REDUCING PESTICIDE DEPENDENCY IN EUROPE TO PROTECT HEALTH, ENVIRONMENT AND BIODIVERSITY

PROCEEDINGS OF THE PAN EUROPE POLICY CONFERENCE

Held 20 November 2003,
Københavns Miljøkontrol,
Copenhagen, Denmark

PAN Europe
Pesticides Action Network Europe

PURE CONFERENCE 2003

Proceedings of the PAN Europe policy conference

Reducing Pesticide Dependency in Europe to Protect Health, Environment and Biodiversity

Held 20 November 2003, Københavns Miljøkontrol, Copenhagen, Denmark

PAN Europe
Pesticides Action Network Europe
Eurolink Centre
49, Effra Road
London SW2 1BZ
UK
Tel : +44 (0)20 7274 8895
Fax : +44 (0)20 7274 9084
Email : stephanie-paneurope@pan-uk.org
Webpage : www.pan-europe.net

PAN Europe is facilitated by PAN Germany and PAN UK

CONTENTS

SESSION 1: WHY IS PRECAUTIONARY USE REDUCTION NECESSARY?

SESSION 2: HOW TO MEASURE PESTICIDES USE REDUCTION?

SESSION 3: TOWARDS AGRICULTURAL PRODUCTION SYSTEMS WHICH REDUCE PESTICIDE USE

SESSION 4: STEPS TOWARDS PESTICIDE USE REDUCTION

LESSONS FROM THE DAY

PARTICIPANTS LIST

ANNOTATED PROGRAMME

EXPLANATORY NOTE TO THE PROCEEDINGS & INTRODUCTION

This policy conference on Reducing Pesticides Dependency in Europe to Protect Health, Environment and Biodiversity was organised by Pesticides Action Network (PAN) Europe and held in Copenhagen on 20th November 2003. The conference attracted 66 participants from regulatory and other government agencies, research, farmer organisations, private sector companies including water companies and NGOs, from 18 countries, including 27 officials from MS and EU agencies in 15 existing and Accession Member States. The conference was held in the context of the 6th Environmental Action Plan and the European Commission's proposals for a Thematic Strategy for a sustainable use of pesticides. Since 2002, PAN Europe has been calling for a specific Directive on Pesticide Use Reduction in Europe (PURE), with legally binding targets and timetables. These proceedings highlight new evidence on pesticide problems for health, the environment and biodiversity and attempt to explain the rationale for pesticide use reduction at EU level under the precautionary principle.

Further presentations describe successful programmes in pesticide reduction, detail specific measures and tools used and progress in Integrated Crop Management, from government and private sectors. Speakers also note challenges to be overcome and promising steps forward. The text should be read in conjunction with the PowerPoint slides from each speaker, provided separately.

We hope that this information serves to foster more support for PURE at national and EU levels.

PAN Europe gratefully acknowledges the contributions by all speakers and chairs and would like to thank the Environment Directorate general of the European Commission, the Danish Environmental Protection Agency and the Copenhagen City Council Environment Department for their support in making the conference possible. The content and views expressed in these proceedings are those of the speakers or of PAN Europe and do not necessarily reflect the views of these donors.

INTRODUCTION

GRETTA GOLDENMAN

I would like to welcome everyone to this conference sponsored by PAN Europe. The Pesticide Action Network had its origin 20 years ago in 1982 in Malaysia. I was very proud to have been there in the beginning. PAN is an effort to bring together non-governmental organisations around the world, in developing countries as well as developed countries, to work together to address pesticide-related problems. PAN International is facilitated through five regional centres. This is a conference sponsored by PAN Europe which is in turn facilitated by PAN UK and PAN Germany. PAN has been working on the PURE campaign, Pesticide Use Reduction in Europe. You will hear more about this as the conference progresses. The PURE campaign has been signed on to by 82 civil society organisations in 27 countries, so there is very broad support for this campaign. I would also like to mention that PAN Europe links 43 organisations, so the network is broader than those PAN participants in this room.

I would like to thank very much the Miljokontrol of Copenhagen who have given us this venue and beautiful site for a conference. The proceedings of this conference will be available later and sent out to each of you who have registered electronically. They will also be available on the websites of PAN Europe and the European Environmental Bureau.

We have a very interesting mix of people here today: people from Member State pesticide registration authorities, agricultural ministries, and environment ministries. We have representatives from civil society organisations, from farmer organisations as well as from the pesticide industry, and we have representatives from the European Commission too. So we hope this exciting mix of people will generate some very good discussion. We have a very tight time schedule but there will be time for discussion at the end of each session.

Gretta Goldenman. Director, Milieu Ltd, Belgium

KEYNOTE SPEECH

HANS CHRISTIAN SCHMITT

Thank you to the Pesticide Action Network for the invitation to address this important conference. First of all, I would like to say to all of you that we need to work together, we all know that, and that is why we have to reduce the use of pesticides. So I hope that you will have a useful exchange of experience during the day which will help us move forward on the issues at hand.

But I also want to mention that pesticides are useful, we have to remember that. We use them to control weeds, pest and fungal diseases in agriculture and forestry, in market gardening and our public parks, as well as private gardens. But on the other hand, pesticides hit more than the organisms we want to get rid of. That is important. They are spread more widely in the environment than we want them to, and we find their residues in our surface water, in our groundwater, and even in food. That is why we need an overall effort to reduce our use of pesticides, and why we must ban the use of pesticides with unacceptable effects on health or the environment.

Reducing the risks from pesticides and reducing our use of them is very important to the Danish government. Our overall policy is laid down in our national strategy for sustainable development. One important reason why it is important for us is the fact that almost all of our drinking water comes from untreated groundwater. Unfortunately we have found unacceptable levels of pesticides and their residues in some groundwater reservoirs. We have even had to close a number of mainly smaller wells and because two thirds of our land is under cultivation in Denmark, the only way we can protect our groundwater effectively is by following a strict pesticides policy. The first Danish Action Plan to tackle the use of pesticides was introduced in 1986. It contained the two basic principles that we still apply today: (i) a strict approval scheme, and (ii) overall reduction in the use of pesticides.

Bichel Committee findings

In 1997, the Danish parliament decided to set up a committee in order to analyse the overall use of pesticides, and how to reduce it. It was named the Bichel Committee after its chairman, and its members represented all stakeholders - scientists, agricultural, the chemical industry, environmental NGOs, and public authorities. Its analysis covered virtually all aspects of pesticide use and the members of the committee agreed fully on the scientific basis of analysis in its conclusions.

I also want to say that we were all agreed in the Danish parliament that it should be done. We have all said that we think it was a very interesting job and a good job that they did. This committee analysed a number of levels of phasing out pesticides, including the economic aspects, ranging from a total phasing out, to maintaining the current level of use. That was very important because very often we get criticised that we never think about how to get most environmental benefit for our money. So the discussion was how to define that. This and the fact the all the committee stood behind the conclusions made analysis a unique basis for the political discussion and decision-making. We have used the Bichel report several times when we have had political discussion. The broad technical and economic agreement among experts allowed the political debate to focus on the setting of objectives and deciding on initiatives to be applied in order to meet these objectives. One very basic finding of the Bichel Committee was that it was possible to reduce the use of pesticides by 30-40% over a period of five to ten years, with no significant economic loss to farmers and to society. Just to mention that again, 30-40% over a period of 5-10 years with no significant economic loss to farmers and to society.

A second recommendation from the committee was to increase efforts to protect vulnerable bio-zones and to have spray-free zones along certain watercourses to protect surface waters from contamination. This issue was very much discussed in the committee but also among politicians. Thirdly, the committee pointed to organic farming as a means to reduce the overall use of pesticides. Almost all members of the Danish parliament could support the recommendations of the Bichel Committee, and the previous government

published a second Pesticide Action Plan in 2000. Its basic objective was to reduce the use of pesticides in agriculture by 50% by the end of 2002. This objective was practically met. Farmers agreed with the experts in the Bichel Committee and they were positive and enthusiastic about reducing their use of pesticides. The agricultural consultants assisted individual farmers in making plans for how to cut their use. The goal for creating spray-free buffer zones along a number of watercourses and lakes was less successful.

New Pesticide Action Plan 2004-09

So now we have just evaluated the results of the second Action Plan which expired in 2002 and I have presented a new plan for further reductions in the period 2004 to 2009. The plan is still based on the conclusion of the Bichel Committee and it expands initiatives compared with the previous plans. They were focussed solely on the use of pesticides in agriculture. In the new plan, market gardens, fruit growing, as well as public and private use of pesticides have been included. This, I believe, is a clear step forward. The new plan anticipates the mean annual treatment frequency in agriculture will be brought down from what we have today, from 2.04 to 1.75 by 2009. One could say well that is reducing about 0.3-0.4 but over a longer time. But I think you all know the first step is easier to take then the next step. Treatment frequency has already been brought down from about 2.23 in 1999, and it is clear that the next reductions, as I said, will be more difficult. It will take a great effort in agriculture- the individual farmer will need to use all our current knowledge of ways to reduce pesticide use, and we must make sure that all of our experience is made readily available. More farmers must learn how to use computer systems in order to forecast the need for spraying. They will have to spend more time in the field to assist the need to control weeds, pests and disease. In order to help farmers, the plan focuses on the opportunities of the individual farm. Together with the consultant, the farmer must prepare tailor-made plans for reducing his use of pesticides. Experience shows that this is a better way to reduce spraying. We have agreed in this plan that by 2007 we will try to find out if it is possible with technology to go further than 1.7, but we don't know that. In 2007 we will have the analysis.

A further goal of the plan is to reduce the overall use of pesticides in agriculture by promoting pesticide-free cultivation. To do that we have made our subsidy scheme for organic farming more flexible, and it will be possible to get subsidies to farm under environmentally friendly conditions without actually being authorised as an organic farm. We also enhance procurement of organic products by public authorities and institutions in order to expand the market.

Protection of our groundwater is extremely important, as I have said. There are a number of initiatives in the plan to protect groundwater against pesticides. We have an early warning system in place so that we can continue to monitor what happens to the pesticides we use. This will allow us to intervene if we think that there is a risk of run-off or leaching of pesticides, even if they are used according to regulations. We also work to identify the areas most sensitive to leaching of pesticides. This will allow us to make agreements with farmers to avoid spraying altogether.We will also make rules on how to wash spraying equipment after use. We know there is a significant risk and many farmers are washing their equipment on bare soil. A better practice would give a clear improvement in protection of groundwater.

As I have said, market gardens and fruit growers are included in the plan. We focus on advice and research into the development of alternative methods of combating pests, support systems and decision making, improved spraying techniques and so forth, that they can use to reduce the need for spraying. We intend to make guidelines for the cultivation of all major crops to assist individual growers in doing the right thing.

I mentioned that spray-free buffer zones have been less than successful in the former action plan. The new plan sets the very ambitious objective of expanding the area of buffer zones three fold [Ed. from 8,000ha in 2002 to 25,000ha] compared to their present extent. Spray-free buffer zones are important to protect the aquatic environment. In contrast to the second action plan, we will include advice to the farmer on the practical and financial possibilities of making buffer zones in order to have them implemented in the tailor-made plans.

In order to prevent incorrect use of pesticides in private gardens, we will launch a broad information campaign and we try to agree

with the producers and importers of pesticides that they should only sell ready-to-use agents to private users.

I very much welcome the Pesticide Action Network campaign to reduce the use of pesticides. I think that is the right way to go. We need to broaden the debate to include the general public. I am sure that this conference will show the great potential to reduce pesticide use in Denmark and all over Europe. It is also an important message to the new members of the European Union that you can have a competitive agricultural sector without having a large consumption of pesticides. I look forward to see the presentation of the Thematic Strategy on the sustainable use of pesticides, which the EU Commission has announced, and the Directive on marketing of the use of plant protection products. We need it to enhance the responsible use of pesticides and conferences such as this will contribute to bring the process forward. I am happy that my Ministry has been able to assist you in important work towards our common goal to reduce the use of pesticides.

I am sorry to say that I have to go to the Parliament, or I would have liked to have a discussion and to hear what you had to say. So I wish you good luck today and I think the exchanging of experiences will help us all, and certainly it will help in the future. Thank you for your attention.

Hans Christian Schmitt, Danish Minister of Environment

WHY THIS CONFERENCE?

CATHERINE WATTIEZ,

Why does PAN Europe organise this conference ? (slides 1 and 2).

Today's conference is, in fact, organised according to the EU political agenda. It is organised, in the context of the elaboration, by the Commission, of the Thematic Strategy on the sustainable use of pesticides but also in the context of the parallel Environment and Health Strategy under development by DG Environment with the involvement of DG SANCO and DG Research. It is also organised in the context of the follow-up of the Biodiversity Strategy. Its aim is to bring Member States officials and other stakeholders together to consider the case for reducing pesticide dependency and some steps towards achieving such a reduction. This conference is organised because there is a need to consider new scientific findings together with a need to recognise gaps in knowledge. There is consequently a need to apply the precautionary principle and to reconsider the case for use and exposure reduction. There is also a need to shift the thinking of policy makers and a need for a forum to discuss what new measures are needed.

New scientific findings show higher impacts from pesticides than expected (slide 3)

No safe level of exposure can be determined for increasing numbers of pesticides , such as endocrine disrupters. " Effects " can be shown at the lowest level of exposure. Evidence is emerging to document combination effects, such as additive or synergistic. Particular vulnerabilities of foetuses, infants and children is shown. More information is now available on how pesticides affect biodiversity. A link has also been found between frequency of application and impacts on biodiversity.

Gaps in knowledge also argue for precautionary approach (slide 4)

There is still too little information on impacts - I should say 'harm' - of combined exposure to low-dose pesticides on health and biodiversity. Complex mechanisms of action and combined effects are difficult to evaluate. Data on real life exposure to multiple chemicals are missing. There are not enough data on how much pesticide is applied in Europe, though more Member States now collect usage data.

The need to reconsider the case for precautionary reduction of use and exposure (slide 5)

According to Eurostat sales figures, tonnages applied are increasing, despite newer low-dose pesticides. European Crop Protection Association (ECPA) data seem to underestimate amounts used. Denmark, the Netherlands, Sweden, etc. prove that use reduction without unacceptable costs is possible. Use reduction is a means to reduce risks and to increase biodiversity.

The Sixth Environment Action Programme calls for action (slide 6)

It calls *" to reduce the impacts of pesticides on human health and the environment and more generally to achieve a more sustainable use of pesticides as well as a significant overall reduction in risks and of the use of pesticides, consistent with the necessary crop protection "*. It commits to halt all biodiversity loss by 2010. It promises a Thematic Strategy on the sustainable use of pesticides.

The need to shift the thinking of policy makers (slide 7)

The Fifth Environment Action Programme promised to achieve a significant reduction in pesticide use, but nothing happened. Precautionary action is needed. Integrated crop management can reduce pesticide use and increase farm profitability. The Thematic Strategy needs to include binding legal requirements additional to Directive 91/414/CEE, including for precautionary use reduction.

The PURE Directive suggested by PAN Europe (slide 8)

In the context of the elaboration of the Thematic Strategy, PAN Europe produced a " suggested text for a Directive on pesticides use reduction ". This text, available at http://www.pan-europe.net , is signed by

more than 81 groups in 26 countries. This text forecasts mandatory use reduction plans for all Member States as well as targets and timetables for use reduction and for more land farmed organically. Integrated crop management is seen as a minimum for all EU agricultural pesticide use. PAN Europe also asks for full access to publicly held information on pesticides. Most of these measures were supported by the European Parliament.

Broader stakeholder participation needed (slide 9)

Finally, there is a need for a broader stakeholder participation. There has been no stakeholder participation related to the Thematic strategy on pesticides since November 2002. There is a need for broader discussion on what new measures are required. Consequently, PAN Europe suggests adopting for the Thematic Strategy the participatory approach piloted by DG Environment, DG SANCO and DG Research in their working groups on Environment and Health and in the follow-up of the Biodiversity Strategy as well as in the elaboration of other Thematic Strategies (Urban Environment, Soil, Marine Environment).

Our hopes for the outcome of this conference (slide 10)

They are to provide an opportunity to consider and discuss the case for pesticide use reduction, to identify steps to achieve pesticide use reduction and to contribute additional input towards a sound political decision that will protect human health, environment and biodiversity. We hope the ideas expressed here are taken on board by the Commission and by Member States in demonstration of their openness to broader stakeholders participation in developing this important EU environmental policy.

Catherine Wattiez, Co-ordinator of the Pesticide Use Reduction in Europe campaign, PAN Europe, Belgium

THE INADEQUACIES OF THE CURRENT LICENSING SYSTEM FOR PESTICIDES

VYVYAN HOWARD

I am a medically qualified toxico-pathologist and also a member of the UK Government Advisory Committee on Pesticides. Therefore, along with some other people present at the meeting, I am involved in decision-making concerning the licensing of pesticides.

I want to briefly talk about risk assessment. Risk assessment is something that we need to think about because it is often presented by developers of technologies to decision-makers as the main tool for stopping the invocation of the precautionary principle. Additionally it is usually presented as hard science. However, there is often so much surmise and assumption in such risk assessments that the amount of hard science can be very little and even in some cases zero. In the latter case, the whole risk assessment can be based solely upon data models, which are assumptions, that have been given the epithet of 'fact-free models'.

Risk assessment was devised by engineers who wanted to predict when engineering structures might fail and collapse. So they devised an objective, mathematical methodology for looking at, for example, the surrounding geology, the materials used, the likely physical forces that structure is likely to experience. As a result of this procedure, engineers can then over-design by a certain factor. Bridges usually are over-designed by a factor of between 5-10 and aircraft by a factor 1.1-1.2. The more you cut that safety margin down, the more you have to spend on researching the reliability of the individual bits (slides 3 and 4).

Risk assessments are not foolproof (slide 5).

Even though they deal with very concrete and finite problems, it is not unusual for unpredicted problems to arise. This is the famous bridge in London, the Millenium bridge, which wobbled. Initially it cost £8 million and they had to spend another £5 million to stabilise it. So even today, with a very sophisticated computer modelling, they do not get it right (slide 6). This was the first jet airliner, the Comet (slide 7). If you look at it, you will notice that it has square windows and you never see those on modern airliners now because when it gets to minus 70°C the metal cracks. Three or four of these aircraft disintegrated in midair and many lives were lost, so risk assessment is not infallible.

A typical risk assessment goes through four phases (slide 8):

- hazard identification, often the most difficult
- hazard assessment , that is hard science. If you find something, you've got to do something
- then, in the case of pesticides, exposure assessment, how much are we likely to face over what period of time ?
- and finally, with the three preceding three phases in position, one can attempt a risk assessment.

Risk assessment is now being applied to complex systems, like the whole planet, where it is impossible to have comprehensive data. If risk assessment is applied to such cases then it become necessary to use data models and this is where levels of uncertainty in the risk assessment can become so large as to make it meaningless. Indeed, depending upon which assumptions are made, it is possible to dictate the outcome. In my experience, the assumptions made and the levels of uncertainty attached to them are usually not stated. That's a problem. This is a complex system, a model of the Scotian shelf food web (slide 10): top of the ocean, bottom of the ocean, birds and fishes... What people are doing when they have done a risk assessment in a system like this is telling you they fully understand it. And yet we know that many of the interrelationships between things in a food web are very non-linear. They are subject to singularities. When that happens, it is usually an irreversible step. Nevertheless, thick, weighty tomes containing unrealistic risk assessments continue to be dumped onto decision-makers' desks with the implicit message that "we have done a risk assessment and it is safe".

This (slide 13) concerns the biodiversity which Catherine Wattiez was talking about before. Each one of these dots represents over hundred fifty species of breeding birds. This was in 1997. If you just compare the biodiversity in West Germany with Eastern

Germany, you see the difference which has been brought about, presumably by farming practices, in one way or another.

Multiple exposures

We know that we are all exposed to multiple pesticides. This is one of the things that is not addressed by current risk assessments. This slide (14) shows maternal plasma concentrations of a number of organochlorine pesticides in countries around the Arctic Ocean, from a survey. You can see that there are various messages to learn from this. Although we put DDT, for instance, out into the environment, what we find in people and animals is DDE, a hormonally active metabolite. Therefore, biotransformation goes on as well. You have to take that into your risk assessment. It is not just what we release into the environment but what what we, the biota, do to it. These compounds have become ubiquitous on the planet, some of the long lasting ones. That's why we phased them out in Europe. However, they still come back to us in our food chain. This is an object lesson, I think, of why we have to take risk assessment with a certain amount of scepticism. We need to be able to decide when it is not adequate and then be prepared to take a precautionary stance. We know that these persistent, bioaccumulative compounds concentrate up the food chain many million fold and humans are at the top of the food chain.

Here we have organochlorine levels, dioxins and PCBs, in human breast milk (slide 17). This is the end result of the pollution that I have been discussing. Have exposures to this complex mixture of organochlorine compounds caused any health problems ? Well, it is very difficult to know but there are indications. This is a slide from Professor Gunilla Lindström, a Swedish professor of chemistry. When she became pregnant for the first time she measured her own dioxin body burden and found that it decreased over the sixth months that she breastfed her child (slide 18). This (slide 19) is from Dr S Pattendien's thesis in Rotterdam, showing the increased body burden of infants that are being breastfed over that period. So here is a major problem which was not taken into account in the initial risk assessment, so this was a failure of hazard identification.

Professor Janna Koppe and her group in Amsterdam have done a lot of research showing that there is a range of health effects associated with exposure in the womb and the breastmilk to this "soup". We can't specify which chemical is causing what. There are many thousands of different compounds there, all lipophilic, they follow the fat. They have associated high dose given by the mother to the foetus and infants with intrauterine growth retardation, faulty imprinting of a number of systems, midline clefting defects, increased altered sex ratio, reduced thyroid hormone levels around birth (slides 20, 21).

This (slide 22) is from Doctor K Lanting's thesis. These children were 3.5 years old when tested. In the right hand column were the mothers with the highest level of PCBs and in the left, those with the lowest levels. The y-axis shows a measure of cognitive performance. What Dr Lanting concluded at the end of her thesis was that the children in the right-hand group were four points worse off on the IQ scale than the ones on the left-hand. We cannot specify what is exactly is causing that. It is an association rather than a causal relationship. But it is an indication that risk assessment definitely let us down in that case. We should have been able to think ahead and say, "well these are persistent chemicals. They are lipophilic, they are non-polar and therefore this, this and this is likely to happen". But we didn't do it and we are making the same mistakes now with brominated compounds and with chlorinated compounds. Let's have a look now at some of the things we are dealing with today. This (slide 23) is an American study of organophosphorous compounds in the background population and you can see these people here above the 90th percentile, here are 700 people looked at, some of them have a really appreciative level of these six organophosphorous compounds. So we know that the exposure goes on.

We know that some compounds that we are using are hormone disruptors (slide 25). This is nonylphenol (slide 24) which is thought to be phased out in Europe and supposed to go in the years 2000. About hormone disrupting properties, in my opinion, the current risk assessment do not adequately address this problem (slides 26, 27). Current risk assessments are based on protocolised tests: acute toxicity , chronic toxicity, transgeneration studies and teratogenesis. They establish a toxic dose in animals and then they apply an uncertainty factor and that is usually a factor of 100 in Europe, 10 for intra-species variability, 10 for inter-species variability. In the

United States they often use an additional factor of 10 for those members of the society who are developing because that is recognised as a period of particular vulnerability and then they adjust the Maximum Residue Limit to try and meet, making some assumptions about dietary intake with this tolerable total daily intake. Each compound is examined on its own, with no acknowledgement of multiple input, no acknowledgement of the effects of multiple compounds with the same mode of action. No acknowledgement that mixtures may have more than additive effects and little recognition of the new toxicology which is replacing Paracelsus. Paracelsus tells us that high dose toxicity in adults, with a few bad actors, "the dose makes the poison". What we are learning actually is that there are many bad actors. They are working, often in combination, at low doses to highjack development. This is a major problem that is not really acknowledged by the current risk assessment process.

Synergistic effects

Just a few words about the work of Dr J. Axelrad who studied for her PhD with Dr Graham McLean and myself in Liverpool (slides 28, 29, 30). We have got an assay which looks at the outgrowth of these little hairlike processes that nerve cells communicate with each other by. This is an in vitro test done in a dish. We can perform it on human cells, or mouse cells, there are many cell lines available. What we do is we grow them up and then we see if we can inhibit this process. That is a prediction of the likely developmental neurotoxicity of that compound. So, we can get an IC50 (inhibition concentration), an effective concentration at which 50% inhibition will occur, and this is a measure that we can use as an index of developmental toxicity . This test actually does rather well when compared with in vivo tests. It is recognised as being a reasonably good predictor, it is not infallible but it is very widely used. Here, for instance, we see the toxicity of glyphosate in this test and then we see it in a number of different formulations and we see that the formulation itself makes the thing more toxic (slide 32). There is a lot of literature about the so-called inerts in pesticide mixtures actually enhancing the toxicity of the active ingredient. So what she did then was to take them in mixtures. This would be 100% substance A and this 100% substance B and this is 50 % / 50%. We have got the initial response curve and we would put these 2 compounds in at an IC20. This would be our predicted response curve if there was only additive action (slide 34). This is between chlorpyrifos and diazinon and we find only an additive action (slide 35). We do not find more or less than an additive effect. On the other hand, if we mix phosmet with pirimiphos-methyl (slide 36), we find a repeatable, more than additive effect and we would call this a synergistic effect. These papers have been published in the Journal of Toxicology *[Interactions between pesticides and components of pesticide formulations in an in vitro neurotoxicity test, Axelrad, JC, Howard, CV & McLean, WG, J. Toxicology 173 (3) 259-268, 2002; The effects of acute pesticide exposure on neuroblastoma cells chronically exposed to diazinon, Axelrad, JC, Howard, CV & McLean, WG, J. Toxicology 185 (1) 67-78, 2003].*

Here is another one which was Tough Weed killer and pirimiphos methyl (slide 37). We were finding synergies up to 20 fold between different compounds (slide 38, 39). It was not invariable, some of the mixtures had literally only an additive effect. What this means in the intact animal we do not really know but it is indicative that there is a mechanism which embarrasses the cells and that is probably predictive of neurobehavioural problems. In the formulation, we find higher levels of synergism according to this.

There is in vivo work. This is a paper by Wurple at al. (slide 40) where they looked at kindling, which is a type of epilepsy modelling in cats. They found that when they gave chlorpyriphos they got this curve response for the vehicle. But if they put the two together, they got a heightening in the toxicity and that ties in to some extent with some of the things we are seeing in our assays. This was a study that was performed on the use of Prioderm, which is a shampoo for headlice which contains malathion (slide 47). This is the reference dose:
0.02 mg/kg/day. We reckon that one of these people was getting 5 times the acute reference dose, and this one 3.5 times, just because of using the shampoo, never mind what was coming in via the diet. So these things come in multiple directions and the risk assessment needs to take that into account. In my opinion currently, they don't.

The British Government put out this warning that the vegetables and some fruits should be peeled, particularly if feeding them to chil-

dren, because otherwise the acute reference dose could be exceeded in some cases for some compounds by up to 6 or 7 times (slide 48). They have since withdrawn this and they say it is safe now, despite quite high levels of variability in residue levels. In UK we appear to do much less residue testing than in other countries in Europe and you could argue in Europe it is probably not adequate.

Conclusions

To conclude (slide 49, 50), we know that for some groups of environmental pollutants that health effects have already been measured in the background population, not in special populations. There is an urgent requirement to reduce exposure to some of these groups of compounds and this particularly true for the foetus. I am very pleased to see that Margot Wallström is putting the foetus and the infant at the centre of her policy. If she manages to do that, then it will protect all of us. There is no question in my mind about that.

What are the best policies to adopt to achieve these aims? There should be reverse onus for liability from damage. With pesticides currently, the producer has to make a dossier so there is reverse of onus to some extent but I think it needs to be extended to deal with some of the more subtle effects that we have been discussing. Strict liability should apply to products that are designed to be toxic and released to the environment. Therefore, even if a toxic effect was unpredictable, because of the nature of the product, I think liability should go with it. We should be looking at ways of reducing exposure to toxic substances on a precautionary basis because I do not think there is an adequate, analytical toxicological approach to the mixture problem. I do not consider that there is any other logical way of dealing with the mixtures problem, other than to say that society must take a hazard reduction approach, probably by using some form of comparative risk assessment.

Vyvyan Howard, Developmental Toxico-Pathology, University of Liverpool, UK

A NEW CONCEPT FOR PESTICIDE ASSESSMENT: ECOGENETICS

PROF. GILLES-ERIC SERALINI

Good morning, Ladies and Gentlemen. I am from CRII GEN (Committee for Research and Independent Information on the Genetic Genie) and the University of Caen in France. I would like to thank all authorities for organizing and being present at this meeting and particularly Mrs Catherine Wattiez for inviting me in your beautiful city of Copenhagen. I am going to present you partially a new concept called ECOGENETICS, It is the study of the effects of environment and its pollution on gene expression at a cellular and molecular level, but taking into account new understandings in comparison to statutory toxicology.

I will present you in 15 minutes a short part of it, blending ecology and genetics and taking into better account complex systems.

Endocrine effects

We know that xenobiotics are pollutants i.e. artificial compounds coming from industrial activities (slide 2), transport, or spreading of pesticides in agricultural fields for instance. ECOGENETICS takes into account BIOACCUMULATION, COMBINED EFFECTS and LONG-TERM EFFECTS of pesticides on health, and for that, one must understand the molecular basis of these actions and demonstrate them.

For this purpose we are going to take the example of the endocrine or hormonal disrupting effects of pollutants. We have studied in my laboratory the effects of a lot of compounds including fungicides, herbicides, including Roundup, one of the main ones used throughout the world and especially with the majority of transgenic plants (GMOs), insecticides like lindane and other pesticides (Slide 3).

We have chosen to study the endocrine disruption at one of the end points of steroidogenesis, the aromatase gene. It encodes for the unique and irreversible enzyme responsible for oestrogen synthesis in the organism. The oestrogens control the physiology in steroidogenic tissues like testis, ovary and placenta during development and activity of reproductive functions (slide 4).

It has also been discovered that oestrogens modulate the nervous system for the control of sexual differentiation and behaviour, and peripheral tissues like the breast (aromatase inhibitors are a drug for breast cancers). Oestrogens have also protecting effects on circulation, bone growth and regulation. The perturbation of oestrogen synthesis in one way or another could thus have pleiotropic effects at different levels like those observed in various wild life pollution.

Usually researchers study endocrine disruption at the level of hormonal receptors, but one must not forget the possible effects on aromatase, transport proteins or DNA, with the formation of adducts, which are pollutants directly linked to DNA (slide 5). Xenobiotics are also metabolized in various tissues by a series of enzymes including the famous cytochromes P450. Aromatase belongs to this super family, it is the 19th member of cytochromes P450. Thus, it may form intermediate metabolites which are more or less toxic (slide 6).

Moreover, the sperm declines, increase in sexual malformations, as we notice today in children of Southern France, particularly in agricultural workers' families, or increase in hormone-dependent cancers have been linked in some cases to pesticides. This could be explained, at least in part, by disruption of aromatase function and oestrogen synthesis (slide 7).

Combination effects

Let's see two examples; the first one combined effects and the second one time-dependent effects of pesticides (slide 8). If there are combined effects of pesticides on health, what is the meaning of the threshold of action of each one, which is the basis to calculate the authorized levels of pollution ? How can you really calculate it ?
Will two non-deleterious substances have no effect in combination? We will see also the case of a pesticide in its formulation product.

We have demonstrated a synergistic inhibition of aromatase activity with, for example, two pesticides: chlordecone and tributyltin (slide 9). On the left, you have the effect of chlordecone and tributyltin inducing 25% of inhibition each, mixed together, they induced 2 to 5 times more inhibition than the double of each concentration (on the right).

How can we explain that ? Let's take another example of combined effects: the effects provoked by a formulation and its active ingredient that are mixed together to act on plants in combination, and which are both found afterwards in the environment. *(NB Editor's Note: The scientific results presented in this section of Prof. Seralini's presentation cannot be reproduced until publication in the scientific literature, so they have been removed from these proceedings).*

Moreover for instance, Roundup is known to cause direct genetic damages in mammals (mice or human, slide 10). It causes also decreases in sperm density and heavy pregnancy problems in farmers (slide 11).

Time-dependent variability

We will take now another and last concept (slide 12). If there are variable time-dependent effects of pesticides on health, we could explain as for a hormone, biphasic effects. What will be the real meaning of the threshold of action ? How can you calculate it ? What about the credo of linear dose-related effects in regulatory toxicology ?

We will follow the same case of a pesticide in its formulation product (slide 13). We see that with Lindane we have differential effects on aromatase activity, with time it can stimulate or inhibit at the same dose !

This can shed a new light on what happens in transgenic plants since Roundup tolerant foods are developed in America with special metabolites in those foods (slide 14). One should remember that GMOs like soya or maize have considerably amplified the use of Roundup which is already becoming one of our main herbicide pollutants for water (Slides 15-19). The endocrine disrupting effects of GMOs should then be analysed carefully, which is definitely not the case today. Since 5 years now, I belong to governmental commissions to examine GMOs. Unfortunately, they are not regularly tested on rats on a 3 months basis. Endocrine disrupting effects are very important to study because 99% of GMOs are designed to tolerate or produce pesticides, consequently they do not reduce their use on a mid or long term basis.

Conclusions

Numerous xenobiotics including pesticides interact with aromatase (slide 20).
It is a good model to study combined and time-dependent effects.
New findings show that Roundup can be an endocrine disruptor and that its formulation products amplify the effects of the active ingredient. Compounds like Roundup can modulate oestrogen effects without being oestrogenic ! Therefore ECOGENETICS can be studied at several levels: cellular viability, enzymatic activity and all steps of gene expression.

Without forgetting my actual collaborators, Safa Moslemi, Sophie Richard and Nora Benachour. I would like to thank all the previous ones that have participated to this work : Céline Nativelle, Herbert Sipahutar and Pascal Sourdaine. Thank you very much for your attention.

Editor's Note: Prof. Séralini's new book entitled 'Génétiquement Incorrect' is available in French, published in 2003 by Flammarion <fbrobeil@flammarion.fr> and contains 300 references to literature examining interactions between the genome and the environment.

Prof. Gilles-Eric Seralini, Laboratory of Biochemistry and Molecular Biology, University of Caen, France

INDIRECT EFFECTS OF PESTICIDES ON ECOSYSTEMS BIODIVERSITY

NIELS ELMEGAARD

I shall be talking about some of the work I've been interested in for the last 20 years: indirect effects of pesticides. I'll start by looking into and defining indirect effects and will give some examples. One important issue is "how important are indirect effects?"

An easy way of getting to it is that indirect effects of pesticide use on species can be defined as those not caused by direct toxic effects. Indirect effects on a species are actually caused by direct effects on another, and you could say, more sensitive species. This is due to many kinds of interspecies relations you find in the ecosystems. You've all heard about effects on food chains and here I illustrate this with a very simple food chain. From the left to right you have the trophic relations, primary producers and then a different number of consumers (slide 3). If you look at one species in the middle of the chain, it will be connected to a food resource lower in the food chain and to a predator higher in the chain. The simple logic of indirect effects is that if you take out the species in the middle, you also affect the species positioned immediately below and above in the food chain, and this effect might be carried on higher up or lower down. In reality, this is much more complex due to effects between parallel food chains- the same species may act as a food source for several other species, and usually does. You may also have interactions crossing trophic levels (slide 4).

Increasing the level of complexity, you have to take into account that not only are there trophic relationships between species but also interactions within the trophic level- intratrophic relations- the most important one is competition between species (slide 5). Now you can see that this is becoming so complex, it is very hard to describe by using models. One thing we often forget in these kind of models is that the most important part of the ecosystem, in temperate and many other systems, is the huge compartment dealing with detritus- i.e. plants, animals, bacteria living off dead organic material. That's a very important part of it.

Herbicide effects on the food chain

If we go back to the direct effects and try to understand what is going on, here you see (slide 6), marked in yellow, species which would usually be affected by pesticides use in Denmark. As in many other countries, we use a lot of herbicides. Every field is usually treated once a year with herbicide so you can be sure that every year you will have impacts on weeds at the first trophic level. Usually the crop is also mildly affected by herbicide applications. The fields are not treated every year with insecticide, but it happens. Insecticide application affects the herbivorous insects. Here I've indicated that they're not all affected necessarily, it depends on timing, when the species is there and how exposed it is if present in the field during spraying. We usually have less direct toxic effects on predatory insects because many of them are hidden during the spraying below stones, in the soil etc. but still some impact from insecticides occurs. In the top of the food web, we usually don't see any direct effects on birds or birds of prey. However, following the logic developed in the earlier slides, you can be sure that if you have an impact on the primary producers, it will inevitably result in impacts through the whole food chain. The logic conclusion of this theoretical discussion is that if a single species is linked to more than one other species in the system, the chance is very high that the indirect effects are more widespread than the direct effects.

There is an important effect of herbicide use in agricultural fields that is not usually mentioned in ecology textbooks discussing food webs. That is the fact that the presence of weeds has an impact on many levels in the ecosystem, just because they are there. Some weed species may not be an important food resource to insects and birds, but they are affecting the microclimate, sometimes very dramatically in the fields, and they are a physical structure in a very simple habitat. If you think of arthropods, such as spiders, many species need physical structures as frames to build their webs in. If you have weeds between the crop plants, the chance of success of these species will increase just because they have better opportunities to build webs.

Gap in risk assessment

Another reason for distinguishing (slide 7, 8) direct and indirect effects is that indirect effects are generally not mentioned in regulations governing pesticide use. These usually deal with direct effects. It also should be mentioned that if we are monitoring the effects of pesticide use on populations in the field, using measures such as population size, density, fecundity, productivity, etc., it is difficult to separate direct and indirect effects. You can criticise many field studies dealing with effect of pesticides on

birds for their lack of ability to separate the two types of effect. But is it important to separate direct and indirect effects and if so, to whom? To the public? To decision-takers? Politicians or pesticide users? Actually, I don't think it's important to the public and therefore may be not to politicians. I guess if the public think pesticides have an impact on populations and this is important, they won't mind whether it's a direct or indirect effect. The problem is that it's very hard to make regulations and laws that take into account and regulate indirect effects.

Studies on birds

I'll show some examples of indirect effects from studies in my lab (slide 9). In this food chain, we have weeds (knotgrass) at the bottom and beetle larvae living on it, and then above is the skylark eating the insects. This is a graph of the composition of food items in skylark nestling faeces. (slides 10, 11). The red bars represent sprayed fields, the green ones unsprayed. Period 1 is before insecticide spraying and period 2 afterwards. The main food items are Carabidae (ground beetles) Lepidoptera (butterflies), and Heteroptera (plant bugs). In the unsprayed fields, the density of butterfly larvae and bugs is significantly higher than in the sprayed fields (red) after insecticide application. In the sprayed fields, however, the appearance of beetles in the faeces of nestlings is higher and the logical explanation is that when you have fewer of these food items, you need to eat more of those. So that's another question of biodiversity, you have to make a living out there and when you reduce the biodiversity of species, you get a less diverse food. Does that mean anything? Actually, we don't know and it's very difficult to find out, whether diversity of food has any importance.

Here (slide 12) data on skylark reproduction per territory in sprayed and unsprayed fields are presented. Green again is unsprayed. A higher fledgling production is observed in unsprayed territories. The pesticides used in the sprayed fields were non-toxic to birds, judged by laboratory tests, and the effects are due to indirect effects on the food resource.

Beetle and hedgerow effects

Another example of complexity of indirect effects: we've studied interaction between the beetle and the host plant (slides 13, 14). We found out that if the weeds survived herbicide spraying the beetle did rather poorly. We searched into the reasons for this, checking a number of herbicides, sprayed onto the plants, and looking for secondary metabolites found in the plants. For three sulfonyl urea herbicides, specific constituents were found only after spraying and the compounds could be found in the plants for weeks after. We also correlated the beetle's survival to the concentration of this compound. Based on these results it was concluded that very low doses of these particular herbicides can change the phytochemistry of plants, which in turn may change their value as food plant to herbivorous insects. The results are important when considering the potential effect of pesticide deposition from the atmosphere etc.

Another study I'd like to mention is the effect of herbicides on hedgerows, outside or between cultivated fields (slide 15). The impact of metsulfuron (a herbicide) on hawthorn is a study still ongoing. We have looked at the density of berries in these hawthorn hedgerows. This is a picture of hawthorn in September with many berries, they produce a huge load of berries (slide 16). This is a hedge affected by 10% metasulfuron dosages, sprayed directly onto the hedge as an experiment, and there is actually no berry production at all (slide 17)! The interesting thing here in relation to indirect effects, is that the reduced production of berries may not affect the survival of the hawthorn population but can affect organisms dependent on those berries, such as insects and birds.

In conclusion (slides 19, 20), indirect effects may take many forms: reducing food sources, removing predation, removing competitors, change in the quality of food plants, change in the habitat in terms of physical structure. There is also pesticide drift onto surrounding habitats, which may have direct effects, which implies there will be indirect effects too. Measured as number of species affected, the indirect effects most likely are more extensive than the direct effects.

Niels Elmegaard, National Environmental Research Institute, Denmark

TOWARDS A COMMON UNDERSTANDING AND PRACTICAL APPLICATION OF THE PRECAUTIONARY PRINCIPLE TO CHILDREN'S HEALTH AND PESTICIDES

DAVID GEE

I just intend to give you the tool and you could apply it yourself to pesticides and children. Much of what I am going to say is contained in the book Late lessons from Early Warnings: the precautionary principle 1896-2000. Much is in there or in another book called Children's Health and Environment: a review of evidence which we published jointly with World Health Organisation who did most of the work, it must be said and both those are available from us. The download is on the website but it is quite thick. In addition, I prepared paper copies of 76 slides which I am not going to show here. I am just going to show half of the slides. But the other half is also interesting I think and therefore, in the version you will receive with the proceedings, you get all the 76 slides.

What I think I will focus on in particular is just misunderstandings about what the precautionary principle (PP) is. In a sense, the scene has been well set by the previous speakers. You drew attention, in particular, to complex systems, massive amount of uncertainty, huge pools of ignorance, which is not the same as uncertainty, and therefore great difficulties for anybody, be they industrialists or consumers or policy makers, in dealing with such complex , largely unknown systems in a way which does not create disasters.

Late lessons from early warnings

The lessons from early warnings is a study of fairly well known disasters (14 of them, from PCBs, CFCs, TBT, benzene , fishing in the North Sea and elsewhere, asbestos, radiation and so on) where we now know enough to know we made a few big mistakes along the way. The report analyses the way in which we made the mistakes, the mismatch between scientific knowledge and decision-making in society, and concludes with "twelve late lessons" at the end of the book which hopefully will help us to produce rather fewer mistakes in the next hundred years: with your help. I would like to summarize some of that material , and to clarify some of the misunderstandings (a) about the precautionary principle itself and (b) about simple terms like risk, uncertainty, ignorance, precaution , prevention, association, causation and that sort of thing. I find that in the last three or four years enormous amounts of time have been wasted on misunderstandings about what words mean, particularly cross culturally. So I'll just race through most things and linger on the ones I think will be the most useful for this morning session.

First of all, two minutes on the European Environmental Agency (slide 2). We do nothing else other than produce information, data, knowledge. We don't make regulations or police them, we don't do fundamental research. We are just information providers. We are legally independent from the Commission, the Parliament and the Council of Ministers but we are financed by the European Institutions. So that I am a European civil servant, I happen not to work in Brussels because Denmark won the fight to have the Agency here, just as London won the Pharmaceuticals Agency and Ireland got the Veterinary Agency. Our sole purpose is to produce information to help identify, frame, prepare, implement and assess the results of better environmental policy measures. And since 1999, our remit has been broadened to take account of 'sustainable development' which is rather broader.

An early lesson lately forgotten was that from Socrates who said 'the wise man basically knows that he does not know '. The precautionary principle (slide 3) began life in Germany in the 1970s with respect to forest death and what was causing that, pollution and so on, and was elaborated there, but internationally it has been drafted around the dilemma of marine pollution. And this quotation from the Marine Pollution Bulletin (1997) captures the essence of the problem (slide 4). We have a lot of data and we have no idea of what it means basically, very often. So it is quite nice to have a fall-back principle to use in situations of great uncertainty where you are already exposing the ecosystem and people to possibly hazardous agents and if you could manage to reduce future and unknowable risk by taking a bit of care and foresight, as you are doing with your reduction campaign here on pesticides, then it makes sense to do so.

Precautionary Principle for policy action

There is no definition in the Treaty of the PP and so there is great misunderstanding because people use their own. This is the working definition we used to produce the Late Lessons book and we sent to all the authors of the chapters like Mr Joe Farman who discovered the hole in the ozone layer, and who wrote the chapter on CFCs and ozone (slide 5). The PP is a general rule of public policy action with an emphasis on the

action, where the situation is potentially serious or irreversible to health and environment, and where there is a need to reduce the potential hazards before we have got strong proof of harm. We need to take into account the likely costs and benefits (in the wider sense, including on the quantifiable and non quantifiable items, across all times of action and inaction. So it is basically looking at the trade-off between taking action, which may have some pros and cons and not taking action, which also may have some pros and cons. Which is the better course of action to take is the key public policy question.

These are not easy decisions, let us not simplify the matter. It is very easy to get it wrong. Thirty years ago, I was teaching shop stewards on chemical safety, advising them to get out of ammonia in the working place because it was toxic and to use freon instead, which was a CFC and not toxic. Freon was much less of a problem for them in terms of toxicity and explosion. It just so happened that freon went out of the workplace and eventually punched a hole in the ozone layer which was not good for the environment. But in those days, in 1974, when I was doing this lecture, I had no idea that freon would become something that could damage the ozone layer. So using the knowledge of the day, I was probably correct to tell these guys not to use ammonia but go for the safer substitute. Which also means we must take care with substitutes today. In general, the stock of knowledge on the substitutes, by definition is less and therefore we can easily make big mistakes by moving from this fairly well known hazard, into the not so well known hazard. So the precautionary principle applies equally to substitutes and alternatives as it does to the things you do not like in the first place. That is an important point to emphasise.

What the Precautionary Principle is NOT

I produced this slide for a meeting recently where the WHO and the Commission were falling out over what does this precautionary principle mean or not mean (slide 6). I read much of the critical literature and produced these 10 points about what the precautionary principle (PP) is **not** and if you get this established quite clearly, it does save days of arguments.

1. For example, it is **not** a prediction.
2. It is a **process** that may or may not lead to action, including bans or just more research or better labelling.
3. It is **not the same as prevention.** Prevention is when you know something and then you can prevent it. Precaution is when you do not know it. If you know it, you just use prevention. Precaution is where you think there could be a big problem and you want to take some steps. Banning smoking in1960 would have been precautionary and preventative. Banning smoking in the year 2003 is purely preventative. Those two words exist in the EU Treaty , are not defined and that is why it is easy to keep an example at the back of your head, like smoking, to illustrate to people the big difference between prevention and precaution.
4. PP is **not based on zero risk.** People are not naive but aim to achieve a lower /more acceptable risk /hazard, with lower, overall welfare costs to everybody concerned, quantifiable and non quantifiable.
5. PP is **not proof against misuse.** Any policy tool can be misused to cause a mess. So do not accept the argument 'I have seen precautionary used in Bangladesh and it made a big mistake etc...' Well it might have done. But that is not an argument against the precautionary principle as a tool. Like all tools, it can be misused.
6. It is **not the same as risk assessment.** You have already heard about some of the limitations of risk assessment. People are trying with good faith and in some ways with some success to improve, expand, make risk assessment more useful in order to deal with the complexities you have seen something of this morning, but the PP is not that. It is another broader, deeper approach to the whole business of complexity within which sits risk assessment, hopefully better risk assessment.
7. PP is **not oblivious of costs.** People often say "you don't care about the costs of applying the PP". But it's right at the heart of the beast. We are trying to reduce overall costs with this tool and therefore we are very concerned about costs, both direct and indirect, short term, long term and secondary costs as well. Secondary costs and benefits are things that you're not really aiming at. So for example, if you reduce fossil fuel consumption, that hits climate change, you happen to get a nice stream of secondary benefits from the health impacts that are now reduced because there is less fossil fuel combustion products around to breathe. When you do the

calculations and add in short and long term, it just so happens that the secondary benefits of reducing fossil fuels consumption in the health domain completely overshadow, at least in the first twenty years, the climate change gain from the reduced use of fossil fuels. So, there is this stream of secondary benefits and also secondary costs where sometimes you do something, you reduce an impact and there is a secondary line of cost you have not thought about which takes away some of the value of what you have done.

8. The PP is **not one sided.** It applies to substitutes and alternatives as I explained before.

9. PP is **not based on anxiety, emotion**, on public pressure. It is based on best of systems complex science. It is a recognition of some of the complexities that you heard earlier, a greater awareness of the complexity of our human biological system and ecological systems. And it is partly in response to complexity that the PP is being used, based on the best of systems science.

10. It is **not a guarantor of consistency** or predictability. This is something in which the Commission Communication is mistaken really. Each case is different. Whether you ban something in the case of X or just call for more research in the case of Y depends totally on the facts of each case. The general principle lies over the top of them as a guide to how you deal with the issue, but the outcome is case-specific, as in legal cases.

The case studies are all false negatives in the sense that society said 'asbestos is safe, PCBs are safe, medical radiation is safe' until we discovered it wasn't (slides 9, 10, 11). That's called a false negative and we got it badly wrong. Now, within science there are some methods used that routinely generate false negatives and they do that because it makes for good science. Unfortunately, it makes for lousy public policy if the subject matter of the science is people's exposure or planetary exposure.

The antibiotics example

This is the essence on how society could act and sometimes does act and we argue that the precautionary principle should act more often on an early warning. What is an early warning? Here's the first early warning about feeding antibiotics in tiny doses to all the animals that we consume (slide 13). For forty years or so there have been trace elements of antibiotics in the food chain because of an accidental discovery, when they found that trace elements of antibiotics make the animals grow fat more quickly. Unfortunately for us, we are consuming trace amounts of antibiotics as a result. Back in the early sixties people said 'won't that cause us to become resistant to antibiotics in future decades ?' And the answer according to the UK Medical Research Council in 1969 was 'Yes. Despite the gaps in our knowledge, we believe, on the basis of the evidence that we do have, that there is a sufficiently sound basis for action'. A very nice collection of words. Basically they were saying, with about 50% probability, that it is dangerous to go ahead. This was not proof beyond any reasonable doubt. This is not normal scientific proof, but it is, as it were, science in the domain of public policy making where the risk of getting it wrong is pretty huge and pretty irreversible. So you use a lower level of proof. We don't know the mechanism of action, they said, and we don't pretend we'll know it for many years but we still have sufficient knowledge to take action.

Unfortunately, the pharmaceutical industry is so powerful that they overrode this recommendation within a year or two and marketed antibiotics as growth promoters until 1999 when the EU banned most of them. By that time, the monopoly provider of this material, Pfizer, took the European Commission to the European Court and said there was insufficient scientific evidence to take this action. This is only two years ago. They lost the case and if you are interested in this whole issue, read the judgement on the antibiotic case because it goes into some details on how you apply the precautionary principle in situations of relatively unknown science but huge risks if you get it wrong.

Timing is critical

Time is critical (slide 29). You have heard the Paracelsus dictum. For 2000 years, toxicology has said 'the dose makes the poison'. As it was pointed out and as we said in our report on children to the ministerial conference in 1999 in London, **it is the timing of the dose that makes the poison** in many situations, certainly in endocrine areas. There is another dimension to time (slide 14). The top level curves are the production of CFCs and then we stopped producing CFCs because we knew it was punching a hole in the ozone layer. But linked to that is the secondary set

of curves. Those two curves are the hole in the ozone layer itself and the radiation coming through it, which, with the long latent period for skin cancer, gives you an increase of such cancers among our children and their children, coming on top of the already rising rate of skin cancer which is there for other reasons. We have definitely caused an excess of skin cancer in the future which is now unstoppable. We have stopped the production of CFCs but this comes too late to avoid harm. This illustrates that if we had decided to act upon the evidence when it was first produced in 1974, when people said in the literature (for which they got a Nobel prize) 'CFCs will punch a hole in the ozone layer', then we could have saved maybe 10-20 years of cancer. And we didn't, we waited until the actual hole was measured in 1985 in Antarctica and then we began to take steps in 1987. So time is critical, which is why you need to move on earlier levels of proof if there is a long latent period between exposure and harm.

Assess pros and cons

You see now 12 late lessons from the book in the abstract and they need to be applied. I focus on just two of them (slide 17): Assess, justify and account for all the pros and cons- that's wider than just costs and benefits. Distribution, secondary benefits, innovation, technology change- many things happen by way of the application of the PP that leads to a stimulus to innovation. Asbestos, CFCs, PCBs, antibiotics in animal feed were largely monopoly products meeting a human need in one particular way only, usually produced by one, or a few companies. And those essentially monopoly products at very low market prices dominated the market for decades and prevented alternatives from coming on to the market. The more you try to stimulate innovation and think of several ways of meeting human needs, rather than just one, then you minimise the chances that you'll be stuck with a big surprise, like a hole in the ozone layer, that you now can't escape from because the one thing that is doing it is a monopoly product. Promoting several technological solutions minimises the size of any future "surprise".

The proportionality principle says 'don't go overboard with this PP'. If you're trying to prevent a smallish hazard, and it's going to cost millions of pounds to prevent it, then it's out of proportion. There is a sense of proportion as a backstop to the misapplication of the PP, which is also important to think about. As part of the approach, look at the alternatives, which is what you're doing in the pesticides campaign.

Risk and uncertainty

Misplaced scientific certainty was one of the prime causes of the mistakes in all those 14 chapters (slide 19). Experts were so certain that all these things were safe, that they carried the rest of society with them. Having a healthy regard for complex systems and areas of uncertainty and ignorance is a good antidote. Have humility, as the Greeks said, as opposed to hubris, where you think you're a god and know everything: with humility you realise your shortcomings. A bit more humility and a bit less hubris among our scientists would help.

It's worth emphasising some simple definitional issues. "Risk"- we think we know the problem, and where just prevention is needed (slide 20). "Uncertainty"-we think we know the impact, but we have no idea of the probabilities. Antibiotics in animal food- still today we don't know the extent to which each of us might become resistant to these because of the low doses we're consuming. We don't know if it's 1in 100, or 10 in a million or 1in a million million. But we know the impact with sufficient knowledge, i.e. resistance, to recognise it as something we don't want.

You're in the area of "ignorance" when you have no idea what's coming up. If you think back to 1973 with CFCs, there was no knowledge of the ozone hole, neither theoretically nor practically, but it appeared the next year theoretically and practically ten years later. Similarly with asbestos mesothelioma cancer: we had no idea in 1958 but did in 1959-60. So ignorance is also an area to look at (slide 21). You can do something about it- e.g. use intrinsic parameters as with chemicals that are highly persistent or bioaccumulative. You know that if you let out millions of tons of something which persists for 100 years and bioaccumulates, the odds are that somewhere it will cause some harm to human bodies, the biosphere, etc. If you want to be on the right side of ignorance, don't let out millions of tons of persistent and or bioaccumulative chemicals.
Why does science produce false negatives? (slides 22, 23) In animal tests, high doses generally produces false positives, but most

of the other features on this slide tend to produce false negatives. Harm does happen in complex biological systems but science often misses it. Finally, you can choose which level of proof to use. The antibiotics committee chair chose 'sufficient basis for action'. It was probably using a concept somewhere in the middle of the range of possible levels of proof. like 'balance of probabilities'. That is what is currently used for climate change. In general, scientists say we are impacting climate with our level of economic activity at the level of 'balance of evidence' proof, not 'beyond all reasonable doubt'. We'll only have that level of proof many years into the future and by that time, if it's true, it's far too late to do anything to prevent it, or even reverse it in less than many decades.. With long timescales, with big, probably irreversible, effects then you have to use lower levels of proof. Society should choose the level of proof appropriate to the likely cost of being wrong, in both directions.

Appropriate frameworks

Who gets the burden of proof is critical (slide 25). The proposed REACH system for chemicals other than pesticides is all about shifting the burden of "proving" relative safety from one to the other, from public authorities to private enterprise.

Using an appropriate framework to evaluate scientific evidence is also critical (slides 36, 37, 38). Choosing an appropriate level of proof and looking at why this product, pesticide or technology is justified in the first place (slide 39) are also important questions. Is it trivial or really valuable? Assessing alternatives, looking at policy measures to deal with the issue, taking decisions that are crystal clear- we have used this level of proof on the basis of this estimation of the costs of taking action and not action and it looks like this.

Because science is not value-free, the old risk management paradigm of saying that clever scientists do the science, which they pass on to the clever policy makers who tell you, the public, what they've done to reduce risks , is now seriously out of fashion. How you frame a scientific question is a value-loaded issue. Right at the front of the risk management process comes the framing exercise which determines the questions to be addressed. What lines of research do we pursue? These are value choices and that's why stakeholders have to be involved at the beginning at the risk assessment stage, in the middle, at the risk management stage and at the end, at the risk communication stage. The whole process is circular and iterative as new knowledge and insights become available.

I hope that the presentation has helped you to better understand and apply the PP to pesticides.

David Gee, Coordinator, Emerging Issues and Scientific Liaison, European Environmental Agency, Denmark

DISCUSSION SESSION 1

Question 1:

H Muilerman: The science we are talking about this morning, is I think, very valid. But it is not used in the regulation process. They simply refuse to use this mixture toxicity in pesticide regulation. How can we get this science taken up by the regulators?

V Howard, Q1: I think there are going to be some presentations later today on ways in which it might be sidestepped, so that the regulators can go and decide whether they are going to licence that pesticide. But if the users decide a different strategy, and comparative assessment is one of those, based on a hazard assessment, then the users will be deciding and I think that is going to be a very interesting debate this afternoon. But I agree that they are very reluctant to embrace anything to do with mixtures because if they go away with the additive model they know that they have got to change everything, and they are not prepared to do that at the moment. But in the long run, the way forward is to follow these innovative ideas, that some of the users are beginning to force the pace.

D Gee, Q1: This is where the precautionary principle does come in. You are quite right in what you are saying, the general public knows a) they are exposed to mixtures and not one thing at a time - so you have won that argument with practically everybody; b) they also know that it is very complicated, and they also know about multi-causality. But because the regulators cannot cope with complexity, mixture effects and multi-causality they are left, as it were, relatively naked. Now they could go away and do fantastic amounts of fundamental science for 35 years and fill some of the gaps, but we don't want that anyway, because that would be too late, and it would cost a lot of taxpayers' money. So the precautionary principle comes along and 'says' because we know that you know that you don't take into account the real world of mixtures, complexity and multi-causality we are going to put the precautionary principle over the top as an approach to deal with some of these things. Then if, for example, this particular pesticide which you think is fundamentally safe - we know that the reality of its use is at the heart of the complexity of mixtures (and these three things) the precautionary principle would invite us to look at reducing it by 50%, and eliminating it by a later date. So in the short term the precautionary principle is very useful in this way.

Question 2:

J Harvey: David Gee, you talked a lot about antibiotics and the way in which the precautionary principle has worked in relation to them - there has been a ban on many growth promoters. But does the precautionary principle work in relation to pesticides?

D Gee, Q2: Well, the specific answer would need somebody closer to both the pesticide regulations and to law, and I am neither. But my understanding is: because it is in the treaty as a fundamental principle, the Commission and all European bodies have to use it in their work. I would have thought that it applies to the pesticide area as equally as it does for everything else. Of course, you have got a whole raft of other laws to deal with pesticides and people will obviously concentrate on those, and probably none of those specific laws have got the words precautionary principle in them. So you have got to invoke the treaty general clauses over the top. But I would have thought that is does apply in this generic sense to pesticides as with everything else.

Question 3:

French Ministry of Ecology: We have heard the question why we don't have a big lobby to the government to integrate this framework which we have heard this morning, this cocktail effect, in the evaluation of products? But my question is when you integrate something new in a legal evaluation move you need to have a clear framework to use, and it is not only research work. So is there some clear framework that we could integrate in regulation, in the industrial process that could be used or do we have only research information at this time?

Question 4:

A side question, in France we have some difficulties to evaluate pesticides, and to interpolate and to compare year to year. So if some other countries or the European Commission have methodologies to compare the trend of pesticides concentrations over time, I would be interested to be in contact with them.

V Howard, Q3: Well, I don't want to pre-empt what Kevin Barker of the Co-op will say this afternoon, but there is a framework that the

Co-op is working on, which I think would be politically unacceptable. But it is an algorithm you drop a compound into, and it goes down and trips hazard triggers, including acute toxicity, mutagenicity, carcinogenicity, most of which they have classifications for. It is written out into a red list, or a green list and then you negotiate with the users and you say, well do you really need that? So it comes back onto an amber list with the intension to get rid of it by substitution. So that is not a risk assessment but a hazard assessment. But it would have an immediate effect in reducing overall hazard, and the complexity of mixtures. But you try and argue that with industry. They want you to prove beyond all reasonable doubt that substance X is causing condition Y in the secure knowledge nobody knows how to go about looking into them. So I think we have to move away from these one-at-a-time things. There is a framework, but whether it can be pushed through politically, I don't know.

French Ministry of Ecology: You are right to underline that there is also a space with the advancement of science and the regulatory process. My experience is that it is clear that the system of regulation doesn't take into account enough new developments in science. We have several problems with that. In France the only GMO expert who is paid by the government to evaluate is designed in the last instance by the industry. This is a real problem. We need contradictory expertise in order to convince the Commission.

D Gee, Q4 (response to the second question): About pesticides in water, I know nothing about that, but there are people who do. There is a great guy who worked for us for some time on this who is now in France and I'll put you in touch with him.

V Howard, Q4: What we do know about pesticides in water is that the consumer is paying enormous amounts of money to have their water purified by the water companies. That is an externality that should really go onto the users. It is one of those examples where it is at the profit of the user at our expense and that is where the use of a pesticide tax which would pay specifically for purification of drinking water might be something which makes a change. So that is one example where we really know that we the consumers are paying for other peoples' benefit.

Question 5:

S Scheuer: A question about chemicals policy, the question of risk assessment versus hazard, and the application of the precautionary principle. In this panel there was a sense that hazard assessments are a very important thing and that risk assessments are in a way not working. This is especially at the political level within different stakeholders, we all know industry is very big and powerful. This is used to polarise events to push against the side of those who want to regulate everything by hazard, rather than a risk based approach. I somehow think this debate does bring us forward. Therefore I would always try to see that we have a role for risk assessment, of course, it is a very important tool. But one has to recognise its limits and we have to be very specific about what we mean about a hazard assessment. I think what David Gee was saying in bringing forward, or having some practical tools for the precautionary principle, is having criteria like we would have with persistency, bioaccumulation. This is very specific that this is not replacing a risk assessment, this is just the trigger for action in the sense of the precautionary principle.

Question 6:

C Smith: US scientists have estimated that a single species evaluation of toxic interactions for 25 chemicals would take 33 millions experiments and cost $3 trillion. I am wondering in the spirit of this conference, whereas the individual level timings regarding endocrine disruption suggest that "the dose makes the poison" is no longer the right way to look at it. It would seem more true that even from the environmental perspective that the test makes the poison because even lower levels can have cause effects and global dosage and once again there are opportunities for small exposures which argues even more forcefully the need for the reduction.

Question 7:

P Kristensen: I would like to ask about the study of Roundup/glyphosate. Have you discussed your findings with the major producer of glyphosate?

GE Seralini, Q7: Only in part because first these results are original results in part and they will be published soon and then we will discuss of course. But we have discussed

them with the producer of glyphosate under the relation of GMOs. We know that 75% of GMOs in the world use glyphosate. So we have discussed them although they are standard regulatory tests that should be done to evaluate GMOs and today it is not only the method. For instance, that we have to give GMOs to rats in order to assess the effects of GMOs on health for pesticides and this is not done yet. So we are far away from using good sound science to evaluate actual products.

Question 8:

E Jones: Speaking as one of the big powerful members from industry that represents the crop protection industry ! One question to Mr Howard: I think you conclude that at the end of the day that organics is the way ahead but surely there must be a question about additive effects of compounds in organic food as well? And the precautionary principle. We have talked about the 100 fold factor used pesticides. Surely that is our precautionary principle (a question to David Gee)

Question 9:

C Wattiez: As everyone knows, epidemiology has many limitations, particularly how to interpret the results of exposure to many different chemicals as well as other factors including genetic susceptibility. Some epidemiologists consider that claiming causality is a step too far. However, it is a question here, shouldn't we consider that several epidemiological studies favour a convergent link between, for example, pesticides exposure and various specific diseases including cancer in children. A causal link can already be established and that we already see harm.

V Howard, Q5,8: Answering my colleague from the Crop Protection Association. I am not naïve enough to think that we won't need pesticides. What I was trying to say is I want to see movement in the direction of organic standards so we are reducing hazards, we are reducing inputs. I would like to see that. But in doing that we should using this hazard minimisation procedure, and we can discuss that later. Now there was a question about risk assessment. I think risk assessment a) should be made much more translucent and easier to understand. There should be a proforma statement under each of them saying which hazards have been identified and tested for. Which ones have been identified and not tested for, and which model assumptions have been made. Because, I don't know whether David agrees with this, he is one of the decision-makers who is marvellously well educated. But my experience is that many decision-makers on that side of the business are not, many people if they are given a risk assessment-these are very complicated concepts and acronyms. Sometimes you get the impression that the difficulty in distinguishing between what is real and what is part science and part model, and they are purposefully made so that you can't decide. We need to make sure that is done.

Elmegaard, Q5: I would like to comment on the concept that pesticide minimisation can handle all the problems that we have been presented with here today. And talking about biodiversity in arable land. No, it couldn't handle all the problems seen here. I would just like to mention two things. One of them is biodiversity of the land. Sometimes pesticides just have been the most important principle impact, so the pesticide registration could control such effects. The other things is that, for example, to talk about the species I mentioned, the skylark. If you change the agriculture to organic farming it wouldn't necessarily improve the habitat for skylarks in all situations because some cropping methods would be substituted that might not allow bird nests in the fields. So that would might not help. You have to look at those things as well and that might be part of the pesticide regulations.

D Gee, Q5,8,9: From the three questions, it is often said that when you do risk assessment, then add a figure safety factor of 100, that's the precautionary principle. Well it is not of course, but it will probably be precautionary, if it is a dose response thing or a sort of low dose-less effects. It will help, therefore one doesn't argue against these factors. But a safety factor applies generally to risks that we think we know something about, and then we know to add a safety factor to it. If we don't know very much at all, then we are really stuck. If you run the tide backwards and think of applying the safety factor to the toxic properties of CFCs, back in the 1960s, it wouldn't have helped us very much with the ozone situation. And similarly, if we had applied a safety factor to the known acute effects of DDT, it wouldn't have helped us with the endocrine effect which was down at the nanogram level of dose. So the complexity of the unknown and the indirect effects our colleague was talking about can't be touched

by the safety factor except in a very crude way. You need to go beyond safety factors to a broader appreciation.

The second point about long term monitoring of exposure (Q6). That is critical. There is not enough of it done. It is very difficult to do some long term monitoring because it is long term, and societies are delightfully short term. But we are joining up with a European network of long term monitoring 'freaks' and we want to promote that very issue. Also linking that long term monitoring to getting a better grip on the data and exposure is fundamental.

And the last question about epidemiology (Q9), you are quite right the epidemiologist of the better sort say "we never can prove causality". But here is a sufficient body of evidence that should be enough. Then you are back to what level of proof do you want to choose? And very often, five or six good studies are sufficient on a balance of evidence level of proof to justify taking action. If the costs of inaction look pretty horrendous, and the cost of action seem pretty good in relation, then that should be sufficient evidence, without waiting for mechanisms of action, which is often what is called for. The epidemiology rarely uncovers mechanisms of action but if you look back through history, the great step with cholera where we saw an association, and decided to take steps. And 50 years later other areas of science uncover the mechanism of action, but we didn't wait for that. That should be the way forward I think.

THE TREATMENT FREQUENCY INDEX - AN INDICATOR FOR PESTICIDE USE AND DEPENDENCY AS WELL AS OVERALL LOAD ON THE ENVIRONMENT

LENE GRAVESEN

Pesticide Risk Indicators

Pesticide risk indicators are by nature simple tools, which aim at comparing changes in risk over time. Some indicators are developed to compare changes in risk to specific organisms, groups of organisms, a certain compartment or the environment as a whole. In some cases, the pesticide risk indicators are used as policy tools, which aims at measuring the effectiveness of risk reduction programmes on a national scale. In other cases, the purpose is to compare the characteristics and effects of different pest control programs and methods on farm level. Because the purpose of risk indicators may vary no single indicator is likely to fulfil all purposes.

The structure and content of pesticide risk indicators vary greatly, but basically they are either based on scoring relevant variables or on an exposure/toxicity ratio. It should be noted that indicators including many variables might turn out to be driven by very few variables like toxicity and sales and that indicator values may vary several orders of magnitude depending on choice of input data.

The ecological effects of pesticides are varied, inter-related and often act in concert with other stressors such as other contaminants and pathogens. Because of trophic interactions effects of pesticides usually extend beyond populations to ecosystems, e.g. reduction of insect populations may indirectly affect bird populations by reducing food availability and deterioration of habitats. Given the complexity of natural systems and the diverse action of pesticides the limitations of indicators should be recognised. Indicators provide indication of risk trends and not absolute measures of actual risks.

The Treatment Frequency Index

The indicator Treatment Frequency was developed in the mid-eighties because it was realised that the increasing use of low dose products was not reflected in the Danish statistics on sold amount of active ingredients. Thus a drop in sales of active ingredient can easily take place at the same time as the number of applications - and pesticide load on the environment - increases.

Definition and calculation

The Treatment Frequency is the calculated average number of pesticide applications in agriculture per year, provided a fixed standard dose is used.

The indicator considers the quantities of each active ingredient sold, the standard dose of each active ingredient in each main crop/crop type in rotation, and the area of arable land in Denmark:

$$TF = \sum_{all\ active\ ingredient} \frac{\left(\frac{SA_{active\ ingredient}}{SD_{croptype}} \right)}{AGRA_{year}}$$

where, SA denotes Sold Amount of individual active ingredients per year SD denotes a defined Standard Dose for each individual active ingredient in each crop/crop type AGRA is the area of arable land in Denmark, and The crop types include: winter and spring cereals, winter and spring rape, seeds, potatoes, peas, maize, vegetables, grass and clover

To calculate the Treatment Frequency, sales of pesticides and acreage with crop types are obviously needed. A standard dose needs to be fixed for all active ingredients in all crop types in which the active ingredients can be used. The fixed standard doses are based on efficacy trials and do thus express the doses necessary to control pests to a certain degree. In addition, knowledge on how pesticides are used are needed to allocate sales data to crop types.

The overall treatment frequency for the whole area in rotation, can be broken down to treatment frequency for groups of pesticides in crop types e.g. treatment frequency for herbicides in winter cereal or treatment frequency for fungicides in potatoes.

A simplified version of the Treatment Frequency ("Treatment Frequency light"), based on the standard dose in the crop type that dominates the use of a given pesticide, is included in an OECD project on Terrestrial Indicators. Preliminary results suggest that the light version show the same trends as the Treatment Frequency.

Treatment Frequency and environmental impact

The Treatment Frequency is regarded as an indicator for the spraying intensity as well as an overall indicator of the environmental impact of

pesticides. Because Treatment Frequency is based on a standard dose that relates to the biologically active field dose it is assumed to reflect the direct effect on target organisms as well as the indirect impact on ecosystems, which results from changes in the quantities and species found in the food chain. Projects under the Danish Pesticide Programme show a relation between pesticide use and bio-diversity.

In a large-scale project, related to the Danish Pesticide Action Plan I, the response of flora and fauna in arable field to reduced dosages of herbicides and fungicides was investigated. After pilot studies the investigations were carried out at five large farms in 1997-1999. The rotation of crops were spring barley, winter wheat and sugar beet. Plots of at least 6 hectare were placed in each crop. The dosage levels were: normal (by definition the farmer's choice of chemicals and dosage); half; and quarter. The reduced dosages lead to higher plant densities, at a quarter dose the densities were significantly higher than at normal dose. Beside this, more plant species were found at the reduced dosages and the proportion of flowering species increased with decreasing dosage. Samplings of insects showed in general higher abundance at reduced dosage. As for plants, this was very clear at a quarter dosage in barley. An over-all analysis of insects in the three different crops strongly supported a general improvement at quarter dosage. Counts of birds revealed that Skylark, Whitethroats and "small seed-eaters" all occurred in significantly higher numbers in response to reduced dosages, especially at a quarter dosage. The effect of half dosage was less clear but the estimates indicate that half of the improvement through quarter dosage is also obtained by half dosage. Investigations of yield and economy revealed limited losses. The economical calculations indicate that on short term, yield reductions are generally counterbalanced by reduced pesticide costs. The effect not properly covered is the risk of accumulated problems with weeds in case of continuing use of reduced dosages. In conclusion both quarter and half dosages will improve the "nature element" of fields. However, the gain at quarter dosage is much more marked. *(Esbjerg, Peter; Petersen, Bo Svenning; Jensen, Anne-Mette M. Johnsen, Ib; Navntoft, Søren; C. Rasmussen; S. Rasmussen. Effects of reduced pesticide use on flora and fauna in agricultural fields Pesticides Research no. 58, 2002).*

Modeling of the population trends in bird population of Danish farmland showed that pesticides affected population size in 3 of 20 species included in the model. Herbicide use has probably affected the populations of Woodpigeon and House Sparrows negatively, while insecticides use has reduced population size in House Sparrow and Yellowhammer. In all species, it was the pesticide use of the previous season, which seemed to affect the population size, indicating that it is the breading success, which is impaired. *(Svenning, B, Jacobsen, E.M. Population Trends in Danish Farmland Birds, Pesticides Research no. 34, 1997)*

Treatment Frequency as a policy tool

A major goal of all Danish Pesticide Action Plans, since the first plan was launched in 1986, has been to reduce the consumption of pesticides, in order to protect people against the health hazards and harmful effects that result from the use of pesticides, and to protect aquatic and terrestrial flora and fauna, groundwater etc. All the plans, including the new Pesticide Plan 2004-2009, have included a specific goal for reduction of the Treatment Frequency. The Treatment Frequency has thus been the key indicator of all the Danish Pesticide Action Plans.

Apart from being an indicator for the overall pesticide load on the environment, the Treatment Frequency is an indicator for the spraying intensity. The Treatment Frequency does also reflect dependency of pesticides, as use of preventive measures, like e.g. crop rotation and resistant varieties, that lead to reduction in pesticide use will appear in the Treatment Frequency.

A committee including all relevant stakeholders (the Bichel committee) investigating the consequences of phasing out pesticides has assessed how different levels of Treatment Frequencies affects agriculture, economy and environment. The committee concluded unanimously in 1999, that applying available knowledge and technology could reduce the Treatment Frequency to 1.4 - 1.7 over a 5-10 year period without significant costs to farmers and the society. A recent update of the calculation confirms that it is possible to reduce the Treatment Frequency without significant costs. Based on the Bichel committee's estimations of reduction potential for herbicides, fungicides, insecticides and growth-regulators in all main crops, Target Treatment Frequencies are established for all main crops, which sum up to the reduction goal on national level, cf. the table below, where Target Treatment

Crop	Area 1999 1000 ha	Target Treatment Frequency				
		Herbicides	Others	Total	% of arable land	% of total TF
Winter wheat	611	1,20	1,10	2,30	27	36
Spring Barley	551	0,70	0,70	1,40	24	20
Winter barley	151	1,00	0,55	1,55	7	6
Potatoes	23	1,00	8,60	9,60	1	5
Sugar beets	63	2,40	0,65	3,05	3	5
Peas	66	1,80	0,70	2,50	3	4
Oilseed rape	105	0,80	0,75	1,55	5	4
Sum	1575				69	80
Others	663				31	20

Frequencies for herbicides are shown.

The Treatment Frequency does thus make it possible to establish tangible risk reduction goals at national level, which can be understood and implemented at farm level.

Monitoring pesticide properties

Changes in inherent properties like toxicity to fish, birds, mammals etc. of pesticides sold in a given period can be monitored by the Load Index. Where the Treatment Frequency is the calculated number of toxic doses in the sold amount of pesticides, with respect to the target organism and related species, the Load Index is the calculated number of toxic doses with respect to a specific organism, like fish, daphnia, birds etc. The Load Index has in Denmark been used to track changes in pesticide load on a given organism due to changes in sales and/or toxicity.

The indicator is calculated separately for mammals, birds, earthworms, bees, fish, crustaceans and algae, etc. The Load Indices provide a relative measure of environmental load concerning specific type of toxicity. In line with most indicators, Load Indices are not a measure of actual effects on populations or ecosystems in the field but calculate a relative risk that can be compared between years. In the 1997 evaluation of the first Pesticide Action Plan the following was concluded with respect to the Load Indices:

Load indices, in which consumption is weighted according to the toxicity of products, show a clear fall with respect to acute and chronic toxicity for mammals. The load indices for acute toxicity for birds and crustaceans have also dropped, whereas the values for fish remain unchanged.

Concluding remarks

- The Treatment Frequency offers a transparent and easy understandable way to monitor pesticide risk and use trends in agriculture.
- A relation between Treatment Frequency biodiversity in the agro-ecosystem has been demonstrated.
- The Treatment Frequency makes is feasible to establish tangible risk and use reduction goals at national level, which can be understood and implemented at farm level.
- Because the purpose of risk indicators vary, no single indicator is likely to fulfil all purposes.
- If needed, changes in inherent properties like toxicity to fish, birds, mammals etc. of pesticides sold in a given period can be monitored by other indicators like e.g. the Load Index.
- Given the complexity of natural systems and the diverse action of pesticides the limitations of indicators should be recognised. Indicators provide indication of risk trends and not absolute measures of actual risks.

Lene Gravesen, Danish Environmental Protection Agency

AVAILABILITY AND ADEQUACY OF PESTICIDES DATA AT EU LEVEL

KOEN DUCHATEAU

I will speak about availability and adequacy of pesticides data at EU level. Within Eurostat, this is the responsibility of the Environment and Sustainable Development unit. Although there has been a reform of Eurostat, I worked before and continue to work on agro-environmental indicators, organic farming, indicators for sustainable agriculture and on agricultural pesticides. In addition, a seconded national expert will focus on pesticides statistics from February 2004 onwards.

Why is there a need for Pesticides Statistics ? (slides 1 and 2)

Because we have to address the increasing demand for detailed data on pesticides and we want to build up a regular, harmonised data collection on pesticides use as a basis to calculate pesticides indicators and pesticides risk indicators. I mentioned use, but it is not only limited to use as you will see later. The main drivers of Eurostat's work are: the 6th Environmental Action Programme 2001-2010 and its "Strategy for the sustainable use of pesticides" on which my colleague from DG Environment will give you a presentation; the "Cardiff" process which deals with the integration of environmental concerns into sectorial policies, here in agriculture (the IRENA project); and the EU Strategy for sustainable development.

Current pesticides statistics

We collaborate with Member States (MS), other Commission DGs and the European Environment Agency. The pesticides data sources available at Eurostat are: annual sales data from MS, annual production data from MS based on the "Prodcom Regulation", use data from a few MS, use data from some MS via the TAPAS programme and use data from the manufacturers, via ECPA (slide 4).

First, I want to speak about sales data from MS (slide 5). These are inexpensive, often based on company returns and therefore should be accurate and easy to produce. The main problem we had was the lack of harmonisation of the classification. Only totals of herbicides, fungicides, insecticides and others are reported and MS attach a lot of footnotes when submitting the data. Eurostat drew up a draft template to achieve harmonised and more detailed reporting, not only limited to herbicides, fungicides and insecticides but also to groups of active ingredients. The data can be found on Eurostat's NewCronos data base. All MS have sent data up to 1999. Some MS have also provided their data for 2000 and 2001. If you look on the websites of OECD and FAO, you will find pesticides sales data, but they are not the same as ours. Agreement has been reached that harmonisation of the questionnaires is needed at the international level. Nevertheless, sales data are not sufficient for monitoring risks.

Secondly, we have also production data from MS (slide 6). This is a reporting scheme based on a Council Regulation. It follows the NACE classification. (24.20 deals with the manufacturing of pesticides and other agrochemical products). The analysis of the data coverage in this area is ongoing, but the data are confidential and can only be accessed by officials from Eurostat. The main problem with these data - PRODCOM database - is that production includes also non-agricultural uses. These data also have to be combined with the export and import data.

Thirdly, some MS carry out use surveys (slide 7). Three MS (SE, NL, UK) carry out statistical surveys at regular intervals. Since synergies need to be exploited, a Eurostat Task Force in 1998 produced guidelines for the collection of pesticide use statistics within agriculture and horticulture (slide 8) but these should be updated because some other MS have carried out since then other surveys and the recommendations for these surveys have to be included.

TAPAS pilot surveys in MS (slide 9). We have also co-financed TAPAS pilot surveys in MS. These are Technical Action Plans to improve Agricultural Statistics and are financed by DG Agriculture. The pilot surveys provide detailed information at crop level, at active ingredient level, on application rate. There is a clear need to extend data collection through regular use surveys in MS with national funding and to improve data quality, to speed up the transmission and to identify national data sources. Statistics Denmark has carried out in 1999, 2001 and 2003 a TAPAS survey on the use of pesticides in agriculture. A draft analytical report of 22 TAPAS projects has recently been sent out for consultation to the MS, via the delegates of the

statistical institutes that attended the October 2003 workshop meeting at Eurostat. Some recommendations from the draft report show some similarities with the recommendations of the PAN network in "pesticide use reporting options possibilities for Europe", especially regarding pesticide use reporting by farmers, pesticide products data base and there should be a kind of working group or steering group set up to improve the availability of these use data within the Community. In the near future a PHARE project on pesticide use surveys in the Acceding Countries will be carried out.

ECPA use data (slides 10 and 11)

Other data are coming from the European Crop Protection Association. Recently a time series from 1992 up to 1999 was published covering aggregated data for EU-15 as well as detailed data by MS, by crop, by active ingredients and by chemical class. This is in fact the only harmonised pesticide use data source for the EU. There is considerable investment from the ECPA members in this work. Since the data are partly confidential, we publish aggregated data, especially where the pesticides are produced by 1 or 2 companies only. These data are also available from Eurostat-Newcronos database, in an aggregated form. Of course, we compared the ECPA data with national surveys carried out by SE, NL, UK: for some crops we found similar data, but in other cases significant differences. Partly this can be explained by differences in methodology. Some country relevant crops and active ingredients are not or only partly covered by the ECPA data. So, we asked for a more detailed documentation of ECPA methodology. We are thinking of getting a new time series to be published in 2005 and to cover EU-25. It should cover the period 2000-2003 and will include a very detailed methodology on how ECPA extrapolates the data. In addition, comparison with national surveys and agreement of relevant experts will be aimed at before the publication of the next version on the use of plant protection products in the EU.

Agricultural practice related to pesticides

I am also working on agri-environmental indicators (slide 12) and on the link of agriculture with the environment. Agricultural practices related to pesticides play a major role in the extent of the impact on the environment, especially the timing of application. TAPAS actions and national surveys on agricultural practices were carried out that include questions on pesticides: products used, time of application, the reason for application (are they helped by some extension workers; what do they use to spray pesticides; are they protecting themselves when they deal with pesticides mixes; what do they do with leftover packaging waste; how do they store; how do they dispose of unused products). These data were not really available yet. A Commission project, PAIS (proposal on agri-environmental indicators) and a part is focused on agricultural practice related to pesticides: we try to collect data on type of equipment, inspection of sprayers - compulsory or optional - , integrated crop protection, packaging waste and unused pesticides disposal.

IRENA operation (slide 13)

The IRENA operation that I mentioned stands for Indicator Reporting on the integration of ENvironmental concerns into Agricultural policy. It is managed by the EEA, with input from DG Environment, DG Agriculture, DG Joint Research Centre and DG Eurostat with regular consultation of MS. A Commission list of 35 agri-environmental indicators has been elaborated and the report to the Council is due end of 2004.

Some indicators are related to pesticides, like #9 - consumption of pesticides, sales, use, aquatic and terrestrial risk, if possible also the treatment frequency index; #20 - pesticides soil contamination and #30 - pesticides in water.

Waste statistics

I included something on waste statistics, because the Commission has a new waste statistics regulation where agricultural waste is included (pesticide packaging waste and unused pesticide disposal). Some studies to collect data on waste, including from agriculture, will be carried out in Member States (slide 14).

Future Thematic Strategy

The draft Thematic Strategy contains a chapter on improved systems for the collection of information on distribution, use, enhanced monitoring on compliance, including annual reporting (slides 15 and 16). It targets great-

ly enhanced data collection schemes on production, import/export, distribution and use of pesticides; improvement of existing monitoring systems, since these are all essential for developing relevant indicators and policy support. Member States will be asked to collect data from industry and distributors on a compulsory basis and from professional users on a voluntary basis.

An annual data collection is foreseen. The methodology for data collection has yet to be decided but it could be a representative survey or systematic collection, for example with farmers, as is currently done in some Member States. We want to centralise these data at Eurostat with publication regular reports. The aim is to arrive at a kind of codex of improved agricultural practices, related to pesticides. There is a necessity to improve control and monitoring schemes for pesticide use. In the future, we have to calculate risk indicators. A steering committee can actively develop the topics discussed here.

Koen Duchateau, European Commission, DG Eurostat, Luxemburg

PESTICIDE USE REPORTING - AN ESSENTIAL TOOL FOR RESEARCH, REGULATORY AGENCIES, AND COMMUNITIES

LARS NEUMEISTER

Introduction

The common way to track data on pesticide use in the EU and most other countries is the collection of sales data. These data are insufficient to help protect human health and the environment. They are not up to date and not specific to crop, active ingredients or the location of use. In a few EU Member States the gathering of data has improved as farmers are required to keep application records, regular surveys are conducted and/or more specific sales data are available. A pesticide use reporting (PUR) system in which a pesticide applicator is legally required to submit pesticide use data on a regular basis to a governmental authority only exists in the EU accession countries Slovakia and the Czech Republic. All commercial pesticide users are required to keep spray records, and data are collected from farms larger 10 ha. The United Kingdom (UK) is the only western country, which maintains some type of PUR system. The UK PUR system is limited to aerial applications, which are carried out over a limited area.

In several US States more extensive pesticide use reporting systems have been established. An analysis showed that four different PUR reporting systems exist:

- all commercial applications (full reporting);
- applications of specific pesticides (restricted use pesticides, known groundwater contaminants);
- applications conducted by certain applicators (customs applicators, pest control companies);
- specific types of applications (aerial applications, soil application).

These four types are not necessarily applied individually. In Arizona a number of types of application must be reported: all agricultural contract applicators hired to apply pesticides; all uses of pesticides under Section 18 of the US Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); agricultural soil applications of pesticide listed on the Arizona Groundwater Protection List; and all agricultural aerial applications. In California all commercial pesticide applications have to be reported; this includes non-agricultural uses (full reporting). Another full reporting system started in January 2002 in Oregon. Data transfer and processing in Oregon operates entirely electronically, which is unique among the PUR systems. In New York State, all commercial applicators (pest control companies and custom applicators) are required to report their agricultural and non-agricultural applications.

The California PUR system

After many years of limited reporting, the California full reporting system was established 13 years ago. Since 1990 almost all commercial applications are reported to the County Agricultural Commission (CAC) and to the Department of Pesticide Regulation (DPR), which is a division of the California Environmental Protection Agency (CA EPA).

Extent of reporting

The California Code of Regulations lays down which persons must report their pesticide use and extent of use. The pesticide user must report:

- date of application;
- name of the operator of the property treated;
- location of property treated;
- crop commodity, or site treated;
- total acreage or units treated at the site;
- name of pesticide, including the US Environmental Protection Agency (US EPA) or State registration number, and
- amount used. In addition, agricultural users have to report:
- location of the property treated, by county, section, township, range, base and meridian;
- hour the treatment was completed;
- the operator identification number issued to the operator of the property treated;
- the site identification number issued to the operator of the property treated;
- total acreage (planted) or units at the site;
- name or identity of the person(s) who made and supervised the application, if the pesticide application was made by an agricultural pest control business.

Since 1 January 2002, contractors who apply pesticides at schools must include on their reporting records: the time the application was completed; the name and address of the school site; and the application location at the school site.

Data transfer and processing

The DPR developed four standardized forms for pesticide use reports, for agricultural use, for non-agricultural use, or pesticide use in schools, and for useof restricted materials.

Data can also be submitted electronically.

The pesticide applicators usually submit the forms or the electronic data to the agricultural commissioner of the county in which the application was conducted.

Hard copy reports are entered manually by the CAC into the database. Entered data are validated in a two-step process whereby the entries are checked for completeness and then corroborated against the county pesticide regulatory database. Errors are corrected in cooperation with the reporting person.

Periodically, counties submit their databases for uploading into the central database to DPR's Pest Management and Licensing Branch.

After loading the data received from the CACs into the central DPR database, some 50 different validity checks are conducted.

Erroneous records go back to the counties for resolution, approved records go into the main database. With the so called Outlier Program, DPR developed a statistical method to detect probable errors for the amounts used and the acres treated. The Product Label Database is the key database to calculate the amounts of active ingredients used. The Product Label Database contains detailed product information on the physical and chemical properties and allows this calculation using the unique US EPA or California product registration number and amount of products reported.

DPR sells the pesticide use report data for a small charge in printed or electronic form. Usage information is also available on DPR's website.

The electronic form of the pesticide use database on CD-ROM contains a comprehensive manual and several other databases which contain information including codes for crops, chemicals and counties.

Utilization of pesticide usage data

California's pesticide use data have been used for a wide range of purposes. The Department of Pesticide Regulation publishes annual summary reports, which include trends in use by particular category, acreage, crop, active ingredient and toxicity.

The last published report contained the 2001 summary data and can be downloaded at DPR's website.

A common use of pesticide use data is the presentation of trends and statistics.

Full reporting in California allows the observation of trends from a large number of different angles. These range from trends of statewide total use, to the use of a specific pesticide on a specific crop, to the pesticide use of an individual farmer in a certain season on a specific crop. The western United States are geographically covered by a grid system with one square mile as the smallest unit: farmers report the location of their application using this grid system. This makes it possible to analyse agricultural use data per square mile .

Queries in the PUR database can be combined with toxicological and/or chemical information. Figure 1 shows the increasing trend of the use of pesticides active ingredients which are probable or known carcinogens.

Utilization of pesticide use data goes further than just looking at trends, reported data are used for a great variety of purposes.

Groundwater protection

In cases of groundwater and/or well water contamination with pesticides, the contamination with pesticides, the pesticide use data can help determine the source of contamination8. Researchers use the data to determine the correlation between certain soil types, type and amounts of pesticide used, and the contamination. At DPR, researchers developed an empirical approach to determine vulnerable areas. Areas with detections of pesticides in groundwater were analysed, and common properties such as soil type and ground water level were identified. The purpose of this approach was to find other areas with similar conditions that may be prone to ground water pollution, which would enable DPR to conduct more efficient monitoring, and prevent ground water contamination before it happens.

Air quality

The California Air Resources Board (ARB) uses PUR data to track reactive organic gas (ROG) emissions associated with pesticide applications. Pesticides were divided into four use

categories, and use data for each of these categories are allocated by county, air district, air basin, and US EPA ozone non attainment area. DPR calculates the ROG emission from the PUR data set and provides that information to Air Resources Board. The Board also makes use of PUR data in designing air monitoring studies, which assess public exposure to airborne emissions of individual pesticides. The Board, in cooperation with DPR, uses GIS to create maps that help researchers identify areas to focus their studies.

Risk assessment

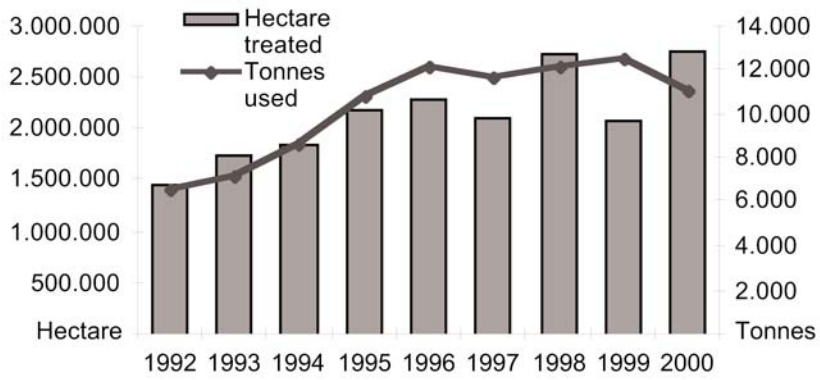
The Medical Toxicology Branch of DPR uses PUR data in dietary exposure analyses. This research incorporated the percentage of the commodities treated with specific pesticides in existing point estimates and probabilistic distribution programmes. Instead of assuming that 100% of a planted crop area is treated, the actual percentage treated is used. The results showed that under consideration of the actual reported percentage, the margins of exposure differ considerably from the margins of exposure formulated under the assumption of a 100% treatment.

Epidemiological studies

Several epidemiological studies were conducted utilizing PUR data. The data allow the creation of maps which present the location of pesticide use with specific toxicological properties and overlay this use with census data and the location of vulnerable population. This method was applied by the California Department of Health Services, Environmental Health Investigation Branch. The researchers conducted a study on the potential exposure of children to pesticides. The results showed that 382,000 children live in areas with high use of developmental or reproductive toxicants, that 135,000 children live in areas with high use of probable and possible carcinogens, and that 417,000 live in areas with high use of genotoxic compounds. Researchers at the University of North Carolina have used PUR data to conduct a case-control study to evaluate the association between foetal deaths and pesticides by overlaying maternal addresses and pesticide applications during pregnancy.

Comprehensive information on the circumstances of the pregnancy, the cause of death due to congenital anomalies, and the proximity to pesticide applications were gathered. 73 cases in ten counties were identified and 611 control cases in the same counties were randomly selected. All applications after conception within the exposure definitions were extracted from the PUR data and the pesticides categorised according to their chemical class or their potential to disrupt the endocrine system.

Figure 1: Use of probable and/or known carcinogens in California 1992-2000



Pesticides listed as B2 = probable carcinogenic by US EPA, and/or as 'known to cause cancer' in State Proposition 65 (Source: DPR 2002)

The results of the statistical analysis showed that, compared to a control group, foetal deaths increased in the third to eighth weeks of pregnancy in women who were exposed to the endocrine disrupting pesticides.

Public right to know

The first thorough analysis of the California PUR data was conducted by the Pesticide Action Network North America (PANNA), in a report titled ' Rising Toxic Tide '. The report showed that pesticide use in California between 1990 and 1995 increased in amount as well as in toxicity. The report was followed with ' Hooked on Poison ' which evaluates trends in use through 1998. PANNA has now developed an interactive website to query the PUR database individually by crop, chemical and geographic area (www.pesticideinfo.org

Other uses of PUR data

DPR and grower communities evaluate pest management practices using PUR data. They mostly look at specific pesticides and crops and measure the success of reduction programme or regulatory measures. DPR also maintains an endangered species project, which overlays pesticide use with habitats of

endangered species. An on-line database helps pesticide applicators to locate areas in the grid system which are limited to certain uses.

Implementation of an European PUR system

The previous examples show that pesticide use data are an essential tool for the evaluation of trends in pesticide use and the protection of human health and the environment.

The European Commission (EC) acknowledges in its proposal for the Sixth Environmental Action Programme that pesticides require particular attention because, *" They can effect human health via contamination of groundwaters, soils, food and even the air. Gaps in the current data on the issue make it difficult to be precise about the scale and trends of the problem but there is sufficient evidence to suggest it is serious and growing."* The EC proposal advises the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions a "Community Thematic Strategy on the sustainable use of pesticides. Elements of this are likely to include: *" (...) better control of the use and distribution of pesticides"* . Similar recommendations were already made in the year 1993 in the 5th Environmental Action Programme, but the data situation has not been improved. The establishment of a PUR systems in Europe could solve this problem.

Since actions, measurements and programme which may derive from a PUR system have to be addressed by the MS, PUR systems have to be implemented and maintained by the individual MS. Each Member States also needs to consider the extent and the data entry format of its own PUR system appropriate to the individual situation.

The protection of human health and the environment and the feasibility are the two factors determining a PUR system. Both have to be considered and weighed by the European Commission and the MS. However, to ensure a high level of uniformity and equality within the EU certain conditions must be accomplished on European level.

First conditions to accomplish

In order to establish a PUR system several conditions have to be established.

Legal Framework

A legal instrument which regulates who must report what information is the first step to be realised. This could be a Council Regulation, a Directive or part of a Directive on sustainable use of pesticides. Another way to legally bind farmers to report their use would be the EU financial aid. This means pesticide use reporting would be a condition to receive financial aid, this also would ensure compliance. The disadvantage is that not 100% of the applicators (e.g. non-agricultural users) receive financial aid, and that aid programme might change over the next years.

Mandatory and uniform record keeping

In order to establish and implement PUR systems mandatory and uniform record keeping by the applicator is critical. The recorded data are the base for different options of reporting system.

To make data entry efficient, standardised forms need to be created. These forms could be provided by the manufacturer. They could already contain product information such as the EU product number, the list of crops for which the product is registered and target organism. Applicators need then just to cross the appropriate data fields, and add individual field/ site and crop/commodity specific information. The records can then entered into an on-line database or send to governmental agencies.

Central product label database

EU product registration needs to be central. An unique EU product registration number for all products containing pesticide active ingredients is needed. Public internet access to nonconfidential data in the database would provide health professionals, governmental and non-governmental organisation fast with very useful information.

In order to create such a database and a EU registration number any manufacturer/registrant must submit electronically the following data for each individual product containing pesticide active ingredients to a central password protected internet database

- Name of the pesticide product;
- Name of the Member State where the product is approved;
- Name, CAS Number, volume and percentage of the active and inert ingredients;
- Chemical class of the individual ingredients;
- Properties of the product (formulation, density, gravity)
- Recommended application rate;
- Use type;
- Target organism;
- Symbols, Risk and Safety Phrases according to Council Directive 67/548, 1999/45.

In return, the central label database will provide the manufacturer with an unique EU registration number and an unique EU barcode for the registered product. The design of the EU registration number should allow that certain information such as:

- the use type of the product (herbicide, insecticide etc.);
- the percentage active ingredient(s);
- the formulation and;
- the Member State of approval; are already revealed by encoding the number. This allows that reported use data can be queried and evaluated much more efficient.

The manufacturer shall use the EU registration number and the bar code on the label of the product. The unique EU registration number in combination with the amount of the product used makes it easy to calculate the amount active and inert ingredients applied. The evaluation of the reported pesti□ãcide use data should be fast and easy operating the central product registration database and the encoded information of the EU registration number. The barcode could be used to track retail sales.

Data harmonisation

The coding system in the EU must be harmonised. Crops and commodities need European wide uniform codes. The codes should be designed that the individual number already allows a distinction, for example between arable crops and fruit and nuts, vegetable, flowers etc. Data analysis is much more efficient this way. Schools, child care centres, parks and other places where non-agricultural pesticides are applied, need uniform site codes across the EU. Other uniform coding systems are needed for application equipment and application methods.

Pilot studies

Each Member State should conduct a pilot study or compile existing material on the internet and PC access of applicators. They should also look at existing agricultural reporting systems in which a PUR system could fit. This could prevent unnecessary workload. In case a country already conducts surveys additional information on current and planned PC/Internet access and the willingness to participate could be requested. The Member States should estimate the costs and consider possible funds for a PUR system. A pesticide levy or a raised value added tax (VAT) are two options to examine.

Conclusion

PUR systems hold a high potential for the protection of human health and the environment. Use data can be utilised for the observation of trends, pest management practices and awareness raising and targeted monitoring. Specific regulatory measures and/ or changing pest management practices can be the resolution. In the European Union or in individual Member States sufficient use data are not available. The implementation of a PUR system could be an opportunity for targeted actions and measurements. One of the first steps towards such a PUR system has to be a European legal framework which sets minimum reporting requirements. The implementation and maintenance is task of the Member States.

Major Sources:

Pesticide Action Network United Kingdom (PAN UK), 2002: Pesticide News No 56, June 2002, pg. 16-18 Pesticide Action Network Germany (PAN Germany), 2002: Pesticide Use Reporting - Legal Framework, Data Processing and Utilisation, Full Reporting Systems in California and Oregon, Hamburg Pesticide Action Network Germany (PAN Germany), 2003: Pesticide Use Reporting - Options and Possibilities for Europe, Hamburg Both studies are available at www.pan-germany.org/download. htm

Lars Neumeister, PAN Germany

DISCUSSION SESSION 2

Question 1

A Craig: A question for Lene Gravesen. I was interested in the concept of load indices to work out how much is exposed, and I wondered if that could be applied to human beings as well?

Question 2

V Howard: Denmark has recently announced a risk on the use of glyphosate because you have found high levels in drinking water. Did any of your models or measurements predict that, or is that just something that has been found by chance?

Question 3

T Davis : My question is about the Danish treatment frequency index, and where you have had this historic drop and which sectors contributed most and which failed, and looking to the future which sectors do you expect that it will be more easier or more difficult?

Question 4

C Caspari: Are you aware of this treatment frequency index being used anywhere else?

L Gravesen: With regard to tolerances for humans (Q1), yes you can calculate this is for mammalian toxicology you have to take the sales data and link human toxicity data.

With respect to the treatment frequency used elsewhere (Q4), not yet as far as I know, but in Sweden and Norway they have a similar concept where they try to calculate the treated area but not in exactly the same way.

With respect to glyphosate (Q2), it wasn't found by chance. We have an early warning system where levels of pesticide are tested at field level. So its's actually from a field trial from 3 different spots in Denmark where so far we have had 24 pesticides which were registered and re-registered, tested with results. In 2 cases glyphosate being one of them, we saw an exceedance of drinking water Directive limit of 0.1 micro gramme per litre. No decision has been taken yet we are working on it but the draft is that the use will be reduced, the farmers will not be allowed to use glyphosate late in the Autumn because the risk of leaching is high there.

Q3-The treatment frequency is only calculated from what we call agriculture. And the main crops in agriculture in Denmark it's winter wheat and barley, and they are the two crops which contribute the most and the drop is primarily due to reducing the use of fungicides But we achieved drops in all types of pesticides. But it is mainly cereals that paint the picture because they simply are the biggest crops and also they are the area where there is most research which show the possibilities of reducing use without cost.

STUDY ON INTEGRATED CROP MANAGEMENT SYSTEMS, PREPARED FOR DG ENVIRONMENT

CONRAD CASPARI

I want to talk to you about a study we did for DG Environment of the European Commisson on Integrated Crop Management, with an overview of key results and conclusions. I should say that all the views expressed are those of the consultants, and in no way are they supposed to express the views of the Commission or its services (slide 2). We undertook this work in 2001, using desk studies and a number of case studies in France, Germany, Italy, Spain and the UK, and we completed it in 2002.

Why was this study commissioned ? To get a first fix, for the Commission, on what the concept of Integrated Farm Management meant and what was out in the field, in terms of research taking place and commercial systems being applied and what the impacts of these ICM systems were.

Wide variation in ICM systems

The first thing we did was to try and look at definitions of ICM (slide 3). There are about 20 pages in our report on this and Integrated Farm Management. I will confine myself to the definition we took on for working purposes, as: "environmentally sensitive and economically viable production systems or processes which use the latest available techniques to produce high quality food in an efficient manner". This incorporates elements of several of the definitions which are around.

We looked at ICM systems in place and identified about 32 commercial schemes across the EU (slides 4,5). Different commercial ones included those with a labelling scheme attached: the AMA-Gütesiegel scheme in Austria which covers fruit, field and greenhouse vegetables, with 20,000 farmers and an independent inspection mechanism, and the HQZ scheme in Germany in Baden-Württemberg. There is an enormous variety of schemes with very different criteria, protocols and inspection mechanisms. In the worst instances, inspection is very limited and the schemes may simply be seen as a way of providing a label for supermarkets to improve their competitive advantage. There is no uniformity in this plethora of schemes at all.

We looked at ten research schemes in more detail. Most of the research protocols for these related to arable crops, while the majority of commercial protocols related to fruit and vegetables. We did an analysis of what the protocols covered and as you can see (slide 6), almost all covered fertiliser and plant protection but for the next category -soil husbandry and tillage restrictions - only half the protocols covered this issue. You can also see a very wide variety of elements covered in the protocols, highlighting the diversity and lack of uniformity among the schemes we looked at.

Environmental impacts

The case studies we did to look at the environmental impacts covered 10 systems in five different Member States, The schemes we chose covered a wide range of crops, for example, vine crops in the Champagne region of France, fruit, mainly, apples, and citrus in Spain, arable crops in the UK (slide 7). We then looked at what results these schemes generated for impacts in different media.

For water, we aggregated across the studies and on balance the results suggest that ICM schemes reduce the incidence of pesticide and nitrate leaching, although very few schemes quantified this impact (slide 8). The results are really derived, not from testing the water, but by implication from the reduction in pesticide usage achieved. To give more details, we had quite significant impacts in terms of usage reduction, but this was measured in different ways, some schemes across the farm as a whole, some for different crops. If we look at results for the UK, for example we see an overall reduction in pesticide leaching of 30-40% over 5-10 years in the FOFP scheme. Similar or even more impressive results were achieved in the schemes in Boigneville in France, Nagele in the Netherlands and the LEAF scheme in the UK. We see quite a high reduction in most of the schemes, although few actually quantified the reduction in active ingredient terms. We found this limited quantification rather disappointing.

For soil impacts (slide 9), it was only one scheme which actually measured a positive reduction in pesticide residues in soil and quantified this. For the others, again this result was by implication from a reduction in usage.

For air (slide 10), we found that better machinery maintenance could reduce spray drift and its effects, and for non-inversion tillage there was a result for fertiliser but not for pesticides.

For biodiversity, looking at the different elements which constitute biodiversity, there is some evidence of an increase in the flora, both a number of the research driven systems and two of the commercial systems indicated that the density of native, non-cropped plants had increased (slide 11). For micro-fauna, a relatively high number of systems gave quantitative evidence of increased populations in terms of biomass, and for macro-fauna, one study indicated increased bird populations. Since these studies, were done, mainly in the late 1980s and 1990s, I think more results have come out and in the UK for example, the RSPB has a control farm where they have specifically looked at macro-fauna and clearly demonstrated that the integrated system used there has resulted in increased bird populations.

Economic impacts

Looking at economic impacts, most case studies showed (slide 14) that although farmers obtained no premium for their crop on the market, the reduction in yield they experienced as a result of lower input usage, was usually fully compensated or more than compensated for by their lower costs. This is a tricky area to measure and I refer strictly to the cost to farmers, not to public goods, which obviously benefit from these systems. For risk in the limited sense of farmers' returns, there is evidence that with lower input usage there is an increased risk for farmers in economic terms, leading to a lack of uniformity in the results, certainly from year to year. With lower inputs, variable costs were generally lower, but management costs higher. Yields tended to be lower but *for profitability, results were generally found to be similar to those obtainable from conventional systems.* You can find a lot more detail on the studies in the report on the Commission DG Environment website. *[http://europa.eu.int/comm/environment/agriculture/pdf/icm_finalreport.pdf]*

Conrad Caspari, Agra CEAS Consulting, UK

VARIOUS CONCEPTS OF INTEGRATED FARM MANAGEMENT AND INTEGRATED FARMING SYSTEMS AND THEIR RESPECTIVE LINKS WITH PESTICIDE DEPENDENCY REDUCTION

CLAUDE AUBERT

You said I would be critical, and I will be, but not about the French government, more about what certain organisations say. As way of introduction, I'm an agronomist and one of the first French ones to start promoting organic farming since the 1960s. With regard to my role as expert to the AFSSA (French Association for Food Safety), I was asked to be on the working group for the comparison of organic and conventional food. It was quite interesting because it was very difficult for some members of the group to admit that the fact that there are much less pesticide residues in organic food is an advantage. They said that if everything is controlled, pesticide residues are not a risk for the consumer -this can help you understand why the French government has such difficulty to admit that pesticide use has to be reduced!

Integrated production versus 'agriculture raisonnée'

In terms of history of Integrated Production (IP), the IOBC (International Organisation for Biological Control) started back in the 1950s. I'm showing you the IOBC definition of IP (slide 2), a little different from that given by earlier speakers, and it goes much further than just crop protection, by intregrating holistic agrosystems, nutrition of the plant and even animal welfare, soil fertility, etc.

Now regarding the history, the problem is this: as the earlier speaker mentioned, schemes won't work if there is no support from politics and markets. And the few experiences of those groups or organisations which tried to put Integrated Farming (IF) into practice at commercial level, didn't succeed because they couldn't find a market for their products. The consumers said they know organic means no pesticides, but IF what does this mean, a little less pesticide? It's not worth paying more, but the farmer needed to get more money at that time, with higher costs.

I will give the present situation in France, since the Agriculture Organizations understood that they couldn't go on in the same way, because the consumer didn't want it, with pollution of food and of the environment, but this situation is not unique to France. About 10 years ago the Forum for Agriculture Raisonnée ("reasoned agriculture") Respecting the Environment (FARRE) was formed. I will show you three slides from this organisation to illustrate the issue, from their French standards for IF (slide 3). Under crop protection, for what farmers should do, they talk about recording treatments, using authorised products, respecting local use restrictions, etc., but this is normal and nothing different from conventional production (slide 4)! The next slide (5) shows that the only specific new requirement by FARRE is not to apply herbicides to ditches, well, that's something, but it won't do much to change the usage of pesticides in French farming. Again, the other requirements are simply standard practice. For benefits to farmers (slide 6), they have very vague statements about communication, some good intentioned phrases but the phrase about " a step for product quality labels" is strange, because if you read the standards, the word quality does not appear, quality food is not mentioned for this type of farming. As an example, aldicarb is one of the most toxic of the 400 or so active ingredients used by French farmers. It's almost impossible to know how much is used in France. What's important is that when replanting vineyards to kill nematodes you can apply 200 kg per ha, an enormous amount (slide 7). In the next slide I compare the IOBC and FARRE guidelines (slide 8)- you can see there is no restriction on pesticides under "agriculture raisonnée", you can use any type of pesticides as many times as you want, as long as you respect the regulations. They say it's Integrated Farming, with no other recommendation than to spray only when necessary.

More progressive approaches

Here is a comparison in wheat across 4 systems: the French "integrated farming"; organic; the Swiss Integrated Production; and the Sustainable Farming Network (slide 9). The last one is a small network, not well known with about 1,500 farmers, mainly in Brittany, working with researchers, and they say it is quite easy to follow these standards. The IP Switzerland potato standards you see here, is a good example of real IF with strict regulations and limitations on spraying and nitrogen fertilizers, which works (slide 10). Swiss agriculture is about 10% organic, 60-70% IP and

the rest conventional. The reason it works is support from Migros and the Coop, the 2 main retail outlets, and from the government, which gives subsidies to organic farmers and lower subsidies to IP farmers. Technically it works but also needs support through the market. I should stress again that the French organisation FARRE is not unique. FARRE is a member of the European Initiative for Sustainable Development in Agriculture, EISA represented by LEAF in UK, "l'Agricoltura che vogliamo" (the Agriculture we want) in Italy, and others in other countries. They share a common concept, so it's much wider than just France where this concept is used.

Further examples are from one of the most interesting applications of real integrated farming in the third world (slide 11). You can see the huge numbers involved, 500, 000 in Sri Lanka, for example, with so much experience of integrated farming and crop management, made by NGOs, never by governments. These show that you can strongly reduce inputs, without reducing yields, which in these countries is very important. The last slide (12) is a survey from the USA comparing residues in organic, integrated and conventional vegetables. You can see what lies behind the concept of integrated production in the US- some reduction in residues, of course, but much less than what can be obtained with organic methods. So my conclusion is that the ultimate objective, of course, is organic farming, but that we have to be realistic: the organic farming will not be widespread tomorrow so we need to find a way in between conventional and organic, and integrated production is a good way. But the problem is that many organisations are using this word, with concepts that have nothing to do with integrated production as it should be understood. We need precise definition and standards for IP, with prohibition of the most dangerous active ingredients, limiting number of sprays, etc. Without this kind of precision, production practice will not change.

Claude Aubert, Terre Vivante, France

INTEGRATED FARMING SYSTEMS: EXPERIENCES IN THE NETHERLANDS

FRANK WIJNANDS

Introduction

I would like to present a more straight forward and very pragmatic way of thinking and doing in Dutch research and policy.

Here is the table of content for my contribution (slide 2). I will start with a short description of the development of integrated farming systems and integrated crop protection. Then, I will focus on the strategy of integrated crop protection. I will elaborate on the parameters and their target values used to quantify the pesticide (reduction) objectives and highlight some results from experimental farms and pilot farms. I will end with an outlook on the future challenges.

Development of integrated crop protection and integrated farming systems (slides 4, 5, 6).

As we know Integrated Crop Protection started in the sixties as Rachel Carson's "Silent Spring" made us aware of the fact that the massive use of new volume pesticides had many unwanted effects. That triggered the development of integrated control schemes combining biological and chemical methods, rapidly developing into integrated crop protection, especially in Europe, by incorporation of all available means of crop protection trying to minimise the pesticides input and looking at as well pest, diseases as weeds. It was the fruit group, I suppose, of the International Organisation of Biological Control (IOBC) who discovered the need to look at all farm practices involved to really make integrated crop protection a success. Farm practices such as crop rotation, fertilisation, soil conservation etc. Integrated crop protection became a strategy on the whole farm level. Thus, the concept of Integrated Farming Systems was more or less born, since this opened the way to integrate other objectives into farming. Objectives related to what now is called sustainability such as minimising nutrient emissions, maintaining and improving biodiversity etc. Integrated farming systems nowadays might be characterized as multi-objective, multi-sustainable farming systems as opposed to conventional farming which is mono-objective, only trying to produce commodities at the lowest price possible heavily based and dependant on the use of agrochemicals.

It was a new challenge for interdisciplinary research teams to develop this integrated farming system by trial and error, by innovating the involved farming methods, trying to achieve the objectives. Bridging apparent conflicts between the different objectives, bridging conflicts or solving conflicts in this multi-objective scheme. The methodology of designing, testing, improving and disseminating Integrated Farming Systems for arable farming was elaborated in a four year European Union Concerted Action. This methodology called prototyping can be characterised as a synthetic research/development effort starting off with a profile of demands (objectives) in agronomic, environmental and economic terms for a more sustainable farming and ending with tested, ready for use prototypes to be disseminated on a large scale. This is in contrast to the common analytical research that starts with a problem or a question and generates, often through single-factorial research, knowledge.

Over the last 20 years these Integrated systems are being developed on experimental farms all over western Europe. In the last 10 years also substantial experience has been gained with developing these prototype systems in co-operation with commercial farms: innovative pilot farms. In the Netherlands this work started in 1979 on a farm called Development Farming Systems (DFS) with a classical comparison of organic, integrated and conventional farming and we rapidly expanded the network of experimental farms involved in prototyping over different regions, not only for arable and vegetable crops but also fruits, bulbs, nursery crops, animal production etc.. This work found its logical progression in pilot farm networks where we develop in a participatory approach Integrated Farming Systems.

Strategy of integrated crop protection

Success with Integrated Crop Protection can only be achieved in the overall context of an integrated farming system. Because then it is not an isolated item in a conventional approach to farming. Our strategy for crop

protection is fairly simple. Maximum emphasis on prevention, a justified need for control and control with all possible methods but with a minimum input of pesticides available.

Prevention (slide 9)

Let's go into some detail for the prevention. Prevention literally means preventing pest, diseases and weeds from developing to economic damaging levels. We can distinguish three levels of prevention. The strategical level focuses on all more structural farm elements, elements that are not easily changeable from year to year, but are in place for a longer time, such as the soil conservation practices, the basic fertilisation strategy and crop rotation. On this level also farm hygiene is an important aspect. These are the factors that really set the scene for the occurrence of pests, diseases and weeds. The second level is the tactical level: the choices that you can make from year to year, such as the cultivar choice, sowing date, density, N fertilisation level etc. There's even a third level, the operational one. When the crop is in place every decision on cultivations or control measures might influence the population development indirectly. This knowledge has to be taken into account.

An important point is to avoid structural errors in the farm practices. The global crop protection industry and science spends billions of dollars to solve problems on an ad hoc basis one by one, problems that are provoked initially by the structural errors made in the farm practices. Problems that could be avoided when the total farm practices would have been carefully re-designed and integrated with prevention as a leading theme.

The need of control (slide10)

Control measures always should be justified for the need, year and site-specific, and based on whatever type of decision support system that is available. The application of standard sprays equals per definition lack of knowledge, because standard sprays never can be justified.

The control (slide 11)

Whenever control is necessary, an adequate strategy should be available and applied integrating all available techniques with minimum input of pesticides. Methods with minimum use such as seed treatment, and row- or spot-wise application are preferred above full field application. Appropriate dosages and when possible a curative approach (field- and year specific), further reduces the input. Finally pesticides should be carefully selected with respect to selectivity and exposure of the environment to pesticides.

Objectives of integrated crop protection (slides 12, 13, 14, 15, 16)

The objectives of Integrated Crop protection are to maintain quality production, minimise the environmental impacts of control measures and decrease the structural dependency on agrochemicals.

The pesticide problem (slide 13)

The structural problem with pesticides is that they can and will emit to every compartment of the environment. The slide shows the different emission routes.

The precautionary principle (slide 14)

In our research we applied already 15 years the precautionary principle with respect to pesticides. Our basic principle is that we should minimise pesticide emissions to air and water because they potentially might be distributed on a wide geographical scale and our knowledge of the potential effects is fragmented and incomplete. So that is in line with the David Gee lecture this morning. Minimising emissions is objective one, knowledge on ecological effects is taken into consideration but is mostly not leading in the design of our strategies.

Quantification use, emission and damage (slide 15)

How do we quantify use emission and damage? Use is very simple: quantify the amount of active ingredient, but it bares hardly any relevance in relation to emission or subsequent potential damage to biota. Then looking at emissions, we developed a parameter set for use on farms, that is called Environment Exposure to Pesticides (EEP). It quantifies the maximum emission risk of pesticides to the air, the groundwater (concentration there), and the accumulation in the soil (persistence). To quantify ecological effects we use the Environmental Yard Stick method developed by the Dutch organisation CLM, which quantifies more or less the potential

ecological damage. Both parameters EEP and EYS are based on standard and public chemical and toxicological properties.

The targets are very simple, emissions to the air are to be reduced by 90% in reference to the period 1987-89. Ground water concentrations levels of pesticides should not exceed the EU norm and of course no treatment should exceed this potential ecological damage threshold for water- and soil life.

Priorities (slide 17)

The highest priority in our work is to minimise emissions to the air, because of the potential wide distribution (deposition elsewhere). And in the second place to avoid the contamination of groundwater and ecological damage to surface waters. This reflects the large amount of surface water in The Netherlands.

Results (slide 19-30)

Firstly some results from the earlier mentioned DFS experimental farm. The farm in Nagele started in 1979. This long-term research really offered the opportunity to develop in depth the potential of Integrated Farming Systems. The next slides give a long term overview of the reduction in pesticide use. To understand the figures I have to explain that the farm set-up had a classical period in the 80s when we compared organic, conventional and integrated farming - full farm scale, during 10 years (slide 20). In the second half of that 10 year period the conventional system reached its chemical peak. In the 90s we abandoned the conventional system and substituted it by more experimental systems. And finally in 2002 we stopped our research because the targets were achieved.

Which crops did we grow? (slide 21). Cereals, potatoes, sugar beet and field grown vegetables are grown in fairly intensive rotations that were almost identical during this whole 23 year period.

Input active ingredients (slide 22)

This sheet shows on the y axis the input of active ingredient, and on the x axis, the different periods on different farms. The first column is the conventional farm in 1984. The second column represents the conventional farm in 1986-90 with as I stated the peak of the chemical input. Then the direct comparison of the integrated farm in the first period 1984 follows, followed by the integrated farm 1986-90 and then dwelling on into the 90s on the integrated and experimental farms. Notice the huge amount of input of active ingredients in the conventional farm, mainly due to the intensive use of soil fumigants to maintain intensive potato growing. But already in the same period, integrated practice drastically reduced the use of pesticides and almost diminished it in the periods during the 90s, at least in terms of active ingredients.

Emission to the air (slide 23)

What about the emission into the air? Expressed as kg active ingredient per ha, and calculated based on the chemical properties of the used pesticide, the columns aggregate the different type of pesticides. Note the high emission into the air in the 80s in the conventional systems and the drastic reduction in the integrated systems during the periods after. It is also important to note that in the period that the direct comparison between conventional and integrated was in place there were no major changes in the available package of pesticides. We had more or less a stop in the introduction of new chemicals in that period. So there is no substitution effect of new chemicals. During the course of the 1990s this additional effect occurs, made possible by the innovations by the chemical industry, that were delivering new pesticides with lower environmental impact.

Percentage of treatments exceeding target value for waterlife (slide 24)

The number of treatments exceeding the target value for water life is still high in the 80s. Some 50 to 60% of the treatments exceeded the potential ecological damage. But this reduced strongly in the 90s, mainly due to the new chemicals, and relatively simple measures like increasing the buffer width between the production field and the watercourse, up to four meters even.

Emission to groundwater (slide 25)

It is the same picture more or less, drastically reduced to under the norm level.

Targets realised (slide 26)

This slide shows the extend to which the set targets were achieved. In the first three para-

meters, the targets were more than achieved. That was one of the reasons that we ended the research on this farm..

Pilot farm network (slide 27)

We started working with commercial farms early in the nineties in a pilot farm network. In this participatory approach we were examining the potential of integrated farming systems in practice, and of course evaluating the opportunities and threats for the wider spread of all those techniques. The network also serves as the backbone of intensified communication with the agricultural community.

Pilot farm networks as policy/research tool (slide 28)

This slide gives an overview on the different pilot farm networks that were run in the Netherlands ever since that first one. We started with a pilot farm network in the beginning of the 90s and it was such a success that we are continued this pilot farm work until today. We just started with a new project with 31 groups - arable, vegetable, nursery crops, bulbs, fruit and even in glasshouses. This network approach is considered as an effective tool to develop together with farmers more sustainable farming systems and as a means to disperse the gained knowledge and experience in the farming community.

Input active ingredients (slide 29)

For what concerns the input of active ingredient from the first period of the pilot farm networks, for instance, data from the conventional farms - in the third column compared to the fourth column, the pilot farms of the same period - give more or less the same impression as the comparative data from the experimental farm (column one and two). And the integrated farm on the experimental unit had the same result as the pilot farm had in practice. That was an overall picture of 38 farms that could in average deliver the same result as we could on an experimental farm. A big success!

Arable farming regions EEP groundwater (ppb) (slide 30)

In a second example, from very recent years, I show you results from arable farms in three different regions for the groundwater concentration of pesticides, in ppb. They show a marked drop from the reference situation 97-99 to 2002. So still making progress. But not as hard as the progress we made in the first period of 1993. Those farms in practice have more difficulties in reaching the same results as experimental farms. There is still a gap.

Perspectives

Positive elements (slide 32)

In the Netherlands Integrated Farming Systems are, from a research point of view, a spectacular success. The results are very convincing, with 80 to 99% percent reduction in the impacts on the environment. With comparable economic results as conventional systems as has been proven on the experimental farms as well as on the pilot farms. It is a challenge though to compete with changes in agriculture. Growing sizes of farms means that we have to simplify our procedures, because on a larger scale we cannot do things so intensively as on a smaller scale. But we keep up with the challenge and the perspectives of Integrated Crop Protection in practice remain good.

Negative elements (slide 33)

However, incentives for application are largely lacking. Of course the package of pesticides available decreases in size forcing farmers either into illegality or into new methods. Is there an incentive from the markets? I do not suppose so, in spite of the EUREP-GAP or other certification schemes. They don't really focus on production methods. These schemes are merely devoted to keeping up the image, avoiding liability, and ensuring food security. Not so much on giving new incentives on sustainable agriculture. Sustainability is even in their terms pre-competitive. What about the government? Governments' hands are tied, they are not even able to use a bonus system to reward extra efforts from farmers. Brussels will not allow that. So the only possibility left is to incorporate integrated crop protection procedures into crop protection acts. An effort that is undertaken now in the Netherlands at the moment.

Challenges (slide 34)

The biggest challenge for the agricultural community is not only to get integrated farm-

ing into practice. A complete transition of agriculture in the 21st Century to a modern sustainable and multifunctional agriculture is badly required. Technology then is just one element needed on this path, research can provide every technology you need. It is not the biggest challenge. That is to get support from agribusiness, stakeholders and farmer organisations for and in this process. Also different types of steering mechanisms have to be applied in synergy to each other, such as legal measures, subsidies schemes, market certification schemes, etc. We need the software; the vision and motivation of all parties to work together in the same direction. We need the hardware, which is the technological knowledge and innovation. And we need the orgware, which means the support of all the organisations. Without the three working together agriculture will degenerate to a, from a societal point of view, marginal existence.

Frank Wijnands, Applied Plant Research, Wageningen Agricultural University and Research Centre, the Netherlands

DISCUSSIONS SESSION 3

Question 1

C Portalez: My colleague from the French Ministry of Agriculture is not present to counter the arguments of M. Aubert but Agriculture Raisonee presented is not the main French government Integrated Crop Management approach. It is a first step to move towards correct regulation.

C Aubert, Q1: I never said that agriculture raisonee is wrong, but it is not integrated farming. The government chose this term as it is easier to understand it in French than the word integrated management.

F Wijnands, Q1: You didn't hear the irony of industry groups promoting agriculture raisonee.

Question 2

C. Stopes: Regarding this Swiss subsidy of integrated production, could this be made mandatory and a basis for subsidy?

F Wijnands, Q2: This is exactly what the Swiss did via their agriculture policy. They have a very strong subsidy to keep smallscale farmers on farms. It's a case of government and the market working together. But Switzerland is not in the EU and it is a unique country.

Question 3

C. Smith: Will farmers be interested to do IPM? How can we get through to those conventional farmers that don't want to do more complicated management?

F Wijnands, Q3: The complexity is there. Now we have Dutch discussions on objectives and means and trying to simplify this complexity. There is sometimes too much romanticism around integrated production with regard to biodiversity, etc. The Dutch system tries to get active results.

C Caspari, Q2: Integrated production systems are advice intensive. But why not use public money to fund this, we are spending □23 billion anyway on subsidy.

E Liegois, Q2,3: We share the conclusions of the Agra CEAS study and DG Environment needs to discuss this with Agriculture and room for implementation.

Question 4

J Hontelez: What about the new Dutch political commitment to greatly increase the number of IPM farms?

F Wijnands, Q4: The pilot farm network is a means to implement government policy with close research and extension links. It's part of the overall policy to expand integrated production as part of the pesticide Action Plan. Over the last three months we are trying to get mandatory IPM but it's a long, frustrating process and not concluded.

Question 5

H. Muilerman: We're at now at an impasse again. There is no disagreement on ICM as a minimum but farmers said that the market must implement this, while NGOs want government to lead and markets to follow. We don't think that EUREPGAP and similar schemes will really deliver.

F Wijnands, Q5: The government may decide to clampdown and enforce this but the Dutch model is for consensus.

Question 6

J Hontelez: I get a sense of deja-vu with the Danish and the Dutch experiences today. In the 1970s both the Dutch and the Danish were testing windmill design development. The Danish opted for a less than perfect model and managed to conquer the US market. How far do the Dutch IPM activities expand into the commercial sector? What is going on in the rest of the sector? The Danish government's hands are not tied, even independent of Brussels. What is the role for CAP reform cross compliance? There should be more room for IPM.

F Wijnands, Q6: One effect from the Dutch research is that it's a slow, step by step adaptation but not adoption of total packages because there are no incentives. The obstacle to widespread implementation is the lack of market or government incentives. Dutch supermarkets are not very interested in integrated production certificates. Yes, Brussels does tie the hands of governments regarding bonus schemes, but what about tax reduction schemes? These have never been accepted in Brussels. Maybe the Danish government is just a better negotiator with Brussels.

THE FUTURE EU THEMATIC STRATEGY ON SUSTAINABLE USE OF PESTICIDES: AN ANSWER TO DEPENDENCY REDUCTION

ERIC LIEGEOIS

I certainly got the message today about the lack of stakeholder participation in the Thematic Strategy, but as you know resources are short within the Commission, so we can't organise stakeholder meetings every week. But my door is always open for discussions. At least we are trying to involve every group of stakeholders perspectives via the other DGs within the Inter-Services group, specially created in view of the adoption of the thematic strategy. At the end of the process, we should get an assemblage of different sticks and carrots, as we presented at the November 2002 conference, with sufficient support for users to accept the new measures we would like to impose.

New legal framework

For pesticides regulation, we now have the new legal framework defining the 6th EAP (slide 2). Five main objectives call for full implementation of existing framework and its revision. Directive 91/414/EEC revision is just starting now, with some delays, also due to lack of resources. We need to include the comparative risk assessment in Directive 91/414/EEC. We are also looking beyond the EU Community, asked to ratify PIC and POPs Conventions. PIC is ratified already and implementing measures adopted since early 2003. We are also involved with discussions on management of obsolete pesticides and I'm pleased to see John Vijgen here [from the International HCH Association] who is putting a lot of energy into this. We will try to find solutions for this big emerging problem in the candidate countries, as they join the EU next year, but we are facing serious problems of resources and need to convince more people of the importance of this issue.

The general objectives defined in the 6EAP for the Thematic Strategy (slide 3) are: minimising hazard and risk to health and environment, improving controls on use and distribution, the famous substitution principle, substituting harmful with less harmful active substances, we'll develop this further, encouraging low-input farming systems and a system for reporting and monitoring progress.

The Thematic Strategy is not developed in isolation (slide 4) but we would like to tackle the "use" stage, but it needs to relate to Directive 91/414/EEC, to residue legislation, to the Water Framework Directive (WFD), soil Strategy and air Emissions. These are all instruments for risk management and we want to approach the Thematic Strategy in terms of risk management. We want to create a strong link between results we can observe from risk monitoring in order to influence risk assessment, which may also mean courageous prohibition of certain substances or uses, according to the provision of Directive 91/414/EEC. We can be critical of Directive 91/414/EEC for its non-holistic approach, analysing risks only substance by substance, but this is not an easy task. In parallel, there will be discussions now on the MRL directives in Parliament and Council.

There are also plenty of other sticks within the legal framework for implementing the measures we would like in the Thematic Strategy (slide 5). To sum-up Environmental policies: WFD, Environment and Health Strategy and soil Thematic Strategy. The Soil Strategy will provide elements for monitoring which is very important to take action for reduction. All the other non-environmental policies can also be of help, including the CAP, Directive 91/414/EEC, Research (FP6), machinery standards, amongst others.

Development of the Strategy

Development of the SUP has been a slow process, involving many colleagues and consultants, but the way for its development was defined in the 6th EAP, with the adoption of a green paper first in order to stimulate internal and stakeholder consultations (slide 6). The final strategy development is now my responsibility for the next few months. We announced initially that it would be ready in early 2004 but this is now delayed due to the new element in Commission management plans which is calling for an extended impact assessment, evaluating all the drawbacks and benefits of all the measures and their different policy options on different stakeholders, including the difficult task of quantifying environmental benefits and health of each measures and their policy options. Stakeholder involvement will be organised like this: we will contract a part of the study to consultants (they are now identified and will be contacting you). This consultation about the costs and benefits of the Thematic

Strategy will take place via a questionnaire on stakeholder views within the next few weeks. This, of course, delays the strategy adoption, which is now foreseen for Sept. 2004. Based on the results of the consultation, the consultants have developed together with all concerned Commission services an option paper based on the stakeholders consultation. The latter will know how and what will be done, but there are still some doubts about timetabling and the option finally retained which will depend from the results of the extended impact assessment.

Strategy content

There is no preferred format defined yet conceptually (slides 7 and 8). My personal preference is to have strict, legally-binding measures but other DGs may not, and they will examine the results of the impact assessment before giving their preference to a given policy option.

We do know there will be national action plans, and for example, the UK is already developing theirs. Our role will be to define the big chapters and the way to develop national action, which will be a first tool to go to Member States to reflect on possible ways to reduce risk and use. Internally we are now discussing short, medium and long term priority measures, as possible options, and we will prioritise integrating these with existing legislation, eg. directives on packaging wastes , but we need to bear in mind the specific calendar for these instruments.

Will everything be new in the SUP ? Not really, there will be no big surprises with respect to content (9). Everything is there in PAN's PURE directive, but details need to be changed. But there is the important issue of usage versus risk and there is some opposition against use reduction at EU level and we need to evaluate the effects, at Community level. Training of sprayers, risk reduction targets, etc can be at least defined and included as important measures for national action plans. The new revision of Directive 91/414/EEC will also bring improvements in pesticide use, defining safe use in a better way and looking more at the issue of minor crops. Illegal use on minor crops is a key concern.

Short and medium term measures

There are some expected short-term measures. Reduced pesticide or pesticide free zones could be possible via the Water Framework Directive, Natura 2000 and also offering MS the possibility of having permanent set-aside system from the first pillar of the CAP (10). I've talked already about the substitution principle in relation to Directive 91/414/EEC. We also need better information of the authorities and we've explained what we expect to have on data requirements, we will probably come up with a new instrument for sales and usage data collection and we could also impose a logbook under the agri-environmental measures. Control programmes for compliance could be developed and will be developed certainly in the revision of Directive 91/414/EEC. Training is so important but we will probably be faced by positions from the MS against imposing EU-wide standards for pesticide training but we will try and put this at least under CAP (agri-environmental measures), leaving a certain flexibility to MS (11). Another thing we foresee is to set up a technical check of sprayers (12). There we have a minimal set of things to allow users to use pesticides in a more sustainable way but we can also go further and help users when they jump in organic farming or Integrated Pest Management; still it remains question mark about minimal criteria for IPM, but we need to encourage people making certain efforts in that direction (13). For those not convinced about the sustainable use of pesticides, the cross-compliance instrument could become a strong 'stick' in order to avoid some misuse of pesticides by maintaining financial penalties.

For medium term measures, regarding protection of water, the WFD will be a long-term action in terms of implementation process, MS have to react by 2006 in order to propose measures to stabilise the situation of contamination of water by chemical compounds (14). We can only play with this instrument of WFD and its daughter directives on a limited medium-term. Same for PPP packaging/container and also for handling and cleaning operations.

Research will encourage implementation by funding research under the FP6 programme in order to seak alternatives methods, like new techniques, GMs, even though we've heard today about possible safety problems . Minor use too, and also indicators are an important point for research. We now have the HAIR project starting (harmonised risk indicators) : it is the follow-up of the OECD

risk indicator activities. It will at the end propose a set of harmonised risk indicators. Denmark is proposing to participate actively in this activity.

Quantitative use reduction?

Finally, the issue of quantitative use reduction (15). Let's see first the point about taxation and levies negotiation and VAT. I can't tell you that we will have that at the end of the day, this is a difficult thing to negotiate with our colleagues. Probably we will simply pass the ball to MS, offering them the possibility of taxation system or VAT harmonisation at the normal VAT rate . Regarding quantitative use reduction, at this stage the Commission is very hesitant, and this is the whole Commission, not just DG Environment, to establish this obligation for each Member State. In order to respect political commitment, such community target points for quantitative use reduction is strongly dependent on implementation of other essential instruments. Firstly, the indicators. Not every member state has a set of indicators ready now. Of course, we can take as first choice Treatment Frequency Indicator. This is a serious candidate for use, and also risk indicators could bring some useful information. Secondly, we are lacking reliable and harmonised system of usage data and in my view, this is one of the bottlenecks before imposing at Community level quantitative use reduction targets. I would like to say that the Commission is not excluding the idea at all. I personally see the usage reduction as a consequence of all the other measures and activities than for the moment an easy political idea to establish, even if there are MS, as we've heard today like Denmark, who uses it. We need to take into consideration all the parallel efforts we will make in reducing the risk, which will mean also at the end reducing indirectly the use. This is perhaps a different approach and we'd be interested in your comments on that subject.

Thanks for your attention.

Eric Liegeois, European Commission Unit C-4 Biotechnology & Pesticides, DG Environment, Belgium

PESTICIDES INDUSTRY VIEWS AND CONTRIBUTION TO THE DANISH PESTICIDES ACTION PLAN

PER KRISTENSEN

My presentation is our view and contribution to the Danish Pesticide Action Plan (slide 3 and 4).

We find it very positive to see the continued loyalty to the fantastic work of the Bichel committee and the similar work on horticulture and vegetables. We were part of the whole process. We also see it very gratifying, that the political plan, and it is a political one, aims at maintaining farming profitability. Farming is rather important still here in Denmark and it's positive that it builds on factual knowledge and agronomic skills. Those were my positives.
I heard the Minister say this morning that we should remember that crop protection products can be very useful. As I've stated here, we've been missing hearing about the benefits of crop protection. My reading is that when you write such things in a political plan, it might not be politically correct to mention the benefits. This is a pity because we have learnt today a lot about views risk assessment and evaluation, and to my knowledge, you need to evaluate benefits, risks and costs, etc. It would be gratifying for us, for farmers, consumers and the whole society to know which environmental improvements have been achieved in Denmark since 1986 when the first plan was implemented.

The volume of crop protection products used has decreased by more than 60% and the application frequency, the lovely "baby" which everybody likes, has been cut by 40-50%, depending on how you calculate it. But as a consumer and a spokesman from industry, what have we gained by this ? By 2009, the Minister said, they want the farmer to achieve a frequency down to 1.7 from 2.0. What we miss from the new plan is what are the expectations for environmental improvements and for risk reduction by taking further steps. I remind you that to do all that Denmark has done costs my business sales, and a large amount of money to the national economy, I can't tell you the cost, so it's reasonable to get a balance. There is absolutely no guarantee that taking the frequency to 1.7 will bring improvements in health and to the environ-

ment. We would like to see the current targets replaced by focus on reduction of risk, especially in the marketplace, where we have achieved a finetuning in use of crop protection. We object, as many people know, that the application frequency is used as an environmental impact indicator, as ECPA has already clearly stated.
(Slide 4). One can always complain, but have we done anything ? Yes, we were very active within the plan, as you can see on this slide (3). We with our colleagues ensured that the basis for decisions was factual, as far as possible. We initiated in 1998 a multi-stakeholder project on Good Application Behaviour, and distributed this with farmers and extension staff to all farmers in Denmark. We support the optimisation of use of our products. However, it is fundamentally wrong to focus on risk only, if you don't take into account the benefits of using our products, and by using the precautionary principle, you will achieve results where you say end use is too big

Per Kristensen, Danish Crop Protection Association

HOW TO INVOLVE FARMERS IN PESTICIDE USE REDUCTION

JAN EKSVÄRD

My talk is in the context of the design of CAP and the world market competition. You know that we had a decoupled system and it will mean that the world market prices will have a bigger effect on what the farmer can do to still have an income. So the farmer has a very small possibility to maintain profit to avoid pesticides and by that run outside the established economic steering system.

Now this is a picture showing what payments from CAP means (slide 2). This is in millions of Swedish Kroner (SEK), and this is general payments, four billion of this is on area linked to crops, and this is environmental payment, about 20%, and that is rather high compared with other Member States. So the total is SEK 9 billion. The farm operating surplus is about SEK5.5 billion. So you see the importance of the payments. The total sales at the farm level from crops and animals are about SEK 35 billion. So when you have this strong steering system, it might be easier to focus on reducing the risk. It is not against focussing on amounts or dosages, but focusing on the risk gives a possibility to manoeuvre within this steering system.

Reduction in Sweden

This slide (3) is the volumes sold in Sweden in the last 15 years. The blue (lower) line is the number of doses. As you can see, there is not very much of a reduction. The volume, however, has been reduced by about 60-65%. We did most of it before 1992. The risk for the environment seems to be mostly linked to the number of doses. So that is not what we would like to see, you can see an increase. And there is for the farmer himself, there is more risk linked to volume, and there we have a much better situation.

So in the short run it could be of value to do as the Danish have done. And I am going to show you an example of what we are doing in Sweden, to focus on risk. In the long term, it is important and necessary to focus on alternative strategies, and alternative chemicals, and integrated crop systems, for example. To change this focus to other methods and systems will also give industry a new opportunity to take initiative in plant protection. And that initiative is wanted from farmers and from society.

Since this steering system is so strong for the farmer to keep his position, it might be necessary to make this clear to society. So it will be possible to make some compensation for the farmer, as you mentioned, and there are some examples of that. In Sweden, there is compensation for organic farmers, which has been successful. About 15% of the area is growing organically in Sweden. About 6-7% are certified organic by area. In many countries there are payments for reduced or no-use of pesticides in water protection areas, which also has been a successful steering system. The reason why you need this is partly because the present policy is a kind of order from society to farmers - produce like this and then you can use this type of fertilizers or pesticides or machinery or fossil energy. And when you want to change that, you must use some kind of economic incentive. That is one possibility. And what we would like to see that targets on pesticide reduction and risk reduction is in line with other agricultural policy, not in conflict with that system. So that is one point I want to make.

Farmers' opinions and knowledge

I will talk about one other thing- farmers have a lot of opinions about pesticides. Many of them are myths (4). And we haven't identified those myths or where they come from. I think that is very important to have a success when we start dialogue with farmers. It is also for us in our organisation. Some of these myths are: high doses are necessary to have an optimum effect; toxic products are more effective; and if products are approved by the competent authority, then they are not dangerous for the environment or health. Another is that "nobody died in our country". Maybe you have some more and I see some of you recognise that. If you have this opinion about pesticides, why should you do any change? You need to have scientific proof that some other values should be used. And if you don't have scientific proof you need to make it likely that there is another way. And the farmers are not stupid, they are like us, so they will understand a good argument.

So I think these two questions are important. This is an example in Southern Sweden ...a river (5). It's an intensive agricultural area

and it is the same type of agriculture during this period, the same type of products used. And it is about the same intensity of the pesticide use. The difference in pesticide application, is related to knowledge the farmer has about the use of pesticides. Here (1995) was a general information meeting where some information was discussed, and it was a heavy reduction achieved. Then (1998) it was an EU supported programme for many farmers and under an environmentally managed system linked to sugar beet production. And the result with the same ingredients has been 99% reduction of pesticides in the water. So it is about the same amounts used but it is a heavy reduction in risk because of increased knowledge of the farmer how to manage the pesticides, how to manage spray maintenance. And I don't say that this is enough, but it is a good way down. And may be with other programmes it is possible.

And I also think it is important to involve farmers and farm organisations very early in the process, like they do in Denmark. And we need to take that back to our own countries and do it also there. So farmers can be able to discuss the values and purposes and the visions and the strategy of how to reach the visions. And by that you will have a higher level of legitimacy and acceptance among farmers and farmers organisations.

Conclusions (6):

- Involve farmer organisations early in the process. Focus on risk reduction.
- Start a process to find alternative methods -this could be in Northern Europe, for example, where the growing conditions are about the same.
- Invest in education and training- we have a programme in Sweden - a safe pesticide use poster that has changed a lot on the farm level. Practical methods in education and scientific documentation.
- Use economic incentives-the Federation of Swedish farmers has suggested to the Swedish government that there should be a 5% tax on pesticides across the EU generally and by that they get enough economy to start new programmes on research and development to get better statistics and creating good educational programmes.

Jan Eksvärd, Swedish Farmers Association

REMOVING HAZARDOUS PRODUCTS FROM THE FOOD CHAIN

KEVIN BARKER

From a retailer's perspective, consumer concern for food safety has always been a major driver for our policy and practice. Indeed, providing safe, wholesome food was one of the founding principles of the Co-op movement some 150 years ago, and so our work on pesticides simply brings those principles into practice.

Whilst consumers are generally happy with the product choice and quality they now see on supermarket shelves, they are increasingly seeing a downside to certain aspects of the food chain, exposed perhaps by health scares, environmental concerns and animal welfare outrages that, quite simply, have shocked the public. This has created an atmosphere of mistrust, not just of the industry but of the whole framework that surrounds food safety and quality.

Against this background, pesticides are an area of concern, and thus I want, today, to concentrate on our work on pesticides and how this activity has developed.

CO-OPERATIVE RETAIL APPROACH

Our policies have been developed over a number of years taking into account the concerns of our members and consumers as well as the needs of the agricultural sector. These policies were brought into the spotlight during the launch of our Green and Pleasant Land report, which highlighted the findings of a number of consumer surveys and also made reference to a number of initiatives that have been undertaken by Co-operative Retail.

CO-OPERATIVE GROUP

In developing our approach, we worked with Farmcare, our farming division, and also with our suppliers. The aims were to reduce any risks from pesticide use, minimising the effects of pesticides and restoring consumer trust in the products involved and our control of them.

CONTROL AND ADVICE

Our starting point was a risk assessment of a number of pesticides, taking into account all of the information that was available, although unfortunately in some cases that was minimal. Our risk assessment considered toxicology, bioaccumulation and persistency within the environment, working with our farmers. If you weren't aware the Co-operative Group in the UK, through Farmcare, is the largest farmer, with a strong ethos of integrated crop management developing from organic farming. With Farmcare we developed controls that involved avoiding certain pesticides and restricting others, controls that we have successfully applied to all growers worldwide.

In the case of the restricted pesticides, these can only be used by specific agreement with ourselves and it is important to understand that where a supplier or grower requests approval for use they have to provide supporting evidence, that other alternatives are not viable controls. In turn, we will discuss and encourage the grower to first consider other control measures including cultural or biological controls, or more benign chemical alternatives before approval is granted. Because of the work done with Farmcare, we were able to suggest viable alternatives and advise suppliers of these as part of the development of our approach, in the knowledge that they would perform at an economic as well as at a control level. We know that an integrated crop management approach can deliver improved overall productivity with less reliance on chemical intervention.

These controls form part of a Code of Practice, which we developed for all suppliers almost four years ago and is applied to the worldwide production of all fresh produce and produce grown for freezing, drying and canning, wine grape production and other commodity crops.

ADVICE TO GROWERS

Working with growers is important in delivering these improvements. Within that, it is extremely important that we do not just apply more restrictions to the agricultural industry, but that we help provide solutions to address consumer concerns. This isn't just about larger growers but also the smaller local growers worldwide who have an equal if not greater need for information and assistance. Getting unbiased advisory information from agrochemical companies is not always easy, especially on the worldwide

stage and yet it is perhaps fundamental in allowing growers to make informed decisions on crop management. Although some progress is being made, through the Environmental Information Sheets, these are UK focused and don't offer comparative information, unless you're prepared to collect them all and do the job yourself, which isn't easy. And of course, it will be some time before they are all available.

I believe that what is necessary is a system that delivers value to the users of the data, allowing ready comparison of alternatives with the user in mind. Our approach has been to develop advisory sheets for individual crops. These aim to share information with growers on the possible control methods for pests in the particular crop so they can make an informed decision on the controls best suited to their needs. The information includes details of preventative measures, cultural and biological controls together with further information on the various pesticides that are approved for use. We also include details on the potential environmental and health effects from the pesticide, enabling a comparative assessment on the available pesticides. Preference is given to finding non-chemical interventions in the first instance, and where these aren't viable, to consider pesticides, but of course, not those that we prohibit, and aiming to use the most benign pesticides available.

ADVISORY SHEET

So far we have sheets for a growing range of crops, including carrots, potatoes, avocadoes, pineapples and coffee, demonstrating our commitment to both growers in the UK and further afield. They have been very well received, and remove reliance on agrochemical sales people for information on their products, which, a cynic might suggest, could be a little biased in its delivery.

We'd like to see this type of approach more widely available, and would welcome support from other stakeholders within the agricultural sector. I'm sad to say that often people find barriers to helping introduce this sort of information, which means that growers and consumers don't reap the benefits. Potentially this type of comparative data could stem from PSD or EU within the approvals process, removing some of the so-called commercial barriers, and serving the consumer and grower need effectively. There has been talk of a PSD approach to comparative risk assessment. We are certainly supportive of this, and await its outcome with baited breath. Unfortunately solutions and support are needed now, especially as pesticides are reviewed and the need for information on alternatives grows. Overall though, an approach using comparative review can support the most effective pesticide management.

The next question is of course, how do we monitor these controls?

MONITORING

All of these steps are used to monitor standards. In the majority of the cases no issues are highlighted, but where they are identified, for example the use of a pesticide without approval, then steps can and have been taken to stop supplies from a particular grower until matters are resolved to our satisfaction. This involves working with growers to find alternatives, and we have been actively providing information to assist this process, as I'll describe shortly.

In line with our co-operative values, we also publicise all of our pesticide results on our web page so that all members, and consumers can access the data. We were the first retailer to do this and this transparency is vital to reinstating consumer trust. I can't understand why all retailers don't or won't follow suit.

There is potential to share this data more broadly, with collaborations then helping to provide a focus, either in research on alternatives or targeting improvements. It is essential that we use all of the information available to target certain crops and pesticides in order to effectively prioritise the work being carried out to minimise pesticide residues in food.

Thankfully over recent months there appears to be a positive shift in the industries approach to dealing with this issue, with both the FSA and Assured Produce Scheme developing projects to investigate opportunities in this area. I am certain that by tapping into the wealth of knowledge within this sector and by providing clear and concise information to the grower many of the detectable residues seen today could be reduced to an acceptable level or eliminated.

There is no doubt that through the minimisation of residues, the industry will be taking considerable steps in addressing the concerns raised by the consumer.

FURTHER DEVELOPMENTS

In developing our approach we have looked closely at the way we manage the pesticides used on our products. As we continue to tighten controls, of most importance is the way we regulate the selection of pesticides. To support this, we formed a new advisory body that reviews the pesticides available, and considers them within our framework of controls.

Pesticides are evaluated against a hazard framework, by a panel of eminent scientists, with input on toxicology, the environment, occupational health, farming and consumer interests. The panel is chaired by Christopher Stopes, a consultant in food and farming, who also sits on the ACP, and its output provides a strong foundation for development of our policies and controls. It has been valuable to work both with Christopher and PAN, through David Buffin, as we have developed the panel. I see this as an important step forward in developing transparent and consumer-focused standards. It does not supersede the regulatory approach, which we obviously adhere to, but provides a parallel approach and a model for development. Perhaps it is something that other, forward-looking retailers might consider joining us in.

With aims of the group established, the discussions over the past 12 months have concentrated on the review of the hazard framework, this review has focused on those issues that crop up most often, for example the most commonly found residues, and those actives with potential for endocrine disruption, with hazard triggers being established for both the prohibited and restricted lists.

The work of this group, including the aims, meeting minutes and further details of the members, will be placed on our website, to ensure that our members and customers are aware of the progress that is being made.

With the framework completed this has allowed us to carry out a review of our pesticide lists, with all pesticides being assessed against the hazard triggers. This has resulted in the updating of the lists, which will now be discussed with our suppliers.

There is no doubt that following these discussions that certain pesticides will have to be removed, temporarily, from the prohibited list due to commercial need. This group of pesticides which is likely to include Carbendazim, the most common residue that we find although always below the MRL, are likely to be listed as highly restricted with suppliers being required to develop reduction plans with their growers to eliminate the use of the pesticide within an agreed timescale.
In an effort to assist in the removal of these pesticides we will also look at opportunities to encourage the development of alternatives and their approval where necessary. To assist in this development there is need for consideration within the regulatory process of mutual recognition and comparative risk assessment, as well as the potential for the introduction of a fast track approval process for those chemicals that sit on the periphery of traditional pesticides. In addition there is also a need for more research into alternatives, led by industry and, potentially, Government.

This is not the end of the process, the advisory group and Co-operative Retail will continue to develop the framework and lists as further information is made available.

AND FINALLY

Collectively we need to address the concerns raised by consumers, to help reinstate their confidence, and their belief that the food they buy has been produced in a manner that is both safe for the environment, the workers in the field and for their own health.

Whether there is a belief within the industry that these controls are already in place is, I would suggest, not sufficient. What matters is what consumers believe and, whilst there may be an opportunity to persuade them of the value and rigour of our collective controls, re-instating their confidence is an uphill task. To help deliver this we need to provide a different type of support to growers, considering their needs for clear guidance and access to viable alternative means of control.

Fundamentally, this is an issue that no one sector can solve on its own, be they growers, agrochemical firms, retailers, regulators or consumers. Concerted action on a range of issues from all involved is perhaps the only way forward to address the issues I think we are all concerned about. If nothing else, perhaps today is about developing the right partnerships to achieve this progress.

Thank you.

Kevin Barker, Co-operative Group, UK

DISCUSSIONS SESSION 4

Question 1

P Witzgall: A comment from our experience in Sweden. Defensive measures are not enough when trying to reduce pesticides, we need to provide farmers with new tools too so they have a choice to move way from old products. One major obstacle is the registration of new products. There is a whole range of bioactive natural compounds which are treated on the same basis as chemicals, for example sex pheromones. They are used in microgramme amounts, known to be non-toxic but species-specific so the potential market is very small. Registration of new compounds is therefore just as important as reducing risk.

Questions 2 and 3

G Jensen: Two questions for Eric Liegois regarding the thematic strategy. First of all I was surprised to see in your objectives you want to reduce risk hazards and you also want low input or no input of pesticides but at the same time you don't have reducing the use of pesticides as one of your objectives. From what we've heard this morning, even low doses and the synergistic effects of pesticides can have effects on human health so I can't understand how the Commission, with their obligation to protect human health under the Amsterdam treaty, how this cannot be one of your objectives? I'm not sure that what you say about realizing this through the other objectives will really work as we don't always know what the harm or hazards are. Secondly, you mention you're going to be looking at exposure to pesticides in the soil, in water and what I want to know is what are the plans for decreasing human exposure? In the Environment and Health strategy there is a pilot project on biomonitoring of exposure to chemicals, will this figure in the Thematic Strategy in any way ?

E Liegois, Q2, 3: This is not mine or the Commission's objective but established by the Council and Parliament decision, i.e the political level will decide. We developed this further by saying we will target risk reduction and use reduction. The impression I get maybe was wrong but, of course, we are also communicating use reduction as one of the objectives. What I said at the end was that some instruments are lacking to impose that at Community level. We know perfectly that smooth implementation will not be easy and we cannot impose that in the Commission proposal. Of course, our proposal will go the Council and their first reaction will be "no way- we don't need Community commitment established by the Commission". We are speaking here in Denmark in a very easy environment, and they defend their position since 1986. I'm not sure if this was so easy politically speaking back then. It could be a slow process to get agreement.

About exposure (Q3), indeed the Thematic Strategy on soil protection in its first action taken will be monitoring contaminants. And in the water framework directive too, we will have instruments for checking contamination level and trying to predict and establish trends in contamination of water bodies. For human exposure, the Environment and Health strategy will put instruments in but bioindicators are not easy to define and identify but working groups are looking at that aspect.. Pesticides will only be addressed in the SCALE project implementation calendar from 2010. This is not my decision, you need to ask my hierarchy! They have decided that children's disease and asthma will be the first problems to be addressed by the strategy but pesticides will only be examined according to their endocrine-disrupting potential. This, for the moment, is the only way pesticides will be considered in the Environment and Health strategy.

Question 4

S. Scheuer: Regarding Mr Kristensen, you asked what are the benefits of use reduction? I think you answered yourself by your statement "as little as possible but as much as necessary". But this is the objective of your association. In itself, it says already that as little as possible, so reducing the use. As far as I understand, the Danish plan has not led to a loss of profitability in the agriculture sector so use reduction is justified and clear, considering that pesticides are toxic substances spread in the environment and ends up with nasty things. To ask now for proof of what exactly are the benefits to justify these measures, is not correct and your statement would not fit with that. How far has the pesticide industry in Denmark been coping with use reduction? Do you have quantitative losses or have you shifted business to a more services oriented approach, as your association name suggests focussing on crop protection and not just selling certain amounts? And for Mr Liegois, regarding the revision of 91/414, you mentioned implementation of

the substitution principle and comparative risk assessment-does the Commission plan to put in clear, hazard criteria for non-inclusion of substances for Annex 1? Criteria, as we have seen being put forward by retailers clearly saying 'this pesticide we cannot accept in our products'.

P Kristensen, Q4: We stand by this motto. If you proofread the Danish action plan, it says the justification is, and has always been, to reduce risk to human health and environment. It has cost much effort and money to society, as all political plans do, somebody has to pay. We're just asking for information on results, how is it going and what do we get for all these efforts as society? The Danish Crop Protection Association covers a bit more than 90% of Danish business and we have lost 60-65% of our net sale value and fired 75% of staff. Is that clear enough?

E Liegois, Q4: Revision of 91/414 will go in the direction of integrating cut-off criteria as for the biocides directive, this is what we are planning. The substitution principle is also here.

Question 5

L. Neumeister: A question for Kevin Barker. How do consumers respond to the efforts of the Co-op and how are your efforts rewarded by them?

K Barker, Q5: Through our membership and consumers, these are extremely well received. We've carried out extensive, independent surveys over a number of years which have highlighted the concerns of consumers. Communicating on the website publication of pesticide results and our programme has been achievable by all consumers. The potential, the one that is often raised, is are customers more tolerant of , for example, beneficials found in produce? By explaining to the consumer about pesticides, reduction programmes and the use of beneficials, yes, they do accept them.

V. Howard, Q4: To comment on Mr Kristensen's question. What have we gained from use reduction? Well, we have gained a clear and measurable decrease in environmental load. What are the benefits? I don't know, this is difficult. We may not be able to assess benefits for 30-40 years' time, in reduction of the rise of cancer incidence. What we're saying is, if you do reduce exposure of populations, we will see health benefits but it's hard to say exactly what they will be. We know there are adverse effects now with the same temporal sequence as the introduction of these compounds but we can't tell you, but we think it will happen.

Question 6

L Baskys: We are one of the Accession countries from next year, I'm from Plant Protection Service in Lithuania and my question is about testing. Testing schemes in the current EU member states are very different even between themselves, some test and some don't. I know, for example Germany, is preparing some regulations and I want to know will there be uniform regulations for all the EU 25 or will it continue as now, with some countries specific and Member States doing it their own way?

Question 7

C. Wattiez: For Mr Liegois, about expected short-term measures with respect to definition or minimal criteria for IPM. We've seen this afternoon very diverse definitions for ICM and Integrated Farming I'd like to know what is the Commission intending to do about this, to deal with this problem and at what level? At EU or Member State level?

Question 8

G. Goldenman: You mentioned one of the obstacles to considering quantified use reduction targets is lack of harmonised data among different Member States. Is the Commission considering putting in place some unified, harmonised requirements so that they can start building that foundation of data?

Question 9

A. Craig: With regard to the difficulties of identifying biomonitoring indicators and that working groups are looking at definitions, has the Commission considered the equivalent of the big American survey, the NHAINES survey, where biochemical tests are made for hundreds of chemical groups? Secondly, do you not agree that people in the EU have the right to know what they're being contaminated with in terms of chemicals and shouldn't there be a survey done for that reason?

E Liegois: Yes, first about spraying (Q6),

indeed it will be harmonised at Community level, we'd like to see that implemented in every Member State according to the same standards which are already defined about the methodology to control the sprayers. There shouldn't be different systems still remaining.

In terms of the ICM definition (Q7), this would be a consequence of this system for compulsory data collection on use, which will lead to ideas on best available practice. IPM goes further and to protect the farmer we need to harmonise but this is not an easy task, as crops vary across member states. We need to look for best available technologies to be examined at least by member states. Q8- Data on usage collection will definitely be harmonised, that's why the use reduction target should be delayed, to have the knowledge first on usage. Of course, we will ask Member States to collect this data on a compulsory basis. That's the intention at the moment. Regarding biomonitoring indicator surveys (Q9), I can't say much because I'm not a toxicologist but I can pass the information on. PAN could also offer their expertise in the working group. And, of course, there is a public right to know. Commissioner Walstrom was very surprised to find out that she has DDT in her blood, a product which has been banned since 1984. For a lay person it's not easy to understand why such a compound is still found in the environment. Bioindicators will be important but without creating too much scare among the public.

LESSONS FROM THE DAY

JOHN HONTELEZ

Conclusions

I was asked to make 15 minutes of conclusions but we only have 2 minutes left and my other excuse is that PAN should reflect much more on all of what has been said today, as conclusions are more than what I can try to do as a summary. We need to think of strategic conclusions and opportunities for coalitions for further discussions.

We've heard that pesticides can do very specific harm so we have to be very careful with what we're doing. We've heard very interesting presentations about how difficult it is to exactly conclude on harm or risk, on combined effects. We've heard that dilution may not mean lesser harm, it can even increase, and it's extremely complex to make definite conclusions on chemicals, especially as they never enter our bodies in isolation. We are exposed to an enormous cocktail combination. That led to discussions on the necessity to apply the precautionary principle, although it was also said that this principle should not be abused either, it has to be applied in a solid manner and David Gee talked about what the principle really means and applying this in a politically responsible manner. We heard a lot about what is being done and what needs to be done to further develop good information systems on how much pesticide we're actually using and about lack of comparability of information for different countries. We heard of different systems being used and experimented on in integrated crop management, which decrease dependency on chemical crop protection. On the one hand, we hear that in Denmark particularly, which is a pioneer in policy for reduction, it can be done without harming the interest of farmers. It does need a combination of legislation, being clear what you want to achieve, but also support, in the sense of advice, training etc.

There was quite a discussion about whether you can do this within the current agriculture framework or whether you need to go beyond that, whether it violates current Common Agriculture Policy. In Denmark, I understand, it can be done within the CAP framework, but in the Netherlands there is political concern that if you start promoting Integrated Farm management, you do have to consider changing subsidy policy, which may be complex in the current policy framework. There is a role for discussion, especially with the recent mid-term reform of CAP, where there is increasing scope. You can go in two ways to make reduced use possible or attractive to farmers: one way is to subsidise farmers that you're expecting specific efforts from, e.g. in areas where you don't want any use of pesticides. The other way, discussed more briefly, is via pesticide taxes etc, letting the market tell more the ecological truth that farmers not using pesticides gain benefits rather than extra problems. But there we see again EU policies coming around the corner, it's very difficult nowadays to implement national taxes without getting into political trouble.

The last section showed that we environmental organisations are certainly not alone in our need for pesticide reduction. We also think of the consumers, with an excellent example in the UK where consumers are well organised and have developed the ability not only to demand pesticide reduction, but to act with farmers and retailers to help them put this into practice. Farmers are also willing to discuss this with environmental organisations, including in terms of profitability which must be taken into account, and we also need to discuss with industry their interests. We might not often reach consensus here but we need to understand at least and the kind of discussions with industry that they've had in Denmark, I feel many people in other countries would be happy to have this form of dialogue. The slogan of 'as little as possible and as much as necessary' is a slogan that the industry in other countries has perhaps not accepted yet.

We've also had the discussion on the Thematic Strategy, which for many of us is a very important focus in the coming year. DG Environment is working within quite a political constraint which means that our main objective, to focus on reduction in use, cannot be taken for granted in the Strategy, for technical reasons, but mainly for political reasons. If we want to make a difference and make use reduction a real part of the Strategy, we all have to work hard and it's clear that we have allies even among some of the Member States so there is a perspective for achieving this in Europe if we campaign in a convincing manner.

John Hontelez, General Secretary European Environmental Bureau

PARTICIPANTS LIST

Helle Raun **Andersen**
Environmental Medicine
University of Southern Denmark
Winsloewparken 17 2.sal
Odense C 5000
Denmark
Tel:+45 6550 3765; Email: hrandersen@health.sdu.dk; Fax: +45 6591 1458

Claude **Aubert**, Expert to AFSSA and Editor
French Assoc. for Food Safety (APSSA)
Terre Vivante
Domaine de Raud
38710 Mens
France
Email: aubert.terrevivante@wnadoo.fr; direct work 33 (0) 476 34 80 80; Fax: 33 (0) 476 34 84 02; Website: www.terrevivante.org

André **Bannink**
VEWIN (Netherlands Waterworks Association) / EUREAU
P O BOX 1019
NL-2280 Rijswijk
Netherlands
Tel:+ 31 70 414 47 91; Email: bannink@vewin.nl

Kevin **Barker**, Quality Assurance Manager
Fresh and Frozen Produce
The Co-operative Group
PO Box 53 New Century House
Manchester M60 4ES, U.K.
Email: Kevin.Barker@co-op.co.uk; Fax: 44 (0) 161 827 57 50; Mobile 07747 622 578; Tel:44 (0) 161 827 62 07; Website: www.co-op.co.uk

Darius **Baskys**
Republic of Lithuania State Plant Protection Service
Kalvariju str. 62
Vilnius LT-2005
Lithuania
Tel:+370 5 262 49 25; Email: vaatdb@vaat.lt

Dominique **Belpomme**, President
Association for Research on Treatments Against Cancer (ARTAC)
57-59 rue de la Convention
Paris 75015
France
Tel:01 45 78 53 53; Email: artac.cerc@wanadoo.fr; Website: www.artac.cerc.org; Fax: 01 45 78 53 50

Peter **Bergkvist**
National Chemicals Inspectorate (KEMI)
PO Box 2 Esplanaden 3 A
Sundbyberg S-172 13
Sweden
Tel:+ 46 8 519 41 100; Email: peter.bergkvist@kemi.se

Kate **Bootle**, Office and Library Officer
Pesticide Action Network UK
Eurolink Centre, 49 Effra Rd
London SW2 1BZ, U.K.
Tel:+44 20 7274 8895; Fax: +44 20 7274 9084; Email: katebootle@pan-uk.org

David **Buffin**, Coordinator UK/Europe Programme
Pesticides News
Pesticide Action Network UK
Eurolink Centre, 49 Effra Rd
London SW2 1BZ U.K.
Tel:+44 20 7274 8895; Fax: +44 20 7274 9084;Email: davidbuffin@pan-uk.org; Mobile: 07880 700428

Conrad **Caspari**, Managing Director
Agra CEAS Consulting
Imperial College at Wye and Brussels Wye Campus
Wye TN25 5AH, U.K.
direct work 44 (0) 1 233 81 21 81; direct work 32 (0) 2 736 00 88; Fax: 44 (0) 1 233 81 33 09; Fax: 32 (0) 2 732 13 61; Email: conrad.caspari@ceasc.com; Website: www.ceasc.com

Marta **Ciraj**
Ministry of Health
Breg 14
SL-1000 Ljubljana
Slovenia
Tel:+386 1 478 6051; Mobile +386 41 769 440; Email: urad.kemikalije@gov.si

Alison **Craig**, PEX Project Coordinator
Pesticide Action Network UK
Eurolink Centre 49 Effra Rd
London SW2 1BZ, U.K.
Tel: 020 7274 6611;Email: alisoncraig@pan-uk.org; Fax: 020 7274 9084; Mobile 07709 730561; Website: www.pan-uk.org

Tim **Davis**, Head
Rm 309
Pesticides Safety Directorate
Environmental Residues Policy Branch,
Mallard House, Kings Pool 3 Peasholme Green
York North Yorkshire YO1 7PX, U.K.
Tel: +44 (19 04) 45 57 52; Fax: +44 (19 04) 45 57 33; Email: tim.davis@psd.defra.gsi.gov.uk; Website: www.pesticides.gov.uk

Koen **Duchâteau**
Unit F3 - Environment and Sustainable Development
European Commission - DG Eurostat
Pesticides Statistics and Indicators Development BECH C4/611
Luxembourg L-2920
Luxembourg
Tel: 352 4301 38 304; Fax: 352 4301 30 039; Email: koen.duchateau@cec.eu.int; Website: http://europa.eu.int/comm/eurostat

Edwige **Duclay**
Water Pollution Office, Ministry of Ecology & Sustainable Development
Avenue de Ségur 20
Paris 07 SP F-75302
France
Tel:33 1 42 19 12 18; Email: edwige.duclay@environnement.gouv.fr

Astrid **Eikeland**
Ministry of Agriculture
Postbox 8007 Dep
0030 Oslo
Norway
Tel:+4722249493; Email: liv-astrid.eikeland@ld.dep.no

Jan **Eksvärd**
LRF (Federation of Swedish Farmers)
Stockholm 10533
Sweden
Tel:46 (0) 771 573 573; Email: jan.eksvard@lrf.se; Website: www.lrf.se

Niels **Elmegaard**
Dept. TERI
NERI (National Environmental Research Institute, Denmark)
ostboks 358 Frederiksborgvej 399
Roskilde DK-4000
Denmark
Tel: 45 89 20 15 85; Tel:45 46 30 12 00; Fax: 45 46 30 11 14; Email: NE@dmu.dk; Website: www.dmu.dk

Judit **Ferenczi**
Plant Protection & Soil Conservation (Zala County)
Kinizsi u. 81 Pf.9
Zalaegerszeg H-8901
Hungary
Tel: +36 92 550165; Email: Ferenczi.Judit@zala.ontsz.hu

Andreas **Fliessbach**
Research Institute of Organic Agriculture (FiBL)
Arberstrasse Postflach
Frick CH-5070
Switzerland
Tel:+41 62 8657225; Email: andreas.fliessbach@fibl.ch

Peder **Gabrielsen**
European Environment Agency (EEA)
Kongens Nytorv 6
Copenhagen DK-1050
Denmark
Tel:+45 3336 7247; Email: peder.gabrielsen@eea.eu.int

David **Gee**, Emerging Issues and Scientific Liaison
European Environment Agency (EEA)
Kongens Nytorv 6
Copenhagen DK-1050
Denmark
Email: David.Gee@eea.eu.int; Tel: +45 3336 7100/42; Fax: 45 33 36 71 99; Website: www.eea.eu.int

Gretta **Goldenman**
Milieu Ltd
29 rue des Pierres
1000 Brussels
Belgium
Email: milieu@skynet.be; Fax: +32 2 514 3603; Tel: +32 2 514 3601

Lene **Gravesen**
Pesticides Division
Ministry of Environment and Energy
DEPA (Danish Environmental Protection Agency) Strandgade 29
DK-1401 Copengagen K
Denmark
Email: lgr@mst.dk; Tel:45 32 66 01 00; Website: www.mst.dk; Fax: 45 32 66 05 35

Tibor **Halmagyi**, General Director
Central Service for Plant Protection & Soil Conservation
Budaorsi u.
Budapest H-1118
Hungary
Tel: +36 1 3091011; Email: Halmagyi.Tibor@ntksz.hu

John **Harvey**, Freelance Journalist / BBC Farming Today
34 Roseberry Road
London SW2 4DD
Email: yitkinsiow@aol.com; Home +44 020 8678 0347

Renate **Hiemke**
Ministry for Environment Nature Conservation and Reactor Safety
Robert Schumann Platz 3
Bonn 53175
Germany
Tel:0228 305 3451; Email: renate.hiemke@bmu.bund.de

John **Hontelez**, Secretary General
EEB (European Environmental Bureau)
34 Bd de Waterloo
Brussels B-1000
Belgium
Tel: 32 (0) 2 289 10 90; Fax: 32 (0) 2 289 10 99; Email: hontelez@eeb.org; Website: www.eeb.org

Vyvyan **Howard**
Head of Developmental Toxico-Pathology Group, Dept of Human Anatomy and Cell Biology
University of Liverpool
The Sherrington Buildings, Ashton St
Liverpool Merseyside L69 3GE, U.K.
Tel: 0151 794 3854 / 5958; Email: c.v.howard@Liverpool.ac.uk; Email: mjhoare@liv.ac.uk sec;
Fax: 0151 794 5517; Mobile 0151 794 7833

Genon K **Jensen**, Manager
European Public Health Alliance (EPHA)
33, rue de Pascale
B-1040 Brussels
Belgium
Email: epha@epha.org; Fax: +32 2 233 3880; Switchboard +32 2 230 30 56

Klaus Melvin **Jensen**
Association of European Consumers (AEC) (Active Consumers)
Rosenoerns Alle 41
Copenhagen 1970 FC
Denmark
Tel:+45 35372030; Email: melvin@aktiveforbrugere.dk

Euros **Jones**
European Crop Protection Association
6 Avenue E. Van Nieuwenhuyse
B-1160 Brussels
Belgium
Email: euros.jones@ecpa.be; Tel:+322 663 1553

Per **Kristensen**, Director General
DCPA (Danish Crop Protection Association)
Amalievej 20
Frederiksberg C DK-1875
Denmark
Tel:45 33 24 42 66; Tel: 45 33 78 52 31; Fax: 45 33 25 84 16; Email: pk@plantevaern.dk;
Website: www.plantevaern.dk

Katerina **Kyriazi**
Ecotoxicology Section
Plant Protection Directorate
Hellenic Ministry of Agriculture
Ippokratous 3-5
Athens 10164
Greece
Tel: +30 210 2124509; Email: a.kyriazi@minagr.gr

Eric **Liégeois**
Unit Biotechnology and Pesticides
European Commission
Directorate C DG Environment 1, rue de Genève
Bruxelles 1049
Belgium
Tel: 32 (0) 2 296 86 16; Tel:32 (0) 2 299 11 11; Fax: 32 (0) 2 296 69 95;
Email: Eric.LIEGEOIS@cec.eu.int; Website: www.europa.eu.int/comm/environment/ppps/home.htm

Else-Marie **Mejeryo**
Swedish Board of Agriculture
55182
Jonkoping
Sweden
Tel: +46 (0) 36 155167; Email: else-marie.mejeryo@sjv.se

Hans **Muilerman**
Stichting Natuur en Milieu (SNM)
Donkerstraat 17
NL- 3511 KB Utrecht
Netherlands
Email: h.muilerman@snm.nl; Fax: 31 30 233 1311; Mobile 06 2721 2196; Tel; 31 30 233 1328

Lars **Neumeister**
Pesticides Action Network (PAN) Germany
Nernstweg 32
Hamburg 22765
Germany
Email: lars.neumeister@pan-germany.org; home Tel/Fax: 49 30 78 89 5650; Tel:49 40 399 191 022; Fax: 49 40 390 75 20;
Website: www.pan-germany.org

Hans **Nielsen**
Danish Ecological Council
Landgreven 7, 4
DK - 1301 Copenhagen K
Denmark
Email: Hans@ecocouncil.dk; Tel:+45 33150977; Website: www.ecocouncil.org

Bernhard **Pallutt**
Federal Biological centre for Agriculture & Forestry (BBA)
Stahnsdorfer Damm 81D
Kleinmachnow 14532
Germany
Tel: +49 (0) 33 20348412; Email: b.pallutt@bba.de

Eveline **Paul**, Head of Department
Austrian Agency of Health & Food Safety
Spargelfeldstrasse 191
Vienna 1223
Austria
Tel: +43 222 73216 5330; Email: paul.eveline@lwvie.ages.at

Jan-Erik **Petersen**
European Environment Agency (EEA)
Kongens Nytorv 6
Copenhagen DK-1050
Denmark
Tel:+45 3336 7133; Email: jan.erik.petersen@eea.eu.int

Sven-Erik **Pettersson**
Kommunal trade union
Box 19039
Stockholm 10432
Sweden
Email: 3039pettersson@telia.com; Email: sven-erik.pettersson@kommunal.se; Tel:+ 8 7282800; Website: www.lrf.se/ (See note);
Website: www.sv-lantarb.se

Cyril **Portalez**
Water Pollution Office, Ministry of Ecology & Sustainable Development
Avenue de Ségur 20
Paris 07 SP F-75302
France

Tel:+33 1 42 19 12 36; Email: cyril.portalez@environnement.gouv.fr

Anna **Ryttberg**
Ministry of Agriculture
Fredsgatan 8 103 33
Stockholm
Sweden
Tel: +46 8 405 1740; Email: anna.ryttberg@agriculture.ministry.se

David **Sadler-Bridge**
Ecospray Limited
Grange Farm Cockley Cley Rd Hilborough
Thetford Norfolk IP26 5BT, U.K.
Tel: 01760 756100; Email: SadlBridge@btinternet.com

Stefan **Scheuer**
EEB- Water Policy
Boulevard de Waterloo34
Brussels 1000
Belgium
Email: water@eeb.org; Tel:+32 2 289 10 90; Website: www.eeb.org

Hans Christian **Schmidt**, Danish Minister for the Environment
Ministry of the Environment
Hojbro Plads 4
Copenhagen K
Denmark
Email: mem@mem.dk; Fax: 45 33 32 22 27; Tel:45 33 92 76 00; Website: www.mem.dk

Gilles-Eric **Seralini**, President du Conseil Scientifique de CRII-GEN
(Comité de Recherche et d'Informations Indépendantes sur le Génie Génétique)
Universite de Caen
Laboratoire de Biochimie et de Biologie Moleculaire - IBFA Esplanade de la Paix
Caen F-14032 Cedex
France
Tel: 33 (0) 231 56 56 84; Fax: 33 (0) 231 56 53 63; Email: criigen@ibfa.unicaen.fr; Website: www.crii-gen.org

Cecile **Smith**
Scottish Natural Heritage
2 Anderson Place
Edinburgh EH6 5NP
Scotland. U.K.
Tel:0131 446 2427; Email: cecile.smith@snh.gov.uk

Carl **Smith**, Project Director/Senior Editor
FASE - Foundation for Advancements in Science & Ed
Park Mile Plaza - Suite 215 4801 Wilshire Boulevard
Los Angeles California 90010
USA
Email: carl.smith@fasenet.org; Fax: +1 323 937 7440; Switchboard +1 323 937 9911

Susanne **Smolka**
PAN Germany
Nernstweg 32-34
D-22765 Hamburg
Germany
Tel: 49 40 399 191023; Fax: 49 40 390 7520; Email: susanne.smolka@pan-germany.org

Bernd **Stein**
Federal Environment Agency
Seeckstrasse 6-10
Berlin D-13581
Germany
Tel:49 30 8903 3131; Fax: 49 30 8903 3138; Email: bernd.stein@uba.de

Christoper **Stopes**
Eco-Stopes Consulting
Wood End Garden Close Lane
Newbury Berkshire RG14 6PP, U.K.
Email: c.stopes@dial.pipex.com; Fax: 01635 38732; Tel: 01635 40998; Tel: 07966 463 489

Vija **Strazdina**
State Stende Plant Breeding Station
P/N Dizstende
Talsu r. LV 3258
Latvia
Fax: +371 329 21 81; Tel: +37 1 3292 181
Email stende.selekcija@apollo.lv

Mark **Taylor**, Acting Pesticides Adviser
English Nature
Somerset & Gloucestershire Team
Roughmoor Bishop's Hill
Taunton Somerset TA1 5AA, U.K.
Tel: +44 (0) 1823250864; Email: mark.taylor@english-nature.org.uk

Maarten **Trybou**
Federal Public Service for Health, Food Chain Security & Environment
Batiment Arcades 5th Floor
Brussels 1010
Belgium
Tel: +32 2 2105101; Email: maarten.Trybou@health.fgov.be

Paulien **van Asperen**
Applied Plant Research
Wageningen Agric. University
Edelhertweg 1 PH Lelystad
8219
Netherlands
Tel: +31 (0) 320 291111; Email: paulien.vanasperen@wur.nl

Claus **Vangsgaard**
Danish Water and Waste Water Association
Danmarksvej 26
DK-8660 Skanderborg
Denmark
Email: cv@DVF.DK; Tel: +45 70 210055

Corinne **Vaughan**
Food Science, Room 503C
Food Standards Agency
Aviation House 125 Kingsway

London WC2B 6NH, U.K.
Tel: 020 7276 8506; Email: corinne.vaughan@foodstandards.gsi.gov.uk; Fax: 0207 276 8513

Francois **Veillerette**
Mouvement pourles Droits et le Respect des Generations Futures
7 Rue Principale Saint Denis Court
60380
France
Tel: 03 44 82 70 37; Email: fv@mdrgf.org; Fax: 03 44 82 70 37; Website: www.mdrgf.org

John **Vijgen**
International HCH and Pesticides Association
Elmevej 14
Holte DK-2840
Denmark
Tel: +45 45 41 03 21; Email: john.vijgen@get2net.dk; Fax: +45 45 41 09 04;
Website: http://hjem.get2net.dk/HCH-Pesticides/

Catherine **Wattiez**, Co-ordinator of Pesticides Use Reduction in Europe
Pesticides Action Network (PAN) Europe Inter Environment Wallonie
Avenue des Tilleuls 70
Rhode-Saint-Genese 1640
Belgium
Email: catherine.wattiez@skynet.be; Fax: +32 2 358 29 26; Tel: +32 2 358 29 26; Mobile 0479 904127; Website: www.pan-europe.net;

Carina **Weber**, Executive Director
PAN Germany
Nernstweg 32-34
D-22765 Hamburg
Germany
Tel: 49 40 399 191023; Email: carina.weber@pan-germany.org; Email: info@pan-germany.org;
Fax: 49 40 390 7520; Switchboard 49 40 399 19100; Website: www.pan-germany.org

Frank **Wijnands**
Applied Plant Research
Wageningen Agricultural University and Research Centre Edelhertweg 1
P.O. Box 430
Lelystad P.O. Box 430
Netherlands
Tel: 31 (0) 320 29 16 26; Fax: 31 (0) 320 23 04 79; Email: frank.wijnands@wur.nl; Fax: www.wageningen-ur.nl

Stephanie **Williamson**, Pan Europe Co-ordinator/Internat Proj Officer IPM
Pesticide Action Network UK
Eurolink Centre 49 Effra Rd
London SW2 1BZ, U.K.
Tel:+44 20 7274 8895; Fax: +44 20 7274 9084
Email: stephaniewilliamson@pan-uk.org;
Website: www.pan-uk.org

Peter **Witzgall**
Swedish Agricultural University (SLU)
Box 44 Alnarp
230 53
Sweden
Tel: +46 40 415307; Email: peter.witzgall@vv.slu.se; Website: www.phero.net;
Website: www.biosignal.org

Kathy **Wormald**, Finance and Funding Manager
Pesticide Action Network UK
Eurolink Centre 49 Effra Rd
London SW2 1BZ
Tel:+44 20 7274 8895; Fax: +44 20 7274 9084
Email: kathywormald@pan-uk.org; Mobile 07786 240930; Website: www.pan-uk.org

Carlo **Zaghi**, Head of Division
Directorate EIA
Environmental Risk Assessment of Chemicals
Ministry of Environment & Territory
Via C. Colombo 44
Roma 00147
Italy
Tel: +39 06 5722 3060; Email: zaghi.carlo@minambiente.it

PAN Europe

Pesticides Action Network Europe

Reducing Pesticide Dependency in Europe to Protect Health, Environment and Biodiversity

20 NOVEMBER 2003
Københavns Miljøkontrol (City Environmental Health office),
Kalvebod Brygge 45, Copenhagen, DENMARK

FINAL PROGRAMME

8.45 **REGISTRATION**

9.30 **OPENING AND WELCOME**

9.35 **KEYNOTE SPEECH**

- Hans Christian Schmidt, Danish Minister for the Environment
- Questions

9.55 **INTRODUCTION**

- Catherine Wattiez, Co-ordinator of the Pesticide Use Reduction in Europe Campaign, PAN Europe

10.05 **SESSION 1: WHY IS PRECAUTIONARY USE REDUCTION NECESSARY?**

The traditional way of controlling pesticides problems has been to tackle each susbstance individually But there is ample evidence to suggest that this approach has not been adequate and that problems associated with contamination of the environment and food by pesticides are serious and growing.

We are just beginning to understand the health effects of exposure to small quantities of pesticides , often over a period of time, as well as the way different contaminants interact in our bodies. A clear overall picture of health impacts resulting from complex, real life exposure is missing.

Moreover,an increasing number of studies show that pesticides negatively affect biodiversity, not only in the place where they are applied but also in other ecosystems. These complex indirect effects on ecosytems are not adressed in pesticides risk assessments or reflected in pesticides risk indicators.

Therefore, as a matter of precaution, the reduction of exposure to all pesticides could be a sound political choice.

- Chair: Gretta Goldenman, Director, Milieu Ltd. (Environmental Law Consultancy)

- *The inadequacies of the current licensing system for pesticides*
  Dr Vyvyan Howard, Head of the Developmental Toxico-Pathology Research Group, Department of Human Anatomy and Cell Biology, University of Liverpool, UK

- *A new concept for pesticide assessment: ecogenetics*
  Prof. Gilles-Eric Seralini, Molecular Biology, cancerology and Endocrinology , University of Caen, President Scientific Committee of CRII-GEN (Comité de Recherche et d'Informations Indépendantes sur le Génie Génétique), France

- *Indirect effects of pesticides on ecosystems biodiversity*
  Niels Elmegaard, Danish Environmental Research Institute (NERI), Denmark

11.00 Coffee break

- *Towards a common understanding and practical application of the Precautionary Principle to Children's Health and Pesticides*
  David Gee, Emerging Issues and Scientific Liaison, European Environmental Agency (EEA), Denmark

- Discussion

11.55 **SESSION 2: HOW TO MEASURE PESTICIDES USE REDUCTION ?**

Pesticides dependency reduction targets are important tools for focusing policies and for selecting measures for implementation The targets are linked to specific indicators used for measuring progress and a common indicator is needed to ensure comparability of dependency reduction efforts – from a baseline year - by individual Member States. Such an indicator should be related to pressures on health, environment but also on biodiversity and should integrate impacts of new « low dose » pesticides. Data for its calculation must be available and it should be easy to calculate and understand.

- Chair: Gretta Goldenman, Director, Milieu Ltd.

- *The Treatment Frequency Index: an indicator for pesticide use and dependency as well as overall load on the environment*

Lene Gravesen, Pesticides Division, Danish Environmental Protection Agency (DEPA), Denmark

- *Availability and adequacy of sales and use data at EU level*
  Koen Duchateau, Pesticides Statistics and Indicators Development, Eurostat, Belgium/Luxembourg

- *Pesticide use reporting: options and possibilities for Europe*
  Lars Neumeister, PAN Germany, Germany

- Discussion

13.00 Buffet lunch (organic food and drinks)

14.00 **SESSION 3: TOWARDS AGRICULTURAL PRODUCTION SYSTEMS WHICH REDUCE PESTICIDE USE**

Integrated crop management (ICM) , integrated farming systems (IF) and organic farming are presented as to be promoted alternatives to the intensive use of pesticides. An increasing number of studies show that ICM and IF reduce incidence of pesticide leaching, impacts on soils , have a positive impact on biodiversity and lead to higher farmer profitability. However, these terms have not been adequately defined at EU level. This leads to great confusion and to the emergence of different concepts not all intended to reduce pesticides dependency. Clarification of these concepts by Member States and the Commission for each crop and crop rotation system could be highly needed for our different regions.

- Chair: John Hontelez, Secretary -General , European Environmental Bureau (EEB)

- *Integrated crop management and integrated farming systems in Europe: farmers economic profitability and environmental benefit from pesticides use reduction.*
  Conrad Caspari, Agra CEAS Consulting and author of 2002 European Commission report on ICM systems in Europe, UK

- *Integrated crop management, integrated farming systems: experience in the Netherlands and farmers profitability*
  Frank Wijnands, Applied Plant Research, Wageningen Agricultural University and Research Centre, the Netherlands

- *Various concepts of integrated crop management and integrated farming systems and their respective links with pesticide dependency reduction*
  Claude Aubert, Terre Vivante, expert to AFSSA (Association Française de Sécurité Sanitaire des Aliments), France.

- Discussion

15.15 Coffee break

15.30 **SESSION 4: STEPS TOWARDS PESTICIDE USE REDUCTION**

In line with the 5th and 6th Environmental Action Programmes, number of political initiatives at national and European level are elaborated and/or taken in order to reduce the use of pesticides and risks associated with their use . Practical steps are also being taken by some retailers and food companies, in response to growing consumers awareness of pesticides impacts and demand for zero residues. Key for a successful reduction plan is also the active involvement of farmers. This session aims to have better insights into these various initiatives, actions and achievements.

- Chair: John Hontelez, Secretary –General, EEB

- *Commission response: development of the Thematic Strategy on the sustainable use of pesticides*
  Eric Liégeois, Unit Biotechnology & Pesticides, Directorate C2, DG Environment, European Commission, Belgium

- *Pesticides industry views and contribution to the Danish Pesticides Action Plan*
  Per Kristensen , Danish Crop Protection Association (DCPA), Denmark

- *How to involve farmers in pesticide use reduction*
  Jan Eksvärd, Swedish Farmers' Association (LRF), Sweden

- *Removing hazardous substances from the food chain*
  Kevin Barker, Quality Assurance Manager Fresh & Frozen Produce, The Co-operative Group (CWS) Ltd, UK

- Discussion

16.45 **LESSONS FROM THE DAY**

- John Hontelez, Secretary –General, EEB

17.00 Conference finish and drinks