

3 CONSOLIDATION OF GOOD PRACTICES ADOPTED IN CUBA

SOIL PREPARATION AND CONTOUR SOWING (Traditional, applied intensively since 1980) Against hurricanes or torrential rain



To prepare the soil for contour cultivation, guidelines are marked out with a ridge plough, placing small stakes that are subsequently adjusted to leave them aligned with the contours. All the work is done following these lines using a traditional plough and animal traction. After marking out the guidelines, the first furrow is ploughed, from top to bottom or vice versa, continuing until the whole area has been tilled. If the plan is to put in fences or hedges, the guidelines should be maintained so as to place them along or within these. In the case of contour sowing, planting follows the curve, more or less, so that master guidelines should be marked out, the longest middle part taken, as many guidelines as necessary (above and below) marked out, keeping a basic distance so that the furrows can be ploughed until the field, parcel or plot has been completed, in accordance with the sowing area chosen. The guidelines should not be too far apart, to avoid the appearance of detour. On steeper slopes, the lines should be closer together, while the space between rows should be a multiple of the width of the road to be used. Working from the edges of the field, then the stakes, which should be visible, are put in; finally, the lines are adjusted and the furrows for sowing are established. The irrigation system is set up after the field has been marked out.

It is a means of agronomic/plant-based conservation of the soil; it enables land to be protected and erosion reduced. Its application benefits agriculture, in the form of higher crop and woodland yields; it maintains the fertility of the soil, makes better use of run-off water, protects the land and contributes to environmental improvement

Manpower of the farm concerned is used, formed into teams of manual workers tasked with controlling soil erosion. Other, partly mechanized teams are set up to control soil erosion and perform soil-improvement tasks. Equipment required includes tractors, trailers, front loader, bulldozer, and dump trucks. The cost is of \$200 per hectare.

It can be adopted in flat and hilly areas, for coffee, cocoa, woodland and fruit-growing areas, mixed crops; in a variety of climatic zones, river basins. Also in small farmers' fields, land worked by cooperatives or firms.

**USE OF LIVING COVERINGS
(Traditional)
Against hurricanes and torrential rain**



This is sowing with species such as bugle, inch plant, shiny bush and other fast-growing species, to cover soils of hillsides, footpaths border and tracks, bridges, rills or gullies, areas or parts of fields with steep slopes, bends in rivers and streams, to protect the soil from flooding and/or slippage caused by rainwater running downhill. Dual-purpose species can also be used, such as marrow, sweet potato, beans and melon. All these species should be planted in wet periods if they are to establish themselves quickly. The areas should be free of other grasses; some can be scattered at random in the field or sown in trenches with a separation of 20-30 cm.

These are important for fruit-, coffee- and cocoa-growing and woodland areas. It protects soils from the effects of torrential rain.

Specifically indicated are sugarcane seed, plantain, maize, sorghum, sesbania, corn, jack bean, pineapple and bamboo, among others. The time for sowing them, in the case of a living barrier of vetiver, plantain, sugarcane, pineapple, king grass, leucaena, live oak or other material, around 100m long, is 20-35 days; the construction of 12 planting holes takes 36 days; cutting of 10 living stakes is done over 16 days. Maintenance is annual. The cost is \$150 per hectare.

This practice can be used in areas with slopes of any kind, in various agro-climatic zones and for small producers, cooperatives or firms.

**USE OF NON-LIVING COVERINGS
(Introduced)
Against hurricanes and torrential rain**



These can be permanent or temporary. The materials used include cuttings, straw, branches, leaves, stones and any plant material that can be gathered. It is placed in the rows between the crops or on slopes. If the material is very bulky, it is cut using machetes. In arid areas lacking vegetation, stones can be used.

This method conserves the humidity of the soil, contributes organic material, and protects the soil from erosion. It also increases microflora activity and improves the physical, chemical and biological properties of the soil.

It is easy to do; the farmer can carry it out with materials at hand. The time required depends on the area to be protected. Maintenance is regular, in line with the life-cycle of the crop concerned and the material used.

It can be adopted with different types of soil relief and agro-climatic zones. It is practical for small producers, cooperatives and farms growing various crops.

**USE OF EARTHWORM HUMUS; CREATION OF RESERVES
(Traditional)
Against hurricanes, torrential rain and flooding**



Worm-farming is a technology for converting solid organic residues out of the soil, working directly with the earthworm, to obtain humus and animal protein. It is the best fertilizer known, containing all the macro- and micro-nutrients plants need, a high biological charge and substances that stimulate plant growth, making it a product of reference in farming practice.

Its main benefits include a healthy environmental impact, since the technology destroys pollutants. Also, its use encourages the creation of new sources of employment.

Worm farms are of various sizes, small, medium and large. Medium-sized units measure 60-96 square metres; and the biggest ones measure over 3,200 square metres. The local workforce is used. Equipment required includes tractors, trailers, front loader, bulldozers, dump trucks, organic fertilizer applicators, oxen for transporting materials such as harvest waste, cuttings, solid waste, and manure. Also required are a tractor with front shovel, a cart, shovels, 3-prong forks, hoes, trucks, machetes, sieving equipment, mill, plastic bags, polythene sacks, sealant, irrigation system, protective clothing, over 270 cubic metres of manure according to the size, at least 2,145 15-inch blocks, $\frac{3}{4}$ plastic pipework, $\frac{1}{2}$ or $\frac{3}{4}$ hoses. A basic farm based on organic material can be set up in about 120 days. Maintenance is carried out annually. The cost is over \$5,000 per farm.

It can be replicated on any slope and any agro-ecological region, for producers, cooperatives or provincial or national firms.

**USE OF COMPOST; CREATION OF RESERVES
(Traditional)
Against hurricanes, torrential rain and flooding**



This is an organic fertilizer obtained through a natural process of transformation of solid organic residues (agricultural, agro-industrial, urban waste or manure). The process is aerobic, with the action of micro-organisms in the right conditions of temperature, humidity, pH and type of compost. It releases substantial amounts of carbon dioxide, water vapour and energy, so that the tank or silo of organic material heats up. Thereafter it cools and matures until reaching the final stage. There are many ways of making compost; in a hole in the ground, in receptacles or on the surface.

The benefits include the certainty of obtaining a natural fertilizer of excellent quality. Its application results in healthy crops and contributes to the development of eminently ecological farming. It helps maintain the nutritional balance of the soil and, hence, its natural fertility.

The workforce of the farm concerned is used. Species adapted to living within large quantities of organic material, not rambling, should be used. They can be fed with any solid organic substance, the manure of any animal, solid organic industrial waste, harvest waste, urban garbage. Prior preparation of this food is essential. Equipment required includes tractors, trailer, front loader, bulldozer, dump trucks, organic fertilizer applicators, and oxen for transporting materials such as harvest waste, cuttings, solid waste, and manure. Also required are a tractor with front shovel, a cart, shovels, 3-prong forks, hoes, trucks, machetes, sieving equipment, mill, plastic bags, polythene sacks, sealant, irrigation system, protective clothing, over 270 cubic metres of manure according to the size, at least 2,145 15-inch blocks, $\frac{3}{4}$ plastic pipework, $\frac{1}{2}$ or $\frac{3}{4}$ hoses. A basic farm based on organic material can be set up in about 120 days. Maintenance is carried out annually. The cost is over \$5,000 per farm.

It can be replicated on any slope in any agro-ecological region, for producers, cooperatives or provincial or national firms.

CONTROL AND ADAPTATION OF RILLS (Traditional)

Against hurricanes (Category 2 and above), torrential rain and flooding



A topographical survey is conducted to define the area affected by the presence of the rill, followed by works upstream. Given that the axis is the central area and that in or into which the run-off water flows, strong, durable structures are established here, able to reduce the speed of flow and maintain a blocking effect. Any kind of obstruction (locks, weirs) is suitable for this operation, although various types that can be temporary or permanent, according to the material used in their construction, are preferable; these serve to slow the run-off water, deposit part of the material upstream, forming a sediment layer. Under favourable conditions, these enable a cover of vegetation to become established, which completely stabilizes the rill bed.

Rills represent the last and most damaging stage of the soil-erosion process, undermining crops, roads, paths, bridges. They are regarded as river basins in miniature, formed by tributaries. They are classified by depth and drainage area, being categorized as deep (depth of over 5 metres), medium-deep (1-5 metres) and shallow (less than a metre); and as regards the drainage area involved, as small (under 2 hectares), medium (2-5 hectares) and large (over 5 hectares).

It avoids the spread of rills, landslips, destruction of houses, paths of communication and crops.

Weirs or locks, dams of branches, trunks, stones, masonry slabs etc. need to be put in place. Equipment and materials required include tractor with trailer, pairs of oxen with cart, dump truck, A-type trestle, machete, hoe, ropes, wire, stones, posts, grass seed, tree (including fruit-tree) supports, living stakes, disposable tyres. The time required is over 30 days.

Maintenance is annual. The estimated cost for a small rill-control project is of \$560, for medium-sized it is of \$3,728.30 and for large one it amounts to \$8651.82.

It can be created in any kind of topography, from near-flat to hilly, in most agro-ecological areas and in most Cuban soils.

EXTRA-DENSE PLANTAIN TECHNOLOGY
(Introduced, since 2001)
Against the threat of hurricanes



This involves high-density sowing in a single crop cycle, which boosts the yields by a factor of two or three and cuts hurricane damage by 70%. It is based on an advanced-technology package, organic concepts and benefits the farm-worker in pay terms. With intensive use of the soil and irrigation, planting (vitroplants, seedlings in bags from nurseries), no replanting, no cuttings, no crop rotation, minimum farm work, organic fertilization at the base and foliage level, avoidance of pesticides.

It results in high production, greatly increased yields, high returns, reduced vulnerability of the plantations to hurricanes, and it is environment-friendly.

Labour requirement is one man per hectare; a sure supply of seedlings, organic material, humus and hoes are also needed. The job takes 10-12 months or 12-14 months according to the variety of plantain used. Maintenance does not require soil preparation, planting is continuous. The estimated cost is \$38,932.59 per hectare.

It adapts itself to any type of soil, topography or agro-ecological region, provided there is irrigation, and can be used on patios, smallholdings, at cooperatives or firms.

MONITORING SYSTEM FOR EARLY DETECTION OF FOREIGN AND EMERGING PESTS

(Introduced, since 1977)

Against hurricanes, torrential rain, flooding, drought, south winds etc.



Monitoring of crops and other plants to detect symptoms of foreign or emerging pests is carried out by Plant Health department specialists and field workers from the people's councils, small producers, cooperatives, firms, territorial plant-protection stations and provincial plant-health laboratories. The Plant Health Research Institute, the Central Plant Quarantine Laboratory and other research agencies within MINAG and other ministries, study and establish methodologies for diagnosis and other activities concerned with early detection and with introducing and establishing natural enemies that minimize the damage caused by pests.

This practice is decisive in preventing the arrival and/or spread of foreign pests potentially capable of causing agricultural disasters, found in neighbouring countries or in distant lands that are trading partners, as well as in the case of biological threats to farm crops, which cause plant-disease disasters in the country.

Requirements include monitoring methodologies, activists and trained producers, notebooks, pencils, magnifying glasses, plastic bags, plastic or glass jars for sample-taking and sending to the laboratory in cases of doubtful identification. The scientific/technical training of the personnel (producers, businessmen, experts, officials) should be kept up to date on a regular basis.

Knowing which foreign pests may appear and having or designing monitoring methodologies, as well as training the technical personnel, it can be applied to any farm crop in any agro-climatic region. It is best used by small producers and cooperatives, but is also used by specialists from provincial and national firms, according to the pest or plant-disease problem to be highlighted.

PLANT-HEALTH MONITORING AND ISSUE OF EARLY WARNINGS
(Introduced, since 1977)
Against hurricanes, torrential rain, flooding, drought, south winds etc.



The producers monitor their crops to detect signs of infectious and non-infectious diseases, damage by insects and other pests, in the wake of hurricanes, torrential rain, flooding, drought, south winds, high concentrations of ozone and other climatic threats. Monitoring is performed on the basis of the pest reporting and forecasting methodologies, crop-management regulations, crop-protection programmes and integrated pest-management programmes.

Early detection of pests and/or non-infectious diseases enables decisions to be taken promptly to forestall plant-disease and pest epidemics among farm crops, optimizing the number of chemical and/or biological treatments and hence raising yields and curbing environmental pollution.

Requirements include: a suitably-trained producer or a specialist who dedicates the necessary minimum time to monitoring the cultivated areas; notebooks and pencils or biros, magnifying glasses, plastic bags or plastic or glass jars for sample-taking and sending to the provincial plant-health laboratory (LAPROSAV) in cases of doubtful identification. The scientific/technical training of the personnel (producers, businessmen, experts, and officials) should be kept up to date on a regular basis, as well as the consumables needed for carrying out the monitoring.

It is applied to any farm crop in any agro-climatic region. It is best used by small producers and cooperatives, but is also used by specialists from provincial and national firms, according to the pest or plant-disease problem to be focused on.

USE OF INSECTIVORES FOR CONTROLLING PESTS AND SAFEGUARDING RESERVES

(Introduced, since 1990)

Against hurricanes, torrential rain, flooding, drought, south winds etc.



This is the control of pests by using their natural enemies, in the wake of conditions strongly favouring the development of plagues. The natural enemies are reared using traditional methods at centres ("CREEs") for the reproduction of insectivores and animals that cause diseases among insects, where reserves are accumulated for emergencies resulting from natural disasters that can trigger insect plagues. Another focus is that of maintaining an appropriate balance among the agro-ecosystems, to enable conservation of these insects that are so useful to agriculture. Conservation is a basic biological control strategy of sustainable agriculture and is central to ecological pest-management programmes. The emphasis is on managing the agro-ecosystem and the aim is to create an environment favouring the activity, survival and reproduction of the natural enemies inhabiting the region concerned.

They are effective in keeping the numbers of insectivores within bounds. They do not pollute the environment and are not injurious to man or to animals.

Requirements include knowing which natural enemies are present in the various crops, how to protect them and learning to rear them. They can be used in any agro-climatic region, for any kind of crop and are generally used by small producers, cooperatives or businessmen.

USE OF *TRICHODERMA* AMONG CROPS FOR BIOLOGICAL CONTROL OF DISEASES CAUSED BY SOIL PHYTOPATHOGENS FOLLOWING TORRENTIAL RAIN; SAFEGUARDING OF RESERVES

(Introduced, since 1990)

Against hurricanes, torrential rain and floods



This is the use of the TRICOSAVE bio-product based on *Trichoderma harzianum* A-34 (antagonistic micro organism) for controlling soil fungi that attack plants (*Phytophthora*, *Fusarium*, *Pythium*, *Rhizoctonia*), as well as nematodes that cause diseases (black shank, damping off) in the wake of torrential rain, which facilitates their penetration of plants. The bio-product is produced using traditional methods in the centres ("CREEs") for the reproduction of insectivores and animals that cause diseases among insects, in various parts of the country; these keep reserves for use in the event of torrential rainstorms. Control can be carried out at the various sites affected by the pathogens; the method of application also takes account of the location of the damage to the plant. Treatments are performed on seeds, the soil, leaves, flowers and fruits.

It is very effective for controlling the diseases that always appear after torrential rain. It is an organic product and, unlike chemicals, poses no pollution risk to humans, animals or the environment.

It requires minimum technical knowledge of application techniques. It is applied like any other fungicide with the specific requirements of the product, obtainable from the nearest CREE.

It can be used in any agro-climatic region, on any affected crop and by small producers, cooperatives or businessmen.

INTEGRATED PEST-MANAGEMENT PROGRAMMES
(Introduced, since 1989)
Against hurricanes, torrential rain, flooding, drought, south winds etc.



This is a system of pest methodologies which, in the context of the related environment and the population dynamics of the damaging species, uses all the appropriate techniques and methods in the most compatible way possible and contains the pest population to levels below which it would cause economic damage. The basic aspects to be considered include the agro-ecosystem, natural control, biology and ecology of the organisms, cultivation as a central approach, sampling and use of critical levels, use of compatible tactics, integration of disciplines and secondary effects of photoprotection. Integrated pest-management tactics include management and encouragement of natural enemies, importing and establishing foreign natural enemies, use of microbiological agents, phylogenetic control, cultural practices, mechanical and physical controls, legal measures, employment of autocidal techniques and use of pesticides.

Integrated pest management optimizes crop yields and ensures their long-term productivity, protects human health and the quality of the environment.

The techniques are employed at national, provincial and local level, by businesses, small producers, with results of practical studies. The time required depends on the crop and the information collected. They are systematically updated or improved with the emergence of new scientific/technical results.

They can be used in various agro-climatic regions, by small producers, cooperatives and firms.

**ACTIVATION OF MONITORING, SURVEILLANCE, COMMUNICATION AND
INFORMATION FOR EARLY-WARNING SYSTEMS OF PEST & DISEASE
AMONG FARM CROPS AND ANIMALS
(Introduced, since 1977)
Against drought**



In the event of severe drought, monitoring, surveillance and communication for early-warning systems of pests among farm crops is activated, based on the signalling and forecasting methodologies used in the territorial plant-protection stations by plant health specialists or activists, as well as the diagnostic methods for early detection of harmful agents. The information is processed by bio-statistics experts and sent to the provincial authority for processing and forwarding to the national plant-health centre and the central plant quarantine laboratory. In the case of animals, the work is similar to that relating to crops.

Implementation contributes to preventing plagues among plants and animals consequent on severe droughts.

Requirements include the availability or formulation of methodologies for reporting and forecasting various plagues among farm crops, methods for diagnosis of pests and diseases among animals.

It can be applied in any agro-climatic region, at local, provincial and national levels.

EVACUATION CENTRES FOR FARM ANIMALS AND PETS FOR THEIR PROTECTION AND FOR DISEASE PREVENTION

(Introduced, since 2002)

Against hurricanes, torrential rain and inland and coastal flooding



Use of evacuation centres for farm animals and pets to ensure their protection and animal wellbeing, as well as prevention of diseases which can be transmitted to humans (zoonoses). The centres are independent of the places where people gather in the event of hurricanes, torrential rain and inland and coastal flooding. The practice reflects Directive No.1 for the planning, organization and preparation of the country for disaster situations, and the plan for mitigating community disasters regarding animal protection and its economics.

The primary benefits include full satisfaction on the part of the population since its animals are cared for and protected and zoonoses are prevented. Better control for veterinary work, enables the creation of a reserve of livestock for feeding the population in case of need and better preparation and organization of evacuation, whether of people or of the animals, consolidating the community orientation group.

Requirements include a specialist studying the community and its locality full-time, to locate these centres according to the vulnerabilities and the number of animals concerned, as well as to monitor the diseases to which they are susceptible there. It requires using paper, pencils or biros for notes, identification of buildings suitable for holding animals, veterinary medicines, personnel trained in animal care, feed, water, scientific/technical training of personnel (producers, members of the public, specialists, officials).

It is applied to coastal communities, those close to rivers or in low-lying areas or tropical or subtropical regions. It is best employed in the communities, but is also used by producers, cooperatives, according to the natural disaster to which they are exposed.

**INSTALLATION OF LOMBARDINI DIESEL PLANTS TO ENSURE
CONTINUITY OF MILKING AT DAIRY FARMS
(Introduced, since 1983)
Against cyclones, hurricanes, torrential rain, flooding**



It consists in using Lombardini diesel plants at farms to maintain the continuity of milking in the event of power failure during the passage of a cyclone, hurricane or torrential rainstorm. The installation and operation of the plant is governed by the manufacturer's instructions.

It avoids loss of milk production in the event of power failure and stabilizes the milking routine. It avoids stress among the animals and diseases of the mammary glands.

Requirements include personal qualified to install and maintain the plant. Training of the personal working at the dairy where the plants are installed, in their use and care.

<u>Equipment to be used</u>	<u>Cost</u>
Lombardini diesel plant	\$1,290.00
Consumption: 1.2 litres per plant per hour	

It can be used at any farm but is best employed at cooperative, firm level, at borough and district level.

**EVACUATION OR MOVEMENT OF CATTLE TO SAFE HIGH GROUND
(Traditional practice)
Against hurricanes, torrential rain, inland and coastal flooding**



This practice is implicit in the culture created by cattle farmers over the years, in response to various natural phenomena, as a means of protection. It needs to take account of the topography of the locality, access roads and the availability of feed and water at the place where the stock would be concentrated. The species to be moved are basically those able to travel on foot, such as cattle, horses, sheep and goats. However, pigs and poultry are moved only in the private sector, since in the state sector they are protected in their ordinary accommodation.

It avoids death among the livestock and the consequent economic loss (since not only the animal but its produce would otherwise also be lost).

The sites to which the livestock is to be transferred should be chosen in advance so as to minimize the risk of losses. Also needed are workers or producers familiar with the species involved. Also, in the place to which they are moved, a grazing area must be created (according to the number of animals involved) while natural reservoirs should be present and veterinary care available. Also needed are skilled personnel (rural cattle inspectors), average pay \$280, as well as a veterinary surgeon and veterinary auxiliary, average pay \$375 and \$335 respectively, and a stock of medicines and instruments needed for attending the species concerned.

It is applied to coastal communities, those close to rivers or in low-lying areas or tropical or subtropical regions. It is best employed in the communities, but is also used by producers, cooperatives, firms, according to the natural disaster to which they are exposed.

**USE OF COVERINGS ON OUTBUILDINGS TO PROTECT
SMALLER SPECIES AND YOUNG ANIMALS
(Traditional practice)
Against cyclones, hurricanes, torrential rain, drought**



The use of covering materials on farm installations or outbuildings is designed to preserve the health and wellbeing of smaller livestock species and young animals (calves, poultry, pigs, rabbits, lambs and kids). The coverings are placed at the sides of open-sided structures as shelter against rain, strong winds and the sun.

The practice preserves the health and wellbeing of the livestock kept in these structures, avoids mortality among the species and reduces expenditure on medicines for treating sick animals.

Requirements include personnel experienced in livestock care. Either natural or man-made materials can be used, as indicated below:

<u><i>Natural materials</i></u>	<u><i>Unit</i></u>	<u><i>Cost per unit</i></u>
- Palm fronds	1 frond	1.00
- Royal palm	doz.	6.00
- Stalks	uno	0.65
<u><i>Man-made materials</i></u>		
- Nylon sheeting	metre	4.00
- Polythene sheeting	metre	6.80
- Jute sack sheeting	sack	0.25
- Canvas	metre	7.20
- Corrugated iron	sheet	17.50

Quantities depend on the size of the outbuilding etc.

It can be used in any structure where animals are reared. Best used at family, cooperative, firm level, at borough and district level.

TRADITIONAL CHEESE-MAKING AS AN ALTERNATIVE MEANS OF SAVING MILK

(Traditional)

Relevant risks: hurricanes, torrential rain, floods



Production of cheese under traditional methods is used as an alternative means of avoiding losses of litres of milk at farms in the event of breakdown of the refrigeration system or because of bad weather and non-availability of milk stabilizers as well as the inability to distribute the milk immediately and directly to the consumer.

This practice reduces economic losses in that the milk is not lost. It is a method of conservation that results in a product of high nutritional value which lasts for 10 days at room temperature.

Requirements include personnel trained in this type of traditional production and a specialist (veterinary surgeon) to check and certify the safety of the finished product. The following materials are needed:

	<u>Unit</u>	<u>Cost/unit</u>	<u>Quantity</u>	<u>Total</u>
* Mould	1	12.00	40	480.00
* Salt	kg	0.10	1 Kg.	0.10
* Gauze	m	1.95	1 m	1.95
* Boiler (20-litre)	1	142.80	2	285.60

Estimated total cost: \$767.65

It can be used at any dairy farm, small milking parlour or anywhere dairy cattle are kept. It is best used at cooperative, firm level at borough and district level.

**SECURING OF ROOFS AT ANIMAL-REARING INSTALLATIONS
(Traditional)
Against hurricanes, high winds associated with severe local storms**



This traditional practice is designed to avoid losses of roofs at poultry, pig and other cattle farms, warehousing and administrative facilities etc., with the resulting cost of replacing coverings and the loss of livestock, products, equipment and materials kept in such places.

It avoids losses of material resources at the installation and of roofing components. It avoids accidental death of livestock of the various species kept. This kind of securing is easy and cheap, so that this practice is adopted in the various sectors of the national economy.

Requirements include the training of personnel. The material needed depends on the size of the structure to be secured.

<u>Materials</u>	<u>Unit</u>	<u>Cost</u>
- Wooden poles	1 m ³	\$43.50
- Smooth wire	1 roll	\$62.00

It can be used on any lightly-roofed farm building, warehouse, dwelling. Best employed at family, cooperative, firm, borough or district level.

In the case of an average battery henhouse, securing its roofs would cost \$10,527.72.

TRAINING AT THE CAMILO CIENFUEGOS TRAINING CENTRE



A technical training centre has been built at the Camilo Cienfuegos genetic agriculture firm ("EPG") in Consolación del Sur, Pinar del Río province, which is used for the preparation of all the firm's personnel in training activities under the disaster-reduction plans. In classrooms or centres similar to this, the agriculture-sector workers are trained and updated annually on disasters in agriculture. In 2007 various seminars, courses and conferences were held at the EPG, including the following:

- Seminar on use of biogas.
- Conference on disaster reduction.
- Course on installing and operating windmills.
- Conference on mitigation of disaster effects on cattle.
- Seminar on installing solar panels as a renewable-energy alternative.
- Disaster reduction: protection of irrigation machinery and equipment.
- Disaster reduction at plant nurseries.
- Seminars on locating solar heaters for warming milk for calves in fattening centres.

**USE OF 'STABILAK' MILK STABILIZERS AND IMMEDIATE DISTRIBUTION
(Introduced as from 2000)
Against hurricanes, torrential rain and flooding**



STABILAK is used to preserve raw, fresh cows', goats', buffalo and other mammalian milk, for 8-72 hours according to the starting quality and temperature of the milk. This product and immediate distribution of the milk are alternatives for avoiding deterioration or loss of milk quality and production, whether caused by interruption of electricity supply, blockage of farm access roads or delay in collecting the milk in the wake of a hurricane or torrential rain. They also apply where the refrigeration equipment at the unit breaks down and in units without refrigeration.

It preserves the quality of the milk, which retains the appropriate parameters at the time of its use by the consumer. It avoids the loss of litres of daily milk at a unit; this could amount to 1000 litres which at 90 cents per litre implies loss of revenue amounting to \$900.00, affecting delivery to the dairy industry and to the consumer. Without STABILAK 200 kg of imported powdered milk should be used to produce the 1,000 litres of lost milk, with a cost amounting to \$830.00. Stabilak is harmless to human health and does not affect the taste, smell or colour of the milk or produce lactic derivatives.

Requirements include competent cattle-farming personnel, training of producers in its use and handling and of the public in the hygienic measures to be taken for consumption of this milk.

In the case of immediate delivery to consumers, the state of health of the milking stock must be taken into account, to avoid the incidence of zoonoses.

The unit price of a packet is \$4.96 and two packets (the 1 and the 2) come in boxes of 50-litre doses, 500-litre doses and 5,000-litre doses of milk which reactivates 8 hours after the treatment, prolonging protection of the milk for a similar period to that of the first activation.

It can be used at any dairy farm, small milking parlour or anywhere dairy cattle are kept. It is best used at cooperative, firm level at borough and district level.

**SINKING WELLS AND BUILDING DAMS FOR WATER SUPPLY
TO CATTLE FARMS
(Introduced, since 1991)
Against drought**



This practice of creating natural or artificial reservoirs, whether dams or wells, is used to store this precious liquid for livestock and crops. It is carried out taking account of the local topography, method of reservoir water supply and the location and dimensions of the aquifer where the well is to be sunk.

It enables the storage of water for supply to cattle farms and crops in the dry season. Moreover, dams enable enrichment of the aquifer and regulate the flow in streams and rills.

Requirements include personnel skilled and qualified in the creation of these reservoirs, as well as a study and analysis to determine their location and construction method (which can be manual or mechanized). Building a dam costs 7,884.26 pesos, while sinking a well costs 1,755.00 pesos.

Its construction can extend to rural and semi rural areas, in any topography. It is best employed in communities, but they are also used by producers and cooperatives.

BEEHIVE FEEDING
(Introduced during the 1970s)
Against drought, impact on vegetation of hurricanes, floods and fires



The hives are fed with moistened sugar, left on a tray or in a receptacle inside the hive.

It avoids death of bees and hives from starvation, and ensures the retention of hives for continuing the production process.

Requirements include the services of beekeepers. Materials needed include feeders, water, sugar, suitable receptacles. The minimum time needed for carrying it out is one day, preferably two days. Maintenance consists in verifying availability of food in the hives, deciding whether further feeding is needed or whether the vegetation has recovered sufficiently to provide food, or whether the hive should be relocated to another area. Cost estimates depend on the number of hives to be fed (around 4-5 kg per hive) and the distances to be travelled. The main items of expense are sugar, fuel and transport.

It is applicable in any region exposed to the extremes that can cause starvation among the hives and at any level in terms of the number of hives, although it is especially applied in cooperatives and among producers with a large number of hives (over 50-100 up to 1,000 or more).

TRANSHUMANCE OF HIVES **(Introduced during the 1970s)**

Against cyclones, hurricanes, rain, flooding, fires



The hives are closed at the bee entrance, preferably at night, their parts (hive body, roof and supporting platform) are secured with strips of wood or are fastened so that they cannot become detached, and are transported to high ground, where the entrances are cleared to permit the bees to fly.

With this practice, death by drowning of bees and hives is avoided; the possibility of retaining strong, healthy hives to continue the production process is ensured.

Requirements include the services of beekeepers. Materials needed include nails, wooden strips or ropes. The minimum time needed for the job is one day, preferably two days. The hives should be examined when the rain stops, to determine whether they should be moved again or fed. Cost estimates depend on the number of hives to be moved and the distances to be travelled. The main items of expense are fuel and transport.

It is applicable in any region exposed to the risk of hurricanes or low-lying areas at risk of flooding and at any level in terms of the number of hives, although it is especially applied in cooperatives and among producers with a large number of hives (over 50-100 up to 1,000 or more).

**CONSTRUCTION AND USE OF REFUGES ON FARMLAND
(Traditional)
Against hurricanes**



This is a hut constructed of wooden posts secured at their joints with screws, a roof thatched to the ground with dry royal palm fronds, wooden slats in front and at the base. It is in frequent use during the hurricane season, typical of the Cuban countryside, able to withstand strong winds and occupied in the critical stages of hurricanes by people, domestic animals, trays of seedlings and seeds, for their preservation until the hurricane has moved on.

It protects people, domestic animals, seedlings, from hurricane-force winds, from rain, without risk of collapse, loss of roofs or other damage.

Requirements include 800 palm fronds (roof), 400 palm petiole tops, 3 cubic meters of wooden poles, 2 cubic metres of sawn timber, 5 kg 5" heavy-gauge nails, 5 kg 2.5" heavy-gauge nails, 5 kg 5" standard-gauge nails.

It can be used in various agro-climatic areas, basically by families, cooperatives and firms.

INSTALLATION OF LIGHTNING RODS
(Introduced, since 1975)
Against thunderstorms

Ante sequías, Ciclones Tropicales, intensas lluvias, inundaciones

It consists in the installation of lightning rods on the various cattle farm outbuildings, to reduce the damage caused by lightning during thunderstorms.

It avoids accidents with lightning to livestock or workers, reduces damage to premises from the same cause as well as the incidence of fires, thereby contributing to the wellbeing of the livestock.

Requirements include personnel trained in installation of these devices, training of personnel at the unit in their functioning and the safeguards to be adopted on the occurrence of thunderstorms.

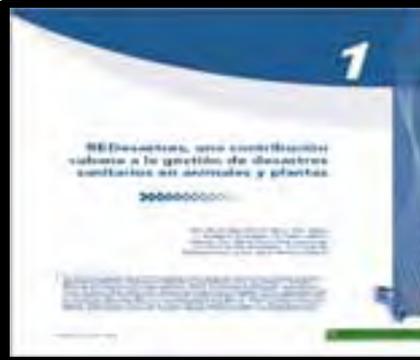
Its implementation can be extended to any structure dedicated to livestock rearing. It is used in the cooperatives' tobacco curing houses.

'REDesastres': multi-institutional network operated by the Centre for Training in the Reduction of Animal & Plant Health Disasters (CEDESAP)

(Introduced in 2005)

Against drought, hurricanes, torrential rain, flooding.

Ante sequías, Ciclones Tropicales, intensas lluvias, inundaciones



Developed to strengthen inter-sector, multidisciplinary cooperation (see <http://www.censa.edu.cu/cedesap> , REDesastres-L@censa.edu.cu), which is key to coping with disasters and a pillar of national strategy. Sponsored by the National Centre for Health in Agriculture (CENSA), the Ministry of Higher Education and EMNDC, it covers the whole country and has 403 members, between institutions, researchers, professors, specialists and executives a various levels in the ministries. It enables real-time interconnection between professionals in a variety of disciplines, notably across all the universities and agricultural research centres, technical and administrative agencies and diagnostic laboratories belonging to the official veterinary and plant health services, as well as all the production sectors. 750 messages have been circulated with salient, updated information and related commentary, obtained from public health bodies and international news agencies, scientific journals, regarding prevention, diagnosis and control of cross-border diseases and especially public-health disaster situations following extreme weather, emphasizing those possibly attributable to climate change. It is endorsed by MINAG, EMNDC and the Ministry of Science, Technology & the Environment (CITMA). It was singled out by INFOTEC as a successful example of the use of information and communication technology for agricultural research and technological innovation in Latin America & the Caribbean. It stimulates multi-sector and interdisciplinary cooperation, opens an additional channel for communication on risk, facilitates preparation of personnel,

enables distance learning, increases the chances of contact and exchange of experience and contributes to optimized use of human resources.

It requires teamwork on a part-time basis, involving close relations with the other members of the network, to optimize the benefits of cooperation, a microprocessor, and connection to a server and to the Internet. Set up a web page and create an E-mail distribution list, a necessary complement for lending dynamism to the network's operations and as a solution for problems accessing the Internet. The operating costs are minimal. It can be replicated by academic institutions, service organizations, industry and research agencies, public and private, in the agriculture sector in any other country.

LESSONS LEARNED

- Good practices have been identified in the various activities and at different levels of the MINAG's infrastructure, which are applied in the stages of the Disaster Reduction Cycle.
- There are many good practices which should be generalized across the various areas of the country and the Caribbean region.
- More work is needed on improving good practices at the various levels of Agriculture & Forestry Sector decision-making and activity
- Work should continue on identifying good practices in the country's various agro-climatic regions.
- Training of personnel engaged in agriculture is one of the most important activities in preparing for disasters.
- Documentation of the good practices identified will contribute to improving training in and organization of this activity in Cuba and elsewhere in the region
- The good practices at grassroots level using traditional, homespun, rough-and ready and similar means have proved efficient in terms of preparation for disasters, have created demand for additional employment in Cuba's fields and have enhanced the public's ability to cope with the effects of extreme weather.
- Management water during droughts also contributes to management of emergencies caused by torrential rain associated with hurricanes and other types of extreme weather.

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