



NRA

NRA Pesticides Strategy

*National Rivers Authority
Anglian Region*

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NRA Pesticides Strategy

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NRA STRATEGY FOR REDUCING THE CONCENTRATION OF PESTICIDES IN CONTROLLED WATERS

SUMMARY

This paper sets out a series of proposals with outline timescales to develop a National NRA Pesticides Strategy, ensure that appropriate resources are identified and that value for money is achieved.

1. INTRODUCTION

1.1 The NRA has duties to monitor the extent of pollution, to use its powers to ensure water quality objectives are achieved, to ensure any discharges are authorised by consent and to maintain a register of environmental information available to the public. The basic aim of the NRA is to maintain the improvement in the quality of Controlled Waters and ensure their fitness for use.

1.2 The Water Resources Act 1991 provides powers to require action to prevent pollution, to request water protection zones and to recover certain related costs.

1.3 The NRA's overall approach has been to require progress to environmentally sound discharge consents and partly based on new regulations, to require precautionary measures to prevent pollution

1.4 The NRA is also the competent Authority charged with controlling water quality in relation to the requirements of a number of EC Directives, which include target values for some pesticides. The Directives involved are:-

- EC "Dangerous Substances" Directive (76/464/EEC)
(and its "daughter" Directives)
- EC "Surface Water" Directive (75/440/EEC)
- EC "Groundwater" Directive (80/68/EEC)

1.5 In the case of pesticides there are over 450 active ingredients approved for use in the UK. This approval is given by Ministers under section 5 of the Food and Environment Protection Act (1985), Pesticide Regulations (1986). In addition, there are many adjuvants used in approved pesticide formulations.

Analyses of water, sediments and biota by the NRA, and others, indicate that there are low concentrations of a wide range of pesticides in all Controlled Waters and that they are also present in the atmosphere. Although these concentrations are below known acute toxicity thresholds, except as a result of pollution incidents, the significance, particularly in relation to longer-term chronic toxicity effects, is largely unknown.

1.6 The UK is also committed to reducing the input of 36 priority hazardous substances, "Annex 1A", by 50% or more between 1985 and 1995, under Ministerial Declaration following the Third International Conference on the Protection of the North Sea (1990) (Appendix 1). A large number of these are pesticides. This has resulted in a requirement for the NRA to monitor loads of these substances discharged via estuaries and direct to coastal waters and will result in further pressure to use the relevant legislation in the Water Resources Act (1991) to reduce pesticide inputs to surface waters.

1.7 The EC "Drinking Water" Directive is implemented in the UK by means of the Water Supply (Water Quality) Regulations. The NRA is not directly responsible for the administration of these Regulations but, under DoE's "Guidance on Safeguarding the Quality of Public Water Supplies", Water Undertakers are required to inform the NRA of any cases where the Directive's pesticide limits are exceeded. The limits specified in the Directive are 0.1ug/l for individual pesticides and 0.5ug/l for total pesticides. As a result of risk to public supplies and the high cost of removing pesticides, the NRA is under increasing pressure to reduce concentrations of pesticides in surface and groundwaters.

1.8 In recognition of the Hague declaration on groundwater and the requirements of the EC Groundwater Directive, the NRA has produced its "Policy and Practice for the Protection of Groundwater" which includes sections on controlling pesticide inputs to groundwater. The NRA is also responsible for administering implementation of a national classification scheme for Listed Substances discharged to groundwater (DoE Direction to NRA dated 13/7/92).

1.9 To meet these objectives the NRA needs to monitor pesticide pollution, control point and diffuse source inputs and to promote the use of Best Environmental Practice. It is also important to implement the recommendations in the NRA report "The influence of agriculture on the quality of natural waters in England and Wales", and the Royal Commission on Environmental Pollution (Appendix 2). Currently there is no consistent operational strategy for the NRA to achieve its duties and aims, nor to influence government and industry.

1.10 A number of other regulatory organisations have responsibilities for approval, manufacture, storage, transport, use and disposal of pesticides. The principal bodies involved are MAFF and the H&SE but the control mechanisms and approvals procedures are extremely complex. This is explained in Appendix 3. In addition, there are a number of non-statutory Guidance notes produced by government departments and industrial organisations such as the British Agrochemicals Association. A list of these Codes and Guidance notes is given in Appendix 4.

2. CURRENT STATUS

2.1 Monitoring

In order to meet statutory responsibilities the NRA has to monitor pesticide concentrations in water, sediment and biota, and the impact of pesticides on aquatic biota, either by their direct toxicological effects or through bioaccumulation.

The majority of NRA pesticide monitoring is targeted at known discharges, primarily identified for the purposes of EC Directives. This concentrates effort on old pesticides, many of which are no longer used. This work is a legal requirement and, in many cases, important, because the older more persistent pesticides (particularly organochlorine insecticides) are still found. It is necessary to monitor the continuing decline of these substances in the aquatic environment.

The emphasis on older products, however, ties up resources. Most pesticides now found in drinking water are more recent products, almost exclusively herbicides and in most cases not on the Red List or Annex 1A. There is a need to release resources, where possible, to concentrate on pesticides being used now to ensure that any "new problems" are detected early. The history of pesticide pollution is that it has always been found as a result of an environmental problem that has already occurred.

Of the 450 approved pesticides in the UK less than half have adequate analytical methods. Of these only about 150 are monitored at all. Anglian Region monitors for about 100 pesticides, but most Regions do significantly less than this. Each Region needs to review its monitoring. It is likely that many programmes will need to be dramatically improved.

2.2 Controlling Point Source Discharges

Consent conditions for pesticides in discharges are based on the best available Environmental Quality Standards (EQSs), which themselves rely on a rather poor knowledge of the persistence and behaviour of pesticides in surface and groundwaters. Currently there are very few statutory limits for pesticides, but there will be an increasing need to formulate use-related EQSs for Statutory Water Quality Objectives and to classify Listed Substances for implementation of the EC Groundwater Directive.

Consent conditions are in principle calculated in the same way as for other pollutants, but in view of the complexity of pesticide fate and behaviour there is a need for further research and development of more complex EQSs to reflect the toxicity of individual pesticides and co-formulations, their breakdown products and possible bioaccumulation.

As with general monitoring, control has centred on the older pesticides from known sources. Much work needs to be done to establish the inputs of current pesticides e.g. herbicides from combined sewerage systems, and to put appropriate controls in place.

2.3 Controlling Diffuse Sources

This activity is virtually non-existent. Normal pollution prevention activities will pick up some of the worst current practices but there is no systematic work in hand to identify or quantify the extent of diffuse inputs of pesticides. Controlling them has hardly even been considered.

The main direct mechanism available to the NRA for controlling diffuse pesticide inputs is to recommend the introduction of statutory Water Protection Zones by the Secretary of State for the Environment.

Use could also be made of Regulations to require precautions to be taken during the storage, mixing and disposal of pesticides; these Regulations would also have to be made by the Secretary of State. In practice introduction of Regulations or Protection Zones will be difficult to achieve until we have accumulated enough evidence to prove existing powers are insufficient.

2.4 Promoting Best Practice

There is a considerable body of literature available on best practice for storage, use and disposal of pesticides (see Appendix 4). If this was adopted universally there would be a significant reduction in pesticide pollution. Some work is done already e.g. at promotions such as Spraysafe, but a much more proactive approach is required to get simple pollution prevention messages across to pesticide users.

Recent research indicates that much "diffuse" pollution results from small scale spillages from mixing or tank washings. If these sources could be eliminated, short term pesticide peaks would be much reduced. This could be achieved by promoting improved techniques such as closed transfer systems, automatic tank and container rinsing machines and pre-mix solutions for small scale users.

In order to meet these objectives and fill gaps in existing knowledge a programme of research and development needs has been identified and this is presented in Appendix 5.

3. DEFINITION OF PRODUCTS REQUIRED

NRA policy

3.1 Set up and resource a "Pesticides Centre of Expertise" to collate NRA data on pesticides and act as a focal point for pesticide issues.

3.2 Prepare a detailed action plan for implementing the NRA Pesticides Strategy

3.3 Produce a Water Quality Series Report on pesticides.

3.4 Implement the NRA groundwater protection policy, particularly in

relation to controlling diffuse pesticide pollution

3.5 Review the information on pesticide concentrations in Controlled Waters derived from the NRA's current monitoring programme including any data from Water Companies etc

3.6 Produce a PIN on Targeting Pesticide Monitoring to improve monitoring and target specific pesticides in the areas and at times of the year when they are most likely to appear, by utilising available information on pesticide use and pollution risk in catchments, e.g. WRC/Farmstat

3.7 Implement the PIN relating to the actions to be taken when Water Undertakers report exceedances of the EC Drinking Water pesticide parameters

3.8 Implement the PIN for regulating discharges from on site treatment systems

3.9 Improve the NRA's risk assessment capabilities relating to pesticides

3.10 Implement the guidelines for investigating and reporting pesticide pollution incidents

3.11 Implement NRA policy and operational guidance on the use of herbicides and promote non chemical methods of pest control, both inside and outside the NRA, wherever possible

3.12 Review the procedures used by the NRA for giving "approval" for on-site disposal of dilute pesticides, sprayer tank washings and sheep dip and produce standard requirements. Encourage the use of on-site treatment systems and safe disposal of sludge and effluent.

Research and development

3.13 Develop and promote practical analytical techniques at appropriate detection limits for all pesticides identified as high priority

3.14 Develop toxicologically based EQSs for existing pesticides and press MAFF and the HSE to require EQSs to be developed as part of the approval or review process

3.15 Develop procedures for determining the environmental impact of pesticides in water, sediment and biota

3.16 Co-ordinate NRA pesticide research and development with Government, industry, research bodies and Universities to study pesticide pathways to water and non-chemical methods of pest control

3.17 Maximise the opportunity provided by the setaside scheme to reduce the risk of pesticide pollution from agriculture e.g. by the use of buffer zones.

Best Practice

3.18 Actively encourage users to follow Best Environmental Practice by producing leaflets, attending agricultural shows and holding seminars

3.19 Encourage the development and use of low risk spraying practices, self cleaning sprayers, automatic dilution and mixing, ready mixed sprays and reusable containers

3.20 Implement the BASIS guidelines for inspection of pesticide stores

3.21 Encourage the extension of the BASIS guidelines to manufacturing plants, large farm stores and other user stores e.g. Local Authorities, spraying contractors and establish minimum requirements for all pesticide stores.

Influencing Government

3.22 Encourage Government to develop national pesticide disposal policy; establish a permanent pesticide retrieval scheme and investigate pricing mechanisms to encourage returnable containers

3.23 Request that the Government initiates a complete review of the current Codes of Practice on pesticide use particularly to incorporate the results of recent research and ban the use of soakaways for pesticide disposal

3.24 If sufficient evidence can be gathered to justify it, seek Regulations from the Secretary of State for controlling storage, mixing and disposal of pesticides on farms

3.25 Press Government to review the arrangements for sheep-dipping, so that users are required to notify NRA of the location and disposal of sheep-dips

3.26 Encourage the Government to act on the recommendations of the Royal Commission on Environmental Pollution's 16th Report "Freshwater Quality".

Liaison

3.27 Continue liaison with other Authorities and Government departments responsible for controlling the use and disposal of pesticides, including MAFF, HSE, DoE and Local Authorities. Contribute to DoE report and National Audit Office Farm Pollution Study

3.28 Continue liaison with other organisations who influence the development and use of pesticides, including BAA, UKASTA, NFU, BASIS, and the WPLCs. Improve liaison with other users e.g. BR, CCs, timber treatment trade etc and promote public awareness of pesticide issues

3.29 Continue to attend working groups organised by the above organisations

3.30 Improve liaison between the NRA regions and with Head Office on pesticide issues.

4. BUSINESS CASE

4.1 It is clear from Section 1 that the NRA has a significant role to play in controlling pesticide pollution. It is equally clear from Section 2 that current practice is far from ideal. In particular:

- most currently approved pesticides have no adequate analytical method;
- most monitoring is targeted at older pesticides, many of which are no longer approved for use;
- there is significant variation between Regions in monitoring and analytical capability;
- monitoring is not adequately targeted at relevant pesticides for each Region, in many cases it is not even known which pesticides are used;
- pollution control, even in the simplest situation (point source discharges) is inadequate with (generally) only List 1 pesticides being covered;
- diffuse pollution control is virtually non-existent;
- currently available advice on best practice is not being followed and yet would probably resolve a majority of current problems;
- as a measure of current control inadequacy 91% of surface water abstractions for potable supply in Anglian failed the EC Drinking Water Directive pesticide standard at least once in 1992. (Increased monitoring would almost certainly pick up previously undetected failures at the remaining 9%).

4.2 As a pollution control authority the NRA urgently needs to address these issues. A significant number of initiatives have been undertaken and much is currently being done but it is largely unco-ordinated. Adoption of this pesticide strategy would have the following benefits:

- action would be taken to co-ordinate the approach to reducing pesticides in Controlled Waters;
- other organisations would see action being taken;

- with relatively little effort, inter-regional consistency could be dramatically improved;
- every Region should aim to reach the required standards;
- resources could be re-deployed, and where necessary, shared or increased to ensure that the most important pesticides were being monitored;
- existing data would be collated and examined and a national pesticides database created;
- with a focal point for pesticides, internal and external queries can be consistently dealt with and referred as appropriate;
- production of a Water Quality Series report on Pesticides would highlight the existing situation pointing out current issues and, as important, allaying the concern of the public;
- each individual component of the strategy will be subject to the rigours of project control, so expenditure and resources can be controlled.

4.3 If this strategy is not adopted the NRA will be seen to have an unco-ordinated approach to pesticide control. There is a significant risk that organisations such as Greenpeace and FOE will compile National pesticide data (often from our Registers) and highlight nationally significant issues of which we are not even aware.

The duties of the NRA and the considerable concern about Environmental impact and human health are the basis for proposing a clear strategy. The fact that this is a considerable task and is currently being carried out on an inconsistent basis has led to the view that support should be given to the development of a Centre of Expertise as a first stage.

The resource implementations of further stages can be determined and signed off on a phased basis when the full action plan is implemented.

5. ACTION PLAN

The Action Plan to produce the required products is presented in a Gantt chart (Table 1). This is an initial, high level, overview of the major projects. Having established the necessary resource with a Centre of Expertise, the first task is to produce a detailed action plan for furthering each project. It is possible some may not be progressed if a substantive case cannot be made and it is certain that the deadlines will be altered. This is catered for in the ongoing review process.

The plan takes the NRA forward to the likely creation of an

Environmental Agency.

One of the major products is the production of a Water Quality Series report on Pesticides. It is proposed that this would contain up to date information on pesticide issues and would also be the vehicle for promoting the NRA Strategy to the public.

6. RESPONSIBILITY

As pesticide issues cover all the functional areas of the EQC, responsibility for the Pesticides Centre of Expertise (PCE) will be direct to the Chief Scientist. The PCE would have Control of the Pesticides Strategy Project reporting to the EQC and consulting as necessary with the Functional Steering Groups, Operations etc. Resource needs and day to day project management would be identified by the PCE. Technical input and quality assurance would be supplied by the Rural Land Use Group, with further expert advice as necessary.

7. IMPLEMENTATION

Table 1 shows the outline plan. A more detailed programme would be produced as a first action point. Each product would be clearly identified and relevant projects would have individual approval. New policy in the form of PINs would be prepared and introduced on a planned basis and within an agreed framework. The strategy would thus have a clear set of objectives, timescales and targets.

It is suggested that the Water Quality Series report could, by public or informal consultation, seek views on whether the priorities, timescales etc. are appropriate. At the very least, the views of MAFF, DOE, HSE, HMIP and the pesticide industry should be sought - although it may not always be appropriate to accommodate all such opinions.

Endorsement is therefore sought for the Pesticide Strategy with a Centre of Expertise in Anglian Region, funded by NHO.

17/3/93

Table 1. Action Plan for NRA Pesticide Strategy Implementation

Activity	Leader	Outline	April 93	July 93	Oct 93	Jan 94	Apr 94	Jul 94	Oct 94	Jan 95
1) Set up Pesticides Centre of Expertise	MJP/JP	[---*]								
2) Produce and update detailed Action Plan	PCE	[-----ongoing-----]								
3) Produce Water Quality Series Report	PCE	[---*---]								
4) Groundwater Protection Policy	AS	[-----ongoing-----]								
5) Review pesticide data	FCE	[---*---]								
6) Target Pesticide Monitoring PIN	PCE	[---*---]								
7) Water Supply Catchment PIN	ADB	[---*---]								
8) On Site Treatment PIN	AJDF	[-----ongoing-----]								
9) Improve risk assessment	SK	[-----ongoing-----]								
10) Guidelines for pesticide pollution	AJDF	[---*---]								
11) NRA Herbicide Use Guidance	AJDF/LAW	[---*---]								
12) Produce disposal guidance	PCE	[---*---]								
13) Develop analytical techniques	FCE/MAJ	[-----ongoing-----]								
14) Develop pesticide EQSSs	SK	[-----ongoing-----]								
15) Develop Environmental Impact Procedures	FCE	[---*---]								
16) Co-ordinate R & D	MB/RH	[-----ongoing-----]								
17) Promote pesticide setaside	PCE	[-----ongoing-----]								
18) Publicity for Best Practice	PCE	[-----ongoing-----]								
19) Encourage new technology	PCE	[-----ongoing-----]								
20) BASIS Stores Inspection	ADB	[-----ongoing-----]								
21) Extend BASIS to all stores	PCE	[-----ongoing-----]								
22-26) Lobby Government	PCE	[-----ongoing-----]								
27) Liaise with Authorities	PCE	[-----ongoing-----]								
28) Liaise with Manufacturers/Users	PCE	[-----ongoing-----]								
29) Attend Working Groups	FCE	[-----ongoing-----]								
30) Improve internal liaison	PCE/NHD	[-----ongoing-----]								

MJP = Mick Fearson
 JP = Jan Pentreath
 PCE = Pesticides Centre of Expertise
 NHD = National Head Office
 AS = Andrew Skinner
 ADB = Alan Barnden

AJDF = Alastair Ferguson
 KRE = Kathryn Eke
 LAW = Louise Waring
 MB = Mervyn Bramley
 SK = Steve Killeen
 MAJ = Mike Jessep
 RH = Bob Huggins

KEY
 [---] Initiate
 [- - -] Produce Draft
 [= = =] Consult
 [*] Approve
 [] Complete
 [-----] Implement
 [=====] Plan and Issue

APPENDIX 1

ANNEX 1A AND RED LIST

Annex 1A

Red List

Pesticides

HCH
DDT
Pentachlorophenol
Hexachlorobenzene
Hexachlorobutadiene
Carbontetrachloride
Chloroform
Trifluralin
Endosulfan
Simazine
Atrazine
Azinphos-ethyl
Azinphos-methyl
Fenitrothion
Fenthion
Malathion
Parathion
Parathion-methyl
Dichlorvos
Trichloroethylene
Tetrachloroethylene
Trichlorobenzene
1,2, Dichloroethane
Trichloroethane
Dioxins
Drins

Gamma HCH
DDT
Pentachlorophenol
Hexachlorobenzene
Hexachlorobutadiene

Trifluralin
Endosulfan
Simazine
Atrazine

Azinphos-methyl
Fenitrothion

Malathion

Dichlorvos

Trichlorobenzene
1,2, Dichloroethane

Aldrin
Dieldrin
Endrin
Polychlorinated Biphenols

Non pesticides

Mercury
Cadmium
Copper
Zinc
Lead
Arsenic
Chromium
Nickel
Tributyltin compounds
Triphenyltin compounds

Mercury and compounds
Cadmium and compounds

Tributyltin compounds
Triphenyltin compounds

APPENDIX 2

Recommendations on pesticides from The Sixteenth report of The Royal Commission on Environmental Pollution "Freshwater Quality"

- 1) Recommend further research be carried out in the UK to assess to what extent the long-range transport of pesticides presents an environmental hazard.
- 2) Recommend that regulatory authorities and the water undertakers should extend and improve their monitoring programmes for pesticides in surface and groundwaters and should periodically analyse and publish the results.
- 3) Recommend local authorities seek to reduce their application and to use less environmentally harmful formulations
- 4) Recommend that periodic surveys of the non-agricultural uses of pesticides should be commissioned by the Government and the results published.
- 5) Recommend that research on ecotoxicology and the mechanisms governing the distribution and fate of pesticides in the environment should continue.
- 6) Recommend that manufacturers of pesticides progressively improve their recovery and treatment processes until no effluent leaves their works without having been rendered effectively inert.
- 7) Recommend that MAFF's guidance on the disposal of pesticides by farmers to be further revised.
- 8) Recommend that the Government seek ways of encouraging the use of systems for treating pesticide waste on farms.
- 9) Recommend that the merits of establishing a similar scheme for non-agricultural pesticides and animal health products containing pesticides should be evaluated.

10) Recommend that those non-agricultural employees who apply pesticides (or supervise their application) should be required to hold a certificate of competence.

11) Recommend that a national strategy (including a timetable) for reducing pesticide use should form part of the UK's water quality plan. Targets should be related to individual pesticides taking particular account of their toxicity and persistence in the environment as well as of the results of research aimed at reducing pesticide usage.

12) Recommend that the national strategy should encourage further research and development of pesticides which are specific in their effect, degrade rapidly in the environment and do not harm parts of the environment which they are not intended to control.

APPENDIX 3

Responsibilities

Approvals for use

The following are responsible for recommending approval:-

- a) MAFF Pesticide Safety Division for pesticides used in agriculture.
- b) H&SE for non-agricultural pesticides, including wood preservatives and pest control products
- c) MAFF Veterinary Medicines Division for pesticides used as veterinary medicines (e.g. sheep dip)
- d) Other pesticidal products e.g. used in paint, paper, manufacturing, food, medicines etc are controlled elsewhere

All currently approved products from i) and ii) above are listed in the annual HMSO publication "Pesticides" with monthly updates on approvals published in the "Pesticides Register".

Current approval procedures require extensive multi-species toxicity testing, bioaccumulation, and persistence studies. The NRA, however, has no direct role in assessing the potential environmental impact of new pesticides prior to their Approval. This is carried out by the Scientific sub-committee of the Government's "Advisory Committee on Pesticides". The sub-committee makes recommendations to Ministers of five Departments who jointly give Approval for a pesticides' use. The Advisory Committee was set up as a requirement of the Food and Environment Protection Act (1985).

The NRA is responsible for providing information to the Advisory Committee on any problems arising from the use of pesticides (e.g. atrazine and simazine) and providing data to support any review of Approval for individual pesticides. This gives the opportunity to comment on particular problem areas.

When the new proposals under the EC "Uniform Principles" Directive 91/414/EEC for pesticide registration are brought into force on 25th July 1993, MAFF and the H&SE will be required to review all existing pesticides. The EC is committed to reviewing all active ingredients over the next fifteen years at a rate of 90 a year and each individual member state will be assigned a pre-agreed number, which for the UK is expected to be about 12. This will involve large workloads for MAFF, and HSE. In addition, manufacturers may have to provide additional toxicological data for older products. This may lead to manufacturers withdrawing products rather than incurring the cost of meeting the new requirements for re-registration.

Approval of new products currently requires the development of an analytical method capable of detecting 0.1ug/l. This may not be adequate if: the method is too time-consuming or expensive to be practical; has no confirmatory techniques, or cannot detect changes in pesticide concentrations where we are concerned at levels 1/10th of EQSs. The introduction of the "Uniform Principles" Directive, however, should at least require a method of detection to the 0.1ug/l level for older pesticides where this is not presently available.

Storage, use and disposal of pesticides

These are regulated by consents, codes of practice and other legal mechanisms under the Pesticide Regulations (1986). Enforcement of the statutory requirements is primarily by H&SE. The relationship between the regulatory functions of H&SE and NRA is covered by a Memorandum of Understanding.

In addition, there are a number of non-statutory Guidance notes produced by government departments and industrial organisations such as the British Agrochemicals Association.

The NRA also has an extensive role in relation to advice given in the Codes and Guidance notes in relation to storage (e.g. under the BASIS scheme), use (e.g. aquatic herbicides) and disposal (e.g. dilute pesticides on site and waste disposal site licensing). The NRA is also directly involved in thorough consultation during the drafting of the Codes of Practice and Guidance documents.

Disposal of concentrated pesticides

This is controlled by the Waste Regulatory Authorities.

APPENDIX 4

Pesticide Legislation, Codes and Guidance Notes

* - refers to Water Authority/NRA as a source of guidance

1) EC Directives

Bathing Water Directive	76/160
Dangerous Substances Directive	84/491 86/280 88/347
Shellfish Waters Directive	79/923
Surface Water Intended for Abstraction for Drinking Water Directive	75/440
Groundwater Directive	80/68

2) Acts of Parliament and Regulations

Water Resources Act (1991)	
Health and Safety at Work Act (1974) *	
Control of Pollution Act (1974) (Part 1) *	
Safety Signs Regulations (1980)	
Health and Safety (First Aid) Regulations (1981)	
Dangerous Substances (Conveyance by Road in Road Tankers and Tank Containers) Regulations (1981)	
Poisonous Substances in Agriculture Regulations (1984)	
Classification, Packaging and Labelling of Dangerous Substances Regulations (1984)	
Food and Environment Protection Act (1985) *	
The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1985)	
Control of Pesticide Regulations (1986) *	
Direction to the NRA under S5 of the Water Resources Act 1991 and relating to Council Directive 80/68 on Protection of Groundwater (13/7/92)	

Road Traffic (Carriage of Dangerous Substances in Packages etc) Regulations (1986)

Health and Safety (Agriculture) (Poisonous) Regulations (1975)

The Deposit of Poisonous Waste Act (1972)

Control of Substances Hazardous to Health (1989)

3) Health and Safety Executive publications

Agricultural Safety Information

AS 6: Crop spraying (1986) *

AS 25: Training in the use of pesticides (1986) *

AS 26: Protective clothing for use with pesticides (1986) *

AS 14: Cyanide gassing powders safe handling

Chemical safety guidance notes

CS 2: Storage of highly flammable liquids (1977)

CS 3: Storage and use of sodium chlorate and other similar strong oxidants (1985)

CS 10: Fumigation using phosphine (1986)

CS 17: Storage of packaged dangerous substances (1986)

CS 19: Storage of approved pesticides by farmers and other users (1989) *

Health and Safety (Regulations) booklets

HS (R) 1: Packaging and Labelling of Dangerous Substances Regulations and Guidance Notes (1978)

HS (R) 7: Guide to the Safety Signs Regulations 1980 (1981)

HS (R) 11: First Aid at Work (1981)

HS (R) 20: Guide to the Poisonous Substances in Agriculture Regulations 1984 (1985)

Medical Series

MS 17: Health Surveillance of Workers Exposed to Organo-phosphorus and Carbamate Pesticides (1986)

HSE Advice Card MS (B) 7 (Revision 2/87) : "Poisoning by Pesticides: First Aid"

HSE Protective Clothing Wall Chart

4) MAFF publications

"Pesticides 1988" (succeeding Reference Book 500: "Pesticides 1986") and subsequent editions of this book. *

Booklet B 2078 : "Guidelines for the Use of Herbicides on Weeds in or near Watercourses and Lakes" (1985) *

Code of Good Agricultural Practice (on avoiding pollution of water) made for the purposes of Section 31 (2) (c) of the Control of Pollution Act 1974 *

Code of Practice for the Agricultural and Commercial Horticultural Use of Pesticides (Revised draft in preparation, May 1990 and to be published jointly with H&SE COSHH Regulations) *

Code of Practice for Suppliers of Pesticides to Agriculture, Horticulture and Forestry (1990) *

MAFF guidance pamphlets:-

Publication

2332 Sheep Handling and Dipping *
593 Sheep Scab *
719 Sheep Dipping and Spraying
767 Farm Chemical Stores *
2077 Farm Waste Management
2272 Guidelines for applying crop protection chemicals *
2449 : Guidelines for applying crop protection chemicals
(Spraying fruit and hops with insecticides and fungicides) *
2198 Guidelines for the disposal of unwanted pesticides and containers on farms and holdings

5) Other publications

National Turfgrass Council

Code of Practice for the use of Approved Pesticides in Amenity Areas

Forestry Commission

Code of Practice for the Use of Pesticides in Forestry - Draft Jan 88 *

FS 2 : Ultra low volume herbicide spraying *

FS 3 : Application of herbicides by knapsack spraying *

FS 4 : Application of granular herbicides *

International Group for Agrochemical Manufacturers (GIFAP)

Guidelines for the avoidance, limitation and disposal of pesticide waste on the farm *

Food and Agricultural Organisation (FAO)

Disposal of waste pesticide and pesticide containers on the farm

Royal Society of Chemistry (RSC)

The Agrochemicals Handbook *

British Agrochemicals Association (BAA)

Garden Chemicals *

Agricultural Training Board

Agricultural Training Board Safe Handling of Chemicals *

Agricultural Training Board 610/WB Safe Use of Pesticides *

Agricultural Training Board 610/TA3 Spraying within the Law *

Agricultural Training board 610/TA4 Storage of Pesticides on Farms and Similar Premises *

British Standards Institution (BSI) publications

British Standard BS5378; Part 1 :1980 "Safety signs and colours"

British Crop Protection Council (BCPC) publications

Nozzle Selection Handbook (1986)

The UK Pesticide Guide

Department of the Environment (DoE)

Waste Management Paper No.21 : "Pesticides Wastes" (1980)

Weed Control and Environmental Protection (1992)

Guidance for Control of Weeds on non-agricultural land (1992)

Water and Fire Authorities/BASIS

Inspection and Approval of Agrochemical Stores by River and fire Authorities for BASIS Registration (1992) *

National Rivers Authority

Policy and Practice for the Protection of Groundwater (1992) *

APPENDIX 5

Research and Development Needs

The aim of the current R&D programme is to fill any gaps in the NRA's technical knowledge in order to carry out the duties described in section 1.2 and to support the objectives detailed in section 1.4

In particular, there is a need to:-

- quantify the sources of pesticide inputs to the aquatic environment
- determine the rates of movement through pathways to surface and groundwater
- determine their fate after entering Controlled Waters
- describe the significance of the concentrations found in Controlled Waters, and
- to evaluate the importance of river morphology, including dead zones, as an influence on the fate of sediment bound pesticides.

The NRA currently has a substantial research programme to resolve these shortfalls in technical information. In a recent review of research and development the following areas were identified as priority needs.

Monitoring

There is a clear need to develop a co-ordinated programme of research to improve the NRA's monitoring capabilities in relation to,

- developing suites of analysis for groups of pesticides and targeting these in areas where the pesticides are likely to be found
- need to develop new techniques for high priority pesticides with no current practical analytical method
- the use of novel techniques for monitoring (including the immunoassay techniques),
- the development of analytical techniques for sediment, biota and aquifer pore water

Biological monitoring of invertebrates in rivers will provide some information on the overall impact. This is unlikely to be sufficient for detecting the effects of all pesticides, particularly herbicides. Full environmental impact assessment will require co-ordination of

chemical and biological monitoring. Specific protocols will need to be developed for evaluating the impact of pesticides depending on the nature of the compounds involved (e.g. plant bioassay tests for herbicides.)

The control of point sources

Traditional techniques for calculating consent conditions for point source discharges of pesticides may not always be appropriate because of the differing fate and behaviour characteristics of individual pesticides. The use of models which can describe the fate of pesticides from point sources may assist assessment of discharge concentrations required to meet these targets. Additionally, a knowledge of sediment/water and particle/water partitioning and the influence of dead zones is required to assess the potential impact of the compounds.

The control of diffuse sources

Knowledge of the quantitative relationships between application rates and risk of diffuse contamination is essential for water quality management. This will be obtained from a combination of information on the behaviour of different pesticides, data from pesticide usage surveys and risk associated with different soil types and base geologies e.g. soil erosion carrying particle bound pesticides into water. It will require investment in basic research on pesticide fate and behaviour and on protocols and models for risk assessment. Quantification of risks within catchments will require knowledge of pesticide usage including sheep dipping, timber treatment, fish farms, aquatic weed control etc.

The current CAP and GATT agreement giving rise to set-aside land present an ideal opportunity to study the effects of land use changes.

Priority pesticides

In addition to prioritising investment in general research areas, it is necessary to prioritise specific pesticides to be studied because of the enormous number of approved products. It is recommended that the following pesticides should take priority.

- a) Those pesticides which are on the Red List and/or Annex 1A
- b) Pesticides commonly found to exceed the EC "Drinking Water" Directive limits - principally herbicides
- c) Pesticides used in large quantities and/or identified as being of significant leaching potential
- d) Insecticides known to be toxic to invertebrates at low concentrations including synthetic pyrethroids

e) Pesticides known to cause environmental damage including those used in anti-fouling paints and in timber treatment

f) Persistent pesticides, especially those which are known to bioaccumulate.

Co-ordination with other research programmes

The NRA's research programme on pesticides, although directed at its own needs, should not be developed in isolation from the interests of Government Departments and of other Agencies, including DoE, MAFF, HMIP and the H&SE. This is particularly important because the investment which is necessary to resolve the problems posed by pesticides in the environment will be very high.

There is also need to develop better liaison with the companies producing pesticides and to encourage new improved methods of pesticide application.