



*DFID Natural Resources Systems Programme*

**DFID Natural Resources Systems Programme, Land Water  
Interface Project R7668: Impact and amelioration of  
sediment and agrochemical pollution on Caribbean coastal  
waters**

**Report of a project inception visit to Barbados, St Lucia  
and Jamaica by Nicole Kenward and Chris Mees, 30  
October - 22 November 2000.**

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## Contents

1	List of acronyms.....	4
2	Introduction.....	6
2.1	Purpose of visit.....	6
2.2	Itinerary.....	6
2.3	Future trips.....	6
2.4	Collaborative Arrangements.....	7
3	Output 3: Estimates of agro-chemical loadings and fate of loadings.....	8
3.1	Introduction.....	8
3.2	Review of administrative procedures of agro-chemical production/import.....	9
3.2.1	Regional.....	9
3.2.1.1	PCB.....	9
3.2.1.2	UNEP: Reducing pesticide runoff to the Caribbean Sea.....	10
3.2.2	St Lucia.....	11
3.2.2.1	Customs & Excise.....	11
3.2.2.2	Pesticide Control Board.....	11
3.2.2.3	SLASPA.....	12
3.2.2.4	Statistics Office.....	12
3.2.2.5	WIBDECO.....	12
3.2.2.6	Importers and Producers.....	13
3.2.2.7	SLBC.....	13
3.2.2.8	IICA.....	13
3.2.3	Jamaica.....	13
3.2.3.1	Customs & Excise.....	13
3.2.3.2	PCA.....	14
3.3	Environmental monitoring.....	14
3.3.1	St Lucia.....	14
3.3.1.1	Review of existing literature and programmes.....	14
3.3.1.2	Snapshot survey.....	15
3.3.2	Jamaica.....	19
3.3.2.1	Review of existing literature and programmes.....	19
4	Output 4 - Review and evaluation of existing agricultural land management.....	21
4.1	Introduction.....	21
4.2	Review of soil management and use of agro-chemicals.....	21
4.2.1	Characterisation of farming units.....	21
4.2.1.1	St Lucia.....	21
4.2.1.2	Jamaica.....	21
4.2.2	Structured questionnaire.....	21
4.2.2.1	St Lucia.....	22
4.2.2.2	Jamaica.....	22
4.2.3	Review of existing legislation and policy.....	22
4.2.3.1	St Lucia.....	22
4.2.3.2	Jamaica.....	22
4.3	Existing projects.....	23
4.3.1	Regional projects.....	23
4.3.1.1	UNEP.....	23
4.3.2	St Lucia.....	23
4.3.2.1	OECS/NRMU Watershed Management Initiative.....	23
4.3.2.2	SLSWMA.....	23
4.3.2.3	WIBDECO.....	24
4.3.3	Jamaica.....	24

4.3.3.1	National Programme of Action for the Protection of the Coastal and Marine Environment from Land-Based Activities (NPA LBA) .....	24
4.3.3.2	From Ridge to Reef (R2R).....	24
4.3.3.3	Environmental Action Programme (ENACT).....	24
4.3.3.4	Coastal Water Quality Improvement Project (CWIP).....	25
5	Output 5 - Options for pollution monitoring .....	26
6	Output 6 - BMP manual.....	27
6.1	Introduction.....	27
6.2	Management options for improving use of agro-chemicals and to reduce agro-chemicals/sediment in the marine environment .....	27
6.2.1	Existing projects/programmes.....	27
6.2.1.1	Regional.....	27
6.2.1.2	St Lucia .....	27
6.2.1.3	Jamaica.....	27
6.2.2	Future of agricultural policies .....	27
6.2.2.1	Banana trade.....	27
6.3	Dissemination workshop.....	28
6.4	BMP Manual.....	28
7	References .....	29
8	ANNEXES.....	30
8.1	Annexe 1 - Project log frame .....	30
8.2	Annexe 2 – Trip 1 itinerary (30 October – 23 November 2000) .....	34
8.3	Annexe 3 – List of relevant contacts and institutions.....	36

# 1 LIST OF ACRONYMS

CANARI	Caribbean Natural Resources Institute
CARDI	Caribbean Agricultural Research and Development Institute
CBO	Community-based organisation
C-CAM	Caribbean Coastal Area Management Foundation (Jamaica)
CCST	Caribbean Council for Science and Technology
CEHI	Caribbean Environmental Health Institute
CIDA	Canadian International Development Agency
CMS	Centre for Marine Science (UWI Mona Campus, Kingston)
CWIP	Coastal Water Improvement Project (Jamaica)
DFID	Department for International Development
DoCh	Department of Chemistry (UWI Mona Campus, Kingston)
DoEH	Department of Environmental Health (St Lucia)
DoLS	Department of Life Sciences (UWI Mona Campus, Kingston)
ECLAC	Economic Commission for Latin America and the Caribbean
EJASP	East Jamaica Agricultural Support Project
ENACT	Environmental Action Programme (Jamaica)
ENCORE	Environmental and Coastal Resource Project (St Lucia)
EU	European Union
FAO	Food and Agricultural Organisation (of UN)
H&S	Health and Safety
IICA	Inter-American Institute for Cooperation on Agriculture
IMDG	International Maritime Dangerous Goods
LBA	Land-Based Activities
LWI	Land Water Interface
MAFFE	Ministry of Agriculture, Forestry, Fisheries and the Environment (St Lucia)
MS	Member State
NEPA	National Environment and Planning Agency (Jamaica)
NGO	Non-governmental organisation
NPA	National Programme of Action
NPI	Natural Products Institute (UWI Mona Campus, Kingston)
NRCA	Natural Resources Conservation Authority
NRMU	Natural Resources Management Unit
NRSP	Natural Resources Systems Programme
OECS	Organisation of Eastern Caribbean States
PCA	Pesticides Control Authority (Jamaica)
PCB	Pesticides Control Board
PI	Principal Investigator
PSO	Private sector organisation
R2R	Ridge to Reef Project, USAID (Jamaica)
RADA	Rural Agricultural Development Authority (Jamaica)
SLASPA	St Lucia Air and Sea Ports Authority
SLBC	St Lucia Banana Corporation
SLBGA	St Lucia Banana Growers Association
SLSWMA	St Lucian Solid Waste Management Authority
SMMA	Soufrière Marine Management Association (St Lucia)
TQFC	Tropical Quality Fruit Company
UN	United Nations
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development

UWI University of the West Indies  
WASCO Water and Sewage Commission, St Lucia  
WIBDECO Successor to WINBAN: Windward Islands Banana Development and  
WINBAN Windward Island Banana Growers Association  
WINCROP Windward Islands Crop Insurance (1988) Ltd

## 2 INTRODUCTION

This three-year research project *Impact and amelioration of sedimentation and agro-chemicals in Caribbean coastal waters* is funded by DFID's NRSP LWI programme (R7668). It follows on from an earlier LWI project *Review of the impacts of pollution by sediments and agro-chemicals of tropical coastal waters with reference to the Caribbean region* (R7111). The present project is managed and conducted by two organisations: the University of York, responsible for the sedimentation aspects of the project, activities commenced in June 2000 and are concentrated in the SMMA in St Lucia; and MRAG Ltd, responsible for agro-chemical components of the project, activities are undertaken in St Lucia and Jamaica. This trip report is the first output for the agro-chemical component of the project.

### 2.1 Purpose of visit

This visit to Barbados, St Lucia and Jamaica took place in October/November 2000 and was one of the first activities of the agro-chemical component of the project. The principal aims of the visit were to finalise collaborative arrangements, to meet relevant institutions, to establish links with other programmes or projects and to source information from any previous studies in the region.

First points of contact were the regional office of DFID in Barbados, and the British High Commissions in Castries, St Lucia and Kingston, Jamaica. Meetings took place with regional institutions (CANARI, CARDI, CEHI, IICA, NRMU/OECS, Secretariat of the Coordinating group of PCB's, UWI, UNEP) in order to introduce this project, find out about any relevant regional or national programmes or projects and explore possible future linkages between projects. Meetings with governmental institutions were held in St Lucia (MAFFE: DoF, Agricultural Services, Extension Unit, Crop Protection Unit; DoEH; SWMA; SLASPA; Customs & Excise) and Jamaica (NEPA: NRCA; PCA) to introduce the project and discuss current practices and past programmes or initiatives. In addition, links were established with existing projects through other donor agencies (CIDA, EU, USAID).

### 2.2 Itinerary

Initial meetings had been set up with collaborators and the itinerary developed as we learned of additional programmes and projects of interest (see Appendix 2 for final version). The contact details of all relevant people and their institutions are given in Appendix 3.

### 2.3 Future trips

The second project trip is scheduled for the period of June 2001 and will involve visits by the PI to St Lucia and Jamaica. In accordance with the log frame (Annexe 1), the purpose of this visit is:

- to initiate structured interviews with farmers through a standardisation and training workshop for agricultural extension officers in St Lucia and Jamaica;
- to carry out key informant interviews through the above workshop;
- to locate monitoring stations in the three watersheds in St Lucia (Roseau, Soufrière, Praslin/Mamiku);
- to collect additional information on imports and further determine analytical requirements; and
- to further explore linkages with other projects.

The Secretariat of the Coordinating Group of PCB's in the Caribbean has invited the Project Team to attend and make a presentation at the 3<sup>rd</sup> meeting of the Coordinating Group of PCB's which is currently scheduled for the 19-21 June 2001 in Dominica. These dates fall within the timing for the second project trip. Attendance of this meeting would greatly aid the project in its aim to produce a BMP manual for the wider Caribbean and for generic dissemination and uptake of project outputs. Members of the group include all the Windward Islands (St Lucia, Dominica, Antigua, St Vincent, Grenada, Montserrat), St Kitts and Nevis, Barbados, Jamaica, Trinidad and Tobago and the British Virgin Islands. The annual meetings are open to all countries that are interested and are also attended by Guyana and the Cayman Islands.

The third project trip is scheduled for September-October 2001. It is likely to coincide with the St Lucian Pesticides Awareness Day on 27<sup>th</sup> September and possibilities for participation will be explored during the second project trip. At present, planned activities within the logframe include:

- Coordination of sampling activities at the three watersheds and distribution for analysis;
- Collation of information from structured interviews and discussions with extension officers;
- Presentation at sedimentation workshop held by the University of York; and
- Coordination of activities with collaborating partners.

#### **2.4 Collaborative Arrangements**

Meetings were held with collaborating partners in St Lucia (MAFFE: Departments of Agriculture and Fisheries; CEHI) and in Jamaica (UWI: CMS, DoCh, DoLS; CARDI; C-CAM). The purpose of meetings was to discuss collaboration and plan joint project activities. Collaborative arrangements have been set out in separate MoU's for each collaborating partner. Although certain outputs are the responsibility of one collaborator, it is intended that all partners will be able to contribute and/or review all project outputs. In this way, the project will draw on the local, national and regional experience of all collaborating partners.

## **3 OUTPUT 3: ESTIMATES OF AGRO-CHEMICAL LOADINGS AND FATE OF LOADINGS**

### **3.1 Introduction**

All collaborating partners in St Lucia and Jamaica are participating in the various activities of Output 3, as follows:

1. Quantify imports of agro-chemicals into participating countries, and describe their use locally;
2. Review agro-chemical toxicity and recommended management in other countries (e.g. USA, EU); and
3. Carry out baseline survey for agro-chemicals in coastal zone in St. Lucia.

In addition to the above activities, activity 4.1 (*Review of administrative procedures of agro-chemical imports/production*) was also researched during this trip and is discussed during this section as it is relevant to Output 3.

The quantification of imports commenced with visits to the PCB, Customs & Excise and the Statistics Office of St Lucia and the PCA and STATIN of Jamaica. Accurate quantification of imports and production in St Lucia is especially important for selection of chemicals for analysis. A St Lucian company, SCIC produces fertilisers and has agreed to provide the project with annual figures. Information on the local usage of agro-chemicals was gathered during visits to MAFFE, WINBAN and WIBDECO in St Lucia, and EJASP and the Coffee Board in Jamaica. C-CAM will be assisting collection of data on production of agro-chemicals in Jamaica.

The agro-chemicals applied in St Lucia and Jamaica vary in accordance with crop type. During this trip, research was based on agro-chemical import and application in St Lucia as this information is required for selection of agro-chemicals for analysis. The dominant agricultural product in St Lucia is the banana. The profitability of bananas is highly variable and there is a high production cost due to requirements of fertilisers, herbicides, insecticides, nematicides and fungicides. Further detail is contained within sections 4.2 and 6.2.

Prioritisation in the selection of chemicals for analysis will also be achieved through the review of agro-chemical toxicity. In particular, UWI (Faculty of Chemistry) is taking a lead role in the preparation of a review of agro-chemical toxicity. CEHI will also be contributing to this activity through relevant experience and reference material.

Administrative systems will be studied within both St Lucia and Jamaica, however environmental monitoring will only take place in St Lucia due to high costs involved with analysis. It was found that a number of studies have already taken place in Jamaica (compared to very few in St Lucia) and these will be identified in Toxicity Review. Imports and production will be quantified in both countries, therefore it will be possible to extrapolate estimates for Jamaica from the results from St Lucian watersheds. Quantification has already taken place for imports to St Lucia in order to determine the environmental monitoring (Section 3.3). Aspects of the baseline survey (timing, location, analyses) for agro-chemicals were discussed in detail with various institutions in St Lucia and presented in section 3.3.

## 3.2 Review of administrative procedures of agro-chemical production/import

### 3.2.1 Regional

#### 3.2.1.1 PCB

A regional body has evolved from a former Windward Islands' initiative. The organisation was formed in 1987 in response to the import of a particular agro-chemical to St Lucia by an agent for the purpose of trials. The agro-chemical had already been banned elsewhere and was distributed to several farmers before the agent was asked to repatriate the agro-chemical. However, the agent then tried to export the agro-chemical to other banana growing countries (including St Vincent and Dominica) before St Lucia was able to advise these countries. This event motivated the Windward Islands to organise annual meetings to ensure collaboration. The organisation was then enlarged to encompass all OECS member states and the annual meetings continued with increased membership (see Table 3.1). Upon acceptance of Barbados for membership in 1995, the meeting was renamed *OECS and Barbados Coordinating Group of PCBs*. Jamaica became a member in 1998 when the organisation was again renamed *Coordinating Group of PCBs*. Details of participating countries are shown in Table 3.1; the meetings are open to all countries that are interested.

**Table 3.1 Summary of annual regional PCB meetings**

Year	Name	Location	Funds	Participating countries	Details
1987	1 <sup>st</sup> meeting of PCBs in the Windward Islands	St Lucia	IICA	Windward Islands	All OECS MS became members
1988	2 <sup>nd</sup> meeting of OECS PCBs	Dominica	IICA	OECS MS	
1989	3 <sup>rd</sup> meeting of OECS PCBs	Antigua	OECS	OECS MS	
1993	4 <sup>th</sup> meeting of OECS PCBs	St Vincent	OUS/USAID	OECS MS	Barbados started to attend
1994	5 <sup>th</sup> meeting of OECS PCBs	St Kitts & Nevis	NRMU	OECS MS	Barbados, Jamaica attended
1995	6 <sup>th</sup> meeting of OECS PCBs	Montserrat	NRMU	OECS MS	Barbados accepted as member
1996	1 <sup>st</sup> meeting of OECS and Barbados Coordinating Group of PCBs	Tortola, BVI	NRMU	OECS MS, Barbados	Jamaica attended
1997	2 <sup>nd</sup> meeting of OECS and Barbados Coordinating Group of PCBs	Barbados	NRMU	OECS MS, Barbados	Jamaica, Guyana attended
1998	3 <sup>rd</sup> meeting of OECS and Barbados Coordinating Group of PCBs	St Lucia	NRMU	OECS MS, Barbados	Jamaica accepted as member
1999	1 <sup>st</sup> meeting of Caribbean Coordinating Group of PCBs	Grenada		OECS MS, Barbados, Jamaica	Trinidad offered membership
2000	2 <sup>nd</sup> meeting of Caribbean Coordinating Group of PCBs	Jamaica		OECS MS, Barbados, Jamaica	Trinidad accepted as member, Cayman Islands attended

Additional members include CEHI who assisted at the 1993 meeting and then attended the 2000 meeting. During this meeting, Dr Joth Singh of CEHI was appointed to the laboratory-working group. This working group was set up to form a network of laboratories to carry out residue analysis or formulation analysis. It was conceived through an FAO project in November 1995, which proposed harmonised guidelines and procedures for registration and control of pesticides in OECS MS. The working group has tried to follow up the FAO's recommendations and are trying to obtain funds from the UN ECLAC. A meeting was held in Trinidad and Tobago in November 1998 and facilitated by CCST to examine the

*Regulation and enforcement of pesticides tolerance levels of exported agricultural products /CCST.* The laboratory-working group includes Grenada (Chair), Dominica and Barbados and Trinidad, Jamaica and CEHI became additional members in 2000. There are three levels of laboratory for agro-chemical analysis, as set out below:

1. Residue analysis (CEHI St Lucia, Barbados)
2. Extraction (MAFFE Union St Lucia, Grenada, Dominica, Antigua, St Kitts)
3. No facilities (could send samples for analysis to laboratories at levels 1 or 2)

The laboratory-working group arranged a meeting to examine reviews, requirements and methodology, however the meeting was cancelled due to lack of funds.

The FAO project referred to above produced three outputs: the first was a regional pesticide database for registration, licensing and quantification. The second was that of a regional-laboratory network (mentioned above) and the last was that of draft legislation for PCBs throughout the Caribbean. Draft legislation has reached varying stages in MS and St Kitts and Nevis is the only country to have enacted this legislation. St Lucian legislation is presently undergoing study by the Attorney General, although there is an existing Act which dates to 1975 but does not include any regulations.

Discussions took place with the Secretariat of the Coordinating Group of PCBs in St Lucia. It appears that our project will be able to assist participating countries through various activities and the Project Team were invited to present the project at the next annual meeting. One opportunity for assistance is through regional administrative control of agro-chemicals, whereby two databases have been identified by the PCBs. The first database was designed by the FAO project (mentioned above) on Access 2.0: there are reportedly problems with this version (JP) and it is not in use at present. The second database is known as GERIFFE and was designed by a GTZ project on Foxpro. GERIFFE has been used by the Jamaican PCA since 1994 and is posted on their website. During the annual meeting in 2000, the MS discussed the adoption of the two databases and concluded that they required more information. MRAG has an opportunity to aid the Coordinating Group of PCBs through a comparison and evaluation of the two databases. It has been suggested that this review take place before the 2001 annual meeting in order to allow discussions regarding further activities for this project.

### **3.2.1.2 UNEP: Reducing pesticide runoff to the Caribbean Sea**

The main objective of the project is to protect the marine environment in the Caribbean Sea by reducing the use of, and reliance on, pesticides in agricultural activities. The project is assisting countries (Nicaragua, Costa Rica, Panama and Columbia) to develop national reports and actions plans to improve their pesticide management. Each country has reviewed their current management practices of pesticides using a committee of national stakeholders. A regional workshop is taking place in January 2001 in order to review and develop a draft regional action plan and proposal to be submitted to the GEF for funding and implementation.

The project aims to strengthen the national regulatory systems for chemical management. Regulatory systems will address issues such as permitting, compliance control, enforcement, trade, handling, use of pesticides and disposal of pesticide waste. The National Action Programme will also include actions to promote integrated pest management practices. National registers of pesticides will also be established.

Discussions took place with UNEP's project manager (TK) and the project team were invited to the regional workshop in January. This is clearly an important and highly relevant project and will be closely followed.

### **3.2.2 St Lucia**

#### **3.2.2.1 Customs & Excise**

There are no specific records for agro-chemical imports and all imports are entered on the UN-designed international imports database that is reportedly used throughout the Caribbean. Imports are grouped in accordance with international tariff bands, brand names are not recorded and original documents are filed per carrier. Customs & Excise appear fully aware of regulations for pesticides and their actions are guided by instructions from the PCB. Customs & Excise have the list of registered pesticides and require the agent to produce a license together with the customs declaration form for each consignment. Each license is issued and signed by PCB and if the agent does not possess a copy of this license, then the imported goods are stored in the Dangerous Goods' Shed by SLASPA. The agent is then directed to the PCB to obtain the appropriate license. Licenses are filed at entry.

#### **3.2.2.2 Pesticide Control Board**

PCB meetings are scheduled at monthly intervals although they are often postponed or cancelled due to busy schedules of board members. The PCB is unfunded and voluntary and is made up of seven members (Table 3.2). Until recently, there has been a lack of national legislation and the OECS took up the original draft produced by the FAO project in 1998. The OECS and Foreign Office have since integrated a chemical warfare element and it is presently under review by the Government.

**Table 3.2 Members of the PCB, St Lucia**

<b>Board member, position</b>	<b>Institution/profession</b>
Dr Stephen King	GP, represents Ministry of Health
Mr Everton Ambrose	IICA, Secretariat of Regional PCB Group
Mr Julius Polius, Chairman	Director Agricultural Services, MAFFE
Mr Guy Mathurin, Secretary	Pest Control, MAFFE
Mr Tedburt Theobalds	Representative, Chamber of Commerce
Mr Henry Lubin	Products Chemist, MAFFE
Mr Lesmond Magloire	Occupational H&S, Ministry of Labour

There are two requirements for import of an agro-chemical: firstly the agro-chemical must be registered by the PCB, secondly a license must be obtained from the PCB for each consignment. In order to register an agro-chemical, an agent submits an A1 form together with an original copy of the product Safety Sheet, a specimen label and any other relevant supporting data (results of trials, WHO data). The PCB meets monthly (or in accordance with the number of applications) to consider applications and make recommendations. From date of application, the PCB has up to 90 days to consider registration. Under the present system, there are no fees, an indefinite registration period and agro-chemicals can be banned at any time. The list of registered agro-chemicals is published and updated annually in the St Lucia Gazette (last edition was 25 September 1999; additional pesticides registered since then are *Spectrum* aerosol #99/018 and *Dursban* TC chlorpyrifos 42.86% #99/019). Anyone can obtain a license, independent of the agent who has registered the agro-chemical. To obtain a license, the shipping agent completes a form noting the brand, volume of shipment and active ingredients. If the agro-chemical is registered, the import license is issued and there is no fee. The license is generally applied for once the shipment has arrived. The Secretary of the PCB maintains records of all registration and licensing for agro-chemicals. At present, these records are not entered on any database and annual summaries are calculated by hand for nematocides, tickicides, rodenticides, molluscicides, fungicides and herbicides.

The system for registration and licensing is likely to change once the new legislation is accepted by the Attorney General. The new legislation covers pesticides and toxic chemicals for warfare and industry and could eventually incorporate fertilisers. Under this system, all pesticides will have to be (fee) registered. Any consignment must have a license (fee based) and operators will need a licence for handling of agro-chemicals (PCB will provide training courses). Registration will last for three years and the registrant will be the sole agent for a certain period or else a fee will be imposed. The new legislation attempts to make sure that the importer is responsible for stewardship (providing emergency information, training, antidotes).

### **3.2.2.3 SLASPA**

SLASPA is informed of shipments of chemicals by each ship's manifest and by shipping agents who write/call SLASPA to identify chemicals and make arrangements for onward transport. There is a dedicated dangerous goods shed where all chemicals are placed upon discharge from the ship. If highly toxic, arrangements are made for chemicals to be transferred ex-ship and straight to a truck for onward transport. All pesticides are placed in the dangerous goods category according to the IMDG code (various classes including oxidising, toxic, flammable and infectious substances) which also regulates storage on ship. Goods are released once instructions are received from Customs & Excise. Goods are reportedly stored for a maximum of six weeks, after which SLASPA informs the consignee that goods will be auctioned unless collected.

The goods are imported in approved containers and are segregated according to IMDG class in the dangerous goods shed. Storage is constrained by space and segregation is sometimes impossible, although contact between containers is minimised. The dangerous goods shed (#2) is unmanned, although locked and inspected regularly. The PI had the opportunity of inspecting the shed and storage was found to be inadequate. The concrete floor was covered by dust and mud with stains around several crates of containers (detailed in Table 3.3). Despite holes in the ceiling, the atmosphere was odorous and leaking; dented, rusting and empty drums were visible in several sections of the warehouse.

**Table 3.3 Details of agro-chemicals in dangerous goods shed, SLASPA**

<b>Agro-chemical</b>	<b>Details</b>
ICI Reglone Bipyridilium pesticides	Liquid, toxic, NOS
ICI Talent weedicides	Broad spectrum pest-emergence for long lasting weed control in bananas and other plantation crops
AKZO Natrets	Fertiliser from Holland

### **3.2.2.4 Statistics Office**

The Statistics Office receives a copy of the customs declaration forms and enters data into their database. They analyse data by end use and by international tariff codes and data has been provided for 1998, 1999 and to mid-2000. It is not possible for them to provide brand specific data.

### **3.2.2.5 WIBDECO**

WIBDECO takes a leading role in the banana certification programme. There are various certification schemes/standards in force, including that of WIBDECO, FairTrade (bans aerial spraying) and EUREPP. Although WIBDECO does not certify growers directly, it follows up certification once buyers have set standards and have certified buyers. Certification criteria are determined by the market buyers and by the vendor (in terms of quality as an asset and

a marketing tool). WIBDECO also produces a Growers' Manual and advises on farming practice.

In terms of banana production, 80% of bananas are grown on 50% of the banana growing area in St Lucia. WIBDECO (GG) reports that there is a low level of information or data provided by farms regarding application of agro-chemicals. From a recent agro-chemical survey, SCIC (TG) described extremely variable application rates and cases where the farmer cannot remember the last date of application.

WIBDECO reported that farmers usually apply pesticides within three and four months from data of purchase. Application rates are usually below recommended rates (due to costs) and application/use is often based on a farmer's perception. WIBDECO (ER) estimates that less than 50% of the recommended volume is applied. Fertiliser application rates are also recommended by WIBDECO varying from  $\frac{3}{4}$ lb/mat every 3 months when dry,  $\frac{1}{2}$ lb/mat every 2 months when very wet, 4-5oz/mat every 2 months when extremely wet. On an annual basis, the recommended rate is 3lb/mat or 1t/acre.

### **3.2.2.6 Importers and Producers**

The majority of agro-chemicals are imported or produced by SCIC. SCIC also imports chemicals for fertiliser production. The majority of agro-chemicals used in St Lucia are sold from the two SCIC depots (Vieux Fort in the south and Cul de Sac in the northwest). SLBC gives farmers credit slips for agro-chemicals which they use at the SCIC depots. Other importers include Renwick & Company and the St Lucia Agricultural Association. Purchases of agro-chemicals (type and volume) are made on recommendations by WIBDECO (based on maximisation of impact of agro-chemical on the crop). SCIC also has an agronomist who characterises soil types (analysis paid for by farmer) and recommends fertiliser type. Purchases of fertilisers are made on the basis of WIBDECO recommendations. Since the decrease in the banana prices in July 2000, sales of agro-chemicals are down by 70% (JP-M).

### **3.2.2.7 SLBC**

There are 3,997 registered shareholders in SLBC. Registered farmers sell their products directly to SLBC. In exchange, they receive a credit facility, assistance from extension officers and advice on soil conservation. The SLBC also produces a Banana Growers' Manual with advice on banana farming, agro-chemical application rates and treatment. All registered farmers purchase agro-chemicals directly from the depots of SCIC (Vieux Fort and Cul de Sac) using the credit facility offered by SLBC.

### **3.2.2.8 IICA**

The IICA has developed a Pesticides' Certification Manual for industrial pesticides control operators in St Lucia. This is a training manual for the certification of pesticides control operators. Although originally intended for industrial pesticides only, the manual has now been extended to agricultural users.

## **3.2.3 Jamaica**

### **3.2.3.1 Customs & Excise**

Customs & Excise do not handle any of the pesticide control legislation or paperwork and require each consignee to produce a permit in order to import consignments of agro-chemicals. Permits are approved and issued by the PCA. If a license is not produced, the agro-chemicals will be shipped back to the consignor.

### **3.2.3.2 PCA**

The PCA was set up in 1992 and has a permanent staff of eight. It was designated in the Pesticides Act to have responsibility to implement legislation and to monitor pesticides. A similar system exists to that of St Lucia and agro-chemicals must be registered and licensed. The agent responsible for registration is recognised as custodian and is the sole agent permitted to import that agro-chemical. Registration is valid for five years and then the product must be re-registered. If the agro-chemical is banned during the five-year period, the PCA then alerts the registration holder, however the PCA has discretion to ban the agro-chemical during the five-year period if it is banned internationally. Once an agro-chemical is registered, the agent must submit a licensing form to the PCA. The form is then approved and stamped by the PCA and the agent orders a shipment. Once the shipment arrives, the agent must pay appropriate duties to the PCA who stamp the form, which is required for release of the shipment from customs.

An additional requirement is for registration of premises that sell restricted pesticides. Manufacturers are legally required to maintain records of purchases and purchaser addresses for reasons of traceability. The PCA also intends to start a license system for pesticide handlers. The PCA also carries out random sampling of consignments in order to look at quality and consistency of the agro-chemical (samples are analysed at UWI).

An agro-chemical is banned once attention is drawn due to a ban by other countries. Once the PCA is aware of a ban, it will find out the reason and act accordingly. The PCA also looks out for exports-only agro-chemicals.

The PCA publishes an Annual Report which details lists of registered agro-chemicals, active ingredients, use and consignee. Details of Annual Reports and the import/registration database (1994 – June 2000) are available on the PCA website.

## **3.3 Environmental monitoring**

### **3.3.1 St Lucia**

#### ***3.3.1.1 Review of existing literature and programmes***

Copies of past studies and documentation were obtained from various institutions visited, including OECS/NRMU, Water Resources Management Unit, and Forestry Department. Relevant reports have already been obtained or are being sought from recent large-scale projects. These include the Coastal Environmental Quality component of the Northwest Coastal Conservation Project (a two year project from 1998-2000 funded by CIDA and conducted by Atria), the Watershed and Environmental Management Project funded by DFID and managed by HTS and ENCORE, a USAID funded project. Collaborating partners will also contribute to a review of existing literature, in particular CEHI and MAFFE (see MoU's in Appendices 5 – 6).

#### **IICA**

IICA has recently been requested by MAFFE to carry out a study of leaf spot control. This study is currently underway and aims to examine the economics of aerial and ground spraying, human and environmental hazards and the effect on non-agricultural crops. A copy of the study has been requested (EA).

#### **Water resources management unit**

This Unit is financed by the EU and has recently been set up. Previously, there was no national agency responsible for water resources and the Unit has four objectives:

1. Safeguard water for agricultural purposes;
2. Develop institutional and legal frameworks to review existing legislation and to propose new legislation;
3. Improve hydrological monitoring, for which MAFFE is historically responsible; and
4. Develop management recommendations in critical watersheds<sup>1</sup>.

Where possible, the project will select sampling sites that are of interest to the Water Resources Management Unit. Possibilities for collaboration on other future activities were discussed (DB/AJ).

### **WASCO**

The Water and Sewage Commission is legally mandated to carry out management of water resources. The Project Team tried to contact Mr Martin Satney who was out of the office during the visit. Future contact will be necessary to locate points of water abstraction in the watersheds.

### **WIBDECO**

WIBDECO advises on agro-chemical type and application rates in order to maximise the impact on the crop, but does not maintain records. SCIC also employs an agronomist who advises on application rates based on soil characterisation. Farmers normally apply within 3-4 months from date of purchase and usually at rates below those recommended by WIBDECO or SCIC. Agro-chemical use is often based on the farmer's perception and is frequently 50% of the recommended rate (ER).

#### **3.3.1.2 Snapshot survey**

Prior to the first trip it was decided that, rather than an extended monitoring programme, the project would organise a snapshot survey. Factors contributing to this decision include the high cost of chemical analyses, the wish to include as many chemicals as possible in the analysis, and for the study to be as comprehensive as possible. Although the non-temporal nature of the survey prohibits any observation of seasonal fluctuations, the scope of the project is to determine the fate of agro-chemicals in the environment. The survey will be carried out towards the end of the wet season (October – November) in order to avoid any short-term fluctuations in baseline levels due to flooding.

### **CEHI collaboration**

CEHI is the regional institution with pesticide analytical capabilities. Collaboration has been organised so that CEHI collects all samples and, where possible, analyses two of the replicate samples. A third replicate will be sent to a UK ISO-certified laboratory for analysis. This verification will aid CEHI in their quality control. Standards of known concentrations will also be analysed by CEHI and the UK laboratory for comparative purposes and quality control.

### **Selection of watersheds 1,2,3**

The selection of watersheds was discussed at the majority of meetings with various institutions and governmental bodies. Most people agreed that banana production had the highest impact on watersheds in terms of agro-chemicals and land-use. Three watersheds have been chosen with a variety of agricultural uses and pressures, as described below:

#### Watershed 1: Soufrieres (17.2 km<sup>2</sup>)

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<sup>1</sup> Critical watersheds have not yet been defined and will be selected following a review of legislation, review of the monitoring database and analysis of parameters to determine critical watersheds. Criteria will include irrigable areas, river health (domestic sewage supply, erosion, waste).

This is a low impact watershed situated on the windward side of the island with high levels of precipitation. There is limited commercial farming and low banana production (MB); the main agricultural crops are root vegetables (dasheen, yams) which use a high amount of fertilisers (NPK). This watershed is critical due to the fringing reef along this coastline. This is the sedimentation research site of York University and thus important to include in the agro-chemical component of the project.

#### Watershed 2: Roseau (49.1 km<sup>2</sup>)

This river basin is located in the banana belt of St Lucia and is well known to be heavily impacted by agriculture, principally by banana production. The construction of a high dam has considerably reduced water flow in the river. Banana cultivation is year-round using aerial- and ground spraying. The Forestry Department has produced a report detailing a significant decrease in birds (St Lucia arial hedgefeeder) due to aerial spraying.

#### Watershed 3: Praslin/Mamiku/Patience (16 km<sup>2</sup>)

This site has been selected to contrast with the other study locations; it has different coastal features from Watersheds 2 and 3 as it is on the Atlantic side of the island with much lower levels of rainfall. Two watersheds drain into Praslin Bay, which has no coral reef, however there is a mangrove stand with sea moss cultivation. There is a virtual absence of banana cultivation (except at Mamiku Estate) and the presence of diverse fruit, vegetable and flower cultivation. It is believed that the impacts of these crops are an important area of study since banana production is on the decline in St Lucia and they represent expected future trends in agriculture. Sampling of this watershed will include seamoss tissue analysis.

### **Sampling design**

The general sampling design matrix is shown in Table 3.4.

#### Location

Sampling at all three watersheds will take place in four locations: the upper catchment, mid catchment, estuarine outlet and coastal reef/lagoon. The possibility of contaminated drinking water was also highlighted by several institutions and it has been decided to include drinking water extraction points when sampling.

#### Media

Three media will be sampled and analysed for presence of agro-chemicals: water, sediment and tissues. In the upper- and mid catchments, sampling of water and sediment only will take place. The additional sampling of tissues will take place in the estuarine outlet and in the reef/lagoon. It is intended that any aquacultural production in the watersheds will also be sampled, such as seamoss in Praslin, Tilapia in Soufrieres. Identification of aquaculture species will take place during the next visit when the DoF aquacultural specialist is back from study leave. Identification of a suitable resident reef fish species will take place following study of DoF records and data collected by University of York.

**Table 3.4 Sampling design matrix**

Details	Number of samples				
	CEHI lab: 2 replicates	UK lab: 1 replicate	CEHI lab: Standards	UK lab: Standards	Total
<b>Watershed 1: Water</b>					
Upper catchment	0	0			0
Mid catchment	0	0			0
Estuarine/outlet	0	0			0
Coastal reef/lagoon	2		1		3
Drinking water extraction point 1	0	0			0

Drinking water extraction point 2					0
<b>Total</b>	<b>2</b>	<b>1</b>			<b>3</b>
<b>Watershed 1: Sediment</b>					
Upper catchment	0	0			0
Mid catchment	0	0			0
Estuarine/outlet	0	0			0
Coastal reef/lagoon	2	1			3
<b>Total</b>	<b>2</b>	<b>1</b>			<b>3</b>
<b>Watershed 1: Tissues</b>					
Upper catchment (Bananas)					0
Estuarine/outlet (*1 species)	2	1			3
Coastal reef/lagoon (*1 species)	2	1			3
<b>Total</b>	<b>4</b>	<b>2</b>			<b>6</b>
<b>Watershed 2: Water</b>					
Upper catchment	2	1			3
Mid catchment	2	1			3
Estuarine/outlet	2	1			3
Coastal reef/lagoon	2	1			3
Drinking water extraction point 1	2	1			3
Drinking water extraction point 2	2	1			3
<b>Total</b>	<b>12</b>	<b>6</b>			<b>18</b>
<b>Watershed 2: Sediment</b>					
Upper catchment	2	1			3
Mid catchment	2	1			3
Estuarine/outlet	2	1			3
Coastal reef/lagoon	2	1			3
<b>Total</b>	<b>8</b>	<b>4</b>			<b>12</b>
<b>Watershed 2: Tissues</b>					
Upper catchment (Bananas)					0
Estuarine/outlet (*1 species)	2	1			3
Coastal reef/lagoon (*1 species)	2	1			3
<b>Total</b>	<b>4</b>	<b>2</b>			<b>6</b>
<b>Watershed 3: Water</b>					
Upper catchment	2	1			3
Mid catchment	2	1			3
Estuarine/outlet	2	1			3
Coastal reef/lagoon	2	1			3
Drinking water extraction point 1	2	1			3
Drinking water extraction point 2	2	1			3
<b>Total</b>	<b>12</b>	<b>6</b>			<b>18</b>
<b>Watershed 3: Sediment</b>					
Upper catchment	2	1			3
Mid catchment	2	1			3
Estuarine/outlet	2	1			3
Coastal reef/lagoon	2	1			3
<b>Total</b>	<b>8</b>	<b>4</b>			<b>12</b>
<b>Watershed 3: Tissues</b>					
Upper catchment (Bananas)					
Estuarine/outlet (* 1 species)	2	1			3
Coastal reef/lagoon (* 1 species)	2	1			3
Coastal reef/lagoon (* sea moss?)	2	1			3
<b>Total</b>	<b>6</b>	<b>3</b>			<b>9</b>
<b>Grand Total</b>	<b>58</b>	<b>29</b>	<b>4</b>	<b>4</b>	<b>95</b>

## Agro-chemical analysis

The first step in determining the agro-chemicals to be analysed is a quantification of agro-chemical imports to St Lucia. Although generic agro-chemical import data is available from Customs & Excise and the Statistical Office, imports are categorised in accordance with international tariff codes (eg 51=organic, 52=inorganic, 56=fertiliser, manufactured, 59=chemical materials). The individual brand names or active ingredients of imports are not captured on databases (data for January 1997 – June 2000 has been obtained).

The PCB issues licenses for any imports of registered pesticides and data for imports during 1998 and 1999 was obtained from the PCB (GM) in order to quantify imports to St Lucia (Table 3.5). It is important to note that this data includes only registered pesticides and does not include raw materials for any pesticides or fertilisers manufactured in St Lucia. Prioritisation of the list of imported pesticides for chemical analysis has been made using the recommendations by SLBC and SCIC (category 4 on Table 3.5).

As far as research shows, there is no manufacture of pesticides in St Lucia (JP/EA/JS/GM). The principal supplier, importer and only manufacturer of fertilisers is SCIC (see above Section 3.1.1.2) (other minor importers are Renwick & Co, Agricultural Association). They have agreed to provide details of quantities/ingredients of fertilisers produced and sold during the past two years (TG). Samples will be analysed for nutrients in accordance with data received from SCIC.

The *Review of Agro-chemical Toxicity and Recommended Management* is separate project output (output 3.2) and will contribute to the selection of agro-chemicals for analytical study. Collaborative work on this output will mainly involve UWI and CEHI. Additional research will be carried out in specialist libraries (Ambleside and Plymouth). Advice will also be sought from the UK laboratory.

**Table 3.5 Imports of registered pesticides for agricultural use, St Lucia**

Category	Brand Name	Agro-	Toxic	AI chemical	AI	1998	1999	Total
Fungicide	Cuprosan 311 SD	1	3	copper oxychloride	Kg	1.5	0.7	2.2
				maneb	Kg	0.5	0.2	0.7
				zineb	Kg	0.5	0.6	1.1
	Fungaflor 75 SP	4	3	Imazalil	Kg	1620.0	11932.0	13552.0
	Mancozeb 80% WP	4	3	mancozeb	kg		87.5	87.5
	Phyton 27	1	2	ammonium formate	litres	0.1	9.0	9.1
				copper sulphate pentahydrate	litres	0.2	13.7	13.9
				sodium sulphate alquiletoxi	litres	0.1	3.2	3.3
	Ridomil MZ 72 WP	1	3	mancozeb	kg	1600.0		1600.0
				metalaxyl	kg	200.0		200.0
	Tilt 250 EC	1	3	propiconazole	litres		682.5	682.5
	Trimiltox-Forte	1	3	copper calcium sulphate	kg	1.5		1.5
				copper carbonate	kg	0.8		0.8
				copper oxychloride	kg	2.3		2.3
mancozeb				kg	2.0		2.0	
Vectra	1	3	Bromaconazole	litres		1.4	1.4	
Herbicide	2-4 D Amine	1	3	dichlorophenoxyacetic acid	litres	56.9		56.9
	Fusilade	1	3	fluazifop-p-butyl	litres	12.8	3.0	15.8
	Gramocil	4	2	diuron	litres	1477.6	4666.8	6144.4
				paraquat	litres	2955.2	9333.6	12288.8
	Gramoxone	4	3	paraquat	litres	5820.0	13158.0	18978.0
	Reglone	4	3	diquat	litres	12.0	1216.8	1228.8
	Talent	4	2	Asulam	litres		1291.1	1291.1
				paraquat	litres		64.6	64.6
Touchdown	4	3	glyphosate-trimesium	litres	3913.0	14517.1	18430.1	

Insecticide	Actellic	1	3	pirimiphos-methyl	litres	28.0		28.0	
	Actellic 50 EC	1	3	pirimiphos-methyl	litres		42.0	42.0	
	Admire 2 Flowable	1	2	imidacloprid	litres	1.3		1.3	
	Basudin	1	3	diazinon	litres	1.2	54.0	55.2	
	Diazinon	1	2	diazinon	litres	86.6		86.6	
	Diazinon 14G	1	2	diazinon	kg		1.7	1.7	
	Diazinon 48 EC	1	2	diazinon	litres		49.5	49.5	
	Dursban	4	2	chlorpyrifos	litres		33.6	33.6	
	Dursban PT 270	4	2	chlorpyrifos	litres	0.3	0.9	1.2	
	Karate	1	2	lambda-cyhalothrin	litres	10.9		10.9	
	Karate 2.5 EC	1	2	lambda-cyhalothrin	litres		6.8	6.8	
	Malathion		1	3	diazinon	litres		76.9	76.9
					malathion	litres	90.5		90.5
	Malathion ULV 91	1	3	diazinon	litres		17.2	17.2	
	Sevin 5%	1	2	Carbaryl	kg	27.0		27.0	
	Sevin 5% WP	1	2	Carbaryl	kg		24.3	24.3	
	Sevin 80 Dust	1	2	Carbaryl	kg		90.4	90.4	
	Sevin 85 S	1	2	Carbaryl	litres		18.5	18.5	
	Sevin 85 WP	1	2	Carbaryl	kg	235.5	6.4	241.9	
	Tambo 440 EC	1	3	cypermethrin	litres	80.5	16.4	96.9	
				profenofos	litres	805.2	163.8	969.0	
	Thiodan 50 WP	1	1	endosulfan	kg		4.5	4.5	
	Trigard	1	3	cyromazine	kg	3.8	11.3	15.0	
Nematicide	Furadan 10G	4	2	carbofuran	kg	9000.0	9280.3	18280.3	
	Miral 10G	4	2	isazofos	kg	7330.0	2220.0	9550.0	
	Mocap 10G	4	2	ethoprophos	kg	6480.0	102085.2	108565.2	
	Rugby	4	1	cadusafos	kg		1080.0	1080.0	
	Vydate L	4	1	oxamyl	litres	2744.4	1865.0	4609.4	

NB. Agro-use: 1&4=pesticide used for agricultural use, 4=pesticide recommended/supplied by SCIC and SLBC.

### **3.3.2 Jamaica**

#### **3.3.2.1 Review of existing literature and programmes**

A number of projects were visited and there are various opportunities for linkages and uptake of project outputs. Relevant literature and programmes are described below.

#### **UWI**

The Faculty of Chemistry has an active department, which undertakes chemical analyses for organisations such as the PCA. There is an active research group (NPI and Department of Chemistry) and recent relevant publications are cited in the reference list (including Brown *et al.*, 1991; Brown *et al.*, 1992; Lawrence *et al.*, 1986; Martin *et al.*, 1995; Mansingh and Wilson, 1995, Mansingh *et al.*, 1995; Mansingh *et al.*, 1999; Robinson and Mansingh, 1997; Robinson *et al.*, 1996; Singh *et al.*, 1991; and Witter *et al.*, 1999). These research groups are included in the MoU with UWI and will be providing expertise in the estimates of agro-chemical loading, in particular the review of toxicity.

#### **Eastern Jamaica Agricultural Support Project (EJASP)**

This is an EU project working together with the Extension Services of RADA. The project assists small farms (less than 5 ha) to improve farming practices, in areas such as irrigation, crop rotation, diversification, new seeds and agro-chemicals. Larger farms receive help from associated Agricultural Boards, such as coffee, citrus, sugar and bananas. Activities include support of coffee growers with intercropping vegetation in years 1-3 of growth (protect seedlings and reduce agro-chemical application) and encouragement of carrot farmers to diversify with pineapples or sweet peas (this reduces need for fertiliser and aids soil

conservation). This project is longterm and we aim to work with the team in order to learn from their experience and provide uptake of results (and *vice versa*).

## **4 OUTPUT 4 - REVIEW AND EVALUATION OF EXISTING AGRICULTURAL LAND MANAGEMENT**

### **4.1 Introduction**

Activities for output 4 have been discussed with collaborative partners and are outlined below:

1. Review administrative procedures of agro-chemical imports / production (discussed in Section 3);
2. Review soil management and the use of agro-chemicals in agriculture; and
3. Identify critical control points for management and dissemination of information.

Most activities involved with this output will be carried out in collaboration with UWI, in particular with CARDI. Information and data for activities 4.1 (discussed in Section 3) and 4.2 were collected during the course of visits to St Lucia and Jamaica and an outline is given below. The identification of critical control points (Activity 4.3) will be carried out following completion of Activities 4.1 and 4.2.

### **4.2 Review of soil management and use of agro-chemicals**

#### **4.2.1 Characterisation of farming units**

A characterisation is important for the purpose of selection of case study farms to investigate soil management and use of agro-chemicals.

##### ***4.2.1.1 St Lucia***

The majority of farming production in St Lucia is bananas and this crop type will be significant in the review of soil management and use of agro-chemicals. Jamaica farming production is more diverse and principal crop types are coffee, sugar cane and bananas.

There are no national agricultural census records available in St Lucia. In order to characterise farming units (size, yield, and location), data has been provided by MAFFE Extension Services (RL) for non-banana crops and by WINCROP for banana crops. WINCROP has provided data from the compulsory insurance scheme for bananas, whereby growers register with details of acreage, locations and number of mats and pay a premium of EC\$0.02 per lb of bananas sold. According to WIBDECO (GG), data for banana growers in St Lucia show that approximately 4% have >10 acres, 14% have 2-10 acres, and 82% have <2 acres. There is a great deal of migration of poor farmers and 80% of bananas are produced by only 50% of growers. It has been reported that many of the banana farmers are struggling to survive (JP-M) and cannot afford to purchase the agro-chemicals needed for profitable farming. The project clearly has a role in researching and highlighting inexpensive and simple methods of soil management and use of agro-chemicals.

##### ***4.2.1.2 Jamaica***

Data is readily available from the National Census and a copy of the 1996 Agricultural Census was purchased. Farming is far more diversified and major crops include coffee, sugar cane and bananas. The study will be divided amongst farms in accordance with the proportion of different crop types.

#### **4.2.2 Structured questionnaire**

The log frame states that workshops will be held with farmers to investigate soil management and agro-chemical use. After discussions with various institutions, it was

decided that the most appropriate means of gaining information would be to carry out structured questionnaire surveys in St Lucia and Jamaica. There will be different versions of structured questionnaire to target different crop types and hence agro-chemicals. Poor farmers will also be targeted as it has been reported that there are a large number of poor farmers who cannot afford to purchase agro-chemicals. The questionnaires will be developed collaboratively, with a lead role from CARDI.

#### **4.2.2.1 St Lucia**

Collaboration has been formed with the Extension Services of MAFFE. Extension officers have had extensive training in PRA techniques and have recently carried out a crop and livestock survey and a fertiliser survey (results of which will be made available to the project). Extension officers are based in different regions and therefore have frequent contact with local farmers. A workshop with the extension officers will be carried out during the next project visit. The aims of this workshop are to brief extension officers and to standardise procedures for the structured questionnaire. Key informant interviews will also take place with extension officers.

It was found that SLBC monitors the use and application rates of agro-chemicals via its pesticides record slip and consignment slip. The project would like to explore this system further during the next trip to see how comparisons can be made between the results from the structured questionnaires, SLBC records and actual importation records.

#### **4.2.2.2 Jamaica**

CARDI has responsibility for the structured questionnaire surveys in Jamaica (see MoU in Appendix 6). A workshop with the interviewers (hopefully RADA extension officers – unfortunately the PI could not make contact with relevant RADA staff during the visit) will take place during the next project visit with similar aims to those described above.

### **4.2.3 Review of existing legislation and policy**

Information was gathered from various sources in St Lucia and Jamaica. A review of national and international legislation and policy (see Section 6.1.2 below) will take place in the next few months.

#### **4.2.3.1 St Lucia**

The OECS prepared the original draft for pesticide legislation in St Lucia (an activity of the regional PCB). This draft has recently been amended to include a Chemical Warfare element and has now been submitted to the Government. The legislation should be approved in the near future.

#### **4.2.3.2 Jamaica**

There is a variety of legislation that covers control, administration, application and disposal of pesticides. Information and relevant Acts were collected from the Legal Department of NRCA (CE and LD-M) and include the following:

- The Natural Resources Conservation Authority Act – The Natural Resources Conservation (Permits and Licences) Regulations, 1996;
- The Natural Resources Conservation Authority Act – The Natural Resources Conservation (Blue and John Crow Mountains National Park) (Declaration) Order, 1993;
- The Natural Resources Conservation Authority Act – The Natural Resources (Montego Bay Marine Park) Order, 1992;
- The Natural Resources Conservation Authority Act, 1991;
- The Watersheds Protection Act, 1963; and

- The Wildlife Protection Act, 1945

### **4.3 Existing projects**

One of the purposes of visits to St Lucia and Jamaica was to find out more about existing projects. It is felt that, as much as possible, the project should develop appropriate linkages with other projects, in order for this project's outputs to feed into their activities and further dissemination of results, and *vice versa*. Relevant projects and possible linkages are described below.

#### **4.3.1 Regional projects**

##### **4.3.1.1 UNEP**

UNEP is coordinating a regional GEF project to develop national reports and action plans to improve pesticide management in Nicaragua, Costa Rica, Panama and Columbia. The aim of this project is to improve regional cooperation to protect the Caribbean Sea through improved pesticide management. A lot of project activities involve administrative systems and the project has been described in Section 3.2.1.2.

#### **4.3.2 St Lucia**

##### **4.3.2.1 OECS/NRMU Watershed Management Initiative**

This is a USAID ENCORE project that has two pilot sites: Talivan watershed in northern St Lucia and Marriaqua, St Vincent. The Talivan watershed has suffered from various problems due to impacts of banana cultivation (agro-chemical use, run off to river), animal grazing (the lower watershed), discharge of effluent from communities (treated by WASCO) and soil erosion. The project formed a core committee of local representatives (farmers and stakeholders) and national representatives (Forestry Department, scientists) to target the existing problems. There was no existing data (number of farms, erosion quantities, etc) and the committee has worked with the communities to set up simple experiments (eg. Sediment traps) to gather information. The project has experimented with biocontrol (geotextile and indigenous matter/vegetative wattles to control bank erosion). Agricultural practices have been investigated to reduce impacts on the environment. After two years of the project, a solid link has developed between forestry and the community and the programme has given rise to modified practices and an awareness of water quality. Discussions have taken place with project management (DP) to create linkages between our projects and to develop uptake of results.

##### **4.3.2.2 SLSWMA**

There is presently no control of hazardous waste and there is a CIDA funded project to support the SLSWMA. The project aims to develop and implement Hazardous Waste Management Guidelines (and/or Regulations) for St. Lucia in the areas of biomedical waste, agro-chemical waste, biological waste and industrial waste (including waste oils and asbestos). As part of this work, the project will also be holding workshops which are intended to inform St Lucians of the health hazards associated with these hazardous wastes and train them in proper handling and disposal practices.

With regard to the agro-chemical wastes, the project is currently in the process of gathering information on the types, and quantities of pesticides being using in St. Lucia. In addition, the current handling and disposal practices are also being investigated. A recent survey of spent chemical generated on the island was conducted by CEHI, and this survey will be

supplemented with a limited waste chemical generation survey which will target a few of the larger farmers as well as some of the smaller farmers.

#### **4.3.2.3 WIBDECO**

This organisation (formerly named WINBAN) plays a lead role in the banana certification programme. UK supermarkets (major buyer of St Lucian bananas) are liable for damage from fruit unless they can show certification, therefore farmers need to obtain certification for their produce. Certification criteria are determined by the market (or supermarkets) and are an asset of the vendor (used as a marketing tool). The buyers set the standards and WIBDECO follows up certification. WIBDECO manages one of several schemes (others are FairTrade, UREP, Organic). An interesting database prototype for certification exists for Dominican farmers (GIS system) that records each grower's management system (farm information) with a snapshot on the economics, yield and chemical history

### **4.3.3 Jamaica**

#### **4.3.3.1 National Programme of Action for the Protection of the Coastal and Marine Environment from Land-Based Activities (NPA LBA)**

The project team was invited to attend the first meeting of the technical group for the preparation of the NPA LBA Jamaica. The aims of this meeting were to assist Jamaica with development of a NPA and to review Jamaica's initiatives and information. The working group on Agriculture, Fisheries and Tourism discussed external/internal pressures to the sectors, which included crop competition, decrease in tariffs, population pressure/poverty, inadequate legislation and enforcement, new pests and diseases, reduction in government support, insecurity of land tenure, and inadequate capacity and organisation of farmers' groups. Agricultural gaps were listed as education and training, research, legislation and policy, monitoring programmes, best practice guidelines, institutional strengthening and capacity building. The project team was able to discuss opportunities for positive uptake of project outputs with workshop participants.

#### **4.3.3.2 From Ridge to Reef (R2R)**

This is a new project funded by the USAID bilateral programme in Jamaica. It is a five year initiative and focuses on achieving upland watershed management results with subsequent improvements along the LWI. R2R aims to address watershed degradation by improving and sustaining management of natural resources in targeted areas. Relevant objectives include: improvement of skills and capacity for sustainable natural resource management, promotion of eco-friendly usage of watersheds, including improved farming practices, promotion of public awareness of the links between activities in upper watersheds and the LWI. The project will target the Great River and Rio Grande watersheds. The Rio Grande, in particular, is mountainous, heavily dependent on agriculture and threatened by deforestation, soil erosion and inappropriate land use.

Discussions with the project manager at USAID (HB) have confirmed the relevance of this project to our own. Guidelines for soil conservation and agro-forestry will be developed within R2R and the project is interested in field testing our guidelines.

#### **4.3.3.3 Environmental Action Programme (ENACT)**

ENACT is funded by CIDA and is a ten year programme that commenced in 1994 to promote sustainable development in Jamaica by developing the capacity of key institutions in the public sector, private sector, education sector and communities. The three areas of activity are environmental education, environmental management and sustainable

development planning. Within environmental management, ENACT aims to increase the use of EMS to reduce pollution and wastes and conserve resources in the public and private sectors. ENACT also supports a capacity development plan for the NRCA, one of the relevant components of this plan is prevention of environmental degradation (database development, resource mapping, increased impact of public education programmes).

ENACT has a quarterly newsletter which is widely distributed to local and national stakeholders with a focus on the ENACT programme and NRCA activities, but also other projects and programmes across Jamaica. ENACT offered to publish an article about our project to improve awareness across Jamaica (J-JB).

#### **4.3.3.4 Coastal Water Quality Improvement Project (CWIP)**

This is a six year bilateral project between the NRCA and USAID. There are five components that will be carried out to impact on coastal zone management, wastewater management, industrial/commercial environmental practices and solid waste disposal, and ultimately improve coastal water quality. The project has two approaches: to strengthen national policies and regulatory processes, and to support community based environmental initiatives through NGOs, CBOs and PSOs to promote environmental practices that enhance sustainable coastal resources management.

The project commenced in 1998 and a number of relevant activities have taken place, including a rapid assessment of coastal problems (highlighting that agricultural run-off contributes most nutrients), organic farming projects in Springfield working with RADA and the use of environmental friendly chemicals and sustainable agricultural practices (in conjunction with CARDI). An extensive monitoring programme (principally nutrient loading and assessment of the impact of new sewage systems) has taken place in Negril and Ocho Rios and data is available to our project (LD/DB).

## **5 OUTPUT 5 - OPTIONS FOR POLLUTION MONITORING**

The following are activities of Output 5:

1. Determine options for monitoring for agro-chemical imports; and
2. Determine alternative options for environmental monitoring to detect changes in concentration of agro-chemicals and sediment loads in coastal zone.

These activities are identified as future activities for all collaborating partners and are included in MoU's.

## **6 OUTPUT 6 - BMP MANUAL**

### **6.1 Introduction**

The project will concentrate on activities of output 6 at a later stage in the project, as described below:

1. Identify management options to improve the use of agro-chemicals and to reduce agro-chemicals / sediment in the marine environment; and
2. Write a BMP manual for Caribbean-wide dissemination.

These future activities were addressed during discussions with governmental institutions and existing projects/programmes. Areas of interest have been highlighted in this section.

### **6.2 Management options for improving use of agro-chemicals and to reduce agro-chemicals/sediment in the marine environment**

#### **6.2.1 Existing projects/programmes**

##### ***6.2.1.1 Regional***

The UNEP project (refer to Sections 3.2.1.2 and 4.3.1.1) has similar aims to our project and we will follow up outputs from this project. The OECS/NRMU have a watershed management programme and meetings took place to discuss uptake of their project results (VC, DP).

##### ***6.2.1.2 St Lucia***

It will be important to link in with the OECS project in the Talivan Watershed (Section 4.4.2) at a later stage in order to look at their practices and to provide dissemination through the BMP manual. Linkage with the SLSWDA (Section 4.4.2) is also necessary for management of agro-chemical waste.

##### ***6.2.1.3 Jamaica***

As described in Section 4.4.3, links have been established with major environmental and coastal management projects, such as R2R, ENACT and CWIP. Their project activities and results will be considered in the identification of management options for improved use of agro-chemicals and to reduce presence and impact in the environment. There are also possibilities for field testing of our recommended practices through the R2R project and CWIP.

#### **6.2.2 Future of agricultural policies**

##### ***6.2.2.1 Banana trade***

In 1995, banana exports represented 47% of total export earnings and 89% of agricultural exports in St Lucia (HTS, 1998). A 1993 WINBAN survey revealed that 65% of all growers depend entirely on bananas as a source of income and it is estimated that 32,000 people (39% of the total labour force) are fully or partly dependant on banana production in St Lucia. The country's dependence on bananas causes a serious challenge to social and economic stability on the island. The recent fall in banana prices (due to GB£ depreciation against the US\$ at the beginning of the 1990s and current weakening of the ECU) has created considerable uncertainty to the long-term future of the banana trade. The current changing banana policies in the EU have led to economic hardship for small farmers over

the past few years and there was a further drop in banana prices in July 2000 (reflected in SCIC sales, which were down by 70% in the months of August-October 2000 (JPM)). The industry is awaiting eventual finalisation of the new EU agreement (GG), and any further deterioration of the banana sector could have serious social consequences.

The future prospects of the banana trade are thus doubtful and may bring about a switch to alternative agricultural crops. Certainly, it was reported that some banana growers are becoming less dependent upon bananas and have started to grow fruit and vegetables. For this reason, a third watershed with a low impact from bananas and higher impact from fruit, vegetables and flowers was selected for environmental monitoring (Section 3.3.1.2).

### **6.3 Dissemination workshop**

The dissemination workshop will be an important route for dissemination and uptake of project results, and formulation of a BMP Manual. Due to the focus of activities in both St Lucia and Jamaica, it has been decided that workshops should be held in each country with relevant local and national stakeholders. One of these workshops will have a regional focus, to which regional stakeholders will be invited, such as the PCB, UNEP, OECS and CANARI. Discussions with the PCB Secretariat were held and it is hoped that the dissemination workshop will coincide with the annual regional PCB meeting.

### **6.4 BMP Manual**

It was stressed by several institutions that the manual should be simple, usable and brief with clear guidelines for farmers. The Manual will be considered in depth at a later stage in the project, and it has been proposed that there be two subsections to the manual: one aimed at administration and the other at best farming practices.

## 7 REFERENCES

- Brown, C., Dasgupta, T.P. and Roberts, E.V. (1991) Slow release formulation part 1 – encapsulation of pesticides by starch matrices. *Jamaican Journal of Science and Technology* **2(1)**: 17-24.
- Brown, C., Dasgupta, T.P. and Roberts, E.V. (1992) Slow release formulation part 2 – studies of pesticide release rates of starch-encapsulated Diazinon. *Jamaican Journal of Science and Technology* **3**: 16-21.
- HTS (Hunting Technical Services) (1998) St Lucia: Watershed and Environmental Management Project Phase II. Final Report. October 1998.
- Lawrence, V., Young, R.E. and Mansingh, A. (1986) The effect of sub-lethal doses of Dieldrin on resting and active metabolism in two species of shrimps. *Comp. Biochem. Physiol.* **85C(1)**: 183-186.
- Mansingh, A. and Wilson, A. (1995) Insecticide contamination of Jamaican Environment III. Baseline studies on the status of insecticidal pollution of Kingston Harbour. *Marine Pollution Bulletin* **30(10)**: 640-645.
- Mansingh, A., Robinson, D.E. and Wilson, A. (1995) Insecticide contamination of the Jamaican environment 1. Pattern of fluctuations in residue levels in the rivers of Hope watershed (1989-1991). *Jamaican Journal of Science and Technology* **6**: 52-67.
- Mansingh, A., Robinson, D.E., Henry, C. and Lawrence, V. (1999) Pesticide contamination of Jamaican environment. II. Insecticide residues in the rivers and shrimps of Rio Cobre basin, 1982-1996. *Environmental Monitoring and Assessment* **63**: 459-480.
- MRAG Ltd (1998) Review of the impacts of pollution by sediments and agro-chemicals of tropical coastal waters with reference to the Caribbean Region. DFID R7111. July 1998. London: MRAG Ltd.
- NPA LBA Jamaica (2000) Report of the First Meeting of the Technical Group for the Preparation of the NPA LBA Jamaica. Kingston, 14-15 November 2000.
- Robinson, D.E. and Mansingh, A. (1997) Insecticide contamination of Jamaican environment. IV. Transport of residues from coffee plantations in the Blue Mountains to coastal waters in Eastern Jamaica. *Environmental Monitoring and Assessment* **54**: 125-141.
- Robinson, D.E., Mansingh, A. and Dasgupta, T.P. (1996) Fate of Endosulfan in soil and in river and coastal waters of Jamaica. *Proc. International Symposium on the use of nuclear and related techniques for studying environmental behaviour of crop protection chemicals. Vienna, 1-5 July 1996*: 301-311.
- Singh, N.C., Dasgupta, T.P., Roberts, E.V. and Mansingh, A. (1991) Dynamics of pesticides in tropical conditions. 1. Kinetic studies of volatilisation, hydrolysis, and photolysis of Dieldrin and  $\alpha$ - and  $\beta$ -Endosulfan. *Journal of Agricultural and Food Chemistry* **39**: 575-579.
- Witter, J.V., Robinson, D.E., Mansingh, A. and Dalip, K.M. (1999) Insecticide contamination of Jamaican environment. V. Island-wide rapid survey of residues in surface and ground water. *Environmental Monitoring and Assessment* **56**: 257-267.

## 8 ANNEXES

### 8.1 Annexe 1 - Project log frame

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
<b>Goal</b>			
Improved resource-use strategies in coastal zone production systems developed and promoted.	<p>By 2002, new approaches to integrated natural resource management and prevention of pollution which explicitly benefit the poor validated in two targeted areas.</p> <p>By 2004, these new approaches incorporated into strategies for the management of coastal resources and adopted by target institutions in two targeted countries.</p>	<p>Reviews by Programme Manager.</p> <p>Reports of research team and collaborating /target institutions.</p> <p>Appropriate dissemination products.</p> <p>Local, national and international statistical data.</p> <p>Data collected and collated by the Programme Manager.</p>	<p>Target beneficiaries adopt and use strategies.</p> <p>Enabling environment exists.</p> <p>Budgets and programmes of target institutions are sufficient and well managed.</p>
<b>Purpose</b>			
Technical understanding, and methods for management of coastal zone habitats improved.	<p>Adoption of BMP methodology into National Plans and land management of target countries.</p> <p>Awareness among local communities and decision-makers of the impacts of sediment and agro-chemical pollution.</p>	<p>Country Policy Plans.</p> <p>Interview surveys of local people.</p> <p>Resource and pollution monitoring.</p>	<p>National Gos and NGOs committed to improved management solutions, and will participate in institutional restructuring, changes to legislature etc.</p>
<b>Outputs</b>			
1. Improved understanding of the effects of sedimentation on (a) coral reefs, (b) on the efficacy of current management measures (marine reserves and zoning plan), and (c) on reef recovery from natural	<p>Measures quantified by the end of research.</p> <p>Final surveys completed by the middle of the third year of research.</p>	<p>Research programme report; scientific papers; leaflet and posters for in-country circulation.</p>	<p>Weather conditions favourable for adequate data collection in the field.</p> <p>Reserves continue to be managed as no-fishing zones.</p>

<b>Narrative Summary</b>	<b>Measurable Indicators</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
<p>disturbances (storms).</p> <p>2. Economic estimates of (a) the value of reefs to the St. Lucian economy, and (b) the costs of sediment pollution.</p> <p>3. Estimates of agro-chemical loadings and fate of loadings in St. Lucia.</p> <p>4. Review and evaluation of existing agricultural land management in participating countries.</p> <p>5. Options for pollution monitoring for participating countries.</p> <p>6. Best management practice (BMP) manual written for the participating countries and generalized for dissemination Caribbean-wide</p>	<p>Workshops held in years 2 and 3 to disseminate findings and solicit user views.</p> <p>Completed by the end of the third year of research.</p> <p>Questionnaire survey of scuba divers completed and analysed by the end of the second year of research.</p> <p>Quantitative estimates of pollution loadings and probable pathways.</p> <p>Identification of shortfalls in BMPs addressed in National Plans.</p> <p>Monitoring options evaluated and described</p> <p>Data on appropriate best management practices collected in year 2 workshop.</p> <p>Manual completed by the end of year 3 of the research.</p>	<p>Research programme report; scientific paper; printed education materials – leaflets and poster; final year workshop.</p> <p>Research programme report.</p> <p>Research programme report.</p> <p>Research programme report</p> <p>Manual defining recommended methodology</p> <p>Second year workshop</p>	<p>Weather conditions favourable for adequate field data collection.</p> <p>Access to in-country chemical import and distribution data.</p> <p>Favourable weather conditions for data collection.</p> <p>Relevant government departments / farmers co-operate.</p> <p>Access to literature on alternative management practices elsewhere.</p>
<b>ACTIVITIES</b>	<b>PROJECT MILESTONES AND BUDGET</b>		<b>IMPORTANT ASSUMPTIONS</b>
1.1 Sedimentation rates monitored and related to rainfall and underwater visibility.	Data analysed annually, and final sampling conducted by end of second year.		Rainfall and underwater visibility data continue to be collected by collaborators

<b>Narrative Summary</b>	<b>Measurable Indicators</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
1.2 Effects of sediment on benthic communities estimated.	Data analysed annually, and final sampling conducted by end of second year.		Sediment effects on reefs successfully separated from other factors causing degradation. Experimental design and previous research facilitates this.
1.3 Sedimentation effects on coral recruitment and juvenile mortality and growth rates estimated.	Data analysed annually, and final sampling conducted by end of second year.		Permission obtained to establish experiments on the reefs (Permission has always been granted in the past).
2.1 The impacts of reserves on fish landings will be estimated.	Data collected during second year of study. Analysed early in third year.		Cooperation of fishers obtained.
2.2 Amenity value of reefs estimated.	Questionnaire survey complete by end of second year; data analysed by early in third year.		Cooperation of scuba diving companies, scuba divers, hotels and tourism companies obtained.
2.3 Opportunities and constraints on coastal fishers to participate in tourism industry evaluated.	Second year workshop to explore and quantify stakeholder interests and involvement in tourism.		Cooperation of fishers obtained.
2.4 Economic the costs of reef degradation to coastal communities estimated.	Modelling initiated at the end of the second year; complete by end of third year.		Biological, fishery and tourism studies completed successfully.
3.1 Quantify imports of agro-chemicals into participating countries, and describe their use locally.	Project report at end of first year. Establishment of baseline database.		Relevant government department make information available.  Data available adequate to estimate imports and application rates.
3.2 Review agro-chemical toxicity and recommended management in other countries (e.g. USA, EU)	Project report at end of second year.		
3.3 Carry out baseline survey for agro-chemicals in coastal zone in St. Lucia.	Snapshot survey of water, sediment and indicator organisms to establish the potential fate of agro-chemicals completed by the end of second year.		Favourable weather conditions during field work phases.
4.1 Review administrative procedures of agro-chemical imports / production	Review completed by end of first year		Co-operation for the collection of import and local distribution data.

<b>Narrative Summary</b>	<b>Measurable Indicators</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
<p>4.2 Review soil management and the use of agro-chemicals in agriculture</p> <p>4.3 Identify critical control points for management and dissemination of information</p>	<p>Review completed by end of first year. Workshop with farmers and government completed in second year.</p> <p>Project report by end of second year.</p>		<p>Farmers co-operate with the collection of information.</p> <p>Adequate data available from baseline sampling and government offices.</p>
<p>5.1 Determine options for monitoring for agro-chemical imports.</p> <p>5.2 Determine alternative options for environmental monitoring to detect changes in concentration of agro-chemicals and sediment loads in coastal zone.</p>	<p>Options for monitoring imports of agrochemicals defined for target countries by end of project</p> <p>Alternative monitoring options based on cost defined for target countries by end of project.</p>		<p>Relevant government departments co-operate</p> <p>Government implements methodology</p>
<p>6.1 Identify management options to improve the use of agro-chemicals and to reduce agro-chemicals / sediment in the marine environment.</p> <p>6.2 Write a BMP manual for Caribbean-wide dissemination.</p>	<p>Management options (including advise on education, training and awareness needs, and appropriate legislative and policy measures to improve management of agricultural non-point sources of pollution) presented at Workshop to relevant stakeholders including farmers and government bodies during final year.</p> <p>Manual disseminated at project end.</p>		<p>Cooperation of farmers obtained.</p>

## 8.2 Annexe 2 – Trip 1 itinerary (30 October – 23 November 2000)

Monday 30/10		Travel: London – Barbados
Tuesday 31/10	0930	Dick Beales – DFID Caribbean Office
Wednesday 1/11		Travel: Barbados – St Lucia
	1030	Michael Cowing – Solid Waste Disposal Authority
	1200	Peter Hughes - Acting British High Commissioner
	1400	Joth Singh, Patricia Aquing, Alvin Lewis – CEHI
Thursday 2/11	0830	David Joseph, Charles Cromer, Arthur Ragnan, Emanuel Bobb, Department of Environmental Health
	1100	Alison Plummer – Bureau of Standards (phone interview)
	1400	Julius Polius, MAFFE
	1530	Vasantha Chase – OECS/NRMU
	1630	Joth Singh – CEHI
Friday 3/11	0830	Anthony Louis, Brian Wardrope – Customs & Excise
	1000	Sarah George – Department of Fisheries
	1130	Michael Bobb – Department of Forestry
	1400	George Grey – WIBDECO
	1500	Erol Reed – WIBDECO
	1615	Janice Brandford – Statistics Office
Weekend 4- 5/11		Road tour around banana plantations and watersheds Reef observation, Soufrières Meeting with Fiona Gell – University of York
Monday 6/11	1030	Yves Renard, Allan Smith – CANARI
	1400	Michael Bobb – Department of Forestry
	1430	Deborah Bushell, Anita James – Water Resources Management Unit
Tuesday 7/11	0830	Kai Wulf - SMMA
	0930	Sean Ferrari – Department of Fisheries
	1130	Jeremy Palmer Martin – SCIC
	1230	Allan Smith – CANARI
		Travel: St Lucia – Jamaica (flight then cancelled)
Wednesday 8/11		Travel: St Lucia – Jamaica
Thursday 9/11	0830	Graham Glover – British High Commission
	1500	Vivian Monteith, Luc Frechette – Canadian High Commission (CIDA)
Friday 10/11	0930	Dale Webber – Department of Life Sciences, UWI
	1130	Chris Baker – EJASP
	1300	Hyacinth Chinsu – PCA
	1800	Peter Espeut – C-CAM
Weekend 11-12/11		Site visit with C-CAM staff, Portland Bight Protected Area Tour in Blue Mountains
Monday 13/11	1030	Professor Dasgupta – Faculty of Chemistry, UWI
	1130	Dale Webber – UWI
	1400	Howard Batson – USAID
	1630	Frank McDonald, Leslie Simpson, Dion Clarke-Harris – CARDI
Tuesday 14/11	0830	Workshop : NPA for LBA, NEPA/NRCA Informal meetings: Tim Kasten – UNEP Mearle Barrett – NRCA Franklin McDonald – NEPA

		Craig Pratt – Environmental Vulnerability Index Project
	1430	George Warner – Centre for Marine Sciences, UWI
	1600	Frank McDonald – CARDI
	1700	Professor Dasgupta – Faculty of Chemistry, UWI
Wednesday 15/11	0830	Workshop: NPA for LBA, NEPA/NRCA (agriculture, fisheries and tourism working group)
Thursday 16/11	0900	Denise Forrest – CWIP
	1000	Jan Orman – CWIP
	1030	Louis Daley – CWIP
	1200	George Wilson – George Wilson – R2R Project, NRCA
	1330	Barbara Scott – Institute of Planning
	1430	Professor Mansingh – NPI
	1500	George Warner, Dale Webber – CMS, UWI
	2000	Peter Espeut – C-CAM
Friday 17/11	0900	Jean-Joseph Bellamy – ENACT, NRCA
	1030	Carole Excell, Lolita Davis-Mattis – Legal Department, NRCA
	1100	Michael Pryce – Statistics Division, Ministry of Agriculture
	1230	The Statistical Institute of Jamaica – STATIN library
	1330	Louis Campbell – Coffee Board
	1430	Timon Waugh – Coffee Board
	1530	Arlene Wilson – NPI
	1600	Professor Dasgupta – Faculty of Chemistry, UWI
Weekend 18-19/11		Travel: Jamaica – St Lucia Reef mapping, St Lucia
Monday 20/11	1000	Janice Brandford – Statistics Office
	1100	Ignatius Jean – WINCROP
	1400	Brian Wardrope – Customs & Excise
	1500	Deborah Bushell – Water Resources Management Unit
	1630	Research – Public Library, Castries
Tuesday 21/11	0830	Rufus Leandre – Extension Services, MAFFE
	1030	Dermot Saltibus – SLASPA
	1130	Ignatius Jean – WINCROP
	1200	Durand Dorseide – SLBC
	1400	Thierry Guillaume – SCIC
	1530	David Popo – OECS/NRMU
Wednesday 22/11	0930	Everton Ambrose – IICA
	1100	Guy Mathurin – PCB
	1400	Julius Polius – MAFFE
	1530	CEHI
		Travel: St Lucia – London

### **8.3 Annexe 3 – List of relevant contacts and institutions**

Tit le	FirstN ame	LastNa me	JobTitle	Company	Address 1	Address 2	City	State	Postal Code	Coun try	Home Phon e	WorkPh one	EEmail	Fax	Other
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	Craig	Pratt		Environmental Vulnerability Project	SOPAC		Suva			Fiji			Craig@sopac.org		www.sopac.org/project/evi.htm
	Jan	Auman	Chief of Party	Coastal Water Quality Improvement Project	5 Oxford Park Avenue		Kington 5	Jamaica		West Indies		876 7543910 /2	ard@cwjamaica.com	876 754391 3	
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	Jean-Joseph	Bellamy	Programme Manager	ENACT	10 Caledonia Avenue	John McIntosh Building	Kington 5	Jamaica		West Indies		876 754 7555/75 68	jbellamy@infochan.com	876 754759 7	www.enact.org.jm
	Louis	Campbell	Soil Conservation & Research Officer	Coffee Industry Board	Regulatory Division	Willie Henry Drive	Kington	Jamaica		West Indies		876 758 2925/39 03	cofeboard-jam@cwjamaica.com	876 758 3905	www.jamaicancoffee.gov.jm
	Hyacinth	Chin Sue	Registrar	Pesticides Control Authority	2-4 King Street		Kington	Jamaica		West Indies		876 967 1092/6	pca@cwjamaica.com	876 967 1285	www.caribbeanpesticides.net

Tit le	FirstN ame	LastNa me	JobTitle	Company	Address 1	Address 2	City	State	Postal Code	Coun try	Home Phon e	WorkPh one	EMail	Fax	Other
	Dionne	Clarke-Harris	Entomologist	CARDI	UWI Mona Campus	Po Box 113	Kington 7	Jamaica		West Indies		876 927 1231/0652	cardi2@cwjamaica.com	876 927 2099	
Dr	Tara P	Dasgupta	Professor & Head of Department of Chemistry	University of the West Indies	Mona Campus		Kington 7	Jamaica		West Indies	876 92720 57	876 9271910 /977 1834	tara@uwi-mona.edu.jm	876 977183 5/9271 640	
	Peter	Espeut	Executive Director	C-CAM	PO Box 33	Lionel Town	Clarendon	Jamaica		West Indies	876 780 1300	876 986 3327		876 986 3956	
	Denise	Forrest	Environmental Management Systems Specialist	Coastal Water Quality Improvement Project	5 Oxford Park Avenue		Kington 5	Jamaica		West Indies		876 7543910 /2		876 754391 3	
	Luc	Frechette	Counsellor (Development)	Canadian High Commission	3 West King's House Road		Kington 10	Jamaica		West Indies		876 5113450	luc.frechette@dfait-maeci.go.ca	876 511 3491	
	Valerie	Gordon	National Coordinator	JSDNP	Dept Geography	UWI Mona	Kington 7	Jamaica		West Indies		876 7024478	vgordon@j-sdnp.org.jm	876 702 4479	
	Timothy J.	Kasten	Co-ordinator Adjunto Encargado	PNUMA UCR/CAR	14-20 Port Royal Street		Kington	Jamaica		West Indies		876 9229267	tjk.uneprcuja@cwjamaica.com	876 922929 2	<a href="http://www.cep.unep.org">http://www.cep.unep.org</a>
Prof	A	Mansingh	Executive Director	NPI	Mona Campus	UWI	Kington 5	Jamaica		West Indies		935 8718	Amansingh@cwjamaica.com		
	Frank D.	McDonald	Team Leader/Senior Plant Pathologist	Caribbean Agricultural Research & Development Institute	University Campus	PO Box 113, Mona Campu s	Kington 7	Jamaica		West Indies	876 92605 49	876 9271231 /0652	cardi@uwi-mona.edu.jm, cardi2@toj.com	876 927209 9	
	Franklin	McDonald	Chief Executive Officer	NRCA			Kington	Jamaica		West Indies		876 923 5155	Nrca@igc-apc.org	876 923 5070	
	Vivian A.	Monteith	First Secretary (Development)	Canadian High	3 West King's		Kington	Jamaica		West Indies		876 926 1500 ext	vivian.mon-teith@dfait	876 511349	

Tit le	FirstN ame	LastNa me	JobTitle	Company	Address 1	Address 2	City	State	Postal Code	Coun try	Home Phon e	WorkPh one	EMail	Fax	Other
				Commission	House Road		10					3454	- maeci.go.c a	1	
	Debbi e-Ann	Ramsey	Researcher	UWI				Jamai ca					Daramsey @hotmail.c om		
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Dr	Georg e F.	Warner	Director	UWI	Centre for Marine Sciences	Mona	Kings ton 7	Jamai ca		West Indies		876 9770262 /935 8835	gfwarner@ uwimona.e du.jm	876 977103 3/1075	
	Timon	Waugh	Research & Deveopment Environmental Coordinator	Coffee & Industry Board	Regulatory Division	Willie Henry Drive	Kings ton	Jamai ca		West Indies		876 7581259 /3903/29 25	Twaugh@ cwjamaica. com	876 758390 5	
Dr	Dale F.	Webber	Coastal Ecologist/Assista nt Director, CMS	The University of the West Indies	Departm ent of Life Sciences	Centre for Marine Science s, Mona	Kings ton 7	Jamai ca		West Indies		809 927 2753/97 7 1609	dwebber@ uwimona.e du.jm	809 977293 7/1033	
	Arlene	Wilson	Research Fellow	NPI	Mona Campus	UWI	Kings ton 5	Jamai ca		West Indies			Awil_83@ yahoo.com		
			Hazardous Waste Advisory Committee	National Farmers Association	Po Box 1717		Castr ies	St Lucia		West Indies		452 7277		453 2348	
	Everto n C	Ambros e	Plant Protection Specialist	Inter-American Institute for Cooperation on Agriculture	Po Box 1223		Castr ies	St Lucia		West Indies		758 451 6760/1	iica@cand w.lc	758 451 6774	
Mr	Harol d	Andrew	Hazardous Waste Advisory Committee	Ministry of Agriculture	Waterfro nt		Castr ies	St Lucia		West Indies	459 5937	459 7329		459 5302	
	Patrici	Aquing	Programme	Caribbean	The	Po Box	Castr	St		West		758	cehi@can	758	www.cehi

Tit le	FirstN ame	LastNa me	JobTitle	Company	Address 1	Address 2	City	State	Postal Code	Coun try	Home Phon e	WorkPh one	EMail	Fax	Other
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