

3. STRUCTURE OF THE DRM SECTOR IN HAITI

3.1 The DRM institutional framework

Haitian authorities have been working on the possibility to establish an institution for Disaster Risk Management since 1983, when an organization for disaster prevention and relief (OPDES) was created to initiate response in case of disaster emergencies. The May 31, 1986 decree put OPDES under the Ministry of Interior (MICT). In 1997, the government created the Civil Protection Division (DPC) within the MICT, to coordinate response actions to disasters and manage risks. After Hurricane Georges in September 1998, Haitian authorities and international organizations committed themselves to draw a national plan for DRM (PNGRD) along with a more effective intervention system, to which UNDP provided active general support. The plan was presented and validated in February 2001 (UNDP, 2004) with the main objectives of:

- (1) Acting on the risk causes and factors in order to reduce the negative impacts of disasters;
- (2) Reinforcing response capacity at central, departmental, and communal/local levels.

Integrative part of a central action plan for the environment (PAE) the PNGRD was meant to tackle issues as diverse as: urbanization standards, territory planning, map analysis of vulnerability, decentralization and integration of the DRM thematic, and natural resources management (UNDP, 2004). In practice this concept is formalized through the coordination structure of the DRM national system.

3.1.1 The DRM National System

Components of the Disaster and Risk Management National System operating at a centralized level and their functions are the following:

National Committee for Disaster and Risk Management (CNGRD): is the central body of the DRM national system, including high-ranking government officials from each ministry or their representatives and the president of the Haitian Red Cross, its mission is to:

- Define the global DRM government policy
- Lead, coordinate and evaluate the implementation of the National Plan programs
- Promote regional integration of DRM issues.

Permanent Secretary Office for DRM is in charge of technical coordination of the DRM national system and includes representatives of all ministries. Its key responsibilities are;

- Convey the top orientations and decisions of the National Committee for DRM;
- Coordinate and implement the DRM National Plan

The Emergency Operation Center (COU) is an ad-hoc and representative entity activated in case of imminent disaster. It includes the representatives of all concerned ministries and of the Haitian Red Cross. Its overall mission is to promote, plan, maintain and coordinate disaster response operations at all levels.

The Civil Direction Protection (DPC) acts as the executive secretary office for both CNGRD and the Permanent Secretary Office, it is based on an administrative arm, a disaster coordination arm, and a risk coordination arm, and coordinates the entire DRM system;

Institutional and sectoral committees / thematic committees: Each governmental institution/ ministry is required to elaborate its specific sector DRM plan and to constitute its own committee which may eventually merge with others to form inter-institutional committees to work on particular thematic axes (e.g. urbanism and building codes, land planning and development, vulnerability and risk mapping, etc.). NB: the MoA contrarily to some other government institutions has not yet elaborated its DRM sectoral plan.

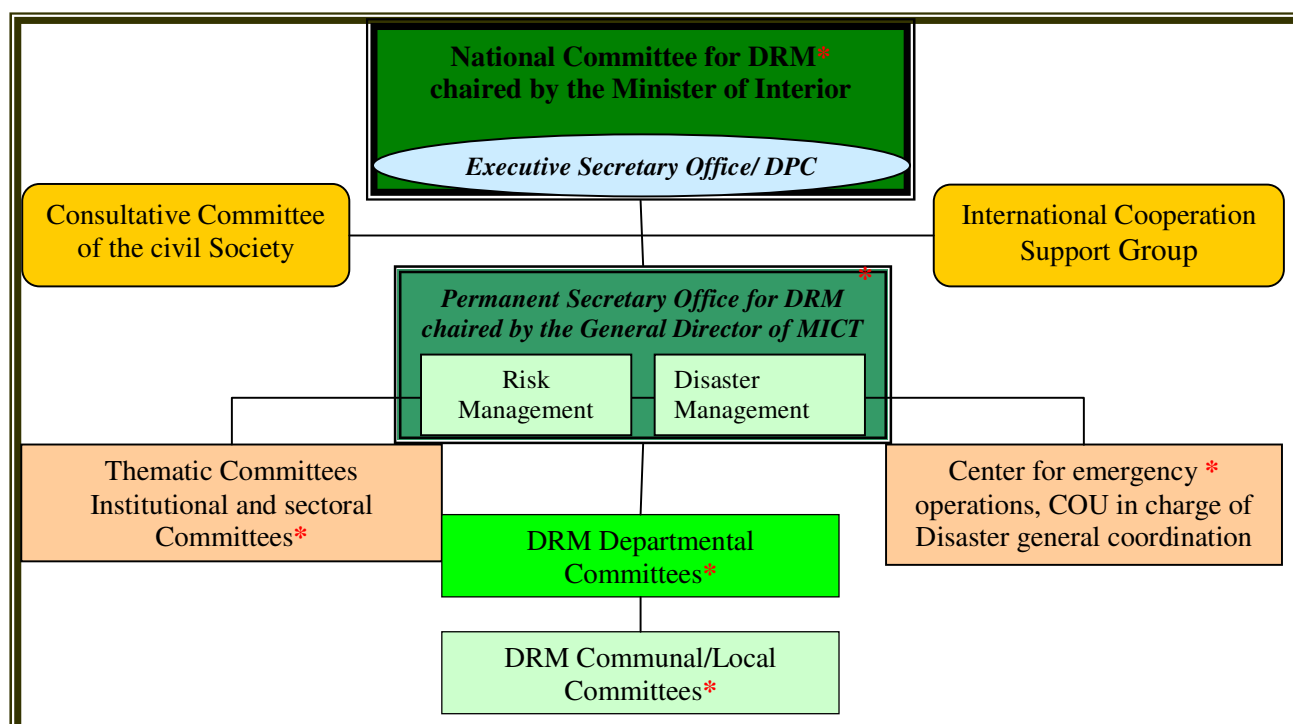
Consultative Committee of the Civil Society: Including individuals from all primary national sectors, its mission is the overall support the DRM process.

The International Cooperation Support group: Including a number of international agencies and NGOs operating in Haiti, its mission is to back up the DRM National System.

Departmental and communal structures: Operating at a more decentralized level, these structures' objective is the implementation of prevention and response actions. Under the supervision of the departmental or municipal representatives of the central government, they include the local mayor's offices, the other government departmental or municipal structures, Haitian Red Cross, NGOs, local community based organizations, and private sector institutions operating in the area.

The departmental and communal committees are responsible for preparing specific local-level action plans to effectively address the needs of the related population as far as DRM is concerned. They also participate in the disaster response coordination. State and autonomous institutions are represented in the DRM structure at all administrative levels but are often less committed in terms of active participation once the level of big cities.

Figure 4 The Haiti DRM National System organization chart¹⁵



¹⁵ Source: UNDP Haiti, 2004; Key: a red asterisk indicates where the MoA is directly represented

3.1.2 Disaster preparedness and mitigation programs in Haiti

Disaster Risk management was hardly included in programs designed over the last 20 years. However, all the stakeholders agree on the complex interrelationships between sustainable development and DRM. According to OXFAM GB in 2001 agriculture and environment constitute the favourite domains of intervention and support for most local, national, and international institutions working for socio-economic development in Haiti. About 69% of the surveyed institutions were working in DRM and 50% were simultaneously involved in prevention and rehabilitation phases. Currently, most of the institutions working in DRM pursue the following objectives:

- Capacity building of institutions;
- Economic empowerment of marginalized populations
- Vulnerability mitigation through the promotion of sustainable use of natural resources.

3.1.3 DRM-based activities undertaken in the agriculture sector

Due to its unpredictable characteristics, DRM in the agriculture sector has historically been a rather secondary topic in Haiti's development programs. Institutions operating in agriculture and environment do not necessarily directly work in the DRM-Ag sector, preferring to address related humanitarian issues such as drinking water supply, relief food and medicine distribution during the response phase. Nevertheless, some actions are taken in the agriculture sector.

When disaster occurs, rapid assessments of needs are carried out by the government through the DPC structures and by local and international institutions and NGOs. Disaster assessment data are generally used to elaborate appropriate disaster relief projects to be submitted to the international and national communities. In this setting, FAO has historically been at the forefront in cooperating with the Ministry of Agriculture and other entities during the response and rehabilitation phases, using disaster damage assessment data it collected to write its own projects for funding FAO then generally executes the project jointly with the MoA. FAO/Haiti has implemented projects contributing to:

- Permanently assess disaster farm needs in collaboration with the Ministry of Agriculture;
- Provide stakeholders with statistical and technical information
- Provide farm inputs to affected farmers through community-based organizations.

In September 1998, after the devastating effects of hurricane Georges on localities in the South, the PADF launched the USAID funded Hurricane Georges Recovery Program which successfully:

- Raised awareness of disaster management and helped 22 communities to develop disaster mitigation, preparedness, and response plans.
- Introduced and distributed 463 tons of improved seed varieties to farmers;
- Implemented 27 subprojects, including the rehabilitation of two roads, seven irrigation systems and eight soil conservation projects);
- Increased ORE's capacity to improve the germ plasm and produce corn, bean and sorghum seeds to be distributed to farmers.

The Haitian NGO ASSODLO undertook a DRM project funded by Helpage International and ECHO in the highly vulnerable town of Fonds-Verrettes, repeatedly swept away by flooding. Among the project's achievements were:

- Community awareness raising;
- Community-based mechanisms and structures for disasters response;
- Mitigation of disaster impacts through reforestation.

After the May 2004 flooding and hurricane Jeanne in September 2004 OXFAM-GB targeted women-headed households in a food security program, which provided seeds and tools in rural areas around Gonaives. In Mapou staff and local counterparts revitalized the local economy by calculating the amount of seeds, tools and livestock required by the population, and allocating vouchers to beneficiaries for use in local fairs promoted on community radios, and through posters and banners. The sellers then redeemed the cost of the voucher from an OXFAM-GB funded local committee.

Following a severe drought in the North-West in 2002, CARE-Haiti distributed seed to 10,000 families in the most heavily stricken municipalities. Program strategies were discussed with the departmental representatives of the MARNDR. The seeds were inspected by CIDPSA, the controlling commission of the MARNDR, before delivery. After hurricane Jeanne, CARE launched a rehabilitation program in the Artibonite and North-West departments, centred on agriculture and livestock. The activities included road rehabilitation, cleaning and repair of damaged irrigation structure on 1,200 hectares of irrigated land, and soil conservation.

The NGOs CRS and CARITAS are about to implement an "Emergency, Disaster and Risk Management Project" funded by the World Bank aiming to reduce disaster vulnerability in 28 communes of the Grande-Anse and South departments. Activities will focus essentially on:

- creation and reactivation of DRM local and communal committees;
- designing of DRM sub-projects;
- revitalization of coordination platforms created in the departments.

Project achievements will be monitored and evaluated, and CRS will share information about results and lessons learned with counterparts.

Table 1 Activities undertaken by some institutions
in agriculture and livestock related DRM

Institution	Intervention area	Activities
MARNDR	Country wide	<ul style="list-style-type: none"> • Damages and needs assessments • Coordination of activities carried out in the sector through the DDAs and S/DDAs
FAO	Country Wide	<ul style="list-style-type: none"> • Damages and needs assessments • Input distributions (seeds, tools, livestock) • Livestock vaccination campaigns • Rehabilitation of irrigation structures
PADF	Aquin, Vieux Bourg, Chantal, Ducis, Camp-Perrin	<ul style="list-style-type: none"> • Creation of communal and local DRM committees • Training of committee members on DRM themes • Raising public awareness about disaster preparedness and mitigation • Improved seed and tools production and distribution • Rehabilitation of irrigation systems • Soil and water conservation projects
ASSODLO	Fonds-Verrettes (West)	<ul style="list-style-type: none"> • Raising public awareness about DRM; strengthening relationships between communities and DPC structures • Creation of disaster preparedness committees • Reforestation projects
CARITAS	Country wide	<ul style="list-style-type: none"> • Seeds and tools distribution • Restocking (related to pig farming) • Rehabilitation of irrigation systems
Action-Aid	North-West, South-East, West	<ul style="list-style-type: none"> • Provision of credit (in kind) to farmers • Seeds, tools and livestock distribution • Capacity building in conservation & agro-forestry
OXFAM-GB	Cap-Haitian, Gonaïves, South-West	<ul style="list-style-type: none"> • Raising public awareness about DRM Seeds, tools and livestock distribution • Soil and water conservation
CARE-Haiti	NorthWest, Artibonite	<ul style="list-style-type: none"> • Raising public awareness about DRM Emergency preparedness planning • Seed distribution • Poultry restocking • Soil and water conservation • Rehabilitation of irrigation canals
CRS	South, Grande Anse, North, North-West	<ul style="list-style-type: none"> • Creation of communal and local DRM committees • Development of mitigation projects

Sources: Adapted from Charlestra (2006, unpublished) and others

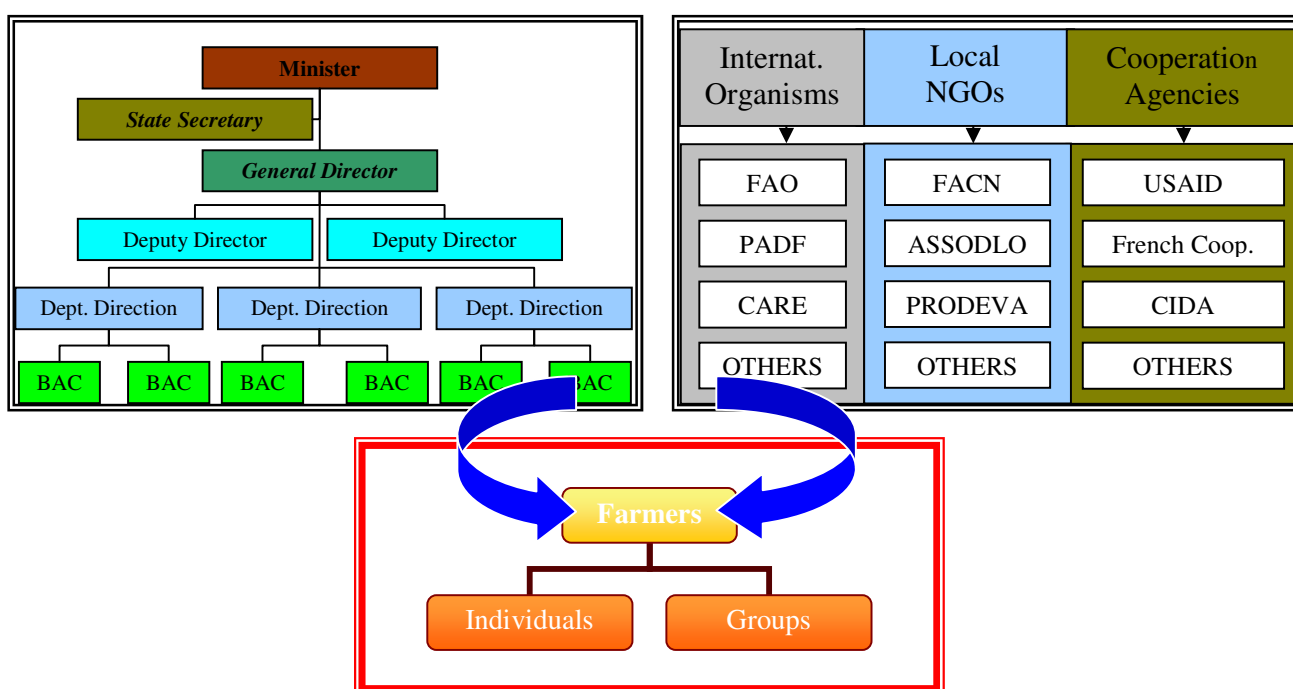
3.2 The Agriculture Institutional Framework

3.2.1 Characteristics of the farm sector in Haiti

The Haitian farm extension system is supported on the one hand by the Ministry of Agriculture and on the other by international organisms, local NGOs, and international cooperation agencies under the Ministry of Planning and External Cooperation umbrella. Those two parties work separately or jointly with individuals and/or grouped farmers to whom they provide technical training and farm inputs such as tools, seeds, fertilizers, etc (see Figure 5), generally free of charge except for the seeds for which small contributions may sometimes be requested. Support provided to farmers is generally not DRM-related. However, after weather-related disasters, relief is delivered to the farmers, including farm-related material. The projects operating within the DRM-Agriculture interface are generally meant to address post-disaster farm issues rather than preparing the farmers to cope with disaster impacts in advance.

The extensive assistance Haitian farmers are used to receiving is likely to negatively affect their creativity and ingenuity, while constituting bad heritage for upcoming programs based on sensitization and motivation to trigger positive behavioural changes).

Figure 5 The Haiti agriculture national framework organization chart



3.2.2 Representation of the Agriculture sector within the National DRM system and existing links

The agriculture sector is directly represented at different levels of the National DRM system by the MoA, though its presence is more perceptible at a decentralized level. The MoA has not designed its intra-institutional DRM sectoral contingency plan yet, so it does not presently cover a leadership position within the DRM national system, and is left to support the DPC/MICT-led decisions in times of disaster.

Present links between the DRM system and the Agriculture sector include: (a) methodical organization of the planned activities), (b) exchange of all relevant data, (c) projects implementation, (d) monitoring, and (e) evaluation. In general, these links are weak, however, they tend to become more effective during the response phase when relief is being rush-delivered to the disaster-stricken as the DPC needs to collect information related to damages at farm-level to prepare damage assessment reports which will ultimately be submitted to donors for emergency relief request.

Moreover, DRM programs in Haiti have historically evolved at a two-fold level to formally include an agriculture-dedicated component on one hand, and on the other to encompass all phases of a disaster instead of being limited to the response phase

as happened in the past. This positive change dates back to Hurricane Georges in 1998, when multi-phase agriculture-based DRM projects were officially designed as the way forward to sustainability in the sector. Though response is still prevailingly the phase addressed DRM related programs implemented in Haiti also address:

- Preparedness, by raising the public awareness and capacity building of committees at different levels (training).
- Response, through input distributions (seeds, tools, livestock)
- Mitigation, through actions to protect the environment (soil conservation, reforestation)
- Rehabilitation, through road repair and rehabilitation of irrigation infrastructures.

The strength of the DRM system is the partnership between the DPC, national and international agencies, NGOs, the civil society and local communities. Moreover, the integrated creation and strengthening of municipal and local DRM committees is important in committing communities and making the process effective. Finally, training and mitigation actions such as soil conservation, roads and farm infrastructures rehabilitation undertaken in most recent DRM projects constitute invaluable investments for longer-term development in the concerned areas.

On the other hand, however, gaps and weaknesses characterize past and ongoing programs, among which:

- Lack of well-trained local evaluators;
- Weakness in the evaluation approach in the agriculture and livestock sector;
- Too much emphasis on response actions rather than on prevention and mitigation on one side, and rehabilitation and reconstruction on the other;
- Lack of cash and inadequate inputs such as improved seeds to disaster-stricken farmers;
- Lack of synergy between actors and consequent tendency to duplication;
- Lack of full involvement of targeted populations in the DRM process.
- Insufficient scope of programs and failure to meet the multiple needs of stricken communities;
- Once needs are established, distribution is undertaken on an equal footing; as such, those beneficiaries who have lost more than others feel that the distribution process is not equitable. In extreme cases, relief was granted to individuals who had not been affected by the disaster;

3.3 The DRM-Agriculture interface: some recommendations for improvements

The following is proposed:

1. The resolutions and provisions decided in the Haitian DRM National Plan which provides a good framework for local issues should be applied by initiating assessments and updating drills;
2. The generally top-down relationship existing between the Ag and the DRM sectors needs to evolve towards a more participative, dynamic, productive, and permanent type and a participative and egalitarian approach should shape the relationships between all stakeholders of the two sectors at all levels;
3. An effective decentralization to the lower administrative levels is recommended, since MoA local representatives is often hampered and remains inefficient since not being authorized to take quick decisions without first reporting to a senior officer or to headquarters, stopping or slowing down the scheduled activities;
4. Local DRM committees created under the impulse of the DPC and the Haitian Red Cross (and dedicated to coordinating training, information sharing, and emergency relief delivery to benefit the population at the local/rural level) should be permanently activated, and trained. Small stipends paid to committee members may ensure an overall better performance
5. It is recommended that the DRM inter-institutional committee dedicated to coordinating DRM sectoral committees be activated;
6. It is recommended that the MoA DRM sectoral committee be activated with mandate to ultimately elaborate, validate and execute agriculture sector-wide contingency plans related to DRM issues at any phase. It should eventually be turned into an autonomous DRM direction provided with adequate resources in view of timely achievement of the scheduled agriculture-related DRM tasks decided in the DRM National Plan;
7. Future watershed management projects, of which the MoA is in charge, should link to disaster and risk management priority framework;
8. Timeliness of early warning and of relief coordination efforts must be prioritized as a key to the success of DRM efforts.

Table 2 Links between DRM & Agriculture sectors and improvement recommendations

Administrative level of action	DRM phase	Links	Recommendations
Central	Before Disaster	Information Planning Execution	<ul style="list-style-type: none"> ➤ Independent direction of DRM sectoral committee at the level of the MoA for a greater efficiency ➤ Finalization of the inter institutional plan for DRM by the DPC/Permanent secretary's office for DRM
	During Disaster	Information Planning Execution	<ul style="list-style-type: none"> ➤ None
	After Disaster	Planning Information Execution Monitoring Evaluation	<ul style="list-style-type: none"> ➤ Preparation and implementation by the DPC of the scheduled sectional response plan with actions and initiatives to undertake in the aftermath of a disaster
	All phases	Planning Information Execution Monitoring Evaluation	<ul style="list-style-type: none"> ➤ More efficient coordination and clearer definition of responsibilities between the DPC and the Permanent secretary's office for disaster and risks management and the other concerned branches of the executive power ➤ Greater involvement of the Ag sector in DRM
Departmental	Before Disaster	Planning Information	<ul style="list-style-type: none"> ➤ A clear definition of the roles and responsibilities of each sector as well as of the links between them is recommended within the existing departmental-level contingency plan; ➤ Involvement of the Ag sector in the design of the DPC funded hurricane related warning messages.

Level	DRM phases	Links	Recommendations
Departmental	During Disaster	Planning Information Execution	➤ Availability of adequate resources to the Agriculture sector for the timely collection, processing and dissemination of natural hazard related early warnings
	After Disaster	Planning Information Execution Monitoring Evaluation	➤ Involvement of the agriculture sector representatives in the DPC post-hurricane season evaluation.
	All phases	Planning Information Execution Monitoring Evaluation	➤ Direct participation and attendance of senior executives from the agriculture departmental direction to scheduled meetings would be recommended;
Communal/Local	Before Disaster	Information	<ul style="list-style-type: none"> ➤ Promotion and implementation of DRM based good practices to help reduce risks likely to occur in the farming system while reinforcing its overall production capacities ➤ Risk assessment as an integral part of the design and implementation process of the selected appropriate practices ➤ Appropriate training of MoA local representatives
	During Disaster	Planning Information Execution	➤ Availability of personnel from both sectors

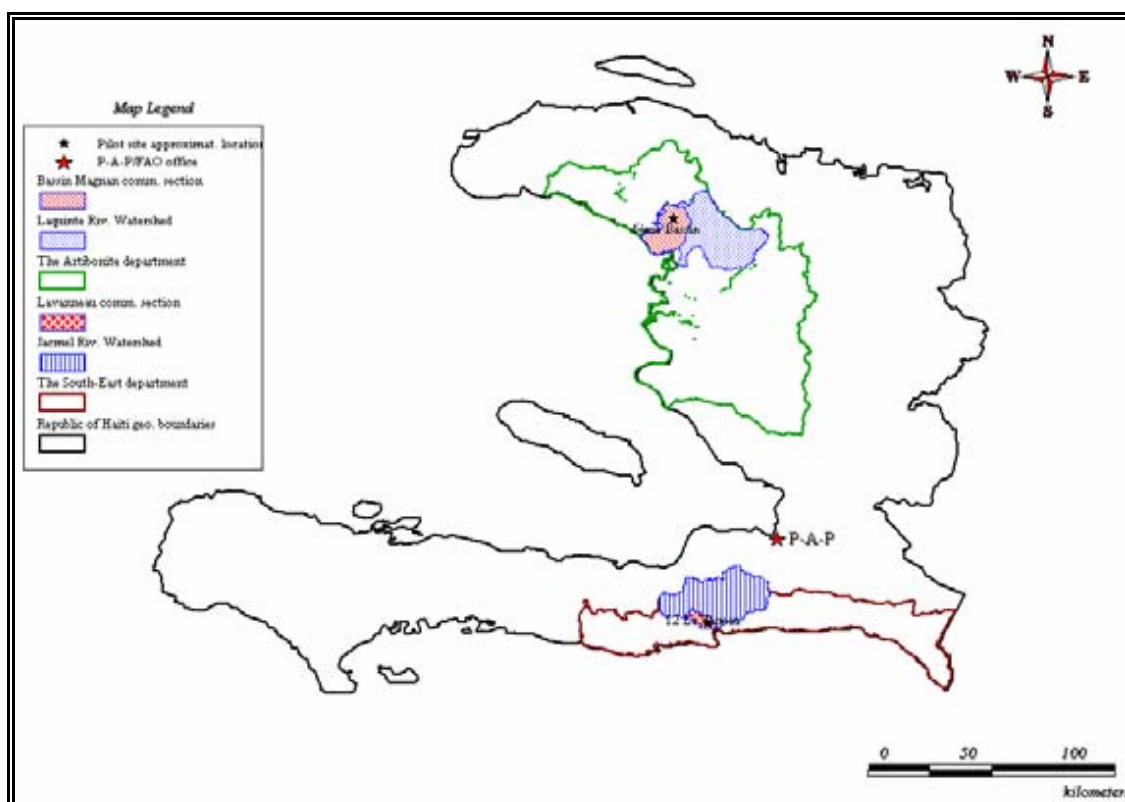
Level	DRM phases	Links	Recommendations
All levels	All phases	Planning Information Execution Monitoring Evaluation	<ul style="list-style-type: none"> ➤ Anticipation to January of the hurricane season related prevention activity campaign ➤ Focus on complementarities between risk management and disaster management within the DRM cycle;

4. PILOT SITE PROFILING

The field research process was administered in the two selected pilot sites and to have a basis for comparison, it was determined that some other sites would also be surveyed. Two of them, Belle-Anse and Marmelade, were selected based on the following criteria:

1. Previous existence of DRM related agricultural good practices;
2. Evidence of FAO and/or other agriculture and/or DRM related NGOs ongoing activities;
3. Request from NGO partners of FAO in DRM to address agriculture and DRM related issues in their operation zones.

Figure 6 Location map of the study area



Source: the Author

Table 3 General characteristics of the selected pilot sites

Name	Geographic area	Agro-ecological zone	Vulnerability to Hazards
<i>Bassin Magnan</i>	Gonaives/Artibonite	Tropical very dry forest / Dry and irrigated plateau	Hurricane, Drought, Landslide
<i>Lavanneau</i>	Jacmel/South-East	Tropical dry forest / Irrigated flood plain and hillsides	Hurricane, Flood, and Wind

4.1 The *Bassin Magnan* pilot site

4.1.1 Location and physiographic features

Bassin Magnan is a small rural community of the interior with an extension of 9 km² within the municipal section of the same name, located 12 km from Gonaives, the capital and main

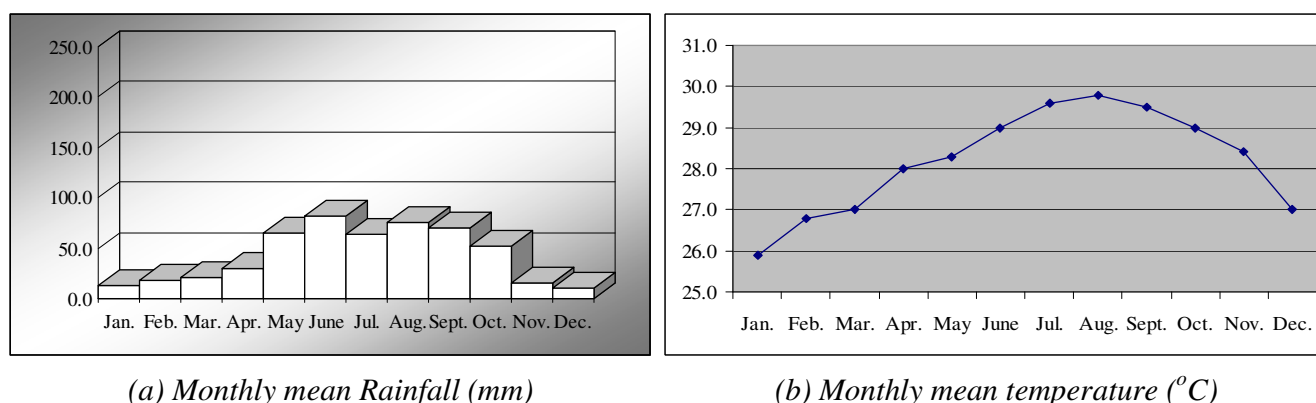
departmental city of the Artibonite. It is situated on a plateau between 160 and 300 m above sea level, steep-sided between the two medium-altitude mountain ranges François, to the North, and Depot/Marie Colas, to the South. These west – east oriented mountains are crucially deforested with less than 1% of dense forest cover. The community is partly located in the “*Deux Bassins*” ravine basin and partly in the SEDRENN river basin both pertaining to the La Quinte River watershed, the main surface water drainage system of the Gonaives and Terre-Neuve area (see Annex 1). Here the land slopes, ranging between 5 and 10%, do not constitute a problem, except in the surrounding hills which are anyway too degraded for farming”.

Climate

In line with the lower Artibonite area pluviometry, *Bassin Magnan* is a leeward and arid zone with hardly 522.5 mm of annual mean rainfall (2 times less than the national average of 1,500 mm). The rainfall curve is almost bell-shaped with two distinct seasons: a wet (or less dry) one from May to October, with a slight dip in July, and a drier one: extending from November to April. The monthly mean pluviometry is no more than 43.5 mm (See Figure 7).

The site temperature increases from January to August and then decreases until December, showing monthly mean value of 28.2°C. Agro-ecologically the pilot site belongs to the tropical very dry forest life zone¹⁶.

Figure 7 Monthly mean rainfall (a) and temperature (b) at *Bassin Magnan*, Gonaives



(a) Monthly mean Rainfall (mm)

(b) Monthly mean temperature (°C)

Source: FIC, SNRE

Demography

About 45,000 inhabitants live in the entire *Bassin Magnan* communal section of which 52% women and 48% men (Higazi, 2006). 40% of the population is less than 15 years old, of which 15% is less than 5 years old. Moreover 55% was estimated to be labour-active. The pilot site considered very densely populated and the respondents of the PRA field session estimate the total population, though no census data are currently available¹⁷.

¹⁶ Based on the Holdridge's (1967) two-parameter ecosystem classification, the tropical very dry forest life zone is defined by mean annual temperature >24°C and mean annual precipitation between 500mm and 1,000 mm.

¹⁷ Of note that the Bassin Magnan pilot site cover a mere 3.93% of the communal section total land area.

Social stratification

A conspicuous indicator of social stratification is that the roof of houses in Declin, the dry fringe, is mostly thatched while those in Cinq Carreaux, the central part of the communal section, are generally made of corrugated iron or concrete. At Declin, animals predominantly raised are free ranging goats and poultry whereas cows and pigs are mostly raised in the irrigated zone. Moreover, the PRA-based community meeting session at *Bassin Magnan* proposed the classification of the local farmers in the following three categories; based on area of land exploited, land tenure and access to paid labour:¹⁸

1. Wealthy farmers exploiting up to 8 ha of mostly privately owned land located in the irrigated zone; they use salaried farm labor and generally possess fields of mesquite they sell to small farmers or coalmen;
2. Medium-class farmers exploiting about 2.5 ha of land partly accessed through ownership, partly through renting and/or sharecropping; needed farm labor is provided by the household members, and partly paid; most of the land is located in the non irrigated zone;
3. Small farmers who exploit at most 0.75 ha generally accessed through sharecropping; the farm labour used is strictly family-provided and the parcels are situated within the dry zone.

History

The biggest changes in the community took place in 1952 when SEDRENN opened a copper extraction plant at Mémé, 5 km from the pilot site. The jobs created through the blazing of a communal/departamental road to Terre-Neuve and the good financial momentum it triggered in the community hardly compensated the ecological disaster caused by the mining and the transformation of landless farmers turned down by SEDRENN into desperate coalmen who cut down all remaining trees to make charcoal. Probably due to the presence of SEDRENN, a baby boom was also observed in the community around 1971.

A community clinic/hospital started to serve the community in 2003 and a small power plant was inaugurated in 2005 in Cinq Carreaux.

4.1.2 Natural resources base

Despite great degradation, the pilot site encompasses most basic natural resources :

Natural forest: Fuel wood lots are important assets in *Bassin Magnan*, belonging to the richest local farmers who eventually “sell” their products to poorer farmers/coalmen who make charcoal from that for a living. The main tree species are mesquite, (*Prosopis juliflora*) and lignum vitae (*Guaiacum officinale*) used for charcoal making. The situation is characterized by an unsustainable exploitation policy, since the intensively harvested trees are not being replaced by new plantations, with the dire prospect of witnessing the disappearance of all trees from the entire area in the mid to long run.

Soils/Land: Soils are prevailingly of the brown vertic/calciic type originated from limestone parent rock. Such impermeable soils are typical of deep valleys plateaus under dry climates, characterized by slightly acid to neutral pH, and high CEC values, 80

meq/100g. Very often affected by active limestone, they are generally fertile; their main problem being water unavailability (GRET-FAMV, 1991).

A typical farm household will exploit 1.56 ha scattered over 3 plots located in different places. The best and most fertile soils within the pilot site, exploited by the wealthiest local farmers, are in the irrigated zone, smaller in size than parcels in the non irrigated zone that smaller and poorer farmers are compelled to exploit.

Water: Irrigation water is provided through a combined system of pumped and river surface water covering a 230 ha total surface irrigated area of which about 80% falls within the pilot site borders. This water is inaccessible to smaller and poorer farmers, generally prevented from exploiting irrigated land for lack of economical means, while about 78% of the 270 of the most fortunate local farm households are able to use it. Drinking water is provided from 7 different springs and water wells. Tap water comes from a single spring and is accessible to 15 - 20% of the total pilot site population, but no private home-delivered services of water supply exist within the pilot site. Moreover, people in the drier fringe are confronting huge problems as far as drinking water supply is concerned, being compelled to use water of dubious quality to satisfy their daily needs.¹⁹

4.1.3 Other socio-economic resources

Access to credit: farm credit from private or state-owned banks is inexistent in the pilot site, as is crops insurance. Informal cash credit systems include:

- “Ponya”; a cash credit with monthly interest rate as high as 30% of the capital;
- “Sol/Sabotaj”: in which participants democratically bound by specific rules regularly save a fixed amount of money at predefined times; on a rolling basis the total amount collected is advanced to a different member of the group until everyone has received the totality of his financial contributions once (Higazi, 2006);
- “Plane” of the land: a kind of pawn-broking in which a farmer in urgent need for money “mortgages” his parcel of land for a period of time during which the “pawnbroker” is entitled to exploit the land until complete reimbursement (Higazi, 2006).

Farming extension services and structures: The farmers complain of the remarked absence of \ government farm services and structures, which are indeed quasi inexistent in the area. Local farm extension is generally the work of international organizations such as FAO, and NGOs such as Hands of Love. Farmers also denounced an implicit clientelism system with the extension agents tending to assist the better off farmers instead of supporting the small needy ones.

Development organisms and local CBOs: Particularly active in the pilot site are FAO (farm infrastructures and inputs), Hands of Love (irrigation water pumping, power supply), AME (Hospital “*Bon Berger*” / health care). No less than 15 associations and CBOs operate with goals as diverse as environmental protection, farm credit, road repairing, animal health, and disaster management.

¹⁹ According to some participants to the PRA session at Bassin Magnan some springs of “drinking water” for human consumption are interchangeably used to water cattle while being located close to open public latrines.

4.1.4 Farming activity at *Bassin Magnan*

As in most of the country, agriculture is the main economic activity at *Bassin Magnan*. Represented subsystems are cropping, livestock and forestry.

Crops

In descending order of market value, main cultivated crops are common beans, vegetables, corn, banana, cassava, pigeon peas, sorghum, millet, sorghum dodo⁴⁷²⁰. While the first three crops are mostly marketed (Higazi, 2006), the latter mentioned are mainly used for household self-consumption. In terms of cultivated land surface area, sorghum is definitely the most important crop in the area, while common beans are cultivated only in the irrigated area and only once a year despite a very short cropping cycle. There are three cropping seasons over a 12-month calendar year, with some crops straddling the next cropping year as far as harvest time is concerned (Refer to Table 8).

In general, the farming tools used, such as machete and hand hoe are anachronistic as well as insufficient in number, resulting in a very labor-intensive activity. Crop yields are very small and far inferior to the invested labor force (Higazi, 2006).

Needed labor force is provided through family labor, paid labor, and mutual aid labor system such as *combit*, based on , volunteer participation, and *colonne*, a more structured system in which a limited number of related workers help each other on a rolling basis and eventually sell labor to others in soil preparation tasks. Through these strategies the difficulties associated with ever skyrocketing costs and locally prevailing scarcity of farm labor may be bypassed.

Chemical fertilizers are not commonly used in *Bassin Magnan* due to their high costs and to inadequate availability of water.

Livestock

Dominant species raised are goats (*Capra hircus*), a species particularly adapted to dry environment, followed by cows and pigs. A single cattle breeder may handle about 4 goats and one cow either directly owned or indirectly tended. Pig farming faces the huge difficulty of food supply due too high prices, while cattle or goats can easily feed on crop residues. Mass deaths, probably due to New Castle disease, once or twice a year tend to discourage farmers from traditional poultry farming that is otherwise very widespread.

Forestry

Forest exploitation is scarcely contrasted through small-scale and scattered reforestation projects undertaken in some strategic and vulnerable spots partly through the volunteer effort of local community based organization (CBO), and partly through formal funds, while farmers are not used to participate in farm-level individual reforestation efforts.

Figure 8 Typical cropping calendar in *Bassin Magnan*, Gonaives, Haiti

		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	
First cropping season	Corn				■				■								
	Sorghum					■								■			
	Millet				■			■									
	Sorghum ⁴⁷				■				■								
	Pigeon peas				■									■			
	Cassava				■									■			→
	Banana						■										→
Second cropping season	Banana								■								→
	Cassava								■								■
	Corn								■					■			
	Sorghum ⁴⁷								■					■			
Third cropping season	Com. beans																■
	S. cassava													■			→
	Sorghum dodo ⁴⁷													■			→
	Banana													■			→

Legend

■	Sowing time	■	Harvesting time	→	Harvest time overlapping the next cropping year
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4.1.5 Characteristics of Livelihoods

Access to irrigated land is a challenge at *Bassin Magnan*, where the vast majority of the land is constantly under extended periods of drought. The lucky farmers to exploit irrigated parcels generally don't pay any water fees for the river-bank pointed system, whereas fees as high as 125.00 HTG/hour²¹ are reported to be paid by farmers using the pump based system. Anachronistic tools and quantitatively inadequate equipment, difficult access to capital, skyrocketing prices of salaried farm labor are just a few of the limitations facing the local farm households. Cash credit is available to some local farmers through the initiative of a local NGO supporting a locally operating cooperative. Loans are granted at a 2% monthly rate but only for emergency situations such as death and severe illnesses involving the 300 members. The majority of farmers in need are compelled to resort to the informal credit system, in which loans are reluctantly granted at monthly rates as high as 20 to 30% (Higazi, 2006). Sometimes, farmers may mortgage or rent their parcels of land or become members of a *Sòl*, or another informal credit system. A number of NGOs executing farm-based projects supply farm extension and training services. Since 1993 an improved seed bank program managed by OPUDB has been operating in *Bassin Magnan*, focused on managing seeds availability and benefiting from FAO technical and material support. An FAO funded improved goat breed distribution and restocking program as a particularly relevant long-term response to livestock related damages brought about by Hurricane Jeanne. A few fortunate farmers own the prized mesquite woodlots which they

²¹ Source: Higazi, 2006

sometimes lease to poorer farmers for charcoal-making. The vast majority of farmers are concerned by the downward trend of availability of farm assets. Understandably, since the site experienced major and recurrent weather-related disasters in the past three years farmers adaptation strategies to sustain a living are growing more and more refined.

Table 4 Coping strategies adopted by local farmers of the *Bassin Magnan* pilot site

Coping strategy	Rationale	Categories of farmers involved	DRM related
Migration	Poverty, insecurity, disaster occurrence, unemployment	Smaller and medium class farmers	Yes
Charcoal burning	Poverty, landlessness	Small and medium class farmers	Yes
Informal cash credit (<i>Ponya, Sòl, Plane terre, Location, Affermage</i>)	Absence of formal credit from banks and other institutions	Small and medium class farmers	Yes
Request for disaster aid	Damage from natural disasters	Farmers from all categories/classes	Yes
Seasonal farm work	Poverty, landlessness, unemployment	Small farmers	Yes
Excavating river sand/gravel	Poverty, extended drought	Smaller farmers	Yes
Farm and food product commercialization	crop system risks/uncertainties	Women prevalingly	No
Improved farming techniques	Water management in drought conditions	Farmers in dry areas	Yes
Selection of appropriate varieties	Drought, hurricanes	All farmers	Yes
Share cropping	Poverty, landlessness	Small and medium-class farmers	No
Scattering of parcels	Weather uncertainty impact mitigation	High and medium class farmers	Yes
Farm crop diversification	Weather uncertainty impact mitigation	All farmers	Yes
Cultural rotation	Soil fertility management	Farmers in the irrigated zones	No
Livestock selection	Poverty, drought and hurricane prone environment	Prevalingly medium and high class farmers	Yes
Herding	Farm asset management	All farmers	Yes
Agro-pastoralism	Soil fertility and farm asset management	Medium and high class farmers	No

4.1.6 DRM Issues at *Bassin Magnan*

Local perception of natural disaster at *Bassin Magnan*

The *Bassin Magnan* respondents identified three dominant weather-related phenomena which fully deserve the label “natural disaster” based on their respective and specifically destructive impacts on all local activity sectors, and their recurrence, listed and defined in descending order of perceived impacts, causes, consequences, and correcting measures as follows:

- Hurricane: a devastating weather-related phenomenon with unknown causes but very destructive to the parcels and crops, livestock, human lives, and infrastructures. It

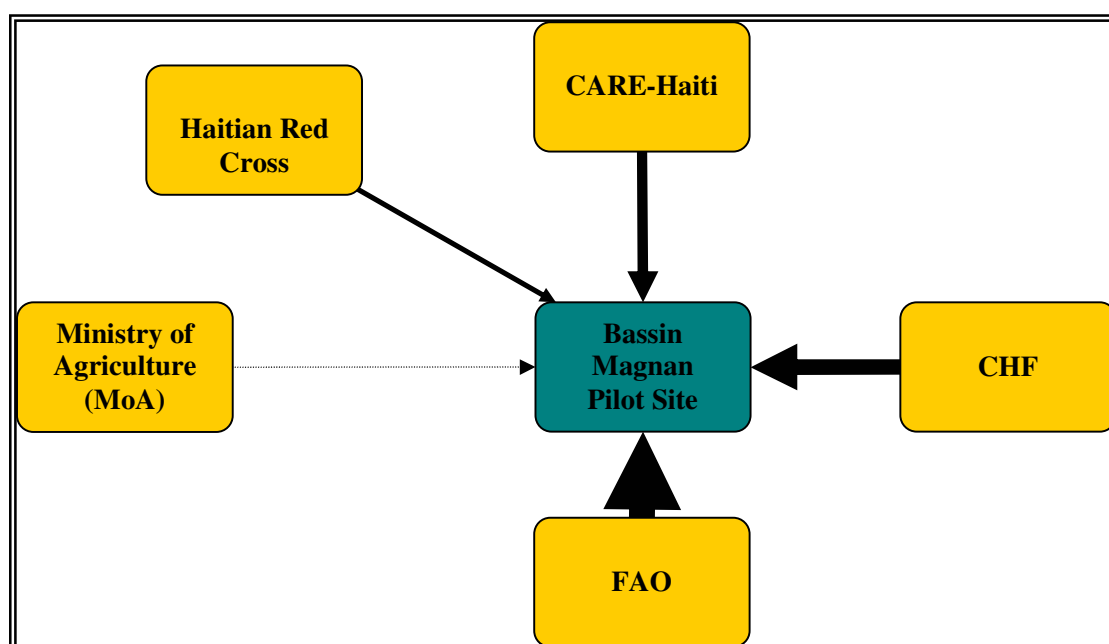
may be addressed through soil conservation and reforestation;

- Flood: a phenomenon by which rivers' banks overflow due to a combination of heavy rains, low soil infiltration and excessive run-off, resulting in soil erosion and fertility decrease, losses of crops and human and animal lives. May be mitigated through soil conservation”;
- Drought: extreme scarcity of rains due to deforestation and wind resulting in delayed farming cycles and cattle abortion. Drilling water wells is considered a corrective measure;

Furthermore, all social categories within the area only have access to hurricane-related early warning information, generally clearly disseminated in Creole. However, very limited economic means can prevent the farmers to fully take heed of the anti-hurricane recommendations conveyed through the early warning messages. The respondents also observed that not many institutions are actually present to support them in time of disasters and their contribution to disaster alleviation and reconstruction was found to be wanting. Of the mentioned institutions, FAO was ranked highest for projects for the recovery farm infrastructures and other farm inputs implemented in the area shortly after hurricane Jeanne. The Ministry of Agriculture, in contrast, is thought to be insufficiently present in the farm related response and recovery effort (See Figure 9).

Furthermore, DRM pre and post-disaster related training is only available to a few local community leaders.

Figure 9 *Bassin Magnan* farmers' perception of the contribution of local and national institutions to disaster response and recovery efforts



Key: The length and width/thickness of the arrows are a direct function of perceived “proximity” and contribution of concerned actors to disaster response and recovery effort

The vulnerability context

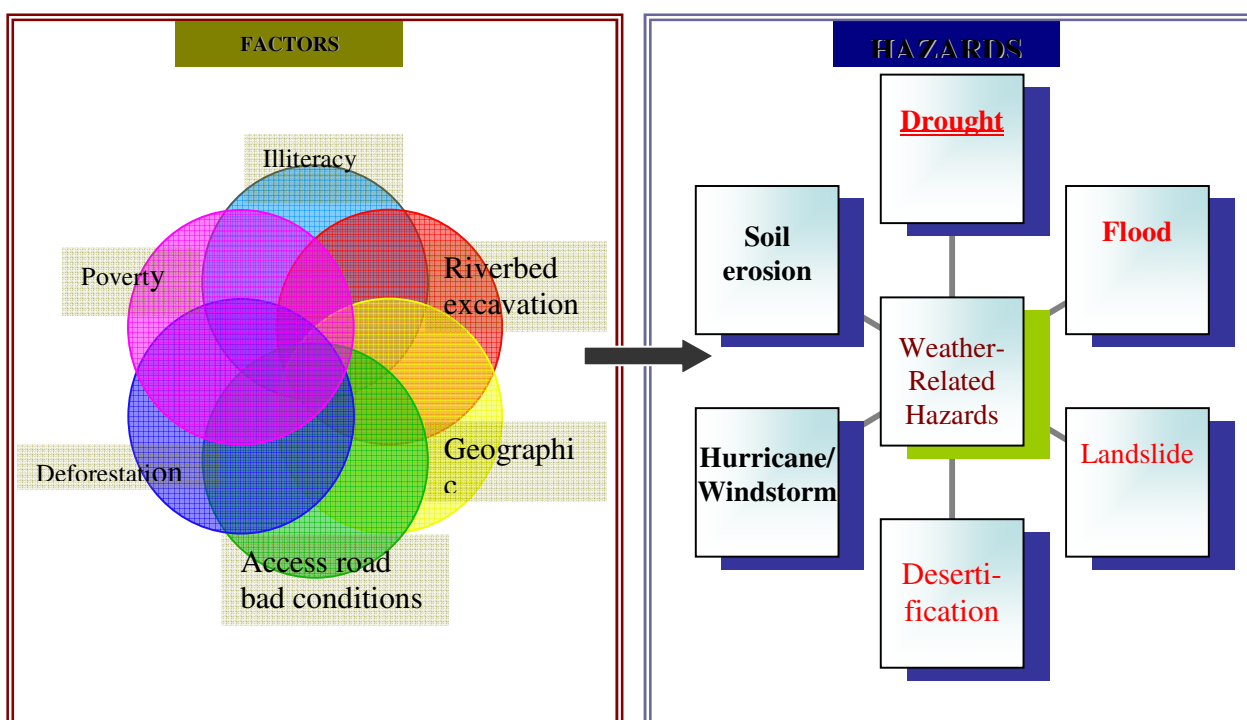
Main sources/factors of vulnerability at *Bassin Magnan* are represented by poverty (a historical and pervasive phenomenon in Haiti and in *Bassin Magnan* which prevents the farmers to take

heed of most recommendations²² related to disaster prevention), geographic location (it is part of a leeward area recently revealed as prone to hurricanes); road access conditions: the main communication local road is a dust, unpaved tract which crosses several forded sections of the site's three rivers, making traffic particularly dangerous during rainy and hurricane seasons; illiteracy characterizing the major part of the local population, deforestation (through which the remaining (mesquite and *lignum vitae*) trees yet accessible are being actively removed for charcoal making); absence or precarity of general and farm-based infrastructures. An additional crucial anthropogenic vulnerability factor is represented by excavation of the nearby by poor and desperate riparians for sand, gravel and stones which are sold as house building material for a living. Since the road crosses the river at the mentioned spots, by undermining the riverbed this digging activity may cause the road to collapse while increasing the risk of riverbank slide.

The above-mentioned factors are in turn considered a cause of vulnerability to the following hazards, in descending order: hurricanes, drought, flood, landslide, soil hydric erosion, and desertification (See Figure 10)

Hurricanes have been particularly damaging in the past ten years, with Georges in 1998 and Jeanne in 2004 the two major events. This is rather unusual since hurricanes seem to be shifting their traditional North-North West path to a more transversal one dangerously crossing the Artibonite area. Soil hydric erosion is pervasive due to an extensive level of deforestation. Those two hazards were not mapped out through the focus group meeting since they hit the entire zone with similar intensity and frequency.

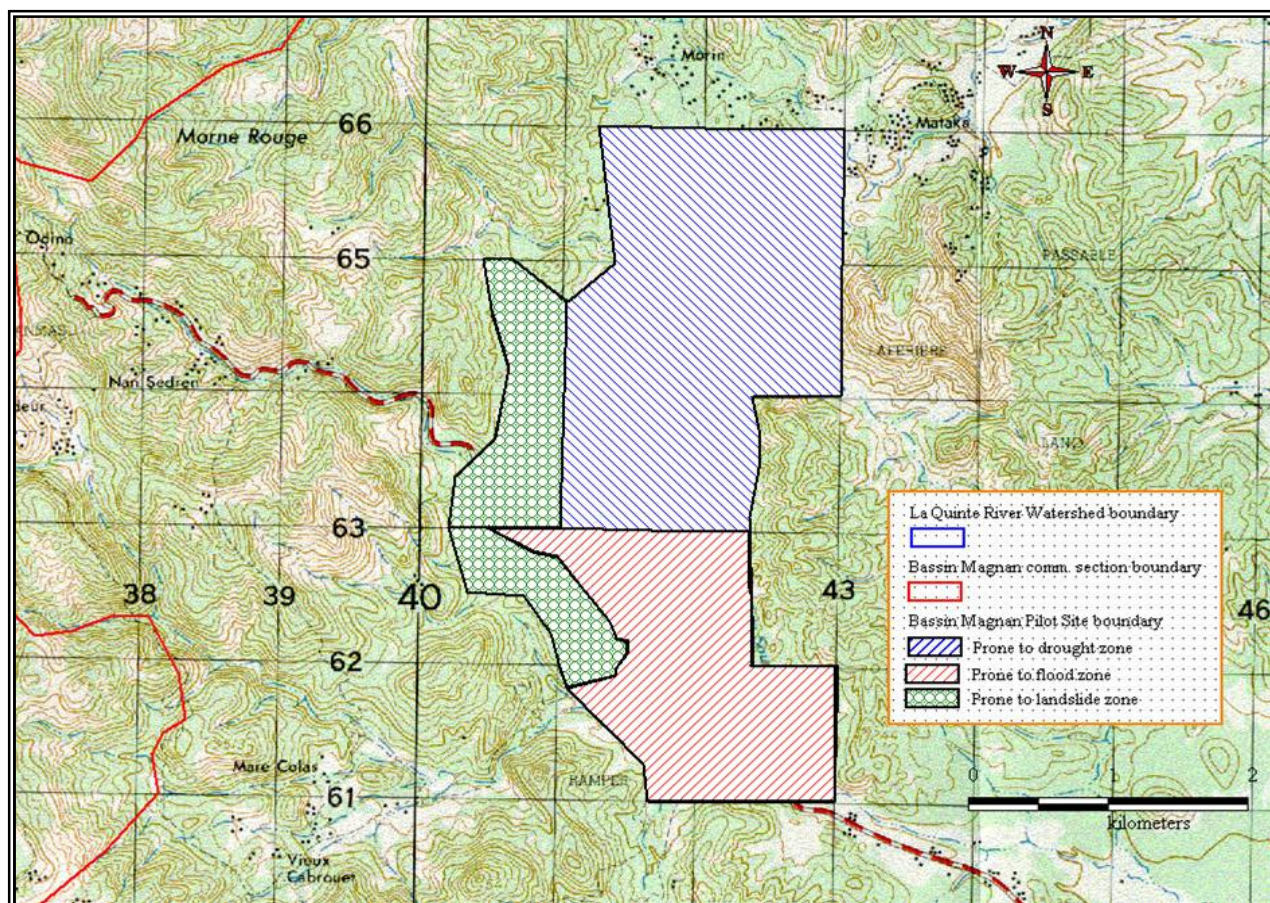
Figure 10 **Vulnerability factors and hazards' exposition at Bassin Magnan**



Key: In descending order of pervasiveness and/or devastating damages potentials, the vulnerability hazards are symbolized by the following types: underlined and bold, bold and regular, hurricane/ windstorm and Soil **erosion** (in black) were not mapped out.

²² Building code, for instance is either inexistent or non enforced anywhere in Haiti (hence in the pilot site) and allow the farmers to build and live in any makeshift hovels/houses.

Figure 11 Rough vulnerability map of the *Bassin Magnan* Pilot Site, Gonaives, Haiti



Source: the Author

4.2 The *Lavanneau* Pilot Site

4.2.1 Location and physiographic features

Lavanneau is a small rural community part of a municipal section 6 km to Jacmel in the South East department, the department's main city which is accessible through a dust road network but only during the dry season. The pilot site is divided in two distinct zones: the Beaudouin area in the lower part, 40 m above sea level, located within the flood plain of the area's main river system; and the Romage area, around 350 meters above sea level). The greater part of the site is located on mid-altitude hillsides exposed to the East and affected by winds blowing in a South/South East – North West direction. Slope is prevailingly between 30 and 40%, and altitude ranges from 40 to 540 m above sea level. The Lavanneau site surface waters mostly empty in the *Rivière Gauche*, itself a tributary of the Jacmel River, draining the Jacmel River regional watershed system (See Annex 3). Due to the proximity of the *Rivière Gauche* to the mouth and

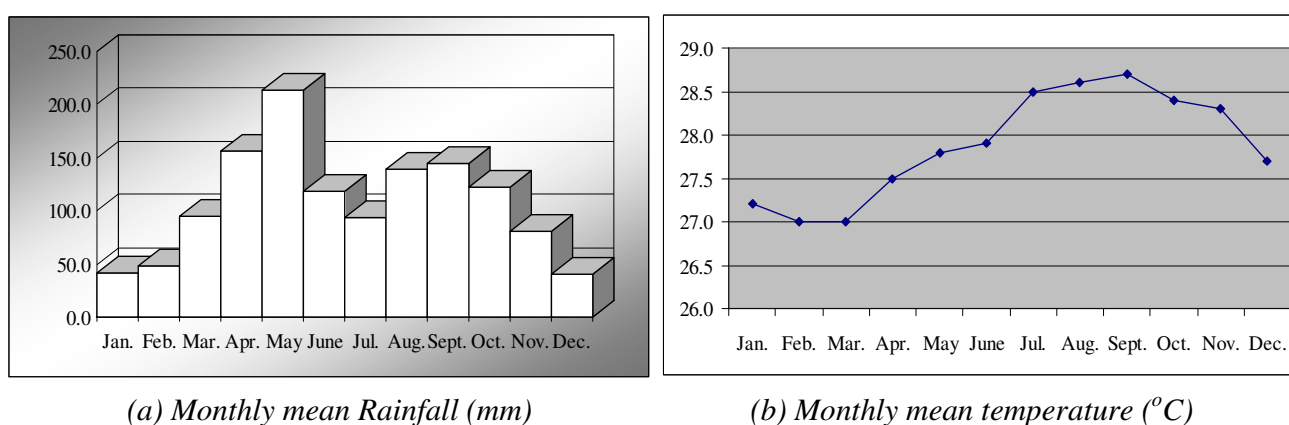
to its erratic bank overflowing patterns and banks, an issue of environmental degradation, part of the surface waters empty directly in the area's regional drainage system, the Jacmel river.

Climate

Lavanneau is characterized by 1295.6 mm mean annual rainfall distributed following a bimodal pattern, with two rain seasons, one from March to June) and the other distributed from August to October. The Lavanneau/Jacmel annual rain pattern seems inconsistent with the country's pluviometry, with June generally drier than July, and October rather than September the wettest autumn month.

In Jacmel the mean annual temperature is 27.8°C. Ecologically, the Lavanneau pilot site belongs to the tropical dry forest lifezone²³.

Figure 12: Monthly mean rainfall (a) and temperature (b) at Lavanneau, Jacmel



Source: FIC, SNRE

Demography

About 11,500 inhabitants live in the entire Lavanneau communal section of which 55% women and 45% men. 60% of the population is less than 15 years old, 30% is between 15 and 65, and 10% is above 65 years old. Moreover 55% of that population was estimated to be labor-active. The pilot site considered very densely populated, and though no data are currently available, the PRA session respondents agreed on estimating around 2,000 inhabitants.

Social stratification

Wealthier Lavanneau inhabitants tend to move to the close by Jacmel, so social stratification is not that apparent within the site. No house has a thatched roof, while most roofs are of corrugated iron and there are 5% houses of concrete.

Moreover, the PRA-based survey classified local farmers in the following four categories, based on area of land exploited, land tenure, and access to paid farm labor:

1. Wealthy farmers representing 10% of the local population, who exploit around 2.5 ha of mostly privately owned land located in the lower and irrigated zone; they generally

²³ Based on the Holdridge's (1967) two-parameter ecosystem classification, the tropical dry forest lifezone is associated with mean annual temperature >24°C and mean annual precipitation between 1,000mm and 2,000 mm.

- use salaried farm labor and own upland small groves/orchards of mesquite and mandarin whose harvesting is sold or leased to poorer farmers;
2. Medium-class farmers who generally exploit 1 ha of mostly hillside land accessed partly through ownership, partly through renting and/or sharecropping; needed farm labor is provided by the household and partly paid;
 3. Small farmers representing 60% of all local farmers, and exploiting at most 0.65 ha of land generally accessed through sharecropping; farm labor is strictly family-provided and parcels are situated in marginal areas;
 4. Landless farmers who account for 5% of the local community; they are generally seasonal migrant farm workers with no access to land.

History

Apparently no marked socio-economic changes occurred in the community over the last 30 years. However, the respondents emphasized a net increase in: (a) percentage of children in full-time education, (b) access to telephone communication, (c) forest clearing for the purpose of fruit tree plantations, (d) number of voodoo temples and churches, (e) number of political organizations and/or community based organizations, (f) number of school buildings, and (g) consumption of imported farm products. On the other hand, the number of children per family, school dropout rates, the number of individuals involved in farm activity, tobacco cropping, global farm production were constantly decreasing. These observed changes were considered to be linked to NGOs' intense activity, providing general support to family planning, and child primary education, as well as the presence of a regional mobile communication carrier, and the preference of young farmers for extra-agricultural activities such as motorcycle taxi driving.

4.2.2 Natural resources base

Fairly degraded, the basic natural resources at Lavanneau are:

Natural forest: dominated by fuel wood (mesquite (*Prosopis juliflora*) is the dominant species used for charcoal burning), fruit trees (mango (*Mangifera indica*), avocado (*Persea americana*), mandarin (*Citrus reticulata*), bread fruit (*Artocarpus altilis*)), and some off-forest timbers (Haitian oak (*Catalpa longissima*), Spanish cedar (*Cedrela odorata*), Simarouba (*Simarouba glauca*)). Bread fruit is a relatively abundant valuable tree crop growing in the lower part of the site. The intensively harvested trees are hardly replaced by new plantations, mainly mandarin and some high value timber species planted thanks to reforestation projects distributing seedling.

Soils/Land: Soils at Lavanneau are of two dominant types of limestone parent rock:

(1): alluvial very deep and permeable soils in the lower part with neutral to alkaline pH, high CEC, 2 to 6% of organic matter content, and relatively high potassium (K) content (Cabidoche, 1984) favoring the cultivation of banana, the highest value local crop;

(2): white rendzine and calcic brown soils on the hillsides, with normal organic matter content; inadequately assimilated iron causing whitening of the crops, presence of active limestone which makes them very alkaline (pH between 7.5 and 9.0), general deficiency of phosphorus (P), potassium (K), magnesium (Mg), and nitrogen (N) (GRET-FAMV, 1991).

A typical farm household exploits 1.53 ha of land distributed over 3 to 4 scattered plots. The most fertile and coveted soils are in the lower part are banana plots and smaller than those in the mountainous zone.

Water: Drinking water is provided through 2 small tap water systems located in Beaudouin and Romage respectively. Supposedly the water supply system is freely distributed to residents through a network of public fountains and wash houses, but a few politically and/or economically dominant farmers derive their private water supply from it. In spite of distribution problems associated to the system's general deficient maintenance, tap water supply is acceptable within the area.

Irrigation water is river-bank pointed in Beaudouin and spring-collected in Romage. These two small-scale systems irrigate at most 1/3 of the site's irrigable land surface. About 120 water users are registered for about 0.32 to 0.62 ha each. Irrigation water usage fees of 500 HTG per year are actually too expensive and never paid, resulting in huge maintenance and expansion problems associated to the local irrigation systems.

4.2.3 Other socio-economic resources:

Access to credit: Despite half a dozen banks and financial institutions operating in Jacmel, access to credit is a crucial issue in Lavanneau. Presently farm credit or crop insurance is not supported by any private or state-owned institution²⁴. An informal cash credit system includes: *Ponya*, *Sol* and mutual loans among close friends and relatives. However, the credit obtained is never nominally supposed to support local farm activities, considered too risky.

Farming extension services and structures: A veterinarian, paid by the MoA is the sole state representative for farm extension. Several NGOs and IOs operating agriculture-based projects in the area, compensate for the scarce government presence in the sector.

Development organisms and local CBOs: About a dozen NGOs and CBOs are active in the pilot site where they operate in sectors as diverse as education, general infrastructure rehabilitation, AIDS and MST prevention, beside agriculture. Among the most active NGOs in Lavanneau are PLAN International (education, ²⁵ farm inputs supply, latrines), Canadian Funds (road maintenance, irrigation system rehabilitation), FAO (seeds), PADF (tools equipment, and seeds distribution), POCHEP (tap drinking water system implementation), CARITAS (farm training and inputs) etc.

4.2.4 Farming activity at Lavanneau

Agriculture is the main economic activity. Despite being relatively close to the ocean, fishery is not practiced, and the represented subsystems are cropping, livestock, and forestry.

²⁴ Between 2000 and 2004, FONKOZE, a national NGO granted all-purpose credits to the local households who used it for small business and commercialization rather than farm activities. In the early 1980s, Banque de Cr dit Agricole, a nationwide state-owned bank granted farm credits which were then used for other purpose,s including direct consumption, commercialization, etc. The recovery rates were so low that BCA ultimately ran bankrupt and had to stop all operations throughout the country and in the pilot site.

²⁵ Tuition fees are fully covered by PLAN linked international sponsors to benefit children of farmers participating in the projects

Crops

Main cultivated crops include, in descending order of market value: banana, common beans, vegetables, pigeon peas, corn, sweet cassava, bitter cassava, and sorghum. Apart from sorghum and pigeon peas, used for household self consumption, all these crops are commercialized on the local market. Sorghum is the largest crop in terms of cultivated area. Common beans are cultivated in both the lower and hilly zones of the site, but at different periods. There are three cropping seasons, with some crops straddling the next cropping year as far as harvest time is concerned. As in *Bassin Magnan*, in Lavanneau too tools are generally outdated and inadequate. Deficient training and general farm support results in an inadequate exploitation of the available farm resources bases, particularly in the upper part of the site where the lack of basic training in gravity irrigation water management in mountainous sites results in inefficient utilization of the water resources with no positive impacts on crop yields. The crop production subsystem is therefore very labor intensive with very low invested capital rate of return and ultimately resulting in more and more farmers abandoning farm activities for extra-farm ones. Needed labor force is paid to salaried workers, provided by household members, or obtained through the *combit* system. In the latter case, only activities like planting/sowing and harvesting are included, being also occasions for the farmers to socialize. The labor intensive activities, such as soil preparation, weed removal, are generally realized through paid or family labor.

Despite water availability, use of chemical fertilizers is not widespread due to high costs.

Livestock

Dominant animal species are represented by domestic pigs (*Sus scrofa*), followed by cows (*Bos taurus*) and goats (*Capra hircus*). Traditional poultry farming is widespread but unfortunately prone to recurrent occurrence of mass deaths, probably due to New Castle disease. As each single local farm household raises at least 8 hens (*Gallus domesticus*), poultry diseases affecting the community about twice a year are a huge concern there.

The diversified cropping system prevailing in the site allows for more or less normal pig farming despite the food-intensive characteristics of this activity. The average 5 heads of cattle herded by local individual farmers is generally accessed through indirect tenure. Veterinarian services for no less than 100.00 HTG per farmer are delivered on an on-demand basis. The community considers these service costs too expensive, seeing that the veterinarian agent is actually a salaried employee of the MoA.

Forestry

No systematic tree planting initiatives compensate the overexploitation of scarce forest resources. Trees, mainly mesquite, are mainly harvested for charcoal making purposes. Breadfruit (*Artocarpus altilis*), and timbers such as Haitian oak (*Catalpa longissima*), Spanish cedar (*Cedrela odorata*), and West Indian sabicu (*Lysiloma sabicu Benth*) are likely spared, but not actually planted and raised, by local farmers for their global economic importance, and so is the high value Mandarin tree, of which generally only wealthy farmers possess some scattered productive trees, or rarely small orchards which they may lease or sell to small farmers. One mandarin tree has a single year harvest and may be leased at 1,250.000HTG per year. In the past small-scale reforestation activities were tried through very short-lived projects which have left no visible mark. Every now and then local farmers participate in farm-level reforestation efforts promoted by NGOs with only superficial success since only fruit and high value timber species meet the expectations of farmers, as opposed to the fast-growing multipurpose and nitrogen-fixing species actively promoted by reforestation projects.

Figure 13: Typical cropping calendar at Lavanneau, Jacmel, Haiti

		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	
First cropping season	Corn				▨				■								
	Com. beans				▨			■									
	Sorghum				▨									■			
	Pigeon peas				▨								■				
	Cassava				▨											■	
	S. cassava*				▨								■				
	Banana			▨	▨												■
Second cropping season	Banana						▨		▨								→
	S. cassava*							▨									■
	Corn												■				
	Sorghum								▨	▨				■			
Third cropping season	Com. beans												▨		■		
	Corn												▨			■	
	Tomato												▨		■		
	S. cassava												▨			→	
	Lima beans												▨			■	
	Banana												▨				→

Legend

▨	Sowing time	■	Harvesting time	→	Harvest time overlapping the next cropping year
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*S. cassava: sweet cassava

4.2.5 Characteristics of Livelihoods

Access to land is more or less easy, though access to irrigation remains a true challenge. The annual fees for two hours a day irrigation of 0.32 to 0.50 ha is ranked high and hard to afford by the average farmer. Needed labor is generally internal and provided by the farmer's family as the minimum 125.00 HTG unit amount fees for a person/day of salaried labor is too high for a poor farmer to afford. Credit is available on a selective basis, and a farmer owning producing mandarin trees has easier access to cash credit from his friends or relatives than a poorer farmer. Farm extension and training is available through the activity of numerous NGOs executing farm-based projects filling in for state institutions whose presence and general contribution are qualitatively and quantitatively insufficient. Improved seeds are supplied on a small scale by NGOs or international organizations such as PADF, and FAO Beneficiaries of pig restocking programs are generally medium and high-class farmers, due to the huge food supply challenges associated with pig farming.

A few farmers have access to direct forest product exploitation through the lease of mandarin trees and of mesquite woodlots used for charcoal burning. Availability of those basic farm assets fluctuates through time, with greater scarcity observed in periods of greater need, further exasperated by the occurrence of weather-related disaster particularly hurricanes.

Figure 14 : Coping strategies adopted by local farmers of the Lavanneau pilot site

Coping strategy	Rationale	% involved	DRM related
Migration	Poverty, insecurity, disaster occurrence, unemployment	Medium and low class farmers	Yes
Charcoal burning	Poverty, landlessness	Medium and low class farmers	Yes
Informal credit : (<i>Ponya, Sôl</i> , land renting)	Absence of formal farm credit from banks and other institutions	Medium and low class farmers	Yes
Request of disaster aid	Damages from natural disasters	All farmers	Yes
Seasonal farm work	Poverty, landlessness, unemployment	Small farmers	Yes
Extra-farm activities	Crop system risks/uncertainties	Women prevailingly	No
Improved farming techniques	Management of disaster risks (floods, hurricanes)	Farmers in dry areas	Yes
Selection of appropriate varieties	Drought, hurricanes	All farmers	Yes
Share cropping	Poverty, landlessness	Medium and low class farmers	No
Farm crop diversification	Weather uncertainty management, small size of land holdings	All farmers	Yes
Cultural rotation	Soil fertility management	All farmers	No
Livestock types/species selection	Poverty, challenges associated with food supply	Medium and low class farmers	Yes
Herding	Poverty, farm asset management and investment risk minimization	All farmers	Yes
Agro-pastoralism	Soil fertility and farm asset management	All farmers	No

4.2.6 DRM issues at Lavanneau

Local perception of natural disaster at Lavanneau

The Lavanneau farmers named four dominant weather-related phenomena ranked as natural disasters based on their destructive impacts, and their recurrence. They are described in their causes, consequences, and eventual correcting measures and listed in descending order of perceived socio-economic impacts :

- Hurricane: God's power manifestation, takes the form of strong winds and heavy rains, probably due to the crossing between a warm and a cold ocean. Very devastating to crops, livestock and human lives, building, and infrastructures, it cannot be prevented, or mitigated;
- Flood: high waters washing away everything they overcome. Probably caused by the degradation of the environment, and there are no effective or definitive remedies to it, other than timely escape after having secured important assets;
- Wind: an excess of air of divine or unknown origins damaging crops and trees, causing outbreak of livestock disease and degradation of soil quality and retention capacity. No efficient anti-wind measures are known of;

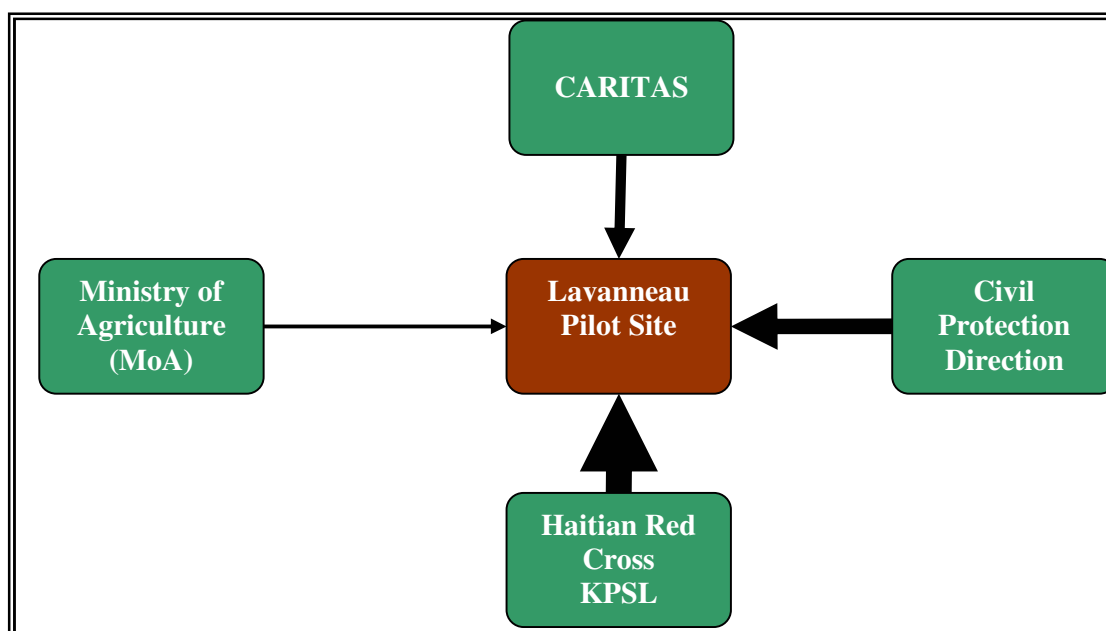
- Drought: extreme scarcity of rains associated with extreme heat due to deforestation and resulting in starvation, massive livestock death and crop loss. No corrective measures are recognized or practiced.

Access to early warning information available only for hurricane related issues is granted to all social categories and is generally clearly broadcasted in Creole; though limited economic means very often prevent local farmers to fully apply the anti-hurricane recommendations conveyed through the early warning messages.

The Lavanneau respondents found that the Ministry of Agriculture participates in the disaster response and recovery local efforts only indirectly by requesting disaster relief from international and or local organization and NGOs operating in the Jacmel area and ranked it poorly as far as the disaster response and recovery efforts are concerned. The Haitian Red Cross, by contrast is the most highly ranked since its staff is generally present on the field to bring first medical aid to the victims while supporting a more or less active network of first-aid agents who are fairly close to the local communities (See Figure 15).

DRM training is available to a few local community leaders including the active members of the the local committee for civil protection, supported by the departmental delegation office or by the Haitian Red Cross local office. The community members have had a limited access to post-disaster emergency relief such as the rehabilitation of the Beaudouin irrigation system after Hurricane Georges in 1998. However, no significant disaster related assistance was distributed in the area over the last 7 years which in fact were cyclonically very active.

Figure 15: Lavanneau farmers' perception of the contribution of local/national institutions to disaster response and recovery efforts.



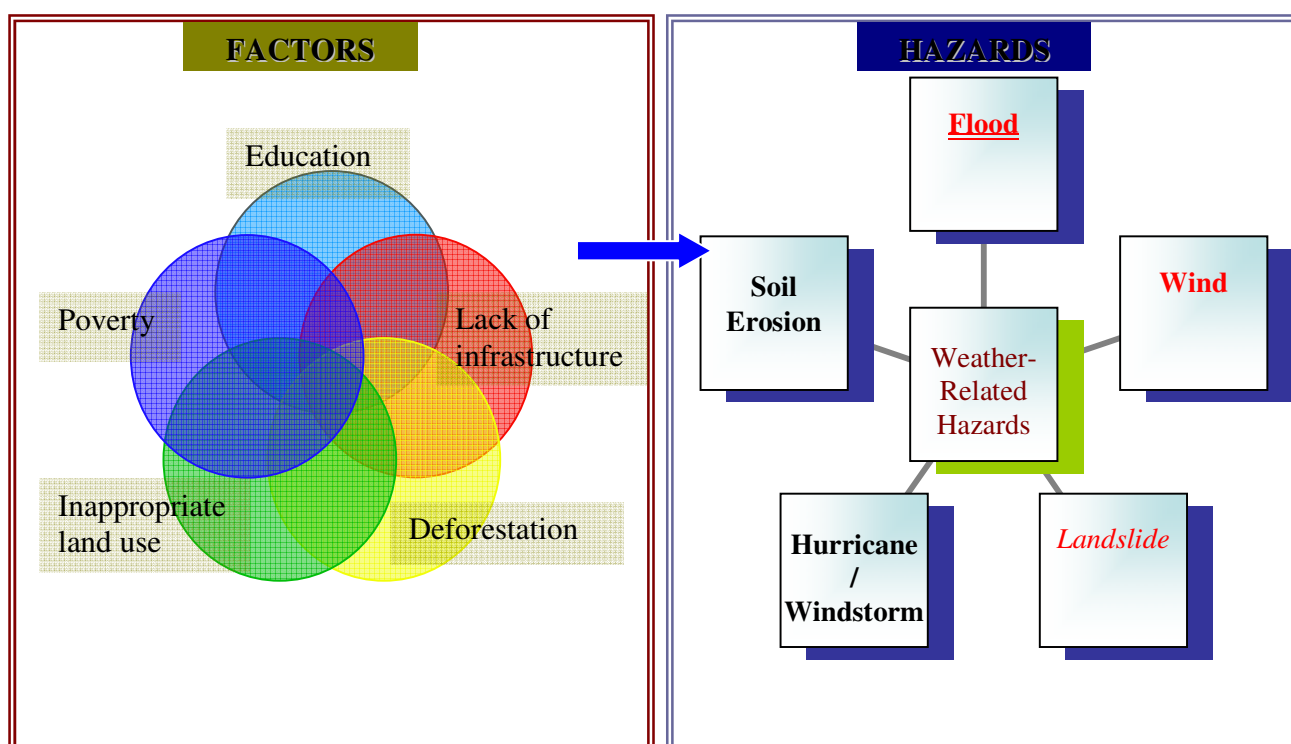
Key: The size of the arrows and their thickness is a direct function of the perceived proximity of institutions as far as DRM relief support is concerned.

Vulnerability context

The following interrelated factors come into play to shape disaster vulnerability in the Lavanneau pilot site:

- most of the residents in the community are very poor farmers;
- lack of general infrastructure, and particularly a deficient road system with no bridges crossing the river and torrential flow and high waters in rainy seasons;
- widespread illiteracy of the local population
- Deforestation, which makes the system environmentally less resilient while exacerbating the negative effects of any adverse phenomenon.
- Inadequate land use systems; population in the lower zone continue to live and intensify cropping activities into the very river bed that is very prone to recurrent flood events. In the higher zone on the other hand, land with steep slopes is cultivated in the absence of any soil conservation correcting measure.

Figure 16 Perceived vulnerability factors and exposure to hazards' at Lavanneau



Key: In a descending order of pervasiveness and/or devastating damages potentials, the vulnerability hazards are symbolized by the following types: **Flood**, **Wind**, regular, and *Landslide*. Hurricane/windstorm and Soil erosion (in black) were not mapped out.

The local river system in rainy seasons is likely to flood the entire lower part of the site, systematically affecting the local population and making floods the most pervasive and recurrent hazard. Despite repeated warnings from the authorities and recurrent disasters with a high rate of casualties, the local population has always declined the proposed plans for total evacuation. In spring and fall high waters can make the site inaccessible, since no bridges cross the principal local river system. In the upper part, recurrent winds cause extensive damages to the farm system, rendered yet more fragile by the weak local farming extension system. Landslide occasionally