DFID Natural Resources Systems Programme

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IMPACT AND AMELIORATION OF SEDIMENT AND AGRO-CHEMICAL POLLUTION IN CARIBBEAN COASTAL WATERS

Management options for the use of agro-chemicals in the environment

JULY 2003

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EXECUTIVE SUMMARY

- In St Lucia there has been a decrease in the number of medium (>10<200ha) and large (>200ha) farms and a corresponding increase in the number of small holdings (<10ha) since the 1960s.
- In Jamaica it is the activities on both the large and small farms that will be important in the management of agro-chemical use.
- Problems identified with respect to the use of agro-chemicals include illegal imports and their use, repackaging of chemicals by vendors removing the labelling, incorrect application, inadequate application equipment and protective clothing.
- There are specific requirements under national legislation as well as international obligations which must be implemented by St Lucia and Jamaica in order to ensure adequate management of the use of agro-chemicals.
- Each of the various national bodies are responsible for specific areas of training and education although a significant amount of overlap appears to exist between the various organisations.
- Model legislation, created by the OECS, includes aspects relating to the use of pesticides and can be considered as a framework for regional or harmonised legislation.
- Regional organisations such as OECS, WIBDECO and CGPC provide additional support and resources to national bodies where needed to encourage better use of agro-chemicals.
- Wider principles for informing agro-chemical management and pest control such as GAP (which incorporates ICM and IPM) and natural or biological control of pests are management options that can be used to ensure better management of agro-chemicals.
- Specific options recommended by international and regional bodies such as the FAO, WHO, ILO, UNEP CAR/RCU and others provide useful best practice guidelines.
- Public health of consumers should be given priority when considering national plans for the use of agro-chemicals.
- The overlap in the functions of the PCB/PCA and Ministries of Agriculture needs to be examined in order to rationalise the use of limited resources.
- Harmonised legislative and administrative systems throughout the region should continue to be pursued, and this should be supported by enhancing national capacity.

ACRONYMS

BVI	British Virgin Islands
C&E	Customs and Excise
CAFP	Caribbean Agriculture & Fisheries Programme
CAR/RCU	Caribbean Regional Co-ordinating Unit (UNEP)
CARDI	Caribbean Agricultural Research and Development Institute
C-CAM	Caribbean Coastal Area Management (Jamaica)
CEHI	Caribbean Environmental Health Institute
CEP	Caribbean Environment Programme
CGPC	Coordinating Group of Pesticide Control Boards in the Caribbean
CIF	Item cost plus Freight and Insurance
CPDA	Chemical Producers and Distributors Association
CPEC	Caribbean Regional Human Resource Development Programme for Economic Competitiveness
CRSP	Collaborative Research Support Program
DDT	Dichloro Diphenyl Trichloroethane
DFID	UK Department for International Development
DNAs	Designated National Authorities
EDADU	Export Development and Agricultural Diversification Unit
EUREPGAP	Euro-Retailer Produce Working Group Good Agricultural Practice
FAO	Food and Agriculture Organization
GAP	Good Agricultural Practice
GCDPP	Global Collaboration for Development of Pesticides for Public Health
GIFAP	International Group of National Associations of Manufacturers of Agro-chemical Products
GIS	Geographic Information Systems
GP	General Practitioner
ICM	Integrated Crop Management
IICA	Inter-American Institute for Cooperation on Agriculture
IMDG	International Maritime Dangerous Goods Code
ILO	International Labour Organization
IPM	Integrated Pest Management
LD_{50}	Lethal $Dose_{50}$ (amount of material which will kill 50% of test subjects in one dose)
LWI	Land Water Interface
MAFF	Ministry of Agriculture, Forestry and Fisheries (St Lucia)
MRAG	Marine Resources Assessment Group Ltd (UK)
MS	Member States
MSDS	Material Safety Data Sheet
MSMA	Sodium hydrogen methylarsonate
MYADP	Morant Yallahs Agricultural Development Project
NRCA	Natural Resources Conservation Authority
NRMU	Natural Resources Management Unit (of OECS)
NRSP	Natural Resources Systems Programme
OAS	Organisation of American States
OECS	Organisation of Eastern Caribbean States
OGA	Organic Grower's Association
PAHO	Pan American Health Organization
PCA	Pesticides Control Authority (Jamaica)

PCB	Pesticides Control Board
PDS	Product Data Sheet
PIC	Prior Informed Consent
PSD	Pharmaceutical Services Division, Jamaica
RADA	Rural Agricultural Development Authority (Jamaica)
SLASPA	St Lucia Air and Sea Ports Authority
SLBC	St Lucia Banana Corporation
STATIN	Statistical Institute of Jamaica
SWMA	Solid Waste Management Authority
USAID	United States Agency for International Development
UWI	University of the West Indies
WASCO	Water and Sewage Commission, St Lucia
WCR	Wider Caribbean Region
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme
WIBDECO	Windward Islands Banana Development Corporation
WINBAN	Windward Islands Banana Grower's Association
UN	United Nations
UNEP	United Nations Environment Programme

DEFINITIONS

Holding — An economic unit of agricultural production under single management comprising all livestock kept and land used wholly or partly for agricultural production purposes, without regard to title, legal form or size. It may consist of one of more parcels, located in one or more separate areas. Economic units engaged solely in forestry and logging or fishing or agricultural services are not considered agricultural holdings.[1]

[1] Source: 1996 Agricultural Census, St Lucia (MAFF, 1996)

BACKGROUND

Introduction

This report contributes to a three-year research project *Impact and amelioration of sediment and agro-chemical*[2] *pollution in Caribbean coastal waters* which 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 by two organisations: the University of York, responsible for the sedimentation aspects of the project; and MRAG Ltd, responsible for agro-chemical components of the project, and was conducted in collaboration with project partners in Jamaica (University of the West Indies: Centre for Marine Sciences, Department of Chemistry, Natural Products Institute, and Caribbean Agricultural Research Institute; and, Caribbean Coastal Area Management Foundation) and St Lucia (MAFF: Department of Fisheries and Department of Agriculture; and, Caribbean Environmental Health Institute). Agro-chemical related activities were undertaken in St Lucia and Jamaica. The project commenced in June 2000 and ends in July 2003, with the publication of guidelines for best management practices for agro-chemical management.

The present document aims to provide a review of the management options or best practice guidelines for the use of agro-chemicals. The review has taken place on a national scale, in St Lucia and Jamaica, and on regional and international scales. The types of agro-chemical users (from small scale farmers through to pesticide operators on a plantation) have been examined as well as the requirements under national legislation and the international obligations in respect of the use of agro-chemicals. Existing management options are discussed for the different user groups and the report concludes by identifying the gaps that exist in both St Lucia and Jamaica to meet the various legislative and international obligations and gives recommendations on how these may be reduced. This information will contribute to the wider project objective of a broader technical understanding of the extent to which agro-chemicals are applied and impacting on the environment in two representative countries in the Caribbean. St Lucia has been selected as a detailed case study, including thorough investigation of the fate of agro-chemicals in the environment. Jamaica has been chosen to provide a contrasting example of intensive agricultural land use on a large Caribbean Island. Agro-chemical inputs were estimated from importation data and literature reviews and differences in appropriate best management practices were explored.

Whilst active administrative management of agro-chemicals commenced with the first Pesticide Control Acts in St Lucia and Jamaica in 1975, subsequent amendments and statutory instruments have incorporated new administrative management options and they have been explored in an earlier report in this series[3]. Management options other than administrative management have been investigated within both St Lucia and Jamaica by a number of project partners[4] whose research contributes to this document (Boodram, 2002; Dasgupta and Perue, 2003; Edwards, 2001; Esteban *et al.*, 2003; Lewis and Esteban, 2002; Pearce and Esteban, 2002; Simpson, 2003).

[2] For the purpose of the current project, the term agro-chemical includes pesticides and fertilisers used in agriculture.
[3] Importation, administration and harmonisation of agro-chemical management in St Lucia, Jamaica and the wider Caribbean (see Esteban *et al.*, 2003).
[4] Jamaica: CARDI, CCAM, UWI; St Lucia: CEHI, MAFF Agricultural Extension Services.

Consultations with relevant institutions[5] have also taken place between November 2000 and June 2002 and this report also draws on comments, experience and work published by their institutions.

Objectives

The objective of this study was to identify existing best practice options for the use and application of agro-chemicals and to highlight potential improvements within case study countries, Jamaica and St Lucia, and for the wider Caribbean. Management options or best practice generally include advice on handling and application of agro-chemicals, and the wider education, training and awareness needs; and also involve appropriate legislative and policy measures to improve management of agricultural non-point sources of pollution. An earlier report in this series[6] focused on appropriate legislative and policy arrangements, whilst this report focuses on institutional arrangements available to provide advice to users of agro-chemicals, generic policies and recommendations towards agro-chemical use on a country, regional and international scale.

This report will look to answer the following questions:

- Amongst the users of agro-chemicals, are there any user groups not targeted to receive advice? Who has jurisdiction for different user groups?
- Are the institutions mandated to implement agro-chemical management achieving all the requirements of international obligations and national legislation in respect of their use, either directly, or via conditions of licensing of intermediary organisations?
- Are there voluntary principles and recommendations that are not covered but which should be given priority within the context of limited resources?

The overriding aim is to improve the use of agro-chemicals in order to reduce their impacts on human health and the environment.

The report draws on research carried out in St Lucia and Jamaica between 2000 and 2002[7] and is divided into four sections followed by details of reference materials.

- Section one covers the characterisation of agro-chemical users in Jamaica and St Lucia, from a large scale plantation farm through to small farms and pesticide applicators, including poor farmers. It describes the institutions responsible for identifying management options and providing advice to agro-chemical users.
- Section two draws on research carried out in St Lucia and Jamaica, and also participation at annual meetings of the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC), to detail current requirements under both national and international legislation as well as any regional organisations that provide support and resources in terms of the use of agro-chemicals.
- Section three describes the internationally recognised management options for the use of agro-chemicals, including generic approaches and alternatives.

[5] Jamaica: PCA, RADA, PSD, Coffee Industry Board, Water Resources Authority; St Lucia: PCB, MAFF, SLASPA, Customs & Excise, OECS, SWMA, STATIN, WIBDECO, Bureau of Standards, SCIC, WASCO, Water Authority.

[6] Importation, administration and harmonisation of agro-chemical management in St Lucia, Jamaica and the wider Caribbean (see Esteban *et al.*, 2003).

[7] Amelioration of sedimentation and agro-chemical pollution in Caribbean coastal waters. DFID NRSP project R7668.

- Based on the policies and recognised management options described in section two and three, section four identifies the existing gaps in both St Lucia and Jamaica to meet the various legislative and international obligations as well as looking to see which best practice guidelines are applied. Recommendations are presented to resolve these gaps in policy, towards improved agro-chemical use.

1 CHARACTERISATION OF AGRO-CHEMICAL USERS

1.1 Introduction

Developing countries use more than 20 % of the world production of agro-chemicals and are responsible for about 70 % of the total number of cases of acute poisoning occurring in the world, which corresponds to more than 1.1 million cases. The extent of the damage to one's health caused by agro-chemical exposure will vary according to the type of crop cultivated, the type of agro-chemical used, the method of application or exposure, the individual susceptibility and the climatic conditions.[8]

This section presents a characterisation of agro-chemical users in St Lucia and Jamaica, from a large-scale plantation farm through to small farms and pesticide applicators, including poor farmers. It describes the institutions that have jurisdiction for farming practices and those responsible for providing advice to agro-chemical users. An earlier report in this series reported on characterisation and quantification of farming units in Jamaica and St Lucia (Simpson, 2003) and highlights are included in this section. With regard to St Lucia, information on the cross section of farmers was provided in a project workshop (Esteban *et al.*, 2001) and through two project reports by representatives of MAFF (Leandre, 2001 and Philigence, 2001).

1.2 Cross section of farmers

1.2.1 St Lucia

This section draws on the last Agricultural Census of St Lucia (MAFF, 1996), and two earlier project reports (Esteban *et al.*, 2003 and Simpson, 2003).

1.2.1.1 Farming units

The area of farmland in St Lucia decreased by 11.5% in the period of 1986-1996 to a total area of 20,770 ha (Ministry of Agriculture, Forestry and Fisheries (MAFF), 1996). In fact, there has also been a steady decrease in the area of holdings since the early 1960s. However, despite this recent decrease in the area of holdings, the number of holdings has increased by 15.7% between 1986 and 1996 to 13,366. This increase in number of holdings and decline in agricultural area has obviously had an impact on the size structure of holdings, and there have been a growing number of small holdings (see Figure 1.1). The recent increase of nearly 2000 holdings was explained by 780 new landless holdings and 1058 more holdings of less than 10ha. There has also been a decrease in medium and large holdings (In this case classification of farms were as follows: small fams were considered to be <10 ha, medium holdings 10-200ha and large holdings >200ha). Due to this increase in the number of smaller holdings and an additional increase in the last 10 years (between 1986 and 1996) in the number of permanent crops (MAFF, 1996), this indicates a more intensive use of land. This is of course important in the context of soil management and the use of agro-chemicals.

[8] Source: www.ilo.org

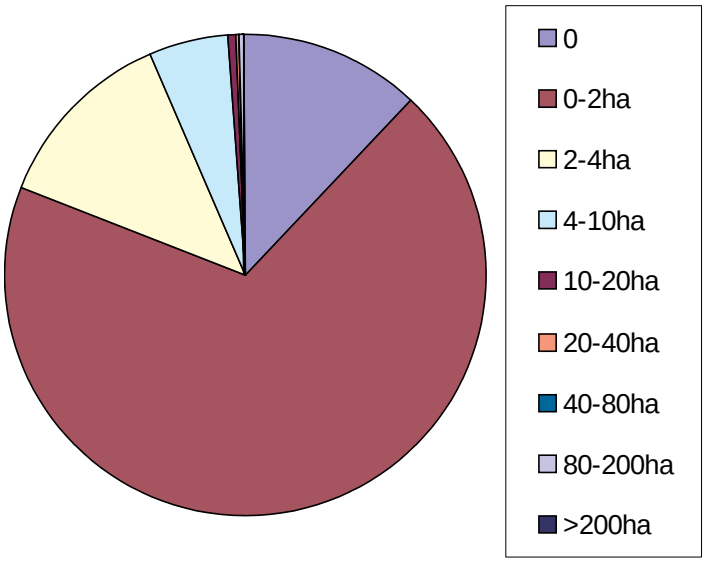

Figure 1.1 Number of holdings in relation to farm size in St Lucia[9]

1.2.1.2 Crop type[10]

The island has very fertile volcanic soils and according to MAFF (1996), 15,795ha of land is farmed out of the total area available for farming of 20,786ha. A survey of a representative sample of large and small farms in three watersheds (150 farms surveyed), Rouseau, Praslin and Soufriere was carried out in early 2002 to determine the main farming practices. For the puposes of this survey, farms were classified as small if they were less than 5ha and large if they were greater than 5ha. 150 farms were surveyed with 23 considered as large farms of more than 5 ha and the remaining 127 farms were below 5 ha and were considered small farms. The majority of farms surveyed were from the Rouseau watershed, as this was the largest and most significant watershed in terms of agricultural production. The primary crops found to be grown on all the farms surveyed in the three watersheds were root crops (38.7%) and bananas (37.3%), and then to a much lesser degree mixed vegetables (8.0%) and tree crops (5.3%) (see Table 1-1). Over the three watersheds surveyed, because bananas were grown on the larger farms, the total area under bananas was actually much higher than that under the root crops, making it the most important crop in St Lucia.

Table 1-1 Main crops grown on the farms surveyed in St Lucia[11]

Crop Type	No. of farms	% of farms
Banana	56	37.3
Mixed vegetables	12	8.0
Root crops	58	38.7
Tree crops	8	5.3
Ornamentals	1	0.7

[9] Source: 1996 Agricultural Census, St Lucia (MAFF, 1996)
[10] For more information see Simpson, 2003 (based on STATIN 1996 data).
[11] Source: Simpson, 2003.

Banana/mixed vegetables	1	0.7
Banana/Root crops	5	3.3
Mixed vegetables/root crops	6	4.0
Mixed vegetables/tree crops	1	0.7
Ornamentals/citrus	2	1.3
Total	150	100%

Previous studies have shown that the Roseau watershed had an estimated 1245 farms with the majority (1200) being considered small farms of 2 ha or less (in this case classifications of farms was the following: small <2ha, medium 2-10ha and large farms over 10 ha). There were 35 medium sized farms of 2-10 ha and 10 large farms of over 10 ha. The large farms grew bananas and tree crops, while the medium sized and small farms grew bananas, tree crops, food crops and root crops. In Praslin, the watershed had a total of about 127 farms with a majority (80) of small farms and about 47 medium sized farms and 10 large farms. The large farms grew mainly bananas, coconuts, citrus and cashew trees and the medium sized and small farms grew bananas, coconuts, breadfruit, cashew trees, vegetables, hot pepper, corn and root crops. Lastly, in the Soufriere watershed, there were over 210 farms with the majority (>200) being small farms. The large farms grew coconuts, cocoa, breadfruit, avocado and mango trees and the medium sized farms grew coconuts, avocado, cocoa and citrus and mango and finally the small farms grew mainly dasheen and yams and other vegetables.[12]

1.2.1.3 Characteristics of Farmers

Data showed that male farmers exceeded female farmers by just under 3:1 in 1996 (MAFF, 1996) and an even greater pattern of 5:1 was observed in the 3 watersheds surveyed. Average age of farmers was in the range of 41 to 50 years old for both male and female farmers. More information on farmer characteristics is detailed in an earlier report in this series.[13]

1.2.2 Jamaica

The farming units and farmers in Jamaica in two study watersheds (Rio Cobre and Wag Water), were characterised in an earlier report in this series.[14] Highlights of this report are presented below.

1.2.2.1 Farming units

Of the 407,434ha of farmland in Jamaica, a considerable proportion (38%) consists of large plantations of over 200ha and these make up a mere 0.11% of the 187,791 registered holdings. On the other hand, smaller farming units of less than 10ha operate 42% of farmland and this land is divided into 90% of the total farming units. The division of farmland into differently sized holdings is illustrated in Figure 1.2 and Figure 1.3, which firstly show the predominance in number of smaller holdings (less than 10ha but in particular less than 1ha) and secondly the dominance of large plantations in terms of farmland area in Jamaica. This means that it is both the small farms, which are likely to put extreme pressure on the land area, and the large

[12] For more information, refer to Workshop Proceedings, 2003 (based on STATIN 1996 data).
[13] Source: Simpson, 2003.
[14] Review of soil management and farming practices, including the use of agro-chemicals in the Caribbean, with particular reference to St Lucia and Jamaica. (see Simpson, 2003)

plantations which need to be considered in terms of agro-chemical use and soil management.

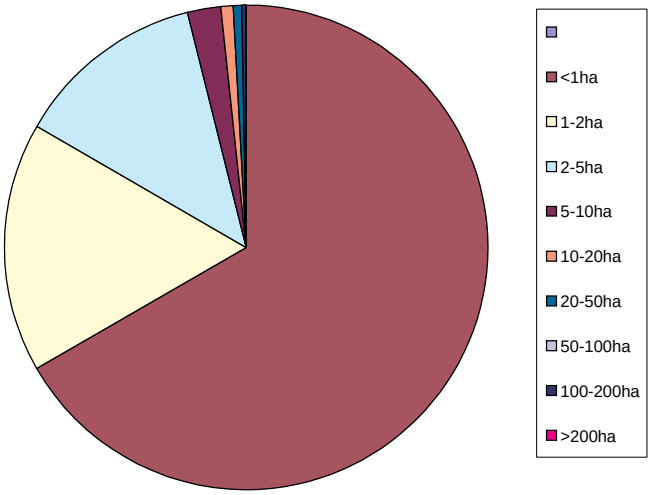

Figure 1.2 Number of holdings in relation to farm size in Jamaica[15]

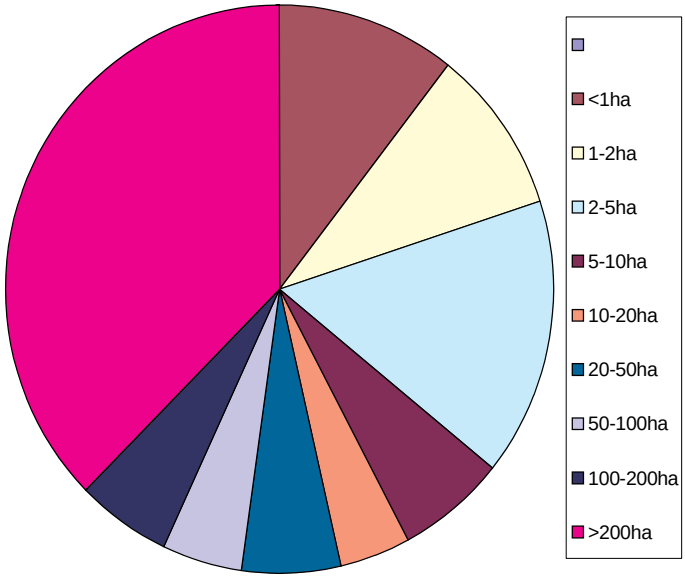

Figure 1.3 Proportion of holdings in relation to size, Jamaica[16]

1.2.2.2 Crop type

Records show that 32% of farmland is under permanent crops, however no data were provided for the area under annual crop. The most important permanent crop is sugar cane (41%), followed by banana, coconut, citrus and coffee (each occupying less than 10% of the area under permanent crop).

There are distinct groups of crops being grown in different categories of farm holding: farms of <1ha grow banana, sugar cane, coffee, plantain and cocoa (in order of importance by area farmed), whereas farms of >200ha grow sugar cane, orange, coconut, banana and pimento. It is interesting to see that both categories of farms

[15] Source: STATIN, 1996.
[16] Source: STATIN, 1996.

placed high priority on sugar cane and banana and summary data are shown in Table 1-2, demonstrating the difference in importance of different crop types.

Table 1-2 Comparison of importance of crop types for large and small farms and for total farms in Jamaica (by area)[17]

Crop (decreasing significance)	Farm size < 1ha	Crop (decreasing significance)	Farm size > 200ha	Crop (decreasing significance)	Farm size Total
Banana	3540	Sugar cane	35536	Sugar cane	53294
Sugar cane	1936	Orange	4492	Banana	16080
Coffee	1815	Coconut	3852	Coconut	13883
Plantain	1318	Banana	3003	Coffee	10807
Cocoa	1039	Pimento	1707	Orange	10261
Other crops	906	Coffee	823	Cocoa	7026
Coconut	875	Other crops	619	Pimento	5061
Mango	866	Mango	575	Plantain	4581
Orange	744	Ortanique	482	Other crops	3951
Pimento	301	Cocoa	221	Mango	3259
Avocado	258	Grapefruit	98	Ortanique	830
Grapefruit	160	Plantain	66	Avocado	759
Ortanique	34	Avocado	10	Grapefruit	717

The Rio Cobre and Wag Water watersheds were selected as representative case studies both under the influence of increasing population. In consultation with RADA staff from the two study catchments (Edwards *et al.*, 2001), it was agreed that the crops of importance were sugar cane, citrus, banana, coffee, yams and mixed vegetables in the Rio Cobre watershed, whilst in Wag Water important crops are coffee, banana, plantain, yams, hot pepper and mixed vegetables. In fact, the larger holdings were dominated by the monocrop system of more permanent crops of sugar cane, citrus, banana, plantain and coffee. Although smaller holdings consisted of a multiple crop system, they also had permanent crops, which tended towards types of cash crops, such as hot peppers, yam and mixed vegetables.

1.2.2.3 Characteristics of farmers

Data for demographics of the farming population were not readily available for the study watersheds and was limited to electoral districts and not watersheds. Data however did show that male farmers exceeded female farmers by just over 4:1 in Wag Water (4,460 male and 1,110 female farmers) and a similar pattern was evident in Rio Cobre (13,128:3,908). Average age of farmers was in the range of 61 to 70 years old. More information on farmer characteristics is detailed in an earlier report in this series.[18]

[17] For more information, refer to Simpson, 2003 (based on STATIN 1996 data).
[18] Simpson, 2003.

2 REQUIREMENTS UNDER INTERNATIONAL OBLIGATIONS AND NATIONAL LEGISLATION

The following section details the international and regional obligations, that either directly, or via conditions of licensing of intermediary organisations, cover the use of agro-chemicals. Furthermore, national laws for agro-chemical management, and the organisations that implement them, are described for the case study countries of St Lucia and Jamaica. Regional organisations and schemes, such as the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC) and the Organisation of Eastern Caribbean States (OECS), are also discussed as they are the main organisations that currently encourage, facilitate and support the harmonisation of legislation for the region.

2.1 International Obligations

2.1.1 The Cartagena Convention and its Protocol Concerning Pollution from Land-Based Sources and Activities[19]

The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, 1983, or the "Cartagena Convention," is the main environmental treaty for the region. The Convention and its Protocols constitute a legal commitment by these countries to protect, develop and manage their common waters, individually and also in cooperation with one another. The Convention has 3 main protocols covering the following areas: combating oil spills; specially protected areas and wildlife; and prevention, reduction and control of marine pollution from land-based sources and activities (LBS Protocol, 1999). The LBS Protocol assists countries in the Wider Caribbean Region (WCR) to also follow the United Nations (UN) Convention on the Law of the Sea and also the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities. Both of these instruments suggest that this problem should be addressed regionally. This is very evident in the WCR, as a large number of the countries are very small and most of the marine environment falls under national jurisdiction, suggesting trans-boundary pollution concerns.

The LBS Protocol to the Cartagena Convention covers the general obligations and responsibilities that states have, as well as specific technical annexes that place strong importance on certain pollution categories. Annex 1 covers a general list of the sources, activities and contaminants that are of concern to the WCR countries. Annex 2 establishes the process for developing regional source-specific controls for the various activities or sources that have been identified in Annex 1. Annex 3 specifically addresses domestic wastewater and sets effluent limitations for the control of sewage that discharges into the marine environment. Lastly, Annex 4 covers agricultural non-point sources of pollution.

National obligations to Annex 4 of the LBS Protocol to the Cartagena Convention (ratified by St Lucia and Jamaica) requires all countries to have national plans in place for the control of agricultural run-off, no later than five years of the Annex entering into force. The plans should also include an evaluation and assessment of the agricultural non-point sources of pollution that may adversely affect the region; comprehensive education programmes for those involved in agriculture; the development and promotion of economic and non-economic incentive programmes; and an assessment and evaluation of legislative and policy measures including the establishment of a plan to implement changes deemed necessary to achieve best

[19] UNEP, 2000

management practices. This LBS Protocol is the first regional environmental agreement where there are limitations placed on effluent and that specific obligations or requirements must be met within a specific time frame. Improvements in pollution control should therefore be evident when countries have correctly implemented these annexes.

2.1.2 FAO Prior Informed Consent

The Food and Agriculture Organization (FAO) of the United Nations set up the voluntary Prior Informed Consent (PIC) scheme in the 1980s, which required exporters trading in a list of hazardous substances to obtain the prior informed consent of importers before proceeding with the trade. In 1998, governments decided to strengthen the procedure by adopting the Rotterdam Convention, which made the PIC legally binding. The Convention helps to give importing countries the tools and information they need to identify potential hazards and exclude chemicals they cannot manage safely. If a country agrees to import chemicals, the Convention promotes their safe use through labelling standards and technical assistance. It also ensures that exporters comply with the requirements that the importing countries impose upon them. Generally pesticides on the PIC list are those that have been scientifically proven to be extremely toxic and have been banned or are severely restricted in most countries. The PIC scheme creates an international approach to exporting these banned or severely restricted chemicals and pesticides among the countries who are signatories of the agreement. PIC also provides a forum for networking among pesticide experts in over 100 countries worldwide to discuss pesticide-related issues.

The PIC procedure is implemented jointly by the FAO and the United Nations Environment Program (UNEP) through the FAO/UNEP Joint Programme for the Operation of the PIC. The Plant Production and Protection Division of FAO is the lead agency for pesticides and UNEP Chemicals, is the lead agency for other chemicals.[20] In addition, designated national authorities (DNAs) are responsible for administrative functions related to the exchange of information and decisions regarding importation of chemicals included in the PIC scheme. In the Caribbean, there are DNAs in Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago.

2.1.3 FAO Code of Conduct

In addition to formally ratified obligations, the Organisation for Eastern Caribbean States (OECS, see section 2.4.2) has recommended member states to adopt and implement the voluntary FAO Code of Conduct on the Distribution and Use of Pesticides (2002), which was developed in consultation with other UN agencies. The main objectives of the Code are to set responsibilities and voluntary standards of conduct for public and private organisations that are involved in or affecting the distribution and / or the use of pesticides, and especially in those countries where there are no national laws to regulate pesticides. The articles of the Code cover: pesticide management; testing of pesticides; reducing health and environmental hazards; regulatory and technical requirements; availability and use; distribution and trade; labelling, packaging, storage and disposal; advertising; information exchange; and monitoring and observance of the Code. It is recommended by the FAO and the OECS that this Code be widely distributed among the various regulatory bodies, and that efforts should be made to implement the articles of the Code.

[20] Source: www.agrifood-forum.net/response/pic.asp (2001)

2.2 Harmonisation of Legislation and Policies

The increased use of agro-chemicals in many of the OECS countries and the varying legislation in the different islands has resulted in very little control over the usage and trade of these chemicals in the region. Model pesticides and toxic chemicals legislation (incorporating many of the regional and international obligations and recommendations) has been developed by the OECS and supported by the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC) and the Inter-American Institute for Cooperation on Agriculture (IICA) (for more information on CGPC and IICA see sections 2.4.5 and 2.4.4 respectively). This model legislation includes aspects relating to the use of pesticides for the OECS and can be considered as a framework for regional or harmonised legislation.

The model legislation suggests that pesticide control boards should be set up in all states and that they should cover not only the control of pesticides but also toxic chemicals. Another requirement is the enactment of required pesticide regulations. Pesticides will also need to be registered and those persons running pest control operations, or selling or manufacturing pesticides, will need to be trained and licensed. Lastly, the model states that pesticides and toxic chemicals should be correctly stored, appropriately transported, and disposed of in adequate containers and packaging. This legislation is also greatly supported by the work of other national, regional and international organisations such as UNEP.

St Lucia and St Kitts & Nevis have ratified the model legislation and St Lucia has based its new Pesticides and Toxic Chemicals Control Act (2001) upon it, however it remains to be implemented more widely in the WCR. In Jamaica a variety of legislation covers management of pesticides. Section 2.3 will look into the current legislation in both St Lucia and Jamaica as well as the institutions mandated to implement agro-chemical management.

2.3 National Legislation

2.3.1 St Lucia

The main legislation in St Lucia that has been set up to assist in the control and use of agro-chemicals includes the following:

- Pesticides and Toxic Chemicals Control Act … No. 15 of August 2001
- Plant Protection Act … No. 21 of 1988
- Plant Protection Regulation 66 of 1995
- Pesticide Control (Registration and Licensing) Regulations No. 71 of 1987
- Pesticide Control Act No. 7 of 1975

Until recently the main legislation was governed by the Pesticide Control Act No. 7 of 1975 however St Lucia has recently introduced a new Pesticides and Toxic Chemicals Control Act in 2001. This is based on the model legislation drafted by the OECS, mentioned in the previous section, and can be considered as a framework for regional legislation.

The requirements in the above legislation are implemented via the Ministry of Agriculture, Forestry and Fisheries and the Pesticide Control Board (PCB) which will both be discussed in the following sections. In addition, a number of intermediary bodies, such as the St Lucia Banana Corporation and the agro-chemical vendors,

also have a role to provide some support to the agro-chemical users by providing training and advice and these will also be described in greater detail. The sections below will discuss the current responsibilities of the various organisations, based on the Pesticide Control Act of 1975. This is due to the fact that many of the requirements of the recently introduced Pesticides and Toxic Chemicals Control Act of 2001 have yet to be implemented.

2.3.1.1 Ministry of Agriculture, Forestry and Fisheries

The Ministry of Agriculture, Forestry and Fisheries (MAFF), through its Extension Services, advises farmers on the concept of integrated pest management (IPM), gives guidelines on how to grow certain crops, and also gives advice on the use of agro-chemicals. For example, a pamphlet that describes the IPM approach has been produced (April 2002) and certain IPM practices are promoted such as:

- The use of natural plant resistance
- Cultural practices, including time of planting, crop rotation, intercropping/mixed cropping, field sanitation, and irrigation.
- Biological control
- Physical/mechanical methods
- Chemical control

Recommendations are also given for: pre-planting, land preparation, nursery, planting out, cultural practices and harvesting. Recently, due to crops becoming more resistant to agro-chemicals, alternative options have been promoted, such as organic farming, biological control, crop rotation and other systems. The principles of IPM (as mentioned above) are being used and due to the various countries that St Lucia exports to, organic production is becoming more and more popular to meet the specific needs of these various markets.[21]

The Extension Services also produce short educational pamphlets to give production guidelines on each specific crop including site selection, time to plant, fertilizer use, weed control, pest and disease control (through natural and chemical methods), harvesting and approximate yields. MAFF has produced brochures on how to grow the following crops: plantain, cassava, celery and parsley, ginger, ginger lilies, herbs, lettuce, orchids, sweet pepper, sweet potatoes and yams.[22]

Farmers are also educated on the use of agro-chemicals (pesticide and fertiliser use). Technological packages are developed for each crop by the promoters and developers of the chemicals and in certain cases, this information is also validated by MAFF or by regional institutions. When there is no prescriptive information on the specific chemicals or fertilisers, farmers are advised to use them according to the information on the packaging labels. Workshops are also held by MAFF to demonstrate the methodologies to be used when applying pesticides or fertilisers, including when and where to use them. These workshops emphasize the safety and health issues relevant to the use of agro-chemicals, and especially those specific to the people that actually spray or apply the chemicals. Farmers are advised on what personal protective equipment should be worn or used during application and also the best methods of storage and disposal of excess pesticides and mixtures.

MAFF also recognizes that many farmers in St Lucia are over 55 years of age, making it difficult to transfer information and technology. It is believed that students have some influence on their parents and can help transfer certain practices on the farm. Schools therefore, educate students on the safety and proper application and

[21] Leandre, 2001

[22] MAFF pamphlets all produced in April 2002 except for the guide to growing plantains which was produced in April 2001.

use of agro-chemicals. Various campaigns and strategies are also used to educate the wider public and advertise the use of agro-chemicals including: radio, TV, newspapers and other media.

Some farmers in St Lucia obtain pesticides without any license and therefore do not necessarily know how to use, store or dispose them. Therefore, the one to one contact with the Extension Services, although sometimes slow and expensive, serves its purpose in ensuring that the proper methodologies are applied when using agro-chemicals.[23]

Recently, MAFF has gone through a process of restructuring and strengthening its various divisions including the Extension Services. They have integrated the previous Engineering Division, into a new Land Resource Management Unit for the management and conservation of soil in St Lucia. This Unit provides support to the Extension Services in drainage construction and other soil conservation measures on farms. They also advise farmers on general farm layout and road construction. Such practices as: the establishment of contours; graded drains and terraces; mulching; gully control; the establishment of tree and fruit crops as barriers to control erosion; agro forestry in excessively sloping areas; intercropping; the use of trash lines especially in banana based farming systems; and many other soil management techniques are promoted by the Land Resource Management Unit to help reduce erosion and affect water management. However, these techniques are costly and therefore farmers are sometimes not able to afford the measures recommended. In the 1980's, subsidies and loans were occasionally provided by the Extension Services to encourage drain construction and maintenance and therefore this was more successful. There have however, been varying degrees of success with the farmers actually using many of these soil conservation techniques, even though they have been instructed on the importance of soil management practices.[24]

2.3.1.2 Pesticide Control Board

In St Lucia, MAFF has also established a specific board under the Pesticides Control Act of 1975, which provides for the control of imports of pesticides, their sale, use and storage. The Pesticide Control Board (PCB) is supported by the Plant Protection Board and the Plant Protection Unit of MAFF, for pest and disease control. The Pesticide Control Board is responsible for advising the Minister of Agriculture on matters relevant to the making of the regulations under the Pesticides Act and also to carry out the provisions of the Act itself. They are also responsible for the registration of new pesticides and issue licenses for each consignment of pesticides. Various details on the interaction between the PCB and other institutions in St Lucia responsible for the control of imports are detailed in an earlier report in this series (Esteban *et al.*, 2003).

The PCB provides advice and training to farmers (all sizes of farms) through the activities of the Crop Protection and Quarantine Unit (MAFF), where the PCB Secretariat is housed. This is done mainly through farmer workshops carried out in the various extension regions.[25] The PCB has established clear guidelines and rules concerning the proper labelling of agro-chemicals before entry into the country. In addition, the PCB has conducted public awareness programmes on agro-chemical usage as well as advising farmers on the proper clothing to be worn and the proper disposal procedures for agro-chemical usage. For the disposal of pesticides, St Lucia also has a Solid Waste Management Authority.

[23] Philigence, 2001
[24] Philigence, 2001 and Leandre, 2001
[25] Mathurin, pers. comm.

As mentioned earlier, the system for registration and licensing is currently changing with the recent issuance of the Pesticides and Toxic Chemicals Control Act, August 2001.[26]

2.3.1.3 St Lucia Banana Corporation

As previously mentioned, the St Lucia Banana Corporation (SLBC) is a specific board for banana farmers and registered farmers sell their products directly to the SLBC. In exchange, the farmers receive a credit facility to buy agro-chemicals, assistance from the SLBC extension officers including advice on soil conservation and informational guides on banana farming and agro-chemical application rates and treatment. Due to the fact that the registered farmers buy agro-chemicals using these credit facilities offered by SLBC, the SLBC has a role and influence in determining the types of agro-chemicals that are imported and manufactured in St Lucia. A Banana Grower's Manual has been produced by the SLBC that gives farmers advice on banana farming and agro-chemical use and application rates. The SLBC's certification programme also requires that all farmers demonstrate their compliance with national and international legislation. Finally, they also use radio and TV programmes to educate and inform their farmers on the use of agro-chemicals.

2.3.1.4 Agro-chemical vendors and manufacturers

Agro-chemical vendors have responsibilities relating to the use of agro-chemicals which may be defined in their terms and conditions of licences. The new Pesticides and Toxic Chemicals Act, based on the model OECS legislation, requires the definition of responsibilities for stewardship of chemicals by importers and others to be reflected through licensing requirements. Although there is no legal requirement for this presently, it will become one once the Act has been more widely implemented.

In St Lucia, the majority of agro-chemicals until recently were either imported or produced by the SCIC as the company imported pesticides as well as raw materials for the production of fertiliser. The SCIC has recently closed and the main importer is now the St. Lucia Agriculturists' Association who distributes to the banana companies and farmers. SCIC had an agronomist that analysed the soil types (paid for by the farmer) and then advised the farmer on the best fertiliser or pesticide to use. Other retail and wholesale suppliers are Renwick and Company and the St Lucia Agricultural Association. Renwick is presently undertaking research with Peto Seed on various farm inputs and agro-chemical usage. The company agronomists conduct training workshops which are usually aimed at all types of farms and extension personnel.[27]

Some of the above mentioned companies and others manufacturing and selling the products, usually conduct training workshops on the use of their chemicals, especially when a new agro-chemical has recently been introduced to the market. The technical packages for various crops are usually distributed to MAFF personnel and farmers and contain information as to which pesticide products should be used on which crops and when to use them. Safety procedures are also strongly recommended by the manufacturers and vendors and these are indicated on the various labels of the chemicals and on the material safety data sheets when they come into the country. All purchases of pesticides and fertilisers (type and volume) are also made according to recommendations made by the SLBC and WIBDECO (see section 2.4.1) based on the maximisation of the impact of the agro-chemical on the crop.

[26] For more information on this Act see Esteban *et al*. 2003.
[27] Mathurin, pers. comm.

2.3.2 Jamaica

There is a variety of legislation that covers control, administration, application, use and disposal of pesticides in Jamaica and the primary ones 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
- Pesticides Act, 1975

The requirements in the above legislation are implemented via a number of organisations in Jamaica which include the Rural Agricultural Development Authority (RADA), under the Ministry of Agriculture, and the Pesticide Control Authority, under the Ministry of Health, which will both be discussed in detail in the following sections. Intermediary bodies such as the various agricultural boards and the agro-chemical manufacturers and vendors also provide support to the agro-chemical users by providing training and advice and their responsibilities will also be described.

2.3.2.1 Rural Agricultural Development Authority[28]

The Rural Agricultural Development Authority (RADA) is under the Ministry of Agriculture and has 60 field or extension officers responsible for about 60 different geographical areas. The size of each geographical area varies according to the number of farmers and the types of crop. Each extension officer holds about two training sessions per extension area per month and tries to assist all farmers irrespective of the crop type and size. The different sessions include training on livestock, crops, farm management and record keeping. All of the field or extension officers must have a College of Agricultural Science educational qualification in order for them to have basic training on agro-chemical use and soil conservation. RADA mainly focuses on domestic agricultural crops and prioritises small farmers as large farmers are generally commodity based and receive significant support from their agricultural boards.

Within RADA, there is also a separate section which covers land husbandry or soil conservation. There are seven officers who are placed in the various parishes to train other extension officers. RADA no longer has funding to practice mechanical methods for soil conservation, as it was previously found not to be cost effective when RADA hired out their equipment to farmers. They now encourage farmers to use what they have on their own land. Some of the land management techniques promoted by RADA include the following:

- Stone barriers
- Grass cover crop (harvested and then used as fodder for livestock)
- Trees (*Lucina, Caliendra*) that grow fast and form barriers
- Contour planting

[28] For more information see Report of a project visit to Jamaica and St Lucia (Esteban, 2001)

There is no standard manual for land management or soil conservation techniques, however, RADA gives training to field officers in order for them to maintain current and up to date methods and practices. The main role of the various extension officers on the farms is to teach land preparation and soil planting methods.

Farmers are encouraged to determine the soil type on their farms and the RADA officers help them to analyze soil samples at the Rural Physical Planning Unit labs. The labs make recommendations and field officers are trained to interpret results and make specific recommendations to farmers. Many farmers do not know their soil type as they cannot afford the soil tests and therefore farmers tend to rely on more traditional methods.

RADA is currently trying to introduce farmers to organic farming and the Organic Growers Association (OGA), which has recently been established in Jamaica, although it is in its very early stages of development. The Ministry of Agriculture encourage this organic movement. The OGA has several inspectors that certify organic growers. In addition, training seminars on organic production occasionally take place to help increase the number of certified inspectors and RADA field officers have been encouraged to participate.

The RADA Extension Services provide advice to farmers through many different informational guides such as two of them titled: Minimum Tillage; and Pineapple Barriers, both produced in conjunction with the Morant Yallahs Agricultural Development Project (MYADP) in St Thomas to encourage soil management practices that can help to reduce erosion on sloping land.[29] Another brochure has been produced on how to make and use the A Frame as well as a guide on the fact that all hot peppers exported from Jamaica to the USA must now be fumigated because of gall midges being found. Two other guides have also been produced on how to use pesticides and fertilisers. These brochures include information on how to:

- choose the right pesticide or fertiliser through soil tests or field trials
- handle the products
- follow Good Agricultural Practices (GAP)
- apply or spray them including measuring and mixing
- clean up after using the chemicals
- transport or store them

In addition, guides have also been produced on how to grow specific crops including broccoli, cauliflower, hot pepper, callaloo, cucumber and cabbage. These include information on site selection, how to grow the crop, recommended varieties, fertiliser application, weed control, pest and disease control through agro-chemical use, harvesting, packaging and storage, transporting and even cooking tips. Lastly, some of the RADA plant protection specialists also produce briefing notes and/or papers on the integrated management of certain crops such as callaloo, sweet potato and paw-paw which can also be useful to farmers. Many of these guides are produced in cooperation and with support from the Caribbean Agricultural Research and Development Institute (CARDI).

CARDI is mainly involved in the research of agro-chemicals in order to transfer technology to farmers. They also provide services to agencies and agro-chemical suppliers for trial purposes. Results from the research on the effectiveness of these agro-chemicals are communicated to the farmers through the RADA Extension Services or through individual representatives of the various agro-chemical suppliers. CARDI has also been involved in land resource management projects in St Lucia.

[29] For more information see Reference section RADA 1999a and 1999b.

2.3.2.2 Pesticide Control Authority

Established in 1992 under Section 3 of the Pesticides Act, 1975, and under the Ministry of Health, the Pesticide Control Authority (PCA) oversees pesticide regulations in Jamaica. The PCA implements legislation and monitors and regulates the use of pesticides. The system is similar to that of St Lucia, where pesticides must be registered and each import consignment must be licensed by the PCA. Regulations also specify the application rates, the maximum acceptable residue and breakdown product levels for the health of humans and domestic animals, the periods of use, the disposal of unused pesticides and used packaging. The PCA keeps registers of pesticides, licensees, authorized persons and premises and a register of pest control operators.

The PCA enforces the fact that according to the Pesticide Control Act, 1975, there are two main classes of pesticides; those which are prohibited and those that must be registered and then are approved for use under certain circumstances. Those pesticides that are prohibited, are prohibited because they are banned in the country of manufacture; banned in other countries; the chemical has been shown to have damages to health or the environment in other countries; records have shown that this chemical has been found in Poison Control Centres in other countries; it is banned by the WHO; or it is on the US Toxic Exposure Survey with the US Environmental Protection Agency (USEPA).[30]

All pesticides to be used are cleared by the PCA and then recommended by RADA. A Senior Plant Protection Officer from RADA is on the PCA Committee. He or she makes suggestions when a new product comes onto the market, or when a new disease requires treatment. The Senior Plant Protection Officer then communicates the new information to the field or extension officers.

In terms of all pesticide users, including farmers, the PCA has a certification programme for pest control operators. This allows for certification of both commercial pest control applicators and private applicators (farmers). These certificates are issued following formal training and a practical exam being taken. Training programmes are given in conjunction with RADA and cover the use of agro-chemicals on specific crops. Various campaigns and strategies are also used to educate the wider public and advertise the use of agro-chemicals including: radio, TV, newspapers and other media. The PCA also certify trainers for the national training agency HEART/NTA. The HEART/NTA provides training for all categories of farms and also to commercial pest control operators.

Users are also required to conform to the relevant clauses in the Drug and Poisons Act which requires all users of poisons to take basic safety and health precautions.[31] This includes ensuring that poisons are kept out of reach of children and are locked up, that they are stored in appropriate containers with correct labelling and disposed of in the correct manner.

The PCA is not involved in regulating fertiliser usage and there is no legislation in Jamaica that is specifically designed to regulate neither their importation nor their use. However their ingredients are regulated under the Pharmacy Act or the Precursor Chemicals Act, 1999 if the chemicals are poisonous or can be used to manufacture illegal drugs. The Precursor Act is designed to control the use of chemicals that are titled: “Precursor Chemicals”. This Act is administered by the Pharmaceutical Services Division (PSD) of the Ministry of Health. Additionally, a permit from the National Environment and Planning Agency (NEPA) may sometimes be required to import fertilisers into Jamaica, in special circumstances where fertilizers may contain living matter (microbes) that may be introduced into the island.

[30] For more information see Esteban, 2001.
[31] Espeut and Hay, 2002

These permits must be submitted to the Customs Department before the goods can be released. Furthermore, the Ministry of Agriculture and Customs Department may have further minor roles in fertilizer administration.

2.3.2.3 Agricultural Boards

Agricultural boards in Jamaica have a large educational role for those farms growing crops that are exported to other countries. The Coffee Industry Board produces various briefing papers to give advice to coffee farmers, including short newsletters with information on various pests and diseases, how to control these pests, which types of fertilisers and chemicals to use and at what rate to apply them. They also issue short brochures on the safety of pesticide use and what precautionary measures to take when using them, as well as what to do should pesticide poisoning occur. Furthermore, educational guides are produced on how to grow coffee. The board may also provide forms for certification for restricted chemicals and therefore has a link to the PCA. Many of the other agricultural boards such as the sugar, citrus, banana and cocoa boards provide similar advisory information and therefore play a crucial role for farmers.

2.3.2.4 Agro-chemical vendors and manufacturers

There are many pesticide manufacturers in Jamaica and one main fertiliser manufacturer that have responsibilities relating to the use of agro-chemicals which may be defined in their terms and conditions of licences. All agro-chemicals that are imported, manufactured or sold have to be listed in the register of pesticides with the PCA or the manufacturer or importer must apply to register the pesticide. Furthermore, each factory must be inspected, approved and registered by the PCA. All of the pesticides and fertilisers must also have correct labelling, according to the Jamaican Bureau of Standards guidelines, and must contain copies of material safety data sheets.

The PCA are working alongside the agro-chemical companies, who have their own field and training days and extension officers that give advice on the use of the chemicals that they manufacture. Legislation to require all dealers in pesticides to register and meet inspection criteria has been drafted but not yet passed. A Training Manual for the Safe Handling and Use of Pesticides in the Agricultural Sector (1996) has been published by the PCA however retailers are not necessarily required to sell or distribute the publication to all of its users.

2.4 Regional Support

There are many regional intermediary organisations that support the national legislation and national bodies in each country. They provide assistance, resources and training that many of the national institutions may not be able to provide due to a lack of funding, resources or expertise.

2.4.1 WIBDECO Certified Farmer Programme

The Windward Island Banana Development Corporation (WIBDECO), formally named the Windward Islands Banana Grower's Association (WINBAN), brings together the banana growers from the Windward Islands (St Lucia, St Vincent and the Grenadines, Dominica and Grenada) in the Caribbean. It plays a key role in the banana certification programme and functions to help export bananas to the UK (the major buyer of St Lucian bananas). The buyers in the UK or other countries set the

standards and certification criteria are determined and then WIBDECO follows up certification.

WIBDECO has a specific programme called the Certified Farmer Programme which aims to develop a pool of farmers or farms that are capable of producing, processing and packaging bananas to meet the specific requirements of supermarkets and other important purchasers in Europe. The programme was started in September 1996 and has specifications that cover the following:

- Farm conditions and practices,
- Farmer characteristics,
- Production environment,
- Pre-harvest practices,
- Post-harvest practices and
- Business relationship between farmer and association.

These specifications ensure consistency in banana production, including the quality and presentation, and guarantees that they have been produced under very controlled conditions. It also states that if agro-chemicals have been used, that they have been used in a careful and correct manner. A certified farmer or farm must therefore abide by the specifications included in the areas mentioned above. This Farmer Certification Programme has potential to help generate increased returns for the banana industry in the Windward Islands, and encouraging and enhancing its survival and the overall economic performance of the Islands.

WIBDECO has also helped farmers by providing technical support through their Extension Services. They have produced a Banana Grower's Manual: A Guide to Successful Banana Production in the Windward Islands (1993), published under its earlier name of WINBAN. It covers areas such as soil and water management, planting, site selection, fertiliser and pesticide use, farm management and harvesting.

WIBDECO has recently, through their associates in the UK, contracted farmers to grow organic bananas and other crops for the wholesale, retail and major markets (including UK supermarket chains such as Tesco, Marks and Spencers and others). These other crops include passion fruit, coconut, mangoes and hot peppers. To date in St Lucia, five farmers and one farmer organization have received organic certification by the Soils Association to produce crops specifically for WIBDECO. The specific farms selected are mainly within the western zone of St Lucia. These lands were selected because of the limited nature of agricultural activities and practices. The St Lucia Banana Corporation and the Jamaica Banana Industry Agricultural Board would be the two local organisations that would have a direct interface with WIBDECO, although Jamaica is not part of the Windward Islands.

2.4.2 Organisation of Eastern Caribbean States

2.4.2.1 OECS certification for commercial pest control operators

The Organisation of Eastern Caribbean States (OECS) promotes regional and international cooperation between the countries of Anguilla, Antigua and Barbuda, the British Virgin Islands, the Commonwealth of Dominica, Grenada, Montserrat, St Kitts and Nevis, St Lucia and St Vincent and the Grenadines. The OECS have a number of sectors or programmes of which the Natural Resource Management Unit (NRMU) in St Lucia is one of them. They cover projects monitoring and controlling the marine and terrestrial environment including soil and water management and fisheries.

Projects include coastal and environmental projects in St Lucia as well as a large public awareness campaign on pesticides which was implemented by the NRMU.

The campaign objectives included raising the level of awareness in the Eastern Caribbean on how agro-chemicals influence environmental and human health. The focus was on a national level, to encourage a reduction in the misuse of agro-chemicals with a view to introducing more effective legislation to manage agro-chemicals. This was done through various workshops, media programmes, distribution of materials to the public, consultation with OECS PCB's and through other means.

The OECS Export Development and Agricultural Diversification Unit (EDADU) helps farmers produce crops of high quality to meet high standards expected by overseas consumers. The EDADU also assist farmers by providing training and technical assistance with packaging, storage, transport and post harvest handling of agricultural produce.

2.4.2.2 OECS Publications[32]

The OECS has produced several briefing papers, including one on the harmonisation of legislation for the region(briefing paper #1) which they are promoting for the member states of the islands of the OECS with the support from the Inter-American Institute for Cooperation on Agriculture (IICA). It also covers information on the FAO Code of Conduct on the Distribution and the Use of Pesticides for guidance on areas dealing with pesticide control and looking into general information on pesticides provided by other agencies such as the USEPA. A second pesticide briefing paper (briefing paper #2) was also published to cover standards (labelling, advertising), quality control and monitoring (imports, inventories, etc.) of pesticides. The third pesticides briefing paper (briefing paper #3) covers general pesticide usage (including selection, handling, application and disposal) and lastly OECS has produced a 4th briefing paper (Pesticides briefing paper#4) on IPM, its importance and the different strategies for control.

2.4.3 The St George's Declaration of Principles for Environmental Sustainability in the OECS

The OECS member states have come together and signed an agreement called the St. George's Declaration of Principles for Environmental Sustainability in the OECS. It encourages the integration of the general principles of sustainable development (social, economic and environmental considerations) into national policies, plans and programmes. The Declaration also affirms the shared commitments by these countries to these principles in order to minimise the impact on the environment.

2.4.4 Inter-American Institute for Cooperation on Agriculture

2.4.4.1 Food safety (hazards, GAP, IPM) training manual (IICA, 2002)

The Inter-American Institute for Cooperation on Agriculture (IICA) is a specialised agency for agriculture and the rural well-being of the people of North America, South America and the WCR. It was founded in 1942 and has its headquarters in Cost Rica. It has many strategic areas of focus of which one is agricultural health and food safety.

IICA has produced a number of guidelines and training manuals that provide information on agricultural health and food safety. IICA has developed a Pesticides' Certification Manual for industrial pesticide control operators in St Lucia. This is a training manual for the certification of pesticide control operators and although it was

[32] See Reference section for complete titles.

originally intended for industrial pesticides, the manual has now been extended to agricultural users. A training manual on Food Safety which describes food laws and regulations affecting international trade and harmonisation was also produced. Safety hazards (biological, chemical, physical) are identified for each activity within agricultural production, such that programmes can be implemented for food safety control. Hazards associated with agricultural production are also identified as part of GAP. Other IICA guidelines include:

- Pest Risk Analysis: a perspective (1993)
- Agriculture and Sustainable Development (1993)
- Agriculture and the Environment (1992)

2.4.4.2 IICA Training Manual (2002) for worker health and the use of safety equipment

In cooperation with the OECS, a training manual was produced covering worker health and the use of safety equipment, which addresses health of agricultural workers in terms of their working environment and protective clothing/equipment, and lists steps required.[33] IICA also produces a number of other useful publications on farm management, pest risk analysis and on other areas.

2.4.5 Coordinating Group of Pesticide Control Boards of the Caribbean

The CGPC was created in 1987, originally for the OECS states, but now brings together all of the pesticide control boards from the various countries in WCR. The group's aim is to discuss effective regulation and control of pesticides for the region. The CGPC was started by IICA and they continue to provide funding and a technical secretariat. The most recent annual meeting (8^{th}) took place in June 2003 and main discussions centred on the harmonisation of pesticide legislation. This study has been closely linked to the CGPC with repeated attendance at their meetings, including the communication of this study's findings, and how best to perhaps implement the recommendations that may be proposed. The group provides a valuable mechanism for information exchange and keeps interest in sound pesticide management at the forefront of the mandates of national PCBs and it has driven a number of initiatives. Furthermore, the CGPC is the key forum for discussion on harmonisation of pesticide legislation and registration, as it brings together the key decision makers with regard to agro-chemical management for most of the Caribbean countries.

[33] Barbara Graham – pers. comm. For more information see www.iica.int

3 MANAGEMENT OPTIONS

3.1 Introduction

Numerous examples of management options or best practice guidelines related to the use of agro-chemicals exist in agriculture and farming to enhance production and crops. These will be introduced in the sub-sections below and examples or case studies given where possible. The recommendations given may be used to support national training and legislation and may be incorporated into national practices.

The sub-sections below will cover the following:

- wider principles for informing agro-chemical management and pest control such as GAP (which incorporates ICM and IPM) and natural or biological control of pests;
- specific options recommended by international and regional bodies

It is important to note that the recommendations or management options given in these sections are not comprehensive and merely give suggested references to further sources of information. There are many other international and regional organisations that provide additional guidance and best practice guidelines.

3.2 Wider principles for informing agro-chemical management and pest control

3.2.1 Good Agricultural Practices

Good Agricultural Practice (GAP) involves the adoption and application of good management principles for the production of wholesome and safe agricultural products for human consumption without affecting the environment and the health of farm workers. It has been defined by the FAO[34] as having four main principles that can be applied to all scales of farming, which include:

- economically and efficiently produce sufficient, safe and nutritious food;
- sustain and enhance the natural resource base;
- maintain viable farming enterprises and contribute to sustainable livelihoods;
- meet the cultural and social demands of society.

GAP is a means of incorporating Integrated Pest Management (IPM, see section 3.2.2) and Integrated Crop Management (ICM) practices within the framework of commercial agricultural production. Adoption of IPM/ICM is regarded by the Euro-Retailer Produce Working Group (EUREP) members as essential for the long-term improvement and sustainability of agricultural production. The 'EUREPGAP Fruits and Vegetables' is a certification that has been developed by a European group of representatives from all stages in the fruit and vegetable sector with the support from producer organisations outside the European Union (EU) (for more information on EUREPGAP see section 3.3.7.1). It is envisaged that in the future many organisations will need to comply with these requirements to be able to export crops to the EU.

3.2.1.1 GAP for the OECS[35]

IICA is currently working on a project to institutionalise GAP for selected commodities in the OECS which includes the development of a comprehensive education

[34] Source: www.fao.org/docrep/meeting/006/y8704e.htm (FAO, 2003)
[35] Graham, 2001 and 2002. Presentations at the 6th and 7th CGPC meetings.

programme for each of the Eastern Caribbean countries. IICA plays a coordinating role in the implementation of the project and ensures its sustainability. Furthermore, the project is managed within the CGPC by the Pesticide Control Boards in each country, as well as in cooperation with the Ministries of Agriculture in each country, the Caribbean Environmental Health Institute in St Lucia and other organisations that also collaborate and contribute. The project is mainly funded by the Caribbean Regional Human Resource Development Programme for Economic Competitiveness (CPEC), with additional support from IICA and other organisations, as well as support from each of the OECS governments.

The overall goal of the project is to increase the economic competitiveness of the OECS through trade in consistently hazard-free, safe and wholesome crops which are to be targeted for export. The main objectives include:

- to increase awareness and adopt the principles and practice of GAP by farmers, exporters, farm leaders, technicians, storage and transportation employees and others involved in the fresh produce industry. The project deliverables will include training packages or modules for various workers
- to introduce and promote the Total Quality Management (TQM) concept and philosophy in all operations of the horticultural business
- to develop and use harmonised sanitary and phytosanitary measures based on international standards in the OECS
- to improve the level of institutional support to those involved in the agri-food chain

A GAP training manual has been produced which contains information on good agricultural practices for the production of dasheen, hot pepper, mango, pineapple, plantain, sweet potato and tomato.[36] Furthermore, a manual for trade and inspectorate of fresh produce has been produced which includes guidelines for the certification of fresh produce inspectors. To date the project has also supported four countries in the region in the drafting of supporting legislation for trade export.

3.2.1.2 Canada's Code of Practice for Sprouted Seeds[37]

An example of GAP is found in Canada's Code of Practice for the Hygienic Production of Sprouted Seeds. Outbreak investigations have indicated that micoorganisms have been found on sprouts and these most likely originate from the seeds. A large majority of the seeds that are supplied to the sprout manufacturers are produced primarily for field planting, where the GAP necessary to prevent microbial contamination of seeds intended for sprouting are not followed. Consequently, seeds may be contaminated in the field or during their harvesting, transportation or storage. This Code therefore addresses and applies GAP and good hygienic practices for the production of sprouted seeds that may be consumed raw. Specific recommendations are given for seed production and general recommendations are set out for the growing of seeds destined specifically for sprout production.

3.2.1.3 Threats to GAP and the success of these recommendations

There are several threats or certain factors that may affect the success of promoting GAP in the Wider Caribbean Region which includes the escalation of food-borne illnesses, pest resistance to approved chemicals and the risk of certain chemicals not

[36] IICA, 2002b

[37] See www.inspection.gc.ca/english/plaveg/fresh/sprointe.shtml (Canadian Food Inspection Agency, 2001)

being registered in the countries.[38] Furthermore there is a need for the control of exotic pests and diseases which may be introduced very easily in a region where countries are in close proximity and where there is a high amount of import and export. This has been shown to happen in St Kitts and Nevis where pests have been introduced whereby insects have been transported on plant material and diseases have been brought in, particularly originating from Asia (hibiscus mealybug, palm thrips, mango seed weevil and citrus mealybug)[39]. Quarantine is therefore necessary. Strict standards for the region through harmonised legislation should help in this regard to ensure that these pest introductions are minimised.

3.2.2 Integrated Pest Management[40]

Integrated Pest Management (IPM) involves taking into account and integrating all the strategies that are available to control pest problems by taking action to prevent problems, suppress damage levels and use pesticides only when and where it is really necessary. The main goals of integrated pest management are to achieve an improvement in pest control, to ameliorate the management of pesticides, to provide a cost effective and hopefully more economical crop protection and finally to reduce the potential hazards often associated with pest control through the use of pesticides. IPM relies on 4 main principles to achieve these goals:

- Exclusion: preventing the pest all together from entering an area and therefore there is no need for pest control.
- Suppression: keep the pest levels to a minimum such that they are not at a level which may cause damage of economic importance
- Eradication: completely eliminate the pest if this is what is needed in some circumstances
- Plant resistance: identify plant varieties which demonstrate a resistance to the pests and then encourage the use of these resistant varieties.

IPM also emphasizes several strategies such as the use of biological controls, the use of pheromones, the use of crop rotation to reduce pest problems, the use of mixed cropping and many others.[41]

3.2.2.1 The IPM Collaborative Research Support Program in Jamaica

Several studies have been conducted using the IPM concept. In the Caribbean the Integrated Pest Management Collaborative Research Support Program (CRSP) team has looked at the impact of pests on callaloo, sweet potato and hot pepper in Jamaica. Their recent findings and ongoing studies are summarised in their 6th annual report.[42]

The pests affecting hot pepper, *Capiscum chinense,* were investigated and in 1998 it was found that the high gall midge was greatly affecting the hot pepper industry in Jamaica. An IPM strategy was developed to reduce the infestations which included both investigations prior to and post harvesting. Over a 12 month period, a methodology was used to test populations and evaluate the potential of both biological control and chemical insecticides to reduce gall midge infestations. This combination and using the IPM principles, suppressed populations of the gall midge for over 3 weeks below a 5% threshold and in addition aluminium phosphide

[38] Pollard, 2002
[39] McComie, 2000
[40] Source: OECS Natural Resources Management Unit, Pesticides Briefing Paper #4,
[41] Source: UNEP, 1998
[42] Source: IPM-CRSP, Sixth Annual Report 1998-1999

demonstrated its potential to kill >80% larvae within fruits without a significant effect on the quality and shelf life of the peppers.

IPM technologies were devised for the management of major pests on callaloo, *Amaranthus* sp.. To test the benefits of these technologies, samples of callaloo were taken from a field experiment that compared routine farmer spraying with the limited pesticide spraying regime. It was showed that there was a potential to reduce the frequency of pesticide application by up to 60% without there being a significant increase in pest damage and economic loss to the farmers.

3.2.2.2 GIS in IPM programmes[43]

Geographic Information Systems (GIS) can be very useful in integrated pest management, which promotes alternative methods or techniques of keeping the level of pest populations low to prevent the excessive use of pesticides. Professor Lawrence Grossman from the Virginia Polytechnic Institute and State University has been working in Jamaica to train people to use GIS in integrated pest management. For example, he has suggested that GIS could be used in an IPM strategy to control fungal infections in peppers. Using GIS could encourage researchers to examine data not only statistically but also spatially. This would allow results to show where the successful or unsuccessful test plots were located and what some of the surrounding conditions might be that may have affected the results. For example, the test plots that were unsuccessful could have been found to all be located close to streams. Knowing these spatial links can be instrumental in successfully managing the IPM programmes.

3.2.2.3 European Commission

The European Commission has a Caribbean Agriculture & Fisheries Programme (CAFP) which is aimed at strengthening the economies of the CARIFORUM member states (most of the Caribbean countries including St Lucia and Jamaica) through enhancing the agriculture and fisheries sectors. One of their main objectives is the control of identified pests through the introduction of IPM practices and enhancing national and regional capacity to develop and transfer IPM technologies by 2004.[44]

3.2.3 Disposal of agro-chemicals

Carelessness in the disposal of agro-chemicals has often meant that there has been pollution and contamination of the environment and possibly the accidental poisoning of animals and humans. It is therefore very important to adopt and implement measures to adequately manage and dispose of agro-chemicals. The FAO have a training manual on the Inventory taking of obsolete pesticides[45] as well as a guide on the Disposal of bulk quantities of obsolete pesticide in developing countries[46]. These are internationally accepted guidelines to give advice on the disposal of pesticides.

The OECS have produced a Briefing Paper[47] which covers information on the proposed model legislation for the OECS states which was initiated by the St Lucia PCB and the Inter-American Institute for Cooperation in Agriculture (IICA). This Briefing paper includes a summary of the various parts of the legislation including a

[43] Source and for more information : www.research.vt.edu/resmag/sc99/Gis.html (2003)
[44] For more information visit their website: http://www.cafpro.org/ and the specific EU site is: http://www.deljam.cec.eu.int/en/projects/environment/cafp.htm.
[45] FAO, 2001c
[46] FAO, 1996a
[47] OECS Pesticide Briefing Paper #1, 1998

section on disposal of pesticides. It suggests that farmers should be encouraged to buy only the amount of pesticide that they need to treat their crops. Furthermore, only the amount of pesticide needed to mix for immediate use should be used. This in turn may lessen the amount of pesticide requiring disposal. Disposal sites also need to be carefully chosen and the proximity of free flowing water, the risk of flooding and potential for erosion need to be taken into account. Ideally the geology of the area should be investigated prior to disposal. Sites should be chosen away from homes, crops, livestock and buildings and fenced out to keep out livestock and people. Containers also need to be decontaminated prior to disposal. They should also never be used for other purposes such as, containers for food, feed or other items. There are many other guides produced by the FAO, WHO, the chemical manufacturers and other organisations that also give best practice options on the disposal of agro-chemicals.

3.2.4 Alternatives to agro-chemicals

3.2.4.1 Natural and applied control

We cannot rely entirely on the use of agro-chemicals for pest control due to their expense, potential damage to the environment and the fact that many insects build up resistance relatively quickly to them. Alternatives must therefore be found and biological or natural control can be solutions to minimize the use of pesticides. Natural control utilises naturally occurring pest enemies or relies on meteorological conditions to affect pest and disease control. In St Kitts and Nevis[48], there is a history of using natural parasites to control the pests on sugarcane stems and pink hibiscus. Natural enemies were introduced in the 1960's to 1980's to control moths, worms, fruitflies, mealybugs and other pests and in most cases these pests were kept at low levels by these introduced parasites. It has therefore been shown to be a successful means to control pests, although there are costs associated, as well as necessary follow-up actions needed.

Applied control of pests and diseases may be based on crop rotation, the selection of disease resistant crop varieties (cultivar or variety selection), changes in sowing dates, alterations in cultivation practices as well as the use of pesticides. The International Code of Conduct on the Distribution and Use of Pesticides (Amended version) published by the FAO offers guidance.[49] FAO has biological control programmes in several pest management projects in the region, eg sugar cane froghopper, gall midge of hot pepper and others.

3.2.4.2 Organic farming

Organic farming is another alternative to using agro-chemicals. This method of farming minimizes the use of synthetically produced fertilizers, pesticides, herbicides, growth hormones, antibiotics, livestock feed additives or even gene manipulation. Organic farming relies heavily on crop rotations, animal manure, crop residues, mulching, the integration of crops and livestock and biological pest control. Some of these techniques are used in other types of agricultural systems however organic farming especially emphasizes that no synthetic products have been used. These techniques therefore maintain the soil productivity and fertility and control weeds and pests without the use of synthetic or chemical products, sustaining the ecosystem and reducing pollution.[50]

[48] McComie, 2000
[49] FAO, 2002a
[50] http://europa.eu.int/comm/agriculture/qual/organic/def/index_en.htm

Furthermore, it has been suggested that correctly managed, organic farming may reduce or eliminate water pollution and helps conserve water and soil on a farm. Some countries such as Germany and France have subsidized farmers to use organic farming techniques as a solution to water pollution problems. [51] The FAO have an organic agriculture website[52] which includes many publications on organic farming including one called: Organic Farming and The Market for Organic and Fair Trade Bananas. Furthermore the European Commission has a useful website[53] on organic farming which includes useful literature and information on the regulations in various countries in Europe.

3.2.4.3 Composting and mulching

Composting and mulching are other tools that can help reduce the use of fertilisers. Composting is a biological process where micoorganisms decompose the organic part of the waste and it is then applied back to the soil. This process takes place under controlled conditions and once decomposed, the material can be handled, stored or applied to the land without adversely affecting the environment. This may include mixing, aerating and also placing piles of compost out in the open air and mixing them periodically. Mulching is the use of cut grass, leaves, wood chips or fibers, crop residues or straw which are placed on the soil surface to temporarily stabilise the soil until the area is used for farming. It is often also used to control erosion. Mulch helps to retain moisture in the soil, protects the soil surface from forces of raindrop impact, reduces evaporation, insulates the soil and suppresses weed growth. Both of these techniques can be used in organic farming and other types of agricultural systems. Mulch can especially be used in conjunction with the use of agro-chemicals. Mulch residue, once microbial and bacterial action takes place, will take up and absorb nutrients and pesticides, delaying them going into the surface waters. The FAO's organic agriculture website[54] contains some useful guides on composting and mulching and many others also exist such as the University of Minnesota's Extension Service in their College of Agricultural, Food and Environmental Sciences.[55]

3.3 Internationally recommended management options

There is a strong move to a possible harmonisation of legislation for the Caribbean region, which will be discussed in section 4.3. This process is greatly supported by the work of other regional and international organisations such as the FAO, UNEP, IICA and others, and their expertise and informational guides may be very useful as guidance to incorporate in to the Caribbean region's model legislation. The various internationally recommended management options are described in the following sub-sections.

[51] http://www.fao.org/WAICENT/FAOINFO/AGRICULT/magazine/9901sp3.htm (FAO, 1999)
[52] http://www.fao.org/organicag/
[53] http://www.organic-europe.net/
[54] http://www.fao.org/organicag/
[55] http://www.extension.umn.edu/distribution/horticulture/DG3296.html

3.3.1 FAO Guidelines on farming practices including use of pesticides, soil conservation and proper use of equipment [56]

FAO has produced a number of documents on agricultural practices and best management guidelines. This section lists and describes a number of these including pesticide management guidelines although the section is not comprehensive.

3.3.1.1 FAO Guidelines (2001) on good practice for application of pesticides

These guidelines offer practical help and guidance to all those involved in using pesticides for food and fibre production and in public health programmes. They cover the main terrestrial and aerial spray application techniques. They include aspects of training, equipment selection, proper use of pesticides, managing operator exposure, decision making (alternatives, risk/benefit, product selection, label information, mixing), safety aspects (health surveillance, transport, storage, handling, waste management, accident procedures, personal protection), application procedures and record making. These guidelines are also supported by the following two publications:

- FAO (2001) Good practice for ground application of pesticides (using field crop, tree and bush crop sprayers)
- FAO (2001) Good practice for aerial application of pesticides (using spray aircraft)

3.3.1.2 FAO Training Manual (2001) for inventory taking of obsolete pesticides

This is a training package to prepare staff to carry out a safe and effective inventory of obsolete pesticides to know quantity, location, condition, source and other information related to obsolete pesticides in the country.

Other training manuals in the same series are the following:

- FAO (1995) Prevention of accumulation of obsolete pesticide stocks;
- FAO (1996) Pesticide storage and stock control manual;
- FAO (1996) Disposal of bulk quantities of obsolete pesticide in developing countries;
- FAO (1999) Guidelines for management of small quantities of unwanted and obsolete pesticides;
- FAO (1999) Inventory Guidelines for obsolete, unwanted and banned pesticide stocks and POPs;
- FAO (2000) Assessing soil contamination: a reference manual.

3.3.1.3 FAO Guidelines (2001) on minimum requirements for agricultural pesticide application equipment

These minimum requirements aim to ensure sprayers purchased are safe to users and to the environment, as well as being efficient and durable. These take into account sprayers already on the market and the prime objective is that member countries adopt them immediately, and begin to eliminate substandard and unsafe

[56] FAO guidelines on standards are based on existing international, European and national standards and other published references, reflecting current manufacturing practice, other national and international standards and field reality in member countries. For more information and publications see the FAO website: www.fao.org.

sprayers from national markets. There are two volumes including: Volume 1: Portable (operator-carried) sprayers and Volume 2: Vehicle-mounted and trailed sprayers.

3.3.1.4 FAO Guidelines (2001) on standards for agricultural pesticide application equipment and related test procedures

The Guidelines on standards provide more precise safety targets for spray equipment, with detailed specifications and requirements, supported by test procedures to measure compliance with the FAO standard. Includes guidelines and training modules on lever-operated knapsack sprayers, motorised knapsack sprayers, compression sprayers, motorised mistblowers, rotary atomiser sprayers and vehicle-mounted and trailed sprayers. Test procedures for parts concern safety, principally in relation to the operator, but also the environment. Again there are two volumes focussing on: Portable (operator-carried) sprayers and another one on Vehicle-mounted and trailed sprayers.

3.3.1.5 FAO Guidelines (2001) for the organisation of schemes for testing and certification of spray equipment in use

- Procedures for the registration, certification and testing of new pesticide application equipment
- Testing and certification of agricultural pesticide sprayers in use

An important means of improving safety and efficiency of pesticides is to influence the state of application equipment currently used to apply pesticides on farms. These guidelines present requirements, options and considerations for a country that wishes to introduce such a scheme. They outline how governments can influence pesticide safety by controlling the quality of new pesticide application equipment manufactured in, or imported into a country. Information is provided on policy, registration of equipment, certification schemes, compliance requirements, financing and quality assurance.

The second Guidelines book covers the testing and certification of the sprayers (including aircraft, large, field crop and orchard sprayers and operator-carried equipment) currently applying pesticides on commercial farms to ensure that, where pesticides are used in crop production, they are applied through equipment that is safe and fully functional.

3.3.1.6 FAO Guidelines (2001) on organisation and operation of training schemes and certification procedures

- Training schemes and certification procedures for operators of pesticide application equipment

These guidelines aim to improve pesticide safety (to users and environment) by giving a general framework that outlines the need for training and the assessment and confirmation of operator competence to improve the safety and efficiency of pesticides in farm use.

3.3.1.7 Guidelines on different land treatment structures and soil management

There are many different guides on soil management and land management practices however these will not be discussed in this report as the focus is primarily on agro-chemical management. It is however important to mention that pesticides often bind to soil particles and are carried downslope through erosion, disperse into the watersheds and eventually end up in the coastal marine environment. Other

pesticides may be soluble in water and enter the surface waters through runoff due to heavy rainfall and erosion. Careful application of agro-chemicals should therefore reduce the pollution at its source and the pollution downstream in the coastal zone and therefore reduce the public health risk to coastal communities.

3.3.2 World Health Organization

The World Health Organization (WHO) has a Food Safety Programme which has produced a number of publications in this area.[57] In 1960, the WHO also established a Pesticide Evaluation Scheme (WHOPES) which is the only international programme which promotes and coordinates the testing and evaluation of new pesticides proposed for public health use. It functions through the participation of government representatives, the pesticide industry, WHO Collaborating Centres and associate laboratories, university associations, as well as other WHO programmes, such as the International Programme on Chemical Safety (IPCS). Since 1981, WHOPES includes a four-phase evaluation and testing programme, which encompasses laboratory testing as well as small, medium and large-scale field studies to evaluate and study the safety, ease of application, efficacy, acceptance of treatment by residents as well as the cost-effectiveness of the proposed product.
The WHO Classification of pesticides by Hazard is well known and has been used in this project's work to prioritise pesticides by using conducting a toxicity review which included the WHO toxicity class.[58]

To strengthen the activities of WHOPES and contribute to the search for alternative safe and more cost-effective pesticides and application methodologies, in addition to further promoting the safe and proper use of pesticides and application equipment, WHOPES has established the Global Collaboration for Development of Pesticides for Public Health (GCDPP). This collaboration provides a forum to exchange information and also further ideas on related subjects to the development and use of pesticides as well as their application equipment. The GCDPP provide an advisory and resource-mobilizing role to WHOPES. [59]

3.3.3 FAO / WHO Codex Alimentarius and Maximum Residue Limits (MRL)[60]

The Codex Alimentarius Commission was created in 1963 by FAO and the WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. The main objectives of the Programme are :

- to protect consumer health and ensure fair trade practices in the food trade
- to promote coordination of all food standards work undertaken by international governmental and non-governmental organizations

It has over 153 member governments that participate and is a framework to try and internationally harmonize projects and activities on food standards and the implementation of fair practices in food trade. Their work includes the establishment of internationally recognized Maximum Residue Limits (MRLs).

The Maximum Residue Limit (MRL) is the maximum concentration of a pesticide residue (in mg/kg) that the Codex Alimentarius Commission recommends to be legally permitted in food products and animal feeds. The MRLs are based on the registered or approved usage of pesticides in accordance with GAP. MRLs therefore represent residue levels which are toxicologically acceptable. Codex MRLs are those that are mainly intended to apply in international trade and are derived based

[57] For more information on the programme see www.who.int/fsf/ and for their publications www.who.int/dsa/cat98/fos8.htm
[58] For more information see www.who.int/pcs/docs/Classif_Pestic_2000-02.pdf
[59] For more information on WHOPES or GCDPP see www.who.int/ctd/whopes/gcdpp.htm
[60] For more information see www.codexalimentarius.net

on the differences in local pest control requirements and therefore resulting in variations from region to region. [61]

The Maximum Residue Limits (MRLs) are used for food products but do not cover fish, sea food or crustaceans. The Codex Alimentarius Commission has established over 2500 MRLs for about 200 pesticides on many foods and crops. It is not mandatory for governments to accept the MRLs established by the Codex Alimentarius Commission although this is gradually changing, as the World Trade Organization is looking at using these Codex standards to resolve trade disputes.[62] MRLs can be regionally established for certain commodities as well as setting up locally relevant MRLs which can be specific to a certain crop grown in a particular country or region.

The FAO and WHO have also produced a joint manual called: *Manual on the development and use of FAO and WHO specifications for pesticides* which includes further information on international pesticide specifications.

3.3.4 International Labour Organization[63]

The International Labour Organization (ILO) has been active in the agricultural sector since the early 1960's. The ILO has a programme on occupational safety and health in agriculture which includes international labour standards. There are also International Conventions on occupational safety and health that protect employers and workers in the agricultural sector.

The ILO provide recommendations and best practice guidelines which are intended for the authorities, professional groups and all those who have responsibilities in creating safety and health regulations or promoting occupational health at a national or company level. The following Codes of Practice concern agriculture and forestry:

- Safe construction and operation of tractors, (1976).
- Safe design and use of chain saws (1978);
- Safety and health in forestry work (1997).

The ILO also publishes a considerable amount of literature that gives guidance on occupational safety and health in agriculture and other related issues. Some of these include the following:

- Technical Guides
    - Guide to safety in agriculture (1969);
    - Guide to health and hygiene in agricultural work (1979);
    - Safety and health in the use of agrochemicals: a guide (1987).
- Occupational Health and Safety Series:
    - No.34 Safety and health of migrant workers (1983);
    - No. 38 Safe use of pesticides: guidelines (1985);
    - No. 63 The organization of first aid in the workplace (1989);
    - No. 67 Occupational lung diseases: prevention and control (1991).

The ILO has also been working in close cooperation with the WHO. The Joint ILO/WHO Committee on Occupational Health has also recently recommended that there be close cooperation with the Pan American Health Organization (PAHO) which is also the Regional Office of the WHO for the Americas. The ILO collaborates on several programmes with the WHO and PAHO in order to maximize efforts and enable projects to be more successful and have a better impact due to the combined efforts.

[61] Source: apps.fao.org/CodexSystem/pestdes/pest_ref/pest-e.htm
[62] Barnes, 2000
[63] Source and for more information see www.ilo.org

3.3.5 Manufacturers / Agro-chemical Industry

3.3.5.1 CropLife International[64]

The International Group of National Associations of Manufacturers of Agro-chemical Products, previously known as GIFAP, and now CropLife International, is a global network which represents the plant science industry. Taking into account the economic, environmental and societal concerns, the plant science industry contributes significantly to promoting sustainable agriculture which is fundamental to food production and poverty alleviation. CropLife International produce many different best management practice guides and recommendations on safe agro-chemical use on behalf of the industry which cover issues such as:

- IPM
- Biosafety
- sustainable agriculture
- safe formulation and use of agro-chemicals
- agro-chemical storage and disposal
- how to implement the FAO Code of Conduct
- agro-chemical poisonings

The industry also works alongside many of the UN programmes and in cooperation with the European Union and organise many conferences to raise awareness and promote some of the best practice on behalf of the industry. Their conferences cover themes and research in many different countries around the world and also focus especially on agro-chemical use in developing countries.

3.3.5.2 Chemical Producers and Distributors Association[65]

The Chemical Producers and Distributors Association (CPDA) brings together manufacturing and distribution companies selling chemicals (not only agro-chemicals) in the US, Europe and Asia. The membership includes about 90 companies that are involved in the manufacture, formulation, distribution and sale of some of crop protection chemicals, fertilizer, adjuvant and inert ingredients used in food, feed and fiber crops, the care and maintenance of lawns, gardens and turf, and in various forestry and vegetation management markets. The association promotes education and training that contributes to product stewardship and industry compliance as well as promoting and advocating their position on certain issues regarding the use of agro-chemicals.

3.3.6 UNEP Caribbean Environment Programme[66]

The Caribbean Environment Programme (CEP) is facilitated by the Caribbean Regional Co-ordinating Unit (CAR/RCU) in Kingston, Jamaica. It was created in 1986 and serves as a Secretariat to CEP. The main objectives of the CAR/RCU are to:

- Provide assistance to all countries of the region
- Strengthen national and subregional institutions
- Co-ordinate international assistance
- Stimulate technical co-operation among countries

[64] For more information and publications see www.croplife.org
[65] For more information see www.cpda.com
[66] Source and for more information see UNEP, 2000 and www.cep.unep.org/

The CAR/RCU is a sub-programme of UNEP's Regional Seas Programme and is under the administration of the UNEP Headquarters in Nairobi, Kenya although it is also directly responsible to the member Governments of the Wider Caribbean Region.

The CAR/RCU, as Secretariat to the Cartagena Convention, along with the Contracting Parties and other relevant organizations is currently designing and implementing projects to support the Convention and the LBS Protocol. Pilot projects for capacity building in various WCR countries provide models for other countries where these can be reproduced. Technology and information exchange takes place through various workshops, conferences and seminars on appropriate technologies and best management practices. In 1994, the UNEP CAR/RCU completed an overview study of land-based point sources of marine pollution in the WCR.[67] Furthermore, two expert meetings held in 1992 and 1994 explored the basic conceptual and structural approaches of the LBS Protocol as well as the challenges involved when addressing a broad spectrum of pollutants. The UNEP CAR/RCU Secretariat has also worked alongside many other organisations and formed partnerships to continue to prevent, reduce, and control marine pollution from land-based sources and activities.

The CAR-RCU manages the Caribbean Environment Programme which covers other areas other than pollution from land-based sources. Their website provides downloadable copies of many of their technical reports on topics related to the marine and coastal environment of the Wider Caribbean Region and includes reports from past meetings and workshops as well as databases on the marine environment for the region. The CAR/RCU is a very useful source of information for best practice guidelines and are one of the very active divisions of UNEP in the region.

3.3.7 Examples from other countries and regions

3.3.7.1 EUREPGAP[68]

The EUREPGAP license or certificate for fresh fruit and vegetables was developed by the Euro-Retailer Produce Working Group (EUREP), which is a European group of representatives from all stages in the fruit and vegetable sector with the support from producer organisations outside the EU. The EUREPGAP certification sets out a framework for good agricultural practice on farms growing horticultural products such as fruits, vegetables, potatoes, salads, cut flowers and nursery stock. These are the minimum standards acceptable for the leading retail groups in Europe although some retailers may exceed these standards. The current EUREPGAP document and procedures have been agreed among partners from the entire food chain for fruits and vegetables after consultation over a three-year period. It involved many different experts and certification bodies and included practical experience from field trials.

The EUREPGAP license/certificate for fresh fruit and vegetables (2001) includes the following:

- EUREPGAP benchmarking procedure
- Checklist for benchmarking
- EUREPGAP control points and compliance criteria
- EUREPGAP protocol for fresh fruit and vegetables
- General regulations for fresh fruit and vegetables

In addition all growers must demonstrate commitment to:

[67] UNEP, 1994
[68] See www.eurep.org

a) Maintaining consumer confidence in food quality and safety
b) Minimising detrimental impact on the environment, whilst conserving nature and wildlife
c) Reducing the use of agro-chemicals
d) Improving the efficiency of natural resource use
e) Ensuring a responsible attitude towards worker health and safety

All organisations or companies wishing to export crops to the EU will soon be subject to the EUREPGAP requirements, as well as several other new regulations that are coming into force.

3.3.7.2 UK Code of GAP for the Protection of Water[69]

The UK's Code of GAP includes a farm waste management plan to help the farmer decide when, where and at what rate to spread manure, slurry and dirty water on the farm. It reduces risk of transfer of pathogens from livestock wastes to water. The management of fertilisers is described to provide appropriate storage and containment of liquid fertilisers and proper application to minimise nitrate leaching. Pesticide management includes proper storage, observing label instructions about "no spray zones" and minimising and/or eliminating tank washings by careful planning, use of rinsing equipment or direct-meter sprayers. The code also discusses the minimisation of nitrate leaching by following recommended rates and timings and to spread fertiliser accurately, at the right rate and avoid application to uncropped areas, hedges, and watercourses. In addition, phosphorus should be applied according to soil analysis and the needs of the crop.

3.3.7.3 US Environmental Protection Agency

The US Environmental Protection Agency (US EPA) is responsible for the registration, licensing and import of pesticides for use in the US. Many of the Caribbean countries are currently exporting to the US and need to abide by the US EPA standards. Jamaica has based many of their laws according to some of the US standards. The US EPA covers the registration of pesticides and their use and determine the allowable pesticide levels in specific foods. In the Caribbean, the EPA provides notification to the region should they ban a particular pesticide in the US. This includes information on the registration of a particular chemical and why their registration may have been suspended or cancelled. The EPA have a very useful website[70] which covers pesticide use, registration, storage and disposal, maximum residue limits, labelling, training, worker safety, alternative pest control methods, environmental effects and many other areas. Specific items that can be found on the website include the following:

- a list of their publications which can be downloaded
- a Federal register of all of their documents
- pesticide use data which contains information on the U.S. pesticide producing and using sectors
- a pesticide management guide which gives information and resources on pesticides at the EPA and elsewhere which is designed to help national pesticide authorities around the world to find information for use in pesticide management decision-making.
- Hotline numbers for poison centres and pesticide centres
- A list of other information centres

[69] Source: www.defra.gov.uk/environ/cogap/watercod.pdf
[70] http://www.epa.gov/pesticides/

4 GAPS IN MANAGEMENT OF AGRO-CHEMICALS IN ST LUCIA AND JAMAICA AND POSSIBLE RECOMMENDATIONS

4.1 Who has jurisdiction for management advice for different farmer groups in Jamaica and St Lucia? [71]

Problems identified by the Pesticide Control Boards in the region in respect of the use of agro-chemicals include illegal imports and their use, repackaging of chemicals by vendors removing labels, incorrect application (over-use, wrong application rate or timing, wrong pesticide for problem, use of cocktails of chemicals), inadequate application equipment and protective clothing. Resulting problems include impacts on human health (poisoning), environmental pollution, exacerbated by lack of soil conservation measures, and impacts on non target species. This misuse means that there is a need for farms to be well advised by the various government agencies and organisations to enable proper use of these agro-chemicals.

There are several gaps in jurisdiction that are evident based on the information presented in this report. Tables 1 and 2 in Appendix 1 show the various implementing organisations involved in the management of agro-chemicals in both Jamaica and St Lucia respectively, as well as what types of farms or users they are targeting.

With respect to jurisdiction for management advice, in summary the following tend not to be covered by either national bodies or the agricultural boards:

- Very small farms (in both St Lucia and Jamaica)
- Medium to large farms producing export crops other than bananas (St Lucia)
- Medium farms producing crops for home consumption (Jamaica)
- No licensing schemes for pest control operators or retailers (St Lucia)

In St Lucia, farming practices for small to large farms (especially for the domestic markets) are covered by the MAFF Extension Services and Jamaica's small farms are covered by the RADA Extension Services. RADA in Jamaica mainly focuses on domestic agricultural crops and prioritises small farms as large farms are generally commodity based and receive significant support from their agricultural boards. Furthermore, in both St Lucia and Jamaica the PCB and PCA regulate the importation, sale and storage of pesticides and also advise and provide some training to farmers of all levels.

In Jamaica, the PCA issues certificates to pest control operators or businesses and registers them in a Register of Pest Control Operators, as well as their premises that are inspected and recorded in a Register of Premises. In addition, all pest control applicators and servicemen employed by these operators must also be certified by the PCA, which includes formal training and a practical exam. The retailers in Jamaica are also licensed by the PCA and have their premises inspected and recorded which therefore gives them some advice with regard to the handling or storage of pesticides. The PCA also approves trainers for all categories of farms including trainers for RADA and the national training agency HEART/NTA. The HEART/NTA provides training for all categories of farms and also to commercial pest control operators. In St Lucia, however, there are no complementary licensing schemes for pest control operators or for licensed retailers and therefore no training is provided as in Jamaica. Farmers must rely on the farm owners or managers to provide training to those employees or farmers applying pesticides on their farms. Additional advice is sometimes also provided by some of the companies that import

[71] For more information refer to Esteban *et al.*, 2003.

pesticides and by external agencies such as CARDI and the OECS. This situation will change as the new Pesticide and Toxic Chemicals legislation is implemented.

For medium to larger farms that export bananas from St Lucia, jurisdiction lies with the SLBC. Registered farmers sell their products directly to the SLBC, who then exports them. Furthermore, WIBDECO facilitates the export of bananas from the Windward Island countries. It also recommends field and harvesting practices and regulates the usage of agro-chemicals for the banana industry in St Lucia and other Windward Islands. It is however important to note that both WIBDECO and SLBC cover only the medium to larger farms that export their bananas. There are however, no other boards or cooperatives for the other crops produced on the island, consequently the medium (to large) farms that grow crops other than bananas are a gap in the jurisdiction.

In Jamaica, there is a predominance of both smaller holdings and secondly a dominance of large plantations in terms of farmland area. The small farms are covered by RADA, and the large plantations that grow the main export crops such as sugar cane, coffee, citrus, bananas and cocoa are covered by their respective agricultural boards. Each board has its own Extension Officers who are available to guide and advise farmers on specific production queries as well as on the use of pesticides and fertilisers. The boards also produce specific informational brochures on topics to help and give guidance to farmers on how to improve their crops and yield and on agro-chemical usage. However, for those medium farms that do not export their crops and mainly target the domestic markets, there appears to be a gap in the jurisdiction.

The medium sized farms that do not export crops, mainly targeting domestic markets, appear to not be covered under the current jurisdiction and organisations that are in place in both Jamaica and St Lucia. These farms have the capacity to cause significant environmental impacts in the case of misuse of agro-chemicals although some of these farmers may already receive some training and advice from the farm owners. This is an area where both RADA and MAFF need to focus their efforts and perhaps expand their role in each country. According to Appendix 1, it is also evident that there is some overlap and duplication in the duties and responsibilities of the PCB / PCA and MAFF / RADA. It is crucial that all categories of farms are given adequate advice and training to ensure the improved use of agro-chemicals and minimise impacts on public health and the environment.

Lastly, it is also important to mention the very small farms in both St Lucia and Jamaica that are most probably not covered by either MAFF or RADA as they are very small in size. They are however, very poorly funded and consequently may not be purchasing nor using agro-chemicals on their farms.

4.2 What constraints exist to implement national and regional obligations and what gaps exist in the system?

Limited human and financial resources are the major constraint. In Jamaica a paid fulltime PCA staff exists but there are no full time staff on the PCB in St Lucia, and this is representative of the situation throughout much of the wider Caribbean. Adoption of the model legislation for the OECS will ensure that relevant international obligations and best practice recommendations are accounted for, but resources need to be found to enable full implementation, to educate users and the public, and to inspect and monitor pesticide operations to ensure compliance with national laws.

Currently in Jamaica and St Lucia full implementation of the requirements of the legislation has yet to be achieved and gaps still remain. Appendix 2 shows which international obligations and best practice recommendations are currently not being addressed or are being partially implemented in St Lucia or Jamaica. Amongst

others, these include, in St Lucia there is no licensing and training scheme for licensed retailers or pest control operators but this should change as the new Pesticides and Toxic Chemicals legislation is implemented.

As the previous section showed, in both countries there appears to be some overlap in the functions of the PCB/PCA and Ministries of Agriculture (MAFF and RADA). Although they are likely to cooperate in many areas to manage agro-chemical use, it may be more productive to maximise resources and divide tasks to minimise this overlap and ensure that all farmers are covered under the two countries' policies and jurisdiction.

According to the requirements of the LBS Protocol to the Cartagena Convention, Caribbean countries need to establish NPAs. These are currently being established by NEPA in Jamaica and the Sustainable Development Unit within the Ministry of Environment in St Lucia. There is however, considerable work still needed to meet all the requirements that need to be incorporated into these plans and the NPAs still need to be formalised amongst the existing agencies and government divisions responsible for agro-chemical use and management in both countries.

In respect of the wider principles for pest control, not covered in the legislation, the GAP principles require promotion, and should occur via the recent CGPC/IICA initiative. This is most probably due to a lack of capacity or expertise in the Extension Services in the various countries concerned. This was evident in the farmer survey from this study, where the Extension Services of both MAFF and RADA focus mainly on small farms where it may be more difficult to promote this concept. This is due not only to funding but may also be attributed to a lack of education and awareness in these small farms.

As St Lucia and Jamaica and many of the other Caribbean countries are exporting crops to Europe and the US, it is important to take into account the recent EUREPGAP certification requirements as well as those of the USEPA. The EUREPGAP requirements will shortly need to be followed to be able to export any crops to the EU. This may be difficult due to some medium-scale farms not having much guidance through either MAFF or RADA or through their agricultural boards. Jamaica at present is not promoting the EUREPGAP requirements although they do promote and adhere to the USEPA guidelines as many more of their crops are exported to the US. Countries in the Wider Caribbean region also need to look to the current FAO, WHO, ILO, UNEP and other international guidelines that give useful advice on international requirements and regulations. The FAO PIC has yet to be formally applied in St Lucia although this is imminent. Many of the international guidelines will be taken into account in St Lucia once their new legislation is implemented. If these are not closely followed by the Caribbean nations, it may have a future impact on their local economies as they may no longer be able to export many of their products.

Last of all, the precautionary principle should be promoted and implemented in all agricultural practices in St Lucia and Jamaica and also on a more regional level in the Caribbean. As there is often limited funding in many of these island states, it is often very difficult to obtain or have the necessary scientific data available to prove a particular cause and effect relationship. It is therefore essential that farmers lean toward the side of caution and take precautionary measures rather than waiting for this evidence to be made available.

4.3 Harmonised Legislation

This study and others have shown that administrative arrangements for agro-chemical management in Jamaica and St Lucia are very complex, and yet the human and financial resources needed to operate the system are often inadequate. There is especially a lack of consistent enforcement in these systems.

With the large number of regional organisations such as WIBDECO, OECS, CGPC, IICA and others, many of the regional concerns are already being addressed, although there appears to be a need for harmonisation and maximisation of resources. The CGPC is especially active in the Wider Caribbean region and brings together the pesticide control boards from many of the Caribbean countries. This group provides a good interface between the various countries and is currently the best forum to discuss a harmonised approach to the effective regulation and control of pesticides through common regional legislation.

The proposed draft model legislation mentioned in Section 2.2 for the OECS countries has been discussed at length within the CGPC and has already been agreed by the PCBs of the OECS in February 2000. The CGPC is currently discussing this model legislation with an aim to have many of the countries adopt it and implement it or use the model for their national legislation. St Lucia is the first country to have done this by modelling their new Pesticides and Toxic Chemicals Control Act, 2001 on this draft legislation.

Due to the small nature of many of the Caribbean nations and the ease with which many products are traded in the islands, it is key that legislation is harmonised. As a consequence, resources may be maximised and the current Ministries of Agriculture and the Pesticide Control Boards in the various countries could potentially concentrate their efforts on enforcement of regulations as well as training for the agro-chemical users and the general public. It is therefore essential that for this legislation to be effective, the respective national governments must ensure that their PCB's are given the necessary resources, including personnel and finances, to educate and sensitise the users and public of their role and to inspect and monitor pesticide operations to ensure compliance with the national laws.

Saunders (1993) has suggested that regional cooperation could reduce national expenditure on the management of agro-chemicals. This is already being done in many different sectors where the intent is to identify those tasks that would normally be done by national governments and that through agreement would be delegated to regional bodies or organisations such as the CGPC or OECS. This includes, but is not limited to, such functions as information collection and dissemination; monitoring and enforcement; and registration and permitting. This is also applicable in the context of setting up and maintaining a database of accepted and prohibited chemicals which would be managed by a regional secretariat such as the CGPC (or a designated local agency or partner), rather than having each country devote their resources necessary to maintain such a database. Other areas where harmonisation may be applied is to designate a regional laboratory or several laboratories to conduct testing, analysis and monitoring, which would help to reduce costs for each country and pool the technical expertise resources. This would of course demand a standardisation of testing protocols that would have to legally satisfy each country.

4.4 General Recommendations

The following general recommendations are suggested based on the various gaps and constraints identified in this report:

- Public health of consumers should be given priority when considering national plans for the use of agro-chemicals (both domestic and export markets):

  - Ensure proper use of agro-chemicals to facilitate food safety, particularly in the case of produce for the home market not captured under export requirements
  - GAP and Best Practice Codes of Conduct for pesticide use (e.g. FAO, IICA, OECS) need to be implemented particularly for domestic products not already covered by existing arrangements and adequate training schemes developed for this
  - Promote linkages between consumers such as hotels and producers
  - Set regionally acceptable (or local) standards for Maximum Residue Limits, in the absence of which the FAO / WHO Codex Alimentarius standards should be applied where possible
  - Ensure adequate analytical capacity to enable monitoring for compliance with standards for public health (i.e. medical and food residue monitoring laboratories)
- In deciding what chemicals to use and where, if doubt exists and there is a lack of available information to inform decisions upon its use, and given limited resources to enable adequate monitoring, a precautionary principle should be applied, and that chemical not used until sufficient evidence is available indicating otherwise.
- Legislation based on the OECS model should be adopted throughout the wider Caribbean to ensure that adequate provision exists in the legislation for the control of the use and application of agro-chemicals.
- Given limited resources, an institutional analysis of PCBs and other relevant executing agencies would be valuable to assess existing capacity and identify constraints and needs, and to suggest alternative mechanisms to overcome identified constraints. Adequate financing mechanisms and cost recovery through licensing are required.
  - The overlap in the functions of the PCB/PCA and Ministries of Agriculture needs to be examined, including which user groups they target, in order to rationalise the use of limited resources. In Jamaica and St Lucia respectively, RADA and MAFF need to examine whether greater effort needs to be spent on targeting medium farms not exporting produce and the best mechanism for reaching them. (Appendix 1).
- In particular emphasis should be placed on strengthening capacity and resources for implementing appropriate licensing, monitoring and compliance control schemes, and training and education of licence holders and users of agro-chemicals. Additional gaps in implementing activities to meet the requirements of legislation and codes of conduct need to be fully identified throughout the wider Caribbean (Appendix 2).
- Legislation relating to the regulation of public end users of agro-chemicals, and their responsibilities should be considered via the CGPC in order to advise national systems. Certification schemes for all users of agro-chemicals should be adopted throughout the wider Caribbean. These should include the provision of training in pesticide use and the implementation of health and safety standards for applicators and farm employees, including adequate home storage.
- Communications experts should be engaged to assist the implementing authorities in delivering messages on the correct use of agrochemicals and public safety issues. This should encompass both targeted training of license holders and farmers, and wider public awareness raising via locally relevant media including the TV and radio. Change-management concepts should be applied

(e.g. to influence changes in: agricultural practice; storage, labelling, sale and disposal of agro-chemicals, outcomes of public health monitoring and research).

- In order to reduce the burden on government organisations, more should be done to investigate where else in the system responsibility for stewardship of agro-chemicals including training in their use and application can be applied. Thus responsibility would be transferred to intermediary bodies and defined in their terms and conditions of licence (importers, manufacturers, retail outlets and pest control operators). Government would maintain a monitoring and compliance control role.
- Given limited national capacity, there is a need to ensure continued and enhanced support provided by regional bodies and external agencies. To avoid duplication of effort at a national level, regional bodies should explore where they can provide assistance common to each state, e.g. to develop and provide regional trainers (of trainers) / courses / workshops to train staff at national PCBs and Agricultural Ministries in all the various functions; To help develop locally relevant material that can be disseminated and promoted via national agencies. Harmonised legislative and administrative systems throughout the region should continue to be pursued, and will enable this to occur enhancing national capacity.
- Through the CGPC, a regional pesticide database for registration, licensing and quantification has been suggested as a good overall means of harmonising pesticide registration amongst Caribbean states, and this study endorses that view. As part of the current project, MRAG has produced a review of the two databases and recommendations for a regional database based on a user requirement survey.[72]

Lastly, it is important to mention that pest control should not be seen as the sole responsibility of the Ministries of Agriculture but also for the Ministries of Health, as is the case in Jamaica,[73] the Customs and Excise Departments and other parts of the government. All of these should contribute to assist and support the work of the PCA in Jamaica, the PCB in St Lucia and PCBs in the WCR. The PCB's should also be encouraged to work with external agencies such as the FAO, UNEP and the US EPA to ensure that their actions are synchronised with those of international organisations.

4.5 How to implement policies and recommendations?

The implementation mechanisms for the above mentioned recommendations were discussed at a workshop at the 8th CGPC Meeting in St Vincent and the Grenadines in June 2003. The outcome of this workshop is summarised in the Workshop Proceedings.[74] Furthermore, the overall recommendations and the strategy for improved agro-chemical use and management, which were developed and derived during this workshop, are presented in an additional report.[75]

[72] Pearce and Esteban, 2002
[73] The PCA is directly under the Ministry of Health.
[74] Mees *et al*., 2003a
[75] Mees *et al.*, 2003b

5 REFERENCES

Barnes, C. (2000) International Food Safety Access to Information – Regulatory Harmonisation. Coordinating Group of Pesticides Control Boards of CARICOM Countries (Fifth Meeting). June 2000.

Boodram, N. (2002) The fate of agro-chemicals in the land-water interface, with reference to St Lucia and the wider Caribbean. DFID NRSP Project R7668. CEHI, St Lucia. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 4).

Canadian Food Inspection Agency (2001) Draft Code of Practice for the Hygienic Production of Sprouted Seeds. September 2001. www.inspection.gc.ca/english/plaveg/fresh/sprointe.shtml

CGPC (2000) Proceedings of the Coordinating Group of Pesticides Control Boards of the CARICOM Countries (Fifth Meeting). Jamaica, 20-22 June 2000.

CGPC (2001) Proceedings of the Coordinating Group of Pesticide Control Boards of Caribbean Countries (Sixth Meeting). Dominica, 19-21 June 2001.

CGPC (2002) Proceedings of the Coordinating Group of Pesticides Control Boards of the CARICOM Countries (Seventh Meeting). Antigua and Barbuda, 18-20 June 2002.

CGPC (2003) Proceedings of the Coordinating Group of Pesticides Control Boards of the CARICOM Countries (Eighth Meeting). St Vincent and the Grenadines, 18-20 June 2003.

Chung, P. (1994) Pests of Pawpaw and their Management. Paper presented at Seminar on Pawpaw Production IICA/JADF/Jamaica Pawpaw Grower's Association October 24-26, 1994, Kingston, Jamaica.

Chung, P. (1999) Getting the Best from Farm Pesticides. RADA. June 1999, Jamaica.

Chung, P. (2001) Notes on Integrated Management of Callaloo. RADA. May, 2001, Jamaica.

Chung, P. (2001) Notes on Integrated Management of Sweet Potato. RADA. April, 2001, Jamaica.

Coffee Industry Board. Some Environmental Tips for Sustained Coffee Production.

Coffee Industry Board. (1997) Coffee News: Technical Highlights, Volume 1, No. 2. April-June 1997, Coffee Industry Board, Jamaica.

Dasgupta, T. and C. Perue. (2003) Toxicity Review for Agro-chemicals in St Lucia and Jamaica. DFID NRSP Project R7668. July 2003. Chemistry Department, UWI, Mona, Jamaica. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 3).

Edwards, P. (2001) The fate of agro-chemicals in the land-water interface, with reference to Jamaica and the wider Caribbean. DFID NRSP Project R7668. Centre for Marine Studies, UWI, Mona, Jamaica. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 5).

Espeut, P. and Hay, D.B. (2002) Administrative procedures for agro-chemical management in Jamaica. Caribbean Coastal Area Management Foundation, Clarendon, Jamaica. DFID NRSP Project R7668.

Esteban, N., C. Mees, A. Philigence, and L. Simpson. (2001) Impact and Amelioration of Sediment and Agro-Chemical Pollution on Caribbean Coastal Waters. Workshop Proceedings Research project DFID NRSP R7668. June 2001. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Workshop report).

Esteban, N. (2001) Report of a project visit to Jamaica and St Lucia. Impact and Amelioration of Sediment and Agro-Chemical Pollution On Caribbean Coastal Waters. Report for research project DFID NRSP R7668. December 2001. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Trip Report 3).

Esteban, N., P. Espeut, B. Hay, C. Mees and S. Seddon-Brown. (2003) Importation, administration and harmonisation of agrochemical management in St Lucia, Jamaica and the wider Caribbean. DFID NRSP Project R7668. C-CAM and MRAG Ltd. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 1).

European Commission-EUROPA website:
http://europa.eu.int/comm/agriculture/qual/organic/def/index_en.htm

FAO website: http://www.fao.org.

FAO and World Health Organization (WHO). Codex Alimentarius. Further information and database on Codex maximum residue limits (MRLs) at: http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm

FAO (1995) Prevention of accumulation of obsolete pesticide stocks

FAO (1996a) Disposal of bulk quantities of obsolete pesticide in developing countries;

FAO (1996b) Pesticide storage and stock control manual

FAO / UNEP (1998) Rotterdam Convention on the Prior Informed Consent (PIC) Procedure fro Certain Hazardous Chemicals and Pesticides in International Trade. Further information and Convention text at : http://www.pic.int.

FAO (1999a) Guidelines for management of small quantities of unwanted and obsolete pesticides

FAO (1999b) Inventory Guidelines for obsolete, unwanted and banned pesticide stocks and POPs.

FAO (1999c) Organic agriculture. A report to the FAO Committee on Agriculture (COAG), 25-26 January 1999. Rome: FAO
www.fao.org/WAICENT/FAOINFO/AGRICULT/magazine/9901sp3.htm

FAO (2000) Assessing soil contamination: a reference manual

FAO (2001a) Guidelines on good practice for ground application of pesticides.

FAO (2001b) Guidelines on good practice for aerial application of pesticides.

FAO (2001c) Training Manual for inventory taking of obsolete pesticides. FAO Pesticide Disposal Series #10.

FAO (2001d) Guidelines on minimum requirements for agricultural pesticide application equipment.

FAO (2001e) Guidelines on standards for agricultural pesticide application equipment and related test procedures.

FAO (2001f) Guidelines for the organisation of schemes for testing and certification of spray equipment in use.

FAO (2001g) Guidelines on organisation and operation of training schemes and certification procedures.

FAO (2002a) The International Code of Conduct on the Distribution and Use of Pesticides (Revised Version). November 2002.

FAO (2002b) Manual on development and use of FAO and WHO specifications for pesticides. First Edition. FAO Plant Production and Protection Paper 173. Rome, 2002.

FAO (2003) Development of a framework of Good Agricultural Practices. Committee on Agriculture, Seventh Session 31 March – 4 April, 2003 Rome, www.fao.org/DOCREP/MEETING/006/Y8704e.HTM.

Graham, L. B. (2001) Assistance to Institutionalize Good Agricultural Practices (GAP) for Selected Commodities in the OECS. Presentation at the 6th CGPC Meeting in June 2001, Roseau, Dominica.

Graham, L. B. (2002) Status of the GAP project for the OECS. Presentation at the 7th CGPC Meeting in June 2002, Antigua and Barbuda.

Gumbs, F. A. (1987) Soil and Water Conservation methods for the Caribbean. Department of Agricultural Engineering U.W.I., St Augustine, St Lucia

Inter-American Institute for Cooperation on Agriculture (IICA) (2002) Pesticides Certification Manual for industrial pesticides control operators in St Lucia.

IICA (1992) Agriculture and the Environment

IICA (1993) Pest Risk Analysis: a perspective

IICA (1993) Agriculture and Sustainable Development

IICA (2002a) Training Manual on Food Safety.

IICA (2002b) Training Manual for Good Agricultural Practices for Selected Crops in the OECS. April 2002. IICA.

IICA (2002c) Training Manual for worker health and the use of safety equipment.

Integrated Pest Management-Collaborative Research Support Program: Sixth Annual Report (1998-1999) Virginia Polytechnic Institute and State University, USA.

Leandre, R. (2001) Review of soil management and farming practices, including the use of agro-chemicals, in St Lucia. St Lucia: Ministry of Agriculture. Research Project DFID NRSP R7668.

Lawrence, J. and Tolin, S. (1999) Integrated Pest Management Collaborative Research Support Program. Sixth Annual Report 1998-1999. Virginia Polytechnic Institute and State University.

Lewis, A. and N. Esteban. (2002) Environmental survey of agro-chemicals in the land water interface of St Lucia. DFID NRSP Project R7668. CEHI and MRAG Ltd. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 6).

Lindsay, J. I. (1999) Aspects of Soil and Water Management. U.W.I., St Augustine, St Lucia.

MAFF (1966) Soil and Land Use Surveys Map No. 20. St Lucia.

MAFF (1996) 1996 St Lucia Census of Agriculture. Final Report. Planning and Statistical Unit, Ministry of Agriculture, Lands, Fisheries and Forestry.

MAFF (2001) Production Guidelines: Plantain. April 2001. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Cassava. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Integrated Pest Management. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Celery and Parsley. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Ginger. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Ginger Lilies. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Herb. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Lettuce. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Orchids. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Sweet Pepper. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Sweet Potatoe. April 2002. Extension Division of MAFF, St Lucia.

MAFF (2002) Production Guidelines: Yam. April 2002. Extension Division of MAFF, St Lucia.

McComie, L. (2000) Challenges to the Plant Health System in St Kitts and Nevis. CARDI, St Kitts/Nevis/Montserrat Unit. www.uwichill.edu.bb/bnccde/sk&n/conference/papers/LDMcComie.html

McPherson, G., H. Hamilton, R.J. Baker and K.F. Nielsen. (1989) Fertilizers for Coffee in Jamaica. Coffee Industry Board and Coffee Industry Development Co. Kingston, Jamaica.

Mees, C., S. Seddon-Brown and N. Esteban. (2003a) Workshop proceedings for the DFID NRSP Project R7668 Workshop held during the 8th Annual Meeting of the Coordinating Group of Pesticide Control Boards of the Caribbean, St Vincent and the Grenadines, 18-20 June 2003. DFID NRSP Project R7668. MRAG Ltd.

Mees, C., N. Esteban and S. Seddon-Brown, 2003. Management of agro-chemicals for improved public and environmental health - A strategy for improved agro-chemical use and management for the Wider Caribbean: DFID NRSP Project R7668. Policy and management strategy document, MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 10).

Ministry of Agriculture, Fisheries and Food (1998) Code of Good Agricultural Practice for the Protection of Water. Welsh Office Agriculture Department. www.defra.gov.uk/environ/cogap/watercod.pdf

OECS Natural Resources Management Unit (1998) Pesticides Briefing Paper #1: Pesticides Legislation.

OECS Natural Resources Management Unit (1998) Pesticides Briefing Paper #2: Pesticides Standards, Quality Control and Monitoring.

OECS Natural Resources Management Unit (1998) Pesticides Briefing Paper #3: General Pesticide Usage.

OECS Natural Resources Management Unit (1998) Pesticides Briefing Paper #4: Integrated Pest Management.

OECS (2002) St. George's Declaration of Principles for Environmental Sustainability in the OECS.

Pearce, J., and N. Esteban. (2002) Database Review and User Requirements Analysis prepared for the Coordinating Group of Pesticide Control Boards of the Caribbean. DFID NRSP Project R7668. MRAG Ltd. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 7).

Pest Control Authority (1996) Training Manual for the Safe Handling & Use of Pesticides in the Agricultural Sector. Kingston, Jamaica.

Philigence, A. (2001) Agro-chemical application (pesticides and fertilisers) in St Lucia. Report for research project DFID NRSP R7668. November 2001.

Pollard, G. (2002) Initiatives through FAO's Regular Programme Activities. Presentation at the 7th CGPC Meeting in June 2002, Bridgetown, Barbados.

RADA (1994) How to grow cauliflower: a training manual for farmers. RADA. April 1994, Jamaica.

RADA (1994) Fertiliser usage: A Training Manual for Farmers. Volume 1: Some Vegetable and Garden Crops. RADA. June 1994, Jamaica.

RADA (1995a) Hot pepper (Scotch Bonnet) production: a training manual for farmers. RADA. August 1995, Jamaica.

RADA (1995b) How to grow broccoli: a training manual for farmers. RADA. March 1995, Jamaica.

RADA (1999a) Best Bet Technology : Pineapple Barriers. RADA Extension Services and Morant Yallahs Agricultural Development Project. September 1999, Jamaica.

RADA (1999b) Best Bet Technology : Minimum Tillage. RADA Extension Services and Morant Yallahs Agricultural Development Project. September 1999, Jamaica.

RADA (1999c) Technology and generation validation: How to make and use the A frame. RADA Extension Services and Morant Yallahs Agricultural Development Project. September 1999, Jamaica.

RADA (1999d) Warning: Jamaican hot pepper exports must be fumigated. Hot Pepper Task Force, Ministry of Agriculture RADA. December 1999, Jamaica.

RADA (1999) Urban Farming Project Crop Profile: Cabbage. RADA, Jamaica.

RADA (1999) Urban Farming Project Crop Profile: Callaloo. RADA, Jamaica.

RADA (1999) Urban Farming Project Crop Profile: Cucumber. RADA, Jamaica.

Saunders, P. M. (1993) Practical Considerations in the Implementation of Industrial Chemicals Legislation in the Caribbean. Dalhousie Law School and Dalhousie School for Resource and Environmental Studies.

Simpson, L. (2001) Outline of existing knowledge of farming practices and soil conservation techniques in Jamaica. Report for Research project DFID NRSP R7668. December 2001.

Simpson, L. (2003) Review of soil management and farming practices, including the use of agro-chemicals in the Caribbean, with particular reference to St Lucia and Jamaica. Research project DFID NRSP R7668. April 2003. CARDI, Jamaica. London: MRAG Ltd. www.mragltd.com (select land water interface; selected project examples and Report 2).

Statistical Institute of Jamaica (STATIN) (1996) Census of Agriculture 1996 Volume 1. Kingston, Jamaica.

United Nations Environment Programme (UNEP) (1994) Regional Overview of Land-Based Sources of Pollution in the Wider Caribbean Region. CEP Technical Report No. 33. UNEP Caribbean Environment Programme, Kingston, Jamaica.

UNEP (1998) Best Management Practices for Agricultural Non-point Sources of Pollution. CEP Technical Report No. 41. UNEP Caribbean Environment Programme, Kingston, Jamaica.

UNEP (2000) Land-Based Sources of Marine Pollution in the Wider Caribbean Region: A Protocol for Action. June 2000. UNEP-CAR-RCU, Kingston, Jamaica.

United States Environmental Protection Agency (USEPA) (1993) Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters. EPA-840-B-92-002. US Environmental Protection Agency, Washington, D.C.

APPENDIX 1

Table 1: Institutions responsible for implementing management control with respect to agro-chemical use in Jamaica

Institution	Functions in respect of agro-chemical management	Public	Small farms	Medium farms		Large Farms	
			Farmers	General	Employee farmers	General	Employee farmers
PCA	Part of Ministry of Health; Administration: implements legislation and monitors pesticides. Regulates import sale and storage of pesticides.	X	X	X	X	X	X
	Use: regulates rates of application and other aspects of use	X	X	X	X	X	X
	In conjunction with licensing of retailers operators, provides advice and training to all types of farmers. PCA approved trainers for all categories including RADA, HEART/NTA, etc.	X	X	X	X	X	X
	In conjunction with licensing of retailers operators, provides training.						
	Public Awareness programmes	X	X	X	X	X	X
RADA extension services	Extension and training, including use of agro-chemicals; produces briefing notes and guides, Focuses on small farms.		X				
Agricultural boards	For all export crops e.g. coffee, sugar. Each board has its own extension officers and produces information brochures to provide advice on agro-chemical use		X	X		X	
Licensed retailers	Licensed by PCA includes training in handling and storage of pesticides? Users tend to ask retailers about rates and choice of chemical.	X	X				
Pest control operators	Licensed by PCA. Requires insurance to operate business to address liabilities. They will include service to farmers but not yet implemented.	X					
Farm owners / managers	Employee farmers / pesticide applicators *may* be provided with advice / training by owner or manager				X		X
External agencies	CARDI- Research and technology transfer to farmers mainly on IPM.						
	OECS training						
	HEART/NTA national training agency provides training to farmers and commercial pest control operators towards certification	X	X	X	X	X	X

Table 2: Institutions responsible for implementing management control with respect to agro-chemical use in St Lucia

Institution	Functions in respect of agro-chemical management	Public	Small farms	Medium farms		Large Farms	
			Farmers	General	Employee farmers	General	Employee farmers
PCB	Part of MAFF; Administration: Regulate import sale and storage of pesticides; registration of new pesticides; guidelines on labelling;						
	Public awareness programmes	X					
	Provide advice and training to farmers (of all sizes) through the activities of the Crop Protection and Quarantine Unit (MAFF), where the PCB Secretariat is housed.		X		X		X
MAFF	Advice on IPM, use of agro-chemicals; educational pamphlets; demonstration workshops; dissemination of material via media and schools with a focus on domestic agricultural crops and small farms as well as medium and large farms.	X	X	X		X	
Agricultural boards (Only bananas)	For export bananas only (SLBC, WIBDECO) SLBC has extension officers who provide advice on agrochemical use. The board also has influence over what chemicals are imported. Certification programme ensures farmers demonstrate compliance with legislation. Use of media to inform public / farmers.	X	X	X		X	
	WIBDECO recommends field and harvesting practices and regulates the use of agro-chemicals			X	X	X	X
Licensed retailers	There appears to be a gap here where there are no complementary licensing schemes for retailers including training provided as there is in Jamaica. They are supposed to demonstrate stewardship of their products. Although there is no legal requirement for this presently, it will become one under the regulations of the new Act.	X					
Pest control operators	There appears to be a gap here where there are no complementary licensing schemes for pest control operators including training provided as there is in Jamaica.	X					
Farm owners / managers	Employee farmers / pesticide applicators *may* be provided with advice / training by owner or manager				X		X
Promoters of Agro-chemicals	Technical packages for various crops are usually distributed to MAFF personnel and farmers. They mainly contain information on the various pesticide products that should be used.	X					
Manufacturers /importers	SCIC, Renwick & Co; SLAA: Some of them have agronomists who carry out training on the use of their various products for sale. These workshops are usually aimed at farmers (all categories) and extension personnel.		X		X		X
Schools	Education of children in safety and proper application of agrochemicals	X					

Institution	Functions in respect of agro-chemical management	Public	Small farms	Medium farms		Large Farms	
			Farmers	General	Employee farmers	General	Employee farmers
External agencies	CARDI- Research and technology transfer to farmers through MAFF. Other organisations mainly supply the PCB with information about pesticides from the international level. Like codes of conduct, labelling regulations, PIC, pesticides safety, changes in status of pesticides registration, etc	X					
	OECS training	X					
	WIBDECO	X			X		X

APPENDIX 2

Formal responsibilities in respect of agro-chemical management, voluntary codes of conduct, principles and internationally recognised recommendations, the institutions responsible for administering them, and the status of implementation.

Legislation; codes of conduct and recommendations	**Management options / action**	**Jamaica: responsible institution, and status of implementation**	**St Lucia: responsible institution, and status of implementation**
International and national obligations and legislation			
Cartagena Convention, Land Based Sources of Pollution Protocol	*1. National plans for agricultural run-off* a. an estimation of loadings that may adversely affect the Convention area;	Convention ratified –Currently establishing a National Plan of Action – NEPA implementing	Convention ratified – Sustainable Development Unit within the Ministry of Environment
	b. an identification of associated environmental impacts and potential risks to human health;	Environmental Health Division of the Ministry of Health – Not yet started	
	c. the evaluation of the existing administrative framework to manage agricultural non-point sources of pollution;	National Environment and Planning Agency (NEPA) – ongoing	
	d. an evaluation of existing best management practices and their effectiveness; and	RADA Extension Services – ongoing but CARDI could help	
	e. the establishment of monitoring programmes.	RADA / NEPA – exists only in limited areas	
	2. Agricultural education programmes a. the establishment and implementation of programmes for the agricultural sector and the general public to raise awareness of agricultural non-point sources of pollution and their impacts on the marine environment, public health and the economy;	RADA Extensions Services / PCA and NEPA.	
	b. the establishment and implementation of programmes at all levels of education on the importance of the marine environment and the impact of pollution from agricultural activities;	NEPA (Public education division & Coastal Zone Branch) – limited programmes	

Legislation; codes of conduct and recommendations	Management options / action	Jamaica: responsible institution, and status of implementation	St Lucia: responsible institution, and status of implementation
	c. the establishment and implementation of training programmes for government agencies and the agricultural sector on the implementation of best management practices, including the development of guidance materials for agricultural workers on structural and non-structural best management practices, to prevent, reduce and control agricultural non-point sources of pollution; and	Ministry of Agriculture- RADA – limited programmes depending on extension services and PCA.	
	d. the establishment of programmes to facilitate effective technology transfer and information exchange.	NEPA / RADA – not formalised	
	3. The development and promotion of economic and non-economic incentive programmes to increase the use of best management practices to prevent, reduce and control pollution of the Convention area from agricultural non-point sources.	NEPA / RADA – not formalised	
	4. An assessment and evaluation of legislative and policy measures, including a review of the adequacy of plans, policies and legal mechanisms directed toward the management of agricultural non-point sources and the development of a plan to implement such modifications as may be necessary to achieve best management practices.	NEPA Legal affairs Division- limited but ongoing. PCA, RADA, UWI,NGO	Adopted the model legislation drafted by the OECS and incorporated the elements into their new Pesticides and Toxic Chemicals Control Act (2001)
OECS / IICA / CGPC model legislation for harmonisation; (note not all requirements of legislation listed relate to use of pesticides)	Formation of PCBs to administer the legislation (now Pesticides and Toxic Chemicals Control Boards)	Model legislation not implemented, National legislation has established the PCA for this purpose.	Yes, new legislation implemented the model legislation into the Pesticides and Toxic Chemicals Act (2001). PCB established but needs to be strengthened and developed.
	Registration and licensing of importers/ manufacturers	PCA	PCB
	Licensing and training of pest control operators	PCA	Not currently undertaken - should be implemented through new legislation

Legislation; codes of conduct and recommendations	Management options / action	Jamaica: responsible institution, and status of implementation	St Lucia: responsible institution, and status of implementation
	Licensing and training of pesticide retailers	PCA	Not currently undertaken - should be implemented through new legislation
	Requirements, training and public awareness re storage transportation, use and application, and disposal of pesticides.	PCA/RADA some overlap of responsibilities	PCB
	Monitoring and compliance control	PCA; Customs and Excise	PCB; Customs and excise - needs strengthening
	Public health monitoring	Ministry of Health	Ministry of Health
	Environmental health monitoring	Ministry of Health and NEPA. UWI and CEHI – limited to locations of interest	CEHI and Dept. of the Environment
Voluntary codes of conduct and best practice guidelines			
FAO Code of Conduct on distribution and use of pesticides (OECS has recommended implementation of this Code)	This includes • pesticide management, • testing of pesticides, • reducing health and environmental hazards; • regulatory and technical requirements; • availability and use; • distribution and trade; • labelling, packaging, storage and disposal; • advertising; information exchange; and, • monitoring and observance of the Code	PCA. Aspects covered include: Pesticides management Reducing health and environmental hazards Availability and use Distribution and trade Labelling, packaging, storage and disposal Advertising, information exchange Monitoring and observance of code	Yes. Aspects covered include: pesticide management; reducing health and environmental hazards; regulatory and technical requirements; availability and use; distribution and trade; labelling, packaging, storage and disposal.
FAO Prior Informed Consent (CGPC has recommended implementation)	Whilst this deals mostly with arrangements for export/import of hazardous substances, the convention also promotes their safe use through labelling standards and technical assistance.	PIC ratified and formally applied through the PCA.	PIC not formally applied. Bureau of Standards and PCB to address the matter of labelling.
GAP	Recently initiated via CGPC. IICA will coordinate with CEHI and national Ministries. National education programmes to be developed	Lack of promotion at present. Responsible agent : Ministry of Agriculture via RADA Extension Services; PCA	Lack of promotion at present. Responsible agent : Ministry of Agriculture via MAFF Extension Services (and OECS)
	EUREPGAP Certification Requirements	Not promoted in Jamaica at present.	Yes. MAFF, Bureau of Standards and WIBDECO.

Legislation; codes of conduct and recommendations	Management options / action	Jamaica: responsible institution, and status of implementation	St Lucia: responsible institution, and status of implementation
ICM		RADA Extension Services	MAFF Extension Services
IPM and promoting organic farming and alternative methods to agro-chemicals	National and regional 'projects' exist. The EU CAFP aims to enhance national and regional capacity to develop and transfer IPM technologies by 2004	RADA Extension Services and PCA (and agricultural boards)	MAFF Extension Services and PCB (and WIBDECO and SLBC)
FAO Good practice for pesticide application		PCA certifies users	PCB and MAFF Extension Services (and SLBC, WIBDECO and OECS)
FAO minimum requirements for application equipment and test procedures			MAFF give training (also pesticide vendors/importers)
FAO Training schemes		RADA Extensions Services, PCA, sellers of agro chemicals, CARDI.	MAFF Extension Services, PCB (and SLBC, WIBDECO and farm owners / managers, OECS, promoters of agro-chemicals and importers, schools)
FAO certification procedures for operators		PCA	Not covered (some certification programme through MAFF)
FAO/WHO Codex Alimentarius / MRLs	This sets maximum pesticide residue limits in food based on approved use of pesticides in accordance with GAP	PCA	No agency
OECS pesticide labelling and advertising standards		PCA	PCB
OECS pesticide selection, handling, application and disposal standards		PCA	PCB
OECS Certification for commercial pest control operators		PCA	Not covered
IICA Food Safety		National Agricultural Heath and Food Safety Coordinating Committee	PCB / MAFF / Bureau of Standards
IICA Worker health and use of safety equipment			MAFF / PCB
WIBDECO standards			WIBDECO, for banana exporters
Control of pesticides at other points in the distribution chain			
FAO obsolete pesticide storage and disposal		PCA	PCB and MAFF Extension Services (and SLBC and WIBDECO)