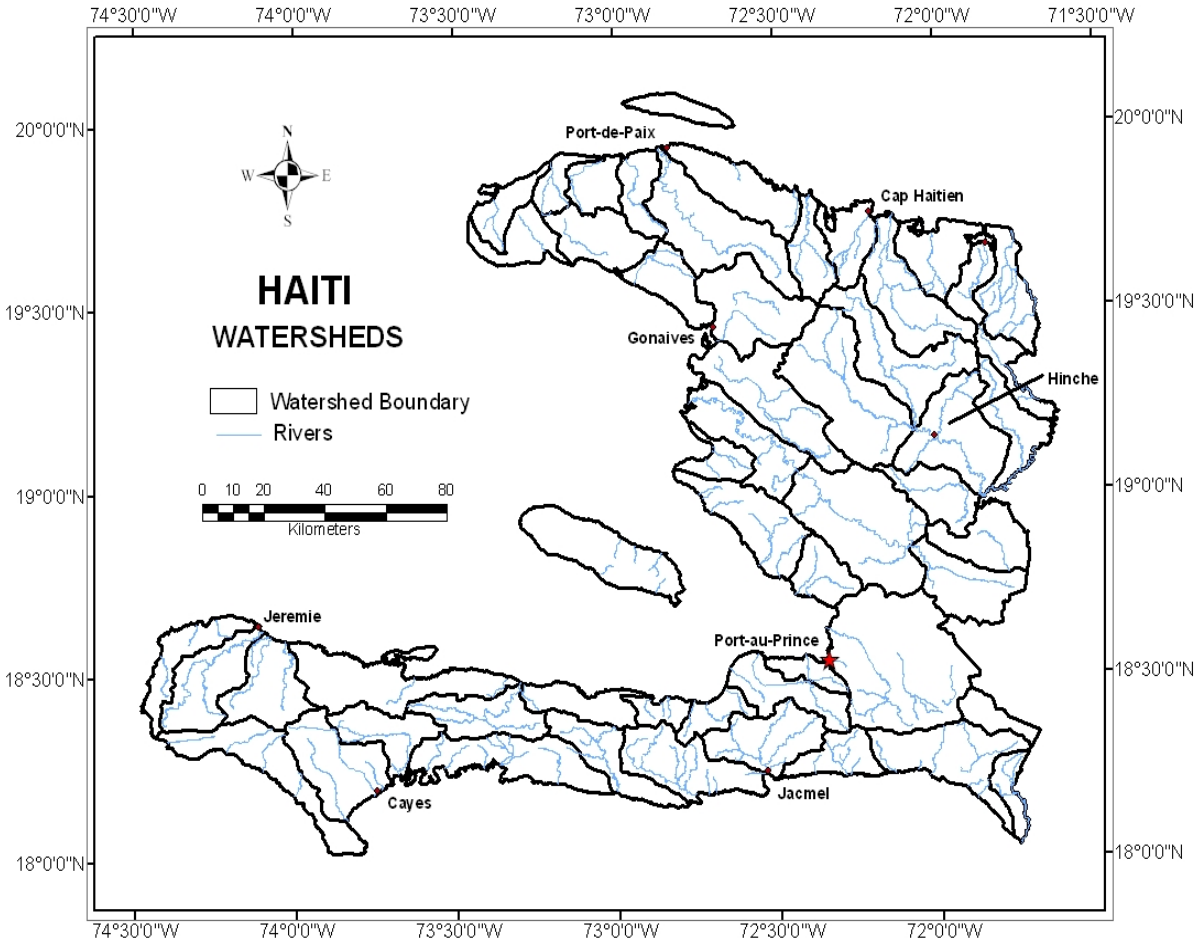
Figure 5: Haiti, Main agro-ecological areas



Source: MARNDR / World Bank, Rural Development in Haïti, May 2005

Another way of identifying homogeneous agro ecological regions is by **watershed**. The country is divided into 30 major Basins (**figures** 6 & 7). This watershed classification is mainly based on the threat of loss of lives (**population vulnerability**) and on risk of damage to economic infrastructures (**infrastructure vulnerability**) caused by Weather hazards. This classification can be useful for planning and designing risk management for specific crops. Crops cultivated in watersheds located in south peninsula are more exposed to hurricane than those cultivated in the North Massif watersheds.

Figure 6: Haiti, major water sheds



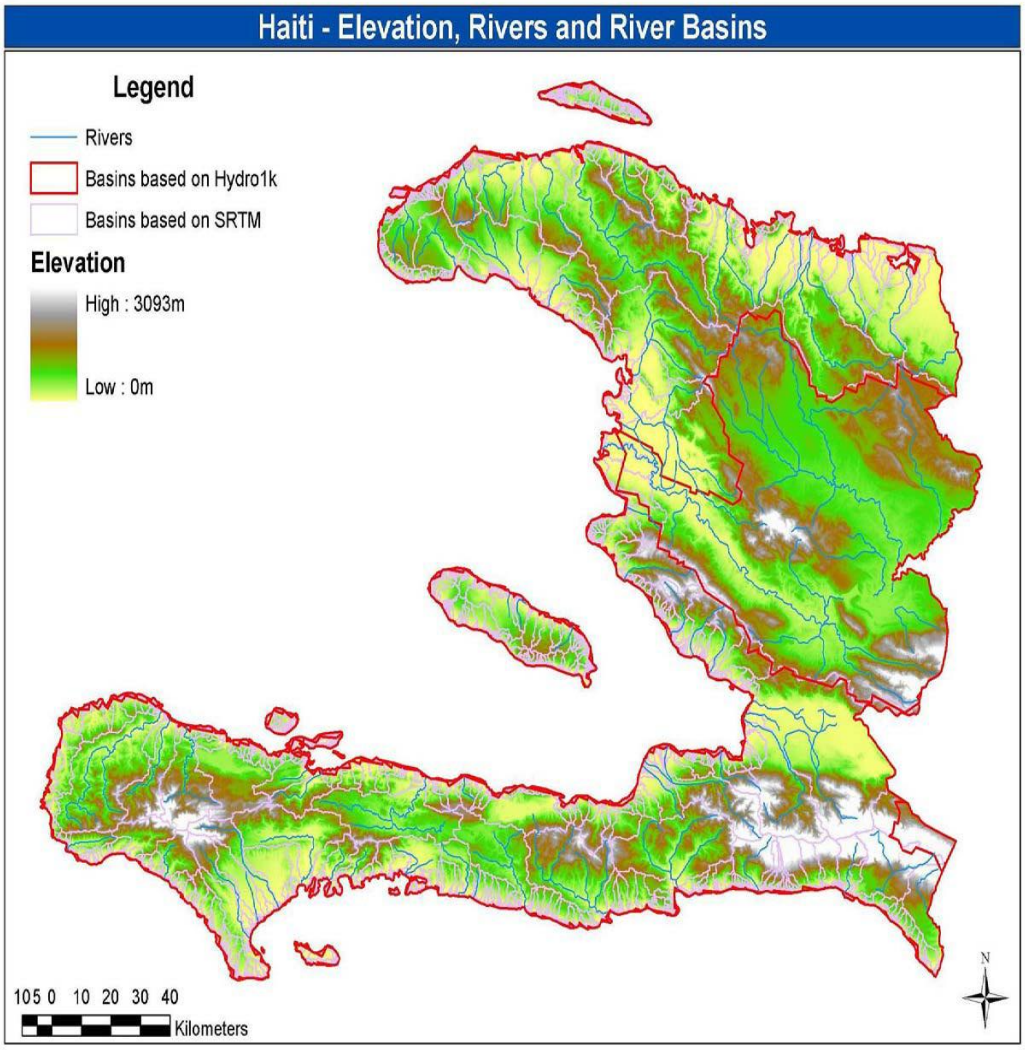
Source: OEA (1972); PNUD (1998); UTSIG (2001)

Population vulnerability results from the housing density in areas prone to flooding like low coastal plains. Watersheds representing the largest urban centers are on the top of the scale in terms of the population vulnerability. Thus, populations living in the Plaine du Cul de Sac watershed are the most prone to flooding with 100 on an vulnerability index classified from 0-100, followed by those living in the lower court's Artibonite (sub watershed) and Les Cayes watershed with respectively 38 and 30 (Ministry of Environment, PANA, Haiti, 2006).

The economic infrastructures compound roads, markets and irrigation networks. The most vulnerable watersheds in terms of irrigation systems are the alluvial plains of Artibonite, Estère, la Quinte, Cul de Sac, Léogane, Arcahaie and Les Cayes where have been conducted the most important irrigation systems in the country.

Elevation can also play an important role in identifying agriculture areas exposed to the same weather hazards like rainfall, increasing with elevation. Thus, rainfall can reach 3000 mm in high altitude areas (over 1500 m). An average, humid mountain areas have over 1400 mm rainfall per year. Such groming areas are especially represented in the departments of the West, the Grand Anse, Artibonite and North (**figures** 5 & 7) and are prone to growing exportables crops like Coffee and fruit-trees (Mangoes).

Figure 7: Haiti, Elevation, Rivers and Watersheds



Source : Rural Development in Haiti: Diagnosis and Intervention Focus, summary report, MARNDR, WorldBank, October, 2005

3.3 Weather risk management in Agriculture

Increasing output and income in agriculture in a sustainable manner requires public and private investments that take into account the different risks (weather & price.) affecting the sector. There are several weather risk management tools that current and future public

authorities can use to reduce income volatility of farmers and make government spending and investments more efficient and sustenable. The risk management tooles can be grouped into mitigation, coping and transfer measures. A key component of the current weather risk management is the investments made by public or private sectors in mitigation activities (irrigation, watershed management, seed improvement, etc.) for lowering the impact of flooding, excess rainfall, drought. Since the impact of the risks cannot always be completely **mitigated**, their effects on farmers and the government can be either **coped** with by using private/public saving and credit, or **transferred** away from the agriculture sector with insurance or derivatives contract (**see table 4**). Up to recently, the GoH and donors have been using a coping strategy without any transfer mechanism. But, the different components of the risk management strategy are linked. Absence of good risk mitigation measures, it will be difficult to extend the use of risk transfer instruments, due to the high frequency of catastrophic events. The lack of risk transfer measures may encourage a reliance on costly ad-hoc response measures to manage risk. In such context, economic actors will avoid the agricultural sector by reducing investment and rationing credit.

Table 4: Haiti, weather risks management tools

Tools	Weather
Mitigation	**Macro**: Irrigation, Seed improvement, Weather data observatory, Flood early warning, Pre-disaster training; **Meso**: Irrigation, Seed improvement ; **Micro**: Crop diversification
Coping	**Macro**: Emergency Fund/ Donor Support (Post-disaster relief); **Meso**: Donor Support (Post-disaster relief) ; **Micro**: Savings/Credit
Transfer	**Macro**: Caribbean Catastrophic Risk Insurance Facility (CCRIF)

Weather risk management in agriculture can be grouped into ex-ante and ex-post strategies. Ex-ante responses take place before the potential adverse event; ex-post strategy take place after the event (**table 5**: below summarizes the financing options for weather risk management). In general, ex-post risk management strategies are less efficient than ex-ante risk management strategies.

Table 5: Financing Options

	TIMING	
ACTORS	**Ex-Ante**	**Ex-Post**
Public	Risk mitigation investments (infrastructures, agricultural extension, pest management systems,…) Macro level insurance	Reallocation of budgetary resources Emergency fund Loan Grant
Private	Avoiding exposure to risk Private investments in risk mitigation Crop and plot diversification Diversification of income sources Precautionary Savings Meso or micro level insurance	Social assistance, social funds and cash transfer Credit Assets liquidation

Source: Anderson 2001, Towsend 2005; Worldbank 2001

Ex-ante strategy for weather risk management in agricultural sector in Haiti suffers from the low level of public-sector and private-sector investment in agriculture. Lack of watershed protection and deficient irrigation infrastructure are major causes of floods and droughts in agricultural areas. The weak fiscal position of the government restricts the level of funding for disaster preparedness. In 2007, the GoH added to its ex-ante risk management tools an index-based insurance, the Caribbean Catastrophic Risk Insurance Facility (CCRIF), a macro insurance pool whose clients include all CARICOM countries members. The CCRIF is designed to limit the financial impact of devastating **hurricanes and earthquake** by providing liquidity very quickly after those negative events. But extreme rainfall, which is a more important risk factor in Haitian agriculture, is not currently covered by CCRIF. That situation raised the interest in designing other types of parametric insurance based on rainfall.

Post-disaster funding in agriculture is partly derived from the Emergency Fund (Fonds d'Urgence)[4], which is financed by a 1 percent tax applied on publi-sector wages. But the post-disaster recovery fund allocated to agriculture consists mainly in various sources of funds that can tapped in an had-hoc manner to deal witn natural desasters. Those funds include reallocation of resources from the national budget, loans and grants from bilateral agencies, representing the bulk of funding.

[4] the Emergency Fund (Fonds d'Urgence, FdU) is set up to tackle all types of emergencies , not exclusively those related to agriculture.

So we can say that the financing of weather risks in the agriculture sector is mainly based on an ex-post management strategy.

From 2004 to 2008, the agriculture sector has received on average about $US 13 million of for post-disaster recovery where as the direct damages to the sector were estimated to $US 315 (**table 8**). This gap implies the needs for moving to a more efficient and effective management strategy that addresses the various risk layers of the agricultural sector for being more conducive to a timely post-disaster recovery than ex-post risk management strategies. With ex-ante risk management strategies money can be disbursed immediately after a disaster .

Table 8: Post Disaster Recovery Funding for the Agricultural Sector (2004-2008)
(In million of US dollars)

Year	Disaster	Damage to Agriculture	Government and donors Support
2004	Hurricane Jeanne & Ivan	37	27,55
2008	Hurricanes Faye, Gustav Hanna and Ike (FGHI)	197,8	36,75
	Total	**314.80**	**64.30**

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

Box1. Traditionnal insurance versus index based insurance

Index-based insurance is designed to overcome shortcomings in traditional agricultural insurance. Since a traditional insurance provides protection against several risk factors(flood, hail, drought, disease, etc.), **pure risk**, the component of premium required to compensate losses, is usually very high. Indeed, traditional insurance schemes require high amount of public subsidies for their viability. Moreover, in a traditional insurance scheme, compensation is based on an inspection of losses on the field. Traditional agricultural insurance is exposed to moral hazard by the insured, because losses observed during an inspection cannot be disaggregated and attributed to insured risk factors or bad management. The inspection contributes to high administrative cost, and increases the insurance premium. Finally, due to the inspection, there can be a considerable time lag between the occurrence of the disaster and the disbursement of the compensation.

Index-based insurance usually provides coverage for a specific risk factor like hurricane, flood, or drought. Consequently, pure risk is lower for index-based insurance schemes. Index insurance avoids moral hazard, by linking the compensation, not to a ground inspection, but to the performance of the indexed variable. The absence of inspection in index-based agricultural insurance, not only lowers administrative cost, it allows the immediate disbursement of money once the index-variable triggers a payment.

Despite its potential advantages, index-based insurance cannot be readily implemented in Haiti especially at the farmer level, because required conditions are not met. of the weak reliable weather data network and the absence of an appropriate legal and regulatory framework.

Analyzing Haiti's territory covering shows deficiency in data collection on key climatic and agricultural variables. According to CNIGS[5] (2009), there are 114 functioning weather stations across the country, referred to as historical stations. The evaluation of the usefulness of the data collected through those historical stations indicates that 111 record just rainfall, 1 of them records just evaporation, and 2 are synoptic stations with the capability to record several weather variables. By taking into account localizations, it displays that 83 of the 114 stations are located in agricultural zones.

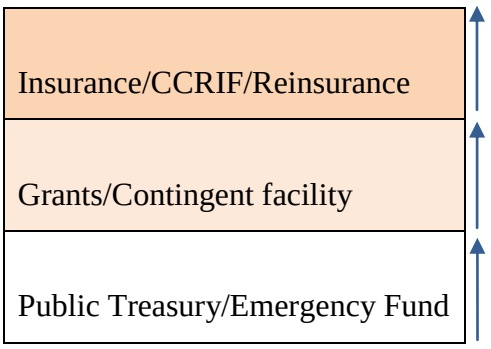
[5] The *National Center for Geo-Spatial Information* (CNIGS, French), an independent government agency under the Ministry of Planning, originally set up to create maps through satellite imagery, was recently given an important role in strengthening the country's weather data infrastructure. Through its *Programme de l'Information Territoriale pour le Developpement Durable* (PITDD), CNIGS is developing several applications like the Agricultural Information System, and the Global Observatory of the Territory (OGT, in French).

IV – RECOMMENDATIONS FOR IMPROVING THE PUBLIC FINANCING OF CATASTROPHIC WEATHER RISK

The recurrence of catastrophic events affecting the agricultural sector in Haiti calls for a more effective and efficient financial risk strategy. The GoH has to adopt measures to make more efficient use of public funds on one hand and, on the other other hand, create incentives for private sector involvement. Here are some Recommendations:

1. Use more efficiently natural disaster response funds by risk management tools like risk layering and potentially risk transfer: the GOH can use new instruments, such as improving the management of emergency funding to agriculture and introducing contingency lines of financing and/or risk transfer mechanism for specific catastrophic risks like hurricane or rainfall to hedge part of the exposure of the agricultural sector to the more catastrophic risks through regional or macro-level financial instruments.
   Few days after the january 12 earthquake, the GoH has received about US$ 7.8 million payouts from CCRIF, approximately 20 times Haiti's premium earthquake coverage of US$ 385,500.

Figure: Risk Layering



The first layer of risk causing low level of losses can be coped with by drawing down public funding. **The next layer of risk** causing high level losses exceeding the GoH response capacity requires funds accessible through Contingent Funds, for post-disaster emergency interventions. Those lines of credit could be set up by multilateral development institutions such as the World Bank. **The last layer of risk** more catastrophic losses could be managed by the government and international institutions through the insurance against catastrophic weather events in the international markets

2. Increase public funds dedicated to the Emergency Fund (Fonds d'Urgence, Fd'U). According to the law of September 16, 1966 creating the emergency fund, this tax should be applied not only to publi-sector wages but to all current Public Administration expenditures.

   More transparent rules should be followed in the disbursement of emergency funds. Emergency Events should be defined in advance in order to prevent the use of emergency funds for other purposes. In case of emergency, funds allocations funds should follow predetermined rules that do not encourage moral hazard. The data of the Golbal Agriculture census should be used for the registration of vulnerable small farmers and for better targetting emergency funding after catstrophic weather events.

3. Make more predictible funds available for post-disaster recovery. Public emergency fund (Fonds d'Urgence) reserves made in the absence of natural disasters could be cummulative so that the GoH would have more ressources during catastrophic disasters years. Moreover, loans and grants from bilateral and multilateral donors represent mostly the bulk of post-disaster recovery funds. It would be more efficient if international donors can commit in advance to a given level of monetary support if damages caused by natural disasters reach a certain threshold, beyond the GoH budgetary response capacity.

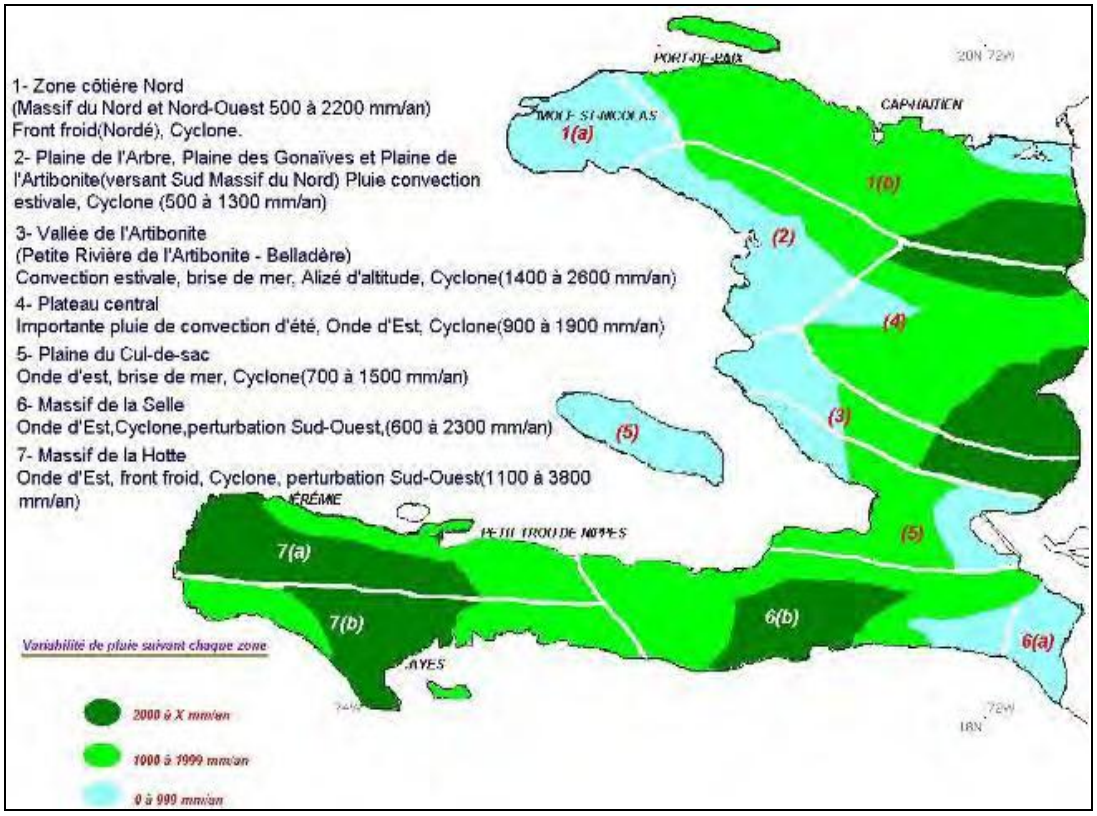
4. Strengthen the agro-climatic data infrastructure by increasing the density of the weather data stations in agricultural zones and in priotity watersheds: Knowledge on weather variables and their impact on agricultural crop yield are very important for risk management. Good data is also required for early-warning system to prevent the disastrous effects of weather hazards like flood.

5. Create an appropriate legal and regulatory environment for developping at medium and longterm the market for agricultural insurance and broaden the range of insurance products that insurers can provide.

6. Increase funds in risk mitigation infrastructure: in absence of risk mitigation investments, high frequency of catastrohic disasters can hamper insurance market development in agriculture and make unaffordable insurance products to many farmers cause of the subsequent increasing premium.

ANNEXES

Annex1: Haiti climatic areas classified by their exposure to rainfall



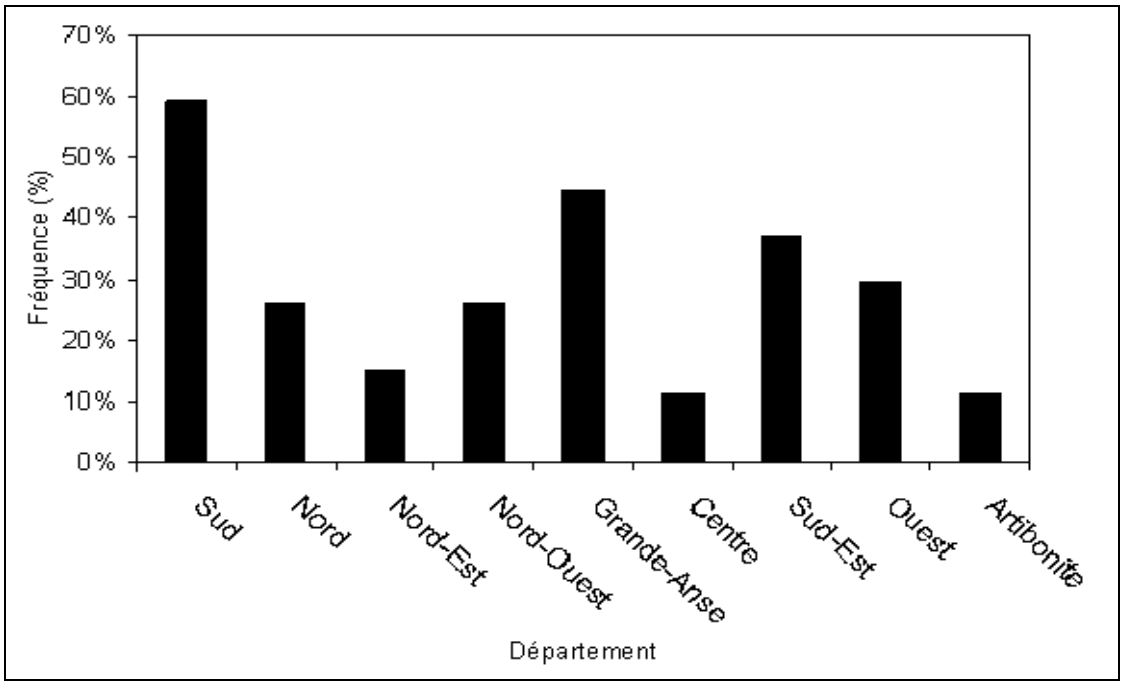
Source: Analysis of multiple natural hazards in Haiti, February-march 2010

Annex 2: Haiti, major water sheds

Basin or Zone	drainage Area (sqkm)	Basin or Zone	drainage Area (sqkm)
1. Bombardopolis/Gonaïves (3)	1.130	16. Cayes-Jacmel/Anse à Pitres (3)	1.201
2. Môle St Nicolas/Moustique (4)	975	17. Grande Rivière de Jacmel	561
3. Trois Rivière	898	18. Côte de Fer/Baînet (2)	1.064
4. Port de Paix/Port Margot	547	19. St Louis du Sud/Aquin	714
5. Limbé	313	20. Cavaillon	400
6. Cap Haïtien	325	21. Cayes	661
7. Grande Rivière du Nord	680	22. Tiburon/St Jean	657
8. Limonade/Ouanaminthe (3)	1.085	23. Jérémie/Les Irois	368
9. La Quinte	700	24. Grande Anse	554
10. L'Estère	800	25. Roseaux/Voldrogue	524
11. Artibonite (10)	6.336	26. Corail/Anse à Veau	849
12. Saint Marc/Cabaret (3)	1.118	27. Grande Rivière de Nippes	465
13. Cul-de-sac	1.598	28. Pte. Riv. de Nippes/Grd. Goâve (3)	691
14. Fonds-Verrettes	189	29. Ile de la Tortue	179
15. Léogane/Carrefour (2)	598	30. Ile de la Gonâve	691

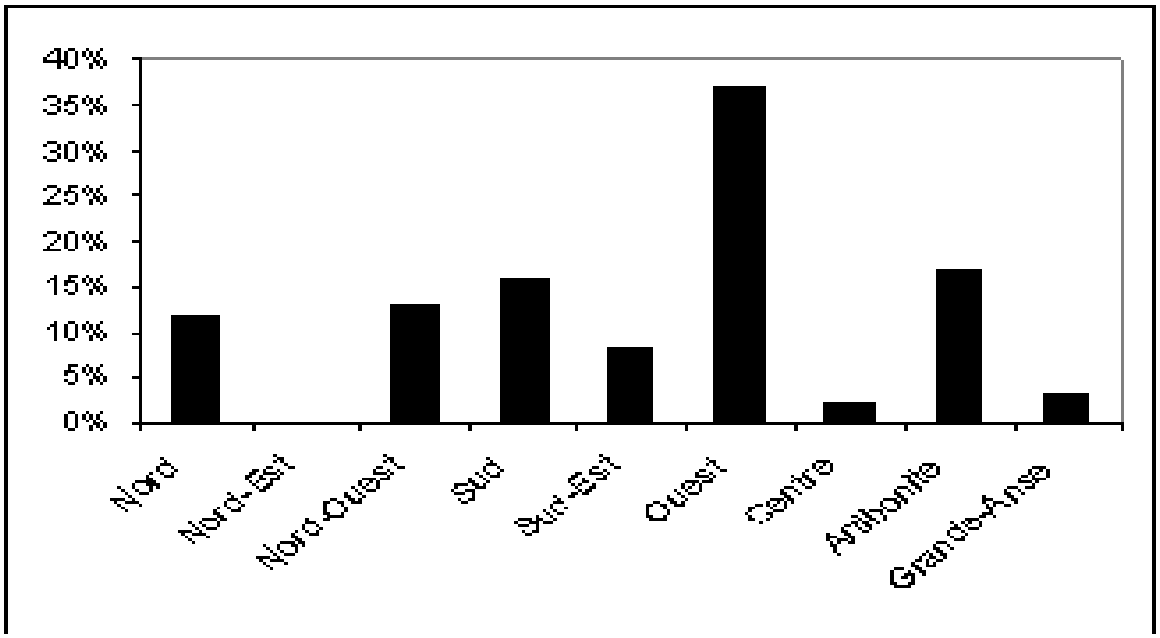
SOURCE: Ministries of Agriculture and Environment, MARNDR/MDE (2000).

Annex 3. Haiti, Hurricane Frequencies by Department (1954-2001)



Source: USAID, Environmental vulnerability in Haiti, findings & recommendations, April 2007

Annex 4. Flood Frequencies by Department (1968-1997)



Source: USAID, Environmental vulnerability in Haiti, findings & recommendations, April 2007

Annex 5: Required resources for the National Investment Plan

Interventions	Required funding (In Thousands US $)		
	Short-Term	Medium & Long Term	Total
Development of rural infrastructure			
Renovation of watershed and forestry	110,000	141,000	251,000
Irrigation and drainage	10,140	99,650	109,790
Production and value chain development			
Livestock	10,000	28,400	38,400
Aquaculture and Fisheries	5,700	26,800	32,500
Crop production			
Access to agricultural inputs and tools	57,580	140,000	197,580
Rural Finance	5,000	19,000	24,000
Post-harvest management and marketing	6,000	39,000	45,000
Urban and peri-urban Agriculture	4,000	12,000	16,000
Local production and humanitarian operations	1,500	10,000	11,500
Agricultural Services and Institutional Support			
Extension by research & training centers	2,000	3,000	5,000
Access to land and tenure security	1,000	3,000	4,000
Health Protection	3,000	10,000	13,000
Quality control and traceability	-	1,000	1,000
Institutional support to agricultural public services	8,200	34,000	42,200
Total	**224,120**	**566,850**	**790,970**

Source: Haiti, National Agriculture Investment Plan, May 2010

Annex 6: Agriculture Public Investment Program by geographical allocations

(In HTG)

	FY2007/2008	**FY2008/2009**	**FY2009/2010**
National	698 361 425,00	4 771 372 056,00	3 649 121 796,98
West	42 291 500,00	142 554 170,00	97 638 252,00
North	183 966 654,00	66 426 654,00	92 000 000,00
South	0,00	12 924 493,00	308 000 000,00
South-East	28 708 850,00	45 077 201,00	128 700 000,00
Artibonite	651 996 025,00	540 594 133,00	1 104 664 000,00
Center	174 750 000,00	172 500 000,00	2 000 000,00
Grande-Anse	2 000 000,00	0,00	0,00
North-East	182 137 482,00	92 705 156,00	76 132 273,56
North-West	87 000 000,00	13 785 938,00	37 935 040,00
Nippes	0,00	102 163 165,00	133 600 000,00
Total	**2 051 211 936,00**	**5 960 102 966,00**	**5 629 791 362,54**

Source: MPCE data, National Budget

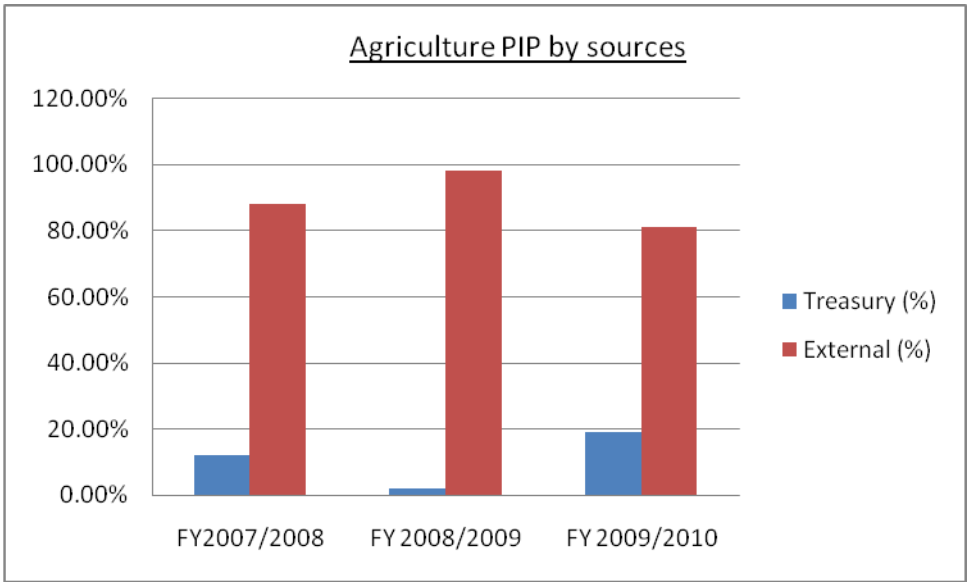
Annex 7: MARNDR Public Investment Program by geographical allocations

(In percentage %)

	FY2007/2008	FY2008/2009	FY2009/2010
National	34,05	80,06	64,82
West	2,06	2,39	1,73
North	8,97	1,11	1,63
South	0,00	0,22	5,47
South-East	1,40	0,76	2,29
Artibonite	31,79	9,07	19,62
Center	8,52	2,89	0,04
Grande-Anse	0,10	0,00	0,00
North-East	8,88	1,56	1,35
North-West	4,24	0,23	0,67
Nippes	0,00	1,71	2,37
Total	**100,00**	**100,00**	**100,00**

Source: Ministry of Finance, Haiti National Budget

Annex 8: Public Investment Program (PIP), yearly allocations to the MARNDR



Source: Ministry of Finance, Haiti National Budget

Annex 9 – Haiti, CCRIF COVERAGE SUMMARY 2009-2010
Final 09/10 Policy Conditions

	Hurricane	**Earthquake**
Annual Premium per peril *(US$)*	$2, 184,500	$385,500
Total Annual Premium *(US$)*		$2,570,000
Attachment Point*/Return Period (years)*	15	20
Exhaustion Point*/Return Period (years)*	75	75
Attachment Point *($ of loss)*	$67, 208,000	$25, 595,000
Exhaustion Point *($ of loss)*	$553, 582,000	$101, 698,000
Attachment Point *(Index Units)*	67,208	25,595
Exhaustion Point *(Index Units)*	553,582	101,698
Full Loss Limit *(US$)*	$486, 374,000	$76, 103,000
Ceding Percentage	8.28463%	10.18827%
Coverage Limit *(US$)*	$40, 294,286	$7, 753,579
25-yr event, policy payout	$6, 494,456	$899,844
50-yr event, policy payout	$25, 438,655	$4, 271,726
75-yr event, policy payout	$40, 294,286	$7, 753,555
100-yr event, policy payout	$40, 294,286	$7, 753,579