

# *Pesticide residues in food*

A briefing for the *IPM in Developing Countries Project* funded by the European Commission *Environment in Developing Countries* budget (DGVIII)

**This briefing introduces issues relating to establishing and implementing the pesticide residue standards in food which govern consumer safety and international trade.**

## **Protecting consumers**

The use of pesticides in food production inevitably leaves residues and strict standards need to be maintained to guarantee consumer safety. Governments need to monitor residues in food and publish the results. Chemically intensive production will continue to generate concerns about the consequences of long term low doses of multiple pesticide residues,



*Pesticide spraying in Costa Rica*

## **Food residue problems**

The overuse, abuse or misuse of pesticides can have serious consequences in food. Large scale poisonings by pesticide-contaminated food are unusual but not unknown: in the US almost 2,000 people became ill after eating watermelons contaminated with aldicarb in 1985. Six deaths and two still births were reported. Many less dramatic cases of food poisoning are unreported. There may be long term health risks from small quantities of residues in food—for example DDT in human breast milk and residues of endocrine-disrupting pesticides. Certain classes pesticides like organophosphates have a common mode of action and their effect may be cumulative. The prevalence of toxic products applied by untrained users in many developing countries gives rise to concern for consumer safety in those countries and in produce for export.

## **International residue standards**

The Codex Alimentarius Commission (which means 'food code' in Latin) establishes a code of food standards for all nations. It was created by two UN organisations, the FAO and the WHO and has committees covering many aspects. Pesticide residues in food are dealt with by the Codex Committee on Pesticide Residues, which bases its work on scientific approvals made by the independent expert panel, the Joint FAO/WHO

Meeting on Pesticides Residues.

## **Standards under the World Trade Organisation**

Since the Uruguay round of the General Agreement on Tariffs and Trade (GATT), Codex has become the basis of international food standards for trade between member countries of the World Trade Organisation (WTO). National standards are based on a country's pesticide crop residue and toxicology data. Codex recommended residue levels may be used by developing countries which do not have their own. Codex meetings are dominated by industrialised countries, many of which include industry in their delegations, and it is vital that developing countries participate and are well-briefed to represent their own interests.

*“We have analysed the main characteristics of 63 outbreaks of toxicity caused by alimentary exposure to pesticides ... these are probably the tip of the iceberg of public health problems caused by pesticides ...”*

*A Ferrer and R. Cabral,  
Food Additives and Contaminants, 1991*

## Residues in food

Pesticides are used widely throughout the world to control insects, diseases and weeds in crops for human consumption. Food safety depends on strict standards to prevent undesirable residues, and provide consumers with sound, wholesome products. The Codex Alimentarius Commission (Codex) is the international body of government representatives establishing standards, with a remit to: “guide and promote the elaboration and establishment of definitions and requirements for foods, to assist in their harmonisation and, in doing so, to facilitate international trade.”

FAO and WHO have been

evaluating the safety of residues in foods since 1962 and establishing Maximum Residue Limits (MRLs) to help ensure that pesticides are not overused and that any residue is safe for human consumption. Over 2,500 MRLs are currently approved covering 195 active ingredients. Standards do not exist for all crops, or for all pesticides, as some are not used on food and not all pesticides leave residues—for example they may be used to clear weeds before planting. Permitted residues are small, being generally measured in parts per million. Residues can arise from:

- ❖ the use on a crop of legally allowed pesticides according to good agricultural practice
- ❖ overuse of a pesticide, or use too close to harvest, of a legally permitted pesticide
- ❖ illegal use of a pesticide that is not approved for that crop
- ❖ incorrect use of pesticides after harvest, to reduce pest infestation in storage or in transit.

## Developing country problems

Many factors can contribute to high pesticide residues in developing countries. Users are generally untrained, have poor literacy and are not aware of the toxicity of the products they use. Instructions are complex, compounded by labels which are often in the wrong language. Containers may have labels missing or damaged. Consistent use of pesticides can lead to insect resistance, which encourages farmers to over-use products. Pesticides appropriate for one crop may be used on others, or pesticides for public health purposes to combat malaria or locusts may be used on crops. (See box).

- Governments and regulators lack the resources

to conduct surveillance of health and safety practices in pesticide application, and to monitor the incidence of residues. Newer pesticides are often too expensive for farmers in developing countries, and cheaper pesticides are often older and more hazardous.

## Standards for residues

Pesticide use is controlled by national regulation, generally a system of registering each pesticide formulation for a specific use and crop. Approvals are based on evaluations of efficacy, user and consumer safety, and environmental impact.

Most industrialised countries have also established laws setting the MRLs that are permitted in food, and which apply to food produced domestically and imported. One objective of Codex MRLs is to facilitate international trade: standards are intended to ensure that importing countries will not prevent import of food commodities because of residues that occur up to the level of the MRL. However there is often a variation between national standards and international recommendations.

Residue limits are set relying on a number of related concepts:

*Maximum Residue Levels (MRLs)*—the legal limit of pesticide allowed (expressed in mg/kg of produce) in food or animal feeds.

*Acceptable Daily Intake (ADI)*—the amount of chemical that can be consumed (in mg/kg bodyweight) 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 nationally authorised safe pesticide use (amount, method, time of application etc.) under actual conditions, so as to leave the smallest amount of residue that is toxicologically acceptable.

Generally the use of a pesticide will lead to residues in food and provided the pesticide is used according to the manufacturer’s label directions and GAP, regulators calculate the residue should be within the MRL and ADI. Although most countries aim to observe Codex MRLs so they can export produce, this does not necessarily mean that they have in place an effective system of national MRLs for domestically produced and consumed food.

## How standards are set

The Codex Committee on Pesticide Residues meets annually, generally in the Hague, to establish and review MRLs for particular pesticides. Decisions are based on an expert technical committee of FAO and WHO, the Joint Expert Meeting on

## Exceeding the limits

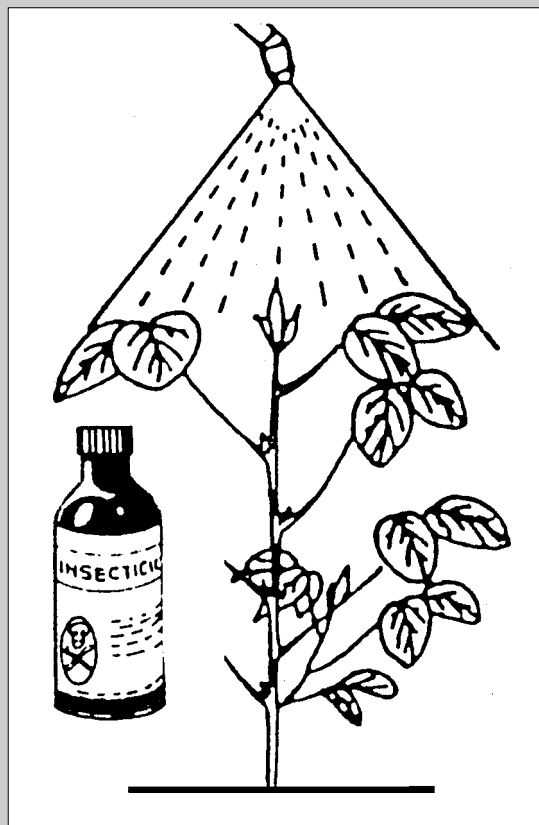
❖ Residues of pesticides are measured in parts per million. By contract, water contamination is measured in parts per billion. Some pesticides are so powerful that parts per trillion can affect aquatic life.

❖ An FAO Inter-Country Programme on integrated pest management (IPM) in Bangladesh found that farmers in Jessore were spraying their aubergines 70-150 times during one season, which means pesticide application was varying from alternate days to twice a day. Spraying in the evening and marketing in the morning is common practice.

❖ Lindane is an agricultural insecticide that has been in widescale use since the 1950s. Codex Committee on Pesticide Residues revised downwards the ADI for lindane in 1997 to 0.001 mg/kg bodyweight. This

means for a 70kg adult, the safe daily limit is now just 0.07 mg. Codex revealed that a person consuming an average local diet in any region of the world could theoretically exceed the ADI by between 3.8 and 12 times. Not enough is known about the effects of lindane on the body although it has been in use for nearly 50 years.

❖ Sometimes mistakes can have serious consequences. Misuse of the fungicide HCB poisoned 3-5000 people in Turkey between 1955 and 1959 with a 10% annual rate of mortality. In the USA in 1977 five people were acutely poisoned by eating food contaminated with the insecticide methomyl: three died.



Pesticide Residues (JMPPR), which reviews evidence on toxicology, residues data and use patterns. JMPPR is made up of toxicologists and residue chemists who act in their own right. The recommendations of the Committee on Pesticide Residues are passed on to the Codex governing body, which generally adopts these as Codex standards.

### *Problems and difficulties*

In practice there are difficulties in using a single standard. MRLs are based on the likely dietary intake of most people. However, diets differ considerably within and between regions. Children's diets differ from adults.

Many classes of pesticides such as organophosphates and carbamates exert similar effects on the body, and toxicology is only now beginning to assess how to take into account the possible cumulative effects. In addition, there are arguments about what constitutes 'good agricultural practice': one country's use of post-harvest chemicals may not be acceptable to another. The issues of pesticide residues from herbicide tolerant or insecticide-producing or otherwise genetically modified crops has yet to be debated. GAP is defined with reference to conventional pesticide applications.

The Ad Hoc Working Group on

Problems Relative to Pesticide Residues in Food in Developing Countries has called for IPM as a preventive measure, and for consideration of IPM when developing GAP information. The Codex Committee on Pesticide Residues has endorsed this request.

### *Monitoring*

To monitor food safety and compliance with MRLs many governments in industrialised countries sample foodstuffs and test for pesticide residues – usually the dietary staples are sampled on an annual basis, and targeted sampling is directed at different items of the diet each year.

Major food retailers in industrialised countries increasingly contract growers directly. The safety of the food supply is not simply a government matter but an issue for commercial operators as well. Retailers will often test for residues but may not disclose the results.

Sources for the protocols and methodology for sampling, analysis and reporting are set out in the resources section below.

### **Impacts in developing countries**

Developing country exporters must meet importers MRL standards, or perhaps in future the international recommendations under WTO rules. Produce which does not meet these standards can be refused entry. This will mean ensuring that produce is grown according to GAP, and that

*“One of the recommendations (of the developing country group) ... was the need to incorporate IPM as a preventive measure to reduce residues.”*

*Codex document CX/PR 98/12,  
January 1998*

## Key points

- ❖ National standards set maximum residue limits on food: exported foods which exceed these limits can be rejected by importers
- ❖ It is vital for developing countries to attend Codex meetings which recommend international standards on residue-related issues
- ❖ Developing country producers need support in implementing good agricultural practice and pesticide residue data appropriate to local conditions.

residue limits are within Codex MRLs. Codex MRLs tend, however, to be based on temperate, northern data. Very often the only source of data which is used to generate GAP is the agrochemical manufacturer. The lack of resources in developing countries for monitoring residues could result in shipments being rejected by importing countries. Some developing countries have voiced concerns that Northern countries may use unrealistic MRLs as a means of trade discrimination to keep out their produce.

Development aid for agriculture can assist countries in meeting residue standards, and improve the capacity to test nationally. This is not only important for exported produce: food for domestic consumption must also be safe for consumers.

Many developing countries cannot send delegations to Codex, or send small delegations. While OECD countries will send perhaps 12 in a delegation, many African countries can send only one. The agrochemical companies often form part of the delegations of industrialised countries, and the Global Crop Protection Federation sends a large group of observers (45 in 1997). As Codex is becoming the arbiter of residue standards in food under the WTO, it is essential that developing countries have the capacity to represent their own interests in this important forum. Training programmes are available to assist, and information is available through the WHO and Codex Secretariat.

### Conclusion

Developing countries need assistance in establishing national food residue standards. Many coun-

tries need to develop the capacity to represent their own interests at the annual Codex meetings. Developing countries also need help not only in putting in place the infrastructure to support residue compliance but also in reducing chemical inputs. A chemically intensive production system will continue to generate concerns about residue safety.

### Contact

Chief, Joint FAO/WHO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00100 Italy. Tel +39 06 52251; Fax +39 06 5705 4593; e-mail [codex@fao.org](mailto:codex@fao.org). The Codex web site is at <http://www.fao.org/WAICENT/FAOINFO/ECONOMIC/ESN/codex/default.htm> and contains details of Codex meetings, papers and the MRL pesticide database. The main publications are:

### Publications

Codex Alimentarius Volume 1: General Requirements. FAO, Rome 1992; and Volume 2B: Pesticide Residues in Food. FAO, Rome 1996. This is a publication of the joint FAO/WHO Food Standards Programme. Volume 2B deals specifically with all pesticides and crops for which MRLs are prescribed, together with recommended sampling and analytical methodology.

Pesticide Residues in Food—1997. FAO Plant Production and Protection Paper 145, Rome 1998. This annual report of the JMPR summarises residue and toxicology concerns, and provides evaluations of data upon which it makes recommendations to Codex for the setting of particular ADIs and MRLs that year.

Pesticide Residues in Food Evaluations: Part I—Residues. FAO Plant Production and Protection Paper. FAO Rome; Part II—Toxicological and Environmental. WHO, Geneva 1998.

Many EU Directives are in force governing MRLs in produce imported and exported from the EU. Information is available from the DGVI Agriculture web site on <http://www/europa.eu.int/en/comm/dg06/index.htm>; and the DGXXIV Consumer Policy and Consumer Health Protection web site on <http://www/europa.eu.int/en/comm/dg24>.



*Pesticide residues in food, PMN No. 8, November, 1998.* This briefing is one of a series prepared by Pesticide Action Network UK (PAN UK), which is responsible for its contents, as consultants to DGVIII of the EC. PAN UK is an independent charity working to reduce pesticide problems in developing countries. Its quarterly journal *Pesticides News* reports on pesticides and IPM.

Contact Mark Davis, Barbara Dinham or Stephanie Williamson at **Pesticide Action Network UK**, Eurolink Centre, 49 Effra Road, London SW2 1BZ, UK Tel +44 20 7274 8895 Fax +44 20 7274 9084 Email [admin@pan-uk.org](mailto:admin@pan-uk.org), Website [www.pan-uk.org](http://www.pan-uk.org)