GLOBAL NORMS AND THE INTERNATIONAL REGULATION OF PESTICIDE PRODUCTION AND USE

PETER HOUGH

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ABSTRACT

This study analyses the various political questions that surround the use and production of pesticide chemicals. The method of analysis employed orders these policy-questions into distinct issues, where it can be seen that groups of questions are related, in terms of representing matters of contention centred on a particular norm of behaviour.

It emerges from this exercise that seven norms of behaviour can be identified as those determining the behaviour of actors within the whole set of pesticides policy-questions (the policy-system). Consequently, seven issue-systems, each comprising of the set of actors for whom a norm is salient, can be isolated.

Each of the seven issue-systems are examined in turn, highlighting the nature of the policy-questions and the political behaviour of the actors involved. Of these seven issue-systems, the first two are based on the prescriptive norms that uphold the use and production of pesticides. These norms are relatively uncontentious in themselves and achieve most significance as the counterbalances to the five proscriptive norms. Hence, most of the political activity in the pesticides policy-system emerges in the issues covered by chapters four to nine, where actors are forced to choose between competing norms to guide their behaviour.

Central to this political activity is the development of international regimes. These are subsets within the an issue-system, responsible for decision-making and the implementation of rules in line with the norm which defines the issue. Two such international regimes are found to be in existence within the pesticides policy-system, regulating the issues of pesticide trade and the contamination of food by pesticides. The five other issue-systems can be seen as essentially unregulated. A number of theories concerning the causal factors in the formation of regimes are then outlined and their applicability to the presence or absence of regimes in the seven issues of pesticides politics considered.

The underlying premise of this study is that the formation of international regimes is facilitated by many factors and not solely by the desire of actors to maximize their interests, viewed in terms of power and short-term calculations of act-utility. Rather, it has been demonstrated that values are a significant force in the emergence of global norms. Hence it transpires that the behaviour of actors in the global-system, as in the pesticides policy-system, should not be understood simply in terms of a traditional rational-actor model according to which actors (usually assumed to be states) are motivated by the need to maximize their power in relation to other actors.

ABBREVIATIONS

ADI	Acceptable Daily Intake
BAA	British Agrochemicals Association
CAC	Codex Alimentarius Commission
CCPR	Codex Committee on Pesticide Residues
CFC	Chloro-fluoro-carbon
DDT	Dichloro-diphenyl-trichloroethane
EC	European Community
EPA	Environmental Protection Agency (USA)
FAO	Food and Agricultural Organization of the United Nations
FAO Code	The FAO Code of Conduct on the Distribution and Use of Pesticides
GATT	General Agreement on Tariffs and Trade
GEMS	Global Environmental Monitoring System (WHO)
GIFAP	Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (International Group of National Pesticide Manufacturer Associations)
IARC	International Agency for Research on Cancer
ILO	International Labour Organization
IPC	Integrated Pest Control
IPCS	International Programme on Chemical Safety
IPM	Integrated Pest Management
IRPTC	International Register of Potentially Toxic Chemicals
IUPAC	International Union of Pure and Applied Chemistry
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
LD50	Dose required to kill 50% of test animals
MIC	Methyl-isocyanate
MRL	Maximum Residue Limit
NGO	Non-governmental organization
NOEL	No-Observed-Effect Level
PAN	Pesticide Action Network
UNCED	United Nations Conference on Environment and Development (1992 Rio "Earth Summit")
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WHO	World Health Organization

GLOSSARY OF TERMS

Active Ingredient The component(s) of a pesticide which is toxic to the pest.

Arsenical Compound containing arsenic.

Carbamates Chemicals made from an ester of carbamic acid that are used as pesticides. They have anti-chlorinesterase properties, ie. they destroy an enzyme essential to a pests nervous system.

Carcinogenic Causes cancer.

Defoliant Chemical that causes leaves to fall from a tree or plant.

Enzyme A chemical produced by a living organism that serves to promote specific biological functions.

Entomology The study of insects.

Epidemiology The study of patterns of disease amongst people.

Formulated Products A pesticide in its final commercial form, ie. the active ingredient mixed with other chemical components.

Fumigant Pesticide applied in the form of a fume.

Fungicide Chemical that kills fungi and moulds.

Hepatoxic Toxic to the liver.

Herbicide Chemical that kills plants.

Larvicide Chemical that kills larvae.

Lipophilic Dissolves more readily in fat than water.

Mutagenic Causes genetic changes which may affect the next generation.

Nematode Small, unsegmented worm.

Organochlorines Pesticides containing chlorine atoms (also known as "chlorinated hydrocarbons").

Organophosphates Pesticides containing phosphorus.

Persistent Slow to break down.

Pyrethroid Pesticide derived from the pyrethrum plant.

Rodenticide Chemical that kills rodents.

Systemic pesticide Pesticide that can enter a plant and move within it. Eg. a systemic fungicide can kill fungi on a part of a plant away from the point of application.

Teratogenic Causes birth defects.

Chapter 1

THE POLITICS OF PESTICIDES

INTRODUCTION

The use of pesticides in their various forms, in agriculture, public health programmes and everyday domestic life has become subject to much debate in the domestic and international arenas in recent years. For the first two decades after the discovery of chemical pesticides in 1939, their use provoked little controversy. The success of DDT (dichloro-diphenyl-trichloroethane) in helping control malaria and other pest-transmitted diseases and the effectiveness of various insecticides and herbicides in reducing crop losses, gave pesticides the aura of another technological breakthrough destined unreservedly to improve man's standard of living forever.

The publication in 1962 of the ground-breaking *Silent Spring* by Rachel Carson, however, highlighted side-effects associated with pesticides and for the first time their use and production became a matter of contention.[1] Carson focused mainly on the capacity of pesticides to pollute the environment and wildlife, helping establish this as an international issue. The impact of pesticides on human health was also considered by Carson, but this did not become an area of great contention until nearly a decade later when the horrific effects of defoliants sprayed by American troops in the Vietnam War became known.

Throughout the 1970's and 1980's pesticide use and production increased but at the same time became more and more contentious, leading to the emergence of other issues on the domestic and international political agendas. Concern over the potential dangers inherent in the capacity of pesticide residues to remain in foodstuffs long after application heralded the phenomenon of "organic farming" and much consumer group activity. As a corollary of this issue

of food contamination and those of environmental pollution and human safety, efforts to apply pesticides more cautiously and develop non-chemical alternatives in pest control, led to the popularization of the concept of integrated pest management (IPM) and the genesis of another political issue concerning pesticides. In addition, the coming to light of pesticide poisonings in the Third World allied to concern in developed countries over contaminated food imports from the Third World, led to the formation of an issue concerning the trade in pesticides.

Pressure groups have helped ensure the maintenance of these issues on the international agenda, prompting individual government responses and the establishment of international guidelines by organizations within the United Nations system. The 1984 disaster at Bhopal, India, when a leak of chemicals intended for pesticide use killed thousands living near the production plant, stimulated public awareness of the hazardous nature of these chemicals. This served to strengthen the position of the pressure groups vis a vis the agrochemical industry in negotiating the means of regulating the various pesticide issues on an international level.

A BRIEF HISTORY OF PEST CONTROL

Pest control is as old as agriculture. Once mankind had taken on the task of rearing plants and animals for its own needs, rather than relying on the random successes of hunting and gathering, any natural competitor for their food became a pest. Measures to protect crops from such pests naturally followed, starting simply with manual weeding and the picking-off of harmful insects. Through time, societies developed more systematic practises, such as destroying crop residues after harvesting, and rotating crop fields to remove pest habitats and thus inhibit their proliferation. Such practises continued for centuries with little refinement, bar the employment of some particularly eccentric tactics to augment them. The Romans used magic rituals to protect vines from moth attack, including the practise of wiping the pruning knife on beaver skin prior to use. In medieval France it was a common occurrence for the church to excommunicate caterpillars, or for grasshoppers to be tried in court for the crime of attacking crops.[2]

The use of chemicals as an aid to pest control did not take off until the late nineteenth Century, although some use was made of sulphur as a domestic insecticide prior to this. Homer refers to this practise, seemingly proving the superiority of the Greeks over their rival ancient civilization in this area of scientific advance.

The effects of Colorado beetles on potato crops and gypsy moths on trees in the USA prompted the entomologist Charles Riley to pioneer the use of arsenical compounds Paris Green (an aceto-arsenite of copper originally used as a paint pigment) and London Purple (an arsenical dye residue) as insecticide sprays. The most extensive use of Paris Green in the immediate years after its development in 1867 was actually as a deterrence against human pests.

Roadside vines were sprayed to prevent pilfering by passers-by, and a number of children were killed in this way.[3] No records exist as to the quality of the wine produced from such vineyards!

The next major development in pest control history occurred with the creation of synthetic organic pesticides during the Second World War years. The insecticidal properties of dichloro-diphenyl-trichloroethane(DDT) were discovered by Dr. Paul Muller of Switzerland in 1939 and it was quickly patented. A whole series of other chlorinated hydrocarbons were soon found to have similar properties, leading to the marketing of benzene hexachloride (BHC), aldrin, dieldrin and others. A second branch of new synthetic pesticides, the organophosphorous compounds, came as a side effect of wartime research into toxic gasses by the German scientist Dr. Gerhard Schrader. After the war Schrader put his research before the Allied states and revealed the potential insecticidal application of the compounds. Parathion was the first major pesticide of this form to be marketed, and others soon followed.

PESTICIDES AND POLITICS

The development and subsequent proliferation of chemical pesticides since the 1940's has had a profound social impact, in a number of ways. The use of pesticides has undoubtedly helped increase crop yields in recent decades, an invaluable aid to mankind in an age of unprecedented population growth. These chemicals have also assisted man in the struggle against diseases spread by insects, particularly in curbing the considerable death toll attributable to malaria.

On the other hand, however, pesticides have also affected society in negative ways. Field workers spraying the chemicals have suffered poisoning, sometimes to fatal extents; food has been contaminated, with occasionally lethal consequences; and the environment has been polluted, to the detriment of many living things within it.

These impacts on human society ensure that the whole question of pesticide production and usage enters the realm of politics. Once a phenomenon is seen to affect a society in some way, it naturally follows that opinions are formed on the desirability or undesirability of such change. These opinions may derive from established values or norms which the phenomenon has challenged, or else from new norms of behaviour that emerge as a result of the new circumstances brought on by the phenomenon. The initial development of chemical pesticides in the 1940's was borne of the desire to increase food yields and control the spread of pest-carried diseases, two well established norms. Chemical crop-protection thrived as a means of satisfying these norms until the 1960's, when public realization of a new set of circumstances prompted new norms to be formed countering the previously unchallenged practise. The emergence of evidence that pesticides were not a panacea for crop protection and

that many pests could develop resistance to the chemicals, was accompanied by the publication in 1962 of Carson's *Silent Spring*, which heralded a wave of opinion concerned by evidence of environmental pollution created by pesticide use. It was at around this time that the field of pesticides can be seen as becoming a political matter.

Politics as defined by Easton represents the "authoritative allocation of values"[4]. Reynolds expands on this, stating that for an act to be deemed political it should incorporate the following elements:

> "...the fact of control or government or authority, the propriety or otherwise of that control, its purposes or functions, and the forms and methods by which it is exercised or competed for".[5]

While precise definitions used by theorists may vary in this way, the common theme of them is the idea that a political act must incorporate an authoritative dimension. Pesticide production and usage was not a political question prior to the 1960's, essentially because it was uncontroversial. The values at stake did not have to be "authoritatively allocated" because all accepted them, and very few people found them to be in conflict with other norms. Bosso, writing about the development of pesticides in American politics, has described this situation as "clientele politics". "The pesticide issue was not salient to any but those benefitting from pesticides, and the scope of the debate was severely limited by those most intimately involved"[6]. With the advent of the new information surrounding pesticide use however, opinions needed to be formed in the light of different, and somewhat contradictory, norms. Pesticides continued to command great support for their contribution to improving crop harvests and fighting diseases like malaria, but this support now had to be justified and reason used to convince others that these benefits outweighed the disadvantages. At the same time, the environmentalists and sceptics had to set out their stall by trying to mobilize opinion behind the new

values they were expounding. In this way, an area of political contention was founded, which has continued and evolved to take on its present form.

Identifying what it is that determines the behaviour of actors in the international system must, of course, be a fundamental goal of international relations theory. Even the traditionalists, the realists, in time have come to accept that this task must incorporate some consideration of international influences, alongside the old idea of the rationally acting state, continually striving to maximize its power in relation to other states. The orthodox realist position was epitomized by Morgenthau.

> "The nation state is to a higher degree than ever before the predominant source of the individual's moral and legal valuations and the ultimate point of reference for his secular loyalties. Consequently, its power among the other nations and the preservation o f its sovereignty are the individual's foremost political concerns in international affairs."[7]

The undeniable growth of interdependence in the world in the last half-century has caused a rethink of this position. International organizations today provide a rich source of moral and legal guidelines to which individuals adhere, as is evidenced by the now commonplace resort by individuals to the European Court of Human Rights, in opposition to their own state. In addition to this, pressure groups, aided by advances in communications technology, have mobilized public opinion across boundaries for international issues such as environmental conservation and pollution, and even for issues solely within the jurisdiction of other states, as with the global anti-apartheid movement.

International relations theorists responded to these developments by adopting new conceptual tools to bring the phenomenon of interdependence within their framework of analysis. Neo-realists were principally responsible for introducing the concept of an international regime, as a

means of revamping the power politics philosophy of Morgenthau, which was in danger of appearing outmoded. A regime, it is argued, is a multi-national agreement on an area of contention which can have an independent impact on world politics. Such regimes however are still understood to rise and fall in line with the powers of the state-actors comprising them. The Bretton Woods exchange rate system, for example, an international monetary agreement which fixed international currencies to gold and the US dollar, collapsed at a time when American power was waning. In this way, realism could be modified to account for international phenomena whilst retaining its basic axioms of inter-state relations that are governed by power.

A second concept used to refine international relations theory in the face of interdependence comes from focusing primarily on the interactions between actors, be they states or otherwise, rather than the actors themselves. Pluralist writers such as Rosenau, Mansbach and Vasquez have adopted a methodology which tries to comprehend world politics by considering the behaviour of actors in relation to specific issues. According to this approach issue-systems, consisting of all actors for whom a particular set of related policy-questions is salient, can be abstracted from the international system as a whole. Political behaviour then is able to be explained in relation to these sub-systems, rather than simply in accordance with the international system as an entirety.

The pluralists have, in general, not attempted to synthesize this usage of issue-systems with the predominantly realist construction of the international regime. The two terms clearly must possess some common ground, however, as any regime must have an issue that it aims to regulate, whilst an issue-system can presumably exist at different levels of complexity, the more complex of which take on greater significance in world politics. This

study attempts to reconcile the two concepts by understanding them as different levels of international behaviour modification. The behaviour of international actors can be patterned to different extents, and it seems profitable to recognise this at the same time as trying to resolve the terminological confusion that has emerged from the bifurcation of theory in this way.

Distinguishing between issue-systems and regimes as international phenomena necessitates a narrower understanding of an issue than is often conceptualised. Rather than considering an issue to be a broad set of related policy-questions, such as "environmental pollution", which incorporates a range of distinctive questions linked by the value that environmental pollution should be avoided, or "pesticides", which encompasses a number of different values linked by a common subject, this study views issues as areas of contention around particular norms. Thus, many, commonly-perceived "issues" must be reconceptualised as amalgamations of issues derived from a common general value or within a similar context of politics. Thus it emerges that the international politics of pesticides is not an issue in itself, but rather a grouping of different issues which can be shown to involve different actors, and modify the behaviour of those actors in different ways. The issues are linked behaviourally by the fact that they concern a common subject, pesticides. This aggregation, involving all actors concerned with pesticide politics in some way, can be termed a "policy-system". Similarly, "environmental pollution" can be seen as an amagamation of issues based on particular norms derived from the common value of avoiding pollution, such as that of avoiding environmental pollution by pesticides. Thus, "environmental pollution" and other broad sets of related policy-questions such as "human-rights" can be termed "wider-issue-systems", linking issues that are derived from a common value. This concept is considered later on in this section.

The first task of this study, it follows, is to isolate the norms that are influential in determining the behaviour of the actors involved in international pesticide politics. After adopting a suitable definition of a norm, a concept more frequently used in sociology and anthropology, we will see that there are seven (at least) that play a part in this political arena. Each of these norms forms the basis of an issue-system, consisting of the actors to whom the norm is salient. The seven identified norms of pesticide politics will be considered in turn as seperate chapters and the make up of each issue-system compared and contrasted in the conclusion. The principle interest in this exercise is to consider how levels of adherence to each of the norms vary and offer explanations for this variance. Where a relatively high level of adherence to a norm exists, this may be reflected in the existence of a regime, a subset of actors within the issue-system responsible for authoritatively allocating a value by implementing rules reflecting the norm upon which the issue-system is based.

Of the seven issues considered, it is shown that only two have consistently seen the norm implemented with regards to all actors within the system. In both of these issues a definitive international regime can be seen at work, successfully implementing international policy on the matter at hand. The fact that actors in the other five issue-systems do not adhere consistently to rules based on the norm can be attributed to either, the lack of any regime regulating the issue, or the failure of an existing regime to implement policy that corresponds to the norm. The efficiency of the implementation of policy by regimes must also therefore be considered, and this is compared for the regimes examined in this study.

It is hoped that the comparison of the seven issues within the field of international pesticide politics, can help offer some basis for understanding under what

circumstances an issue-system may spawn an international regime. At the same time, some explanation can hopefully be offered for the relative successes and failures of regimes throughout world politics to implement policies in line with the relevant norm.

THE NORMS OF PESTICIDE POLITICS

It is clear that the politics of pesticides involves a number of different norms, each of which are sought to be legitimized in society by the actors upholding them. A method of analyzing an area of political contention, such as that concerning pesticide use and production, is to break it down into issue-systems, which are areas of contention derived from a particular norm. Rosenau, for example, considers an issue-system to be in operation wherever it can be seen that actors; "engage in distinctive behaviour designed to mobilize support for the attainment of their particular values."[8] Norms are the informal rules that emerge from this contention to guide the actors to whom they are salient. As the policy-system of pesticides contains a number of different norms, it can be seen that it should not be understood as a single issue in itself, but rather as an amalgamation of issues, involving different actors and modifying the behaviour of such actors in different ways.

The first step towards analyzing the issues of pesticide politics, and any regulatory structures that derive from them, is thus to isolate the norms which guide the behaviour of the actors concerned. A sociological definition of norms is provided by Robin Williams."Norms....are rules of conduct; they specify what should and should not be done by various kinds of social actors in various kinds of situations."[9] Although primarily intended for the study of individuals in community settings, this definition is flexible enough to be used with respect to the international political behaviour of organisations and governments.

The fact that pesticide politics operates around a number of norms has already been referred to. It is possible to find at least seven such norms in operation in the

international discourse on pesticide matters.

1, "We should strive to attain optimal food yields."

2, "Disease and damage due to pests should be limited."

3, "The misuse of pesticides leading to human poisoning should be prevented."

4, "The international trade in pesticides should be regulated"

5, "Pesticides should not be overused."

6, "Environmental pollution by pesticides should be limited"

7, "The contamination of food by pesticides should be limited"

Norms and Values

These norms, as rules of conduct for the actors in pesticide politics, are derivative of more general values and principles which govern the behaviour of individuals and groups in many walks of domestic and international life. This distinction between specific norms and more abstract values is eloquently expressed by Kratochvil.

> "Values are not only more general than rules, or norms, but they influence decisions on the basis of largely cathectic considerations. As opposed to rules which prescribe specific actions, values inform the attitudes of actors. Rather than addressing the rational calculating abilities of decision makers, values serve to strengthen the will and the emotional attachment to social objects or states of affairs".[10]

Norms and their derivative issue-systems emerge from this contention between actors aiming to attain certain values.

Making this connection between specific norms and more general values, requires a consideration of international norms as something more than observable patterns of behaviour, arrived at through a rational maximization of interest. Thus, the age old philosophical debate, as to whether man's actions are guided purely by self-interest or if morality or "divine love" plays a part, re-surfaces in the inter-paradigm debate in international relations theory.

Hobbes' pessimistic view of a society in which all actions are guided by fear and avoidance of "social bad"[11], corresponds to the Realist's model of rationally-acting states aiming to maximize their power to maintain order in an anarchical world. Durkheim's vision of a moral code made up of norms as "social facts", constraining individual choices[12], finds favour in pluralist international relations theory with its stress on interdependence and the development of international systems (phenomena which necessarily imply that international behavioural forces exist).

Opinion in both philosophy and international relations is divided on whether such "rules of conduct" are derived from the interests of the actors, or have independent influence and constrain such interests. The former opinion is expounded by Hume, who considers norms to be "artificial virtues"[13], in that they are conventions of behaviour arrived at when actors interests are furthered by cooperation. Many of the conventions that make up international law seem to bear this out. The customary rules that bays or continental shelves should belong to the adjacent state, developed because of the salience of the idea to maritime states. Similarly, Smart refers to norms as "mere rules of thumb"[14], used by rational actors (act-utilitarians) as rough guides to behaviour based on past experience. Realist thinkers in international relations have adopted this approach to hypothesize about the behaviour of international actors. Rosencrance made this explicit in stating, "history is a laboratory in which our generalisations about international politics can be tested"[15]. Theories such as the balance of power system emerge from this approach to explain and predict the behaviour of international actors.

Opponents of this school of act-utilitarianism / Realism believe that actors do not follow rules of conduct only when it furthers their interests to do so. Kratochvil

criticizes the methodology of observing past behaviour to demonstrate norms, pointing out that this is not a value free exercise.

> "Because rule-following is part of moral assessments, the question of whether a norm predicted the actual outcome accurately telescopes several important concerns that ought to be distinguished into one factual observation"[16].

Kratochvil also points out that norms are not invalidated if they sometimes fail to determine an actors behaviour, as is the case with the development of international law. Furthermore, non-observance of a norm can even serve to strengthen its influence, if the actor concerned seeks to excuse or explain its behaviour. David Owen's admission as Foreign Minister that the UK's support of the Shah of Iran was immoral but necessary for the "national interest" (i.e. oil), demonstrated that a value had entered the calculation, even though it had been overridden.

Kratochvil proceeds to argue that values play a part in norm compliance, pointing out the fact that people will often follow legal norms because of the value that one should observe the law, rather than merely through fear of sanctions. Values thus are seen as distorting the rational calculations of an act-utilitarian. "Rather than addressing the rational calculating abilities of decision makers, values serve to strengthen the will and the emotional attachment to social objects, or states of affairs"[17]. It is the presence of values in a society that give norms the status of a phenomenon and not merely an epiphenomenon.

Thus it transpires that the seven norms outlined can be seen as specific forms of more general codes of conduct by which human relations are guided. Norm (1) on optimizing yields is related to the general practical fact that any society needs to produce sufficient food to supply the needs of its constituents. Norm (2) on preventing disease is derived from the moral principle that human suffering should be alleviated where possible. All human societies accept

this principle to some extent, as is evidenced by the universality of practising medicine and healing. Norm (3) on preventing poisoning can also be seen to derive from this ethic. Norm (4) on the trade in pesticides is a specific version of the general principle that inter-state trading in any hazardous commodity needs to be subject to some control. The issues of trading arms and industrial waste are thus related to the corresponding practise with pesticides, in the sense that they all share a common principle. Norm (5) on the overuse of pesticides is unique to pesticide politics but ultimately can be seen as a corollary of all the other norms and values of pesticide politics, as the idea of avoiding the overuse of pesticides is to respect the need for optimizing food yields and curbing disease whilst avoiding general pollution and poisoning. Norm (6) on pollution is the specific interpretation of the value that any environmental pollution is undesirable, and should be limited. Norm (7) on food contamination relates to the general norm that food should be kept as free as possible from impurities, which again ultimately exists as a product of the ethic of alleviating human suffering.

Norms (1) and (2) can also be categorized as "prescriptive" in that they represent the bases for an actor positively choosing to produce and/or use pesticides. The value of making money could, of course, be added to this list. The rest of the seven norms are "proscriptive" as they represent the factors explaining why an actor should not take a particular course of action relating to pesticide trade, use, or production.

The Rationality of Norm Compliance

A clear demonstration of how norms can emerge comes from considering the theories of public goods and the Prisoners Dilemma. A public good is something which if available to one actor, is correspondingly also available to others free of cost. Examples of this are fish and ozone, in that they

have both suffered depletion to the detriment of all, because environmental quality and food-supplies are treated as a "free-good" by actors. The rational act in terms of a straight cost-benefit analysis, would be for all actors to continue discharging chloro-fluoro-carbons (CFCs) and destroy the ozone layer, and with it themselves. Similarly, the Prisoners Dilemma is a fictional game which illustrates how actors can come to cooperate and act contrary to the maximization of act utility for purely self-serving reasons. According to the game, two prisoners held for the same crime in different cells are aware that giving evidence could get them cleared and result in the other prisoner being prosecuted. However, if both were to blame the other then neither would get off. So in reality, therefore, it is in both their interests to stay silent and accept the light sentence that this entails. To do this requires trust in the other prisoner to do likewise. Keohane coined the term "myopic self-interest"[18] to distinguish between such a narrow, short-term view of the rational act and what he describes as "bounded rationality"[19] by which behaviour can be better understood.

The irrationality of acts of "myopic self-interest" demonstrates that the truly rational act is often to follow a norm generated by a common interest. Sartorius upholds this in formulating a theory by which conduct can be explained by reference to shared systems of social morality, in which actors accept that they cannot directly appeal to utility.

> "Considerations of utility lead to the participation of each in the creation and support of a system of norms which bar direct appeals to utility and which are backed by sanctions which each has a role in applying".[20]

This in some way mirrors the concept of an issue-system in international relations theory, without abandoning the traditional idea of the rational actor.

From Norms to Regimes

Sartorius goes on to describe how actors can come to make decisions which, although not maximizing act utility, can be seen as rational. The first method he describes is for an individual or group of individuals unilaterally to contribute to the cost of providing a public good, in the expectation that others will follow the example and so make the initially-irrational act rational. This seems to correspond to Keohane's belief in the importance of "entrepreneurial actors"[21] in regime formation, which is examined in the next section. The voluntary unilateral cutting of CFC emissions by certain states in recent years, provides an illustration of this idea. The second of Sartorius' "solutions" is for individuals to form organizations which redefine their interests in favour of providing public goods. As the cost of establishing such organizations may make the act irrational however, Sartorius envisages a third scenario. In the situation he describes there are, "specific social norms backed by social sanctions which are neither legal nor quasi-legal"(organizational rules).[22] This appears to parallel the pluralist interpretation of regimes in international relations.

The establishment of regimes to uphold social norms in this way can be facilitated by their capacity to utilize authoritative knowledge on the issue at hand. Peter Haas' treatment of the role of "epistemic communities" in regime formation emphasizes this. Epistemic communities, according to Haas, are:

> "...transnational networks of knowledge based communities that are both politically empowered through their claims to exercise authoritative knowledge and motivated by shared causal and principled beliefs".[23]

For issues of a scientific or highly technical nature, any consensus of opinion from a united grouping of experts is likely to carry significant political weight. An epistemic community can serve to establish the validity of a principle in the eyes of actors, who may then come to see that a

particular norm is salient to them. The issue of ozone depletion is illustrative of this. The firm establishment of the principle that "CFCs erode the ozone layer", by a scientific community centred on the United Nations Environment Programme (UNEP) and the British Antarctic Survey, was the catalyst for governments to agree to reduce emissions of such chemicals in the late 1980's. The discovery of a hole in the ozone layer above Antarctica in 1985 served to confirm that an opinion many scientists had been stating for a number of years was valid and undermined contrary arguments that governments had utilized in defence of maintaining similar levels of CFC emissions.

The ways in which norms come to influence actor-behaviour through the social systems derived from issues and in regimes is considered in the next section of this chapter. Although the seven norms of conduct, that I have identified as guiding behaviour within the pesticides policy-system, are related and often derivative of the same basic moral value, each can be shown to produce a distinctive issue-system, featuring their own particular forms of political processes and regulatory structures. One principal way in which the issues within the pesticides policy-system vary, is in the existence or absence of a regime. As I mentioned earlier, the terms issue-system and regime are rarely used in tandem in international relations theory. The task of the following section therefore is to hopefully try and reconcile the two terms, as a means of offering greater insight into how international behaviour is patterned than has been achieved by solely using either one as a conceptual tool.

ISSUE-SYSTEMS AND REGIMES

The distinction between an issue-system and an international regime is, as I mentioned earlier, not always evident in international relations literature. David Easton pioneering the use of systems analysis in political science, defined a political system as, "any set of variables selected for description and explanation".[24] This permits consideration of even the loosest system of interest, suggesting an issue can be conceptualized wherever one can identify interdependence or behaviour modification in a given area of consideration. Mansbach and Vasquez's definition of an issue as consisting of, "contention among actors over proposals for the disposition of stakes among them",[25] seems to be in line with this. This is clearly in contrast with the orthodox understanding of a regime, summized by Krasner as, "sets of implicit or explicit principles, norms, rules around which actors expectations converge in a given area of international relations".[26] The neo-realist regime goes beyond the Eastonian political system, as Keohane emphasizes in his distinction between regimes and mere agreements. A regime must consist of something more substantial than temporary alignments on an issue, which will change in line with changes of power or in the interests of the actors concerned, it is stressed.[27]

At this point it may appear that the difference between an issue-system and a regime is obvious and a relationship between the two is possible to conceive, but the positions of the regime and issue theorists are not always this clear. Definitions of an issue-system often go beyond an Eastonian political system, and definitions of an international regime are not always as restrictive as Krasner and Keohane.

Terminological confusion on issues and regimes is

completed by the Puchala and Hopkins definition of a regime, which seems equatable to Mansbach and Vasquez's definition of an issue. For these liberal theorists, a regime is synonymous with a political system as Easton understood it. "A regime exists in every substantive issue area in International Relations where there is patterned behaviour."[28]

Thus it transpires that there seems to be no universally accepted understanding of either an issue-system or an international regime and that the two terms can be synonymous, or even interchangeable.

The Issue Cycle

Whichever way one chooses to apply the concepts of issue-systems and regimes, it is clear that the behaviour of actors in international relations can be "patterned" to different extents, by such international phenomena. In view of this it may be conceivable to reconcile issues and regimes by understanding them as different stages of international behaviour modification. Mansbach and Vasquez, whilst not explicitly considering regime formation, acknowledge that issues influence actors to differing extents at different times by using the idea of an "issue cycle". "During its life, an issue may be characterized by changes in stakes, and variation in the cast of actors that are contending for them."[29] The key stages identified within this issue cycle are; crisis, ritualization, dormancy, decision-making, and administration.

On an issue entering the global agenda Mansbach and Vasquez propose that a crisis stage is enacted in that; the issue creates a sense of urgency to act on it, or that it creates shifts in political order, or that it may threaten some accepted norms of behaviour. The ad hoc interactions of actors affected by this crisis will then evolve until a

"patterned set of expectations"[30] over the issue has developed, the ritualization stage. Tacit rules and procedures between the affected actors prevent the unwelcome return to a situation of crisis. Once an issue is ritualized in this way, the next stage is for it to be removed from the global agenda. This can occur in a three ways. Firstly, the issue may be directly resolved and an administrative allocation of values made, in an administration stage. Failing this, the issue will become dormant in that it is relegated to the periphery of public attention, after which it either enters a decision-making stage (an interim between administration and dormancy), or remains unresolved in a state of atrophy.[31]

The administration stage of the issue cycle is prominent in domestic politics, where governments can enact binding laws on their constituents, but clearly less so in the decentralized global society. Mansbach and Vasquez hence conclude that issues on the global agenda will generally remain unresolved, in the absence of world government, and continue to be contended by some actors indefinitely. Administration can occur in global politics, however, in the form of the work of United Nations' functional agencies, or by informal regimes. The work of the Codex Alimentarius Commission in setting universal standards for permissible levels of impurities in foods, including pesticides, it will later be shown, comes into this category. Mansbach and Vasquez accept that this may be so, but argue that this stage is so rarely reached in international society that it is not worthy of further enquiry. The feeling that international administration is negligible is further borne out by the authors admission that their model of an issue cycle only applies to "critical issues" that dominate the interests of the major actors, and not to the majority of issues which are only salient to a minority.

Thus, Mansbach and Vasquez's issue cycle, whilst

demonstrating the way in which an issue can develop to the status of an administrating regime, does not provide a complete understanding of the relationship between the two concepts. There is no accounting for "non-critical" issues, despite the fact that international regimes can be shown to exist in issues of "low politics", and outside the spheres of interest of the major actors. The regime currently in operation in the Arctic regions concerning the conservation of polar bears, developed without any of the upheavals expressed in the "crisis stage" of the issue cycle, and without ever featuring in the critical interests of the world's major actors. Thus, a more general explanation of how an issue, be it critical or not, can arrive on the international agenda and proceed to influence the behaviour of actors is needed.

Paradigmatic Positions

One interpretation of how an international regime can emerge from an issue-system is provided by Keohane.[32] He maintains the realist axiom of a rational actor by arguing that a regime is developed from the cost-benefit analysis of a government acting as a "political entrepreneur". A regime will only be formed when the entrepreneurial government realizes that making ad hoc agreements on issues produces higher costs than making such agreements within the framework of an international regime. To explain the conditions under which an actor would come to this decision, Keohane introduces the concept of "issue density". The main drive of this concept is that regimes are more likely to be attractive to the actor designing them when the issues are highly interdependent.

> "We only expect regimes to develop where the costs of making ad hoc agreements on particular substantive matters are higher than the sum of the costs of making such agreements within a regime framework and the costs of that framework."[33]

This calculation is tied up with how dense the issue

area under consideration is, in terms of the level of interdependence of its constituent issues. The intensity of agreements formed between relevant actors will reflect the issue density. In a situation of low issue density, ad hoc agreements will suffice, as these agreements will not impinge greatly on each other and the establishment of a regime would not be worth the organizational costs involved. Where issue density is high, on the other hand, potential agreements are likely to be interrelated and the establishment of negotiating procedures for a range of related issues would become a rational act.

Keohane thus sees rational government actors as the catalysts for regime formation, and upholds the theory of hegemonic stability as a key factor in this process. The pluralists place less stress on the role of governments, pointing to the many examples of international regimes which are essentially non-governmental, as is generally the case in international sports regulation. Keohane asserts that international cooperation could have the potential for positive social benefits but still not induce regime formation, as the crucial factor concerns what the entrepreneurial government can gain from cooperation. This proposition is also not shared by pluralists, as it does not account for the phenomenon of regimes developing their own norms, which are then internalized by actors. Human rights regimes, such as the European system centred on the European Court of Human Rights, appear to constrain the signatory governments for a general social good, without apparently serving the interests of a single entrepreneurial government.

The crux of the difference between the neo-realist and pluralist paradigms emerges at this point. Keohane's belief that an entrepreneurial actor must profit sufficiently for international cooperation to occur, requires a scenario where the potential entrepreneur is,"large relative to the

whole set of potential beneficiaries."[34] This presupposes an underlying power structure, which ultimately dictates when an issue-system can spawn an international regime. The pluralists do not go along with this, arguing that power is not always fungible and that there is effectively not a single international system, but rather separate systems for each issue, in which the concerned actors capabilities are defined merely in terms of that issue, and its salience to them. It is clear that imposed regimes do exist however, in which an actor uses its underlying relative strength in some capacity to order international cooperation to its benefit. Examples of this include colonial trade regimes and the British dominated oceans regime of the nineteenth century. On most occasions, however, regimes are formed from reconciling common interests among various actors, purely within the issue at stake. When this is not the case, as in the examples given, an actor is able to coerce issue-salience on others, a form of power fungibility.

Keohane's idea of an entrepreneur is not irreconcilable with the idea of issue salience however, if it is accepted that the actor undertaking support-building behaviour for its position on an issue does so invariably because the issue is most salient to it, rather than because of any underlying economic or military advantage it may possess. The entrepreneur will usually hope to gain from its proposed regime in terms of better flows of information or facilitating profitable agreements, but instances of regime formation without obvious individual gain for an actor can be seen. Cobb and Elder recognize that the selfless actions of "do-gooders" can create issues at the domestic level, and there is plenty of evidence that this is so at the level of international society.[35] The sort of international altruism seen in human rights regimes and conservation regimes such as the one for polar bears referred to earlier, indicate that the idea of rationally-acting entrepreneurs initiating regime formation has its limitations. An issue-system can

exist independently of the interests of principal international actors, and a regime will develop from this when its values and norms are tacitly legitimized by actors in so far as they come to expect an authoritative allocation of those norms and values to occur.

Lower Levels of Resolution

At this stage it seems profitable to offer a further definitional proposition to this study by distinguishing between an issue-system and a wider issue-system, in relation to regime formation. An issue-system, as has been outlined, will consist of all actors who perceive, or are made to perceive, an issue as being salient to them. A wider issue-system will then consist of any number of such issue-systems which are linked by a common general norm or value. The fact that the issue of pesticide trading is linked to the issues of trading industrial waste and armaments was referred to earlier. In this instance the common general norm is the desire to in some way to control the trading of dangerous commodities, which can be seen as forming a wider issue-system. The government bodies and pressure groups aiming to regulate the trade in pesticides may not derive their opinions solely from within this system of interest, and might be conscious of, if not actively involved in, other areas of trade in toxic or dangerous commodities. This range of related issues thus effectively forms another system of interest, at a lower level of resolution.

The existence of a system of interest at a lower level of resolution may be explicitly recognized by the actors concerned in the formation of what could be termed a "multi-regime". The issue of controlling levels of pesticide residues in food, which is later shown to be regulated by a regime centred on the Joint Meeting on Pesticide Residues (a WHO/FAO body) and the Codex Committee on Pesticide Residues (CCPR), can be understood as a subset of the wider issue of

limiting general impurities in food. This wider issue system, in turn, is regulated by a regime, the Codex Alimentarius Commission, which includes the CCPR along with other committees regulating issues such as the levels of veterinary drugs and additives in food. Thus, the Codex Alimentarius Commission can be seen as an amalgamation of regimes within a wider issue-system, a multi-regime.

A wider issue-system in turn may be influenced by an application of values on a universal, or a near universal, scale. I referred earlier to the fact that the norm of limiting pesticide residues in food is ultimately derived from the moral value of avoiding human suffering, which I proposed was universally accepted. This sort of value can be understood as a lower level of resolution still, providing the basis for numerous issue areas including, for instance, the ideas of non-combatant immunity in warfare and the illegality of slavery. Oran Young conceptualizes something along these lines, which he refers to as an "international order."

> "International orders are broad, framework arrangements governing the activities of all (or almost all) the members of international society over a wide range of specific issues."[36]

An order differs from a regime in that it applies only abstract values and does not have decision-making procedures. A world government would be a hyper regime and not an international order. Issue-systems and international regimes can be understood as higher resolutions of wider issue-systems and international orders; the system of interest being in turn more precisely defined and regulated.

CONCLUSION

As outlined earlier, I propose that international pesticide politics ultimately amounts to a contention over values resulting in seven particular norms of conduct. The seven issues derived from this are examined in turn in the following chapters. Although, as I have already stressed, the issues overlap in terms of the actors involved and in that the norms are sometimes derivative of common values, it can be shown that each norm is observed by a particular set of actors. The same norm may be contested, or relegated behind preferred contrary norms by other actors within the policy-system of international pesticide politics. A distinct political process of value allocation can thus be seen in operation for each of the defined seven issues.

For each of the following seven chapters therefore, I first attempt to demonstrate the existence of the international norm, by looking at how actor behaviour relates to the particular prescription or proscription. If the same actors contended the seven norms in the same way, international pesticide politics could be dealt with as a single issue, but as will become evident this is not the case. The following chapters will highlight the fact that levels of adherence to each of the norms varies considerably, which is to some extent reflected in the existence or absence of regimes, assuming responsibility for implementing rules based on the norm to salient actors. The distinctive effects that pesticides have on the world socially and ecologically are mirrored by distinctive patterns of political responses, requiring an analysis of this subject to take on a correspondingly fragmented approach.

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Chapter 2

R E A P I N G T H E R E W A R D S

The Use of Pesticides for Increasing Crop Yields

THE DRIVE TO INCREASE CROP YIELDS

The original reason for the development and use of pesticide chemicals was to reduce crop losses to insects, fungi, and weeds, and so ensure better yields. The fact that crop yields need to be increased is accepted by all in the face of an ever increasing world population, and as such this constitutes a norm. Pesticides represent one potential means of satisfying this norm, through the process sometimes referred to as "agromedicine".

> "Agromedicine is the integrated interdisciplinary application of the skills and knowledge of agriculture, applied chemistry and medicine to the promotion of an adequate and wholesome food supply for the welfare of man".[1]

Pesticides are also employed in the protection of non-food crops, such as cotton.

The barrier that pests, in their various guises, pose to satisfying the norm of obtaining optimal crop yields is considerable. Pimentel, in a paper for the 1983 CHEMRAWN (Chemical Research Applied to World Needs) II Conference, demonstrated that 35% of the world's food crops prior to harvesting, and between 10 and 20% afterwards, are destroyed annually by a combination of insects, plant pathogens, weeds, micro-organisms, rodents, and birds. In the USA, Pimentel estimates that 37% of all crops are lost each year, despite the use of pesticides and other forms of crop protection. Of this total, 13% are believed to be lost to insects, 12% to weeds, and 12% to plant pathogens.[2] His conclusion is that; "Clearly the continued use of both non-chemical and chemical pesticides is essential to food and fibre production in the world".[3]

It is, of course, in the overpopulated Third World that the norm of obtaining optimal crop yields is most pertinent, the same arena in which the prohibitive norms concerning pesticide use are most pertinent. The moral dilemma facing

the actors concerned with pesticide politics is the stark fact that while imposing strict restrictions on pesticide use and imports in the Third World would reduce accidental deaths and environmental pollution, it would also be likely to reduce the amount of food on the plates of already undernourished peoples. This continues to be the spur for the maintenance of pesticide use amidst the international voices calling for restraint in the name of human safety, environmental protection, and food purity. The compromise practise of adopting "integrated pest management", balancing the norms of optimizing crop yields and minimizing pesticide use, is a complex procedure making up a separate issue which is looked at in a later chapter.

Chemical pesticides have undoubtedly made food and fibre production more efficient. It is estimated that while the average American farmer produced enough food for himself and nine others in the 1940's, this had increased to include himself and thirty-one others by the 1970's.[4] This statistic is not wholly attributable to the introduction of pesticides in agriculture. The mechanization of farming, the introduction of high-yielding crop species and advances in the use of chemical fertilizers have also played their part, but other data does bear out the fact that pesticides have improve crop yields.

Country/area	Pesticide use (kg/ha)	Rank	Crop yield (tonne/ha)	Rank
Japan	10.8	1	5.5	1
Europe	1.9	2	3.4	2
U.S.A.	1.5	3	2.6	3
Latin America	0.22	4	2.0	4
Oceania	0.20	5	1.6	5
Africa	0.13	6	1.2	6

Fig.1. *Pesticide use and yields of major crops in certain countries and areas*[5]

The previous table, even if based upon highly aggregated data, does show a clear correlation between the input of pesticides and the subsequent yield in crops, but the relationship between the two variables is not straightforward and needs to be qualified. Yields do not rise in strict proportion to the amounts of pesticide used. Japan may average yields that are four and a half times the size of those in Africa, but they use eighty-five times as much pesticide. It appears that ultimately, more pesticide does not equate to more food or fibre. A number of cases show evidence of this.

> "In India, where cotton growers used three million kilograms of DDT in 1970 to produce just over five million bales of fibre, DDT use had doubled but cotton yields remained the same six years later."[6]

A more extreme example comes from Nicaragua, where cotton yields, "fell by a total of 30% from 1965 to 1969", despite increased insecticide applications.[7] Partial explanations for such cases and this general trend include; the raising of cosmetic standards demanded of fruit and vegetables by retailers, the unintentional destruction of natural pest predators, the use of high-yielding but more vulnerable crop species, and the move away from crop-rotation to monoculture.[8] The chief cause of continued crop losses in the face of pesticide use however, is pest resistance, which develops in the face of continued exposure to chemicals. In the Nicaraguan case, the explanation offered for the drop in cotton yields was an increase from five to nine in the number of species of resistant cotton pests that were "economically important" in the previous ten years.[9] The problems posed by pest resistance and resurgence, examined in Chapter 6, are such that even the agrochemical industry has come to question the future of purely chemical crop protection and to explore alternative options. However, despite the growth in non-chemical integrated pest control techniques, pesticide sales continue to grow and they are still widely considered as an essential means of satisfying

the norm of optimizing crop yields.

The following diagram shows how the level of world pesticides production increased continually from the 1940's, when they were first introduced into agricultural and public health use, until the mid 1980's. The histogram uses figures for the volume of produced pesticides, rather than their sales value. These figures are not frequently quoted (hence the unusual layout of the time axis), but give a more accurate reflection of production as sales figures are obviously distorted by the rate of inflation and corporate pricing policy.

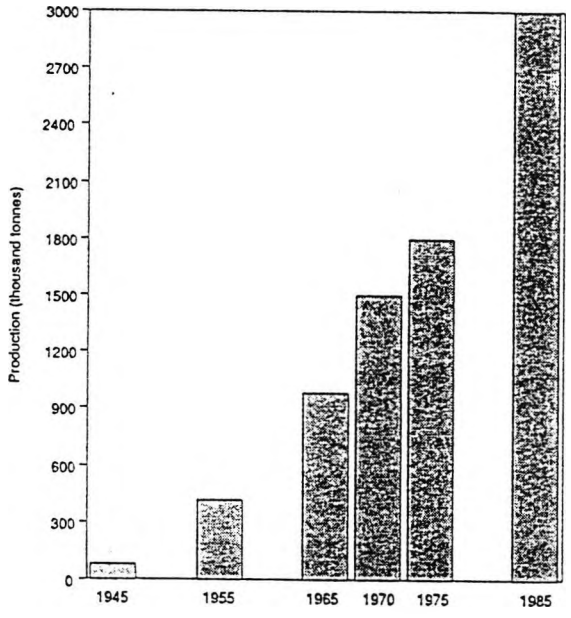

Fig.2 *World production of formulated pesticides*[10]

In recent years, pesticide production does appear to have levelled off, however. The total world end-user market in 1992 was estimated to be worth US$25,200 million, which represented a drop of 6% from 1991 sales (which, in turn had fallen 2% from the previous year).[11]

THE POLITICS OF USING PESTICIDES TO INCREASE CROP YIELDS

The need to ensure food security in the face of the famines that have continue to afflict many Third World countries is clear. Continued population growth looks likely to place ever greater demands on the world's food and fibre supplies and one solution to this is to strive to increase crop yields. Pesticides, even when allowing for the problems of pest-resistance, have provided a means of achieving this. However the evidence that emerges throughout this study is that the achievements of pesticide chemicals in this regard have not been without some costs. Human poisoning, environmental degradation, and food contamination have all been side-effects of the production, distribution and use of pesticides on food crops in the latter part of this century. Pesticide use on fibre crops, of course, does not invoke any food contamination problems, but is still controversial in terms of environmental pollution and worker safety. These problems have given rise to the development of the prohibitive norms of conduct concerning pesticides, which are considered in later chapters. The political choices facing the actors within the pesticides policy domain thus have tended to amount to a prioritising of goals; choosing between the norms prescribing pesticide use and those that proscribe it in some way.

Naturally, the chief advocates of pesticides as a tool for boosting crop yields are the representatives of the chemical industry. Two organizations involved in this political process of advocacy are The International Union of Pure and Applied Chemistry (IUPAC) and The Groupement International des Associations de Fabricants de Produits Agrochimiques (GIFAP).

IUPAC

Founded in 1919, IUPAC is, "an international, non-governmental organization dedicated to the advancement and

application of chemical science and technology"[12], and includes crop-protection chemicals amongst its range of interests. It is a member of the prestigious International Council of Scientific Unions (ICSU), a body serving to coordinate international scientific research. IUPAC is an association of over 40 national professional chemists bodies, with 12 other subordinate members known as "observer countries". It hosts a General Assembly every two years at which future research projects and Conferences are discussed. Fifteen-hundred scientists work for IUPAC on a voluntary basis, staffing 32 commissions representing different branches of chemical research. In addition, some 8,000 scientists from over 80 countries are affiliated to IUPAC as individuals, enabling them to cooperate in the work of IUPAC commissions. Some of these affiliate members from Third World countries are sponsored by IUPAC grants.

A number of international conferences are sponsored by IUPAC, of which the best known are the CHEMRAWN (Chemical Research Applied to World Needs) series. The second of the CHEMRAWN conferences, held in Manilla in 1982, was a forum for IUPAC's work on crop-protection chemicals. Entitled "Chemistry and World Food Supplies: The New Frontiers", the conference was attended by a number of leading pesticide scientists, many of whom presented papers, and was co-hosted by the International Rice Research Institute.[13]

The WHO and FAO regularly obtain technical advice from IUPAC on pesticide and other chemical matters and the organization has enjoyed "Specialized Consultative" status with the FAO since 1955. Under this arrangement, representatives of the FAO Director-General attend all IUPAC meetings, whilst IUPAC are able to send representatives to FAO Conference and Council sessions. Thus, IUPAC carries a significant level of respect as a source of authoritative knowledge on the issue of increasing crop yields through pesticide use. Hence, IUPAC is part of an "epistemic

community" within the issue-system. It also contributes to the epistemic communities of other pesticide issues through its all-round chemical expertise. IUPAC's role in relation to pesticides is not solely one of advocacy. Its knowledge in regards to chemical toxicity gives it an input into the issues of environmental pollution, human poisoning and food contamination. For example, IUPAC reguarly provides technical assistance to the International Programme on Chemical Safety (IPCS), the focus of the United Nations' activities concerning the issue of human poisoning by pesticides and other chemicals (see Chapter 4).

GIFAP

The Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP), the international representative of agrochemical companies, is the most important organization involved in the promotion of pesticides for improving crop yields. The group was set up in 1967 and consists of 50 national agrochemical associations, 21 of which are full members and 29 are "associate members."[14] The national associations of the worlds five main pesticide producing and exporting states (USA, Japan, Germany, UK, and Switzerland) are full members, and in all over 1,000 companies and 90% of the world's pesticide producers are represented.

GIFAP has a General Assembly made up of representatives from each of the full member associations. The ten members of the Executive Committee, including the President and Vice-President, are elected by the General Assembly, which meets at least once a year. Policy is decided by the Executive Committee, which has a six-man secretariat based in Brussels. GIFAP's technical documents and reports are developed by a system of working groups and committees, each dealing with a particular issue or geographical area. Three

Steering Committees organize the agendas for these groups: a Technical/Regulatory Steering Committee for the issue-based groups, a Regional Steering Committee for the regional work groups, whilst Europe has a separate committee of its own.

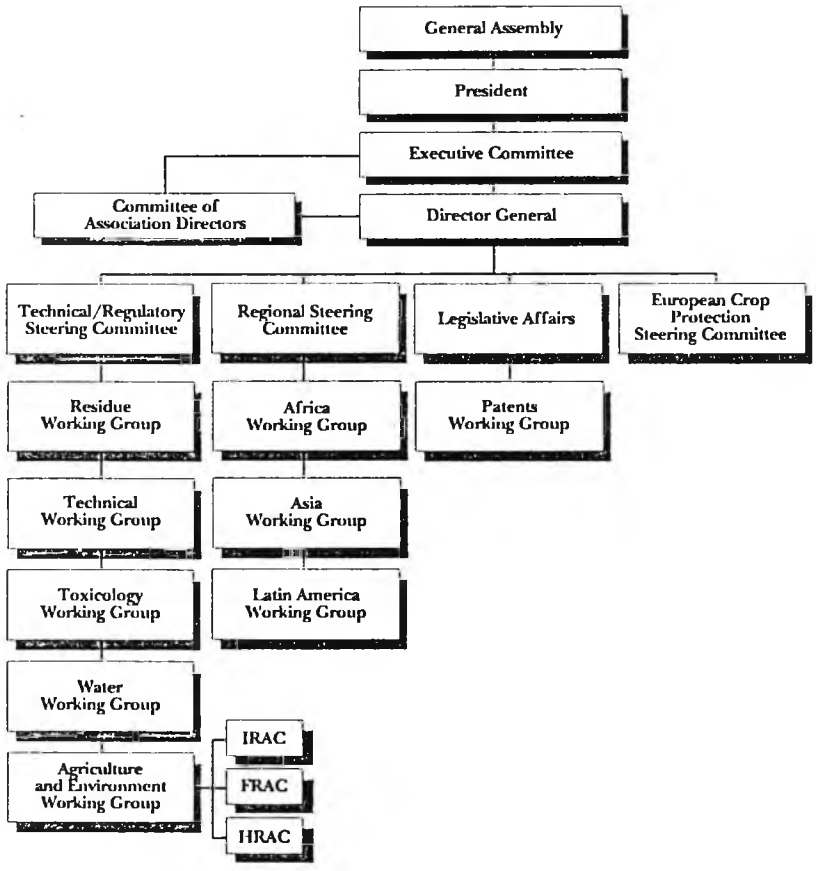

Fig. 3. *The Organizational Structure of GIFAP*[15]

GIFAP are involved in all pesticide issues as the voice of the industry, including regulation-setting and research into Integrated Pest Management (IPM), but obviously its chief concern is promoting the positive angle on crop-protection and resisting what it feels are excessive regulatory constraints from being placed on the industry by the FAO, EC, or individual governments.

> "GIFAP's overriding objective is to promote optimal food and fibre production worldwide through appropriate crop protection with agrochemicals...".[16]

Formally, GIFAP has "liaison" status with the FAO, a

position it acquired in 1967. This status is fifth out of the five ranks of formal relations operated by the FAO, but in effect the relationship between the two institutions has always been strong. The high point in relations occurred in the early 1970's, when the Industry Cooperation Programme was set up as a joint bureau organizing seminars in the Third World outlining the importance of chemical technology in furthering development. This programme was short-lived owing to pressure put on the FAO from various NGOs, but the FAO has continued to be criticized for being over-receptive to the interests of industrial lobbies.[17] GIFAP have representatives present at most FAO and WHO Expert Committee meetings dealing with pesticides and has "observer status" on the FAO/WHO Food Standards Programme and its regulatory organ the Codex Alimentarius Commission.

CONCLUSION

The work of IUPAC, and more importantly GIFAP, within the issue of increasing crop yields by pesticides can be understood as amounting to an epistemic community which serves to counter the knowledge-based systems promoting a retreat from pesticide usage. The effect of this situation where separate epistemic communities are competing for the high-ground in providing knowledge to concerned actors, has been to confuse technical areas: a recurrent theme in pesticide politics. List and Rittberger have referred to this as "scientific politicking"[18], considering it a factor in the failure of regime creation in environmental issues. It seems reasonable to argue that the work of GIFAP in promoting the positive aspects of chemical protection given scant coverage elsewhere, and in countering claims made in opposition to pesticides, has been influential in inhibiting regime development within the issues of human poisoning by pesticides, pesticide pollution and the introduction of IPM.

The issue of obtaining optimal crop yields through pesticides is itself not regulated in any way, as it represents an area of agreement over a prescriptive norm. Regimes usually only serve to prohibit certain practices, and are rarely a feature of issue-systems which derive from a norm providing the basis for doing something. Regimes that serve to promote a common good do exist. GATT, for example, basically regulates the issue of promoting free trade in the world economy. However, free trade is a common good that requires promotion because it does not exist, in the fullest sense, in the world economy. Rules and decision-making procedures are needed to prevent actors from inhibiting free trade, but they are not needed to induce actors into using pesticides to improve their crop yields. Rules and decision-making procedures are required, however, to prohibit or put restrictions upon actors using, producing, or trading pesticides in any way. Activist political actors within

issue-systems based on prescriptive norms thus will tend to serve a role of advocacy, promoting that norm with the intention of persuading other actors of its saliency to them, in the hope that it will be placed higher on their political agenda of preferences than competing proscriptive norms.

Thus it can be seen that the political role of the actors, within the issue of increasing yields by pesticide use, basically amounts to promoting that norm to a higher position on the agenda of the actors within the pesticides policy-system than is held by the proscriptive norms. This competition for a prime location on the political agenda forms the basis for much of the international politics of pesticides.

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Chapter 3

F I G H T I N G P L A G U E

A N D P E S T I L E N C E

The Role of Pesticides in Controlling Pest Transmitted Diseases

INTRODUCTION

A second prescriptive norm upholding the use of pesticides derives from the value that human suffering should be minimized wherever possible. Human suffering from pest-carried diseases has been, and continues to be, considerable, and the key means of alleviating this suffering has been through the chemical control of the pests. Whilst noting the negative impact that pesticide toxins have had on human health, McEwen and Stephenson conclude that, "their role in improving world health is one of the outstanding chapters of preventive medicine".[1] A number of fatal diseases have been brought under at least partial control with the aid of chemicals used to eradicate the insect, or other organism, responsible for transmitting it to man.

Malaria

This devastating disease, transmitted by mosquitos of the *Anopholes* genus, has probably been responsible for more human deaths than any other. Even though instances of it declined this century, it was still claiming around 2.5 million deaths a year in the early 1950's.[2] In response, the WHO in 1955 launched a global eradication programme, the largest of its kind in public health history. The use of DDT around human dwellings in the late 1950's and 60's rapidly killed all mosquitoes that came into contact with it, and virtually eliminated the disease in all areas in which it was used. An illustration of DDT's success in eliminating malaria comes from comparing the numbers of infections before and after its extensive use in Sardinia, Italy. There were 78,000 cases of malaria on the island in 1942 prior to the use of DDT, compared with only 9 in 1951, after several years of treatment with the insecticide.[3]

This success story was echoed throughout the world, although ultimately pesticides have proven not to be the panacea that the WHO and others had anticipated. Mosquito

resistance to DDT and other insecticides arose in response to their extensive usage in public health programmes, and also indirectly from their use in agriculture. Resistance to DDT was first recorded in 1946,[4] only seven years after its discovery, and the number of resistant species has risen continually since then.

Added to the problem of resistance were the well-documented side-effects of DDT, namely its persistence in the atmosphere, wildlife and human body-fat. As a result, DDT use in malaria-control has diminished over the years and it is now banned or severely restricted in over thirty countries. The WHO formally abandoned its global eradication programme in 1975 which had been based largely on DDT applications, and the disease has since been partially controlled by a variety of techniques. DDT treatments have continued in a lesser role, other insecticides have been employed, and non-chemical control methods based on destroying mosquito habitats utilized. In general, the value of avoiding human suffering has come to be less clearly satisfiable through the use of pesticides in public heath campaigns, allowing the proscriptive norms associated with pesticide use to become more salient.

Replacement insecticides have not matched the success of DDT in its early years, and malaria has resurged in Africa, South-East Asia and South America. In Ceylon (now Sri Lanka), where DDT had reduced the annual number of malaria outbreaks to seventeen by 1963, its withdrawal prompted a resurgence of the disease to greater levels than ever, reaching an estimated two million cases in 1970.[5] By the 1990's malaria was claiming around 1.5 million lives a year worldwide[6], with the disease gaining resistance to drugs such as chloroquine and mefloquine, in addition to the *anopholes* mosquito's resistance to DDT and other insecticides.

A 1992 "Malaria Summit" in Amsterdam, organized by the WHO and bringing together health ministers from 95 countries, concentrated on fighting the deepening malaria problem by earlier diagnosis and treatment of the disease. The use of insecticides, and even non-chemical pest-control methods like introducing natural predators to the mosquitoes, or draining the swamplands to destroy their habitats, appear to be near abandonment. In this particular battle it would seem that the insect is close to victory and that man is ready to settle for a damage limitation strategy.

Schistomiasis

After malaria, schistomiasis is widely believed to be the most significant parasitic disease of man, affecting between 200 and 250 million people a year in tropical regions.[7] It is caused by flatworms and transmitted to man via aquatic snail larvae in freshwater habitats. Molluscicides are frequently applied to such habitats, particularly niclosamide and copper-sulphate. In addition, biological control methods have been adopted, such as introducing fish predators to the snails and releasing benign snails which can compete with the pest snails for food.

Onchocerciasis

This disease, sometimes referred to as "river blindness", is caused by nematode worms and transmitted by *simulium* black-flies. It is endemic in West-Africa, where in 1976 the WHO coordinated an international campaign to eradicate it in the Volta Basin region. The disease has not been eradicated, but it has been partially controlled through the use of larvicides such as temophos, and more recently by biological control methods including the use of *Bacillus thuringiensis* bacteria.[8]

Filariasis

Like onchocerciasis this disease is caused by nematode

worms, and in 1992 was estimated to have infected some 78 million people worldwide.[9] Filariasis can be passed on to man either by *simulium* black-flies or mosquitoes and can lead to elephantitis. Diethyl-carbamazine applications have often been used for controlling the carrying genus of mosquitoes, but current research centres on the use of the biopesticide *Bacillus sphaericus* to eradicate the parasitic worms.

Dengue

Dengue fever and the related dengue haemorrhagic fever are also mosquito-borne diseases. DDT applications around human dwellings and the destruction of mosquito habitats are techniques which have been employed to control the disease.

Trypanosomiasis

Also known as "sleeping sickness", trypanosomiasis has long been endemic to tropical parts of Africa and is caused by a protozoan parasite transmitted to man or cattle by Tsetse-fly bites. The disease continues to infect sporadically, but has been kept at low levels partly through the use of endosulfan sprays and the removal of vegetation forming the flies' habitats by herbicides. The use of dieldrin to try to eradicate the flies has diminished, owing to resistance and revelations of its effects on human health. As a result, the use of traps incorporating other insecticides has become an increasingly popular method of control.[10]

Leishmaniasis

A variety of infections caused by the Leishman protozoa can occur in man through transmission by sandflies. Infection can occur through sandfly bites, or indirectly via dogs and rodents. Sandflies can be repelled indoors with conventional sprays, whilst wider control with larvicides and the destruction of breeding grounds have also been employed.[11]

Lice-borne Typhus

Typhus of the form transmitted by body-lice is generally

avoided by observing basic sanitary standards and as such has disappeared apart from some areas of North East Africa and the Middle East. Pesticides have proved effective for louse control on occasions however, as evidenced by the use of DDT powder by Allied troops in Naples during the 1943 invasion of Italy.

Plague

Although this historically destructive disease, which is transmitted by oriental rat fleas, has not reached epidemic levels since the 1920's, it is still known to reoccur periodically in South East Asia. It has been restricted to low levels however, and its spread has been halted through the use of rodenticides and insecticides on board ships and at their ports.

Other Uses of Pesticides in Public-Health

Other vector-borne diseases which have prompted the use of pesticides for their control include; Japanese encephalitis, an inflammation of the brain transmitted by mosquitoes, and Chaga's disease (American trypanosomiaisis) caused by Cone-nose bugs.

In addition to the control of such diseases, pesticides have also contributed to improving general aspects of modern domestic life. Bactericides keep homes cleaner, particularly in the kitchen, whilst insecticides reduce the possibility of infection via houseflies and cockroaches. Pesticides also contribute to the control of what is termed "biodeterioration", a collective term for a variety of harmful effects caused by pests to human artifacts. Examples of this include; the gnawing of electric cables by rodents, the clogging of ship engines by seaweed, and the presence of fungi in textiles or paintings.

Problems associated with pesticides used in public health programmmes

The side-effects of DDT use are well documented. The stability of the chemical was part of its original attraction, but ultimately it has proved to be its "Achilles heel". The persistence of DDT in the atmosphere and in animal tissue has created sufficient alarm in the last thirty years for it to be gradually phased out of use in many public health programmes. Though the impact of DDT on human health remains subject to dispute, its effects on wildlife have been significant (see chapter 5). In addition, pest-resistance to DDT has reached such levels that its use in some spheres of public health is now impractical even before environmental costs are considered. In many instances, resistance to DDT or other insecticides such as dieldrin or malathion has resulted from the over use of these chemicals agriculturally, making the problem even more difficult to contain.

Aside from the use of DDT, which is now banned or restricted in over thirty countries, the use of pesticides in areas of public health has been widely accepted as necessary and generally less controversial than their use in agriculture. David Bull of OXFAM maintains this in his book, "A Growing Problem". "There is no question of advocating the complete withdrawal of pesticides from public health use."[12]

Bull does, however, qualify the acceptance of using pesticides in this way in the light of the associated problems of human poisoning, environmental pollution and pest resistance. His conclusion is that a policy of combining non-chemical control with pesticide use, known as "integrated vector control", should be adopted in public health programmes.[13] This principle of keeping pesticide use at a necessary minimum mirrors the theory of Integrated Pest Management in agriculture, which has already been touched upon and constitutes another issue of pesticide politics, considered in chapter 6. The case of malaria, however, in which we have seen that the *anopholes* mosquitoes appear to

be beyond any form of chemical control, represents a further erosion of the once near-universal acceptance of pesticide use in public health operations.

THE POLITICS OF USING PESTICIDES IN PUBLIC HEALTH PROGRAMMES

We have seen that the norm stating that the damage and disease caused to man by other "pest" organisms should be restricted is very widely accepted in human society and has provided a powerful prescriptive force for the use of pesticides in this context. Acceptance of the importance of pesticides in attempting to satisfy this norm has, in general, been wider than for their role in increasing crop yields, the other norm underpinning pesticide use and production. The stark reality of mass human suffering and death, in the face of diseases such as malaria, has provided political actors with a less problematic choice between the prescriptive and proscriptive norms of pesticide use than the one they encounter when making decisions on whether or not they should be used for increasing crop yields.

This fact is evidenced by government decisions given under the "Prior Informed Consent" rule, whereby they are required to indicate whether they wish to permit the future import of particular pesticides (see Chapter 7 for a full elaboration). A number of governments have given consent to the future importing of aldrin, dieldrin and DDT, but for public health operations only. The governments of Ethiopia, Malaysia, Sudan, Tanzania and Zimbabwe have prohibited the use of the three insecticides for agricultural use, but have reserved the right to import them for assisting in any present or future campaigns to control pest-transmitted tropical diseases.[14]

In addition to this, the examples of successful Integrated Pest Management (IPM) schemes utilizing fewer chemicals (see Chapter 8) have tended to weaken the validity of the basic principle that "pesticides increase crop yields". This is a situation that, until recently, had not been arrived at for the use of pesticides in public health programmes. Bull referred to the need for the employment of

non-chemical controls to be increased in public health,[15] but, until recently, no commentator or actor of note had ever advocated the wholesale phasing out of chemical methods of pest control in health programmes, as they had for the purpose of optimizing crop yields.

Recently however, the principle that "pesticides help prevent the transmission of vector-borne diseases" has come to be seen as questionable, chiefly in the light of extensive insect resistance. Thus, the issue-system has begun to be subject to far more contention amongst its constituent actors than has ever been the case before. In general, however, the global politics of pesticide use in public health programmes is dominated by the non-controversial decision-making of an epistemic community centred on various WHO Expert Groups.

WHO Expert Committee on Vector Biology and Control

The principal global actor within the issue-system of vector-borne disease control is the WHO Expert Committee on Vector Biology and Control. This is basically an academic gathering which serves as a focal point for the epistemic community working on this issue. The committee usually meets once a year in Geneva, and produces technical advice papers on particular areas of vector biology, which are then made available through the WHO Technical Report Series.

The Committee came into being when it replaced the WHO Expert Committee on Insecticides (founded in 1949) in 1976. It regularly includes leading academics in the field of pesticides, such as Dr. Copplestone and Professor Jeyaratnam, and also invites relevant representatives from UNEP, FAO, ILO, and GIFAP, along with three or four secretariat officials.

The members of this and all other WHO expert committees are drawn from a panel of experts set up by the

Director-General (head of the Secretariat) after consulting the national delegates. The panel in this case is the Division of Vector Biology and Control which also provides the personnel for a number of the other expert committees dealing with the control of individual diseases. The Director-General is not involved in the actual selection of experts for a committee, but he encourages the committee to involve as wide a range of nationalities as is possible.

The technical reports which derive from the meetings are intended to contain independent opinions, and conclude with lists of recommendations for general governmental actions and for WHO action. The 1990 meeting, for example, responded to requests from WHO member-state delegates for information concerning the domestic use of pesticides. The Committee drew up a list of recommendations for ensuring the safety of domestic pesticides, which it proposed the WHO should incorporate into the Pesticide Evaluation Scheme (WHOPES). It also called upon the WHO to make the provisions known to the FAO when preparing guidelines for national registration schemes.[16]

The Committee has continually maintained the importance of pesticides in meeting their aims.

> "The Expert Committee on Vector Biology and Control has always realized that the achievement of its principal objective - the control of vector-borne diseases - depends to a large extent on the use of pesticides".[17]

The problem of insect resistance to many pesticides used in public health operations did, however, in the 1980's lead to the Expert Committee discussing aspects of Integrated Vector Control and promoting the use of some biological control methods. A 1982 meeting of the Expert Committee began reviewing the question of the biological control of vectors[18], and at the 1985 meeting[19] it for the first time considered the safety aspects of introducing the genetically manipulated organisms (GMOs) *Bacillus thuringiensis* and

Bacillus sphaericus into operational use. The use of other GMOs for biological vector control has been researched but, as yet, only the aforementioned two bacteria strains have been adopted for WHO backed programmes. Despite advances in research into the use of GMOs, the Expert Committee maintains that pesticides remain the principal weapon in the fight against insect transmitted diseases. "Chemical pesticides will continue to play a dominant role in disease vector control in the foreseeable future."[20]

Other WHO Expert Committees

Other forums for research and debate within the WHO structure have had an input into the issue-system of the chemical control of vector-borne diseases. An expert committee exists for most of the diseases reviewed earlier in this section, and the use of insecticides obviously features prominently on their agendas when discussing recommendations to make to governments and WHO public health programmes. There are WHO Expert Committees on: malaria, schistomiasis, filariasis, onchocerciasis, trypanosomiasis, and leishmaniasis, which serve to collate recent advances in understanding and controlling the diseases.

The recommendations of such committees become WHO policy if approved by the World Health Assembly, the annual gathering of all member-state delegations. The implementation of policy is carried out by the Executive Board, a 31 man body of experts (not delegates) elected by the Health Assembly. The Director-General (who is appointed by the Health Assembly on the nomination of the Executive Board) is required to be present at all Executive Board meetings to report how far the recommendations of the various expert committees have been acted upon.[21]

WHOPES

The WHO Pesticide Evaluation Scheme provides an international system for testing and evaluating pesticides

intended for public health use. WHOPES in 1982 took over this role from the WHO Pesticide Evaluation Programme, which had screened over 2000 chemicals since its inception in 1960.[22] The scheme consists of a network of laboratories in WHO Collaborating Centres, Universities, and industrial premises throughout the world, which test various formulations that are then passed on for further assessment by WHO staff in field studies, carried out in conjunction with national authorities. Finally, specifications for chemicals which have gone through the evaluation scheme are produced to accompany the pesticides when sold, and are published in a periodically updated manual. [23]

Other Organizations involved in the Politics of Pesticide Use in Public Health Programmes

Whereas the expertise of the WHO in public health matters is generally accepted by international organizations, other global actors also play a part in the issue-system. The funding of WHO directed programmes, for instance, can come from diverse sources. The Onchocerciasis Control Programme, for example, is sponsored by the Food and Agricultural Organization, United Nations Development Programme and the World Bank, in addition to the WHO. The WHO staff on this programme, including entomologists and epidemiologists, are recognized as having the chief executive responsibility in overseeing operations, but the World Bank manages the finances and directs the distribution of resources to areas affected by the disease.[24]

In addition, the WHO have increasingly drawn on the expertise of scientific groups specializing in bio-pesticides, strains of bacteria able to eliminate disease-carrying pests, as part of their control programmes. The French Scientific Research Institute for Development and Cooperation have worked under the WHO's tropical disease research programme in the use of *Bacillus sphaericus* in eradicating mosquitoes carrying filariasis in Cameroon.[25]

CONCLUSION

An epistemic consensus on the importance of utilizing chemical methods of pest control in the fight against pest-transmitted diseases, has for many years allowed WHO bodies to recommend and sponsor public health operations using pesticides that are restricted in agricultural use. However, this strong consensus of opinion has begun to erode. The reason for this is not the result of a gradual raising of the proscriptive norms of pesticide use on the agendas of salient actors, as is the case for pesticide use in agriculture, but rather it is due to a change in circumstances which has weakened the validity of the principle that "pesticides help prevent the transmission of vector-borne diseases". Any cost-benefit analysis applied by an actor when deciding on the need to use pesticides in the face of malaria and other destructive diseases, used to weigh very heavily to the benefit side, but with the emergence of greater levels of insect resistance the balance has become less asymmetrical.

Pesticides widely considered too hazardous for use in agriculture are still often used for public health programmes, but this practice has recently been less free from criticism than was previously the case. The WHO had begun to meet opposition for its continued reliance on the older, organochlorine insecticides such as DDT[26], partly prompting the virtual abandonment of pesticide use in malaria control announced at the 1992 Amsterdam summit. The epistemic community directing global public health campaigns still very much remains centred on the WHO and its various committees of experts, but the anti-pesticide lobby and proponents of biological pest control have started to have a greater impact on the political process.

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Chapter 4

W H E N A N I L L W I N D B L O W S

-The Issue of Human Poisoning by Pesticides

EXTENT OF THE PROBLEM

Chemical pesticides are by their very nature poisonous. The toxicity of such substances can never be applicable only to the targeted pest, so the fact that they need to be applied with care to avoid human poisoning is a norm of their use.

A precise understanding of how widespread human poisoning from pesticides is globally has never been possible, because of a lack of conclusive information on the issue in many countries. The inevitable result of this lack of hard facts is a tendency for the basic pro and anti-pesticides camps to swing to extremes, and make exaggerated estimates based on assumptions favourable to their own causes. In 1972 a WHO Expert Committee estimated that around 500,000 people a year are poisoned by pesticides, of which some 5,000 are killed.[1] In 1977 Copplestone, a regular member of WHO pesticide Expert Committees, made a more detailed survey of fatalities and estimated that the figure was nearer 20,640 a year.[2] A 1985 WHO study confirmed an annual death toll of around 20,000, whilst also claiming that the total number of unintentional poisonings was around 1,000,000 annually.[3]

These startling statistics are dismissed by the agrochemicals industry as scaremongering by the anti-pesticides lobby. The WHO figures are certainly open to question in terms of the size of the samples from which they are derived. The 500,000 poisonings estimate of 1972 was based on a survey of only 19 countries, whilst the supposedly more precise estimation of fatalities in 1977 was actually only deduced from the findings of a nine country survey and some governmental notifications. Full records of poisonings do not exist in most countries, and the WHO made some questionable generalisations in their figures, such as including deaths by chemicals not intended for pesticidal use and considering the most minor forms of skin irritation

as a case of pesticide poisoning. The British Agrochemicals Association claim that there has been, "no fatal accident from a pesticide in normal use since 1974"[4] on a UK farm, and that domestic accidents involving pesticides and requiring medical attention are rarer than those involving either deck-chairs or plant pots. Professor Kenneth Mellamby is amongst those who feel that the scale of human poisoning from pesticides is far less dramatic than claimed by the WHO, OXFAM, and others. In a letter to the New Scientist, Mellamby stated that, "the number of deaths from pesticide poisoning in 1977 and 1978 was probably measured in the hundreds and not hundreds of thousands."[5]

This counter-estimate of pesticide related deaths has, in turn, been criticised for being far too conservative. It is widely held that large numbers of poisonings go unreported in the Third World, because workers fear it may cost them their jobs, and also because they do not associate such illnesses with their work. Added to this is the problem of actually proving a link between an agricultural worker's illness or death and his exposure to pesticides. The death of a man by cancer may be the long term effect of having worked with carcinogenic sprays a number of years ago, but this is basically impossible to prove conclusively. Nicholas Hildyard is of the view that many instances of poisoning go unrecorded, even when they are reported by victims, because of the inexperience of medical staff in the Third World, who do not connect symptoms such as headaches and drowsiness with exposure to pesticides.[6] Emerging evidence that DDT and other organo-chlorine pesticides can be transported to a foetus via the placenta or later to the baby through the mothers milk, further bears out the fact that the extent of pesticide poisoning is an extremely difficult thing to monitor accurately.

One rare attempt to study systematically the nature and extent of pesticide poisoning in a Third World country was

carried out by Jeyaratnam, de Alwis, and Copplestone in Sri Lanka between 1975 and 1980.[7] The study showed that approximately 13,000 people a year were admitted to government hospitals for acute pesticide poisoning, of which around 1,000 died. This would seem to suggest that Mellanby's estimation of world pesticide poisoning was indeed conservative, but the survey also revealed that only a small fraction of the Sri Lankan deaths were the result of the accidental ingestion of the chemicals. Some 73.1% of the patients were admitted after having attempted to commit suicide with the aid of pesticides. A distinction thus needs to be made between intentional and unintentional exposure to pesticides, to appreciate properly the norm that precautions should be taken to prevent poisonings.

TYPES OF POISONING

1. Intentional Exposure

Other surveys of pesticide poisonings backup the findings in Sri Lanka that the majority of cases are not accidental. A survey led by Jeyaratnam in 1987 found that Indonesia, Malaysia, and Thailand all had suicide levels at between 60 and 70% of the total cases of poisoning.[8] The WHO have suggested a figure of 2 million suicide attempts annually, of which 200,000 are successful, based on Jeyaratnam's work[9], but this clearly is highly hypothetical. It is likely however, that the frequency of this varies widely from country to country, according to cultural attitudes to suicide, and the general availability of the particularly lethal pesticides. In Malaysia, for instance, over 80% of the suicide attempts using the herbicide paraquat were made by Hindus, in contrast to only 5% by Malay Muslims. Islam officially forbids suicide and Indians make up the bulk of workers on plantations using paraquat.[10] The Pesticides Board of Malaysia were so alarmed by this phenomenon that they made the addition of a foul-smelling agent to paraquat compulsory, to try and deter its ingestion for suicide. The reduced availability of pesticides like paraquat to the general public in Third world countries would doubtless help reduce cases of their deliberate ingestion, but this kind of precaution does not equate with the norm we are considering here, namely that people should not be innocently poisoned through the use of pesticides.

2. Unintentional Exposure

Accidental poisoning from pesticides can occur in a number of ways. Indirect poisoning, via contaminated food and water is considered later as a separate issue, the focus here being on direct, accidental poisonings resulting from pesticide misuse.

a) *Occupational Exposure to Pesticides*

The principal victims of accidental pesticide poisoning are, predictably, the agricultural and public health workers involved in their application. Instances of this are highest in the underdeveloped world, where workers are often ignorant of the hazardous nature of their work, and management are often negligent in safeguarding the health of their employees. Many accounts from the Third World reveal cases of workers not being provided with protective clothing or washing facilities, whilst working with highly toxic chemicals.

Jeyaratnam's survey of pesticide poisoning in Sri Lanka, which as mentioned earlier revealed that 73% of all hospitalized cases were deliberate suicide attempts, also indicated that 69% of the remaining poisoning cases were of an occupational nature.[11] Copplestone considers this figure to be in line with the global pattern; "occupational exposure usually accounts for 60-70% of all accidental poisonings"[12] Included in this category of exposure are instances of workers being contaminated whilst mixing or spraying the chemicals, those entering fields after spraying, and those working in the formulation of pesticides.

Cases of occupational exposure in the Third World are not always well documented, but it is known that 2,800 workers spraying malathion were poisoned during a malaria control programme in Pakistan in 1976.[13] In this case inadequate safety measures were the primary cause of the poisoning (malathion is a relatively "safe" insecticide). In other cases this problem is exacerbated by the fact that the pesticides used are the particularly toxic chemicals outlawed or restricted in most developed countries. In addition to all of this, it should be appreciated that the susceptibility of Third World workers to pesticide exposure is higher than their developed world counterparts, owing to the higher temperatures in which they work, and the higher

levels of malnutrition and disease to which they are prone. It is widely accepted that occupational poisoning by pesticides can be greatly diminished once the trading of particularly hazardous chemicals is brought under control, and worker-safety standards in the developing countries are implemented at levels similar to those in the developed world.

> "In countries with reliable statistics it is evident that injuries to workers caused by pesticides are uncommon compared with those caused by working on farms with machinery or injuries caused by falls, lifting excessive weights or manual cultivation".[14]

Long-Term Health Effects -

Whilst acute[15] pesticide poisoning is largely prevented in the developed world, concern remains over the possible long-term health effects of prolonged exposure to pesticides by workers. Central to this concern are the possible cancer risks involved in exposure to particular chemicals. Many pesticides have proven carcinogenic in animal testing, and this has fuelled enough fear for some governments to restrict or ban chemicals principally on these grounds. The value of this form of testing however, is questioned by many scientists.

> "We can observe and measure an increased incidence of liver tumours in a population of laboratory rats ,exposed to 500 parts per million of a given pesticide in its food for a lifetime, but how do we use this information to assess the risk of cancer in humans exposed intermittently to 0.01 parts per million of the same pesticide in their drinking water".[16]

Whilst it does appear that the actual hazard posed by pesticides classified as carcinogenic to people working with them is far less straightforward than might at first be imagined, studies have shown higher cancer levels amongst such people. A link between occupational exposure to arsenical pesticides and lung cancer is convincingly shown in a study by Mabuchi, Lillenfield and Snell.[17] This sort of evidence also needs to be qualified however.

> "Epidemiological studies of pesticides for cancer risks are complicated by shortcomings in human exposure data, the multiplicity of pesticide exposures, changes in pesticide-use patterns, a rapid turnover of employees, and the latency of cancer."[18]

There is a case to be made for pesticides as a causal factor in cancer outbreaks, but as with many suspected causes of cancer, the case remains not proven. A major breakthrough for victims claiming compensation for cancer came in July 1992, however, when a UK out-of-court settlement awarded Mr. George Yates £90,000 after a number of doctors backed his claim that he had contracted soft-tissue sarcoma, after being exposed to dioxins whilst applying wood preservatives for ten years without sufficient protective clothing.[19]

Aside from their potential carcinogenicity, the other long term health fears associated with pesticides derive from the persistence of the organochlorine chemicals. Chemicals like DDT and dieldrin are known to possess "lipophilic" characteristics, meaning that they dissolve in fat more readily than water, and as such they are prone to be stored as residues in human tissue. The presence of these residues have been linked to a variety of health disorders. Fifty-seven cases of neurological disease are known to have resulted from exposure to the insecticide chlordecone by manufacturing workers in Virginia in 1975, and the symptoms persisted for over four years in some cases.[20] Other ailments which have been associated with organochlorine deposits in body fat include immune-system disorders and reproductive effects, but the evidence is generally not conclusive.[21]

The restrictions on the use of organochlorines in many countries, have not eliminated concern over long-term occupational exposure to pesticide chemicals. Organophosphate pesticides basically replaced organochlorines in British sheep-dips in the 1980's due to the worries over the persistence of the former types of

chemical, but instances of "dipping-flu" have become more common than ever. Farmers have long been known to suffer nausea and headaches after treating sheep (a practise which was legally binding until 1992), and in one case widespread paralysis followed the outbreak of such symptoms. Doctors have been unable to diagnose the cause of the paralysis, but the National Farmers Union has called for the whole question of sheep-dipping to be investigated.[22]

b) *Collateral Poisoning by Pesticides*

Pesticides applied conventionally on crops may occasionally affect people other than those employed in their application. The main way in which this can occur is as a result of the drifting of pesticides sprayed on agricultural land, over residential areas. The two principal ways in which the general public has been exposed to pesticides in this manner are by the drift of chemicals used in aerial spraying, and by the drift of vapour following the evaporation of chemicals after application.

The latter form of pesticide drifting was responsible for an outbreak of skin rashes, inflamed eyes, and wheezy chests in the village of Stretton-on-the Fosse in Warwickshire in 1982. A volatile herbicide used on a nearby farm evaporated in a spell of warm weather, several days after application, and settled as a gas cloud over the hollow in which the village is located.[23]

The spraying of residents with pesticides despatched aerially is a commonly recorded complaint in rural Britain[24], and has led to calls for a complete ban on this method of application. Considering that aerial spraying only accounts for around 2.3% of all pesticide applications in the U.K., this would seem to suggest that poisonings resulting from this practise are liable to be far more significant in the Third World, where aerial spraying is more common and generally less subject to regulation. As is the case with many aspects of the health impact of pesticides, the scale

of this problem is impossible to fathom owing to the difficulty of matching conclusively symptoms of poisoning with their causal factors. This is especially so if the effects are long-term. In addition their is a lack of data in the places where the problem is likely to be greatest, the underdeveloped world.

c) *Poisoning by Domestically Used Pesticides*

As was mentioned earlier, the BAA has defended the safety record of its members' products in the garden, by pointing out that fewer accidents requiring attention were attributable to pesticide chemicals than to either deckchairs or plant-pots. This convincing defence of the use of weedkillers, slug-pellets and the like is challenged, however, by the Pesticides Trust and others on the grounds that accidents known to result from pesticides are but the tip of the iceberg. This "iceberg", they propose, is predominantly composed of long-term ailments of the forms already mentioned, which can not decisively be attributed to the victims contact with a pesticide at some stage of their life.

Despite the growing popularity of "organic gardening" in Europe and North America, it is pertinent to remember that the household garden is by far the largest proportional recipient of pesticide chemicals. Dudley estimates that,"about a kilo. of pesticide active ingredient is applied to every acre of British garden, every year".[25] The National Academy of Sciences in the USA has shown that 4 to 8 times as much pesticide per acre is applied by homeowners as by farmers, and that this disparity is on the increase.[26] The very fact that such a density of toxic chemicals can be found in the place where families live, and in particular where children play, has widened the range of the concerns over the long-term health effects, from workers using pesticides to the whole population. Some parts of Florida, Pennsylvania, and Illinois already have bye-laws requiring

residents to notify neighbours before using chemical sprays on lawns or trees, and moves have been made in Congress to develop Federal legislation along these lines.[27]

The representatives of the pesticide industry respond to such public concern by reminding critics that products sold over the counter in garden-centres are much diluted versions of those sprayed over farmland. Since those chemicals used agriculturally are subject to rigorous testing in the industrialized world, as is outlined elsewhere in this chapter, it does seem fair to conclude that the general public need not be too alarmed about the toxicity of garden products, so long as they are used according to instructions and stored away from the reach of children.

An area of real concern over the question of garden pesticide use must still remain, however, with the alleged existence of a black-market in chemicals conducted through horticultural societies. "Garden News" reported on a garden society that had a £10,000 a year turnover on pesticides such as aldicarb, which is subject to rigid safety instructions when used agriculturally and classified II on the WHO Classification by Hazard scheme.[28] The potential existence of such trading merely serves to add further mist to the already murky area of pesticide poisoning.

Recent events in Europe suggest that the main focus of concern over domestically-used pesticides should not be in the garden at all, but rather in the family home. The possible health effects of various wood preservatives, used to prevent woodworm damage, have come to the fore in recent years. The British law firm Leigh, Day and Co. are known to have won settlements in around 60 cases for employees of firms specializing in timber treatments. Details of such settlements have been kept confidential, but one worker is known to have died of leukaemia, whilst others have suffered from a number of ailments ranging from wide-scale paralysis

and blood disorders, to milder flu-like symptoms.[29] The chemicals cited as responsible for causing such disablements are tributylin oxide (TBSO), pentachlorophenol (PCP), and lindane. These same chemicals have been used in wood preservatives intended for domestic use, and in 1991 the first British householders began suing preservative manufacturers for poisoning. TBTO and PCP have ceased to be used in the UK for wood-preserving products owing, respectively, to domestic legislation and an EC directive, but lindane continues to be licensed for use in British homes. A UK Government enquiry, carried out by the Advisory Committee on Pesticides, could find no link between lindane and apaplastic anaemia, as had been alleged by Leigh, Day & Co. on behalf of a Mr. William Gaskill.[30] In Germany, prosecutors have sued a wood preservative firm for chemical negligence on behalf of 50 people, who are amongst an estimated 200,000 sufferers from diseases linked to lindane, TBTO and PCP. The chief dilemma in these cases, as in all instances of pesticide poisoning, is actually proving the culpability of the chemicals for the disease above any other potential explanations.

c) *Poisoning Due to Industrial Accidents*

Accidental poisoning during the production and transport of pesticides can, of course, affect the health of the general public, in addition to those employed in the industry. This was made most dramatically evident at Bhopal, India on the 2nd of December 1984 when a gas leak at a plant formulating a chemical for use as a pesticide caused the worlds worst ever industrial accident.

The disaster at the Union Carbide plant in Bhopal does appear to have been the culmination of circumstances close to any "worst-case-scenario" imaginable for a chemical production site. The plant's end-product, the carbamate Carbaryl, also known as Sevin, is not particularly hazardous (category II of the WHO Classification by Hazard),

but the chemical methyl-isocyanate (MIC) which is used in its production is extremely toxic to man. As an intermediate chemical, however, MIC did not feature on the WHO,s Classification by Hazard and even failed to appear on UNEP's International Register of Potentially Toxic Chemicals. Indian authorities thus were completely unaware that the chemical was being stored.

On top of the fact that no one was really aware of the nature of a chemical used at the plant, it has since emerged that safety standards were also poor. One worker had been killed and three others injured by exposure to phosgene, another chemical used in the processing of MIC, in 1981 during Bhopal's first year as a manufacturing unit. (N.B. phosgene was one of the chemicals used on the battlefields of World War One). In the following year a visiting safety team from Union Carbide's headquarters in the USA described the plants MIC unit in an internal report as possessing, "serious potential for sizeable releases of toxic materials"[31] . Such concerns were echoed in the Indian press in a series of reports by local journalist Raj Kumar Keswani, culminating in an article for the Hindu periodical "Jansata" just six months prior to the accident. Investigations into the accident later found numerous examples of negligence which aided the tragic gas leak. A refrigeration unit used to maintain MIC at a lower and more stable temperature, had been switched off to save money, while temperature and pressure gauges were routinely ignored by workers because of their unreliability. When a leak was reported by workers, it is believed that a supervisor told them it would be dealt with after a tea break, in an hours time. There was no return to work after that teabreak however. [32]

Added to the ignorance as to the nature of MIC and the negligence over safety precautions at the plant, is a third factor accentuating the Bhopal tragedy. Bhopal is a poor city and many thousands of people lived in crowded slums

near to the Union Carbide plant. These people were powerless to protect themselves from the escaping fumes which spread over the ground (MIC is heavier than air). David Weir has pieced together eye-witness reports of the Bhopal tragedy to come up with a dramatic account of the night of December 2nd 1984.

> "Hundreds of thousands of residents were roused from their sleep, coughing and vomiting and wheezing. Their eyes burned and watered, many would be at least temporarily blinded. Most of those fortunate enough to have lived on upper floors or inside well-sealed buildings were spared. The rest, however, opened their doors onto the largest unplanned human exodus of the industrial age. Those able to board a bicycle, moped, bullock, car, bus, or vehicle of any kind did. But for most of the poor, their feet were the only form of transport available. Many dropped along the way, gasping for breath, choking on their own vomit and finally drowning in their own fluids. Families were separated; whole groups were wiped out *at* a time. Those strong enough to keep going ran 3,6 to 12 miles before they stopped. Most ran until they dropped".[33]

Estimates of the numbers of casualties vary, but it is believed that 200,000 people were exposed to the gas and 17,000 permanently disabled as a result. The immediate death toll could have been anywhere between two and eight thousand, as most of the victims were not formally recorded in any way, and the killing of entire families hindered any identification process. Long-term health effects include various breathing and digesting disorders along with birth defects and spontaneous abortions. After years of legal wrangling, Union Carbide USA and their Indian subsidiaries were finally made liable for prosecution in 1991, opening up the way for compensation payments to 500,000 people and for the setting up of a hospital in the city to deal with on-going ailments.

Bhopal- "Titanic" or "Iceberg"?

The Bhopal disaster, as we have seen, was a consequence of a set of particularly dire circumstances. As such it has

been evaluated by many within the chemical industry as a fluke, a one-off disaster unlikely to occur again. A speaker at the "Chemistry After Bhopal" conference in London in 1986 compared the disaster to the sinking of the Titanic, an undoubted tragedy but not justifying the abandonment of sea-travel.[34] Many sceptics of pesticide production safety however turn the Titanic analogy on its head, as they believe Bhopal, rather, represents the tip of an iceberg, with a vast number of smaller accidents lying submerged from public and political view. Weir, in his book *The Bhopal Synderome*, argues that the tragedy is continually repeated in "mini-Bhopals" and "slow-motion Bhopals"[35], in which unseen poisoning occurs. The determination to learn the lessons of the Bhopal tragedy, led to the setup of a "No-More Bhopals" network at a 1985 Nairobi conference on development. The network is organized by the Environmental Liaison Centre and the International Coalition for Development Action.

Whilst it is fair to consider Bhopal as a one-off accident in terms of its scale, many examples of "mini" and "slow-motion Bhopals" can be found. In 1976 over 500 kilogrammes of toxic vapour were released after an explosion at a chemical plant in Seveso, Northern Italy, after a build up of pressure. Trichlorphenol and dioxin TCDD, a constituent of the infamous "Agent Orange", pumped out to form a large cloud around the plant, although no acknowledgement of this was made to nearby villages for four days. Within three weeks pets and crops had died, thirty people were hospitalized with burns or liver pains, and one person had died. The principal health impacts at Seveso were long-term however, owing to the highly teratogenic nature of the released gases. Accurate medical records were not kept in the aftermath of the disaster, but a Dr. Alberto Columbi conducted research revealing that even by 1978 birth defects were at a rate of 53 per thousand in the areas around Seveso, compared to an average of below 5 per thousand in

the Lombardy region as a whole.[36] The Catholic Church became involved in the issue, when some women contaminated by the poison flouted Italian law and had abortions performed.

The fact that tragedies can occur outside the glare of the sort of media interest shown at Bhopal, is seen in the case of the P.T. Montrose DDT plant at Cicadas, Java. Suspicions that the plant had been secretly burning off waste at night were confirmed by an investigation, conducted by WALHI (Indonesian Environmental Forum) and KRAPP (Indonesian Network Against the Misuse of Pesticides), in 1985. It emerged that, over time, 25 villagers had been killed as a result of this action.[37]

e) *Man as the Pest-The Military Application of Herbicides*
A further means by which people have been poisoned by pesticides is as a result of their use by wartime enemies as defoliants. Investigations into the potential military applications of herbicides began in the USA in 1941, although stocks of 2,4,5-T and 2,4-D earmarked for use against the Japanese were never used during World War Two.

The British were the first to undertake such a strategy in the early 1950's during the Malayan emergency, when 2,4,5-T and 2,4-D were used to clear lines of communication and wipe out food crops in the struggle against the communist uprising.[38] ICI provided the technical advice for the British and Malayan governments, and in 1952 fire-engines spraying STCA and Trioxane, mixtures of the aforementioned herbicides, were sent along a number of key roads. After seven months, however, studies suggested that it was more effective, both economically and practically, to remove vegetation by hand and the spraying was stopped. In 1953 the use of herbicides as an aid to fighting the guerillas was restarted, as a means of destroying food crops grown by the communist forces in jungle clearings. Helicopters despatched STCA and Trioxane, along with pellets

of chlorophenyl n' n' dimenthyl urea onto crops such as sweet potatoes and maize.[39] Studies which highlighted the environmental and health damage resulting from similar spraying operations ten years later in Vietnam, have never taken place in Malaya.

The use of herbicides was far more widespread in Vietnam, with an estimated 17 million gallons of 2,4,5-T, 2,4-D, picloram, and cacodylate sprayed, in a variety of mixtures, on jungle foliage and enemy crops by the US Air Force between 1962 and 1971. American scientists have estimated that 10% of Vietnam's inland forests, 36% of her mangrove forests, and 3% of cultivated land have been affected by the programme codenamed "Operation Ranch Hand".[40] This scale of ecological disruption indirectly affected the health of the Vietnamese populus by reducing the quality of their nutritional intake and creating refugees, who were susceptible to disease, but most dramatic were the alleged cases of direct toxification by herbicides.

Dioxin, which arises as a contaminant in the manufacture of 2,4,5-T, is known to be extremely toxic to man. An estimated 170 kg. of this poison was sprayed over Vietnam and the neighbouring countries of Laos and Cambodia, amidst the applications of Agent Orange.[41] Dioxin, as has already been shown in the Seveso disaster, is believed to be teratogenic, hepatoxic, mutagenic, carcinogenic, a skin-irritant, and responsible for increasing cholesterol levels in blood. Many studies have linked instances of such symptoms amongst South Vietnamese residents and their offspring with the Agent Orange sprayings between 1962 and 1971. However, as is in the nature of toxicology, and particularly carcinogenicity and teratogenicity, proving what are the causal factors is extremely difficult, if not impossible. Numerous instances have come to light of spontaneous abortions and infant deformities in the last twenty years[42], but a conclusion from the "1983 International

Symposium on Herbicides and Defoliants in War" was that:

> "No study published to date seems to be conclusive in either proving or disproving an association of phenoxy herbicide / dioxin exposure with adverse outcomes of pregnancy in humans. "[43]

The evidence is more conclusive with regards to liver damage resulting from dioxin exposure. A paper from the same symposium found that:

> "Chronic hepatitis was more than ten times as prevalent among those subjects who had been directly exposed to military herbicides (more than a decade previously) than among those who had not"[44]

Whether or not Vietnamese birth deformities, liver damage or any other ailments can be attributed to "Operation Ranch Hand", no compensation has been forthcoming for any of the victims. The Cambodian government attempted to claim compensation for damage done to the Kompong Cham province during the American herbicide campaign, but the case dissolved with the overthrow of that government in 1970. The only people who have been compensated for illnesses attributable to "Operation Ranch Hand", are soldiers who fought on the same side as those responsible for the spraying. War veterans in the USA, Australia, and New Zealand, who have suffered subsequent skin and liver disorders or birth defects in their offspring, won a long battle for compensation in 1979, when a US Federal Judge ruled that they could sue the companies responsible for manufacturing Agent Orange, led by Dow Chemicals. Over 45,000 people have since claimed a share of the $180 million in damages from Dow and six other chemical firms. Dow agreed to the settlement in the face of public pressure and mounting legal costs, but have always maintained that the various illnesses incurred by the veterans are not related to the Agent Orange sprayed in Vietnam. Much scientific data does appear to support this view, and show that troops could not possibly have been exposed to levels of dioxin sufficient to cause any permanent damage.

> "A soldier directly sprayed would attain an internal body concentration of 7 X 10^{-5} microgrammes kg^{-1} or 1/1750 of the minimum toxic dose; soldiers moving through previously sprayed areas would ingest much less... the dioxin sprayed with Agent Orange in Vietnam cannot have caused systemic illnesses in Vietnam veterans or birth defects in their children".[45]

Despite the inconclusiveness of scientific data relating to Agent Orange exposure, the USA's defoliation campaign in Vietnam, Cambodia, and Laos was roundly condemned by America's scientific community and many international statesmen. Continued pressure by the "Herbicide Assessment Commission" (HAC), including a petition signed by 5,000 scientists (of whom 17 were holders of Nobel prizes), led to the termination campaign in 1971 amidst public horror at evidence of horrific birth defects occurring in the South Vietnamese population.[46] In 1972 at the UN Conference on the Human Environment at Stockholm, Swedish Prime-Minister Olaf Palme denounced the use of herbicides in war as "ecocide". Palme made no explicit reference to the American actions in Vietnam, but the implied criticism caused grave offence to the Nixon administration, who responded by withdrawing the US ambassador from Stockholm. Full diplomatic relations between the two countries were suspended for over a year (January 1973-May 1974).

The United States government had always considered herbicides (along with riot-control agents) to be outside the Geneva Protocol on Chemical and Biological Weapons, and hence considered that their actions in the Vietnam War were not contrary to international law. When the USA finally became signatory to the Protocol fifty years into its life in 1975, they did not refer to herbicides, but subsequent announcements have denounced their use as agents of warfare, except in routine situations (such as in clearing vegetation around US military base camps).

THE POLITICS OF PREVENTING HUMAN POISONING BY PESTICIDES

Whilst the extent to which pesticides affect human health is unclear, and subject to dispute between environmentalists and the chemical industry, the fact that the chemicals are potentially hazardous and that safety standards are needed to regulate their production and use is accepted by all. Most actors involved in the politics of pesticides, including governments, international organizations, and NGOs representing industry and environmentalists alike, have at some time proposed guidelines for pesticide production and use with the intention of safeguarding human health.

Governments

All national governments have some laws or guidelines concerned with the safety of workers dealing with pesticides, though of course these vary greatly both in terms of their scope and in the extent of their implementation. The United States has had pesticide legislation since the 1910 Insecticide Act, and today has probably the worlds most extensive regulatory system based around the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA). FIFRA basically amounts to a licensing system in which all persons involved in selling pesticides are compelled to register the chemical with the Environmental Protection Agency (EPA), an independent body responsible for ensuring registered pesticides have passed stringent safety standards. At the other end of the scale is Senegal where, despite the existence of a government commission designated to formulate pesticide laws, actual regulation is reported to be negligible. A report compiled by PAN and other environmentalist groups, coordinated by the Environment Liaison Centre, concluded that: "Essentially, no pesticide control exists in Senegal due to weak regulations for dealing with violations of the law".[47]

The world pattern for national pesticide regulation

roughly corresponds with the examples of the American and Senegalese systems, with developed countries possessing far tighter controls than their underdeveloped counterparts.[48] The far greater levels of human poisonings in the underdeveloped world are a reflection of this situation.

Pressure Groups

Pressure groups have been active on pesticide issues since the early 1950's, when concerns as to the growing resistance of insects to DDT and its possible effects on wildlife began to be aired by the International Union for Conservation of Nature and Natural Resources (IUCN), which was set up in 1948.[49] As has already been shown however, the real catalyst for political responses to pesticide matters was the publication of Rachel Carson's *Silent Spring* in 1962. Most concern over pesticides was at this stage concentrated on environmental side-effects of the sort articulated by Carson, and consequently they became the focus of American conservation groups, such as the Sierra Club and the National Wildlife Federation. The impact upon humans of pesticides was also considered by such groups, but this did not become the predominant pesticide issue until the effects of Operation Ranch Hand on Vietnamese citizens began to be seen in the late sixties. The work of the Herbicide Assessment Commission, an offshoot of the American Association for the Advancement of Science (AAAS), which led to the abandonment of Operation Ranch hand in 1971, also gave impetus to groups to act against the dangers of pesticides used in conventional settings.

Up until the 1980's, a variety of pressure groups lobbied industry, government, and international organisations over pesticide matters alongside other concerns. The Friends of the Earth (FoE), the International Organization of Consumer Unions (IOCU), and Oxfam were amongst the most prominent of NGOs to propose guidelines for pesticide use. Oxfam's 1982 publication, *A Growing Problem-*

Pesticides and the Third World Poor, explicitly set out safety standards it recommended governments, international agencies and the agrochemical industry to observe.[50]

The Pesticides Action Network

A May 1982 conference of NGOs addressing the issue of global pesticide trade at Penang, Malaysia finally brought about the creation of an international body dedicated solely to campaigning on pesticide issues, the Pesticides Action Network. The conference was co-hosted by the IOCU and the Malaysian branch of FoE (Sahabat Alam Malaysia), and these groups, along with OXFAM and many others agreed to coordinate efforts in a broad-based coalition, organized through six decentralized regional headquarters (Dakar, Nairobi, Penang, London, San Francisco, and Palmisra in Colombia). PAN naturally assumed the forefront of the world movement to regulate pesticide use and distribution, but from early on it supported the FAO's right to act as the international regime for these issues.

> "The Pesticide Action Network (PAN) International recognizes the pivotal role that the Food and Agricultural Organization (FAO) plays in formulating and promoting major advances in agricultural policies and practises around the world."[51]

PAN were very active in the instigation of the FAO Code of Conduct on the Distribution and Use of Pesticides (see later section), and from then on have fulfilled a "watchdog" role, monitoring its implementation and lobbying for new, more stringent provisions to be included.

Interest Groups

The chief sectional interest within the issue of pesticides and their health impact is clearly that of the chemicals manufacturers, which is represented by GIFAP. GIFAP has a permanent Toxicology Working Group (ToxWG), which regularly publishes guideline booklets and technical information derived from the work of ad hoc working parties. Sets of

guidelines exist outlining; safe uses of pesticides, protective clothing standards, and the safe transportation and storage of chemicals. These booklets generally come in four languages, and are worded simply in order for them to be easily understood by farmers and other agricultural workers. At the same time, GIFAP(ToxWG) is involved in assessing the toxicity of pesticides and producing technical papers to defend many products against contrary toxicological evidence. In 1991 for instance, much work was done by the group in refuting claims by the International Agency for Research on Cancer (IARC) that pesticide spraying constituted a serious cancer risk, and in countering the estimates of the WHO/UNEP Working Group on the Public Health Impact of Pesticides Used in Agriculture on the actual incidence of pesticides poisoning cases. The IARC indeed can be seen as another interest group within this issue, albeit with a far more limited focus of interest.

The Role of UN Agencies

The effects that pesticides can have on human health have also stimulated a number of UN bodies to produce guidelines, aiming to minimize poisoning incidence. The WHO, FAO, ILO, UNEP and even the World Bank have attempted, with varying levels of success, to establish internationally accepted standards for the regulation of this issue.

The World Health Organisation

The WHO has a long history of involvement in the issue of pesticides and their health impact, having begun its series of publications on the toxicity and specifications of particular chemicals in 1953, following the report of an Expert Committee on Insecticides. The WHO has continued to be a source of technical information for pesticide toxicity over the years, with its expert committees functioning as focal points for the epistemic community within the issue-system.

The Expert Committee on the Safe Use of Pesticides, for example, in 1973 devised the idea of a standard worker exposure protocol, with the intention of it becoming a definitive reference for those concerned with the safety of workers applying new organophosphorous pesticides, which were beginning to replace DDT. In 1975 the Standard Protocol was published in the guise of the "Survey of Exposure to Organophosphorous Pesticides in Agriculture". This document outlined the techniques which could be used to determine when levels of exposure to OP pesticides became hazardous, and included a variety of means by which pertinent medical data could be collected to assess the health of spraymen. In 1978 the Expert Committee on the Safe Use of Pesticides recommended an extension of the protocol to include other types of pesticide, and in 1982 a revised and updated protocol was published, applicable to all types of pesticides.

Undoubtedly the WHO's most influential work in the area of pesticide poisoning prevention is the Classification by Hazard scheme, which is today widely accepted as the authoritative guide to pesticide toxicity. The scheme was begun in 1975 after approval by the 28th World Health Assembly. The scheme was proposed in 1973 by the WHO Executive Board and prepared over the next two years on the basis of recommendations by the WHO Expert Advisory Panel on Insecticides. Full guidelines, classifying individual pesticides into four categories in terms of their potential hazard to man, were first published in 1978 and have continued to be periodically revised and re-issued over subsequent years.

The following table demonstrates how the four categories are arrived at. Both the oral and dermal toxicity of each pesticide are considered in the assessment, and account taken of the fact that solid formulations are inherently less hazardous than liquid. The LD_{50} figure is a

statistical representation of the amount of the pesticide per kilogram of body weight that is believed would kill 50% of rats in testing. In addition to these four classifications by hazard, the WHO publishes a fifth table of pesticides which in their estimation, "are unlikely to present any acute hazard in normal use".[52]

Hazard class		LD_{50} (rat) (mg/kg of body weight)[a]			
		Oral		Dermal	
		Solid[b]	Liquid[b]	Solid[b]	Liquid[b]
Ia	Extremely hazardous	5 or less	20 or less	10 or less	40 or less
Ib	Highly hazardous	5–50	20–200	10–100	40–400
II	Moderately hazardous	50–500	200–2000	100–1000	400–4000
III	Slightly hazardous	over 500	over 2000	over 1000	over 4000

[a] A dosage of 5 mg/kg of body weight is equal to a few drops ingested or a splash in the eye. 5–50 mg/kg of body weight equals up to one teaspoonful, and 50–500 mg/kg of body weight corresponds to up to two tablespoonfuls.
[b] The terms "solid" and "liquid" refer to the physical state of the product or formulation being classified.

Fig.4. *WHO Classification of Pesticides according to degree of hazard to human beings*[53]

The WHO Recommendation does not specify any symbols for use in labelling pesticides according to their hazard classification, implying that they envisage their role

within the issue-system of pesticide poisoning as principally epistemic, and that the functions of regulating the issue and implementing any rules lie elsewhere. The scheme has been accepted by most of the relevant actors however, and in many cases used as the basis for regulations with legal effect. The EC's 1978 Classification, Packaging, and Labelling of Dangerous Preparations (Pesticides) Directive was based on the WHO classification scheme, and formally implemented in 1985. The EC classification has only three categories rather than four, "very toxic", "toxic", and "harmful", but these are almost identical with the WHO's categories Ia, Ib, and II. The United Kingdom's "Pesticides Safety Precautions Scheme" adopted in 1983 follows the EC directive, and hence also follows the WHO classification. Some countries have adopted the WHO classifications, but placed some pesticides in a different category, on the basis of their own research and experiences. Malaysia, for example, classifies paraquat as "highly hazardous" rather than "moderately hazardous", probably as a consequence of the popularity of this chemical as a means of committing suicide.

The WHO and EC classification schemes are widely accepted around the world, but a number of states do employ their own, distinct schemes. The USA, Bulgaria, Brazil, Canada, and Japan for instance, operate different numbers of categories, different testing procedures, and/or place different emphasis on the distinctions between dermal and oral toxicity or between liquid and solid pesticides.[54] The Canadian system, in particular, is unique in that pesticides are classified according to their intended use, as well as by their toxicity. All pesticides, regardless of their toxicity, receive a "restricted" classification, if they are intended for use in environmentally sensitive locations such as forests, or around lakes and rivers. On top of this, provincial governments in Canada can apply their own versions of the federal classification scheme.

The International Programme on Chemical Safety

From 1980, the work of the WHO on the safety aspects of pesticides has been channelled through the International Programme on Chemical Safety (IPCS). The IPCS arose out of the collaboration of the WHO, the International Labour Organisation (ILO), and UNEP, when it became apparent to them that areas of their work overlapped. The WHO's regional office in Europe had from the 1970's been researching the area of preventing accidents involving toxic chemicals, whilst the ILO was devising an alert system to aid occupational safety. Both of these operations saw the advantage of absorbing the work of UNEP's International Register of Potentially Toxic Chemicals (IRPTC), and the IPCS was born.

The IPCS clearly sees its role as epistemic, defining itself as; "providing the internationally evaluated scientific basis on which Member States may develop their own safety measures".[55] The WHO is the "executing agency for the programme"[56], and the Central Unit of the IPCS, responsible for day-to-day activity, is located in the Division of Environmental Health, in Geneva. Membership of the programme is open to both states and NGOs. There are 27 countries represented in the programme, sometimes through designated national agencies, and also two international institutions, UNEP's IRPTC and the IARC (International Agency for Research in Cancer). The IPCS's budget of around $9 million biennially is 20% derived from the WHO's regular budget, with the rest coming from voluntary donations by UNEP and the member states.[57]

The WHO had already been cooperating with UNEP on the "Environmental Health Criteria" (EHC) programme since 1973, producing a series of documents on the health and environmental impact of individual pesticides, and in 1980 this was brought under the IPCS umbrella. The EHC programme forms a central part of the IPCS. WHO task groups regularly

meet in a variety of locations to consider particular chemicals and produce a report. One of the group acts as a chairman, a secretariat is made up of IPCS staff and civil servants from the host country, and observers are usually present, including a GIFAP representative. Other output from the IPCS include Health and Safety Guides, International Chemical Safety Cards, and poisons information monographs. The 1992 United Nations Conference on the Environment and Development (UNCED) boosted the role of the IPCS by prescribing it the central role in its proposal for an intergovernmental mechanism to coordinate chemical risk assessment and management. The proposal also advocated that the FAO and OECD Chemicals Programme be involved in the IPCS.[58]

Other Agency Involvement

a) UNEP- Aside from their role within the IPCS, UNEP also independently operates the IRPTC which participates in that programme. The IRPTC represents another input into the complex epistemic community that is concerned with the "wider-issue" of human poisoning by chemicals, of which the issue of pesticide poisoning forms a part. IRPTC provides an international source of knowledge on the potential hazards of chemicals, utilized by other UN agencies and states. It has adopted a more regulatory orientated stance on the issue of chemical trading, which will be examined in the later chapter on the trade in pesticides.

b) World Bank- In 1985 the World Bank announced a set of guidelines aiming to avert any damage to human health or the environment from pesticides when used in development projects funded by the bank. The guidelines were drawn up with the assistance of the United States Agency for International Development (USAID), and in general give support to the work of the FAO and WHO on the issue of pesticide poisoning. The guidelines call for adherence to FAO guidelines on "Good Labelling Practise", and for the WHO

Classification by Hazard scheme to be the benchmark in the choice of appropriate pesticides for a project.

The F.A.O.'s Code of Conduct

Whilst the roles of the WHO and the IPCS can be summarized as basically epistemic, the FAO can be seen as having taken the initiative in terms of regulation-setting, with its "Code of Conduct on the Use and Distribution of Pesticides". This broad document aims to establish international standards for pesticide safety and trade, by which governments and companies may be judged.

> "The code is designed to be used ... as a basis whereby... any citizens concerned may judge whether their proposed actions and the actions of others constitute acceptable practises".[59] (Article 1.6).

The code was drawn up after the "FAO Second Government Consultation on International Harmonization of Pesticide Registration Requirements" in Rome in 1982, which formally endorsed a working paper of the FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards. This action represented a response by the FAO to NGO pressure for action to be taken on the issue of human poisoning by pesticides. David Bull of OXFAM was even given the task of drawing up an initial list of proposals for the code.[60] The consultation called upon the FAO to draw up an appropriate code in consultation with other UN agencies and relevant international bodies.

The code basically aspires to regulate the issues of both human pesticide poisoning and international pesticide trade. The provisions dealing with trade are considered in Chapter Seven, as this issue, while clearly interlinked with that of safety, involves different questions and different stakes for the actors concerned. Regulating the export of the more hazardous pesticide formulations will of course contribute to the goal of minimizing human poisoning, but ultimately that goal is only achievable by the domestic

implementation of measures to ensure the safe use of such products. This is explicitly recognized in Article 3 of the code. "Governments have the overall responsibility and should take the specific powers to regulate the distribution and use of pesticides in their countries". (Art. 3.1).[61]

Articles 4, 5, 6, 7, 10, and 11 are of particular relevance to the issue of minimizing human poisoning by pesticides. Article 4 calls on the agrochemical industry to ensure that all products have been satisfactorily tested in accordance with "good laboratory practise"[62], before being made available. Reports of these tests should be granted to any government authorities of the country where they are sold, if requested. Articles 5 and 6 request that governments should implement a registration scheme for pesticides, based upon the "FAO Guidelines for the Registration and Control of Pesticides". Article 7 further recommends that governments ought to develop these schemes in accordance with the WHO's Classification by Hazard categories.

The agrochemical industry, both in the guise of GIFAP and the separate companies, does regularly test products for toxicity and as we have seen GIFAP position papers are available on request. The industry does also, in principle, support the notion of national registration schemes meeting international standards. GIFAP has long campaigned for this, although their motivations are somewhat different from those which drove the FAO to include this provision in the Code. GIFAP's interest in harmonizing registration schemes is based on cutting costs for pesticide manufacturers.

> "In similar markets, absence of harmonisation frequently represents a considerable cost factor. A small local formulator or manufacturer, for example, could find himself faced with a government requirement to carry out a test on a product which no other government requires - and such tests are rarely inexpensive."[63]

Surveys suggest that all states do possess registration schemes, proscribing the domestic uses of certain pesticides on the basis of toxicity testings. These schemes differ greatly in rigour and style, as was highlighted in the previous examples contrasting American and Senegalese legislation, and the variations from the WHO scheme in classifying pesticides by hazard. The FAO Code of Conduct has as its goal the levelling-up of national regulation standards, and whilst the interests of industry do not coincide with stringent restrictions, it does have a stake in the closer approximation of standards, producing something of an international consensus on the issue. GIFAP was very active in promoting harmonization at the 1977 and 1982 Consultations on International Harmonization of Pesticide Requirements, the second of which spawned the FAO Code of Conduct. Governments, at the two international consultations and elsewhere, have tended to have little sympathy with the agrochemical industry's appeal against "non-tariff barriers" created by independent registration schemes. The consultations did not greatly advance the harmonization of national registration schemes. Governments reaffirmed the feeling that setting their own standards for testing and registering pesticides was a facet of their sovereign rights, in spite of industry appeals that harmonisation was a "a prerequisite for solving the worlds food problem".[64]

The one striking exception of countries agreeing to bring their registration policies closer together comes predictably from the part of the world where national sovereignty has been most eroded or "pooled", Western Europe. The first set of guidelines for pesticide registration to be produced, with the idea of developing international consensus, came from the Council of Europe in 1962. This set of guidelines was derived from a 1959 agreement which set up a Public Health Committee, whose task it was to investigate questions related to hazardous

chemicals.[65] The European Community followed the example of its largely ineffective counterpart institution, and in 1978 produced the Directive for Common Registration of Agrochemicals. After extensive debate between member states on the familiar lines of sovereignty versus common interests, the directive was finally approved by the Council of Ministers in August 1991.[66] By 1993 the twelve member states of the EC were supposed to have adjusted their national laws and implemented a common registration scheme. A follow up "Uniform Principles" directive introduced in August 1992 aimed to standardise the testing and evaluation of pesticides whilst taking into account variations in climate and agriculture throughout the community.[67] By August 1993 a "Positive List" of plant protection chemicals was intended to be in existence, common to all EC states.

Alongside registration, the key means by which safety measures for those producing or using pesticides can be implemented is through the standardisation of labelling and advertising information for the chemicals. Article 10 of the FAO Code of Conduct clearly spells out a set of acceptable standards for the labelling of pesticide containers. Producers are called upon to ensure that instructions for using the product are in an appropriate language, give the storage life of the chemical, show how to dispose of it safely, warn against reuse of the container, and most importantly display the "hazard classification" of the pesticide as defined by the WHO. Article 11 deals with advertising practises, charging companies with the responsibility for ensuring that; any claims made for a product can be properly validated, any pictures used show full safety precautions being observed, and that advertisements should not be made for restricted products without clearly stressing that they are restricted.

GIFAP and the agrochemical firms claim that these FAO code provisions are being implemented on their behalf, but

the verdict of a report by the Environment Liaison Centre (ELC) in Nairobi, from where PAN operates in East Africa, is that the code has had little impact on safety standards in the Third World. The ELC report collects evidence from twelve Third World countries and gives numerous examples of pesticides being repackaged into new containers without warning labels once imported, and highlights the fact that the labels frequently are ignored, because of illiteracy. In this instance it seems that the problem lies not in the agrochemical industry failing to observe the FAO guidelines, but in the guidelines themselves not being sufficient to counter the problem. In the case of advertising practises, however, the evidence does point an accusing finger at the agrochemical industry.

> "In the mass of advertisements and promotional leaflets collected in Latin America, Africa, Asia and the Pacific, it is virtually impossible to find a single one which satisfactorily follows the provisions of the FAO code."[66]

Code Article		Number	%
	Promotion material surveyed	45	100.0
11.1.13	No warning about hazards/symbols	30	66.7
	No manufacturers name	11	24.4
11.1.11	Guarantees profits	18	40.0
11.1.1, 11.1.7	Claims of efficacy without validation	25	55.6
11.1.12	Dangerous practises shown	10	22.2
11.1.17	No reference to the need to read labels	14	37.0
11.1.2, 11.1.8	Invalid safety claims	9	20.0

Fig.5. *Advertising Infringements of the FAO Code in Ecuador (1987)* [65]

The report provides examples of pesticides classified by the WHO as "highly hazardous" being advertised as "safe for human beings", and photographs of people demonstrating spraying techniques without wearing protective clothing. An overt example of such an advertisement is probably a photograph used by the Solo Technology Company of Germany depicting two scantily clad models smiling gleefully whilst carrying spraying equipment.

A further provision related to the issue of limiting human poisoning by pesticides, is found under Article 8.1.9 of the code, which calls on industry to ensure that, "persons involved in the sale of any pesticides are trained adequately to ensure that they are capable of providing the buyer with advice on safe and efficient use". GIFAP itself admits that the agrochemical industry has failed to comply with this provision."Detailed observations in various developing countries have revealed however that we continue to fall far short of the standards of the FAO Code of Conduct".[70]

It seems fair to conclude that the pesticide industry has failed to observe the FAO code on a number of occasions with respect to advertising, but it should be acknowledged that it has generally fulfilled its obligations in terms of correctly labelling its products for export. Whereas pressure has been maintained on the industry to improve its advertising standards, the focus in terms of the labelling problem has been to develop a new, more stringent set of guidelines. A worldwide campaign towards this end was begun on the 12th May 1991 by eleven pressure groups, aiming at international promotion via the WHO rather than the FAO.

CONCLUSION- A Regime?

It has been established that there is sufficient consensus amongst actors on the importance of safeguarding human health from pesticide poisoning for this to constitute an international norm, but is it possible to conclude that an international regime exists within the issue-system? The chief aspirant to this role is clearly the FAO with its Code of Conduct on the Use and Distribution of Pesticides. Chapter Seven will detail how other provisions of this code eventually became the basis of a regime regulating the issue of the international trade in pesticides, but its impact on the issue of human poisoning is less dramatic. Registration schemes still vary greatly in scope throughout the world, with many states falling well below the standards promoted by the FAO. Advertising practises continue to flout the code's recommendations, and the industry admits that it has failed to observe the provisions on training pesticide salesmen. The Code's labelling provisions have had an impact on industry behaviour, but have proved so inadequate in curbing the problem of poisonings in the Third World that they have not gained the respect of many of the salient actors.

Thus it seems that the FAO's Code of Conduct provisions relating to the issue of human poisoning by pesticides, have not developed to a status whereby they are universally accepted as rules. The key factor in this failure was the rejection of the Code's labelling provisions in 1991 by the pesticides protest lobby for being too lenient. Up until this point there had been consensus amongst the actors in the issue-system that the FAO Code was the focal point for rule-formulation, even if those rules were not being widely implemented. GIFAP continues to treat the FAO as the legitimate source of decision-making within the issue, but this view is no longer shared by all actors.

The epistemic community, centred on the WHO, has attained a widely respected position within the issue-system, as is evidenced by the worldwide impact of the Classification by Hazard scheme and the fact that the pesticide protest lobby turned to the WHO for leadership in its campaign to develop new pesticide labelling standards. However, this epistemic community, as we have seen, does not aspire to regime status and has continually abdicated rule-setting and implementation to others. In effect, the question of preventing human poisoning by pesticides has been transformed from being an issue regulated by an ineffective regime towards becoming an issue without a regime at all. The recurrent problem within pesticide politics is at the heart of this. There is sufficient consensus for a norm to exist amongst actors, but their divergent interests have so far prevented the development from this of specific rules that are acknowledged by all and have behavioural effect.

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Chapter 5

WHEN A WEAPON MISSES THE TARGET

The Issue of Environmental Pollution by Pesticides

INTRODUCTION

The fact that all pesticides are by their nature toxic substances means that any contamination of unintended targets with them is potentially hazardous, and so undesirable. Thus the prevention of environmental pollution by pesticides has become an undisputable norm of conduct, guiding the behaviour of all actors. Once again, however, it can be seen that there are different levels of adherence to this norm. To some actors, the evidence of environmental damage due to pesticide use is enough to warrant the outright abolition of their use in any capacity, whereas others merely wish to see them used with some consideration for their ecological consequences. The basic premise that environmental pollution from pesticides is a negative consequence of their use and should be limited, does however represent a universal norm by which all are guided to some extent.

As with human poisoning, the actual extent of pollution by pesticides is unclear and disputed by scientists and political actors alike. Traces of pesticides can be found in the soil, in the water, in the air, and in unintended crops and animals, but there is little consensus as to when this equates to pollution at a level at which we should be concerned.

FORMS OF PESTICIDE POLLUTION

1. Pesticides in the Soil

The soil is the principle recipient of pesticides, the source of which may be deliberate or accidental. The direct application of pesticides to the soil is a common practise in agriculture, particularly in the use of herbicides. It has been estimated that 25% of all agricultural land in the USA is treated with pesticides in this way, every year.[1]

In addition to this however, a significant amount of pesticides continually enter the soil unintentionally due to the drifting of these chemicals when sprayed and their fallout from the atmosphere. Unlike with the intentional entry of pesticides into the soil, this source is indiscriminate and affects a much wider land area, including areas where their presence may be wholly undesirable. Much of the pesticides intended for crop application clearly will miss their target or run off the plants into the soil beneath. A report by Beasley, Rohrbach, Mainland and Meyer in 1983 demonstrated that around 65% of an insecticide spray used on blueberry bushes found its way into the soil.[2] To this can also be added the entrance of pesticides into the soil from crop residues, leaf fall and root deposits. A less voluminous but more widespread source of pesticides which enter the soil is by atmospheric fallout. Small amounts of pesticides have been detected in raindrops and atmospheric dust, which are absorbed into the soil on reaching the ground.

A number of possible fates await a pesticidal chemical on entering the soil.

> "Once in the soil, pesticides can be absorbed onto soil particles, chemically bonded to other compounds in the soil, volatilized from the soil surface into the atmosphere, moved through the soil by molecular diffusion, leached or run off into water, taken up by plant roots or ingested by soil fauna (thus entering the food chain), or degraded."[3]

Whether the presence of a pesticide in the soil constitutes an environmental problem or not depends somewhat on the length of its persistence. A quickly degrading pesticide will not be likely to disrupt the ecosystem greatly, but a highly persistent chemical may have biological effects beyond the period of its usefulness. A GIFAP report has identified four types of such biological effects which could be environmentally damaging. These effects concern the capacity of chemical residues to ; i) survive long enough to affect succeeding crops, ii) effect soil organisms, iii) leach into water used for human consumption, and iv) cause long-term damage to soil fertility.

The effects of residues on living organisms can be summarized into four categories. They may; a) be directly toxic, b) cause genetic resistance, c) be passed on to other organisms, or d) have sub-lethal effects on behaviour or reproduction.[4]

2. Pesticides in Water

As with the soil, pesticides may enter water sources either deliberately or accidently, although instances of the former are far fewer. Relatively tiny amounts of pesticides are applied to streams, ponds, and reservoirs in order to protect fish, attack weeds and algae, and control insects which breed in water. These sorts of practises are generally restricted in the West by firm legislation. In the U.K. for example, the local water authority are required to be contacted before any spraying operations in or around freshwater areas can be undertaken. In the Third World however, the deliberate adding of pesticides to freshwater is more common and often more haphazard. The use of pesticides for fishing has been reported on a number of occasions. Bull found it to be a common practise in Ghana.

> "The fishermen or farmers then use the insecticides by pouring them into the water of small shallow streams, following the flow downstream until the fish begin

floating to the surface."[5]

The unintentional contamination of groundwater remains the more serious problem however. Pesticide residues can enter water through drift and atmospheric fallout in the same way as they do the soil, but also in a number of other ways. Chemicals in soil may enter nearby water through runoff or be carried there with eroded soil particles. Pesticides also may make up some of the industrial effluent regularly pumped into streams and rivers. This could be the wastes from fabric plants practising moth-proofing or from the manufacturing, formulating, and packaging stages of production in an agrochemical firm. Similarly, sewage will often contain pesticide traces such as the bactericides found in some soap and cosmetic products.

On top of this, spills of pesticides into rivers have been known during the storage and transportation of the chemicals. Hundreds of tonnes of pesticides and other chemicals were washed into the Rhine at a Sandoz warehouse in Basle, Switzerland in November 1986, after a fire was brought under control with hoses. Similarly, the derailing of a railway tanker in California in July 1991 caused severe contamination of the Sacremento River, which runs alongside the rail line. This river feeds the local water supply at Lake Shasta and as a consequence nearly 200 residents of the area required immediate hospital treatment for nausea and dizziness.[6] Animals may also suffer in this way if pesticides contaminate their drinking water. OXFAM reported on such an incident in Bangladesh in 1981 when the runoff of pesticides from waterlogged bogland caused hundreds of cattle deaths.[7]

The effects of a cumulative input of pesticides into groundwater can also be lethal to the organisms which inhabit there. An increase in the mortality of bacteria, fungi, algae, aquatic invertebrates, amphibians, reptiles or fish will disrupt the food webs which exist between them and

therefore upset the ecosystem in operation there. The fact that pesticides concentrate in the tissues of aquatic organisms more readily than in terrestrial life forms exacerbates this problem.[8] Of most concern to man is the effect on some fish populations through such pollution, either by direct poisoning or indirectly due to a depletion of their traditional prey. Large scale declines in the numbers of paddy field fish in Malaysia in the early 1980's due to a mysterious disease termed as "wabak kurdis" (scabies epidemic) was found to be directly attributable to the increased use of pesticides on rice plants.[9] Any precise estimate of overall losses of fish due to pesticide poisoning is difficult because of the nature of marine habitats.

The presence of pesticides in groundwater can also have sub-lethal effects on aquatic life. The raising of the water temperature due to pesticide presence, or the entry of the chemicals into fish brains or nervous system, can impact the behaviour and reproductive capacities of them.[10] The most serious consequence of this behavioural change occurs when a species of fish develops a resistance to the pesticide it has been exposed to. When this happens, these fish become capable of carrying once lethal amounts of chemicals within themselves, which can then be passed on to the next organism in the food web. As a result of this traces of pesticides have even been found in polar bears.[11] Of course, the next organism in the food web could also be man.

3. Pesticides in the Air

Pesticide droplets have been detected in the atmosphere over most parts of the globe. Clearly therefore, they are capable of falling to earth many miles from the areas where they were originally intended to be applied.

Pesticide vapours enter the atmosphere in many ways. A significant proportion of pesticides may be lost during

spraying, through drifting in the wind, or evaporation. A 1978 Canadian survey found that up to 35% of the herbicide 2,4-D volatized on application to prairie soils.[12] Volatilization can also take place on secondary deposits of pesticides. Some particularly persistent substances, such as DDT and dieldrin, remain long enough as surface residues after falling with rain that they are subject to evaporation again. Other routes by which pesticides enter the atmosphere include the escape of vapours from pesticide manufacture and formulation plants, and the introduction of residues within dust storms originating in agricultural areas.[13]

Though the density of pesticides which fall to earth from the air are far less of a hazard to man and the environment than the pollution of soil and water, concern remains at the build up of toxic vapours in the atmosphere. Wheatley estimated that 1/6th of all DDT produced up until 1974 was contained in the atmosphere.[14] The extent of this contamination has decreased over the years however, with the decline in the use of DDT and the use instead of less persistent chemicals.

A different form of environmental hazard due to the existence of certain pesticides has emerged in recent years. The soil fumigant methyl bromide was in 1992 confirmed as a significant agent in the depletion of the ozone layer. A UNEP report concluded that around half of all methyl bromide applications to the soil are ultimately emitted into the atmosphere, and that once there their capacity for ozone destruction are at least thirty times greater than that of organochlorine compounds, such as the infamous "CFCs" (chloro-fluro-carbons). The report estimated that between five and ten percent of annual global ozone depletion was attributable to methyl bromide.[15]

4. Pesticides and Wildlife

The effects that the presence of pesticides in water can have on aquatic organisms has been considered, but many other forms of wildlife can also be affected by exposure to these chemicals. A 1983 UK Ministry of Agriculture, Fisheries and Forestry "Approved Products for Farmers List" stated that the proportions of pesticides which are "harmful" or "dangerous" are; 88% for fish, 46% for bees, 43% for livestock, and 42% for wildlife and game. In developing countries, where broad spectrum pesticides are still widely favoured to the more pest-specific varieties, because of their comparative cheapness, these proportions will undoubtedly be higher.

Insects, birds, mammals and plants may become contaminated with pesticides directly on spraying, through the soil or water, or by directly or indirectly consuming them in food. In the UK, MAFF have a policy of warning all farmers intending to use herbicides about the potential ill-effects on neighbouring "susceptible" crops. One such susceptible crop is believed to be the wild rose found in rural hedgerows, whose numbers have rapidly declined as a result of spraydrift from various herbicides.[16] The technique of spraying pesticide droplets contained within minute plastic spheres, known as "microcapsules", is known to have had dire consequences for bees. The capsules attach themselves to hairs on the bee in the same way as pollen does, and can then be taken into the hive and possibly eaten. The realization of this problem has led to the addition of latex to the capsules in the USA, reducing the likelihood of their take-up by bees.[17]

Pesticide residues in the soil can directly poison the organisms which inhabit there, or indirectly poison the organisms feeding on them. The effects on organisms within the soil have been well researched, as this obviously has repercussions for the quality of the soil and its role in

crop production. The general conclusion of most research is that the effects of pesticides on soil organisms are usually short-lived and that populations will return to normal quickly after a decrease. One exception to this is the persistent insecticide dieldrin, which has been used to control termites and beetle larvae for numerous seasons at a time. Beneficial soil arthropods have been unintentionally reduced in number for long periods by the application of this chemical to the soil.[18] The decreased usage of persistent organochlorine pesticides in the developed world has minimized the hazards to soil habitats, but the problem persists in the Third World.

The greatest route by which wildlife come into contact with pesticides is through the contamination of their food sources. It may be the case that the effects of pesticides on soil-inhabiting organisms are limited, but the impact on some predators of these organisms can be far more profound. Birds are far more subject to taking in pesticide residues in this way as their bodies break down harmful chemicals less readily than do mammals. The birds most vulnerable are those at the top of the food chains, the birds of prey. Persistent chemicals such as DDT and dieldrin end up deposited in these creatures via small birds who feed upon contaminated insects in the soil. The birds of prey are left with the biggest deposits from having accumulated the toxic residues of all organisms below them in the food chain. This process is known as biomagnification. In the UK the sparrowhawk ceased to be resident for 25 years because of direct poisoning from their prey and the thinning of their eggshells due to pesticides. The bird began to reestablish itself in the late 1970's once the residues of organochlorine pesticides used in the 1950's had finally began to disappear.

Birds are also prone to a more direct poisoning by organochlorine pesticides when feeding on treated seeds, or

when their habitats become contaminated. Aldrin and dieldrin were widely used in the UK in the late 1950's and 60's as a seed treatment to protect cereal grains from insects, and it is now widely accepted that this contributed to the temporary extinction of sparrowhawks and a decline in kestrels generally. The lethal component of aldrin and dieldrin for the kestrels is the chemical HEOD. A 1992 report from the Institute of Terrestrial Ecology reviewing this subject concluded that:

> "In the period 1963-75, HEOD probably accounted for about 50% of all recorded Sparrowhawk deaths and 39% of all recorded kestrel deaths in eastern arable districts".[19]

The higher mortality rate in the east of England is explained by the more intensive use of dieldrin and aldrin in this area, while further evidence of the culpability of these pesticides comes from the resurgence of kestrels when they began to be restricted by legislation.

> "The proportion of deaths attributed to HEOD declined between 1963-75 and 1976-86, following a marked reduction in aldrin-dieldrin use, and fell to nil in 1987-90, when aldrin and dieldrin were withdrawn altogether."[20]

The fact that the hawks were contaminated via seeds as well as through biomagnification was borne out by the sight of dead birds around recently sewn fields in the early 1960's. The RSPB have also reported deaths of geese and swans in the east of England due to the consumption of treated wheat grain.[21]

The spraying of a bird's habitat, a practise common in the control of vector-borne diseases, has also been shown to affect their mortality. Woodland areas treated with pesticides with the intention of controlling disease-transmitting insects, can cause local bird populations to suffer poisonings. Surveys in north-western Zimbabwe have demonstrated this to be a side-effect of the use of DDT to

control tsetse-flies in operations to restrict the spread of trypanosomiasis in cattle. A comparison between areas of treated and untreated woodland showed up a considerable impact by DDT on chat songbirds.

> "In the 1987-89 treatment area, numbers fell by 88% over 33 months... Numbers in the unsprayed area fell by 13% over the same period... In a second study area, a further treatment of DDT one year after the first, was followed by a 74% decline in numbers over nine months".[22]

Physiological explanations have been offered to explain the fact that birds, and falcons in particular, appear to be far more susceptible to pesticide poisoning than other animals. A link between DDT and the thinning of egg-shells is well documented, and this problem has been shown to be most acute amongst falcons. Also, the fact that organochlorines are highly lipophilic gives credence to the theory that they assume greater toxicity in falcons and migratory birds, because these creatures tend to "burn off" more stored fat than other birds and animals owing to their lifestyle, which allows the pesticide residue to enter the nervous system.[23]

The evidence of pesticides affecting other animals is less conclusive. As with human health, the impact of organochlorines and other pesticides on mammals in normal exposure situations tends to be minimal. The carcinogenicity, teratogenicity, and mutagenicity of pesticides to rats in laboratory experiments has only been proven on the exposure of the creatures to amounts of the substances far in excess of natural encounters. Two cited exceptions to this general pattern for mammals however, are that of the bat and the mink.[24]

5. Pesticides and Crop Losses

Pesticides may also be responsible for damaging farm crops when the chemicals become volatile, or unintentionally come into contact with crops other than those they are intended

to protect. The drift of vapour from neighbouring crop fields, the effects of herbicide residues which have remained in the soil after application on a different crop in a previous season, or changes in the nature of the pesticide due to the climate can all be causes of crop losses.

In the UK, a Norfolk farmer in 1990 turned down an offer of £48,000 compensation from Du Pont after his sugar beet crop had been destroyed as a result of persistent residues of the sulfonylurea chemical "Ally", which had been used on preceding cereal crops. The farmer turned down the offer of compensation because of a "confidentiality clause" and took legal action against Du Pont, whilst Friends of the Earth and the National Farmers Union lobbied the government for action to provide farmers with greater information on the problem of persistent herbicides.[25]

In 1992 American farmers in Florida suffered great losses in vegetables such as cucumbers and broccoli apparently because the Du Pont fungicide "Benlate" (benomyl) had turned poisonous due to heat and humidity.[26] The fact that pesticides can become volatile in the face of high temperatures obviously has significant implications for Third World importers, though the extent of this problem is unclear. Pimentel has estimated that the cost of negative pesticide effects on crops in the USA is about $70 million a year.[27]

Summary

It can be proven that pesticides sometimes pollute the environment and poison the organisms that inhabit it, but the overall significance of this to the natural world is still open to debate. The influence of pesticides is one of many inputs determining the balance of nature, alongside far less contentious human practises such as building reservoirs and dams or fishing.

> "Nature is not static and ... the balance of nature is a shifting one, the result of countless influences and an endless struggle among the inhabitants of any particular community. Pesticides add elements to the struggle and, at least temporarily, shift the balance. Whether this results in a better or worse environment cannot be determined until we learn what better or worse means. The concept that any change is bad can be embraced only if we assume that evolution has, in 1979, finally reached an optimum stage for all".[28]

Whilst the wholesale contamination of the environment by care-free pesticide application is clearly undesirable, minor changes to an ecosystem need not necessarily be viewed as ecologically damaging, especially if the net result includes something like saving a forest from insect destruction.

THE POLITICS OF ENVIRONMENTAL POLLUTION BY PESTICIDES

The issue of pesticide-induced environmental pollution was the catalyst for the appearance of the whole pesticides policy-system on the international political agenda, and also to some extent the emergence of the hyper-issue of environmental degradation itself. Rachel Carson's "Silent Spring" in 1962, whilst considering human poisoning, focused primarily on the effects of pesticides on wild animals, vegetation and rivers. As is well documented, the book had a profound influence on many people and, despite numerous attacks on its scientific authenticity by industrialists, it is recognized as having helped fuel the take-off of environmental politics in the 1960's.

It would seem reasonable to conclude however, that since the early 1960's environmental pollution by pesticides has ceased to be the most contentious issue within pesticide politics, falling behind the issues of human poisoning and food contamination. This is reflected by the fact that no international bodies deal solely or specifically with pesticide pollution. The FAO Code of Conduct we have seen, basically deals with human safety and pesticide trading, the WHO Classification by Hazard Scheme fixes its toxicity measurements in relation to humans and not other ecological considerations, and there are no inter-agency working groups within the UN system concentrating entirely on pesticide pollution.

This is not to say, however, that ecological considerations are absent in pesticide politics. Pressure group influence has aided the banning or restriction of many pesticides principally on ecological grounds, and visible improvements in the biodiversity of some countries have been seen in recent years due to such action.

The politics of environmental pollution by pesticides

generally operates at the state or regional level, and not directly on a global scale.

National Regulation

The testing procedures for registering new pesticides nationally, referred to in Chapter 4, normally incorporate environmental criteria as well as toxicity to man. The USA's FIFRA system, for instance, was in 1972 augmented by the Federal Environmental Pesticide Control Act (FEPCA), which decreed that a chemical should not be registered unless it could be shown that, "it will not cause unreasonable adverse effects on the environment".[29] In reality, human health concerns have generally predominated in the American registering of pesticides, especially with concern to the suspected carcinogenicity of particular chemicals.

In line with the two FAO Government Consultations on the International Harmonization of Pesticide Registration Requirements in 1977 and 1982, expert meetings on the environmental criteria for registration took place in 1977, 1979 and 1981. The difficulties inherent in setting universal standards for registration were made explicit at the 1981 meeting.

> "The balance between risk and benefit may differ greatly under different socio-economic systems. Under a highly developed well-resourced system, harm to a rare bird species may be sufficient reason to avoid or restrict the use of a particular chemical. In situations where vector-borne human diseases, starvation, or malnutrition are possible factors, however, the risk/benefit analysis may lead to a different decision."[30]

This assessment is borne out by reality. It is difficult for governments in many underdeveloped states to prioritise environmental issues such as pesticide pollution, when they are seen to be counter to their immediate and basic interests. Hence the environmentally hazardous organochlorine pesticides are still frequently used in much of the Third World, despite their reduced use in much of the

developed world. The advent of Prior Informed Consent as a rule of the international trade in pesticides has however at least ensured that importing authorities are now made aware of products that have been restricted on ecological or health grounds in other countries. The impact that PIC will have on environmental pollution still remains to be seen, but ultimately the decisions relevant to the issue are still being taken at the level of national government, often according to a perceived "national interest".

Regional Regulation

Exceptions to this general pattern of independent national regulation within the issue-system of pesticide pollution are found in the form of regional intergovernmental arrangements. These come in two forms. Firstly, there exist regional regimes, set up when neighbouring states share a common stake in a particular policy question, such as the avoidance of polluting common stretches of water. The second form of regional regulation occurs due to the effect of political cooperation between states in other issues, what is known as "spillover" in the neo-functionalist model of regional integration.[31]

a)"Common Stake Regional Regimes"- A number of intergovernmental agreements have been signed throughout the world which aim to delimit the amounts of pesticides discharged into particular seas or other tracts of water. Sixteen governments have signed the Mediterranean Action Plan (MAP) which is attempting to cut levels of discharge into the Mediterranean, whilst nine countries are signatories to the North Sea Conference which aims to do likewise for that sea. The MAP dates back to the 1976 Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution. This convention committed the signatories to the general principle of protecting the environmental quality of the sea, and was proceeded by three protocols considering particular forms of pollution. The

third of these, adopted in 1980, was the "Land-Based Sources Protocol", which included regulations to control pesticide pollution. The most significant agreement concerning pesticides under the Barcelona Convention came in 1991, when the signatory governments committed themselves to a phase out of organophosphate pesticide use by 2005.

The North Sea has been subject to a number of multilateral agreements concerning various forms of pollution. Of most relevance to pesticide pollution is the 1974 Paris Convention for the Prevention of Marine Pollution from Land-Based Sources. This corresponds with a sister convention, the 1972 Oslo Convention on Control of Dumping from Ships and Aircraft, and together they have spawned the Oslo and Paris Commission (OSPARCOM) which has regularly met to monitor the implementation of the provisions of the twin conventions. This system was augmented in 1984 by the inauguration of ministerial conferences dealing with the problem of North Sea pollution. These conferences have worked closely together with OSPARCOM and a further homogenization of the system was completed in 1992 when the Oslo and Paris Conventions were formally merged, "into a single Convention under which all sources of pollution which may affect the maritime area covered by the convention can be addressed."[32]

The regime formed from these conferences and conventions in fact covers the North East Atlantic, Norwegian Sea and parts of the Arctic Ocean, in addition to the North Sea. The focal point of the regime is a "black" and "grey" list of chemicals according to which the dumping or runoff of certain substances into North Sea bound rivers or pipelines is either banned outright or restricted. Chemicals in the black list are completely prohibited, whilst those in the grey list are to be limited by permits granted by the appropriate national authorities.[33]

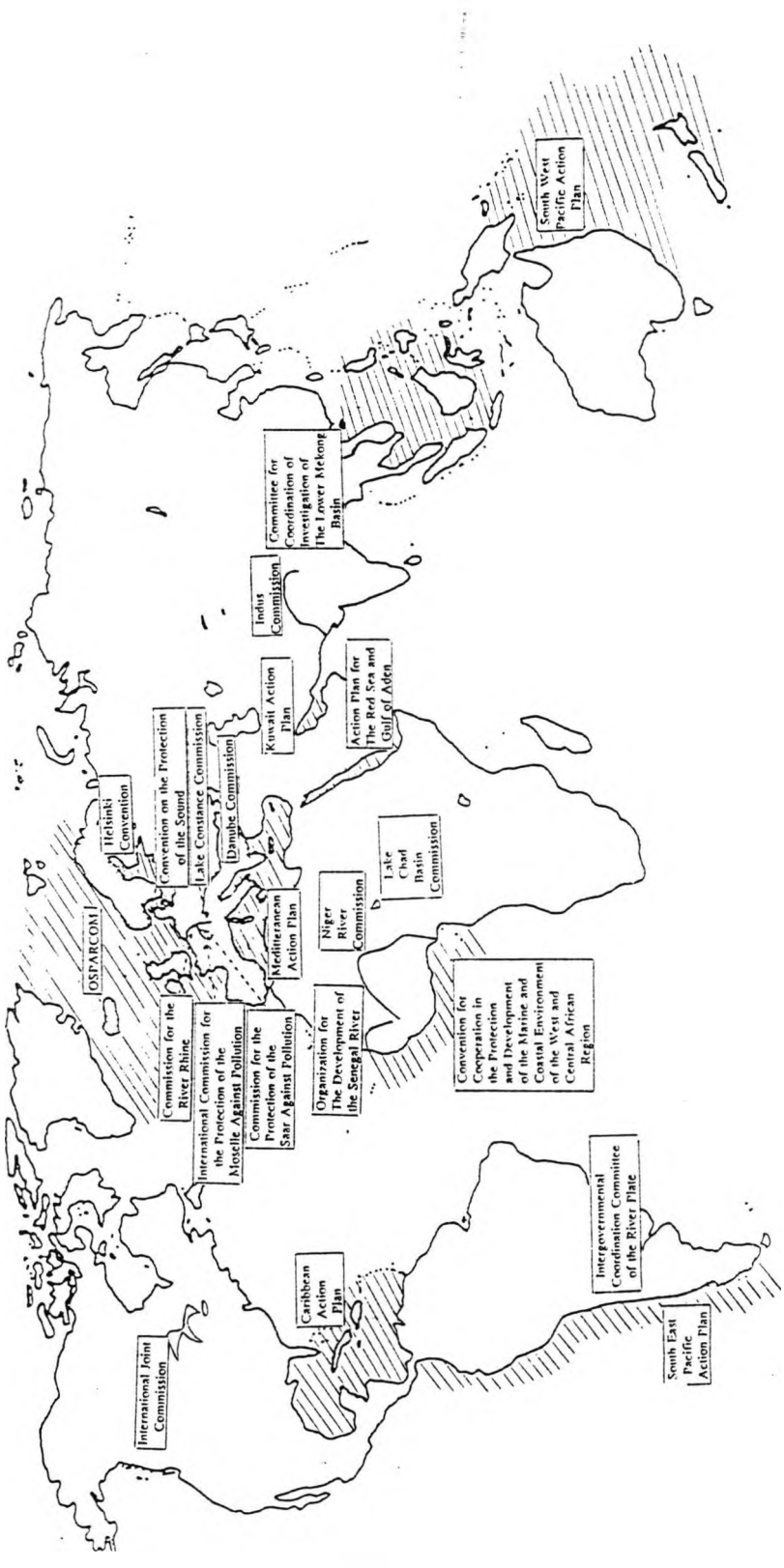

Fig. 6, *Regional environmental regimes with rules relating to pesticides*

A similar regional regime is operated for the Great Lakes in North America by the International Joint Commission of the United States and Canada (IJC), which dates from the United Anglo-American Boundary Waters Treaty of 1909. Specific consideration of pesticide pollution came about in 1978 when the Great Lakes Water Quality Agreement adopted various recommendations from the Pollution from Land Use Activities Reference Group (PLUARG). In 1992 the IJC called on the Canadian and American governments to phase out the production of organochlorine chemicals, which of course includes a number of pesticides.[34]

Numerous other bilateral and multilateral agreements aiming to control pollution are in operation throughout many of the world's rivers, lakes, seas and oceans. The Commission for the River Rhine, which now comprises one part of a series of arrangements on the Rhine basin, was indeed the worlds first intergovernmental organization having been established at the Congress of Vienna in 1815. The map (fig. 6) shows the locations of the many regional agreements which deal, at least in part, with environmental pollution, including that caused by pesticides. The action plans listed all utilize the expertise of UNEP staff on their secretariats, and are coordinated with UNEP's Regional Seas Programme. Although not all rivers, lakes, and coastlines are subject to some form of pollution regulation, international lawyers have recognized that there is movement towards an international norm on this question. "A consistent tendency is observable towards the formation of an *opinio juris* which makes the prevention of pollution in international rivers and lakes obligatory for riparians."[35]

b) "Spillover Regimes"- The primary example of the "spillover" form of environmental cooperation comes from the home of normative functionalist theory, Western Europe. Reference has already been made to the EC's Registration scheme (see Chapter 4), which aims to standardize the

national pesticide licensing systems. The follow-up Uniform Principles Directive which aims at standardizing the testing and evaluation of pesticides, has been preoccupied with environmental criteria in its drafting stages.

> "The drafters have already decided that more experience is needed about the impact of pesticides on non-target aquatic flora, and the fate of pesticides in air, before the draft can be fully achieved."[36]

EC involvement in environmental issues such as pesticide pollution has evolved gradually since the mid 1970's. The first EC directives with relevance to pesticides to be issued were concerned with the quality of drinking water (1975) and the disposal of polychlorinated biphenyls (PCB's) (1976). Since 1973 EC environmental policy has been guided by four Action Programmes (1973-76, 1977-81, 1982-86, 1987-92), which have set out basic goals concerned with controlling pollution and managing natural resources. In addition, the EC has acted as signatory for some of the regional regimes already referred to. The commission has exercised its supranational authority by committing all 12 member states to the North Sea agreements, the Mediterranean Action Plan, and the 1976 Bonn Convention on the Protection of the Rhine Against Pollution by Chlorides.[37]

Environmental policy was not envisaged for the EC by the Treaty of Rome, but its incorporation onto that "framework treaty" from 1973 onwards has been justified on the grounds of it being a facet of the moves towards ensuring fair competition. Differing national environmental legislative standards represent an uneven playing surface and a barrier to free trade, it is argued. The development of such policies represents a classic enactment of the functionalist scenario of economic integration "spilling over" into other policy sectors.

Global Regulation

We have seen that the issue of environmental degradation by

pesticides is predominantly dealt with at the national or regional level, and usually only at the latter level when states are forced into bilateral or multilateral arrangements through the existence of common stretches of water. EC environmental policy relevant to pesticides is an exception to this, but then the EC is very much a unique case in international politics as a whole. Within much of the hyper-issue of environmental degradation, the EC can best be conceptualized as having superseded its constituent member-states as a chief international actor. The EC has acted in the traditional manner of a state in establishing a registration scheme for pesticides and signing regional environmental agreements with nearby countries. By and large therefore, pesticide politics in the environmental sphere is basically conducted at the governmental level, albeit with the input of environmental pressure groups and an epistemic community.

The explanation for this is that pesticide pollution is fundamentally a localized problem. The problems of contaminated and poisoned wildlife are not significantly transferred across state boundaries, and although the question of contaminated water does frequently become a cross-border problem it never really takes on a global dimension. To put it another way, the ecologies of the USA or the EC countries are never greatly affected by the misuse of pesticides in African or South American countries.

An outstanding exception to this general situation has emerged in recent years however, with the findings about the effects of the presence of the soil-fumigant methyl-bromide on the atmosphere. The fact that organohalogen[38] chemicals accumulate in the atmosphere and do indeed have a global environmental impact has long been known. However, this has never been considered to pose a significant threat to global security until the discovery that methyl-bromide is a significant ozone-depleting agent.

Hence a global agreement concerning methyl-bromide use and production was reached in November 1992 at Copenhagen in a follow-up meeting of the Montreal Protocol, a treaty dealing with the issue of ozone depletion. The Copenhagen meeting decreed that methyl-bromide production and consumption levels should be frozen at 1991 levels from the start of 1995. Concerns had been voiced about the health and local environmental effects of methyl-bromide for years (the Netherlands government carried out an extensive phasing-out programme during the 1980's), but it took the realization that the chemical posed a threat to global security for it to be made subject to any international regulation.

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer arose out of the 1985 Vienna Convention for the Protection of the Ozone Layer, by which the 28 signatories basically just confirmed the existence of ozone depletion as a global problem and agreed to increase research and the exchange of information. The Montreal Protocol added substance to the Convention, agreeing to the progressive phase-out of chloro-fluoro carbons by 50% and paved the way for further agreements. By 1989, 81 governments had agreed to the Helsinki Declaration on the Protection of the Ozone Layer which called for a complete phasing out of CFC use and production by the year 2000. The Copenhagen agreement represents a continuation of the process started in Vienna in 1985. Campaigners, including most prominently Friends of the Earth, have petitioned for a new, tighter international commitment to reduce methyl-bromide use and production. It has been reported that the European Commission drafted proposals for a 50% cut by 2000, but failed to publish the draft after an intervention by Commission President Jacques Delors. It is believed that Delors was pressured into this action by the French government on behalf of the agrochemical firm Atochem, a major producer of methyl-bromide, owned partially by the state.[39]

Pressure Groups

Although the regulation of pesticide pollution remains a predominantly governmental concern, international non-governmental actors do play a role within the issue. Environmental pressure groups such as Greenpeace and Friends of the Earth (FoE) include pesticide pollution on their agendas, and the Pesticide Action Network is as active on the ecological aspects of pesticides as it is on the other pesticide issues. PAN's "Dirty Dozen" campaign was backed by Greenpeace and Friends of the Earth, and indeed was adopted from a similar domestic campaign organized by "Environmental Action" in the USA. Launched on "World Environment Day" June 5th 1985, the "Dirty Dozen" campaign does appear to have been influential in encouraging a reduction in the use of persistent organochlorine pesticides in the developed world.

The FoE are currently active on the problem of methyl-bromide induced ozone depletion referred to earlier. They have concentrated a lobbying campaign on Brussels, calling on the EC to go beyond the requirements of the Montreal Protocol and completely phase out methyl-bromide use by 1995

The Worldwide Fund for Nature (WWF) also take an interest in pesticides because of their environmental impact, as is evidenced by the employment of a Chemicals and Consumer Policy Officer, a post currently held by Peter Hurst. Hurst, in collaboration with the Pesticides Trust and the Copenhagen Centre for Alternative Social Analysis, produced in December 1992 a report calling on governments to reduce pesticide use on environmental grounds. The report was particularly aimed at the member-states of the Organization for Economic Cooperation and Development (OECD), appealing for them to follow the example of the Dutch, Danish, and Swedish governments and implement national pesticide reduction schemes.[40]

Similarly, the International Union for Conservation of

Nature and Natural Resources (IUCN) has long maintained an interest in pesticide pollution matters. In 1966 the General Assembly of IUCN passed a resolution which, besides noting the environmental hazards posed by pesticides, called for greater control over the trade in these chemicals.[41] In 1980, IUCN collaborated with WWF, FAO, UNEP, and UNESCO (United Nations Educational Scientific and Cultural Organization) to develop the "World Conservation Strategy", a general outline of global guidelines for nature conservation. This strategy encouraged the wider introduction of non-chemical methods of pest control, arguing that, "...excessive pesticide use promotes resistance..., destroys natural enemies, turns formerly innocuous species into pests, harms other non-target species, and contaminates food and feed."[42]

Pressure groups specializing in particular areas of wildlife protection have also been known to have an input into pesticide regulatory politics. The Royal Society for the Protection of Birds (RSPB) are, of course, principally a domestic organization, campaigning to safeguard the interests of wild bird species in the UK, but at times their work has had international ramifications. The 1991 banning of strychnine for controlling foxes in the Republic of Ireland, was encouraged by the RSPB by the advancement of information linking the use of this poison and the decrease in numbers of birds of prey. The RSPB have also managed to exert an influence on the issue of human poisoning by pesticides through the use of their expertise on toxicity. The Pesticide Exposure Group of Sufferers (PEGS) was set up by Enfys Chapman in 1988 to counsel victims of sprayings after she had been provided with technical information concerning organophosphate poisoning, collated by the RSPB in the USA.[43] This provides an interesting example of functional issue linkage, with the power of the RSPB, in terms of its resources and access to epistemic knowledge, giving it the capacity to influence a policy question, which seemingly is not salient to the group.

UN Agency Involvement

Within the UN system, although there are no commissions or working groups set up to deal specifically with pesticide pollution, a number of groups do have competence on the issue in an epistemic capacity. The Environmental Health Criteria Programme under the International Programme on Chemical Safety umbrella (see Chapter 4), includes environmental considerations in its reports on the toxicity of specific chemicals which are used by the International Register of Potentially Toxic Chemicals and other relevant organizations.

The UNEP/WHO Global Environmental Monitoring System (GEMS) has also been involved in producing information related to pesticide pollution. Set up after a recommendation at the 1972 UN Conference on the Human Environment at Stockholm, GEMS was intended, "to do the "earthwatching" and to provide the monitoring data needed for assessment of the state of the environment and for its environmentally sound management."[44]In effect, Gosovic asserts, GEMS has never really developed as a truly coordinated system claiming that this was always, "more of a wish and a verbal assertion than a reality".[45] Instead, he summarises the system as a, "series of discreet environmental monitoring projects carried out by agencies and partly or fully funded by UNEP".[46] Moves to establish a permanent intergovernmental machinery were rejected at a 1974 Intergovernmental Meeting on Monitoring and any coordination has rested with the Governing Council of UNEP.

GEMS' brief is clearly wide, but it has taken part in some monitoring of DDT and other organochlorine pesticides in the biota. The most significant work of GEMS in the field of pesticide pollution has been in collating data on the contamination of drinking-water sources, most recently in 1988.[47] An earlier assessment by GEMS was used by the WHO in publishing guideline values for drinking-water sources.

These guideline values were found to be exceeded in rivers in five countries and in lakes in three countries, and in one instance by a factor of 1000.[48]

Another relevant UN programme is the International Referral System for Sources of Environmental Information, organized by UNEP. Established in 1975, INFOTERRA is basically a network designed to be able to refer enquiries on a vast range of environmental topics to relevant registered institutions. Information on pesticides and their impact on the environment is obtainable through the network, which in 1984 became interlinked with the UNEP IRPTC (see Chapter 7). The IRPTC was designated as one of an original four INFOTERRA "special sectoral sources" which were intended to provide, "comprehensive substantive information on priority environmental topics".[49]

CONCLUSIONS

It is clear that the issue of pesticide induced environmental degradation is not subject to regulation by a single and specific regime as a subset of the issue-system, in the way that we have seen for the issue of international pesticide trading, and is demonstrated in the following chapter on food contamination by pesticides. In effect, it appears that internationally the issue is deeply integrated into the wider issue-system of land-source marine pollution and other areas within the hyper-issue of environmental degradation, such as ozone depletion and the survival of specific animal species. Policy questions within the issue of pesticide pollution thus are dependent on the perceived significance of related environmental questions for their placing on the international agenda. Methyl-bromide was long recognized as a hazard to birds, bees and other wild animals[50], but it took the recognition of its connection with the more salient subject of ozone depletion for the chemical to become regulated globally. Epistemic consensus, in this case, needed to be allied to a sense of crisis before regulation could occur. This is a theme explored in the final chapter.

The issue-system of pesticide pollution also greatly overlaps some of the other issues within the pesticides policy-system, in terms of the epistemic community and, for the issue of pesticide trading, the regime. The national and EC pesticide registration schemes and aspects of the International Programme on Chemical Safety, which were considered in the chapter on human poisoning, also incorporate environmental considerations as we have seen. At the same time, the Prior Informed Consent procedure on which the international pesticide trade regime is centred can, of course, be seen indirectly as a regulatory body for the issues of both human poisoning and environmental degradation by pesticides. Under PIC, as we shall later see, the fact

that a particular pesticide has been banned or severely restricted in one country on human health or environmental grounds is automatically made known to potential importers.

The point made at the start of this section, that the issue of pesticide-induced environmental degradation is generally less-contentious than the other pesticide issues, is borne out by these isolated examples of international regulation. Only where the issue-system overlaps either; (i) vertically with another issue within the policy-system (pesticide politics), or (ii) horizontally with another issue in the hyper-issue of environmental degradation, does any form of international regulation occur. Hence we see the importance of the placing of an issue on the international agenda, as perceived by actors, in influencing regime creation. This is a theme very much at the heart of international pesticide politics and is something that will be explored in the final chapter.

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Chapter 6

THE SECRET INGREDIENT

-The Issue of Food Contamination by Pesticides

INTRODUCTION

Chapter Four considered the problem of human poisoning by pesticides resulting from a direct exposure to the chemicals. Human poisoning by pesticides can also occur indirectly, through the consumption of contaminated foodstuffs or drinking water. This form of poisoning adds an extra dimension to the more-direct human poisoning considered earlier, because of the strong international dimension to the issue. Whereas exposure to pesticides through occupation or accident is basically a localized problem, capable of being countered by national legislation or education, the contamination of food must inevitably become a matter of worldwide concern because of the extensive international trade in this commodity. Any norm that food should not be traded if it is dangerously contaminated with pesticides needs to be adhered to equally by all participants in the world economy, if it is to have behavioural effect. Merely regulating imports nationally is insufficient as a means of upholding the norm, because if the regulations of a state are not in line with the export regulations of their trading partners, the supply of an essential commodity will disappear.

This reciprocity must in some way be responsible for the unique formalization of this norm on the international agenda. Clearly, the issue of food contamination is functionally related to that of pesticide trading but, as we shall see, the issue has developed its own distinct political processes. None of the other norms within the policy system of pesticides has gone as far down the road towards international regulation as the issue of delimiting the amounts of pesticide residues found in human foodstuffs.

EXTENT OF THE PROBLEM

As with all areas of pesticidal pollution, the extent to which the presence of pesticide residues in food represents a threat to human health is unclear and hotly disputed between the actors to whom the issue is salient. High doses of agrochemical toxins have been responsible for a number of acute poisonings and even deaths of people eating the contaminated produce. The worst food poisoning epidemic of all time occurred in Iraq in 1971-2, due to the consumption of bread made from wheat grain treated with an organo-mercury fungicide. 6530 local farmers and members of their families were admitted to hospital with varying symptoms, and 459 died. The fact that the symptoms took at least 60 days to appear, contributed to the size of this catastrophe.[1]

Direct poisoning of this sort results from an ignorance of the hazardous nature of pesticides. Reports from the Third World abound with stories of farmers continuing spraying right up until harvesting time, in the face of heavy pest infestation.[2] Pesticides are even known to have been used for fishing, as was illustrated in the chapter on environmental pollution. There have even been cases of criminally fraudulent uses of pesticides, of which one of the most infamous concerned the doctoring of Italian wine in 1992. Four million litres of wine produced in the Veneto region of N.Italy were seized by police and four men arrested for lacing the wine with pesticides, with the intention of slowing down the process of it turning to vinegar.[3]

Alongside the effects of such wanton misuse of pesticides, food produce can also be contaminated accidentally by spraydrift or by a leakage of the chemicals during storage. Seventeen people were killed in 1976 due to being poisoned by the insecticide parathion, which had contaminated wheat flour in a warehouse storing the two

together.[4]

Such cases represent extreme instances of poisonings resulting from malpractice, but the subtler health impact of pesticide residues remaining in foodstuffs after their normal application has emerged as a major consumer and health issue in the last twenty years.

A 1991 Report by the UK Working Party on Pesticide Residues found that 48% of potatoes, 32% of cereals and 29% of fruit and vegetables that were sampled contained some traces of pesticides.[5] The rise to prominence in North America and Europe of organic food, grown without the aid of any chemical pesticides or fertilizers, is a testament to the public concern over the presence of potentially toxic residues in their food. However, even organic food has occasionally been found to contain traces of pesticides. In some instances this is likely to be a result of unscrupulous producers, but some minor contamination by pesticides in rain or groundwater is also possible.

The significance to human health of traces of pesticides that remain in foodstuffs from conventional pest control applications, or arrive there by environmental pollution, is subject to great debate. As was made clear in the chapter on human poisoning, many uncertainties exist in relation to the possible long-term effects on human health of pesticides. GIFAP are unequivocal in defending their produce against charges of making foods carcinogenic or hazardous in some other way.

> "The question is "Are we poisoning the very crops which we are seeking to protect?" The short answer is "No""[6]

GIFAP point to the industry's own testing procedure for new products which can often take over seven years and result in only one in ten to fifteen thousand chemicals actually reaching the market. On top of this, they argue

that government studies of pesticide residue levels in imported and home-grown food plus the national legislation dealing with this, provide an extra check that ensures consumer safety.[7]

However, although industry testing procedures and national regulations are generally quite stringent, in the West at least, poisonings by pesticides contained in food do occur. In the Republic of Ireland in 1992, 29 people suffered acute poisoning after eating cucumbers illegally treated with aldicarb, a carbamate classified as 1(a) in the WHO hazard scale.[8] Similarly, in 1985 108 people in the USA were poisoned by aldicarb contained in Californian watermelons.[9] The use of aldicarb was not approved nationally in either case, indicating that domestic inspection and control procedures are often inadequate guarantees of consumer safety. Senator Pat Upton, speaking in the wake of the Irish aldicarb poisoning outbreak, estimated that only 2000 samples of food were tested each year in Ireland out of a total of 2.5 million tonnes that are consumed.[10]

In addition to this problem of enforcing food safety standards, there remain questions as to the integrity of the corporate and national testing of pesticides, designed to determine their likelihood of remaining as residues in food. In September 1992 the President and three other employees of Craven Laboratories in Texas were found guilty of falsifying tests on pesticides, in order to get them approved for use by agrochemical companies. Craven's evaluations of pesticides had been accepted by the US Environmental Protection Agency, the UK Ministry of Agriculture and other national authorities for a number of years, and this revelation obviously created concern for the safety of foodstuffs treated with pesticides approved by the laboratory.[11] This was not the first time that a contracted testing laboratory had been found to have

supplied bogus information relating to pesticides. Three executives at Industrial Bio Test in the USA were jailed after a trial in 1983, when it was discovered that they had concocted laboratory tests on animals in order to get certain pesticides and pharmaceutical chemicals registered.[12] IBT had apparently conducted around 800 tests on animals for 140 pesticides, most of which proved to be invalid. The fraudulent testing had been going on for a number of years and it is believed that the US government had been aware of it from as early as 1977.[13]

Aside from such cases of fraudulent testing, the findings of the scientific community concerned with the issue of the pesticide food contamination are often subject to much debate. Little epistemic consensus exists as to the effects on human health of small traces of various pesticides in food, despite the existence of global guidelines delimiting acceptable levels of the residues.

The carcinogenicity of certain pesticides is a particularly moot point, as was shown in Chapter 4. In the USA the "Delaney Clause" a provision of the Food, Drug and Cosmetic Act effectively outlaws the presence of any suspected carcinogen from human food. This contrasts with most other national legislation schemes which generally accept that it is unnecessary to go to the trouble of prohibiting food on the basis of the presence of infinitesimally tiny traces of a suspected cancer-inducing chemical. Cancer scientist Bruce Ames, Director of the Environmental Health Sciences Centre at the University of California in Berkeley, has added his weight to the sceptics camp. Ames' core argument is that it is hypocritical to show concern over the presence of pesticide traces in food, because such food invariably contains far greater levels of natural toxins. Ames has estimated that the average American consumes 1.5 grammes per day of "natural pesticides", produced by all plants as a defence against

predators, which amounts to 10,000 times the daily consumption of synthetic pesticides. Very few natural toxins have been tested on animals for carcinogenicity in the way that synthetic pesticides have, but of those that have been tested over half were found to cause cancer.[14] Ames goes further to argue that banning pesticides would actually result in an upsurge in cancer in the general public, as the resultant increase in fruit and vegetable prices would worsen the dietary intake of the poor, a factor known to increase the risks of cancer. He concludes by savaging the pressure groups who have campaigned to have stricter limits on pesticide use. "The rich lawyers who are running environmental organizations may not care, but the poor care."[15]

Ames' views have, of course, proved controversial. Pressure groups including The US Consumers Union, Parents for Safe Food, and the Pesticides Action Network, have criticized Ames for undermining their efforts to highlight dangerous food residues.

> "No one will dispute that there are natural toxins. The point is that pesticides are a controllable and avoidable extra burden to our bodies. People have little control over natural toxins, but can control - and expect controls on - artificial pesticides".[16]

A similar lack of consensus exists over the potential for birth defects to ensue from the consumption in food of pesticides suspected to be teratogenic.

Another area of contention concerns the possibility of a so called, "cocktail effect", of different pesticide residues in food. Pesticides are often used in combinations, and it has been shown that pesticides that are comparatively "safe" individually may acquire more dangerous properties when mixed with other chemicals (a process known as "synergism").[17] In the UK, the Pesticides Trust has called for more testing of pesticide mixtures and *Which*

magazine have concluded that: "The possible effect of these mixtures on our health hasn't yet been fully assessed".[18]

Aside from the divergence of opinion concerning the dangers of pesticide residues in foodstuffs, there is also some controversy over the actual need for chemical control in the case of some fruit and vegetables. It is well established that a certain percentage of pesticides are used not to save a crop from pest destruction, but merely to maintain its appearance to a particular standard. Customer expectations ensure that retailers demand blemish-free products from farmers and exporters, although there are no discernible health risks inherent in partially brown bananas or lettuces containing a few holes in their leaves. Maintaining the cosmetic value of products leads to the spraying of crops until close to harvesting time, a practice which increases the likelihood of residues in the final product.

Similarly, consumer demand for fruits and vegetables out of season means that chemicals are often used on stored produce to avoid insect or fungus attack.

> "...now consumers are "hooked" onto regular supplies of beautiful looking foods 365 days of the year. The increased risk of high pesticide residues is probably an inevitable side effect of this process".[19]

Contamination of Drinking Water

A key route by which pesticides can enter the human body is via drinking water. Contamination of drinking water by pesticides occurs in two ways. Pesticides applied intentionally or accidently to rivers and lakes may be carried into aquifers, or secondly they may gradually be leaked into ground water supplies through the soil. The latter process is very slow, and as a consequence it is the more persistent chemicals which tend to be found as contaminants in drinking water. More dramatic

contaminations can occur when pesticides are dumped or spilled in large quantities. The Section on water pollution in Chapter 5 described how a Californian drinking water supply was poisoned after the derailing of a railway tanker. A similar contamination occurred in Peterborough in 1992, when an aquifer serving the city was infected by waste produce from a weedkiller manufacturer dumped nearby. The scale of contamination was massive, but was prevented from reaching households by newly installed water filtration technology. No human harm resulted from this incident, but the fact that such a large scale contamination of an aquifer could occur obviously highlights a potentially widespread danger to human health, particularly in countries lacking modern water-treatment technology.

THE POLITICS OF PESTICIDE RESIDUES

The norm that "food contamination by pesticides should be limited", it will transpire, is the one of the proscriptive norms of pesticide politics that has proved itself most salient to the actors in the policy system and travelled furthest down the road of international regulation. The desire for international standards, delimiting acceptable levels of pesticide residues, has proved more widespread than that for more general human exposure and for environmental pollution.

This consensus on the need for global rules, however, emerges despite wide differences in opinion on the actual threat to human health posed by traces of pesticides in food. The basic premise that the presence of toxic chemicals in foodstuffs is undesirable is of course unquestionable, but a wide divergence of opinion exists as to how far to go to safeguard human health. In the United States, we have seen, the "Delaney Clause" of the Food, Drug and Cosmetic Act effectively outlaws the presence of any suspected carcinogen from American foodstuffs, even in minute amounts. This sort of absolutist stance is also adopted by some pressure group activists. Lang and Clutterbuck conclude their chapter on residues in food in "P is for Pesticides" by stating bluntly, "there should be ***no*** contamination of food by pesticides".[21]

This strand of opinion is rejected, predictably enough, by the chemical industry, but also by much of the epistemic community. Bruce Ames, as we have seen, is very much opposed to this approach, and many other scientists have argued that it is folly to worry about inconceivably small traces of chemicals in everyday food. GIFAP have made full use of such scientific opinions, in producing reports dismissing the threat to human health of pesticide residues in food.

> "The foundation of modern toxicology rests on the tenet that "the dose makes the poison". Indeed, without specifying amounts, the word "toxic" is meaningless. Many dietary compounds which at small levels are harmless or even essential to health can be toxic at higher levels - Vitamin A is a particularly well known example".[22]

A rather more eccentric approach to demonstrating the lack of danger posed to health by ingesting pesticides was adopted by the well known entomologist, Dr Ronald Fennah. Dr Fennah, who was to later become Director of the Commonwealth Institute of Entomology, whilst working in the West Indies in the 1940's is reported to have inhaled daily 100mg of DDT powder, and drank water dusted with the insecticide for thirteen months. This bizarre ritual was carried out to demonstrate the safety of the only recently discovered chemical. Fennah apparently suffered no ill effects and lived to 77.[23]

GIFAP Residue Working Group

GIFAP have a group set up to represent the interests of the pesticide industry on questions arising within the issue of residues in food. As has already been mentioned, GIFAP have frequently utilized favourable scientific opinion in producing papers countering claims made about the potential harm resulting from pesticide residues in food. The Residue Working Group (Res WG) make an effort to provide personnel for any FAO trials concerning residues in food, and for all Codex Committee on Pesticide Residues (CCPR) meetings.

Pressure Groups

The issue of pesticide residue in food is a concern of many of the aforementioned environmental and consumer organizations such as Greenpeace, Friends of the Earth, and the International Organization of Consumers Unions, as well of course as PAN. PAN has facilitated links between these

groups on the issue of residues in food, particularly in the context of the "Dirty Dozen" campaign. This campaign, which touched upon all of the proscriptive norms in pesticide politics, included an effort to raise public awareness of the potential hazard to health posed by the presence of certain pesticides in foodstuffs. The IOCU, along with the American based pressure-group the National Resources Defense Council (NRDC), collaborated on an article entitled "Your Daily Dose of Pesticide Residues" promoted as part of PAN'S "Dirty Dozen Information Packet".[24] This article warned that the existence of national and UN Acceptable Daily Intake levels (ADI) and Maximum Residue Limits (MRLs) for residues in food are not sufficient to guarantee human safety.

> "There is no fool proof way of ensuring an absolutely safe universal ADI given the diversity of food products consumed and different vulnerabilities of individual consumers, especially young children and malnourished people, who are more susceptible than the "average" person, assumed in tests to be a well-fed adult man".[25]

Abraham and Mott also highlighted the difficulties in implementing MRLs and ADIs, citing that only one in fifteen shipments of fruit and vegetables crossing the USA/Mexican border are inspected, and that residue testing in much of the underdeveloped world is negligible.

The Regulation of Drinking Water Contamination

The problem of pesticide residues in drinking water is often treated as separate from the general issue of food contamination, and has attracted some distinctive actors and rules. The Codex Alimentarius Commmission, which serves as a multi-regime for the whole wider-issue of food contamination, does technically include drinking water within the definition of its subject matter."Food" means any substance, whether processed, semi-processed, or raw, which is intended for human consumption, and includes drink.."[26]

In practice however, Codex's guideline standards,

including these of the Codex Committee on Pesticide Residues, (CCPR) have generally not been applied to drinking water. An exception to this exists for bottled mineral water, as this is a traded product, but as standard drinking water is transported and consumed within state boundaries it is not considered within the Codex's sphere of interest.[27]

Clearly, drinking water contamination is linked functionally to the issue of environmental pollution by pesticides, and some of the organizations referred to in Chapter 5 are also active on this area of the residues in food issue. The Global Environmental Monitoring System, as was outlined in Chapter 5, has been involved in setting global standards for the contamination of drinking water sources since 1976, research which led to the WHO establishing a figure of 10 microgrammes of pesticides per litre of water as a global safety standard.[28] Friends of the Earth have become involved in this area through their work on river pollution. In 1988 FoE reported the UK Government to the European Commission, over levels of 12 different weed-killers in tapwater in a number of parts of the country. The European Community took up the case, and in 1991 Carlo Ripa di Meana the environment Commissioner chastised the Government for permitting regional water companies to exceed EC standards.

The EC issued a directive on drinking water in 1985 establishing a Maximum Admissible Concentration (MAC) for pesticides and it has gradually been adopted by the member states. The directive imposes a stringent MAC for the presence of any pesticide in water of 0.1 microgrammes per litre and 0.5 microgrammes per litre for mixtures of pesticides, a level 100 times lower than the WHO standard.

This delimitation has met with opposition throughout the EC for being excessively cautious and expensive to implement. Representatives of the water industry in the UK

responded to Commission criticism of standards in Southern England, by claiming that the Directive had no scientific basis. Derek Miller of the Water Research Centre reasoned of the pesticide limit that, "Often you cannot even measure such low amounts... The directive amounts to a statement that we do not want any pesticides in our water", and concluded that, "there is no toxicological basis for trying to do it".[29]

In 1992, British water industry representatives and scientists coordinated with like-minded colleagues in other EC countries to form "Eureau", an international lobby group aiming to revise the Drinking Water Directive. Eureau held the first in a regular series of campaigning seminars in London in July 1992. Whilst cost-cutting is undoubtably one aim of the group, they deny that this is their sole objective.

> "We are not trying to weaken the directive, but only to bring it up to date with current scientific knowledge. We want to weed out the redundant bits, add new parameters in some places - for example, to include bromine compounds - and to make others more specific. We want to spend money where there is good evidence of a risk to health".[30]

The Codex Alimentarius Commissions Role in Regulating Pesticide Residue Levels in Food

Very much at the heart of the issue-system of pesticide residues in food, and the wider-issue of food contamination, is the Codex Alimentarius Commission, the implementing machinery of the Joint FAO/WHO Food Standards Programme. The Commission began life in 1963 following the recommendation of an FAO/WHO Conference on Food Standards in the previous year.

> "The purpose of the Programme is to protect the health of consumers and to ensure fair practices in the food trade; to promote coordination of all food standards work undertaken by international governmental and non-governmental organizations; to determine priorities and initiate and guide the preparation of draft standards through and with the aid of appropriate organizations;

to finalize standards and after acceptance by governments publish them in a Codex Alimentarius either as regional or worldwide standards."[31]

The membership of Codex is open to any member-state or associate member of the FAO and WHO that wishes to join. Regular sessions of the Commission are held once a year at the headquarters of either the WHO or FAO, in Geneva and Rome respectively. The member-states of the Commission vote on a majority basis for the adoption of a draft standard for a particular issue concerned with food quality. An allowance is also made, within the rules governing Codex, for regional standards, "on the proposal of the majority of members belonging to a given region submitted at a session of the Codex Alimentarius Commission".[32] In most instances, the draft standards voted on at the Commission are prepared by subsidiary bodies specializing in a particular issue.

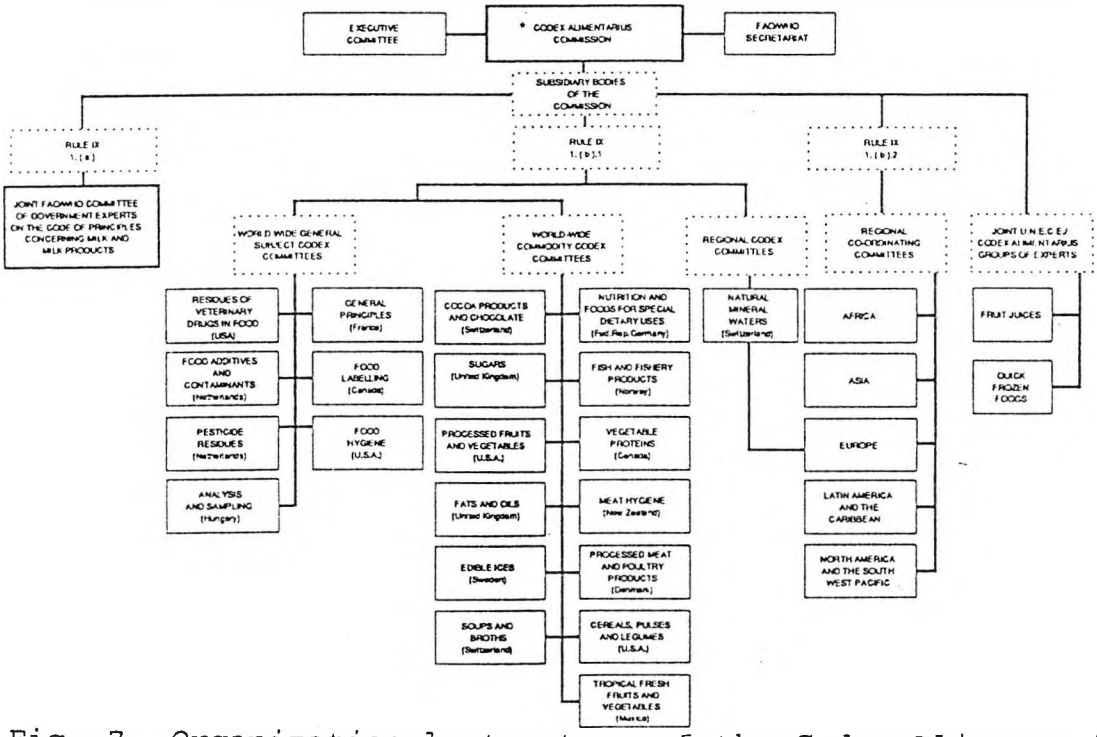

Fig. 7. *Organizational structure of the Codex Alimentarius Commission and subsidiary bodies.*[33]

-The Codex Committee on Pesticide Residues

The Codex Committee on Pesticide Residues (CCPR) consists of delegations of the member states of the Commission who meet normally once a year, for a week, in the

Netherlands. The main part of these meetings is taken up in working on designating "Maximum Residue Limits" (MRL) for particular pesticides in food. The MRL is a figure denoting the maximum permissible amount of a pesticide in a food. It is calculated by estimating how much of a particular produce a person could consume without exceeding the Acceptable Daily Intake (ADI) of residues. The ADI can be defined as "The amount of a chemical which can be consumed every day for an individual's entire lifetime with the practical certainty, on the basis of all the known facts, that no harm will result"[34]

The ADI, in turn, is established by deducing the level at which the chemical has "no observed effect" on animals and dividing this by a safety factor of 100. Another means of deciding this figure may be used as "determined by toxicologists in the light of all relevant facts known at the time".[35] The MRL also tries to take account of regional variations in pest control practices, as the standard figure is based on trials conducted according to "Good Agricultural Practices" (GAP), by which FAO guidelines for safe and optimal pesticide use are observed.

This technical work is undertaken by the CCPR's sister group, the Joint Meeting on Pesticide Residues (JMPR)[36], an annual grouping of experts from the FAO and WHO, who meet alternately in Rome and Geneva for around 10 days in September every year. Meetings are composed of government scientists and leading academics in the field, without any corporate representation. The CCPR's deliberations are very much reliant on the findings of this body, whose task it is to respond to its technical queries and devise appropriate MRLs for it to consider.

The establishment of MRLs for pesticides is a lengthy and multi-faceted procedure, summarized in the following table.

i.	CCPR arrange priority list for consideration by its annual meeting. (Often after a recommendation by member)
(1)	JMPR prepare recommended limits
(2/3)	Secretariat distributes the MRL recommendations to governments and IOs for comments / proposed amendments.
(4)	CCPR formulates recommendations for proposed DRAFT CODEX MAXIMUM LIMITS.
(5)	Proposal submitted to Commission via secretariat with view to adoption as a DRAFT STANDARD.
(6)*	DRAFT STANDARD sent out to all members and any interested IO's for comment.
(7)*	CCPR considers comments and decides whether to amend draft standard.
(8)	Draft standard submitted to Commission by Secretariat with view to adoption as a CODEX STANDARD

a) CODEX STANDARD circulated to governments for acceptence.

b) Standard published as APPROVED CODEX MRL

* *(These stages may be omitted if CCPR decides a pesticide is non-controversial)*

Fig. 8. Codex Alimentarius Commission Decision-making Process for the Establishment of Maximum Residue Limits

Government acceptance of Codex MRLs is encouraged by permitting two degrees of compliance; "full acceptance" and "free distribution". A Government giving full acceptance to an Codex MRL undertakes to, (a) ensure that any imported or home-produced food conforms with the relevant specifications and (b) that it will not enact legislation to hinder the distribution of any food conforming with the limit. A Government agreeing to free distribution with regards to Codex MRLs commits itself only to the second of the two requirements.[37] In addition, Governments which do not accept a Codex MRL are requested to state the reasons why.[38] Boardman, using data collated in 1981, estimated that Government acceptance of Codex MRLs, either in full or partial, was just under 70%.[39] By 1992 over 2,000 MRLs had been set for 80 pesticides.[40]

The CCPR conducts much of its work through *ad hoc* working groups, which meet separately and report back during the Committee's session. The Ad hoc Working Group on Priorities and Ad hoc Working Group on Acceptances have specific roles to play in the formulation, dealing respectively with sections (i) and (a) of the above table. Two other *ad hoc* groups also meet during a CCPR session, working on the questions of residue problems in developing countries and the methods of analysis. Hence, the CCPR has also been involved in making recommendations to the Commission on the means of providing technical assistance to developing countries to aid the testing for residues in food. The Commission can then pass on such information to the FAO or any other organizations involved in an aid programme.

EC Residue Regulation

Whilst it can be seen from the figures of Government acceptances of Codex MRLs that a certain level of international harmonization has been achieved, the most extensive consensus has occurred within the European

Community, as is the case in other areas of pesticide politics.

The EC has four current directives (five if the drinking water directive is included) which adopt MRLs for a variety of foodstuffs and pesticides. The directives draw on the work of the CCPR and JMPR, but do not set identical MRLs, in general favouring more stringent limits. The UK Ministry of Agriculture has acknowledged the role of the CCPR by stating that, "Codex MRLs are taken as presumptive standards in the absence of a UK MRL".[41]

The EC's involvement in the issue of pesticide residues in food derives from the 1986 Single European Act, Article 100a of which commits the European Commission to ensure the member states apply a high degree of environmental, consumer and public health protection.[42] The 1990 Directive on Residues in Fruit and Vegetables[43] updated an earlier non-mandatory directive setting MRLs for a wide range of fruit, vegetables and animal foodstuffs.[44] In addition, directives exist covering cereals[45], meat, and dairy products[46]. Member states are permitted to enact lower national MRLs but products within the EC standard should be allowed free movement across national borders MRLs can be periodically amended by a majority vote in the Council, but new standards require unanimity.

The International Impact of a Codex MRL

Aside from the EC, the setting of legally binding residue limits for pesticides in distributed food has remained the preserve of national authorities. The United States, for instance, has in general set far more vigorous limits for its foodstuffs than those set by Codex, largely due to the catch all "Delaney Clause". However, the existence of international guidelines has at least provided standards by which governments may be judged and lobbied. Monitoring of international food contamination standards with the aid of

the benchmark Codex ADI's and MRL's has been undertaken by the UN, the chemical industry, and pressure groups alike.

The UNEP/WHO Global Environmental Monitoring System (GEMS) coordinated an extensive survey of eleven countries (Australia, Austria, Canada, Guatemala, Hungary, Ireland, USA, UK, New Zealand, Sweden, Japan), with data derived from twelve years of research (1971-1983).[47]

The findings from the eleven collaborating centres show that the intake of organochlorine and organophosphorous pesticides were always within JMPR ADI standards where they existed, although some samples contained aldrin, dieldrin and lindane levels close to the limit.

GIFAP's Residues Working Group has also conducted a monitoring of national food contamination levels, the findings of which have been published as the periodically updated "Pesticides in Food" Report. The reports serve to show that residue levels are invariably found to be within Codex limits but some discrepancies are reported. For example, a survey of Swedish food contamination standards, using data derived from the Swedish National Food Adminstration, found that 0.5% of domestic food commodity samples and over 3% of imported food samples exceeded maximum legal levels. The report accounts for this by stating that Sweden's "Maximum allowable levels are based on ADI's from the JMPR which are conservative and that occasional samples over these tolerances are not considered to represent any serious health hazard".[48]

Pressure groups concerned with the issue of residues in food have also been known to use Codex standards to highlight cases of contamination, even though these groups are generally critical of such standards, (as emerges later in this section). Greenpeace in Brazil in 1991 conducted spotchecks on foodstuffs in several cities and found that,

on average between two and five percent contained pesticide residues over the MRLs of the Government or Codex.[49]

In general then, it appears that monitoring and testing operations have found that Codex standards for residue levels are only very occasionally exceeded. However, as was illustrated earlier in this chapter, concern has been raised about the quality of such testing. Evidence that only tiny fractions of food are routinely tested in a developed country like the Republic of Ireland and that major testing laboratories in the USA have been proved to be fraudulent, raises the question of how much impact global guidelines standards can have, particularly in the Third World, where the problem is clearly going to be most acute.

The Future of Codex

Codex pesticide MRLs have developed as a significant set of global guidelines for the issue of residues in food, despite their essentially voluntary character, and clear problems in their implementation as even non-compulsory standards. They serve as a yardstick by which governments may be judged in the absence of national standards, and as a guide for governments as to what is internationally acceptable when setting such national standards.

The status of Codex standards, in pesticide as well as other food contaminants, have of late, however, been the subject of debate concerning their establishment as legally binding global demarcations. This has arisen out of the ongoing efforts of the General Agreement of Trade and Tariffs (GATT) and a number of actors supporting it, to liberalize world trade in as many commodities as possible. National differences, in the levels of contaminants permissable in food produce, create obstacles to the free trading of such produce, contrary to the ethos of GATT, who favour globally agreed standards.

In October 1989, the Bush administration in the USA presented for the Uruguay Round of GATT talks the "double zero" plan, which aimed to curb domestic agricultural subsidies and the right of states to limit the importing of food on "non-scientific" grounds. The criteria deemed not to represent "scientific evidence" included social, economic, cultural, and religious grounds for limiting food imports. In effect, the basis of the plan is that a state would be required to prove scientifically the need for a particular restriction on food imports. The plan advocated the legitimizing of Codex food standards as the source of acceptable scientific evidence on which the international trade in foodstuffs should be governed. GATT took on board this idea in 1990 and hence it could become internationally binding law on the completion of the Uruguay Round. In the event of this occurring, any attempt by a country to enforce domestic MRLs on food stricter than those advocated by Codex could lead to them being challenged to justify the legislation on health or environment grounds, or else face the penalty of either GATT-sanctioned trade retaliation or the payment of compensation to exporting countries.

Environmental and consumer groups are alarmed at this prospect because, as we have seen, Codex standards are often lower than those set nationally (or by the EC). A worldwide lowering of standards is thus seen as the likely scenario of the international harmonization of food standards, including those limiting pesticide residues.

> "If Codex standards become a "ceiling" on the regulations that can be enforced on imported goods, farmers in countries with stricter standards will find themselves competing with imported foods produced under much less strict environmental regulations. If this situation begins to threaten their economic survival, they may feel compelled to lobby for lower standards to create a level playing field.."[50]

The underlying fear of environmental and consumer groups is that Codex standards cannot be relied upon to

guarantee consumer safety because the body is not impartial in its judgements.

> "Under the provisions of the draft GATT treaty, responsibility would be handed over to a small group of supposed experts, many of whom have vested interests in the companies whose products they are judging".[51]

The evidence that Codex committees are populated more by industrial and corporate representatives than those representing consumers is incontestable. The UK based pressure group National Food Alliance in 1993 published a report based on two years of monitoring Codex Committees (89-91), which was endorsed by 47 other groups worldwide, and highlighted this apparent bias. The report found that of the 2,578 participants in the various meetings only 26 came from consumer organizations with none from environmental groups. In contrast, 660 of the participants came from the food industry.[52] This report goes on to call for a reform of Codex to increase the representation of public interest groups. However, the selection of participants is made by Governments, when compiling a national delegation to send to the Codex Commission and various committees, so this imbalance can not really be blamed on Codex itself.

It is clear however, that the adoption of Codex MRLs in place of national limits would, in general, represent a loosening of safety standards in many countries. In the USA, for example, the adoption of Codex MRL's would greatly increase the acceptable levels of DDT residues (EPA Action Thresholds) in the following foods; Broccoli (x33), Carrots (x10), Grapes (x20), Lettuce (x33), Potatoes (x50), Apples (x10), Bananas (x50), Peaches (x50), Pineapples (x33), Strawberries (x20).[53] Standards would also be loosened in the EC and many other developed countries.

It is an interesting illustration of the incoherence of the state an as actor in modern international politics that

the USA Government should be campaigning internationally for rulings that would undermine its own domestic legislation and with it American sovereignty. Bush's "Double Zero" plan can be construed as a continuation of a long-running power struggle between the President and the Environmental Protection Agency. In the 1980's the Reagan administration attempted to dilute the EPA's pesticide standards with the intention of reducing the regulatory burdens on the food industry. EPA officials sympathetic to the industry were appointed and an attempt to "change" the science of toxicology was made, by altering the safe factor by which residues are divided in calculating the legal limit and encouraging less emphasis to be placed on data derived from animal testing.[54] Reagan's changes failed to get off the ground however, owing to disapproval by the courts and Congress, creating a simmering feud between the executive and EPA which re-emerged in 1989 despite a change in President, with Bush replacing Reagan. If the effect of the incorporation of the "Double Zero" plan in the Uruguay Round is that Codex standards replace the more-stringent Delaney Clause standards, the EPA will have lost a major battle.

The overwhelming conclusion, which can be drawn from this domestic American political struggle and from the composition of national delegations to Codex meetings, is that corporate interests often seem to predominate over those of environmental and consumer groups in the eyes of governments. Hence, the international legitimation of Codex standards in the event of a completed Uruguay Round of GATT talks is feared by environmentalists as a global corporate conspiracy riding roughshot over the interests and rights of consumers. In an intriguing twist to the traditional dialogue between Governments and pressure groups, the issue of food safety has seen environmental and consumer organizations citing the threat to national sovereignty posed by Government backed action.

"Food standards should be set openly, their main

purpose being the protection of consumers and the environment. Individual nations should not be obliged to sacrifice high standards in order to facilitate world trade and the movement of global capital".[55]

CONCLUSION

The role played by the Codex Committee on Pesticide Residues within the issue of food contamination by pesticides does appear to fulfil the criteria of an international regime as defined by Krasner, and adopted for this study. The CCPR, in fact, can best be conceived as a regime within the multi-regime of the Codex Alimentarius Commission, which regulates the whole wider-issue of food quality standards. The Codex Alimentarius Commission has some thirty subsidiary bodies; five of which act as Regional Coordinating Committees, one of which deals with general principles, whilst the rest deal with a particular foodstuff or contaminant. The diagram below is a simplified representation of how the issue of pesticide residues in food can be understood as a subset of the wider issue of impurities in food, all dealt with by relevant sections of a multi-regime.

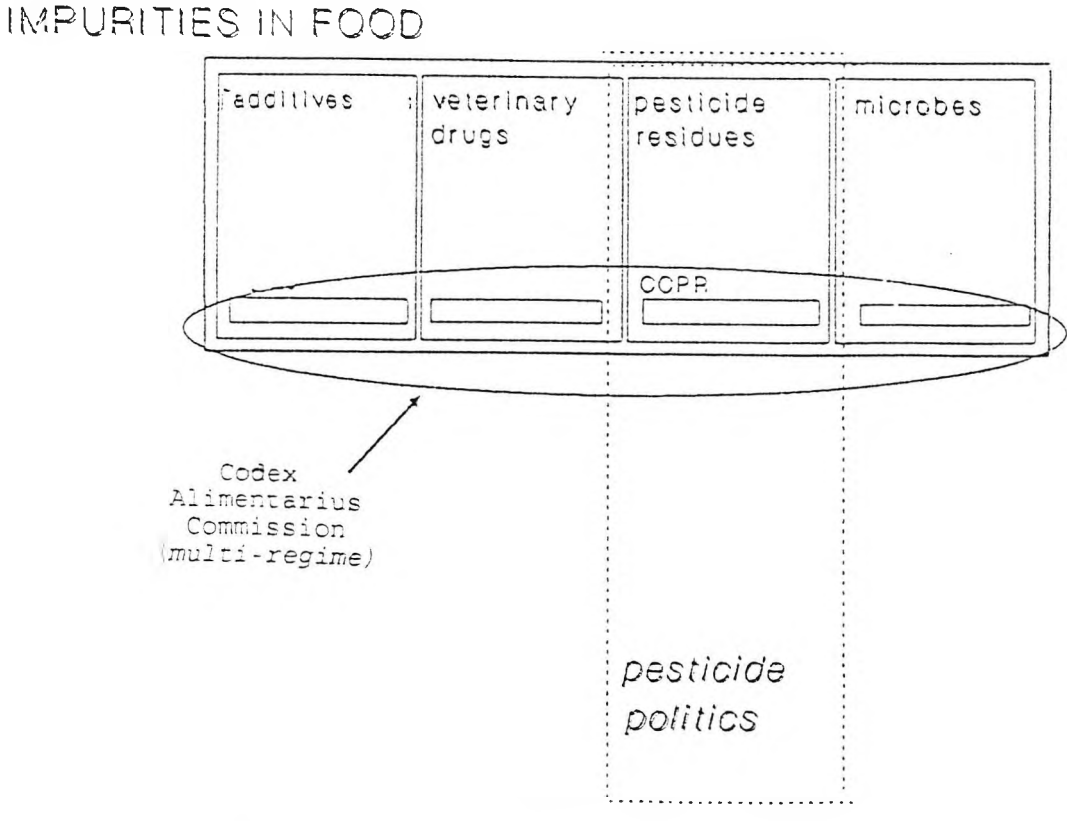

Fig. 9. Theoretical location of the issue-system of food contamination by pesticides.

Despite the levels of dispute as to the actual threats to human health posed by the presence of pesticide traces in food, the norm that such contamination needs to be in some way delimited seems to meet near universal acceptance. Although their motives may be different, environmentalist and consumer groups, the food and chemical industry, and governments acknowledge the need for standards governing the issue.

Codex deliberations over pesticides and other questions of food quality have been subject to criticism, particularly by pressure groups, but its standards have had an impact internationally. The work of the JMPR concerning pesticides is a strong source of international technical expertise, which we have seen is drawn upon by governments, as well as the CCPR in setting rules governing the distribution of food. Thus, the JMPR represents the focus of the epistemic community within the issue, whereas the CCPR is part of a multi-faceted regime, setting rules to be approved by the decision-making machinery of the Codex Alimentarius Commission.

The behavioural effect of the regime on related actors is seen in the high level of acceptance of its rulings by member governments, and the fact that its standards are widely accepted as applicable in the absence of comparable national standards. Thus there is at least a partial implementation of its rules, which is sufficient to consider it as fulfilling the functions of an international regime.

The possibility remains, however, of the CCPR, and Codex as a whole, strengthening its role by having its rules becoming binding on all members and enforceable with sanctions. If the current Uruguay Round of GATT talks are completed in full, Codex would actually acquire genuine supranational authority, backed by GATT as the enforcer. This would be a real case of a world government for food

standards, a true "regime" rather than a "quasi" regime, as the present arrangement could in the circumstances be conceptualized.

This strengthening of the regime, if it were to come about, would represent a classic case of international bargaining, of governments realizing the collective benefits of collaboration. A completion of the Uruguay Round would open up a significant amount of international trade, netting governments anything between $200 billion and $5.2 trillion in total.[56] A cynical view of this, in the context of the empowerment of a non-elected global body to govern food standards, is that even the sacred cow of state sovereignty may be sacrificed on the altar of profit.

In effect, the increase in authority of the Codex on the completion of the GATT talks would reflect a change in its underlying principle. Rather than fundamentally being guided by the motive of safeguarding the quality of food commodities, as the Codex was in its foundation and still is today, the regime would in this instance be more geared towards the goal of standardizing the regulation of food commodities in order to facilitate trade. The regime and its salient actors in this scenario would have undergone a shift in their values, having become more informed by the desire to maximize economic gains in comparison to the value of minimizing human suffering. This would not be to say that the latter value would be necessarily subserviant to the former, but it would certainly be in competition with it in shaping the aspirations of the actors.

Codex standards are presently almost certainly sufficient to safeguard human health. The work of the JMPR is impartial, and well respected. Codex standards, despite the levels of corporate influence, reflect their work to a large extent. The fear exists however that with an inexact science like toxicology, judgements could over time become

too informed by the value of maximizing economic gains and less so by that of minimizing human suffering. The lack of epistemic concensus on the issue, as highlighted earlier in this chapter, could allow the purpose of the regime to become blurred or even, some fear, to be hijacked by the free trade ethos of big business.

> "When scientists do reach agreement, it can be a powerful force that can even overcome political and national differences. However, when science is uncertain, as is typically the case is assessing the risks of toxic chemicals, there is more room for political factors to shape the way different countries interpret science in making policy decisions".[57]

Governments are prepared to override the value of maximizing economic gains when scientific evidence of a threat to human welfare or the environment is presented clearly, as seen in the agreement to cut methyl-bromide production and use (see Chapter 5) and various other environmental regimes, but when evidence is less clear-cut they are less inclined to do so.

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Chapter 7

P E D D L I N G P O I S O N S

-The International Trade in Pesticides

THE PROBLEM DEFINED

The introduction into the Third World of Western agricultural technology in the 1960's and 70's, known commonly as the "Green Revolution", created a dependence on pesticides produced in the West and opened up a massive new trade, flowing from North to South. Some 96% of all pesticides are produced in the industrialized North[1] and, while most of the trade in these products is within these countries, some 20% of pesticides are sold to the Third World to the tune of around £2.4 billion per year[2]. With increased public consciousness of pollution and the merits of organic farming in Europe and the USA, the Third World market looks to expand and become increasingly attractive to the big agrochemical firms in the West.

International regulation of the trading of pesticides has, until recently, been extremely lax and certainly not kept in step with municipal law in the developed states. Awareness of the hazardous nature of many substances used for pest control has gradually seen the most toxic chemicals becoming banned or restricted in the West with rigorous safety guidelines for their application developed. Many pesticides banned and withdrawn from use domestically in the developed world, however, have continued to be marketed to the Third World where most states have weak regulatory procedures or lack the resources to enforce efficiently those that do exist. The response of many agrochemical firms to greater scrutiny of their produce by health and environmental groups in the West has been to redirect their goods to such less restrictive markets. Following the banning of DDT in the USA because of its carcinogenic qualities, some chemical companies turned to Third World trading partners to stave off losses from accumulated stocks of the chemical. Possibly as a result of this, DDT levels in the average Nicaraguan and Guatemalan citizen in 1981 were reported to be over 30 times that of the countrymen of their major trading partner[3]. Many reports show that pesticides

banned in the USA such as dieldrin, aldrin, heptochlor, and chlordane have been freely marketed abroad, along with the particularly lethal leptophos, a chemical never registered in the USA.[4] In 1981 Weir and Schapiro revealed that over 25% of the USA's exported pesticides were unregistered, with their destination invariably being an undeveloped country[5]. Often the main importers of such products are subsidiary bodies of the companies manufacturing them in the first place. A Costa Rican offshoot plant of Standard Oil of California was in 1979 reputed to be the principal importer of pesticides restricted in the North America.[6]

The flood of particularly toxic pesticides into the Third World, backed up by persuasive advertising, has accentuated the problems which arose when such products were used widely in the West, as specialized knowledge on pesticides is much more scarce and levels of illiteracy prevent workers from even reading safety instructions printed in their own language. A clear theme which emerges from this study is that the "side-effects" of pesticide use; human poisoning, environmental pollution and food contamination, are at their most damaging in the underdeveloped world. As these costs have become apparent, the development of the norm that the international trade in pesticides needs to be controlled has occurred.

It is probably not being over-cynical to argue that acceptance of this norm has been influenced by the realization in the West that trading in deadly toxins ultimately hurts them also. Pesticides profitably dumped on the Third World market can return to Western consumers in their food imports from the same countries, in a process which has been labelled the "circle of poison"[7]. In 1967, for example, 300,000 lbs of beef from Nicaragua were refused entry into the USA, because of excessive DDT levels. Central America had been one of the chief recipients of restricted US pesticide exports during this period[8]. The consumer demand

for products such as coffee, sugar, and particularly cotton ensures that this circle cannot be broken without acting on the problem of the trade in dangerous pesticides. The US Government in 1981 estimated that 5% of food imported into the USA contained levels of pesticide residues illegal under domestic restrictions[9]. Around 50-70% of all food produced in the Third World is exported to developed countries, rather weakening one defence of the agrochemical corporations that their trade helps improve living standards in the less developed countries by increasing food production levels.

REGULATING THE INTERNATIONAL TRADE IN PESTICIDES

Whether their motivations are genuinely altruistic or purely those of self-interest, it is evident that there is some consensus amongst the actors within the pesticides policy-system that the international trading of the chemicals needs to be subject to some form of control. GIFAP (Groupement International des Associations de Fabricants de Produits Agrochimiques) have acquiesced to the norm of regulating the trade in pesticides on the basis that greater uniformity in the limits of residues in food will at least simplify the process of trade, even though trading standards may be tightened.

International Register of Potentially Toxic Chemicals

The first organization to take steps towards establishing guidelines for international pesticide trading was the United Nations Environmental Programme (UNEP). The idea of an International Register of Potentially Toxic Chemicals (IRPTC) was first aired at the 1972 Stockholm Conference on the Human Environment, and came into existence in 1976. UNEP's initial aspirations in this area were ambitious, seeking to develop rules, "as a first step towards a global convention"[10], but ultimately the IRPTC developed more humbly as a body for facilitating information exchange.

The register is coordinated from the Programme Activity Centre in Geneva and its two chief services are the running of an extensive data bank providing hazard assessments and regulatory information on chemicals and the operation of a global network which facilitates collaboration on such matters with other organizations. The recipients of such technical information are varied.

> "Although IRPTC is designed primarily to aid national authorities responsible for the protection of human health and the environment, its services are currently available to everyone at no cost."[11]

UN Consolidated List

After a series of resolutions in the UN General Assembly which raised alarm about the trading of toxic chemicals, a "Consolidated List of Products Whose Consumption and/or Sale Have Been Banned, Withdrawn, or Not Approved by Governments"[12] was compiled in 1982. The vote to compile the list was carried by 146 votes to 1, with the USA as the sole opponent. This directory has been regularly updated in the past decade and contains details of over 500 hazardous products, of which around a third are pesticides.

FAO Code of Conduct

The most comprehensive attempt to establish a framework of guidelines for the international trade in pesticides is found within the FAO's Code of Conduct on the Distribution and Use of Pesticides.[13] A previous chapter examined the Code's guidelines relating to the safe use of pesticides, such as labelling and registration standards. What will now be considered are the provisions relating to the distribution of pesticides. The two most relevant articles in this regard are Article 8 "Distribution and Trade" and Article 9 "Information Exchange".

Article 8 calls upon the agrochemical industry to ensure all products are fully tested before being exported and that the results of these tests are submitted to the importing country's authorities before the products arrive. A further provision requests that pesticides intended for export be properly packaged and labelled in accordance with the guidelines set out elsewhere in the Code. Article 8.1.5 attempts to address the problem referred to earlier, whereby subsidiary bodies of big multinational chemical companies within the underdeveloped countries are responsible for importing pesticides restricted in the country of the parent company. The provision requires companies to ensure that the subsidiary bodies employ the same standards in producing or manufacturing pesticides as are required in their own

countries.

Article 9 deals with the question of notifying importing countries as to the nature of traded pesticide chemicals. It is suggested that governments of exporting countries should inform the authorities of the importing state if they have restricted the use of the pesticide domestically. Article 9.5 acknowledges the role of UNEP's IRPTC and calls on governments to provide information on pesticide control legislation prior to the implementation of the FAO Code, in the form of an inventory for the IRPTC. A further provision in the article charges the governments of importing countries with the responsibility of establishing procedures for receiving and dealing with such information exchanges.

The evidence from studies monitoring the FAO Code, in the first few years after its introduction, was that the provisions dealing with pesticide trade and information exchange have had little impact in the underdeveloped countries. A detailed report of several non-governmental organizations coordinated by the Environmental Liaison Centre examined implementation in 12 countries in Africa, Asia and South America and concluded that:

> "In each of the countries surveyed, pesticides containing ingredients classified by WHO in class 1A or class 1B were found to be freely available and being transported, sold, and used in extremely unsafe manners."[14]

The explanation for this was that:

> "It is clearly beyond the capabilities of the governments in these countries to provide the massive inputs necessary to control the trade in these products."[15]

Similarly, an FAO questionnaire distributed to all UN members in 1986 evaluating the impact of the Code of Conduct found that over 40% of governments in Africa, Asia, and the Pacific region had not been receiving any notification from exporters when importing banned or highly restricted

pesticides.[16]

PAN from the outset were unequivocal in their belief that the Code's "haphazard prior notification scheme" was inadequate.

> "Even countries with adequate regulations in place find that notification arrives all too often after a dangerous chemical has already entered the market."[17]

Prior Informed Consent

PAN and the other pressure groups critical of pesticide trading practices, were unifiedly adamant that the shortfalls of the FAO Code's distribution provisions could be remedied by the inclusion of a requirement that importing countries give "prior informed consent" before receiving pesticides. According to PAN, prior informed consent (PIC) means that:

> "before a pesticide that is banned or restricted in its country of origin can be exported to anothe country, a authorized government in the importing country must (1) be notified about the pending import along with the reason the pesticide is restricted in the country of origin, and (2) agree to the pesticide's importation."[18]

The FAO Code's notification requirements in Article 9 were always very much a compromise measure designed to avoid antagonizing the chemical industry, and never satisfied the demands of the various pressure groups lobbying for trade regulations. The Organization for Economic Cooperation and Development (OECD), hardly a vociferous campaigner against Third World exploitation, in 1984 adopted a notification scheme which though falling short of PIC went further than the FAO code. The "Guiding Principles on Information Exchange Related to Export of Banned or Severely Restricted Chemicals"[19] centred around the idea of a two-tiered notification procedure, under which the initial information exchange on exporting a restricted chemical can be

supplemented by further information at the request of the importing country.

UNEP adopted a similar two-tier notification scheme[20] but only after more ambitious "prior authorization" guidelines proposed by a Working Group of Experts had been dropped in the face of pressure from GIFAP and representatives of the exporting countries. Similar pressures were responsible for the last minute withdrawal of PIC from Article 9 of the FAO Code of Conduct in the final stages of its adoption in 1985. Despite appearing on seven of the eight drafts of the code, Prior Informed Consent was removed from the final draft, apparently as a result of strong British and American persuasion.

> "The FAO, already preoccupied with famine issues, was politely reminded that its sister organization, UNESCO, lost 25% of its budget when the United States, angered by its policies, withdrew funding".[21]

No national delegation officially requested the deletion of the PIC provision and 30 countries protested at its removal, but it appears that covert pressure convinced delegates at the 1985 FAO Conference that the Code as a whole would be at risk if a compromise over Article 9 was not accepted.

> "The majority expressed deep concern that the principle of "Prior Informed Consent" no longer appeared in the present version of the Code... These members, however recognized the need not to delay the adoption of the Code."[22]

Led by PAN and OXFAM, the campaign to incorporate PIC into Article 9 of the FAO Code carried on regardless of the finalisation of the Code. OXFAM's attempts to incorporate PIC into British legislation via the 1985 Food and Environment Protection Act was rejected by the government on the basis that it was unnecessary because, "Britain will honour all of its international obligations"[23]. A few weeks later Britain's "international obligations", in the shape of

the FAO Code, emerged minus Prior Informed Consent. In other arenas however, the PIC proponents did make some headway. The Netherlands became the first country to formally embrace PIC into domestic legislation in 1985.

Some international progress towards the legitimization of PIC was made in June 1987 with the adoption by UNEP's Governing Council of the "London Guidelines for the Exchange of Information on Chemicals in International Trade."[24] These guidelines expanded the scope of the IRPTC by requesting that states notify the IRPTC of domestic chemical restrictions with the idea that the information could then be transmitted to the relevant authorities of other countries. In addition, a working group was set up to investigate the possibility of including PIC provisions into the IRPTC system. Despite such developments, PIC failed to be re-included in Article 9 of the Pesticide Code when revisions to the Code were debated at the November 1987 session of the biennial FAO General Conference.

By 1989 however, Prior Informed Consent finally gained international legitimization, as a rule governing international pesticide trading. The American, British and German representatives at the 1987 UNEP Working Group meeting had continued to resist the inclusion of PIC in the London Guidelines. However, this stubborn resistance had the effect of galvanizing support for PIC from Third World delegates at UNEP's Governing Council. PAN were instrumental in mobilizing all representatives from countries party to the Group of 77 developing nations lobby to campaign for PIC's inclusion in the London Guidelines. As a result, the 1987 UNEP Governing Council, whilst not officially incorporating PIC into the London Guidelines, passed a pledge that the provision would be included at the next Council session in 1989.[25] Hence in 1989 the Council established a voluntary PIC procedure, in which the IRPTC served as the body responsible for transmitting the relevant

information between importing and exporting countries. Seventy-five countries joined the scheme in its first year of operation. UNEP's provisional acceptance of PIC in 1987 prompted similar action at the November 1987 FAO Conference. A Resolution was passed ensuring that PIC be added to the FAO Code by the next FAO Conference in November 1989.[26]

Prior Informed Consent has, in fact, developed as a two-pronged rule. On one hand, the procedure operates around a globally applicable list of chemicals which should not be exported without the expressed approval of the appropriate importing authority. On the other hand, PIC requires that exporters should make importing authorities aware of the fact that a traded chemical is banned or severely restricted in their own country. The "PIC list", derived from the first of these two facets, is the focal point of the procedure by which governments can prohibit the import of particularly dangerous pesticides. All "designated national authorities" are asked to make a prior decision on the future importing of chemicals on the list, which exporters are obliged to respect. For any countries which have failed to give such a decision,

> "the status quo with respect to importation shall continue, ie. the chemical should not be exported without the explicit consent of the importing country, unless it is a registered pesticide or a chemical for which use or importation has been allowed by government action in the importing country."[27]

The implementation of PIC since November 1989 has proved to be a lengthy and complicated procedure. For an exported pesticide to require the PIC procedure to be enacted, it must be in Category 1 A of the WHO Classification by Hazard and be banned or "severely restricted" in at least five countries. Determining when a pesticide can be classed as having been "severely restricted" by a government has proved controversial and resulted in far fewer chemicals becoming subject to PIC restrictions than was first anticipated. By 1992 only

thirty-two pesticides were on the PIC list, around half the total that PAN had aimed for. Decision Guidance Documents (DGDs) have been produced by the FAO/UNEP Working Group on the Implementation of PIC to clarify the details of the PIC procedure, and inform importing countries of their rights.[28] From the beginning of 1992, any ban or severe restriction on a pesticide that brings it within the PIC parameters will automatically lead to its addition to the initial list of 32 chemicals. The eventual scenario is for the two aspects of the PIC procedure to be merged. "The intention is that gradually all chemicals that have been banned or severely restricted in any participating country will be included."[29]

The FAO/UNEP Working Group has been continually lobbied by PAN for a widening of the list of pesticides subject to PIC restrictions in trade, highlighting the fact that chemicals which are not "severely restricted" in the West are often still highly dangerous in the arena of the Third World, where worker-safety guidelines are generally more lax and hotter climates can increase the volatility of the products.

Whilst the demands for an expansion of the scope of PIC is likely to continue for some time, the establishment of the principle as an international rule has been completed by GIFAP's acknowledgement of its legitimacy. GIFAP's annual report for 1991 announced as one of its aims for 1992 that it would, "continue to cooperate with FAO/UNEP on the implementation of PIC"[30]. The reason for this apparent "U-turn" on PIC appears to be a fear of the alternatives, such as an outright prohibition of the export of certain pesticides. The drafting of a bill in the USA during 1991-2 proposing to introduce export controls for pesticides raised alarm in the agrochemical industry and prompted GIFAP to take the extraordinary step of criticizing the bill on the grounds that it was contrary to the FAO Code of Conduct.

"A major concern ... is the appearence of a draft Bill

> on pesticide export control in the USA which is very much at variance with PIC in the FAO Code, namely that this draft legislation is export rather than import control orientated"[31]

GIFAP here opportunistically interpreted PIC as recognition that trade regulations for pesticides should be based only on import rather than export restrictions. In a choice between PIC and export restrictions of the sort discussed in the US Congress, PIC is the lesser of two evils for the pesticide industry. As we shall see in the following section, some Third World Governments are still only too happy to accept dangerous pesticides.

Governmental Influence on the International Pesticide Trade

Despite the development of internationally accepted rules of conduct governing the trade in pesticides, the policies of national governments continue to have a profound impact upon the issue and, to a certain extent, undermine the global arrangements. The international rules concerning pesticide trade, centred on the PIC procedure, are principally import constraints rather than exporting restrictions. The "dumping" of hazardous chemicals, banned in their country of origin, on Third World markets has not been outlawed. Rather, those Third World countries have been given greater means of resisting such imports, if they so desire. The desire of many Third World governments to restrain this trade is, however, questionable.

Robert Repetto of the World Resources Institute has undertaken detailed research in a number of underdeveloped countries and discovered that many governments, far from acting to control pesticide imports, buck the market to boost the incoming trade of the chemicals.

> "Third World governments subsidize pesticide production and sales by a variety of mechanisms: through access to foreign exchange on favourable terms, through tax exemptions or reduced rates, through easy credit, and through sales below cost by government-controlled distributors."[32]

Repetto's study used teams of consultants to underdeveloped countries, three each from Asia, Africa, and Latin America. After identifying the various subsidizing mechanisms used in these countries, their impact was assessed by comparing the prices of pesticides after subsidization with their hypothetical price in the absence of any governmental intervention. In order to find the price of pesticides minus the subsidy, average exchange rates and import duties were assumed for importers, along with average sales taxes and credit charges for buyers.

Region and Country	Rate of Subsidy: Percentage of Full Retail Costs
Africa	
Senegal	89
Egypt	83
Ghana	67
Latin America	
Honduras	29 (35)[a]
Colombia	44
Ecuador	41 (55)[a]
Asia	
Indonesia	
food & other annual crops	82
Pakistan	negl. (19)[a]
China	19

a) Includes subsidies captured by private distributors as higher margins between their costs and selling prices, but not passed along as lower retail prices.
Source: World Resources Institute (Data derived from detailed country tables and country reports.)

Fig. 10 Average Rates of Pesticide Subsidies [33]

The above table demonstrates the extent of the subsidies in Repetto's study. As can be seen, the levels of subsidy can be very high. In a third of these case studies they are in excess of 80% of the total retail cost. The figure for

Pakistan reflects a change in agricultural policy undertaken by the government in 1980, which ended both pesticide price subsidizing and centrally directed crop spraying. This change in direction is reported to have had a beneficial effect on Pakistani agricultural efficiency, with farmers becoming more discerning in their choice of pesticides, and the levels of wastage being reduced.[34]

CONCLUSIONS

The presence of the Prior Informed Consent rule since 1989 for the trade in the most hazardous pesticides has confirmed the existence of an international regime, located within the issue-system of pesticide trading and the wider issue-system of chemical trading. Krasner's benchmark definition of a regime as featuring "principles, norms, rules and decision-making procedures"[35], is met by the combined work of the FAO and UNEP's IRPTC in this "given area of international relations". The norm that the international pesticide trade needs to be regulated is nearly universally accepted, with even the chemical industry acquiescing. The rule that prior informed consent must be given by importing countries before hazardous chemicals can be exported has been established to ensure that this norm is respected. The "decision-making procedures" within this issue-system are embodied in the work of the FAO/UNEP Working Group on the implementation of PIC, which involves setting the criteria for determining when particular chemicals are to be subject to PIC restrictions in trade, and the procedures that exporting companies and importing authorities are obliged to follow.

Krasner's use of the term "principles" in his regime definition basically mirrors what are in this study considered as values. Finlayson and Zacher, in Krasner's landmark publication *International Regimes*, describe principles as ,"prevailing beliefs that underlie states' policy orientations to a variety of issue areas"[36], and go on to describe as an example, "a belief that free trade enhances the welfare of all countries". The "principle" (or value) underlying the norm of regulating the trade in pesticides / toxic substances, namely the desire to avoid human suffering, can be understood as having superceded the value of free trade in this particular issue. The arguments of the chemical industry when originally opposing the implementation of PIC were based on the need to uphold the

"principle" of free trade. Their eventual acceptance of PIC was not so much a shift in values however, as a re-orientation in the light of new circumstances. The realization that the alternative to an international trade regime based on the PIC rule could be a scenario with greater restrictions on free trade forced the industry to rethink their strategy and retreat a few yards in order to defend themselves from a more damaging attack. The industry lost the battle over PIC in order to ensure that they did not lose the war over free trade. The new cease fire line between the two values delimits the norm that has generated the regime now in operation in this particular issue.

A further criterion for determining when an international regime is in operation, not explicitly articulated by Krasner, is evidence of a behavioural effect, through the implementation of defined rules or at least from observable compliance with a particular norm. List and Rittberger include such a criteria in their classification of a regime.

> "The identification of a regime requires the observation of norm and rule guided behaviour, ie. some minimal effectiveness which can be measured by the degree of rule-compliance."[37]

Measuring the implementation of PIC is not as straightforward as it might be for other international rules. This is firstly because its details are still evolving, and secondly because its implementation will not necessarily have a positive effect on the problem that it is designed to help remedy. The FAO/UNEP Working Group has been busy over the last three years debating which pesticides should be included in the PIC process and on formulating the documentation to be sent to importing authorities when the rule is invoked. Measuring the impact of the rule is also complicated by the fact that there could, in theory, be a 100% compliance with it but, at the same time, a negligible effect on the trade in hazardous pesticides. The rule can

only serve to make importers more aware of what they are importing. The final decision still lies with such authorities on whether or not to import.

Ultimately, the successful implementation of PIC can only be gauged by evidence that importing authorities are being provided with documentation detailing regulatory information on any product that is on the PIC list entering their country. At present for chemicals not yet on the official PIC list, there is a reliance on the goodwill of the exporter, as the requirement for information exchange for these chemicals is only bilateral. Neither the FAO Code of Conduct nor the London Guidelines require that such records are kept by the secretariat. The Canadian Designated National Authority (DNA) have made it known that they have received notifications from the USA and the European Community for particular pesticide compounds and constituent ingredients and that they are, "not aware of any violations of the notification rule".[38] However, Canada's importing regulations have always been advanced enough to safeguard the country from importing dangerous chemicals and the conclusion of their DNA was that, "in Canada, the PIC procedure has had very little or no effect on the importation of pesticides"[39]. Similarly, the DNA for Sweden has stated that, "the PIC procedure has no significance for the importation of pesticides to Sweden"[40]. Sweden, in fact, by February 1993 was alone in having made the final import decision to permit the import of the first six chemicals to be listed as restricted by the PIC provision, subject to its own inspectorate's advanced approval.

For chemicals included on the PIC list the relevant information comes centrally in the form of Decision Guidance Documents (DGDs) produced by the FAO/UNEP Joint Secretariat after review by the FAO/UNEP Joint Group of Experts on the Implementation of PIC. This information is ultimately intended to be expanded to include all chemicals restricted

in any participant country.

Implementation of the PIC rule can be seen to have begun once the DGDs on the first six pesticides on the PIC list (aldrin, dieldrin, dinoseb & dinoseb salts, fluoracetaide, and HCH mixed isomers) were distributed to all governments taking part in the procedure in September 1991. Once the scheme is expanded to include any domestically restricted pesticides, the rule will be fully implemented as private bilateral information exchange will have been fully replaced by a complete central global network open to all.[41]

The FAO and UNEP have also striven to try to make the PIC rule go further in countering the problem of the trade in hazardous pesticides by empowering Third World importers with greater knowledge of their rights under the procedure. Various training schemes in the Third World have been initiated by the FAO and UNEP/IRPTC in the past three years to strengthen the regulatory capabilities of underdeveloped countries. In 1991, UNEP/IRPTC and the UN Institute for Training and Research (UNITAR) combined to create a training programme for implementing PIC[42]. This programme initially concentrated on Asia, with the first FAO-UNEP/UNITAR Regional Workshop on the Implementation of PIC held in Manilla, The Philippines, in August 1991. Collaboration with the FAO is intended to continue in similar future workshops in Africa and Latin America. A central theme of these workshops is the encouragement of countries to develop National Registers of Potentially Toxic Chemicals (NRPTCs), and foster links with the IRPTC. Extra budgetary support for these training programmes is to be provided by the governments of the USA, Switzerland, Netherlands and Finland.

The FAO/UNEP Joint Group of Experts on PIC have even contemplated trying to make the PIC rule legally binding,

although the 26th FAO Conference Session in November 1991 rejected this idea as premature. A number of delegates at that conference did, however, announce their satisfaction with the progress made in implementing PIC and the effects it was having on their imports.[43]

It is clear that the implementation of the PIC rule has begun, looks like continuing, and is being supplemented by moves to make it have more impact on the trade in dangerous pesticides. In light of this, it is fair to conclude that the PIC procedure is a rule that has had observable behavioural impact and that the final criterion for determining the existence of a regime has been met by the combined work of UNEP and the FAO within the issue-system of international pesticide trading.

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Chapter 8

S T E E R I N G A M I D D L E C O U R S E

Avoiding the Overuse of Pesticides, the Concept of Integrated Pest Management

INTRODUCTION

The norm that pesticides should not be overused is unusual in that it is not derived from a single value and hence not part of a wider issue-system cross-cutting other policy-systems. The norm, in effect, represents a compromise between the competing norms and values that guide actor behaviour within the pesticides policy-system. Integrated Pest Management, the offspring of this norm, is a concept that aims to balance the values of avoiding human suffering, avoiding environmental degradation, and maximizing economic gains.

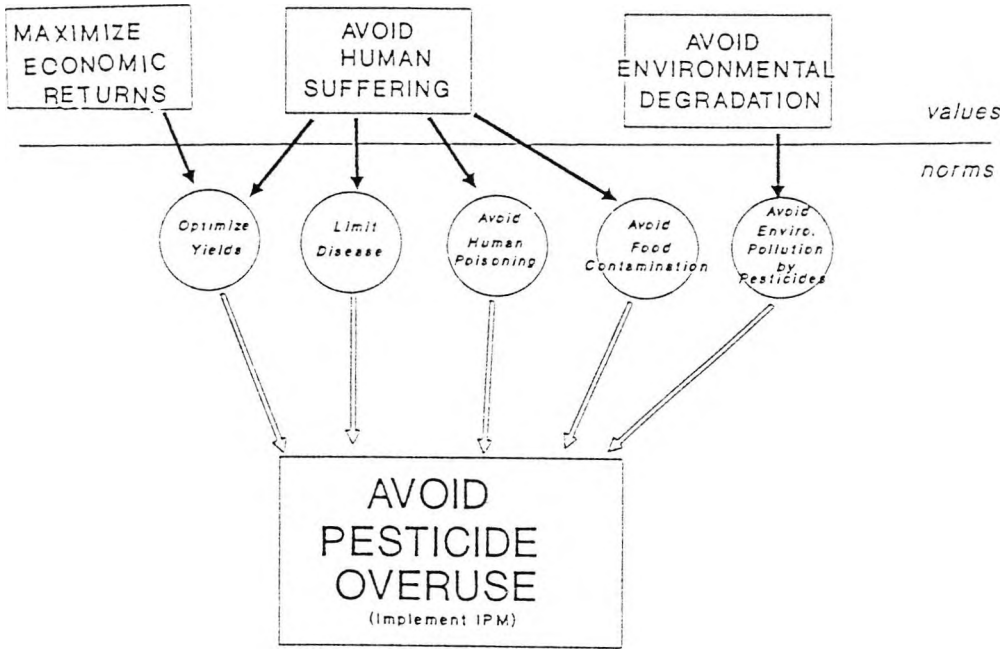

Fig. 11. Relationship between the norm of avoiding pesticide overuse and the other norms and values within the pesticides policy-system.

In light of the damage that can be done to the environment and human health by the misuse of chemical

pesticides, many people have called for a more limited use of these substances in general, going beyond the sort of trade restrictions considered earlier. A body of opinion has steadily emerged which would like to see all uses of manufactured pesticides ended, in favour of alternative practises of pest control. Even more conservative voices within the pesticides policy-system have come to aspire towards a situation in which reliance on chemicals is replaced by a multi-faceted approach to the problem of crop-protection in agriculture. Some governments have implemented legislation reducing pesticide use. The governments of Denmark, The Netherlands and Sweden in the late 1980's launched schemes to cut pesticide use by 50% before the end of the century.[1] The inclusion in the FAO's Code of Conduct of Article 3.8 stating: "Governments and the pesticide industry should develop and promote integrated pest management"[2], seems to signify that the principle that pesticide usage be kept to a minimum has developed the status of an international norm. The agrochemicals industry has noted this, and made efforts not to appear out of line with such opinion. A Shell report on their agrochemical business acknowledges that:

> "Environmental and economic arguments as well as sound biological principles support a trend to integrated pest management (IPM), by which is meant the coordination of agricultural practises and biological and chemical control of pests" [3]

The report goes on to stress that IPM ultimately must still be dependent on chemical applications. The acceptance of the role of other methods of pest-control, however, indicates a tacit acknowledgement of the norm of minimizing chemical use.

The development of this norm has its roots not only in the problems of environmental and human poisoning referred to earlier, but also in the growing realization that overreliance on chemicals in agriculture has its own pitfalls. Whilst crop yields undoubtedly improve with the

initial application of pesticides, these yields are difficult to sustain because pests often develop resistance to a particular toxin after prolonged exposure to it. The number of insects known to be resistant to pesticides rose from around 50 in the 1950's to over 400 in the 1980's.[4] The physiological adaptation of insects to a pesticide can take on a number of forms. Some insects have been known to evolve a layer of their body which is impenetrable to a pesticide, whilst others develop systems which can store insecticides and then detoxify them. The *Aedes aegypti* Mosquito in Malaysia has developed the capacity to excrete an insecticide which was once fatal to it, before it can be absorbed.[5] Research in Malaysia has also revealed that pests can sometimes develop resistance to types of insecticide other than the one which has actually been used against it. The "diamond back" moth is now immune to the effects of both organophosphate and carbamate pesticides, despite never having been exposed to the latter form of chemicals.[6]

On top of this problem of pest resistance is the phenomenon of pest resurgence in the face of continued exposure to pesticides. Pesticides often eliminate natural predators of the targeted pest, which can lead to the pest actually flourishing after a while.

The response of farmers to pest resistance and resurgence is often to increase the dosages of pesticides, which merely serves to exacerbate the problems of pollution, poisoning and food contamination, whilst ultimately not improving yields. The development of resistance to pesticides can cause even more direct harm. The resurgence of malaria in much of the Third World in the 1980's was due principally to the widespread resistance of mosquitoes to chloroquine, which for years had successfully suppressed their numbers. Disease-carrying pests may also indirectly become immune to chemical control, as has been identified in the Cameron Highlands of Malaysia where houseflies are now resistant to a number of insecticides, owing to the fact

that they tend to hatch their larvae in vegetable beds.[7]

The effect of this growing problem of pest resistance has been to make the issue of minimizing the use of pesticides salient to the industry that manufactures them. The realization from the agrochemicals industry that it is in their interests to discourage the overuse of their products is, of course, a position far removed from that of the environmentalists, some of whom call for an outright end to pesticide use, but the common ground between them can be seen to constitute a genuine international norm.

THE ALTERNATIVES TO CHEMICAL PESTICIDES

a) Biological Control

The most widely used alternative to chemical pesticides in agriculture is the practise of mobilizing the natural predators of a pest in order to control it. This usually involves the introduction of a natural enemy somewhere where it does not naturally occur. For such predators to become established in their new habitat, however, a small pest population must be maintained in order for them to continue suppressing the pest. Careful research is required before such action is taken in order not to upset the ecosystem and create new, unforseen problems. If a predator is introduced which also attacks crops or beneficial insects it can become a pest in its own right, as happened when Sri Lankan crows were introduced to Malaysia with the intention of controlling coffee caterpillars.[8] An alternative to introducing new species to a habitat is to augment an already present pest predator by providing it with food and facilities for breeding.

The most common form of biological control is the use of insects to control other insects. This technique has been employed successfully in the protection of cassava crops in Central Africa by the International Institute of Tropical Agriculture, an internationally funded centre based at Ibadan in Nigeria. IITA research discovered a number of predators to the mealy-bug, the cause of a considerable depletion in cassava yields, and launched the worlds largest ever biological control programme based around the parasitic wasp *Epidocrasis lopezi*. The wasp quickly became established in much of the "cassava belt", which stretches from Senegal to Mozambique, and helped reverse a crisis which was costing around $2 billion annually in losses.[9] The mealy-bug is now under control in all nineteen countries in which the wasp was released and crop losses have fallen from 50% to below 20%.

Biological control can also include the use of microbes as pathogens against a variety of pests. Some well known examples of this include *Bacillus thuringiensis*, used by organic gardeners to control caterpillars and *Trichodermavinide*, which attacks silver leaf fungus on fruit trees. The advantage of microbes over insects in biological control is that they are usually more specific predators and are less prone to infest beneficial crops or insects. The field of biopesticides has been boosted by the development of a technique to increase genetically the capacity of microbes to kill their insect hosts. Research by Tomalski, Miller and Stewart at the Institute of Virology and Experimental Microbiology in Oxford has succeeded in implanting genetic fragments from the venom of scorpions and mite into the genome of insect-specific baculoviruses, greatly increasing their deadliness when infecting insect hosts.[10]

b) Resistant Plants

Another means of reducing dependence on pesticides in agriculture is to breed strains of crops which are inherently resistant to their normal predators. Many voices within agriculture are now appealing for a switch from the traditional practise of breeding plants for maximizing yields, as the "green revolution" had taught the Third World, to focusing on producing hybrid species requiring less chemical protection. Once again, economic arguments have been critical in altering perspectives within the agricultural community. The risks to human health and the environment from excessive pesticide use have been well documented, but the appeal of this form of crop protection lies in the fact that it reduces production costs and offers better guarantees of regular, albeit smaller, yields. In the U.K. the National Institute of Agricultural Botany has introduced minimum standards of resistance for new cereal crops, and has a policy of refusing to recommend any crop failing to meet this standard, however high yielding it may

be. It has been estimated that two-thirds of the U.K.'s annual 4.5% rise in wheat production in recent years is the result of varietal improvements in the crop.[11]

Much current research in the field of plant resistance is concentrated on isolating the genetic traits responsible for this, so that they can then be bred into other plants not possessing such a facility. The pioneer in this new era of genetically engineered crops is a strain of tomato which has been inter-bred with a gene from the bacterium *Bacillus thuringiensis*. This bacterium kills caterpillars and its toxin, if introduced into a plants genetic make-up, can make the plant resistant to caterpillars and other common pests.

Probably the most significant research in developing resistant strands of plants is being carried out by the IITA on the banana and its close relative the plantain. These fruits, which represent a staple food for over 60 million Africans, have increasingly fallen victim to a fungal disease known as Black Sigatoka, first discovered in 1973 in Zambia. The natural resistance of bananas to disease is negligible, owing to a continual history of selective breeding which has produced extremely low levels of genetic variability between fruits. Big plantations, responsible for providing the West's supply of bananas, have overcome this problem with the aid of chemicals, but this is an option not open to Africa's many subsistence farmers.

The IITA have promoted the use of "cooking bananas", resistant to Black Sigatoka, as an interim solution but these are less popular than plantains and research has concentrated on producing resistant versions more similar to the traditionally popular fruit. The search for such a fruit led scientists from the IITA to South-East Asia, where varieties of fertile, wild banana can be found. Resistant genotypes of this wild banana have been collected and propagated in the laboratory to produce new hybrid

species of banana. A process of evaluation is now going on to determine which new strain of banana/plantain is most appropriate to be bred for agricultural use.[12]

c) Non-Fatal Chemical Controls

There exist a number of ways to help protect crops from pests involving chemicals, but which fall short of directly killing the pest. The chemicals used are less toxic and consequently less hazardous to man and the environment than traditional pesticides.

Probably the best researched of these chemical control methods involves the use of insect sex pheromones. Either the natural substance or a synthetic version can be applied so as to disrupt the mating of insects or lure them into traps. One such product is the synthetic sex-hormone Sellbate, which trials show can be as effective as organo-phosphorous insecticides in keeping stem borers away from rice crops.[13] A different method of controlling insects by disrupting their reproductive activities is to use chemicals, known as chemosterilants, to sterilize the males of a pest species. These chemicals have the disadvantage of being mutagenic to the pest, so permitting the target organism genetically to develop resistance in the same manner as many have to conventional pesticides. A means of sterilizing insects without chemosterilants does exist however, involving the exposure of the pest to radiation. An FAO sponsored project has successfully controlled Mediterranean fruit flies in this way.[14]

Other forms of non-fatal chemical control have been researched but, as yet, with little success. Insect repellents are openly marketed for use in protecting people from irritation and bites, but their application in agricultural situations has not been developed. A similar idea is to use "anti-feeding compounds" to make a host

plant distasteful to an insect.[15] Research into this is also at an embryonic stage. Some progress has been made on the use of chemicals as growth regulators to either retard the development of the insect or, conversely, to accelerate the ageing process. This is clearly a sophisticated process and it will require a great deal of research before it represents a viable means of everyday insect control.

d) Cultural Controls

Not all of the non-chemical forms of crop protection are procedures rooted in technology, however. Cultural controls, limiting pests by affecting their habitats, are in general based on the techniques employed by farmers to protect their crops before dependence on pesticides set in, in the latter part of this century.

Returning to the age old practise of crop-rotation is one such form of cultural control. With the advent of the green revolution, crop rotation was basically abandoned in favour of monoculture. Monoculture allows for more economical harvesting and sowing, but at the same time permits pests to flourish. Multi-cropping, on the other hand, provides pests with only small areas of host crops to inhabit, while the practise of having fallow seasons within the cycle breaks up any pattern of gradual pest proliferation.

Another traditional farming practise which can be rediscovered as a means of culturally controlling pests, is the destruction of crop residues after harvesting. Burning or ploughing fields after they have been harvested removes any remaining pest habitats and eggs, otherwise free to flourish when the new growing season comes around. Interplanting a cash crop with plants or flowers which deter its pests is another old-fashioned agricultural technique which is beginning to find favour again, with the rise in

consumer demand for organic produce in the West. Planting orange marigolds amongst crops of green peppers, for example, attracts pollinating insects to the flowers whilst simultaneously repelling other potentially harmful insects with their scent.[16] Similarly,the application of natural products such as lemon-rind, tobacco plant stems, and ash can be effective in killing some insects or at least in deterring them. Farmers in Northern Ghana are known to use the liquid derived from boiling Seem leaves as a pesticide against caterpillars and weevils, which infest soya bean crops.[17]

The use of physical controls against pests can sometimes be an effective means of limiting their damage without resort to chemicals. Placing metal barriers in the ground around a crop field is a way of deterring termites or rodents, for example, while utilizing yellow boards covered in glue can serve as a means of trapping whitefly. Projects in the UK, Norway and Sweden are currently exploring the benefits of creating banks of grass in the middle of crop fields, providing habitats for spiders and beetles which are the natural predators of aphid pests.[18] The thinking with this simple procedure, created by exempting tracts of the field from ploughing, is to reverse the effects of a gradual increase in the size of crop fields which has resulted in fewer hedgerows, and with it fewer predators to the aphid. The costs of creating the banks and sacrificing a small area of cultivation have been calculated at initially about £85 per 50 acres, falling to only £30 per year thereafter. How much pesticide can be saved from this procedure is as yet unclear, but the evidence so far is promising. Rhone-Poulenc have supported Dr. Wratten of Southampton University in his campaign to develop wider research into this form of cultural pest control, providing further evidence of the chemical industry's own commitment to reducing dependence on its produce.[19]

e) Integrated Pest Management

Integrated pest management (IPM) utilizes the various pest control techniques mentioned previously, in line with the norm that chemical pesticide use should be optimized. The FAO/UNEP Panel of Experts have defined the concept as follows:

> "A pest management system that in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest population at levels below those causing economic injury.[20]

This represents very much an holistic approach to pest control, as the whole ecosystem of which the plant and pest form a part is always considered. This is a total change in approach to traditional pest control, where each pest is treated as a separate problem, and any interrelationships are not considered. Thus, for instance, a fundamental principle behind IPM is the idea that the targeted pest should never be completely eliminated but rather maintained at an acceptable level whereby damage to the crop is not economically significant.

The conception of this economic threshold indicates that IPM is rooted in more than merely the desire to restrict pesticide use for the good of the environment and human health. It becomes apparent that what are at first seemingly contradictory norms form the framework on which the system is operated. The value on which traditional pesticide use is based, namely the optimization of profit by increasing yields and decreasing damage, is still influential under IPM, but is reconceptualized. By operating a system in which the aim is to satisfy all of these norms, the idea of an optimum yield becomes understood both in terms of economic profit and the human and environmental costs. Balancing these disparate aspirations requires that systematic research be undertaken before the appropriate remedies are integrated into the economically deficient ecosystem in question. At a simple level this may just

mean taking time to estimate levels of pest infestation in a region prior to applying appropriate crop protection techniques, rather than applying pesticides immediately as a preventative measure. This sort of action will be likely to cut the farmers input costs, whilst simultaneously lowering the risk to the environment. The ultimate projection of this idea is to refine the deduction of the optimal yield with the aid of computer technology. Computer models can be made of the complex ecological interactions making up the system under consideration, to determine which measures of pest control represent the most appropriate long-term methods of obtaining an optimal yield.

This idealistic IPM system has yet to be fully practised, but examples of successful programmes based on the principles discussed can be found. The first well documented implementation of an IPM programme occurred in the cotton plantations of the Canete Valley in Peru in 1956. After a decade of successfully controlling pests in the area through the use of organochlorine insecticides, farmers suddenly began to lose around 70% of their crops to the original pests. This situation arose from the widespread development of insect resistance to the pesticides and the simultaneous demise of the natural enemies of the insects due to indiscriminate spraying. Entomologists asked to look into this problem came up with a radical package of measures. Applications of insecticides were drastically reduced from up to forty sprayings per season to only one or two, quarantine measures were introduced, and planting times became regulated. These measures proved successful, and after two seasons cotton yields returned to their previous levels.[21]

Another IPM success story is the case of a trial done in the 1970's in Alabama to find an alternative to relying on DDT spraying on cotton crops. The conventional production practices were compared to a new short-season technique, which used a higher plant density with controlled inputs of

fertilizer and irrigation to limit plant size. The application of pesticides was done in accordance with information derived from scouting, to find the levels of pest population and with it the economic threshold for spraying. The total amounts of pesticide used were at only around a quarter of the traditional method, but after three years of similar results for the two methods, yields became substantially better from the IPM system. With the accompanying reduction in insecticide and irrigation costs, it became clear that the new production methods were far more economically viable for the area, as well as being more productive and less hazardous.[22]

Problems Associated With IPM

Whilst the attraction of a scheme in which the environmental and human hazards of pesticide use are reduced at the same time as economic profits are maximized is obvious, IPM is not without its drawbacks as a pest control scheme. The proposed alternatives to pesticides for use in crop protection also possess flaws which can become apparent if they are not carefully operated. Intensive research is required before biological control schemes can be enacted, to ensure that the ecosystem is not undesirably disrupted by the introduction of a pest predator. It needs to be ensured that the predator is specific to the pest it is intended to control, or else it may become a pest in its own right by attacking crops or beneficial insects. The introduction of Cane toads to Australia and of crows to Malaysia to control coffee caterpillars are cases in point. In both instances the introduced species' are accepted as having caused more harm than good to the crops they were intended to protect.[23]

The augmentation of advances in genetic engineering to the field of biological control, creating what are known as biopesticides, has created great excitement in the scientific world but has also brought with it concerns as to their usefulness and possible side-effects. Biopesticides by 1991 had only secured around 1% of the pesticide market,

which an article in "Nature" magazine summed up as being the result of , "technical snags with their development".[24] The article, which heralded new advances in the area of biopesticides, still admitted that: "Formulated insect pathogens often break down quickly on plant surfaces; they may be costly to produce; and they kill pests more slowly than chemical insecticides".[25] The research being considered promises to overcome the third problem by genetically strengthening the pathogens of microbes and also making them adaptable in the face of pest resistance, but a number of concerns over this technology remain. Fears exist among some scientists that engineered viruses could be capable of replicating and migrating to other, unintended hosts.

Developing a means of pest control without resort to chemicals or pest predators, by breeding pest resistant crops, also has its weaknesses. For a start it is possible that the crop variety with the best resistance may have a yield that is too low to make it economically viable, or that its quality may be below what is expected by consumers. Only a limited number of resistant crops will be able to match these essential criteria. It is also known that a side-effect of increasing a crops resistance to a particular pathogen can be to reduce its resistance to another. As with the GMOs debate, concern has also been aired as to the ramifications of manufacturing genetically engineered crops that are resistant to pests. Recent evidence that some insects have become resistant to *Bacillus thuringiensis*, the toxic genes of which have been incorporated into tomato plants, suggests that this form of pest control is prone to the same Achilles heel that has basically called pesticide use into question.[26]

Perhaps the biggest fear concerning this technology however, is that ultimately it may actually provide a new, and bigger stage for pesticides to act on and thrive. It should be remembered that it is agrochemical businesses that own the vast majority of plant breeding companies, and the

possibility remains that far from using resistant crops as an alternative to chemicals, they will be exploited as a means of allowing more intensive pesticide use. Crops have already been developed which are resistant to particular herbicides rather than weeds, allowing greater quantities of such herbicides to be used against the weeds without harming the crop.[27] The potential environmental consequences of this do not need spelling out, suggesting that the technology of inducing greater crop resistance is in the wrong hands and could exacerbate a problem it was hoped it could help solve.

The mutagenic effects of chemicals used to sterilize male pests has already been discussed, and it is clear that all forms of "indirect" pesticides are still very much in their infancy as crop protection alternatives. At the same time, it is a common delusion that natural chemicals are inherently safer than their synthesized counterparts, and so more preferable for use as pesticides. The use of tobacco based solutions is frequently cited a traditional pest control agent which can be rediscovered as an alternative to modern insecticides, but nicotine is as hazardous as most synthetic chemicals owing to its high mammalian toxicity.

The use of IPM as a package of pest control measures has had its successes, as has been illustrated, and has the potential to thrive once successfully harnessed to computer technology. Extensive national pesticide reduction schemes have thus been implemented in Denmark, Sweden and the Netherlands, three of the world's wealthiest countries. IPM's applicability as an antidote to all the ill-effects associated with pesticide use does need to be qualified however. The bulk of environmental and human tragedies occur in the Third World, where the application of such substances is basically unregulated. IPM does not always represent a viable alternative in these states because ultimately it is rooted in advanced technology. Returning to age-old methods

of pest control may be less hazardous for Third World workers, but it should be remembered that it was the inadequacy of such measures to protect crops that led to the Green Revolution and chemical control in the first place. An economically viable IPM system requires sophisticated technology and a well-trained workforce able to analyze the ecology, geology, and agronomy of a region and prescribe the appropriate solution. These prerequisites are clearly not to be found in most Third World countries (the farmers of the Canete Valley example were wealthy and well educated). This problem is recognized by the epistemic community. A paper presented at the 1989 FAO/UNEP Panel of Experts on IPM appealed to Western universities to make their data bases available to institutions promoting IPM in the developing world, but this appeal has not met a great response as yet.[28] There may well be an international norm prescribing that the use of pesticides be kept at a minimum level, but it seems that the people to whom this is most pertinent cannot afford the prescription charges.

THE POLITICS OF AVOIDING PESTICIDE OVERUSE

The norm that pesticide chemicals should not be overused has found expression within the concept of integrated pest management, supported to some extent by the chemical producers themselves. The realization by the agrochemical companies that promoting optimal rather than maximum pesticide use was in their interest in combating pest resistance and improving the image of their product, was the critical factor in the development of the norm. The concept of IPM was a brainchild of agricultural scientists in the late 1950's and early 60's, when the problem of pest resistance in the face of prolonged exposure to the same chemicals became apparent. Environmentalists, in time, obviously came to see the attraction of a concept that aimed to reduce pesticide usage, but from the start IPM was, to a large extent, rooted in the desire to maintain chemical pest control rather than phase it out. The establishment of avoiding pesticide overuse as a global norm was confirmed by the appearence of a recommendation for IPM at the 1992 UN Conference on the Environment and Development.

> "Governments at the appropriate level and, where necessary, with the assistance of international and regional organizations, the private sector, non-governmental organizations and academic and scientific institutions should: ... Promote the use of integrated pest management based on the judicious use of bio-control agents".[29]

There has been some response to the norm in developed countries. In the developing world however, it seems to be in the interests of neither the farmer nor the industry to promote alternatives to chemical control, and it is far less evident that a norm of minimizing chemical use is behaviourally significant.

Avoiding the overuse of chemicals in pest control would appear, therefore, to be unregulated. No international body can be shown to be a source of authoritative ruling in relation to the norm and respected by most actors in the

issue-system. The previous chapter outlined how the FAO Code of Conduct provisions concerning the trade in pesticides have taken on the form of a legal framework and undoubtedly affected actor behaviour. The Code of Conduct also contains provisions on integrated pest management. Article 3.8 states: "Governments and the pesticide industry should develop and promote integrated pest management."[30] It is difficult to comprehend the FAO's Code of Conduct provisions amounting to a regime with concern for promoting IPM however. Support for limiting the role of chemicals within pest control seems to come from the pesticide industry only when it serves their interests to do so. David Bull refers to a chairman of the British Agrochemicals Association who confirms this point.

> "There is no getting away from the fact that companies will promote what they have to sell through the medium of advertising. Good agricultural practise, integrated methods of pest control are unlikely to feature in advertisements unless they help to promote the product in question".[31]

In the developing world, pure chemical control is promoted as avidly as ever and it is clear that IPM has not been legitimized as a rule to be observed by relevant actors to the same extent as the rules for pesticide trading.

Equally, environmentalist groups often appear only to promote IPM as a public compromise or front for moves to try to eliminate all uses of chemicals in pest control. This is evident in the subtle change in emphasis seen when basically anti-pesticide lobbyists define integrated pest management. A report by the World Commission on Environment and Development seems to envisage IPM as a transitional phase towards the complete replacement of chemical control by alternative methods. "..an optimal combination of biological and chemical control technologies with the gradual phasing out of the latter to rely on natural controls".[32] Similarly, P.A.N. have stated that;"I.P.M. means non-chemical methods of pest control should be implemented first and foremost".[33]

Support for IPM by both industry and environmentalists then, seems to some extent to be only forthcoming when serving their principal interests, namely either promoting or eliminating chemicals. This would seem to suggest that a regime does not exist for the issue of avoiding pesticide overuse, because in general the relevant actors have not been persuaded to adopt different forms of behaviour. The result of this has been to make the concept of IPM highly ambiguous and, consequently, frequently misunderstood.

FAO/UNEP Panel of Experts on IPC

The task of clarifying such ambiguity usually lies with an epistemic community, and in this case the focal point of such a community can be seen to be the FAO/UNEP Panel of Experts on IPC (integrated pest control). In the 1960's the FAO became the institutional focus of chemists and entomologists who had become concerned with the growth in pest resistance and began to extol the virtues of reducing reliance on traditional insecticides. An FAO panel of experts first met in 1967, and in 1974 collaborated with UNEP experts to establish a global programme with regular biennial sessions. The panel has described its role to be that of: "enhancing awareness and adoption of IPM practises, particularly in the developing world".[34] The panels contain a regular quota of twelve experts from the FAO and UNEP, plus a varied assortment of speakers from international organizations and universities, who present papers advocating specific recommendations for action concerning the implementation of IPM. Sub-panel working groups provide technical information on specific areas of interest, such as biotechnology, IPM training programmes, IPM for vegetables, pesticide resistance, the biological control of plant pathogens, biodiversity and pesticide subsidies. A number of IPM programmes have been initiated by the panel, one of the most influential being the "Inter Country Programme for the Development and Application of IPC in

Rice-Growing in South and South-East Asia", involving nine states.

However, as outlined earlier, IPM is a process requiring training, expertise and certain levels of technology, and this has been a constraining factor in its widespread adoption in the developing world. The FAO/UNEP Panel of Experts has explicitly recognised a lack of resources as hampering their progress. The 1979 session reported that the "Near East Inter-Country Programme for IPM in Cotton" would have to be limited in scope because; "The training/liaison officer post could not be established for lack of funds".[35] Bull concludes that the dissemination of information on IPM is "appallingly limited".[36]

Even when the IPM proponents succeed in providing information for the governments of the developing world, the willingness to act upon it is not always there. For a start, any governments adopting a national IPM promotion campaign will be competing with huge multi-national corporations promoting chemical control, in the battle to win the minds of the farmers.

Thailand, for instance, hosted the first "Southeast Asian Pesticide Management and IPM Workshop" in 1987 which recommended governmental backing for IPM schemes and the ending of state subsidies on pesticides.[37] Thailand has enacted domestic legislation in line with the FAO Code in its registration procedure requiring permits for all people using "poisonous articles" and guidelines for the storage and disposal of pesticide containers, but has not acted to advance IPM and alternatives to chemical pest control. Thailand has a very large and labour-intensive agricultural sector, which uses high levels of pesticides, most of which are imported by multi-national companies. The drive to increase food exports is at the heart of the Thai government's aim to expand its economy, and, whilst they are

sensitive to the hazards associated with pesticide misuse, they seem reluctant to impose restrictions on the MNC's when they appear to have aided Thailands growth in food exports.

A similar situation seems to exist in Brazil, where the need to service an enormous national debt has led to a blinkered drive to increase the production of cash crops, such as sugar cane and coffee, for export. Between 1964 and 1979 pesticide use increased by 421%, although agricultural productivity rose by only 4.9%.[38] The Brazilian government has taken steps to provide for the safety of workers using pesticides and generally complied with the FAO labelling standards, but effectively continue to discourage alternative pest control measures by subsidising pesticides. A 17% tax rebate exists on pesticides, whilst general reductions on the importing of raw materials and finished products provide further incentives for farmers and plantation owners to maintain chemical based control strategies.

Not all Third World governments have remained immune to the arguments of the IPM epistemic community, centred on the FAO/UNEP Panel of Experts. The Minister of National Development for Indonesia proudly exclaimed in a January 1987 press conference that, "Indonesia is the first nation in the world to ..... put into effect as national policy what is known as integrated pest management".[39] This move was accompanied by the banning of 57 of the more hazardous pesticides, representing a dramatic shift in government policy for a country which had actively promoted pesticides through government subsidies for many years. The cause of this u-turn appears to have been a combination of increased pest resistance and secondary resurgence in the face of pesticide applications, along with the coming to light of pesticide-related tragedies, in particular the case of the DDT plant at Cicadas, Java (outlined in chapter 4). Some five years earlier than the Indonesian policy change, the

government of Nicaragua set up a National Committee on Integrated Control and implemented IPM techniques. This followed a dramatic dip in the yields of Nicaragua's principal cash crop, cotton, due to widespread pest resistance.[40] A conclusion from these cases seems to be that some situation of crisis has to occur before the adoption of new strategies in line with the opinions of the epistemic community takes place. Bull's research points him towards this hypothesis also."Where IPM programmes do exist they are usually applied to the protection of plantation and cash crops, and to large holdings, often as a response to a pesticide crisis".[41]

Mansbach and Vasquez's issue-cycle, described in the opening chapter, concurs with this hypothesis with its assertion that issues need to pass through a "crisis stage" before entering the political agenda. The Indonesian example could also suggest that maybe an international regime does in fact exist for the issue of introducing IPM, but is reliant on domestic crises for its implementation. Young and Osherenko's recent study included as factors inducing regime formation, "knowledge" in the particular form of epistemic communities, and as a subset of "interest" factors, "exogenous shocks or crises".[42] Environmental regimes undoubtedly are very influenced by the emergence of crises, be they a tragic catastrophe such as at Cicades, or "manufactured crises", as Young and Osherenko describe the instances of long running problems suddenly brought to the agenda by media or NGO interest.[43] Examples can be found to bear out this theory. The discovery of the hole in the ozone layer above Antarctica accelerated governmental action and caused them to make greater use of the advice of various scientific bodies, who had been warning of the dangers of chloro-fluoro-carbon emissions for years. Haas, writing on the role of epistemic communities also supports the hypothesis. "Regimes are created following widely publicized environmental disasters which mobilize public (and epistemic) demands for governmental action".[44]

It is difficult however, to demonstrate conclusively that governments require dramatic evidence of the shortcomings of chemical pest control, before they act to encourage their national farmers to begin adopting IPM schemes. Indonesia represents a rare instance of a government actively promoting alternative modes of plant protection, in association with the expert advice of the FAO and other organizations. The governments of Denmark, Sweden and the Netherlands introduced radical pesticide reduction programmes without the spur of any great national emergencies. India, shaken by the Bhopal disaster, would appear to be a likely source of interest for pesticide alternatives, but her government, whilst responsive to the need for pesticide legislation, has not adopted any crusade to transform crop protection in the way seen in Indonesia. A number of IPM schemes have been put into operation around the world, but they have tended to be isolated examples, backed by groups within the epistemic community rather than national schemes with government backing. The FAO Programme for Integrated Pest Management in Rice, of which Indonesia is part, embraces countries responsible for 82% of the worlds supply. However, out of the 120 million farmers working on rice plantations in the countries included in the programme, only an estimated 500,000 have actually been affected by it. This, according to Peter Kenmore the coordinator of the programme, can only represent a, "drop in the bucket".[45]

CONCLUSION

It would appear, therefore, that the norm of minimizing pesticide applications in line with the concept of integrated pest management, is supported by an international epistemic community but cannot be said to be regulated by an international regime. As we have seen, the epistemic community, made up of the FAO/UNEP Panel of Experts and other bodies such as the University of California/USAID Pest Management and Related Environmental Protection Project and the British Centre for Overseas Pest Research, has influenced individual farmers and occasionally governments to adopt IPM in favour of traditional techniques of pest control. However, no political mechanisms have developed alongside this knowledge-based system. Although IPM has support from both environmental and industrial actors in the pesticides policy-system, it is still not sufficiently established as the correct practice for farmers to follow and governments to support that non-compliance with the norm invokes any sort of sanction. In short there is no authoritative allocation of the norm. According to Haas, under an "epistemic consensus regime...Both leaders and laggards will have to modify their policies in light of the new regime."[46] Whereas some evidence of this can be seen in the issues of trading pesticides and pesticide residues in food, IPM has not had this level of widespread influence.

The question remains as to why the epistemic community proposing IPM adoption throughout the world, has not been the catalyst for regime formation of the sorts seen in the pesticide trade and pesticide food contamination issues. Three partial explanations have been touched upon in this section. Firstly, the epistemic community lacks the resources to make its knowledge available to all potential benefactors. A key reason for this has been the lukewarm interest of the anti-pesticides lobby in IPM. Paarlberg makes the case that, unlike the Codex Committee on Pesticide

Residues and the Expert Panel on PIC, the FAO/UNEP Panel of Experts on IPC,

> "never became politicized in the early 1980's; it remained dominated by entomologists, and attracted little interest either from the NGO community or from industry."[47]

PAN and its allies have undoubtedly concentrated their efforts more on the problem of pesticide trading with the Third World, whilst the agrochemical industry have only shown interest in IPM as a means of maintaining the viability of chemical crop protection in the Developed World. Hence, the second factor restraining regime formation is the fact that the epistemic community's knowledge has to compete with contrary bodies of opinion still advocating traditional pesticide use, which possess greater resources and influence. Thirdly, as a corollary of the first two points and the fact that the knowledge espoused by the epistemic community is complex, serious flaws in the existing knowledge of potential recipients seems to be required before the alternative option is chosen. This is compounded by the fact that IPM is a difficult concept to implement. It is a straightforward task for a farmer or government to comply with standards of acceptable labelling on pesticide containers or permissable levels of pesticides in foods, but less so to know how not to use "too much" of a pesticide. Ambiguous rules will always be prone to ambiguous implementation.

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Chapter 9

FROM VALUE-SYSTEMS TO REGULATORY-SYSTEMS

Reflections on the Seven Issues of Pesticide Politics

PESTICIDE NORMS AND THE GLOBAL AGENDA

It is apparent that the international regulation of pesticide production and use derives from a complex amalgam of organizations, rules and informal norm-guided patterns of behaviour. This study has attempted to clarify this complexity by disaggregating the whole area of international pesticide politics into seven particular issues. The seven issues have been isolated by considering which global norms are responsible for guiding actor behaviour in relation to pesticide use and production questions and then discerning where this has led to the formation of distinct systems of actors in contention over related questions.

The seven issue-systems that are isolated for analysis clearly overlap, both in terms of the actors to whom the issues are salient and, in some cases, the policy questions. Governments and specific pressure and interest groups such as the Pesticides Action Network (PAN) and the Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP), have an interest in all pesticide issues. Equally, some policy-questions may have a bearing on two or more issues. The question of labelling standards for pesticide containers, for example, cross-cuts the issues of human poisoning and the international trade in pesticides. Similarly, whilst the problem of drinking water contamination can be seen as a facet of general food contamination, it cannot be divorced from the issue of environmental pollution.

However, for many of the actors involved in pesticide politics, only one of the seven issues may be salient. The International Agency for Research on Cancer have made a notable input into pesticide questions, but solely those concerning the issue of human health. Likewise the involvement of the World Wide Fund for Nature and the Parents for Safe Food campaign in pesticide politics are

almost exclusively confined to the issues of environmental pollution and food contamination respectively. Thus, the group of actors for whom a particular issue is salient varies across the seven issues considered here.

The clearest means of contrasting political behaviour on the issues comes from considering the extent to which the norms are endorsed by actors. In particular, this leads us to contrast the formation of epistemic groupings and decision-making bodies within the issue-systems. It is clear from this study that pesticide use and production is unevenly regulated, with some issues featuring a far greater patterning of actor behaviour than others. In six of the seven issues considered, international bodies have been established to deal at least partly with the issue, either in a regulatory or in a purely epistemic capacity. The exceptional issue is that of increasing crop yields through pesticide use. This issue-system does not contain any specific epistemic or regulatory bodies. It operates through economic market processes. The continuation of the market is supported by GIFAP and the chemical industry, as it sustains their desire to maximize profits from pesticide production and use, countering the five proscriptive norms advocated by other actors. All seven cases meet the Mansbach and Vasquez criteria for an issue as featuring: "contention among actors over proposals for the disposition of stakes among them".[1]

Global Norms

The opening chapter introduces the idea of norms as applied in this study, and states the seven norms around which the issues of pesticide production and use are focussed. Chapter One also describes the ways in which the seven norms are linked to each other, either by a common underlying value, or through the fact that an issue represents an area of contention over competing norms. The norm upon which the issue of avoiding the overuse of pesticides is based, for instance, is shown in fact to be derivative of five of the

more general norms of pesticide politics (see diagram in Chapter Eight).

The norms of pesticide politics can also, of course, be linked with norms outside the pesticides policy-system. The values of avoiding human suffering and avoiding environmental degradation, which are shown to underlie all seven norms, clearly inform the opinions of actors on a whole range of political issues. The very loose system of norms and issues formed from such values are termed "international orders" by Oran Young[2]. At a higher level of resolution, we can see how specific norms in one policy-system can be related to norms in other policy-systems by more general norms. A recognition of the linkages between the norm of minimizing food contamination by pesticides and other norms of food hygiene has been made explicit by the existence of a multi-regime organization, the Codex Alimentarius Commission. This body regulates a whole range of issues related to the general norm of maintaining hygienic standards in food: a wider issue-system. (see Chapter Six)

It becomes clear through the course of this study that the levels of adherence of actors to the seven norms varies considerably. An actors adherence to a global norm is determined, firstly, by how salient they perceive the norm to be to them in allocating stakes to satisfy a particular value by which they are guided. Secondly, an actor may be influenced by other actors into adhering to a particular norm. This political process can come either in the form of coercion, whereby an actor is persuaded into compliance against its own instinctive self-interest, or as a result of education, by which actors are made to see that a norm is salient to them by reason.

Salience

The perceived salience of a norm to an actor is, of course, relative to the perceived salience of other norms. The process of influence through education previously described, amounts to the act of convincing others that a particular norm is *more* salient to them than a competing norm. Mansbach and Vasquez summarize this aspect of agenda-setting as, "a struggle over salience rankings".[3]

This "struggle over salience rankings" is the central dynamic of pesticide politics. All seven norms considered in this study are salient to the central actors on both sides of the fence in pesticide politics (ie. the agrochemical industry and the consumer/environmentalist lobby). The political stance of those actors emerges from how they choose to prioritize those norms. Basically this amounts to a contest between the prescriptive norms of optimizing crop yields and limiting pest-transmitted damage and disease, and the proscriptive norms of avoiding human poisoning, limiting environmental pollution, limiting food contamination, regulating trade and avoiding the over-use of pesticides. Most environmental pressure groups accept the importance of pesticide use as an aid to improving crop yields, but in their eyes this norm should not be satisfied at the expense of considerations of environmental quality. Equally, the chemical industry is not oblivious to the potential dangers inherent in pesticide production and use, but serve to promote the positive side of it to potential recipients.

For those more peripheral actors for whom only certain norms of pesticide use and production are salient, the "struggle over salience rankings" is clearly less influential in determining their political stance. These actors, however, still contribute to this process of agenda formation through the advocacy of particular norms, intended to highlight the salience of them to other actors. The International Agency for Research on Cancer is only concerned with pesticide questions in so far as they overlap

with the issue of cancer prevention. Thus, the IARC are an element in the pesticides policy-system and can pursue goals which may impinge on other pesticides issues, but they are not influenced by norms other than that of avoiding human poisoning by pesticides and limiting food contamination by pesticides. In this way, issue-specific actors can still serve to influence the overall prioritizing of norms in the policy-system, as determined by the central actors, governments and regimes.

Values

The obvious contrasts in the political stances of different actors are in the nature of the values that they are aiming to satisfy in prioritizing the norms in the way they do. The fact that the agrochemical industry should promote the use of agrochemicals is, of course, wholly predictable as it is in their self-interest to do so. However, this "self-interest" can still be understood as value-guided behaviour, a fact commonly overlooked in the traditional realist approach to international politics. The chemical industry promote chemical crop-protection and chemical-based public health campaigns, because they represent stakes for the value of maximizing economic returns. The environmentalist and consumer groups' level of adherence, however, derives from more abstract values, such as the desire to avoid human suffering and the protection of the environment as a common good.

Mansbach and Vasquez recognize this difference in making a distinction between "concrete" and "transcendental" stakes. Stakes represent the basic gains or losses that stand to be incurred by actors in contention over a norm. Concrete stakes represent a means of directly satisfying a value, whereas transcendental stakes are, "entirely abstract and non-specific, and which concern beliefs, prescriptions, or norms about how people should live or behave"[4]. Clearly

the prescriptive norms of pesticide use and production, in the eyes of the chemical industry, involve concrete stakes. Conversely, the prioritizing of the proscriptive norms by environmental and consumer groups represents a case of acting on transcendental stakes for the achievement of more abstract values.

Similarly, Rolston has distinguished between instrumental and intrinsic values. "Instrumental value uses something as a means to an end; intrinsic value is worthwhile in itself"[5]. Rolston introduces this distinction to appeal for environmental protection to become considered as an intrinsic value and respected for its own sake, rather than respecting it merely when it invokes other values such as security or wealth maximization. The evidence gathered in this study, concerning the issue of environmental pollution by pesticides, suggests that, internationally, stakes in environmental questions are generally perceived to be instrumental. The international agreement on curbing methyl-bromide use and production came about because of the fact that the chemical represents a threat to global security, as it is an agent of ozone depletion. The existence of regional environmental regimes, regulating common stretches of seas or rivers, can be understood as "rational", utilitarian acts of cross-border cooperation in order to reduce the costs of ensuring clean drinking water and fish stocks.

Fish and clean drinking-water represent "concrete" stakes as opposed to the "transcendental" stake of having a clean river for its own sake. Hence, the ideas of concrete and transcendental stakes and intrinsic and instrumental values share much common ground. Corporate groups will invariably find concrete stakes most salient, whilst actors guided by ideology, such as environmental pressure groups, will place greater emphasis on transcendental stakes, which they perceive as having intrinsic value. Nevertheless, the distinction between concrete and transcendental stakes is

not clear cut ultimately. It is possible to conceptualize a clean river as a concrete stake, salient to environmentalists because it is instrumental in satisfying the abstract value of environmental quality.

Nevertheless, it is clear that the salience of an issue to an actor can be due either to its direct or indirect potential for value satisfaction. A clear example of actor support for reasons of indirect value satisfaction is seen in the issue of food contamination by pesticides. The chemical industry have come to support the global norm of avoiding human suffering through the establishment of international standards, because this is seen as a means to the end of increasing the trade in pesticides. The norm emerged as a specific interpretation of the value of avoiding human suffering, but has come to be salient to the chemical industry for its role in realizing the very different value of maximizing economic returns. Hence, "actors may seek the same stake in the name of different values".[6]

A similar case in point is seen in the agrochemical industry's compliance with the norm of regulating the international trade in pesticides. As was demonstrated, GIFAP have come to adhere to the Prior Informed Consent (PIC) rule to which they had previously been vehemently opposed, because this was seen to be the best means of safeguarding the trading of pesticides. As was stated in the conclusion to Chapter Seven, the industry tactically retreated in the battle over PIC, in order not to risk losing the war over free trade. Had they not responded to demands to introduce the PIC procedure, the possibility of greater restrictions on trade in the form of prohibitions on the trade in certain chemicals would have loomed. The guiding ethos of free trade, derived from the value of maximizing economic gains, in this instance had persuaded the industry to acquiesce to a norm derived from a

contrasting value and to accept a rule that actually was designed to restrain their capacity to trade in pesticides. As commentators have been frequently prompted to pronounce, politics can make strange bedfellows.

We have seen that pesticide politics, in common with many areas of political contention, centres around a "struggle for salience rankings" amongst competing norms for the formation of an international agenda. The struggle between the prescriptive and proscriptive norms of pesticide use and production has led to a situation whereby the same prescriptive norms have acquired different rankings for different issues. For example, we have seen that pesticide use is generally more proscribed in agriculture, when the aim is to satisfy the norm of optimizing crop yields, than it is for purposes of pest control in public health programmes. This has been demonstrated by the government decisions given under the PIC rule, whereby they are required to indicate whether or not they wish to permit the future import of particular pesticides. A number of governments are shown to have given consent to the future importation of the insecticides aldrin, dieldrin and DDT, but for public health operations only[7] (see Chapter Three). The World Health Organization (WHO) still advocates the use of DDT in certain situations, despite recognizing the dangers inherent in its use by categorizing it "I" in their Classification by Hazard scheme (see Chapter Four). A Scientific Officer at the WHO's malaria unit is reported to have recommended DDT for malaria control, stating that it was, "the first choice for indoor...spraying".[8]

Hence, different sorts of political decisions concerning pesticide use and production have been made in each of the different issue-systems. Ultimately, this is reflected in the fact that international regimes have been formed within the two issue-systems of pesticide trading and food contamination by pesticides, but not within any of the

other issue-systems.

Political decisions concerning pesticide use and production cannot, however, be made solely within the issue-system of one of the seven issues. The issues clearly are functionally linked. Increasing pesticide use in the face of a crop shortage or on the outbreak of a pest-transmitted disease may well rectify such problems, but may do so at the expense of environmental quality, human safety or food purity. As a result, governments, to some extent will make decisions on questions of pesticide use and production from the broader perspective of the whole policy-system, rather than solely within a particular issue-system. A large section of the pesticides policy-system is invariably affected by a government decision on any pesticide question. The decision of the Netherlands government to reduce greatly their dependence on pesticides, and in particular soil fumigants, was made because of concerns over worker safety and environmental pollution but has had ramifications for the Dutch flower industry in the form of reduced yields. A government spokesman when asked the reasons for taking a decision which could undermine one of the country's major industries explained: "The plan will cause the growers some financial problems, but environmental protection is a priority".[9]

Thus it can be seen that decisions on questions of pesticide use and production are very often considered in terms of a costs-versus-benefits assessment, which incorporates a number of issues. Whereas pressure groups and corporate representatives will have clearly defined spheres of interest, a government has to be concerned with all issues that its country has a stake in and order its priorities in the way it feels is most appropriate. Pimentel, relating this situation to the USA, announced: "The dilemma that society faces is how to protect the nation's food resources from pests while protecting the

environment and public health".[10]

Pimentel attempts to quantify the USA's costs and benefits accrued through the use and production of pesticides, whilst acknowledging the difficulty of setting figures for environmental and health "losses". The USA is estimated to spend around $4 billion per year on pesticides, from which it gains $16 billion in improved crop yields[11]. Added to the costs of pest control are the "indirect costs" due to environmental and health damage resulting from pesticides. Pimentel has calculated that this amounts to a figure of around $1 billion, summarized in the following table.

	Cost (millions of $)
Human poisonings	250
Animal poisonings and contaminated livestock products	15
Reduced natural enemies	150
Pesticide resistance	150
Honeybee poisonings and reduced pollination	150
Losses of crops and trees	75
Fishery and wildlife losses	15
Government regulations concerning pesticide pollution	150
Total	955

Fig. 12. *Estimated costs of US pesticide use*[12]

Whilst these figures on the face of it seem to provide a clear vindication for current rates of pesticide use in the USA, Pimentel uses them as a basis for arguing for substantial cuts in their use. Pimentel proposes that although a 50% reduction in pesticide use, achieved by implementing non-chemical control methods, would increase costs by about $1 billion, it would be desirable in that it

would reduce environmental and health costs.[13]

Clearly, of course, such a cost-benefit analysis of the whole pesticide policy-system would produce very different conclusions if applied to countries less economically developed than the USA. As we have seen, Third World governments faced with famine and tropical diseases have more acute problems to remedy than their developed world counterparts. At the same time, such governments lack the resources to solve such problems with non-chemical control methods, which may be environmentally favourable and safer to use, but are more expensive. Hence the dilemma central to international pesticides politics: the prescriptive norms are most salient to those same countries where the proscriptive norms are also most salient. The cost-benefit analysis for many African, Asian and Latin American countries amounts to a choice between higher rates of pesticide pollution and poisoning and higher rates of malnutrition and malaria. The proscriptive norms can only take priority on a national agenda when that government is able to continue satisfying the prescriptive norms. As Algerian President Boumediene is reported to have stated in the run up to the creation of the Mediterranean Action Plan in the 1970's: "If improving the environment means less bread for the Algerians then I am against it".[14]

There are seven distinct issue-systems making up the pesticides policy-system, invoking different values and involving different sets of actors, but at the same time they are clearly interdependent. The prioritizing of one norm will inevitably lead to the relegation of another one on the political agenda. We have seen how such acts of prioritizing one norm over another will vary from country to country, according to circumstances and how governments perceive their responsibilities. This delicate balancing act becomes all the more difficult when the system of interest is widened, as it is in the devising of global regulations.

Internationally, we have seen that priority appears to be given to limiting food contamination and regulating pesticide trade above the other proscriptive norms of pesticide politics. The issue-systems based on these two norms have developed global regimes, phenomena not present in the other issue-systems (although regional environmental regimes do exist as does the global ozone-depletion regime, which overlaps the pesticides policy-system through its provisions on methyl-bromide). The following section aims to offer some explanations as to why the apparent prioritizing of norms in this way has occurred internationally and whether this alone accounts for the process of regime formation seen in two of the issue-systems. At the same time it will be considered whether, in addition, factors within the issue-system are influential in fostering or inhibiting regime creation.

EXPLANATORY FACTORS FOR REGIME CREATION

1. Hegemony

The theory of hegemonic stability upholds the belief that regime creation results from the desire to prioritize those global norms that are considered to enhance international order. According to this theory, the dominant international actor is the catalyst for regime formation, seeking to enforce norms and rules that will ultimately serve to maintain its hegemony, and with it international security. Thus, according to this approach, regime creation can be accounted for structurally in line with the balance of international capabilities. This hypothesis, in its strictest sense, therefore implies that political behaviour within individual issue-systems is irrelevant in accounting for the development of international regimes.

> "...order in world politics is typically created by a single dominant power. Since regimes constitute elements of an international order, this implies that the formation of regimes normally depends on hegemony".[15]

The theory of hegemonic stability incorporates the central realist axiom, of states rationally aiming to secure themselves through maximizing their power, in the face of growing interdependence between countries. The chief exponents of this view, including Kindleberger[16], Keohane[17], Krasner[18] and Gilpin[19], are principally concerned with the politics of the world economy, for which the theory does appear to have some descriptive utility. The United States undoubtedly found itself in a position of hegemony in the international system in the years after World War Two until the 1970's, having a preponderance of economic resources and military capabilities. Consequently, much of the post-war international economic and military order was moulded to suit their interests. Institutions such as the North Atlantic Treaty Organization (NATO), South East Asian Treaty Organization (SEATO) and ANZUS coopted much of the non-communist world to an American view of security, whilst the

"Bretton Woods system" of financial agreements tied most developed capitalist countries monetarily and through trade to the US economy. The other classic example of hegemonic stability advanced by the Realists is the international trade system of the mid- to late-nineteenth century, which was dominated by Great Britain by virtue of her vast Empire and naval strength.

Without doubt, Great Britain and the United States were able to utilize their capabilities to order international cooperative arrangements to suit their needs in the nineteenth and twentieth centuries respectively. However, critics of hegemonic stability theory point out that many international institutions and regimes have either survived the decline of a hegemon or been created in the absence of one. Although the decline of US hegemony in the 1970's was accompanied by the cessation of the Bretton Woods fixed exchange rates system, most other international arrangements including the General Agreement on Tariffs and Trade (GATT), the World Bank and the regional banks continued to function according to the same guiding norms as before.

In addition to this, many examples of regimes created in the last twenty years, when American hegemony has receded, have been offered by writers seeking to prove the deficiencies of hegemonic stability theory. A range of environmental and conservation regimes have been established in the last two decades, which seemingly owe little to the balance of capabilities in the state-system. A regime aiming to conserve Polar Bears in the Arctic was set up in 1973 including both major Cold War protagonists, the USA and USSR, and a number of smaller powers, because it represented a common (non-security) concern which transcended ideological differences, without apparently advancing the economic or military interests of any of the participating governments.[20]

A number of explanations have been offered for the failure of many international institutions and regimes to collapse in the absence of continued American hegemony. One response is to argue that, although American power relative to the rest of the world has declined, she still maintains a sufficiently preponderant position to continue directing international arrangements in a way which favours her interests.[21]

An alternative view is the argument that a hegemony still exists within the international system in the form of a trilateral power structure formed by the USA, Japan and the European Community. This view accepts that American hegemony has declined and that in terms of economic power she is rivalled by Japan and the EC. However, as this group shares a general ideology in favour of capitalism and liberal democracy, it can be reasoned that they jointly have assumed the role previously enjoyed alone by the USA, of expressing their values in the form of international institutions and regimes.

A third explanation comes from the idea of a time-lag existing between the rise and fall of regimes and underlying changes in the structure of power. The assumption here is that regimes formed during eras of hegemonic stability "assume a life of their own"[22], and so are liable to continue despite subsequent realignments of power in international society. Krasner explains the phenomena of time-lags as being a result of custom, uncertainty and cognitive failing[23]. States party to a regime may continue to adhere to its rules and principles through habit, being reluctant to defect in order to maximize short-term interests through the fear of incurring long-term costs. Equally, although states may not be entirely satisfied with the regime to which they are party, they may be unwilling to bear the costs of constructing an alternative system. It is through these sorts of "feedback mechanisms"[24], Krasner argues, a regime

can survive the decline of the hegemon whose preponderant position in the international system had created the conditions for its creation.

These explanations can be offered as reasons for the maintenance of regimes set up during the age of American hegemony. However, they do not account satisfactorily for the setting up of regimes such as that described for polar-bear conservation, or indeed for the regime regulating the trading of pesticides, outlined in Chapter Seven. Polar-bear conservation cannot be seen as serving the interests of any hegemonic power structure, be it unilateral, trilateral or otherwise. Equally, the forces behind the instigation of a regime for the trade in pesticides were, if anything, counter-hegemonic. The Prior Informed Consent rule was established against the wishes of the governments of the United States and United Kingdom and in the interests of developing countries, rather than any of the powerful states.

The regime dealing with the issue of pesticide residues in food, however, could be argued to represent an attempt to legitimize the interests of a hegemonic group. As was argued in Chapter Six, recent moves to empower the Codex Alimentarius Commission with the right to have its residue tolerance levels made legally binding in international trade over those set nationally, have come from the big chemical corporations in North America and Western Europe. In this instance, as we have seen, hegemonic power was not a significant factor in the regime's establishment. It could be argued, however, that it has assisted in its maintenance and remains a potentially significant variable for regime change.

The conclusion that can be drawn from the evidence of regimes in pesticide politics and elsewhere, is that while hegemony may be a factor in regime creation, maintenance and

change, it is not the single overriding variable that the hegemonic stability theorists would have us believe. Hegemony is not a necessary condition for regime creation, rather it is one of a number of variables which can explain the phenomenon.

2. *Issue-Specific Power*

The hegemonic group referred to earlier as that aiming to change the normative nature of the food-residues regime, does not meet the criteria of a hegemon in the classical sense. The agrochemical industry, which is the driving force behind moves to empower the Codex Alimentarius Commission with supranational authority in pesticide-residue legislation, is not a hegemon in terms of the international system as a whole. They are an influential lobby to the governments of North America and Western Europe, but they do not yield much influence in issues outside chemical politics. Thus, the power possessed by the agrochemical industry is *issue-specific* and infungible, unlike that purported to be wielded by the United States government in the post-World War Two years. However, issue-specific power has invariably been conceptualized in terms of coherant state-actors, rather than non-state hegemons such as the agrochemical industry.

Neo-realist theorists were made aware of the low fungibility of state power by the USA's inability to utilize its military capabilities in the economic sphere, where she had become rivalled by Japan and the European Community, and adopted an, "issue-differentiated theory of hegemonic stability"[25]. According to this modification of hegemonic stability theory, an actor with a preponderant share of resources within a particular issue-system is able to foster the creation of a regime in that issue-system which serves its interests.

Jonsson adopts an issue-specific power framework to try to explain the attempt by the United States government, in the late 1970's, to change the international aviation regime by increasing deregulation and so improving the USA's commercial share of international flights.

> "Although the regime challenge came at a time when there were cumulative signs of declining overall American power, there was no corresponding change of the issue-specific power structure in international air transport. The United States remained by far the strongest aviation nation and did not hesitate to exploit its issue-specific power".[26]

This American challenge failed to change the nature of the aviation regime, despite their advantage over their competitors in terms of aeronautical technological development and vehicle manufacturing and the fact that they represented by far the biggest market in world air commerce. Jonsson accounts for the failure of the American challenge by the fact that her actions had the effect of mobilizing a coalition of opponents, who were able to derive their influence from the fact that they essentially were supporting the status-quo and had the backing of the existing regime, the International Air Transport Association (IATA).

An additional factor identified by Jonsson, is the fact that the USA itself was split on the issue, a situation the IATA was able to exploit. This is a key point and one which has been inadequately addressed by power-based theorists. The development of complex interdependence in the international system has increased the number of instances whereby the "state actor" is an unusable concept. This is most clearly so for states with highly pluralistic political systems, such as the United States. Chapter Eight highlights the divergence of opinion between the American cabinet and the Environmental Protection Agency over the issue of pesticide residues in food. Here we see one part of the government, informed by chemical industry representatives,

campaigning for international standards that are opposed by another part of the government that currently commands most legal authority on such questions.

We have already seen that national authorities deal with a wide range of political issues, which forces them to prioritize some over others. In some instances this inevitably leads to issues where different sections of a state's apparatus seek to advocate positions which are in some way contradictory. This clearly presents another problem for the theory of hegemonic stability, even in its issue-specific form. The USA's capabilities, even when considered purely within the confines of individual issues such as international aviation and food contamination by pesticides, may still represent an inaccurate guide to their level of influence. Firstly, the capabilities of a state may be divided between competing forces and, secondly, a government may not be able to translate an advantage in capabilities into preferred outcomes. As the aviation regime case shows, actors resisting change can utilize factors that compensate for any disadvantage in resources. Issue-specific knowledge and the facility to use existing political arrangements to form blocking coalitions are prominent amongst such factors.

3. *Leadership*

Young accepts the premise that state-power is of only limited utility in explaining cases of regime formation.

> "...The role of power in international society is not limited to structural power exercised by states. Individuals may also become leaders by acting to translate the structural power of states into bargaining leverage applicable to specific instances of regime formation".[27]

This form of power utilization is described by Young as "structural leadership"[28] and can be seen as a modified version of hegemonic stability theory, omitting the underlying assumption of that theory that an actors

resources can and will always be mobilized. Hence, Young ascribes the role of Henry Morgenthau, the USA representative at the 1944 Bretton Woods Conference, as that of a structural leader able to draw upon his country's predominant resources in negotiating the post-war international monetary regime.[29]

Young goes further in arguing that individual leadership can still be an important factor in regime creation even when the actor being represented does not possess significant structural power. Individuals negotiating on behalf of parties not in command of any advantage in resources, may still help fashion international arrangements by acting as either "entrepreneurial" or "intellectual" leaders. Young's "entrepreneurial leader" shares some similarity to Keohane's "political entrepreneur"[30], referred to in Chapter One. For both, the entrepreneur's chief contribution to regime formation is to facilitate cooperation between actors where the potential for mutual benefits exists, but a spur is needed to induce collaboration. This is achieved by the individual acting as an innovator for the popularization of an issue. Where Young and Keohane differ is over the latter's proviso that the entrepreneur needs to be, "large relative to the whole set of potential beneficiaries"[31]. Young accepts that structural power can augment the bargaining leverage of an entrepreneurial leader, but reasons that it is not essential to the cause. He rightly cites the numerous examples of influential individuals in intergovernmental organizations who actually derive their influence from being the representatives of small states, which gives them credibility in the eyes of others as agents of the common good, rather than that of national interest.[32]

The "intellectual leader", according to Young, is an individual who shapes the comprehension of an issue and how to deal with it, through reasoning and innovative thinking.

The role of Monnet in inspiring European integration in the 1950's is used as an example of such an individual. Young considers the presence of a leader, in one of the three guises, to be an essential criterion for regime creation. He goes further in arguing that: "The establishment of effective international institutions ordinarily requires the interplay of at least two forms of leadership".[33]

Individual leadership is not a striking feature of pesticide politics, but the development of the Prior Informed Consent rule, upon which the international pesticide trade regime is based, was aided by some displays of leadership. David Bull of OXFAM first coined the phrase "prior informed consent", which was adopted by PAN as the prescribed means of regulating the trade in pesticides. He was also responsible for producing the first draft of the FAO International Code of Conduct on the Distribution and Use of Pesticides, in which PIC was included as a provision. PAN's European Region coordinator in the 1980's, Marianne Werning, was a focal point for the lobbying of FAO national delegates to support the Pesticides Code as a whole, and the PIC procedure in particular. At the FAO Conferences, certain delegates took the lead in organizing support for PIC. Delegates from the Netherlands, which was the first country to introduce PIC into domestic law in 1985, continually acted as proponents of the procedure being included in the FAO Code of Conduct. The leaders of the Third World coalition which built up in favour of PIC, were the delegates of Ecuador and the Philippines, whose speeches at the 1985 FAO Conference have been seen as a significant stage in its legitimization[34]. The failure to obtain an endorsement of PIC in 1985 might be interpreted by some analysts as a result of a "hegemonic" influence wielded by the chemical industry and the governments of the USA and UK. However, the mobilization of delegates in 1985 and 1987 in favour of PIC ultimately led to its incorporation into the FAO Code in 1989. PAN delegates helped instigate PIC as an

issue of Third World solidarity at the 1987 UNEP Governing Council by circulating amended versions of UNEP's "London Guidelines for the Exchange of Information on Chemicals in International Trade", featuring PIC, to all delegates who belonged to the Group of 77.[35] If Young's threefold classification is applied to the pesticides trade issue, Bull and a number of PAN representatives, led by Werning, can be seen as intellectual leaders, whilst the delegates of Ecuador and the Philippines played the role of the entrepreneurs.

4. *Epistemic Communities*

The utilization of the "power of ideas"[36] by individual leaders represents an attempt to reshape the knowledge that actors possess on an issue. This knowledge will be reflected in the principles of any regime set up to regulate the issue. Whereas the norms of a regime will emerge from consensus within the whole issue-system, an epistemic consensus on technical questions will tend to be arrived at by a sub-set of that issue-system, establishing principles which serve as yardsticks in understanding the nature of the problems faced and the consequent emergence of norms. This sub-set of actors has been termed an "epistemic community".[37]

Haas considers epistemic communities to be an explanatory variable for regime creation, alongside power and interest based explanations. His most extensive research has been on the development of the Mediterranean Action Plan (MAP), a regional regime regulating marine pollution in that sea[38]. The crucial factor in the creation of MAP was the decision of the North African countries to take part in the regime after initially showing hostility to it as being counter to their interests. Haas' research found that this redefinition of interests was not the result of any "arm-twisting" by the regions hegemonic power, France, over countries heavily dependent on her trade. Conversely,

Algerian compliance with the rules of MAP came at a time when their trade with France had dropped considerably.[39]

Instead, Haas proposes that the MAP's creation was chiefly instigated by a grouping of like-minded ecologists and marine scientists who gained access to national administrations and the United Nations Environment Programme (UNEP) secretariat. This epistemic community established the principles that were gradually accepted by the Mediterranean state governments in formulating the norms and rules of the regime.

> "The principles are that Mediterranean currents and wind patterns transmit pollutants across national borders and that these pollutants interfere with other uses of the sea (such as recreation, tourism, fishing and navigation) thereby necessitating coordinated national control policies".[40]

Haas considers epistemic communities to be most influential in environmental issue-systems, where the principles being established are of a highly technical, scientific nature. In such cases, the epistemic community gains empowerment from the fact that they provide an understanding of areas that are unfamiliar to decision-makers. Hence, the discovery of a hole in the ozone layer over Antarctica in 1985 and the consensus of scientific opinion as to the causal role of chloro-fluoro-carbons in this process led to the formation of an international regime curbing CFC use and production within two years. The principle that "CFCs are eroding the ozone layer" was established by a small group of atmospheric physicists and chemists from a variety of national and international organizations, including UNEP and the British Antarctic Survey[41]. The expertise of this group in relation to the issue was accepted by most governments and the principle became the catalyst for political action.

The issue of ozone depletion clearly represents a case whereby the establishment of an epistemic consensus was the

starting point for international political cooperation and regime formation. In such cases, a united voice of recognized experts on an issue serve to provide a clear understanding of a problem requiring a political response. In effect they create a new "fact", of which political actors must be aware and respond to in some way. This cognitive process of establishing a fact may occur some time after its physical establishment. The hole in the ozone layer is actually believed to have emerged in 1975 and the pollution of the Mediterranean had been going on for many years prior to the signing of the MAP. The key factors in regime creation appear to be, firstly, for the political actors to be persuaded that a principle espoused by an epistemic community is indeed a fact and, secondly, for them to accept that a new fact is significant enough to warrant a re-prioritization of the norms that guide them on a particular issue.

Epistemic consensus is a powerful force for political action, but scientists and intellectual groupings do not always reach harmonious conclusions. For instance, there is not the same level of scientific convergence on the causes of the global problem of rainforest depletion as there is for ozone depletion, which is reflected in the absence of any international regime for rainforest conservation. We have seen that an epistemic consensus is lacking in some of the areas of pesticide politics, particularly in the issues of human poisoning and pesticide residues in food. Estimates of human deaths and illnesses attributable to pesticides vary considerably and proponents of proscriptive and prescriptive norms both use scientific opinion to bolster their positions. The competition between different bodies of scientific opinion, or "scientific politicking"[42] is a recurrent theme in pesticide politics issues and tends to inhibit the establishment of principles as "facts" in the minds of political actors.

A crucial point here is that scientific opinion can be a product of the political process as well as an input into it. It is too simplistic and idealistic to think that an epistemic consensus will always emerge independently and proceed to unite all actors within an issue-system. Favourable scientific opinions can be seized upon by particular actors and then magnified by their power and/or leadership skills. The controversial opinions of cancer scientist Bruce Amyes, who feels that the carcinogenic threat posed by pesticides is exaggerated, have been utilized extensively by the chemical industry in countering the claims of the anti-pesticide lobby (see Chapter Six). Furthermore, scientists may be employed by a political actor to produce data which serves their cause. GIFAP and the American Chemical Society regularly publish scientific research on pesticide toxicity which ultimately serves to promote its production and use, albeit in a responsible manner.

At the ultimate level, scientific opinion may be politically manipulated or even corrupted. In Chapter Six we saw how the Reagan administration in the USA attempted to dilute the regulatory standards governing the issue of pesticide residues in food. The government appointed scientists sympathetic to its cause to the key regulatory and epistemic body, the Environmental Protection Agency and attempted to alter the rules by which the EPA came to calculate its "safe" tolerance levels[43]. Also in the USA, we have seen the occurrence of fraudulent testing by scientists, in order to gain political approval for particular pesticide products.

Internationally, environmental and consumer pressure groups have expressed concern over the level of influence wielded by the chemical industry over UN bodies dealing with pesticide issues. The Food and Agricultural Organization (FAO) has long been criticized for being too "cozy" with

industry in general[44]. In particular, the level of corporate influence at Codex Alimentarius Commission (CAC) meetings is cited as a reason for the establishment of pesticide residue limits far less strict than those of North America and Europe.[45]

In this instance, however, it is not the epistemic community that is being manipulated but governments. The Joint Meeting on Pesticide Residues (JMPR), the scientific body responsible for FAO/WHO testing and data on residue questions, is not composed of any corporate representatives, but government delegations to CAC committees are heavily weighted in favour of the food and chemical industries. This represents an instance of a powerful actor using its capabilities and leadership skills to use the output of an epistemic community in a way which furthers its interests. The industry has accepted the validity of JMPR research but succeeded in reinterpreting its output as serving to establish maximum rather than minimum global standards. Hence an epistemic consensus which originally helped uphold the norm that "residue levels in food should be limited", because of the principle that "residues can harm human health", is being utilized to uphold the very different value of promoting free trade. Similarly, the chemical industry has reinterpreted the meaning of the Prior Informed Consent rule in pesticide trading[46]. A rule formulated to control pesticide trade has been reconceptualized as a means of de-legitimizing any attempt by governments to outlaw completely the export of particular pesticides.

For the issues of pesticide residues in food and pesticide trading, the industry has been forced to acknowledge the legitimacy of a rule and respond to it politically. In both cases they have had the capacity and adroitness to respond in a way which minimizes their losses. In the case of food residues, the industry could actually be seen to increase their gains, since the enforcement of the

current global regulations would represent a lowering of most current national standards.

"Scientific politicking" is a feature of all seven issues in international pesticide politics. The issues of human poisoning, environmental pollution and food contamination are all conspicuous for a lack of epistemic consensus. The issue of avoiding pesticide overuse by implementing a policy of Integrated Pest Management owes its existence to an epistemic consensus on the desirability of the concept, but this has not led to the formation of an international regime. Part of the reason for this is that the epistemic group upholding the desirability of IPM has to contend with the existing, still well-established body of opinion on the merits of conventional chemical pest control.

An epistemic consensus is clearly an important factor in the establishment of an issue on the international agenda, but for a regime to evolve from the issue-system it is necessary for the epistemic consensus to overturn the existing knowledge of actors concerning that issue and any other issues to which it may be linked by value or function. This can happen in two ways. Firstly, the epistemic consensus may be augmented by the structural power and/or leadership skills of actors who can then persuade others of a norm's salience to them. Thus, the chemical industry's support for the international regulation of pesticide residues in traded food products has been important in the creation of the regime based on the Codex Alimentarius Commission. Similarly, their eventual support for the PIC rule was the crucial factor in the creation of an international regime governing pesticide trade. The second way in which epistemic consensus on an issue may lead to the overturning of existing knowledge and the creation of a regime is when the principle espoused by an epistemic community is conceived by actors to be superior to their present knowledge. This inducing of salience through

enlightenment is usually the result of a discovery by an epistemic community, which is significant enough to alter immediately the actors established knowledge and alter their prioritizing of norms and issues. The discovery of a hole in the ozone layer above Antarctica represents such a case, as does the subsequent discovery that the soil fumigant, methyl-bromide, is an agent of ozone depletion. Ozone depletion since 1985 has been universally conceived of as a threat to security and, hence, political responses have followed. This leads us to another partial explanatory factor for regime creation, the onset of a crisis.

5. *Crises*

The clearest way by which an actor can be convinced of the need to place a particular issue higher up its political agenda and move towards international cooperation, is when that issue becomes conceived of as a threat to its security. Hence, the discovery of a hole in the ozone layer coupled with the understanding that this posed a major health threat, prompted a quick international response. Similarly, the Chernobyl nuclear accident in 1986 dramatically highlighted the need for international safety standards, which were formulated in agreements the following year[47]. In such circumstances the role of epistemic communities becomes crucial, as governments seek expert advice to try to establish the principles upon which to base cooperation.

> "Decision makers do not always recognize that their understanding of complex issues and linkages is limited and it often takes a crisis or shock to overcome institutionalized inertia and habit and spur them to seek help from an epistemic community."[48]

The sudden emergence of such threats to global security are obviously not common, but cooperation may be ignited by "crises" of a lesser sort in which public opinion is

mobilized sufficiently strongly for governments or international organizations to act. Young refers to a "manufactured crisis", consisting of media and NGO pressure, as being partially responsible for the formation of the regime aiming to conserve Polar-bears.[49]

Clearly any "crisis", even in a lesser form in which no threat to security is apparent, needs to have international ramifications for it to act as a catalyst for international cooperation. The erosion of the ozone layer potentially threatens everybody, whilst spills of nuclear radiation can travel thousands of miles and threaten the livelihoods of people outside the country where the accident occurred. However, as we saw in Chapter Five, environmental pollution by pesticides rarely becomes an international problem and as such tends to remain regulated at the national level. The international agreement to freeze methyl-bromide use and production arose because this represented a global threat, whilst the various marine pollution regimes dealing with the issue have remained localized to countries sharing common stretches of water. Pesticide politics' greatest-ever crisis must surely have been the Bhopal disaster of 1984, in which thousands of people died and world media attention highlighted the culpability of lax safety standards for the tragedy. Despite the attempts of pressure groups and activists to try to utilize the crisis' impact for the development of safety guidelines[50], Bhopal was not a catalyst for international action in the way that Chernobyl was. This was basically because the chemical industry was able to show satisfactorily that safety standards prevented any possibility of such an accident occurring in the Western World.

A crisis is very likely to induce governments and other actors into creating an international regime based on principles that are upheld by a consensus of experts, when that crisis is sufficiently salient to them. The level of

salience need not necessarily be of the order of a threat to security, as is evidenced by the polar-bear and other conservation regimes, but if the crisis is seen to hold little significance outside its country of origin then significant cooperation is unlikely.

6. *Utilitarian Explanations*

According to the liberal/idealist school of thought, against which realism initially emerged as a response, international cooperation was inherently desirable as a means of reaping joint gains for all, as opposed to relying on the actions of governments who tend only to maximize their own short-sighted interests. This approach, which can be seen as a forerunner of the modern pluralist paradigm of International Relations, represented an adaptation of the classic economic liberalism of Adam Smith and his contemporaries. The maximization of economic utility, it was argued, could only be achieved by minimizing governmental control of the world economy and promoting free trade. Hence, the General Agreement on Tariffs and Trade (GATT) and other forms of international economic cooperation were encouraged in the years since World War Two.

Utilitarian arguments in favour of international cooperation have been applied outside the economic sphere, as responses to international problems where only a collective response can facilitate an optimal outcome for all. The theories of public goods and the prisoners dilemma, outlined in Chapter One, describe how norms which do not maximize short-term utility calculations can nevertheless serve as beneficial guides to behaviour. Hence, an international regime to control CFC emissions can be conceptualized as a rational response to the problem, even for those governments for whom curbing CFC production incurs most costs (see Chapter Five).

The adaptation of utilitarian arguments for regime creation from the economic sphere to the public goods sphere can, however, produce contradictions. That fundamental expression of economic liberalism, free-trade, is diametrically opposed to many forms of utilitarian cooperation over the allocation of public goods. Any international regime that proscribes the use, production and trade of a particular item, on the grounds that it is likely to be depleted to levels that are disadvantageous to all, runs counter to economic utilitarianism.

The inability to provide public goods, and other areas exogenous to economic production in which cooperation is necessary, have been termed "political market failures"[51]. When such cases arise, cooperation will still be in the interests of all but may require a "political entrepreneur" to bear the short-term costs of initiating the process. Keohane considers that regime creation partly represents the rational maximizing of utilities by actors. He is at pains to point out that such a functional analysis is, "not a substitute for the analysis of power"[52], but rather should supplement hegemonic stability as an explanatory theory of regime formation. The basic assumption behind the utilitarian/ functionalist theory of regime creation is that actors will cooperate in order to reap joint gains.

This returns us to the debate, opened up in Chapter One, over the nature of "norms", the consensual guides to behaviour, from which issue-systems derive and regimes may subsequently form. The utilitarian approach clearly assumes norms to be "artificial virtues"[53] which merely reflect the interests of actors. If this approach is supplemented by hegemonic stability theory, as in Keohane's work, the norms will be seen as reflecting the interests of actors but in a way weighted in favour of the more powerful actors. Hence Donelan defines a norm as, "a record of the methods and results of power politics".[54]

Certainly, examples can be offered of norms that serve to satisfy the interests of all participating actors. As was argued in Chapter One, much of customary international law can be understood in this light. The development of the norms that maritime states are entitled to claim jurisdiction over bays and continental shelves adjacent to their territories or declare a 200 mile Exclusive Economic Zone (EEZ) in the surrounding seas bear testimony to this. However, many international regimes have succeeded in legitimizing norms and rules, and gaining compliance from actors, for reasons other than self-interest or the interests of a dominant actor.

An interesting illustration of this is provided by Harald Muller, from the realist preserve of security politics[55]. Muller shows how the Anti-Ballistic Missile (ABM) Treaty, which had formed the centrepiece of a strategic nuclear arms regime since 1972, managed to survive with its norms, rules and principles intact despite a move by the US government in the early 1980's to abandon it for reasons of national interest. The Reagan administration announced its desire to implement a Strategic Defence Initiative (SDI) policy, which would achieve national security through exploiting the USA's advantage in capabilities, rather than putting their faith in a bilateral treaty based on trust. This policy proposal was abandoned after a concerted campaign, both domestic and international, which sought to uphold the norms of the ABM Treaty. The US State Department valued the confidence provided by maintaining a security regime; the USA's allies feared that an American unilateral approach to security would ignore their security needs; and the body of experts (epistemic community) responsible for negotiating and implementing the ABM Treaty added their opposition.

> "...the rules of the regime were used throughout the debate as the standard of measurement for permitted and prohibited behaviour. Despite great efforts by the SDI proponents, they were not able to overcome the barrier

> the regime had created to their preferred projects. Opponents were able to mobilize around the ABM Treaty rules as a "system of reference", and also to rally opposition around the regime norms against which SDI was basically directed."[56]

In pesticide politics, we have seen that the British and American governments and the chemical industry finally came to accept the legitimacy of PIC as a rule governing the trade in pesticides, despite having previously blocked its incorporation and possessing the capabilities to do so again. Earlier in this chapter it was shown how the US government attempted to create a new international aviation regime to suit the interests of American airlines but were prevented from doing so. As with the ABM case, this attempt by an American administration to utilize their capabilities in order to maximize their interests floundered on both domestic and international opposition which rallied around the existing regime structure.

Positing that international regimes are created rationally as a means of reaping mutual gains for actors is too simplistic. Norms can emerge from values other than those of maximizing economic returns or wielding power. PIC was legitimized as an international rule because those proposing it were able to claim the higher moral ground. The norm of regulating the trade in pesticides was derived from the value of minimizing human suffering, which was evidenced by the casualties of pesticide misuse in developing countries. Against this, arguments based on maintaining free trade were eventually overcome and moral reason was able to triumph over *raison d'etat*.

7. *Cognitive Theories*

A further challenge to the rationality of the utilitarian approach comes from cognitive theory, which stresses the ambiguous nature of reality and the subsequent importance of ideology and perception in determining behaviour. Jonsson

has argued that the concept of an international regime is inherently cognitive and subjective[57]. Krasner's widely accepted definition of an international regime adds to the four components: principles, norms, rules and decision-making procedures, the qualifying phrase, "around which actors expectations converge in a given issue-area". As the linking of issues into "issue-areas" is also essentially a mental construction, Jonsson reasons that cognitive considerations must play a part in the process of cooperation and regime building.

The importance of psychological factors in decision-making has been stressed by foreign-policy analysts since the 1950's. The Sprouts in 1956 first elaborated the concept of separate operational and psychological environments in decision-making. Decisions may be implemented in the "operational world" but they are decided in the "psychological world" of the decision-makers mental constructions[58]. Jonsson seeks to apply such an approach to regime theory, as an accompaniment to the utilitarian explanation. "Cognitive theory does not assume irrationality but explores the *limits* of human rationality".[59]

Ernst Haas, probably the leading exponent of cognitive theory in International Relations, concurs in the belief that the approach should only be considered as a partial explanation for regime creation. In his opinion, a theory of regime creation or change must accept:

> "...the existence of power differentials and the importance of hierarchy among states- without sacrificing to such a view the possibility of choice based on perception and cognition inspired by additional calculations".[60]

Haas stresses the importance of actors sharing a common perception of a problem as requiring cooperation before any fruitful bargaining process can be initiated. The idea of "consensual knowledge" as a prerequisite for cooperation

clearly echoes the work on epistemic communities and their role in the establishment of principles, in response to which regimes may be created. However, cognitive theory can also offer insights into the nature of the bargaining process itself and the determinants of its success or failure.

A key factor in the successful fostering of cooperation must be a sense of trust between the parties concerned. An actor needs to have some assurance that their partners in cooperation will abide by the norms and rules of a regime before they too will accept them. Thus the perceptions that cooperating parties hold of each other are significant in the bargaining process which precedes regime formation.

The level of trust one actor will have in another will be gauged according to the previous behaviour of that actor in similar cooperating situations. In other words, the reputation of an actor is integral to successful bargaining and regime creation. "International regimes depend on reputational mechanisms to get norms started"[61]. Reputation will aid regime formation in two ways. Firstly, as we have seen, an actor must have a trustworthy reputation for others to agree to cooperate and formulate concessional agreements. Secondly, an actor may be induced into acquiescing to norms and rules that are against its immediate interests for fear of developing an untrustworthy reputation which could hinder future cooperation on political questions more salient to them. This idea points up a fundamental flaw in the utilitarian approach to regime formation. An actor cannot afford to maximize utility on a particular issue if it means that they will be shunned in future and be unable to cooperate in areas that do further their interests or values.

Thus, moral pressure can induce an actor into acquiescing in a global norm and abiding by the rules of a

regime, through fear of the effects on its reputation of not doing so. This was surely a factor in the decision of the chemical industry to back down to pressure and accept the legitimacy of the PIC rule in regulating the international trade in pesticides. The potential loss in trade through having its exports to the Third World more closely monitored, was offset by the prospect of acquiring a poor reputation which would damage its public image and ability to negotiate with pressure groups in future. The industry thus took the decision to bow to pressure and act against its direct interests in order to strengthen its position in countering the greater potential threat to its interests of the outright prohibition of exporting certain pesticides. Compromise is the art of bargaining, and bargaining, to a large extent, is the art of international politics.

8. *Implementation*

A final, and essential, criterion for regime formation is the qualification that, before it can be accepted as a phenomenon actor behaviour must be affected by the regime's norms, rules and decision-making procedures. As pointed out in the conclusion to Chapter Seven, List and Rittberger have added the appendage of "minimal effectiveness" to Krasner's standard definition of an international regime[62]. As List and Rittberger point out, this qualification enables us to distinguish between regimes and treaties, since a regime's rules may be informal. It also enables a distinction to be made between rules that are actually observed and "rules" which exist in writing but have no discernible influence on actor behaviour.

Hence, Mendler's research into the issue of the working conditions of foreign journalists concludes that there is no regime in operation, despite the existence of norms, rules and a principle[63]. Rittberger states of this case,

"norm observance and rule compliance varied so greatly

> over time and across countries, especially in Eastern Europe and the Soviet Union, that - using effectiveness as a criterion - it did not seem warranted to acknowledge the existence of an international regime".[64]

Similarly, despite the fact that there is a norm declaring that human poisoning by pesticides should be minimized and there are various global safety standards for working with pesticides and for selling them, I have concluded that there is no regime in existence for the issue of human poisoning by pesticides. In contrast, the PIC rule is part of the same FAO Code of Conduct as the provisions for safety, advertising and labelling, but it can be seen as having formed the basis for a regime. This is because it has been implemented and had some effect on the behaviour of the actors within the issue-system.

A regime's behavioural effects may be sub-optimal, when compared to the initial goal of the norm from which it emerged, but if it can still be seen to have influenced political behaviour then its existence can be confirmed. Not adopting this criterion for the existence of an international regime serves to make the phenomenon indistinguishable from that of an issue-system. An issue-system is an area of contention around a norm or number of norms, which represent specific interpretations of more general values applied to a set of political questions. For a regime to be seen to have emerged from an issue-system there needs to be evidence of political behaviour, an authoritative allocation of the norms and values being contended. This can be said to have occurred if a set of rules and decision-making procedures have been laid down by a would-be regulatory body, and the rules and decisions are also acted upon by the actors within the issue-system.

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CONCLUSIONS

NORMS	STRUCTURE OF THE ISSUE-SYSTEM
Prescriptive	
1) *"We should strive to attain optimal food yields"*	UNREGULATED. Wide consensus on the use of pesticides. Norm competes with all proscriptive norms.
2) *"Disease and damage due to pests should be limited"*	UNREGULATED. Wide consensus on the use of pesticides, but beginning to erode.
Proscriptive	
3) *"The misuse of pesticides leading to human poisoning should be prevented"*	UNREGULATED. Global guidelines in FAO Code of Conduct, but not widely adhered to.
4) *"Environmental pollution by pesticides should be limited"*	UNREGULATED. Regional regimes and global controls on ozone depleting pesticides, but no system-wide global regulation.
5) *"The contamination of food by pesticides should be limited"*	REGULATED. Codex Committee on Pesticide Residues sets global standards which have behavioural effect.
6) *"The international trade in pesticides should be limited"*	REGULATED. Prior Informed Consent Rule included in FAO Code and implemented with some success.
7) *"Pesticides should not be overused"*	UNREGULATED. Some national and local implementation of IPM measures, but no real global implementation.

Fig. 13. *Summary table of the seven norms of pesticide production and use and their derivative issue-systems.*

The seven issues of pesticide politics, we have seen, each represent an area of consensus around a particular norm of behaviour concerning pesticide use and production. Actors in the pesticides policy-system will need to prioritize some of these norms over others in determining their behaviour in relation to pesticides policy questions. At the most fundamental level, this choice will be between one of the two norms prescribing pesticide production and use and one or more of the five proscriptive norms. In addition, however, actors will also tend to prioritize between the proscriptive norms in that some of them will be deemed to override the prescriptive norms more often than others. As a result of this process of ranking norms, the seven issue-systems feature different levels of contention over their constituent policy-questions.

ISSUES	FACTORS AFFECTING REGIME CREATION							
	Hegemony	Issue-Specific Power	Leadership	Epistemic Communities	Crises	Utilitarian Factors	Cognitive Theories	Implementation
1. Yields	—	—	—	—	Third World famine	—	—	—
2. Public Health	—	—	—	—	Malaria resurges et al	—	—	—
3. Human Safety	—	—	—	WHO classification but no universal consensus	Bhopal Cicades etc	—	—	—
4. Pollution	—	—	—	—	Sevesco Aral Sea, Basle, etc	For regional & methyl-bromide regimes	—	—
5. Food	Western Corporate interests	Chemical & food industry	—	FAO/UNEP JMPR	—	Simplifies trade	—	YES
6. Trade	—	—	Bull, Werning etc.	PAN, Oxfam etc	—	Bhopal Cicades	Reputation of chemical ind.	YES
7. IPM	—	—	—	FAO/UNEP Panel of Experts on IPC	Pest resistance Aral Sea	—	—	—

Fig. 14. *Summary table of the factors affecting the creation of regimes in relation to the issues of pesticide politics.*

Where an issue-system features a high degree of consensus over its central norm and a high rate of actor-compliance with rules and decisions designed to uphold that norm, then an international regime can be seen to have emerged, regulating the issue. The regulation of an issue at the global level is a complex process requiring a combination of favourable circumstances for its accomplishment. This chapter has examined a number of factors which influence the development of international regimes (summarized in fig.14). The lack of a world legislature, executive or judiciary comparable to those found in most domestic political systems, makes any "authoritative allocation of values", internationally difficult to achieve. Authoritative allocations of global norms and values do occur however and they do not necessarily represent the imposition of rules favouring a dominant actor or coalition of actors.

Values inform political stances and decisions and are promoted internationally by pressure groups, by international institutions and even by governments. Moral pressure can induce powerful actors to compromise and come to the bargaining table more often than traditional power-politics theory would have us believe. International institutions, in particular those contained within the United Nations system, may fall well short of the "embryonic world government" vision of utopian internationalists, but they have attained sufficient credibility to help foster cooperation amongst divergent interests and make the international system something less than anarchic. International regimes are able to emerge from this international system of mixed actors (governments, international institutions, transnational corporations and non-governmental organizations) in which values compete alongside power and interests in shaping the norms and rules by which actor behaviour is guided.

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APPENDIX

International Code of Conduct on the Distribution and Use of Pesticides

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS
Rome, 1986

Contents

Introduction

The action by FAO to develop, in consultation with appropriate United Nations agencies and other organizations, an International Code of Conduct on the Distribution and Use of Pesticides follows and accompanies many other events, some going back 25 years. All these events were designed to benefit the international community and to serve to increase international confidence in the availability, regulation, marketing and use of pesticides for the improvement of agriculture, public health and personal comfort.

One of the basic functions of the Code, which is voluntary in nature, is to serve as a point of reference, particularly until such time as countries have established adequate regulatory infrastructures for pesticides.

The Director-General of FAO in 1981 suggested that such a Code could help to overcome a number of difficulties associated with pesticides. The FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards, at its meeting in 1982, agreed that activities involving the export and import of pesticides, and thereby their safe use, might be best dealt with through the adoption of a Code of Conduct. To that end a working paper was prepared for the FAO Second Government Consultation on International Harmonization of Pesticide Registration Requirements, Rome, 11-15 October 1982. The formal decision to develop the Code was taken at that Consultation, which recommended that FAO, in consultation with the appropriate United Nations organizations and bodies and international organizations outside the United Nations system, should draft a Code (1). The Code itself was adopted by the FAO Conference at its Twenty-third Session in 1985 by way of Resolution 10/85, which appears as an Annex to the present publication.

A number of governments and organizations have expressed

concern about the propriety of supplying pesticides to countries which do not have infrastructures to register pesticides and thereby to ensure their safe and effective use. It should be noted that the development of national regulatory programmes is the first priority of FAO activities in this field. There has also been concern over the possibility that residues of certain pesticides, not needed or not permitted in particular countries, are present in imported agricultural commodities produced in other countries where the use of such pesticides is not restricted. While recognizing that it is impossible to eliminate all such occurrences, because of diverging pest control needs, it is none the less essential that every effort be made to apply pesticides only in accordance with good and recognized practices. It is at the same time important for industrially developed countries to recognize, in their regulatory activities concerning residues, the pest control needs of developing countries, particularly the needs of countries in tropical regions.

In the absence of an effective pesticide registration process and of a governmental infrastructure for controlling the availability of pesticides, some countries importing pesticides must heavily rely on the pesticide industry to promote the safe and proper distribution and use of pesticides. In these circumstances foreign manufacturers, exporters and importers, as well as local formulators, distributors, repackers, advisers and users, must accept a share of the responsibility for safety and efficiency in distribution and use.

The role of the exporting country needs to be considered. Much emphasis has been given recently to the desirability of regulating the export of pesticides from producing countries. It is generally accepted that no company should trade in pesticides without a proper and thorough evaluation of the pesticide, including any risks. However, the fact that a product is not used or registered in a particular exporting country is not necessarily a valid reason for prohibiting the export of that pesticide. Developing countries are mostly situated in tropical and semi-tropical regions. Their climatic, ecological, agronomic, social, economic and environmental conditions and therefore their pest problems are usually quite different from those prevailing in countries in which pesticides are manufactured and exported. The government of the exporting country, therefore, is in no position to judge the suitability, efficacy, safety or fate of the pesticide under the conditions in the country

where it may ultimately be used. Such a judgement must, therefore, be made by the responsible authority in the importing country in consultation with industry and other government authorities in the light of the scientific evaluation that has been made and a detailed knowledge of the conditions prevailing in the country of proposed use.

The export to developing countries of pesticides which have been banned in one or more other countries or whose use has been severely restricted in some industrialized countries has been a subject of public concern which has led to intensive discussions on whether the exporting country should assume responsibility for the marketing and use of such products in the importing country. In this respect it is essential to note that when pesticides are banned, the reasons are toxicological, environmental or social. Valid and adequate toxicological reasons justifying banning a product are of concern, though not necessarily of equal importance, to most countries. Consequently, such products should not be exported or imported without careful consideration of the toxicological implications for those likely to be exposed.

While a Code of Conduct may not solve all problems, nevertheless it should go a long way toward defining and clarifying the responsibilities of the various parties involved in the development, distribution and use of pesticides, and it should be of particular value in countries which do not yet have control procedures. Where there is a pesticide regulatory process in a country, the need for a Code of Conduct will obviously be less than where there is no such scheme in operation.

The Code of Conduct is not a short or simple document, mainly because the nature, properties, uses and effects of pesticides are diverse and therefore require comprehensive consideration. Furthermore, the strong public pressure for banning or restricting the use of some effective and much-needed pesticides often stems from a lack of understanding of the many important issues involved. This document is designed, therefore, also to provide the general public with some basic guidance on these issues.

Text of the Code

Article 1. Objectives of the Code

1.1 The objectives of this Code are to set forth responsibilities and establish voluntary standards of conduct for all public and private entities engaged in or affecting the distribution and use of pesticides, particularly where there is no or an inadequate national law to regulate pesticides.

1.2 The Code describes the shared responsibility of many segments of society, including governments, individually or in regional groupings, industry, trade and international institutions, to work together so that the benefits to be derived from the necessary and acceptable use of pesticides are achieved without significant adverse effects on people or the environment. To this end, all references in this Code to a government or governments shall be deemed to apply equally to regional groupings of governments for matters falling within their areas of competence.

1.3 The Code addresses the need for a cooperative effort between governments of exporting and importing countries to promote practices which ensure efficient and safe use while minimizing health and environmental concerns due to improper handling or use.

1.4 The entities which are addressed by this Code include international organizations; governments of exporting and importing countries; industry, including manufacturers, trade associations, formulators and distributors; users; and public-sector organizations such as environmental groups, consumer groups and trade unions.

1.5 The standards of conduct set forth by this Code:

1.5.1 encourage responsible and generally accepted trade practices;

1.5.2 assist countries which have not yet established controls designed to regulate the quality and suitability of pesticide products needed in that country and to address the safe handling and use of such products;

1.5.3 promote practices which encourage the safe and efficient use of pesticides, including minimizing adverse effects on humans and the environment and preventing accidental poisoning from improper handling;

1.5.4 ensure that pesticides are used effectively for the improvement of agricultural production and of human, animal and plant health.

1.6 The Code is designed to be used, within the context of national law, as a basis whereby government authorities, pesticide manufacturers, those engaged in trade and any citizens concerned may judge whether their proposed actions and the actions of others constitute acceptable practices.

Article 2. Definitions

For the purpose of this Code:

Active ingredient means the biologically active part of the pesticide present in a formulation.

Advertising means the promotion of the sale and use of pesticides by print and electronic media, signs, displays, gift, demonstration or word of mouth.

Banned means a pesticide for which all registered uses have been prohibited by final government regulatory action, or for which all requests for registration or equivalent action for all uses have, for health or environmental reasons, not been granted.

Common name means the name assigned to a pesticide active ingredient by the International Standards Organization or adopted by national standards authorities to be used as a generic or non-proprietary name for that particular active ingredient only.

Distinguishing name means the name under which the pesticide is

labelled, registered and promoted by the manufacturer and which, if protected under national legislation, can be used exclusively by the manufacturer to distinguish the product from other pesticides containing the same active ingredient.

Distribution means the process by which pesticides are supplied through trade channels on local or international markets.

Environment means surroundings, including water, air, soil and their interrelationship as well as all relationships between them and any living organisms.

Extension service means those entities in the country concerned responsible for the transfer of information and advice to farmers regarding the improvement of agricultural practices, including production, handling, storage and marketing.

Formulation means the combination of various ingredients designed to render the product useful and effective for the purpose claimed; the form of the pesticide as purchased by users.

Hazard means the likelihood that a pesticide will cause an adverse effect (injury) under the conditions in which it is used.

Integrated pest management means a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest populations at levels below those causing economically unacceptable damage or loss.

Label means the written, printed or graphic matter on, or attached to, the pesticide; or the immediate container thereof and the outside container or wrapper of the retail package of the pesticide.

Manufacturer means a corporation or other entity in the public or private sector or any individual engaged in the business or function (whether directly or through an agent or through an entity controlled by or under contract with it) of manufacturing a pesticide active ingredient or preparing its formulation or product.

Marketing means the overall process of product promotion, including advertising, product public relations and information services as well as distribution and selling on local or international markets.

Maximum residue limit (MRL) means the maximum concentration of a residue that is legally permitted or recognized as acceptable in or on a food, agricultural commodity or animal feedstuff.

Packaging means the container together with the protective wrapping used to carry pesticide products via wholesale or retail distribution to users.

Pesticide means any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant-growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

Pesticide industry means all those organizations and individuals engaged in manufacturing, formulating or marketing pesticides and pesticide products.

Pesticide legislation means any laws or regulations introduced to regulate the manufacture, marketing, storage, labelling, packaging and use of pesticides in their qualitative, quantitative and environmental aspects.

Poison means a substance that can cause disturbance of structure or function, leading to injury or death when absorbed in relatively small amounts by human beings, plants or animals.

Poisoning means occurrence of damage or disturbance caused by a poison, and includes intoxication.

Product means the pesticide in the form in which it is packaged and sold; it usually contains an active ingredient plus adjuvants and may require dilution prior to use.

Protective clothing means any clothes, materials or devices that are designed to provide protection from pesticides when they are handled or applied.

Public-sector groups means (but is not limited to) scientific associations; farmer groups; citizens' organizations; environmental, consumer and health organizations; and labour unions.

Registration means the process whereby the responsible national government authority approves the sale and use of a pesticide following the evaluation of comprehensive scientific data demonstrating that the product is effective for the purposes intended and not unduly hazardous to human or animal health or the environment.

Repackaging means the transfer of pesticide from any commercial package into any other, usually smaller, container for subsequent sale.

Residue means any specified substances in food, agricultural commodities, or animal feed resulting from the use of a pesticide. The term includes any derivatives of a pesticide, such as conversion products, metabolites, reaction products, and impurities considered to be of toxicological significance. The term "pesticide residue" includes residues from unknown or unavoidable sources (e.g. environmental) as well as known uses of the chemical.

Responsible authority means the government agency or agencies responsible for regulating the manufacture, distribution or use of pesticides and more generally for implementing pesticide legislation.

Risk means the expected frequency of undesirable effects of exposure to the pesticide.

Severely restricted — a limited ban — means a pesticide for which virtually all registered uses have been prohibited by final government regulatory action but certain specific registered use or uses remain authorized.

Toxicity means a physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means.

Trader means anyone engaged in trade, including export, import, formulation and domestic distribution.

Use pattern embodies the combination of all factors involved in the use of a pesticide, including the concentration of active ingredient in the preparation being applied, rate of application, time of treatment, number of treatments, use of adjuvants and methods and sites of application which determine the quantity applied, timing of treatment and interval before harvest, etc.

Article 3. Pesticide management

3.1 Governments have the overall responsibility and should take the specific powers to regulate the distribution and use of pesticides in their countries.

3.2 The pesticide industry should adhere to the provisions of this Code as a standard for the manufacture, distribution and advertising of pesticides, particularly in countries lacking appropriate legislation and advisory services.

3.3 Governments of exporting countries should help to the extent possible, directly or through their pesticide industries, to:

3.3.1 provide technical assistance to other countries, especially those with shortages of technical expertise, in the assessment of the relevant data on pesticides, including those provided by industry (see also Article 4);

3.3.2 ensure that good trading practices are followed in the export of pesticides, especially to those countries with no or limited regulatory schemes (see also Articles 8 and 9).

3.4 Manufacturers and traders should observe the following practices in pesticide management, especially in countries without legislation or means of implementing regulations:

3.4.1 supply only pesticides of adequate quality, packaged and labelled as appropriate for each specific market;

3.4.2 pay special attention to formulations, presentation, packaging and labelling in order to reduce hazard to users, to the maximum extent possible consistent with the effective functioning of the pesticide in the particular circumstances in which it is to be used;

3.4.3 provide, with each package of pesticide, information and instructions in a form and language adequate to ensure safe and effective use;

3.4.4 retain an active interest in following their products to the ultimate consumer, keeping track of major uses and the occurrence of any problems arising in the actual use of their products as a basis for determining the need for changes in labelling, directions for use, packaging, formulation or product availability.

3.5 Pesticides whose handling and application require the use of uncomfortable and expensive protective clothing and equipment should be avoided, especially in the case of small-scale users in tropical climates.

3.6 National and international organizations, governments, and pesticide industries should take action in coordinated efforts to disseminate educational materials of all types to pesticide users, farmers, farmers' organizations, agricultural workers, unions and other interested parties. Similarly, affected parties should seek and understand educational materials before using pesticides and should follow proper procedures.

3.7 Governments should allocate high priority and adequate resources to the task of effectively managing the availability, distribution and use of pesticides in their countries.

3.8 Concerted efforts should be made by governments and pesticide industries to develop and promote integrated pest management systems and the use of safe, efficient, cost-effective application methods. Public-sector groups and international organizations should actively support such activities.

3.9 International organizations should provide information on specific pesticides and give guidance on methods of analysis through the provision of criteria documents, fact sheets, training sessions, etc.

3.10 It is recognized that the development of resistance of pests to pesticides can be a major problem. Therefore, governments, industry, national institutions, international organizations and public-sector groups should collaborate in developing strategies which will prolong the useful life of valuable pesticides and reduce the adverse effects of the development of resistant species.

Article 4. Testing of pesticides

4.1 Pesticide manufacturers are expected to:

4.1.1 ensure that each pesticide and pesticide product is adequately and effectively tested by well-recognized procedures and test methods so as to fully evaluate its safety, efficacy (2) and fate (3) with regard to the various anticipated conditions in regions or countries of use;

4.1.2. ensure that such tests are conducted in accordance with sound scientific procedures and good laboratory practice (4) — the data produced by such tests, when evaluated by competent experts, must be capable of showing whether the product can be handled and used safely without unacceptable hazard to human health, plants, animals, wildlife and the environment (3);

4.1.3 make available copies or summaries of the original reports of such tests for assessment by responsible government authorities in all countries where the pesticide is to be offered for sale. Evaluation of the data should be referred to qualified experts;

4.1.4 take care to see that the proposed use pattern, label claims and directions, packages, technical literature and advertising truly reflect the outcome of these scientific tests and assessments;

4.1.5 provide, at the request of a country, advice on methods for the analysis of any active ingredient of formulation that they manufacture, and provide the necessary analytical standards;

4.1.6 provide advice and assistance for training technical staff in relevant analytical work. Formulators should actively support this effort;

4.1.7 conduct residue trials prior to marketing in accordance with FAO guidelines on good analytical practice (5) and on crop residue data (6, 7) in order to provide a basis for establishing appropriate maximum residue limits (MRLs).

4.2 Each country should possess or have access to facilities to verify and exercise control over the quality of pesticides offered for sale, to establish the quantity of the active ingredient or ingredients and the suitability of their formulation (8).

4.3 International organizations and other interested bodies should, within available resources, consider assisting in the establishment of analytical laboratories in pesticide-importing countries, either on a country or on a multilateral regional basis; these laboratories should be capable of carrying out product and residue analysis and should have adequate supplies of analytical standards, solvents and reagents.

4.4 Exporting governments and international organizations must play an active role in assisting developing countries in training personnel in the interpretation and evaluation of test data.

4.5 Industry and governments should collaborate in conducting post-registration surveillance or monitoring studies to determine the fate and environmental effect of pesticides under field conditions (3).

Article 5. Reducing health hazards

5.1 Governments which have not already done so should:

5.1.1 implement a pesticide registration and control scheme along the lines set out in Article 6;

5.1.2 decide, and from time to time review, the pesticides to be marketed in their country, their acceptable uses and their availability to each segment of the public;

5.1.3 provide guidance and instructions for the treatment of suspected pesticide poisoning for their basic health workers, physicians and hospital staff;

5.1.4 establish national or regional poisoning information and control centres at strategic locations to provide immediate guidance on first aid and medical treatment, accessible at all times by telephone or radio. Governments should collect reliable information about the health aspects of pesticides. Suitably trained people with adequate resources must be made available to ensure that accurate information is collected;

5.1.5 keep extension and advisory services, as well as farmers' organizations, adequately informed about the range of pesticide products available for use in each area;

5.1.6 ensure, with the cooperation of industry, that where pesticides are available through outlets which also deal in food, medicines, other products for internal consumption or topical application, or clothing, they are physically segregated from other merchandise, so as to avoid any possibility of contamination or of mistaken identity. Where appropriate, they should be clearly marked as hazardous materials. Every effort should be made to publicize the dangers of storing foodstuffs and pesticides together.

5.2 Even where a control scheme is in operation, industry should:

5.2.1 cooperate in the periodic reassessment of the pesticides which are marketed and in providing the poison control centres and other medical practitioners with information about hazards;

5.2.2 make every reasonable effort to reduce hazard by:

5.2.2.1 making less toxic formulations available;

5.2.2.2 introducing products in ready-to-use packages and otherwise developing safer and more efficient methods of application;

5.2.2.3 using containers that are not attractive for subsequent reuse and promoting programmes to discourage their reuse;

5.2.2.4 using containers that are safe (e.g. not attractive to or easily opened by children), particularly for the more toxic home-use products;

5.2.2.5 using clear and concise labelling;

5.2.3 halt sale, and recall products, when safe use does not seem possible under any use directions or restrictions.

5.3 Government and industry should further reduce hazards by making provision for safe storage and disposal of pesticides and containers at both warehouse and farm level, and through proper siting and control of wastes from formulating plants.

5.4 To avoid unjustified confusion and alarm among the public, public-sector groups should consider all available facts and try to distinguish between major differences in levels of risk among pesticides and uses.

5.5 In establishing production facilities in developing countries, manufacturers and governments shoud cooperate to:

5.5.1 adopt engineering standards and safe operating practices appropriate to the nature of the manufacturing operations and the hazards involved;

5.5.2 take all necessary precautions to protect the health and safety of operatives, bystanders and the environment;

5.5.3 maintain quality-assurance procedures to ensure that the products manufactured comply to the relevant standards of purity, performance, stability and safety.

Article 6. Regulatory and technical requirements

6.1 Governments should:

6.1.1 take action to introduce the necessary legislation for the regulation, including registration, of pesticides and make provisions for its effective enforcement, including the establishment of appro-

priate educational, advisory, extension and health-care services; the FAO guidelines for the registration and control of pesticides (9) should be followed, as far as possible, taking full account of local needs, social and economic conditions, levels of literacy, climatic conditions and availability of pesticide application equipment;

6.1.2 strive to establish pesticide registration schemes and infrastructures under which products can be registered prior to domestic use and, accordingly, ensure that each pesticide product is registered under the laws or regulations of the country of use before it can be made available there;

6.1.3 protect the proprietary rights to use of data;

6.1.4 collect and record data on the actual import, formulation and use of pesticides in each country in order to assess the extent of any possible effects on human health or the environment, and to follow trends in use levels for economic and other purposes.

6.2 The pesticides industry should:

6.2.1 provide an objective appraisal together with the necessary supporting data on each product;

6.2.2 ensure that the active ingredient and other ingredients of pesticide preparations marketed correspond in identity, quality, purity and composition to the substances tested, evaluated and cleared for toxicological and environmental acceptability;

6.2.3 ensure that active ingredients and formulated products for pesticides for which international specifications have been developed conform with the specifications of FAO (8), where intended for use in agriculture; and with WHO pesticide specifications (10), where intended for use in public health;

6.2.4 verify the quality and purity of the pesticides offered for sale;

6.2.5 when problems occur, voluntarily take corrective action, and when requested by governments, help find solutions to difficulties.

Article 7. Availability and use

7.1 Responsible authorities should give special attention to drafting rules and regulations on the availability of pesticides. These should be compatible with existing levels of training and expertise in handling pesticides on the part of the intended users. The parameters on which such decisions are based vary widely and must be left to the discretion of each government, bearing in mind the situation prevailing in the country.

7.2 In addition, governments should take note of and, where appropriate, follow the WHO classifications of pesticides by hazard (11) and associate the hazard class with well-recognized hazard symbols as the basis for their own regulatory measures. In any event, the type of formulation and method of application should be taken into account in determining the risk and degree of restriction appropriate to the product.

7.3 Two methods of restricting availability can be exercised by the responsible authority: not registering a product; or, as a condition of registration, restricting the availability to certain groups of users in accordance with national assessments of hazards involved in the use of the product in the particular country.

7.4 All pesticides made available to the general public should be packaged and labelled in a manner which is consistent with the FAO guidelines on packaging (12) and labelling (13) and with appropriate national regulations.

7.5 Prohibition of the importation, sale and purchase of an extremely toxic product may be desirable if control measures or good marketing practices are insufficient to ensure that the product can be used safely. However, this is a matter for decision in the light of national circumstances.

Article 8. Distribution and trade

8.1 Industry should:

8.1.1 test all pesticide products to evaluate safety with regard to

human health and the environment prior to marketing, as provided for in Article 4, and ensure that all pesticide products are likewise adequately tested for efficacy and stability and crop tolerance, under procedures that will predict performance under the conditions prevailing in the region where the product is to be used, before they are offered there for sale;

8.1.2 submit the results of all such tests to the local responsible authority for independent evaluation and approval before the products enter trade channels in that country;

8.1.3 take all necessary steps to ensure that pesticides entering international trade conform to relevant FAO, (8), WHO (10) or equivalent specifications for composition and quality (where such specififfications have been developed) and to the principles embodied in pertinent FAO guidelines, and in rules and regulations on classification and packaging, marketing, labelling and documentation laid down by international organizations concerned with modes of transport (ICAO, IMO, RID and IATA in particular);[1]

8.1.4 undertake to see that pesticides which are manufactured for export are subject to the same quality requirements and standards as those applied by the manufacturer to comparable domestic products;

8.1.5 ensure that pesticides manufactured or formulated by a subsidiary company meet appropriate quality requirements and standards which should be consistent with the requirements of the host country and of the parent company;

8.1.6 encourage importing agencies, national or regional formulators, and their respective trade organizations to cooperate in order to achieve fair practices and safe marketing and distribution

[1] ICAO: International Civil Aviation Organization
IMO: International Maritime Organization
RID: International regulations concerning the carriage of dangerous goods by rail
IATA: International Air Transport Association.

practices and to collaborate with authorities in stamping out any malpractices within the industry;

8.1.7 recognize that the recall of a pesticide by a manufacturer and distributor may be desirable when faced with a pesticide which represents an unacceptable hazard to human and animal health and the environment when used as recommended, and cooperate accordingly;

8.1.8 endeavour to ensure that pesticides are traded by and purchased from reputable traders, who should preferably be members of a recognized trade organization;

8.1.9 see that persons involved in the sale of any pesticide are trained adequately to ensure that they are capable of providing the buyer with advice on safe and efficient use;

8.1.10 provide a range of pack sizes and types which are appropriate for the needs of small-scale farmers and other local users to avoid handling hazards and the risk that resellers will repackage products into unlabelled or inappropriate containers.

8.2 Governments and responsible authorities should take the necessary regulatory measures to prohibit the repackaging, decanting or dispensing of any pesticide in food or beverage containers and should rigidly enforce punitive measures that effectively deter such practices.

8.3 Governments of countries importing food and agricultural commodities should recognize good agricultural practices in countries with which they trade and, in accordance with recommendations of the Codex Alimentarius Commission, should establish a legal basis for the acceptance of pesticide residues resulting from such good agricultural practices (7, 14).

Article 9. Information exchange

9.1 The government of a pesticide-exporting country which takes action to ban or severely restrict the use or handling of a pesticide in order to protect health or the environment domestically should

notify, directly or indirectly, the designated national authorities in other countries of the action it has taken (15).

9.2 The purpose of the notification regarding control action is to give competent authorities in other countries the opportunity to assess the risks associated with the pesticide, and to make timely and informed decisions as to the importation and use of the pesticides concerned, after taking into account local, public-health, economic, environmental and administrative conditions. The minimum information to be provided for this purpose should be:

9.2.1 the identity (common name, distinguishing name and chemical name);

9.2.2 a summary of the control action taken and of the reasons for it — if the control action bans or restricts certain uses but allows other uses, such information should be included;

9.2.3 the fact that additional information is available, and the name and address of the contact point in the country of export to which a request for further information should be addressed.

9.3 If export of a banned or severely restricted pesticide occurs, the country of export should ensure that necessary steps are taken to provide the designated national authority of the country of import with relevant information.

9.4 The purpose of information regarding exports is to remind the country of import of the original notification regarding control action and to alert it to the fact that an export is expected or is about to occur. The minimum information to be provided for this purpose should be:

9.4.1 a copy of, or reference to, the information provided at the time of the notification of control action;

9.4.2 indication that an export of the chemical concerned is expected or is about to occur.

9.5 Notification of control action should be provided as soon as practicable after the control action is taken. For pesticides banned

or severely restricted before the implementation of the Code, an inventory of prior control action should be provided to the International Register of Potentially Toxic Chemicals (IRPTC), unless such information has already been provided.

9.6 Provision of information regarding exports should take place at the time of the first export following the control action, and should recur in the case of any significant development of new information or condition surrounding the control action. It is the intention that the information should be provided prior to export.

9.7 The provision of such information by the exporting country must take into account protection of the confidentiality of data in the importing country.

9.8 Governments of importing countries should:

9.8.1 establish internal procedures for the receipt and handling of such information from the exporting country;

9.8.2 ensure that such information received is not used in any manner which would be inconsistent with the provisions of the General Agreement on Tariffs and Trade (GATT).

Article 10. Labelling, packaging, storage and disposal

10.1 All pesticide containers should be clearly labelled in accordance with applicable international guidelines, such as the FAO guidelines on good labelling practice (13).

10.2 Industry should use labels that:

10.2.1 include recommendations consistent with those of the recognized research and advisory agencies in the country of sale;

10.2.2 include appropriate symbols and pictograms whenever possible, in addition to written instructions, warnings and precautions;

10.2.3 in international trade, clearly show appropriate WHO hazard classification of the contents (11) or, if this is inappropriate

or inconsistent with national regulations, use the relevant classification;

10.2.4 include, in the appropriate language or languages, a warning against the reuse of containers, and instructions for the safe disposal or decontamination of empty containers;

10.2.5 identify each lot or batch of the product in numbers or letters that can be read, transcribed and communicated by anyone without the need for codes or other means of deciphering;

10.2.6 are marked with the date (month and year) of formulation of the lot or batch and with relevant information on the storage stability of the product.

10.3 Industry should ensure that:

10.3.1 packaging, storage and disposal of pesticides conform in principle to the FAO guidelines for packaging and storage (12), the FAO guidelines for the disposal of waste pesticides and containers (16), and WHO specifications for pesticides used in public health (10);

10.3.2 in cooperation with governments, packaging or repackaging is carried out only on licensed premises where the responsible authority is convinced that staff are adequately protected against toxic hazards, that the resulting product will be properly packaged and labelled, and that the content will conform to the relevant quality standards.

10.4 Governments should take the necessary regulatory measures to prohibit the repacking, decanting or dispensing of any pesticide into food or beverage containers in trade channels and rigidly enforce punitive measures that effectively deter such practices.

Article 11. Advertising

11.1 Industry should ensure that:

11.1.1 all statements used in advertising are capable of technical substantiation;

11.1.2 advertisements do not contain any statement or visual presentation which, directly or by implication, omission, ambiguity or exaggerated claim, is likely to mislead the buyer, in particular with regard to the safety of the product, its nature, composition, or suitability for use, or official recognition or approval;

11.1.3 pesticides which are legally restricted to use by trained or registered operators are not publicly advertised through journals other than those catering for such operations, unless the restricted availability is clearly and prominently shown;

11.1.4 no firm or individual in any one country simultaneously markets different pesticide active ingredients or combinations of ingredients under a single distinguishing name;

11.1.5 advertising does not encourage uses other than those specified on the approvel label;

11.1.6 promotional material does not include use recommendations at variance with those of the recognized research and advisory agencies;

11.1.7 advertisements do not misuse research results or quotations from technical and scientific literature; and scientific jargon and irrelevances are not used to make claims appear to have a scientific basis they do not possess;

11.1.8 claims as to safety, including statements such as "safe", "non-poisonous", "harmless", "non-toxic", are not made, with or without a qualifying phrase such as "when used as directed";

11.1.9 statements comparing the safety of different products are not made;

11.1.10 misleading statements are not made concerning the effectiveness of the product;

11.1.11 no guarantees or implied guarantees — e.g. "more profits

with...", "guarantees high yields" — are given unless definite evidence to substantiate such claims is available;

11.1.12 advertisements do not contain any visual representation of potentially dangerous practices, such as mixing or application without sufficient protective clothing, use near food, or use by or near children;

11.1.13 advertising or promotional material draws attention to the appropriate warning phrases and symbols as laid down in the labelling guidelines (13);

11.1.14 technical literature provides adequate information on correct practices, including the observance of recommended rates, frequency of applications, and safe pre-harvest intervals;

11.1.15 false or misleading comparisons with other pesticides are not made;

11.1.16 all staff involved in sales promotion are adequately trained and possess sufficient technical knowledge to present complete, accurate and valid information on the products sold;

11.1.17 advertisements encourage purchasers and users to read the label carefully, or have the label read to them if they cannot read.

11.2 International organizations and public-sector groups should call attention to departures from this Article.

11.3 Governments are encouraged to work with manufacturers to take advantage of their marketing skills and infrastructure, in order to provide public-service advertising regarding the safe and effective use of pesticides. This advertising could focus on such factors as proper maintenance and use of equipment, special precautions for children and pregnant women, the danger of reusing containers, and the importance of following label directions.

Article 12. Monitoring the observance of the Code

12.1 The Code should be published and should be observed

through collaborative action on the part of governments, individually or in regional groupings, appropriate organizations and bodies of the United Nations system, international governmental organizations and the pesticide industry.

12.2 The Code should be brought to the attention of all concerned in the manufacture, marketing and use of pesticides and in the control of such activities, so that governments, individually or in regional groupings, industry and international institutions understand their shared responsibilities in working together to ensure that the objectives of the Code are achieved.

12.3 All parties addressed by this Code should observe this Code and should promote the principles and ethics expressed by the Code, irrespective of other parties' ability to observe the Code. The pesticide industry should cooperate fully in the observance of the Code and promote the principles and ethics expressed by the Code, irrespective of a government's ability to observe the Code.

12.4 Independently of any measures taken with respect to the observance of this Code, all relevant legal rules, whether legislative, administrative, judicial or customary, dealing with liability, consumer protection, conservation, pollution control and other related subjects should be strictly applied.

12.5 FAO and other competent international organizations should give full support to the observance of the Code, as adopted.

12.6 Governments should monitor the observance of the Code and report on progress made to the Director-General of FAO.

12.7 Governing Bodies should periodically review the relevance and effectiveness of the Code. 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.

Annex

FAO Conference Resolution 10/85:
International Code of Conduct
on the Distribution and Use of Pesticides

THE CONFERENCE,

Recognizing that increased food production is a high priority need in many parts of the world and that this need cannot be met without the use of indispensable agricultural inputs such as pesticides,

Noting that FAO's study entitled *Agriculture: toward 2000* foresees a steady increase in the worldwide use of pesticides,

Convinced that such growth in pesticide use is likely to take place in spite of necessary intensive parallel efforts to introduce biological and integrated pest control systems,

Acknowledging that pesticides can be hazardous to humans and the environment and that immediate action must be taken by all concerned, including governments, manufacturers, traders and users, to eliminate, as far as possible and within the scope of their responsibility, unreasonable risks, not only in the country of origin but also in the countries to which pesticides may be exported,

Being aware that the requirements for the safe and proper use of pesticides in some developed countries have led to the adoption of complex systems of regulations and of enforcement mechanisms, but that many other countries have neither such mechanisms nor the necessary legislation, regulations or infrastructures to control the import, availability, sale or use of pesticides,

Convinced that additional efforts are needed to enable such countries to control pesticides more effectively and to assess the hazards which could result from their use or misuse,

Recognizing that a voluntary International Code of Conduct, based on internationally agreed technical guidelines, would provide a practical framework for the control of pesticides, especially in countries that do not have adequate pesticide registration and control schemes,

Noting that such a draft Code was reviewed by the Committee on Agriculture at its Eighth Session, and endorsed by the Council at its Eighty-eighth Session,

Having further noted the conclusions and recommendations of these bodies,

1. *Hereby adopts* a voluntary International Code of Conduct on the Distribution and Use of Pesticides as given in the annex to this Resolution;

2. *Recommends* that all FAO Member Nations promote the use of this Code in the interests of safer and more efficient use of pesticides and of increased food production;

3. *Requests* governments to monitor the observance of the Code, in collaboration with the Director-General who will report periodically to the Committee on Agriculture;

4. *Invites* other United Nations agencies and other international organizations to collaborate in this endeavour within their respective spheres of competence.

(Adopted 28 November 1985)

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