control over pesticides

A background paper produced by the Pesticides Trust

About pesticides

Pesticides are used to kill or control harmful or undesirable organisms. The term most commonly refers to synthetic chemical substances. There are about six hundred different pesticide chemicals, each with different properties, used in the UK: farmers and users cannot be expected to know each of them because there are too many.

Unlike other toxic chemicals:

- pesticides are designed to kill or injure living systems;
- they are deliberately introduced into the environment and there are pesticide residues in food, water, soil and air;
- very small amounts - parts per billion or parts per trillion - can cause damage;
- they are dispersed globally over large areas of the rural and urban environment
- people have little choice about exposure;
- and farmers become dependent on pesticides but pests become resistant.

UK usage

As well as agriculture and amenity use, pesticides are also used as wood preservatives, headlice treatments, and in public health. Sheep dips are usually regarded as pesticides, although in the eyes of the law they are classified as veterinary medicines, as are flea treatments. Veterinary medicines fall under a different regulatory regime and are dealt with by the Medicines Acts and the Veterinary Products Directorate.

There may be many active ingredients and other co-formulants in a formulated pesticide. The active ingredient will have a formal chemical name and a CAS-number; it will also have a common name (paraquat, glyphosate) and a trade or product name (Gramoxone, Roundup). Pesticides are made up into different formulations containing combinations of active ingredients with varying concentrations. The physical form may be liquid solutions, powders, granules or other forms. Professional products are usually formulated differently from amateur or home and garden products.

In the UK, most pesticides are used in agriculture. The market for UK pesticides was £516 million in 1996; exports were £1,234 million - over twice as much. UK sales represented 25.5 million tonnes, of which 90% was used in agriculture and horticulture, 7% in garden and household use and 3% in industrial, amenity and forestry sectors.

Are we using more or less?

The number of chemical active ingredients approved for use in pesticides has increased from some dozens in the late 1950s to some 600 in the 1990s, and those 600 active ingredients may be formulated in some thousands of different products. As a rule of thumb, pesticide use has doubled every ten years since the early 1950s. The concept of 'use' is not straightforward. New products have tended to be lighter in weight than older products, requiring less weight of pesticide per unit area treated. These newer products are, by definition therefore, more powerful chemicals.

Although it is true to say we are in general using less pesticide measured by weight than in earlier years, the chemicals used are more active. Farmers are treating more often during the season and the number of applications has increased - although some of these applications may be at reduced doses. There is also a trend for products to be more specific and less residual - the trend is for the use of less persistent classes of chemical, with quicker degradation times. The trade-off may be more frequent use of selective products

What is the law?

Pesticides are toxic chemicals and their usage is controlled by law. The Food and Environment Protection Act 1985 states that no pesticide can be advertised, sold, supplied, stored or used unless it has been approved jointly by the six responsible ministers - including Agriculture (MAFF) and Environment (DETR). Ministers are advised on approvals by a committee of independent scientists, the Advisory Committee on Pesticides (ACP) which produces annual reports that cover many aspects of pesticides use.

Agrochemical companies applying for the registration of a pesticide active ingredient have to submit a dossier setting out the results of prescribed testing protocols. The test protocols are published in *The Registration Handbook* which provides a comprehensive guide to policy and controls, and to registration procedures which set out data requirements

and other matters.

Approvals are published in the official journal *The Pesticides Register*. An approval is given for the use of a particular chemical on a specified crop or crops, at particular dose rates and under specified conditions. Data on new active ingredients are published by MAFF's Pesticide Safety Directorate in the *Evaluation* series of documents - these are publicly available.

Pesticide users are, in general, required to have a Certificate of Competence in order legally to use pesticides, and ministers have issued Approved Codes of Practice on the use of pesticides in a number of areas - including agriculture and amenity use.

In addition, health and safety legislation applies to the majority of pesticide usage. The Health and Safety at Work Acts, and the Control of Substances Hazardous to Health (COSHH) Regulations apply to most uses of pesticides by professional users and establish a framework for the assessment of risks by employers and other users covering a number of headings:

Elimination: does a pesticide have to be used at all - can use or exposure be eliminated completely?
Substitution: can a safer or less toxic product or formulation be used instead?
Technical and engineering controls: how can these be used to minimise exposure?
Operational control: how can safe systems of work and working practices be used to reduce exposure?
Personal protective equipment: this represents the last line of defence against exposure when other means have failed, and should not be the first choice to reduce exposure.

Pesticides worldwide

In 1995 global pesticide sales increased by nearly 9% to US$30,265 million sales, with increasing sales in Asia, Latin America and to a lesser extent in Africa. Developing countries may account for 35% of all pesticides sales by 2000, compared with only 19% in 1988. Yet many of the products sold in developing countries are older, cheaper pesticides which are more persistent in the environment or more hazardous to the health of the user. Although these products used to be exported from Northern countries, there are now concerns about production in the South.

Internationally, controls over pesticide use - particularly in developing countries - are difficult. Pesticides are often used by poor and illiterate farmers with no training or access to medical facilities. Agencies such as the UN food and Agriculture Organisation (FAO) and the UN Environment Programme (UNEP) do their best. Such controls as there are, like the joint UNEP/FAO *Code of Conduct on the International Distribution and Use of Pesticides* are voluntary documents and do not have the force of law.

In areas of regular pesticide use the environment is deteriorating, resulting in contaminated water supplies, loss of plant diversity, insect resistance and cattle deaths. There is pressure to increase pesticide use. But intensive pesticide use will not be the answer to food shortages, which are caused by lack of access to and distribution of food.

Current concerns

We need to **resolve the current agricultural policy contradiction** between high input agriculture and the health and environmental concerns about pesticides.

We need to recognise that less intensive pesticide use cannot be encouraged by market forces alone. Non-chemical research does not have the same promise of profit or commercial prospect in the form of a saleable product. **A greater investment in terms of farmer and user skill and training is required.**

Farmers - who cannot be experts in the many active ingredients and formulations - need i**ndependent advice** to enable them to choose safer chemicals.

Policy at present examines chemicals to see if they are individually "safe", rather than focusing on the problems of pest control. The banning or restricting of one chemical may lead to the overuse of the substitute. **We need to look at life-cycle analysis of pesticides.**

Decisions on the 'acceptable' levels of risk are made largely by expert committees. **Users should be involved in saying what are the acceptable risks of pesticides.**

Resources

The Advisory Committee on Pesticides Annual Reports (HMSO) listing new pesticides approved, issues considered and actions taken during the year.

Pesticides: Code of Practice for the Safe Use of Pesticides on Farms and Holdings. MAFF/Health and Safety Commission 1990. HMSO, London. The 'Green Code' provides advice on safe use.

The British Agrochemicals Association's Annual Review and Handbook (BAA, Peterborough) gives the industry overview of sales, issues and trends.

The *Evaluation* series of monographs published by MAFF sets out a summary of the available data on particular pesticides.

Pesticides News and other publications of the Pesticides Trust give a topical overview.

pesticides around us

A background paper produced by the Pesticides Trust

Silent Spring?

Rachel Carson's book *Silent Spring* in 1962, describing the effects of organochlorine pesticides such as DDT on bird populations, was the first public statement of concern that pesticides could affect the wider environment. There was also in the 1960s concern about the possible effects of hazardous pesticides exported from the North and causing severe health and environmental problems in developing countries. A UN Food and Agriculture Organisation survey in 1995 compared the effect of ten years of effort to reduce the impact of pesticide use in developing countries. It revealed no change on health issues and a deterioration of the environment.

There is concern both in northern and southern countries as to how the external costs of production, particularly in the environmental area, can be paid for under post-GATT trading regimes, where intensive agriculture is being encouraged. Environmental concerns do not respect national boundaries: how do pesticides affect the UK environment? These concerns can be listed under a number of headings - air, soil, water, and wildlife.

Air

The majority of pesticide application is by spraying. Pesticide spray can drift and vapourise, causing non-target effects. Incorrect application in windy conditions or using equipment that is not properly calibrated means that the pesticide may not reach its intended target. But a large proportion even of a pesticide that is properly applied will vapourise into the atmosphere. Many people have been affected by spray drift.

Non-target effects can also arise when a persistent pesticide is used. Many of the UN-designated Persistent Organic Pollutant (POPs) pesticides were originally used in southern countries, and are now found because of aerial transport in the environments of Nordic countries. DDT is found in the body fat of arctic penguins. Even relatively newer pesticides travel in the atmosphere: the herbicide atrazine has been found on many occasions in rain.

The soil fumigant methyl bromide, applied world wide to kill soil pests before planting crops such as peanuts, strawberries and tobacco, and also used in commodity fumigation under quarantine regulations in international trade, damages the ozone layer. It is one of the substances listed under the Montreal Protocol to the Vienna Convention, and international reduction targets have been set.

Soil

In general, residues of pesticides in soil in the UK do not pose the same degree of hazard as residues in other environmental media. Farmers generally rotate crops, so that if a pesticide persists in soil, it may damage following crops. The chief concern relating to pesticides in soil is the process of pesticide leaching through the soil or running off into water courses or to underground water courses.

In developing countries however, the inappropriate use of pesticides or the use of the wrong products has led to instances of soil pollution from persistent pesticides and sometimes damage to following crops.

Water

One teaspoonful of spilled pesticide concentrate could pollute the water supply of 200,000 people for a day. In one second, two sprayer nozzles can deliver enough pesticide to contaminate a 3 km long brook. Customers of water companies in England and Wales are paying on average £4-£5 per year in their water bills to make sure their water is treated to meet the European standard for individual pesticides in drinking water.

The EU Drinking Water Directive has been the driving force in regulating pesticides in drinking water. However, in some areas of the UK about 75% of our drinking water comes from ground water, which is difficult if not impossible to cleanse if polluted. Many agricultural areas in the UK overlie chalk, which contain fissures that mean aquifers can become polluted with pesticides that are quickly transported considerable distances from their field of use. Surface and river water is also vulnerable to pesticide run-off, particularly if pesticide application is followed by heavy rain.

There is also an effort to introduce more Environmental Quality Standards for pesticides, to try and prevent concentrations of pesticides in water from affecting aquatic flora and fauna. Concentrations of chemical can affect wildlife at some degrees of magnitude lower than affect humans. Minute quantities of pesticide can have serious

effects. The marine biocide TBT has been linked with the depletion of shellfish populations. Concentrations of TBT at two parts per hundred billion have the effect of making male whelks sterile. Samples of sea water from the surface microlayer of the North Sea may contain 10 times the amount needed to induce sterility.

The UK has set up the Working Party on the Incidence of Pesticides in Water which has just published its first report. As expected, cereal herbicides are the main offenders in terms of breaching the drinking water limits, together with herbicides used against weeds on hard surfaces by local authority and other amenity users. Discharges of sheep dip pesticides to water are also a concern.

There is a shortage of ecotoxicological data on a number of pesticides, particularly some widely used fungicides. The report also comments on the inadequacy in some cases of analytical methods to detect and test for some active ingredients.

Wildlife and biodiversity

Farming by definition directly affects biodiversity. FAO estimates that 75% of the genetic resource for food and farming has been lost in this century. Pesticides can reduce species diversity and cause ecological damage. Pesticides have effects on wildlife. The effect of DDT poisoning on bird reproduction is well known, but other pesticides too have direct and indirect effects on fish, birds, bees and other species, and on their habitats and food chains.

It is estimated that the use of herbicides on farms in the period 1940-62 in the UK has led to the disappearance of perhaps half the farmland birds and beneficial insects, and that some 75 species of plants that used to be common in European cornfields are now endangered. Habitats and water sources have been polluted.

The RSPB and others noted an 89% decline in sparrow numbers from 1969 to 1994; and 82% for grey partridge; and 58% for skylarks. The decline is based on herbicide and insecticide use destroying the birds' food chains. Insecticide use on farm crops rose from 5% of crops treated in 1970 to 90% in 1990; and in the same period herbicide sprayings rose from 1.3 applications a year to 2.5.

Is history repeating itself?

35 years after the appearance of *Silent Spring*, a number of chemicals, many of which are organochlorines and other pesticides, are now linked with adverse effects on wildlife. They appear to damage the endocrine system which leads in turn to hormone-related damage that has been found in some US populations of birds, reptiles, fish, mammals, and molluscs. These problems arise from the combination of a number of factors. Pesticides are tested in laboratories and on small scale wildlife populations. However, the effects of pesticides as a result of actual field use may be different from those predicted in laboratory experiments.

Whereas the effects of pesticides on health are relatively constant from population to population - toxic effects are similar for most people - environmental and non-target effects vary greatly from site to site depending on local conditions. For wildlife species already stressed by declining habitat and other pressures, reproductive problems caused by chemical hormones could deliver the *coup de grace*.

Critical factors will vary not only from region to region, but also from farm to farm and within farms. Farmers have relatively little information that would enable them to consider the specific effects of pesticides on local populations. The European Union urgently has to resolve the contradiction between increasing intensive agriculture and the need to reduce environmental pollution.

Current concerns

More support is needed for environmentally-friendly farming systems that use less pesticides.

There should be a **tax on environmentally hazardous pesticides.**

Farmers need **information on the environmental effects of pesticides** so they can perform an environmental COSHH evaluation.

Better baseline monitoring is needed of environmental indicator species to give early warning of problems.

Because pesticides are international transboundary pollutants, **greater support should be given to developing countries** to ensure that they are equipped to use less polluting technologies.

Resources

Unwelcome Harvest: Agriculture and Pollution. G.R. Conway & J. Pretty. Penguin Books, London 1991.

Sustainable Use of Soil. Royal Commission on Environmental Pollution. (19th Report: Cmd 3165). HMSO, London 1996. An up to date account of soil pollution and calls for a soil protection policy.

Pesticides in Water. Report of the Working Party on the Incidence of Pesticides in Water. Department of the Environment. HMSO, 1996. Overview of water pollution from pesticides.

The Indirect Effects of Pesticides on Birds. L.H. Campbell, A.S. Cooke (Eds). Joint Nature Conservation Committee, Peterborough, 1997.

pesticides and farming

A background paper produced by the Pesticides Trust

Are pesticides essential?

Current agrochemical practice is fighting a battle it is not winning, and may be losing, against resistant pest populations. We rely for our food on a small number of crop varieties, and those are often highly bred and vulnerable to pests and disease. Rates of resistance to pesticides are increasing, and rates of pest and disease attack are not diminishing. How can farmers produce food using fewer pesticides, or using no pesticides at all? There is a lot of evidence to support the sustainable basis of farming systems that do not rely so much on pesticides and fertilisers and repeatedly growing the same crop in the same field.

There are other means of controlling pests besides chemical pesticides. Habitat and land management can promote pest control, as can organic farming, and the selective use of lower inputs. Cultivation practices, biological control and post-harvest storage are all well-known areas where dependence on chemicals can be reduced.

Alternatives to synthetic chemical pest control also require greater time and skill from farmers, generally being less commercially saleable, and need more support from government funded - as opposed to agrochemical company - research. There is a range of alternatives, from reducing chemical inputs to the organic option of using no pesticides at all.

Pesticide reduction policies

Our European neighbours Denmark, Sweden and the Netherlands have been concerned at their pesticide use (Netherlands uses about four times as much pesticides compared to the UK but Denmark and Sweden use less than we do). They have nevertheless adopted percentage reduction targets for pesticides use. Agriculture and technology in the UK are different but some of the features of reduction policies are instructive. The three main thrusts of pesticide reduction are:

- to reduce (minimise) use
- to reduce (minimise) risks to health and the environment and
- to reduce (minimise) the reliance of agriculture (and horticulture and other sectors) on pesticides.

Use reduction does not mean using less weight of pesticide. The use of newer, low-dose active ingredients achieve this in any event. These are lighter and more powerful and have correspondingly higher biological activity. Use reduction means lower than recommended label doses, fewer applications and less waste or overuse.

There are already many examples of use reduction. Isoproturon, a cereal herbicide, has been found increasingly in water courses - MAFF advice has been to reduce the pesticide application rate by 40%. It is already government policy that certain pesticides designated as dangerous to aquatic life (the 'Red List' pesticides) should be reduced by 50% of 1985 levels (a target that has not been met). Many farmers already use lower than recommended doses of pesticide, or fewer applications in an effort also to reduce their chemical bills.

The reduction of use in many cases means reducing risks to health and the environment. Using less also means reducing exposure - particularly if the most hazardous chemicals are substituted. Delivery can also often be improved so that the pesticide more effectively reaches its target.

But above all we need to reduce our dependence on pesticides. Many crop varieties are vulnerable to particular pests, and are dependent on one or two active ingredients to achieve control. Non-chemical alternatives are urgently required. This will become a problem of increasing importance as industry, driven by economic factors, focuses on the largest and most profitable markets. This will leave smaller or minor markets without support. Reduction of dependence is unlikely to be achieved without refocusing The European Union Common Agricultural Policy support so that environmentally friendly farming is protected, instead of paying solely for volume production.

Organic agriculture

Organic production is one obvious option. The organic market is growing at 30% per year: Sainsburys alone has 50 organic lines, with 13 guaranteed in store at any one time. Organic farming is a systematic approach that:

- prohibits the use of artificial pesticides, fertilisers or

other chemicals;

- bases production on crop rotation to encourage soil fertility;
- preserves wildlife habitats;
- and minimises pollution.

Organic farmers and growers have pest problems, like other farmers; however, they commonly report a low incidence of disease in their crops, and this is increasingly being confirmed by objective studies. Farms are profitable and many withstand comparison with conventional farms with similar rotations. In many cases profit depends on the organic price premium; but then so do conventional cereal farmers depend on their EU arable area subsidies. More assistance needs to be given to farmers to make the transition to organic agriculture.

Lower-input agriculture

Experiments in recent years have been made on what are termed Integrated Farming Systems (IFS). There are different variations on the theme, but the overall objective is to use a balanced crop rotation to reduce pest, weed and disease problems whilst maintaining soil structure and fertility. The system does not ban synthetic chemical pesticides and fertilisers as does organic agriculture, but aims to make a substantial reduction in synthetic inputs. There have been a number of different studies on farm sites throughout Europe. Generally farms have shown a slight overall reduction in yields compared with conventional farms, but input costs have been reduced, and profits were equal to or better than conventional farms.

In a specific case, results from the UK government-funded LIFE project (Less Intensive Farming and Environment) show that over a five-year rotation a low input regime overall yields were reduced by 10-15% compared with conventional farming; but savings from lower inputs were between 33%-35% and gross margins were the same or 2% greater than conventional. Herbicide use was reduced by 26%, fungicides by 79%, and insecticides 80% on average. This shows that lower input regimes mean farmers can make profits from using less pesticides.

Integrated Crop Management

ICM is a new term, confusingly similar to IFS, and spearheaded by the organisation Linking Environment and Farming (LEAF - an acronym confusingly similar to LIFE) and supported by the pesticide producer industry. It is difficult to define ICM but it includes environment, conservation and wildlife considerations in the farmer's plan. It does not aim to reduce pesticides or other inputs, but instead aims at 'minimal' or 'responsible' use.

ICM intends to promote a label scheme for its merchandise perhaps to be agreed with the major retailers, but it is too early to say what its impact will be for consumers. One guess is that it will represent current best practice in intensive agriculture, rather than any new departure.

One aspect of ICM that is positive is its encouragement to the non-farming public to visit farms. The more people who know how food and farming go together the more educated consumers will be in supporting sustainable agriculture.

The Common Agricultural Policy (CAP)

CAP is the cornerstone of the European Union, and takes over half the EU budget. Until the 1992 reforms it aimed mainly at supporting prices and paid subsidies for volume production. Member states and the Commission are discussing further necessary reforms because of the enlargement of the Union and GATT.

The likely effect will be to reduce agricultural subsidies. It is to be hoped that the budget available for less-intensive pesticide systems under the Agri-environment programme will be increased from its present 3% of CAP and that support will be decoupled from production.

Current concerns

The European Union **Common Agricultural Policy should provide greater support to organic** and other environmentally friendly farming.

More research and support should be given to alternative non-chemical pest control strategies.

Government policy should include **targets for real pesticide reduction.**

Resources

Regenerating AgricIture - Policies and practice for sustainability and self-reliance. Jules Pretty. Earthscan, 1995. A survey of the policy and evidence for sustainable agriculture.

Growing Greener - a report on the environmental sustainability of UK Agriculture. David Baldock et al. CPRE and WWF, London, 1996. An examination of the environmental costs of production of UK agriculture.

Regular articles on organic and lower-input systems appear in *Pesticides News*.

pesticides in food

A background paper produced by the Pesticides Trust

Food residues

Pesticides increase agricultural productivity in the short term, but there is no such thing as a free lunch: the food we eat often contains pesticide residues, even if they are measured in parts per million or parts per billion. How do pesticides get into food as residues? Residues can arise in different ways:

- from the use of legally allowed pesticides according to good agricultural practice
- when food is treated to help preserve it from pests after harvest or in transit
- from overuse of a pesticide, or in occasional cases, from the use of a pesticide that is not approved at all in the UK, or not approved for that particular crop or purpose
- and even organic food may contain residues of pesticides, often from spray drift from a pesticide-using neighbour.

Not all pesticides that are used on food crops leave residues - the pesticide may be used early in the season before the crop is grown, to clear the ground of weeds. Below we look at food safety, residues and concerns.

Food safety

Who is to make sure that pesticides in food are safe? In this country it is fortunately very rare that people are made ill from eating food containing pesticides. In developing countries the picture has often been different.

No pesticide can be manufactured, stored, advertised, sold or used for any purpose in the UK unless it has first been approved as safe by government ministers, acting on the advice of the Advisory Committee on Pesticides, an independent committee of scientists.

he incidence of pesticides in the food chain is the responsibility of the MAFF-administered Working Party on Pesticide Residues (WPPR), which produces annual Reports that set out the results of food monitoring.

There are three levels of laws governing the amount of pesticides allowed in food. The UK has regulations that set out Maximum Residue Levels (MRLs) that are permitted in food. The EU has issued Directives to protect consumers by EU MRLs. In addition, the Codex Alimentarius Commission, the international standards-setting body sponsored jointly by the UN Food and Agriculture Organisation (FAO) and the World Health Organisation, sets MRLs in the interests of facilitating international trade and protecting the health of consumers.

All these limits rely on a number of related concepts:

- Maximum Residue Levels (MRLs) - *the legal limit of pesticide allowed in food.* An MRL is the maximum concentration of pesticide residue (expressed in mg/kg of produce) legally permitted in or on food commodities or animal feeds.
- Acceptable Daily Intake (ADI) - *how much can be consumed without harm.* ADI is the toxicological baseline on which MRLs are based. ADI is the amount of chemical that can be consumed every day for an individual's entire lifetime in the practical certainty, on the basis of all known facts, that no harm will result.
- Good Agricultural Practice (GAP) - *how a pesticide is used by the farmer.* GAP represents the conditions of pesticide use (amount, method, time of application etc) so as to leave the smallest amount of residue that is toxicologically acceptable.

Residue testing

In the UK, residue monitoring consists of regular surveillance of dietary staples, targeted analysis of products where residues might be expected, and a rolling programme of sampling other foods. The details of residue sampling and results are to be found in the WPPR annual reports. There are a number of issues that have been highlighted in recent years.

- In 1995, for example, some 31% of food sampled contained pesticide residues below the permitted Maximum Residue Levels (MRLs).
- About 1% contained residues in excess of permitted levels.
- Some 68% of food does not contain detectable pesticide residues.
- There were 3200 samples and results for 77,500 pesticide/commodity combinations were reported.

Resources for sampling and testing are never sufficient to provide a statistical picture of the food supply. Although imported foor is sampled, it is not possible to sample more than a very small number of consignments. And there is

always concern as to whether the level of sampling is sufficient. The crops that tend to produce occasional residues greater than MRLs are lettuce, spinach and carrots. The levels of organophosphate pesticides in carrots highlighted concerns about the variability of pesticide residues in food crops. Residue sampling is generally carried out on the basis of taking a number of individual samples of apples, carrots or beans for example and then homogenising the samples before carrying out analytical determinations.

MAFF's recent work on carrots has demonstrated that there can be considerable variations in residue levels between individual carrots, that may be neighbours in the same planting. The level of variation can be as much as 40-fold. This work has, in recent months, been replicated in a range of other crops with similar results.

A further development from the finding of residue variation is the concern that harm may result from the short-term ingestion of pesticide residues in food. In announcing the first results of its investigation into residues in carrots MAFF conceded that there was a possibility that short-term acute effects could be felt - possibly stomach ache. This admission has now triggered work to recalculate safety margins based on the possibility of acute pesticide concerns, as well as long-term concerns. This is an international pesticide issue, not just a UK concern.

Should we worry?

The exposure of consumers to pesticides in food is relatively low: the worry is not so much the amount of pesticides that consumers may eat, but how those food crops are produced. Relative to the exposure of workers who use and apply pesticides, both in this country but more particularly in developing countries, consumer exposure is less of a problem.

Advice is often given that the best way to reduce pesticide residues is to wash food. This is true for those pesticides that remain on the surface of the food in the same way as dirt. However many pesticides are systemic, which is to say that they penetrate into the body of the crop or food item and washing cannot remove these residues.

Those who eat special diets which rely on a small number of foods produced using pesticides may consume more pesticides as a result of their diet, but in general consumer health is not the most important issue - except perhaps for children.

Children's diet is different from the diet of adults in terms of the both the type and proportion of food eaten. Because children are developing, their bodies and metabolisms may also be more vulnerable to the longer term effects of pesticides. It is also important to remember that the long-term effects of low doses of different pesticides are not known. Pesticides are chemicals that have only been in widespread use for forty years or so compared with many of the other chemicals the body has to deal with in diet.

Consumers are also advised to eat organic food as a way of avoiding pesticide residues - although this cannot be guaranteed. Because the neighbouring farmers may use pesticides, the food from organic farms may contain small amounts of pesticide residues. Pesticides spray drift from neighbouring farmers may contaminate organic crops, even though the organic farmer does not use pesticides.

Current concerns

Much of the food we eat is imported from other countries. There is only limited control we can have over the way pesticides are used in other countries and only a limited amount of **testing of imported food.**

It is not only government that tests for the safety of pesticides in food - the retail industry has duties under the Food Safety Acts to ensure the food supply is safe. **Retailers should publish their own residue monitoring results** so consumers can be assured of the safety of food they sell but have so far refused to do so.

Different sub-groups of the population consume different diets. In the UK, surveys have recently been carried out to examine the diets that toddlers and vegetarians eat. **The impact of pesticides on children needs investigating**.

Larger amounts of more powerful chemicals are used each year on food. T**he long term impacts of low doses of more pesticides are uncertain**.

Many of the current residue problems arise from the legal use of permitted pesticides by growers. There may be little that consumers can do to reduce residues. Instead **there needs to be an overall reduction of pesticides use and chemical farming**.

Resources

Annual Report of the Working Party on Pesticide Residues 1996. MAFF/HSE. HMSO, London 1997. Published regularly, an account of the results of residue monitoring in food with a summary of issues and future programmes.

UK Technical Policy on the Consumer Risk Assessment of Pesticide Residues. Consultation Paper 17 January 1997, PSD, York (ref: AAHL/3/97). Sets out the current policy for residue testing.

pesticides and health

A background paper produced by the Pesticides Trust

Are pesticides safe?

Pesticides are toxic chemicals and are designed to kill living organisms: sometimes they can have adverse effects on users or others who may come into contact with pesticides, either in the short or the longer term. Before a pesticide can be authorised for use in the UK, a data package - which includes human health and safety data - has to be approved by the government. It is, however, difficult to tell what the long-term, low dose effects of pesticides are on people because:

· pesticides are poisonous and so reliance is placed on the results of testing on animals (usually rodents) or on testing tissue or other samples in the laboratory instead of on living organisms;
· humans are exposed to many different chemicals - even operators who work with pesticides use many different active ingredients - so that it is extremely difficult in practise to isolate the effects of one particular pesticide; and
· experts and regulators frequently disagree what are the hazards and risks.

Acute poisoning in the UK

The main risk of acute or short term adverse effects from over-exposure - perhaps 90% of the risk - from pesticide use is from the mixing and loading of pesticides. In the UK there is no single definitive source of figures on acute pesticide poisoning, and it is necessary to combine information from hospitals, from the National Poisons Units, the Health and Safety Executive and other sources. A recent review concluded:

· at least 5500 suspected pesticide poisoning incidents occur annually in the UK
· of these annual incidents some 700 patients, including approximately 500 children under 10 years, are admitted to hospital - most of the children admitted were discharged in less than two days
· only 17% of the 998 cases of suspected poisonings were 'confirmed' or 'likely' poisonings and most of those fortunately had only mild (64%) or moderate (31%) symptoms
· but approximately 20 deaths from pesticide poisoning are reported annually in England and Wales and all occur in adults (usually men) and most are due to the apparently suicidal or para-suicidal ingestion of the herbicide paraquat.

HSE produces an annual report of pesticide incidents investigated, and its Pesticide Incidents Appraisal Panel examines cases where there are allegations of ill-health caused by pesticide use. Incidents involving crop spraying are the most frequent cause of complaint. In the UK, the herbicide glyphosate was the most frequently mentioned active ingredient cause of complaints and poisoning incidents notified to HSE between 1990-95.

Many of the complaints involve skin conditions and allergies, but many also involve the acute and longer term adverse effects from exposure to organophosphate (OPs) and carbamate pesticides. Not all adverse effects result from arable agriculture - many result from exposure to domestic wood preservatives, or OP sheep dips (licensed as veterinary medicines), or from amenity spraying by urban local authorities.

It is generally accepted that poisoning incidents are under-reported. There are a number of possible reasons for this. Except in cases of immediate acute exposure, people may not always realise at the time that they have been exposed. Sometimes it is difficult to find out the active ingredient involved; not everyone has confidence in the investigating authorities; and there may be subsequent difficulties for an employee reporting an incident arising at work.

Chronic effects

As well as the acute effects of exposure, there may be longer term effects. Pesticides are linked with chronic illnesses and conditions, including cancers, reproductive and neurological effects, which may take many years to become manifest. OP sheep dips have been in use for well over 40 years, but only now is there a gradual acknowledgement that the use of OP dips can lead to long-term health problems.

Scientists and regulators also take different views, such is the complexity of the subject. In recent years there have been concerns about the safety of a number of pesticides used on food, including daminozide (used on apples as Alar),

and the EBDC group of fungicides, where US regulators took the view that there was a cancer risk and the ACP in the UK took a different view. Currently the US considers the herbicide cyanazine a possible cancer risk, and has negotiated a voluntary phase out with the manufacturers. The product was the fifth largest selling herbicide in the US, although it has very little use in the UK and is not restricted.

The International Agency for Research on Cancer published its view that the use of all insecticides entailed a cancer hazard for users; but again, most regulators disagreed. It is also true to say that the UK has restricted some products that are permitted in the US.

There are differences in approach between US regulators and the ACP in the UK. A more mathematical modelling approach, particularly towards cancer, is used in America. The UK approach is based more on biological endpoints and actual biological mechanisms. Much US work focuses on cancer, whereas Europeans tend also to look at other endpoints.

In the UK, lindane, a wood preservative and agricultural insecticide (also known as Gama-HCH) has been linked with aplastic anaemia and also breast cancer. Benomyl, a fungicide widely used in agriculture and gardens, has been linked with anopthalmia, the 'babies without eyes' syndrome. In none of these cases has a definite link been established, although in some cases there have been added restrictions on use.

Other widely used pesticides that have been restricted in the UK for health reasons in recent years include vinclozolin, a fungicide that can cause birth defects in the foetus, and carbaryl, an insecticide used in orchards, amenity treatments and public health.

Current attention worldwide is focused on possible endocrine disrupting chemicals, of which many are pesticides, that may be associated with adverse reproductive effects in wildlife, but also in humans, including reductions in the male sperm count and the increased incidence of testicular cancer.

Developing countries

The World Health Organisation estimates that every year 3 million people suffer acute, severe pesticide poisoning. Accidental deaths from pesticide poisoning worldwide are estimated by the World Health Organisation at 300,000 a year, mainly in developing countries.

An International Labour Office report of 1996 draws attention to dangers in the agricultural sector, where 14% of all known occupational injuries and 10% of all fatal injuries are caused by pesticides. It is estimated that about 60-70% of all cases of acute unintentional pesticide poisoning are due to occupational exposure, on a worldwide basis; again, workers in developing countries are most at risk.

In the meantime, the corporate agenda is clearly to intensify pesticide use in developing countries. Pesticide sales are increasing, and industry predicts that developing countries will account for over one-third of all sales by the year 2000. There are also pressures from development agencies and banks to increase pesticide use and to liberalise trade and health and safety controls to the detriment of pesticide users and their families.

Current concerns

There should be a greater emphasis on **reducing the risks from exposure to all pesticides**

More **training in toxicology and the adverse effects of pesticide exposure** is needed for medical practitioners.

There should be **greater access to information particularly on the long-term adverse effects** on human health of pesticides, particularly cancer, neurotoxic and reproductive effects.

Consideration should be given to **no-fault compensation** for victims suffering adverse effects after exposure.

Resources

Pesticides Incidents Report 1996/97. Field Operations Directorate Investigations 1 April 1996 - 31 March 1997. HSE Books, Sudbury, Suffolk. HSE's annual report of pesticide incidents investigated during the year.

Surveillance of Human Acute Poisoning from Pesticides 1990-1993. Pesticide Monitoring Unit, National Poisons Information Service (Birmingham Centre). November 1993. Compilation of acute poisoning data in the UK.

Pesticide Poisoning. Notes for the guidance of medical practitioners. Ed. Dr Alex Proudfoot, Department of Health (2nd edition) 1996. A review of symptoms and treatments, and includes an index of product names and chemical active ingredients.

Public Health Impact of Pesticides Used in Agriculture. World Health Organisation, Geneva, 1991. An overview of the health problems arising from pesticide use in developing countries.

Pesticides, Policies and People. Peter Beaumont, Pesticides Trust, 1992. Survey of the health problems linked with pesticide use.