The Success of a Voluntary Code in Reducing Pesticide Hazards in Developing Countries

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Introduction

The health and environmental problems arising from pesticide use in developing countries has received widespread recognition. At its decision-making biennial Conference of 1985 the Food and Agriculture Organization of the United Nations (FAO) adopted the International Code of Conduct on the Distribution and Use of Pesticides (the FAO Code) to address the issues. The Code was amended in 1989 to include a section on prior informed consent (PIC) to enable governments to prohibit imports of certain hazardous pesticides. In 1995 governments agreed to develop the PIC procedure into a Convention by 1997, and to strengthen the FAO Code by 1999. This chapter sets out the problems which the Code aims to solve, analyses its impact, and draws attention to the potential strengthening pesticide regulation. (Pesticide is the generic term for insecticides, herbicides, fungicides, rodenticides, and so on. The pesticide chemical is referred to as the 'active ingredient' and the product, generally sold under a variety of trade names, is the 'formulation'.)

Pesticides, the Environment and Development

Modern use of pesticides dates from the end of the Second World War, owing much to the science of nerve gases. The initial increases in yield derived from insect pest control were dramatic, and the use of insecticides spread rapidly through the late 1940s. One result was to expand the production of crops in developing countries to serve markets in industrialized countries. Usage expanded again with the introduction of high-yielding varieties, particularly of maize and rice during the 1960s. While this green revolution increased production of some food crops, it brought socio-economic costs: investment focused in more fertile areas; land concentrated in the hands of richer farmers who could afford irrigation and inputs; the dispossessed migrated to the cities; dependence on a narrow range of varieties encouraged pest outbreaks and led to high inputs of pesticides, particularly insecticides.[1]

Governments and industry now recognize that pesticides should be better targeted and more restrained, but their use is widely accepted as essential in producing food for an expanding global population. Industry estimates that pesticides prevent approximately 30 per cent of post-harvest losses. In areas where agricultural labour is scarce, pesticides can save farmers time or laborious weed control. The consequent health and environmental costs are recognized, but seen as an unfortunate consequence which is manageable in the long term with the development of safer pesticides and training in safe use.

Health Problems

The full extent of the health impact of pesticides in developing countries is impossible to calculate because of the lack of data, medical centres, and monitoring. However, the World Health Organization (WHO) has estimated that there are a minimum of 3 million acute severe cases of pesticide poisoning and as many as 20,000 unintentional deaths each year (pesticides are also a common suicide agent), primarily in developing countries.[2] One WHO study indicates that 3 per cent of agricultural workers in developing countries suffer a poisoning incident each year, resulting in 25 million occupational poisonings.[3] A further source of concern is that long-term effects of regular exposure—chronic illnesses and conditions, including cancers and reproductive, and neurological effects—may take many years to appear.[4]

Health problems are not restricted to developing countries, but are magnified there because of the conditions prevalent in poorer societies and households. These include lack of access to clean water for washing; absence of medical facilities or other access to antidotes; lack of training; shortage of technical and cultural controls to minimize or eliminate pesticide hazards; inability to afford protective clothing or equipment; high rates of illiteracy and inability to read complex label instructions; labels not written in the language of the user; the virtual impossibility of wearing protective clothing in hot and humid climates; mixing of hazardous active ingredients by hand; inappropriate use of pesticides (head lice control, fish-drying); reuse of containers for food or water storage.

Agriculture is the major area of work in most developing countries, occupying on average of 60 per cent of the population, compared with less than 9 per cent in industrialized countries.[5] In developing countries most farming communities are totally dependent on the success of their crop for their subsistence or livelihood—and

dependent on good health to produce it. Poor health has a negative influence on productivity, yet a recent review found that the most common occupational health problems in agriculture were those associated with pesticides.[6]

Environmental Problems

The environmental problems of pesticides first attracted widespread public concern over thirty years ago when Rachel Carson's *The Silent Spring* introduced many to the problems of organochlorine pesticides, such as DDT, which persist in the environment and accumulate in the food chain.[7] Organochlorines are also widely found in human breast milk and have been implicated as a possible cause of breast cancer.[8] Persistent pesticides are not contained within national boundaries, and travel as far afield as the Arctic and the Antarctic, being found in the body fat of penguins.[9] One pesticide, methyl bromide, has been confirmed as a significant ozone depleting compound for inclusion in the Montreal Protocol.[10] Other environmental problems are caused by pest resistance to pesticides, which in turn encourages over-use, destroys natural enemies of pests, and affects local biodiversity.

The interrelationship between environment and development is often more critical in developing countries where people are dependent on a healthy environment for subsistence. At the same time there is less government regulation, inadequate infrastructure, and poor capacity for enforcement. Water sources become contaminated resulting in widespread fish kills and affecting cattle (as well as human) health. Aerial application often sprays human settlements and non-target crops. Pesticide disposal is a great problem, not only of old containers, but also of large quantities of obsolete stocks: in Africa tens of thousands of tonnes of pesticides, largely donations, are beyond use and leaking into the environment.[11]

Level of Use

Pesticide use is expanding after many years of relatively stable sales. The market was valued in 1994 at $US27,825 million and is expected to reach $US30,000 million by 1998. While the largest users are North America (30 per cent), East Asia (mainly Japan) (28 per cent), and Western Europe (24 per cent), an industry source predicts that 35 per cent of sales will be in developing countries, particularly Asia and Latin America, by the year 2000.[12] The market is dominated by a handful of companies. In 1992 the top fifteen controlled 86 per cent of the market, and in 1993 twelve companies controlled 75 per cent.[13] There is increasing concentration in the market as expensive research and development costs and high competition forces smaller companies to sell out. Nevertheless, there is growing production by national companies as well as transnationals in a number of developing countries, notably India, China, South Korea, Taiwan, Mexico, and Brazil.

Scientific Understanding of the Impact of Pesticides

There are nearly 1,000 pesticide active ingredients in use, each with a different target and impact. Companies are required to test each active ingredient they develop for toxicity, carcinogenicity, and other health impacts, environmental accumulation, residues, and persistence. All industrialized countries in the Organization for Economic Co-operation and Development (OECD) operate registration systems, which require companies to submit scientific data. Each product (which includes different formulations of each active ingredient) is registered for each crop on which it is used. Most developing countries now have some legislation or regulations,[14] but few have capacity for detailed scientific analysis.

The WHO classifies all pesticides according to their toxicity, ranging from Class Ia (extremely hazardous); Ib (highly hazardous), II (moderately hazardous), III (slightly hazardous), and products which are unlikely to present acute hazard in normal use. The International Programme on Chemical Safety, part of the WHO, develops environmental health criteria on active ingredients which reflect the collective views of international experts; at present 161 are available. International food residue standards (maximum residue levels, or MRLs) are set by the joint WHO–FAO body Codex Alimentarius but again do not cover all active ingredients and there are wide differences between these standards and those set in different countries.

Carcinogenic properties of a limited number of active ingredients are investigated by the International Agency for Research on Cancer, part of the WHO, but there is little scientific data on the long-term chronic effects and few epidemiological studies on pesticides. The International Agency for Research on Cancer attempted to evaluate the effect of long-term exposure to insecticides and concluded that, while based on limited evidence, 'the spraying and application of non-arsenical insecticides entails exposures that are probably carcinogenic to humans'.[15] This classification—which is disputed by industry—has serious implications for millions of people who use insecticides occupationally, especially in developing countries, where exposure and relative use is high.

The high cost of testing means there is little independent analysis of active ingredients and regulatory knowledge lags behind scientific knowledge. There is, for example, increasing evidence that certain pesticides mimic the action of animal and human hormones, which may result in malformations and cancers, or upset oestrogen levels and cause abnormal sexual development and impaired reproduction.[16]

The International Response to the Problem

The FAO Code

The FAO Code is primarily addressed to governments and industry, and to a lesser extent public-sector organizations such as environmental and consumer groups and trade unions. Although the Code is voluntary, industry is committed to observing its provisions, and the international association of national agrochemical producers, known by its acronym, GIFAP, has made compliance obligatory for its members. The Code was reaffirmed at the 1992 UN Conference on Environment and Development (UNCED), under chapter 14 of *Agenda 21*, 'Promoting Sustainable Agriculture and Rural Development'.

In 1989 the Code was expanded to include 'Prior Informed Consent' (PIC) under which countries may act to restrict import of certain banned and severely restricted pesticides. The PIC procedure is operated jointly by FAO and the UN Environment Programme (UNEP) as an identical procedure was adopted for all chemicals under the London Guidelines on Exchange of Information on Chemicals in International Trade: FAO is the secretariat for pesticides, and the International Register of Potentially Toxic Chemicals of UNEP is the secretariat for chemicals.

UNEP advocated that PIC be developed into a legally binding instrument and this was endorsed in chapter 19 of *Agenda 21*, 'Environmentally Sound Management of Toxic Chemicals including Prevention of Illegal International Traffic in Toxic and Dangerous Products'. The Commission for Sustainable Development subsequently requested FAO and UNEP to proceed with a Convention and the governing bodies of both organizations have passed enabling resolutions. In March 1994 UNEP convened an inter-agency meeting attended by the FAO, the International Labour Organization, the WHO, the UN Institute for Training and Research, and the General Agreement on Tariffs and Trade (GATT), to consider modalities for the legally binding instrument.[17] UNEP will host negotiating meetings, and has set early 1997 as the completion date.

Two other recent international initiatives add support to the Code and PIC. The Inter-governmental Forum on Chemical Safety, established following UNCED to co-ordinate various UN agency responsibilities on chemicals, called on the PIC procedure to be made legally binding to strengthen mechanisms dealing with hazardous chemicals in international trade. Following a commitment made at UNCED, the Canadian government hosted a conference in June 1995 to discuss the possible phase-out of persistent organic pollutants, which include many of the pesticides in the PIC procedure. The conference recommended that further work be carried out to restrict use, including developing a convention, within the framework of the Forum.[18]

Principles and Practices in the Code

The Code establishes good conduct in pesticide matters, listing government and industry obligations on:

- pesticide management, defining the responsibilities of governments and industry; testing to evaluate safety, efficacy, and environmental fate;
- reducing health hazards;
- regulatory and technical requirements;
- availability and use;
- distribution and trade;
- information exchange and prior informed consent;
- labelling, packaging, storage, and disposal;
- advertising;
- monitoring the observance of the Code.

Public interest groups are called on to draw attention to departures from the advertising obligations of the Code.

There is an underlying assumption that good practice will be adopted and that this in turn will address pesticide problems. The overall thrust of the Code is to establish practical standards and it does not invoke the polluter pays or the precautionary principles, although these are increasingly referred to in the context of the Code. There is some movement in governments, the FAO, and development agencies to call for investment in alternatives, including research into and training for non-chemical alternatives.

Institutional Follow-Up

The strength and weakness of the Code lie in its voluntary nature: strength in that it elaborates detailed standards and secures industry commitment, but weakness in that there is no reporting mechanism, no monitoring, and no means of enforcement beyond public pressure and self-policing by the parties. However, the practices outlined in the Code are elaborated by FAO in a series of detailed guide-lines, and resources have been committed to help governments introduce pesticide legislation.

The FAO conducted a survey in 1986 followed by another in 1993–94 to measure the effectiveness of the Code and concluded that although it is widely acknowledged, it has had insufficient impact on pesticide problems. These findings led the FAO Council to recommend updating the Code by the end of the century, and that some sections be made legally binding. The failure to make inroads into pesticide problems has encouraged FAO Council to call for stronger measures in a revised Code, for example: promoting sustainable agriculture, especially through integrated pest management;[19] providing increased financial assistance for implementation, particularly in Africa; and restrictions on availability of highly toxic formulations where they cannot be used safely.

Making PIC Work

The aspect of the Code with most potential to reduce availability of pesticides hazardous to health or the environment is the PIC procedure. Details of pesticides included in PIC are circulated to participating governments, which register their decision to allow or prohibit import. The decisions are circulated to governments, which must inform their exporters, who in turn agree not to export contrary to a decision. PIC decisions are transparent, providing a basis for monitoring and enforcement. The procedure, welcomed by most developing countries, has encouraged governments to set decision-making structures in place. Participating countries appoint a Designated National Authority to co-ordinate the national response and communicate with the Secretariat. Such a national contact-point on pesticides raises the general level of communication, and helps co-ordination nationally and eventually within regions.

Table 1. Pesticides included in the PIC procedure

Pesticide active ingredients included at October 1995

Aldrin	Dinoseb
Chlordane	EDB (ethylene dibromide)
Chlordimeform	Fluoroacetamide
Cyhexatin (for 'de-Pic')	HCH (mixed isomers)
DDT	Heptachlor
Dieldrin	Mercury compounds

Pesticide active ingredients identified for inclusion by end 1996

Binapacryl	Hexachlorobenzene
Bromacil	Lindane
Captafol	Melaic hydrazide
Chlorobenzilate	Pentachlorophenol
EDC (1,2 dichloroethane)	Toxaphene
Ethylene oxide	2,4,5-T

Pesticide formulations identified for inclusion by end 1996 on the grounds of causing problems under conditions of use in developing countries

Methamidophos (600g/l (soluble concentrates) formulation and higher)
Monocrotophos (600g/l (soluble concentrates) formulation and higher)
Phosphamidon (1,000g/l (soluble concentrates) formulation and higher)
Methyl parathion dust formulations, emulsifiable concentrates
Parathion (currently available formulations)

Pesticides to be included if found to be produced or in use

Chlordecone	Mirex
Chlorobenzilate	Nitrofen
DBCP	Schradan
Demeton	Sodium fluoride
Endrin	Strobane
Kelevan	Telodrin
Lead compounds	Thallium sulphate
Leptophos	

Source: Food and Agriculture Organization and United Nations Environment Programme (1995), *FAO/UNEP Joint Programme for the Operation of PIC*, Circular V (Nairobi: UNEP; Rome: FAO, July) and Minutes of Eight FAO/UNEP Joint Panel of Experts.

Under the present definition, pesticides are included in PIC if they are: (1) banned, severely restricted, or withdrawn from use for health or environmental reasons in at least five countries; (2) banned, severely restricted, or withdrawn from use by any one country after 1 January 1992; (3) found to cause health problems under conditions of use in developing countries, including all those in WHO hazard category Ia. A pesticide is only formally in the procedure when one of these conditions is met and a Decision Guidance Document for the active ingredient has been agreed and circulated to the participating countries. By October 1995 only twelve pesticides were included (see Table 1). These have generally been banned because of environmental persistance. A further 17 have been identified and are awaiting completion of the guidance documents to assist government decisions on import. These include five pesticides found to cause problems under conditions of use in developing countries. A number of additional pesticides appear to be obsolete, but would be included if they were found to be in production or use and FAO is investigating their status.

The proposed PIC Convention may provide a stronger basis for preventing hazardous pesticide trade. However, it is important to note that even as a Convention, PIC is only a mechanism for information exchange, enabling governments in developing countries to make informed import decisions. In itself, the PIC Convention will not extend any ban or severe restriction on pesticides.

International Monitoring for Compliance

No institution has responsibility for monitoring compliance, although informal monitoring is provided to some extent by independent researchers and non-governmental organizations (NGOs), both of which publish information.[20] NGOs participating in the Pesticides Action Network have been active in monitoring the observance of the Code and drawing attention to transgressions, particularly in relation to industry advertising practices. Their role is generally regarded as positive by governments and the UN, and some NGOs attend as observers at relevant government-level meetings, and on the joint UNEP–FAO expert panel on the implementation of the PIC procedure. However, industry resources are greater.

There have been discussions with customs and excise authorities to identify a system for tracking pesticides in the PIC procedure through customs: but this would involve complex and costly steps. Some mechanisms may be considered during the Convention negotiations.

A number of workshops for pesticide regulators have provided some training in chemical management and promoted a better understanding of how to use the PIC procedure, but these are too few. For example, the first workshop in Africa—the region with most need—was only held in September 1995.

National Responses in Implementing the Code

Achievements and the Effect of International Collaboration

The Code aims to improve standards of distribution and use in developing countries, and calls on industrial countries to prevent their industries from exporting problems. However, it calls on importers and exporters to implement it equally, failing to take account of the greater resources available in developed countries.

The standards and targets have been widely adopted as national regulations, although implementation and changing practices come more slowly. By May 1995 130 countries had appointed a Designated National Authority to operate the PIC procedure. In some countries this appears to be a token appointment and no import decisions have been conveyed to the Secretariat, because of either lack of interest at a higher government level, or competing decision-making centres within government departments.

The European Union became the first region to make the PIC procedure legally binding under its Regulation 2455/92, which also covers its information exchange obligations under the FAO Code. However, few of the first pesticides in the procedure are exported from Europe, making it difficult to assess the impact of the Regulation. The European Union held a conference in July 1995 which recommended improvements in the Regulation and identified elements for inclusion in the PIC Convention.

Review, Monitoring, and Accountability

Review and monitoring of national implementation of the Code is generally lacking. Industry compliance is voluntary, although the major agrochemical corporations (GIFAP members) have embodied their obligations in 'product stewardship' policies. There are, nevertheless, breaches in developing countries. Many of the national companies or generic manufacturers involved in pesticide production, formulation, or sale are not aware of the Code or have no interest in complying. NGO monitoring reveals regular abuses, but beyond taking information to the public arena to apply pressure, no sanctions are available.

Monitoring compliance with the PIC procedure would require better information from both exporters and importers on trade, and documentation on the production sites. Statistics on pesticides in trade are highly aggregated and inaccessible, as companies argue on the need for commercial secrecy. Furthermore, regulatory authorities administering PIC as exporters do not necessarily know what is produced, formulated, or exported from their country, and governments in importing countries do not know what is imported. Independent checks on hazardous trade are thus extremely difficult.

National Follow-Through on Commitments

The main obligations of governments of the exporting countries, apart from ensuring companies comply, fall under Article 9, covering information exchange and PIC. The Code states that exporting governments should ensure that importing governments receive prior notice of shipments of pesticides which are banned or severely restricted in the country of export. The European Union provides only for notification of a shipment of the first export from the whole European Union. The importing government receives a reference number for the active ingredient, which accompanies subsequent exports from any European Union Member State. It is extremely difficult for an importing developing country to check all imports for this reference number. At the recent European Union conference, this aspect attracted many criticisms, with recommendations for more frequent notifications—if not prior to each shipment, at least annually—a procedure followed in the USA.

The Impact of the FAO Code on Pesticide Problems

There have undoubtedly been successes in terms of raising both public and government regulators' awareness of pesticide hazards. Most developing countries now have legislation or regulations relating to availability, distribution, and use,[21] but few have the capacity to analyse data. The FAO survey of 1993–4 confirmed this situation, whereas the 1986 survey found that more than 50 per cent of developing countries had no legislation enabling the government to restrict pesticides marketed in the country.[22] However, the recent survey revealed that in spite of significant progress introducing pesticide legislation and regulations, other improvements are limited to non-existent: 'Health hazards remain a major preoccupation and improvement on this point generally appeared to be limited'; and 'The effect of pesticides on the environment . . . was substantially worse than in 1986, which may reflect the increased awareness of the importance of the subject.'[23]

These problems persist because of the conditions under which pesticides are used. For example, a study in Indonesia in 1993 on the occupational health of 214 farmers concluded that 21 per cent of spray operations resulted in poisoning: it found that women and children in farming households who wash work-clothes and enter fields after spraying are also affected.[24] The agrochemical industry has to a certain extent accepted that conditions of use in developing countries are not ideal. It promotes 'safe-use' and GIFAP has initiated three pilot safe-use projects in Kenya, Thailand, and Guatemala. Nevertheless, industry tends to classify the inherent conditions in developing countries as cases of 'misuse' or 'abuse' of pesticides.

There is considerable concern that the pesticides in the PIC procedure are not those most responsible for causing health hazards in developing countries, although they do cause other hazards (environmental persistence, carcinogenicity). The first twelve are no longer widely produced or traded. The negotiations for a Convention need to find a way of including those causing problems in developing countries, but because of the lack of information on specific active ingredients this is no easy task.

As more pesticides enter the PIC procedure governments may find these are used extensively in agriculture in their country and may not be able to prohibit import until better alternatives are available. This underlines the need for investment in training and in alternatives. Already, Designated National Authorities in developing countries are frustrated by the lack of information on alternatives to the small number of pesticides in PIC. FAO cannot recommend alternatives, though it asks governments which ban a pesticide to state what alternatives they use. In some cases these have proved equally hazardous. Ultimately, a broader perspective promoting integrated pest management and other sustainable agricultural approaches must be the most feasible means of reducing and eliminating the use of hazardous pesticides.

Barriers to Progress

Reasons for Successes and Failures

The limited impact of the FAO Code is not so much a 'failure' as an indication of the extent of the problem to be addressed, and the inherent hazards of pesticides under conditions of use in developing countries. The lack of substantive impact also reveals the limits of regulating trade as a way of controlling corporate practice. The element of the Code with most potential to limit availability is the PIC procedure, but this is essentially only a provision for information exchange and at best can only limit trade in certain pesticides.

The success of the Code is constrained by government reluctance, at a national or international level, to hamper industry and free trade, further encouraged by international trends in liberalization and reduced regulation. Although a trade and environment committee of the World Trade Organization will consider the effect of trade on the environment, its lengthy agenda and relaxed time-scale have not set the pace for change.

On the positive side, PIC has increased concern about chemical hazards and a recognition that if pesticides are to be exported and used in developing countries, there needs to be more training in management. Industry advice on safe use of pesticides attempts to address the problem, but many rural communities in developing countries are ill-equipped to use pesticides. The scale of training and resources needed to change these is beyond the economic capacity—and the political will—of most governments in developing countries.

In contrast to their safe-use initiatives, companies continue to promote older, more hazardous, pesticides in developing countries. Corporate investment to develop a new product is extremely high: a survey of twenty-two companies indicated their global research expenditure rose by 88 per cent between 1987 and 1992, to $US1,900 million a year.[25] At these levels of expenditure, the research for 'safer' more effective pesticides is directed towards farmers and crops which can pay the prices to recoup the investments, not farmers in developing countries. Companies therefore prolong the market life of older products whose research costs have been recouped, by marketing them in developing countries.

The market for pesticides is expanding in developing countries, yet the problems are unlikely to diminish without radical action. The major transnationals have generally stopped production of the small number of the older hazardous pesticides, particularly the environmentally persistent organochlorines, but are still big producers of organophosphates and carbamates—which are particularly hazardous to the health of users. Many of these older pesticides are increasingly made in a small number of developing countries (China, India, South Korea, Taiwan, Brazil, Mexico). Their cheapness and ease of use makes them attractive to poorer farmers.

Potential for Overcoming Obstacles

The mooted reform of the Code will assist by further raising expectations, and was anticipated from the outset in its existing conclusion: '[the Code] should be considered a dynamic text which must be brought up to date as required, taking into account technical, economic, and social progress'.[26] The development of a PIC Convention offers opportunities to address the limitations of the existing procedure in the light of experience: the draft of elements which might be included recognizes the need to strengthen its provisions.[27]

The governing bodies of FAO and UNEP have agreed the Convention should take a similar form to the existing procedure in order to reach agreement by early 1997, suggesting that amendments be added later as protocols. Some governments will argue for a strong Convention. The Danish and Malaysian governments took an initiative within the framework of the PIC Convention to ban a producer from exporting domestically banned chemicals, and Denmark will host parallel discussions to explore this option. There is, however, a danger that a ban on exports of banned chemicals will encourage production to transfer, possibly to some developing countries—industry in many developing countries is already in a position to produce banned

pesticides. A safer strategy would identify pesticides which are so hazardous to either health or the environment that they are on phased out of production internationally (along the lines of the Montreal Protocol for ozone-depleting chemicals), while others remain in the PIC procedure.

As PIC is a trade-based mechanism, some sanctions need to be developed through the World Trade Organization to provide teeth. For example, in the January 1995 meeting of the Trade and Environment Group, the European Union suggested that the World Trade Organization could act as a safety-net to reinforce rules under a PIC Convention: 'if a World Trade Organization Member did not participate in a future PIC Convention, goods covered by the PIC procedures and produced in its territory might usefully be covered (by trade agreements)'.[28] Trade agreements have never yet been used to support environmental measures: as one international lawyer observed 'It is the almost complete failure to consider other international legal developments which distinguishes the GATT system from other international bodies.'[29] Given the expanding trade in agrochemicals resulting from trade liberalization, the World Trade Organization should be urged to take action. At this stage, its timetable for considering trade and environment measures does not reflect this urgency.

It remains to be seen whether the proposed PIC Convention will address the constraints of the existing PIC procedure. There are clear indications from the experience gained in developing PIC of areas where stronger action, or greater clarity, could achieve more. For example, there are no satisfactory criteria for identifying pesticides which are causing problems in developing countries, a clear priority in targeting pesticide hazards in developing countries. OECD countries need to take more responsibility for restricting the flow of hazardous products, providing information to help regulators in developing countries, and providing resources not only for training in chemical management, but also for developing and promoting non-chemical methods of pest control.

The lack of any mechanism for monitoring compliance also needs to be addressed. International statistics are too aggregated, making it impossible to track trade in hazardous chemicals. At present, no information is required on the production sites of plants producing hazardous chemicals. National registers of such sites, with a degree of public access to this information, would not only enable more strategic monitoring of trade, but also strengthen accountability to the communities living near to sites producing hazardous chemicals. The US toxic release inventories have established a precedent for this approach, and community 'rights to know' need to be developed to challenge industry demand for secrecy.

The Code and the PIC Convention provide a basis for safer use and safer pesticides. Because of the conditions in developing countries, related to poverty, education, housing, clean water supplies, medical facilities, and other living conditions, it is not possible for many pesticides to be used safely, and this limits the effectiveness of the Code and PIC. Many successful methods of non-chemical pest control, or reduced use of chemicals, are practised, including organic agriculture, integrated pest management, and other agro-ecological approaches. They are increasingly well understood, and applied to a wide range of crops and conditions, and there is scope for increasing their viability. The need to go further down this route is recognized in the proposed amendments to the Code. The Code and a PIC Convention are part of a general awareness of the need for safer practices, but their ability to be more effective needs to be underpinned by safer, sustainable, alternatives to chemical pesticides.

Notes and References

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19. Integrated pest management does not necessarily exclude pesticide use, but suggests use as a last resort, and then using least-toxic products. It promotes knowledge-based agriculture with a better understanding, for example, of beneficial insects, good horticultural practices such as pruning and removing diseased plant material, and understanding of levels of economic damage.
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