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Government of Saint Lucia  
Ministry of Planning and Development

**Watershed and Environmental Management Project**  
Phase II

**Final Report**  
November 1997

**Volume 4**  
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- Annex 8 Environmental Assessment and Management**
- Annex 9 Main Socio-Economic Issues**
- Annex 10 The Community Participation Programme**
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**Hunting Technical Services**  
Hemel Hempstead  
England

in association  
with

**Mott MacDonald Limited**  
Cambridge  
England

**Under assignment to the Department for International Development, UK**

**WATERSHED AND ENVIRONMENTAL MANAGEMENT PROJECT  
PHASE 2**

**VOLUME 4**

**CONTENTS**

- Annex 8. Environmental Assessment and Management**
- Annex 9. Main Socio-Economic Issues**
- Annex 10. The Community Participation Programme**
- Annex 11. Legislation and Institutions**
- Annex 12. Project Memorandum and Terms of Reference**

## ACRONYMS AND ABBREVIATIONS

ACP	African, Caribbean and Pacific
AESD	Agricultural Engineering Services Division (of MAFF&E)
ADCU	Agricultural Diversification Coordinating Unit
API	Aerial Photography Interpretation
BDDC	British Development Division in the Caribbean
CAMMA	Canaries and Anse La Raye Marine Management Area
CANARI	Caribbean Natural Resources Institute
CAP	Chapter of GoSL Legislation
CARDI	Caribbean Agricultural Research and Development Institute
CBO	Community Based Organization
CEHI	Caribbean Environmental Health Institute
CIDA	Canadian International Development Agency
CPP	Community Participation Programme
CRM	Coastal Resource Management
CZM	Coastal Zone Management
CZMU	Coastal Zone Management Unit
DCA	Development Control Authority (of MP&D)
DFID	Department for International Development (UK)
EC\$	Eastern Caribbean Dollars
EEZ	Exclusive Economic Zone
EH	Environmental Health
EIA	Environmental Impact Assessment
ENCORE	Environmental and Coastal Resource Project
EU	European Union
FAO	Food and Agricultural Organization (of UN)
GATT	General Agreement on Tariffs and Trade
GIS	Geographical Information System
GoSL	Government of St. Lucia
GTZ	German Technical Mission for Co-operation
HTS	Hunting Technical Services
ICZM	Integrated Coastal Zone Management
IFAD	International Fund for Agricultural Development
IoH	Institute of Hydrology (UK)
ISM	Island System Management
LCB	Land Conservation Board
LCDC	Land Development and Drainage Committee
MAFF&E	Ministry of Agriculture, Forestry, Fisheries and Environment
MCWT&PU	Ministry of Communications, Works, Transport and Public Utilities
MF,P, IS&PS	Ministry of Finance, Planning, Information Services and Public Services
MH,HS,FA&W	Ministry of Health, Human Services, Family Affair and Women
MM	Mott MacDonald
NEAP	National Environmental Action Plan
NEC	National Environmental Commission
NEMO	National Emergency Management Organisation
NGO	Non-Governmental Organisation
NRMU	Natural Resource Management Unit (of OECS)
OAS	Organisation of American States

OCDP	Orchard Crop Diversification Project
OECS	Organisation of Eastern Caribbean States
PM	Prime Minister
PPU	Physical Planning Unit (of MP&D)
PS	Permanent Secretary of GoSL Ministry
SFAD	Small Farmer Development Project
SFAP	Small Format Aerial Photography
SI	Statutory Instrument of GoSL Legislation
SLAA	St. Lucia Agriculturalist Association
SLBGA	St. Lucia Banana Growers Association
SLNT	St. Lucia National Trust
SMMA	Soufriere Marine Management Area
SWM	Solid Waste Management
TDB	Tourist Industry Development Board
TOT	Technical Operations Team
ToR	Terms of Reference
TRoPRo	Tropical Produce Support Project
TSD	Tropical Storm Debbie
USAID	United States Agency for International Development
USDA	United States Development of Agricultural
UWI	University of the West Indies
WASA	Water and Sewerage Authority
WIBDECO	Successor to WINBAN
WINBAN	Winward Island Banana Growers Association
WMO	World Meteorological Organisation
WTO	World Trade Organisation
WWF	World Wildlife Fund

# **Annex 8**

## **Environmental Assessment and Management**

## ANNEX 8

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# 1 ENVIRONMENTAL ASSESSMENT

## 1.1 Availability of Data

The most useful single source of information in the Environmental Field is the Country Environmental Profile, produced for St. Lucia by the Caribbean Conservation Association in 1991, under finance from the Island Resources Foundation, National Development Foundation and USAID. This document reviews all existing information in the Environmental sector, including Physical, Biological and Human Issues, the Institutional Framework, and gives a list of recommendations for environmental management.

Further useful references include:

- the Watershed and Environmental Management Project Consultants' Report (World Bank / ODA TA), Dec 1994, orientated specifically to address the main issues resulting from the Tropical Storm Debbie (TSD);
- the Watershed and Environmental Management Phase I Final Report (May 1996), (again focussing on TSD issues);
- the St. Lucia Medium Term Economic Strategy Paper, 1993-96;
- reports by David Harris of WINBAN during the period 1992-95 concerning the Banana Industry.

Current Environmental Projects underway in St. Lucia include the following:

- the CIDA-funded NW Coastal Zone Management Project (investigating the Coastal Zone from Roseau Beach to Cap Estate);
- the Soufriere Marine Management Area (SMMA) , now with some French-funding (investigating the zone from Choiseul Bay to Anse Mamin);
- the ODA-funded Project with CEHI concentrating on water quality and fresh-water aquatic ecology: this has just been completed, with a preliminary draft report having been seen by the Consultants.
- the System of Parks and Protected Areas Project, under the St. Lucia National Trust, identifying further areas for nature protection, including Grande Anse National Park, Morne Fortune Historic Site, Praslin protected landscape, Pointe Sable National Park, and Anse La Liberte Project.
- Environmental Education Project, under the Department of Forestry.

In reviewing existing information and projects the Consultants have become increasingly aware that most of these have been focussing more on the symptoms of the environmental problems, rather than on the sources of these problems. Thus the all-important soil conservation problems have received little attention, while the studies in the marine and freshwater ecology fields have been well covered. The Consultants are thus intending to redress this imbalance.

## 1.2 Environmental Issues

The long list of environmental issues applying both internationally and specifically to St. Lucia is given in **Table 1.1**, which also gives an approximate assessment of the relative importance of these issues in the St. Lucian context. In the table the most important issues, i.e. those representing current environmental costs of more than EC\$10m/year, are denoted by three arrows; two arrow and one arrow indicators denote less important issues, assessed to be in the order of EC\$1-10m and 0.1-1m respectively. The table, however, does not show inter-relationships between issues, e.g. marine siltation being caused by silt in rivers in turn produced by river bank scouring and soil erosion.

**Table 1.2** highlights the specific physical issues and outlines possible solutions to these issues. Further detail on these issues is given in the following Sections.



TABLE 1.2: ST LUCIA: ENVIRONMENTAL PHYSICAL ISSUES, RELATIVE IMPORTANCE, AND POSSIBLE SOLUTIONS

GROUPING	SPECIFIC ISSUE	IMPORTANCE	POSSIBLE SOLUTIONS
Soil Erosion	1 Surface Wash	<<<	a)Major campaign to install trash lines & maintain trash cover in banana lands: Extension Service to be strengthened; b)Steeper lands (some >25, all >30deg) to be underplanted with perennial trees c)Steepest land (>35deg), and land above water intakes, to be acquired by govt for forestry plantations.
	2 Mass Movements(Landslides)	<<<	a)Highest risk areas (>35deg, more concave) to be identified and planted to perennial trees b)Surface Drainage in high risk areas to be improved; c)Areas threatening infrastructure to have compulsory acquisition orders
Soil Degradation	3 Loss of Plant Nutrients	<<	a)Solutions 1 a,b,c to be implemented; b)Balanced nutrients to be applied to all crops.
	4 Nutrient Imbalances	<<	a)Study to be implemented covering macro & micro elements*;
	5 Acidification	<<	a)Soil testing programme to be implemented*;
	6 Pesticide Accumulation	<	a)Lime to be applied to balance N – fertilizer additions a)Study to concentrate on potential hot spots(banana sheds etc)
	7 Adverse Pesticide Affects	<<	a)Break crops to be promoted of nematicide use; b)Research on biological control (nematode – trapping fungi) to be promoted; c)Alternate use of different nematicides;
	8 Soil Surface Exposure	<<<	{a)Maintain even trash cover; b)Not too rigorous weed control c)Promote earthworm activity (lime application);
	9 Decreasing Soil Infiltration	<<<	{reduce nematicide use} d)improve soil drainage
	10 Spoil Disposal	<	Spoil to be used to improve shallow soil areas (small homegardens)
	11 Soil Waterlogging	<<	[Flat alluvial areas, lowermost river valleys: problem with bananas –drains to ensure WT below 50cm]
	12 Salinity & Sodidity Increase	<<	Small, localised problems only, particularly on Windward coast;
	13 Inappropriate Agric.Land Use	<<<	Promote perennial treecrops in steeper banana areas; don't grow seasonal crops
	14 Land Lost to Construction	<<	Don't allow building in flat alluvial lands; Selective Land Zoning for Construction in shallow soil areas;
Land surface/drains	15 Surface Run – off	<<<	a)Solutions 1 a,b,c to be implemented
	16 Surface drainage	<	b)Attention to be focused also on agric.drains, and drainage of farm tracks & paths;
Rivers	17 Sediment Load	<<<	Farmers to be advised in design & layout of drains
	18 River bank Erosion	<<<	Solutions 1 a,b,c to be implemented (solution lies more in land upstream, less so in rivers)
	19 Solid debris load	<<<	a)Maintenance of 20m river reserves (permanent trees); b)Planting of cover plants;
River Water Quality	20 Dry Season Flow	<<<	c)Avoidance of River straightening d)Promotion of 1 a, b, c, above.
	21 Flooding	<<<	a)Better rubbish collection & public education; b)Farmers to clear debris from farm drains;
	22 Nutrient Loads	<	Promote perennial tree cover over larger proportion of watershed a)Better upstream water management b)Grow dasheen & Terminalia arjuna in lowest areas
Groundwater	23 Pesticide Loads	<	Unlikely to be major problem, except in some rivers in dry season – Monitor river nutrient contents (incl K, N, and P2O5) and BOD in Lower Roseau, Choc, Castries; control cultiv. above WASA intakes.
	24 Groundwater Recharge	<	Unlikely to be major problem in rivers, but needs study.
Marine	25 Groundwater Quality	<<<	[A massive problem, but solutions lie upstream in better land management]
	26 Siltation	<<	Temporary solutions (vacuum cleaning of reefs etc) needs further study.
CLIMATE	27 Nutrient loads	<<	[A problem in Rodney Bay Marina, and in Castries Harbour]
	28 Pesticide Affects	<	Needs further study; particularly pesticide adsorbed onto colloidal material, deposited in sea.
	29 Decreasing wind Protection	<	Ridgetops require permanent treecover for > 100m width.

Note Relative importance assessed in terms of annual financial losses represented by each issue: <<< massive costs.>ECS10m/yr: << large costs.>\$1m/yr: sig.costs.>\$100k/yr.

### 1.3 Soil Erosion

Soil erosion is by far the most important single environmental problem facing the country, both in terms of current economic losses (losses of topsoil, nutrients, worsening of run-off and resulting flash-flooding, damage to infrastructure) and future threats to other activities (directly to tourism and fishing, and indirectly, through declining agricultural productivity and rural incomes, to the stability of the entire country).

Analysis of the Erosion Problem must separate the two main groups of processes: surface wash and mass movements.

**In the case of surface wash**, maintenance of ground cover, both vegetation cover and trash cover, is the most important factor in reducing erosion. (Trials on maintaining ground cover with banana trash in sloping smallholder banana fields are reported on in Annex 7.) The Consultants consider that widespread banning of banana cultivation on steep slopes would not be enforceable in the St. Lucian context. There is an additional danger that bans on bananas would lead the land to be cultivated to far more damaging crops, for example taro or seasonal vegetables. The presence of trash has been demonstrated to have a marked beneficial effect on soil infiltration rates, as well as having positive benefits in several other areas (soil surface protection against raindrop impact, increase in structural stability, recycling nutrients, keeping soil surfaces cool, improving the rooting environment). A major campaign to install trash lines and maintain trash cover in banana lands thus needs to be instigated, particularly on the steeper banana lands.

Land of over 30 degree slopes also needs to be targeted for underplanting with perennial trees, with a view to replacing the bananas completely by these trees. For banana land of between 20 and 30 degrees, partial replacement of bananas with rows of trees planted on the contour would be beneficial - (See Annex 5 for Possibilities for Alternative Cropping). Both programmes need the active support of the Extension Services for technical assistance in setting out the conservation measures.

For **mass movements (landslides)** the highest risk areas need to be identified and planted to perennial trees, and the complete banning of felling of existing perennial trees needs to be enforced for these areas. Essentially, high risk areas are those above 35 deg slope and possessing a more concave topography. Where these areas are above or below existing infrastructure and settlement, they should have the highest priority. The Cul de Sac Valley shows the greatest density of this land, and is thus an ideal test watershed for this activity. Some complete banning of cultivation is advocated in the worst cases: these areas should be acquired by government and planted to forestry trees.

SFAP mapping, ideally at 1:7,500 scale, should be undertaken for such areas, and initial slope analysis based on the 1:10,000 topo mapping (see Section 2.2.2 of Annex 4) can be overlaid with this mapping to pick out the worst problem areas.

Photos illustrating aspects of soil erosion and conservation in the Upper Watershed Areas are given in **Figures 1.1 and 1.2.**, and aspects specifically relating to agricultural practises are given in **Fig.1.3.**

Based both on assessments of erosion available locally, and the Consultant's recent work in Sri Lanka where erosion studies were reviewed, an attempt has been made to assess soil erosion losses at different slope limits for the different landcover types as observed in the very recent Small Format Air Photography. These figures are given in **Table 1.3**, and expressed in terms of average soil losses per ha per year. These would include losses through both surface wash and mass movements, with losses averaged out on an annual basis.

Some slope limits should be placed on different types of cultivation. In the St. Lucian context, and on existing cultivated land, the Consultants would suggest limits should initially be placed as follows:

Annual/Seasonal Cultivation	10degrees
Monocropping Bananas	20degrees
Bananas with treecrops, aligned on the contour	30degrees
Treecrops, full cover	35degrees
Long-cycle Forest Plantations (selective felling)	40degrees
Conservation Forestry	no limit.

The Consultants consider that it is important that precise figures be stipulated, as these can readily be verified in the worst cases of misuse by use of a simple clinometer. Other countries, (St. Kitts, Malaysia) have formal slope limits stipulated in land use legislation; others (Sri Lanka, Indonesia) have limits stipulated in guidelines on land use adopted by government institutions, and followed closely by any internationally-funded project.

There is a strong case for setting up a Land Bank in the country in order to reallocate unused or grossly underutilised land to those who are either landless, or possessing and cultivating land which is too steep or otherwise unsuitable for such uses. In the course of their work, the Consultants observed very many cases of both categories. These aspects are further discussed in the Institutions and Recommendations Sections of the Report.

#### 1.4 Soil Degradation

Soil erosion is the largest processes of soil degradation. However, there are other processes which must also be considered. These include the following:

##### 1.4.1 Loss of Plant Nutrients and Nutrient Imbalances

WINBAN estimate that 30% of nutrients applied to sloping land are lost through surface wash processes. Where concave colluvial footslopes exist below sloping areas, bananas are observed to be showing much better growth than in upslope areas, demonstrating the degree of nutrient redistribution. Farmers in these cases can compensate for this by applying more fertiliser to sloping areas than to footslope areas. Secondly, by carrying trash from the footslope areas and spreading this on the slopes (currently being practised in the field trials) they are then improving the fertility and physical status of the sloping land.

However, in most cases nutrients once mobilised will end up in the rivers where they may present a problem to the fauna and flora as well as being a loss to the farmer.

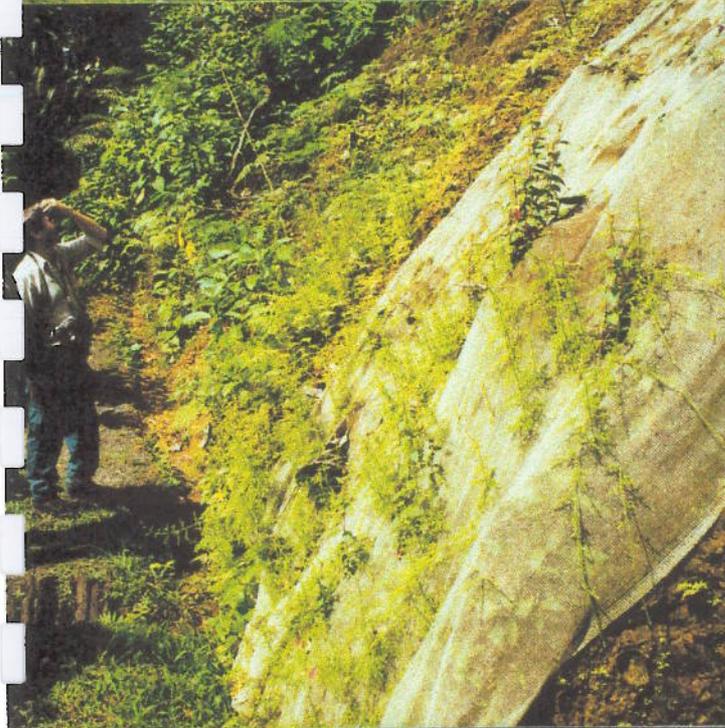
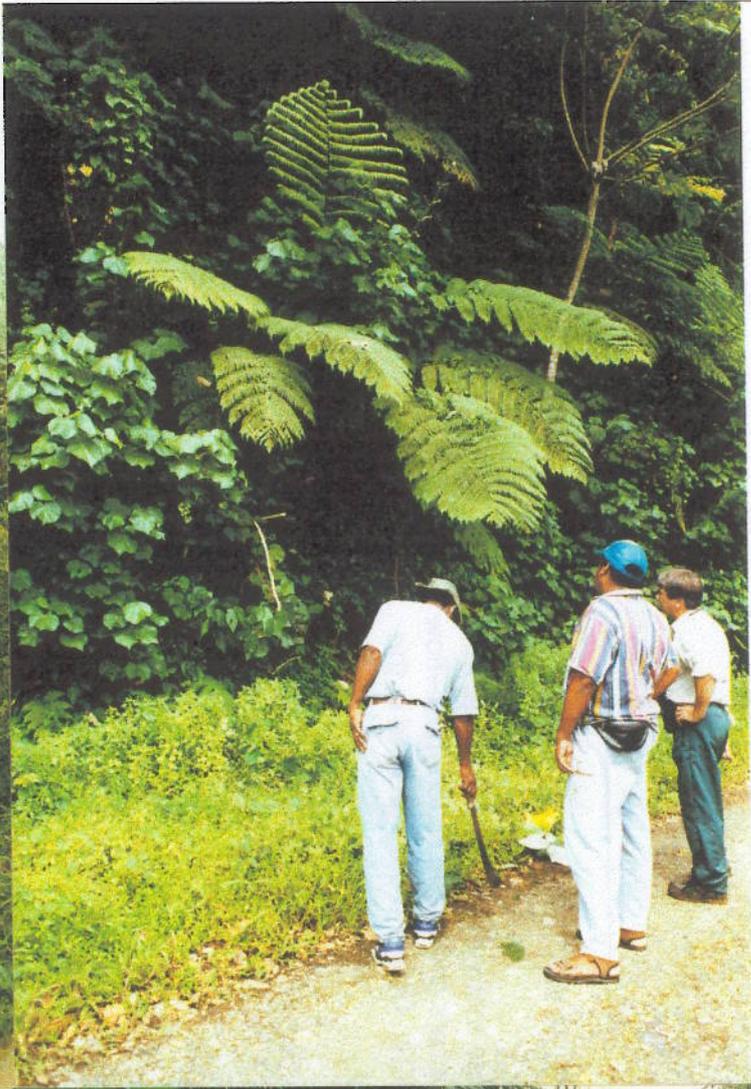
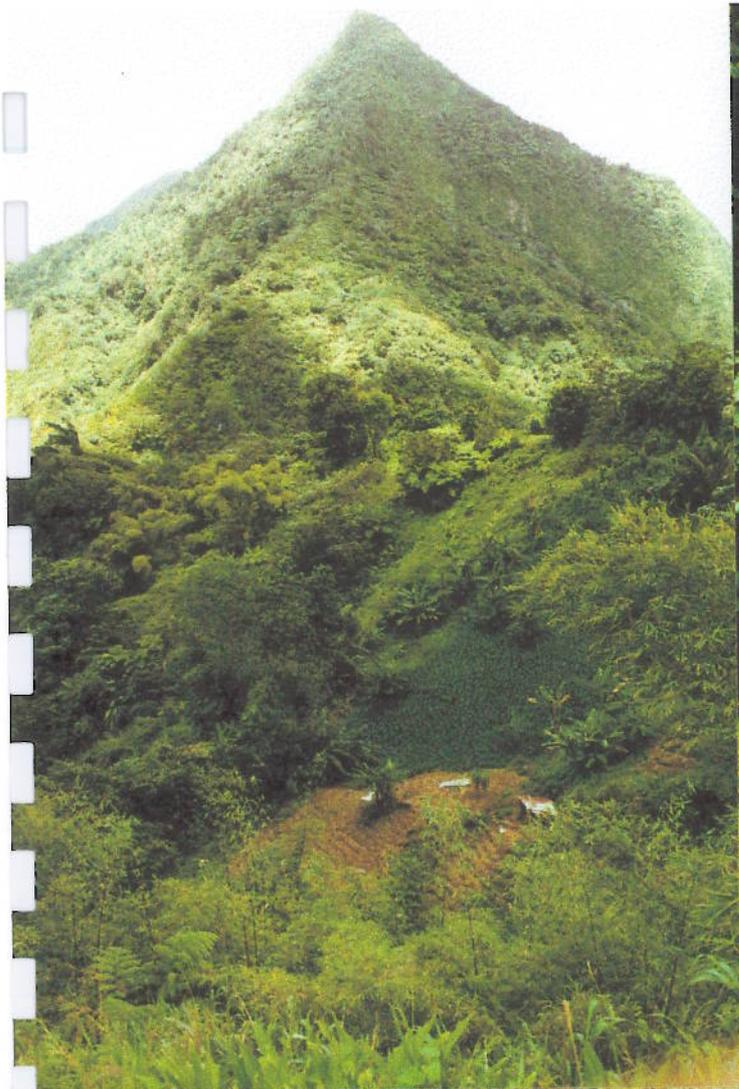
Efficiency of fertiliser application can be considerably increased by frequent small applications, and above all by good trash management, particularly installation of trash lines. Tied contour drains will also retain nutrient rich topsoil on slopes. Sub-surface fertilizer injection has been considered by WINBAN and this urgently needs further investigation, particularly for highly sloping land. Further development of the injector tool, and fertiliser efficiency trials on sloping land, should be carried out.

Removal of plant nutrients also takes place with the removal and sale of the crop, and these nutrients must be compensated for. Use of banana fertiliser is not ideal for many crops, and Table 1.3 shows fertiliser compositions recommended in Sri Lanka (Ceylon) for a wide range of perennial crops being grown in St. Lucia. For many crops there is a need to change composition from a more evenly balanced NPK mixture initially, to a high-K NPK mixture when the treecrop gets to the bearing stage. Higher P fertilizers are required for some crops (breadfruit, jakfruit, tomatoes, peppers), and to compensate for anion fixing soils (e.g. the allophanoid soils in St. Lucia).

**FIG 1.1. SOIL EROSION AND CONSERVATION: UPPER WATERSHED AREAS**

- T left** Upper Soufriere Watershed. Encroachment on Forest Reserve and cultivation of annual crops by encroachers on v. steep slopes with no soil conservation measures. This cropping would be leading to soil losses of up to 500 t/ha/year.
- T right** Mahomang (*Hibiscus perambacensis*) – top left of photo – and tree ferns. Mahomang is an excellent local species for slope stabilisation.
- M left** Experimental use of biodegradable netting for stabilisation of mass – movement scars. Note natural regrowth of vegetation through netting. Des Cartier Forest Trail.
- M right** Scouring by fast – flowing river cutting into hillslope, leading to massive slumping during Tropical Storm Debbie. This is the site of trials on rip – rap protection and bio – engineering trials, Upper Troumassee River (Photo mid – October, 1996)
- B left** Cul de Sac, Ravine Souffre, S of Marc Marc (seen in distance). Agric. feeder roads extending banana cultiv. into steep forest land. Note both bare soil surfaces in banana fields and mass movement scars. (SFAP C5 – 29)
- B right** Upper Dennery Valley. Bannana cultivation encroaching onto Primary Forest. Scale c. 1:3,000. (SFAP 4 – 24)

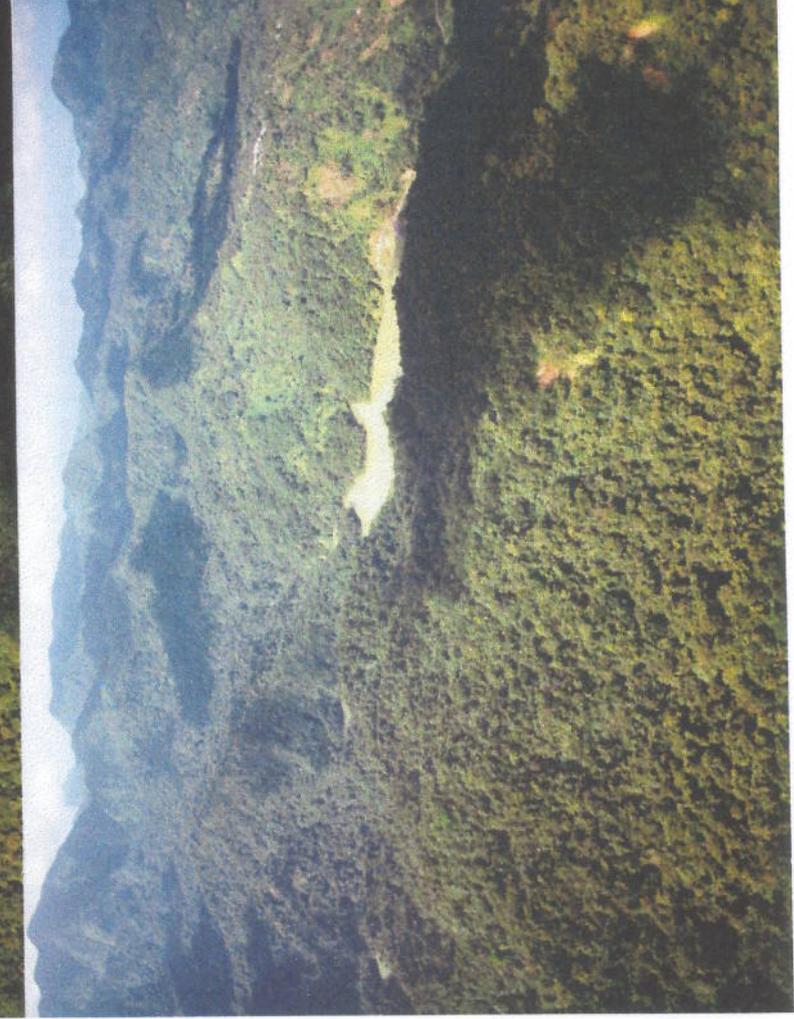
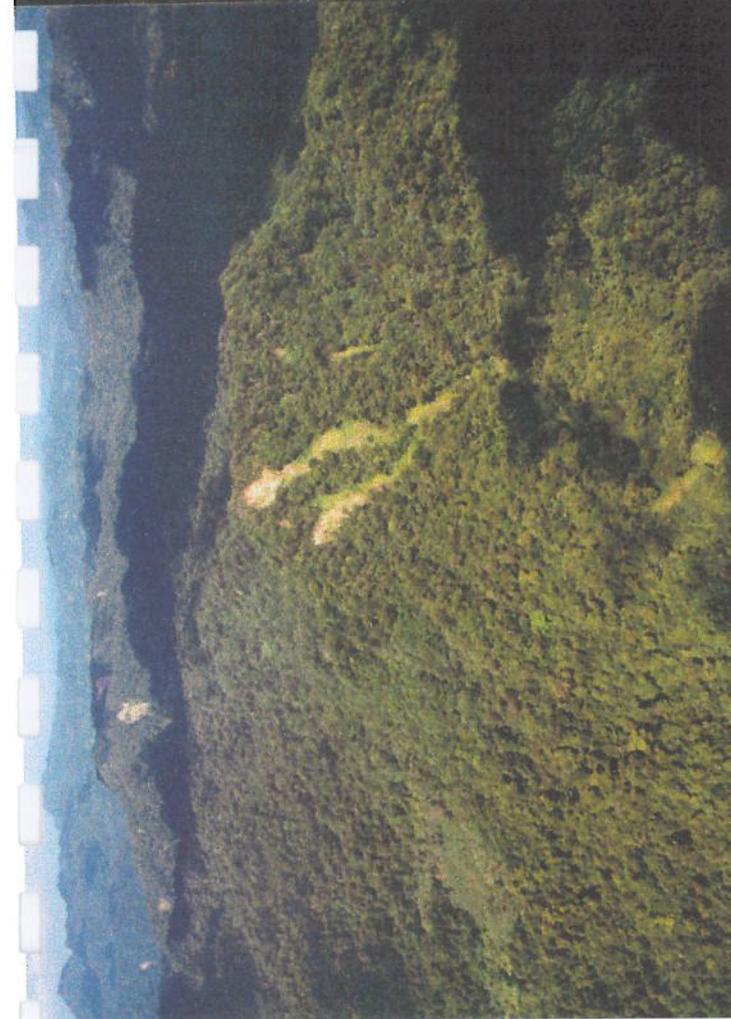
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**FIG 1.2. SOIL EROSION AND CONSERVATION: UPPER WATERSHED AREAS**

- T left Just SW of Dennery Watershed, looking SW across main water-divide. Note mass -movement scars remaining from TSD. Nearest scars produced much mud-flow material, deposited along streams (see photo 4-29). Scars in background in the top end of Cul de Sac Watershed. (SFAP C5-35)
- T right Small landslide scars; secondary regrowth colonising mudflow scars following valley bottom through primary forest area to W of Dennery Valley. Scale c. 1:3000 (SFAP 4-29)
- B left Cul de Sac/Roseau water divide, looking S across Roseau reservoir and steep mountains in S of island. Note areas of cultivation within dam catchment, and turbidity of reservoir water. (SFAP C4-2)
- B right Cul de Sac, E of Marc Marc. Agricultural feeder roads extending banana cultivation into steep forested land. It is alarming that construction of these feeder roads is continuing, and indeed, being accelerated. (SFAP C5-4).

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### FIG 1.3. SOIL EROSION AND CONSERVATION: AGRICULTURAL PRACTISES

- T left** Establishment of Trash Lines in banana fields. These trash lines will retain any eroded soil on the slope. Experiment set up by Mr Martin Satney in 1996 on the land of Mr Descarte in the Micoud area. Note the use of the M-frame to position the stakes on the contour. Our trials covered trash lines and trash cover, but showed that shortage of suitable nearby material for stakes was a problem. Glyricidia would be the ideal material, but nurseries and strip plantings should be set up in all areas to supply stakes. Loppings from green sproutings from these stakes would be an excellent green manure & mulch material.
- T right** Misuse of land on very steep slopes: recent clearing for annual crop cultivation in the Upper Soufriere Watershed. There is an urgent need to impose slope limits for such cultivation, as soil losses could easily be as high as 500 t/ha/year on steep land. Publicity and education is slowly getting over the message that such cases of gross misuse of land are unacceptable.
- B left** Slumping due to scouring along river bank affecting good agricultural land, right bank of Roseau River. However, cost of gabion mattresses and rip-rap would be much too high in relation to any agricultural benefits achieved here by protection. Biological measures including grass planting on banks, and tree planting as a double row along top of bank would be recommended. Mangoes, breadfruit, coconuts, avocados, bamboo, teak (drier areas, good drainage—as here), mahogany (shade required) would be suitable.
- B right** Cultivation of taro on landslide / slump material produced by Tropical Storm Debbie in 1994. Material from this slump crashed into the house at the left, killing a child in the front bedroom. Dasheen grows well in wet soil produced by slumping, but is a problem in that the crop is cultivated on an annual basis, exposing the soil surface to further erosion. Permanent tree cover in these areas is an urgent necessity.

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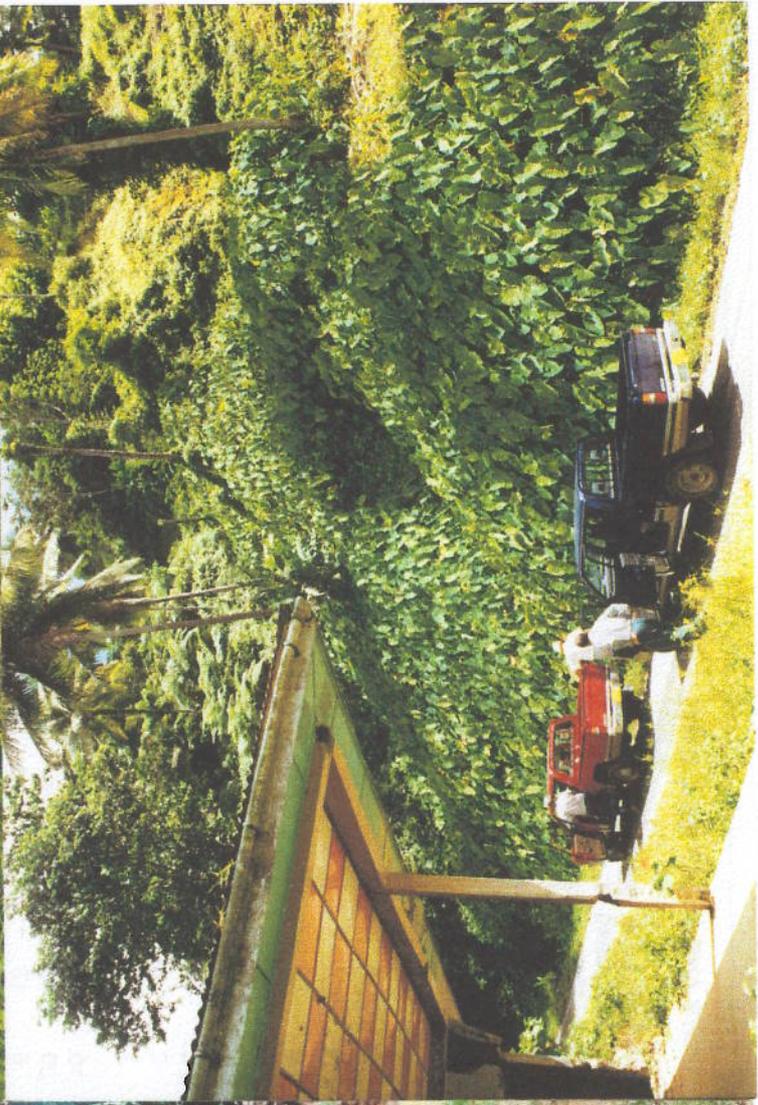


TABLE 1: 3: SOIL EROSION LOSSES ASSOCIATED WITH DIFFERENT LAND COVER UNITS AND SLOPE GRADIENTS

Unit Subunit Mapped	Description	% bananas	Estimated soil loss, t/ha/yr, for slopes of:				Remarks on current rates of erosion: (Applies to land under average levels of management)
			2deg	15deg	25deg	35deg	
1a	1a Rain Forest (broad leaved)		0.1	1	3	5	Most of erosion through Mass Movements.
1b	1b Montane Thicket						
1c	1c Mangrove						
1d	1d Elfin Woodland						
2	2 Plantation Forest Species		0.2	2	6	10	Assumes long-cycle plantatns; selcty felling, good mnmnt.
3	3 Secondary Forest / Logged + -enriched Primary Forest		0.2	2	4	7	Most of erosion through Mass Movements.
4	4 Scrub Forest		0.2	2	6	10	Soils more highly erodible for these areas
5	5 Open Woodland						
6	6 Grassland / Scrubland		2	20	60	100	Assumes some seasonal cultivation (c 20% of area / yr)
6b	6b Commercial Agricultural Lands (eg Estates)	90	7	14	40	60	(Assumes higher % of good land.& better level of mnmnt)
6bf	6bf V.intensive banana cultivation	(0)	14	25	60	100	Deep drains in alluv.land show appreciable erosion
6bc	6bc - " -, v.young plant crop, or currently fallow	65	4	8	25	50	Ground cover commonly poor.
6cb	6cb - " -, interplanted with coconuts forming 15-50% cover	35	2	4	14	30	Some protn.from surface wash, little from mass movmts
6g	6g - " -, interplanted with coconuts forming 55-80% cover		1	4			Some protn.from surface wash, little from mass movmts
7	7 Grassland (generally hydromorphic)						Permanent dense cover usual
7b	7b Intensive Small Farming						
7bf	7bf Intensive smallholder banana cultivation	80	10	20	60	100	Deep drains in alluv.land show appreciable erosion
7bc	7bc - " -, v.young plant crop, or currently fallow	(0)	20	40	90	150	Ground cover commonly v.poor.
7cb	7cb - " -, interplanted with coconuts forming 15-50% cover	60	6	12	40	90	Some protn.from surface wash, little from mass movmts
7cb	7cb - " -, interplanted with coconuts forming 55-80% cover	30	3	6	20	45	Some protn.from surface wash, little from mass movmts
7bt	7bt - " -, interplanted with treecropps forming 15-50% cover	60	6	12	35	60	Treecropps give better protcn from mass movements
7bt	7bt - " -, interplanted with treecropps forming 55-80% cover	30	3	6	17	30	Treecropps giving good protcn from mass movements
7m	7m Mixed smallholder cropping	50	5	10	20	75	Fair coverage by treecropps/perennials
7tm	7tm Mixed smallholder cropping dom.by treecropps	20	3	5	15	25	Treecropps giving good protcn from mass movements
7t	7t Smallholder treecropps	0	2	4	12	20	Well established trees / complete ground cover
7r	7r Seasonally cultivatd and/or bare soil surface	0	40	90	200	500	Massive erosion, especially on steeper slopes.
8	8 Mixed Small Farming						
9	9 Rural Settlement (houses, yards, and immediate houseplots)		6	12	40	90	Combines area of mixed cultivatn, plus high runoff area
10	10 Urban, Periurban/Residential, Commercial, Institutional, Industrial						
10i	10i Industrial/Institutional		6	12	40	90	Combines area of mixed cultivatn, plus high runoff area
10h	10h Residential / Homegardens		6	12	40	90	Combines area of mixed cultivatn, plus high runoff area

Complex Units include:

2/1: 2/7t; 5/7m; 5/7t; 7c/5; 7d/2; 7t/5.

Note: First unit in complex assumed to occupy 60% of area of the complex, second unit 40%.

Note: estimates on erosion include both surface wash and mass movements, averaged on yearly basis. Erosion estimates are of the Consultants, largely based on comparisons with: Hunting Technical Services Limited, June 1984. The Roseau, Denny, and Cul de Sac Drainage and Conservation Project.

LTS, RDC, HTS, March 97. Sri Lanka: Upper Watershed management Study (ADB PPTA). Land Resources, Land Use Planning, and Watershed Management Aspects.

Note: Above legend is an enlargement, with small modifications, of the Hunting Technical Services 1984 legend.

The current nutrient status of St. Lucian agricultural soils needs to be studied, as the heavy use of high-K banana fertilizer may have led to severe nutrient imbalances in some cases. This becomes even more important when crop diversification is considered, as many alternative crops require quite different N:P:K ratios to bananas.

Rational use of fertiliser, at frequent and small applications, and at the recommended levels, will enable complete crop canopies to be achieved quickly, and will have a net overall effect of reducing the rate of erosion. The Consultants have found little evidence on overuse of fertiliser. The high-K nature of the fertiliser has little effect on aquatic life, potassium being the most benign of the major nutrients in terms of inducing algal growth, particularly in marine environments where the element occurs naturally in large quantities.

#### **1.4.2 Soil Acidification**

Heavy use of fertilisers over the last 20-30 years for banana cultivation has led to large falls in soil pH, with average values for most soils in the prime banana agro-ecological zones having fallen from about 5.8 as reported by Stark et al in 1966, to current values in the range 3.8-4.8 (Harris, 1995). pH(H<sub>2</sub>O) values of 7 of the 8 composite samples taken in the agricultural trials were also in the range 4.6-5.0. Acidifying affects of heavy fertilizer applications have been the major cause of this marked fall in pH.

Although bananas are tolerant of fairly low pH values, calcium deficiencies have been shown to exist, and marked responses have been observed to lime applications both in St. Lucia, and in other islands. Recommended liming rates (WINBAN) are 2tonnes / ha at planting, with further applications of 500g / mat every 2 years. Harris (1995) recommends a ratio of 3:1 be maintained for NPK fertiliser:lime applications so that soil acidity problems are not worsened. On this basis, the island is using only 2% of lime requirement, which is a major cause for concern.

For most crops of the humid tropics, some tolerance exists to high acidity, and liming to pH values over 5.7, (or exchangeable aluminium saturation percentages of under 40%) are not advocated. However, pH(H<sub>2</sub>O) values of less than 5.2, or aluminium saturation percentages of more than 65%, should be corrected with lime applications for all but the most acid-tolerant crops (e.g. tea, rubber). Some crops, notably cocoa, require higher pH soils, with values of 6-6.5 being ideal.

Lime is even more essential for earthworm activity, and thus areas treated with lime are likely to show higher infiltration rates, and higher structural stability. (This is currently under investigation with the soil conservation trials). Thus increased lime application will probably lead to reduced run-off and erosion.

Cost of lime (\$22.50 per 50kg bag) is a major disincentive for farmers, with this high cost being related to the low volumes traded. Purchase of larger quantities of lime in bulk, or development of local sources, should be investigated, as local agriculture should be applying 5,000 -6,000 tons / year. Imported dolomitic lime could be a major source of magnesium, which would be considerably cheaper than the magnesium included in the existing NPK fertiliser mixture, which is in the form of kieserite (MgCl<sub>2</sub>). Agricultural lime for treecrop use in the tropics should be in the form of the cheaper carbonates (i.e. fine ground limestone) rather than burnt lime which is much more soluble and more expensive.

#### **1.4.3 Pesticide and Herbicide Issues**

Monitoring work undertaken by CEHI has shown only one measurement of detectable pesticide residues in river water from upper watershed areas (B.Lloyd, pers comm). It would thus appear that pesticide contamination of river water is not a major current problem, although it deserves further

**TABLE 1.4 : FERTILIZER MIXTURES AND SCHEDULING FOR TREECROPS OF THE HUMID TROPICS**

	N P2O5K2OMgO			Spacing		Plants /ha	Timing	Application, Kg/plant					Application, Kg / ha					Applcn,Units/ha/yr											
	N	P2O5	K2O	MgO	X(m)			Y(m)	0mo	3mo	6mo	9mo	12mo	Total	0mo	3mo	6mo	9mo	12mo	Total	N	P2O5	K2O	MgO					
<b>Avocado</b>	11	23	15		8	8	156	Planting	0.5									78					78	9	18	12			
								Year 1		0.2	0.3	0.5							31		47	78		9	18	12			
								Year 2		0.4	0.5	0.9							63		78	141		15	32	21			
								Year 3		0.6	0.7	1.3							94		109	203		22	47	30			
								Year 4		0.8	0.9	1.7							125		141	266		29	61	40			
								Year 5		1.0	1.1	2.1							156		172	328		36	75	49			
								Year 6etc		1.2	1.3	2.5							188		203	391		43	90	59			
<b>Banana</b>	11	12	14		3	3	1111	Planting	0.3									333					333	37	40	47			
	11	12	14					Year 1		0.2	0.2							222	222				444	49	53	62			
	15	8	30					Year 1				0.3	0.3	0.6							333	333	667	100	53	200			
	15	8	30					Year 2etc		0.4	0.4	0.4	0.4	1.6				444	444	444	444	1778	267	142	533				
<b>Breadfruit</b>	0	47	0																										
<b>Cashew</b>	20	16	13		7	7	204	Planting	0.5									78					102	11	23	15			
								Year 1		0.06	0.06	0.11								11		11	22	4	4	3			
								Year 2		0.11	0.11	0.22								22		22	45	9	7	6			
								Year 3		0.22	0.22	0.44								45		45	90	18	14	12			
								Year 4		0.45	0.45	0.90								92		92	184	37	29	24			
								Year 5		0.65	0.65	1.30								133		133	265	53	42	34			
					7	14	102	Year 6etc		0.90	0.90	1.80								92		92	184	37	29	24			
<b>Cinnamon</b>	22	12	15					Year 1												125		125	250	55	30	38			
								Year 3etc												250		250	500	110	60	75			
<b>Citrus(y)</b>	22	12	15		4	5	500	Planting	0.5									225					225	50	27	34			
<b>Citrus(m)</b>	15	16	20					Year 1		0.22	0.22	0.44								110		110	220	48	26	33			
								Year 2		0.45	0.45	0.90								225		225	450	68	72	90			
								Year 3		0.7	0.7	1.30								325		325	650	98	104	130			
								Year 4		0.9	0.9	1.80								450		450	900	135	144	180			
<b>Clove(1)</b>	9	8	16	1	6	7	238	Planting	0.1									21					18	2	1	3	0		
								Year 1		0.03	0.06	0.09									7		13	20	2	2	3	0	
								Year 2		0.11	0.22	0.33									26		52	79	7	6	13	1	
								Year 3		0.33	0.45	0.78									79		107	186	17	15	30	2	
								Year 6		0.6	0.6	1.20									143		143	286	26	23	46	3	
								Year 9		0.8	0.8	1.50									179		179	357	32	29	57	4	
								Year 12		1.5	1.5	3.00									357		357	714	64	57	114	7	
<b>Coffee</b>	20	10	18		2.5	2.5	1600	Planting	0.3									480					480	96	48	86			
								Year 1		0.06	0.06	0.11									88		88	176	35	18	32		
								Year 2etc		0.11	0.11	0.22									176		176	352	70	35	63		
<b>Cocoa</b>	19	8	16	4	3	3	1111	Planting	0.3									333					333	63	27	53	13		
								Year 1		0.06	0.06	0.11									61		61	122	23	10	20	5	
								Year 2		0.11	0.11	0.22									122		122	244	46	20	39	10	
								Year 3etc		0.17	0.17	0.33									183		183	367	70	29	59	15	
<b>Coconut(y)</b>	9	10	13		8	8	156	Planting	0.5									78					78	7	8	10			
								Year 1		0.7	0.7	1.4									109		109	219	20	22	28		
								Year 2		0.7	0.7	1.4									109		109	219	20	22	28		
								Year 3		0.9	0.9	1.8									141		141	281	25	28	37		
								Year 4		1.1	1.1	2.2									172		172	344	31	34	45		
								Year 5etc		1.3	1.3	2.6									203		203	406	37	41	53		
<b>Coconut(m)</b>	10	6	31		8	8	156	(Bearing)		2	2	4								313		313	625	63	38	194			
<b>Mango</b>	24	12	10		10	12	83	Planting	0.3									25					25	6	3	3			
								Year 1		0.3	0.6	0.9									25		50	75	18	9	8		
								Year 2		0.9	1.2	2.1									75		100	175	42	21	18		
								Year 3		1.5	1.8	3.3									125		150	275	66	33	28		
	9	15	13					Year 4		2.1	2.1	4.2									175		175	350	32	53	46		
<b>Papaya</b>	9	19	24		3	3	1111	Planting	0.2									222					200	18	38	48			
								Year 1etc		0.2	0.2	0.2	0.2	0.8							222	222	222	222	889	80	169	213	
<b>PassionFruit</b>	11	12	15	5	2	5	1000	Planting	0.3									300					300	33	36	45	15		
	15	16	20					Year 1		0.2	0.2	0.4	0.8								200	200		400	800	120	128	160	
								Year 2		0.5	0.6	1.1										500	600	1100	165	176	220		
				High!				Year 3		0.7	0.9	1.6											700	900	1600	240	256	320	
								Year 4etc		1	1.1	2.1											1000	1100	2100	315	336	420	
<b>Pepper (1)</b>	14	11	14	2	2.5	2.5	1600	Planting	0.08									120					120	17	13	17	2		
								Year 1		0.03	0.03	0.03	0.08									40	40	40	120	17	13	17	2
								Year 2		0.05	0.08	0.13										80	80	120	200	28	22	28	4
								Year 3-5		0.10	0.12	0.22											160	192	352	49	39	49	7
								Year 6-15		0.20	0.20	0.40											320	320	640	90	70	90	13
<b>Pineapple</b>	15	5	33		0.5	2	10000			0.03	0.03	0.03	0.03	0.10</															

monitoring. The banning of cultivation above water intake points is essential because of the high potential use of pesticides in the cultivated areas, and particularly because of possibilities for accidental spillage which could be catastrophic.

The major pesticide use for banana cultivation is on nematicides, with alternate use of carbamates and organophosphorus compounds being recommended. Actual useage of these chemicals is only 60% of the recommended rates (Harris, 1995), with the consequence that blow-downs and other crop losses are much higher than they should be. Nematicides tend to be applied only in the immediate vicinity of the banana mat, leaving most of the area untreated. However, nematicides are of environmental concern because of the damage they also cause to other soil fauna, notably earthworms. Under-use of nematicides thus would have a beneficial effect on earthworm populations, and thence soil infiltration rates. Nematode control by biological agents (e.g. nematode trapping fungi) is a possibility for future research activity. Another is the use of break crops (e.g. pineapples, Brachiaria grass as is used in the French islands, or arrowroot in St. Vincent) for a period of one year or more. After the break crop nematicides do not have to be applied for another two years. However, application of this method to St. Lucia would be limited to the flatter lands only.

Hot spots in pesticide contamination are likely to occur around banana sheds where fungicide is used. Contamination of the surrounding area by this and other chemicals would appear probable. In many cases discarded chemical containers litter the vicinity of these sheds.

WIBDECO and the SLBGA recognise the problems that pesticides have caused and the greater threat that they may pose in the future. The 'Certified Growers Programme' has a check-list of criteria, including 5 essential criteria, each of which has to be met for certification. Two of these comprise the use of chemicals, and the disposal of any waste. Charcoal pits have to be installed near the respective packing sheds for the disposal of any waste chemical, notably fungicide solution used for soaking the fruit prior to packing. Diothene sheeting and other non-biodegradeable waste also has to be disposed of carefully: WIBDECO advocate on-farm burning of these waste materials by the farmer himself.

WIBDECO have recently introduced a draft 'Code of Practice for Banana Producers in the Windward Islands' which covers all areas (including banana plantation development, soil management, field practices, pesticide management, sigatoka control, packing houses, waste management, labour practices, worker health/ training, and integrated crop management policy review). Accompanying this document is a more specific draft document: 'Guidelines for Pesticides Use and Waste Management for Banana Producers in the Windward Islands'. It is likely that with certification now proceeding rapidly (60 farms per week being vetted, and approximately 30 farms certified), and with continued close interest from the supermarket sector, paying premium prices for quality fruit, that the certified farmers will closely be following recommended practices on use of pesticides and disposal of waste.

Farmers not certified will increasingly comprise the hillside farmers on the most marginal land. These farmers will face increasing pressure to diversify out of bananas. However, in mixing their bananas with other crops they will be forced to adopt hand-spraying for leafspot control, rather than the cheaper aerial spraying. A further reason for hand spraying of bananas when mixed with some crops (notably nutmegs) is the sensitivity of the alternative crop to leafspot spray. Although this does not apply for the common alternative treecrops grown in St. Lucia, it will have to be watched in any introduced crop.

In the long term research on biological control mechanisms is likely to pay dividends. Two areas already mentioned are:

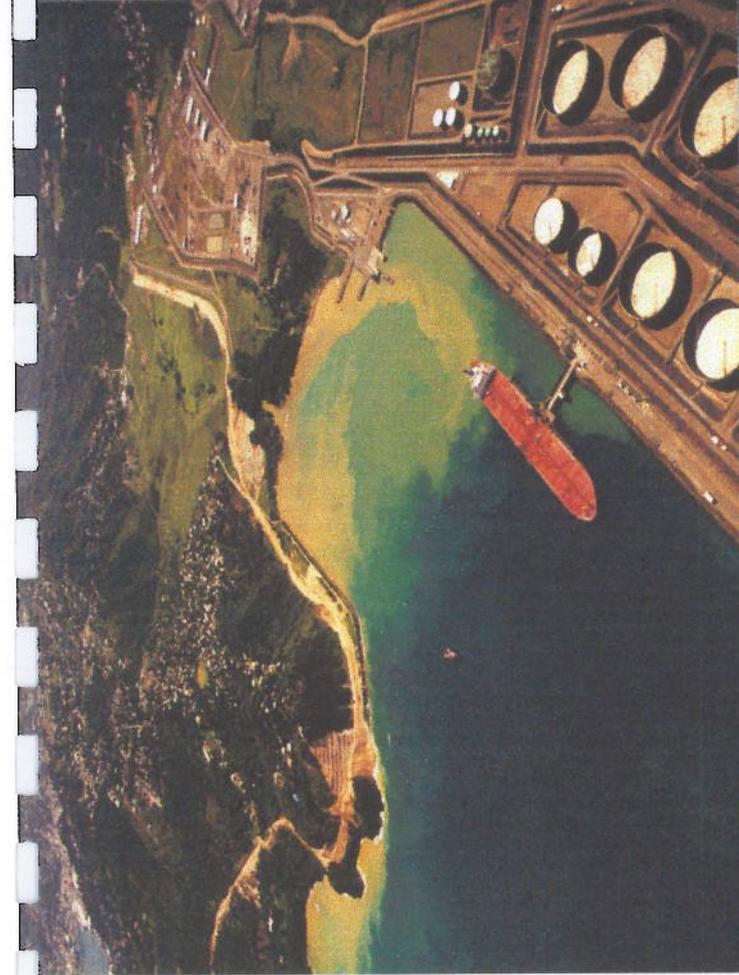
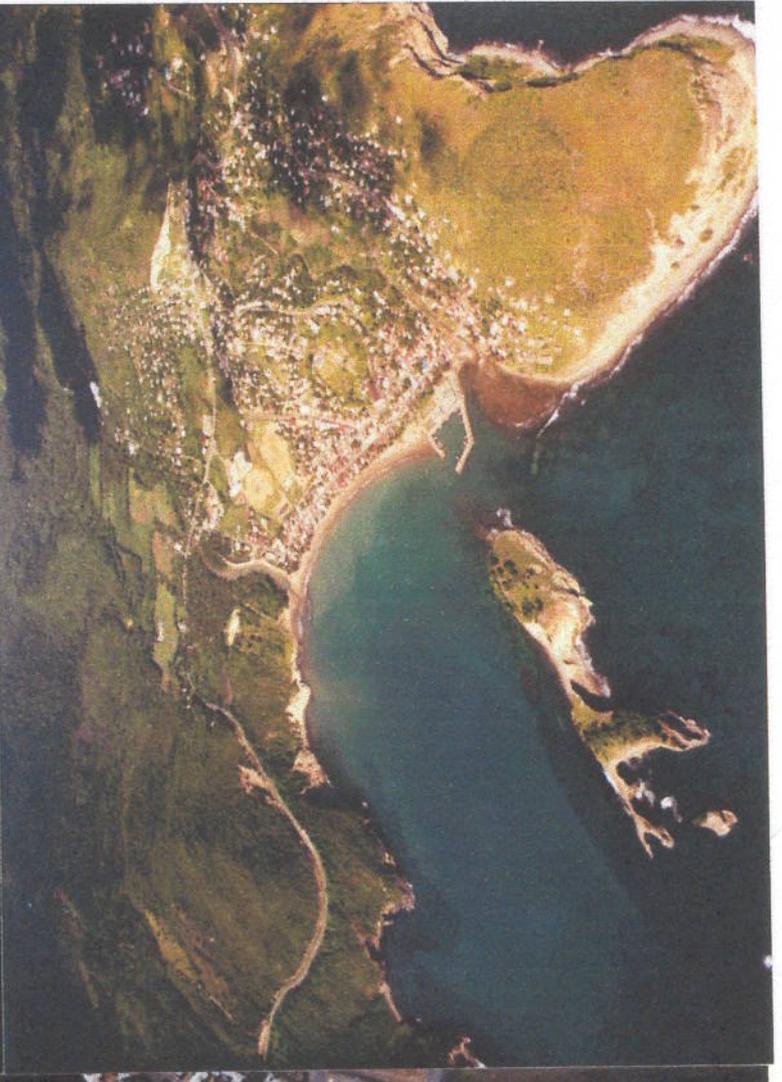
- nematode trapping fungi;
- shade-tolerant cover crops with nematode-deterring root exudates.

Research on biological control would be beyond the immediate scope of local resources, but would be the ideal subject for University research, and/or for research funded by external projects.

#### FIG. 1.4 PROBLEMS IN THE LOWER WATERSHEDS AND COASTAL ZONES.

- T left** NW Cul de Sac. Note major area used for oil terminal; remaining floodplain zoned for industrial/commercial expansion; floodplain too narrowly confined by road project and embankment; straightening and canalisation of lower river prevents silt deposition in lower floodplain worsening silt deposition in sea; road project currently tipping spoil into sea; silt stirred up by shipping; Ciceron rubbish dump encroaching on wetland forest; bad erosion of the beach (12 people are currently mining beach sand for construction; expansion of Castries into the surrounding areas. (SFAP photo C6 24)
- T right** Cul de Sac: extreme NW. A complex of environmental problems seen here: the new road project producing massive siltation; silt accumulation in bay; severe beach erosion due to sand mining; breaching of sand bar across river mouth leading to more silt in sea and drainage of wetland forest; problems of town rubbish tip – further degradation of wetland forest; unplanned periurban expansion & encroachment; smallholder cultivation exposing bare soil in recently settled areas. (SFAP photo 8 – 28)
- B left** NW Cul de Sac: Area zoned for industrial & commercial expansion but problems are evident: river straightened & canalised and cut off from floodplain; flood – plain v. confined by new road project & oposite embankment – also by bridge & W. coast road; massive encroachment by construction onto good agric. land; flood – risk to buildings is evident. Further problem is that unconsolidated alluvial materials require very expensive foundations and/or are not suitable for multi – storey building. (SFAP photo 8 – 25).
- B right** Dennery. Mouth of river and town. Note shallow soil areas on convex ridges which can be zoned for building if not too steep – spoil from rivers can be used to increase soil depth in homegardens in such areas. Only moderate siltation in Dennery Bay: natural formation of sand bar at mouth of river leading to silt being trapped in lowermost part of river; cultivation to annual crops in alluvial floodplain beyond main road – use of dry season river water for irrigation needs regulation; Dennery Town would benefit from beautification and tree – planting scheme. (SFAP photo C3 – 19).

File: VSAPINOT.wk3



#### **1.4.4 Soil Surface Exposure and Decreasing Soil Infiltration**

This is a major contributory factor to the soil erosion problem, and was addressed directly in the soil conservation and erosion control trials which are reported in Annex 7. Maintenance of an even trash cover, establishment of trash lines, tolerance of some weed cover, promotion of earthworm activity, and improved soil drainage will all lead to improved soil structure and increased infiltration.

#### **1.4.5 Spoil disposal**

Landslide materials, accumulated silt on roads and in infilled river-beds has to be disposed of, and in most cases this has been done on the nearest relatively flat land, with relatively little thought of how the spoil material may be used to maximum effect. Cases of inappropriate disposal of spoil material were seen in the Phase 1 works (see environmental section in Annex 1, and summary and conclusions given in Section 2 below.)

Two major uses of spoil material would be for building sand or aggregate, and as rootable material for plants.

Building sand and stone for aggregate is currently extracted from many river beds, mainly on an ad-hoc basis. With the current high rates of soil erosion, much material is tending to accumulate in river beds, and in certain sections much of this is of the correct size fraction for use as building sand, although lenses of silt or finer material may also be present. Extraction of such material, if properly regulated, may actually be beneficial in allowing capacity of the river channel to be maintained. Care has to be exercised in moving excavators and loaders into and out of the river bed, so that banks with their stabilising vegetation are not damaged. Rapid rates of extraction may have an adverse effect on the balance of sand accumulation and removals on beaches, so this needs to be monitored carefully.

In most major watersheds, areas adjacent to the lower alluvial floodplains have large proportions of shallow soils, and these would benefit considerably by having an increased depth of rootable material. Finer-textured materials deposited in the lowest sections of the river bed are also of greatest value as rootable materials, having higher available water holding capacities (AWCs) and CECs than the more sandy materials deposited in higher sections. Thus spoil should be targeted for these shallow soil areas, particularly those being earmarked for homegardens. The outer area of Dennerly town is a clear example of this (see Figure 1.4, bottom right-hand photo). Soil profiles here are commonly only 20-30cm deep, and vegetation thus dries out very quickly during dry periods. A further 20-30cm of rootable material would benefit such areas enormously. Ideally old topsoil material should be mixed with the new spoil material, and additional fertiliser nutrients applied in the first year.

#### **1.4.6 Soil Waterlogging**

High watertables in the alluvial floodplain areas represent the greatest limitation to high banana yields in these areas for most years: flooding will represent a catastrophic limitation in perhaps 1 year in 10. The drainage problem is aggravated by infilling of the drains by silt brought down by frequent floods. Maintenance of water tables (WTs) below 90cm are required for bananas, particularly in drier areas, but many areas show WTs within 50cm. All of the drainage installed is by open, usually steep-sided drains.

For the lowermost courses of the major rivers, elevation differences between the ground surface and the river bed are too low for drains to be installed to the optimum depth - say 1.0-1.4m. Drain depth tends to decrease in the marginal banana land to the limit where drainability is too problematic, and hydromorphic grasses or wetland forest become the dominant vegetation types.

Construction of open drains in the very poor structured alluvial silt materials also presents problems in that the sides of the drains are susceptible to local scouring and slumping during periods of heavy rainfall. Possibilities of stabilisation of drain sides with trash lines say placing the lines within 40cm of the drain bottoms or with cover crops need to be investigated. Deepening of the main drainage lines in the area to the North of Bexon Office has recently been undertaken, with some depths exceeding 3m. Bad slumping along the sides of these drains was noticed here.

## 1.5 Dry Season Water Resources

### 1.5.1 Resource Availability

The rainfall characteristics of the island are significantly skewed with on average 60% of the annual rainfall occurring in the period August to November inclusive (33% of the year). The period January to May inclusive has relatively low rainfall with no month with a major consistently low expectation of rainfall, although February to April is generally the driest.

The water resources of the island are predominantly surface based with no natural surface storage (lakes). Groundwater resources are limited and located primarily in the lower alluvial regions in the Cul de Sac, Roseau and other major river basins. These groundwater resources are reportedly very small and are not considered to be of any major use. Some small scale domestic water supply systems might be sustainable.

The dry season water resources of the Island are therefore the baseflows of the river system together with any run-off which results from rainfall during the dry season. Resource estimates are presented in Annex 2, Appendix A, Table A.14 and also in the Main Report, Chapter 2.

The base flows in the watersheds depends on several factors including:

- a) catchment area;
- b) soil types and their depth and waterholding capacities;
- c) land use and vegetation cover both in terms of reducing soil surface evaporation and the influencing rainfall-runoff characteristics;
- d) abstractions from the river system by human intervention (irrigation etc.).

Agricultural development can impact on base flows by adversely modifying 'c)' and 'd)' above.

In some areas, natural springs exist derived from interflow from the upslope soil masses. Some of these springs form the sources for water supply schemes e.g. Soufriere. Spring waters can be high in sulphur and other minerals whilst during the wet season most springs become larger and more plentiful (or evident).

Since 1995, the completion of the Roseau Dam has improved the water availability in the dry season in the northern part of the Island. The reservoir has a reported storage capacity of 2.6 Mm<sup>3</sup> (700 million gallons) when full. The catchment area of the reservoir is about 830 ha. With an annual rainfall in the catchment of about 3000mm might yield an average runoff volume of about 25 Mm<sup>3</sup> (see Annex 2, Appendix A, Table A.16). Evaporation losses from the reservoir could be of the order of about 0.5 Mm<sup>3</sup> each year indicating that the replenishment of the annual storage volume is not a major issue. The problem possibly lies in the storage capacity of the reservoir in the context of soil erosion and sediment deposition. The catchment area of the reservoir comprises steep slopes in an area prone to --- high intensity rainfall, hence an area susceptible to landslides, debris flows and general soil erosion.

The large disparity between storage volume and annual runoff increases the danger of sedimentation. The flushing of sediment out of a reservoir is always difficult and the risk is that the spillway and

outlets pass water with low sediment concentrations in relation to inflows resulting in encouraging the accumulation of solids in the reservoir storage area.

Dry season flows in the lower reaches of the rivers draining the watersheds of St. Lucia can range from flows of 100 l/s to 200 l/s for the larger watersheds in the central part of the island to zero in the smaller watersheds. The inter annual variations in low flows can be large in percentage terms being a function of the preceding wet season rainfall volumes and the intermittent rainfalls which occur during the dry season.

The baseflows naturally vary with passage down the river system. In the upper catchments, where even though the baseflow generation is high in terms of l/s/km<sup>2</sup> of catchment, the volume flow is small and this impacts against the needs of WASA in terms of diversions.

### 1.5.2 Resource Utilisation

Of the 37 identified 'watersheds' on the island, several provide the basis of water supplies for domestic and industrial purposes, 16 contain water intakes managed by WASA (Water and Sewerage Authority). The intakes are generally located in the upper parts of the watersheds to ensure a good water quality. The intake structures divert water by gravity to basic water treatment plants where chlorination is the main activity. Details are presented in Annex 2 Section A.2.

Although the diversions are generally small, normally less than 10 l/s, there has been a continued need for WASA to resite some of their intakes higher up the catchments to ensure the quality of supply deemed necessary. The main reason for the resiting is the encroachment of agriculture, normally banana cultivation on progressively higher and generally steeper ground.

As the intakes are moved higher up the catchments, the following problems become more acute:

- the base flow in the river channel is reduced;
- the site is generally in a steeper river section with higher risk of debris movement putting the structure itself at risk of damage;
- the site becomes more inaccessible probably reducing the level of structure integrity checking, river flow measurement and water quality monitoring which should be undertaken;
- the length of the delivery pipeline is increased probably increasing the risk of damage to the pipework since the alignment is generally down the river banks/ beds.

Only about 50% of the population have direct water supplies to their households with almost 30% of the population having to rely on public standpipes although there has been a substantial improvement in the situation in recent years. In 1970, only 12% of the population had a supply direct to their dwelling. Increasing the proportion of household supplies, and with a growing number of in-house showers, washing machines and other water consuming household devices, water demand will increase putting a greater strain on the water resources of the Island.

In total, water volumes supplied by WASA are currently of the order of 12 Mm<sup>3</sup> to 14 Mm<sup>3</sup> per year. This includes system losses.

In addition to diversions for water supply, there are abstractions for irrigation schemes. As far as is known, all abstractions for irrigation schemes are downstream of WASA intake sites. The majority of irrigation schemes are based on sprinkler systems and abstractions are not believed to be high. Most irrigation units are less than 2 ha although some larger areas exist, 50 ha in the Fond River catchment. In total it is estimated that there is just over 1,000 ha being irrigated, although other reports indicate 2,500 ha. (Rodriguez), although this figure would appear high. Data is still be gathered on the existing

irrigation extent in St. Lucia (AESD for a forthcoming FAO Irrigation Study). Current abstraction levels could thus be of the order of 1,000 l/s in the dry season.

Abstraction for irrigation supplies does not require a license nor are water charges applied. This situation should not be allowed to continue, especially in the light of the limited surface water resources which are believed to exist on the dry season.

The inter-annual variation in resource availabilities has not yet reached critical levels. In dry years, supply shortages exist and rotation is put in place. However, the situation is currently managed by WASA. In the future with increasing demands due to:

- the increased populations and hence increased population demands;
- the increase in the percentage of households with direct connections;
- the improvement in household living standards (more washing machines etc.);
- the increases in tourism and their requirements;
- the increase in adoption of irrigation owing to increasing farmer affluence; the need for crop diversification and improvement of quality of produce;
- the increasing home garden irrigation demand.

- there is a need for much improved water resources management on the Island.

## **1.6 Floods**

### **1.6.1 Cause of Floods**

Flooding in St. Lucia is almost totally related to short duration high intensity rainfalls. If preceded by a period of at least average rainfall, such antecedent moisture conditions can aggravate the flooding situation. In some circumstances and locations, the flooding can be caused by inadequate drainage channel capacities or more commonly inadequate cross drainage capacities.

A full description of the flooding conditions as related to St. Lucia is presented in Annex 3 and the associated appendices.

Little information exists to date on the rainfall intensities which have been experienced on the Island. Analyses during the course of this project have demonstrated the importance of high rainfall intensities over a period of about 4 to 6 hours duration in terms of flood flow generation and landslide propensity. Intensities peaking in excess of 70 mm/hr have been recorded both during TSD and the event of October 1996 {See Annex 2, Appendix B and C for more details}. Rainfall intensities cannot be readily related to daily rainfall totals, the basis for the majority of the climatological data base within AESD.

Apart from the lack of short duration rainfall information across the Island, little information exists with regard to flood discharges. Flood events in the past have often not been recorded because the equipment did not operate or since it was damaged or overtopped. No crest level gauges have been in place to record peak water levels. There has been a major focus on directing the climatological (esp. rainfall) and hydrometric records on agronomic/ agricultural information needs rather than flood management information. Few peak flood discharge current meterings have been undertaken.

### **1.6.2 Impact of Floods**

The flood flows experienced in a normal flood season do not create many problems. Some bananas and other agricultural production can be lost but this can be generally associated with the cultivation

being undertaken within the floodplain and often very close to the river bank. Some flooding of urban areas takes place on a regular basis and is associated with under-capacity cross drainage structures or badly located dwellings.

Severe flooding resulted from the rainfall and storm events of September 1994 (TSD) and October 1996 affecting both agriculture and the rural and urban infrastructure (see Annex 2, Appendix B and C). These were floods of a relatively high return period depending on the river catchment in question. For the majority of the Island the event of TSD was the worse, although for some catchments on the west coast, the flood flows of 1996 were considered to be more severe. This could be due to the changes in river morphology brought about by TSD.

Flooding of agricultural land in the lower regions of the main river valleys of Cul de Sac, Roseau, Mabouya, Troumasse and Fond were flooded to depths of between 0.5 and 1.5m during both TSD(1994) and October 1996 although the absolute values naturally vary from place to place in the flood plains. In many instances, the flood depth is not the problem for the bananas but the velocity of flow and the forces on the stems of the plants. Velocities of flow in the main channels of these rivers was estimated to be between 2 m/s and 2.5 m/s during the main flood period of October 26th with flow velocities on the flood plains probably of the region of 0.5m/s to 1 m/s. The interface between these two flow regimes will be near the river banks where higher water pressures will be brought to bear. In addition to the problems caused by the physical flow of the water is the impact of floating debris on the standing bananas. Build up of debris on the stems increase the flow resistance and hence the overturning force aggravating the situation. Swathes of banana plants are flattened as was evidenced in all the above valleys during both flood events.

During severe flood events, many of the cross drainage structures are unable to pass the full stream discharge without overtopping and/or by-passing. The active flood plain is larger, generally extending across the full alluvial plain of the lower catchments resulting in considerable damage to banana plantations and other flood plain agriculture.

The high floods which pass down the floodplain will tend to deposit the sediment loads derived from erosion of the upper catchments. The lower velocities of flow and shallower depths of flow will tend to encourage the deposition of sediment on the flood plain areas. The sediment also gets deposited in the open drainage system of the plantations on the flood plain and thereby reduces the quantity of sediment entering the marine environment. It is believed there is a net positive build up of sediment on the flood plains during severe flood events.

The response to the floods of TSD of straightening the meandering routes of the main rivers in the larger alluvial plains through loop cutting will reduce the amount of flood plain flow and hence tend to increase the quantity of upper catchment sediment which passes out to sea. The increased channel slopes resulting from meander loop cutting will increase flow velocities increasing the sediment carrying capacity of the river hence accommodating the probably increased sediment loads. The destabilisation of the natural river morphology and the creation of unprotected virgin new river embankments will also tend to increase the amount of river channel erosion which takes place. The effects of the 'new channel system' is considered to an indirect impact of the severe floods.

## **1.7 Water Qualities**

### **1.7.1 Dry Season**

Sources of contamination of the surface water system during the dry season are both agricultural and domestic. Since there is often rain showers even in the dry season, agricultural waste is still liable to

enter the natural drainage network. Field visits have indicated that domestic effluents can be as problematic and these include:

- washing of clothes in the river system;
- people washing themselves in the rivers;
- washing of motor vehicles;
- seepage from water closets and septic tanks;
- contaminants from domestic refuse dumped near/ in the river;
- contaminants from small industries, garages etc.;
- debris from banana packing stations, spillage of agro-chemicals being a risk.

During the dry season dilution ratios are small and hence any contamination can be problematic.

Most of the above listed contamination problems are found normally in the lower reaches of the river system. The impacts of the quality of the water impacts on both the users as listed above and on the aquatic ecology system.

Since the dry season flows are generally small and pollution of the river system is not normally very serious, the adverse impact on the marine environment is slight. Problems are more likely to be found in localised pools near centres of population where water movement is small and hence potential contamination is high.

In the upper catchments where the majority of the WASA intakes are located, pollution from domestic sources is rare and the major problem is seen to be that derived from agriculture (see Annex 2, Appendix A, Section A.5). WASA are sometimes compelled to move their intakes further upstream when a potential pollution source is identified. In these catchments more intensive monitoring of activities is required.

Water quality monitoring is undertaken on many of the waters delivered by the intakes, testing including turbidity measurements and coliform counts. Water quality testing for agrochemicals is more complex and is not undertaken as a matter of course. During the recently completed River Surveillance Project undertaken at CEHI through ODA funding, testing for agro-chemicals was undertaken for some of the WASA intake sites; however, no significantly high levels of contaminants were found.

Another finding of the River Surveillance Project was the low biotic scores of the majority of the rivers in St. Lucia. This low level of aquatic diversity and aquatic life populations was considered to be due to the flow characteristics of the river system with low and often uncertain dry season flows and high and very 'flashy' flood season flows, the latter tending to flush the system of small creatures whilst the former highlights a fragile life support system.

### 1.7.2 Flood Season

During the flood season, the water quality problems change. Dilution ratios are generally high in relation to such inputs as seepage from water closets and clothes washing. However, the higher rates of runoff washes both soil particles and large amounts of waste debris into the river system. Apart from the high sediment loads, the other common debris being transported in the river system are:

- coconuts;
- plastic bottles and containers (sometimes ex agro-chemical bottles);
- glass bottles (normally rum);
- plastic bags, particularly the blue plastic sheeting used in banana cultivation.

The natural ecosystem related to the aquatic and marine systems will be used to the entry of some sediment, organic matter and coconuts. However, the volumes of sediment transmitted to the marine

environment has increased in recent years although the absence of any sediment measurement programmes for the river system means this cannot be confirmed. Experience, and research elsewhere indicates that with higher rainfall intensities and increases in land area devoted to agriculture, without good soil conservation practices, leads to high rates of soil removal from catchments. Some of this eroded soil enters the natural drainage system to pass out into the marine environment.

Research studies by others on the west coast has indicated an increase in the deposition of soil sediments and 'blue plastic bags' on the important coral beds. However, this research and monitoring work has only been undertaken over the last few years which have been affected by the impact of TSD and the flood events of October 26th 1996.

In relation to the upper catchments and the WASA intakes, the wet season problems are dominated by high turbidity levels and the blockage of the intakes. The high turbidities can be very problematic leading to a need to sometimes close down the supply system. Despite having filters at the intakes, sediment still enters the pipeline system causing blockages and hence closures. High turbidities in the water delivered to customers is unpopular and results in many complaints which are also received when closures are necessary. Some of these issues could be addressed by better intake arrangements and improved treatment facilities.

## **1.8 Coastal Marine Environment**

### **1.8.1 Siltation**

Siltation in the near coastal zone was illustrated in a spectacular way during the Small Format Air Photography undertaken by the consultants on 16 Oct 97 (see Photos in Fig 1.4 and on report cover). Apart from any damage to coral and other marine life, the plumes of silt would have been very unpleasant to tourists in nearby resort areas - in this case Marigot Bay (between Cul de Sac and Roseau Valleys) and La Toc Bay (to the North of Cul de Sac). As 16th October followed several days of relatively dry weather, the problem is even more alarming. In addition to silt being carried down the Cul de Sac River, the problem as observed in Fig 1.4 would have been aggravated by two other factors: the recent arrival in the bay of the large oil tanker and its associated tugboats which clearly had churned up much bottom silt previously deposited in the bay; and also the new road project which has bulldozed enormous quantities of spoil material into the sea. Both of these types of activities clearly need to be monitored more closely by the NEC.

The Consultants on many occasions during the last 12 months have experienced turbid waters when swimming in three main areas: Coubaril Point (1km to the N of Cul de Sac River Mouth), Vigie Beach, and Choc Bay. In an island where the main industry is tourism, and where tourists are attracted mainly by the beaches and spectacular coastal scenery, this is of major concern. Tourism, as essentially a fashion industry, is extremely sensitive to adverse publicity, and thus turbidity in these three tourist areas must be afforded the greatest attention.

In other areas the marine siltation problem appears much less severe, with the sea to the north of Choc Bay being visibly very much clearer at all times. Fig 1.5 shows the location of the tourist hotels (the size of the circles being approximately in proportion to the capacity of the hotel), and the main coral reef areas in relation to the main sources of siltation (the size of the triangle being proportional to the estimated annual volume of silt reaching the sea). With a predominant northerly current from the North, the main problem areas can be seen to be from Choc River to just south of Roseau Bay.

Recent studies in St. Lucia on the impacts of siltation on coral reefs have included the very recent paper by Sladek Nowlis, Roberts, Smith and Siirila, covering damage caused in the period following

Tropical Storm Debbie. Studies covered siltation effects from three rivers: the Soufriere (Watershed 25), and the much smaller Anse Galet and Anse Mamin Rivers (small parts of Watersheds 28 and 26 respectively). The authors covered sampling points from 250m to 1250m from the mouths of these rivers. They found that TSD damage was considerable, with coral mortality exceeding 50% at the most heavily impacted site. Coral mortality was also correlated with depth of fine sediments in nearby areas.

The three rivers covered in the above study are notably less problematic in terms of volumes of silt likely to be washed into the sea during flood periods, which make these findings even more alarming. Although precise quantitative data is lacking, the Consultants noted that at times of high rainfall and flash flooding during the periods Sept-Nov 96 and June-July 97, that the worst rivers in terms of silt deposition were clearly the Cul de Sac, Roseau and Fond D'Or, but in terms of impact on beaches frequented by bathers, the Choc was the most problematic.

### 1.8.2 Solid Wastes

Solid wastes in the coastal marine environment include domestic rubbish, agricultural biodegradable waste (coconuts, banana trash, forest litter, branches and logs, dead animals etc.), and non-biodegradable, mainly plastic waste (diothene sleeves, pesticide bottles). Much of this rubbish is carried to the sea every year by the 37 main rivers in the country. A large quantity becomes washed up on the beaches where it becomes unpleasant to bathers and local residents. Much plastic rubbish, particularly diothene tubing, becomes entrapped in corals and marine growth, where it is reported to badly affect the habitat of marine animals as well as the corals themselves.

Collection of domestic rubbish is let to contractors on price-sensitive contracts. Quality of collection is said to be poor in many areas, with much rubbish left uncollected for various reasons. On collection days rubbish is left by the side of the road in loose plastic bags where it is picked over by domestic animals, and at rainy times may be washed into the nearest streams.

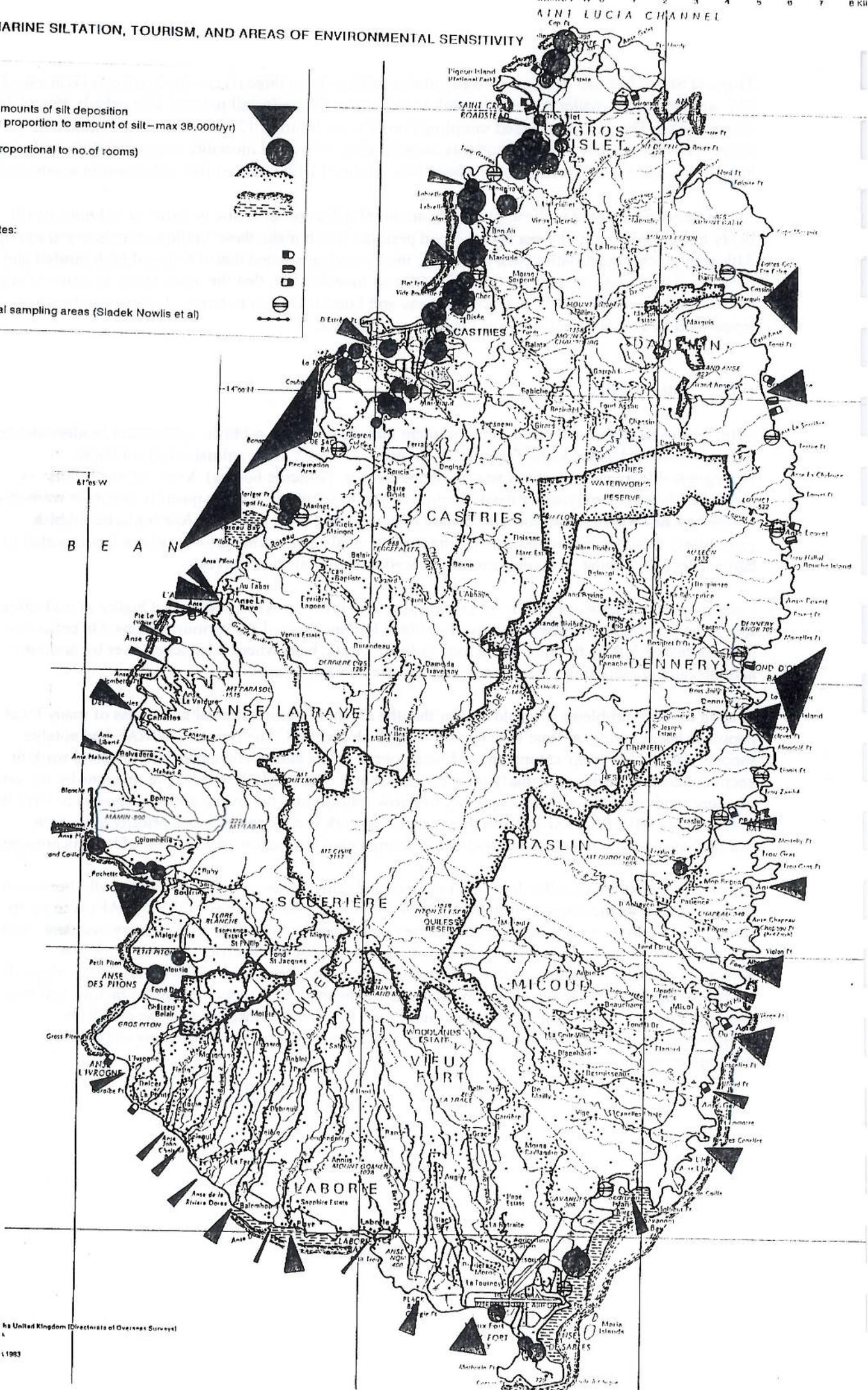
In spite of these problems it would appear that the extent of environmental awareness of many local people is encouraging, at least with respect to rubbish disposal. The Dennery WMAF had notable success with its 'clean up' campaign, and local tourist hotels and public authorities do good work in keeping beaches clean, particularly after flood or storm events. MC&W have put up signs by the side of many road bridges warning people not to throw rubbish into the rivers, and this appears to have had some effect. WIBDECO/SLBGA in their extension work is covering this as a priority area, with disposal of plastic containers and diothene sleeving being criteria for certification of banana growers.

Keeping streams free of fallen logs and branches and other organic waste has traditionally been seen by local people as the responsibility of MC&W, but one of the functions of the WMAFs is to try to change this outlook, with the people themselves being responsible for keeping waterways clear. With the fall in the price of coconuts associated with the closing of the Soufriere factory (now just reopened) enormous quantities of uncollected coconuts have been washed down the rivers, where they contribute both to river scouring and to blockage of channels. The reopening of the factory will help this problem: the installation of trash lines in banana fields would also help, as the nuts from interplanted coconuts would get trapped on the lines rather than rolling downslope and into the drainage channels.

FIGURE 1.5: MARINE SILTATION, TOURISM, AND AREAS OF ENVIRONMENTAL SENSITIVITY

**LEGEND**

- Sites & annual amounts of silt deposition  
(size of triangle proportional to amount of silt—max 38,000t/yr)
- Tourist Hotels  
(size of circle proportional to no. of rooms)
- Forest Reserves
- Reefs
- Seagrass Beds
- Turtle Nesting Sites:  
Hawksbill  
Leatherback  
Green
- Mangrove areas
- Post-TSD coastal sampling areas (Sladek Nowlis et al)



### 1.8.3 Liquid Wastes

Liquid wastes comprise domestic and ship sewerage, drainage waters from urban areas, and effluents from factories and agricultural processing facilities. Problems imposed by the wastes may be due to any or all of the following:

- harmful microorganisms in the effluents themselves (faecal coliforms, pathogenic viruses, etc.);
- subsequent decomposition of organic materials within the effluent, making the material and surrounding water anaerobic;
- harmful compounds or elements in the effluent (e.g. pesticide residues, heavy metals);
- Oily materials forming a film on the water surfaces, and inhibiting aeration.

In St. Lucia all of these mechanisms can be seen to be operating. With very little tidal difference (c 0.6m), and with little wave action and only weak currents on the Leeward (Caribbean) side of the island, these problems are aggravated. Both Castries Harbour and the marina at Gros Islet are almost completely enclosed and suffer badly from eutrophication due to influx of organic materials and mineral nutrients. Both areas now have strict requirements on non-dumping of sewerage and solid materials in the sea, but both areas show problems due to previous accumulation and to current influx of materials from the land. The high population density in both of their watersheds further aggravate the problems. Solution to these problems lies in firstly ensuring that all houses have flush toilets emptying into septic tanks and secondly that any domestic and agricultural organic residues remain on the land and are not washed into streams. River reserves and trash lines would both help in this respect.

Marigot Bay, which is more open than Castries Harbour but more enclosed than other bays along the Leeward Coast, has incipient problems of eutrophication, associated with accumulation of silt materials and algal blooms. Floating oily deposits and organic residues were observed by the consultants during several visits.

Monitoring of river water or sea water for faecal coliforms and other harmful organisms is not routinely carried out. CEHI have facilities for these analyses but do not have routine monitoring functions. Sampling undertaken on previous projects have shown that all coastal communities have 'sewage-driven water quality problems along their shores with typical bacterial counts often being in excess of international health standards. One coastal community studied in Summer, 1994, had faecal coliform counts in excess of 8million per 100ml in the river and 80,000 in the marine water.'

St. Lucia has been moderately successful in attracting light industry, most of which does not show directly major problems of water pollution. The one big exception to this, observed by the consultants, is the rum distillery in the Lower Roseau Valley which in June/July 1997 was causing major problems to the Lower Roseau River, colouring the water black and giving very strong smells of anaerobic decay. A neighbouring farmer complained bitterly that he could not use river water for supplementary irrigation, and his problem was aggravated by the river straightening associated with the Phase 1 works.

### 1.9 Terrestrial Fauna and Flora

Small Caribbean Islands, in spite of showing a wide spectrum of agro-ecological zones with vastly different rainfall regimes, do not show very high bio-diversities per square km in comparison to continental areas. Thus numbers of bird, animal and plant species would be much less, for example, than a similar climosequence across the Orinoco watershed in Venezuela. Ecological buffering is also much less in these islands than in continental areas. Thus an introduced insect pest, for example, is likely to be much more of a problem in St. Lucia than in Continental areas because the number and variety of predators in St. Lucia would be much less.

However, the islands are noted for their endemic species, and the numbers of endemics per square km would be higher than that for continental areas. In the case of birds St. Lucia has 5 island endemics, of which three are endangered (St. Lucia Parrot, St. Lucia wren and Semper's warbler). In addition there are 10 regional endemics, of which three again are endangered (the forest thrush, the rufous night jar and the white breasted thrasher).

Habitats for these endangered species include the central rainforest areas (the St. Lucia parrot) and the dry seasonal woodland in the north-eastern parts of the island (the thrasher and the wren). The mangrove areas are also under threat, with less than 200 acres remaining. Current conservation programmes have been fairly effective in raising the level of awareness for the conservation of both endangered species and their habitats, and several areas have been targeted for conservation programmes if not brought directly into nature reserves.

Current dangers at the moment centre on further expansion of the road network, both agricultural feeder roads which will probably be targeted at inland areas (and pose a further threat to the remaining central rainforest areas) and the proposed Chinese-financed highway, which will cut through habitats of the endangered thrasher and the wren.

#### **1.10 Health Issues:**

Health issues relating to watershed management include water-spread disease vectors: mosquitoes, sandflies and snails.

St. Lucia is free of malaria and habitats for the malarial mosquito (water in generally rural areas in bright sunlight) are generally less common than that for other mosquitos. However, vectors for dengue fever and yellow fever are much more common, these mosquitoes breeding in relatively clean water (e.g. water in discarded tyres, open coconuts or in the collection bowls under flower pots). The relatively low permeabilities of St. Lucian soils (particularly the montmorillonite soils in the drier areas) mean that in the wet seasons even upland areas may harbour mosquito breeding grounds, and these areas commonly surround the major population centres.

Sandflies, which breed in very wet soil or shallow mud are likewise common in these coastal areas. They tend to be attracted by individuals with high hormone content, and may induce very unpleasant allergic reactions in many individuals. They may spread a number of fevers, although in St. Lucia these are apparently somewhat uncommon.

Bilharzia has also been present in St. Lucia and the Consultants were warned by local people in one particular area that stagnant water may still harbour the parasites.

Successful watershed management would tackle the problem of breeding grounds for these disease vectors, particularly the clean up of any plastic waste and broken coconuts which would breed the dengue mosquitos.

#### **1.11 Planning Issues: Conflicting Demands from Different Sectors**

A successful watershed and environmental management programme over the whole island must be aware of the conflicting demands on land and water from different sectors. A summary of this situation is given as follows:

### **1.11.1 Nature Protection.**

This must be afforded the highest priority, both for the protection of habitats for the endangered and endemic species, and for protection of the soil and water resources in the central mountainous area of the island: the latter is particularly important for dry season baseflow. Any failings in this area is likely to have very large negative effects on the rest of the economy: dry season water supplies would be negatively impacted, as would the tourism industry, affected particularly by silt and rubbish in the coastal areas and damage to the marine and terrestrial environments. Greater attention to nature protection is likely to attract more tourists as well as obtain a good name for the island in the eyes of the international conservation movement (cf Costa Rica).

Protection of the Forest Reserves is in the hands of the Forest Department, but much forest land is in private hands. Where this private land is in the steep, high-rainfall central part of the island, every incentive must be given to the land owners NOT to develop their holdings to agriculture. The biggest incentive would be for the government NOT to finance any feeder roads in these areas. Another incentive could be for owners to be able to receive income tax rebates for steep land kept under forestry.

Private scrub forest land (coastal areas) may be of great value for protection of endangered species (particularly in NE of the island) or may be of relatively little value (areas near Castries, e.g. to the north of Ciceron). Studies need to be undertaken to zone these areas. Again provision (or non-provision) of infrastructure will determine whether the areas will finally be used or encroached upon.

### **1.11.2 Tourism.**

Tourism is highly concentrated, mainly in the NW part of the island, but with smaller developments at Marigot Bay, the Soufriere area, and the Vieux Fort area. This makes conflicts of land use somewhat easier to resolve. Attention to the northern watersheds (particularly Choc and Castries and Cul de Sac) are likely to improve coastal water quality significantly for 80% of the tourist areas. However, development of tourism has meant that land values for these areas have risen enormously with the result that much of this area is held by land speculators and is lying idle. Appropriate land taxation would be the best mechanism to get this land into production and to generate revenue for government.

A further problem in the 'tourism rotweila belt' is the introduction of light industry and commercial premises without controls on architectural quality and landscaping. Stricter zoning in this area is required. Also much could be done in the way of roadside tree planting and beautification. Industry and commerce should ideally be zoned for other areas, both to relieve pressure on this belt and to create employment elsewhere.

Tourism in other areas has to co-exist on a more even footing with other sectors of the economy.

### **1.11.3 Agriculture**

The problems of agriculture have been discussed in detail elsewhere. These include problems of banana monoculture, erosion and run-off, worsening flooding in bottomland areas, and encroachment into steep forest areas.

There is a very urgent need to stop any further land clearing in steep upland areas. This should be firstly tackled by stopping cultivation above WASA intakes, and by imposing slope limits on cultivation of new land. A complete ban on new feeder roads should be imposed and no funds should be spent on feeder roads serving excessively steep areas.

Ideally smallholders should be able to cultivate annual crops in less steeply sloping areas. Underutilised lands of less than 10 degrees slope need to be investigated for inclusion into a land bank for such a purpose. This would then relieve pressure to some extent on the steeply sloping land.

#### **1.11.4 Industry**

In a St. Lucian context industry should be zoned to create employment and to minimise negative impacts with tourism, residential and agricultural areas. Inappropriate zoning of flat land with a high flood risk has been seen in several areas, the most notable being the lower floodplain of the Cul de Sac. In these areas, a 1 in 5 to 1 in 10 year risk of flooding would be acceptable for seasonal cropping (5-10% of crops being damaged) but this would be unacceptable for building. A further building problem in the flat land is inadequate subsoil materials for foundations.

The policy of moving light industry to the people, rather than people to industry, is to be supported where the people are living in areas of no risk of flooding or landslides, and in general most areas in the Em and Dm agroecological zones show relatively low risks. However, in some upper watersheds a large proportion of the people may be in risk areas, and this is particularly true for the Chopin Ridge-Ravine Poisson areas. In these areas both Government and the private sector should be wary of siting employment-generating enterprises.

Ideally shallow soil areas in gently sloping upland areas, particularly in agro-ecological zones Em and Fm would be more appropriate for building. Although surface materials are of montmorillonite clay, these can be removed exposing much better materials for foundations.

#### **1.11.5 Residential Areas**

The same comments on building in floodplain areas also apply for residential land uses, with many houses having been flooded in the TSD and 26 Oct 96 events.

Building in landslide-risk areas has also occurred in many areas, the sites being susceptible either to land movement or to burial by mudflow materials. In general, land which is on, or immediately below, slopes of 25 degrees or more is at risk: that over 30 degrees represents a high risk. In the Chopin Ridge / Ravine Poisson areas, perhaps as many as 60% of the houses are in landslide risk areas, with about 30% in areas of high landslide risk. Although immediate resettlement of these people is not realistic, any further building needs to be controlled very vigorously.

Large areas of land of shallow soils in gently-sloping upland areas (Agro-ecological Zones Dm and Em) could increasingly be used for residential purposes. However, for homegardens in these areas soil depth is a limiting factor. Increasing soil depth both by local bulldozing and landscaping would be valuable (topsoils of montmorillonite materials have to be removed from the building site, and this can be used to increase soil depth in the garden areas. Similarly depositing spoil materials from river beds etc. into these areas would be beneficial.

#### **1.11.6 Infrastructure**

Although government may have relatively little control over private lands, it closely controls infrastructure, notably roads and drainage. This infrastructure in turn has a large affect on developments on the adjacent private lands. Both new road developments and repairs to existing roads will increase intensity of land use in the adjacent areas. In the past it is clear that these have not been subject to an EIA process, and gross mistakes have been made. It is most important that these are not repeated in the future, and it is most important that any international money is not seen to be supporting developments which are causing massive environmental damage such as is seen in Figure 1.4.

## 2 ENVIRONMENTAL IMPACT OF PHASE 1 CIVIL ENGINEERING WORKS

### 2.1 Description of the Phase 1 Works and Initial Environmental Considerations

Phase 1 works are described in detail from an engineering and hydrological viewpoint in the River Engineering & Hydrometeorology section of the Interim Report. Table 2.1 summarises the main features of these works, including their division into some 26 contracts (listed as A to Z, excluding O but including AA). For comparison, original estimates (Dec 94 report) and final sums allocated for the works are given in adjacent columns, and some further explanation on what was involved in the works is given in a remarks column.

The large difference in the original and final estimates can be explained by:

- a) much more extensive gabion walls were finally constructed in three of the lower river systems, mainly for protection of urban areas, comprising Soufriere, involving an extra EC\$1.6m; Canaries, an extra \$1m, and Anse la Raye, an extra \$0.45m;
- b) major rip-rap protection for Dennery town (extra \$0.96m);
- c) more extensive re-sectioning and loop-cutting in four of the rivers (Cul de Sac, extra \$1.5m; Roseau, extra \$1.7m; Mabouya, extra \$0.68m, Troumassee, extra \$0.34m);
- d) new identified works at Vieux Fort and Choiseul (extra \$0.23m).

Comparisons of costs and cost benefits represented by the works are outside the scope of this Annex. However, it should be appreciated that items a), b), and d) are essentially for protection of urban areas and vital infrastructure, while item c), involving an extra \$4.2m, was undertaken mainly for the protection of agricultural land.

Environmental Issues relating to Ph1 activities were discussed by ERM in their March 1995 report ('St. Lucia: River Engineering, Environmental Considerations'). A very comprehensive list of issues and accompanying notes was given, including:

- downstream drinking water, irrigation, industrial abstraction;
- downstream human water use (informal water supplies, bathing, laundry)
- livestock watering;
- land ownership, use, access, owner preferences;
- compensation - assessment, amounts, procedures;
- traffic - volume, timing, routing, safety;
- noise, dust, disruption;
- aesthetics, tourism/scenic values;
- spoil disposal
- enhancement possibilities;
- receiving marine environment;
- fisheries - freshwater, estuarine;
- wetlands;
- aquatic vegetation;
- bankside vegetation, especially trees;
- diversity/stability of existing channel and bank form;
- channel substrate;
- upstream sediment sources.

TABLE 2.1: PHASE 1: PRIORITY WORKS

Cont- -ract	Watershed/River Location	Reach	Approximate Dimensions (m) L D	Form of Works	Unit Rate EC\$/km (Dec '94 Rprt)_(Apr96)	Total EC\$M	Actual EC\$M	Remarks
<b>RIVER WORKS</b>								
A	Souffriere	a. Main channel	2,000	Desilting, river training bank stabilisation	1,000,000	2,000	3,550	Major gabion walls protecting urban infrastructure
B	Cul de Sac	a. Main channel	1,000	Desilting	50,000	0.050	0.000	}
C		b. Odsan Ravine	3,000	Desilting	18,000	0.054	0.011	}Included major loop - cutting
D		c. Desglos Ravine	3,000	Desilting	18,000	0.054	0.051	}channel re-alignment and
E		d. Ravine Souffre	2,000	Desilting & bankstabilisation	52,100	0.104	0.031	}re-sectioning. Some gabion
F		Taraprasad Br. to Rav. Roches	1,000	Right bank stabilisation	50,000	0.050	0.056	}walls & rip - rap proth continuing
G		Odsan Bridge to L'Abbaye	8,000	Desilting, resectioning	70,000	0.560	2,134	}
H	Roseau	a. Main channel	1,500	Desilting, mouth breaching	20,000	0.030	2,100	}Included major loop - cutting
I		b. Main channel	200	Debris clearance	0,004	0.004	0.008	}channel realignment/resectioning.
J	Canaries	a. Main channel	4,000	Desilting	50,000	0.200	1,365	}Incl.gabions & masonry walls
			500	Bank stabilisation	300,000	0.150		}protecting town infrastructure
K	Anse la Rayea	a. Main channel	200	Bank stabilisation	400,000	0.080	0.534	Incl.gabions & masonry walls
L	Fond	a. Main channel	2,000	Debris clearance, desilting	41,000	0.082	0.100	Some gabion protection to town
M	Dennerly	a. Main channel	1,000	Desilting, river training	500,000	0.500	1,462	Major rip - rap protectn to town
N	Canelles	a. Main channel	1,400	Desilting, mouth breaching	25,000	0.035	0.100	}De-silting & debris clearance
P		b. Main channel	600	Desilting, bank stabilisation	41,000	0.025	0.046	}
R	Mabouya	a. Tributary	1,200	Desilting	50,000	0.060	0.741	}Included major loop - cutting, }channel realignment/resectioning.
S	Troumassee	a. Main channel	2,000	Resectioning, lower & upper	80,000	0.160	0.500	}Included major loop - cutting, }channel realignment/resectioning.
<b>DRAINAGE WORKS</b>								
T	Roseau	a. Morne d'Or	1,000	Debris clearance & desilting	46,500	0.047	0.018	
U		b. Belair Mains	1,500	Desilting	46,500	0.070	0.007	
V		c. Roseau Mtn.d'Or	1,500	Desilting	31,000	0.047		
W		d. Hollywd-Jacmel	1,100	Desilting	46,500	0.051	0.002	
X	1 Fond d'Or	a. Den'ry-Farmco	6,000	Debris clearance & desilting	18,000	0.108	0.042	
		interceptor drainage channels	5,000	Desilting	18,000	0.090		
<b>OTHER</b>								
Y	Vieux Fort	}					0.084	
Z	Choiseul	}					0.150	
<b>TOTAL COSTS:</b>						<b>4.61</b>	<b>13.09</b>	

The ERM Report emphasised that all bankside vegetation, especially trees, should be retained (a recommendation largely carried out) but that new planting should also be undertaken (largely not yet undertaken). Excavation of only one side of river banks was emphasised (recommendation taken up in the detailed plans and then largely implemented). Stabilising landslide scars and other sources of sediment was also emphasised, as was disposal of silt and debris and land ownership and compensation issues.

However, area specific recommendations appeared not to have been made, and the controversial loop-cutting operations appear not to have been commented on. (Engineering inputs appear to have followed the environmental input, rather than running concurrently.)

## **2.2 Method of Assessment**

The current assessment comprised the following stages:

- i. Reconnaissance visit to the most important parts of all 26 schemes. This was undertaken during different periods in October and November 1996, and in June and July, 1997, accompanying both local Ministry engineers and the Consultant's engineering staff.
- ii. Inspection of available detailed plans. A rapid inspection was made on all available plans, and more detailed assessment was made on three of the valleys where most disruptive work was undertaken (Cul de Sac, Roseau and Mabouya). In addition Troumassee valley was quickly inspected, with a closer inspection being given to the loop-cutting undertaken in the area below the main road bridge. Table 2.2 (3 pages) gives major features of the plans for these three valleys.
- iii. Listing of the major measures undertaken and identification of major issues applying to these measures (screening & scoping)
- iv. Detailed field inspection of the major and most controversial areas which comprised the Cul de Sac, Roseau and Mabouya Valleys, where major re-sectioning and loop-cutting operations have been undertaken. Field inspection included walking along riverbanks through most of the valleys, inspection of crops, groundcover, soil surfaces and materials and current sources of erosion. All local farmers encountered were consulted regarding extent of damage during TSD, extent of flooding during 26 October and 11 November 1996, effect of the works on their land, and their opinion on the effectiveness of the works. River mouth areas and adjacent beaches were also visited to see if actions upstream had adversely impacted on those areas.

## **2.3 Results of the Assessment**

Comments on the detailed plans (covering the 3 major valleys) are given in Table 2.2. Any special comment on the plans with respect to environmental considerations is given in a separate column, while comment on the situation as observed in the field (July, 1997) is given in the last column.

The Environmental Evaluation for the Phase 1 works programme is given in Table 2.3 under the 12 main groupings of work measures undertaken.

In addition to this tabular data further important information, including external factors, should be noted:

TABLE 2.2: CONTRACT G: CUL DE SAC: LIST OF DETAILED MAPS, SCALE 1:1000

Plan Name / no.	Date of Plan	Chainage	Old Bed Elevations	Prop. Bed Elevations	Resect- -ioning	Loop- -cutting	Infilling	Rock Protectn	Planting	Comment on Plans (wr to environment)	Comment on Field Situation (as of July,97)	Notes
Ferrands Quarry/ Texaco Garage	15-Jun-95	6330 - 7150			Y		160	370	Y	N	(Major cuts)	
										Some tree protn lost due to loop cutting Planting not specified Consultation w.land-owners specified		
Texaco Garage	14-Jun-95	6150 - 6330			Y				Y	N	Repairshop & possibly road being threatened	15
	09-Jun-95	5900 - 6150			Y				Y	N		
										Retention of trees Local spoil dumping Retention of most trees - some to be cut Local spoil dumping -ditto -		
Odsan	31-May-95	5700 - 5900			Y				Y	N		
Deglos Brdg(dwms)	26-May-95	5420 - 5700			Y		70	70	Y	N		
Deglos Brdg(upst)	10-Apr-95	4950 - 5420			Y				Y	N	[Deep drains now being cut in adjacent land]	16,17,18
Deglos Brdg(upst)	13-Apr-95	4850 - 5050			Y		40	10	Y	N		
Jules Spmkt Divsr	26-Apr-95	4500 - 4850			Y		300	150	Y	Y		
										(fewer specifications)		
Jules Spmkt(upstr)	26-Apr-95	4000 - 4500			Y		110	110	Y	N		
DeglosRavn(upstr)	10-May-95	3775 - 4000			Y				Y	N		
Mr Wayne's Land	04-May-95	3400 - 3775			Y		150	170	Y	N		
										Consultation w.landowners specified.		
Mr Brown's Land (prop.diversion)	16-May-95	1700 - 2320										
-ditto-	20-Mar-95				N		290	400	N	N		
Abbayee Divsn. & Rock Prctcn. CDS/G/D/01	27-Mar-95	? ?			Y		130	?	Y	N		
										2 Maps but in different format: Printed map, but no site instructns. V.rough sketch		
TOTAL CUTTING/INFILL(m)							1250	1280				

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TABLE 2.2 (CONT): CONTRACT H: ROSEAU: LIST OF DETAILED MAPS, SCALE 1:1000

Plan no.	Date of Plant	Chainage	Old Bed Elevations	Prop. Bed Elevations	Resect - ioning	Loop - cutting	Infilling	Rock Protectn	Planting	Comment on Plans (wr to environment)	Comment on Field Situation (as of July,97)	Note
	22-Apr-96	8350 - ++			Y	Y	Y			Crude sketch only: little detail & not to scale.	Farmer claiming additnl 0.5 acre lost, further land threatened. Land only 2m above river level. (Distillery effluent problems) V.little Perennial Tree Protection Reasonable tree cover in places Reasonable tree cover in places	2
ROS/H/13	30-Jun-95	7950 - 8350			Y	200	200	Y	Y			
ROS/H/12	30-Jun-95	7450 - 7950			Y	150	150	Y	Y	Some tree protn lost due to loop cutting		
ROS/H/11	29-Jun-95	6950 - 7450			Y	300	420	Y	Y	Some tree protn lost due to loop cutting		
ROS/H/10**	29-Jun-95	6450 - 6950			Y	150	150	Y	Y	V.major loop cutting		
ROS/H/09	29-Jun-95	6050 - 6450			Y	250	250	Y	Y			
ROS/H/08	28-Jun-95	5650 - 6050			Y	100	150	Y	Y			3,4
ROS/H/07	28-Jun-95	5250 - 5650			Y	150	150	Y	Y			
ROS/H/07	28-Jun-95	4650 - 5250			Y	230	200	Y	Y	Retention of Roseau Grass Spoil to form embankment problematic		5
ROS/H/06	27-Jun-95	4050 - 4650			Y			Y	Y			6
ROS/H/05	27-Jun-95	3650 - 4050			Y			Y	Y			7
ROS/H/04	06-Jun-95	3250 - 3650			Y			Y	Y			8
ROS/H/03	04-Jun-95	2900 - 3250			Y			Y	Y			9
ROS/H/02/4**	09-Jun-95	2450 - 2900	87.3	89.1	87.0	88.0	300	250	Y	Consultation w.indowners specified.		
ROS/H/02/3/01/r1	22-Jun-95	2150 - 2450	89.1	90.4	88.0	89.0	100	100	Y	WASA intake		10
ROS/H/02/2	08-Jun-95	1750 - 2150	90.4	91.0	89.0	89.4	200	200	Y	Width of channel not specified	River consticted by embankment	11
ROS/H/02/1	07-Jun-95	1300 - 1750	91.0	92.5	89.4	90.5	130	130	Y	Retention of Roseau Grass Plant trees along embkmts Spoil embankments	OK None planted Coarse-textured, not stabilised	11
TOTAL CUTTING/INFILL(m)							2130	2350				

Note: any planting specified in Ph1 plans is for grasses only. No trees specified.

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TABLE 2.2 (CONT): CONTRACT R: MABOUYA: LIST OF DETAILED MAPS, SCALE 1:1000

Plan Name / no.	Date of Plan	Chainage	Old Bed Elevations	Prop.Bed Elevations	Resect- ioning	Loop- cutting	Infilling	Rock Protectr	Planting	Comment on Plans (wr to environment)	Comment on Field Situation (as of July,97)	Note	
Downstrm.La Caye Bridge		7400 - 7800			Y			Y	N	Spoil to be used to raise tracks: further quarry waste also required Further desilting specified to river mouth (900m)	Raising track bunds/riverbanks means less silt deposited in floodplain and area of wetland forest.	1	
Downstrm.La Caye Bridge	26-Jun-95	7100 - 7400	(-0.5m)		Y			N	Y	Planting of new trees specified		(2)	
La Caye Rd Brgd	23-Jun-95	6700 - 7100	(-0.5m)		Y			N	Y	Spoil to raise tracks Retention & Replanting of trees specified			
Upstrm.La Caye	23-Jun-95	6200 - 6700	(-0.5m)		Y			N	Y	Retention & Replanting of trees specified	Much more tree planting requ. Infilling w.v.sandy material:Many b'na topples.Steep bank unvegd	4	
Downstrm.confli.w. Derniere Riviere Confluence with Derniere Riviere	23-Jun-95	5700 - 6200	(-0.5m)		Y	130	140	Y	N	Loop-cutting; partial infilling specified	Partial filling:stagnant ponds. Clouded land title, improper LU	4	
Downstream Riche Fond Bridge	22-Jun-95	5100 - 5700	(-0.5m)		Y	220	220	Y	N	Loss of several mature trees		16	
Downstream Riche Fond	22-Jun-95	4570 - 5100	(-0.5m)		Y	240	200	Y	N	Loss of several mature trees Only partial filling of channel.			
Downstream Riche Fond	19-Jun-95	4000 - 4570	(-0.5m)		Y	120	100	Y	Y	Loss of several mature trees			
Downstrm. Grand Riviere	19-Jun-95	3500 - 4000	(-0.5m)		Y	40	30	Y	Y	Loss of many mature trees	Bank eroding. Some ipil-ipil pntd. (Loopcutting not undertaken)	14,15	
Downstrm. Grand Riviere	19-Jun-95	3100 - 3500	(-0.5m)		Y			Y	N		(Loopcutting not undertaken)	13	
Downstrm. Grand Riviere	19-Jun-95	2600 - 3100	(-0.5m)		Y	160	150	Y	N		V.sandy infil material - much sand extracted by locals.Rough grazing.	12	
Downstrm. Grand Riviere	18-Jun-95	1970 - 2600	(-0.75m)		Y	110	180	Y	N		Partly - filled area used only for grazing.Eroding banks(4m).Major (Major blockage in river at 2500.) Infilling now only grazing land. Damage to banks by cattle. New land not fully used.	10,11 8,9	
Downstrm. Grand Riviere	18-Jun-95	1530 - 1970	(-1.0m)		Y	100	130	Y	N				
Upstr.Bridge E.of Grand Riviere at Grand Riviere	10-May-95	1070 - 1530	(-1.0m)		Y	140	150	Y	N	S. diversion problematic			
Between Bridges at Grand Riviere	31-May-95	770 - 1070	(-1.0-1.5m)		Y			Y	N				
Downstr.of First Rc Brdg at Grand Riv.	?	550 - 770	(-1.5-2m)		Y			Y	Y				
DERNIERE RIVIERE To Grand Riviere Confluence	?	2930 - 4140	?		Y	190	200	Y	N	Considerable loop-cutting	More bankside tree planting req.	7	
TOTAL CUTTING/INFILL(m)							1450	1500					

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### **Cul de Sac:**

- a) Beach area: Hess oil terminal (S area) and new road project (N area) dominates the bay, and both are major eye-sores. According to locals the beach has deteriorated greatly since the oil terminal was constructed. Dead trees along the seaward side of the beach indicate extent of recent beach erosion. Beach sand at the confluence of the river is currently being mined by locals for sales for - building material (currently some 10-12 people employed here). Inland of the beach a substantial area of wetland forest exists together with a little degraded mangrove. Much rubbish (mainly plastic) lies on the surface in this area. However, many crabs and much birdlife was observed. Rocks in adjacent areas to the beach have substantial algal coverings. Water is slightly turbid in all areas, and very silty in areas where run-off is occurring from the road project. Some areas of
- b) destabilised embankments occur and potential mass movement materials are threatening the new road alignment.
- c) Inland of wetland forest a major area is being used as a rubbish dump (c300x150m), and some of the forest area has clearly been bulldozed for this dump. Rubbish appears to be blown/washed into surrounding areas.
- d) Lower floodplain is being drastically altered by the road project, with much spoil material currently being added to raise the level of the road. Alignment of the road, however, would appear too far to the south, with insufficient floodplain width between the industrial sites to the south of the river and the road project to the north (only 60-65m). Width of the main (straightened) river channel is very low (only 6m) with only 1m of freeboard existing to top of river bed. Width and height of main road bridge opening would appear also a major limiting factor during high flood periods: flood waters would spill over main road.
- e) Unharvested coconuts are a major environmental hazard in the lower floodplain, harbouring water and breeding mosquitoes, and contributing to much of the solid rubbish being carried down by the river. Further upstream, later in the day, and following steady rain, the river rose to some 30% of channel capacity. Coconuts constituted some 90% of floating debris, other organic rubbish some 5%, and plastic rubbish another 5%.
- f) Surface drainage in the bananas in the floodplain presents problems in that the sides of the drains are v. steep over a height difference of commonly 1.5-2m. Trash cover is very good in the area between the double rows of bananas, but is non-existent over the steep sides of the drains, and very bad erosion is thus commonly observed in these locations. (Solution to the problem may be installation of trash lines, say at 30cm from the bottom of the drains.)
- g) Current deepening of side channels (not a Ph1 activity) is being undertaken, drains excavated to 2.5-3m depth. Sides of drains are very steep (>>45deg) with no vegetative cover being provided. Spoil is dumped on the immediately adjoining land, raising adjacent track level by some 0.5m, and piled on the adjacent banana land by a further 0.5-1m. Some back-cutting of adjoining tributary drains was seen, level of the latter drains being some 1-1.5m higher.
- h) Landowner badly affected by Ph1 loop-cutting activities:
  - i) approx 2 acres out of holding of 31.6 acres have been lost by the new channel;
  - ii) access to a further 2.5 acres of banana land has been lost: river is not fordable in wet weather, and banana production from that land is thus lost;
  - iii) river bend, at the start of the cut-off loop, is further eroding the right bank, threatening overspilling at the same place where TSD floodwaters cut through the land.
  - iv) bank erosion along new section of cut-off loop is affecting the right bank, with a 3m width already lost.

- v) landowner has been prevented (!!?) from planting trees along the river bank, apparently because of access along the adjacent road being required for bank repair/desilting activities. Planting of trees - notably mango and Honduras mahogany has been undertaken in a line 9m from river (i.e. too far to be effective for bank stabilisation).

Landowner has not been compensated for lost land and is threatening to take legal proceedings against government. (This represents the clearest case investigated where Ph1 activities have led to problems.)

#### **Roseau Valley:**

- a) Beach area: wide and high beach with little evidence of any coastal erosion or sand mining. River confluence appears slightly raised-i.e. tendency for beach sand to dam rivermouth. Riverwater is black in colour with very bad smell, due to influx of anaerobically decomposing effluent from Bounty Rum Distillery. Adjoining sea area to the south of river mouth is discoloured for a distance of some 150-200m, over a width of 50m. Platform 30m offshore leads to 15inch pipe through which coastal tankers discharge molasses to supply rum distillery. Inland of beach is a large alluvial area with rough grazing, and some of this is clearly swampy. All is adversely affected by bad smell.
- b) Landowner badly affected by Ph1 loop-cutting activities and distillery effluent in river. Land located 550m E of beach, 350m W of distillery. Owner had 5.91 acres, but 0.5 acres already lost to recent river erosion promoted by deflection of water from cut-off loop. Farmer claims 10 young coconut trees, 45 bananas, 20 plantains 1 breadfruit have been lost. Farmer has planted trees along river bank, but trees are too young to be effective for root stabilisation. Landowner clearly a very proficient farmer, having farmed here since 1992, with well-managed bananas, taro, citrus, hybrid coconuts (just bearing), and mahogany. Drainage and flooding in bananas is a major limiting factor, with lower banana areas only 2m above current river level. Land was fully flooded in TSD (5ft flooding) and 26 Oct 96 (2ft), but apart from 0.5 acre river bank, all trees and most bananas survived. Farmer currently deepening drainage from 0.5-0.7 to c.1m below mat level. Black distillery effluent prevents farmer from using tributary stream for irrigation. (Solution: buy another 80m of pipe, make small aqueduct over tributary, and take water from main channel 50m upstream?) Base of stream shows >1m of black anaerobic ooze. <<Landowner: William Gabriel>>
- c) Wasted low cut-off loop, c 150m equilateral triangle, v.uneven landsurface, c2m above river bed level. Possible use as overspill channel, but land could be used for seasonal agriculture during non-flood periods (Dec-June), or planting to perennial trees. (Chainage 59).
- d) V.bad riverbank erosion with banks 3-6m high. some 6m high sections are subject to bad slumping. Almost no tree planting has been undertaken along these banks, although grass/weed vegetation is now good in most areas. Tree planting and care in early years is now urgently required. Bank materials mostly vfSL: ideal rooting medium for most crops. Silt disposal appears local, adding to the already high banks. (Chainage 48-32).
- e) Left bank embankment recently constructed by large private landowner of mainly coarse textured materials (stoney/gravelly coarse sand). Banks steep 30-45deg, but now f.well vegetated (wild species). Embankment however, constructed too near river, which is now being constricted. Chainage 20-24.
- f) Further downstream, left bank. Embankment continuing, c.2-3m height, v. coarse material being used. Some parts eroding. Urgently needs planting and stabilisation. River again is probably being constricted. Sand and gravel extraction is occurring in places. Right bank is well vegetated. Chainage 15-19.

TABLE 2.3: ENVIRONMENTAL EVALUATION, PHASE I WORKS PROGRAMME

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Measure Undertaken	Status of Operation	Observed Impact			Comments & Lessons for Future Events
		Parameter	Size	Major effect	
<b>1) Clearance of loose debris (organic &amp; rubbish)</b>	Undertaken for 10 Rivers, usually combined with measures 2 & 3, below.	i) Removal of blockage, + + + + + + + + + + / - ii) Removal of org. mat. + + +	Less risk of collapsed infrastr. + + + Decreased floodplain flooding + + + Decreased WTs in adjac. land + + + Increased channel flow rate + / - Less eutrophication, health hazard + + +	Non - controversial. Debris to be removed to rubbish dump. Any decomposable rubbish can be used as compost / mulch on adjacent land, although separation from non - decomposables time - consuming. Dead animals, etc to be buried.	
<b>2) Removal of Sediment to original channel bed level within original channel (de-silting)</b>	Undertaken for 9 rivers, often in association with other activities	i) Removal of blockage, + + + + + + + + + + / -	Less risk of collapsed infrastr. + + + Decreased floodplain flooding + + + Decreased WTs in adjacent land + + + Increased channel flow rate + / -	Non - controversial. Fine - textured sediment to be used for partial, but even, infilling of meander loops, and for increasing depth of shallow soil areas in nearby sloping land.	
<b>3) Resectioning: A: Widening of existing channel, smoothing channel sides, &amp; some grading</b>	Major work on 5 rivers: Cul de Sac, Roseau, Mabouya, Troumassee, Soufriere	i) Removal of riverbank material + + + - - - - - -	(all of above effects, plus:) Current loss of agric. land - - - Future threats to agric land - - - Loss of riverbank habitats - - -	Overall beneficial, but some problems: a) needs to be combined with Measures 9 and esp. 10 b) fine - textured sediment to be used as above c) level of detailed planning, consultation & compensation needs improvement, d) effect downstream needs consideration.	
<b>4) Resectioning: B: Deepening existing channel below original bed level</b>	Significant work on 5 major rivers (as above)	i) Removal of riverbed material/deepening + + / - ii) Increased erosivity of existing channel - - - iii) Increased erosivity of tributary channels - - -	(all of above effects, as in 3), plus: Aggravated bank erosion, undercutting below rooting depths - - - Aggravated erosion in tributaries - - -	Overall problematic, & likely to create more problems than it solves. Deepening of channel should be undertaken only to original elevation of former channel.	
<b>5) Rock protection (rip-rap) along base of eroding channel bank: Directly Protecting Infrastructure</b>	Undertaken on all 10 rivers: major work at Denney,	i) prevention of river bank erosion + + + ii) possible movement during high flows - - -	Partial protection of eroding bank + + + Movement causing channel obstruction and bank scouring - - -	Overall beneficial, but gabion baskets much more effective, although much more expensive.	
<b>6) Rock protection (above) Mainly protecting Agricultural Land</b>	Undertaken on all 10 rivers	(as above)	(as above)	Expensive in relation to benefits	
<b>7) Gabion Baskets along eroding channel bank: Directly Protecting Infrastructure</b>	Major works in most rivers: heavy investment in Soufriere, Anse la Raye, Cul de Sac, Canaries,	i) prevention of river bank erosion + + + ii) interstitial spaces within basket + + + iii) appearance + + - - -	V. good protection of eroding bank + + + Provision of shelter for riverine fauna. + + + Permeable to tree roots + + Initially unsightly - - -	Very expensive (c. EC\$200/m <sup>2</sup> ), but justified for protection of essential infrastructure. Should be combined with permeable/ root penetrable filter blanket and planting of tree vegetation on adjacent land.	
<b>8) Gabion Baskets along eroding channel bank: Mainly protecting Agricultural Land</b>	Undertaken in a few rivers only.	(as above)	(as above)	High cost not justified in most cases.	
<b>9) Planting cover crops/ grasses on river banks (vetiver, Rosseau grass)</b>	Mentioned in many (but not all) plans, c. 80% undertaken.	Est. of groundcover + + + Est. of dense rooting + + + Provision of fodder + / - Lack of taproots - - -	Prevention of raindrop impact + + + Stabilisation of surface soil + + + Cattle may trample bank + / - Soil below 1m not stabilised - - -	Effective in surface soil stabilisation, but not as effective for long - term river bank stabilisation as planting of trees. Should thus be combined with tree planting. Vetiver preferable to Roseau.	
<b>10) Planting trees along river banks</b>	Not emphasised sufficiently in Ph1: only c10% planted.	Est. of deep root syst. + + + Est. of litter layer + + + Shading of undergrowth + / - Shading of adj. crops - - -	Prevention of slumping + + + Increased raindrop protectn + + + increased infiltration + + + Change of species + + + Loss of crop income - - -	Overall highly beneficial: double row of trees needs to be established on both banks, and maintained by land owners. Large number of species are possible, bringing med. & long - term income to farmers. Needs much more promotion.	
<b>11) Meander (Loop) - Cutting</b>	Major work on 3 rivs. (Roseau - 2130m Mabouya - 1450m Cul de Sac - 1250m) Smaller work on Troumassee.	Imprvmt. in drainability + + + ii) Increased erosivity - - - Removal of trees/vegtn - - - Large vol. of spoil - - - Loss of agric. land - - - Loss of access to cut - - - - off land - - -	Increased speed of drainage + + + Aggravated bank erosion - - - Loss of habitat, income. - - - Further silting of river channels - - - Need for compensatn to Indowner - - - Need for compensatn to Indowner - - -	Overall highly problematic: not recommended for any future programmes. Many land disputes / compensation claims outstanding. Increased flow rates of river may aggravate bank erosion during future floods, and increase claims from other landowners.	
<b>12) Infilling old meanders</b>	Major work on 3 rivs. (Roseau - 2130m Mabouya - 1450m Cul de Sac - 1250m) Smaller work on Troumassee.	Creation of new land - - - - - - Est. of some infilld area + + +	Legal status of new land - - - Texture, fertility of new land - - - Estab. of some new agric land. + + +	Any benefits from new land creation have been fairly small due to clouded legal status, and quality of new land (texture of soil, fertility, evenness of surface, flood hazard).	
- partial filling, upstream side only		Est. of infilled areas + + + Lower infilling elev + + - - -	Estab. of new agric land. + + + Overspill flood channel + + Flood hazard for most crops - - -	Partial, but even filling, has been more successful than filling of upstream part of loop only. Old loop then serves as reserve flood channel.	
- partial but even filling					

### **Mabouya Valley**

- a) Lowermost floodplain. Beach is protected by 150m-wide inland strip of wetland forest, relatively undisturbed. Inland is low floodplain, generally 0.1-0.6m above river level. Riverbank has artificially been heightened to c 1-1.5m above river level. Backswamp drains join main river within wetland forest area. Large floodplain area is used only for rough grazing, with much less disturbance than in other 2 large valleys. Raising of riverbank has clearly led to more silt deposition in the sea, and less in floodplain and wetland forest area.
- b) Problems of loop-cutting and partial infilling of old meanders.
  - i) uneven filling at low elevation, leaving stagnant ponds;
  - ii) topsoil in infills is too sandy, causing banana topples. Old topsoil should be retained, and moved as surface material for new infill site.
  - iii) landsurface in infill is left in too uneven a condition.
  - iv) land title for infill appears uncertain: occupiers are essentially encroachers on government land, - and government does not obtain money from beneficiaries.
  - v) sandy infill materials have subsequently been mined by locals for building material.
- c) silt removal from channels: much of silt has been added to existing bank, adding to unevenness of land. Texture is generally more sandy than surrounding soil material, which is not always beneficial for crops.
- d) Cattle in riverbank areas: much evidence of cattle causing localised bank collapse in attempting to graze areas near the river and to move down to the river to drink. Cattle should be kept well away from river bank areas. Land use should exclude digestible grass in these areas. River banks should have double row of trees on each bank, then bananas inland. Lower cut-off meander loops should be under seasonal (flood-resistant) crops, e.g. taro, or perennial, hydrophyllic trees.

### **2.4 Conclusions of Ph1 Works & Lessons for Future Events.**

1. By necessity Ph1 planning and implementation was undertaken in a hurry, and time did not permit environmental assessments of specific detailed plans. Although environmental lessons have now been learnt from both planning and implementation stages of the work, the Ph1 engineers should be complimented in doing much accurate work in a short period of time at the planning stage for a high proportion of the work undertaken. We should all now learn the environmental lessons coming out of the Ph1 works and change a number of items in any future work.
2. **The Format of many of the Ph1 detailed plans (1:1000 scale)** is good, with existing riverbanks, areas/features of flood damage, existing trees, and recommendations for remedial works required being clearly shown. Widening of river channels was correctly specified to occur only on inside of river bends, with the maximum of bankside vegetation retained on the eroding outside bend. A few of the plans very usefully showed location of landholdings, name, and even phone numbers of the owners. This format should be repeated in any future series of works, but with additions and modifications as shown in items 3-10 below.
3. **Planting of bankside trees** should be specified as a top priority, a double row of trees on each bank being required. Tree seedlings should be provided by government, together with instructions on planting and maintenance (fertilising and spot weeding in the initial 2-3 years). A wide range of species should be made available, with final selection to be made by the landowner. Planting of grasses, which was specified in many of the plans, and also implemented in most cases, is not sufficient alone to stabilise banks below 1m depth. Maintenance of trees should be the responsibility of the landowner, who should obtain any produce from the trees.

4. **Planting of grasses or leguminous cover crops** should be undertaken on bare landsurfaces ---- together with the above trees. For planting on exposed subsoil material, small NPK fertiliser applications should be made at the time of planting. Grasses and cover crops will be effective in the first few years in reducing soil erosion, but will eventually be largely shaded out by the more effective perennial trees. Vetiver (khus-khus) grass is a preferred species because it is not palatable and it has low maintenance requirements as well as being short (and therefore obstructing river flow to a lower extent than, for example, Roseau Grass). Cattle should be kept well away from river bank areas.
5. **Making graded river embankments of unconsolidated transported material** is likely to prove a failure, particularly where the embankments are more than 3m in height and not stabilised quickly by perennial, deep-rooting vegetation.
6. **Deepening of river channels below original levels** is likewise likely to lead to increased problems of riverbank erosion. Any future cleaning of river channels should only be undertaken to original bed levels.
7. Any **future meander (loop)-cutting** should not be undertaken, except in exceptional circumstances (e.g. where current meanders are threatening major infrastructure over a wide area). In these exceptional circumstances the following conditions should apply:
  - i) names and contact phone nos/addresses of landowners should be given on the plans, and inset boxes drawn showing details and dates of compensation, land exchanges, and conditions of land uses being accepted by the respective landowners. Access to cut-off land and possible compensation claims by owners losing land due to future erosion should be considered carefully.
  - ii) soil from new cuts should partly infill the old meanders to an even but lower elevation, in order both to make a secondary flood channel and to create new agricultural land, compensating for the loss of land represented by the loop cut. Topsoil (0-30cm) from the cut should be stored to one side, and finally positioned as topsoil for the infilled meander. Sandy materials should be avoided for the surface 30cm of these infill areas.
  - iii) Weir structures may have to be constructed in cut off sections to slow the flow of water and reduce risk of increased bank erosion.
8. **Gabion baskets** are highly effective at reducing bank erosion, but should only be used for protection of urban areas and essential infrastructure. (Gabion baskets, however, are too expensive to be considered for protecting agricultural land.) Gabions should further be stabilised by placement of permeable membranes, and adjacent bank areas should be planted to trees. Gabions are generally favourable environmentally, providing habitats for fish and small aquatic animals. They are somewhat unsightly, but are generally rapidly vegetated (vines, creepers, eventually shrubs and trees).
9. **Heightening of banks in the lowermost parts of each valley** reduce silt deposition in the floodplains, backswamps and wetland forest areas (including mangroves). Increased amounts of silt are then deposited in the sea. The lowermost part of floodplains should thus be kept under natural vegetation or rough grazing and allowed to flood. Further encroachment of these areas should not be allowed to occur, and likewise further raising of river banks/bunds in these areas should not be undertaken.
10. Although the above measures may be essential, contributory causes to peak flooding events should be appreciated. Major improvements can be made by **better soil conservation measures**, notably trash management in bananas, and by **major planting programmes for perennial trees** in place of both bananas and annual crops on sloping land, particularly that over 25 degrees.

### **3 POTENTIAL ENVIRONMENTAL ISSUES, PHASE 2 PROPOSALS**

#### **3.1 Description of Measures Proposed**

Phase 2 proposals in nearly all cases are fundamentally different from the Phase 1 Priority Works in that they are centred on long-term measures to improve watershed management and particularly soil and water conservation. They inherently thus should involve most of the farmers in the island, and most of the implementation work will have to be done by the farmers themselves, with government officers providing advice, possibly undertaking local planning, and probably assisting in provision of any materials required. Most of the Phase 2 proposals are currently under trial and thus these assessments (July, revised November, 1997) are somewhat tentative.

Phase 2 measures proposed include:

Banana trash management on sloping land:

- maintenance of uniform trash cover, with trash aligned on contour;
- trash lines on contour, held by closely-spaced short stakes;

Banana trash management on flat land served with deep surface drains

- trash lines towards base of surface drain

Tied contour drains on sloping land;

Stone-lined stepped drains, gully plugs and check dams;

Retention/establishment of a 10m-wide river reserve, planted to trees.

#### **3.2 Method of Assessment**

Observations and measurements are currently underway on trials being undertaken. In addition these include discussion with the local farmers on whose land the trials are being undertaken, some neighbouring farmers, agricultural officers, and research officers of the MAFF&E and WIBDECO. Research reports relating to crops affected were also studied. For the banana trash trials, four sites were investigated (see Annex 7). Observations and recordings were made at the start of the trials (Nov.96), during the end of the Dry Season (June/July,97), and final observations were made during the peak of the second Wet Season (Sept-November,97).

For each proposed measure, a long-list of parameters which might be affected was devised, and the major effect on each and the relative size of impact was assessed. A +++rating denoted a large beneficial impact; a rating conversely signified a large negative impact, and a +/- denoted both beneficial and negative impacts. Parameters were then indexed according to size of impact, from very positive to very negative. Any applicable mitigating measures, to be employed against negative impacts, were then listed.

The status of the recommendation, its cost per acre and the area (or distance) over which the measure should be implemented, were listed for each of the proposed measures.

#### **3.3 Results of Assessment**

Results of the assessment are tabulated in Table 3.1.

TABLE 3.1: POTENTIAL ENVIRONMENTAL ISSUES, PHASE II PROPOSALS

Proposed Measure	Status of Recommendation	Cost of Recommendation	Approx. Area (ac) or Distance (km)	Parameter	Possible Impact Size	Major effect	Mitigating measures (for negative impacts)
<p><b>Banana trash management:</b>                      1) uniform trash, aligned on contour</p>	<p>Recommended by WINBAN/WIBDECO (Manual, p2-3). Implemented on steep land by best farmers. Needs major prom-otion by agric. extension officers &amp; WMAFs. Farmers to supply labour: trash materials supplied in situ (plus some trash from nearby alluvial &amp; colluvial banana areas?)</p>	<p>Approx. 4 extra man-days/acre to set up thereafter 3 man-days/acre/yr to maintain (in addition to routine detrashing) (ie 7 days in year1 -or ECS210/acre; 3 days in Yr2 etc or ECS90/acre)</p>	<p>All land &gt; 5deg (c12,000acr)</p>	<p>i) Infiltration/runoff                      ii) Nutrient recycling                      iii) Soil Ecology                      iv) Rooting volume                      v) Weed control                      vi) Lime application                      vii) Fertiliser applicn                      viii) Leafspot control                      ix) Nematode control                      x) Borer control                      xi) Trafficability                      xii) Blocking drainage                      xiii) Snakes                      xiv) Snails &amp; slugs</p>	<p>+++                      +++                      ++                      ++                      ++                      -                      ++                      -                      ++                      -/+                      -                      -                      -                      -                      -                      -                      -                      -</p>	<p>Infiltrn. rates increased 3x: run-off &amp; erosion markedly decreased; nutrients retained in soil                      Uniform, more efficient                      Increased ecosystem buffering -reduced soil pathogens                      Banana rooting to surface                      Much improved weed control                      Adversely affecting broadcasting Improved incorpn by soil animals                      May adversely affect b' casting Lower losses thru run-off                      Increase in humidity &amp; retention of possible diseased leaves                      Problems w nematode spraying                      Cut psuedostems attract borers                      Difficulty in walking/slipping in wet weather                      Washing into drainage lines                      Possible increase in population                      Big increase in population                      Retention of soil materials                      N-fixation by glyricidia stakes                      Retention of trash materials debris, etc</p>	<p>Broadcast lime before trash application                      Apply in semi-circ. above mat, within 1.5ft radius.                      Maintain uniform thin trash cover; should dry v. quickly, not increasing air humidity                      Maintain 1-1.5ft radius trash-free                      Psuedostems to be cut into strips to dry out quickly, then to be used mainly in trash lines.                      Psuedostems to be cut into strips and used in trash lines.                      Trash cover to be used also with trash lines                      Workers to wear boots                      Monitoring wr to population and damage: use of metaldehyde, slugit or methiocarb if necessary</p>
<p>2) trash lines</p>	<p>Recommended by WINBAN/WIBDECO (Manual, p2-3). Implemented on steep land by some of the best farmers. Needs major prom-otion by agric. extension officers &amp; WMAFs. Farmers to supply labour: trash materials supplied in situ (plus some trash from colluv. &amp; alluv. areas?) Supply of stakes to be organised by agric. extrn officers &amp; WMAFs?</p>	<p>Approx. 4 extra man-days/acre to set up thereafter 3 man-days/acre/yr to maintain (in addition to routine detrashing) (ie 7 days in year1 -or ECS210/acre; 3 days in Yr2 etc or ECS90/acre)</p>	<p>All land &gt; 5deg (c12,000acr)</p>	<p>as above, i-x, and xiii-xiv, but localised along contour lines                      i) Retn. eroded soil                      ii) Net nutrient increase                      iii) Retn. trash material</p>	<p>+++                      +++                      ++</p>	<p>Retention of soil materials                      N-fixation by glyricidia stakes                      Retention of trash materials debris, etc</p>	<p>Monitoring wr to population and damage: use of metaldehyde, slugit or methiocarb if necessary</p>

TABLE 3.1 (CONT): POTENTIAL ENVIRONMENTAL ISSUES, PHASE II PROPOSALS

Proposed Measure	Status of Recommendation	Cost of Recommendation	Approx. Area (ac) or Distance (km)	Parameter	Possible Impact Size	Major effect	Mitigating measures (for negative impacts)
3) Tied contour drains	Recommended by WINBAN/WBDECO (Manual, p1-2). Implemented on steep land by many of the better farmers, but design of drains could be improved in most cases. Ties/dams to be kept open in wet season, closed in dry season to retain water.	Expensive. 150-300m drains required /acre, c. 10-30 mandays to install, 4-8 mandays /yr to maintain. (Begin with coarse spacing, increase density if required) Total cost: EC\$300-1000 for installation, c. \$150-300/acre for maintenance. AESD & extension staff to promote & assist in field design.	All banana land, ie. 19,000ac.	<p>i) Dry Season Runoff Control</p> <p>ii) Wet Season Runoff Control</p> <p>iii) Wet Season Water Retention</p>	+++	<p>Retention of water &amp; silt on slope - increased water avail. in Dry Seas. - much increased nutrient retentn.</p> <p>Retention of most of silt on slope; slowing rate of drainage/runoff</p> <p>Retention of some water on slope; a) increasing landslide risk in some areas of &gt;30deg slope</p> <p>b) breeding ground for mosquitoes</p>	<p>Reduce height of ties/check - dams in Wet Season, especially for steeper land. Design drains to deflect water away from high landslide - risk areas. Keep trash out of drains - desilt frequently</p>
4) Stone-lined, stepped drains; gully plugs & check dams.	Designs given in Engineering Interim Report. (Also recommended in WINBAN Manual, but no details given.)	Very expensive, both in labour and materials. Approx 10-20 man-days/100m drain, ie. EC\$350-700 plus \$350-700 for materials.	Most threatened areas only:	Prevention of gulleys	+++		
5) Retention of 10m River Reserve	Legislation, but not enforced: frequent annual crop cultivation occurs to edge of river. Forest Dept & AESD active in planting river banks. Double rows of deep rooting trees on 4x8m spacing recom-mended, thinned to 3x8m after 5 years.	Cost of planting & establishment over 3 years c. EC\$300/100m. Bananas can be retained to give partial shade for first 3 years.	Lower parts of all 20 major rivers: c. 200km total, 100km requiring major attention.	<p>i) Riverbank stabilisation</p> <p>ii) Provision of habitat</p> <p>iii) Buffer for sedimentation</p> <p>iv) Buffer for fertilizers &amp; pesticides</p> <p>iv) Fallen trees, bridges culverts etc</p> <p>v) Loss of income</p>	<p>+++</p> <p>++</p> <p>-</p> <p>++</p> <p>++</p> <p>--</p> <p>--</p> <p>--</p>	<p>Prevention of rapid erosion of riverbanks.</p> <p>Habitat for animals, birds. Habitat also for some crop pests, &amp; harmful animals.</p> <p>Riverbank buffer for deposition of coarse sediment from river.</p> <p>Intrusion of fertiliser nutrients &amp; pesticides minimised by buffer.</p> <p>Problem of fallen trees blocking bridges culverts etc</p> <p>Loss of income due to planting of less profitable crop:</p>	<p>Some trimming of tree branches &amp; unstable trees may be required: Bananas to be grown as shade crop for initial 3 years: efforts on marketing req for alternative crops &amp; products.</p>

### 3.4 Conclusions on the Phase 2 Proposals

1. **Maintaining a uniform trash cover in banana fields** will have a very large positive effect in reducing run-off and surface wash erosion. Experimental data suggests that infiltration rates are increased by a factor of 3 by this trash cover over bare soil surfaces in both wet and dry seasons. The large increase in porosity under the trash is caused both by denser banana rooting extending to the mineral soil surface, and by much increased soil animal (particularly earthworm) activity. Infiltration over 30mins averaged 52mm in the wet season and 94mm in the dry season, as compared to 18 and 34 mm respectively for bare soil surfaces.
2. The cost of setting up and maintaining this trash cover is minimal, totalling 4 mandays and 3 mandays/acre/year respectively, valued at EC\$120 and \$90 respectively at current labour rates. All materials are produced in situ in the field, and no extra material costs are involved.
3. Increased rooting volumes, more efficient nutrient recycling, increased ecosystem buffering, much improved weed control, improved incorporation of fertilizer and lime, and an increased retention of soil water are all positive impacts of this recommended measure which benefit the area receiving the trash. Release of the infiltrated water over a longer time period will entail less sharp peaks of river flows, and release as cleaner water, with lower contents of suspended sediments. These parameters will benefit downstream areas.
4. Some possible negative impacts have been noted and are continued to be monitored. These include problems with nematicide spraying, possibly increase in borer attacks, difficulty in walking over fields in wet weather, possible increase in snake population, and an observed big increase in snail populations. However mitigating measures for all of these negative impacts are suggested.
5. In addition to maintenance of uniform trash cover **installation of trash lines** is also recommended, particularly for steeper slopes and in fields where trash production is heavy. These trash lines have further positive impacts - in addition to those listed in para 3 above - in that retention of soil materials and trash itself on slopes is improved. Where stakes are of glyricidia, further loppings of fresh leaves will add symbiotically-fixed nitrogen to the soil. No additional negative impacts are observed with trash lines.
6. Tied contour drains have further benefits if properly constructed and maintained. Further eroded soil would be retained on the contour, but this material should periodically be cleaned out. Water would also be retained on the contour, which would be doubly beneficial during the periods where potential evapotranspiration exceeds rainfall (Jan-June for many areas - see Section 2 of Interim Environmental report). However these drains show a number of disadvantages:
  - for landslide risk areas (slopes >30 degrees, more concave topography) risk of landslides would increase unless ties in the drains are managed very carefully;
  - during wet seasons drains serve to improve both surface and subsurface drainage - increased WTs, albeit of short duration, will have an adverse effect on yields;
  - cost of drains is relatively high (10-30mandays/acre for installation, 4-8md for maintenance).
7. **Establishment and retention of a 10m-wide river reserve** (double rows of trees on either bank) will have a large and favourable effect on stabilising riverbanks. Further positive impacts include provision of a buffer for deposition of coarse sediment from the river (as well as any trash), a buffer for intrusion of fertiliser nutrients and pesticides, and a habitat for wildlife. A very wide range of species are suitable for this riverbank planting, which ideally should be undertaken on a 8x8 ft spacing.

## 4 PRESCRIPTIONS FOR IMPROVED WATERSHED & ENVIRONMENTAL MANAGEMENT: SUMMARY AND CONCLUSIONS

### 4.1 Agricultural Land, Production, and Practices

1. Major emphasis must be placed on soil conservation, particularly in banana lands. This emphasis should include:

- optimal trash management to protect entire soil surfaces;
- stakes closely spaced on contour to retain trash (trash-lines);
- tied contour drains (careful management required on steeper slopes and landslide-risk areas);
- better design of vertical drains, with bio-engineered controls;
- integration of drainage from paths and tracks, with field drainage.

Work on the banana land should be the responsibility of the SLBGA staff, and criteria for certification of sloping land should include trash management. Any future project would seek to finance up to 5 SLBGA officers to work full time on soil conservation extension and certification. This would be through a grant to the SLBGA from the LCB who would monitor progress of soil conservation improvements.

It is reassuring that the Banana Certification Programme by WIBDECO/SLBGA is proceeding at a promising pace, and could in the near future be used as the major mechanism for improving soil conservation on steeply sloping banana lands.

The existing MAFF&E Extension Service would be strengthened to undertake soil conservation extension work on other crops.

2. Encouragement should be given to farmers to re-plant banana areas to permanent treecrops in sensitive areas, vis:

- at ridgetops, and within 100m of ridgetops,
- on land of >30 degrees slope,
- on landslide-risk areas, irrespective of slope.

On steep slopes, planting of some permanent treecrops within existing bananas should be encouraged, leading to gradual replacement of some bananas by treecrops. Top priority should be given to banana land of over 30 degrees slope, comprising some 1900 acres(760ha), followed by land of 25-30 degrees slope (2500 acres - 1000ha). Any future project should make planting material available to farmers, together with fertiliser inputs and technical advice. To compensate for loss of income in years 2-5 farmers would be encouraged to take loans through the local credit unions, to whom the project would extend soft loan money on a revolving basis. Alternative crops to be immediately promoted would include Julie Mango, Breadfruit, Avocado, Sweet Orange and Cocoa.

3. Prohibition of clearing of NEW agricultural holdings on forest land should be enforced, particularly in the following cases:

- at ridgetops, and within 100m of ridgetops;
- on land of >30 degrees slope;
- on landslide risk areas, irrespective of slope.

Prohibition should be backed up by public education, involving the media, the agricultural extension service, schools, churches, police, and coordinated through the local Watershed Management Action Forces (WMAFs).

4. Felling of any perennial trees on slopes of >25 degrees should be prohibited, these trees being the best guarantee that the land on which they stand will not be subject to landslides.
5. Bans should be enforced on the cultivation of land above WASA (drinking water) intakes.
6. A major effort should go into coordination of marketing of treecrop products, using
  - existing banana boat transport and marketing channels in the UK;
  - inter-island trade (particularly to Barbados & Trinidad);
  - air freight, particularly to the UK, Canada, and Europe.
  - local tourist hotels, cruise ship and yacht suppliers.
 MAFF&E would be strengthened to improve publicity and information services. Produce would include commonly exported produce such as mangoes, avocados, bread-fruit, guava, golden apple, cashew, soursop. Trials would be undertaken on new treecrops, particularly rambutans, mangosteens, jakfruit, durian.
7. Some alluvial lowlands, particularly in the most flood-prone areas, could be considered for alternative seasonal crops, or crops more tolerant of flooding or waterlogging, eg dasheen.
8. Underutilised lands of less than 10-15 degrees slope should be available for agricultural use by suitable landless smallholders. The Land Taxation mechanism could be employed to encourage land owners to use such land to full potential. A Land Bank Programme should be considered to facilitate agricultural use of such land.
9. The decline in the coconut industry, and the current felling of coconut trees, gives major cause for concern. Coconut trees are extremely useful in binding the soil in many banana plantations. A major effort is required on marketing so the decline in this important, and eco-friendly crop, is reversed. The recent re-opening of Soufriere factory is to be welcomed, and it is in everyone's interest that repurchasing of coconuts is quickly resumed.

#### 4.2 Forestry

10. Forest buffer zones should be extended into existing agricultural areas in landslide-risk areas.
11. The 20-metre river reserve should be rigorously enforced. Mixed perennial treecrops and some timber species should be encouraged. Radical pruning of older trees should be discouraged.
12. The excellent current work of the Forestry Department in education and public awareness should be further encouraged, including the introduction and planting of a wider range of forest species, both indigenous and exotics. The Jak-fruit (*Artocarpus heterophyllus*) deserves promotion, as this is useful as a fruit, a vegetable, and is an excellent timber tree.

#### 4.3 Landslide-Risk, and Flood-Risk Areas and Zonation

##### Landslide Risk:

13. A major emphasis on public education should be targeted for the worst landslide-risk areas (e.g. Ravine Poisson), and the highest-risk areas should be rezoned for permanent tree cover. High risk areas are those where the following characteristics coincide:
  - steep slopes (all areas of >35 deg, most of 30-35 and some of 25-30 deg),
  - high intensity rainfall (see Fig x.x in Annex Y),
  - areas of concavity (influx of water)

- absence of deep taproots of perennial trees;
- deep soil (particularly >200cm).

Human interventions such as cuts into the slope for roads or houses, or further cultivation of the slope, can increase landslide risk further.

14. New building should be carefully vetted in landslide-risk areas. This includes building on private land as well as public building and roads.
15. In the highest risk areas the WMAF in association with the Disaster Preparedness Committee should warn local people during periods of very high risk, i.e. when hurricanes or tropical storms are forecast at times when soils are already at field capacity. Temporary relocation in safe nearby buildings (e.g. schools) could be provided for these people during these relatively short periods. Local committees could also be more involved in undertaking inclinometer-type monitoring of very high risk areas, particularly on an daily or hourly basis during high risk periods.
16. Rapid replanting of landslip materials and exposed river banks to cover-crop species should be carried out. Landslips on private land, misused for cultivation, should be planted to permanent treecrops.

#### **Flood Risk:**

17. Floods in St. Lucia are always flashy and are over within 6 hours or so. Coastal towns and villages, invariably built adjacent to river mouths, have an additional hazard of storm tides and surges increasing water levels during many cyclone-induced flood periods. Periods of high flood risk coincide with periods of high landslide risk: Disaster Preparedness Committees and WMAFs must aim to address the issue of both risks occurring concurrently.
18. Floodplain hazard mapping has been undertaken for the whole island with flood extent lines marked on the 1:2,500 maps. Severity of flooding, however, will be variable within this area: generally the higher up the watershed, the more aggressive will be the flood wave due to the steeper slope and more confined conveyance channel. Certain watersheds are confined or narrow over much of their length and can cause considerable damage when funnelled flows reach the downstream centres of population (e.g. Canaries, Castries, Dennery). There is urgent need for tighter planning controls within the flood hazard areas: if building is allowed, it should be with an open lower storey.
19. Infrastructure affected by the flooding during TSD and 26 October 96 is in danger of being affected by future flooding situations. That infrastructure affected, and those dwellings damaged, should be addressed as part of WMAF activities. Recommendations should be made for flood proofing, flood protection measures or for the relocation of the structure.

#### **Land Zoning:**

20. Building should be encouraged in the drier, less steep areas, nearer the coast (especially Agro-ecological Zones Em and Dm, - see Figure 1 of Annex 4), and discouraged in steeper, inland areas. The Land Taxation mechanism coupled with a computerised Land Bank could be used here to facilitate this.

#### 4.4 Engineering & Operations

21. No new road construction (or road repair) should be allowed in sensitive areas, ie steep or landslide prone areas, or above drinking water intakes.
22. Materials from de-silting operations should be selectively moved to nearby shallow soil areas on adjacent upland areas, to increase capability of these lands.
23. The function of the floodplains as a vital overflow during floodpeaks and as a trap for silt and debris should be appreciated. Riverbanks should be protected by at least a double row of trees. Straightening of river channels should be discouraged. Building on the floodplain, particularly in the lowermost parts, should be discouraged. Land zoning for these areas needs urgently to be re-assessed.

#### 4.5 Water Resources Management and Monitoring

24. Upper watershed areas are not covered by any recent aerial photography, and this is a major constraint in land use studies and monitoring. Conventional air photography is not suitable for these conditions. It is thus recommended that Small Format Air Photography be commissioned, which would involve photography from a helicopter hired at short notice on an hourly basis.
25. Continuous flow gauges and sediment gauges on major rivers need to be installed. The dry season river discharge monitoring programme needs to be made more systematic and regular. The dry season discharges would be mainly gauged by current metering: these values need to be analysed in the context of upstream abstractions and the rainfall characteristics of the period prior to gauging.
26. Dry Season water resources are very scarce and without much scope for major irrigation development: irrigation should thus be concentrated on the highest value (mainly horticultural) crops. However, the database on dry season flows is small and needs to be improved to enable a forthcoming FAO irrigation study to be well founded. Considering the scarcity of dry season water, there is need to introduce the licensing of abstractions and some means of charging for irrigation water, preferably by volume but at least by irrigated area. Legislation on this needs to be designed and effected.
27. Improved water quality monitoring is advocated, particularly of the river waters upstream of WASA intakes, and such testing should include pesticide residues. Sampling of lower positions in the river systems, particularly during the Dry Seasons, needs also to be undertaken.

**ANNEX 8**

**Appendix A**

## **ANNOTATED BIBLIOGRAPHY: ENVIRONMENT, LAND USE AND AGRICULTURE**

**Agricultural Engineering Services Division (A.E.S.D.), Ministry of Agriculture, St. Lucia. 1995. Annual Agromet Bulletin.**

Introduction

Rainfall (P) (Monthly totals, Map)

The Hurricane Season

Effective Rainfall (Peff) (Monthly totals, Map)

Reference Evapotranspiration (ETo) (Monthly totals, Map)

Water Deficit (Peff-ETo) (Monthly totals, Map)

Pan evaporation and ETo comparisons given for Union, Winban, Hewanorra, Cardi and Barthe Nursery, but missing values apply to all but Union.

Calculation on Peff should be questioned: note derivation of regression equation based on river base loads representing deep leaching.

**Barker, D.H.(ed) 1994. Vegetation and Slopes Stabilisation, Protection and Ecology. Proceedings of the international conference held at the University Museum, Oxford, 29-30 Sept.1994. Thomas Telford.**

**Brinkman, R., & A. Young (ed), 1976. A Framework for Land Evaluation. FAO, Rome, Soils Bulletin No 32.**

**Boshell V., J.F. 1990. Agrometeorology in St. Lucia: Report of the Second Mission to the Country. World Meteorology Organisation. United Nations Development Programme. Castries, St. Lucia. June 1990.**

Useful discussion on climatic requirements of pineapple and cashew.

Cashew: optimum temps 27 deg; dry season duration: 4,5,6,mo optimal, 3-7 mo satisfactory, 2-8 marginal; mean annual rainfall 1000-2000mm optimal; 800-2200 satisfactory.

**Caribbean Conservation Association. 1991. St. Lucia: Country Environmental Profile. CCA, Island Resources Foundation, National Research & Development Foundation, & USAID.**

Contents:

1.1 Physical & natural environment

1.2 Landscape & land use

1.3 Human resource base: demographics

1.4 Historical background

1.5 The economic context

2.Common Property Resources

2.1 Introduction

2.2 Forest resources

2.3 Wildlife

2.4 Water resources

2.5 Coastal & marine resources

2.6 Resource conservation and heritage protection

2.7 Natural hazards

3.The Rural/Agrarian Environment

3.1 Overview of the Agricultural Sector

3.2 International responsibilities & relevant legislation

3.3 Problems & issues

3.4 Directions for the future & policy recommendations

#### 4. The urban/Industrial Environment

##### 4.1 Tourism

##### 4.2 Industry & Environmental Aspects

##### 4.3 Energy resources

#### 5. Institutional Framework for Environmental Management

#### 6. Synthesis of Environmental Issues & Recommendations

**Crown Agents Institutional Development Group in association with Sir William Halcrow & Partners. May, 1996. St. Lucia: ODA Post Tropical Storm Debbie Rehabilitation Project. World Bank Watershed & Environmental Management Project, Phase I. Final Report. British Development Division in the Caribbean.**

##### 1. Introduction

##### 2. Completed Work and Work Outstanding

##### 3. Financial Status

##### 4. Recommendation on Routine Maintenance of Completed Works

##### 5. Recommendations on the Rehabilitation, Implementation and Management of Further Works

##### 6. Environmental Considerations

##### 7. Phase 2 Activities

##### 8. Matters Outstanding for Action & Decision by Government

#### Appendix 1: St. Lucia: River Engineering Environmental Considerations(ERM)

##### 1. Introduction

##### 2. Environmental Issues Checklist:

- downstream drinking water, irrigation, industrial abstraction
- downstream human water use (informal water supplies, bathing, laundry)
- livestock watering
- land ownership, use, access, owner preferences
- compensation assessment, amounts, procedures
- traffic-volume, timing, routing, safety
- noise, dust, disruption
- aesthetics, tourism/scenic values
- spoil disposal
- enhancement possibilities (aggregate, playing fields, wetland enhancement)
- receiving marine environment
- fisheries - freshwater, esturine
- wetlands
- aquatic vegetation
- bankside vegetation, especially trees
- diversity/stability of existing channel and bank form
- channel substrate
- upstream sediment sources.

##### 3. Engineering Options

###### 3.1. Channel Form

###### 3.2 Bank Form

###### 3.3 Spoil Disposal

###### 3.4 Culverts

##### 4. Operational Considerations

##### 5. Annotated Bibliography

**De Boer M.W.H.(ed.) Sept.1987. Land Evaluation for Estate Crops in Indonesia. Criteria for Rubber, Oil Palm, Coconut, Cocoa and Tea Cultivation. Government of Indonesia, Directorate General of Estates, Team Khusus Proyek Perkebunan Inti Rakyat.**

- 1.Introduction
- 2.Description of Land Use
- 3.Required Land Qualities
- 4.Composition of Land Qualities
- 5.Land Suitability Classification
- 6.References

Land Suitability Criteria: for Rubber, Oil Palm, Coconut, Cocoa, Tea.

Note:

Land Evaluation follows FAO Framework for Land Evaluation methodology.

Criteria for S1, S2 and S3 ratings are well justified, based on extensive experience in SE Asia, mainly Indonesia and Malaysia.

All of these crops are ecologically suited to St. Lucia. However, high labour costs in St. Lucia (US\$10-12/day cf \$3-4 for S & SE Asia) preclude rubber & tea which have a high labour requirement. Oil palm and tea also have a requirement for a concentration of land (>2000ha and 500ha respectively) around a factory centre, a criteria which would be difficult to meet in St. Lucia.

Cocoa and coconut and both economically and ecologically suited to St. Lucia. Of the many land qualities considered, the most limiting for St. Lucia would be slope, rooting depth, and consecutive dry months / soil moisture deficit in dry periods.

**Clark, Jane. 1994. Bio-Engineering in the Caribbean. Report on March 1994 Field Visit. Research contract R 5809. Oxford Forestry Research Programme.**

St. Lucia work includes: use of *Gliricidia sepium* for horizontal fascines, live fences and check dams; propagation of *Bambusa vulgaris*.

Work is orientated heavily towards road cutting and river bank stabilisation, but is also applicable to vertical drainlines in agricultural land.

**FAO. 1977. Guidelines for Watershed Management. FAO Conservation Guide**

1. Land Classification for Watershed Management.
2. The Integrated Watershed Approach for Development Project Formulation
3. Environmental Impact Analysis and Forestry Activities
4. Evaluating Results of Conservation Projects
5. Application of Remote Sensing to Watershed Management
6. Evaluation of Erosion Conditions and Trends
7. Methods of Soil Erosion Monitoring for Improved Watershed Management in Tanzania
8. Predicting Soil Losses due to Sheet & Rill Erosion
9. Procedures for Determining Rates of Land Damage, Land Depreciation and Volume of Sediment Produced by Gully Erosion
10. Use of Runoff Plots to Evaluate Soil Loss
11. Protection of Cultivated Slopes - Terracing Steep Slopes in Humid Regions
12. Gully Control Structures and Systems
13. Logging and the Environment, with Particular reference to Soil and Stream Protection in Tropical Rainforest Situations
14. Reducing Erosional Impacts of Roads
15. Watershed Organisations and Socio Economic Factors
16. Forest Management to Minimise Landslide Risk
17. Wattling and Staking

**FAO 1979 Watershed Development, with special reference to Soil and Water Conservation. N.Gil. FAO Soils Bulletin 44.**

**Fresh Produce Journal, 29 Aug 97.**

Of particular interest is:

**'Banana Trade Battles on in Unfolding WTO Drama'**

**'Wholesale Market Prices'**

(this covering all fresh fruit & vegetable produce in UK market, both imported and local).

**Government of St. Lucia. May 94. National Environmental Action Plan (Draft).**

Environmental legislation: short term:

- revised Town & Country Planning Act - EIA Guidelines
- Forest Resources Conservation Act
- Beach Control Act
- Public health Act

longer term:

- Public Health Act - water quality, industrial pollution, solid/hazardous waste management.

**Government of St. Lucia. June 97. National Environmental Action Plan.**

The finalised version of the above document.

Environmental Issues are discussed under 11 headings: 1. Solid Waste Management; 2. Liquid Waste Management; 3. Hazardous Waste Management; 4. Water Resources Management; 5. Coastal Zone and Marine Resource Management; 6. Land Use Management; 7. Agriculture, Forestry & Wildlife; 8. Tourism Resources; 9. National Parks, Protected Areas and Historic Sites; 10. Natural Hazards; 11. Other Issues (Air, Noise & Chemical Pollution and Energy).

This NEAP is very strong on waste management, and much less strong on agricultural and rural issues, particularly soil and water conservation. Trash management in bananas, trash lines etc. are not mentioned. How better soil conservation is to be managed is not mentioned, e.g. the need to revamp the extension services, particularly in soil conservation, and to strengthen the BGA's extension staff in soil conservation activities.

**Government of St. Lucia. Mar 94. St. Lucia- Medium Term Economic Strategy Paper, 1993-96.**

**Central Planning Unit, Ministry of Planning, Personnel, Establishment and Training (WB Assisted).**

Increase in GDP of 6% pa over 75-92, with tourism increasing from 4 to 10% of GDP, manufacturing 4-8%, agriculture decreasing 18-13% and other services 74-69%. Land area harvested increased 0.5% pa.

Unemployment c17% (Nov 92), with female unemployment twice male unemployment.

Banana receipts US\$60m/yr, tourism \$163.

Comprehensive property tax to be introduced 93-95

Labour shortages: 1200 work permits issued in 1992, only half being to CARICOM nationals.

Agriculture: represents 13% of GDP, 60% of merchandise exports, and 50% of employment, but involves over-reliance on bananas. Problems are: over-allocation of land, labour & investment to bananas, including 8500 small farmers on fragmented holdings, input subsidies & tax exemptions for farmers, high agric wages (EC\$25-40/day) plus labour shortages. Marketing undertaken through SLBGA. Banana production increased from 82,000 tons in 1985, through 84,000 tons in 1987 to 132,000 tons in 1990. Current EEC quota is 127,000 tons, but at 20% lower prices.

Scheduled drop in prices of 40-50%, with best case scenario of 20% fall corresponding to 30% decrease in export output.

Other export crops: include breadfruit, hot peppers, mangoes, plantains. St. Lucia Marketing Board (SLMB) sole importer of fruit & veg; guaranteed market for non-traditional agricultural crops. Close links with tourist industry, with reps sitting on SLMB board of directors, and SLMB reprsnt on hotel committees, but 'there remains a dire need to strengthen institutional mechanisms to allow the full exploitation of the vast potential for tourism linkages' (para 44, p7). Cocoa: production increase of 62% in early 90s.

Zoning legislation to restrict land use in Roseau & Mabouya Valleys.

Tourism: 10% of GDP, 10,000 jobs. 334,000 tourists in 91-92 of which 175,000 were stay-over tourists, staying in 3200 rooms. Planned capacity is 3500 rooms by 1995 and 5000 by 2000.

Environment: Areas of concern:

- solid waste management
- land overuse, including deforestation
- degradation of the coastal zone
- water pollution
- loss of habitat

Economic forces underlying environmental degradation:

- inadequate definition of property rights
- price-tax-subsidy policies
- population growth
- demand for low-income housing

Forests: 18,000ha (30% of total area), 8000ha rain forest, 10,000 dry woodland/scrubland. 5 endemic bird species. Deforestation of 3% pa.

Forestry Management Plan (CIDA) and Tropical Forestry Action Plan (TFAP) (FAO) help to decrease forest conversion.

Inter-ministerial coordinating mechanism to be established on environmental management. Govmt will review land rentals & taxation; introduce land zoning; undertake squatter regularisation programs on a priority basis; promote community-based settlement & environmental awareness programs; implement integrated CZM plan; support protected areas at Qualibou and SE coast; ammend legislation to permit St. Lucia National Trust to create and administer national parks.

#### **Government of St. Lucia. Dec 94. Watershed and Environmental Management Project. Consultants Report. World Bank & UK BDDC.**

1. Background;

2. Priority Activities;

3. Watershed and Environmental Management;

Annexes:

1. St Lucia-Environmental Status;

Introduction;

Environmental Problems (alphabetical listing:)

Current Solution and Management Problems

2. Recommendations for creating a National Environmental Management Program for St. Lucia. -

Recommendations for Creating a National Plan.

Background;

Proposed Planning Program;

Staffing.

TOR for Environmentalist

3. Meteorology, hydrology, rivers and water resource management.

Ministry of Communications, Works & Transport (MOCWC), Office of the Meteorological Services (stations at 2 airfields; current upgrading of instruments from WMO)

Ministry of Agriculture, Lands, Forestry and Fisheries (MOALFF)

Agricultural Engineering Services Division

40 raingauges; only 14 operational in 1980; daily rainfall data post-1955, monthly figures only pre-1955; rainfall intensity from 5 stations during TSD plus estimates from a further 3 stations; 428mm/day recorded at Bexon, rainfall intensities reaching 125mm/hr (short duration), 107mm/hr (15mins), 96mm/hr (30mins), 89mm/hr (1hr). Other stations showed max intensities of over 60mm/hr.

Rivers: 37 catchments, 49.1km<sup>2</sup> (Roseau) - 4.8km<sup>2</sup> (Mt Bellevue)

Suspended sediment: 450t/km<sup>2</sup>/yr for Roseau; 370 for Cul de Sac; 1300 for Troumassee & Millet, equivalent to 0.2-0.7mm/year. (HTS 1984 calculations: 0-3.5mm/yr, depending on soil type.)

4. Assessment of conflict between actual and recommended land use.

Assessment of conflict made by Forestry Master Plan on 37 watersheds, according to stability of soils (Ahmad & Shen, 1988), definition of 4 broad land capability (or treatment) categories, including Agriculture (A), Agroforestry (AF), Forestry (F) and Protection (P).

Note conflict classes defined as Low, Moderate, High, V.High & Not Evaluated (urban, rock, etc.). Overall % of land in each class was 60.6, 25.4, 5.9, 0.8 and 7.3; However, Soufriere showed 16.1% in H but had clean water after storm of 11-12 Oct; Cul de Sac had 1.7 in H and 0.1 in VH but showed v dirty water. Evaluation made for Slope classes of <10, 10-20, 21-30, >31.

COHESIVENESS	SLOPE (degrees)	CAPABILITY CLASS	TREATMENT <25acres	TREATMENT >25acres
HIGH	<10	A1	A	A
	11-20	A2	A	A
	21-30	A3	AF	AF
	>31	A4	AF/F	F
MODERATE	<10	B1	A	A
	11-20	B2	AF	AF
	21-30	B3	AF	F
	>31	B4	F	F
LOW	<10	C1	A	A
	11-20	C2	AF	AF
	21-30	C3	AF/F	F
	>31	C4	F	F

5. Post TSD landslide Hazard Assessment: Preliminary Report. Rogers, C. Dec 94.

Over 400 landslides recorded, 90% occurring in upper catchments;

landslide density in worst areas was 12-20/km<sup>2</sup>;

87% of landslides were debris flows (shallow features, occurring within 10m of ridgecrests).

**Harris, David. 1992. Inception report. TCO Agronomist / Crop Physiologist. WINBAN.**

Subjects covered include: Steep Slopes and Soil Erosion & degradation of Soil Structure:

Conclusions: 'there do seem to be soil-related constraints to production associated with poor drainage and steep slopes which are not adequately addressed by current recommendations'.

'lack of a reliable estimate of the area of land being used to grow bananas. An aerial survey of the islands....could provide information concerning banana production in relation to the slope of the land and position in the catchment'.

'Bealing advocated use of deep rooted companion crops to aid aeration and rootability in heavy clay soils.'

Studies on fertilizer placement & rooting distribution, using soil away from root mats; fertilizer incorporation methods.

Liming is increasingly necessary.

Soil conservation by trash lines, mulch & vetivier is essential; terracing is too expensive; anchoring trash lines is essential.

Weed control recommendations, particularly for hill farms, need to be sorted out.

Soil moisture-rainfall-crop performance relationships need to be sorted out.

'Four sites, representing a range of altitude and rainfall, have been selected for the evaluation of the effect of better trash management on sloping fields.'

**Harris, David. May 1995. Final Report. June 1992 - May 1995. TCO Agronomist / Crop Physiologist. WINBAN Research & Development Division.**

Subjects covered include:

WINBAN package: need for balanced use of inputs;

Current problem of lack of extension support, particularly at field level: WINBAN covers research leaving BGAs to cover extension, but cuts in prices have forced BGA cuts in field activities especially on input packages and soil conservation;

Overseas Visits Reports (1-27);

Newspaper and WINBAN Newsletter Articles (28-35)

(see in particular:

34 'The value of banana trash, Mar 94': well managed banana fields can produce 36 tonnes trash/acre/year, containing 200lbs of nitrogen and 240 lbs potassium, equivalent to 10 bags of NPK fertilizer valued at approx EC\$480. An even spread of trash will encourage earthworms, increase soil infiltration, protect soil surface from raindrop impact, and keep soil surface cool, facilitating greater root colonisation.)

Published Papers (36-39)

Internal Discussion Papers (40-63)

(see in particular:

40: Draft proposal for R&D to address major field constraints in WI banana production: (includes experience of French Islands)

nematodes: nematicides are 2nd most expensive input: break crops or fallow would control nematodes:

pineapples, brachyaria grass for 1 year, then replanting with clean material; no nematicide then needed over next 2-3 years.

liming: 2t/ha at planting, thereafter 500g/mat after 2 yrs, with rate proportional to fertilizer use.

windbreaks: large increases in yield obtained; Erythrina fusca now used because of fast growth and semi-open habit.

46: Balanced inputs in banana production.

Fertilizer and limestone: minimum ratio of 3:1 should be maintained, requiring 4800 tons/yr limestone for SL (only 100 t actually imported)

(16,100 tons fertilizers used in peak year of 1988)

Nematicide: 7.5ml vyadate or 20g furadan required - only 60% of required input: case for alternating type of nematicide used (carbamates/organo-phosphates) in order to reduce build up of nematode resistance.

53: Possible savings to be made in the WI banana industry

sub-surface placement of fertilizer: requires 1/3 less fertilizer, i.e. 2 lbs cf 3 lbs, saving EC\$4.2m or 1.7c/lb

54: Drainage & Irrigation: Irrigation recommended only for high-tech farms already producing 10t /acre in areas of dry season rainfall of <360mm; yield increase of 4.4t/acre required to justify expense.

55: Labour-saving devices: an applicator for sub-surface placement of measured amounts of granular fertilizer.

**Harris, David. July 1994. Soil and Water Management for Bananas and Plantains in the Windward Islands. Paper presented at the 30th annual meeting of the Caribbean Food Crops Society, St. Thomas, USVI, July 31-August 5, 1994.**

Problem of slope: >50% of land has slopes of >20 degrees, farmed by 24,655 registered growers, leading to low yields 6.6 t/acre over 41,700 acres for the 4 islands. Trial yields 15-23 t/acre.

Two soil conservation measures could be promoted:

- use of trash for mulch
- use of vetiver/khus-khus grass in grass lines.

Trash production is 90 t/ha fresh, 9 t/ha dry weight; ground measurements showed 7.3 t/ha dry weight, giving 8x ground cover if spread evenly.

Earthworm numbers very variable: <50->500 worms/sq metre, but 50% more worms and 65% more worm biomass under trash.

Sampling undertaken in 3 areas at 7m, 100m and 300m amsl

Variable	5-10m	100m	300m	SIGF
worms/m <sup>2</sup>	147	204	159	NS
worm mass/m <sup>2</sup> (g)	10	13	8	NS
dry wt (mg/worm)	68	75	52	NS
organic matter %	2.9	2.5	6.3	***
pH	4.8	3.8	4.0	*
bulk density (g/cm <sup>2</sup> )	1.09	1.08	0.87	***
water content %	36	40	54	***

Variable	No Trash	Trash	SIGF
worms/m <sup>2</sup>	136	203	NS
worm mass/m <sup>2</sup> (g)	7.8	12.9	NS
dry wt (mg/worm)	67	63	NS
organic matter %	3.5	4.3	NS
Ph	4.0	4.4	NS
bulk density (g/cm <sup>2</sup> )	1.04	0.99	NS
water content %	40	47	*

Vetiver trials showed that dry matter yield was badly affected by shade and by low pH: 75% shade decreased dm yield to <50%.

Problems of adoption of trash technology:

- trash moved downslope, clogging drains
- interference with chemical application

**Hess, Oleen, 1990. Cocoa Production Technology. Pan Americal Development Foundation, Cocoa Rehabilitation & Development Project, (USAID).**

Practical growers' manual, written for the farmer at basic level, and orientated particularly towards Grenada.

**Hudson, N. 1971 & 1981. Soil Conservation. Batsford Academic and Educational Ltd., London.**

1. Man and soil erosion
2. The mechanics of erosion.
3. The physics of rainfall
4. The erosivity of rainfall
5. The erodibility of soil
6. The principles of mechanical protection
7. The estimation of surface run-off
8. The design of mechanical protection works
9. Land management
10. The universal soil loss equation
11. Control of erosion by crop management
12. Gully erosion
13. Erosion control on non-arable land
14. Wind erosion and its control
15. Erosion research methods
16. Problems of implementing soil conservation practices and policies.

**Hunting Technical Services Limited, June 1984. The Roseau, Dennery, and Cul de Sac Drainage and Conservation Project. Volume 1. Main report. Project Funded by the European Development Fund.** Banana exports increased from 30,000 tons in 1975 to 54000 tons in 1983, but production in 3 large estates on alluvial land decreased by half in absolute terms and from 30% to 9% as a percentage of SL's total export. Tables presented on Land Use Classes (HTS, 1984) and Land Capability Classes (OAS, 1981), showing much land in classes VI and VII is cultivated to bananas(p8). Map showing subcatchments given (p20). Cul de Sac: cultivation of 20-30 deg slopes increased 111% and >30 deg slopes 47% from 1966-77; overall increase in cultivated area of 16%. Rainfall intensity/duration curve plotted for La Caye (p29). Coefficients of runoff (p30) adapted from USCS,1972, showing slope, soil permeability and land use divisions, but only slope divisions to 10 deg given. Design discharges of subcatchment streams given (p31). Sediment loads wr to river discharge levels given (p39):concentrations to 4.8% measured. Crop yield depressions wr to WT depth given (p71). Production inputs and costs for bananas given (p74).

**Hunting Technical Services Limited, June 1984. The Roseau, Dennery, and Cul de Sac Drainage and Conservation Project. Volume 2. Appendices. Project Funded by the European Development Fund. Appendix C. Soils and Agriculture.**

Soils: discussion of primary data from Green Book (1966)  
 Hydraulic Conductivity: 4 replicates for Piaye C: 0.01, .01, .02, .13m/day  
 Land Use Classes: 2 secondary forest (incl some shifting cultiv); 6 commercial agric & estates; 7 intensive small farming, 70%+ cultivated; 8 mixed small farming, 15-20% cultivated.  
 Changes in Land Use: Cul de Sac showed %increases in cultiv between 66-77

	10-20	20-30	>30deg slope
7.intensive small farming	17	111	47
8.mixed small farming	117	55	46

10% of total catchment area changed from forest to cultiv over period 66-77, varying between 1 and 32% for different subcatchments.

Erosion hazard Classes defined on slope and land use combination:

Class	Cul de Sac	ha	%	t/ha/yr	mm/yr
0 None		640	14	0	0
1 Slight		505	11	19	1
2 Moderate	2E-F, 3D-F, 6D-F, 7D-E, 8D	1695	38	25	1.4
3 Severe	7F, 8E	855	19	47	2.6
4 V.severe	8F	320	7	63	3.5
settlements, etc.		500	11		

Erosion: no measurements made, but values derived from Universal Soil Loss Equation:  $A = R \times K \times LS \times P \times C$

A soil loss, R erosivity, K erodibility, LS slope length, P conservation practice factor, C crop management factor.

Erosivity: erosivity factor of 1049.

Erodibility: K factor, 0.03 gL- 0.69 SiL; for St. Lucia we assume 0.2-0.4 for CL or C soil.

Conservation Practice: 0.6 - 1.0

Crop Management: 0.1, full cover, - 0.5 bare soil & no crops.

Estimated Soil Loss: cleared slopes, 10 deg, 30m length, no soil conservation practices, losses are 47-63tonnes/ha/yr.

Critical areas in Cul de Sac Watershed:

Four Roads Junction	4	44ha
Mount du Chazeau	4	57
Trois Pitons	3	60
Dubrassay	4	40
Deglos	4	34
Bexton	3-4	40
Marc Marc	3-4	125
L'Abbaye	3	70
Ravine Poisson	3	170

Drainage requirements for bananas: min WT of 90cm required, definite requirement for 60 cm+, 50% loss at 20cm.

**Hunting Technical Services Limited, June 1984. The Roseau, Dennery, and Cul de Sac Drainage and Conservation Project. Volume 3. Maps.**

**Project Funded by the European Development Fund.**

Maps at 1:12,500 scale based on air photos of 1977 and 81, soils data of 1966, and field surveys of Mar 84. Present Land Use Map shows areas cleared of forest between 66 and 77.

**Hunting Technical Services Limited, October, 1987. Drainage and Land Conservation Programme. Progress report IX and Final Progress Report 1987. Ministry of Finance and Planning, Technical Assistance Contract No.5100 33 65 012. Project Funded by the European Development Fund.**

Comment: orientated towards drainage in alluvial areas, rather than conservation in sloping areas. However, includes Land Conservation & Improvement Act, 1987, and background on the Land Conservation & Drainage Boards & Steering Committee for the Formation of the Land Conservation Board; mentions that articles published in press on watershed conservation.

**Hunting Technical Services Limited, 1992. Environmental Management for Development Planning. Course Notes.**

**Land and Water Use Unit, Ministry of Agriculture. Climatological Tables for St. Lucia, 1964-83**

**Lang, D.M., March 1991. Report on Landuse / Watershed Management in St. Lucia. FAO TEAP Country Mission Team.**

Project preparation study for FAO. Project outlines given for: Agro-forestry regional project; Land Use Planning Project; and Soil Conservation & Agroforestry Training (including BGA staff).

Review of previously proposed watershed projects include: Choiseul; Fond St. Jacques Village -headwaters of Migny River, a tributary of the Soufriere river; Dennery-Fond d'Or upper watersheds of the interior.

(Background summary also v.useful with statistics: e.g. 13,900 tonnes of fertiliser, 300 tonnes of leaf spot oil and more than 100 tonnes of paraquat were required to produce 112,000 tonnes of bananas in 1986.)

**Lloyd, B. and Thorpe T. April, 1997. The Development & Integration of Biotic and Chemical Monitoring with Land Use Assessment for Tropical River Resource Management: River Surveillance in the Caribbean. Centre for Environmental Health Engineering (CEHE) & Dept of Civil Engineering, University of Surrey. ODA Environmental Research Programme, Final Report on Research Project R5936.**

Main findings are:

- amount of forestry around sampling points is the most important variable affecting macro-invertebrates in St. Lucia's streams
- strong criticism of the GoSL/WB Ph1 works (post TSD) [much of this is justified, but much is not]

- use was made of SPOT imagery of July 96 (20m ground resolution) for land use analysis. Some 13 land cover classes were defined. However, field control proved that a 'relatively low classification accuracy' was achieved. A 'confusion matrix' was constructed, showing overall accuracy of only 53%, and no major land use type showed more than 61% accuracy.

**Madramootoo, C.A., G.T.Dodds, and Z. Alikhani. Feb.1994. Proceedings of a National Policy Workshop on Sustainable Land Management. McGill University, Canada, & Government of St Lucia.**

Includes papers:

King-Joseph, A. Overview of the St. Lucia Water Sector and Current WASA Activities.

(well-presented and useful Environmental Impact Assessment summary report)

Bushell, D., Polius, J., and Norville, P. Land and Water Degradation and Control Measures in Major St Lucia Watersheds.

(useful listing and rapid analysis of degradation manifestations)

Dyer, H. and Ward, F. Health and Toxicology Problems due to Water Contamination.

(useful text-book material discussed in the St. Lucian context: water-associated diseases, pesticides, nitrate & phosphate, and heavy metal problems).

**Migeot, J-Y., and P.Hadwen. April, 1996. St. Lucia Water Resources. Preliminary Assessment. Informal Report Vol.1. Land and Water Use Unit, Ministry of Agriculture, and UN Dept. of Technical Cooperation for Development, Project STL/85/002**

Useful data on catchments, and some surface water; no quantitative data on groundwater; some met data questionable (e.g. v.low Eto figures). Useful geological background & review.

**Norville, P. Oct.1990. The Design and Evaluation of Soil Conservation Systems in St. Lucia. Unpublished MSc thesis, Dept of Agricultural Engineering, Macdonald College of McGill University, Montreal, Canada.**

Experiments undertaken from 15 June-end Dec, 1988. at St. Lucia Model Farms Ltd., 2.5km E of WINBAN Centre.

Slopes of 10-24degrees; elevation 100-130 feet; vegetation secondary bush & minor gardens, following sugarcane before 1966.

Soil Types: Area of experiments covered Warwick C, Jean Baptiste SiCL, Mabouya SiC, Bocage stonyC, & Canelles C. Bulk densities low: 1.0-1.3; hydraulic conductivities v.low (0.05-0.1m/day).

Rainfall, & runoff measured for control, & treatment plots involving terracing, contour drained plot, & strip cropped plot.

Contour drains spaced 8-11m apart, but no ties in drain;

Strip cropping system-strip widths of 15m plus contour drains as above;

Conservation bench terraces, constructed by bulldozer.

No significant runoff occurred when daily rainfall was less than 14mm;

27 storms produced signif runoff: 1004mm leading to 507mm runoff in the control (i.e. 50.5%). Excluding highest intensity storms of 211mm and 119mm, [producing runoff of 204 and 100mm (92.1%)], 674mm of rainfall occurred in storms of 14-54mm producing 203mm of runoff (30.1%). Runoff coefficients for these storms varied from 4% to 85%, depending heavily on antecedent soil moisture.

Control runoff of 507mm compared to 637mm in contour drained plot, 649mm in strip cropped plot.

Some subsurface throughflow would have been produced in all plots.

Soil erosion measurements were made for only a few rainfall events, and excluded the high-rainfall events.

Results are thus v. low (<87kg/ha).

Banana yields varied from 8.4t/ha (terraced plot: major ground disturbance and exposure of subsoil material) to 12.8t/ha (contour drained plot).

**Polius, Julius J.N. Dec.1989. Mabouya Valley Development Project. Soil Investigation and Land Use in Glavier / Bosquet D'Or. A 'Treatment Oriented' Approach. St. Lucia.**



reefs: Anse Mamin; Anse L'Ivrogne; Fregate Island Nature Reserve;

Local use of wood: charcoal (now replaced by gas); mahogany & blue mahoe;

Administration: Chief Forest & Land Officer; Asst Chiefs-Conservation & Protection; Range Officers (5)

#### Implementation of Plan:

Forest Reserves: reforestation of 756 acres; maintain newly-created forest plantations of 1000 acres; patrol 79 mile boundary of reserves; maintain roads, tracks & walks.

Crown lands: establish list of rural crown lands & survey their limits (63 parcels, 2700 acres); establish management guidelines; give TA to tenant; promote water conservation activities in water catchment areas.

Private Lands: intensify extension forestry activities in buffer zones around reserves; water catchments; forested areas; land use conflict zones; forested areas.

- continue community woodlots: Aupicon, Pierrot Youth Organisation, Morne Sion, Marne Jaques
- promote educational programme

Expand reserves: forested areas contiguous with existing reserves; within existing WASA water catchments; upper parts of watersheds

Wildlife & Applied research: incl. 'selection of a watershed and organisation of a pilot project to improve the land use system using extension and other land use management techniques'.

Environmental Education: School Programme: teacher training workshops & others; inter-regional production of Jacquot magazine; local production of educational material, coordinating & operation of school programme.

Community programme: promotion programmes in critical areas;

#### Volume 3: Watersheds Description.

**St. Lucia Banana Growers Association, undated. Purchases and Sales Agreement between St. Lucia Banana Growers Association and Certified Banana Growers for the Production and Marketing of European Union Quality Standard Bananas. (16pp)**

Detailed specifications covering certification, inputs, banana cutting & shipping, payments, fruit quality & packing, inspections, sanctions.

Specifications schedule includes Terrain ('flat to moderate slope').

**Schiechl, H.M., and R. Stern, 1992. Ground Bioengineering Techniques for Slope Protection and Erosion Control. Blackwell Science.**

**Stark, J., Lojoie, P., and A.J. Green. Oct. 1966. Soil and Land Use Surveys No. 20, St. Lucia. Soil Research and Survey section of the Regional Research Centre, Imperial College of Tropical Agriculture, University of the West Indies.**

Note: Mapping undertaken at 1:25,000 scale, most of mapping units being complexes of two Soil Series. Some 52 Soil Series, and 9 Miscellaneous Land Types were defined. Mapping units showed also Slope Categories (A: 0-2, 2-5, 5-10, 10-20, 20-30, F: >30 degrees); Erosion Categories (0-grade 5 [severe erosion]), and stoniness (6 classes). Soil Series were described and discussed. Analysis of some 45 profiles were presented, covering all significant soil series. analysis covered pH, CEC, TEB, exchangeable cations, C, N, P<sub>2</sub>O<sub>5</sub>. Soil Units were placed within a 7-class Land Capability System (Steele et al, 1954, related to the 8-class USDA system).

**WASA, 1994. A New Water Supply for North St. Lucia: the Roseau Basin Water Development Program. Program Description. (pamphlet)**

Main features:

Dam 130ft high, 600ft across, rockfill with concrete face slab;

Lake 1 mile long, storage capacity 700m gallons;

Weir and balancing tank on Millet River;

Pipelines: 11.3 miles long;

Water Treatment Plant at Ciceron;

Cost EC\$115m;

Environmental considerations: addressing key concerns: incidence of bilharzia (schistosomiasis); natural flow conditions in the Roseau River; preservation of habitat of St. Lucia parrot; land use & reforestation in watershed.

**WIBDECO (Windward Islands Banana Development and Exporting Company Ltd.). 1996. Certified Farms and Farmers - Specifications.**

Farm Size: 54 cartons/week minimum x 20 x 52 / 2240 = 25 tons; i.e. 2 acres+

Farm Environment:

<25% of farm bananas on slopes >30degrees

<3 consecutive months on drought, unless irrigated

soil not compacted; good internal drainage; depth >36ins (91cm)

WT >36ins depth

surface water drainage system - water within 36ins to be removed within 24 hours.

protection from salt spray and winds from sea

farm not within Forest Reserve, Animal or Plant Sanctuary, or Protected Area.

Use of Agrichemicals:

materials & guidelines of WIBDECO to be adopted; farmer to keep records of all chemical use, and chemical name, date, rate, operator, and area covered should be recorded.

Husbandry Practices: weed control?? regular detashing, etc.;

Fruit Carriage Practices:

Fruit Processing Practices: fungicide & alum

Fruit Packaging Practices: carton Handling & Transportation Practices:

Business Relationship Between Farmer & Association:

Farmer Responsibilities:

De-certification & Re-certification:

(See also SLBGA, undated, Purchase & Sales Agreement [above])

**WIBDECO, 1997. Code of Practice for Banana Producers in the Windward Islands. (Draft).**

Subjects covered include: Banana Plantation Development (2); Soil Management (3); Field Practices (4);

Pesticide Management (5); Sigatoka Control (6); Packing Houses (7); Waste Management (8); Labour Practices (9); Worker health/Training (10); ICM Policy Review (11);

Soil management section includes the statement:

<<Soil structure is affected adversely by erosion and compaction. Soil erosion can be reduced by an appropriate soil mulch such as plant residues. In this regard, it is important to have all crop residues evenly distributed in the field, except at the base of the plant where fertilisers are generally applied.>>

**WIBDECO, 1997. Guidelines for Pesticides Use and Waste Management for Banana Producers in the Windward Islands. (Draft).**

Subjects covered include: Pesticide Management (4), including Training, Control & Application Records, Storage, Usage, Mixture Preparation, Application, Sanitary & Personal Hygiene, Spillage, Disposal; Packing Houses (5); Sigatoka Control (6); Waste management (7) including Containers and Sleeving Diothene.

**Windward Islands Banana Growers' Association (WINBAN), 1993. Banana Growers' Manual. A Guide to Successful Banana Production in the Windward Islands. Fourth Edition. 107pp. Voice Press, St. Lucia.**

Contents: 1.Soil and Water Management; 2.Drainage; 3.Trash Management; 4.Supplying; 6.Varieties; 7.Field establishment; 8.Fertiliser Use; 9.Limestone Use; 10.Pruning and Follower Setting; 11.Weed Control;

12. Bunch Protection; 13. Moko Disease Control; 14. Leafspot Control; 15. Nematode Control; 16. Insect Pest Control; 17. Slug and Snail Control; 18. Harvesting and Handling; 19. Farm Management; 20. Trouble Shooting.

# **Annex 9**

## **Main Socio-Economic Issues in Watershed and Environmental Management Planning**

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Appendix A: Reconnaissance Survey/Exercise

# **St. Lucia: Watershed and Environmental Management Project**

## **Final Report**

### **Annex 10**

## **Main Socio Economic Issues in Watershed and Environmental Management Planning**

### **Chapter 1**

#### **Introduction**

The general concept on which the socio-economic rationale is built and which forms the backbone of the recommended approach for sustainable watershed and environmental management are basic facts of St. Lucia's topography. St. Lucia's land surface is rugged with mountain peaks and deeply incised river channels. Over half the country has slopes of greater than  $20^{\circ}$  and more than 75% of the island has slopes over  $10^{\circ}$ . This indicates that there is a need to apply soil conservation measures of one type or another to the vast majority of the land on the island. A general restriction for open-land cultivation is commonly considered at about  $10^{\circ}$  slope, but, because of the limited flat land available, cultivation is carried out on lands with steeper slope. The entire island is topographically segregated into 37 watersheds of which four (Cul-de-Sac, Cannelles, Roseau, Fond D'Or/Mabouya) account for more than 60% of St. Lucia's good agricultural land (GIS, 1988).

It is therefore imperative to view any attempt at improving the current management of the island's watersheds as an approach towards general social and economic sustainability of the entire island. No farmer will ever change his/her cropping pattern or improve cultivation/conservation practices unless he can foresee a convincing increase in returns. Therefore, successful and sustainable land-use planning, in agriculture in particular, can only be sound if the socio-economic conditions for the required changes can be made favourable. It is in this light that the National Watershed & Environmental Management Plan has been developed.

## Chapter 2

### Socio-Economic Background

#### Economic Situation

The development of the St. Lucian economy has been largely constrained by its small population and limited natural resource base. No mineral assets of economic importance have been identified but the country's fertile volcanic soils provide the resource base for agricultural development, long the dominant economic sector. Other natural resources are now being exploited in support of tourism which today rivals agriculture as the country's lead economic growth sector. The period 1960's to 1970's was characterised by relatively high rates of overall economic growth, but the economy experienced a slowdown beginning in the late seventies and continuing through the 1980-82 period. This decline has been attributed to a combination of factors, including the international recession, a series of destructive natural disasters, and political uncertainty. However, in the period from 1983 to 1989, St. Lucia experienced real growth averaging nearly six percent, largely as a result of increases in banana production and tourist arrivals and high levels of construction activities. Since 1990 there has been a slowdown with an average annual rate of growth declining to 3.9%. The forecast for 1997/98 is in the region of 1%.

In 1994, according to estimates by the World Bank, St. Lucia's gross national product (GNP), measured at average 1992-1994 prices, was US\$ 501 million, equivalent to US\$ 3,450 per head. The GDP share of the tourism sector, measured by hotels and restaurants, increased from 8.4% in 1977 to 11.7% in 1995. This is reflected by a steady increase in total visitors from 151,000 in 1985 to 436,000 in 1995. The contribution of agriculture (mainly banana for export) declined in the period 1977-1995 from 17.5% to 11.2%. Government Services still provide a large share of the GDP with 13.6% in 1995. The share of the manufacturing sector fluctuated somewhat, increasing from 6.3% in 1977 to as much as 9% in 1987 before falling to 7.0% in 1995. The development of the country's physical infrastructure resulted in the steady growth of the construction sector from 4.4% (1977) to 8.5% (1995) of real GDP. Other important sectors of the economy are transport and communication (18%), wholesale and retail (13%) and banking and insurance (10%).

The agricultural sector is the largest single employer in the country representing 25% of the employed labour force. Most of the employment is attributable to the banana industry, given the dominance of the sub-sector with 12% of the GDP (banana exports only) and almost 50% of total export earnings. The banana industry comprises not only the agricultural sector of crop production (104,000 tonnes in 1995) but also processing and packaging. Furthermore, the highly developed marketing and distribution structure within the domestic economy has resulted in the substantial linkage between the industry and a number of other sectors, e.g. transport, storage and communications, including port operations. Therefore, the total GDP of the banana sector, consisting of all related economic activities and services, is far higher than just the value of production and can be estimated at about 30-40% of GDP. Any difficulty in the banana sector reverberates quickly and widely to other sectors, and has a depressing effect on incomes and employment in those sectors. The country's dependence on banana poses a serious challenge to economic and social stability on the island. Beginning in 1993, the pound sterling began depreciating against the US dollar and by the end of 1993 the pound had depreciated by about 20% relative to year end 1991. The resulting fall in banana prices combined with considerable uncertainty facing the industry due to changing banana policies in the European Union have led to economic hardship for small farmers over the past four years, a situation forecast to deteriorate. The

present strength of sterling can bring only a temporary respite. The level of social dissatisfaction and an indication of the potential for social unrest linked to a further aggravation of the situation became evident for the first time in 1993 when a three-day strike by banana farmers protesting against low prices led to two deaths during violent clashes with police. Any analysis of the economic prospects faced by St. Lucia must take account of the role of the banana sector in the economic life of the country (see also 4.2).

## **2.2 Population and Labour Force**

St. Lucia has experienced a high population growth rate in the post-World War II period. Between 1960 and 1970, the population is estimated to have grown by 17%; between 1970 and 1980, the estimated increase was 14%; and between 1980 and 1990, some 16%. The effect of this rapid growth over several decades means that St. Lucia will continue to have a relatively young population over the next three to four decades, even if the birth rate were to decline significantly in the short term. The country is therefore at the stage in which the population is very young, and contains a large number of women of child bearing age. The provisional estimate of the population at the end of 1994 was 142,689. The annual population growth rate is estimated at about 1.9%. Two-thirds of the population is rural, and average household size is between 4 in urban and 6 in rural areas. Over 40% of households are headed by women: 46% in urban areas and 38% in rural areas.

The employed Labour Force is distributed as follows: 25% employed in agriculture, 12% in manufacturing, 12% in trade, 9% in construction, 8% in tourism, and 34% in other services. The unemployment rate has gradually increased over the years and is currently estimated at 20% island-wide with record heights between 32% and 35% for the districts of Anse-La-Raye, Choiseul and Laborie. The proportional contribution of the 15-19 year age group to the employed labour force is 7% whereas their share of the unemployed labour force is 27%. About 55% of the unemployed labour force is below 24 years of age. However, the recorded unemployment is said to be merely the tip of an iceberg of workers not recorded in the labour force.

The labour market issues relate to relatively high wages, particularly for agricultural labour, skills mismatch and low productivity. The market for skilled labour is tight because of the expansion of construction activities. Daily wage rates for unskilled labour are high and average ECS 35. The adult literacy rate is estimated at 82%, but according to the findings of the 1993 Labour Survey, only 1.6% of the total population attained university education with 53% completing primary and 15% completing secondary school. The government recognises that there are insufficient school places at the secondary level: during 1992 secondary schools were able to accommodate only 50-60% of the total number of students aged 11 and 12. The statistics reveal that generally the number of unemployed persons reduces significantly as educational attainment increases. Consequently the greatest number of unemployed persons had either passed only a limited number of standard examinations or had not passed any examination. Women are better trained for the formal job market than male counterparts.

Overall, a high proportion of the population is under thirty years old (65%). This group experiences severe unemployment, insufficient school places, particularly for the pursuit of higher education, increasing incidence of drug abuse and addiction, a high incidence of teenage parenthood, and alienation from the decision making process. Young people are generally reluctant to get involved in agricultural production or indeed any traditional rural employment activities, and consequently there is rural-urban migration and a dissatisfied youth population in the rural areas. With the decline in the rate of growth of the economy, and with the limited prospects for a substantial expansion in investment in

the foreseeable future, there is likely to be continuing high levels of structural unemployment in the informal sector and in agriculture. It is certain that if the fertility rate stays as high as it is now, the population will double in less than forty years. The safety-valve of out-migration is not functioning as well as it did in the past and there seems little prospect for changes in immigration policy on the world scene, especially in popular destination countries. But it is, unfortunately, very easy to overlook the fact that the slope of St. Lucia's population growth curve has been quietly growing steeper. It is likely to become worse, densities will rise, as will difficulties with youth alienation, crime, over crowding and the maintenance of social peace. On top of this, natural hazards such as hurricanes and tropical storms strike the island sporadically causing substantial setbacks to the economic development through damage to economic and social infrastructure.

## Chapter 3

### The Economic Impact of Tropical Storm Debbie on the Economy

Although the degradation of natural resources is usually a gradual process, the destruction caused by natural hazards such as hurricanes and tropical storms demonstrate in a harsh and brutal manner the actual degree of deterioration of the environment and the mis-management of land resources, resulting in enormous economic and social losses. In the case of St. Lucia it took the painful experience of Tropical Storm Debbie (September 1994) to bring home the urgent need for determined action towards improving the management of natural resources. The current Watershed and Environmental Management Project and its subsequent implementation provides the main thrust towards achieving improvements. On September 10, 1994, Tropical Storm Debbie (TSD) struck the island of St. Lucia. Incessant rain was reported as high as 15 inches over a 10 hour period. This level of precipitation contrasted sharply with the average of 12 inches for the month of September in the previous five years. Moreover, heavy rains in the preceding weeks had already resulted in extensive soil saturation. The continuous intensive rainfall led to widespread run-off, flooding, and massive landslides contributing to the washing away of soil, trees and crops and contributing to the formation of debris which choked rivers and damaged adjoining farmland. As a consequence, the storm resulted in about 600 persons having to be placed in emergency shelters, extensive inundation of agricultural land, disruption of electricity supply and telephone services, road and airport closures, and unavailability of tap water to the entire population. Four deaths and several injuries were reported. The heaviest damage occurred in the areas of Dennery, Anse La Raye and Soufriere.

The agricultural sector bore the brunt of the damage. Valley areas were most severely affected due to flooding and deposition of materials (soil, debris etc.) stripped from along the river banks or deriving from the steep hillsides in the watersheds. More than 400 severe landslides occurred all over the island but especially on cultivated land in the steep hilly areas. Apart from the evident physical damage to crops and infrastructure, non-apparent losses included leaching/washing away of residual fertilisers and the consequences of continuous waterlogging. Estimates by the MAFF&E reveal that as much as 10% of productive land had been lost due to land slip, severe erosion, and river re-location. The total economic loss for the agricultural sector was estimated at about EC\$ 133 million or about EC\$ 153 million when including damage to related infrastructure (see Table 3.1). This represented 13-15% of the 1993 GDP. While this remains the official record, subsequent reports suggested that losses could have been over estimated by as much as 10%.

Damage to crops involved the entire range of commodities grown on the island. Official government estimates indicated that almost 60% of the total acreage under banana cultivation had been affected. Of this, about 20% was so severely damaged that replanting was required, consequently extending the period of full recovery to at least two years. The economic loss through to December 1994 alone was equivalent to 18,000 tons of banana equivalent to EC\$ 32 million (at 1994 prices). The cumulative loss over the 18 months following the storm's impact was estimated at EC\$ 76 million. Furthermore, the economic loss in tree crops (especially coconuts, cocoa), fruits, root crops and vegetables accounted for another EC\$ 46 million. Losses in forestry were recorded in both natural and planted forests, and resulted mainly due to landslip. In fisheries, major loss was observed in terms of damage to fishing pots and facilities (buildings, boats etc.). Moreover, sediment flowing into the sea buried parts of coral reefs and marine fisheries habitats. Apart from the partial or complete destruction of crops, the siltation of drains and fields left strewn with debris, substantial damage to farming and forest infrastructure contributed to the total loss account. The economic costs of lost soil and forest

resources, permanently damaged valley farmland, affected coral reefs (as well in relation to returns from tourism) and reduced fish catches have not been evaluated. In the livestock sector losses occurred through drowning of stock and destruction of pens located in the flooded areas.

Costs for the rehabilitation and reconstruction of water systems, bridges, roads and buildings/houses, i.e. general social and economic infrastructure were estimated at about EC\$ 50-60 million. Flood water and siltation caused extensive damage to all water intakes, precluding WASA from using its water catchments for water distribution to the public. The rehabilitation works comprised mainly the replacement of damaged pipelines and restoration of water intakes. The rehabilitation works for desilting and river training accounted for the bulk of the EC\$ 14 million spent under Phase I of the Saint Lucia Watershed and Environmental Management Project. The country's main reservoir project (Roseau Dam) was extensively damaged. Six bridges were totally swept away by the flood waters, while four others suffered significant damage. While the surface of most roads remained unaffected by the storm, landslides resulted in the collapse of road shoulders. Two main arteries, the Barre De L'Isle and the West Coast Road, collapsed in parts due to land slip. However, most of the road damage was recorded on feeder roads which adversely affected the transportation of agricultural produce. The housing sector together with community support facilities suffered severely. About 233 houses were damaged of which about 100 were rendered uninhabitable.

On a conservative basis, the total economic loss as a result of the Tropical Storm Debbie was finally estimated at about EC\$ 250-270 million<sup>1</sup> or close to US\$ 100 million. This represents about 25% of the 1993 GDP. However, the above damage inflicted by the storm affected the economy not only by direct income loss to the private sector and the burden of enormous rehabilitation costs for the public sector, but led inevitably to reduced tax income for the Government, significant loss of foreign earnings, food shortages, increased food import bill, as well as adverse social hardships.

It is not possible to prove with scientific certainty the direct relation between the disastrous consequences of Tropical Storm Debbie or similar natural hazards and the human impact on land-use and environmental management. However, experience and long-term observation confirm that over-exploitation of natural resources and general watershed mis-management are responsible for aggravating the dimension of social and economic losses, in both, the immediate and long-term basis. The most crucial socio-economic<sup>2</sup> aspects with respect to sound watershed management in St. Lucia's are analysed below.

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<sup>1</sup> This includes a rough estimate for the sizable flood-related damage to business inventories and personal belongings.

<sup>2</sup> It is implicit that this annex does not investigate the technical aspects of land-use, river training, drainage, land conservation etc. but concentrates purely on socio-economic analysis.

**Table 3.1: Tropical Storm Debbie - Economic Loss Estimate of Agricultural Sector**

Crops	Unit	Number	Unit Value (EC\$)	Total Value (EC\$ million)
Banana	acres	8120	9360	76.00
Tree Crops	acres	3600	5900	21.24
Fruit Crops	acres	2250	5000	11.25
Root Crops	acres	3300	4000	13.20
Vegetables	acres	190	6000	1.14
<b>Total Crops</b>				<b>122.83</b>
<b>Livestock</b>				
Cattle	head	300	2000	0.60
Pigs	head	600	400	0.24
Other	head	3318	95	0.32
<b>Total Livestock</b>				<b>1.16</b>
<b>Forestry</b>				
Natural	acres	800	10000	8.00
Plantation	acres	155	7300	1.13
<b>Total Forestry</b>				<b>9.13</b>
<b>Fisheries</b>				
Fishpots	units	3000	250	0.75
Nets	units	24	10000	0.24
Boats	units	4	29250	0.12
Engines	units	2	6000	0.01
<b>Total Fisheries</b>				<b>1.12</b>
<b>Infrastructure/Facilities</b>				
Farm roads	miles	80	50000	4.00
Tracks/paths	miles	23	5000	0.12
Forest roads	miles	1	75000	0.08
Drains	acres	6300	2000	12.60
Farm storage	units	83	2500	0.21
Field sheds	units	432	1500	0.65
Animal Pens	units	56	13600	0.76
Greenhouses	units	10	18000	0.18
Fish. Buildings	units	5	52000	0.26
Fish. ramps	units	1	85000	0.09
Drainage(Fish.)	units	1	15000	0.02
Fish ponds	units	12	4583	0.05
<b>Total Infrastructure/Facilities</b>				<b>19.00</b>
<b>GRAND TOTAL AGRICULTURE SECTOR</b>				<b>153.24</b>

Source: data derived from MAFF&E

### Critical Socio-Economic Aspects of Watershed Management

The following elaboration is based on an intensive reconnaissance survey<sup>3</sup> during which discussions were held with farmers, fishermen, non-farming residents, children, government officers and other people. In addition, secondary literature was reviewed and discussions held with individuals of various institutions and organisations, and several governmental departments operating on specific projects/programmes or island-wide.

In order to work out a feasible action plan for watershed and environmental management it is imperative to explore and define as accurately as possible the main constraints currently hampering the efforts towards sound and sustainable management of the island's natural resources. Although there may be an infinite number of socio-economic factors inhibiting watershed development and socio-economic transformation, the need for immediate action and practicability of approaches indicates that prioritisation must be the ruling parameter for decision making. In the light of future prospects in watershed management three broad socio-economic areas become apparent as being strategically the most important, i.e. (i.) people's perception on natural hazards and their causes, (ii.) the interpretation of the current and future role of banana cultivation, and (iii.) the need for diversification and the impediments hampering the socio-economic transformation needed to ensure long-term sustainability in watershed management.

#### 4.1 People's Perception on Land Conservation and Drainage

Soil erosion represents one of the main problems in agriculture worldwide. Poor soil and water management, intensive production on vulnerable land, overgrazing and deforestation undermine the capacity of soils and create obstacles to increased crop, feed, and fuel production. In the past, most natural resources were considered common property, providing a productive base for crops and other basic needs. Today however, the continued dependence by an increasing number of individuals on a finite natural resource base results in the over-exploitation of the resources and a serious loss in their productivity. Furthermore, soil erosion and water run-off also increase costs to rural (agricultural) and urban communities through devastating floods and landslides (see 3.).

People in St. Lucia are generally aware of the potential danger of torrential rainfall and respective floodings. The reconnaissance survey revealed that asked about the causes for the devastating flooding resulting from Tropical Storm Debbie, the most frequent answer was *cutting of the forest* (deforestation). Not even one person mentioned agricultural land use as such. However, some farmers expressed the opinion that *God is responsible for sending the heavy rains and that mankind has no possibility to control the consequences, such as flooding and landslides*. This "explanation" is quite sensible considering the fact that people could hardly recall any similar devastating (flood) event during their entire lifetime<sup>4</sup>. Furthermore, the rainfall resulting from TSD is generally believed to have been of the intensity which occurs once every 50 years.

With respect to soil erosion, the general understanding about the direct relationship between topsoil run-off on sloping/steep land and flooding (siltation/blockage of rivers and main drains) in the

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<sup>3</sup> Details on the methodology used are summarised in appendix I.

<sup>4</sup> A few persons said that hurricane Allen caused equal damage in 1980.

downstream areas/plains was limited and not well understood. Nevertheless, once explained the farmers agreed that *this cause/effect explanation could be true*. Generally, farmers were not very aware of the soil (silt) washed downstream but were almost exclusively concerned about *the masses of water that cause damage to crops, roads, bridges and houses*. In this respect the incidence of surface erosion as a consequence of flooding on plains was seen as possibly the main problem by farmers cultivating on flood-prone areas. In fact, "erosion" was normally associated with surface washing of land rather than with top-soil run-off from steep land. Hillside farmers were much less concerned about the issue of land conservation and flooding than those cultivating in down-stream areas. A few fishermen (Dennerly) observed the incidence of "dead bottom fish" after TSD. This, apparently, was due to the silt washed into the sea and suffocating the fish.

Also the risk of landslides deriving from heavy rainfall was considered only by some farmers in areas widely known for landslide hazards (e.g. Marc, Ravine Poisson). Here again, the impact of land use, may it be through cultivation practices, construction of feeder roads or enlargement of human settlements were not seen as important factors contributing to the aggravation of flood damage or land degradation. Especially the aspect of banana cultivation with its limited ground cover was, intentionally or not, never blamed as contributing to the problems of land degradation and drainage. The fact that flooding and heavy rains contribute substantially to the inefficiency of the fertilizer applied, especially on steep hillsides, was not always known by the farmers interviewed.

Exclusively the need for drainage was widely acknowledged and all farmers interviewed drained their field by maintaining simple run-off drains. However, most of these drains, especially those in the hillsides, were not placed along the contour line and were not properly maintained. Reasons mentioned by farmers for the noticed negligence in drain maintenance were *expensive labour force* and *lack of technical knowledge*. All farmers asked for assistance in proper drainage on-farm. In this context disputes between neighbouring farms concerning the responsibility of clearing blocked drains leading to the main stream, was reported frequently. Finally, village residents mostly acknowledged the need for educating people not to dump waste and garbage into drains and rivers.

In summary, it has become apparent that the general perception on the issue of land conservation and drainage by farmers and by a large portion of the residents in the watersheds is far from being adequate. The most critical aspects of this analysis are:

- Except for surface erosion on plains, soil erosion on slopes is not realised as a problem;
- Flooding and landslides are often characterised as being unavoidable;
- The impact of land-use is viewed mostly from the angle of de-forestation only;
- Farmers lack the knowledge of suitable soil erosion prevention practices and proper drainage of fields (i.e. insufficient technical advisory service);
- Residents in the flood plains/flood-prone areas are aware of the dangers associated with flooding but mostly blame the government for not maintaining the main drains properly (incl. river bank stabilisation and river training/desilting);

The on-going destruction of forest cover which has coincided with the expansion of banana cultivation onto forested lands, is dramatically altering the island's hydrology. In conjunction with high sedimentation rates resulting from accelerated soil erosion in unprotected upland areas, drainage ditches fill, culverts clog, streams overflow, and flooding has now become a major problem in many prime valley bottom agricultural areas and in coastal and urban areas alike. The importance of this "green gold" for St. Lucia's economy has for years disguised the fact that the natural and physical environment to support banana production is becoming increasingly marginal. Unfortunately, realisation has come only since financial profitability of banana cultivation has started to decline.

#### 4.2 The Apparent Profitability and Risky Path of Banana Dominance

The predominant importance of banana production for the economy in St. Lucia can easily be highlighted by just one economic indicator. In 1995 the total value of banana exports amounted to EC\$ 128.1 million, i.e. 47% of total export earnings or 89% of agricultural exports. When referring to the economic indicators of what is generally called the *banana sector*, the real importance of this commodity for employment and economic performance of the country is only partially revealed. Any analysis of the banana sector has also to include the related economic activities which are non-agricultural by definition. Excluding public and parastatal services (MAFF&E, SLBGA, etc.), the sub-sectors of agricultural input supply and commercialisation, e.g. fertiliser, pesticides, packaging, transportation, road construction, and port handling depend to a certain extent directly on the production and export of banana. Furthermore, the income generated (directly and through taxes, customs duties, and handling charges) contributes significantly to the purchasing power of the country's economy and to consumption. In general, this has a direct beneficial effect on the performance of all other sectors of the economy (see also 2.1).

Being the dominant agricultural commodity, banana cultivation is consequently by far the most important farming activity in the watersheds of the country. According to unofficial estimates, banana cultivation amounts to around 15,000 acres compared to the island's total cultivated area of 39,000 acres<sup>5</sup> which include temporary and permanent crops as well as fallow. However, the preliminary results of the 1996 Agricultural Census estimate the area under banana at about 19,000 acres or almost 50% of the area under cultivation. Based on an average of 5.5 members per household and around 5200<sup>6</sup> registered banana farmers island-wide (SLBGA), the total number of people depending fully or partially on banana cultivation can be estimated at around 29,000. When including a conservative average of 0.20<sup>7</sup> permanent paid farm worker per acre, the total population related to banana "cultivation" only, i.e. excluding other sub-sectors of the banana industry (see above) totals 32,000 or 23% (47,000 or 33% using the figure of 8,000 active banana growers) of the island's population<sup>8</sup>. Furthermore, employment statistics (WIBDECO) show that the banana industry as a whole employs about 25,000 people (21,000 direct and 4,000 indirect) which would represent 39% of the total labour force. It becomes, therefore, evident that even on a conservative basis at least 1 in 3 inhabitants of St. Lucia is economically dependent on the banana industry.

From the farming point of view, bananas are popular for a number of reasons. The crop provides a regular income, both for farmers and their workers, throughout the year whereas most other crops,

<sup>5</sup> Agricultural Census 1996.

<sup>6</sup> According to WIBDECO the number of active banana growers in St. Lucia is much higher, i.e. 8,000: Economic and Statistical Review 1996, WIBDECO 2/1997; The Ministry of Planning usually indicates 10,000 banana farmers.

<sup>7</sup> Based on model analysis, see Table 2.

<sup>8</sup> This does obviously not mean that those households do exclusively depend on banana as income source (see below).

notably tree crops, only produce a pay-off following a lag period during which labour and other inputs must be paid for. It is the only crop with an extensive export marketing system and a guaranteed market. For this reason also access to credit, either through SLBGA or local banks, is good. St. Lucia as the other islands of the Caribbean, is periodically affected by severe storms and hurricanes and banana, as a tall, shallow-rooted plant with a weak aerial structure is quite easily blown over or snapped. Nevertheless, it is relatively easy to reestablish by ratooning and vegetative propagation with little or no land preparation. Bananas are largely immune from the ravage of theft. This is because they are shipped in the unripe state and the varieties grown are not well-suited to cooking. Furthermore, the abundance of fruit renders any losses insignificant in contrast to other crops, where theft is probably the largest category of loss.

According to the reconnaissance survey and various statistical sources, the average farm size for banana producers within the islands' watersheds ranges between 3-8 acres (average 5.5 acres). According to a WINBAN survey<sup>9</sup> carried out in 1993, 65% of all banana farmers in St. Lucia depend completely on bananas as a source of income, and another 30% derive half and more of their total income from banana cultivation. The larger the size of the farm the stronger is the reliance on banana as a mono-crop. However, the reconnaissance exercise in the two pilot watersheds of Dennery and Cul de Sac revealed that although being by far the most important income source, the household's total income was mostly composed of a variety of contributions, such as non-agricultural permanent/seasonal employment of wives/women or of other household members, consumption/sale of produced food crops (mostly root provisions) and fruits (especially oranges), remittances, part-time fishing, and other. The field survey revealed further that farm-income was used almost exclusively to cover household expenses and to pay for basic agricultural inputs. The fact that very few resources are used for farm investments (for farm development) may be interpreted twofold. Either the income is too small to allow for investment or farm improvement is not of high priority vis-a-vis consumption.

The profitability of bananas is highly variable and is influenced by a whole range of factors. To attempt to produce an average crop model would inevitably lead to a misrepresentation of the situation. The Consultants have developed two models, and these are presented at Tables 4.1 and 4.2.

The moderate input/average output model (Table 4.1) would be representative of many hillside farms. It assumes that half the recommended inputs are used with standard labour requirements, with the exception of harvesting labour. It shows that after making allowances for labour and family labour the cost of production at 31 cents equals the price paid for bananas, and that profit is therefore zero. It further assumes that the farmer meets all pre-harvest labour requirements, and a proportion of harvest labour. As these have been included as costs, the farmer "earns" \$2,295 per acre, or on a typical 3 acre hillside farm, \$ 6,885 per annum. Bearing in mind that the opportunity cost of the farmers labour is not very high (Section 2.2 refers) it is possible to justify the farmers decision to stay in production.

The model at Table 4.2 assumes a much greater use of inputs, standard figures for pre-harvest labour, but harvest labour in proportion to the higher yield. Under this regime, it can be calculated that the farmer "earns" \$ 4,981 from his labour (included in cost of production) and \$ 2,620 from his bananas, a total of \$ 7,601 per acre.

Seen from a National perspective - SLBGA costs must be added. These are: 13 cents per lb. for boxes, 2.2 cents for leafspot control, 2 cents for insurance and an estimated 5 cents for SLBGA

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<sup>9</sup> *Productivity Constraints Study, WINBAN, November 1993.*

The on-going destruction of forest cover which has coincided with the expansion of banana cultivation onto forested lands, is dramatically altering the island's hydrology. In conjunction with high sedimentation rates resulting from accelerated soil erosion in unprotected upland areas, drainage ditches fill, culverts clog, streams overflow, and flooding has now become a major problem in many prime valley bottom agricultural areas and in coastal and urban areas alike. The importance of this "green gold" for St. Lucia's economy has for years disguised the fact that the natural and physical environment to support banana production is becoming increasingly marginal. Unfortunately, realisation has come only since financial profitability of banana cultivation has started to decline.

#### 4.2 The Apparent Profitability and Risky Path of Banana Dominance

The predominant importance of banana production for the economy in St. Lucia can easily be highlighted by just one economic indicator. In 1995 the total value of banana exports amounted to EC\$ 128.1 million, i.e. 47% of total export earnings or 89% of agricultural exports. When referring to the economic indicators of what is generally called the *banana sector*, the real importance of this commodity for employment and economic performance of the country is only partially revealed. Any analysis of the banana sector has also to include the related economic activities which are non-agricultural by definition. Excluding public and parastatal services (MAFF&E, SLBGA, etc.), the sub-sectors of agricultural input supply and commercialisation, e.g. fertiliser, pesticides, packaging, transportation, road construction, and port handling depend to a certain extent directly on the production and export of banana. Furthermore, the income generated (directly and through taxes, customs duties, and handling charges) contributes significantly to the purchasing power of the country's economy and to consumption. In general, this has a direct beneficial effect on the performance of all other sectors of the economy (see also 2.1).

Being the dominant agricultural commodity, banana cultivation is consequently by far the most important farming activity in the watersheds of the country. According to unofficial estimates, banana cultivation amounts to around 15,000 acres compared to the island's total cultivated area of 39,000 acres<sup>5</sup> which include temporary and permanent crops as well as fallow. However, the preliminary results of the 1996 Agricultural Census estimate the area under banana at about 19,000 acres or almost 50% of the area under cultivation. Based on an average of 5.5 members per household and around 5200<sup>6</sup> registered banana farmers island-wide (SLBGA), the total number of people depending fully or partially on banana cultivation can be estimated at around 29,000. When including a conservative average of 0.20<sup>7</sup> permanent paid farm worker per acre, the total population related to banana "cultivation" only, i.e. excluding other sub-sectors of the banana industry (see above) totals 32,000 or 23% (47,000 or 33% using the figure of 8,000 active banana growers) of the island's population<sup>8</sup>. Furthermore, employment statistics (WIBDECO) show that the banana industry as a whole employs about 25,000 people (21,000 direct and 4,000 indirect) which would represent 39% of the total labour force. It becomes, therefore, evident that even on a conservative basis at least 1 in 3 inhabitants of St. Lucia is economically dependent on the banana industry.

From the farming point of view, bananas are popular for a number of reasons. The crop provides a regular income, both for farmers and their workers, throughout the year whereas most other crops,

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<sup>5</sup> Agricultural Census 1996.

<sup>6</sup> According to WIBDECO the number of active banana growers in St. Lucia is much higher, i.e. 8,000: Economic and Statistical Review 1996, WIBDECO 2/1997; The Ministry of Planning usually indicates 10,000 banana farmers.

<sup>7</sup> Based on model analysis, see Table 2.

<sup>8</sup> This does obviously not mean that those households do exclusively depend on banana as income source (see below).

notably tree crops, only produce a pay-off following a lag period during which labour and other inputs must be paid for. It is the only crop with an extensive export marketing system and a guaranteed market. For this reason also access to credit, either through SLBGA or local banks, is good. St. Lucia as the other islands of the Caribbean, is periodically affected by severe storms and hurricanes and banana, as a tall, shallow-rooted plant with a weak aerial structure is quite easily blown over or snapped. Nevertheless, it is relatively easy to reestablish by ratooning and vegetative propagation with little or no land preparation. Bananas are largely immune from the ravage of theft. This is because they are shipped in the unripe state and the varieties grown are not well-suited to cooking. Furthermore, the abundance of fruit renders any losses insignificant in contrast to other crops, where theft is probably the largest category of loss.

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administration. This brings the real economic cost of production within a range of 44.2 cents/lb. to 53.2 cents. Seen against average receipts from sales of 53 cents, it is clear that margins are from negative to very small, hence the accumulation of SLBGA debt, EC\$ 13.4 million in 1996 and EC\$ 7.6 million up to August 1997. Exports in 1996 amounted to 106.3 thousand tonnes, so price support to growers was 0.57 cents/lb.

The high unit cost of production is influenced by many factors, most significant of these are the cost of inputs and high labour costs, particularly on steep land and on land some distance from a motorable road. With variable costs ranging from 22 cents/lb. on flat, high producing land to 31 cents on marginal hillside farms, some structural adjustment within the banana industry is inevitable. The Certified Farmer Programme which aims at rewarding farmers producing high quality fruit, cannot because of production criteria stipulated as part of the package, accommodate many small producers in marginal areas. This means in effect that the benefits of the programme will go mainly to farmers occupying the limited area of flat valley bottom land. Even so, it is doubtful whether even these farmers can compete on production cost, with Dollar banana producing countries.

During the past four to five years, the profitability of bananas has been falling across the board, and without doubt some farmers are already losing money. However, this fact is masked by:

- the way in which the SLBGA cess mechanism operates, which hides the cost of inputs
- alternative sources of family income which are not taken fully into account.
- the farmers failure to believe after 20 years of good profits that bananas are not still his best cash crop.

One final and critical factor which cannot be ignored and which impacts strongly on the long term sustainability of banana production in St. Lucia, is the global trade environment.

The EU banana market is going through its most difficult period for decades. The banana trade is much more volatile now than previously. Absorbing between 90% and 97% of the Windward islands bananas, the U.K. market with its lucrative and stable supermarket sector, probably one of the best developed and sophisticated in the EU, has become a major target for market predators. The market has been hit by excessive supplies from dollar banana producing countries and only modest increases in demand. In the EU banana trading has become a buyers market where low grade/quality fruit<sup>10</sup> is not only discounted, it just cannot find buyers. With the exception of 1994 when due to hurricanes, droughts and a tropical storm the banana production of the Windward islands was substantially reduced, there is a clear trend towards declining banana prices. By December 1996 the Windward Free On Track (FOT) price (green price) was down to Pound Sterling 360/ton compared to Pound Sterling 450/ton a year before. According to the current FAO banana world market observations, the market situation is now one of abundant supplies which are putting downward pressure on world banana prices. Moreover, the outlook for increased demand is tempered by the size of the overall tariff quota for banana in the EU; the maturity of the United States market; and uncertainty over future rates of expansion in the markets of Eastern Europe and the countries of the former USSR. Within this environment, import prices are declining in most markets, putting downward pressure on exporter revenues and hence producer prices. At the same time, indications are that in spite of declining import and wholesale prices, in many cases retail price margins are increasing. Crucial to the short-term survival of the St. Lucia banana industry, and the only instrument left apart from the necessary direct

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<sup>10</sup> Due to inadequate pre- and post harvest fruit quality management and poor transport systems/facilities, St. Lucia and the Windward island are periodically facing the problem of below standard delivery of quality fruit.

**Table 4.1: Banana On - Farm Crop Model: Moderate Input/Average Output**

Activity Budget: Banana (1 acre)		banana price: EC\$/lb.		0.31
Output	Unit	Unit Cost(EC\$)	Quantity	
Bananas	tons	694.40	7.00	4860.80
<b>Total Return</b>	EC\$			<b>4860.80</b>
<b>Cost of Production (variable costs only)</b>				
NPK (fertilizer)	bag	50.00	10.00	500.00
SA (fertilizer)	bag	45.00	1.00	45.00
Lime	bag	19.60	3.00	58.80
Vydate (nematicide)	gallon	104.70	1.00	104.70
Mocap (nematicide)	15 kg	108.00	0.50	54.00
Gramoxone (weedicide)	lit.	12.00	5.00	60.00
Reglone (weedicide)	lit.	17.00	1.00	17.00
Round-up (weedicide)	lit.	34.00	2.00	68.00
Sleeving diothrene	roll(30kg)	111.40	1.00	111.40
Twine	roll	31.00	1.00	31.00
Harvesting materials	LS	100.00	1.00	100.00
<b>TOTAL MATERIALS</b>	EC\$			<b>1149.90</b>
Resupplying	md	30.00	3.00	90.00
Fertilizers	md	30.00	3.00	90.00
Nematicides	md	30.00	1.00	30.00
Weedicides/Trash management	md	30.00	7.00	210.00
Sleeving	md	30.00	6.00	180.00
Detrashing	md	30.00	2.00	60.00
Deflowering	md	30.00	11.00	330.00
Drainage	md	30.00	2.00	60.00
Propping	md	30.00	6.00	180.00
Pruning	md	30.00	10.00	300.00
Field Sanitation	md	30.00	2.00	60.00
Misc.	md	30.00	3.00	90.00
Total pre-harvest:	md	30.00	56.00	1680.00
Harvest:	md	40.00	42.00	1680.00
<b>TOTAL LABOUR</b>	MD		<b>98.00</b>	<b>3360.00</b>
other				
Transportation	LS	400.00	1.00	400.00
<b>Total Variable Cost</b>	EC\$			<b>4909.90</b>
<b>Return after Labour</b>	EC\$			<b>-49.10</b>
<b>Return before Labor</b>	EC\$			<b>3310.90</b>
<b>Return to Labour-day</b>	EC\$			<b>33.78</b>
<b>Return to Family Labour-day</b>	EC\$			<b>31.30</b>
Variable Cost of Production	EC\$/ton			701.41
<b>Variable Cost of Production</b>	EC\$/lb			<b>0.31</b>

**Table 4.2: Banana On - Farm Crop Model: High Input/High Output, Certified Farm**

Activity Budget: Banana (1 acre)		banana price: EC\$/lb.		0.31
Output	Unit	Unit Cost(EC\$)	Quantity	
Bananas	tons	694.40	13.00	9027.20
<b>Total Return</b>	EC\$			<b>9027.20</b>
<b>Cost of Production (variable costs only)</b>				
NPK (fertilizer)	bag	50.00	18.00	900.00
SA (fertilizer)	bag	45.00	2.00	90.00
Lime	bag	19.60	6.00	117.60
Vydate (nematicide)	gallon	104.70	2.00	209.40
Mocap (nematicide)	15 kg	108.00	1.00	108.00
Gramoxone (weedicide)	lit.	12.00	5.00	60.00
Reglone (weedicide)	lit.	17.00	1.00	17.00
Round-up (weedicide)	lit.	34.00	2.00	68.00
Sleeving diothrene	roll(30kg)	111.40	1.00	111.40
Twine	roll	31.00	1.00	31.00
Harvesting materials	LS	100.00	1.00	100.00
<b>TOTAL MATERIALS</b>	EC\$			<b>1812.40</b>
Resupplying	md	30.00	3.00	90.00
Fertilizers	md	30.00	3.00	90.00
Nematicides	md	30.00	1.00	30.00
Weedicides/Trash management	md	30.00	7.00	210.00
Sleeving	md	30.00	6.00	180.00
Detrashing	md	30.00	2.00	60.00
Deflowering	md	30.00	11.00	330.00
Drainage	md	30.00	2.00	60.00
Propping	md	30.00	6.00	180.00
Pruning	md	30.00	10.00	300.00
Field Sanitation	md	30.00	2.00	60.00
Misc.	md	30.00	3.00	90.00
Total pre-harvest:	md	30.00	56.00	1680.00
Harvest:	md	40.00	52.00	2080.00
<b>TOTAL LABOUR</b>	MD		<b>108.00</b>	<b>3760.00</b>
other				
Transportation	LS	740.00	1.00	740.00
<b>Total Variable Cost</b>	EC\$			<b>6312.40</b>
<b>Return after Labour</b>	EC\$			<b>2714.80</b>
<b>Return before Labor</b>	EC\$			<b>6474.80</b>
<b>Return to Labour-day</b>	EC\$			<b>59.95</b>
<b>Return to Family Labour-day</b>	EC\$			<b>67.93</b>
Variable Cost of Production	EC\$/ton			485.57
<b>Variable Cost of Production</b>	EC\$/lb			<b>0.22</b>

reduction of unit costs of production, is improving the fruit quality.

Since the Lome Convention was signed between the EC and ACP countries in 1976, St. Lucia has been benefiting from the related preferential trade agreement. Entirely based on the anticipated prospects and the confidence in the subsidised access to a guaranteed buyer's market, St. Lucia's agriculture transformed rapidly into a banana dominated single commodity sector. The banana industry developed rapidly into the economy's driving force. The year 1993 was a momentous one in the history of the banana industries of St. Lucia and ACP banana exporting countries. A new banana regime was implemented by the single European Market in July 1993. As a consequence, banana exports from St. Lucia to its major market, the United Kingdom, changed from unlimited duty-free access to a situation of quantitative restrictions to the tune of 127,000 tonnes per year with any additional exports being subject to duty. Since then and in the wake of the General Agreement on Tariffs and Trade (GATT), it is becoming increasingly apparent that the general belief in free-trading as the main instrument to develop sustainable markets will leave the European Commission little room for manoeuvre in order to restrict the import of the cheaper Dollar bananas (non-ACP) and will therefore gradually lead to a reduction and ultimately abolition of major multilateral and bilateral trade agreements. The World Bank predicted in 1993 that the ACP producers would, on a medium term basis, lose half of their market in a free-trade regime.

The medium term future of the banana industry in St. Lucia will therefore be determined by external factors impacting on the quota level accorded to dollar producing countries, and prices as well as the consequences of the recent outcome of the petition filed against the European Union at the World Trade Organisation by the American Government (and Latin-American banana producing countries). This concluded that the current marketing regime for bananas in the European Market is discriminatory. In September 1997, by handing down their judgment, the three appeal body members rejected 20 of the 23 appeal codes presented by the EU against the WTO's earlier ruling in May and finally confirming that the EU's banana import regime flouts fair trade rules. The EU is accused of guaranteeing high-cost Caribbean bananas access to the EU market which discriminates against producers in other developing countries, penalises consumers, and awards monopoly rents to banana marketing companies. Even if a future WTO ruling goes the EU's way, the regime's days are numbered. Since it was drawn up before the EU's last enlargement, a majority may no longer exist in the Council of Ministers to renew it. The regime's fate also hinges on the Lome Convention, the EU's main trade-and-aid instrument which expires in the year 2000. Any extension beyond that will depend on other WTO members' willingness to continue exempting it from the organisation's rules. It is therefore no secret that the guaranteed banana market will remain for a limited period only (2000 or 2002 when the EU banana rules expire) after which St. Lucia and the Windward Islands will have to compete on equal terms with larger producers whose costs of production are almost half and supplied quality better. Unless farmers can cut unit costs dramatically (which seems to be almost impossible at the already low input levels and the aforementioned restricted possibility of large-scale yield increases) and increase quality of produce the industry will not be able to survive, with catastrophic effects on the island's economy and social stability.

It can't be overemphasized enough that potential social unrest as a consequence of a further substantial decline in banana profitability/prices (on a medium term basis, and particularly after 2000/2002), would have an immediate and even more disastrous effect on the stability of the second foot of the economy, i.e. the tourism industry. As the development on the banana world market is clearly transparent, St. Lucia has little choice but to diversify the economy and seek with all resources available to reduce banana dependency. In order to maintain social stability in the long run and soften

the side-effects of economic transformation, immediate and determined action is needed.

### **4.3 Constraints to Economic Transformation**

As a consequence of the above, it is certain that the current agricultural land-use pattern and in its wake the economic base of most watersheds in St. Lucia will have to be transformed in order to keep up with the challenge of long-term sustainable economic growth, social stability and environmental protection. Nevertheless, in order to do so constraints have to be defined and prioritised before proceeding to action.

#### **4.3.1 Limitations for Land-Use Enforcement and Alternative Income Generation**

In order to safeguard and sustain the environmental equilibrium within the watersheds of the island, proper land-use is vital. As far as land-use enforcement is concerned, this is operationally and socially limited to economic and social infrastructure as well as the existing forest reserves, Crown land, and generally all areas which are severely endangered by the current environmental circumstances (e.g. severe risk of landslides). Generally, the construction of roads (and feeder roads), the enlargement of villages, and the illegal encroachment into the forest areas have to be strictly monitored and proper land-use ultimately enforced.

As far as the cropping pattern is concerned, agricultural land-use enforcement as part of watershed management is currently economically and socially unacceptable. In this respect any attempt to force farmers out of farming on steep land, e.g. > 25-30° is illusive. Apart from the enormous technical and operational difficulties to define for the individual farmer those areas of his/her plot that would have to be taken out of production (or would have to be modified in terms of crops grown), the current more than tense economic situation of farmers in St. Lucia precludes any intervention bound to face complete rejection by the farming population. Furthermore, the critical situation with respect to employment creation has to be taken into account. With an estimated average unemployment rate of 20% island-wide and with peaks as high as 35% in the southwest of the country (see also 2.2) it becomes evident that the present employment strategy must be to at least maintain current levels of occupation rather than embark on risky experiments.

Furthermore, investigations into the feasibility of employment transfers between agriculture and other sectors are not encouraging. Despite some pilot activities in a number of projects (e.g. ENCORE, Mabouya Valley Development Project etc.), the reconnaissance exercise revealed clearly that so called alternative employment possibilities or potential income generating activities are currently restricted or non-existent. For the bulk of farmers and agricultural labourers the only alternative is to work seasonally, e.g. in construction or sometimes go as farm worker overseas (USA Farm Workers Programme seems to be phasing out). The capacity of other non-agricultural sectors to absorb unemployed rural and mostly un-skilled labour was revealed to be negligible. The transformation of the economy, therefore, can only be achieved with agriculture and not against it. It is in this light that any approach towards environmentally sound watershed management will have to incorporate economically and socially acceptable instruments for agricultural development, and in particular agricultural diversification.

### 4.3.2 Impediments to Agricultural Diversification

Based on the current scenario and the evident future development with respect to the world market for banana, the need for agricultural and therefore economic diversification is more urgent than ever. The Agricultural Census 1996 indicates clearly that the area under banana cultivation has increased since 1986. Furthermore, the economic dependency on the banana industry, far from being reduced, has become even more dominant since that time. Although awareness of the need for diversification developed in the 1980s, and despite all efforts shown by the OECS, especially by setting up the Agricultural Diversification Coordinating Unit (ADCU), very little has been achieved *de facto* on a large scale. Although, there are a number of encouraging initiatives, such as the "Adopt a farmer" programme (St. Lucia Hotel & Tourism Association) or the "Greenhouse" programme focusing on flower and vegetables schemes (French Cooperation), the impact of these programmes will remain limited in terms of numbers of farmers and acreage involved. Most activities focus on farmers who can provide some economies of scale, adequate credit worthiness and preferably flat land suitable for irrigation where there is sufficient water<sup>11</sup>. It is important to further pursue these programmes but much more is needed in order to involve the core of the farming community, i.e. small to medium scale farmers characterised by limited capital resources, low technical skills, restricted access to arable land, and forced to cultivate on steeply sloping land or in flood-prone areas. Before proposing any catalogue of action, it is imperative to highlight the main impediments to agricultural diversification for the farming community in the island's watersheds.

#### i) THE KEY ISSUE - Lack of Markets and Marketing

When asked about their general motivation on gradually diversifying from banana to other crops, the unanimous answer of the farmers was not surprising. On the one hand, farmers still believe that banana prices and returns will go up again. On the other hand, they don't see any realistic possibility (crop) to seriously engage in alternative commodities. The predominant reason is the lack of available markets and of secured sale of crops produced. Most farmers declared that in the event of bananas becoming even more unprofitable, they would rather abandon banana fields than engage (invest) in a crop with doubtful prospects. Investigations made apparent that if an efficient and reliable marketing structure was in place and the sale of produce at an acceptable price could be ensured the majority of farmers wouldn't have any inhibition to gradually reducing banana production and seriously engaging in such alternative crops. The absence of stable markets and efficient marketing that links the farmers plot with the market or market agent has been revealed as the crucial issue to be addressed for successful diversification in agriculture.

In the same context, another important and related issue is the actual status of the technical advisory system with respect to market information. Farmers are relatively isolated from any sort of market information system, and reports produced, especially in UK and through ADCU, are not "translated" and seldom reach either the field extension officer or the farmer. The technical advisory system, including radio, does not provide any such information to the farmer in a practically useful way. No "hard" message with respect to possible alternative crops or markets reach *de facto* the farmer through the formal information systems.

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<sup>11</sup> For example, the "Adopt a farmer" programme is quantitatively irrelevant. Up to August 1997 only nine Hotels have "adopted" on average 2 farmers (total 18 farmers) who supply vegetables and fruit crops on a regular basis and based on contractual arrangements.

## ii) Lack of Technical Skills and Demonstration Plots

Based on the fact that farmers have been relying on banana as the main commodity for so long, technical experience with "new" crops has been revealed to be limited. This is equally the case with respect to the scarce knowledge of farmers vis-a-vis soil erosion prevention methods and proper drainage. Here again, the extension system has to be up-graded. Farmers expressed their interest and wish to see with their own eyes how a potential alternative crop is cultivated and what the yield can be. According to the farmers, on-farm demonstration plots for alternative crops in the vicinity of the farms would substantially contribute to the process of convincing them of their viability. In this respect the farmer would have to obtain exact data on input/output relationships and the expected net-return in financial terms (i.e. cost of production and current market prices for the produce).

## iii) Praedial Larceny

Another important impediment for a shift from banana to other crops is the incidence of praedial larceny. Without exception, all farmers interviewed feared the possible theft of crops grown, especially root crops and vegetables. As already pointed out above, due to the abundance of fruit, bananas are largely immune from the ravages of theft whereas for other crops, theft is probably the largest category of loss. A substantial increase in planting of tree crops would alleviate this problem. Despite the existence of the *Praedial Larceny Act* that provides powers to prosecute those who steal produce from others, in practice the enforcement is almost impossible. The MAFF&E has appointed two produce inspectors to monitor the incidence but no significant impact can be expected from this attempt. Farmers tend to believe that any such inspector could even himself become involved in illegal actions attracted by whatever sort of shared returns. Moreover, the seriousness of praedial larceny is mirrored by the fact that some communities have considered the establishment of "watch teams". In the *Marc* community (Cul-de-Sac) for instance, such a watch team composed of three members has been set-up. Working in shifts these teams are supposed to patrol the community area on a 24-hours basis.

## iv) The Belief in Banana

There is still an unbroken, deep-rooted, belief by farmers in the strength of banana production. As described above (4.2), a large proportion of the farmers grew up with banana and many of them have hardly any experience with other cash crops, except for a number of traditional root crops. On average, banana farmers in St. Lucia have been involved in banana production for about 20 years. The reconnaissance exercise revealed that farmers can hardly recall which crop was grown on their land before they started farming. In most cases the land was either cleared from forest or secondary vegetation or banana plants were already there when the land was bought, rented, inherited or occupied. In view of the serious situation it is necessary to acknowledge that farmers (and the economy) have been spoiled by two decades of guaranteed banana market and respective high returns.

Apart from these four major issues, there are a number of other limitations inhibiting the progress towards agricultural diversification. The following socio-economic features are generally considered impediments to agricultural development in St. Lucia, and in general to any attempt towards intra-sectoral changes. However, investigations revealed a rather different picture.

The prevailing ownership pattern or land tenure in agriculture is often cited to be a major barrier to effective diversification, particularly towards tree crops. However, the reconnaissance exercise revealed that this argument is only valid to a certain extent. Although it is true that, the percentage of owned land is currently not more than 52%<sup>12</sup>, the implications of family land ownership (30%) on the practicability of diversification are much less serious than generally claimed. Farmers cultivating family land reported that the decision on what crops to grow is mostly a personal one, namely of the person to which the respective plots have been assigned by the family, although in some cases such a decision has to be taken by the family as a whole. Furthermore, it was reported that provided economically viable production systems are proposed there is little scope to believe that changes in cropping pattern would not be accepted by other family members. The third most important category of land tenure is rented land (13.5%). Within this form of land ownership the percentage of land rented from Government increased from 2.8% to 4.4% within the last ten years. Normally, these are long-term lease agreements which leave the farmer the possibility, by contract and psychologically, to freely chose which crop to grow. Therefore, taking into account that on about 80% of all agricultural parcels (owned, family land, rent from Government) the question of land tenure is not a serious limitation, current government thinking concerning land ownership constraints to diversification are in need of revision. Similarly, with on average 1-2 plots per farm, land fragmentation in St. Lucia is not a major issue.

The incidence of advanced farmers age and consequently unavailability of labour force is generally mentioned as another constraint to agricultural development and diversification. However, the reconnaissance exercise revealed that male farmers are mostly around 50 years of age (47 years, WINBAN survey). For women farmers the average age was found to be even lower. It is sufficient to say that the current average farmers age is in accordance with general socio-demographic expectations and does not represent a major constraint as such<sup>13</sup>. Nevertheless, the fact that the farming generation of today is predominantly middle-aged, evidences the difficulties associated with a low level of formal education and the willingness to participate in broader community-based initiatives. More important, however, is the fact that the younger generation is generally reluctant to engage in farming being sometimes even opposed to helping out on the parents land without any direct cash payment. Mainly due to the low esteem of farming, the young people express their unwillingness to take over the farm from their parents. Underlying factors contributing to this problem are not only the declining reputation of traditional farming as a profession but the exhaustive manual work, the limited acreage and low income. Younger people see no hope of farming meeting their expectations of consumer goods and comforts. However, contrary to most other investigations in this field, the reconnaissance exercise revealed that shortage of labour, as such, is not an issue, not even during harvest days. The unanimous response was that, although expensive, labour was continuously available throughout the year *as long as they are paid*. However, the fact that family labour is becoming scarce forces farmers to hire more farm workers which contributes to increasing cost of production (financially). However, whether family or hired labour is used, this does not influence the profitability of production, in economic terms.

Another frequently cited impediment to investments in farming, for tree crop cultivation in particular, is the question of access to credit. Most farmers interviewed during the reconnaissance exercise were familiar with the procedures for obtaining agricultural credit. Many of them had previous experience, mostly for buying farm land or a pick-up. The WINBAN survey confirmed that almost 50% of all

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<sup>12</sup> *Agricultural Census 1996, op.cit.; WINBAN (op.cit.) estimates the land tenure distribution for banana farmers in St. Lucia: owned 52%, family land 30%, rented 13.5%.*

<sup>13</sup> *In comparable watersheds of Jamaica, the average farmers age is 53.*

banana farmers have had experience or currently use credit<sup>14</sup>. Formal sources of credit are predominant (> 90%). Although, there is a general tendency to avoid the use of credit, farmers reported a willingness to borrow money for investment in farming as long as the related sale of produce could be ensured. Female farmers representing about 11% of all banana farmers in St. Lucia (WINBAN), reported no gender related problem regarding access to credit. However, access to credit may well be an issue for some farmers whose land is family-owned. But even in these cases, most credit unions still provide credit as they do not request formal collateral on land. In summary, access to credit cannot be seen to be a major impediment to changes in St. Lucia's agriculture.

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<sup>14</sup> *Although indirectly, most banana farmers use credit continuously through the cess mechanism of SLBGA.*

## Chapter 5

### Action Priorities for Sustainable Watershed and Environmental Management

Based on the above findings this chapter highlights the immediate action priorities with respect to the general socio-economic dimension of watershed and environmental management planning in St. Lucia<sup>15</sup>. As mentioned before, these recommendations have to be seen against the background of sustainable watershed management being crucial for economic growth and social stability of the country as a whole. The following deals basically with action areas which are of vital importance for the medium and long-term sustainability of the country's watersheds, social, economic and consequently environmental future. Therefore, the inclusion of these proposed actions is indispensable to the sound implementation of the National Watershed and Environmental Management Plan.

#### 5.1 National Task Force for Agricultural Diversification & Marketing

The economic situation described above calls for immediate and determined action towards diversification. For more than a decade, the idea of diversification of the agricultural sector has been discussed and analysed. There is no need for sophisticated research to come to the conclusion that *de facto* little has been achieved in the field of agricultural diversification over the past ten years (compare 4.3.2). Furthermore, the natural and economic environment to support banana production is becoming increasingly marginal and with the development of the banana world market shifting towards rapid market liberalisation and free trade (compare 4.2) it would be politically, socially and economically irresponsible to delay determined action towards economic diversification in St. Lucia. Falling profitability of bananas in marginal hillside areas and financial disincentives embodied in the Certified Grower Scheme, could well encourage a trend towards alternative cropping. There is an inherent danger that farmers could move into annual cropping with disastrous effects on soil erosion. This emphasises the need for rapid government action in promoting tree crops. However, at the present time, despite the threatening prospects to the economy (see above), there are no specific plans in place which seem appropriate for the rapid and large-scale transformation necessary. The thrust towards diversification does not seem to be currently supported by major programmes of research and development. Technical Annex 6, Possibilities for Alternative Cropping, discusses the topic in greater depth.

The efforts of the OECS (through its Agricultural Diversification Coordinating Unit, ADCU), the Caribbean Research and Development Institute (CARDI), the University of the West Indies (UWI) and the Inter-American Institute for Cooperation (IICA) are having some marginal impact, but none of this has resulted in a major diversification into crops capable of supplanting bananas in visible trade. The agricultural sector faces the task of breaking with the past and shifting into new lines of production many of which must immediately ensure the certainty of an earnings stream that bananas achieved in the hey-days of the industry. The required shift out of banana production represents momentous psychological and social changes for the farmers, and requires far more than the traditional extension efforts to effect the change over. The task for the agricultural sector, in particular, is to manage the transition into new forms of production which are currently ill-defined. The challenge that the government of St. Lucia and all stakeholders of the economy face relates to the mechanism to be put in place to provide a reliable marketing and distribution network capable of delivering high quality

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<sup>15</sup> Issues and action needed with respect to the threatening state of people's perception and limited knowledge on land conservation and drainage are further elaborated in the Community Participation Programme for Watershed Management, technical annex (2).

produce from a diversified agriculture to fastidious external markets. The banana experience proves that in can be done. If the farmers, affected by the changed competitive rules of bananas, are to be saved from poverty, then a comparable marketing infrastructure must be developed for the produce into which they are to be encouraged to shift. While this is best private sector driven, the government will have to assist in the area of institution and infrastructure building and cannot abdicate its responsibility in this regard. However, there is need for great caution, since the transition to alternatives to banana production requires deft management to avoid the destitution and rural-urban migration that attended the collapse of the sugar industry in the late 1940s. It is at the level of the State that the full social costs implications will have to be addressed.

One approach could be the establishment of a National Task Force for Agricultural Diversification and Marketing at the institutional level of the Prime Minister's Office comprising the most powerful stakeholders in the economy, such as:

Ministry of Planning

Ministry of Agriculture

Ministry of Finance

Ministry of Trade and Industry

Ministry of Transport

St. Lucia Marketing Board

St. Lucia Chamber of Commerce

St. Lucia Fresh Produce Exporters Association

St. Lucia Hotel and Tourism Association

St. Lucia Tourist Board

St. Lucia Banana Growers Association

Windward Island Banana Development and Exporting Company

East Caribbean Exporters Association

National Farmers Association

National Trust

Private sector business and trade representation (incl. farmers and farming communities)

It must be emphasised that the implications of agricultural diversification in St. Lucia go far beyond the mandate of the Ministry of Agriculture but impacts directly on trade, commerce, industry, transport and tourism (the latter in terms of the in chapter 4.2. mentioned potential impact of social unrest and the aim of gradually substituting the import of agricultural products). The above forum would have to investigate pragmatic ways to facilitate and stimulate private (and public) investment for the agriculture related economic transformation of the economy. To a large extent the assessment of potential diversification alternatives is synonymous with the evaluation of the market entry of a firm. The major forces that influence such a decision are: the structure of the respective industry; supply considerations, including strategies of existing firms; the nature and characteristics of the demand for the product; the market access conditions in the importing countries for the commodities concerned; the ability to acquire key inputs; and the industry in context of the economy in general. The complex interface between governments, international donors and private sector on issues of financing options and determination of proper balance of economic and social goals is critical to the evaluation of banana diversification alternatives. It is important that such a Task Force does not just delineate recommendations but it should have the mandate and the means to induce immediate changes in economic policy and related legislation. Furthermore it would need the necessary financial resources, e.g. within the framework of a donor-financed national investment project/programme, in order to guide and execute pragmatically the aggressive marketing strategy needed. This would, entail:

- Inviting potential investors to St. Lucia in order to explore ways and conditions for investment and business establishment;
- The search for alternative commodities has to be started from the demand end. According to the proposals made by potential national and foreign investors, comprehensive market feasibility studies have to be commissioned that look into local and international demand for potential commodities to be grown/produced/processed in St. Lucia. It is important that these studies determine and quantify the needs in marketing infrastructure on the island as well as the sensibility of different options with respect to changing commodity and input prices.
- Creation of an attractive business environment including the elaboration of investment incentive packages for potential investors, exporters, trade and shipping companies. This could include tax holidays for two years after business establishment/investment, reduction or exemption from customs/import duties and port handling charges and taxes, reduction of utility charges, facilitated access to credit, etc.

The ultimate objective would be to attract and boost business and commerce in order to set up direct market linkages between the producer (farmer) and the market agent or market. This seems to be one of the few possibilities to induce the farmer to engage seriously in alternative crops. Private sector marketing mechanisms such as contract farming, crop advisory service, provision of inputs and crop-credit availability, crop transport and processing arrangements would be of primary importance. SLBGAs and WIBDECOs expertise and facilities would be beneficial, especially in order to kick-start new lines of marketing. In this context it is also vital to broaden the geographical focus from UK/EU in order to tackle with determination other regional and international markets, the North-American Market and the US in particular. The USA is the biggest single country buyers market in the world and offers to St. Lucia economic advantages for many crops from the geographical and logistical point of view (e.g. frequency and costs of sea/air transportation within the Caribbean and to the US). For logistical reasons and in order to achieve the some times necessary economies of scale, coordination with other Caribbean islands should be continued. However, the latter should be promoted in a purely business (private sector) minded way avoiding involvement in situations of political embarrassment and dependency.

Other approaches are explored in Annex 6 and further developments of this theme, including external support, are contained in the Main Report.

## **5.2 Reform of the Agricultural Advisory & Information System**

In order to tackle the main issues related to the inefficiencies in the current agricultural advisory and information system a follow-up for implementation on the following recommendations is strongly advised:

- (a.) Streamlining of the Agricultural Advisory System.

The current situation whereby SLBGA field officers and agricultural extension officers are responsible for giving advice<sup>16</sup> related to agricultural production has revealed decisive deficiencies. For the sake of better resource use and increased efficiency it is recommended to unify the advisory system (including

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<sup>16</sup> SLBGA officers have basically the mandate to advise banana farmers with respect to leafspot control and post-harvest related aspects of banana production.

the current mandate of SLBGA field officers). Such a coordinated agricultural advisory service would have to incorporate a mechanism that provides up-to-date market information transferred in a "digestible" manner to the end-user (farmers). Another important issue is the mobility of the extension staff. Government could consider giving loans for cross-country motorcycles, which have proved to be successful and cheap in other countries. Generally, there is an urgent need to review the advisory system from the point of view of operational effectiveness and motivation, staff needs (in numbers and in terms of training) and financial requirements. On a long term basis a transformation of the agricultural extension into a private sector and commodity driven system would have to be considered seriously.

(b.) Training Needs.

There is an urgent need to train extension staff (including current SLBGA field officers) in the areas of soil conservation on banana and annually cropped land, drainage, and the cultivation aspects of non-traditional crops. The staff would be available to give technical support to WMAF's.

(c.) On-farm Trial & Demonstration Programme.

While there is an urgent need to embark on a programme of demonstration plots, this can only be done once all existing data has been reviewed, and crops of known profitability, ecological compatibility and for which markets exist, identified. Technical Annex 6, expands on this theme.

Once new cropping system have been determined and costed, the demonstration plot programme would be progressively expanded inline with WMAF development, with the objective of achieving maximum impact on farmers. The demonstration plots would include appropriate soil erosion prevention and drainage methods. As mentioned earlier, a properly implemented on-farm trial programme (in the vicinity of the farms) combined with enhancing the potential marketing environment seem to be essential for any attempt towards agricultural diversification. The main purpose of these demonstration plots is not the agronomic experiment but the psychological effect achieved in seeing a potential crop grown on the farmer's plot. However, the opportunity to gather sound data on inputs and outputs should not be ignored and the process would lead to ever better estimates of gross margins<sup>17</sup>. Regular and systematic observations would also lead to a deeper understanding of management parameters .

### 5.3 Determined Action against Praedial Larceny

Based on the above findings (4.3.2) there is a need for determined action against the incidence of praedial larceny. A number of attempts have been undertaken in the past few years with little success. Governments' latest plans are to undertake a growers registration/licensing exercise island-wide. Use could be made of growers/producers lists of the SLBGA, Marketing Board and other organisations or groups with farmer memberships. Once registered, whoever sells agricultural produce would have, on request, to identify him/herself and reveal the name of the respective grower. No produce should be allowed for trading without a declaration of origin. In addition, and in view of the magnitude of the matter, consideration would have to be given, through legislation, to substantially increasing the punishment for breaking the law. (*Praedial Larceny Act 13/78*). A large increase in the number of

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<sup>17</sup> The prominent instrument of comparing cost of production of competing crops is entirely meaningless unless the existing or a potentially realistic market value (price) can be applied for actual profitability analysis.

fruit trees and planting in orchards could drastically reduce this problem.

The above priorities call for the active responsibility of the government and of other political/economic stakeholders from the private sector. However, in order to reverse the current situation of environmental degradation and economic stagnation with respect to the resource base of the island's watersheds, the issue of wider social responsibility has to be tackled pragmatically. Peoples participation and community initiatives are increasingly recognised as indispensable parts of sustainable management of natural resources. Experience suggests that the benefits of environmental management are more likely to be achieved when the ultimate clients are actively involved in designing and implementing the work necessary. It is important to make people understand that watershed management in St. Lucia is certainly not to be seen as an activity of ecologically minded naturalists but as a paramount necessity in order to safeguard and sustain the economic well-being of the people. In this context the most serious issue in watershed management is how to prevent further expansion of cultivation into St. Lucia's remaining forest areas and persuade the farmers cultivating steep hillsides to give up practices which cause soil erosion and subsequent flash floods, river siltation, crop and properties' damage and deterioration of land and water quality in downstream areas. Furthermore, clearing works of drains need the active involvement of the local population and can only be effective if coordinated with landowners work on-farm. All this can only be achieved if based on active community participation and transfer of responsibility to the local strata. A detailed description of the Community Participation Programme in Watershed Management, is given in Technical Annex 10.

# **Annex 9**

## **Appendix A**

## Appendix A

### RECONNAISSANCE SURVEY/EXERCISE - Farmers/Peoples Informal Interview Checklist -

It is important to be aware of the fact that the informal reconnaissance methodology, as an exploratory tool, requires a high degree of flexibility by the interviewer during the field work. In other words, it is not the task of the interviewer to collect all information based on the "checklist" but to assess the relevance of respective data requirements for the individual case (interviewed person) and for the sake of the overall objective of the exercise/study. The so-called semi-structured questionnaire is therefore just the basis for the discussion with the interviewee and quantitative data are only exceptionally collected during a reconnaissance exercise. The main text of the above technical annex contains all relevant conclusions derived from the information which was finally made available during the field exercise.

#### Farmers/Peoples Informal Interview Checklist

##### General Aspects

- sex of head of household
- location of residence
- household composition (how many persons belong to household; out-migration)
- age profile
- availability of household members for farm work
- permanent/seasonal hired labour force (for what activities, which months)
- main source of income** (full-time/part-time, incl. of other household members)
- main crops (in acres or plots)
- land use pattern, acres of land cultivated, land left idle
- topography of plots
- type of tenure** (family land, own, rent, squat)
- land problems** (erosion, flooding, stony etc.)
- location/distance** to roads, village, river etc.
- own vehicle/management of transportation (of banana crop)

##### Soil Erosion/Flooding/Landslides

- perception on flood rains, soil erosion (washing of land), flooding, landslides**
- type of preparation towards flood events**
- perception of economic losses involved, main sort of loss/damage**
- perception/importance of prevention methods and drainage**
- perception of cause/effect relation (which are main reasons for these problems)**
- soil erosion prevention methods applied, drainage activities
- perception on inter-cropping, contour farming, trash cover, minimum tillage, vegetative barriers, cross-slope barriers, run-off drains, simple gully control
- reasons for banana cultivation (open land cultivation) on steep/flood prone land
- implication of land tenure (family land) with respect to effective soil conservation and drainage, e.g. planting of trees, intensive soil erosion control, maintenance of drains etc.
- perception on and level of diversification, tree crops production, potential alternative

- crops, impediments (e.g. praedial larceny, all but banana)
- tree crops on the farm (mango, avocado, citrus, breadfruit, coconut, cacao, other)
- which tree crop would be preferably grown, what sort of assistance needed
- efficiency of extension towards diversification, soil erosion prevention etc.
- perception on preventive measures
- general knowledge/information on watershed management available
- need for community involvement in prevention/works implementation, education, training, information

#### Income

- different sources of income sources (% distribution)  
(on/non-farm, off-farm, other h. members, remittances)
- level of monthly/annual income by source of income (farm income in particular)
- percentage of income by banana
- where is the money invested (in agriculture or other, and why)
- current and potential relevance of other on- and off-farm earnings/employment

#### Banana crop budget

- cost of production and yield of banana crop per acre and year
- why do farmers stick to banana
- to what level has the price to drop in order to leave banana production
- banana revenue covers cost of production?
- % of hired labour in banana production
- comparable hired labour rates in the area
- different hired labour rates (harvest and non)
- fixed/imputed costs

#### Other

- estimate of economic loss during TSD and 26 October 1996
- labour availability
- efficiency of marketing, price levels
- access to technical assistance, by which service/organisation
- access to credit/services (source), collateral needed, experience, gender relation

#### **Individual Farmers Interviews:**

	<b>Dennery River Watershed</b>	<b>Cul-de-Sac River Watershed (and other)</b>	<b>Total</b>
steep hillside (mainly banana)	5	6	11
on flood plains	4	5	9
Total	9	11	20

Farmers selected had to be representative for the area in terms of acres cultivated, income, number of

household members, and gender of head of the household. The selection procedure was based on consultation with local extension officers and on random investigations, i.e. "road-side" selection.

**Interviews with people residing/working in flood prone/landslide areas:**  
(incl. Denmery village, Bexon, Ravine Poisson)

Carried out by driving/walking through the respective affected areas and talking to people. Special attention was given to people residing along rivers and in flood-prone landslide areas. Women and children were included, the latter in view of the educational importance of the matter investigated.

Total number of interviewees: 25 (excluding individual farmers, see above)

# **Annex 10**

## **Community Participation Programme in Watershed Management**

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# St. Lucia : Watershed and Environmental Management Project

## Final Report Annex 10

### Community Participation in Watershed Management

#### Chapter 1

##### Background and Rational

In order to work out a feasible action plan for watershed and environmental management it is imperative to explore and define as accurately as possible the main constraints hampering the sound and sustainable management of natural resources. Although there may be a number of socio-economic factors inhibiting watershed development, there is a need for immediate action and practicability of approaches indicates that prioritisation must be the ruling parameter for decision making. In the light of future prospects in watershed management three broad socio-economic areas become apparent as being strategically the most important:

- the interpretation of the current and future role of banana cultivation;
- the impediments hampering the socio-economic transformation needed;
- the people's perception of natural hazards, their causes, and the need for land conservation and drainage.<sup>1</sup>

Soil erosion represents one of the main problems in agriculture worldwide. Poor soil and water management, intensive production on vulnerable land, overgrazing and deforestation undermine the capacity of soils and create obstacles to increased crop, feed, and fuel production. In the past, most natural resources were considered common property, providing a productive base for crops and other basic needs. Today, however, the continued dependence by an increasing number of individuals on a finite natural resource base results in over-exploitation of the resources and a serious loss of productivity. Furthermore, soil erosion and water run-off also increases the cost to rural (agricultural) and urban communities through devastating floods and landslides.

People in St. Lucia are generally aware of the potential danger of torrential rainfall and flooding. The reconnaissance survey<sup>2</sup> carried out during the project showed that when asked about the causes of the devastating flooding resulting from Tropical Storm Debbie, the most frequent answer was *cutting down the forest* (deforestation) and no body mentioned agricultural land use as such. However, some farmers expressed the opinion that *god is responsible for sending the heavy rains and that mankind has no possibility to control the consequences, such as flooding and landslides*. This "explanation" is quite sensible considering the fact that people could hardly recall a similar devastating flood event during their entire lifetime<sup>3</sup>. Furthermore, the rainfall resulting from TSD is generally believed to have been of the intensity which occurs once every 50 years.

With respect to soil erosion, the general understanding about the direct relationship between topsoil run-off on sloping/steep land and flooding (siltation/blockage of rivers and main drains) in the downstream areas/plains was limited and not well understood. Nevertheless, once explained the farmers agreed that *this cause/effect explanation could be true*. Generally, farmers were not very aware of the soil (silt) washed downstream but were almost exclusively concerned about *the masses of water that cause damage to crops, roads, bridges and houses*. In this respect the incident of surface erosion as a

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<sup>1</sup> Socio-economic factors (i.) and (ii.) are dealt with in Annex (9): Main Socio-Economic Issues in Watershed and Environmental Management Planning.

<sup>2</sup> For details on the methodology used for the reconnaissance survey, see appendix I in Annex (9): Main Socio-Economic Issues in Watershed and Environmental Management Planning.

<sup>3</sup> A few persons said that hurricane Allen caused equal damage in 1980.

consequence of flooding on plains was seen as possibly the main problem by farmers in flood-prone areas. In fact, "erosion" was normally associated with surface washing of land rather than with top-soil run-off from steep land. Hillside farmers were much less concerned about the issue of land conservation and flooding than those cultivating in down-stream areas.

The risk of landslides after heavy rain was considered only by some farmers in areas widely known for landslide hazards (e.g. Marc, Ravine Poisson). Here again, the impact of land use, be it through cultivation practices, construction of feeder roads or enlargement of human settlements was not seen as contributing to flood damage or land degradation. Moreover banana cultivation with its limited ground cover was never blamed for degradation and drainage. The fact that flooding and heavy rains contribute substantially to the inefficiency of the fertiliser use, especially on steep hillsides, was not always known by the farmers interviewed.

The need for drainage was widely acknowledged and all farmers interviewed drained their fields by maintaining simple run-off drains. However, most of these drains, especially those in the hillsides, were not placed along the contour line and were not properly maintained. Reasons mentioned by farmers for the noticed negligence in drain maintenance were *an expensive labour force* and *lack of technical knowledge*. All farmers asked for assistance in proper on-farm drainage. In this context disputes between neighbouring farms concerning the responsibility of cleaning drains leading to the main stream, were frequently reported. Finally, village residents usually acknowledged the need for educating people not to dump waste and garbage into drains and rivers.

In conclusion, it was apparent that the general perception of land conservation, drainage, and environmental management by farmers and by a large percentage of residents in the watersheds is far from adequate. The most critical aspects of this analysis are:

- Except for surface erosion on plains, soil erosion as such is not regarded as a problem;
- Flooding and landslides are often characterised as being unavoidable;
- The impact of land-use is viewed mostly from the angle of de-forestation only;
- Farmers lack the knowledge of suitable soil erosion prevention practices and proper drainage of fields (i.e. insufficient technical advisory service);
- Residents in the flood plains/flood-prone areas are aware of the dangers associated with flooding but mostly blame the government for not clearing/maintaining the main drains properly.

In order to gradually reverse the current environmental degradation and economic stagnation with respect to the resource base of the island's watersheds, the issue of wider social responsibility has to be tackled pragmatically. Peoples participation and community initiatives are increasingly recognised as indispensable parts of sustainable management of natural resources. Experience suggests that the benefits of environmental management are more likely to be achieved when the ultimate clients are actively involved in designing and implementing the necessary work.

It is important to make people understand that watershed management in St. Lucia is not to be seen as an activity of ecologically minded naturalists but as a paramount necessity in order to safeguard and sustain the economic well-being of the people (see also Annex 9). In this context the most serious issue in watershed management is how to prevent further expansion of cultivation into the remaining forest areas and persuade farmers cultivating steep hillsides to give up practices which cause soil erosion. Furthermore, the clearing of drains needs the active involvement of the local population and can only be effective if co-ordinated with the landowners work.

All Government efforts would be useless without the co-operation of farmers and those living/farming by riversides and on the sloping lands of the watersheds. To change not only agricultural but also general behavioural/educational attitudes that have a negative impact on soil conservation, drainage effectiveness, and on flow of rivers, will take patience and determination. The well documented acceleration of soil erosion and soil fertility decline and the frequent occurrence of natural disasters and consequent economic loss related to the mismanagement of the watersheds calls for an urgent and radical change in watershed and environmental management. This will only be achieved if based on active community participation and transfer of responsibility to the local communities.

## Chapter 2

### The Need for a Community based Organisation and Sustainability

In St. Lucia, the earliest community based organisation (CBO) emerged in the post-emancipation period with former slaves creating institutions of their own to pool resources and to provide some form of collective economic and social security. Some of the oldest Friendly Societies can trace their lineage to such initiatives. The Friendly Societies extended their scope, becoming in some cases, credit unions - more formal economic institutions. The 1970s brought a qualitative change among CBOs in St. Lucia and the Caribbean, with the development initiatives of the Caribbean Conference of Churches which led to the transformation of many vibrant CBOs into NGOs. The advent of grant funding, accessible through well-written project proposals, changed the focus of these CBOs from community self-reliance to community development; and their structures experienced a corresponding change from loose associative structures to more bureaucratic forms resembling the official structures from which they sought to create alternatives. Notwithstanding the greater dependence on external funding, the movement from CBOs to NGOs helped many communities to discover a greater capacity for improving life. Where the Friendly Societies of the past undertook social action, directed at ameliorating the conditions of specific groups; the CBOs/NGOS were able to act on a broader stage, challenging the State, confronting its deficiencies and undertaking community development initiatives. However, the demise of the local government system has been a major structural factor affecting development at the village level. This system of elected local government was suspended in 1980/81 as a result of allegedly undue partisan political influence in the local government electoral process. This form of local governance, while not exercising extensive jurisdiction was nevertheless important as a vehicle for leadership formation at a community level and for improving local services such as sanitation and waste disposal. The demise of the system left a void which CBOs have sought to fill.<sup>4</sup>

Today, most communities in St. Lucia are characterised by an increased reliance on central government for meeting even the most basic needs, a sense of dis-empowerment, the loss of accountability of local officials to the community, and the weakening of community leadership and community engagement. However, in the absence of "official" mechanisms for generating and revitalising community leadership and participation, the CBOs have emerged as a useful instruments able to address some of the needs of rural communities. Nevertheless, CBOs in St. Lucia are characterised by strengths as well as sometimes chronic weaknesses.

The elected local government provided a form of official accountability not exercised by the CBOs and it is this element that ensures the sustainability of the community development initiatives. CBO leaders have had to face the challenge of defining meaningful, tangible activities which could stimulate broad community participation and involvement so that everyone in the community is able to find a role for him or herself in the process of community development. The electoral process facilitates the rejuvenation of leadership, bringing new actors to the stage. However, often the leadership is personalised, limited to a core of the membership and with provision for succession. Generally, the short life span of many CBOs can be attributed to the absence of leadership and succession options after the initial dynamic leadership has left the scene. In addition, CBOs often rely on just a few people to do most of the work within a limited organisational capacity. Much depends on the knowledge of the persons involved in the state agencies or other sources of support and on how to access them, on their ability to plan and successfully execute community projects and on their ability to mobilise community resources. Not every idea or project should be handled through a CBO as these organisations must recognise their limitations and learn to distinguish when a desire requires advocacy or lobbying of institutions with a stronger capacity to implement than the CBO. The projects undertaken by CBOs should be commensurate with their capacity to plan and implement. While there is nothing wrong with CBOs taking on community development challenges, it is necessary for them to do so with a realistic sense of what they can achieve. Another issue for many CBOs is the difficulty of steering well clear of partisan political influences or even denominational religious differences.

Although it is important to be aware of the potential constraints, CBOs have still proved to be an efficient instrument in community mobilisation and participation on a long term basis.

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<sup>4</sup> Gray, Steve and Jules, Didacus: *West Coast/St. Lucia - Assessment of Community Based Groups, ENCORE Project, Castries 11/1996.*

The Community Participation Programme in Watershed Management (CPP-WM) has been developed based on a thorough constraint analysis in order to avoid, to the extent possible, the general shortcomings of CBOs and to achieve long-term sustainability. The basic features of successful CBOs are:

- a clear and specific geographic focus usually limited to a specific community or location;
- local management and control;
- a clear agenda emphasising single local issues/needs of general priority.
- the leadership must be energetic and capable of mobilising support behind the goals of the organisation even where direct participation might be limited;
- opportunities must be created for members of the community to contribute in different ways according to their differing capacities;
- successful CBOs must be self-reliant, undertaking their own fund-raising activities and providing support mechanisms for membership.

The current pilot programme is located in the watershed of the Dennery river, however, the intention is, within the framework of the National Watershed and Environmental Management Plan, to replicate the programme for all the main watersheds of St. Lucia on a medium term basis, possibly within the next ten years (1998-2007).

In order to achieve the highest efficiency possible with respect to community participation and to avoid duplication of efforts and resources as well as overlapping of command areas, maximum use must be made of existing initiatives and institutional structures. Nevertheless, a strong and continuous commitment by the communities, the Government and the individual residents of the watersheds will determine the long-term sustainability of the programme.

## Chapter 3.

### The Community Participation Programme: Main Features

This Chapter highlights the main features of the Community Participation Programme in Watershed Management (CPP-WM) whilst Chapter 5. and the Appendices provides details of the most important aspects of the programme as well as guidelines for application or replication of the approach.

#### 3.1 Institutional Setting

Under the authority of the *Land Conservation and Improvement Act of 1992*, the *Land Conservation Board (LCB)* is responsible for the general supervision of land and water resources island-wide<sup>5</sup>. The same Act defines a legal provision for the institutional establishment of local entities. In this respect, the GoSL has agreed with the concept of using so-called local *Watershed Management Action Force (WMAF)* groups as a way of ensuring community participation for sustainable watershed management.

It is important that the name used for this community group reflects both the strength and importance of its mandate, and a firm and adequate institutional setting. The term WMAF has been adopted in favour of the more formal Land Conservation and Drainage Committees.

The WMAFs will be institutionally headed by the Land Conservation Board and will be responsible for land conservation, drainage and other watershed management related issues (see Section 3.2) within one or more watersheds. In this context, it would be advantageous if GoSL would match the boundaries of the eight administrative regions to watershed boundaries. The jurisdiction of the WMAF would extend to all parts of the watershed where an existing authority does not already have control, e.g. the Queen's Chain or in forest reserves where authority rests with DCA and Forestry Department respectively. The enforcement the provisions of the Land Conservation and Improvement Act, for example the declaration of Protection Orders will be the responsibility of the LCB rather than the WMAF.

Operationally, a *Watershed Management Unit* to be established within the Agricultural Engineering Division of the MALF&F will meet the administrative demands of the LCB and WMAFs and in particular help to prepare the respective annual operational and financial budgets. With respect to river related works, the LCB/WMAFs would be assisted by a *River Management Unit* which would be expected to work closely with the WMAFs, determine the river and main drainage works and either carry out the necessary capital-intensive work itself or by contract. Additional direct support in technical matters would be ensured by *Agricultural Extension, Forestry Extension, the Coastal Management Unit* and the *Solid Waste Management Authority*. Furthermore, external support would be provided by a number of organisations and groups which would have to be represented either in the LCB and/or form part of the respective local WMAF. When requested by a WMAF, the authority of the LCB would institutionally ensure the continuous and direct assistance of the support groups, governmental in particular (e.g. Agricultural and Forest Extension). The requests for support would be processed through the Watershed Management Unit as the operational catalyst between WMAF and LCB. A CPP Co-ordinator would be assigned to the Watershed Management Unit in order to facilitate and streamline operational matters of the programme (CPP-WM).

At field level, direct day-to-day support in technical matters would be provided by a Technical Operations Team (TOT) seconded to the CPP-WM and supervised by the Watershed Management Unit (see Section 3.5 and Appendix A). The number of TOTs may gradually increase according to the needs arising during the replication process of the CPP-WM.

With respect to existing community groups it is possible that watershed specific arrangements will become more appropriate for the formation of WMAFs than a rigid pre-defined institutional arrangement. This means that apart from the co-ordinating and empowerment function of the LCB, existing and efficient community groups could be used as a vehicle for WMAF formation. However, in

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<sup>5</sup> In this context a wider definition of the Land Conservation and Improvement Act would be useful and even the name of its Board could be modified by including the words Watershed Management, e.g. Watershed Management Board.

order to achieve the most fertile institutional environment a number of general issues remain:

- (i.) Unfortunately the Land Conservation Board which should spearhead land conservation and improvement work has only met once (14 November 1995). Despite the resolutions of its first meeting, no progress has been made towards formulating Regulations. Government should therefore be urged to resuscitate the LCB as soon as possible.
- (ii.) With respect to the composition of the present LCB it is noticeably short of farmers, SLBGA and generally speaking of non-government representation. In view of the community participation required in watershed management it will be necessary to address this issue in the near future. Furthermore, a senior official of the Ministry of Education and the Chairman of the Office of Disaster Preparedness should have a seat on the LCB.
- (iii.) Establishment of a well functioning Watershed and River Management Units under the MAFF&E, equipped with the necessary power and resources to act as a coordinating body for the operational and budgetary aspects of the WMAFs;
- (iv.) Formal establishment, within the Watershed Management Unit, of the post of a CPP Co-ordinator in Watershed Management and official appointment of officers to the Technical Operations Team(s);
- (v.) Revision of the current Environmental and Development Policies to incorporate the Community Participation Programme in Watershed Management (CPP-WM) as an official policy instrument. This would form the long-term policy foundation for the recommended approach.
- (vi.) The aforementioned proposal to match the boundaries of the eight administrative regions to watershed boundaries would be beneficial for the administrative and operational effectiveness of the programme.

### **3.2 Tasks and Responsibilities<sup>6</sup>**

The tasks and responsibilities of the WMAFs are directly linked to the objectives of the Community Participation Programme. Indeed, the programme must be implemented largely by or through the WMAF at the local level.

As mentioned above, the most serious issue in watershed management is how to prevent further expansion of cultivation into St. Lucia's remaining forest areas and persuade the farmers cultivating steep hillsides to give up practices which cause soil erosion and subsequent flash floods, river siltation, crop and properties' damage and deterioration of land and water quality in downstream areas. Furthermore, the clearing of drains needs the active involvement of the local population and can only be effective if co-ordinated with landowners' work on-farm. In this respect the Community Participation Programme, through the WMAF, will have to pursue the change not only of some agricultural practices but also general behavioural/educational attitudes and their proven negative impact on soil conservation, drainage effectiveness, and on flow of rivers.

In general, there are three main areas which if properly addressed, will lead to sound community based watershed management, namely Education & Training, Implementation of Works, and Monitoring & Communication.

#### ***Education & Training***

Environmental problems occur largely because human activities affect the natural resource base adversely. Often, these inappropriate and/or detrimental activities are the result of a lack of knowledge, of both the environment and the consequences of certain activities on the environment. The basis of environmental education and awareness programmes is the belief that, if they possessed sufficient appropriate knowledge, people would change their attitudes or behaviour so that the particular environmental situation will improve.

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<sup>6</sup> For details on the activities to be programmed within the CPP-WM, see also appendix IV.

Therefore, the main long-term objective of the community participation programme is to form the basis for needed sustainability of environmental and watershed management in the *minds of the people*. A continuous effort in educating and training people is indispensable to the transformation of watershed management from an "highly expensive emergency programme" to a natural process deeply rooted in comprehension and personal responsibility of the individual towards the environment and the community as a whole.

The WMAF would have to streamline all educational and training efforts related to watershed management for the locally concerned communities. This would have to go far beyond the creation of broad public awareness and such campaigns alone seldom produce tangible results in terms of substantial behavioural changes. The Community Participation Programme will therefore provide continuous **Internal Training** for the members of the WMAF and, where necessary, for the Technical Operations Team. The CPP will organise these internal training sessions in order to build the intellectual and managerial foundation needed to guarantee the WMAF's ability to operate as efficiently as possible to the benefit of the community (see Section 5.4). It must be realised that the participatory process involves both the community and government. While many ideas may be generated at community level, a lack of technical understanding may make it necessary for ideas to be "seeded". This process would be effected through internal training, which would form the basis for the multiplication of knowledge and awareness transfer from the WMAF to the community as a whole. Assisted by the aforementioned support groups, Agricultural Extension and Forest Extension in particular, and facilitated by the Watershed Management Unit, the WMAF will then on a continuous basis:

- (i.) co-operate with the local schools, youth and sports clubs, to organise and carry out workshops on relevant topics, such as "causes of flood flows/flood damage", "human intervention and its impact on the environment", "responsibility of the individual towards the community", etc. In the longer run the content of such continuous workshops should become institutionalised as part of the official curricula programme of schools;
- (ii.) organise and implement extension workshops/field days for farmers with respect to proper soil erosion prevention/drainage and environmentally sustainable agricultural practices (including the use of agro-chemicals);
- (iii.) co-operate with local adult clubs and groups, e.g. Mothers & Fathers, to organise evening sessions on general environment-related behaviour, e.g. "household/solid waste management", "the need for community management" etc.;
- (iv.) promote and inform about other related activities, such as river bank protection, reforestation/revitalisation of abandoned/degraded land, improvement of housing design to reduce risks of damage by flooding, enhancement of physical environment (beautification and landscaping) etc.

### ***Implementation of Works***

One of the main causes of flooding and flood damage is lack of river channel maintenance and insufficient clearing of drains. With respect to a proper functioning of the natural and constructed drainage system in the watershed, there are generally three sections to be distinguished:

- the main stream or river;
- smaller on-farm/private drains;
- so-called intermediate drains which can, but do not always link the smaller drains to the main river.

It is important to involve farmers and the population living in the watershed in clearing rivers and drains, especially before and during the rainy season and when tropical storms or hurricanes are imminent. The WMAF would have to organise river and intermediate drains clearing activities, as well as the removal of debris and garbage blocking the down-flow. Where necessary, this would include aspects of solid waste disposal/collection as well as repair and construction of drains. The execution of these works would be based on the mobilisation of community (clearing) campaigns and, if necessary, hired labour.

The works related to land conservation and drainage is restricted to activities which are financially and technically feasible within the mandate and resource capacity of the WMAF. The necessity for heavy works such as river training and physical river bank stabilisation will have to be communicated to the respective higher authority for implementation, e.g. River Management Unit.

Such matters as improved soil conservation and drainage on farmers fields will form part of the WMAF programme and they would be supported in this by the TOT as would the change to more environmentally protective cropping.

### *Monitoring & Communication*

In the long run, the cost of implementation can be reduced dramatically if prevention and education are given priority. The WMAF will be responsible for constantly monitoring the state of the local drainage system and observing the potential risks arising from improper agricultural practices, areas prone to landslides, or inappropriate/illegal (feeder) road construction etc. The WMAF/TOT would record all relevant observations and take actions as needed. One of the first activities of a newly established WMAF would be the recording and mapping of the respective geographical area with respect to the natural and constructed drainage system, landslide hazards, flood prone areas, accelerated soil erosion, land use, and land ownership. These initial surveys would help to define more accurately problems, priority works and actions needed, especially with respect to the elaboration of the WMAF's work plan (see also Section 5.2 and Appendix D)

As mentioned above, as far as minor or intermediate works are concerned, the WMAF would have the mandate to carry out the works itself or by contract. Where capital-intensive works are concerned, the respective request would be communicated to the responsible authority for execution.

In addition to these three main areas of general WMAF responsibility (Education & Training, Implementation of Works, Monitoring & Communication), the WMAF would act as a catalyst with respect to local issues relating to sound watershed management and would include:

- the mediation in local disputes such as the responsibility of landowners in the clearing of drains;
- the swapping of eroded land for reforestation/suitable Crown land;
- inappropriate/illegal (feeder) road construction;
- the promotion of alternative crops and community based marketing initiatives, and information on markets and prices.

The following are the core responsibilities of the WMAF:

- (i) implementation of/participation in land conservation programmes to prevent erosion and subsequent river siltation; provision of technical assistance to adopt agricultural practices less damaging to the flow of rivers;
- (ii) workshops/educational programmes and public awareness campaigns with respect to proper environmental and watershed management (including solid waste management, use of agro-chemicals, and maintenance of adequate water quality);
- (iii.) cleaning and de-blocking of main and secondary drains and culverts;
- (iv.) monitoring of the drainage system and soil movements;
- (v.) communicating needs for capital-intensive works to be carried out by higher authorities;
- (vi.) river bank protection;
- (vii.) reforestation and other forestry activities;
- (viii.) promotion of improved housing design, road infrastructure, and appropriate in-house water storage facilities to reduce risks of damage by run-off and flooding etc.;

Figure 3.1 shows, as an example, the general work plan priorities defined by the Dennery WMAF.

### **3.3 Authority of Enforcement**

Without adequate authority, the WMAF is doomed to failure. The activities of the WMAF are intended to generate desired changes in cultural practices and behavioural attitudes. This is not a simple matter

and may no doubt create areas of tension within the community, unless and until it is realised that the WMAF has the authority to enforce its regulations, very few people will take it seriously. The Land Conservation Board has been fully empowered under the *Land Conservation and Improvement Act* with the required level of authority to pursue its responsibilities (e.g. Protection Order, or sec. 14 para. 3 and 4 of Act). Accordingly, the Board should delegate some of its authority to the WMAF. It would be imperative to establish regulations within the by-laws of the LCB, to assist the management of the WMAF and important areas for enforcement are:

- implementation and monitoring of work which falls under the management of the watershed area, especially where delinquent farmers/residents are concerned;
- the rights to generate own funds and manage them with autonomy, where this is appropriate.

### **3.4 WMAF Formation and Membership<sup>7</sup>**

For the formation of the WMAF it is necessary to organise community meetings to which all influential persons and representatives of community groups as well as all locally based government officers should be invited. The intention of the initial community meeting is to sensitise the community vis-a-vis the topic of land conservation/drainage and explain the need for community participation in watershed management and

- explain the relationship between people's attitude, environmental mis-management and the respective consequences;
- present the main ideas of the community participation programme;
- highlight the need for community participation and formation of a WMAF;
- explore the views of the community representatives regarding the formation of a WMAF for the watershed;
- explore the view of the community on tasks, responsibilities and resources needed for the WMAF;
- explore the possible composition of WMAF based on interest and enthusiasm show by participants;
- to delineate the next steps towards establishment and empowerment of the WMAF.

Depending on the socio-demographic characteristics of the communities the list of invitees will vary. A possible list of invitees for the inception community meeting is given below and would include the Head of the Watershed Management Unit, the CPP-Coordinator and the TOT(s).

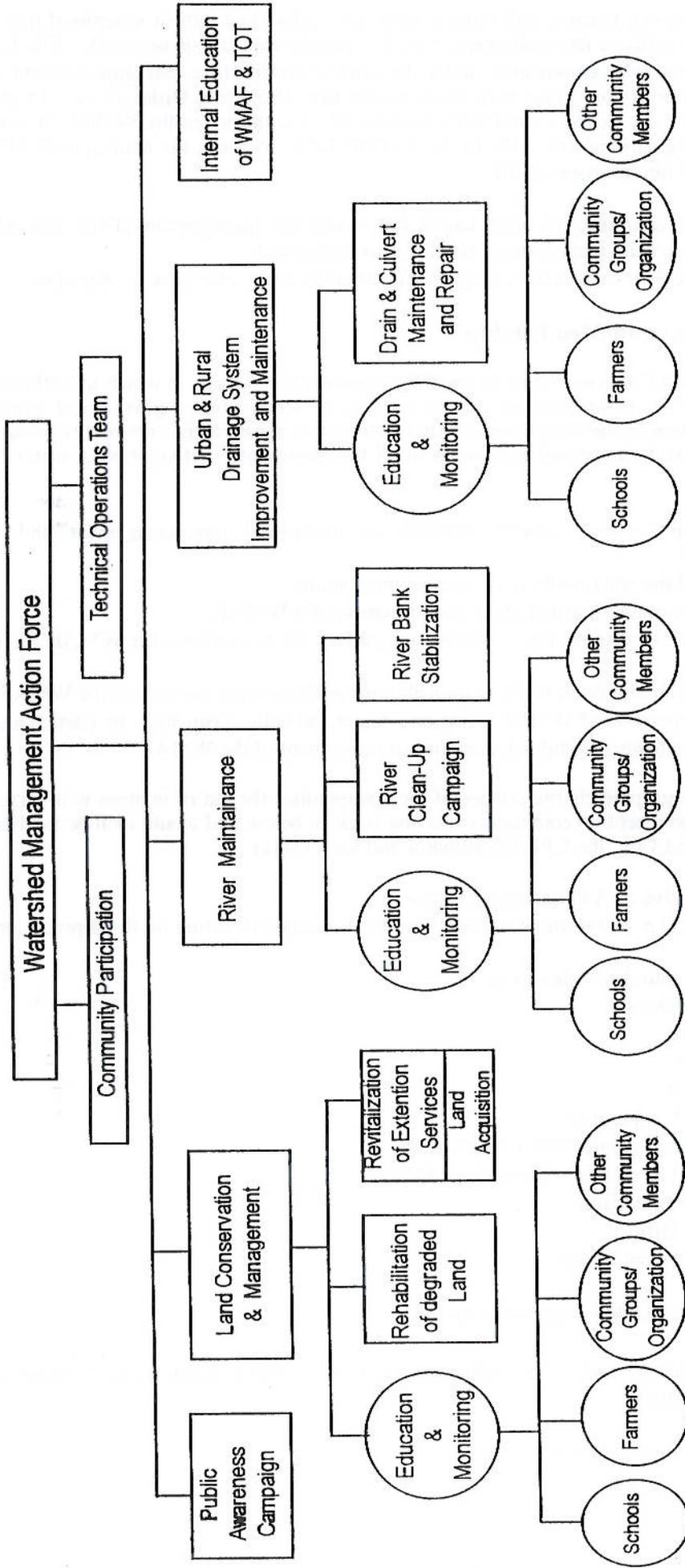
- Village Clerk/Representative of Administrative Region
- Farmers Representatives (i.e. representing hillside farmers, farmers cultivating on flood-prone land, SLBGA/NFA)
- Representatives of local churches/religious groups
- School Principals and teachers
- President of Adult Groups
- President of Youth Clubs
- President of Sports Clubs
- President of Fishermen's Cooperative
- Chairman of local Disaster Preparedness Committee
- Representative of (future) River Maintenance Unit (MCW&T)
- Area Agricultural Extension Officer
- Area Forestry Extension Officer
- Area Community Development Officer
- WASA Area Officer
- Representative of Solid Waste Management Authority
- Local Police Officer
- National Trust Area Officer and other influential persons of the community (e.g. from the commerce or business sector)

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<sup>7</sup> For details on step-by-step actions towards the establishment of a WMAF, see chapter 5.1.

Figure 3.1

# WORK PLAN PRIORITIES OF THE DENNERY WATERSHED MANAGEMENT ACTION FORCE



Additional : Survey Of Human Resources

An effective WMAF can be viewed as being pivotal to the successful and sustainable management of the respective watershed. The WMAF should be quite manageable devoid of too large or unnecessary membership and the emphasis should be on action, getting decisions implemented rather than being merely theoretical.

Depending on the dimension of the geographical mandate the WMAF should be composed of not more than fifteen to twenty (15-20) **permanent members** representing the community from the point of view of potentially influencing watershed management. Ideally, government officers should not exceed more than one third of the membership. Except for the village clerk or the representative of the administrative region to which the respective watershed belongs, all government officers of the WMAF would be non-voting members. This is important in order to keep the prime responsibility at the community level. Depending on the view of the members, exceptions would be possible where a proposed member of the WMAF, although being a government officer, is an acknowledged representative of the local community. In addition to the permanent members of the WMAF, non-permanent members deriving mainly from the aforementioned support groups would be co-opted whenever necessary. The composition of a WMAF, as suggested below, would have to be adapted according to the socio-demographic characteristics of the respective watershed. It is important to include the most influential local personalities in the Action Force and to have a substantial representation of women (not less than one third). It may happen that one person of the community is the Chairman of/or represents two or more local community groups, this is quite common in St. Lucia and beneficial for group formation in terms of keeping the number of WMAF members down. An example for possible member composition<sup>8</sup> is as follows:

- Farmers (at least 4, rep. hillside farmers and those cultivating flood-prone areas)
- Community Adult Groups/Schools representatives (at least 4,)
- Youth and Sports Club representatives (at least 2)
- Religious Groups representatives (at least 1)
- Village Clerk
- Agricultural Extension Officer
- Forestry Officer
- Community Development Officer
- SLBGA
- WASA
- Police Officer
- The Local Teacher

Members of the WMAF should be elected/confirmed by an annual community meeting and appointed by the chairman of the LCB for a period of one year and be available for re-appointment after the completion of her/his term. Once established, the WMAF would elect its chairperson and executive members for one year with the option of three consecutive terms. The executive should comprise the Chairperson, a Deputy Chairperson, the Secretary, and one or two Public Relations Officers. WMAF chairperson and executive members would not be paid a stipend and their commitment should be viewed as a voluntary service to their community and country.

### **3.5 Technical Staff and Operations**

In order to demonstrate the paramount importance of watershed management vis-a-vis all other social and economic activities, and in view of the necessity to sustain watershed management on a continuing basis, the WMAF will be assisted by the CPP Co-ordinator and a Technical Operations Team (TOT). However, it is important to emphasise that the WMAF is not obliged to respond either to the CPP Co-ordinator or to the TOT, but may consider the advice given or ask for the assistance.

As mentioned earlier, the CPP Co-ordinator would be seconded to the Watershed Management Unit and would have the overall responsibility for managing the CPP-WM, especially in view of the island-wide replication process, and facilitating of work to be done on the community level. The CPP Co-ordinator

<sup>8</sup> This is a general list which has to be modified according to the local situation, e.g. by including representation of local farmer groups or fishermen.

should be experienced in community mobilisation/participation and the management of such programmes. Furthermore, the CPP Co-ordinator would have to be highly knowledgeable on watershed management issues and general agricultural/rural development<sup>9</sup>. The CPP Co-ordinator would report directly to the head of the Watershed Management Unit. The TOT has the task of assisting and providing technical guidance to the WMAF in the preparation and implementation of the WMAF Work Plan. The Technical Operations Team, which is supervised by the Watershed Management Unit, comprises a Technical Operations Supervisor, two Field Officers, and a secretary-cum-account clerk. Ideally, both, the Technical Operations Supervisor and the Field Officers would be selected by the WMAF members and supervised by the chairman. However, due to the limited skilled human resource base in most watersheds, the members of the TOT would have to be appointed by the Watershed Management Unit.

The Technical Operations Supervisor would have to ensure the technically sound preparation/execution of the WMAF's annual programme and should be a technically skilled, preferably in the field of agricultural engineering with extensive experience in community work and teaching (need for educational programmes). The Field Officers would be highly mobile in order to ensure monitoring functions and works execution. They would be in constant touch with farmers and residents of the watershed. They would also monitor the development in the watershed to ensure that the policies of the WMAF were respected. According to the nature of the tasks involved, one field officer should be an experienced agricultural extension officer and the other a technical person from the Agricultural Engineering Division. The Field Officers would be assisted by such members of the WMAF and workers necessary to carry out the programmed activities in the field, e.g. clearing of drains. Hiring and dismissal of workers would be the responsibility of the Technical Operations Supervisor. The secretary-cum-account clerk should possess knowledge of accounting to enable her/him, besides clerical duties, to record the administrative operations of the TOT/WMAF. For the project trial period (CPP-WM only) of two years, government will assign adequate staff to the pilot-WMAFs. However, it is implicit that depending on the increasing capacity of the individuals, the speed of the replication process, and the availability of resources, one TOT could handle more than one WMAF.

In the initial stages, frequent WMAF meetings might be necessary, in order to organise and establish the WMAF on a sound footing. Once established the WMAF should meet on a monthly basis and in emergency cases, as the need arises. Meetings should be well planned, members timely and properly briefed and the event conducted in a business-like manner. Most WMAF members are likely to have busy schedules and will not attend meetings unless they feel it is worthwhile or purposeful. Decisions, should always be incorporated into a definite plan for follow up actions, to avoid uncertainty on the part of members. The meetings would have to be called on a day and time convenient to the majority of the members. General community meetings would be held on an annual or six monthly basis. At this occasion the WMAF would discuss the annual work programme, present the financial accounts, and discuss important issues with the forum. The venue of the meetings would be one of the community meeting places, e.g. school, multipurpose centre, the regional centre or any place which offers an environment conducive to concentration and purposeful discussions. The work of the WMAF would entail an established reporting schedule. Apart from monthly Programme Implementation and Watershed Observation Reports, the WMAF would transmit on a quarterly basis Financial and Administrative Reports to the LCB (through the Watershed Management Unit at the MAFF&E).

The preparation of an Annual Work Plan is a very important activity and entails a sequence of actions (for details, see 5.2). Although the WMAF would be responsible for the preparation of the work plan, the TOT would technically investigate problem areas and propose technical solutions to the Action Force. Once the work plan has been finalised by the WMAF specific Project Description/Implementation Request Forms would be completed and sent to the CPP-Coordinator (see Appendix B). These request forms would only be necessary if the technical and/or financial resources required for specific activities/projects exceeded the WMAF's capacity. The Watershed Management Unit would then have to evaluate the request before proceeding with respective funding and/or delivery of technical support.

The annual work plan will contain a number of projects for implementation. These should be categorised to reflect the need for external support, thus:

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<sup>9</sup> Appendix I outlines draft Terms of Reference for the CPP-Coordinator as well as the members of the TOT.

- minor works for self-help or supported by local fund raising;
- works requiring external support for which the WMAF would be given a budget;
- works to be implemented through MCWT&PU.

### 3.6 Resources Required & Funding

For both the community and the Action Force members it is important that the WMAF has a physical location with which it can be identified and from where it can operate. The WMAF should be well located, preferably with an office at the regional centre of the main village of the watershed. Mostly, these centres provide office accommodation to the agricultural extension officer, forestry officer, public health officer, community development officer, social services, youth and sports, village council and others. All of these sectors will in some way be involved in the effective conservation and maintenance of the watershed. The location of the WMAF in the regional centre would also facilitate easy access and interaction with other stake-holders and assist in fostering stronger relationships. In addition it is more convenient for farmers and others to contact more than one of the technical officers at the same location.

Besides the need for office space, the services of a telephone/fax and a computer/typewriter would be indispensable but could be shared with other people working in the centre or nearby offices. Equally, basic office facilities and office supplies for the TOT/WMAF and accommodation for clients or visitors should be made available. In order to carry out its educational and training functions basic facilities would be required, such as overhead projector and screen, flip chart and easel, TV monitor and VCR, camcorder, slide projector, basic library of relevant educational materials. The library should be able to facilitate schools, groups and individuals who are desirous of obtaining information on watershed-related topics. It might be argued that some of the above stated facilities could be borrowed, however, people are often unwilling to lend sensitive equipment which in any case may not be available when required.

It is important from the beginning to limit within reason, financial dependency from whatever external source of funding. It is therefore indispensable at the time of establishment to minimise fixed costs of the WMAF. Apart from the aforementioned CPP Co-ordinator and the TOT (the number of TOTs may gradually increase during the replication process of the CPP-WM) no additional staff should be employed on a continuous basis. Furthermore, wherever possible maximum use should be made of existing community or government facilities. The principle of voluntary engagement must apply to WMAF members, and to the community in the execution of works identified for execution by the WMAF as part of its' programme. However, in addition to the inevitable establishment costs there is a need to have an annual operational budget on a reliable and continuous basis.

As the system develops the WMAF should handle more financial responsibility. For minor works, locally raised funds or contributions in the form of volunteer labour should be available. At the next level which should include such works as river bank planting, river clearance, an allocation should be made available through the WMU and costs should be included in the Land Conservation Board's annual budget. Main administrative expenditure categories are summarised below.

#### WMAF establishment cost categories:

- Establishment fund for basic office equipment, teaching and training equipment etc.;
- Equipment/agricultural tools and possibly small farm motor implements to facilitate drainage and soil conservation work;
- One 4WD vehicle to cope with the difficult terrain of the area (or guaranteed use of existing government vehicles);

#### WMAF operational expenditure categories (recurrent):

- Staff salaries (for the CPP-WM: CPP Co-ordinator and TOTs);
- Office running costs and supplies;
- Expenses for works execution (incl. hired labour);
- Vehicle maintenance and running costs;

- Expenses for educational and training materials, workshops, field days, etc.

Appendix B shows a tentative budget for establishment and operational expenditure. However, apart from testing the WMAF approach vis-a-vis its operational capability, a realistic operational budget will have to be re-assessed during the 2 year trial period of the pilot-WMAF. The actual expenditure for conservation and drainage works (i.e. works execution) in particular will depend heavily on, the scale of works, the capacity to mobilise voluntary labour force from the community, and the possibilities of external fund raising and self-financing.

The pilot-WMAF(s) will be financed initially by GoSL funds, however, it is imperative that the GoSL considers regular recurrent budget allocations for the CPP-WM from its revenue budget, in order to secure sustainability of the programme. Nevertheless, it is expected that substantial efforts should be undertaken by the WMAFs to establish appropriate mechanisms for self-financing. This is important in order to gradually reduce budgetary dependency from government funding and therefore to increase public acknowledgement of the community effort. In this period of transitional funding, the issue of self-reliance must be kept in focus and even while providing financial assistance to the WMAF, every effort must be made to ensure that dependency is not created. Money is available within the villages if it is sought and village fund raising activities have been very successful, even in some of the poorest communities of the West Coast. The WMAF, through the Land Conservation Board, should have the right and obligation to approach various local funding agencies with a view to obtaining assistance in financing appropriate projects as the need arises. Fund raising in general, as well as on special occasions, e.g. at workshops or when drainage clearing works need urgent implementation, would be the most common approach to self-financing. In this respect the WMAF could subcontract local community groups, e.g. Sports Club, to execute activities like drain clearing campaigns etc. Doing so, the respective group could carry out its own fund raising activity whenever needed. The WMAF internal training programme includes, for example, workshops/seminars on local fund-raising and self-financing (see Section 5.4). In order to improve support to agriculture, e.g. drainage, both with regard to standard and time utilisation, it is possible that the Action Force may consider the purchase of some small agricultural implements for on-loan-service to farmers of the watershed and nearby areas. This would add dimension to the activities and services of the WMAF in the area and also gain added revenue for the operations.

With respect to the provision of incentives these should not be of a monetary kind, quite the opposite; they would be in the form of technical assistance and training, support to demonstration plots, and donations of plants for re-forestation or river bank stabilisation. Whereas it may be a positive approach for farmers and other individuals to be offered incentives as an encouragement towards change for better development, it is equally advisable that a system of incentives does not lend itself to abuse. The client should rather, where appropriate, be asked to contribute towards the service in the form of levies or other mechanisms. Funds could therefore be raised from conservation and drainage rates. A Watershed Management Fund could be established. The LCB could impose a Water Abstraction License which WASA, farmers, and any water user would have to pay according to the use of this natural resource. Additionally, the collection of fines with respect to abuse/misuse of the community and state-owned drainage system as well as with respect to any deliberate activity having deleterious consequences vis-a-vis the proper functioning of the watershed should become part of direct local revenue to the Action Force. The principle must be established that those who benefit pay<sup>10</sup>.

Outside financial assistance can be a real incentive to CBOs but it must always be complementary to local efforts and initiatives. The other principle is that outside assistance can be most helpful if it is applied to the execution of key projects which are clearly seen as community priorities and in which there is significant local input (of an in-kind if not financial nature).

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<sup>10</sup> See respective annex on 'legal and institutional aspects'.

## Chapter 4

### Lessons Learned from the Pilot CPP-WM

Community Participation, especially in a country like St. Lucia which lacks a deep-rooted history of community responsibility and empowerment, is a long process and needs an extended start-up period. Once the official trial period for the Community Participation Programme is over, i.e. by December 1998, a real assessment will be possible. However, a few lessons and conclusions can already be drawn at this yearly stage of the trial.

- (i.) From the CPP in the Dennery watershed it has become apparent that increasingly government, the business sector and the communities themselves are coming to appreciate the potential of community involvement in the protection of natural resources and other areas of social and economic development. Through the efforts and support of the participating Ministries, it has become evident that GoSL is moving towards the recognition that community participation not only improves the chances of a project's success but that community participation is a human right in itself - the right and responsibility of people to take charge of their own lives and to become involved in the process of projects which affect their interest and livelihoods. At the community level, the CPP-WM has begun to introduce the community to new ways of addressing practical issues. This will go a long way in assisting the members of the Dennery communities to become more aware of their choices and their ability to determine priorities. Previously, communities have relied solely on decisions of government and other outside agencies.
- (ii.) As with most community participation programmes, another lesson worthy of emphasis is that the community participation process which implies empowering groups, communities and organisations to take control of their (natural) resources is not a process which occurs overnight, but takes time and patience. To transfer a community from a mode of dependency to one of control and self-reliance is challenging, slow and gradual. It requires a drastic change in attitude, and needs time to allow people to develop new thoughts, skills and knowledge based on critical reflection on the realities of and constraints on their particular economic and social environment.

In this context, participation by a community can sometimes be discouraged or short circuited by more powerful sections in that community or by the principal implementing agency or Ministry. Because of the pressure to speed up implementation of a programme, the responsible agency may find it difficult to encourage greater consultation or act on the basis of collective decisions taken by the community. A common occurrence to be avoided is that under donor or project pressure the implementing agency may choose to take action or decisions which should rest with the community.

- (iii.) The peoples understanding of what community participation really means has been shown be limited or incorrect. At the beginning of the programme there was a tendency towards the view that the community (through the WMAF) would be willing to co-operate in problem identification and the elaboration of recommendations as to how to overcome these problems, but that the execution of the necessary work was the project or the government's concern. Furthermore, the WMAF initially focused exclusively on project (works) proposals which entailed the involvement of the Ministry of Works (e.g. desilting of the river mouth) and where no direct involvement of the community was needed (in terms of works execution). Although these more "spectacular projects" can impress people and are important to promote the WMAF, real community mobilisation and participation starts and consists of activities which are mainly carried out (intellectually but in particular physically) by the members of the community based group and the wider community, and which require a limited if any budget (e.g. clearing of the village drains). Furthermore, the time-lag between the identification of more complex and technically demanding projects and the actual execution is long whereas smaller community based activities require little time to organise. This is important to take into consideration in order to overcome the "dry" initial start-up phase of the WMAF during which the community and the Action Force members are eager and impatient to see that "things are happening". This lesson has to be learnt and careful manoeuvring and adequate education

(especially internal training) is needed to make the people understand the philosophy on which the CPP-WM is grounded. It is therefore imperative to concentrate in future replications of the CPP-WM on these sort of "simple" projects and activities, especially in the start-up phase.

- (iv.) As may be expected, community spirit is often lacking, especially when personal gain rather than benefit to the community as a whole is involved. For example, farmers who recognise that poor farming practices such as cultivation on steep hillsides without proper soil conservation contribute to the process of degradation find it difficult to make changes. For such farmers it is difficult to look beyond their own need to provide a livelihood for themselves and their families to the social (and long-term economic) good of the entire community or country. This becomes even more difficult when alternatives are not simple and clear-cut. Although this is appreciated as being the current mind set of the farmers - this is precisely the issue which must be addressed through the motivational efforts of the CPP.

However, it is the considered view of the team that bananas are likely to be the dominant crop for the foreseeable future and that much better soil conservation practices are readily achievable in banana fields through efficient trash management. This would comprise maintenance of uniform trash cover, and the installation of trash lines. This simple extension message should be propagated by the WMAF as a major thrust of their activities.

- (v.) Despite the acknowledged benefits of the CPP-WM, many community members are still reluctant to give time and effort to the programme. This general scepticism derives from the fact that people are generally wary of government, community and other projects or programmes which typically promise some sort of relief from one form of hardship or the other but which have shown no continuity or tangible results. Some community members are discouraged and cynical despite their understanding of the potential benefit of the CPP-WM. This situation limits the level of community involvement in the process of programme implementation, as some persons despite their knowledge are for now content to hand over their participation rights to the WMAF rather than become actively involved in the process.

The lesson to be learned from the people's scepticism and reluctance towards such programmes is that the undertaking of a CPP-WM in the watersheds of St. Lucia will require serious long-term commitment on the part of the government and from the members of the respective WMAFs. Care should be taken not to raise community expectations to a level beyond the implementation capacity of the programme.

- (vi.) Strong leadership of a WMAF is of vital importance to the sustainability and the success of the group and the CPP as a whole. It is essential that the WMAF be led by strong, dynamic, enthusiastic and community oriented chairpersons and executive members who have the ability and skill to direct and mobilise community interest and effort. The Dennery WMAF has been fortunate in being led by a chairperson and deputy who are both well known and actively involved in other community organisations and affairs. The deputy chairman in particular bears many of the qualities mentioned. These two individuals, one an experienced farmer and the other an experienced Forest Range Officer are well grounded in the knowledge and skills of proper watershed management and well placed in their leadership roles. The strengths of these leaders have proven to be an important factor in getting the CPP off the ground and in mobilising the otherwise generally passive membership of the WMAF. The leadership factor in the Dennery experience clearly indicates that for the success of the CPP-WM, very careful consideration must be given to leadership choices.
- (vii.) It is important that any newly established WMAF be given physical identity through the provision of a proper office from which it (and the TOT) can operate. Adequate office facilities should be made to promote confidence and operational efficiency. The selection of an office with sufficient space and at a good location must be considered with care. A single room or a shared facility would not be acceptable.
- (viii.) For the sake of the communities and the success of the community participation programme careful selection is necessary with respect to the CPP Co-ordinator and the officers of the Technical Operations Team. The candidates should meet the conditions set by the Terms of Reference and should be able to demonstrate their full commitment and personal interest in

community work. Furthermore, staff appointed should be fully available for the respective duties set by the CPP and should therefore be entirely disengaged from any other duty. In this context it is necessary that management responsibilities be determined and clearly understood by all players as early as possible. This is especially critical during the establishment phase of the WMAF.

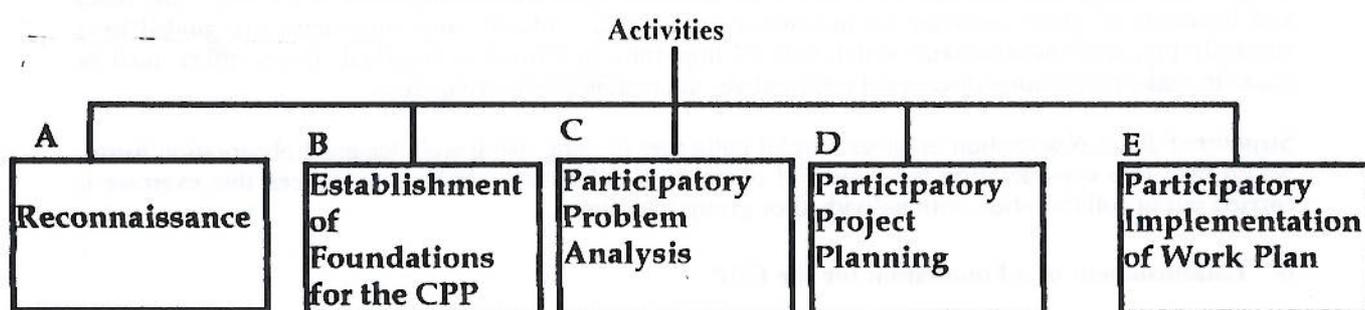
## Chapter 5.

### Guidelines for Application/Replication of the CPP-WM

With respect to the replication process of the Dennery CPP-WM to other watersheds, within the framework of the National Environmental and Watershed Management Plan, the selection and priority ranking of the watersheds should be based primarily on the degree of environmental degradation and the urgency of priority engineering works. However, it is important that where larger watersheds are concerned (with many settlements in different locations) an appropriate sub-division of the area be considered in order to achieve, as far as possible, socio-demographically coherent zones in which a WMAF would be established. This decision, however, will only be possible after a thorough reconnaissance survey has been carried out in the respective watershed.

The contents of this chapter provide no hard and fast rules for the establishment of the Community Participation Programme in Watershed Management (CPP-WM) but rather it offers guidelines based on the process and experiences gained in the establishment of the CPP at Dennery. The activities involved in the establishment of the CPP-WM can be discussed under five distinct and separate categories as outlined below and elaborated in the Action Catalogue shown in Appendix C and outlined below:

#### 5.1 Activities for the Establishment of the Community Participation Programme in Watershed Management



The individual steps can be broken down as follows:

- A: Reconnaissance Exercise/Surveys
- B:
1. Inception Meetings and Initial Sensitisation
  2. Establishment of an 'Interim' WMAF
  3. Meeting of 'Interim' WMAF/CPP-Coordinator/WM - Unit
  4. Sensitisation and Publicity Campaign
  5. Establishment of the WMAF
  6. First meeting of the WMAF
  7. Appointment of Technical Operations Team (TOT)
  8. Identification of External Support Groups (ESG)
- C: Participatory Problem Identification and Prioritisation
- D:
1. Participatory Preparation of WMAF Work Plan
  2. Participatory Project Planning and Prioritisation
- E:
1. Implementation of Priority Projects/Activities
  2. Participatory Monitoring
  3. Participatory Evaluation
  4. Internal Education Program for the WMAF and TOT

While an attempt has been made to organise the recommended activities into a logical sequence of events some activities for example, the Sensitisation and Publicity Campaign and the Internal Education Programme for the WMAF are activities which are ongoing and which may commence at earlier points in the CPP than those set out in the Action Catalogue. The time frame for the commencement and duration of these and other activities should be determined by the WMAF or community, based on their particular circumstances and needs. Some additional background for the Action Catalogue is summarised below.

#### **A. Reconnaissance**

The main aim of the reconnaissance exercise is to gather information on and to establish initial contacts with the community, using quick and inexpensive approaches for data collection offered by the Rapid Appraisal Methods outlined in the Action Catalogue. Key informant interviews involve interviewing a selected group of individuals who are in a position to provide the information, ideas and insights required.

Key informant interviews are usually conducted on the basis of an open-ended questionnaire that allows respondents to answer questions in their own words. The sample size for this survey type ranges from 25-50 persons who are selected using non-probability sampling techniques. Convenience sampling for example, allows respondents to be interviewed in places of easy accessibility (e.g. markets, shops, public meetings).

Community interviews take the form of public meetings open to all community members. The dates and locations of these meetings are announced in advance. Ideally such interviews are guided by a carefully prepared questionnaire which lists all important questions to be asked. Every effort must be made to make the ensuing discussion informative, interesting and participatory.

Structured direct observation involves careful gathering of data, using well designed observation forms, which take into consideration the nature of object to be observed. In most instances this exercise is carried out in collaboration with individual or group interviews.

#### **B. Establishment of a Foundation for the CPP**

With respect to the establishment of the WMAF, selection of prospective members should ideally be done at a general community meeting at which there is representation from all or for the very least, most community groups. The concept of the WMAF (i.e. function and composition) must have been clearly and fully detailed and explained. Where possible, members from an existing WMAF of another community should be brought in to make presentations and to answer queries about their committee.

The selection of members for the WMAF may ideally follow the guidelines outlined in Section 3.4, however, the Dennery experience has illustrated that this group may not necessarily be formed based on the identical composition or using the selection process recommended. The objectives and interest of different individuals and/or organisations differ, making it sometimes difficult to incorporate the commitment of those recommended, at this particular time or at all.

As previously mentioned the Sensitisation and Publicity Campaign (SPC) is an ongoing process which should span and run simultaneously with all other activities in the CPP-WM. The objectives, means and media will however change to suit the current need and context. In the Dennery experience major sensitisation and publicity efforts commenced after the completion of the reconnaissance exercise. However, for future replication of the CPP, one could also recommend that an initial SPC be conducted prior to the reconnaissance survey to establish a base on which the reconnaissance exercise will proceed. The initial SPC can take the form of a general public information exercise which utilises media accessible to and preferred by the target population. In this event an initial survey would be necessary to determine the latter. Details on the Sensitisation & Publicity Campaign

#### **C. Participatory Problems Analysis**

Participatory Problems Analysis allows members of the community to identify and analyse environment-related problems, and to seek solutions and strategies for action. Through education

processes such as workshops, seminars etc. the community can begin to learn to develop the desire and capability for collective and individual action.

This approach teaches and instils the knowledge and skills required in a community participatory approach to watershed management such as, community problem identification and analysis, prioritisation and community goal identification.

#### **D. Participatory Project Planning**

The WMAF work plan is the core aspect of the participatory project/activity planning exercise. Details on the step-wise elaboration of the work plan are given in Section 5.2.

The educational work which should have preceded the participatory problem analysis, should ensure that project planning and prioritisation is not a long drawn out process. Priority projects/activities identified by the WMAF are now developed with detailed project/activity description, with the assistance of outside agencies and other resource persons. Following this, the approval of the larger community is solicited by taking the completed project proposal back to them.

#### **E. Participatory Implementation of Work Plan**

This involves the implementation of priority projects/activities which are part of the general work plan or master plan, in accordance with project proposals which have been prepared. The project cycle is however, not complete without monitoring and evaluation of the activities.

The main purpose of participatory monitoring is that it generates information during the project life which can be utilised to make adjustments and/or modifications where needed. It involves the regular recording and periodic analysis of information collected by the community and WMAF. The recording and analysis process, where necessary, is done with the assistance of relevant resource persons.

Participatory evaluation incorporates the efforts and ideas of both the community (through the WMAF) and relevant resource persons who take time off to examine past activities in order to make decisions about the future. The role of resource persons is to assist the community/WMAF in planning and executing the evaluation exercise; the resource persons should therefore guide not lead.

The Internal Education Programme is an essential component of the final work plan. However, its initiation needs not await the completion of a work plan for the programme to commence. The program should begin whenever the need arises for new knowledge and skills.

A local committee or WMAF may be fortunate in having members who are equipped with relevant knowledge and skills with regards community participation programmes and watershed management. This is the case with some members of the Dennery WMAF. However, an Internal Education programme is vital to the general development of the knowledge, understanding, skills and outputs of the individuals who make up the group (WMAF). The main areas of knowledge and skills development are outlined in Section 5.4. Although these are a reflection of the needs of the Dennery WMAF, experience shows that the topics prioritised by the Dennery pilot group are very close to expectations in other similar CPPs. Nevertheless, the possibilities are limitless and programmes of each group may therefore reflect different needs and focus. Like the SPC, the Internal Education Programme should span and run simultaneously with all other activities of the Action Catalogue (see Appendix C).

However, it offers recommendations not rules as to how a CPP in watershed management should be replicated. It is therefore suggested that the ideas and activities may be modified, where necessary, according to the specific conditions and requirements of the respective watershed/group.

It must also be realised that without technical guidance, many essential activities particularly unpopular interventions, may not be identified by the WMAF and included in their work plans. Ideas will need to be "seeded", specific problems identified and action taken to solve these problems.

### **5.2 Detailed Guidelines: Elaboration of WMAF Work Plan**

The Dennery Watershed Management Action Force Work Plan or Work Plan as it has been referred to in the Action Catalogue, details the WMAF's conception of watershed management problems in the Dennery Watershed and its proposed strategy towards problems solutions. This work plan represents a comprehensive master plan aimed at sustainable management of the watershed and from which annual work plans will have to be compiled. This entails that the work plan activities defined are prioritised, with detailed project proposals and participatory implementation depending on resource availability and other annual circumstances.

The main content of this work plan can only be determined by the community through the WMAF as it is the community which is best placed to identify their problems, solutions, priorities and needs. The final product however, should result from the combined efforts of the community (through the WMAF), The Technical Operations Team (TOT), the CPP Co-ordinator / Watershed Management Unit, external support groups, and other resource persons. Apart from the WMAF's input, the additional technical expertise of the TOT and other players is vital to the preparation of a document which is practical and technically sound.

The following section elaborates the activities which led to the final preparation of the work plan document. As the Dennery WMAF was the first experience within the CPP-WM a lot of assistance in editing and technical reviewing was carried out by the CPP Co-ordinating Team. The recommended step-by-step approach has been slightly streamlined but basically follows the Dennery model.

#### **Four Steps to the Watershed Management Plan: (Dennery Experience)**

##### **Step 1**

- The first exercise undertaken by the WMAF towards the preparation of a work plan was to conduct a series of field tours of the watershed and its environs. The objectives of this exercise were three fold:
  - to familiarise members of the WMAF with the physical target area.
  - for the purpose of conducting problem identification exercises with the community.
  - to consult with the community regarding solutions to problems.
- Sites visited were:
  - the Dennery and Trois Lo rivers (the two main waterways in Dennery).
  - the watercatchment at Errard.
  - forest and farm lands within Errard and Bazile.
  - urban drainage in the Dennery Village.

At the end of each session the committee held discussions to review and record findings for future reference.

##### **Step 2**

- At WMAF meetings the field tours were reviewed and ideas generated from the problem identification process were consolidated and recorded as preliminary ideas for a draft work plan.
- These preliminary ideas were then circulated to the members of the TOT and External Support Groups for comment and review.
- Dates were set for consultation between WMAF, TOT and External Support Groups on material circulated. Invitations sent out to TOT and External Support Groups for proposed consultation.

##### **Step 3**

- Selection of WMAF representatives to work with TOT and External Support Groups on the preparation of a draft work plan.
- Consultation between the WMAF and the External Support Groups for discussion of the proposed work plan:  
Present were:
  - (Project Co-ordinator)

- CPP Co-ordinator
- Members of the WMAF and TOT
- Representatives of community organisations/groups
- Members of the External Support Groups comprising representatives of Forest and Lands Department, Agricultural Engineering Services Department, Ministry of Community Development, Ministry of CW&T, Ministry of Health, Agricultural Extension Division, Dennery Police Station
- Conclusions of consultation recorded and circulated.
- Date set by which the draft work plan should be completed.
- Small working group set up, (comprising members of the TOT, WMAF, External Support Groups and other resource persons) to finalise content of the draft work plan.
- Working sessions of working group to finalise content and format of work plan and to compile draft for circulation to WMAF, TOT, and External Support Group for comment and review.
- Working meeting conducted for technical review and to finalise the production of a work plan based on solicited comments and review.
- Preparation of the final document and circulation to WMAF, TOT, OTST and community organisations/groups.

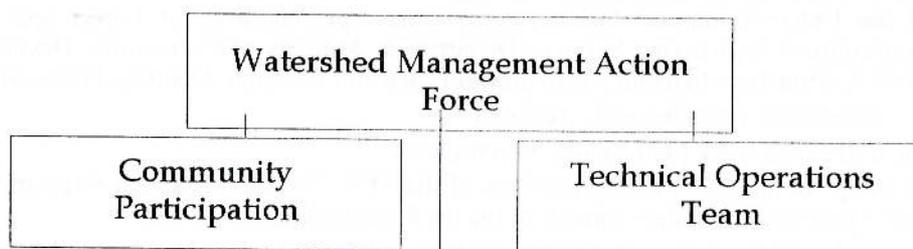
#### Step 4

- Presentation of work plan to the larger community for final review and acceptance.
- Technical review and editing based on feedback from the larger community.
- Distribution of copies to all stakeholders, interested groups, and external support groups.

The Dennery WMAF work plan has been elaborated as a Master Plan. This is very general but contains all priority areas of action identified by the WMAF (within the frame of the CPP-WM) and necessary to be tackled for a sound and sustainable management of the Dennery river watershed. Although the activities are prioritised as such, the respective annual work plans will have to be prepared by selecting priority activities out of the master plan. The work plan (master plan) comprises five (5) main, one (1) supplementary component, and respective sub-components. The objectives and means for each of the work plan priorities/components are elaborated in the respective Dennery Master Plan (Appendix D) and in more general terms in Section 3.2 and 5.1.

The information outlines five basic steps taken by a WMAF in the preparation of their work plan. The key aspect in the process is to ensure general community involvement. While the WMAF represents a cross section of the community, it would limit the scope of the CPP to allow the process to rest solely with this small committee. Members of the community having specialist knowledge should be co-opted as and when required, and on completion, the full work plan should be presented and discussed at a public meeting.

## Work Plan Priorities of the Dennery Watershed Management Action Force



### WORK PLAN:

- A) Internal Education of WMAF and TOT
- B) Public Awareness Campaign
- C) Land Conservation and Management
  - Education & Monitoring
  - Soil conservation on farmers fields
  - Rehabilitation of Degraded Land
  - Integration of foot paths and track drainage with farm drains
  - Revitalisation of Extension Services; Land Acquisitions
- D) River Maintenance
  - Education and Monitoring
  - River Clean-up Campaign
  - River Bank Stabilisation
- E) Urban & Rural Drainage System Improvement & Maintenance
  - Education & Monitoring
  - Drain and Culvert Maintenance and Repairs
  - Solid waste Management

Additional: Survey of Human Resources

### 5.3 Detailed Guidelines: Sensitisation & Publicity Campaigns

#### The Objectives

The main objectives of a Sensitisation and Publicity Campaign (SPC) is in the first instance, to present to the target community the main ideas of the Community Participation Programme in Watershed Management (CPP-WM). Once the programme has taken root in the community, the objective then is to keep the community and general public continually updated on the activities and progress of the CPP as directed by the local group i.e. WMAF. The programme is then intended to facilitate the free flow of information to the community and set the stage for a two way communication process. A variety of different media geared at establishing this two way communication flow will be discussed.

#### Points to Note

The activities of the SPC as far as possible are to be co-ordinated and directed by the WMAF with assistance from any community members who have relevant expertise and experience to offer to the activities undertaken. Care should be taken to include other community members who express an interest in being a part of the exercise in any possible way, however small. All features (e.g. news releases and documentaries) must focus on the target community in terms of the experiences, problems and achievements of individuals and organisations/groups of the community. This would allow other persons or groups in the community apart from the WMAF to identify with the general programme and to generate the desired community participation spirit. The more persons who are allowed to become involved in the process, the greater the variety of ideas which will be generated. This ensures greater variation in the sensitisation and publicity process; and that the participatory process is not monopolised by one section of the community.

## The Means and Media

The reconnaissance exercise which is recommended for execution at the inception of the CPP is a valuable tool for gathering information which can be utilised at all stages of the programme including the SPC. An invaluable output of the reconnaissance exercise therefore, is the information gathered on the following:

- the most popular media accessible to community members;
- information on community facilities
- other vital information relevant to the establishment of a CPP (Action Catalogue)

Using this information it is possible to determine and select (before the SPC begins) the means and media to be utilised in the SPC.

As the Dennery experience illustrates for example, it is important that any activity should give cognisance to factors such as the importance of Creole as a means of communication in the community.

This information is key as all activities of the SPC must therefore cater to the needs of both the Creole and English audience. A televised panel discussion which was a key component of the Dennery WMAF SPC was therefore conducted using both the Creole and English language.

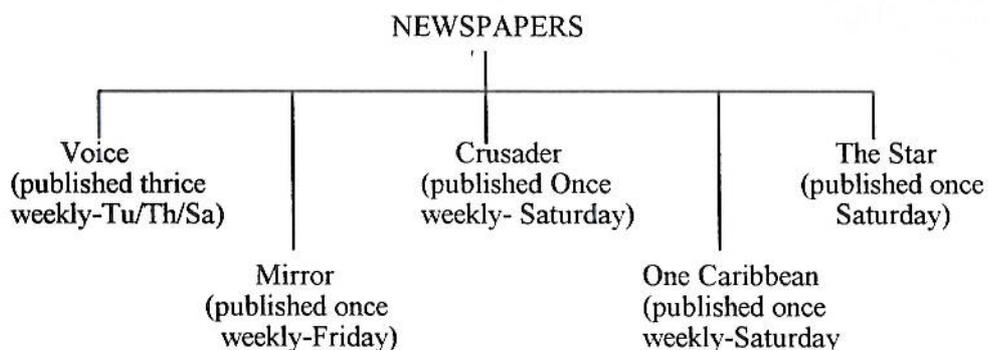
Other important back ground information concerns people's preference for various information media. Is it the radio, television or news print? What programme types are popular and preferable; and as the Dennery experience taught, which of the above media are accessible to the community? When the televised panel discussion was to be publicly aired it was important to have had previous knowledge that while there were two local television stations which could be utilised to air the programme, television reception in Dennery allowed the majority community members to view only one of the two stations. It was important therefore to ensure that this station was utilised. Another important piece of information about the Dennery community was that the local Creole program "Juk Bois" by far the most listened to program by community members, has a large audience in the community and therefore is a vital medium through which information could be disseminated.

Thus far only television, radio and newsprint have been identified as useful media for the SPC. Before other media can be discussed it is important to note that within each of these medium there are a variety of different means or programmes which can be utilised for the SPC. Within the St. Lucian context for example several local radio stations broadcast and offer a variety of different programmes which can be accessed for the dissemination of information; in many cases cost free. The figures below show a list of local programmes and possibilities related to the above media which can be utilised. Note that many of the televised and radio programmes e.g. "Juk Bois" (Radio 100 - FM) and

News Maker Live (Daher Broadcasting Services) allows for the audience to "call in" and facilitates a two way communication process.

Figure 5.1

### Options for Sensitisation and Publicity within the Print Media



The panel discussion to which reference has already been made is a useful tool for a one way or two way flow of information. In the two way effort, telephone lines are opened up to allow the public to question the panellist. The panellist may be chosen from the WMAF and the community or among resource persons identified as knowledgeable and experienced on the topic of concern. Along with a moderator who directs the course of the discussion, the panellist imparts a predetermined body of information to the target population. Such a discussion may be conducted either on radio, television or as part of a community or smaller group meeting.

Interviews are also a useful tool of the SPC. The interview can take several forms and can be presented either on radio, television, in print through the newspaper or at a community or other group meeting. The selected interviewee(s) disseminate information through an informative question and answer session which focuses on a particular topic or activity.

Spot meetings have been used by the Denney WMAF as part of their SPC and have proven to be an effective and useful tool. For these sessions the WMAF members hooked up a public address system to the back of a vehicle and set out to predetermine locations to conduct a sensitisation exercise. This exercise took the form of impromptu public meetings at specified location (e.g. at public gathering points) where different individuals spoke to those present about the CPP and its current progress. As anticipated people around and in house gathered to listen. The sessions were kept brief 10-20 minutes so as not to disturb people unduly from their activities. Such sessions have great potential for two way communication - discussion and exchange of ideas, if it is carefully planned how such discussion is to be initiated and sustained.

Meetings with community members and groups may take several forms:

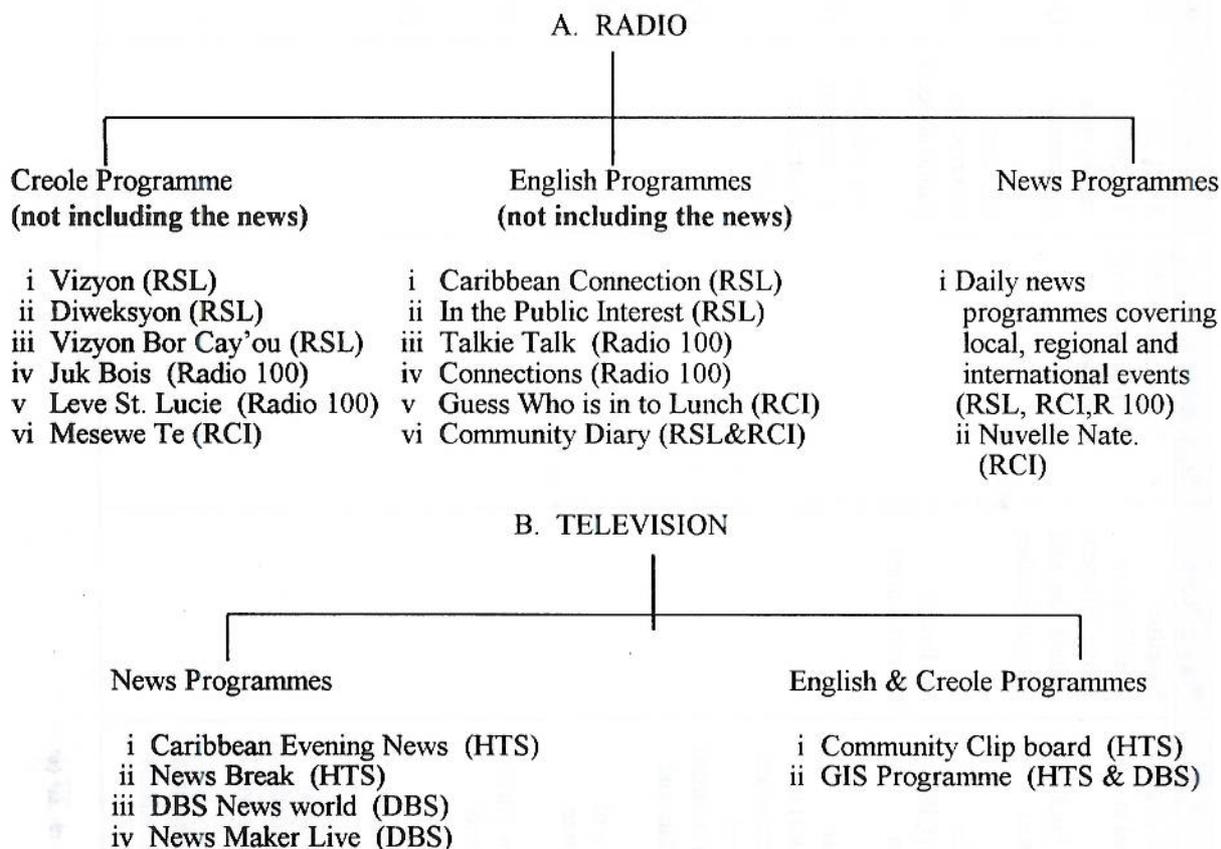
- informal one to one and/or small group meetings which allow for the free flow of information between both parties.
- community representatives meetings. This involves inviting representatives of community groups/organisations to a meeting or meetings to discuss relevant issues which fulfill the objectives of the SPC.
- community meetings which take the form of public meetings open to all community members to discuss as indicated previously.
- house to house meetings (if time and other resources permit).

A televised documentary featuring the community and the WMAF's involvement in watershed management; which outlines and features aspects of their work plan, problem areas in the community, community members and examples of projects being implemented can prove to be a useful informative tool which can also be used in a CPP replication exercise.

It is important that whatever means or media is chosen, that the target population is given prior notice of the activity planned so that they can make plans to tune in or attend. This of course would not apply in the case of spot meetings which are impromptu and intended to operate on people's natural curiosity to know what is happening. This prior notice of intended activities may be circulated formally in the form of a written/printed invitation or notice to community members or target group; through fliers distributed and posters placed on community notice boards or in other vantage points or through public notices via radio, television or the local newspaper. In the case of the radio for example notices can be aired on popular programmes or through the non profit making community service programmes such as the "Community Diary".

Figure 5.2

Options for Sensitisation and Publicity within the Electronic Media



**KEY**

**RSL:** Radio St. Lucia

**Radio 100:** Radio 100 - Helen FM

**RCI:** Radio Caribbean International

**HTS:** Helen Television System

**DBS:** Daher Broadcasting Services

**Preparation of an Action Plan for Activities of the SPC**

For the benefit of the WMAF, to allow the committee to organise and keep track of the procedures of each SPC activity, it is essential that an action plan be prepared for each activity. An action plan outlines the tasks to be undertaken, how and when the tasks will be undertaken, who is involved in and responsible for each task, the resources and cost required. A chart is a simple and easily understood format to use for an action plan as illustrated in the sample overleaf. At the end of the planning and implementation exercise of each task, the chart represents a detailed strategy for future reference and/or replication. The information in the sample table represents the actual course of events for one activity in the SPC of the Dennery experience.

**SAMPLE ACTION PLAN FOR SENSITISATION AND PUBLICITY CAMPAIGNS:**

Activity	Schedule	Media	Procedure	Person Resp.	Equipment	Cost	Result
Panel discussion	2.7.97 Government Information Services (GIS) Recording studio 10:00 A.M.	Television • Helen Television System • Daher Broadcasting Services	<ul style="list-style-type: none"> <li>• Content and format of panel discussion discussed at WMAF meeting.</li> <li>• Panellist selected; briefing session held with non WMAF members</li> <li>• Contact made by Co-ordinator with the (GIS) office to set date for recording.</li> <li>• Meeting of panellist (including moderator) to finalise content, format and questions to be asked.</li> <li>• - Panel discussion recorded at GIS studios on date and time specified.</li> <li>- immediate review of recording to determine quality for air play.</li> <li>- date and time for public air play discussed and finalised with GIS personnel.</li> </ul> <p>Public notices on "Juk Bois" (popular Creole radio programme) and Community Diary to alert target population to date and time programme will be aired. (Publicity to be start 5 days to a week before programme aired.)</p>	<p>Panellist: Ivan Gaspard Alfred Prospere Joanna Raynold Fermin Faucher</p> <p>Moderator: Martin Satney</p>	<ul style="list-style-type: none"> <li>• Video cassette for WMAF record of discussion.</li> </ul>	<p>\$ 121.50 5 spots on creole radio programme (i.e. cost incurred for public notices).  free publicity also done on Community Diary</p>	<p>DONE  DONE  DONE  DONE  DONE  DONE</p>

#### 5.4 Detailed Guidelines: Internal Training Programme

The need for an Internal Training Programme for a local committee or WAMF has already been illustrated; its importance however, cannot be over emphasised. The Dennery experience has that Internal Training should be a compulsory component of the work programme of the WMAF.

While community members will bring valuable local knowledge and expertise to the CPP, it must not be assumed that those who volunteer their services are necessarily equipped with sufficient or relevant knowledge and skills. It is critical therefore that close attention be paid to the process of internal strengthening aimed at organisational sustainability to move the community beyond the mode of dependency of one of control and self reliance.

At Dennery, internal training has been targeted mainly at the WMAF and TOT with a view to improving first, the knowledge and skills of those charged with responsibility for establishing the base of the CPP and the path towards sustainable and effective watershed management. This focus demonstrates a positive initial step for replication, but the approach adopted within each watershed should be flexible and reflect the resource base and needs of the community.

The content of the Internal Training Programme may vary with the needs of each watershed or community, but the objectives should be directed along the following general lines:

##### Objectives:

1. To foster change in the perception, knowledge and attitude of the target group to watershed management.
2. To improve the understanding of the target group on:
  - the conception and technical aspects of watershed management;
  - the institutional and legislative aspects which relate to watershed management.
3. To improve the performance and output of the target group's work towards implementation of a programme aimed at effective and sustainable watershed management.

To achieve these objectives it is essential that the methods of presentation or instruction be varied, reflecting an adequate balance between practically oriented and theoretical sessions. Practical sessions which take the participants out into the field to investigate/interact in the actual environment, are particularly important. These exercises provide an excellent opportunity for "hands on experience" in dealing with the practical issues and to consolidate the understanding of situations as they exist on the ground.

Like the practical training, theoretical sessions should be interactive, incorporating the use of visual aids, based if possible on the particular environment or experience of the target group. To be effective, training must be conducted using the language, type and level appropriate to each particular group of participants.

The following list outlines the main areas of knowledge and skills development in the Dennery WMAF. While the topics reflect the specific needs of Dennery, they represent many of the basic skills and principles which should be covered by training programmes generally.

##### Main areas of knowledge and skills development:

- The physical aspects of a watershed.
- Watershed management i.e. land and water conservation, prevention of soil erosion and flooding.

- Local legislation governing watershed management in St. Lucia.
- Community participation and mobilisation in watershed management.
- Leadership skills.
- Group dynamics.
- Conflict management.
- Fund raising/self-financing/costs recovery.
- Project identification and formulation (including budgeting and cost estimates).
- Organisational capacity building.
- Goal setting and achievement.
- Methods and mechanics of communication.
- Report writing/minute taking/public speaking.

The organisational aspects of the Internal Training Programme are as important as the content / form and the programme is best handled by the CPP Co-ordinator or any such full time administrative officer of the WMAF who will take responsibility for identifying, contacting, briefing and negotiating with resource persons who will conduct the training. It is important that discussions with the prospective trainers cover in detail, aspects of instruction such as content, approach, language and technique, themes and topics, venues, days and times for sessions to ensure that the training provided caters to the existing need.

A large pool of resource persons exists, both within the community, government and NGOs can be utilised as trainers/instructors. Some suitable organisations include:

- The Natural Resource Management Unit (NRMU) of OECS;
- Caribbean Natural Resources Institute (CANARI);
- Environmental and Coastal Resources Project (ENCORE);
- St. Lucia National Trust;
- Ministry of Agriculture, Fisheries, Forest and the Environment.
- Ministry of Education, Youth, Sport and Human Resource Development.
- Ministry of Community Development, Culture and Co-operatives.
- Ministry of Finance, Planning, Information Services and the Public Service;
- Ministry of Communication, Works, Transport and Public Utilities.

Unlike the Dennery WMAF programme which specifically targeted its membership and the officers of the TOT, other Internal Training Programs may wish to train a select group of individuals from all sectors of the community who can be regarded as the critical training resource for the future. In the long term this approach will increase and strengthen the pool of local resource persons and to ensure continuity for the training programme.

Topic or theme selection, which will be influenced by the existing need, is the responsibility of the community through the WMAF and sessions must be conducted at the convenience of the recipients. The participants must therefore be the ones who determine the time, day and venue of sessions. As far as possible, they too should have an input in determining other factors such as the approach to training. The training schedule should be circulated well in advance of the first session to allow participants to organise their time and other activities to facilitate attendance.

Periodic evaluation of the programme is of paramount importance to determine the impact of the training and the extent to which the skills/principles imparted are being applied. The evaluation of each session or set of sessions is also necessary to provide feedback to the trainers and to determine whether objectives are being met.

# **Annex 10**

## **Appendix A**

Draft Terms of Reference for the CPP-WM Officers

**COMMUNITY PARTICIPATION PROGRAMME IN WATERSHED  
MANAGEMENT**

(CPP-WM)

Draft - TERMS OF REFERENCE

In order to demonstrate the paramount importance of watershed management vis-à-vis all other social and economic activities, and in view of the necessity to institutionalise watershed management on a continuing basis, the Watershed Management Action Forces (WMAF) will be assisted by the Community Participation Programme Co-ordinator (CPP Co-ordinator) and a Technical Operations Team (TOT). In this regard, the officers will follow the institutional and operational framework set in the document "Community Participation Programme in Watershed Management" prepared for the National Watershed and Environmental Management Plan.

**A. Community Participation Programme Co-ordination**

The Community Participation Programme for Watershed Management (CPP-WM) will be guided by the CPP Co-ordinator. The CPP Co-ordinator will be seconded to the Watershed Management Unit and would have the overall responsibility to operationally manage the CPP-WM and facilitate the work to be done on the community level.

**Functional Post: Community Participation Programme Co-ordinator**

- General:
- i. The officer should have a broad experience in community mobilisation/participation and the operational management of community development programmes. Furthermore, the CPP Co-ordinator should be highly knowledgeable on watershed management issues and general agricultural/rural development.
  - ii. The officer's main responsibility is to ensure the smooth overall implementation of the CPP-WM, in particular with respect to the island-wide replication process. In this regard, the officer will follow the institutional and operational framework set in the document "Community Participation Programme in Watershed Management" prepared for the National Watershed and Environmental Management Plan.
  - iii. The officer will of necessity work closely with and facilitate smooth communication/operation between all stakeholders of the CCP-WM, i.e. the respective communities, the respective WMAF(s), the Watershed Management Unit and River Management Unit, and other relevant technical and community-oriented supporting agencies and groups (governmental and non governmental).
  - iv. The CPP Co-ordinator should have the institutional authority of a head of

division and will report directly to the chairperson of the LCB and liaise in technical and operational matters with the Head of the Watershed Management Unit.

**Other Duties:**

- i. The officer will ensure the proper preparation and facilitate operationally the execution of the WMAF's annual work plans and related activities.
- ii. The officer will submit timely and accurately written quarterly progress reports to the LCB's chairperson. Copies of all written reports must be submitted to the Head of the Watershed Management Unit.
- iii. The officer will, together with the Head of the Watershed Management Unit, supervise and facilitate the activities of the Technical Operations Team (TOT) and the respective WMAF(s).
- iv. The officer will make sure, through the Technical Operations Team, that the technical equipment and other materials provided to the WMAF(s) are efficiently and properly utilised and managed. To this end, quarterly administrative reports (together with the quarterly progress reports) must be submitted.
- v. The officer will make sure that all the aspects of programme execution with financial implications are approved by him/herself and the Head of the Watershed Management Unit. In this context the officer will be responsible for the proper management of the CPP's financial resources and will maintain the respective financial accounts and supervise the financial budgets. To this end, quarterly financial statements reports (together with the quarterly progress reports) must be submitted.
- vi. The officer will attend meetings of the WMAF(s) in an ex-officio capacity.

**B. Technical Operations Team (TOT)**

Direct day-by-day support will be provided in technical matters by the Technical Operations Team(s) which will be seconded to the Community Participation Programme in Watershed Management (CPP-WM). The TOT(s) will be supervised by the Head of the Watershed Management Unit. Operationally the WMAF would execute and promote its tasks and activities with the technical assistance of the TOT which is composed of a Technical Operations Supervisor supported by two Field Officers (one from agricultural engineering, the other one from agricultural extension) and by a secretary-cum-account clerk.

**Functional Post: Technical Operations Supervisor**

- General:**
- i. The Technical Operations Supervisor should be a technically skilled person, preferably in the field of agricultural engineering with extensive experience in watershed management, community work and teaching (need for educational programmes).
  - ii. The officer will report directly to the Head of the Watershed Management Unit, with copies circulated to the CPP-Coordinator and the Land Conservation Board (LCB), and the respective chairperson(s) of the

WMAF(s).

- iii. The officer will of necessity work closely with the respective communities to be which she/he is assigned, the respective WMAF(s) (the chairperson in particular), the CPP Co-ordinator, the Head of the Watershed Management Unit, and other relevant technical and community-oriented supporting agencies and groups
- iv. The specific activities and functions of the officer will be determined by the prepared and approved plan of action of the CPP-WM.

**Other Duties:**

- i. The officer will ensure the proper preparation and effective technical supervision and execution of the WMAF's annual work plan and related activities.
- ii. The officer will submit timely and accurate written quarterly progress reports (and any other reports upon request by the WMAF's chairperson or the LCB's chairperson) to the WMAF's chairperson. Copies of all written reports must be submitted to the Watershed Management Unit and the CPP-Coordinator.
- iii. The officer will supervise and direct the activities of the two TOT field officers assigned to the TOT an the respective WMAF(s).
- iv. The officer will make sure that the technical equipment and other materials provided to the WMAF(s) are efficiently and properly utilized and managed. To this end, quarterly administrative reports (together with the quarterly progress reports) must be submitted.
- v. The officer will make sure that all the aspects of programme execution with financial implications are approved by the CPP-Coordinator and the Head of the Watershed Management Unit. In this context the officer will be responsible, with the assistance of the two field officers and the WMAF's executive members, to recruit labour deemed necessary for the execution of the activities of the WMAF's action plan.
- vi. The officer will attend meetings of the WMAF(s) in an ex-officio capacity.

**Functional Post: TOT Field Officer**

- General:**
- i. The officer should be a technically skilled person in the area of (1) **agricultural engineering**/(2) **agricultural extension** and should have experience in community work.
  - ii. The officer will report directly to the Technical Operations Supervisor, with copies circulated to the WMAF's Chairperson, the CPP-Coordinator, the Head of the Watershed Management Unit, and the LCB's chairperson.
  - iii. The specific activities and functions of the officer will be determined by the prepared and approved plan of action of the CPP-WM.

**Other Duties:**

- i. The officer will liaise with community groups/organisations, farmers and residents in general of the watershed(s) with the objective of strengthening and

reinforcing the relationship between the communities and the WMAF(s).

- ii. The officer will monitor all developments in the watershed in order to ensure that the policies of the WMAF are respected.
- iii. The officer will prepare and submit to the Technical Operations Supervisor accurate and timely monthly reports of activities and accomplishments.
- iv. The officer will supervise and where relevant implement the programmed activities in the field, assisted by the members of the Action Force, other community members/groups when and where necessary.

**Functional Post:** Secretary-cum-Account Clerk

**Duties:** The secretary should possess knowledge of accounting to enable her/him besides the clerical duties as typist to record the administrative operations of the TOT/WMAF.

# **Annex 10**

## **Appendix B**

**WMAF - ESTABLISHMENT, ANNUAL OPERATING BUDGET,  
AND IMPLEMENTATION REQUEST FORM**

The following tentative budgets indicate the estimated cost of establishing and operating a Watershed Management Action Force (WMAF) under two different financing scenarios. **Budget A** assumes that all equipment, vehicles and other operating costs are met entirely by the GOSL. **Budget B** reflects a reduced estimate which envisages the possibility of establishing the proposed office at the (e.g. Dennerly) Regional Office where the premises and some equipment will be shared with government departments already established there. It also proposes to include the use of existing GOSL vehicles as an option to purchasing new ones. However, one of the main objectives of the trial period of the pilot-WMAF (Dennerly) is to accurately assess the realistic financial requirements and possibilities for self-financing in order to give guidance for the replication process to follow.

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**Budget A**

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<b>I. ESTABLISHMENT COSTS</b>	<b>(EC\$)</b>
1. BASIC OFFICE EQUIPMENT	:17,544
2. TRAINING EQUIPMENT	:15,091
3. VEHICLE AND MACHINERY	:133,427
<b><u>TOTAL ESTABLISHMENT COSTS :</u></b>	<b><u>166,062</u></b>
<b>II. ANNUAL RECURRENT OPERATING COSTS. (EC\$)</b>	
1. STAFF SALARIES*	:(97,847)
2. VEHICLE MAINTENANCE & RUNNING COSTS	: 7,100
3. TRAINING AND EDUCATION	: 20,400
4. OFFICE SUPPLIES	: 2,468
5. UTILITY BILLS	: 15,240
6. CONSERVATION WORKS**	:(25,000)
7. DRAINAGE WORKS**	:(25,000)
8. Contingencies (10%)	:(19,305)
<b>TOTAL ANNUAL RECURRENT COSTS*</b>	<b><u>:212,360</u></b>

\* During the replication process of the CPP-WM the recurrent expenditure for staff salaries of one TOT will serve more than one WMAF, probably 2 or more.

\*\* For the time being there is no possibility to estimate the financial requirements needed for the conservation and drainage works. The realistic dimensions of the works to be implemented will depend on the continuous needs of each individual WMAF, the size and nature of geographical areas, and the capacity of the Action Force to mobilise voluntary work contribution. It is therefore difficult to estimate these costs accurately at present.

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**Budget B**

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<b>I. ESTABLISHMENT COSTS</b>	<b>(EC\$)</b>
1. BASIC OFFICE EQUIPMENT	: 13,444
2. TRAINING EQUIPMENT	: 15,091
3. MACHINERY	: 86,356
<b><u>TOTAL ESTABLISHMENT COSTS :</u></b>	<b><u>114,891</u></b>
<b>II. ANNUAL RECURRENT OPERATING COSTS.</b>	<b>(EC\$)</b>
1. STAFF SALARIES*	:(97,847)
2. VEHICLE MAINTENANCE & RUNNING COSTS	: 7,100
3. TRAINING AND EDUCATION	: 20,400
4. OFFICE SUPPLIES	: 2,066
5. CONSERVATION WORKS**	:(25,000)
6. DRAINAGE WORKS**	:(25,000)
7. Contingencies (10%)	:(17,741)
<b>TOTAL ANNUAL RECURRENT COSTS*</b>	<b><u>:195,154</u></b>

\* During the replication process of the CPP-WM the recurrent expenditure for staff salaries of one TOT will serve more than one WMAF, probably 2 or more.

\*\* For the time being there is no possibility to estimate the financial requirements needed for the conservation and drainage works. The realistic dimensions of the works to be implemented will depend on the continuous needs of each individual WMAF, the size and nature of geographical areas, and the capacity of the Action Force to mobilise voluntary work contribution. It is therefore difficult to estimate these costs accurately at present.

Assumptions used and details of cost estimates:

**ESTABLISHMENT COSTS**

**BASIC OFFICE EQUIPMENT**

<b>Equipment</b>	<b>approx. unit cost EC \$</b>	<b>Number</b>	<b>Total cost EC \$</b>
secretary's chair	800.00	1	800.00
office desks	1200.00	3	3600.00
office chairs	300.00	5	1500.00
filing cabinet	1400.00	1	1400.00
fax machine/telephone	2500.00	1	2500.00
photocopier	1600.00	1	1600.00
computer/printer/mouse	5500.00	1	5500.00
dustbins	12.00	1	12.00
filing trays	33.00	3	99.00
diskette tray	60.00	1	60.00
transformer	300.00	1	300.00
foot extension cord	150.00	1	150.00
stapling machines	16.00	1	16.00
paper punch	7.00	1	7.00
		<b>Total cost :</b>	<b>17,544.00</b>

(Estimated costs of all office equipment and stationery based on prices obtained from various office equipment and stationery stores).

**B. TRAINING EQUIPMENT**

<b>Equipment</b>	<b>approx. unit cost EC \$</b>	<b>Number</b>	<b>Total cost EC \$</b>
flip charts	55.00	6	330.00
easel	200.00	1	200.00
slide projector	2300.00	1	2300.00
slide projector carousel	45.00	1	45.00
slide screen	500.00	1	500.00
overhead projector	2800.00	1	2800.00
multi-system video recorder	1900.00	1	1900.00
TV monitor (20@)	2500.00	1	2500.00
stand by generator	4000.00	1	4000.00
camera	300.00	1	300.00
video tapes	12.00	12	144.00
audio tapes	3.00	24	72.00
		<b>Total cost :</b>	<b>15,091.00</b>

## C. VEHICLE AND MACHINERY

### - Agricultural tools

Equipment	approx. unit cost EC \$	Number	Total cost EC \$
forks	145.00	2	290.00
trench spades	36.00	2	72.00
shovels	35.00	2	70.00
cutlasses	17.00	2	34.00
file	10.00	1	10.00
pickaxes	29.00	2	58.00
crowbar	32.00	2	64.00
wheel barrows	220.00	2	440.00
line	28.00	6 (rolls)	168.00
tapes	75.00	2	150.00
		<b>Total costs :</b>	<b>1356.00</b>

(Source : El Paso Marketing - American Drywall)

### - COSTS OF ONE 4 WHEEL DRIVE VEHICLE - APPROXIMATE COST : \$ 47,071.00

Vehicle - 4x4 WD Mitsubishi - Diesel Engine 2500cc Duty free

(Source : JQ Charles Motor Sales Department)

### - COST OF HEAVY DUTY MECHANICAL EQUIPMENT - MINI TRACTOR OR EXCAVATOR - APPROXIMATE COST : \$ 85,000.00

Mini tractor or excavator recommended for drainage activity on small scale projects not requiring vast drains and very difficult operations e.g. steep terrain.

(Local agent or source of information cost : Sunset Motors)

**TOTAL COST OF VEHICLE AND MACHINERY : \$ 133,427.00**

## II. RECURRENT OPERATING COSTS EC \$.

### STAFF SALARIES

Staff salaries are based on discussions with Mr. Martin Satney re. (Director, Agricultural Engineering) qualifications required for each post. Salaries quoted based on relevant grades as established by the Government of St. Lucia Estimates 1996/1997.

1. **Technical Operations Supervisor :**  
Grade 9  
Approximate annual salary : \$29,743
2. **Field Officers (2) :**  
Grade 7  
Approximate annual salary : \$24,591 (2x)

3. Secretary/accounts clerk :  
 Grade 5  
 Approximate annual salary : \$18,921

**TOTAL STAFF SALARIES : \$97,847**

**VEHICLE MAINTENANCE AND RUNNING COSTS.**

Nature of maintenance	Total Cost EC\$
tyres (4 tyres @ \$350.00)	1400.00
service ( estimated cost)	2500.00
cleaning material ( estimated cost)	200.00
fuel ( estimated cost)	3000.00
<b>Total costs :</b>	<b>7,100.00</b>

(Source of information : informal discussions with garage personnel of JQ Charles Motor Sales Department)

**C. TRAINING AND EDUCATION.**

( estimated on the basis of 12 sessions - 1 session per month). Costs based on informal discussions with personnel from various government offices.)

	Approximate cost \$
-Stationery / film processing (\$300 per workshop)	3600.00
-Transport - field trips (\$350 per trip)	4200.00
-Facilitation (1 facilitator @ \$300 per workshop)	3600.00
-Refreshments/ meals (approx. 25 participants per session at \$25 per head)	7500.00
-Printing of posters, leaflets etc.	1500.00
<b>Total costs :</b>	<b>20,400.00</b>

**D. UTILITY BILLS**

Utility bills	Monthly average costs EC \$	Year total EC \$
Telephone	500.00	6000.00
Office rental	700.00	4200.00
Fax rental	300.00	3600.00
Electricity	100.00	1200.00
Water	20.00	240.00
<b>Total costs :</b>		<b>15,240.00</b>

## E. OFFICE SUPPLIES

Stationery	approx. unit cost EC \$	Number	Total cost EC \$
masking/ scotch tape	6.00	12	72.00
diskettes	55.00 per pkt.	6	330.00
rulers	1.00	3	3.00
sharpeners	1.00	3	3.00
scissors	13.00	2	39.00
legal pads	4.00	12	48.00
pencils	1.00	24	24.00
staple removers	3.00	2	6.00
push pins	3.00	6	18.00
erasers	1.00	3	3.00
steno pads	7.00	4	28.00
file suspenders	135.00 per set	1	135.00
markers	15.00 per doz.	3	45.00
paper (typing/copying)	236.00 per box	5	1180.00
post it notes pads	12.00 per doz.	2	24.00
toner	90.00	4	360.00
fax paper	7.00	6	42.00
paper clips	5.00	6	30.00
pens	1.00	36	36.00
glue	7.00	6	42.00
		<b>Total cost :</b>	<b>2468.00</b>

## F. CONSERVATION WORKS & DRAINAGE WORKS

For the time being there is no possibility to estimate the financial requirements needed for the conservation and drainage works. The realistic dimensions of the works to be implemented will depend on the continuous needs of each individual WMAF, the size and nature of geographical areas, and the capacity of the Action Force to mobilise voluntary work contribution. It is therefore difficult to estimate these costs accurately at present. However, discussions with various government personnel in the fields of agriculture and forestry and other persons in the commercial sector who have some experience with drainage and conservation works provided the following information :

### Cost for drainage works:

- Drains : 3 feet approx. \$40 - 60 per chain
- : 18 inches approx. \$24 - 20 per chain
- : 1 foot approx. \$12 - 15 per chain

-Mini tractor or excavator recommended for drainage operations on small scale projects Operators fees \$10 - \$15 per hour.

-Mechanical Operation of mini tractor in the Dennery Area might be in the range of \$115 - \$130 per hour,

**Tied Contour Drains on sloping land (any crop):**

-setting up: 20 man-days/acre for installation at \$40./man-day (range 10-30 man-days depending on drain spacing and depth)

-annual maintenance: 6 man-days/acre at \$40./man-day (range 4-8 man-days/acre)

TOTAL COST: \$800./acre for year 1  
\$240./acre for year 2 etc.

**Cost for conservation works :**

**Banana Land: Improved Trash Management:  
Maintenance of Uniform Trash Cover:**

-setting up: 4 person-days/acre at \$30./day (extra labour input)

-annual maintenance: 3 person-days/acre at \$30./day

TOTAL COST: \$210./acre in year 1  
\$90./acre in year 2 etc.

**Installation and Maintenance of Trash Lines:**

-setting up: 4 person-days/acre at \$30./day (extra labour input)

-annual maintenance: 3 person-days/acre at \$30./day

(Assumes local availability of stakes of 30-50 mm Ø and 60-90 cm long).

TOTAL COST: \$210./acre in year 1  
\$90./acre in year 2 etc.

[Installation and Maintenance of Trash Lines is advocated in addition to a Uniform Trash Cover in cases where slopes are particularly steep and/or where extra sources of trash are available.]

**Arable (Annual Cropping Land):**

-Planting - four chains of Khus-Khus (Vetiver Grass) planting materials require one man and one woman day (\$40 + \$30 = \$70)

-One truck load Khus-Khus: digging - 2 to 3 man days at \$40 per day.

-General conservation works estimated as \$5000.00 per acre for manual labour required to carry out works with an additional \$1550 for maintenance costs.

# **Annex 10**

## **Appendix C**

**B. ESTABLISHMENT OF FOUNDATION FOR COMMUNITY PARTICIPATION PROGRAMME**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Inception Meetings and Initial Sensitisation</b></p>	<p>(i) To present to the target community the:</p> <ul style="list-style-type: none"> <li>• main ideas of the community participation programme.</li> <li>• need for the community participation in watershed management.</li> <li>• need for the establishment of a local group to take on the responsibility of community based watershed management.</li> </ul> <p>(ii) To explore the view of the community on their needs and priorities re: Watershed Management and to determine their readiness to address these needs.</p> <p>(iii) To explore the view of the community on tasks and responsibilities of and resources needed for the local group envisaged.</p> <p>(iv) To explore the possible composition of the local group.</p> <p>(v) To outline the procedure towards establishing and empowering of the local group envisaged.</p>	<p>Establish contacts with key persons (e.g. community leaders in particular) identified in reconnaissance exercise for the purpose of organising and conducting:</p> <ul style="list-style-type: none"> <li>• informal one-by-one and/or small group meetings</li> <li>• community representatives interviews/meetings. (for details, see chapter 3.4).</li> <li>• Community interviews (which take the form of public meetings open to all community members).</li> </ul>	<ul style="list-style-type: none"> <li>• Initial sensitisation of community to ideas of the community participation programme.</li> <li>• Preliminary ideas of the community's perception of their needs, priorities and their readiness to address these needs outlined and documented.</li> <li>• Preliminary views and ideas of the community re: establishment of local group outlined and documented.</li> </ul>

**ACTION CATALOGUE FOR THE APPLICATION/REPLICATION OF THE COMMUNITY PARTICIPATION PROGRAMME  
IN WATERSHED MANAGEMENT  
(to be facilitated and co-ordinated by the CPP - Coordinator)**

**A. RECONNAISSANCE**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Reconnaissance Exercise/ Surveys</b></p>	<p>To gather information concerning:</p> <ul style="list-style-type: none"> <li>• the existence, status and composition of community groups/organisations in target community.</li> <li>• government personnel, government institutions (eg. schools), Non Governmental Organisations and other institutions (eg. religious) which operate within the target area.</li> <li>• influential individuals of the community</li> <li>• community facilities (eg. community centres) as possible venues for meetings, workshops etc.</li> <li>• best possible instruments for disseminating information to community</li> <li>• advantage and constraints to paving "The Way Forward".</li> </ul>	<p>Use of various Rapid Appraisal Methods:</p> <ul style="list-style-type: none"> <li>• informal surveys</li> <li>• key informant interviews</li> <li>• structured direct observation</li> <li>• community interviews</li> </ul>	<p>Comprehensive list of:</p> <ul style="list-style-type: none"> <li>• community groups/ organisations including information on executive composition. Contact persons, telephone numbers and addresses</li> <li>• government personnel who serve community including designation, work address and telephone numbers.</li> <li>• Non Governmental Organisations and other institutions, including contact persons, addresses and telephone numbers.</li> <li>• community facilities including seating capacity, equipment, furniture etc. available there; location, proximity to main concentration of population and availability for public use.</li> <li>• The most popular information media from the community point of view; including information on television and radio reception and newspaper preference</li> <li>• Written record of other vital information relevant to the establishment of a community participation programme e.g. best days for conducting community meetings.</li> </ul>

**B. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Establishment of an 'Interim' Watershed Management Action Force (WMAF)</b></p>	<p>The establishment of a small working group with the general responsibility to:</p> <ul style="list-style-type: none"> <li>• direct future sensitisation activities.</li> <li>• mobilise community support.</li> <li>• initiate preliminary efforts to establish the operational base for the community participation programme.</li> </ul>	<p>Establishment of working group based on preliminary ideas identified by community members at inception meetings. Selection procedure to be determined by community members. Possible options for selection:</p> <ul style="list-style-type: none"> <li>• nominations</li> <li>• elections</li> <li>• offer of voluntary service</li> </ul>	<p>Establishment of a temporary, small working committee/ group. (minimum 5 members).</p>
<p><b>Meeting of 'Interim' WMAF with the CPP- Coordinating Team/Watershed Management Unit</b></p>	<ul style="list-style-type: none"> <li>(i) to formally introduce Interim WMAF to the CPP- Coordinating team.</li> <li>(ii) to appoint a chairperson and secretary to the Interim WMAF.</li> <li>(iii) to review role of 'Interim' WMAF and responsibility of individual members.</li> <li>(iv) to discuss "The Way Forward" e.g. to finalise procedure for follow up community meetings, sensitisation and membership of proposed and formalised WMAF.</li> </ul>	<p>Focus Group Discussions.</p>	<ul style="list-style-type: none"> <li>• Role of 'Interim' WMAF and responsibility of members detailed and outlined.</li> <li>• Appointment of secretary and chairperson to 'Interim' WMAF.</li> <li>• Ideas on "The Way Forward" outlined, detailed and documented.</li> </ul>

**B. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Sensitisation and Publicity Campaign (SPC)</b></p>	<p>To conduct an ongoing sensitisation programme aimed at:</p> <ul style="list-style-type: none"> <li>the disseminating of information as outlined in objective (i) under 'Inception Meetings and Initial Sensitisation'.</li> <li>keeping community and general public continually updated on the activities and progress of the Community Participation Programme as directed by the local group.</li> </ul>	<ul style="list-style-type: none"> <li>As outlined under 'Inception Meetings and Initial Sensitisation'.</li> </ul> <p><b>IN ADDITION</b></p> <ul style="list-style-type: none"> <li>Use of other means identified in reconnaissance exercise as most suitable for community. Examples of means/media which could be utilised:               <ul style="list-style-type: none"> <li>Schools and Parent Teacher Associations in Community</li> <li>Newspapers</li> <li>Radio (creole radio programmes where applicable)</li> <li>Television</li> <li>Through Government Information media eg. Government Information Service (GIS)</li> <li>Use of posters, fliers, bill boards</li> <li>Spot meetings</li> <li>House to house meetings</li> <li>Panel discussions and interviews on radio and TV.</li> <li>Through the public relations media of community groups/ organisations eg. religious organisations, clubs etc. (for details, see chapter 5.3)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Created awareness of the target community on the need for community based watershed management and the CPP in general.</li> <li>Ongoing outflow of information to community and general public.</li> <li>Appropriate record of all information disseminated, eg.               <ul style="list-style-type: none"> <li>video tapes</li> <li>audio tapes</li> <li>newspaper clippings</li> <li>reports, minutes</li> <li>samples of promotional material</li> </ul> </li> </ul>

**B. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Establishment of the Watershed Management Action Force</b></p>	<p>To establish a committee (i.e. the WMAF) which will be pivotal to the successful and sustainable management of the respective watershed. (maximum 15-20 persons)</p>	<p>Following the initial sensitisation programme and inception meetings the 'Interim' WMAF will at a public community meeting or community representatives meeting select persons to serve on the WMAF. Possible options for selection</p> <ul style="list-style-type: none"> <li>• nominations</li> <li>• elections</li> <li>• offer of voluntary service</li> </ul> <p>(for details, see chapter 3.4)</p>	<p>Established WMAF</p>
<p><b>First meeting of the WMAF</b></p>	<p>(i) to appoint an Executive to the WMAF. (ii) to outline "The Way Forward".</p>	<p>Election of Executive members from total member pool of the WMAF.</p>	<p>Appointed Executive comprising the following:</p> <ul style="list-style-type: none"> <li>• Chairperson</li> <li>• Deputy chairperson</li> <li>• Public Relations Officers</li> <li>• Secretary</li> </ul> <p>Documentation of ideas to "The Way Forward".</p>

**B. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Appointment of Technical Operations Team (TOT).</b></p>	<p>To equip the WMAF with a Technical Operations Team (of no less than 3 persons) to facilitate and technically guide programme execution on a continued basis.</p>	<p>TOT to be selected by WMAF members or, alternatively, to be appointed by respective Ministry (through the Watershed Management Unit). (for details, see chapter 3.5)</p>	<p>Appointed TOT composed of:</p> <ul style="list-style-type: none"> <li>• Technical Operations Supervisor</li> <li>• Field Officers (2)</li> <li>• Secretary-cum Accounts Clerk</li> </ul>
<p><b>Identification of External Support Groups and Organizations.</b></p>	<p>(i) To identify organisations and their representatives who will where and when appropriate provide operational and technical assistance to the WMAF.</p> <p>(ii) To establish a network between the WMAF, the CPP- Coordinating team/Watershed Management Unit, and external support groups and organisations.</p>	<ul style="list-style-type: none"> <li>• Research to identify the general institutional set up within which the WMAF will operate.</li> <li>• Establish contact with relevant institutions to identify and brief potential future resource persons. (for details, see chapter 3)</li> </ul>	<p>Comprehensive list of organisations and the representatives including, address and contact numbers, which will provide operational and technical assistance to the WMAF.</p>

### C. PARTICIPATORY PROBLEM ANALYSIS

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Participatory Problem Identification and Prioritisation</b></p>	<p>(i) To identify and analyse environment related problems which exist within the watershed.</p> <p>(ii) To prioritise problems identified in an effort to determine the feasibility and urgency with which each will be addressed and within what time frame.</p>	<ul style="list-style-type: none"> <li>• WMAF/ The TOT and other community members take part in field trips to identify and examine environment related problems within the watershed.</li> <li>• Workshops and/or meetings to discuss observations on field trips, to analyse the cause of problems and to identify possible solutions.</li> <li>• Workshop and meetings also aimed at selecting the pressing problems which need addressing</li> </ul>	<p>The identification of preliminary ideas for a work plan outlined and documented.</p>

**D. PARTICIPATORY PROJECT PLANNING**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Participatory Preparation of WMAF Work Plan</b></p>	<p>To produce a work plan for the sustainable management of the Watershed through the combined efforts of the WMAF, the Technical Operations Team and External Support Groups.</p>	<ul style="list-style-type: none"> <li>• WMAF's preliminary ideas for the work plan to be circulated to members of the TOT and External Support Groups for comment and review.</li> <li>• Consultation between WMAF and TOT for discussion of proposed work plan.</li> <li>• Selection of WMAF representatives (by committee) to work on the preparation of a draft work plan (assisted by TOT and CPP-Coordinating Team).</li> <li>• Working meeting(s) with selected representatives of the WMAF, the Technical Operations Team, members of the External Support Group and the CPP - Coordinating Team to finalise content and compilation of a draft work plan.</li> <li>• Circulation of draft work plan to all members of the WMAF, the Technical Operational Team, the External Groups and other resource persons for comment and review.</li> <li>• Working meeting to finalise production of work plan based on final comments and review.</li> <li>• Presentation of work plan to the larger community for final review and acceptance. (Details, see chapter 5.2)</li> </ul>	<p>Watershed Management Action Force- Work Plan.</p>

**D. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Participatory Project Planning and Prioritisation</b></p>	<p>(i) To identify and prioritise projects/ activities based on WMAF Work Plan.</p> <p>(ii) To develop detailed proposals and action plans for projects identified.</p> <p>(iii) To determine budgets, monitoring and evaluation procedures for project implementation.</p>	<p>Based on Work Plan</p> <ul style="list-style-type: none"> <li>• WMAF meets to identify and prioritise activities/projects and to develop detailed proposals and action plans for these.</li> <li>• Selected community members participate in meetings with the WMAF to discuss details of projects and to identify the necessary participatory monitoring and evaluation procedures.</li> <li>• WMAF and Technical Operations Team meet to discuss details of budgets, needs of time, resources etc. of priority projects identified and examine development options and funding sources.</li> <li>• Completed project proposals and action plans to be taken to the larger community for final revisions and acceptance.</li> </ul>	<ul style="list-style-type: none"> <li>• Priority project proposals, action plans and budgets completed for implementation process. (completion of 'Project Description/ Implementation Request Forms')</li> </ul>

**E. PARTICIPATORY IMPLEMENTATION OF WORK PLAN**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Implementation of Priority Projects/Activities.</b></p>	<p>To implement priority projects/activities identified by the WMAF based on a community participatory approach and in accordance with elaborated Work Plan.</p>	<ul style="list-style-type: none"> <li>• The activities and procedures for implementation are to be undertaken in accordance with the detailed project proposals. Frequent referral to action plans are necessary to ensure that projects are implemented in an orderly and timely fashion.</li> </ul>	<p>Completed Projects and Projects in Action.</p>
<p>Participatory Monitoring</p>	<p>(i) To generate information during the life cycle of the project which will guide modification if necessary.</p> <p>(ii) To generate information which can be utilised during the evaluation procedure.</p> <p>(iii) To ensure that proper standards are maintained during project implementation and to determine whether resources are being utilised effectively.</p>	<ul style="list-style-type: none"> <li>• Conduct participatory monitoring workshop for all interested persons.</li> <li>• community and WMAF to take responsibility for:               <ul style="list-style-type: none"> <li>- determining what is to be monitored</li> <li>- selecting the monitoring procedure</li> <li>- analysing and documenting the monitoring conclusions</li> </ul> </li> </ul>	<p>Report on participatory monitoring procedure (to be included in detailed project proposals: see above).</p>

**E. Continued**

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
Participatory Evaluation	To have community members and the WMAF actively involved in conducting a participatory evaluation of their projects.	<ul style="list-style-type: none"> <li>• Conduct participatory evaluation workshop for all interested persons.</li> <li>• Community and WMAF to take responsibility for:               <ul style="list-style-type: none"> <li>- determining what is to be evaluated</li> <li>- analysing and documenting the evaluation results.</li> </ul> </li> <li>• Present conclusion of respective project evaluation to community.</li> </ul>	Report on participatory evaluation of the respective project.

E. Continued

ACTIVITY	OBJECTIVE	MEANS/METHOD	OUTPUT
<p><b>Internal Education Programme for the WMAF and TOT</b></p>	<p>(i) To foster changes in the perception, knowledge and attitude of the WMAF towards watershed management.</p> <p>(ii) To improve the understanding of the WMAF re:</p> <ul style="list-style-type: none"> <li>• conceptional and technical aspects of watershed management</li> <li>• the institutional and legislative aspects which relate to watershed management in St. Lucia.</li> </ul> <p>(iii) to improve the performance and output of the WMAF's work towards sound preparation and implementation of the work plan</p>	<ul style="list-style-type: none"> <li>• Internal Education Programme to be coordinated by the Community Participation Coordinating Team.</li> <li>• The form and content of sessions to be determined by facilitator in accordance with the CPP - Coordinating Team and the WMAF. (for details, see chapter 5.4 and Denney Work Plan - Appendix IV).</li> </ul>	<ul style="list-style-type: none"> <li>• Internal Education of WMAF and TOT in Watershed Management.</li> </ul>

# **Annex 10**

## **Appendix D**

Compiled by Joanna Raynold, Community Participation Coordinator  
Technical review by Albert Lieberg, Socio-Economist Consultant  
(St. Lucia Watershed and Environmental Project)  
Based on proposals elaborated by the Denmery - WMAF

## INTRODUCTION

The St. Lucia Watershed and Environmental Management Project was conceived after Tropical Storm, Debbie, which hit St. Lucia on 9-10 September, 1994, causing severe and wide spread damage to the environment, property, agricultural land, river/drainage systems and social and economic infrastructure.

Following this devastation, the Government of St. Lucia made an urgent request to the World Bank for assistance which materialized initially in the form of a team of consultants to assess the situation. This team with the support of the British Development Division in the Caribbean (BDDC) worked in St. Lucia from November to December 1994. The result of their investigations and assessments was the formulation of the "The Watershed and Environmental Management Project". This proposed a two phase strategy:

- Phase I which is now completed, comprised a priority works program to effect repairs to the river and drainage systems. These works responded to the need for emergency rehabilitation of river systems and other structures associated with the damage as a result of the storm.
- Phase II was designed to take a longer term view of environmental management. The main objective is to strengthen the environmental management of watersheds in St. Lucia through the development and implementation of a National Watershed and Environmental Management Plan, within a 5-15 year period.

In an effort to enhance the future success of the implementation of the National Watershed and Environmental Management Plan, active community involvement for recommended institutional and developmental changes is expected to be a key element. In this respect, a Community Participation Program in Watershed Management (CPP-WM) was initiated as a trial in the Dennery Watershed. This trial is expected to run for a minimum period of two years with project support. Thereafter, the CPP-WM is to be incorporated into the official GOSL development policy. In the long run, the CPP-WM will have to develop mechanisms of cost recovery and self-financing in order to increase sustainability. The intention is to gradually replicate this program in all Watersheds in St. Lucia.

The Dennery and Cul de Sac Watersheds were chosen as pilot areas which are representative of the physical, economic and social conditions of other watersheds in St. Lucia. The Dennery river Watershed, located on the east coast is small and provides a pilot area which is relatively homogenous in comparison to Cul de Sac. It is this homogeneity and the concentration of a population in a smaller geographical area which facilitates, in the given time frame, a trial based on the community involvement approach. Cul de Sac, among other considerations, was chosen on the basis of its location on the west coast and its size, being one of the largest watersheds in the island. It is also one of the most degraded and more complex watersheds, in which there are many conflicting landuses reflected by the diversity of economic and social activities.

Though different in many respects, the two watersheds share similar problems, such as soil erosion, flooding, river siltation, and the deterioration of land and water quality associated with poor watershed management. There are therefore many lessons to be learned from the experiences of these watersheds.

## **COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT FOR DENNERY**

Participation represents a process by which people take an active and influential role in shaping decisions that affect their lives. In the context of the community, it involves allowing the people to decide, and act in a structured and well organized manner. It implies empowerment of groups, communities and organizations, allowing them to actively participate in the management of their development and that of the community as a whole.

People's participation and community initiatives are increasingly being recognized as indispensable mechanisms for the sustainable management of natural resources. Experience shows that developmental objectives are more likely to be achieved, if the beneficiaries are actively involved in designing and implementing the work necessary. It becomes therefore evident that the efforts of the government, NGOs and other organizations and institutions involved in watershed management would be insufficient without the cooperation of farmers and other sections of the population living within the watersheds, particularly on the most sensitive and critical sites - steep slopes, along the river banks and flood plains.

The idea for a community participation program was officially brought to Dennery on 27 January, 1997 when project personnel organized and held a meeting with various individuals and representatives of community groups/organizations operating in the Dennery Community. The purpose of this meeting was to inform about the project objectives and to solicit opinions on the necessity and feasibility of conducting such a program in the Dennery Community. There was a general positive response to the proposals of the project and most importantly it was agreed that a local committee/group should be created to implement the program and to direct related activities.

Following further consultations, meetings and other sensitization efforts, on March 22, 1997 a group of volunteers, representatives of a wide cross section of community groups/organizations, met to establish the local committee previously mentioned. At present the committee comprises some 15 persons and operates under the name of the "Dennery Watershed Management Action Force" (Dennery/WMAF). A temporary executive has been appointed until such time that the committee has established a firmer footing. The existing executive is therefore as follows:

### **EXECUTIVE**

<b>Chairperson</b>	<b>: Edme Celestine</b>	<b>Secretary</b>	<b>: Roseline Felix</b>
<b>Deputy Chairperson</b>	<b>: Alfred Prospere</b>	<b>Public Relation Officers</b>	<b>: Jerome Gideon</b> <b>: Ivan Gaspard</b>

The task and the responsibilities of the WMAF are directly linked to the Community Participation Program. Through the WMAF, the community is expected to become actively involved in the organization of programs to direct land conservation, drainage and other watershed management related activities within the geographical boundaries of the respective watershed.

In this respect the WMAF will work to effect changes in agricultural practices and also in the general behavioural/educational attitudes that have proven to have a negative impact on proper watershed management. The three main instruments which will be utilized to effect good watershed management are:

1. Works Implementation
2. Monitoring & Communication,
3. Education and Training.

These will involve the following activities:

1. implementation of and participation in land conservation programs to reduce erosion and subsequent river siltation; provision of technical assistance geared towards the adoption of appropriate agricultural practices;
2. cleaning and unblocking of main and secondary drains and culverts;
3. monitoring of drainage systems, and the organization of works to be implemented;
4. communicating the needs for capital intensive works to be carried out by higher authorities/Government agencies;
5. Workshops and other educational programs and public awareness campaigns with respect to proper watershed management, including solid waste management;
6. river bank protection and stabilization;
7. reforestation and other forestry activities; especially in relation to watershed protection;
8. promotion of improved housing and infrastructural design and appropriate water conservation measures to reduce the risk of damage by runoff and flooding etc.

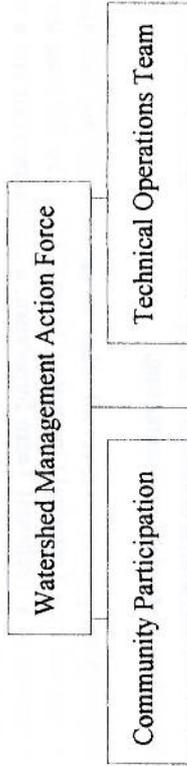
In addition the committee will act as a catalyst to ensure that local issues relating to sound watershed management are addressed. This would include:

1. The mediation of local disputes, for example, related to the responsibility of land owners in drain maintenance.
2. The swapping of eroded land (best reforested) for suitable Crown lands.
3. Monitoring to prevent inappropriate or illegal construction/or infrastructural developments. e.g., feeder roads.
4. The promotion of alternative production systems and information on markets and marketing.

In order to demonstrate the paramount importance of Watershed Management vis-a-vis all other social and economic activities, and in view of the necessity to institutionalize watershed management on a continuing basis, the WMAF is assisted by a Technical Operations Team (TOT). The TOT has the task to assist and technically guide the WMAF in the implementation of the WMAF-Work Plan. The team comprises of a Technical Team Supervisor, a field supervisor and a secretary. The Technical Team Supervisor and the field supervisor are technical experienced in watershed management and community development.

The herewith presented work plan has been elaborated as a Master Plan. This entails that the work plan activities defined are prioritized as such but detailed elaboration and implementation will depend on the timely circumstances. It represents, therefore, not an annual work plan but a comprehensive Master Plan base for the compilation of annual work plans. All activities/ projects to be carried out will have to be defined in details through the compilation of the "Project Description/Implementation Request Form" (see appendix III).

**Work Plan Priorities of the  
Dennery Watershed Management Action Force**



**WORK PLAN:**

- A) Internal Education of WMAF and TOT
- B) Public Awareness Campaign
- C) Land Conservation and Management
  - Education & Monitoring
  - Rehabilitation of degraded land
  - Revitalization of Extension Services; Land Acquisitions
- D) River Maintenance
  - Education & Monitoring
  - River Clean-up Campaign
  - River Bank Stabilization
- E) Urban & Rural Drainage System Improvement and Maintenance
  - Education & Monitoring
  - Drain and Culvert Maintenance and Repairs

**Additional:** Survey of Human Resources

**Program component: A. INTERNAL EDUCATION OF WMAF AND TECHNICAL OPERATIONS TEAM**

**OBJECTIVES**

1. To foster changes in the perception, knowledge and attitude of the target group towards watershed management.
2. To improve the understanding of the WMAF and the Technical Operations Team on:
  - (a) conceptual and technical aspects of watershed management;
  - (b) the institutional and legislative aspects which relate to watershed management in St. Lucia.
3. To improve the performance and output of the WMAF and the Technical Operations Team's work towards implementation of the work plan.

Program component: A. Internal Education of WMAF and Technical Operations Team

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other Requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1,2,3	<p>(i) Lectures and field tours on:</p> <ul style="list-style-type: none"> <li>(a) The physical aspects of a watershed</li> <li>(b) Watershed management, i.e. land and water conservation, prevention of soil erosion and flooding</li> <li>(c) Local legislation governing watershed management in St. Lucia</li> </ul> <p>(ii) Seminars, workshops, group discussions on:</p> <ul style="list-style-type: none"> <li>(a) community participation and mobilization in watershed management</li> <li>(b) leadership skills/group dynamics/conflict resolution</li> <li>(c) fund raising, self financing and cost recovery</li> <li>(d) project identification and formulation (including: budgeting and cost estimates)</li> <li>(e) organizational capacity building</li> <li>(f) goal setting and achievement</li> <li>(g) methods and mechanics of communication</li> <li>(h) report writing/minute taking/public speaking</li> </ul> <p>(iii) Regional program - "Designing Community Forestry Activities and Programs for Rural Development"</p>	JR	F & L		14.6.97 14.6.97		
		JG,PV	F & L CANARI	2 x \$312.00 = \$ 624.00	28.7 - 01.8.97		

**Program component: B. PUBLIC AWARENESS CAMPAIGN**

**OBJECTIVES**

1. To inform persons in the community of the Community Participation Program and its objectives.
2. To sensitize the community to the activities and progress of the WMAF.
3. To sensitize the community on their role and relationship in watershed management.
4. To increase the resident's awareness and knowledge on "causes of flood flows/damage", "human intervention and its impact on the environment" and "the responsibility of the individual towards the community". (see as well respective sections on "Education").

**Program component: B. Public Awareness Campaign**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1.2	<p>(i) Radio Interviews:</p> <p>(a) Radio St. Lucia English and Creole News program</p> <p>(b) Interview on creole radio program "Juk Bois" Helen FM- Radio 100</p> <p>(c) Helen FM- Radio 100 News broadcast</p> <p>(d) Radio Caribbean "Guess who is in for Lunch"</p> <p>(ii) Spot meetings through out village to sensitize community and to disseminate information about the project</p> <p>(iii) Village tour with:</p> <ul style="list-style-type: none"> <li>• area representative</li> <li>• Minister of Communication, Works and Transport</li> <li>• Dennyry Disaster Preparedness Committee</li> <li>• representatives WMAF</li> </ul>					<p>Ongoing</p> <p>3-4/6/97</p> <p>10/6/97</p> <p>11/6/97</p> <p>2/6/97</p> <p>8/6/97</p> <p>11/6/97</p>	

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
3 and 4	(iv) News articles in: (a) Crusader (b) One Caribbean (c) Mirror (d) Voice (e) Star	AP,IG	JR			14-28/6/1997 ongoing	
	(v) Televised session News Break- Helen Television System	WMAF	JR				
	(vi) Televised panel discussion	AP,IG	FF, JR	GIS		2/7/97	
	(vii) Meetings with community groups/organizations		MS				
	To be defined when appropriate						

GENERAL OBJECTIVES
<ul style="list-style-type: none"><li>- To utilize the education process as a medium of fostering change in the perception, knowledge and attitude of residents of the Dennery Watershed towards watershed protection and management.</li><li>- To sensitize the target population to the problems, diversity and utility of the Dennery Watershed.</li><li>- To achieve a greater level of awareness and community participation in watershed management activities.</li></ul>

SPECIFIC OBJECTIVES
<ol style="list-style-type: none"><li>1. To promote public awareness for the need to conserve the forest within the watershed.</li><li>2. To increase recognition and appreciation of the threat to water resources created by deforestation and the removal of vegetation in watershed areas and areas of steep gradient.</li><li>3. To increase the awareness and knowledge of the community, particularly farmers, with respect to proper soil erosion prevention/drainage and environmentally sustainable agricultural practices (including proper use and handling of agro-chemicals).</li><li>4. To encourage community groups/organizations, schools clubs/groups and community members in general, to undertake special projects aimed at sustainable watershed management e.g. tree planting, etc.</li><li>5. To monitor the state of the art of the watershed and potential risks e.g. improper agricultural practices, areas prone to erosion/land-slides, inappropriate/illegal (feeder) road construction etc.</li></ol>

**Program component: C. Land Conservation & Management**

**Sub component/element: Education & Monitoring**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1,2,3,4,	<p>(i) Organization of extension workshops/field days for farmers with respect to proper soil erosion prevention/drainage and environmentally sustainable agricultural practices (including use of agro-chemicals)</p> <p>(ii) Meetings, field trips, seminars and workshops with community groups/ organizations, school groups e.g. environmental clubs.</p> <p>(iii) Designing and distribution of information posters, fliers etc. produced through e.g. school competitions</p> <p>(iv) Erection of informative bill board based on community competition design</p> <p>(v) Organization and presentation of popular theatre to present problem to community and target population.</p> <p>(vi) Use of electronic and print media for information sharing, interviews, discussion and news releases.</p> <p>(vii) Training for community leaders and resource persons who will be responsible for education programs.</p> <p>(viii) Establishment of regular watershed monitoring tours to observe, record and report the potential risks for the watershed arising from e.g. improper agricultural practices, areas prone to landslides or inappropriate/ illegal (feeder) road construction etc.</p>						
5							

**Program component: C. LAND CONSERVATION & MANAGEMENT**

**Sub component/element: REHABILITATION OF DEGRADED LAND**

**OBJECTIVES**

1. To identify degraded lands within the watershed in need of rehabilitation.
2. To discourage further degradation of lands within the watershed.
3. To rehabilitate degraded lands within the watershed.

Program component: C. Land Conservation & Management Sub component/element: Rehabilitation of degraded land

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1	<p>(i) Field surveys and desk studies to:</p> <ul style="list-style-type: none"> <li>(a) identify degraded lands (flood prone areas, land slide hazards, eroded land, etc.)</li> <li>(b) categorize lands according to degrees of degradation.</li> <li>(c) identify landuse.</li> <li>(d) categorize farms according to size</li> <li>(e) identify model farms re-good land management.</li> <li>(f) categorize farmers and land owners on the basis of their willingness to participate in proposed programs.</li> </ul>						
2 /3	<ul style="list-style-type: none"> <li>(i) Consultation with land owners and farmers to participate in the problem identification process, to identify the possible approaches to solving problems and to outline the way forward.</li> <li>(ii) Self help projects and activities e.g. replanting of deforested areas and introduction of agro forestry involving individual land owners or community groups/organizations.</li> </ul>						

**Program component: C. LAND CONSERVATION & MANAGEMENT**

**Sub component/element: REVITALIZATION OF FORESTRY AND AGRICULTURAL EXTENSION SERVICES**

<b>OBJECTIVES</b>
<ol style="list-style-type: none"><li>1. To identify the strengths and shortcomings of the Extension Services of the Forestry and Agricultural Divisions in an effort to determine possible approaches for revitalization.</li><li>2. To foster through greater community participation, a better understanding and acceptance of the nature and importance of the extension services available.</li><li>3. To make recommendations to the relevant ministry which will propose suggestions for revitalization of the extension services identified.</li></ol>

Program component: C. Land Conservation & Management

Sub component/element: Revitalization of Forestry and Agricultural Extension Service

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1,2	<ul style="list-style-type: none"> <li>(i) Consultation with the recipients of the extension services.</li> <li>(ii) Meetings, seminars, lectures and workshops with target population.</li> <li>(iii) Consultation between target population and officials of the two Extension Services Division.</li> </ul>						
3	<ul style="list-style-type: none"> <li>(i) Production and presentation of a working paper which will propose recommendations for the revitalization process.</li> </ul>						

**Program component: C. LAND CONSERVATION & MANAGEMENT**

**Sub component/element: LAND ACQUISITION**

**OBJECTIVES**

1. To increase the area of protected forest within the Demnery Watershed through the acquisition of private lands which should remain under forest.
2. To discourage further degradation of forest lands in the watershed, particularly lands degraded through poorly planned agriculture activity.
3. To make recommendations to the relevant government departments and ministries concerning lands which should be made absolute protected areas or conservation areas.

**Program component: C. Land Conservation & Management**

**Sub component/element: Land Acquisition**

Objectives	Activity/Mean/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1 and 2	<p>(i) Field survey and desk study to determine private land ownership in watershed and to identify boundaries of protected forest.</p> <p>(ii) Consultation with private land owners to identify the possible approaches to solving the problem and to outline the way forward.</p> <p>(iii) Meetings, field trips, seminars and workshops with farmers and other private land owners to create an awareness for the need to increase areas of protected forest.</p>						
3	<p>(i) Consultation with Technical/Operational personnel within relevant government departments and ministries to identify possible approaches to solving the problem and to outline the way forward.</p> <p>(ii) Production and presentation of a working paper which will propose recommendations for the land acquisition process.</p>						

**Program component: D. RIVER MAINTENANCE**

**Sub component/element: EDUCATION & MONITORING**

<b>GENERAL OBJECTIVES</b>
<ul style="list-style-type: none"><li>- To utilize the education process as a medium of fostering change in the perception, knowledge and attitude of residents of the Dennyry Watershed towards watershed protection and management.</li><li>- To sensitize the target population to the problems, diversity and utility of the Dennyry Watershed.</li><li>- To achieve a greater level of awareness and community participation in watershed management activities.</li></ul>

<b>SPECIFIC OBJECTIVES</b>
<ol style="list-style-type: none"><li>1. To develop and circulate educational material which will create public awareness with regards to solid waste disposal in rivers.</li><li>2. To create an awareness among community members, especially farmers of the dangers of poor land management, (e.g. cultivating along the rivers' edge and on steep slopes).</li><li>3. To create an awareness among farmers of the consequence of improper disposal of agriculture waste (e.g. coconut husks, agro-chemicals, and diothene bags etc.)</li><li>4. Monitoring the flow of the main rivers and tributaries in terms of siltation, waste etc. blocking the down-flow; Communicate if necessary to responsible authority.</li></ol>

**Program component: D. River Maintenance**

**Sub component/element: Education & Monitoring**

Objectives	Activity/Means/Tools	Responsibility of			Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other		
1,2,3	<p>(i) Meetings, field trips, seminars and workshops with community groups/workshops with community groups/ organizations, farmers, school groups e.g. environmental clubs.</p> <p>(ii) Designing and distribution of information posters, fliers etc. produced through e.g. school competitions</p> <p>(iii) Erection of informative bill board based on community competition design</p> <p>(iv) Organization and presentation of popular theatre to present problem to community and target population.</p> <p>(v) Use of electronic and print media for information sharing, interviews, discussion and news releases.</p> <p>(vi) Training for community leaders and resource persons who will be responsible for education programs.</p>					
4	<p>(vii) Monitoring the flow of main river and tributaries in terms of siltation, waste etc. blocking down-flow. Communicate to responsible authority.</p>					

Program component: D. RIVER MAINTENANCE

Sub component/element: RIVER CLEAN UP CAMPAIGN

**OBJECTIVES**

1. To collect baseline data which will be utilized to assess and address problems associated with solid waste disposal in rivers and waterways.
2. To sensitize the community to methods of proper solid waste disposal, particularly with regards disposal in rivers and drains etc.
3. To effect when necessary, river clean up exercise e.g. desilting and or removal of solid waste.
4. To conduct an assessment of wave dynamics at the mouth of the "Trois Lo" and Dennery rivers to determine the effect of wave action on the backflow of water up the river channel and on siltation at the mouth of the Dennery River.

**Program component: D. River Maintenance**

**Sub component/element: River Clean Up Campaign**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1	<p>(i) Interviews with residents, health and village council personnel.</p> <p>(ii) Field visit with residents and technical personnel for problem identification.</p> <p>(iii) Survey of area to assess the adequacy of solid waste facilities.</p>						
2	<p>(i) Meeting and field trips with residents, community groups, schools.</p> <p>(ii) Designing and distribution of informative posters, fliers etc. produced by WMAF or through school competitions.</p> <p>(iii) Organization and presentation of popular theatre to present problem to community and target population.</p> <p>(iv) Use of electronic and print media for information sharing, discussions and news releases.</p>						
3	<p>(i) Physical clean up and disposal of debris and solid waste through the organized efforts of community or school groups and with the assistance of e.g. the village council or Ministry of Communication, Works and Transport.</p>						
4	<p>(i) Activities to be determined by the Technical Team responsible for exercise.</p> <p>(ii) Communicate need for access road for "Trois Lo River" for river development and solid waste collection.</p>						

**Program component: D. RIVER MAINTENANCE**

**Sub component/element: RIVER BANK STABILIZATION**

**OBJECTIVES**

1. To discourage further degradation of river banks particularly through agricultural activity.
2. To create an awareness among residents, particularly farmers, of the need for proper land management along river banks.
3. To organize and implement special projects which are aimed at effective and sustainable river bank stabilization.
4. To conduct regular field visits with relevant technical personnel, residents and other stake holders to assess and monitor problems of poor land management which exist and occur along river channels and other areas within the watershed.

**Program component: D. River Maintenance**

**Sub component/element: River Bank Stabilization**

Objectives	Activity/Means/Tools	Responsibility of			Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other		
1,2	<p>(i) Field survey and consultation of residents and relevant technical personnel to:</p> <ul style="list-style-type: none"> <li>(a) identify problems</li> <li>(b) determine solutions</li> <li>(c) create awareness</li> </ul> <p>(ii) Education and sensitization exercise with target population through:</p> <ul style="list-style-type: none"> <li>(a) meetings</li> <li>(b) field tours</li> <li>(c) seminars and workshops</li> <li>(d) design and distribution of fact sheets, posters, filers</li> <li>(e) use of electronic and print media</li> </ul>					
3	<p>Implementation of special projects, i.e. river replanting program through farmers' branch groups, other community groups and schools to address problems identified.</p>					
4	<p>Monthly field visits to sites.</p>					

**Program component: E. URBAN & RURAL DRAINAGE SYSTEM IMPROVEMENT AND MAINTENANCE**

**Sub component/element: EDUCATION & MONITORING**

<b>GENERAL OBJECTIVES</b>
<ul style="list-style-type: none"><li>- To utilize the education process as a medium of fostering change in the perception, knowledge and attitude of residents of the Dennerly Watershed towards watershed protection and management.</li><li>- To sensitize the target population to the problems, diversity and utility of the Dennerly Watershed.</li><li>- To achieve a greater level of awareness and community participation in watershed management activities.</li></ul>

<b>SPECIFIC OBJECTIVES</b>
<ol style="list-style-type: none"><li>1. Increase awareness and knowledge of residents on importance and techniques of proper drainage system management as well as land owners responsibilities in clearing of drains.</li><li>2. To secure a constant open - flow of the drainage system through changes in attitudes induced by education of the community.</li><li>3. Identify and monitor respective improvement/repair works to be undertaken by WMAF and other authorities.</li></ol>

**Program component: E. URBAN & RURAL DRAINAGE SYSTEM IMPROVEMENT AND MAINTENANCE**

**Sub component/element: Education & Monitoring**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1,2	(i) Hold workshops with schools, local groups and farmers on relevant topics such as household solid waste management, proper drainage systems (urban and rural) etc.						
3	(ii) Regular drainage system surveys, especially before the rainy season; Communicate major repair works to respective authorities.						

**Program component: E.**

**URBAN & RURAL DRAINAGE SYSTEM  
IMPROVEMENT AND MAINTENANCE**

**Sub component/element: DRAIN AND CULVERT  
MAINTENANCE AND REPAIR**

**OBJECTIVES**

1. To identify and implement priority works related to maintenance and repair of drainage channels (e.g. drains and culverts) in both rural and urban areas of the watershed.
2. Establish drain clearing activities/campaign for urban and rural areas to allow a continuous and proper drainage of the watershed.

**Program component: E. URBAN & RURAL DRAINAGE SYSTEM IMPROVEMENT AND MAINTENANCE**

**Sub component/element: Drain and Culvert Maintenance and Repair**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1	<p>(i) Field surveys to:</p> <ul style="list-style-type: none"> <li>(a) identify and map all existing drains and culverts within the watershed</li> <li>(b) identify drains and culverts in need of improvements or maintenance works.</li> </ul> <p>(ii) Implementation of works identified from field surveys through the efforts and assistance of:</p> <ul style="list-style-type: none"> <li>(a) Denny Disaster Preparedness Committee</li> <li>(b) WMAF other community groups/organizations</li> <li>(c) Denny Village Council</li> <li>(d) Relevant Government departments and ministries e.g. Ministry of Communications, Works and Transport.</li> </ul>						
2	<p>(i) Carry out regular drainage system clearing activities/campaigns for both urban and rural areas.</p>						

**Additional: Human Resource Survey**

**OBJECTIVES**

1. To identify and harness the exploitable human resource potential within the pilot area to be utilized in the developments of the policies and programs of the WMAF.
2. To create an awareness among the target population of the human resource potential and diversity which exist in the pilot area and which can be sourced for the benefit of the project.
3. To design methods and systems to effectively utilize the human resources identified.

**Additional: Human Resource Survey**

Objectives	Activity/Means/Tools	Responsibility of			Budget and Other requirements	Time frame	Limiting Factors/Remarks
		WMAF	TOT	Other			
1,2	(i) Analysis of demographic data to: (a) ascertain the human resource potential of the area. (b) categorize and catalogue the existing human resources.						
3	(i) Consultative meeting with potential clients.						

**Appendix J**

**Composition of the Denney Watershed Management Action Force (WMAF):**

GA	-	Gills Arthur	SL	-	Stanley Lascaris
EC	-	Edme Celestine	OP	-	Olson Peter
TD	-	Thora Dundas	AP	-	Alfred Prospere
RF	-	Roseline Felix	DP	-	Dannison Prospere
IG	-	Ivan Gaspard	PR	-	Philippa Regis
JG	-	Jerome Gideon	DT	-	Dorcas Tobie
TH	-	Theresa Howell	PV	-	Peter Vidal
VPJ	-	Velda Peter Joseph			

**Other Abbreviations:**  
F & L: Forest and Lands Department

**Composition of Technical Operation Team:**

1. FG: Festus George  
TECHNICAL PROGRAM SUPERVISOR

2. FF: Fermin Faucher  
FIELD SUPERVISOR

3. FJ: Fitzgerald John  
FIELD SUPERVISOR

4. LE: Luica Pierre-Emile  
CLERK TYPIST - REGION 3

**Project Personnel:**

1. MS: Martin Satney/Felix Jaria  
Project Co-ordinator

2. JR: Joanna Raynold  
Community Participation Co-ordinator

**Appendix II**

**“Project Description/Implementation Request Form”**

Dennery - Watershed Management Action Force

**PROJECT DESCRIPTION/ IMPLEMENTATION REQUEST FORM**

**Request No.**

Work-Plan Activity/Project: \_\_\_\_\_

Objectives: \_\_\_\_\_  
\_\_\_\_\_

Description of Activity/Project: (including details, e.g. on area, no. of feet etc., where appropriate)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Proposed executing body: \_\_\_\_\_

Technical Support by: \_\_\_\_\_

Time-Frame: \_\_\_\_\_

Equipment/materials to be borrowed:

<u>Item</u>	<u>Period</u>	<u>Source</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Vehicle needed (no. of days): \_\_\_\_\_

Budget Estimate: \_\_\_\_\_  
\_\_\_\_\_

*(detailed break-up, see page 2)*

Remarks/Other: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: \_\_\_\_\_

Signature (WMAF- Chairperson): \_\_\_\_\_

**BUDGET ESTIMATE**

Work-Plan Activity/Project: \_\_\_\_\_

<u>Materials</u>	<u>Unit</u>	<u>Unit-cost</u>	<u>Quantity</u>	<u>Total (EC\$)</u>
1				
2				
-				
-				
-				

Equipment:

- 1
- 2
- 
- 
- 

Fuel:

Hired Labour:

<u>Activity</u>	<u>Persons-days</u>
1	
2	
-	
-	

Other (e.g. tuition fees)

Contingency

**TOTAL ESTIMATE**

Budget Notes:

# **Annex 11**

## **Legislation and Institutions**

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Appendix B	Government Community Based and Other Organisations in the Dennery and Cul de Sac Watersheds.

# St Lucia : Watershed and Environmental Management Project

## Final Report Annex 11

### Legislation and Institutions

#### Chapter 1

#### Introduction

##### 1.1. Inputs and Timing

The Institutions and Legislation Specialist's contribution to the project was split into two parts:

- an initial input from 10 October to 6 December 1996, to review existing legislation and institutions and propose an institutional development programme for 1997;
- a second input from 3<sup>rd</sup> to 19<sup>th</sup> December 1997 to review institutional progress over the previous year and to define and cost a 5 year Watershed Management and Environmental Development Programme.

This Annex details the existing legislation / institutions and recommends the institutional changes required to implement the Watershed and Environmental Management Programme. The Main Report sets out and costs a five year development programme.

##### 1.2. Work Programme.

The team member's terms of reference (ToR) are reproduced in Appendix A. The gap between the two inputs had a considerable impact on the work programme and led to changes in approach based on eleven months of project experience.

General elections were held in May 1997 and resulted in a landslide victory for the main opposition party. The resulting appointment of new Ministers, and some changes in portfolios and senior civil servants has led to delays in policy making and a noticeable reduction of impetus in a number of areas important to the project. It is hoped that these problems will be short lived.

In an attempt to inform and influence opinion the following workshops were held with Government stakeholders:

- on 3<sup>rd</sup> December 1996, to consider possible institutional changes (in practice few of the anticipated institutional changes were put in hand during 1997, as will be evident from subsequent sections of the report );
- on 28<sup>th</sup> October 1997, to describe progress to date and to attempt to determine Government opinion regarding the way in which the development proposals should be formulated.

##### 1.3. Layout of the Report

Following this Introduction, Chapter 2 reviews the environmental legislation on the St Lucian statute books and divides the enactments broadly by sectors, such as agriculture, forestry and tourism.

Chapter 3 discusses the institutions responsible for administering the laws which relate specifically to watershed management and suggests that the project should take only a limited interest in Coastal Zone

Management (CZM), in view of the fact that the Fisheries Department, with assistance from a number of aid agencies, is undertaking a considerable CRM programme. Chapter 4 follows a similar pattern to Chapter 3 and evaluates the Government and non-government institutions involved in environmental management as a whole.

The project ToR require the Consultants to give considerable attention to the part that communities could play in preserving the environment and managing natural resources in the watersheds. A first step in this process was to determine the Community Based Organisations (CBO) which exist at Dennery and Cul de Sac, the watersheds chosen for detailed study. A summary of the findings appears in Chapter 5 with a detailed description in Appendix B.

Chapter 6 proposes a framework for the management of the environment as a whole with special attention being given to watershed management . Proposals prepared at the start of the project have been modified in the light of experience and costs for the resulting development programme appear in the Main Report. There was limited and even disappointing progress on the institutional front during 1997, which can be attributable to a number of factors. Nevertheless the development plan has been formulated on the basis that problems can be overcome and that there is a real commitment on the part of Government to achieve the aims and objectives of the programme on a long term and sustainable basis.

## Chapter 2

### Environmental Legislation

#### 2.1. General

The presentation makes a subjective distinction between:

- watershed legislation; those laws most closely involved in the watershed management project;
- environmental legislation; laws which impact on the wider environmental field;
- disused legislation: laws which are still on the statute books, but which are not used for a variety of reasons..
- areas where there may be a need for new and/or amended legislation

The following sections detail the existing environmental legislation, with comparatively less attention being paid to the laws and regulations dealing with the built environment. The division into various sectors such as agriculture and forestry is a matter of convenience and some overlap is inevitable. There are a number of instances where legislation cuts across sectoral boundaries, for example the forthcoming Disaster Prevention and Preparedness Act will affect most, if not all, sectors. This legislation is with the Attorney General's Office (November 1997), was drafted by the Caribbean Law Institute in Barbados<sup>1</sup> and is one of a series of "Harmonised Legislation" to be adopted, with local variations, throughout the Commonwealth Caribbean in response to common problems.

Using a similar approach to that adopted in the Disaster Prevention and Preparedness Act, the development proposals make provision for the short term appointment of a legal specialist to draft and/or revise environmental legislation prior to progression through the normal legal process. In the following sections reference is made to legislation which the legal specialist should review and if necessary, revise. During the lawyer's first input, it would be necessary to agree a work programme and order of priorities for drafting legislative change.

#### 2.2 Watershed Legislation

##### 2.2.1 Agriculture

###### *a). Land Conservation and Improvement Act (10/92)<sup>2</sup>*

The Act provides for the conservation of land in St Lucia and for the establishment of a Land Conservation Board, responsible for advising the Minister on the following matters:

- the general supervision of land and water resources;
- stimulating public interest in the improvement and conservation of land/water resources;
- recommending legislation;
- co-ordinating the efforts of other conservation bodies/Government agencies;
- implementation of the Act and drafting Regulations;
- advising the Development Control Authority on matters concerning land conservation and improvement.

---

<sup>1</sup> To avoid repetition, frequent reference is made to the Institute's publication "The Environmental Laws of the Commonwealth Caribbean (1991)". Information on more recent legislation was obtained from the Attorney General's office and the cooperation of the Director of Legal Drafting is gratefully acknowledged.

<sup>2</sup> Act 10 of 1992

The Board has a wide ranging mandate, including responsibility for making Protection Orders to:

- prohibit, regulate and control the clearing of land for cultivation, the grazing/watering of livestock and the lighting of fires.;
- prohibit or restrict the cultivation of specific crops;
- regulate the method of cultivating land;
- destroy without payment of compensation, crops planted in contravention of the Act.

The Minister may, with advice from the Board, make General/Specific Protection Orders or declare Conservation Areas. and the Act provides for the right of appeal against such orders.

The Board may make such Regulations as appear to be necessary and there is provision for the appointment of Conservation Officers, for the acquisition of land by private treaty or compulsory purchase and for the imposition of penalties for offences.

The Board comprises the Permanent Secretary MAFF&E (Chair), Director of Agricultural Services, Chief Engineer WASA, Chief Technical Officer (Planning) MFPIS&PS, Chief Engineer MCWT&PU, Chief Forest Officer MAFF&E, the Senior Agricultural Engineer MALF&F (Executive Secretary) and four non-government members appointed by the Minister

Any 6 members shall form a quorum and members serve for 3 years unless they resign or are removed from office, all members may be re-appointed.

No regulations have been formulated and at present, the Board has no access to funds, other than those which might be provided by Government. The legislation was first proposed by the Consultants in 1984 and the draft Bill became available by the end of 1987. The Act finally reached the statute books in April 1992 and again nothing happened until after TSD, when the Board was finally appointed in 1995. The Board met for the first (and only) time in November 1995 and hopes that the LCB would be re-activated in 1997 have been disappointed. In spite of this poor record, much of the development plan is based on the assumption that the LCB can be made to work and work well, in the future.

**The legal specialist to review and if necessary revise the legislation and draft the regulations.**

***b). The Pesticides Control Act (7/75)***

The Pesticides Act regulates and controls the use of pesticides, provides for the establishment of the Pesticide Control Board and the appointment of inspectors with powers to inspect and seize unauthorised pesticides. The effectiveness of the legislation has been enhanced by the enactment of regulations (SI 70 and 71 of 1987<sup>3</sup>) to control the labelling storage and distribution of pesticides. In addition, an amendment to the Act (27/88), increased the fines/penalties which may be imposed and enlarged the membership of the Board from five to eight members. Finally protection for employees engaged in the trade is provided by the Employees (Occupational Health and Safety) Act (10/85) administered by the Ministry of Education, Culture and Labour.

The Board meets every 2 months and executive powers are entrusted to the Plant Protection and Quarantine Unit in MALF&F which operates effectively. The Pesticide Control Board and the OECS have also been effective in promoting public awareness of the dangers inherent in pesticide use. Dumps of old and/or banned pesticides are known to exist and approaches could be made for international assistance to destroy these stocks and the Consultants have suggested an appropriate course of action.

---

<sup>3</sup> Up to 1978 subsidiary legislation was published in the form of Statutory Rules and Orders in Supplements to the Gazette. Thereafter these were entitled Statutory Instruments (SI)

*c) St Lucia Banana Growers Association Act (6/67)*

Provides for the repeal and replacement of the St Lucia Banana Growers Ordinance (Cap 35) and the establishment of the St Lucia Banana Growers Association (SLBGA). The Act transfers all of the assets and liabilities of SLBGA Limited a public corporation to the Authority. The original SLBGA was established in 1934, became SLBGA Limited in 1953 and reverted to the status of a statutory corporation by the 1967 Act.

Three Dissolution of the Board Orders were enacted in 1988, 1993 and 1994 which gives a good indication of the often troubled relationship between GoSL and SLBGA (The Minister of Agriculture has powers under Section 44 of the Act to direct the Board to regulate its affairs. If the Board fails to comply, it is lawful for the Minister, after obtaining the approval of Cabinet, to dissolve the Board). Regulations 43/81 and 55/90 respectively establish the categories of growers (large, medium and small) and make arrangements for the supervision of Branch elections.

*d) The Praedial Larceny Act (13/78)*

The Act provides powers to prosecute those who cause damage to crops or who steal produce from others. It is said that inability to enforce the Act is a major factor in preventing farmers from diversifying away from bananas i.e. thieves tend not to steal bananas, but will take vegetables, root crops and anything else that can be sold.

The Police are responsible for enforcing the legislation, but admit that the breakdown in the Rural Constable system and the increased complexity of Court action makes it difficult to secure a conviction. (Note drug addicts are said to be the main offenders and thus none of the social constraints which could be expected to restrict theft in rural areas appear to apply).

In an attempt to address the problem the Extension Division (MAFF&E) employs two Produce Inspectors (one in the north and one in the south of the Island) to check on those who might be involved in selling stolen produce. Exporters are listed and there is provision to licence farmers/vendors who are known to the local extension officer. Inspectors have been successful in prosecuting a number of unlicensed vendors, however there are problems including:

- inspectors are frequently threatened and have asked if they could be issued with firearms (refused);
- there is a lack of transport.

Neighbourhood watch schemes have been effective, but there are difficulties with vigilantes taking the law into their own hands. There is no obvious way of enforcing the legislation except by continued support to the Produce Inspectors, possibly some improvement in the licensing system and the hope that community action in the watersheds will have an effect in future.

*e) Crown Lands Ordinance (Cap 108, 2/252)*

The controlling legislation is the above pre-independence Ordinance which vests control of Crown lands in a Commissioner who is charged with carrying out surveys, taking possession of, leasing and collecting rents on Government land. The Commissioner may, with the approval of the Governor General, sell Crown land and receive the proceeds from such sales. The Commissioner is also the custodian of all maps, plans and diagrams relating to Crown land.

There is provision in the Ordinance for the Commissioner to take possession of unoccupied lands or lands whose occupant appears to have no legal title and after due legal process to declare such land as the property of the Crown.

The ordinance gives the Commissioner limited powers to control squatting and is said to be in need of revision. **The legal specialist to review the legislation with a view to revision.**

### 2.2.2. Forestry

#### *a) Forest, Soil and Water Conservation Ordinance<sup>4</sup> (CAP 25, 7/198<sup>5</sup>)*

The controlling legislation is the above, pre-independence Ordinance which was up-dated in 1983 by the Forest, Soil and Water Conservation (Amendment) Act. It provides for the appointment of a Chief Forestry Officer charged with the management of Crown Land and with the general administration of the enactment. The Ordinance empowers the Governor-in-Council to declare any Crown Lands a forest reserve and there are wide ranging powers for the prevention of soil erosion/landslips, the maintenance of water supplies and the protection of roads and bridges. In 1983, a number of forest reserves were declared including the Castries Water Works Reserve, and the Barre de L'Isle reserves.

Other (non-Crown) lands may be designated as protected forests with powers for the Governor-in-Council to regulate or prevent the felling of timber, the clearing of land for cultivation, the trespassing of livestock, the setting of fires or other prejudicial acts. Again in 1983 using the Statutory Instrument process, several protected forests were declared including Marquis Estate Areas, the Monier Plateau and others.

As an incentive to increase forest production, provision is made for the owners of protected forests to be remitted the land tax that may be in force at the time, subject to compliance with the applicable rules. In addition there is provision to regulate timber dealers/producers and both measures should encourage responsible exploitation of resources and help to reduce the incidence of illegal harvesting of forests from both public and private land. The illegal clearing of both Crown and forest land for drug growing involves the Police and 122,000 marijuana plants were destroyed between January and October 1996.

#### *b). Wildlife Protection Act (9/80)*

The Act repealed the Wild Birds Protection Ordinance and the Turtle and Fish Protection Ordinance and establishes three categories of wild fauna:

- those that are absolutely protected which must not be caught, owned or offered for sale;
- those that are partially protected which may only be hunted in the open season;
- those that are unprotected.

The Act does not afford protection to wild flora, but the Forestry Department maintain that there are adequate provisions under the Forest, Soil and Water Conservation Ordinance to achieve this objective.

### 2.2.3. Fisheries

#### *Fisheries Act (10/84)*

The Act is concerned with the environmental management of maritime areas and of their resources. It charges the Minister with the management and development of fisheries to ensure their optimum utilisation and in order to regulate/conservate the resource, there are powers to licence foreign fishing vessels and to declare local fisheries management areas

In addition the Minister has the power to declare marine reserves for the protection of marine flora/fauna, to promote scientific research as well as to preserve and enhance the natural beauty of such

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<sup>4</sup> Up to 1/3/67 the statutes of St. Lucia were entitled Ordinances and thereafter Acts.

<sup>5</sup> Refers to the Laws of St. Lucia (up to 30/6/57) Chapter 25, Vol 7, page 198.

areas. In general the Act makes provision for various conservation and enforcement measures, which are further refined in the Fisheries Regulations (SI 9/94)

The implementing regulations makes provision for the appointment of a Fisheries Advisory Committee consisting of: the PS (Chair), the Chief Fisheries Officer (Secretary), 3 persons appointed by the Minister from the fishing industry and 2 other persons also appointed by the Minister. The regulations include; licensing of foreign fishing vessels, local fishing licences/registration, sports fishing and fish processing. Conservation aspects of the regulations prohibit the removal of lobsters, turtles, corals, sponges, conch and sea urchins except with the permission of the Chief Fisheries Officer.

A Fisheries Advisory Committee has not yet been created, but might be instituted in the future.

#### 2.2.4. Water

Previous sections have discussed the following enactments which have a bearing on water resources:

Forest Soil and Water Conservation Ordinance;  
Land Conservation and Improvement Act.

##### *a). The Water and Sewerage Authority Act (18/84)*

This is the principal legislation for the sector and replaces the Public Health (Sewerage and Drainage) Ordinance whose assets were absorbed by provisions of the Act. The legislation imposes on government the obligation to promote a national water policy which devolves on the Water and Sewerage Authority (WASA) established by the Act and requires WASA to:

- establish a hydrological network and carry out periodic water surveys;
- prepare estimates of future demand for water;
- prepare plans for securing more efficient management of water;

Although not specifically stated, the powers conferred on WASA imply that water is a public resource over which the state enjoys an unimpeachable right of access and that there are no private rights over water which the state can only alienate on payment of compensation. There is a view that this supposition should be clearly stated in the enactment to prevent future miss-understanding.

The composition of the Authority was amended by the Water and Sewerage Authority (Amendment) Act 13/96 and now consists of: Chairman appointed by the Prime Minister, Director of Finance or representative, Chief Engineer MCWT&PU, not less than three and not more than seven other persons appointed by the Minister with expertise in business, finance, engineering, planning, law, housing, medicine etc.

The Authority aims to be self-sufficient, but there is provision for government to underwrite the operating costs. In the discharge of its functions the Authority enjoys wide discretion to:

- prohibit or regulate the placement of materials which may impair or reduce the capacity within a catchment;
- prohibit or regulate acts considered conducive to the pollution or diminution of the supply of water in any river or watercourse;
- conserve water and prevent waste /misuse or contamination of supplies;
- cope with existing or threatened water shortages;
- require the Chief Forest Officer under the Forest Soil and Water Conservation Ordinance to take action to stop de-afforestation.

The Act is supported by comprehensive regulations (SI 47/95) which are thought to have replaced earlier and hastily prepared regulations (September 1989) formulated in order to comply with financial obligations for the Roseau Dam.

**The legal specialist to review and if necessary revise the legislation and regulations.**

***b) Other Water Legislation.***

Other legislation relevant to the Water and Sewerage Act, is the Public Health Act (8/75) and the Public Health (Water Quality Control) Regulations (SI 14/78), established under the Act. These regulations set standards for the purity of the water supply and address issues such as the construction of water supply systems, the construction and location of wells, the quality of domestic and industrial water supplies and penalties for infringement of the regulations.

**2.2.5. Mining**

***The Beach Protection Act (2/67)***

This Act governs sand mining on beaches, is administered by the Ministry of Communications, Works, Transport and Public Utilities and establishes the need for a licence to dig and remove sand/other materials from beaches. The illegal mining of sand continues apace in response to the demands of the construction industry and is a serious problem in spite of severe penalties introduced by amendments to the Act in 1984 and 1987.

Pumice deposits in the south of the island are being exploited to supply a small proportion of the demand for building material. Short of barging building sand into St Lucia, pumice presents the only real alternative to illegal mining and consideration should be given to an expansion of the industry by a commercial contractor.

**2.2.6. Planning Land Use and Development.**

Following the change of Government in May 1997, responsibility for the implementation of environmental projects passed to MAFF&E, although policy issues remain with the Ministry of Finance, Planning, Information Services and the Public Service (MFPIS&PS) and mention must be made of the following.

***Land Development (Interim Control) Act (8/71)***

This is the controlling legislation for land use and development in St Lucia and provides for the establishment of a Development Control Authority (DCA). The Act requires written permission from the Authority to develop any land in the country and details the procedures for making development applications. The Authority does not enjoy uncontrolled discretion to grant or refuse development permission and certain classes of development are exempt from the need to obtain Authority approval and the Minister may refer particular applications to Cabinet for a decision.

The Consultants engaged on the NW Coastal Zone Management Project suggested that the DCA should take responsibility for new Coastal Zone Management legislation in addition to the administration of the Land Development (Interim Control) Act. This proposal is contained in the Phase I Final Report dated January 1995 and should be reconsidered in the light of more recent events including the work of the Watershed and Environmental Management Project

**The legal specialist to review and if necessary revise the legislation.**

## **2.3. Environmental Legislation**

### **2.3.1. Agriculture**

#### ***a) Plant Protection Act (21/88)***

Gives the Minister of Agriculture the authority to prohibit or restrict the importation or movement of fruit, planting material, soil etc., in order to protect the agricultural resources of the country. It establishes the need to obtain a permit to import plant material and the requirement to produce a phytosanitary certificate from competent authorities in the country of origin. The Act gives the Minister wide powers to prevent the spread or otherwise control plant pests and provides for compensation to farmers and others whose plants/planting material has been destroyed in order to eradicate or prevent the spread of pests/diseases.

In addition there is provision to establish a plant quarantine service and whilst the Act repealed the Plant Protection Ordinance it retained the relevant regulations until such time as these could be updated. The Act is now supported by comprehensive Plant Protection Regulations (Statutory Instrument (SI) 66/95) which take into account, for example, the possible entry of in-vivo and in-vitro planting material. The legislation appears to be supported by an effective administrative machine, in the form of the Officers in the Crop Protection and Quarantine Section of the Research and Development Division (MAFF&E)

There is provision for the Minister to establish a Plant Protection Board and a five person Board (Chief Plant Protection Officer, Plant Pathologist, Legal Officer, Forestry representative and a Secretary), has been in existence since 1990 and meets regularly.

#### ***b). The Animals (Diseases and Importation) Ordinance (CAP 41, 1/341)***

The Ordinance requires owners to segregate diseased animals and notify the proper authorities of disease in herds/flocks. There is provision to destroy diseased animals and to compensate owners. It also establishes the need to obtain a licence for the importation of birds, reptiles/insects, animal carcasses or animal by-products. The need for legislation of this sort is clearly very desirable and appears to be properly enforced by the Veterinary Division of MAFF&E.

Animal Health Regulations under the provisions of the Ordinance were drafted in 1993 and additional Animals (Diseases and Relocation) Regulations were drafted in 1996. At the end of 1996, these two sets of regulations, had not reached the statute books. The definition of bees as animals in the regulations will make the Importation of Bees Ordinance (CAP 42, 1/378) redundant.

**The legal specialist to review progress with the legislation.**

#### ***c). Animals Trespass Ordinance (CAP 39, 1/318)***

The Ordinance empowers owner/occupiers of land to seize and impound animals found trespassing and to kill certain categories of straying livestock and at least in theory, prevents the destruction of land occasioned by un-tethered or straying livestock.

At present the Police are responsible for enforcing the legislation and have in the past shot cattle/pigs under the provisions of the Ordinance. There is, on occasion, a problem with straying cattle and the Police would like to transfer responsibility for the Act to MAFF&E, but neither the Police nor the Department of Agriculture have a pound in which to hold stray livestock.

#### ***d). Co-operative Societies Ordinance (CAP 82, 1/746)***

Provides for the formation, regulation and operation of Co-operative Societies, with the Registrar of Co-operative and Friendly Societies being responsible for the Ordinance. The 22 Credit Unions in St

Lucia continue to prosper, but the other 20 co-operative organisations are generally less successful (e.g. only 2 of the 7 agricultural co-ops are active). There is a Credit Union and a Fishing Co-operative in Dennery, but apparently no co-operative activity in Cul de Sac. All Co-operative Department staff are based in Castries.

*e). Other Agriculture Related Legislation.*

Brief mention should be made of the following enactments:

- Marketing Board Act (18/67) - provides for the establishment of a Marketing Board charged with promoting the proper and effective marketing of agricultural produce;
- Model Farms Act (1982) - provides for GoSL to guarantee loans from the Commonwealth Development Corporation (CDC) and Geest (Estates) Limited to Model Farms Limited;
- Livestock Meat Marketing Board Ordinance (17/64).

### 2.3.2 Forestry

*Water and Sewerage Authority Act (18/84)*

This Act is discussed in more detail in Section 2.2.4, but places a responsibility on the authorities to establish and protect water catchment areas and adequate legislative arrangements are in place to co-ordinate activities between WASA and the Forestry Department. In practice, it is necessary to acquire the lands needed to protect water supplies and a number of parcels of land have recently been purchased.

### 2.3.3. Fisheries

*The Maritime Areas Act (6/84)*

The Act is primarily concerned with establishing the maritime jurisdiction of the state and incorporates various provisions of the United Nations Convention on the Law of the Sea (1982) including a definition of:

- the limits of St Lucia's territorial sea, where the country has complete sovereignty over fisheries;
- the extent of the continental shelf with the rights of exploration, exploitation, management and conservation in respect of the living resources;
- the exclusive economic zone (EEZ) with similar powers over the sea-bed and subsoil.

The enactment governs activities in the Fisheries sector and also has a bearing on marine pollution as discussed in Section 2.3.6.

### 2.3.4. Mining

Apart from ilmenite in some beach sand, there are no known deposits of valuable minerals in St Lucia and the mining of industrial minerals, largely for the construction industry, is controlled by the following legislation

*a). The Minerals (Vesting) Act (7/66).*

*The Radio-active Minerals Ordinance (CAP 118, 3/322).*

The first of these two Acts, vests ownership of minerals in the State and it is unlawful to explore for, or mine minerals except with the authority of and in accordance with, the conditions of a government licence. Similar conditions apply to the exploration and winning of radio-active minerals. There are no regulations in existence for either the Act or the Ordinance.

**b). Crown Lands Ordinance (CAP 108, 2/252)**

The Act entitles the Minister to establish conditions for the exploration and mining of minerals on State lands leased for that purpose, but no leases appear to have been granted.

**2.3.5. Tourism**

The quality of the country's tourist industry is, in the final analysis, dependent on the environmental health of several related sectors of the economy and inevitably involves a number of Ministries including:

- Ministry of Tourism and Civil Aviation, which is concerned with natural resources, parks and beaches;
- Ministry of Health, Human Services, Family Affairs and Women responsible for water supplies;
- Ministry of Communications, Works Transport and Public Utilities whose responsibilities include sand mining and beach control;
- Ministry of Agriculture of Forestry, Fisheries and the Environment;
- Ministry of Finance, Planning, Information Services and the Public Service which regulates building in coastal and other areas.

Specific tourist legislation or legislation which has a considerable bearing on the tourist industry is discussed in the following sections

**a) The Tourist Industry Development Act (4/81)**

This Act is administered by the Ministry of Tourism and Civil Aviation and provides for the establishment of the Tourist Industry Development Board, (TDB) with wide powers to promote and develop all aspects of tourism. In addition the Board is charged with the administration of tourist facilities and the promotion of amenities for the industry.

The TDB is very active (meets at least monthly), has a non-Government Chair and sub-committees for Finance, Special Events, Marketing/Promotions etc. At present all funds come from GoSL, but the Board is considering a structure similar to that of the Barbados Tourism Development Corporation and would like to be able to raise funds direct from the tourist industry. The TDB has 28 paid employees and promotional offices in US, France, Canada, Germany and UK

**b). The Parks and Beach Commission Act (4/83)**

Other than this Act, which is of considerable interest to the tourist industry, St Lucia has no other beach control legislation on the statute books. Activities in the coastal zone are controlled by the Parks and Beach Commission which is charged with the responsibility for maintaining facilities in parks, gardens, and beaches and for prescribing sanitary conditions in these areas.

In addition, the Commission may also advise the Minister on measures to protect coastal zones from environmental degradation. Until recently the Commission was a single person, but has been re-constituted to include representatives from the Ministry, Police, Tourist Industry, Forestry, Hotel and Tourism Association etc. A very recent development (November 1997) is the proposed formation of a National Conservation Authority which would take responsibility for this, or similar legislation if the Parks and Beach Commission Act is repealed.

**The legal specialist to review the situation.**

**c). St. Lucia National Trust Act (16/75)**

The Trust is responsible for the management of national parks designated for this purpose by the Government and to date, three such parks have been created ( Pigeon Island National Landmark,

Frigate Island Nature Reserve and Maria Islands Nature Reserve). The Act does not give the Trust powers to prevent the destruction of buildings of historical or cultural significance, but it may acquire such sites/buildings and preserve these as a public trust. It appears that the DCA may have sufficient powers to prevent the demolition or alteration of buildings of historical or cultural significance by withholding planning permission in appropriate circumstances.

*d). Other Tourism Legislation*

Other legislation which has a bearing on the tourist industry includes

- Forest, Soil and Water Conservation Amendment Act - see Section 2.2.2 a).
- Wildlife Protection Act (9/80) - see Section 2.2.2 b).
- The Fisheries Act - see Section 2.2.3 which empowers the Minister to declare marine reserves for the protection of flora and fauna and to promote scientific research

### **2.3.6. Marine Pollution**

The applicable enactments on the statute books relating to marine pollution are not numerous but their collective scope is quite extensive. As discussed in Section 2.2.3, the Fisheries Act, empowers the Minister to take a variety of measures for the conservation of the marine environment, its flora and fauna, but the principal legislation in this area is the Merchant Shipping Act.

*a). Merchant Shipping Act (3/81)*

A section of this Act, in effect, incorporates the provisions of two wide ranging pieces of English legislation relating to pollution of the marine environment (The Merchant Shipping (Oil Pollution) Act of 1971 and the Dumping at Sea Act of 1974) into the laws of St Lucia:

*b). Oil in Navigable Waters Act (2/84)*

*Maritime Areas Act (6/84)*

The first of these Acts makes it an offence to discharge oil from any vessel or apparatus on the sea or on land into the territorial waters of the state, whilst the second Act confers upon the state the right to protect and preserve the marine environment of the EEZ.

### **2.3.7. Waste Management**

*a) The Litter Act (24/83)*

The Act, which is the responsibility of the Minister for Health, Human Services, Family Affairs and Women, makes it an offence to litter public places, or private places without the consent of the owner or to aid or abet such activities. Provision is made for enforcement of the Act, for the removal of abandoned vehicles and for the appointment of litter wardens.

By amendments in 1985 and 1993 the effectiveness of the Act was considerably enhanced and the legislation addresses the problem adequately. The difficulty is that the applicable legislation is not, or can not, be enforced and there is a need for the public to be conscious of the litter problem. This and other environmental issues might be solved in the longer term by an educational programme, on both a formal and informal basis.

*b). Solid Waste Management Act (20/96)*

This Act provides for the establishment of a Solid Waste Management (SWM) Authority charged with providing a co-ordinated and integrated system for the collection, treatment and recycling of waste including hazardous waste. The Authority acquires the assets, liabilities and functions of the Castries Corporation in relation to SW collection/disposal and is responsible for the management of sanitary landfills and is required to consult WASA prior to establishing such landfills.

A quorum of 6 persons is required, the membership of the Authority being; five senior civil servants, the Clerk of the Castries Council and representatives from, St Lucia Chamber of Commerce, Association of Professional Engineers and the St Lucia Tourism Association and three other persons appointed by the Minister.

Members serve for a 3 year term and may be re-appointed, whilst those who absent themselves from three consecutive meetings will cease to be members of the Authority.

There is provision to raise funds from haulage and tipping fees and from an environmental levy imposed on all visitors to St Lucia. This levy will be collected by the Air and Sea Ports Authority and paid over to the SWM Authority. A Manager has been appointed, but Regulations have not yet been formulated.

The project in St Lucia is one of a number of SWM projects in the Caribbean to be funded by the World Bank.

**The legal specialist to review the situation.**

***c). Public Health Act (8/75)***

The Act focuses on promoting and protecting the health of the population and addresses the problem of waste disposal as an aspect of public health management, rather than an environmental issue. The Act establishes the Public Health Board and authorises the Minister to delegate any of his statutory functions to the Board. There are a large number of Regulations relating to the Act including:

- Public Health (Nuisances ) Regulations (SI 10/78)
- Public Health (Offensive Trade) Regulations (SI 11/78)
- Public Health (Water Quality) Regulations (SI 14/78)
- Public Health (Disposal of Offensive Matter) Regulations (SI 21/78)
- Public Health (Sewage and Disposal of Sewage and Liquid Industrial Waste Works) Regulations (SI 22/78)
- Public Health (Slaughter House) Regulations (SI 69/80)
- Public Health (Food Legislation) Regulations (SI 70/80)

**2.3.8. The Built Environment**

In addition to the Land Development (Interim Control) Act - see Section 2.2.6 and for the sake of completeness, mention is made of the following planning, land use and development legislation.

***a).. The Town and Country Planning Ordinance (CAP 175, 3/125).***

***The Housing Ordinance (11/66).***

The Town and Country Planning Ordinance vests responsibility for carrying out its provisions in the Central Planning and Housing Authority which was subsequently dissolved by the Housing Ordinance and its powers / functions transferred to the St Lucia Housing Authority.

The Housing Authority is charged with carrying out the Government's housing policy, subject to the Minister's direction and enjoys wide powers, including:

- investigation into improved methods of house construction, standards and design;
- construction of housing units on state land;
- acquire houses/land by purchase or lease;
- participate in housing projects;

- guarantee house improvement loans and requires the Treasury to establish a Home Improvement Insurance Fund.

Although the enactments provide the framework for sound environmental management, implementation is said to be impaired by financial and human resource constraints.

**b). Other Land Use and Development Legislation**

Mention is made in Section 2.3.5 b) of the Parks and Beaches Commission Act, which empowers the Commission to develop public amenity areas. Other relevant legislation includes:

- National Development Corporation Act (9/71) which confers on the Corporation the functions of a Planning Authority under the provisions of the Town and Country Planning Ordinance;
- The Rodney Bay Development Act (8/70), authorisation for Rodney Bay Limited to carry out land improvement works.
- The Housing and Urban Development Corporation Act (14/71) which empowers the Corporation to develop designated areas and charges it with administering the Slum Clearance and Housing Ordinance (CAP 174. 3/86);
- The Aliens (Land holding Regulations) Act (10/73) allows the Cabinet to grant aliens permission to own land;
- The Public Works and Roads Ordinance (CAP 178, 3/208) confers on the National Development Corporation the power to make temporary roads or to regulate the course of rivers in order to preserve or maintain any road;
- Control of Advertisements Ordinance (25/60) provides controls relating to the display or exhibition of advertisements in the interests of amenity, public morality or public safety;
- Crown Lands Ordinance see Section 2.3.4 b).

**2.4. Disused Legislation**

There is provision for repealing laws which have become "spent" and for removal from the statute books. The following laws are not used and are thus, appear to be "spent".

**The legal specialist to review all legislation in this section and determine which laws should be repealed.**

**2.4.1. Agriculture**

**a). Board of Agriculture Ordinance (CAP 24, 1/196)**

This Ordinance establishes the Board of Agriculture and charges it with advisory and consultative functions which are wide enough to allow it to advise on agricultural land use and conservation. Staff in MAFF&E can not remember the last time a Board was appointed, although a casual check in the St. Lucia Archives, provides information on the planters and others who served on the Board in the past. The Department of Agriculture would appear to consult agriculturists/farmers less frequently than it should and a revival of the Board of Agriculture might be justified.

**b). The Government Pasturage Lands Ordinance (CAP 212, 1/378)**

The Ordinance allows for lands owned or controlled by the state to be declared as government pasturage and permits those holding licences to graze tethered livestock on such land. Livestock Division staff in MAFF&E appear not to make use of the provisions of this Ordinance.

**c). The Agricultural Small Tenancies Act (22/75)**

The Agricultural Small Tenancies Act provides, in theory, a mechanism for persuading tenants of holdings of not more than five acres to observe sound and environmentally friendly cultivation

practices. Failure to comply with the provisions of the Act permits the landlord to terminate the tenancy on production of a certificate from the competent authority that the tenant is failing to employ good husbandry practices. Department of Agriculture staff appear to be unaware of the legislation and certainly have no knowledge of the law being applied.

**d). Old Agricultural Industries**

Legislation which applies to agricultural industries which are now defunct or struggling to survive include:

- St Lucia Limes Association Ordinance (CAP 37, 1/307);
- Cotton Ordinance (CAP 34, 1/310);
- Coconut Industries Fund Ordinance (CAP 34, 1/297) and regulations of 1959.

**2.4.2 Forestry**

**a) Timber Industry Development Board Ordinance (24/63)**

In 1983, the provisions of this Ordinance were incorporated into the Timber Industry Board Ordinance (Amendment) Act (12/83) and the Board so established is charged with the development, preservation and maintenance of the timber industry.

There were two sawmills in St Lucia in 1970 (Timber Industry Sawmill at Castries and the St Lucia Fine Timbers Sawmill at Patience Estate near Micoud). Both mills subsequently closed down and at present all timber conversion is by chain saws and "Alaskan guides". Chain saws must be licensed (annual fee between EC\$30 and \$50) and it is assumed that this legislation is, in effect, redundant

**2.5. Need for New Legislation or for Amendments to Existing Legislation.**

In the past, Consultants and others have identified weaknesses in existing environmental legislation and have spent considerable time and effort in drafting new laws, or in proposing suitable amendments to existing Acts or Statutory Instruments. There is a tendency for such legislation not to be "owned" by the institution responsible for implementation and in consequence little effort has been made to have the legislation adopted. The following Sections detail some of the areas where inadequacies are said to exist.

**The legal specialist to review all legislation in this section and determine if there is a need for laws to be drafted or amended.**

**2.5.1. The Pesticides Control Act (7/75)**

There is some concern that the present Act does not provide powers to control the movement, storage, and distribution of toxic chemicals. To this end the OECS Legal Unit prepared a Draft Pesticides and Chemical Control Act in 1994, as one of a series of "harmonised" laws which might be adopted throughout the region.

There appears to be little urgency for the adoption of this legislation.

**2.5.2. Proposed Coastal Zone Management Act**

The Consultants working on the NW Coastal Zone Management Project state that there is a need for specific legislation and presumably take the view that amendments to the Fisheries Act of 1984 will not suffice.

A draft Coastal Zone Management Act (and Regulations) was prepared in January 1993 as part of an OECS/NRMU and GTZ project. This seeks to provide OECS countries with a legislative and regulatory basis for ensuring a sustainable use of resources within their coastal zones. The stated approach is to enable states to adopt regulations without drastic alteration to their enabling legislation and if adopted would lead to the repeal of the Beach Protection Act and in so doing transfer responsibility for beach protection from MCWT&PU to MAFF&E

The Fisheries Department, as the concerned authority, will presumably review the need for new legislation and will be aware that, where appropriate, amendments to existing legislation is always an easier option than drafting new legislation.

### **2.5.3. Proposed Water Resources Act and Selected Regulations**

This draft legislation, prepared in January 1990 by a FAO consultant, was intended to supersede the Water and Sewerage Authority Act, 1984 and incorporate the major provisions of the Land Conservation and Improvement Bill, 1987 (now the Land Conservation and Improvement Act 10/92)

Whilst the proposed legislation never eventuated and was to an extent overtaken by events, it pointed out a number of deficiencies in both the WASA and LCB legislation including:

- how the LCB would be funded (no provision to raise drainage rates) and how it would gain access to Crown Land to offer in lieu of compensation;
- public rights in water (the right to investigate, use, control, protect, manage and administer the water of St Lucia).

The pragmatic approach would be to establish or improve the institutions responsible for administering the existing legislation and then progressively make amendments to the Acts in question.

**The legal specialist should re-consult the draft Water Resources Act of 1990 to determine if amendments are needed.**

### **2.5.4. The Wildlife Protection Act (9/80)**

The Act does not afford protection for wild flora and there is a suggestion that the provisions of the Act may need to be enlarged to accommodate the obligations assumed by the GoSL under the CITES Convention. The Forestry Department state that there are sufficient powers under the Forest Soil and Water Conservation (Amendment) Act of 1983 to protect wild flora and there may be little incentive to amend the Act.

### **2.5.6. Land Development (Interim Control) Act (8/71)**

There is no requirement for environmental impact assessments (EIA) to accompany applications for significant land use and development, or that environmental considerations should be taken into account when the Development Control Authority (DCA) makes its decisions. Whilst EIAs are not required by statute, the DCA does routinely require EIA on "large development projects undertaken by the private sector" but this does not comprise .. "an efficient, uniform, multi-disciplinary vetting process for all major development projects and plans -- whether public or private"<sup>6</sup>.

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<sup>6</sup> USAID 1991. St Lucia Environmental Profile. USAID document produced by Island Resources Foundation, Red Hook, St, Thomas, Virgin Islands 332 pp.

In practice extensive use is made of the 1988 GoSL "Manual for Developers" prepared by the Physical Planning Section in the MFPIS&PS with OAS assistance. In addition the Medium Term Strategy Paper<sup>7</sup> states that the Government is committed to "establish procedures and guidelines for environmental impact assessments and ensure their implementation".

## 2.6. Conclusions

Legislative improvements are always possible and this Annex proposes and the Main Report includes the costs of reviewing and where necessary up-dating the environmental legislation as a support to the normal legislative process. In general, the existing legislative base is adequate, but there is a pressing need for co-operation and collaboration amongst the various agencies involved in the protection and improvement of the environment.

There is also an urgent need, at the national level, to recognise the cost of undesirable environmental practices. The lack of progress in some aspects of the project during 1997 (see Section 1.2), gives the impression that there is a lack of interest in the environment at the political level. This impression may well be false and may simply indicate that the Government has other pressing problems with which to contend and that, in due course, the environment will occupy its rightful place in the decision making process.

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<sup>7</sup> CPU 1994. St. Lucia Medium Term Economic Strategy Paper 1993-96. Central Planning Unit GoSL March 1994

## Chapter 3

### Institutions Responsible for Watershed Management Legislation

#### 3.1. Watershed and Coastal Zone Management

This Chapter considers the existing institutions charged with the administration of the legislation listed in Section 2.2 and referred to as the "Watershed Legislation". However before pursuing this issue it is important to define the Consultants interpretation of their areas of responsibility, particularly as the ToR place some emphasis on the Coastal Zone Management (CZM) aspects of the project

The inter-relationship of CZM (or Integrated Coastal Zone Management ICZM) with Watershed Management is recognised and the Consultant's endorse the view that for small islands there is a need to adapt CZM principals to accommodate the holistic Island Systems Management (ISM) philosophy. Nevertheless the agencies responsible for CRM and Watershed Management are different and provided there is co-operation and co-ordination at the policy level (see Chapter 6) it should not be necessary to do more than briefly review the present CZM activities and plans.

##### 3.1.1. The Coastal Conservation Project

Also called the NW Coastal Zone Management Project (funded by CIDA), was carried out by the Fisheries Department and Atria Engineering Consultants and covers the area from the south of Roseau beach to the top of Cap Estate. Phase I, the Pre-feasibility Study, took from late 1993 to January 1995 with a second phase due to start early in 1998. The project includes, seven watersheds, one of which is Cul de Sac.

Drafted prior to the change of Government and almost certainly in need of re-thinking, the Project envisaged a Coastal Zone Management Unit (CZMU) as part of the Ministry of Planning, but answering to the DCA. Sector Advisory Panels would ensure that other agencies co-operated with the CZMU. A new Coastal Zone Management Act would be formulated and the DCA would be responsible for both this and the Land Development (Interim Control) Act. Amongst other preliminary recommendations the project proposes an Environmental Ombudsman.

In preparation for Phase II of the project, the Fisheries Division has created a CZM Section and it appears likely that the project initiative will be translated into a permanent CRM institution.

##### 3.1.2. Soufriere Marine Management Area (SMMA)

The SMMA covers the coastal area from just north of Choiseul Bay to Anse Mamin, north of Soufriere. This is largely a self-funded project, administered through the Fisheries Department with some external assistance. A recent contribution from France of FF1.5 million, will be spent on watershed management in the Soufriere area. The project involves a high degree of participatory management by the stakeholders and is a good example of both the success and the frustrations of this type of development.

##### 3.1.3. Canaries and Anse La Raye Marine Management Area (CAMMA)

The Fisheries Department awaits Cabinet approval for the CAMMA which will "fill the gap" between SMMA and the NW Project Area. In due course a series of Marine Management Areas will probably encircle the Island and will relate to/be influenced by, the equivalent Watershed Management Area.

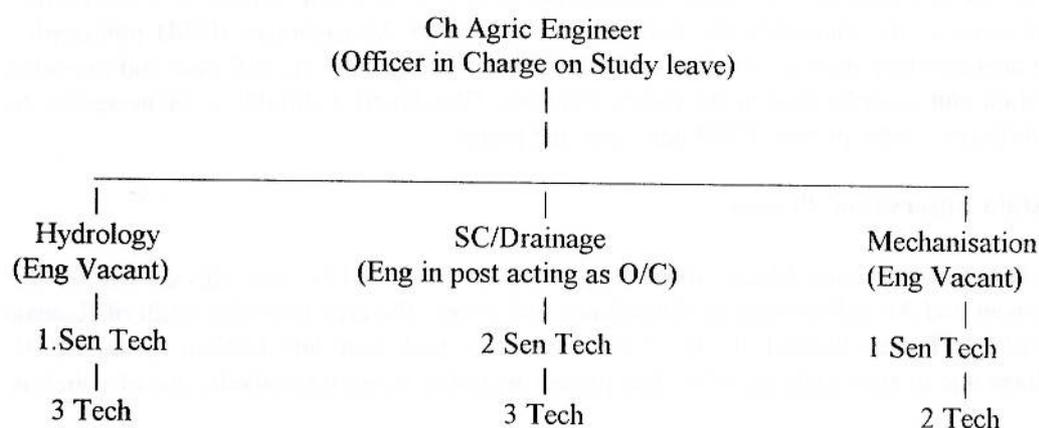
## 3.2. Agricultural Department

### 3.2.1. Agricultural Engineering Services

The Agricultural Engineering Services Division of the Agricultural Department is, or should be, the implementing agency for the Land Conservation and Improvement Act. The present organisation of the Division is shown in Figure 3.1.

Figure 3.1

#### Establishment, Agricultural Engineering Services Division



Of the 4 Senior Technicians, one has been suspended, one post is vacant and two posts are filled by experienced staff.

Of the 8 Technician posts, two are vacant, one is on secondment to Mabouya Valley Development Project and five staff are in post.

Other staff include 2 Clerk/Typists.

All staff are based in Castries and out of a total complement of 16 engineers and technicians only 8 posts were occupied at the end of 1997.

### 3.2.2. Agricultural Extension

A comparatively large staff resource which hardly impacts on watershed management at present is the Extension Division of the Department of Agriculture which consists of a Chief Agricultural Extension Officer, and the following staff:

- 11 Co-ordinators (Subject Matter Specialists);
- 2 Produce Inspectors (see Section 2.2.1d);
- 30 Extension Officers of various grades based in the 8 Regions;
- 8 Support staff.

Extension staff cover the eight Regions and are based at Union Agricultural Station.(# 1), Babonneau.(# 2), Dennery.(# 3), Micoud.(# 4), Beausejour.(# 5), Soufriere.(# 6), Roseau (# 7). and Bexon (# 8). Each Region is staffed by a Senior Agricultural Assistant (mostly diplomates trained in Jamaica, Trinidad or Guyana) and two or three Agricultural Assistants. The latter are either diplomates or older experienced officers. The Division is responsible for all extension services, other than the banana crop.

Extension, Engineering Services and the Forestry Department have worked together in the past on joint projects, but much more could be done in this regard.

### 3.2.3. Crop Protection and Plant Quarantine

The Crop Protection Unit in the Research and Development Division is responsible for the administration of The Plant Protection Act (21/88) and the Pesticides Control Act (7/75). The respective Boards meet regularly and the Unit appears to operate satisfactorily.

### 3.3. St Lucia Banana Growers Association (SLBGA)

Established under the Act (6/67), the SLBGA is charged with marketing and control of all bananas produced, has a responsibility to promote, finance and assist the industry and is the sole exporter. The nine person Management Board is made up of 6 members elected at the Annual SLBGA Conference of Delegates and 3 members nominated by GoSL.

#### 3.3.1. Organisation of the Association

All banana growers are eligible to join the Association and are organised into 46 Branches throughout the Island. Each Branch has a Management Committee of seven persons, including a Chairman and Secretary. Branches return delegates to the Annual Conference of Delegates in the ratio of one delegate for every fifty farmer members (110 delegates were eligible to attend the 25th Conference, with two Branches either failing, or not being eligible to return delegates). The Association's income is derived from a levy of 4.6 cents/lb on all bananas handled

#### 3.3.2. SLBGA Branches in the Pilot Watersheds

Watershed	Branch	No. of Delegates
Dennery	Dennery	5
Cul de Sac	Crownland/Marc	2
	Forestierre	2
	Odsen	2
	Ravine Poisson	1
	<b>Total</b>	<b>17</b>

The two watersheds contain approximately 15.5% of the banana growers in the country, (i.e. 17 out of the 110 delegates). Appendix B lists the current Chairmen and Secretaries of the Branches listed above.

#### 3.3.3. SLBGA Advisory Services

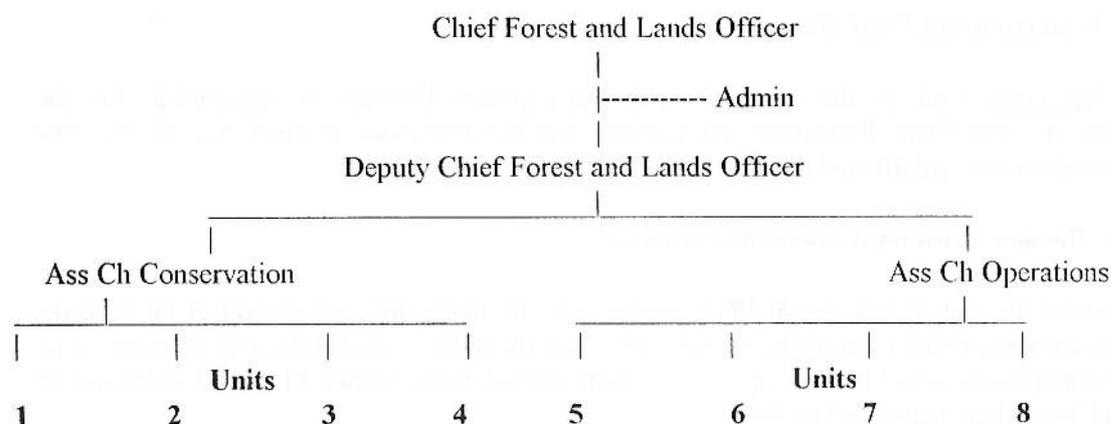
The Island is divided into five Regions (Northern, West Central - includes Cul de Sac, East Central - includes Dennery, Eastern and Southern) with a Regional Manager and six or seven Technical Service Assistants in each Region

### 3.4. Forestry Department

The Department is responsible for administering the Forest Soil and Water Conservation (Amendment) Act of 1983 and for the Wildlife Protection Act of 1980. The main organisational structure of the Department is shown in Figure 3.2

Figure 3.2

Establishment Forestry Department



**Units**

1. Protection and Patrol Unit - 1 Patrol Officer and 3 Assistant Patrol Officers.
2. Education and Information Unit - 1 Environmental Education Officer, an Assistant Environmental Education Officer, 3 Naturalists and 4 Trail Guides.
3. Wildlife Unit - 1 Wildlife Officer and an Assistant Wildlife Officer.
4. Research Unit - 1 Research Officer and an Assistant Research Officer.
5. Nursery Unit - 1 Nursery Officer and an Assistant.
6. Survey and Mapping Unit - 2 Surveyors and 2 Draftsmen.
7. Crown Lands Unit- 2 Lands Officers and 6 Lands Assistants.
8. Forest Operations Unit - 5 Range Officers, 5 Extension Officers and 12 Forest Officers.

A number of the units are of special interest to the project including:

- the 5 Range Officers responsible for the areas of Forest Reserve - North, Dennery, Quillesse, Millet and Soufriere - about 30% of the country is forested of which 16% is in private hands and 14% Crown;
- the 5 Extension Officers (3 posts are vacant) responsible for working with Community groups;
- the Education/Information Unit which includes Eco-tourism (the largest source of Forestry Department revenue). This Unit, could with minor assistance, provide publications and other material for use in the watershed management campaigns;
- the Protection and Wildlife Units.

The Forestry Department leads the country in conservation education, a programme which started in 1979 with a campaign to save the St Lucian parrot. It then extended into other areas such as forest, wetlands, bio-diversity protection and the recent River Conservation Project. A pleasing feature is the Department's genuine interest in conservation, the legacy of the late Gabriel Charles MBE, formerly the Chief Forest and Lands Officer

**3.5 Survey and Mapping Section (MFPIS&PS).**

The Survey and Mapping Section is part of the Planning Department (MFPIS&PS) and amongst other duties is responsible for the purchase and acquisition of land for Government purposes and would, for example, assist WASA to acquire land to protect water catchments. It also implements the Crown Lands Ordinance in addition to the Land Registration Act and the Surveyors Act of 1984. Administration of Crown lands is the responsibility of the Commissioner of Crown lands (also the Chief

Surveyor) acting through the Crown Lands Office which is staffed by both Survey officers and others seconded from the Forestry Department.

This somewhat confusing division of responsibilities between Survey and Forestry comes about because the Forest, Soil and Water Conservation (Amendment) Act charges the Chief Forestry Officer with the management of Crown Land. Thus the Commissioner of Crown Lands relies on the Forestry Department to collect rents, serve notices on those in arrears and evict squatters from Government land.

It is estimated that Crown land accounts for 15 percent of the total area outside Forest Reserve and provided that the land is not needed for forestry, it is available for lease for agricultural or other uses (the Crown Lands Officer is of the opinion that all Crown land outside forest reserve is occupied, either legally or illegally). Crown land for agriculture, typically 5-10 acre lots, is usually held under annual leases at rentals of \$100/acre and clauses in the tenancy agreement prevent the planting of permanent crops except with the prior approval of the Commissioner. In practice, this restriction tends not to be enforced and consideration could be given to removing the clause in the interests of soil conservation.

Cabinet must approve all leases of Crown Land other than annual leases and the Surveys and Mapping Section handles 15-20 agricultural applications / year for leases up to 25 years. In addition there are 5-6 applications / year for the lease of land in the Queen's chain (usually for tourist or residential use) and the legislation also makes provision for the sale of Crown Land.

Security of tenure on Crown land does not appear to be a major factor in preventing farmers from growing permanent crops and a more significant problem appears to be the under-utilisation of private land. Where Crown tenants have problems, perhaps methods could be found for helping growers to obtain longer term leases.

### **3.6. Water and Sewerage Authority (WASA).**

The Water and Sewerage Authority Act of 1984 imposes on government the obligation to promote a national water policy which devolves on WASA.

The controlling authority is the WASA Board which comprises a non-Government Chairman, the Director of Finance, the Chief Engineer MCWT&PU, the Chief Medical Officer, the PS in the Ministry of Tourism and Civil Aviation and two non-Government nominees. The Board meets at least every month. Cash flow is a severe problem, caused partly by continuing problems with the billing system and partly because GoSL is said to owe WASA in excess of EC\$ 2.0 million - an accumulated debt related to the supply of water to schools and other government institutions

#### **3.6.1. Water Supply and Billing.**

WASA have an image problem in some areas, partly caused by the previous government policy of providing free water to small communities. Despite this, there are 32,000 connections, seventy percent of which have metres (sold to householders at approximately half price). The balance of households are charged on estimated consumption and WASA plan to put everyone on a meter in due course.

The current price of water is \$5.00 per 1000 gallons and meters are read every month (used to be quarterly). Three years ago WASA asked GoSL for approval to increase prices and are still waiting for approval.

Defaulting on paying water rates is not regarded as a severe problem and the first priority is to get WASA's invoicing system operating properly. WASA are prepared to cut off those who default - for example a number of hotels were poor payers in the past, but now pay on time.

### **3.6.2. Water Catchments and Hydrology.**

Although there would appear to be sufficient provisions in existing legislation to protect catchment areas, in practice WASA find that unless GoSL owns the area there is no control (see Section 2.3.2 for reference to recent purchases)

The WASA Act requires the Authority to establish a hydrological network and carry out periodic surveys. There is a difference of opinion within WASA regarding this obligation - the technically correct view that WASA should have control over its raw material and the pragmatic belief that it is better to continue to co-operate with the Agricultural Engineering Services Department (AESD) who have better trained staff and equipment.

The Consultants are of the opinion that WASA are struggling to maintain an adequate water and sewerage service to St. Lucia and that taking over responsibility for the hydrological network would mean additional recurrent costs with no prospect of a financial return. The need for AESD to provide an improved service is discussed elsewhere.

### **3.6.3 Water Sources and Sewerage**

WASA divide the Island into three zones, the North East, North West and South with superintendents responsible for the supply and distribution of water in each of the zones. These zones do not physically match the eight regions used by MALF&F and other government agencies and there is no reason why they should do so.

There are three main sources of supply Roseau Dam, Hill 20, and Grace (Vieux Fort), in addition there are 26 minor intake sites which are costly to maintain. There is a need for a dam in the south to supply what could be an important area for future development and two possible sites are being investigated. In addition some form of water grid with low head pumping would be practical for much of the east of the Island.

There are two main sewerage treatment plants, one at Castries and a new one to serve the north of the Island. Two small plants are located at Vieux Fort and Micoud. All other areas operate on septic tanks or pit latrines.

## **3.7. Ministry of Communications, Works, Transport and Public Utilities (MCWT&PU)**

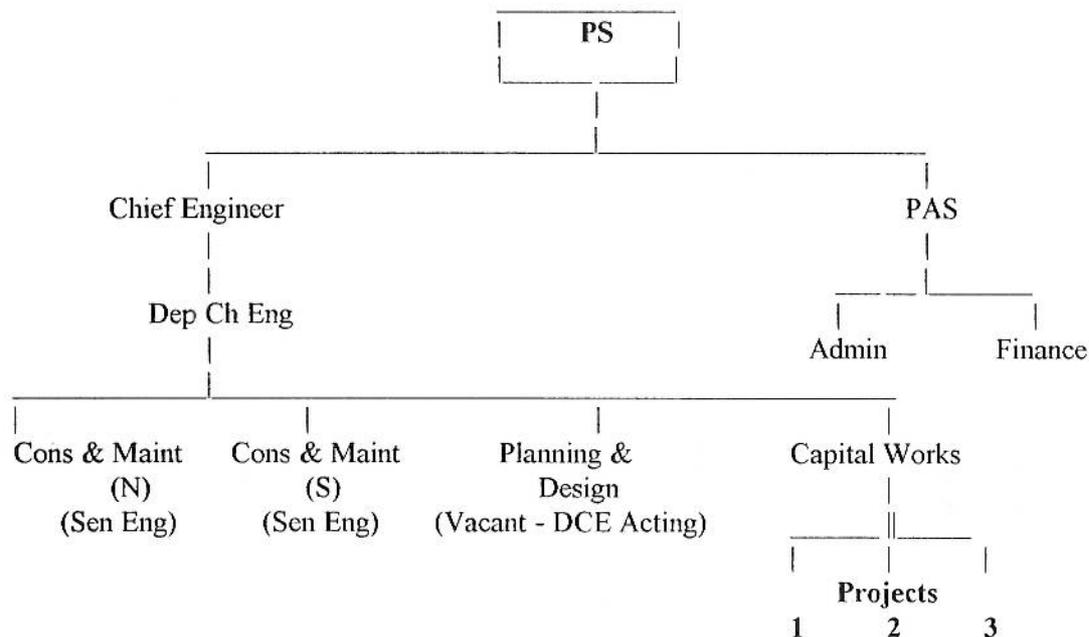
Two Departments of MCWT&PU have important environmental responsibilities, namely the Works Department and the National Meteorological Office.

### **3.7.1. Works**

Figure 3.3 shows the organisation and establishment of the Works Department which was responsible for the post-TSD remedial works and will be called upon to make good damage caused by major storms in the future. It would also continue to carry out river training and protection works near main roads and buildings, but routine river maintenance and management duties would be the responsibility of the River Management Unit in LSD (see Section 6.4.2)

Figure 3.3

**Establishment, Works Department**



**Capital Projects**

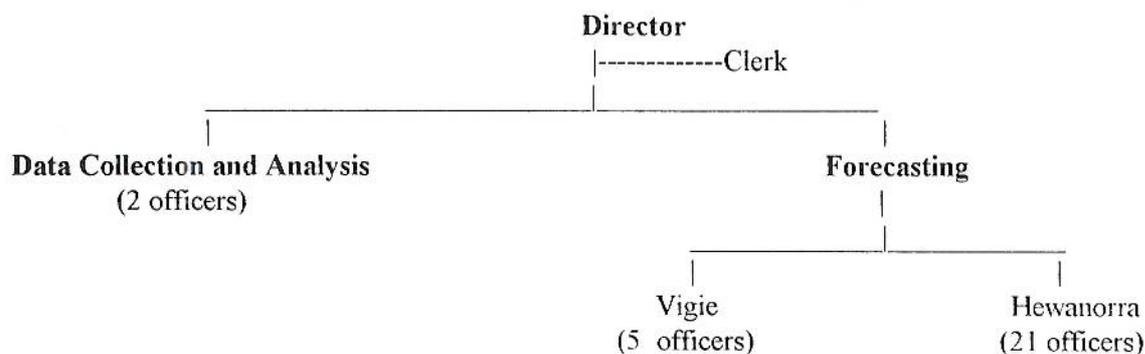
1. Castries / Cul de Sac Highway
2. Water and Environmental Management Project
3. Rehabilitation and Road Improvement and Maintenance Project (RIMP). Cost EC\$23 million.

**3.7.2. Meteorological Services**

The Government Meteorological Service is part of MCWT&PU and maintains a small office in Castries with all other staff based at the two Airports. Figure 3.4 shows the existing establishment, although it is not clear which posts are occupied. There has been a long running campaign to have the hydromet work presently carried out by AESD transferred to MCWT&PU and the head of the Meteorological Service stated that if Agricultural Department staff were transferred to his Department, an improved service would result as MCWT&PU staff tend to be better trained. The Consultants believe that there should be no change to the present areas of responsibility, but an effort should be made to improve the service provided by AESD/LCB.

Figure 3.4.

**Establishment Meteorological Services**



## Chapter 4

### Institutions with an Environmental Interest

This Chapter considers the organisations and institutions with an interest in the St. Lucian environment and in general covers those responsible for implementing "Environmental Legislation" (see Section 2.3). The division between the agencies considered in Chapters 3 and 4 and is somewhat arbitrary, as there is overlap between agencies/areas of interest and in the final analysis this approach has been adopted for ease of reporting

#### 4.1 Government Institutions

##### 4.1.1. Environmental Unit (MFPIS&PS)

The Environmental Unit in the Ministry of Finance, Planning Information Services and the Public Service (MFPIS&PS) is responsible for policy issues in the fields of: Environment, Energy, Science and Technology. Amongst other duties, the Unit is required to act as the Secretariat for the National Environment Commission (NEC), which in turn should be St. Lucia's principal environmental authority

The decision to establish the NEC was confirmed by Cabinet in March 1995 (Cabinet Conclusion 450 of 23/3/95) in response to a submission from the Ministry drawing attention to the perilous state of the environment following TSD. Cabinet agreed that the NEC would provide an appropriate basis for sustainable management through the implementation of a proposed National Environmental Action Plan (NEAP)

The broad functions of the NEC are as follows:

- to provide guidance and advice to Cabinet, parastatal and non-governmental organisations (NGOs) on environmental matters;
- to co-ordinate the inputs of Governmental and NGOs as well as private sector agencies/interests in the implementation of the NEAP;
- to mobilise financial and technical resources in support of environmental projects and activities, especially at the community level;
- to monitor and evaluate the implementation of the NEAP;
- to assist with the design and delivery of training programmes/workshops in environmental management and sustainable development;
- to organise and/or supervise applied research in accordance with the NEAP.

The World Bank requires its clientele to adopt NEAPs and with Bank assistance GoSL produced a draft plan in May 1994 (basically an instruction as to how GoSL should prepare the final document). The Environmental Unit completed the NEAP early in 1997 and it was finally approved by Cabinet in May 1997, just before the change of Government

The National Environmental Commission, the organisation charged with overall responsibility for national environmental management has still not been nominated and has yet to hold its first meeting. The 3 year gap between the draft and final NEAP gives the impression that the GoSL's environmental machinery moves slowly. In passing, it should be noted that environmental issues in St. Lucia tend to have a long gestation period - an Environmental Commission was first established by the late Gabriel Charles and others in 1981, but faded away for lack of political support, only to be re-launched in June 1995.

#### 4.1.2. Physical Planning Unit (MFPIS&PS)

The Physical Planning Unit (PPU) services the DCA which is, in turn, responsible for the Land Development (Interim Control) Act of 1971. The Unit includes a GIS Section which is well equipped with human / other resources and would need little additional assistance, in order to meet the demands of a future Watershed and Environmental Management Programme.

The Consultant's ToR require attention to the roles, functions and responsibilities of central and local institutions regarding settlements in flood plain and coastal areas including building regulations in hazard zones. The Manual for Developers (1988) in Section 3.4 Disaster Prone Areas, states:

*"If an area possesses characteristics and is located in an area where life and property may be in constant threat (then) if the area is developed, a Development Order may be issued to prevent development of the area".*

The PPU state that, as hazard areas have not been designated, there has been no attempt to progress beyond the statement quoted above. However, when dealing with individual planning applications, in a hazard-prone area, the DCA may grant approval for the proposed development, provided the developer complies with special conditions. In practice there is, unfortunately, no legal mechanism to force developers to adhere to the conditions of approval.

A comparison can be drawn between the approach adopted for the Queen's Chain and the approach which might be adopted for hazard-prone areas in the future. The DCA commissioned a report on procedures for granting leases within the Queen's Chain (the area encircling the Island, which lies within 187.5 feet of high water mark) and the resulting policy document was adopted in February 1988 and for example, specifies:

- the procedure for granting leases in the Queen's Chain and notes that Cabinet have granted leases without ascertaining if the proposed land use is acceptable to DCA;
- the development policy including maximum leases of 25 years, renewable;
- the types of development to be permitted in each of the three zones of the Chain and adjacent coastal environment;
- that public access should be available to all developments adjoining or on the Queen's Chain.

Enquiries in a village like Demery, indicate that people build where they can find land and that in practice the planning process tends to be extremely casual. Because of limited land, a significant percentage of houses might be in flood or landslide areas and the true position could only be ascertained by a detailed housing survey, along with the identification of alternative housing plots for those who should be relocated.

#### 4.1.3. Office of Disaster Preparedness (ODP)

In 1979 the UN funded a Pan-Caribbean meeting of Ministers of Health to discuss disaster preparedness in the Region. This led to the formation of a Unit in St Lucia, with a former Cabinet Secretary acting as the Disaster Co-ordinator.

The Office of Disaster Preparedness (ODP) answers to the Office of the Prime Minister, is regarded both in St. Lucia and in the wider Caribbean as an effective organisation and employs three full time staff (Disaster Co-ordinator, one staff member and a Secretary). The original National Emergency Advisory Council, changed its name to the National Emergency Management Organisation (NEMO) and meets once a year to decide on actions needed in the event of a hurricane or other disaster

Regional DP Committees were planned to cover the same areas as Regional Councils, but in the recent past, local elected representation has been replaced by nominated Councils. Under the circumstances the DP Office has organised local Emergency Committees at Gros Islet, Dennery, Micoud, Vieux Fort, Choiseul, Soufriere, Canaries, Anse La Raye and Laborie. Each of these Committees is made up of all the Civil Servants in the area, plus others such as the Priest, Schoolmaster, Representatives from the Tourist Industry and others. In some cases there may be Sub-Committees for example to represent Rural as opposed to Urban areas. Funds are limited, but the DP Office will pay transportation costs and projects/workshops are often sponsored. The DP Committee Secretaries, who are also the local Town or Village Clerks receive a salary from the Office of Local Government.

At the national level the NEMO is divided into 6 smaller committees responsible for - Information and Evaluation - Transportation - Telecommunications - Management of Supplies - Health and Welfare - Emergency Works (divided into Immediate, Intermediate and Long Term). In an emergency, there are 3 tiers of involvement:

- Decision Makers - PM, Cabinet, Police
- Managers - The 6 Committees set out above - for example the membership of the Health Committee includes, Chief Engineer MCWT&PU, Permanent Secretary MFPIS&PS, Clerk to the Castries Council, Planning Officer Ministry of Health, Local Government Officer in Ministry of Community Development and representatives from WASA, LUCELEC and the Tourist Industry.
- Communities - i.e. the 9 local Emergency Committees. Emergency Operation Centres are designated. and the local member of the House of Representatives should also be involved.

The DP Local Committees have much in common with the community based organisation which the project has established at Dennery. The ODP state that, the most important thing the project can do is to map the areas prone to landslides, flooding and the coastal areas most prone to storm surges.

#### **4.1.4. Environmental Health Department**

The Environmental Health Department in the Ministry of Health, Human Services, Family Affairs and Women, is responsible for the administration of the Litter Act (24/83) and the Public Health Act (8/75) and its associated Regulations. In addition the Chief Environmental Health Officer is responsible for many of the solid waste management (SWM) functions which will in time be taken over by the SWM Authority established under the Solid Waste Management Act of 1996

##### ***a) Litter Act (24/83)***

It will be at least 4 years before implementation of the Litter Act becomes the responsibility of the SWM Authority, although this is the ultimate intention. Following amendments to the Act in 1985, efforts were made to enforce regulations with the appointment of Litter Wardens. Their effectiveness was greatly reduced following a court ruling which demonstrated that wardens are relatively powerless and the Police are said not to take littering seriously.

About three years ago, the French funded a campaign to clean up old vehicles which resulted in a temporary improvement to the environment. It is however difficult to judge when a vehicle is "litter" - there are powers to remove vehicles which appear to be derelict to a pound - held for a period and then scrapped if not reclaimed - However the Chief Environmental Health Officer does not have access to a pound.

##### ***b) The Public Health Act (8/75)***

The Public Health Board (Chief Medical Officer is the Chair) established under the Act, had not met for at least three years (as at December 1996). Public Health Officers were re-designated as

Environmental Health (EH) Officers some time ago and EH Inspectors are based in each of the 8 Regions responsible for the inspection and improvement of the environment. There is a total Inspectorate staff of 25, but with some 235 other employees, many of whom are EH Aids (Assistant EH Officers) or sanitary workers responsible for clearing up rubbish. One staff member is responsible for testing water quality at both the intake and at the tap, with the analysis of samples being done at the Caribbean Environmental Health Institute (CEHI).

There is a land fill site at Cul de Sac which does not have a proper access road and is difficult to use in wet weather. An important job for the SWM Authority will be the establishment of a proper landfill sites to serve the Castries and Vieux Fort areas.

#### **4.1.5. Veterinary Division (MAFF&E)**

The Chief Veterinary Officer is responsible for the administration of the Animal (Diseases and Importation) Ordinance. Importers of livestock of any description are required to obtain a licence and strict limits are placed on the areas which may export stock to St. Lucia. The Veterinary Division does not have an Animal Quarantine Station and a system of farm quarantine is used until stock can be shown to be free of disease. A similar licensing system applies to the importation of animal products. In addition the country does not have a central slaughter house and there is apparently little need for such a facility. Animals are killed in make-shift abattoirs and when necessary veterinary officers co-operate with Public Health officials on an informal basis to enforce the Public Health (Slaughter House) Regulations (SI 69/80).

## **4.2. Regional Organisations**

### **4.2.1. Natural Resources Management Unit (NRMU) of the Organisation of Eastern Caribbean States (OECS).**

The Central Secretariat of OECS is located in St Lucia with an Economic Affairs Division in Antigua. Until January 1996, there was also a Fisheries Unit in St Vincent, which has now merged with the St. Lucia based NRMU. The NRMU receives assistance from USAID / WWF / GTZ and in addition DFID has a commitment to support the following programmes:

- a Regional Coastal Resources Management (CRM) initiative
- a Watershed Management component which will come on-stream after the Watershed and Environmental Management Project has been completed
- a water quality project - see Section 4.2.3.

#### **a) Programmes**

The following three programmes with which NRMU and/or Fisheries Department are involved have a high degree of public participation and are of environmental interest::

- NMRU are running a Public Awareness campaign on Pesticide use which involves the Pesticides Control Board and the Caribbean Environmental Health Institute (CEHI). Plans are in hand to expand this work under the CRM programme.
- Soufriere Marine Management Area (SMMA) was established in 1992 and became operational in 1995. The Fisheries Dept. acts as the Chair of the Technical Advisory Committee which draws representatives from a wide range of stakeholders including the fishing community, water taxi owners, tourist industry, the Soufriere Foundation, Customs Department and hotels in the area. The SMMA has attracted aid funds from both the French and the ENCORE project, but is said to cover recurrent costs from income earned from mooring fees, diving permits etc. Staff comprises a

Manager and 4 Wardens and there are apparently no plans to change the present, "Government, but with Autonomy" structure of SMMA.

- Sea Urchin Programme - In the past the harvesting of sea urchins in the Vieux Fort area seemed to be reasonably well self-regulated. Following Hurricane David in 1989/90, sea urchins disappeared for 4 years - when they eventually re-appeared there was indiscriminate harvesting which resulted in Government imposing a moratorium. Harvesters asked for this to be lifted and CANARI/Fisheries worked together to explain the biology of the urchin and helped to form a group of those interested in harvesting and cleaning. This group decides who will be involved in the industry and the size of urchins which may be taken. The normal harvesting season is from September to December, but in 1995 the Group asked that the season be closed after only 3 days as there was an insufficient crop

**b) The Environmental and Coastal Resources Project (ENCORE).**

The project started in 1992, has recently been extended by 15 months and is due to end in December 1998. The project is funded by USAID through WWF and OECS. The Local Site Management component of the project is managed by GoSL staff members with a similar local Government team involved in Dominica (training, public awareness, institution building etc.)

Work is concentrated in the Canaries, Soufriere and Anse La Raye areas and excluding the SMMA and SWM work, trials have been established at Font St Jacques where farmers are being encouraged to plant trees between dasheen on steep slopes to aid soil stabilisation. Similar work is being undertaken at Zenon, plus a sustainable charcoal production project at Canaries in conjunction with the National Trust.

**4.2.2. Caribbean Natural Resources Institute (CANARI)**

CANARI was established 20 years ago as a charitable foundation and has been at Vieux Fort for about 11 years. Also in the US Virgin Islands (St Croix) The organisation concentrates on the following narrow band of issues and is heavily committed to participatory management:

- Applied Research;
- Analysis - learning from applied research;
- Advocacy - dissemination of information.

CANARI has a total staff of twelve (7 in St Lucia and 5 in St Croix) and an annual budget of US\$700,000. The organisation obtains funds from:

- Programme grants - US Foundations, DFID, etc.
- Specific project grants - UN etc.
- Training fees, which account for 15 percent of income

Previous mention has been made of CANARI's work with the sea urchin project. In addition the organisation is involved in the sustainable development of sea grass beds, in the production of charcoal from mangroves and is working with a group of farmers in the Millet, Praslin and Pelouse areas.

CANARI have, with assistance from DFID, produced a video "People are Trees, Trees are People" which features areas on the edge of the Dennery watershed.

**4.2.3. Caribbean Environmental Health Organisation (CEHI)**

CEHI was established 10 years ago, provides expertise in water related subjects for the smaller Caribbean Islands and has received assistance from a number of aid projects including:

- GTZ has provided consistent support to the Institute (capital for the well appointed building and continuing technical assistance);
- CEHI was the base for DFID funded work which ended in mid 1997 (The Development and Integration of Biotic and Chemical Monitoring with Land Use Assessment and Tropical River Resource Management). The results of the work are of interest to the Watershed and Environmental Management Project;
- the Caribbean Basin Water Management project which is responsible for the co-ordination of training for all Water Authorities in the member countries.

Staff consists of a director and four professional staff from the Region in addition to expatriate staff. It would appear that WASA and other Water Authorities in the Region could, or should make greater use of CEHI for water quality monitoring.

### 4.3. Non-Government Organisation (NGOs)

#### 4.3.1. St Lucia National Trust (SLNT)

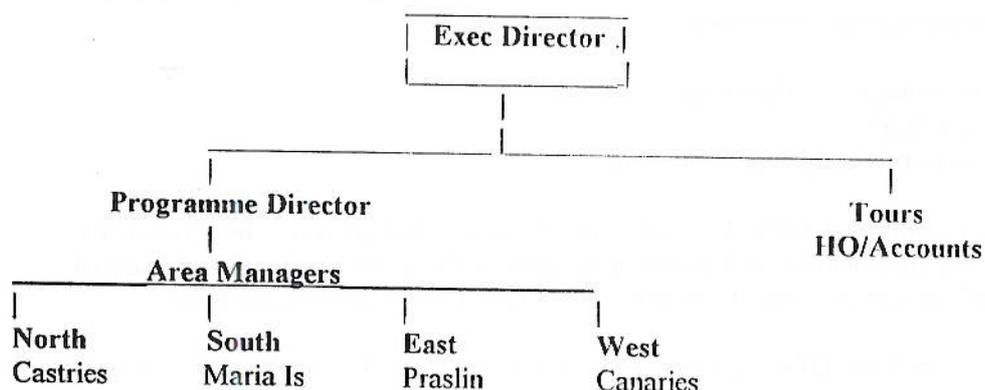
The SLNT was established in 1975 by the National Trust Act and control is vested in a Council consisting of 7 people elected from the membership, 2 nominated by Govt and 2 by the Archaeological and Historical Society. Council meetings are held at least every two months. An Architectural Heritage Committee has recently been established consisting of SLNT, a representative from MFPIS&PS and the private sector.

Income comes from entrance fees, money raised by members and from a government grant which started at EC\$1.0 million in 1993, declining by \$100,000 per year (ie. \$600,000 in 1997). The SLNT has a total of 45 staff organised as shown in Figure 4.1

At present three SLNT properties have been developed - Pigeon Is, Frigate Is and Maria Islands. A property (130 acres) at Canaries is in the process of being developed as a Camp site and in addition there are a number of properties/sites which have been donated to the trust including five on the Morne.

Figure 4.1

#### Establishment of the St. Lucia National Trust



The SLNT would like to acquire a 20 acre wetland site at Bois d'Orange which is a site for migrating birds. The area is privately owned with a lot of houses and so far it has been impossible to protect the area from further development. In this regard the SLNT made a submission to GoSL at the end of 1992

for the designation of a number of "Protected Areas". Government did not reject the proposals, but have asked the Trust to work on one scheme at a time.

Although appointed as the custodians of the national heritage, the Trust is vulnerable to political pressure and a case in point is the Savannes Bay area (518 hectares) which was placed under the legal protection of SLNT in 1982. Ten years later, it was removed from SLNT control by GoSL, in the face of protests from all conservation interests, so that the area could be developed as a tourist resort.

#### **4.3.2. World Wildlife Fund (WWF)**

The WWF provided an initial 2 year technical assistance input to the ENCORE project and now acts on behalf of USAID as the project's funding agent (the money passes from USAID to WWF to OECS + CEHI and the participating Governments, St Lucia and Dominica). The project has a budget of US\$8 million over 5 years and the routing of funds through WWF came about when USAID closed down its office in Barbados.

It is probable that WWF will not stay in St Lucia after the end of the ENCORE project, but there are other local organisations with similar interests to WWF.

#### **4.3.3. Other NGOs with an Environmental Interest**

- RARE Centre for Tropical Conservation - a USA-based funding agency with a small staff, but able to position funds to maximum effect (e.g. provided assistance for nature trails, the "save Jacquot project" and a family planning campaign in St Lucia.).
- The Folk Research Centre - have or could be helpful in Public Awareness Campaigns.
- St Lucia Whale and Dolphin Watching Association - which is affiliated to the Eastern Caribbean Coalition for Environmental Awareness.
- St Lucia Naturalist Society - started in 1978 and funded by subscriptions from the 180 members plus donations. Current campaigns include:
  - study and documentation of mangroves;
  - identification and documentation of waterfalls;
  - bird watching and recording migratory patterns of certain species;
  - turtle watching, tagging and recording;
  - beach cleaning and recording of garbage accumulation on beaches.

There would be advantages in the NGOs and others forming an environmental pressure group (possibly named "Friends of St Lucia") which the NEC should encourage.

#### **4.4. Community Based Organisations (CBOs)**

Following a political decision, local elected representation has been replaced by nominated Councils in the towns and villages. This is said to have resulted in a weakening of community activities.<sup>8</sup> GoSL have made some efforts to redress the situation, through:

- Ministry of Community Development, Culture, Local Government and Co-operatives- with responsibility for decentralisation and the administration of local government;
- Office of Women's Affairs - first established in 1986 within the Ministry of Community Development, transferred to the Attorney General's Office in 1994 (thought appropriate that the

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<sup>8</sup> Reported in a Seminar (November 1996) following an ENCORE funded review of CBOs in the Soufriere, Canaries and Anse La Raye areas - carried out by St Lucia Consultants, Creative Solutions.

Unit should answer to a woman Minister) and finally to the Ministry of Health, Human Services, Family Affairs and Women following the change of Government in 1997.

There has been a long tradition of community and self help in St Lucia<sup>8</sup> and a "grass roots" expansion in the 1970s of CBOs which are collectively called Mothers and Fathers Groups. These have developed in various ways and in response to various situations - some single sex, some for married couples, some for younger people etc. - most of which are involved with the church in some way. There is now a National Association of Mothers and Fathers Groups which receives assistance from Government.

Many examples of successful CBOs could be cited, for example there is frequent mention of the Soufriere Foundation and of the Canaries Ambulance and Development Association (this CBO with assistance from St Lucians living in UK and USA, raised money for an ambulance and are building a community centre)

An important part of the Consultant's work has been to identify and involve the CBOs at Dennery and Cul de Sac in watershed management and the proposed approach is covered in more detail in Chapter 5.

## Chapter 5

### Government, Community based and Other Organisations in the Dennery and Cul de Sac Watersheds

#### 5.1. Approach

The Land Conservation and Improvement Act of 1992 provides an appropriate legislative vehicle for the institutions/socio-economic development of the two watersheds. Unfortunately the Land Conservation Board (LCB), which should spearhead land conservation and improvement work, has only met once (on 14th November 1995) and has been of no help during the project period. However, it is interesting to note that the minutes of the first LCB meeting discussed, in general terms, a similar programme of work to that undertaken by the Project.

A possible way of taking "the project to the people" is provided by the following extract from the Consultant's (Hunting Technical Services Limited) Drainage and Land Conservation Programme, Final Report dated 1987:

*"The Steering Committee for the formation of the Land Conservation Board did not completely agree with the Consultant's proposals for Drainage Boards with boundaries drawn up around the lower river basins. Rather a complete watershed was preferred which could be designated a Conservation Area. Within this area a Land Conservation and Drainage Committee (LCDC) could be formed consisting of representatives drawn from throughout the complete catchment. In this way it was felt that any action carried out on the upper slopes that would affect land lower down, would be properly considered. Whilst such LCDCs are not specifically mentioned in the Act there is general provision for delegating the work of the LCB to committees, thereby allowing LCDCs to be formed and modified as the need arises".*

The possibility of establishing LCDCs in the Dennery and Cul de Sac watersheds was agreed by the Chairman of the LCB (Permanent Secretary, MAFF&E) in November 1996 and should have been ratified by the whole Board, had it held a meeting. As the momentum for community involvement gathered pace it was decided, again with the approval of the PS, that "Watershed Management Action Force (WMAF)" was a more appropriate title than LCDC and Annex 9 and 10 to the Report set out the progress made during 1997.

#### 5.2. The Danger of an Unsuccessful LCDC/WMAF Campaign.

The Interim Report warned that any community development programme requires a very serious commitment from GoSL. Unlike the physical trials programme, community participatory programmes such as that envisaged and put in place at Dennery, can not be simply started and stopped (the catastrophic results of an early withdrawal of support are well documented as are the difficulties of re-starting programmes amongst discouraged and cynical communities). The ENCORE project, has been involved in participatory management work in the Soufriere, Anse La Raye and Canaries areas since 1992, and would be the first to emphasise the difficulties involved.

#### 5.3. The Work Programme.

In order to start the programme and allow GoSL to make decisions, the Consultants engaged a full time Community Participation Co-ordinator (Ms J Raynold) and a part-time Adviser (Mr M P Toussaint MBE) on 11 November 1996. The initial work programme was straightforward and involved the identification of all of the organisations in the two watersheds - a task completed at the end of 1996. The social and to an extent, the economic characteristics of the watersheds, are set out in Appendix B

and some of the significant differences between the two are summarised in Table 5.1 Time and resource constraints resulted in a decision to concentrate efforts at Dennery with a much more limited participatory programme at Cul de Sac.

Some Characteristics of the Watersheds

Table 5.1.

	Dennery	Cul de Sac
Area (1)	21.4 sq. km	40.9 sq. km
Population (2)	2,918	12,806
Centres with population > 300	2	13
Approximate no. of banana farmers (3)	250	600

Notes (1) See Table 6.1

(2) 1991 Census

(3) Estimated from the number of delegates eligible to attend the SLBGA Conference of Delegates.

The information collected, provided a good indication of where to target the WMAF campaign and the results of the WMAF team's efforts are fully reported in Annex 10. The participatory programme developed on the understanding that a strong GoSL commitment would be forthcoming, including a minimum two year investment in the Dennery programme. At the time of writing the Final Report, important management lessons have been learned, but in practice the participatory programme has only just started.

The future of the programme now appears to be in danger of terminating - a situation which the Consultant's feared might happen at the start of the Project. GoSL assumed responsibility for the CPP Co-ordinator's contract in May 1997, but the contract ends in mid-November 1997 at which time the Co-ordinator will return to MFPIS&PS. Urgent action is needed to ensure continuity of the Dennery programme and failure to meet GoSL's clearly defined obligations, will have serious consequences

#### 5.4. Some Initial Responses to the Survey.

In conclusion, the following extracts from the CPC's Report (see Appendix B) written in November 1996 should be noted:

*The prospect of a programme which would address the issues of watershed management and the negative consequences of mis-management was generally well received. The impact of TSD in 1994 and the more recent/frequent heavy rains on the social and economic livelihoods of people has generated an increased awareness of issues such as deforestation, construction and cultivation on hill slopes, as well as poor drainage systems in both residential and agricultural areas. As such many people expressed an interest in seeing the objectives of the LCDC programme implemented.*

*Community members and government personnel working in the watersheds indicated that mobilising individuals and groups is a particularly challenging exercise. The feeling is that people are wary of government, community, or other projects which have typically promised relief from one form of hardship or the other, but have shown no continuity or tangible results*

## Chapter 6

### Development Proposals for Watershed and Environmental Management

This Chapter sets out the institutional aspects of the development programme for the management of the environment in general and of the watersheds in particular over the five year period 1998/1999 to 2002/2003. Preparing a development plan in a period of uncertainty and with few of the necessary structures in place, is a hazardous process and it would be prudent to revise the plan every year in the light of experience (i.e. prepare a "rolling plan" every November to coincide with the annual budgeting process).

#### 6.1 General

The development plan takes the view that the proper management of the Country's watersheds and of the associated river/coastal systems is the responsibility of GoSL and ultimately of everyone who lives on the Island. Non-governmental organisations, community groups, aid agencies and others can certainly help, but Government must put in place and operate the necessary management framework.

The solution to the problem, which everyone recognises, particularly after torrential or even heavy rain, requires a long term commitment, does not respond to a "quick fix" and requires a multi-agency approach. The Interim Report noted that:

*"Integration of multiple agency interests into a single programme is difficult. Without exception, institutions will defend their turf and only yield authority and prerogative grudgingly. Getting institutions to co-operate in multi-sectoral activities towards integrated common goals - those that no institution can accomplish alone - is certainly one of the toughest jobs for natural resource authorities"<sup>9</sup>*

Whilst recognising the above, institutional strengthening, co-operation between agencies and decision making over the project period has been disappointing and Government's already minimal watershed management machinery is arguable weaker at the end of 1997 than it was at the start of the project.

#### 6.2 Management Assumptions

The development plan is based on the assumption that considerable institutional improvements will be forthcoming and the following sections set out the minimum steps which GoSL should put in place. Failure to address these issues will weaken or even invalidate the development plans and aid donors might reasonably require evidence of GoSL commitment prior to making funds available. St Lucia has, at least in many fields, an adequate number of capable, well trained, civil servants and there are sufficient examples of well motivated units and individuals to support the view that progress is possible.

#### 6.3 National Environmental Management.

Figure 6.1 shows an organisational structure which is based on existing legislation and Cabinet decisions, but which needs to be put in place without further delay. It does not require the invention of new organisations, or any great initial increase in staff or expenditure. Implementation of the work would however require co-operation amongst the agencies involved and a determination to make progress. The following Sections discuss the components of the structure in more detail.

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<sup>9</sup> GoSL, Watershed and Environmental Management Project - Consultants Report December 1994.

### **6.3.1 National Environmental Commission (NEC)**

Immediate steps should be taken to appoint the members of the NEC and Cabinet should be invited to consider the appointment of a non-government Chair - someone known to have a strong commitment to preserving and enhancing the environment.

The Commission should meet every second month, in the first instance and the meeting schedule should be set out a year in advance. Initial tasks would be:

- endorse the National Environmental Action Plan (NEAP) and set work priorities;
- consider and if possible endorse the watershed management development plan.

Every financial year, the Commission should check and agree all Government funds allocated for the protection/enhancement of the environment, prior to the announcement of the budget. In addition it would be appropriate for the NEC to allocate and require agencies including the LCB to be accountable for the expenditure of such funds.

At this stage the Environmental Unit in MFPIS&PS (referred to in Figure 6.1 as the Environmental Office) does not require enlargement, although its future role, (acting as the Secretariat for the NEC, monitoring/evaluating programmes, co-ordinating environmental legislation and involvement in international treaty obligations) will require additional staff.

### **6.3.2. Operations Group**

The units making up the Operations Group (see Figure 6.1) are mainly considered in Section 6.4 and are fundamental to management of the watersheds. The exception is the Coastal Zone Management Unit and it would be proper for the NEC to ask MAFF&E (Fisheries Department) to prepare a position paper regarding long term CZM plans. As with watersheds, the coastal zone is a GoSL responsibility and requires a dedicated institution to protect and improve the resource; projects can certainly assist, but the management process must be driven and co-ordinated by Government.

### **6.3.3. Support Group**

The Support Group will have an indirect role in the watersheds and will include a number of government and quasi-government agencies, some of which are shown in Figure 6.1. These organisations will usually receive public funds and should be required to prepare annual environmental plans which relate to the NEAP and the watersheds. The plans would record progress against set objectives and the submission dates should be staggered throughout the year, to enable the NEC to give proper consideration to individual statements.

### **6.3.4. Advisory Group**

The NEC should invite the organisations, which have wide environmental interests shown as the Advisory Group in Figure 6.1, (not necessarily a comprehensive list) to an annual seminar to discuss important environmental issues. Papers for presentation should be available prior to the meeting and the NEC should encourage an active exchange of views. St Lucia has organisations with sectoral environmental interests (wildlife, archaeology, marine resources etc.), but appears to lack an active environmental pressure group. Far from discouraging a group of this nature, the NEC has an obligation to encourage healthy debate, particularly if it leads to action.

# Proposed Structure for Environmental Management

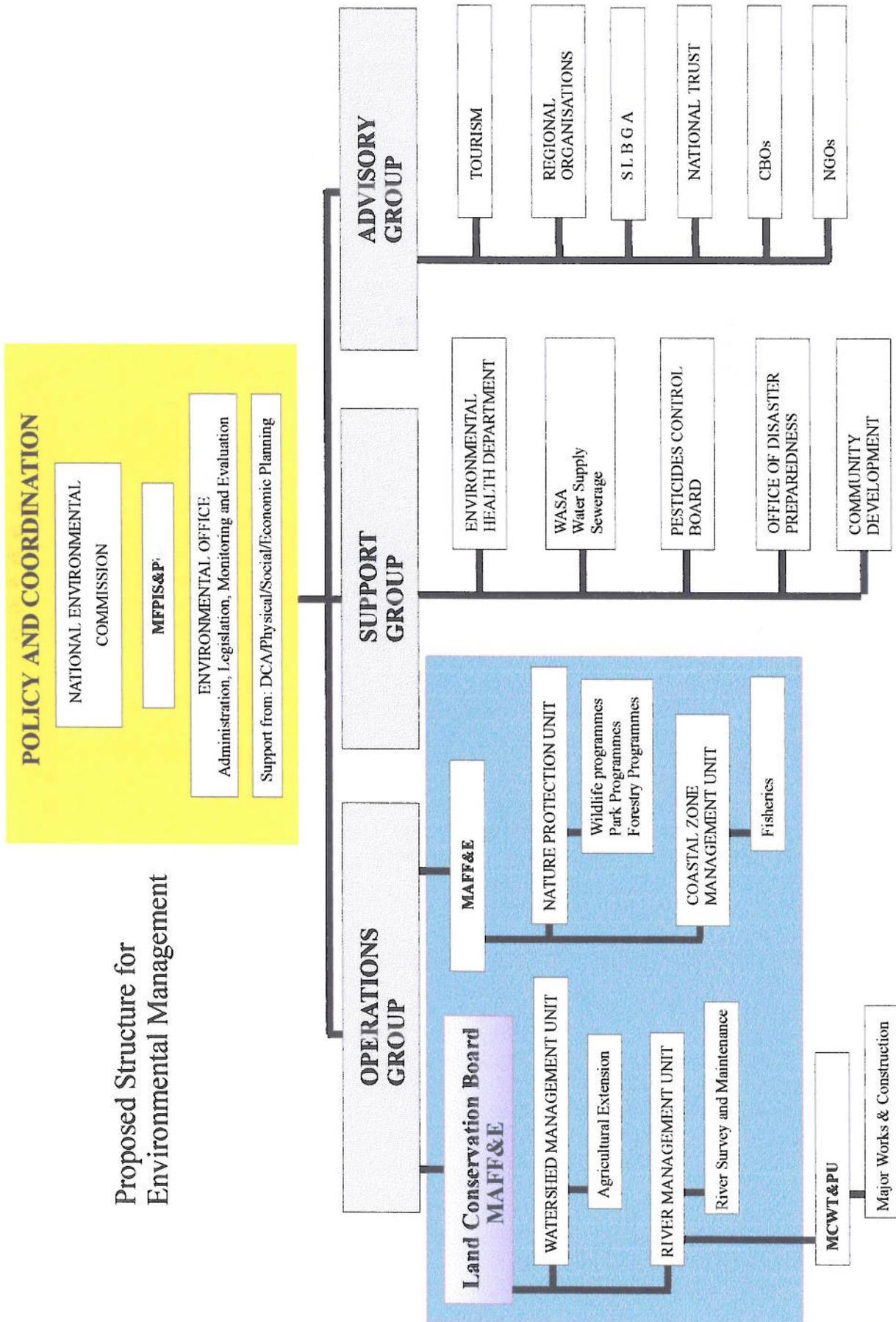


Figure 6.1

## **6.4. Watershed Management**

### **6.4.1. Land Conservation Board (LCB)**

Earlier Sections have made reference to the inactivity of the LCB and urgent steps must be taken to rectify the situation. An active Board supported by an efficient executive is essential to implementation of the development plan; Figure 6.2 shows the organisation of the LCB and forms the basis for the development plan elaborated in the Main Report.

The Land Conservation and Improvement Act makes provision for an 11 person board (7 government officials and 4 non-government members) and the Minister should consider:

- reducing the number of government members on the Board (e.g. the Secretary to the Board could be a non-voting member);
- appointing a representative from the tourist industry, the SLBGA and a banana grower to be non-government members of the Board;
- instructing that the Board meets every second month with meetings scheduled on alternate months to the NEC.

There is a need to draft Regulations for the LCB and later in the plan period (say 2000/2001) there may be advantages in changing the legislation to convert the Board into a more autonomous organisation, to be known as the Land Conservation Commission. The development plan makes provision for a legal specialist to address both of these issues.

### **6.4.2 Executive of the LSB**

With effect from April 1998, the present AESD would cease to exist and all staff and resources would be transferred to the executive arm of the LCB, this change would recognise the need to:

- continue and improve the hydromet service;
- abandon any residual agricultural mechanisation ambitions;
- limit the provision of civil engineering services;
- concentrate on meeting the technical needs of soil/water conservation and development in the watersheds;
- develop a drainage and where appropriate, irrigation capability;
- meet the administrative and technical demands of the LCB and the WMAFs

The internal organisation of the LCB would involve five units as follows;

#### **a) Common Services**

This unit will supply the secretariat for the LCB, comprising the Chief Agricultural Engineer and Accounts, Secretarial and Workshop staff; it should be noted that the development plan assumes that the LCB will have greater financial responsibilities than the present AESD and there is accordingly provision to strengthen the LCB's financial capability.

#### **b) Community Participation Unit**

The number of Community Participation Programme Co-ordinators in this Unit would increase from 1 in year one to 4 later in the programme. There is provision in the development plan for WMAFs to incur recurrent and capital costs which would be controlled by the CPP Co-ordinators

**c) Hydromet Unit**

The Hydromet Unit's duties, responsibilities and staff would differ little from the activities carried out by AESD at present. Staffing would consist of a Hydrologist and five technicians for most of the plan period.

**d) Watershed Management Unit**

At full development, the Unit would consist of an agricultural engineer and six technicians (3 to service the WMAFs in the west and 3 for the east of the Island).

**e) River Management Unit**

The River Management Unit would mirror the Watershed Management Unit and would also consist of an agricultural engineer and six technicians.

**6.4.3 Watershed Management Action Force (WMAF)**

The WMAF experience in Dennery is detailed in Annex 10, but it has only been possible to carry out a very limited programme at Cul de Sac, nevertheless there is sufficient information to estimate the staff and other costs required to promote WMAFs over the 5 year period.

The plan is based on the assumption that development in the 37 watersheds will occur over the five year period and at year five would involve the establishment of 20 WMAFs as illustrated in Figure 6.3 and listed in Table 6.1. The priority for development has been predetermined in the case of Dennery and Cul de Sac, whilst in the other watersheds, the development has been based on a perceived order of priorities. Experience might indicate a different order of priorities and this could be taken into account in subsequent "rolling plans".

The estimates make provision for LCD staff, both technical and the CPP Co-ordinators, but no financial provision has been made for the Technical Operations Team (TOT) staff provided by Extension, Forestry or other Government agencies required to implement the development programme in the watersheds.

**6.5 Non-LCB Staff Involved in Watershed Management**

Previous mention has been made of the involvement of the Agricultural Extension Service in LCB work and there may be a need to formalise this relationship, for example by designating one officer in each region to work exclusively with the WMAFs. In addition to extension officers, it is anticipated that the following units in the Forestry Department will be closely involved in the watershed development programme:

**a) Protection and Patrol Unit and the Wildlife Protection Unit**

During the plan period it is anticipated that there will be dialogue between LCB and the Forestry Department to determine areas of common interest in the watersheds.

**b) Education and Information Unit**

The CPP Co-ordination Unit in LCB should not establish its own information service, but should come to an arrangement with the Forestry Department to use the services of the Education and Information Unit to provide publications and other material for use in watershed management campaigns

# Watershed and Environmental Management

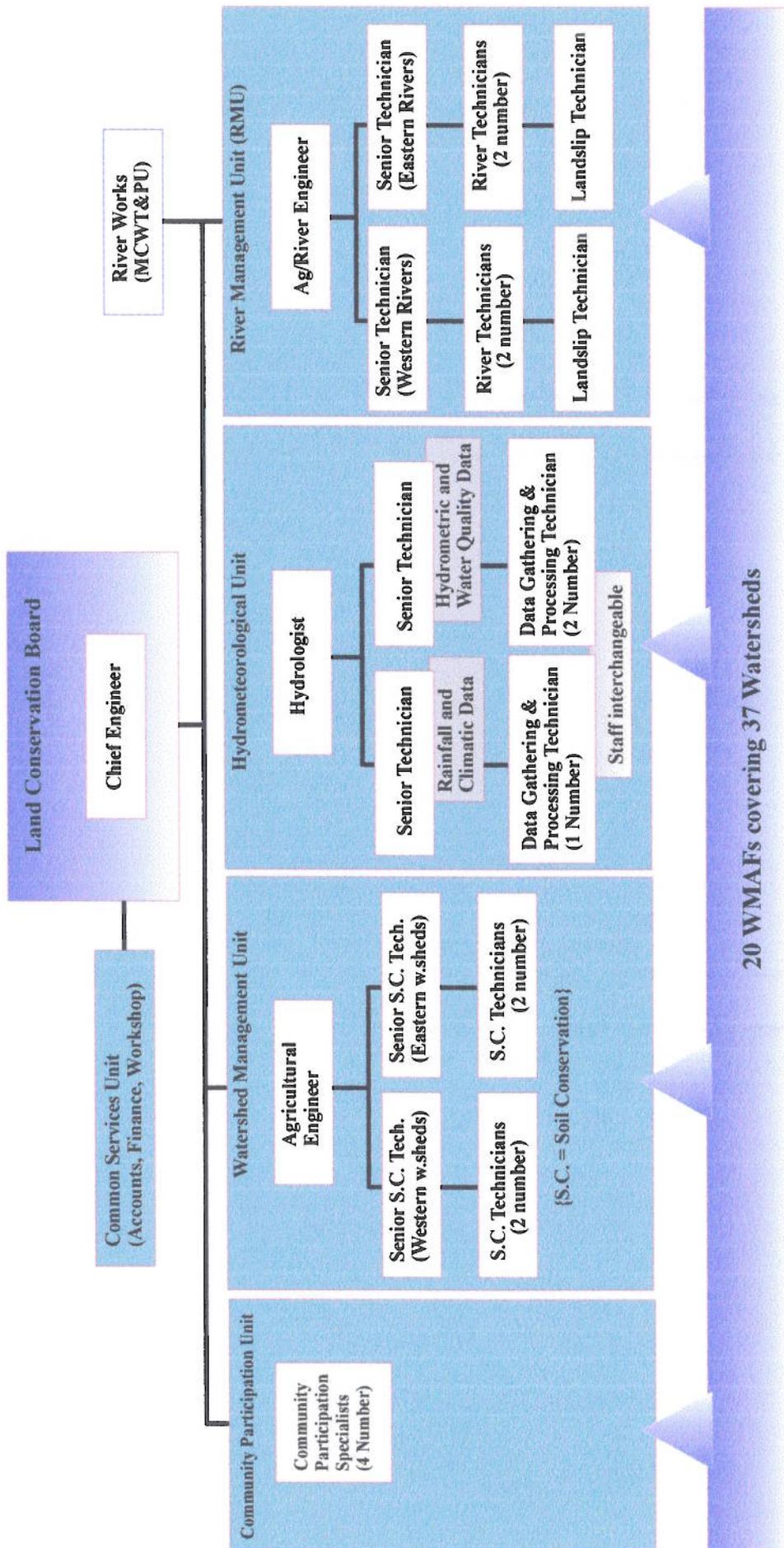


Figure 6.2

Programme for Development of Watershed Management Plans

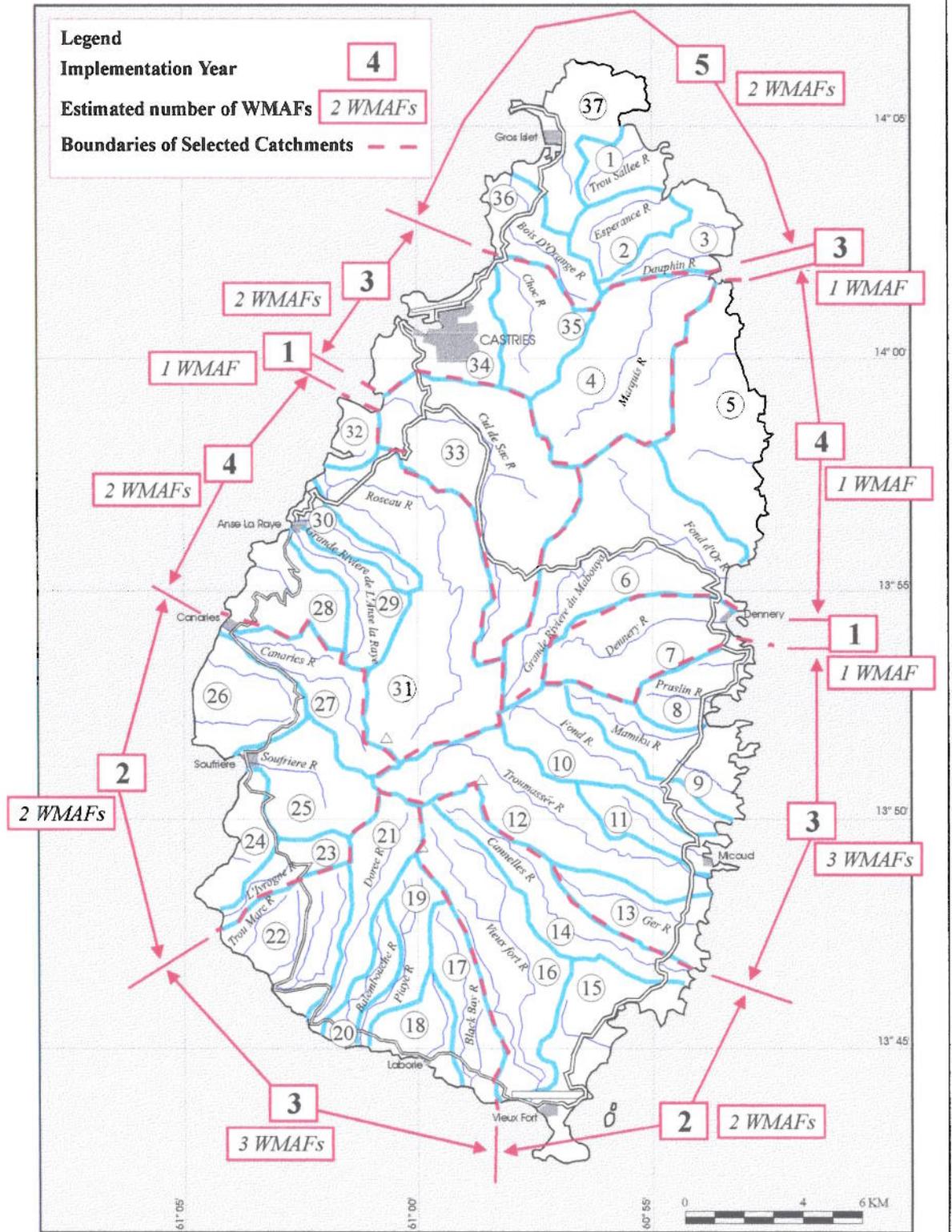


Table 6.1

## Development Programme by Years

Year	Region	W/sh no.	Name	WMAF no.	Sq km
1	3	7	Dennery	1	21.4
	8	33	Cul de Sac	2	40.9
			<b>Sub Total</b>		<b>62.3</b>
2	5	14	Canelles	3	17.3
	5	15	Roarne / Rugeine / Palmiste / St. Urban	3	22.8
	5	16	Vieux Fort	4	28.8
	6	23	L'Ivrogne	5	6.5
	6	24	Pitons	5	7.1
	6	25	Soufriere	5	17.2
	6	26	Mamin / Mahout	6	13.7
	6	27	Canaries	6	14.6
			<b>Sub Total</b>		<b>128.0</b>
3	2	4	Maquis	7	31.0
	3	8	Riviere Gadet / Trois Islet	8	11.0
	4	9	Mamiku / Patience	8	16.0
	4	10	Fond	9	18.1
	4	11	Volet	9	8.6
	4	12	Troumassee	10	31.7
	4	13	Micoud / Ravine Bethel	10	13.1
	5	17	Black Bay	11	15.2
	5	18	Laborie	11	5.5
	5	19	Piaye	12	9.6
	5	20	Balembouche	12	5.2
	6	21	Doree	13	11.1
	6	22	Choiseul / Trou Barbet / Trou Marc	13	18.1
	8	34	Castries	14	14.3
	8	35	Choc	15	12.2
			<b>Sub Total</b>		<b>220.7</b>
4	2	5	Grande Anse / Louvet	16	29.2
	3	6	Fond d'Or	16	41.0
	7	28	Anse la Verdure / Cochon / Galet	17	13.1
	7	29	Grande Riviere de Anse-la-Raye	17	8.9
	7	30	Petit Riviere de Anse-la-Raye	17	5.7
	7	31	Roseau	18	49.1
	7	32	Mt. Bellevue	18	4.8
		<b>Sub Total</b>		<b>151.8</b>	
5	1	1	Salle / Lapins	19	6.7
	1	2	Esperance	19	9.7
	1	3	Trou Grauval / Dauphin	19	10.0
	1	36	Bois d'Orange	20	11.3
	1	37	Cap	20	15.4
		<b>Sub Total</b>		<b>53.1</b>	

Total all Watersheds - 615.9 sq. km.

## 6.6 Administrative Regions and the Watersheds.

MAFF&E and preferably other Ministries should match the boundaries of the eight Administrative Regions to the thirty seven Watersheds in the Island, as shown in Figure 6.4 and Table 6.2. In practice this would involve only minor changes in areas of responsibility and apart from being a logical development, the change would be a good opportunity for GoSL to demonstrate its commitment to watershed management.

Table 6.2, shows that when re-configured the Regions are not all the same size (e.g. Region 5 is nearly twice the size of Region 1), but these differences are not important as staff should be deployed in response to need rather than simply land area.

Administrative Regions Based on Watersheds

Table 6.2

Region	Name and Number of Watershed	Total area (Sq km)
1	Salle / Lapins (1), Esperance (2), Trou Grauvail / Dauphin (3), Bois d'Orange (36), Cap (37).	53.1
2	Maquis (4), Grande Anse / Louvet (5).	60.2
3	Fond d'Or (6), Dennery (7), Riviere Gadet / Trois Islet (8).	73.4
4	Mamiku / Patience (9), Fond (10), Volet (11), Troumassee (12), Micoud / Ravine Bethel (13).	87.5
5	Canelles (14), Roarne/Rugeine/Palmiste/St. Urban (15), Vieux Fort (16), Black Bay (17), Laborie (18), Piaye (19), Balemboche (20)	104.4
6	Doree (21), Choiseul / Trou Barbet / Trou Marc (22), L'Ivrogne (23), Pitons (24), Soufriere (25), Mamin / Mahout (26), Canaries (27).	88.3
7	Anse la Verdure / Cochon / Galet (28), Grande Riviere de Anse-la-Raye (29), Petit Riviere de Anse-la-Raye (30), Roseau (31), Mt. Bellevue (32).	81.6
8	Cul de Sac (33), Castries (34), Choc (35),	67.4
	<b>Total</b>	<b>615.9</b>



## APPENDICES

**Appendix A Terms of Reference: Institutions/Legislation Specialist.**

**Appendix B Government, Community Based and Other Organisations in the  
Dennery and Cul de Sac Watersheds.**

## TERMS OF REFERENCE

### INSTITUTIONS / LEGISLATION SPECIALIST

1. Confirm Government of St. Lucia's strategy for rationalising institutional arrangements for land and water resource development and management, particularly water management, both quantitative and qualitative.
2. Consider the existing institutional framework, design an appropriate structure and organisation for the institution(s) responsible for watershed and environmental management, together with proposed powers and linkages with other agencies and local groups.
3. Define the roles, functions and responsibilities of central and local institutions concerned with natural resource and environmental management including:
  - water use/disposal, quality, quantity and distribution;
  - land use quality and zoning;
  - river management, including reserves and maintenance in riverine and coastal areas;
  - settlements in flood plain and coastal areas, including building regulations in hazard zones;
  - disaster preparedness and management;
  - forestry conservation protection and management;
  - public awareness education and participation.
4. Propose modifications or additions to existing legislative instruments governing the development and management of natural resources and the environment. In addition examine powers and mechanisms for enforcement, making appropriate recommendations to enhance effectiveness. Particular attention should be given to existing institutional capabilities and related aspects affecting effectiveness of enforcement.
5. Develop a programme for establishing the institutional framework which should include:
  - offices and related physical infrastructure and facilities island wide (equipment transport etc.);
  - appropriate GIS system for monitoring and evaluating watershed management activities;
  - Human Resource Development programmes including the public awareness and educational component;
  - cost estimates (Capital and recurrent for the first five years).
6. Consult with the environmentalist for the legislative framework for environmental management.
7. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

## Appendix B

### GOVERNMENT, COMMUNITY BASED AND OTHER ORGANISATIONS IN THE DENNERY AND CUL DE SAC WATERSHEDS

A summary of preliminary field investigations in the Dennerly and Cul-de-Sac watershed.

#### B 1. POPULATION<sup>1</sup>

##### a) Dennerly.

Community	Population
Anse Canot	384
Bazile	1
Bois Joli	52
Dennerly Village	<u>2481</u>
Total	2918

##### b) Cul de Sac.

Community	Population	Community	Population
Barre Duchaussee	245	La Croix Maingot	422
Ti Colon	494	Ciceron	2128
Soucis	205	Odsan	808
Morne Fortune	1843	Goodland	660
Ravin Poisson	655	Trois Pitons	483
Ferrand	18	L'Abbayee	757
Barre St Joseph	-	Dubrassay	-
Barre Denis	592	Crown Lands	298
Deglos	-	Marc	920
Bexon	1352	Forestierre	646
Floissac	46	Guesneau	<u>234</u>
		Total	12806

#### B 2. APPROACH

Preliminary field investigations were conducted by the locally appointed Land Conservation and Drainage Committees (LCDC) Co-ordinator, Miss Joanna Raynold and the locally appointed LCDC Adviser Mr Michael Toussaint.

Visits are made to the various communities which fall within the two pilot areas to identify and where possible locate the government officials, SLBGA Branches, community organisations/groups and influential individuals. Having established contact, the aim was to conduct informal discussions to familiarise them with the objectives of the project and to gather information regarding the existence and status of community organisations and to get a feel of the general atmosphere which exist in the communities re: participation in community development activities. This exercise is conducted with a view to co-opting the assistance and resources of the institutions they represent in the consultation and

<sup>1</sup> Population figures taken from the 1991 census

participatory process of the LCDC programme.

The prospect of a programme which would address the issues of watershed management and the negative consequences of mismanagement was generally well received. The impact of TSD in 1994 and the more recent and frequent heavy rains on the social and economic livelihoods of people has generated an increased awareness of issues such as deforestation, construction and cultivation on hill slopes and poor drainage systems in both residential and agricultural areas. As such, many of the persons approached, expressed an interest in seeing the objectives of the LCDC programme implemented.

Although the programme is timely, as it provides a response to the problems of mismanagement in watershed areas, December is a bad month to start the campaign in view of the cultural tradition for all work to "slow down" during the weeks approaching Christmas.

The following points arose in discussions with Community members

- The use of the 'screen' is an important means of attracting an audience and maintaining interest.
- It is important for anyone working with the communities to keep to their word and be on time for planned activities. Observing these courtesies is important to the people in the community.
- The mobilisation of community members is most effective through group/organisation leaders.

### **B 3. DENNERY WATERSHED**

The two visits to Dennery on 11 and 12 November, 1996 were conducted, on Monday 11 by Mr Peter Thompson (Institutions Specialist) and Miss Joanna Raynold (LCDC Co-ordinator) and on Tuesday 12 by Miss Joanna Raynold. The first point of contact was established at the Dennery Regional Office from which the following government ministries/divisions provide services:

- Ministry of Agriculture (Departments of Agriculture and Forestry)
- Ministry of Health
- Ministry of Community Development, Youth, Social Services and Sports
- The Dennery Village Council

The Regional Office at Dennery proved to be a useful starting point for contact with government officials. Several of the officers operating from the office also live in the community and were able to provide additional information particularly with regards to key community groups and community leaders.

From all indications, while several community organisations/groups exist, the most vibrant is the Dennery Disaster Preparedness Committee, chaired by Mr Ivan Gaspard, who is also the Village Clerk, an active community member and reputed to be an effective community mobiliser. The general opinion of the persons contacted is that this group is perhaps the most successful at mobilising the efforts of community members as it deals with matters which have a direct and tangible impact on the lives of the people.

Community members and government personnel working in the watersheds have indicated that mobilising individuals and groups is a particularly challenging exercise. The feeling is that people are wary of government, community or other projects which have typically promised relief from one form of hardship or the other, but have shown no continuity or tangible results.

#### *GOVERNMENT PERSONNEL RESPONSIBLE FOR DENNERY WATERSHED AREA:*

1. Alfred Prospere (Range Officer), Peter Vidal (Assistant Forest Officer)

Forestry Division, Phone No.: 453-4016

2. Fermin Faucher (Agricultural Assistant) Resides in Dennery

Dennery Regional Office, Phone No.: 453-4016 (work), 453-4347 (home)

3. Ms. E Joseph (District Health Team Leader, Health Educator), Wayne Williams (Environmental Health Aid), S Vidal (Vector Control Officer, Secretary Disaster Preparedness Committee, Health Team PRO) -

Dennery Regional Office Phone No.: 453-4016 (work)

4. Ivan Gaspard (Village Clerk), Dennery Regional Office, Phone No.: 453-4016

5. Marinus Pascal (Community Development Officer)

c/o Ministry of Community Development, Phone No.: 452-4880 (work)

6. Franklin Bray (Family Case Worker)

c/o Social Services Division, Ministry of Community Development.

#### *SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

Dennery Branch (Gills Arthur, Chairman, Roseline Felix, Secretary) Returns five delegates to the Annual Conference of Delegates

#### *COMMUNITY GROUPS/ORGANISATIONS*

1. Dennery Disaster Preparedness Committee (Chairman: Mr Ivan Gaspard, also Village Clerk) Phone No.: 453-4153 (Home), 453-3325 (Post Office), 453-4016 (Regional Office)

2. Married Couple's Group (President: Ms. A Stanislaus, also member of 1 above)

Active member: Ms. M Skelly, c/o Dennery Girl's Primary

3. Dennery Youth Council (President: Mr Felix Eudovic, Principal Aux-Lyon Combined School)

4. All Black Sports Club. (Contact: Alfred Prospere)

5. Dennery Fisherman's Co-operative (Secretary: Oliver Williams Phone No.: 453-3414, Treasurer: Kenneth President, Phone No.: 454-3334)

6. Dennery Mother's and Father's Group

#### *SCHOOLS*

1. Clendon Mason Secondary School (Principal: Mr Egbert James, Phone No.: 453-3329)

2. Dennery Girl's Primary (Principal: Ms. A Stanislaus)

3. Dennery Boy's Primary (Principal: Mr. Marcus Edward, Phone No.: 453-4263)

#### *CHURCHES*

1. Roman Catholic, 2. Seventh Day Adventist, 3. Church of God (Contact: Godwin Prospere)

4. Pentecostal Church, 5. Evangelical Church, 6. Apostelical Church

*POSSIBLE LOCATIONS FOR COMMUNITY MEETINGS, WORKSHOPS ETC* -Community Center (most central location) or Dennery Regional Office or Dennery Multi-purpose Centre

*BEST MEDIUM FOR DISSEMINATING INFORMATION* - through the Churches. - on the Creole radio programme - via the Schools.

#### **4. CUL-DE-SAC, WATERSHED**

The Cul-de-Sac watershed covers a much more extensive area than Dennery and comprises some 22 individual communities from Goodlands in the north to Ravine Poisson in the south. The area falls within the Agricultural Regions 7 (Anse La Raye) and Region 8, (Castries).

The reconnaissance exercise took a form similar to that conducted in Dennery. The first point of contact was with government personnel in the Cul-de-Sac watershed. From these officers some information was gathered about the community organisation/groups and a listing of key informants was generated. These individuals or groups were then contacted for additional information.

##### **a) Government Personnel Responsible for the Cul de Sac Watershed**

1. Mr Methodist Faucher (Acting Senior Agricultural Assistant), Mr Francois Henry (Agricultural Assistant) Phone No 452-1768 - home, Ms Antonia Felix (Agricultural Assistant) c/o Region 7 Office, Model Farms, Roseau, Phone No.: 451-4238
2. Mr Cyril Henry (Senior Agricultural Assistant), Mr Aloysius Les Flores (Agricultural Assistant), Ms Eurice Perineau (Agricultural Assistant), Mr Joseph George (Agricultural Assistant)  
c/o Region 8 Office, Marc, Phone No.: 451-2277
3. Mr David Lewis (Range Officer, Northern)  
c/o Forestry Division, Phone No.: 450-2078 (work)
4. Mr Marinus Pascal (Community Development Officer)  
Ministry of Community Development, Phone No.: 452-4880 (work)
5. Mr Lennard Montoute (Youth and Sport Officer)  
Ministry of Community Development, Phone No.: 452-4880 (work), 450-0061 (home)

##### **b) Communities in the Cul de Sac Watershed.**

###### **i) BEXON**

Bexon's sphere of influence extends beyond the central area of Bexon to the communities of Odsan, Marc, Crownlands, L' Abbaye, Ravine Poisson and Floissac.

In these communities it is reported that the churches (i.e. Catholic, Seventh Day Adventist, Baptiste, Pentecostal and Jehovah's Witness) play an important and influential role in the lives of community members and in community development. It is therefore suggested that any community development effort must be approached through these religious organisations.

It is also reported that there is a marked absence of community spirit as the community is divided along religious lines. This division has in the past posed a challenge to mobilising community members as a single unit or to getting a representative group together at one location.

In the smaller communities of Crownlands, Floissac and Marc formal community organisations/groups are almost non-existent. There is a heavy dependence on Bexon for everyday activities related to religion, education, health, sport and culture.

###### *BEXON (CENTRAL), COMMUNITY ORGANIZATIONS/GROUPS*

1. Bexon Development Committee (Vice president: Sydney John (John John) Phone No.: 451-2153 (home), 452-2871/2/1583 (work), 453-1602 (work)
2. Disaster Preparedness Committee (affiliation to 1 above)

3. Mother's and Father's Group (Contact: Ms Stephen, Phone No.: 451-0080 (home) or Maryana Sexius, Phone No.: 451-2312 (home)
4. Sports Club (Contact: Jean)
5. Drug Free Club (Contact: Jemma Stephens)
6. Path Finders Club - SDA affiliation (Contact: Sydney John (John John) Tel: 451-2153 (home)
7. Catholic Youth groups / Choir (Contact: Clementia Eugene Tel: 452-4880 (work)452-2503 (home)
8. Literary Group (Contact: Anselma Montrope,-Classes held on Monday, Tuesday and Thursday)

#### *CHURCHES*

1. Seventh Day Adventist, (Contact: Pastor Jariah), 2. Baptiste (Contact: Ernest Clifford)
3. Catholic (Contact: Fr Jerry Beniere), 4. Pentecostal, 5. Jehovah's Witness

#### *SCHOOLS*

1. Bexon Primary School (Principal: Marily Bayne)
2. Bexon Infant School (Principal: Morrison Blanchard, Phone No.: 451-2212 - work)

*BEST DAYS FOR COMMUNITY MEETINGS ETC* - Monday, Tuesday and Sunday afternoon and evening

*POSSIBLE VENUE FOR COMMUNITY ACTIVITY* - Bexon Infant School

#### **ii) ODSAN**

##### *SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

Odsan Branch (Augustus Andrew, Chairman Tel 451-0453, Leonard Esnard, Secretary, Tel 453-0721) Returns two delegates to the Annual Conference of Delegates

#### *COMMUNITY ORGANIZATION/GROUPS*

1. Odsan Development Committee (Contact: Moses Charles)
2. Odsan Mother's Group (Contact: Una Charles, Phone No.: 452-7519 - home or Pamela Mathurin, Phone No.: 451-0440)
3. Netball Team (Contact: Rosemary Clement)
4. Kenton Music/Cultural Group (Contact: Mr Kenton, Phone No.: 453-0843/451-2379)

#### *CHURCHES*

1. Seventh Day Adventist, 2. Pentecostal (Contact: Pastor Emilaire), 3. Catholic.

#### *SCHOOLS*

Odsan Combined School (Principal: Catherine Albert, Phone No.: 453-0721)

*BEST MEANS OF DISSEMINATING INFORMATION* - Through church and school

*POSSIBLE VENUE FOR COMMUNITY MEETINGS* - Odsan Community Centre - Suggested days and times for community meetings - Sunday and Thursday evenings, or Monday and Tuesday

*OTHER INFORMATION* - Adult literacy classes held on Monday, Tuesday and Thursday evenings.

**iii) MARC**

*COMMUNITY ORGANIZATION/GROUPS*

Mother's and Father's Group (Contact: Veronica Duplesis, Phone No.: 451-0391 - home)

*CONTACT PERSONS IN THE COMMUNITY*

1. Albert (Youth Worker), 2. Ms Raymond (c/o Forestry Division Union), 3. Mr Danny Brown

**iv) CROWNLANDS**

*SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

A single Crownlands / Marc Branch represents the two communities (Chairman, Patrick Brown, Secretary Stephen Lesforis, or Andrew Duplesis, Phone No.:451-0174 (home). Returns five delegates to the Annual Conference of Delegates

*COMMUNITY ORGANIZATIONS/GROUPS*

Mother's and Father's Group (Contacts: 1. Edison Charles, 2. Louisa Aubry (alias sister) Phone No.: 451-0837, 3. Rosaline, c/o Clementia Eugene, Ministry of Community Development, Youth, Sports and Social Services

*POTENTIAL COMMUNITY MOBILIZER*

Mr Aiden Pemberton (lives near new Bexon school)

*BEST MEDIUM FOR THE DISSEMINATION OF INFORMATION* - 1. Public address system, 2. Leaders, 3. Bexon church/school

*POSSIBLE VENUE* - Christopher Edward's Hall (located at the gap of Bexon and Crownlands)

*BEST DAY AND TIME FOR COMMUNITY MEETINGS* - Sundays 4:00 p.m.- preferably early December or January.

**v) L' ABBAYE/RAVINE POISSON**

The communities of L'Abbaye and Ravine Poisson are officially regarded as two separate entities. The two communities are however integrated socially and economically. The dominant religion in the area is the Seventh Day Adventist to which most community groups are affiliated.

*SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

Ravine Poisson Branch (Albert Weeks, Chairman. Maria Robert, Secretary) Returns one delegate to the Annual Conference of Delegates

## *COMMUNITY GROUP/ORGANIZATIONS*

1. L' Abbaye Primary School (Principal: Mrs Vera Hunte Phone No.: 451-0528 (work) 451-4331 -home, Parent Teacher's Association, Chair Casina Emmanuel, Phone No.: 452-6058)
2. L' Abbaye SDA Church (Elder: Mr Benjamin Emmanuel, Phone No.: 452-6055 Treasurer: Joseph Cadette, Phone No.: 453-7129)
3. Path Finder's Club - SDA (Leader: Maximen Rene, Phone No.: 452-0201)
4. Community Service (Leader: Miss Lucille John, c/o Bexon Supermarket)

*BEST MEDIUM FOR DISSEMINATION OF INFORMATION* - Through Schools, Churches, Group Leaders, Via the Radio.

*POSSIBLE LOCATIONS FOR COMMUNITY MEETINGS* - The Seventh Day Adventist Church

*BEST DAY AND TIME FOR COMMUNITY MEETINGS* - Sunday - 3:00 p.m.

### **vi) CICERON**

There appears to be little concern for environmental matters related to watershed management in Ciceron. Unlike many other communities in the pilot area there were no serious effects on the social or economic lives of community members as a result of the events related to the mismanagement of watershed areas.

Several community groups exist and are functioning but the members interest mainly relates to sports and culture. Some division exist in the community between residents who originate from Ciceron and those who were relocated from Conway (in Castries). There is also reported to be some division created by partisan politics.

The existing churches play no real role in community development. At present the most vibrant and influential organisation in the community are the Ciceron Seagulls United Sports and Cultural Club and the Ciceron Mother's and Father's Group. These groups do not, however, represent or unite a wide cross section of community members.

## *COMMUNITY GROUPS/ORGANIZATION*

1. Ciceron Seagulls United Sports and Cultural Club (President: Dr George Joseph, Vice President: Felix Nathan Phone No.: 452-3676 - work)
2. Ciceron Development Committee (not currently functioning. Deals, inter alia with matters related to disaster preparedness, President: Felix Nathan)
3. Ciceron United Mother's and Father's Group ( Contact person: Josiah Regis)
4. Ciceron Mother's and Father's Group (Contacts: Mrs Victoria Reid, Miss Monica Joseph)
5. Ciceron Methodist Women's Group (Contact person: Angela Hippolyte - Group involved in community projects)
6. Ciceron Avengers (Netball group)
7. Ciceron Lawn Tennis Group ( Contact: Mr Felix Nathan)
8. Ciceron Credit Union (Contact Person: Mrs Victoria Reid, Phone No.: 453-7299 - home)

## *POTENTIAL COMMUNITY MOBILIZERS*

1. Mr Felix Nathan (Teacher Ciceron Combined School, Chairman Ciceron Development Committee, Vice President Ciceron Seagulls United Sports and Cultural Club, Chairman Ciceron Lawn Tennis (group))

2. Nurse Niles (Resident Nurse, Ciceron Health Center, Phone No: 453-7934 - work)
3. Mrs Victoria Reid (Involved in Mother's and Father's Group and Credit Union - Tel: 453-7299)

#### *CHURCHES*

1. Methodist Church, 2. Baptiste Church, 3. Pentecostal Church (Contact person: Pastor Claude) 4. Gospel Hall

#### *SCHOOLS*

1. Ciceron Combined School (Principal: Miss Rosalene Philogene, Phone No.: 452-3676)
2. Also two Pre-schools and a Day care centre

*BEST MEDIUMS FOR DISSEMINATING INFORMATION* - Through the church, - On community notice board at the Community Centre or by writing to individual groups

*POSSIBLE VENUES FOR COMMUNITY ACTIVITY* 1. Ciceron Combined School, 2. Ciceron Community Centre, 3. Ciceron Society Hall

*SUGGESTED TIMES FOR COMMUNITY MEETINGS ETC* - Weekend days or the evenings on weekdays.

#### **vii) TI COLON AND BARRE ST JOSEPH**

There are no organised community groups in Ti Colon. Community members generally are involved in activities of Barre St Joseph and Cul-de-Sac.

#### *POTENTIAL COMMUNITY MOBILIZER OR CONTACT PERSONS:*

1. Bernadette Sony ( Pre School Teacher, c/o Barre St Joseph Pre School - Involved in Mother's and Father's Group, Active community member)
2. Peter Emmanuel - resides at Ti Colon (President Chopper's United Sports Club, Cul-de-Sac Phone No.: 451-5570 (home))
3. Black Squad Sports Club - not an active group. (Contact Gregory Williams - lives at Barre St Joseph, c/o Radio Shark Castries, or Francis Paul, Last Vice President. Tel : 451-5045 (home).)
4. Miss Judith Sony (Miss Shabine), Key figure in the community - President Mother's and Father's Group

#### **viii) LA CROIX MAINGOT**

Discussion at La Croix Maingot were held with a joint group of individuals who were identified as key persons in the community, but who at present have no active representation in community organisations. They can however help to forge links with other community members and to provide information about the community. These individuals are:

1. Joseph Avril - Resides in the community. (Teacher at Anse-La-Rayé, also involved in the ENCORE Anse-La-Rayé Agricultural project)
2. Mr Peter Eristhee (Teacher La Croix Maingot Combined School)
3. Mr Lucius Prescott (Teacher La Croix Maingot Combined School)

The general feeling of those interviewed was that any programme which would educate or sensitise community members about watershed management / soil conservation and related issues particularly as it relates to agriculture and land use for building construction would be welcomed and appropriate given the area's susceptibility to landslips and the tendency for people to construct their homes on steep hill slopes.

#### *SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

La Croix Maingot Branch (Andrew Brown, Chairman, Audrey Frederick, Secretary) Returns two delegates to the Annual Conference of Delegates

#### *COMMUNITY GROUPS/ORGANIZATIONS*

1. Catholic Prayer Group (Contact person: Veronica Raymond, resided near La Croix Maingot Health Centre)
2. Youth Group (Contact person: Christine Joseph - regarded as key figure in the community c/o Helen's Mini Mart, La Croix Maingot, Phone No.: 451-4172 - work/home)
3. Diabetic Group c/o La Croix Maingot Health Centre.
4. La Croix Maingot Combined School (PTA President: Julian Alphonse, c/o Mrs Agath Alphonse, La Croix Maingot Combined School)

#### *CHURCHES*

La Croix Maingot SDA Church (Elder: Franklin Bray) Tel: 451-5808 (home), 453-0652 (work).

#### *SCHOOL*

La Croix Maingot Combined School (Teacher in charge: Thelma Ferdinand, Tel: 451-4148)

*BEST MEDIUMS FOR DISSEMINATION INFORMATION* - through Schools, Churches and Health Centers, via a mobile public address system or by radio and television

*POSSIBLE VENUE FOR COMMUNITY ACTIVITIES* - The old School at La Croix Maingot

*BEST DAYS/TIMES FOR COMMUNITY MEETINGS* - Evenings of Sunday, Monday and Tuesday

#### **ix) BARRE DUCHAUSEE**

##### *EXISTING COMMUNITY GROUPS*

1. CDC Mother's and Father's Group, (Contact: Hendrickson Joseph, c/o Wyndham Hotel)
2. Dynamic Youth ( Contact Dona Charlemagne, Student St Joseph's Convent)

#### **x) CUL-DE-SAC AND SOUCIS**

Cul-de-Sac and Soucis are officially regarded as separate communities, within the area however the residents use the two names interchangeably. The residents are united by common cultural, sporting and other community interests

## *COMMUNITY GROUPS MOTHER'S AND FATHER'S GROUP*

1. Cul-de-Sac Mother's and Father's Group (Contact: Julianita Pierre, c/o La Clery Health Centre Resides at Soucis, Phone No.: 453-0695 - home, 452-4303 - work)
2. Dragon 17 (President Victor Bonnette (Zex) Key community figure and community mobiliser, Phone No.: 453-0695 - home)
3. Chopper's United (Contact: Peter Emmanuel c/o Government Printery)
4. Diabetic Group (Contact: Veronica Sylvester)

## *SCHOOL*

George Charles Secondary School, Cul-de-Sac (Principal: Mr Bonaventure Jn Baptiste  
Phone No.453-0252/452-7231

*POSSIBLE VENUE FOR COMMUNITY MEETING ETC* - Cul-de-Sac Recreation Centre

## **xi) BARRE DENIS**

### *COMMUNITY GROUP/ORGANIZATIONS*

1. Le Jeunes de Barre Denis (Contact: Theodora Henry, c/o Central Library, Castries  
Phone No.: 452-2875/7053 (work)
2. Active Sports Club (Magella Prospere PRO, c/o North American Assembly Factory Odsan)
3. Barre Denis United Mother's and Father's Group (Leader: Julietta Marius, Tel: 451-5197  
- home, Member: Marcia Edmund Phone No.: 451-5134 -home)
4. Catholic Prayer Group and Choir, Catholic Chapel, Barre Denis (Contact: Audrey Prescott  
- prayer group, Fr. Lambert St Rose (priest)

## **xii) GUESNEAU**

### *COMMUNITY GROUPS/ORGANIZATIONS*

1. Guesneau Evangelical Church (Contacts: Mr Joe Valcent, Miss Carol Valcent, Forestiere  
School, Phone No.: 452-2233 (work)

### *POTENTIAL CONTACT PERSONS*

1. Miss Euginia Greg (Co-ordinator - Day Care Centre, Ti Rocher, Phone No.: 451-9308)
2. Ti Rocher Combined School (Principal: Mrs Judy Johannes, Phone No.: 452-1587)

## **xiii) FORESTIERE**

### *SAINT LUCIA BANANA GROWERS ASSOCIATION (SLBGA)*

Forestiere Branch (Denis Jawahir, Chairman, Mr Canicius Mark, Field Officer, Phone No.:  
450-5993 - home, 452-2551 - work) Returns two delegates to the Annual Conference of  
Delegates

### *COMMUNITY GROUPS/ORGANIZATIONS*

1. Path Finder's Club (Leader: Mrs Julietta Biroo, Phone No.: 451-8968)
2. Adult Literary Group (Facilitator: Mrs Marie Malaykhan, Phone No.: 451-8635)

## *SCHOOL*

Forestiére Methodist Primary School (Principal: Mr Iram Isaac, Phone No.: 452-2233 (school), 452-1117 (home))

## *CHURCHES*

1. Roman Catholic Church, (Celebrant - Parish Priest -Marchand Phone No. - 452-3724 Church Leader - Mrs Marie Malaykha). 2. Methodist Church (Steward: Rufus Khodra, Phone No.: 451-6129 - home, 453-2367 -work). 3. Seventh Day Adventist Church (Elder: John Barley Phone No.: 450-5739). 4. Community Service - SDA Church Group (Contact Mrs Lucia Auguste). 5. Gospel Hall (Pastor: Webster Gajadhar Phone No.: 453-0300)

## *POTENTIAL COMMUNITY MOBILIZERS*

1. Mrs Marie Malaykhan - Phone No.: 451-8635
2. Mr Rufus Khodra (Principal Assistant Secretary, Ministry of Education, Culture and Labour)
3. Mr and Mrs Anthony Khodra - Phone No.: 453-0445
4. Guy Joseph - Phone No.: 451-8820

*BEST MEDIUM FOR DISSEMINATION OF INFORMATION* - School, Churches, Public Address Speaking System, Influential Persons - Mr Anthony Khodra and Mrs Marie Malaykhan.

*POSSIBLE VENUE FOR COMMUNITY ACTIVITIES* - The school

*SUGGESTED TIME FOR COMMUNITY MEETINGS* - Sunday - 4:00 p.m.

## **xiv) TROIS PITONS, DU BROSSAY, DEGLOS**

These communities are very interrelated in various social and economic activities. Trois Pitons appears to be the centre of the three in terms of activities. These communities depend on Ti Rocher, Bexon, Odsan for educational, health, religious (R.C.) and sporting facilities. Deglos is almost a completely farm area, with few residents.

## *COMMUNITY GROUPS/ORGANIZATIONS*

Mother's and Father's Group (Leader: Miss Christella Remy, Mr Jerry Jn Baptiste and Mr Clement)

## *CHURCHES*

1. Church of God (Minister: Mr Remy Joseph, Phone No.: 452-4647). 2. Seventh Day Adventist (Leader: Mrs Dina Felix, c/o Day Care Centre, Ti Rocher, Phone No.: 451-9308)

## *POTENTIAL COMMUNITY MOBILIZERS*

1. Cecil Alexander and Philippa Alexander, Phone No.: 452-5716
2. Miss Rosalie Daniel, Phone No.: 451-6120 (home) 452-5479 (work)
3. Mr Jules St Jules - Phone No.: 451-0560
4. Maggie - Phone No.: 451-0504

*BEST MEDIUM FOR DISSEMINATION OF INFORMATION* - Through Public address system and Leaders / Influential Persons

*POSSIBLE VENUES FOR COMMUNITY MEETINGS* - Odsan Boxing Plant

*SUGGESTED DAY AND TIME FOR COMMUNITY MEETINGS* - Mondays - 5:00 p.m.

#### **xv) MORNE FORTUNE AND GOODLANDS**

Morne Fortune and Goodlands are suburban areas which mainly fulfil a residential function. There is no real sense of community as exists in other areas. Most residents utilise the services and facilities available in the neighbouring communities. Residents appear to be socially divided and there is no one organisation or group which is representative of a wide cross section of the residents.

#### **GOODLANDS, CONTACT PERSONS**

1. Mr Leonard Leonce - Phone No.: 453-1766, (leader of an informal group concerned with the upkeep of the Upper Goodlands area. The concern of this group is mainly for the maintenance of infrastructure such as roads.
2. La Rose Group (Contact: Lisa, Phone No.: 452-4197)
3. Mr Abel C Ghirawoo - Phone No.: 453-2676
4. Mrs Catherine Albert (Principal Odsan School Phone No.: 453-0721 -work)
5. Mr E Eudovic - Eudovic Art Studio, Phone No.: 452-2747
6. Mr Timothy Charles - Phone No.: 452-7519

#### **MORNE FORTUNE COMMUNITY ORGANIZATIONS/GROUPS**

1. Emmeralds Sports Club (Contact: J Mitchel, c/o Central Library)
2. Morne Fortune Planning Committee, c/o St Lucia National Trust (Contact: Charmaine Nathaniel, Phone No.: 452-5005 - work)
3. Catholic Religious Groups(eg. Youth, Choir, Brownies, Cub Scouts etc.,)  
c/o St Benedict's Center Contact: Fr Clarence Watrin.

# **Annex 12**

## **Project Memorandum and Terms of Reference**

**ST LUCIA**

**Project Memorandum**

**TECHNICAL ASSISTANCE TO THE WATERSHED AND  
ENVIRONMENTAL MANAGEMENT PROJECT**

**British Development Division  
April 1996  
Final Version**

## **1. SUMMARY AND RECOMMENDATION**

1.1 The project aims to assist the Government of St Lucia in establishing the basis for integrated watershed management. This will reduce pressure on the environment from both natural disasters and human impact and will contribute significantly to the long term sustainable development of St Lucia.

1.2 The project will provide 29 months of short term consultancy: 7 months for a Team Leader and 22 months for a range of specialist inputs covering water/land resources, river engineering, hydrology/meteorology, agriculture and land use, geomorphology, sociology, economics, environment, and management.

1.3 The Government of St Lucia will provide counterpart staff, and will be responsible for the implementation of the Project Team's recommendations with respect to management plans, and institutional and legislative reform.

1.4 It is recommended that the project be approved and that funds up to £344,000 be made available from the St Lucia Technical Cooperation programme.

1.5 The Project Officer will be the BDDC Environment and Marine Resources Adviser.

## **2. FRAMEWORK**

2.1 The Project Framework and Header Sheet are attached below.

## **3. PROJECT RATIONALE**

### **3.1 Background**

3.1.1 In September 1994 Tropical Storm Debbie (TSD) hit St Lucia depositing from 250 - 500mm of rain in the interior in a few hours. The rain fell on already saturated soils and the resultant flooding caused substantial damage to island infrastructure, agriculture and environment. The inevitable consequences of flooding were compounded by poor drainage systems, inadequate river management and poor agricultural practices on marginal lands.

3.1.2 Four people died, and many were injured or displaced from their homes. Banana production was decimated and landslides and coastal sedimentation caused significant environmental damage.

3.1.3 The Government of St Lucia (GoSL) sought assistance from the World Bank to prepare a reconstruction programme and to recommend action towards sustainable long term watershed management. The British Development Division (BDDC) funded the resultant consultancy which was executed by the World Bank.

3.1.4 The World Bank provided immediate emergency assistance to GoSL for priority engineering works and activities to rehabilitate the damage from TSD, and medium term action to redesign hydraulic infrastructure to minimise damage from future storms (Phase 1). BDDC contributed to the costs of the emergency works by funding the supervising engineer.

3.1.5 The World Bank also recommended a second, longer term, approach to mitigation (Phase 2) which was essentially the preparation of an integrated watershed management plan which would, when implemented, reduce risk from natural disasters and control adverse human impact on sensitive areas.

3.1.6 The World Bank Phase 2 management plan was subsequently scrutinised in detail and refined by both BDDC and the GoSL. In response to a request from GoSL (who have been in consultation with the World Bank) BDDC agreed to consider funding the finalised plan, as described in this memorandum, by grant Technical Assistance.

## 3.2 Policies

3.2.1 The Country Strategy paper (January 1996) for the Eastern Caribbean focuses on the preservation of the environment, and specifically highlights integrated coastal management and watershed management as the main areas where assistance is needed. The CSP further identifies watershed management as a focus for BDDC in St Lucia.

3.2.2 The proposed project will also contribute to ODA's policy of enhancing the effectiveness of multilateral institutions (World Bank) by collaborative working, and taking forward the groundwork of the the World Bank-funded Phase I.

3.2.3 The GoSL has already set up an Environmental Unit in the Ministry of Planning, Development and the Environment (MPDE), has invested significantly in coastal zone management and is soon to establish a Coastal Zone Management Unit in MPDE. GoSL has also signed a World Bank loan agreement to implement both phases of the Watershed and Environmental Management Project (although the Phase 2 funding will not be required for technical assistance given that BDDC funds are available), demonstrating its commitment to the policy of sustainable development. The World Bank funds will be used for related purposes with respect to additional work on Phase 1 issues.

## 3.3 Project Approach

3.3.1 The project comprises Technical Assistance for consultancy and will provide up to 29 months of specialist input:

- |   |                                    |          |
|---|------------------------------------|----------|
| - | team leader                        | 7 months |
| - | supervising engineer from Phase 1  | 0.5      |
| - | river engineer/hydromet specialist | 4        |

-	land use specialist	3
-	socio economist	4
-	geotechnical engineer	3
-	environmental specialist	2.5
-	institutional/legislation	3
-	other expertise to be determined	2

Detailed Terms of reference for each specialist are at Annexe 4. The supervising engineer from Phase 1 will join the Team leader for two weeks at project inception to ensure continuity and to expedite field briefing.

3.3.2 In view of the strong field emphasis of the work the project will also provide funds for transport and field expenses incurred by the consultancy team.

3.3.3 The project approach will involve four core elements:

- collation of existing data on watershed management programmes in St Lucia, identification of problems experienced and solutions applied and their relative degrees of success ✓
- identification and field testing of solutions to unsolved problems (eg flood hazard planning, landslide/slope stabilisation, sustainable land use, river stabilisation, social impact, conservation of biodiversity and environment), disaster preparedness and management. ✓
- review of existing institutional infrastructure and legislation for integrated watershed management; participatory design of an improved institutional structure, identifying necessary human resource development; recommendation of legislative reform to enhance effectiveness and efficiency, including powers and means of enforcement. ✓
- on the basis of the above, design and implementation of pilot watershed management plans for two selected sites; design of a strategy for extrapolating pilot site results to the whole island system on a watershed basis. ~~~~~

3.3.4 Economic aspects: The flood damage to St Lucia came at a difficult time. Formerly reasonable annual sustainable growth has slowed to less than 3% during the 1990s, largely due to changes in the external environment. Increased competition from the Latin American banana industry is eroding preferential market arrangements in Western Europe and concessional aid flows have declined at the same time.

3.3.5 Agriculture contributed 20% of GDP in 1994 and employed almost a quarter of the labour force in 1991. Loss of income from agricultural production was

identified as the main economic impact of TSD, with GoSL loss estimates of EC\$ 134.9 million equivalent to 12.2% of 1993 GDP.

3.3.6 Losses to physical infrastructure (water supplies, roads and bridges) were estimated to be EC\$ 74.2 (6.7% of GDP).

3.3.7 Action to promote sustainable land use and to reduce the impact of heavy rainfall on infrastructure and agriculture will clearly reduce the negative economic and financial impact of the storms to which St Lucia is routinely exposed. In addition, the tourism industry on which St Lucia is becoming increasingly reliant, depends significantly on the quality of the environment. Implementation of integrated watershed management plans will protect and develop the resources which attract tourism.

3.3.8 Environmental aspects: St Lucia retains a rich and diverse natural heritage. From the coast to the mountain tops habitats vary from coral reef to mangrove to semi-arid scrub, dry woodland, moist forest, and rain forest. Up to five local or regionally endemic species of bird survive along with several regionally endemic reptiles. These assets are the resource base on which the tourist industry will be developed.

3.3.9 The St Lucia National Environmental Action Plan (1994 Draft) identified the major environmental concerns facing the island:

- poor solid and liquid waste management
- coastal zone degradation
- inadequate protection of forests and water catchments
- land use conflicts, deforestation and habitat loss

All of these are intrinsically linked, in one way or another, to the poor institutional structure/framework.

3.3.10 The proposed project will have a directly beneficial effect with respect to the last three of these issues (BDDC is also assisting GoSL with a solid waste management project).

3.3.11 Agriculture dominates land use in St Lucia, occupying about 55% of the land surface (1989). Forest clearance for agriculture has proceeded rapidly with almost 20% of the land area being converted to agriculture between 1977 and 1989. This has included marginal land and steep slopes.

3.3.12 Unmanaged clearance of forest, poor land use practice, inadequate river management and poor drainage systems have major negative impacts on both terrestrial and coastal environment. These impacts cannot be assessed or controlled at a single point in the system, and a holistic approach is required. This must identify the various point sources of degradation/risk, follow their pathway of influence throughout the watershed from mountain top to coastal shelf, and design integrated management strategies to prevent and mitigate. This is the rationale of the proposed project.

3.3.13 Social issues: TSD caused the death of four people, injured around 24 people, made 37 people homeless and displaced a further 500 people. Some 150 people had to be relocated to reduce vulnerability to future disasters. The cost of these events was estimated by GoSL at EC\$ 10 million. Reduction of the impact of tropical storms through effective watershed management will bring a direct benefit in terms of human safety and well being.

3.3.14 A 1991 census indicated that agriculture occupied around one quarter of the workforce although many farmers are subsistence producers who often have other sources of income. Sustainable watershed management will bring clear benefit to those producers in the medium term through reduction of losses due to natural disasters. Such management actions may, however, bring short term disbenefit to farmers through removing their access to marginal lands, and systems for compensation will need to be developed and implemented.

3.3.15 Where relocation of communities or families is a requirement for sustainable management there may be wide ranging social impacts. Some of these impacts are likely to be gender specific and the project socio-economic specialist will study and make explicit the expected costs and benefits for women (eg access to community services and changes in livelihood). It is expected that this will be addressed through collaboration between the consultants, the Social Planning Unit of the Ministry of Planning, Development and Environment, the Ministry of Legal and Womens' Affairs and the Ministry of Community Development. ?

3.3.16 The GoSL is already addressing social issues exposed by TSD and the project will pay specific attention to the social and financial implications of watershed management planning and will adopt, wherever possible, a participatory approach to the design process. ✓

3.3.17 Institutional issues: The resource management function in GoSL is not specifically designed to address multidisciplinary issues, and there is some overlap of function with consequent dispersal of responsibility for administering and enforcing management programmes and necessary legislation. Whilst there is a range of relevant legal instruments these are not specifically designed to support an integrated management approach.

3.3.18 Lack of inter-institutional coordination is likely to lead to fragmentation of some key government functions such as development control and resource protection. The World Bank consultancy pointed out that at present forests, banana crops, water supply, fisheries and communities within a watershed are all managed by different authorities working in relative isolation.

3.3.19 Recognising that the institutional issue is central to sustainable management, the project will undertake a review of the current institutional, legislative, regulatory and administrative environment and will recommend appropriate changes and enhancements to support the sustainable implementation of watershed management plans for St Lucia.

### 3.4 Evaluation

3.4.1 Evaluating the success of the project with respect to the preparation of watershed management plans incorporating solutions to specific problems identified by GoSL, will be relatively straightforward. Outputs will be reviewed by BDDC staff at end of project and will incorporate, as far as possible, the views of key stakeholder groups.

3.4.2 Evaluation of success on the ground will be far more difficult. The timescale of the project will preclude all but the most preliminary assessment of the impact of proposed solutions and strategies within the pilot watershed management areas. It will not be possible at project end to evaluate the likely success of the planned expansion of the pilot management plans to the rest of St Lucia. This will be the responsibility of the GoSL in collaboration with key stakeholders, taking up opportunities for participatory monitoring where appropriate.

3.4.3 Under these circumstances, BDDC should evaluate the application of the project's outputs to their impact on watershed and environmental management in 1998.

## 4. IMPLEMENTATION

### 4.1 Management arrangements

4.1.1 The Ministry of Planning Development and Environment will designate counterpart staff for the external consultants and will, through these officers, facilitate wide ranging inputs to the planning process. This will involve the inputs of key government stakeholders including the Departments responsible for planning, agriculture, fisheries, forestry, coastal zone management and water resources. The Environment and CZM Units will have a key role.

4.1.2 Non-government stakeholders will be involved in the planning process through the consultancy team field work, particularly the work of the socio-economist in collaboration with the Social Planning Unit of the MPDE.

4.1.3 The St Lucia Project Manager will be the Chief Agricultural Engineer (Ministry of Agriculture). The Project Manager will liaise with an Inter-Ministerial Steering Committee formed by GoSL to advise the project.

4.1.4 The consultancy Team Leader will be responsible for coordination of all specialist inputs and for liaison with GoSL through the Project Manager. The Team Leader and his team will have access to the component members of the Inter-Ministerial Steering Committee for inputs on technical and policy issues. Detailed TORs for the consultants are attached as **Annex 4**.

4.1.5 The ODA Project Officer will be the BDDC Environment and Marine Resources Adviser, supported by the Economic, Institutional Development, Forestry, Social Development and Senior Natural Resources Advisers and the Programme Officer.

4.1.6 Subject to the views of the GoSL, the operation of the completed project will be the responsibility of whichever body the project identifies as most appropriate to that task. However, the Ministry of Planning, Development and Environment will retain an overall responsibility for coordination.

## 4.2 Timing

4.2.1 Bar charts of Activities and Consultants' Inputs are at **Annexes 1 and 2** respectively: a Work Breakdown Structure is at **Annexe 3**.

4.2.2 It is envisaged that the project will take place over a 12 month period to facilitate evaluation of both new (Phase 2) and existing Phase 1 field trials (for example slope stabilisation and river training) and to permit assessment of the effectiveness of measures recommended in the pilot plans before inclusion in a National Watershed Management Plan.

4.2.3 Target date for project inception is 1 July 1996. The Team Leader will be in place for four months from that time and will coordinate and manage the inputs from the other specialists within that period. The Team Leader will return to St Lucia for a further three months, five months after completion of the first phase of the work. The team leader will be able to draw on a further 2 months of specialist support (currently unallocated to any specialism) at that time. During this period assessments of actions and trials will be made and recommendations for inclusion in the National Plan will be drawn up.

## 4.3 Inputs

4.3.1 Cost estimates are as follows:

	1996/97	1997/98
(a) Short and medium term consultancies	£136,000	£96,000
(b) Travel and subsistence	51,000	36,000
(c) Field transport and support costs up to	25,000	
<b>Total</b>		<b>£344,000</b>

4.3.2 Some support costs (item c above) will be available for immediate, small purchases of specialised equipment and for local field expenses. The level and details of disbursement of this expenditure will be agreed in advance between BDDC and the GoSL.

4.3.3 The consulting company recruited will be expected to provide tools of the trade and facilities such as portable computers and printers.

4.3.4 GoSL will be expected to provide office space and basic office equipment, and also additional transport when necessary.

#### **4.4 Contracting and Procurement**

4.4.1 The consultancy will be awarded through a competitive tendering exercise.

#### **4.5 Accounting**

4.5.1 The consultancy firm will be paid directly by ODA on receipt of invoices. All local support cost purchases will be presented by the consultants for payment supported by receipts.

#### **4.6 Monitoring**

4.6.1 Monitoring will be undertaken by the Project Officer, supported by the Project Team as required, by way of visits at months 2, 6 and 9 of the project schedule.

#### **4.7 Reporting**

4.7.1 The consultants will report as specified in their Terms of Reference. The Team Leader will be responsible for the collation of the consultants' reports, and will provide a draft Pilot Watershed Management Plan at the end of month four of the project. The Team Leader will produce a final Pilot Management Plan on completion of the project, and will also provide a final report incorporating the key results of each consultancy input and a strategy for expanding the Pilot Plan to the entire Island System.

### **5. RISKS**

5.1 The GoSL is not currently organised to address an integrated approach to integrated watershed management. There is a risk that the necessary inter-institutional coordination (and implicit goodwill) will not be achieved.

5.2 The greatest risk, related to 5.1 above, is that the project will produce a pilot management plan with tested components, but that this will remain on the shelf rather than be implemented in practice. Difficulties with respect to social impact, legislative requirements and enforcement capacity could lead to this outcome.

# Project Logical Framework WSHED

Narrative Summary (NS)	Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions
<b>Goal:</b>			
1 Long term sustainable development of St Lucia	1.1	1.1	1
<b>Purpose:</b>			
1 Natural resources of St Lucia optimally and sustainably exploited with minimum risk of damage from natural disasters	1.1 Damage to infrastructure, agriculture and human lives from future tropical storms measurably reduced 1.2 Productive capacity sustainably enhanced	1.1 GoSL, press and other agency reports on the impact of tropical storms 1.2 GoSL Agricultural production and tourist revenue statistics	1 GoSL is willing and able to commit the necessary human and financial resources to implementation of the plans designed in the study
<b>Outputs:</b>			
1 A management plan for two pilot watersheds completed and tested	1.1 Comprehensive management plan lodged with MPDE and other stakeholders by month 11.5 of project	1.1 Consultants reports and BDDC monitoring	1 Solutions acceptable to all key stakeholders are found for technical, sociological, legal and institutional constraints
2 Appropriate institutional and regulatory basis for effective, integrated watershed management identified	2.1 Model institutional structure and supporting legislative framework presented to MPDE by month 3 of project	2.1 As 1.1	
3 A strategy for extension of the pilot management plan to the whole of St Lucia designed	3.1 Practical recommendations for implementation of watershed pilot plan principles island wide with MPDE by month 12	3.1 As 1.1	
<b>Activities:</b>			
1.1 Collate existing information on watershed management problems in St Lucia and evaluate solutions currently available	Short term consultancy £ 232,000 Travel and subsistence 86,600	1.1 Consultants reports	1 Sufficient background data exist; Phase 1 activities have contributed solutions to core problems; timescale is sufficient to permit evaluation of Phase 2 trials; institutions are prepared to collaborate in integrated management; legal requirements for enforcement are constitutionally acceptable; watersheds are sufficiently similar for pilot plans to be applied across the board
1.2 Design and test management options for problems where current solutions are absent or inadequate.	Field costs 25,000 TOTAL £ 343,600	1.2 Consultants reports	
1.3 Review existing legislation for watershed management and make recommendations for priority improvements		1.3 " "	
1.4 Identify two appropriate pilot sites as the subject for a watershed management plan		1.4 " "	
1.5 On the basis of 1.1 and 1.2 and in consultation with local stakeholders, draft a watershed management plan for the two sites		1.5 " "	
2.1 Review existing institutional responsibilities for all components of watershed management		2.1 " "	
2.2 Review existing mechanisms for interaction between government stakeholders and between government and		2.2 " "	

# Project Logical Framework WSHED

Narrative Summary (NS)	Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions
other stakeholders 2. the basis of 2.1 and 2.2 recommend any institutional reform required to ensure sustainability of the management plan		2.3 " "	
3.1 On the basis of 1.5 and 2.3 above produce a strategy for extending the pilot plans to the entire island system, and design an implementation schedule		3.1 " "	

## ST LUCIA WATERSHED MANAGEMENT

## BAR CHART OF ACTIVITIES

TASKS	Jul '96	Aug	Sep	Oct	Nov	Dec	Jan '97	Feb	Mar	Apr	May	Jun '97
Review existing reports and data	-	—										
Field evaluation of existing tests (Phase 1 solutions)		—	—		-							
Initiate field trials for unsolved issues			—	--	--	--	--	--	--	—	—	—
Identify pilot watershed (s)			-									
Draft pilot management plan				—								
Review legislation		—	—									
Review institutional structure		—	—									
Draft revisions to legislation			—								—	
Design Institutional structure model			—								—	
Assess performance of Phase 1 and 2 field trials					—					—	—	
Finalise pilot plan												—
Prepare strategy for extending pilot plan to entire island												-

— Consultancy in field

-- Tests on going under GoSL supervision



Work Breakdown Structure

Output	Activity	Task
<p>A management plan for two pilot watersheds completed and tested</p>	<p>Collate existing information on watershed management problems in St Lucia and evaluate solutions currently available</p> <p>Design and test management options for problems where current solutions are absent or inadequate.</p> <p>Review existing legislation for watershed management and make recommendations for priority improvements</p>	<p>1. Obtain and review existing documents</p> <p>2. Field assessment of river and slope stabilisation activities, land use patterns, social impact, environmental impact, and hazard warning, economic implications FULL TEAM</p> <p>1. Initiate pilot tests where necessary with respect to land use practice, socio-economic risks and vulnerability, slope and river bank stabilisation, hydrological hazard and drainage, marine impact mitigation. RE, SE, LU, GT, EN</p> <p>1. Prepare a digest of the relevant existing legislation, and in consultation with other team members recommend modifications, or new instruments to facilitate implementation of a national watershed</p>

ABBREVIATIONS FOR TEAM MEMBERS

- TL = TEAM LEADER
- LU = LAND USE PLANNER
- SE = SOCIOECONOMIST
- GT = GEOTECHNICAL
- RE = RIVER ENGINEER
- EN = ENVIRONMENTAL
- IT = INSTITUTIONAL/LEGAL

Work Breakdown Structure

Output	Activity	Task
<p>Appropriate institutional and regulatory basis for effective, integrated</p>	<p>Identify two appropriate pilot sites as the subject for a watershed management plan</p> <p>On the basis of 1.1. and 1.2 and in consultation with local stakeholders, draft a watershed management plan for the two sites</p> <p>Review existing institutional responsibilities for all</p>	<p>management plan IT WITH TEAM SUPPORT</p> <p>1. In consultation with the GoSL and local communities, identify two pilot watersheds in which to test and evaluate solutions to watershed management needs. The site must encompass all major social, technical and institutional issues TL, SE</p> <p>1. Review the results of the literature study, field evaluation tests, technical assessments, legislative, institutional and socio-economic studies TL</p> <p>2. In consultation with GoSL and the involved communities draw up a pilot management plan TL plus GoSL</p> <p>1. Define the roles of central and local institutions concerned</p>

Work Breakdown Structure

Output	Activity	Task
<p>watershed management identified</p> <p>A strategy for extension of the pilot management plan to the whole of St Lucia designed</p>	<p>components of watershed management</p> <p>Review existing mechanisms for interaction between government stakeholders and between government and other stakeholders</p> <p>On the basis of 2.1 and 2.2 recommend any institutional reform required to ensure sustainability of the management plan</p> <p>On the basis of 1.5 and 2.3 above produce a strategy for extending the pilot plans to the entire island system, and design an implementation schedule</p>	<p>with environmental management issues IT</p> <p>1. Propose an appropriate revised infrastructure and a programme for its establishment IT</p> <p>1. Review the performance of tests executed under Phase 1 and Phase 2 of the project and the pilot management project and refine pilot plan FULL TEAM minus IT</p> <p>2. Drawing on the literature study and the outcomes of both phases draw up a blueprint for an island-wide watershed management plan. TL</p>

**WATERSHED AND ENVIRONMENTAL MANAGEMENT PROJECT**  
**TERMS OF REFERENCE PHASE 2**

1. **General**

The Consulting Firm will provide a team of suitably qualified professional staff to carry out the activities outlined in the Terms of Reference. The following technical disciplines will be represented in the team:

- water/land resources planning (team leader);
- river engineering;
- hydrology/meteorology;
- agriculture and land use;
- geomorphology;
- sociology;
- economics;
- environment; and
- management

In selecting the team, the Consulting Firm is expected to minimize the number of expert, as far as possible, by proposing multidisciplinary professions, that is, with expertise in more than one of the above fields. The Consulting Firm is encouraged to make maximum use of national, or where appropriate, regional professionals and technical staff. The team members should have appropriate degrees in the relevant disciplines, at least five years post graduate experience, and have extensive experience in the Caribbean as well as extensive knowledge of Caribbean Watershed and Environmental Management issues.

The team members will collaborate and work closely with their counterparts in the relevant government departments and other organisations, and will ensure maximum appropriate transfer of knowledge and technology.

## TEAM LEADER TERMS OF REFERENCE

The appointed Project Team Leader will work closely with the Interministerial Steering Committee and will have the primary responsibility for generally planning the team's work, producing a detailed implementation programme with cost breakdown of project activities, including staff schedules, to ensure the satisfactory achievement of project outputs.

The Team Leader will have a degree in civil engineering, economics, or a relevant planning discipline and have proven experience in leading multidisciplinary teams and in formulating plans, strategies and programmes for the development and management of natural resources. Experience in Watershed/Environmental Management would be desirable particularly land/water management and river flood mitigation.

Experience in St. Lucia, the Caribbean or tropical regions with comparable conditions will be necessary.

The Team Leader must take full responsibility for collaborating with the Government of St. Lucia in order to achieve project objectives and outputs. In this regard, the primary project outputs will be the Pilot Project, the Watershed Management Plan and the Institutional Development Programme.

The Team Leader will report to the Government of St Lucia Project Manager and will liaise with other government departments through the Interministerial Steering Committee. The Team Leader will also be responsible for liaison with BDDC over project implementation.

### Objectives

- a) To design and prepare a medium to long term watershed management plan up to the year 2010.
- b) To make appropriate recommendations for institutional strengthening of the relevant Government departments.

### Scope of Work

- 100 Project Inception
  - 110 Mobilize Project Team
  - 120 Confirm project area selection and carry out socio-economic, agricultural, forestry and environmental survey, including related coastal and near shore zones.

- 130 Review and analyze all existing reports, strategies, plans and legislations concerned with watershed and environmental management in river basins and associated coastal zones.
  - 140 Advise and assist with any Phase I activities which may continue into 1996.
  - 150 Liaise with Phase I River Engineer Advisor (or his GoSL successor) and the supervising engineer on the progress of design and construction works for the effective handover of all relevant data and materials.
- 200 Preparation of the pilot project for incorporation of findings into overall plan
- 210 Select pilot project area based on field reconnaissances and public consultations.
  - 220 Survey of the site(s) selected.
  - 230 Identify structural components of the pilot project e.g. river stabilization, river reserves.
  - 240 Identify non-structural measures e.g. changes in land use, flood proofing, hazard warning system, maintenance, legislation, environmental monitoring.
  - 250 Review measures initiated in Phase I and incorporate into the pilot project.
  - 260 Formulate plan for implementation and management of the pilot project including outline, design and cost estimates, social impact and EIA.
- 300 Preparation of Plan
- 310 Use the findings of the pilot project, inter alia to formulate and design structural components of the plan.
  - 320 Carry out economic, social impact and financial analysis and EIA in further detail.
- 400 Institutional Strengthening
- 410 Review existing policies, procedures and Ministries/Departments involved in Watershed Management for implementation of the Watershed Management Plan.
  - 420 Review legislation and regulations governing watershed management and protection.

- 430 Make recommendations on manpower requirements and training.
- 440 Prepare the institutional arrangements required for watershed management including roles and responsibilities of the various Ministries.

Specific attention should be paid to:

- Water use/disposal
- Land use
- River management
- Waste disposal/treatment
- Urban development of flood plains
- Building regulations in hazard zones
- Disaster preparedness and management
- Forestry conservation
- Public awareness, education and participation.

- 450 Propose modifications/additions to existing legislation and examine powers of enforcement.
- 460 Prepare a programme for establishing the institutional framework for watershed and environmental development and management. To include mechanisms for participatory management and monitoring.

#### Reporting

The Consultant shall submit to GOSL Ministry of Planning, Development and Environment:

1. An inception report within four weeks of engagement.
2. Progress reports by the 12th and 20th week of engagement.
3. A draft final report covering activities and tasks outlined at 200, 300 and 400 after 5 months.
4. The final report incorporating the comments of GOSL within two (2) weeks of receipt of such comments.

#### OBLIGATIONS OF THE GOVERNMENT OF ST. LUCIA

1. Provide access to all relevant data, reports, maps and plans and other information relevant to the project and necessary for the effective conduct of the project.

2. Provide access to all relevant data, reports, maps and plans and other information relevant to the project and necessary for the effective conduct of the project.
3. Assist the Consultant in making contact with relevant Government of St. Lucia officials, non-government agencies, community leaders and others who could contribute to project development/implementation.
4. Facilitate the Consultants with access to locations and sites relevant to the project, and facilitate the undertaking of surveys, investigations and trials.
5. Provide technical and professional counterparts, as appropriate, in the relevant disciplines to assist the Consultant's team members and who, in turn, would benefit from transfer of knowledge and technology.

**AGRICULTURAL/LAND USE SPECIALIST**  
**TERMS OF REFERENCE**

The primary responsibility of the Agriculturalist/Land Use Specialist is to work with Government of St. Lucia and other local experts to assess agricultural and land use planning, practices, policies and related legislative instruments and databases in St. Lucia. This is required to prepare and execute the work plan for the Phase II Watershed and Land Use Management activities, which will lead to recommendations for appropriate agro-ecological zoning - the physical basis for crop diversification. Inter alia, additional responsibilities will be to:

1. Assess agricultural and land use practices and identify the most suitable agricultural land.
2. Review relevant reports, land use planning and legislation, soil resources and land crop suitability.
3. Analyze agro-climate data that would lead to appropriate agro-ecological zoning and land suitability classification.
4. Determine and recommend methods and practices that would minimize further land degradation.
5. Work closely with geotechnical/geomorphology specialist to investigate/test relevant pilot treatments relating to land use, landslide and debris flow hazards and soil erosion in a selected watershed(s) - the success of which will determine its future adoption in the draft Watershed Management Plan.
6. In collaboration with the Institutions/Legislative Specialist, make recommendations on legislative policy and institutional aspects based on investigations, field activities and assessment of institutional needs, to achieve sustainable land and water use and effective environmental management.
7. Assess local institutional knowledge and capability and make recommendations for institutional development and training for human resource development.
8. Determine and evaluate potential impacts, direct or indirect, of Phase I and II works on land use issues.
9. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

## SOCIO-ECONOMIST TERMS OF REFERENCE

1. The primary responsibility of the Social Scientist is to design a work plan for the Phase II studies. The overall objectives are to develop a socio-economic and environmentally sustainable plan to reverse the current balance in upland catchments and facilitate changes in agricultural and water management practices that can lead to increased agricultural productivity utilizing sound environmental terms. During the preparation and implementation of the projects, the social Scientist will give special attention to the affected population and the relevant social actors (stakeholders) that are or should be involved within the decision making process for project design and implementation.
2. Identify local experts to assist in the consultation and participatory process - dissemination of information and organizing of appropriate dialogue mechanisms, with relevant governmental and non-governmental agencies including community groups, etc.
3. Determine and evaluate the social and economic implications of Phase I civil works on the population (affected and benefactors) and incorporate relevant recommendations to promote socio economic justifiable projects for the Draft Watershed Management Plan.
4. Identify and evaluate hazards, risks and social vulnerability of the population with respect to civil works (effected, investigated and proposed) and other land use measures.
5. Prepare a draft resettlement and rehabilitation strategic plan to be discussed with and finally adopted by relevant actors and stakeholders. This should include consideration of medium to long term socio-economic and environmental measures to support sustainable (land and water) management of natural resources. Additionally identify and evaluate the socio-economic and cultural implications from inevitable displacement of the population.
6. Develop appropriate participatory management and monitoring mechanisms which will be required to ensure effective and sound implementation of project sub-components, including the improvement of legislative and institutional instruments/aspects.
7. Formulate recommendations to facilitate (a) local community management of project components and/or (b) early cost recovery of projects/project components.
8. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

**GEOTECHNICAL ENGINEER/GEOMORPHOLOGIST**  
**TERMS OF REFERENCE**

1. Evaluate on-going works on Phase I and replanting of high risk areas by Forestry Department.
2. Develop a work programme ensuring the adoption of successful techniques and measures implemented in Phase I, the use of local knowledge of bio-engineering applications as well as appropriate techniques and measures in the treatment and stabilization of river banks and high risk landslide affected areas (agricultural and non agricultural).
3. Review reports and other related databases on land degradation due primarily to landslides and debris flows.
4. Work closely with land use specialist to develop and establish pilot treatments for riverbank stabilization and cultivated steeplands, which will be evaluated for sustainability and effectiveness for possible incorporation in draft Watershed Management Plan.
5. Collaborate with Land Use Specialist to develop a monitoring and evaluation plan for watershed project pilot treatments.
6. Review existing maps, plans, etc. related to landslide and debris flow hazard zoning.
7. Carry out more detailed field studies and analyses to improve the accuracy of landslide hazard mapping to a scale of 1:10,000 in St. Lucia.
8. Conduct technical analysis to determine possible correlation between rainfall intensity - duration and initiation of landslide/debris flows.
9. Formulate recommendations to help minimize possible damages and losses from landslides and debris flows during natural disasters of the magnitude of Tropical Storm Debbie and recommend more effective and efficient disaster management including appropriate hazard warning systems/mechanisms.
10. Assess local institutional knowledge and capabilities and make recommendations for institutional and human resource development in slope stability.
11. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

**INSTITUTIONS/LEGISLATIVE SPECIALIST**  
**TERMS OF REFERENCE**

1. Confirm Government of St. Lucia's strategy for rationalizing institutional arrangements for land and water resources development and management, particularly water management - qualitative and quantitative.
2. Considering the existing institutional framework, design an appropriate structure and organization or the institution(s) responsible for watershed and environmental management, together with proposed powers and linkages with other agencies and local groups.
3. Define roles, functions and responsibilities of central and local institutions concerned with natural resource and environmental management including:
  - water use/disposal, quality, quantity and distribution;
  - land use, quality and zoning;
  - river management, including reserves and maintenance in riverine and coastal areas;
  - settlements in flood plain and coastal areas, building regulations in hazard zones;
  - disaster preparedness and management;
  - forestry conservation, protection and management;
  - public awareness, education and participation.
4. Propose modifications or additions to existing legislative instruments governing the development and management of natural resources and the environment. In addition examine powers and mechanisms of enforcement, making appropriate recommendations to enhance effectiveness. Particular attention should be given to existing institutional capabilities and related aspects affecting effectiveness of enforcement.
5. Develop a programme for establishing the institutional framework, which should include:-
  - offices and related physical infrastructure and facilities islandwide (equipment, transport etc.)
  - appropriate GIS system for monitoring and evaluating watershed management activities;

- Human Resource Development programmes, including the public awareness and education component;
  - cost estimates (Capital and recurrent for the first five years).
5. Consult with the Environmentalist for the legislative framework for environmental management.
  6. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

**RIVER ENGINEER/HYDROMET SPECIALIST**  
**TERMS OF REFERENCE**

1. Confirm priority rivers and watersheds in consultation with GOSL personnel.
2. Review and evaluate civil works implemented under Phase I and make relevant recommendations to GOSL on the technical improvements/deficiencies that need immediate attention and that can be adopted successfully in other river basins.
3. Prioritize river and drainage engineering works in each prioritized river basin/watershed which may be incorporated in developed project proposals of the draft Watershed and Environmental Management Plan, which will include routine maintenance of rivers and main drainage systems.
4. Undertake hydrological analysis to classify and map hydrologic hazards and risks to produce a flood plain hazard zoning map of St. Lucia.
5. Formulate recommendations for effective disaster management (preparedness, warnings, evaluation, etc.). The hazard mapping should also include areas that are vulnerable to tidal influences/storm surges particularly in low lying coastal settlements.
6. Review and evaluate the existing and proposed national hydrological and meteorological networks and make recommendations to eliminate any existing technical and management inefficiencies.
7. Supervise the installation and operations of new hydrometeorological equipment.
8. Train local technical personnel in the proper management, processing and analysis of hydromet data.
9. In collaboration with the Institutions Specialist develop an appropriate institutional framework for the more efficient management of the island hydraulic infrastructure and the related water resources, both from a qualitative and quantitative standpoint.
10. In collaboration with the Legislative Specialist, review and recommend possible improvements in existing legislative instruments, taking into consideration proposed institutional improvements/adjustments, enforcement mechanisms and the role of local NGOs and community groups etc.
11. Assess local knowledge and capability in related areas (hydrology, river engineering and water resource management) and make recommendations for training of local personnel.
12. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the management plan.

**ENVIRONMENTALIST**  
**TERMS OF REFERENCE**

1. Design the work programme for the terrestrial and near shore marine ecology investigations which will lead to recommendations for sustainable watershed management in Phase II.
2. Design a work programme to review and make recommendations for the legislative framework for environmental management.
3. Develop a plan to reverse the current environmental imbalance in upland catchments and facilitate socially and environmentally sound land, agricultural and water management which will lead to agricultural productivity. Consideration must be given to (apart from erosion within the watershed), indirect and longer term impacts of flooding including loss of productive soil, leaching of residual soil nutrients and water logging of valley bottom lands because of unfilled river beds. In addition, special attention must also be given to mitigating near-shore and in-shore damage to coral reefs and marine habitats.
4. In collaboration with the Legislative Specialist provide a detailed analysis of existing legislation relating to land, water and agricultural management and its implementation. Particular areas of concern are:
  - resettlement programmes which might be required by long term environmental management measures identified;
  - people participation in the planning and project implementation process;
  - restrictions on land use.

The results of this will be used to develop a matrix of options for reform of existing legislation, the new legal instruments and enforcement mechanisms to facilitate achievement of socially and environmentally sound and financially and economically viable, watershed management.

5. Review the civil engineering works programme developed during Phase I to ensure that it complies with EIA impact class B of the World Bank's Operational Directive 4:01 Annex A.
6. Review the potential environmental issues as they relate to the results coming out of the Phase II pilot treatment works. Analyse these results to ensure that they comply with EIA impact class A of the World Bank's Operational Directive 4:01 Annex A.
7. Access local knowledge and capability and make recommendations for human resource development

8. Report findings to the Team Leader who will be responsible for the collation of all specialist inputs into the Management plan.

## QUALIFICATION OF SPECIALISTS

The Specialists should have a proper understanding of river hydraulics and morphological processes. They should have practical experience in the design and implementation of river works, enabling them to participate actively in efforts that aim at an expedient implementation of the proposed programme of works.

- Should have sound understanding of the project cycle.
- Practical experience in project preparation, evaluation (ante and post), implementation and management.
- Sound understanding of logical data and good judgement on costs and benefits of the works proposed for implementation.
- Should have as a minimum MSc in their respective area of specialization, with five years in similar local/tropical conditions dealing with watershed and environmental management projects.