



CGPC



DFID Natural Resources Systems Programme

## Policy and Management Strategy Document

# Management of agro-chemicals for improved public and environmental health

A strategy for improved agro-chemical use and management for the Wider Caribbean



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## EXECUTIVE SUMMARY

**The effects of agro-chemical pollution on human health, the environment, and economic resources are well known.** The need for effective control of such pollution is internationally recognised, and international agreements provide a framework to address the problem.

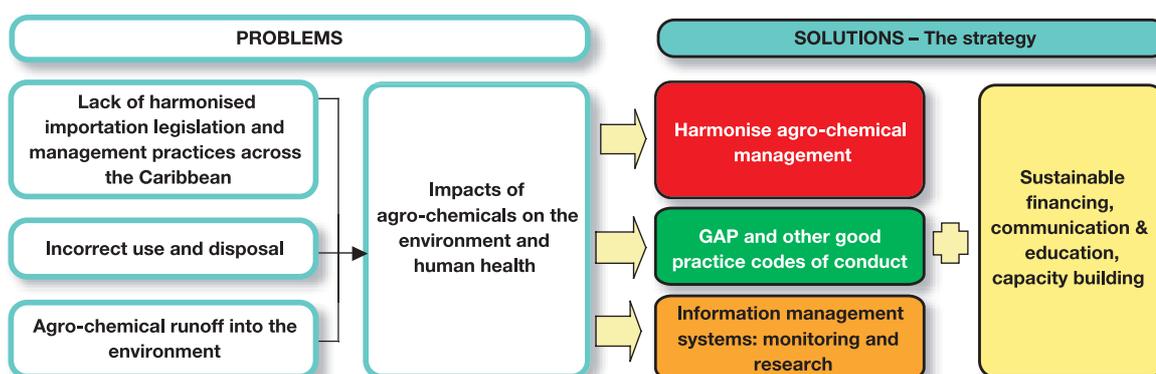
This strategy for improved agro-chemical use and management for the Wider Caribbean outlines the ten key prioritised management recommendations that have been developed with the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC). The strategy translates these recommendations into actions that may be undertaken at regional and national levels to harmonise pesticide control measures, to support and finance existing institutions and improve collaboration, and to promote good agricultural practice through information, training, and outreach work.

The strategy provides detailed guidance on developing health and environmental monitoring plans and on research and

planning that should be undertaken in support of these. It makes recommendations on sustainable financing, capacity building, and communication and education programmes that are required in support of the strategy.

In addition to the strategy document, nine Technical Reports have been produced covering different aspects of the strategy. They include studies of critical control points for management and the amelioration of agro-chemical pollution in case study countries: Jamaica and St. Lucia. These technical reports incorporate detailed recommendations on implementation. Six information briefs have also been developed to provide additional tools to enable the various aspects of the strategy to be effectively implemented.

Figure 1 illustrates problems identified in the research reports and the solutions offered by the strategy. A diagram showing the inter-relationship of the different research documents and the principal components of the strategy can be found in Section 3.



**Figure 1** Moving from problems to solutions

The following prioritised recommendations were developed through the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC) for improved agro-chemical use and management in the Wider Caribbean.

### Harmonised agrochemical management (mitigation of pollution)

1. Harmonised procedures for agro-chemical management should be adopted throughout the Wider Caribbean.
  - Model legislation on Pesticides and Toxic Chemicals should be ratified and adopted. This will dictate the administration, use, and monitoring of agro-chemicals.
  - Administrative procedures should reflect the requirements of the harmonised legislation and be promoted.
  - A locally owned and managed database should be developed for harmonised administration and information sharing.
  - Regionally acceptable (or local) standards for Maximum Residue Limits should be established, in the absence of which the Food and Agriculture Organisation (FAO)/World Health Organisation (WHO) Codex Alimentarius standards should be applied where possible.
  - Regional environmental reference sites need to be established.

### Supporting the system for agro-chemical management

2. Sustainable financing and cost recovery mechanisms must be investigated and, where necessary, novel and creative means found to develop capacity and to fulfil all the functions of the various institutions involved in all aspects of agro-chemical management. External sources of funding must be explored and fully utilised.
3. Communications experts should be engaged for communication, education, and training purposes; change-management concepts should be applied.
4. Undertake an institutional analysis and evaluation of the capacity and resource needs of Pesticide Control Boards (PCBs) and other relevant executing agencies (e.g. extension services, monitoring and research agencies, medical laboratories) throughout the Wider Caribbean. Duplication of effort should be rationalised.
5. PCBs must be adequately staffed and financed to administer and implement national legislation relating to agro-chemicals. There should be a dedicated full-time staff. The composition of the Board of Directors should include representation from the private sector and persons with experience in ecological issues and the fate of agro-chemicals in the environment.

### GAP and other good practice codes of conduct (mitigation of pollution)

6. Good Agricultural Practices (GAP) and other good practice codes of conduct for agro-chemical use need to be implemented, particularly for domestic products not already covered by existing arrangements.

### Informing management decisions (monitoring and research)

7. Promote implementation and further research on Integrated Pest Management (IPM) and Integrated Management of Pests and Pesticides (IMPP) as a means of improved management of the use of pesticides.
8. Socio-economic analyses, including cost-benefit analyses, should be conducted for different farming practices, including options for agro-chemical use (e.g. IPM).
9. Carefully designed public health monitoring plans must be developed. Ensure adequate analytical capacity to enable monitoring for compliance with standards for public health (i.e. medical and food residue monitoring laboratories).
10. Carefully designed long-term environmental monitoring plans must be developed (from the farm to the sea).



Effective monitoring of agro-chemicals from the farm to sea is essential for improved public health.

# TABLE OF CONTENTS

|          |  |          |
|----------|--|----------|
|          | Acknowledgements .....   | i        |
|          | Executive summary .....  | i        |
|          | Figure 1 Moving from problems to solutions .....   | i        |
|          | Ten key recommendations .....  | ii       |
|          | Acronyms .....   | iii      |
| <b>1</b> | <b>Introduction</b> .....  | <b>1</b> |
| <b>2</b> | <b>A strategy for improved agro-chemical use and management</b> .....  | <b>2</b> |
| 2.1      | Strategy framework .....   | 2        |
| 2.1      | Figure 2 Strategy for improved agro-chemical use and management .....  | 2        |
| 2.2      | Implementing the strategy as a whole .....   | 3        |
|          | 2.2.1 Multilevel response .....  | 3        |
|          | 2.2.2 Nine regional projects for implementation .....  | 3        |
| 2.3      | Implementing harmonised agro-chemical management .....   | 3        |
| 2.4      | Implementing GAP and other good practice codes of conduct .....  | 4        |
| 2.5      | Informing management decisions .....   | 5        |
|          | 2.5.1 Public health monitoring .....   | 5        |
|          | 2.5.2 Environmental monitoring .....   | 5        |
|          | 2.5.3 Further research .....   | 5        |
| 2.6      | Supporting improved agro-chemical use and management .....   | 6        |
|          | 2.6.1 Sustainable financing .....  | 6        |
|          | 2.6.2 Communication and education .....  | 6        |
|          | 2.6.3 Capacity building .....  | 7        |
| <b>3</b> | <b>Strategy implementation: tables and annexes</b> .....   | <b>8</b> |
|          | Figure 3 Information inter-relationships .....   | 8        |
|          | Box 1 Details on how to implement the strategy for improved agro-chemical use and management for the Wider Caribbean ..... | 9        |
|          | Box 2 Complete list of recommendations agreed by CGPC .....  | 13       |
|          | Box 3 Complete list of Project Reports .....   | 15       |

# ACRONYMS

|                 |   |                 |   |
|-----------------|---|-----------------|---|
| <b>C&amp;E</b>  | Customs and Excise  | <b>IMPP</b>     | Integrated Management of Pests and Pesticides               |
| <b>CARDI</b>    | Caribbean Agricultural Research and Development Institute             | <b>IPM</b>      | Integrated Pest Management                                  |
| <b>CARICOM</b>  | Caribbean Community and Common Market                                 | <b>LBS</b>      | Protocol on Land Based Sources of Pollution                 |
| <b>C-CAM</b>    | Caribbean Coastal Area Management (Jamaica)                           | <b>LWI</b>      | Land Water Interface  |
| <b>CEHI</b>     | Caribbean Environmental Health Institute (St. Lucia)                  | <b>MAFF</b>     | Ministry of Agriculture, Forestry and Fisheries (St. Lucia) |
| <b>CGPC</b>     | Coordinating Group of Pesticide Control Boards of the Caribbean       | <b>Min. Ag.</b> | Ministry of Agriculture                                     |
| <b>DFID</b>     | Department for International Development (UK)                         | <b>MRAG</b>     | Marine Resources Assessment Group Ltd (UK)                  |
| <b>EU</b>       | European Union  | <b>MRL</b>      | Maximum Residue Limit                                       |
| <b>EUREPGAP</b> | Euro Retailer Produce Good Agriculture Practice                       | <b>NPA</b>      | National Plan of Action                                     |
| <b>FAO</b>      | Food and Agriculture Organization                                     | <b>NRSP</b>     | Natural Resources Systems Programme (of DFID)               |
| <b>GAP</b>      | Good Agricultural Practice  | <b>OECS</b>     | Organisation of Eastern Caribbean States                    |
| <b>ICENS</b>    | International Centre for Environmental and Nuclear Sciences (Jamaica) | <b>PAHO</b>     | Pan American Health Organization                            |
| <b>IICA</b>     | Inter-American Institute for Cooperation on Agriculture               | <b>PCA</b>      | Pesticides Control Authority (Jamaica)                      |
| <b>ICM</b>      | Integrated Crop Management  | <b>PCB</b>      | Pesticides Control Board                                    |
|                 |   | <b>PIC</b>      | Prior Informed Consent                                      |
|                 |   | <b>POPs</b>     | Persistent Organic Pollutants                               |
|                 |   | <b>UNEP</b>     | United Nations Environment Programme                        |
|                 |   | <b>UWI</b>      | University of the West Indies                               |
|                 |   | <b>WHO</b>      | World Health Organization                                   |

## There is international recognition of the need to control agro-chemical pollution.

### Developing countries

Although developing countries use only 10–25% of the world's pesticides, they suffer up to 50% of the reported cases of acute poisoning and 73–99% of the reported fatalities among pesticide applicators. Farmers in developing countries are especially at risk because of inadequate training or inability to read application instructions for hazardous pesticides.<sup>1</sup>

### The Caribbean

In the Caribbean, it is the poor who are at greatest risk. Toxic loadings must be reduced and better health and safety practices employed to protect people and to safeguard the environment and economic resources. Problems that have been identified in respect of the use of agro-chemicals include:

- Illegal imports and their use
- Repackaging of chemicals by vendors without labelling
- Incorrect application
- Inadequate application equipment
- Failure to wear protective clothing.

Effects include harm to human health (poisoning), environmental pollution (exacerbated by lack of soil conservation measures and resulting sedimentation), as well as impacts on non-target species.

The environment of the Wider Caribbean Region is especially vulnerable to agro-chemical pollution because of the small size of its islands. Pollutant sources within watersheds are closely linked to the wider coastal and marine environment. Pollutants, therefore, may be found in high concentrations in coastal waters. The Cartagena Convention (1983) and its Protocol on Land Based Sources of Pollution provide a framework to address this problem and outline the obligations of Caribbean states in ameliorating agro-chemical pollution, including the development of a national action plan to address land-based pollution (as detailed under Annex IV).<sup>2</sup> These national action plans are yet to be put in place and it is suggested that technical working groups are established to develop them. These groups should include members from a wide variety of stakeholders (Ministry of Agriculture, PCBs, national environmental agencies, and research institutes).

Given limited capacity, however, the emphasis should be to reduce imports of the more toxic pesticides and control the administration and distribution chain, thus reducing toxic agro-chemical loadings. At the same time, better practices should be employed in the use of agro-chemicals, and their fate should be monitored.

### This document

Section 2 of this document describes a strategy for the improved use and management of agro-chemicals throughout the Wider Caribbean. The strategy was developed through consultation with the Coordinating Group of Pesticide Control Boards of the Caribbean (CGPC) during the 8th Annual Meeting of the CGPC in St. Vincent and the Grenadines in June 2003. The strategy is based upon the findings of three years of research, from which ten key prioritised management recommendations were derived by the CGPC (see page ii).

'Strategy implementation' (Section 3) provides tabular details of the specific tasks needed to implement the strategy (Section 3, Box 1) and lists the prioritised and endorsed recommendations (Section 3, Box 2).<sup>3</sup>

In the preparation of this strategy, critical control points for management and the amelioration of agro-chemical pollution were examined with specific reference to two case study countries (Jamaica and St. Lucia). Nine technical reports with detailed recommendations, and six information briefs were also developed. These documents provide additional tools and information to enable the various aspects of the strategy to be effectively implemented. Boxes 1 and 3 in Section 3 provide full reference details of these projects and outputs.

### Pre-implementation

The strategy may be implemented at different levels via both national and regional actions. There is a need for national governments to act promptly and, concurrently, to initiate regional actions coordinated through the CGPC to inform their national programmes.

National governments and the CGPC should also develop prioritised plans of action to achieve implementation of their respective components of the strategy and to identify local and external sources of funding.

Implementation of the strategy will require integrating and coordinating the actions of a number of agencies. Section 3 illustrates a number of actions that may need to be undertaken, but the priority and order of these will be context-specific for each Caribbean country. In some cases a mechanism for undertaking these actions may be linked to the action plan required under the Cartagena Convention. A participatory consultative process involving the users of agro-chemicals, those affected by pollution, and the implementing agencies will be important to achieve an effective agro-chemical management plan, and thus pollution control.

<sup>1</sup> Source: PCA (2003) Summary Annual Report April 2002–March 2003. Paper presented to CGPC 8th Annual Meeting in St. Vincent & Grenadines, June 2003.

<sup>2</sup> UNEP (2000) Land-Based Sources of Marine Pollution in the Wider Caribbean Region: A Protocol for Action. June 2000. UNEP-CAR-RCU, Kingston, Jamaica.

<sup>3</sup> The CGPC also recommended during its closed session that:

- The 'strategy' and its recommendations be promoted to national governments, by the CGPC, for adoption and future implementation.
- A policy statement, relating to the strategy and its recommendations is presented to the CARICOM for potential support.
- The formulation of a prioritised work plan would augment these actions.

**The following strategy was designed to incorporate all the recommendations resulting from research on impacts and amelioration of agro-chemicals in Caribbean coastal waters (DFID, NRSP Project R7668).**

The strategy covers various aspects of agro-chemical management including the need for harmonised legislation across the region, the incorporation of good agricultural practices (GAP) and other good practice, public health and environmental monitoring and research, and socio-economic studies.

Crosscutting issues that impact on and support the strategy are shown to be public awareness, sustainable financing, communication and education, and capacity building.

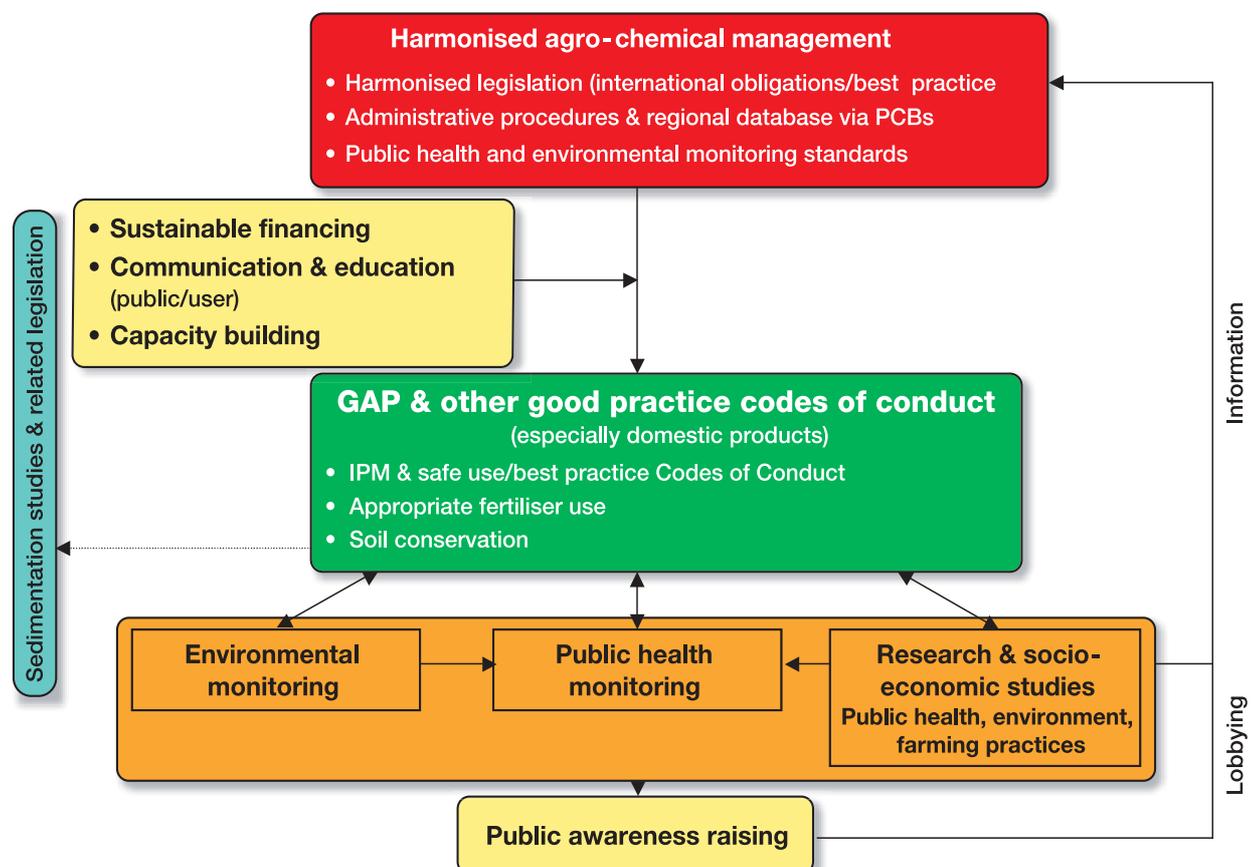
Additionally, there is a link through GAP (and soil conservation) to the sedimentation studies conducted during project R7668. Although these studies have an impact on the GAP and other good practice used, they will not be a focus of this report.

The strategy relates to requirements across the Wider Caribbean. However, it is noted that among the countries consulted there is varying capacity to implement the strategy. For example, in Jamaica, the administrative system is well advanced, and some of the recommendations are already

being implemented. St. Lucia has based its new Pesticides and Toxic Chemicals Act (2001) on the Organisation of Eastern Caribbean States (OECS) model legislation. As has been the case, continued sharing of experience and information via the CGPC will help inform the amelioration of agro-chemical management systems throughout the Wider Caribbean. The development of national implementation plans will recognise existing actions and prioritise new ones.

The success of the strategy needs to be measured through a range of indicators designed to monitor both the uptake of the strategy, and the resulting benefits from its implementation. Indicators to monitor the benefits of the strategy will need to be defined on a national level as discussed in Section 2.5: Informing management decisions. Such indicators should ideally be available and collected via existing mechanisms, and reported in the annual reports and statistics of the institutions involved (e.g. the quantities of imports, the numbers of licences issued).

Indicators to measure the uptake of the strategy i.e. movement towards an holistic and integrated approach to agro-chemical use and management in the Caribbean will be developed during a communications and advocacy project following R7668. There will be uptake indicators available in the form of guidelines by January 2005.



**Figure 2** Strategy for improved agro-chemical use and management

The following sections outline goals and describe mechanisms for implementing the recommendations contained within this strategy.

The required actions are indicated in Section 3, which may be used as a basis for national and regional action plans.

### 2.2.1 Multilevel response

The strategy requires action at both national and regional levels. National governments need to act promptly and concurrently, to initiate regional actions coordinated and agreed to by the CGPC. Together, national governments and the CGPC should each develop prioritised plans of action to achieve implementation of their respective components of the strategy and to identify local and additional funding from external agencies including the private sector.

PCB members (or other institutions with responsibility for agro-chemical management) should inform national governments of requirements and coordinate the development of national plans of action (NPAs).

### 2.2.2 Nine regional projects for implementation

Nine projects, mostly short-term scoping studies, have been identified for implementation at a regional level, with the aim of providing information and highlighting the potential need for additional resources (see Section 3, Box 1: Details on how to implement the strategy for improved agro-chemical use and management in the Caribbean).

Recommended actions arising from the projects may, however, be long-term and will require sustainable financing mechanisms to support them. The CGPC should coordinate the commissioning of these projects initially by appointing members tasked with the responsibility of developing terms of reference for each project. The CGPC should then identify sources of funding (including those through the private sector) and implement each project appropriately.

**Given the complexity and number of tasks involved in administering agro-chemical control, and the lack of national resources to address all the tasks, harmonisation of administrative arrangements is seen as a means of making better use of limited resources in the region.**

Harmonisation also brings benefits to the PCBs administering the system, to other authorities involved in agro-chemical management, and to applicants wishing to register or import products.

#### Adopting model legislation

The Legal Unit of the OECS has developed model pesticides legislation for the Caribbean region. If this model is adopted nationally, it will bring considerable benefits, including the following:

- Addressing international obligations that are currently not fully met throughout the Wider Caribbean
- Addressing common administrative procedures and a framework for good practice management and use of agro-chemicals
- Addressing common regional public health and environmental monitoring standards
- Cost-savings and sharing of resources.

Governments must widely adopt and implement the model legislation to enable and support harmonisation. This requires the establishment of Pesticide and Toxic Chemical Control Boards for administration and control of the management system, thus achieving implementation of common administrative procedures throughout the Wider Caribbean. Once legislation is adopted, mechanisms for harmonisation should be locally owned and managed. Experience should continue to be shared through the established regional body, the CGPC.

Pesticide and Toxic Chemical Control Boards must be adequately staffed and financed (see Section 2.6) and have appropriate Board membership, including representation from the private sector and persons with experience in ecological issues and the fate of agro-chemicals in the environment.

The OECS should review and update the model legislation to reflect the recommendations arising from the 8th Meeting of the CGPC<sup>4</sup>, including changes in the recommended Board composition and minimum schedule of meetings; sustainable financing mechanisms for the PCB; and legislation concerning public end users of agro-chemicals. Recommendations for these amendments should be communicated to the OECS by the CGPC via a policy paper or other written communication.

International obligations also provide for common standards. It is necessary for relevant regional bodies and government departments to bring Conventions and their Protocols (e.g. LBS Protocol to Cartagena Convention and Rotterdam Convention for Prior Informed Consent (PIC)) to the attention of the Ministry of Legal Affairs in each country, and to lobby for governments to ratify, sign, and implement them where this has not already been done.

In addition to legislation and administration, harmonisation also includes development and acceptance of regional public health and environmental standards (see Section 2.5).

A regional database for recording registration and management of pesticides is a valuable tool to support the process of harmonisation and enable information sharing. In order to achieve this, a project proposal needs to be produced and funded locally or via an external agency.<sup>5</sup> Such a project would have two phases:

- To conduct a regional user requirements analysis, an evaluation of the institutional capacity (for use and management), the available resources, and sustainable financing
- To develop the database and provide training and capacity building for its sustainable use.

<sup>4</sup> Note that these changes may be implemented directly at a national level, prior to any changes to the model OECS legislation.

<sup>5</sup> The 8th CGPC meeting in 2003 endorsed a recommendation for MRAG to develop such a proposal and seek funding.

**A framework for good agricultural practice (GAP) aims to produce safe food through the use of suitable soil management practices, and appropriate and safe application of agro-chemicals.** Other good practice codes of conduct for agriculture and the use and application of agro-chemicals also exist.

#### Good agricultural practice

GAP incorporates good practices for integrated crop management (ICM), integrated pest management (IPM), and takes into account alternatives to pesticides. Amongst international certification schemes, the EUREPGAP scheme defines minimum standards acceptable to EU retailers, which are important since Caribbean exporters now need to comply with these standards. Furthermore, the US Certification scheme has other standards that Caribbean countries must also comply with. Plans to institutionalise GAP for selected commodities in the Caribbean region have been initiated through the OECS and promoted via CGPC. Additionally, a large number of internationally recognised codes of conduct and good practice guidelines for the use and application of agro-chemicals exist, including some developed specifically for the Caribbean region.

- GAP, IPM, and good practice codes of conduct must be promoted to reduce agro-chemical use and encourage the development of alternative solutions.
- Training, communication, and education of farmers are vital.
- Soil testing should be conducted on farms to ensure appropriate use of fertilisers.
- Soil conservation and water management practices are essential to reduce run-off and agro-chemical application and pollution.
- Within national systems, jurisdiction for all user groups needs to be defined and duplication of effort reduced to rationalise the use of limited resources.

Implementation of GAP and other good practice codes of conduct should be spearheaded through the establishment of a national coordinating body, which should include representatives from the Ministries of Agriculture, Health, Environment, Trade, Bureau of Standards, PCB, Agricultural Boards, and the private sector.<sup>6</sup> This body should have a mandate that includes:

- Ensuring that supporting policy and legislation are in place. This can be achieved through a review of national legislation in relation to international/regional requirements for GAP and other good practice codes of conduct. Required changes should be highlighted to the Ministry of Legal Affairs in each country through a policy brief
- Keeping relevant implementing agencies informed of the requirements of GAP and other good practice codes of conduct (e.g. Extension Officers, PCB staff) through workshops, written reports, and other communication material, and developing their capacity (see Section 2.6)
- Promoting public awareness, farmer training, and extension delivery to all producers, processors, and exporters in relation to GAP and other good practice codes of conduct (see Section 2.6)
- Developing and promoting locally relevant alternative agricultural practices such as IPM, appropriate fertiliser use, soil conservation (e.g. via the promotion of existing technologies through the extension services and training) and, where necessary, appropriate national and regional research (see Section 2.5)
- Ensuring that all categories of farmer are covered by the mandates of implementing agencies and adhere to the requirements for GAP other good practice codes of conduct, including domestic producers not already covered by existing arrangements. This requires an institutional analysis.

Sediment run off carries agro-chemical residues – both can be avoided through GAP or other good practice codes of conduct.



<sup>6</sup> Note that the concept of a National Agricultural Health and Food Safety System with a National Advisory Body, including representatives from agriculture, health, trade, environment, producer organisations, exporters, and importers is currently being promoted through the CGPC.

**Agro-chemicals are known to accumulate in the environment and to have detrimental effects on human health and the environment. Long-term monitoring programmes and targeted research are essential in order to evaluate these impacts.**

Monitoring helps to identify changes in agro-chemical pollution, danger spots, and particularly problematic chemicals. Furthermore, socio-economic studies need to be conducted to better assess the impact on public health, the environment, and also on the farming practices that may be used in the region.

#### Coordinated research and information sharing

At a regional level, greater collaboration between Caribbean states is needed, assisted by relevant regional bodies through partnerships, for coordinated research as well as improved mechanisms for sharing of information. It may be possible to pool resources for the Wider Caribbean countries, such that research and long-term monitoring programmes could be funded through a regional agency or body like the CGPC. Key issues to tackle include:

- Addressing the lack of knowledge about the chronic and acute effects of agro-chemical use on people, including occupational exposure, environmental pollution, and food contamination. Both new research and a compilation of existing studies are required to inform public health programmes.
- Monitoring and research throughout the Wider Caribbean into the fate of agro-chemicals in the environment is insufficient. Long-term environmental monitoring programmes and targeted research activities, including bioaccumulation and toxic effects of agro-chemicals in the environment, should be established.

### 2.5.1 Public health monitoring

In relation to requirements for public health standards within national legislation, the specifications of a monitoring plan for acute and chronic effects of agro-chemicals on human health need to be developed.

It is noted that Jamaica has a health reporting system that could form the basis of a monitoring plan. This system could be discussed at CGPC and, if appropriate, promoted by them to other Caribbean Ministries of Health.

Otherwise, public health monitoring can be achieved by means of a project undertaken at a regional level by an appropriate institution (e.g. CEHI) and recommendations communicated to Ministries of Health through project reports, policy briefs, and workshops. This will inform national public health monitoring plans and avoid duplication of effort. At the same time, this project should also evaluate regional and national capacities for monitoring and analysis in order to determine what levels of analytical capacity are required at a national level, and what can be shared at a regional level. Sustainable financing mechanisms should be explored (see Section 2.6).

The CGPC should immediately commission a report to investigate acceptable maximum residue limits (MRLs) based on existing standards (e.g. Food and Agriculture Organization (FAO)/World Health Organization (WHO) Codex Alimentarius

and PAHO standards) that could be applied throughout the Wider Caribbean. This report should be delivered to the CGPC and recommendations should subsequently be promoted by PCBs to their governments for adoption by national bureaux of standards. This report should also highlight areas where MRLs are lacking and indicate priorities for targeted research to develop locally relevant MRLs.

The CGPC should identify sources of funding (including the private sector) and develop project proposals for appropriate organisations to implement research priorities. Once MRLs are established, the CGPC/PCBs should inform importing countries, trading partners, consumers, supermarkets, and agro-processors of the locally applied standards via consultations, publications, and the media.

### 2.5.2 Environmental monitoring

As indicated in Section 1, the LBS Protocol of the Cartagena Convention requires the establishment of a national plan of action (NPA). A technical working group should be established for this purpose. One component of the NPA should be a carefully designed long-term environmental monitoring plan. A regional initiative would inform national governments and avoid duplication of effort. This can be achieved through a regional project by an appropriate institution (e.g. CEHI) and recommendations communicated to relevant ministries through project reports, policy briefs, and workshops. At the same time, this project should also evaluate regional and national capacities for environmental monitoring and analysis in order to determine what level of analytical capacity is required at a national level, and what can be shared at a regional level. Sustainable financing mechanisms should be explored (see Section 2.6).

At a regional level, there is a need to establish reference sites and harmonisation of standards for permissible levels of agro-chemicals in the environment. The CGPC should immediately commission a report to investigate acceptable reference conditions and standards. As with the report on public health monitoring, this report should be delivered to the CGPC and recommendations should subsequently be promoted by PCBs to their governments for adoption by national environmental agencies. Furthermore, this report should indicate priorities for targeted research. The CGPC should identify sources of funding (including the private sector) and develop project proposals for appropriate organisations to implement research priorities. Once established, these standards should be incorporated into the NPA.

### 2.5.3 Further research

The CGPC should coordinate the establishment of priorities for targeted socio-economic studies (including cost-benefit analyses) in relation to farming practices and the impacts of agro-chemicals on human and environmental health. A project should be commissioned to achieve this (using a similar approach to that described above). The project should develop a comprehensive research plan indicating priorities and a schedule for implementation. The plan and prioritised recommendations should also be communicated to national governments and relevant research organisations (e.g. UWI, CARDI) via a report. Funding to implement the plan, or components thereof, should be sought from international donors, national governments, and the private sector. A technical sub-committee, or appointee of the CGPC, should monitor implementation of the research strategy to avoid duplication of effort and periodically review the plan.

**Limited human and financial resources are the major constraint to the full implementation of national and regional obligations and good practice codes of conduct for agro-chemical management.** Sustainable financing mechanisms are required to maintain systems for administration and control of agro-chemicals, to finance environmental and public health monitoring programmes, and to ensure that communication, training, and education programmes are implemented.

Within national systems, the jurisdiction for all user groups of different bodies responsible for aspects of agro-chemical management (e.g. PCB and Ministry of Agriculture, extension services) needs to be defined and duplication of effort reduced to rationalise the use of limited resources.

Public awareness raising, training, communication, and education of the private sector (including farmers) are also vital.

### 2.6.1 Sustainable financing

At a national level, Ministries of Finance and Planning should investigate the feasibility of alternative cost-recovery mechanisms for agro-chemical management, to include financing of administration, monitoring, education, and public awareness building. Suggested mechanisms that national governments could immediately implement include: a tax levy on imports, permits and licence fees (with regard to registration, import, manufacture, export, premises, retailers, users and applicators), and penalties for infringements of the legislation.

At a regional level, a complementary study of sustainable financing mechanisms for the administration, monitoring, education, and public awareness raising relating to the use of agro-chemicals will inform national governments about generic alternative funding options. This can be achieved by means of a project undertaken at a regional level by an appropriate institution in collaboration with national Ministries of Finance and Planning who would submit country-specific feasibility studies for compilation and review.<sup>7</sup> Study results and ensuing recommendations should be communicated to Ministries of Finance through written reports, policy briefs, and workshops. This information may be incorporated into national financial plans. The Ministries of Finance should be approached through the Ministries that govern the PCBs. The CGPC should coordinate the request for such a project.

At the national level, changes in financial arrangements should be communicated well in advance through the legal gazette and other appropriate publications and media.



Public awareness of the impact of agro-chemicals is required at all levels including schools.

### 2.6.2 Communication and education

There are three areas in which communication and education are important:

#### 1. Training (capacity building) for staff within the system, i.e. administrative staff of the PCB, and Port Authority and Customs and Excise officers, agricultural extension officers, scientists in monitoring and research laboratories, and other institutions involved in agro-chemical management.

The PCB should deliver training to all staff within the system. This may be achieved by appointing a training officer to identify, develop, and implement training courses and materials for other agencies involved in the system. Agricultural extension officers will require additional training in other aspects not covered through PCBs via existing established mechanisms. Provision should be made to attract adequately trained staff from universities for monitoring and research (see also Section 2.6.3: Capacity building).

Training of staff within the PCBs (e.g. nominated training officers) in the requirements of implementing common legislation and procedures can be achieved by means of a project undertaken at a regional level by an appropriate institution (e.g. by OECS, CEHI) and implemented through a regional training of trainers workshop. The CGPC should coordinate the request for such a project. Training of staff within PCBs in other important areas of agro-chemical management may also be achieved via participation in relevant international meetings.

Training of training staff within the PCBs and extension services in change management procedures can also be undertaken by means of a regional project, led by an appropriate institution (e.g. OECS, UWI) and coordinated and implemented in the way described above.

#### 2. Training of the private sector involved in agro-chemical use, i.e. manufacturers, distributors, retailers, and end users (farmers, pesticide control applicators).

Training of users of agro-chemicals (related to good agricultural practice, storage, labelling, sale, use, and disposal) should be delivered by a combination of the PCB and agricultural extension services. This may be achieved by appointing a training officer within the PCB and via existing Communications Units within the Ministry of Agriculture to identify, develop, and implement training courses and materials for users. Where necessary, communications experts should be engaged to advise training of trainers within the PCB and the agricultural Communications Unit. Additional media (such as publications, TV, and radio) should be employed by the PCB and the Communications Unit to deliver messages to users in an appropriate format suited to the educational standard of the target group.

#### 3. Public awareness raising (particularly for children, the most vulnerable group, and for medical professionals).

Improved public awareness of human health and environmental issues related to agro-chemicals should be delivered by a combination of the Ministry of Health, Ministry of Agriculture, PCBs, and external agents such as the WHO and the FAO. Their Communications Units and training staff should develop materials in conjunction with the media for widespread communication to the public via TV, radio, newspapers, workshops, and exhibitions, etc. Additionally,

<sup>7</sup> The experience from Jamaica, which has a financing mechanism for the PCA, will be relevant.

these groups should work with the Ministry of Education to include these issues in school curricula. Medical professionals should be targeted separately and specific materials developed to inform them. Training of medical staff is appropriate both by medical practitioners, to improve diagnosis and treatment of chronic and acute agro-chemical poisoning, and by PCBs, in details of the commonly applied chemicals and their effects on human health.

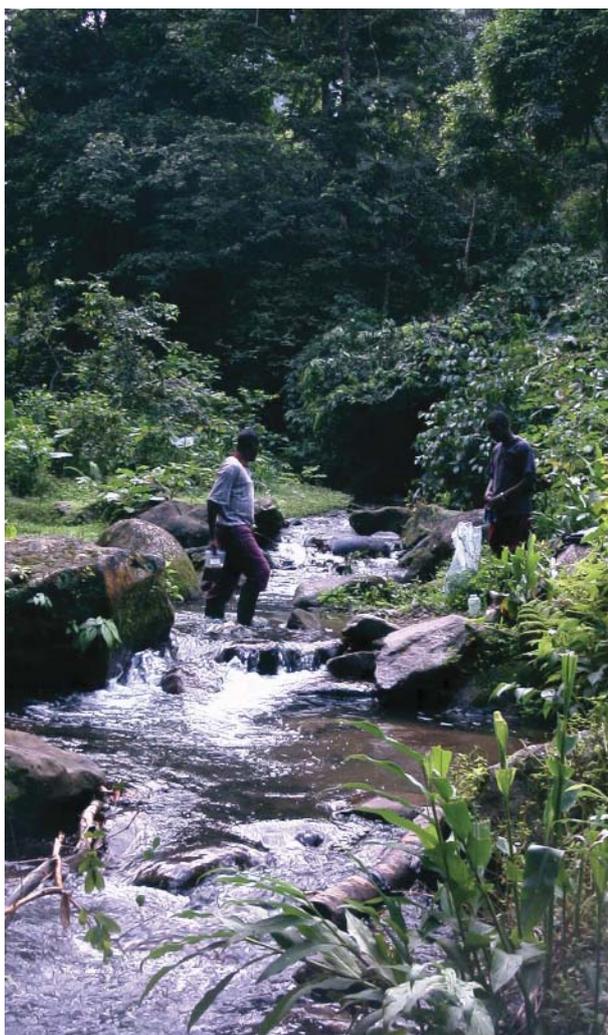
### 2.6.3 Capacity building

As a matter of national priority, Ministries of Planning should undertake an institutional analysis and evaluation of the capacity and resource needs of PCBs and other relevant executing agencies for agro-chemical management (e.g. extension services, monitoring and research agencies, and medical laboratories) to inform relevant Ministries. This would complement and inform the study on sustainable financing mechanisms (see Section 2.6.1).

At the regional level, a complementary study of institutional arrangements should compile national reports and evaluate national and regional capacity and existing initiatives. This will inform governments of what needs to be developed at a national level and where regional capacity exists or needs

further development, e.g. where insufficient national capacity exists, regional research and monitoring support could be provided by CEHI or UWI. This can be achieved by means of a project undertaken at a regional level by an appropriate institution in collaboration with national Ministries of Planning who would submit country-specific institutional studies for compilation and review. Study results and ensuing recommendations should be communicated to Ministries of Planning, Health, or Agriculture with responsibility for the PCBs, through written reports, policy briefs, and workshops. This will further inform national institutional arrangements. The CGPC should coordinate the request for such a project.

To address capacity requirements throughout the system, governments need to evaluate to what extent activities will be contracted out against being performed 'in-house'. In the latter case, provision should be made by relevant Ministries to attract adequately trained staff from universities. In relation to monitoring and research in particular, contracting out may be a sensible alternative to the development of government-established laboratories. The private sector, including universities, could be funded to undertake research and monitoring on their behalf.



Ensuring water free from agro-chemical contamination will not come free of charge – we need to identify sustainable financing mechanisms.



Training and capacity building of PCB staff will enable them to implement a strategy for improved agro-chemical use and management.

The following diagram shows the inter-relationship of the technical reports, information briefs, and the principal components of the strategy (indicating the key recommendations of the CGPC, R1-R10).

**Figure 3** Information inter-relationships

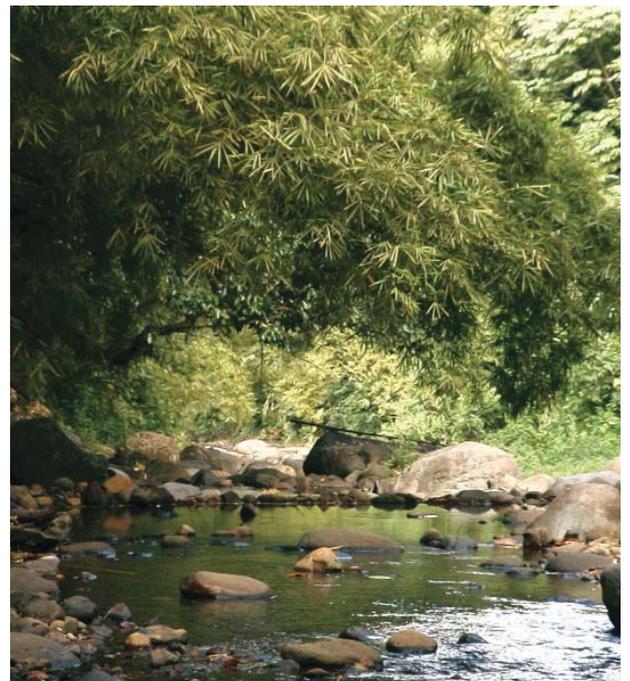
| A STRATEGY FOR IMPROVED AGRO-CHEMICAL USE & MANAGEMENT   |  | ENTRY POINTS FOR MANAGEMENT ACTION  | LOOKING FOR MORE INFORMATION?<br>Information Brief No.      Technical Report No.   |  |  |
|--|--|---|--|--|--|
| <b>SUPPORTING THE SYSTEM FOR AGRO-CHEMICALS MANAGEMENT</b><br>Sustainable financing (F2), Communication and education (F3), Capacity building (R4, R6) | <b>MONITORING:</b> effects of pollution<br><br><b>INFORMING MANAGEMENT DECISIONS</b><br>Environmental and public health monitoring and research (R9, R10) Social impacts – socioeconomic research – farming practices (R7, R8) (harmonised public and environmental health monitoring standards) | <b>PUBLIC AND ENVIRONMENTAL HEALTH MONITORING – EVIDENCE AND IMPACTS OF AGRO-CHEMICAL POLLUTION</b> | 2: The fate of agro-chemicals in the land-water interface in St. Lucia and Jamaica: Environmental monitoring<br><br>3: The quantification and toxicity of agro-chemical imports into St. Lucia and Jamaica | 3: Toxicity review<br>The fate of agro-chemicals in the land-water interface<br><br>4: ...in St. Lucia<br>5: ...in Jamaica<br>6: Environmental survey (St. Lucia)<br>8: Environmental monitoring options |  |
|  | <b>MITIGATION:</b> Action to prevent agro-chemical pollution<br><br><b>GAP &amp; OTHER GOOD PRACTICE CODES OF CONDUCT (R6)</b><br>Good agricultural practice (GAP)/integrated pest management (IPM)/appropriate fertiliser use/soil conservation   |   | <b>AGRO-CHEMICAL USE AND DISPOSAL</b>  | 4: The on farm use of agro-chemicals and associated soil management and farming practices in St. Lucia and Jamaica<br><br>6: Management options for the use of agro-chemicals                            | 2: Soil management, farming practices, the use of agro-chemicals<br><br>9: Management options for the use of agro-chemicals          |
|  | <b>HARMONISED AGRO-CHEMICAL MANAGEMENT (R1)</b><br>Harmonisation of national legislation & international obligations incorporating best practice<br>Harmonised administration and regional information system (database/website)   |   | <b>IMPORT AND MANUFACTURE, SALE AND DISTRIBUTION CHAIN</b>   | 5: Harmonisation of agro-chemical management in the Caribbean (See also 3)   | 1: Importation, administration and harmonisation of agrochemical management<br><br>7: Database review and user requirements analysis |

**Information Brief 1:** Management of agro-chemicals for improved public and environmental health

See Box 3 for full references and website links to access documents.



Monitoring agro-chemical residues in water samples is required to protect public health.



The strategy for improved agro-chemical use and management will help to maintain a clean environment.

**Box 1** Details on how to implement the strategy for improved agro-chemical use and management for the Wider Caribbean

Regional projects for coordination through the CGPC have been numbered (i) – (ix). References to those projects are marked, e.g. ‘from a regional review project (ii)’.

| National or regional level | Implementer | Action | How to communicate and supporting actions required |
|----------------------------|-------------|--------|--|
|----------------------------|-------------|--------|--|

#### Implementing the strategy as a whole

|          |      |   |  |
|----------|------|---|--|
| National | PCB  | Develop a prioritised plan of action based on the following, including costed proposals for implementation over time. Seek national and where appropriate, external funding to implement the plan of action.  | Deliver plan of action. Policy briefs. Lobby Ministers, Treasury, to seek support for implementation of the plan.<br>Develop appropriate funding proposals directed at external agencies to augment national plans.  |
| Regional | CGPC | Develop a prioritised plan of action for the nine regional projects (below) including costed proposals for implementation over time:<br>(i) Database<br>(ii) Public health monitoring<br>(iii) MRLs<br>(iv) Environmental monitoring<br>(v) Research strategy<br>(vi) Cost recovery mechanisms<br>(vii) Train trainers – legislation<br>(viii) Train trainers – change management<br>(ix) Institutional arrangements. | Appoint CGPC members to develop terms of reference for each project in order to achieve this. Identify sources of funding (including the private sector) and seek tenders to undertake each project.<br>CGPC to request via written communication that OECS update model legislation.<br>PCB members to inform national governments of CGPC plan of action.<br>Execute the plan of action and deliver its outputs. |

#### Implementing harmonised agro-chemical management

|          |   |  |  |
|----------|---|--|--|
| Regional | OECS Legal Unit                           | Review and update model legislation.   | CGPC to develop policy paper/written communication to OECS outlining recommended additions to the legislation. |
| National | PCBs; CGPC                                | National Governments sign and implement relevant international protocols (e.g. PIC, POPs).                       | PCBs and CGPC to prepare policy statement. PCBs to lobby governments.  |
| Regional | Via project for a local web-host and PCBs | Establish a locally owned and managed database: develop project proposal (i) (MRAG); fund and implement project. | Via CGPC, develop project outputs in a policy brief to inform governments of requirements.                     |
| National | PCBs                                      | Fund, support, and utilise the regional database.  | PCBs to share information via the database.  |

#### Implementing GAP and other good practice codes of conduct

|          |  |   |  |
|----------|--|---|--|
| National | Government   | Establish a national coordinating body to oversee the implementation of GAP and other good practice codes of conduct.   | Policy brief prepared by Min. Ag./Min. of Health/PCB.  |
| National | GAP coordinating body/legal department               | Review national legislation in relation to requirements for GAP and other good practice, certification and ensure supporting legislation is in place.   | Policy brief produced by coordinating body to Min. Legal Affairs or equivalent.  |
| National | Relevant Ministries represented on coordinating body | Build capacity of GAP implementing agencies.  | Min. Ag., PCBs, and extension services develop training/education/certification programme and implement.                                       |
| National | Min. Ag. Extension services/PCB                      | Promote GAP and other good practice codes of conduct (and certification where appropriate) to all agro-chemical ‘users’. Test soils to advise appropriate fertiliser use. Raise public awareness. | Min. Ag. (ICENS in Jamaica) test soils – advise farmers. Min. Ag. Communications Unit/PCBs develop training/education programme and implement. |
| National | Min. Ag. Communications Unit/PCB                     | Develop locally relevant alternative agricultural practice through research and development projects.   | Via Communications Unit, incorporate project outputs into training/education programme.  |

| National or regional level | Implementer | Action | How to communicate and supporting actions required |
|----------------------------|-------------|--------|--|
|----------------------------|-------------|--------|--|

#### Implementing GAP and other good practice codes of conduct, continued.

|          |                               |  |   |
|----------|-------------------------------|--|---|
| National | Min. Planning (Min. Ag., PCB) | Undertake an institutional analysis to ensure that all categories of farmer are covered by mandates of implementing agencies and address any omissions or duplication. | Min. Planning to prepare report on institutional arrangements and relevant implementing agencies to adjust accordingly. |
|----------|-------------------------------|--|---|

#### Informing management decisions

##### Public health monitoring

|          |  |   |  |
|----------|--|---|--|
| National | Ministry of Health                                     | Develop a public health monitoring plan for acute and chronic effects of agro-chemicals on human health, and implement. Update the plan following recommendations arising from a regional review project (ii).  | Ministry of Health to provide details of existing plans, infrastructure and capacity to regional review project.   |
| Regional | Appropriate body, e.g. CEHI                            | CGPC to commission a regional project (ii) to develop the specifications of a public health monitoring plan for acute and chronic effects of agro-chemicals on human health. The project should also define what must be done at a national level and what can be achieved at a shared regional institution.                        | Project team to prepare a report and briefing documents on requirements of a public health monitoring plan for agro-chemicals, and via regional seminar inform relevant national implementing agencies for incorporation of recommendations into national plans. |
| National | Bureau of Standards, Min. Health, PCB, Min. Ag.        | Apply locally appropriate MRLs, in the absence of which apply FAO/WHO Codex Alimentarius. Update and adopt the MRLs following feedback from regional project report (iii).  | PCBs/Bureau of Standards to inform importing countries, trading partners, consumers, supermarkets and agro-processors of the locally applied standards via consultations, brochures and the media.   |
| Regional | Appropriate body, e.g. CEHI; UWI, external consultants | CGPC to commission a report (iii) to investigate acceptable MRLs based on existing standards (e.g. FAO/WHO Codex Alimentarius) that could be applied throughout the Wider Caribbean. This report should also highlight areas where MRLs are lacking and indicate priorities for targeted research to develop locally relevant MRLs. | Project team to prepare a report and briefing documents on MRLs, and via regional seminar inform relevant national implementing agencies for incorporation of recommendations into national plans. CGPC members to lobby for implementation.                     |

##### Environmental monitoring

|          |  |   |  |
|----------|--|---|--|
| National | A wide group of stakeholders: Min. Ag., PCBs, national environmental agencies and research institutions.<br><br>Ensure PCBs within this group. | Establish a technical working group to develop a national plan of Action for the amelioration of agro-chemical pollution (as detailed under UNEP's LBS Protocol, Annex IV) to include plans for long-term environmental monitoring – implement. Augment the plan following recommendations from regional project report (iv) (see also Report 8 of the current project).  | Technical working group to inform Ministry of Legal Affairs to ensure supporting legislation is in place, and to inform all relevant implementing agencies of necessary action.  |
| Regional | Appropriate body, e.g. UWI, CEHI, External consultants/agencies  | CGPC to commission a regional project (iv) to: <ul style="list-style-type: none"> <li>Develop the specifications of a monitoring plan for the effects of agro-chemicals on the environment</li> <li>Investigate the feasibility of establishing shared reference sites</li> <li>Define harmonisation of standards for permissible levels of agro-chemicals in the environment.</li> </ul> The project should also define what must be done at a national level and what can be achieved at a shared regional institution. | Project team to prepare a report and briefing documents on environmental monitoring, and via regional seminar inform relevant national implementing agencies for incorporation of recommendations into national plans. CGPC members to lobby for implementation. |

| National or regional level | Implementer   | Action   | How to communicate and supporting actions required   |
|----------------------------|---|--|--|
| <b>Further research</b>    |   |  |  |
| Regional                   | Multi-disciplinary project team: scientists, medical practitioners, agronomists, socio-economists, via appropriate body | CGPC to commission a project (v) to establish, and develop a schedule of implementation for, a comprehensive research strategy based on prioritised targeted research (to include socio-economic and cost-benefit analyses) in relation to: farming practices, and, the impacts of agro-chemicals on human and environmental health. | Project team/CGPC to communicate the strategy and recommendations to national governments and relevant research organisations (e.g. UWI, CARDI) via a report and prioritised recommendations. Funding to implement the strategy, or components thereof, should be sought from international donors, national governments, and the private sector. A technical sub-committee or appointee of the CGPC should monitor implementation of the research strategy to avoid duplication of effort and periodically review the strategy. |

### Supporting the system for agro-chemical management

#### Sustainable financing

|          |   |  |   |
|----------|---|--|---|
| National | Ministry of Finance; Ministry of Planning | Investigate the feasibility of alternative cost-recovery mechanisms (e.g. tax levy on imports, permit and licence fees, penalties) for agro-chemical management (including administration, monitoring, education, and public awareness raising). Implement appropriate cost recovery mechanisms. In due course, update mechanisms based on recommendations of the regional review report (vi). | Communicate changes in financial arrangements well in advance to those affected through the Legal Gazette and other appropriate publications and media.<br><br>National Governments to provide information on local feasibility studies for review in project (vi). |
| Regional | Appropriate financial body                | CGPC to commission a regional study (vi) of sustainable financing mechanisms for all aspects of agro-chemical management.  | Review team to prepare reports and policy documents, deliver via CGPC members and seminars.   |

### Communication and education

#### Capacity building

|          |  |  |  |
|----------|--|--|--|
| National | PCB  | Appoint a training officer within the PCB to identify appropriate training needs throughout the system. Develop appropriate training in-house or contract out training services. | <b>Aimed at staff within all agencies in the system for agro-chemical management.</b><br>PCB training officer to develop and implement training courses and materials.   |
| Regional | Min. of Ag. Communications Unit of extension services                                    | Train agricultural extension officers in GAP and other practice for aspects not covered through PCBs.  | Communications Unit to deliver appropriate training to extension staff.  |
| Regional | OECS legal department  | CGPC to commission a regional training of trainers workshop (vii) for the requirements of implementing new common legislation arising from OECS.                                 | Project team to deliver training course to PCB training officers and other relevant staff.   |
| Regional | UWI or other appropriate body  | CGPC to commission a regional training of trainers workshop (vii) for the requirements of implementing change management procedures.   | Project team to deliver training course to PCB training officers and other relevant staff.   |
| National | PCB training officer; Communications Units in Min. Ag.                                   | Identify and deliver training needs (e.g. GAP, storage, labelling, sale, use and disposal practices) to 'users' of agro-chemicals (including retailers, importers and farmers).  | <b>Aimed at users of agro-chemicals.</b><br>Training staff to develop and implement training courses and materials for all users.  |
| National | Government information service; PCB training officer; Communications Units in Min. Ag.g. | Develop materials for widespread communication to the public related to all aspects of agro-chemical use and their potential impacts – focus on human health.                    | <b>Aimed at public awareness raising.</b><br>Deliver via TV, radio, newspapers, workshops, exhibitions, etc.<br><br>Medical professionals should be targeted separately and specific materials developed to inform them. |
| National | Min. Education, Min. Ag., PCBs   | Define relevant issues relating to agro-chemicals and GAP for inclusion in school curricula. Develop appropriate materials.  | Deliver classes to schoolchildren.   |

| National or regional level          | Implementer  | Action  | How to communicate and supporting actions required   |
|-------------------------------------|--|---|--|
| <b>Capacity building, continued</b> |  |   |  |
| National                            | Min. Planning with relevant ministries, PCBs, and other executing agencies | Undertake an institutional analysis and evaluation of the capacity and resource needs of PCBs and other relevant executing agencies for agro-chemical management.<br>Identify alternatives to the development of government-established facilities where appropriate, e.g. fund the private sector, including universities, to undertake research and monitoring.<br>Implement appropriate capacity building. | Inform authorities of capacity and resource needs via a report or information briefs.<br>Provide details of national capacity for regional review report (ix). |
| Regional                            | Appropriate body, e.g. UWI, external agencies                              | For aspects of agro-chemical management that can be covered regionally (e.g. shared analytical capacity), CGPC to commission a regional appraisal (ix) of institutional arrangements: compile national reports, and evaluate national and regional capacity and existing initiatives.   | Implement appropriate capacity building at a national and regional level.  |



The close relationship between land, water and sea in the Caribbean gives an urgency to addressing agro-chemical pollution.

**Box 2** Complete list of recommendations agreed by CGPC\*

**Harmonised agro-chemical management**
**Legislation**

- **Model legislation on Pesticides and Toxic Chemicals should be ratified and adopted throughout the Wider Caribbean. This will dictate the administration, use and monitoring of agro-chemicals.**
- Legislation concerning public end users of agro-chemicals, and their responsibilities should be considered for incorporation into model legislation.
- The UNEP LBS Protocol, Annex IV Agricultural Non-Point Sources of Pollution, should be widely ratified and adopted throughout the Caribbean.
- Requirements under the UNEP LBS Protocol for a national plan of action (NPA) should be developed by each State throughout the Wider Caribbean based on model plans currently being developed for Jamaica and St. Lucia.
- Model plans should incorporate requirements specified under Annex IV for pesticides and fertilisers, IPM/IMPP (as appropriate), and the recommendations of this project. All relevant stakeholders including the PCA/PCB should be consulted in drafting the plan.
- Legal advice is needed in the further development of legislation, its incorporation into national laws, implementation, and enforcement.

**Administration**

- **PCBs must be adequately staffed and financed to administer and implement national legislation relating to agro-chemicals. There should be a dedicated full-time staff. The composition of the Board of Directors should include representation from the private sector and persons with experience in ecological issues and the fate of agro-chemicals in the environment.**
- **Administrative procedures should reflect the requirements of the harmonised legislation and be promoted throughout the Wider Caribbean.**
- **A locally owned and managed database should be developed for harmonised administration and information sharing.**
- Harmonised guidelines for pesticide registration should be promoted.
- Harmonised guidelines for certification of pesticide control operators should be promoted.
- More emphasis should be placed on enforcement and adequate provision made for inspectors to undertake this.
- It is recommended that a Prior Informed Consent procedure be adopted to give importing countries the tools and information needed to identify potential hazards and exclude chemicals they cannot manage safely.
- Systems for appropriate selection of chemicals based on their benefits, human and environmental health threats and international agreements should be regionally established and applied. In doubt, a precautionary principle should be applied.
- The need/desirability for common arrangements for licensing, definition of standards, promotion of alternatives to pesticides, and other matters should be explored at a regional level, and prioritised.

- Terms and conditions of licensing should be used as a mechanism to ensure compliance with requirements for packaging, labelling, storage, distribution, and disposal.

- The greater regulation of the sale of pesticides to end users and their responsibilities for them should be explored.

**GAP and other good practice for agro-chemical management**

- **GAP and other good practice codes of conduct for pesticide use need to be implemented, particularly for domestic products not already covered by existing arrangements.**
- 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, including adequate home storage and disposal.
- Public health of consumers should be given priority in national plans for the use of agro-chemicals (e.g. GAPs for domestic and export markets).
- Soil testing is required to determine precise fertiliser requirements.
- Soil conservation techniques, composting, and mulching should be promoted.
- Explore mechanisms to transfer greater responsibility for stewardship of agro-chemicals to intermediary bodies (industry) e.g. via terms and conditions of licensing.
- Within national administrative systems, gaps in jurisdiction over particular user groups need to be addressed (e.g. in Jamaica and St. Lucia, medium farms that do not export produce).

**Informing management decisions**
**Public health monitoring**

- **Carefully designed public health monitoring plans must be developed. Ensure adequate analytical capacity to enable monitoring for compliance with standards for public health (i.e. medical and food residue monitoring laboratories).**
- **Regionally acceptable (or local) standards for Maximum Residue Limits should be established, in the absence of which the FAO/WHO Codex Alimentarius standards should be applied where possible (harmonisation component).**

**Environmental monitoring**

- **Carefully designed long-term environmental monitoring plans must be developed (from the farm to the sea).**
- Monitoring and research must be carefully targeted taking account of the toxicity and volume of chemicals used and gaps in knowledge from past research.
- Baseline and reference data need to be established where little data and research exists.
- Monitoring priorities should be adjusted periodically to reflect changes in the knowledge base of the agrochemicals' properties, importation and usage patterns, as well as social conditions.
- Evaluate the potential for locally shared reference conditions relating to similar habitats throughout the Caribbean versus the need for locally specific conditions. Compile data on undisturbed and less disturbed habitats to develop a regionally applicable set of reference conditions.

\* Top ten recommendations highlighted in bold.

- Evaluate the potential for harmonisation of standards (i.e. permissible levels in the environment) throughout the Caribbean. Jointly explore standards appropriate to the local environmental conditions, and establish national/regional standards.

#### Research and socio-economic studies

##### Public health

- Particular need for studies on the human health and social impacts of pesticides, due to: occupational exposure; and, contaminated food.
- Additional research is needed to identify whether there may be correlations between pesticide exposure and certain medical conditions such as cancers, infertility, and other health effects.

##### Environmental health

- Conduct more locally relevant (tropical) studies into the transport, fate, and persistence (degradation) of agro-chemicals and their break-down products. Studies should include terrestrial (especially soil) and aquatic (including marine) environments, and a range of agricultural areas (low to high impact) and important crops.
- More research into the bioaccumulation of pesticides (up the food chain) and the chronic toxicity of residues to terrestrial and aquatic fauna during different periods of agricultural activity.

##### Farming practices

- **Socio-economic analyses, including cost-benefit analyses, should be conducted for different farming practices, including options for agro-chemical use (e.g. IPM).**
- **Promote implementation and further research on IPM (IMPP) as a means of improved management of use of pesticides.**

#### Implementing mechanisms

##### Sustainable financing

- **Sustainable financing and cost recovery mechanisms must be investigated and, where necessary, novel and creative means found to develop capacity and to fulfil all the functions of the various institutions involved in all aspects of agro-chemical management. External sources of funding must be explored and fully utilised.**
- Monitoring and research – Governments to provide adequate funding and legislative support for a central regional environmental and public health laboratory and the relevant university departments and state laboratories to monitor agro-chemical use.

##### Communication and education

- **Communications experts should be engaged for communication, education, and training purposes; change management concepts should be applied.**
- Raise public awareness of the detrimental effects of agro-chemicals and their persistence in the environment.

- Research bodies must explore better mechanisms for delivering messages from research to key policy and decision-makers.
- Messages on the correct use of agro-chemicals and public safety issues must be delivered. This should encompass both targeted training of licence holders and farmers, and wider public awareness raising via locally relevant media, including TV and radio.
- Raise awareness of the benefits of GAPs (for human and environmental health); provide farmer training in GAPs.
- Training/awareness raising of the public and staff of implementing agencies of the requirements of the legislation is needed.
- Training/awareness raising of Port Authority and Customs and Excise officers is needed in respect of the register of permitted and banned substances.
- Training in the use of a regional database for harmonised registration of agro-chemicals.
- Training and certification of Extension Officers, farmers, and pesticide applicators in correct use of equipment.
- Raise awareness of the public and the medical profession of the detrimental lethal and non-lethal effects of pesticides on human health.

#### Capacity building

- **Undertake an institutional analysis and evaluation of the capacity and resource needs of PCBs and other relevant executing agencies (e.g. extension services, monitoring and research agencies, medical laboratories) throughout the Wider Caribbean. Duplication of effort should be rationalised.**
- Investigate what must be covered at a national level and what can be achieved regionally to avoid duplication of effort and cost (e.g. training; communications and promotional material; promotion of harmonised legislation).
- Greater collaboration between Caribbean states is needed, assisted by relevant regional bodies, through a) partnerships for collaborative research; b) improved mechanisms for sharing of information.
- Particular emphasis should be placed on strengthening capacity and resources for implementing appropriate licensing, monitoring and compliance control schemes, and training and education. Additional gaps in capacity to implement the requirements of legislation and codes of conduct in respect of the use of agro-chemicals need to be fully identified throughout the Wider Caribbean.
- With regard to a regional database for harmonised registration of agro-chemicals, an assessment of the institutional constraints, and capacity and resource needs is required.

**Box 3** Complete list of project reports

**Report 1:** 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.

**Report 2:** 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. DFID NRSP Project R7668. CARDI (Jamaica).

**Report 3:** Dasgupta, T. and C. Perue, 2003. Toxicity review for agro-chemicals in St. Lucia and Jamaica. DFID NRSP Project R7668. Chemistry Department, UWI, Mona.

**Report 4:** 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.

**Report 5:** 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.

**Report 6:** 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.

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**Information Brief 1:** Management of agro-chemicals for improved public and environmental health (2003)

**Information Brief 2:** The fate of agro-chemicals in the land-water interface in St. Lucia and Jamaica: Environmental monitoring (2003)

**Information Brief 3:** The quantification and toxicity of agro-chemical imports into St. Lucia and Jamaica (2003)

**Information Brief 4:** The on farm use of agro-chemicals and associated soil management and farming practices in St. Lucia and Jamaica (2003)

**Information Brief 5:** Harmonisation of agro-chemical management in the Caribbean (2003)

**Information Brief 6:** Management options for the use of agro-chemicals (2003)

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Roberts, C.M., N.L.H. Barker, F.R.G. Gell, C.K. Schelten and J.P. Hawkins, 2003. Impact and amelioration of sediment pollution on coral reefs of St. Lucia, West Indies. DFID NRSP Project R7668. University of York, York.



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