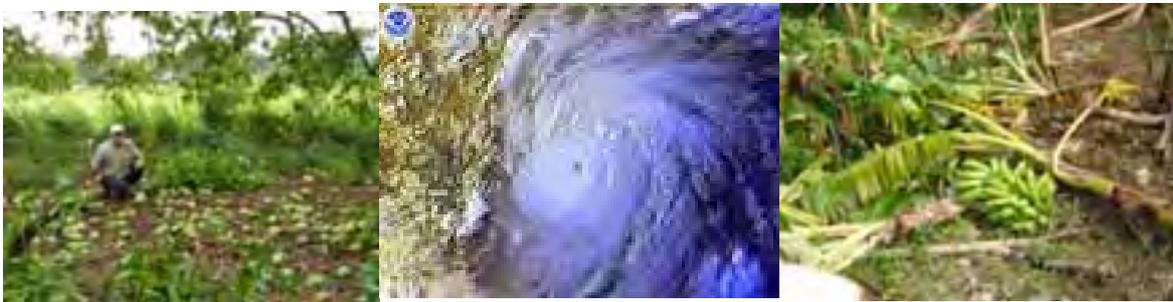




TCP/RLA/3101

**Assistance to Improve Local Agricultural Emergency Preparedness
in Caribbean Countries Highly Prone to Hurricane Related Disasters**



**Good practice examples for disaster risk reduction in
Cuban Agriculture**

Final project report

April 2008

Submitted by:



The Food and Agriculture Organization of the United Nations

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**Assistance to Improve Local Agricultural Emergency Preparedness
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**Consolidated by
Ministry of Agriculture**

Technical guidance: Disaster Risk Management Group, FAO, Rome

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EXECUTIVE SUMMARY

The vulnerability of the Caribbean region to hydro- meteorological hazards such as hurricanes, floods, drought, high magnitude rainfall and related hazards such as landslides is underscored. The recurrent impacts of these events have wreaked havoc on environment, economy and society throughout the region. Although the contribution of agriculture to Caribbean regional Gross Domestic Product (GDP) has steadily declined over the last two decades, this sector has remained a major employer of labour and as such a main player in the livelihood profile of the region. The extreme vulnerability of the agricultural sector to a variety of hazards/disaster has been a perpetual focus of hazard/disaster management and interventions in the Caribbean. Over the past decade, the FAO has regularly responded to the relief/rehabilitation/reconstruction needs of the sector in the aftermath of hurricane-related disasters. While such response and rehabilitation interventions are important, the extent of devastation caused to the agricultural sector by the 2004-2005 hurricane seasons stresses the need to move from a reactive to a proactive mode in order to facilitate more long term and sustainable benefits from interventions. It is in recognition of the immense negative impact of the 2004 hurricane season on the agricultural landscape of the Caribbean region and in response to the urgent call for assistance from regional policy makers, that the FAO funded the regional project Assistance to improve local agricultural emergency preparedness in Caribbean countries highly prone to hydro-meteorological hazards/disasters.

Jamaica, Haiti, Cuba and Grenada were among the worst affected countries by hurricane-related disasters during 2004-2005, hence the urgent need to emphasize preparedness as a mitigation strategy for the impacts of these events. While the aforementioned countries, in particular Cuba, have advanced Disaster and Risk Management (DRM) frameworks that address preparedness and mitigation issues to different extent and involve a wide cross-section of stakeholders, there are still weaknesses in linking long-term development planning within the agricultural sector with the realities and projections of recurrent natural hazards/disasters and improving preparedness and mitigation measures. Over the last decade the Caribbean region has been experiencing a paradigm shift in this regard, with increased recognition of the importance and advantages of community-based disaster management planning. It is this approach to DRM which was advocated and promoted in the FAO regional TCP project.

Given the limited time horizon and budget available per country under this project in the context of this TCP, Cuba decided to focus the Cuba contributions to the project on the documentation and sharing of good practice examples for disaster risk management in agriculture, including regional level sharing of experience. Cuba organized and hosted the second regional workshop implemented under this project.

This report provides the summary of examples of good practices adopted in Cuba in various agricultural sectors, which contribute to mitigating the damage caused by hurricanes and similar events. Each practice includes its name, the event to which it applies, whether traditional or introduced (if the latter, the year of introduction), a summary of the practice, the benefits reported, the material requirements and the prospects for replicating it in other regions of the area, with photographs.

LIST OF ACRONYMS

CARICOM	Caribbean Community
CENSA	Nacional Center for Health in Agricultura
CITMA	Ministry of Science, Technology & the Environment
DRM	Disaster Risk Management
EMNDC	National Civil Defence agency
GDP	Gross Domestic Product
IMV	Institute for Veterinary Medicine
INISAV	Institute for Plant Health Research
FAO	Food and Agricultura Organization of the United Nations
GDP	Gross Domestic Product
MINAG	Ministry of Agriculture
MINVEC	Ministry for Foreign Investment and Economic Cooperation
SLSs	Severe Local Storms
TCP	Technical Cooperation Program

1 INTRODUCTION

The vulnerability of the Caribbean region to hydro-meteorological hazards such as hurricanes, floods, drought, high magnitude rainfall and related hazards such as landslides is underscored. The recurrent impacts of these events have wreaked havoc on environment, economy and society throughout the region.

Although the contribution of agriculture to Caribbean regional GDP has steadily declined over the last two decades, this sector has remained a major employer of labour and as such a main player in the livelihood profile of the region. The extreme vulnerability of the agricultural sector to a variety of hazards/disaster has been a perpetual focus of hazard/disaster management and interventions in the Caribbean. Over the past decade, the FAO has regularly responded to the relief/rehabilitation/reconstruction needs of the sector in the aftermath of hurricane-related disasters. While such response and rehabilitation interventions are important, the extent of devastation caused to the agricultural sector by the 2004-2005 hurricane seasons stresses the need to move from a reactive to a proactive mode in order to facilitate more long term and sustainable benefits from interventions.

Jamaica, Haiti, Cuba and Grenada were among the worst affected countries by hurricane-related disasters during 2004-2005, hence the urgent need to emphasize preparedness as a mitigation strategy for the impacts of these events. While the aforementioned countries, in particular Cuba have advanced DRM frameworks that address preparedness and mitigation issues to different extent and involve a wide cross-section of stakeholders, there are still weaknesses in linking long-term development planning within the agricultural sector with the realities and projections of recurrent natural hazards/disasters and improving preparedness and mitigation measures. Over the last decade the Caribbean region has been experiencing a paradigm shift in this regard, with increased recognition of the importance and advantages of community-based disaster management planning. It is this approach to DRM which was advocated in the FAO project being implemented.

1.1 Main Goal and Outputs envisaged by the regional project

The goal of the project was to contribute to community-based disaster management planning and community level risk management within the agricultural sector.

The regional project had three target-audience specific expected outputs:

- i) Local communities/small scale farmers: identification, demonstration and replication of locally adapted good practices for response preparedness and assessment of demand responsive training related to innovative preparedness activities.
- ii) Local Government Departments: inputs to local action plans for timely, efficient and demand responsive emergency operations to minimize adverse effects of hurricane-related disasters on the agricultural sector and integration of agricultural issues into local contingency planning.

- iii) Government and relevant ministries (rural and agricultural ministries) and international community: recommendations and best practices examples to enhance national and local preparedness in national and international post-emergency agricultural rehabilitation programs.

Given the limited budget available per country under this regional TCP, Cuba decided to focus its activities and give highest emphasis on the third above project output, including regional level sharing of experience in the context of the regional workshops implemented in the context of the project .

1.2 Project Implementation Strategy in Cuba

The regional project adopted an iterative, participatory implementation process to identify and compare lessons learned and good practice examples of disaster preparedness for emergency response and preparedness in the agricultural (including livestock) sector with special emphasis on the local institution and farm levels. Thereafter, this information was valued in order to promote replication in selected pilot sites of techniques which would add value to existing systems. Key recommendations for improving agricultural disaster preparedness aspects of the national/local DRM systems in place, and for the impacts of preparedness activities (or the lack of them) on immediate emergency relief and rehabilitation operations, were analyzed and shared at regional level. Close collaboration with government DRM programmes and other agriculture and livelihood development work was established at the onset of the project in each country to avoid possible duplications and establish a platform for mutual learning and action. Operational linkages were also established with FAO Emergency Coordinators and other FAO development projects in the region.

The first project phase focused on the in-depth situation analysis. It also encompassed research activities to identify existing good practices for DRM in agriculture, to analyze the existing institutional set up and approaches for DRM in agriculture, and to understand the vulnerability context in selected pilot sites caused by natural hazards. National Workshops were organized in each of the participating countries in order to evaluate and prioritize the identified good practices in view of their impacts and potential for replication as well as a Regional Technical Workshop held in January 2007 which provided a platform for technical exchange among the four country teams about the good practices identified, and to discuss their replication potential across the region. Mr Julio González González, head of MINAG's civil defence arm, gave a detailed presentation at the Kingston workshop on Cuba's experience gained in performing tasks responding to natural disasters affecting Cuban agriculture.

In follow up to the Kingston workshop a technical working group was set up in Cuba in April 2007 to guide national level project activities. It was drawn from EMNDC, MINVEC, FAO, INISAV, IMV and MINAG's national authorities. The working group decided to focus project activities in Cuba mainly on the documentation and sharing with partners of good practice examples, of which there are many in Cuba, to enhance national and local preparedness in national and international projects and programs.

In June 2007 the working group conducted a national workshop on disaster response, with the cooperation of various agricultural institutions. Other participants included centres belonging to Cuba's Academy of Science, to the Ministry of Education (National Centre for Agricultural Health) and Civil Defence specialists in agriculture in the provinces. The national workshop led to the consolidation of examples of good practices adopted in Cuba in various agricultural sectors, which contribute to mitigating the damage caused by hurricanes and similar events.

Finally, in order to discuss and conclude the results and outcomes of the regional project a second Regional Synthesis Workshop organized and hosted by the government of Cuba was held in Havana in October 2007. Representatives from local government and civil societies from Cuba, Grenada, Haiti and Jamaica and other CARICOM countries were invited to share lessons learned, good practices and recommendations. Other representatives from the international community currently working on hurricane disaster relief and preparedness in the region were also invited. Workshop findings and recommendations have been documented in a separate report.

2 NATIONAL CONTEXT OF DRM IN CUBA

The national context of the project implementation relates to the geographical location of Cuba in relation to hydro-meteorological hazards such as hurricanes, floods and drought, the dualistic structure of the agricultural economy which results in extreme vulnerability of most farmers and the social and economic impact of recent hydro-meteorological hazards that undermine attempts towards sustainable development.

2.1 Geographical Location

The Cuban Archipelago lies in the Caribbean basin, between $19^{\circ} 49' 36''$ and $23^{\circ} 17' 09''$ North and $74^{\circ} 07' 52''$ and $84^{\circ} 54' 57''$ East, the most easterly of the Greater Antilles (Fig.1) with a surface area of 110,860 square kilometres, of which the mainland accounts for 96.6% and cays and islets (of which there are 1,600) account for 3.4%. It has a long, narrow outline, with a maximum width of 191 km in the eastern region and a minimum width of 31 km in the west. It is 1,200 km long.

Fig 1. Geographical location of Cuba



The climate is tropical, seasonally humid with marine influence and semi-continental features. Average temperatures on the plains are between 24 and 26°C - higher in the east and below 20°C in the mountains. Rainfall is variable throughout, greater in the west with a gradual west-east diminution. The annual average is 1,300 mm. There are two recognized seasons: the wet (summer), from May to October, and the dry (winter) from November to April. The differences between the west and east reflect the frequency and intensity of storms, the effects of hurricanes, frontal systems and other meteorological factors responsible for complex processes of formation and distribution of rainfall closely related to the nature of the underlying surface.

Thunderstorms, characterized by dangerous electrical discharges in the Cuban countryside, straight-line winds and heavy rain in short bursts account for a substantial proportion of the strongest wind and heaviest rain recorded in Cuba. They are most frequent in inland areas and under specific weather conditions; they are a common occurrence from June to mid-October and rare during the rest of the year (the 'winter').

Active tropical depressions, cold upper lows, prefrontal squall lines and tropical cyclones are weather phenomena that lead to severe local storms (SLSs), which can develop at any time of year. A storm is classified as an SLS when one or more of the following apply: heavy rain exceeding 100 mm; winds gusting to speeds over 60 mph, tornado, waterspout, hail.

Hurricanes are among the most important meteorological events affecting Cuba between June and November; the diameter and strength of their wind systems make them dangerous

phenomena that affect large areas for a certain period, as well as bringing substantial volumes of rain. The winds tend to spread the reproductive material of crop pests, while the associated high levels of humidity favour the development of fungal diseases. August, September and October are the months with the highest incidence of hurricanes and cyclonic disturbances generally; these originate in the Caribbean Sea, Gulf of Mexico and South Atlantic. The probability of occurrence in the western half of the island is about double that for the eastern half.

Another meteorological phenomenon that has a disastrous impact on agriculture is drought. This is a silent event whose beginning and end generally go unnoticed. Apart from the damage to crops, it also increases the risk of fires in woodlands and other rural areas and favours the emergence of insect plagues and viral infections associated with vectors. An important element of the work so far is management of water, with a dual purpose - in case of drought and of the opposite (when rainfall is extremely heavy). This involves weirs, dams, windmills and drinkers for poultry and pig farms.

Records of recent years show an increase in the frequency of hurricanes affecting the Cuban archipelago and neighbouring countries, as well as larger-diameter hurricanes with stronger winds, reflecting the effects on the Caribbean area of global climate change.

2.2 Background

Various weather phenomena involving precipitation, as well as hurricanes, cause considerable damage to Cuban agriculture. Strong winds and torrential rains destroy outbuildings and other facilities on cattle farms (Fig.2), poultry farms (Fig.3), apiaries (Fig.4), pig farms (Fig.5) and greenhouses (Fig.6), as well as irrigation equipment (Fig.7). They damage crops and production (Fig.8) as well as plantations (Fig.9). Hurricane winds spread the reproductive material of crop pests (Figs. 10 & 11) in such a way that over the time, at the beginning as an initiative coming from the producers, technical workers, managers, specialists and researchers, and with the political will of the Cuban government, work has been done on searching for solutions using the existing resources, to minimize the impact of the largest and severest hurricanes of the last 10 years and the most frequent SLSs, reflecting the influence on the Caribbean area of global climate change.



Fig. 2. Damage to cowsheds



Fig. 3. Destruction of battery henhouses.



Fig. 4. Impact on beekeeping



Fig. 5. Pigsties



Fig. 6. Greenhouses



Fig. 7. Damaged irrigation equipment



Fig. 8. Wind-damaged fruit trees



Fig. 9. Hurricane damage: banana plantation

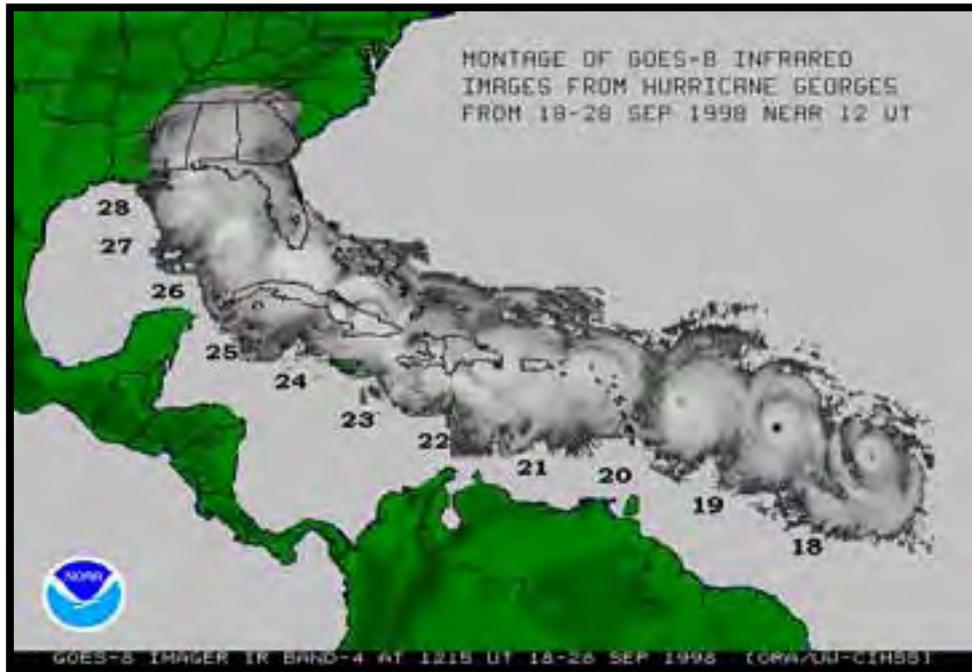


Figure 10. Path of Hurricane Georges, which spread *Paracoccus marginatus*.

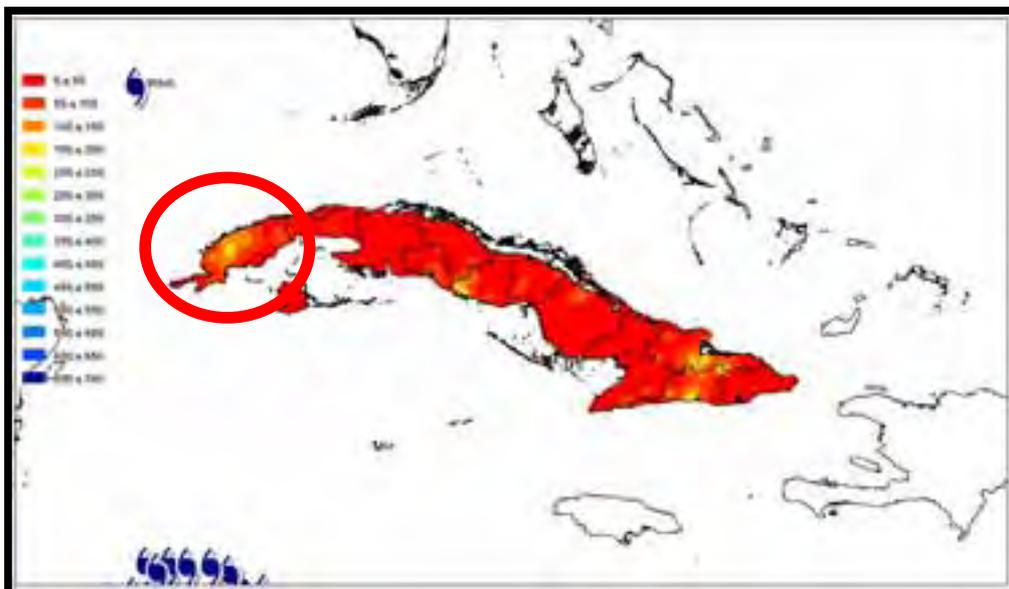


Figure 11. Dissemination of *Peronospora hyoscyami* in Pinar del Río by Hurricane Mitch.

To cite a specific example, when in August 2004 Hurricane Charley struck at a specialist poultry firm's site, roofs were destroyed (Fig.12), as were the chick nurseries (Fig.13), warehouses (Fig.14), avenues, and administration areas. Bio-security was compromised, with 800,000 birds in the open (Fig.15), substantial losses of stock (animals killed or destroyed for sanitary reasons) (Fig.16), outbreak of respiratory and enteric diseases. Also, damage was caused to electrical and water-supply networks, coverings, nursery equipment, fences and other sanitary barriers; serious disruption of flock movements and of the technological flow.



Fig. 12. Damage to roofs Fig. 13 Damage to chick nurseries Fig. 14. Damage at warehouses



Figure 15. Disruption of bio-security

Figure 16. Death and slaughter for sanitary reasons

Thousands of birds and eggs were lost. It took six months for the farm to recover (Table 1).

Table 1. Comparison of the production indicators at the specialized poultry farm before and after Hurricane Charley (August 2004).

Indicator	Units	July 2004	August 2004	February 2005
Birds (average)	000s	649.3	398.2	602.5
Egg production	000s	17,745.3	8,662.2	14,527.4
Layers	000s	14,610.5	5,580.8	12,191.2
Eggs per bird	Ratio	22.5	14.77	20.24
Eggs	%	72.57	47.64	72.27

More recently, between October and early November, eastern Cuba experienced several days of rain caused by the tropical depression that became Tropical Storm Noel, creating a series of problems for agriculture. Persistent torrential rain was the primary result of the phenomenon, and caused flooding and damage to crops.

An important factor is the training, from production to the highest level, that is being carried out on a regular basis and in all cases supported by research centres, universities and national, provincial and district authorities. It is an activity that provides valuable feedback for all concerned.

2.3 Current situation

A detailed study was carried out by the MINAG, guided and coordinated by the EMNDC and based on organized effort at all levels of government from national institutions to the People's Councils, taking account of economic objectives but prioritizing humanitarian aims. This led to the introduction of a series of measures - political-ideological, socio-economic, public order, judicial, foreign relations, computing and communications - during the disaster reduction cycle, with emphasis on the **planning stage**; this is permanent and the most effective - it includes measures aimed at reducing vulnerability and enhancing the monitoring and forecasting systems (Fig.15).

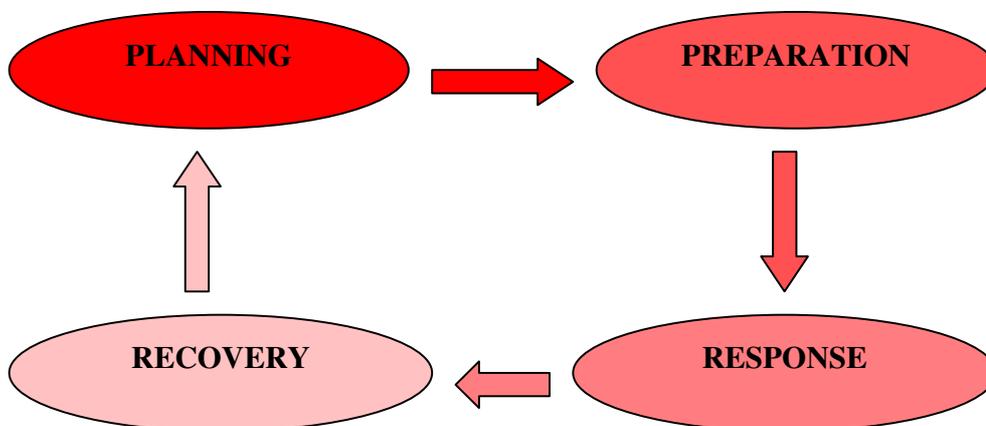


Figure 15. Organizational diagram of the disaster reduction cycle.

The **preparation stage**, which takes account of actions that ensure an optimal response, includes the formulation of disaster-reduction decisions and plans, as well as the updating of these, preparation of personnel, activities to take place before the impact of the danger with the aim of reducing damage.

The **response stage** should take account of measures that start when the impact of a potentially-destructive threat is imminent or in progress; it is the exercise of management of steps based on the approved disaster-reduction decisions and plan; their planning naturally takes account of the stages assumed for each type of disaster.

The **recovery** stage starts when the danger is perceived to have passed and is no longer a threat, or when the situation that evoked the response is under control. It includes two sub-stages: **rehabilitation**, aimed at restoring key services (water supply, food preparation, medical care, electricity supply), damage assessment and aid for the victims; and **reconstruction**, involving construction and repair of buildings, installations and infrastructure. The time this takes depends on the scale of the losses and damage suffered and on the country's economic resources available for such purposes.

At the various levels of the MINAG infrastructure (national, provincial, municipal, production unit) there are multidisciplinary groups that study, analyze and formulate recommendations on threats, vulnerabilities and risks; they are also in contact with the Municipal Risk Centres, where present.

Between December of each year and May of the next, directives and guidelines are received from the EMNDC which are studied and adapted to MINAG's specific characteristics, while those of the agriculture and forestry sector are also included. The guidelines for preparing the annual national plan of disaster-reduction activities are then formulated. This plan is circulated to intermediate levels: national authorities and provincial delegations on agriculture; the civil defence chief (the president of the provincial government) proceeds on a similar basis to that adopted in MINAG, incorporating the particular features of the territory concerned. The procedure at the lower levels (municipal delegation, production unit and municipal firm), in response to the guidelines and provincial plan received, is similar; in the production units, the plan is drawn up and agreed in detail with the People's Defence Council. At all levels, the plans are reconciled with Civil Defence. Following approval, the process operates in reverse: the returns go to MINAG in April, are analyzed during May in the course of the national meteorological review, which also involves validation of the plans drawn up. The work proceeds systematically to ensure effective mitigation of disasters in each agriculture-related unit in Cuba.

Of primordial importance in the annual plans for disaster-reduction activities is the planning stage, which actions are associated to deadlines for implementation and are usually funded. Each unit draws up a prioritized list of actions needed to solve problems that increase vulnerability, with the aim of including its solution in the plan so as to eliminate the risk, in accordance with the resources available. Top priority is accorded to training all personnel in disaster reduction at every level of MINAG's structure, to make all the workers aware and prepared for minimizing the damage arising in such emergencies.

The difficulties deriving from the economic embargo imposed on Cuba since 1959 and those associated with the collapse of the socialist camp in 1989 have meant that the nation has fewer resources for coping with extreme weather conditions, which have become more

frequent and severe in recent years. Droughts, hurricanes and torrential rainstorms, strong winds and flooding are prime examples. The socio-political and climatic mishaps, in the latter case related to global climate change, have stimulated inventiveness among the public in general and farm workers in particular, who have responded to the lack of supplies mentioned with a variety of homespun, traditional or local solutions, which crudely but efficiently replace their missing modern-technology counterparts. This has led to the creation of new jobs in Cuba's countryside, as well as better management of natural resources, and has enhanced the capacity of the public at large to cope with these emergencies. Examples include the use of an excavator-shovel part to clean out the overflow channels of small, local reservoirs, of ploughing equipment to clear sediment from these reservoirs and from drainage channels, of biogas instead of conventional fuel for lighting farmhouses and milking parlours and for cooking, of sewage for organic fertilization of crops.