PAN Germany

Pestizid-Reduktion

Pestizide passen nicht ins Leben

Towards Pesticide Use Reduction in Germany

Pesticide Action Network Germany

Pesticide Action Network Europe

Towards Pesticide Use Reduction in Germany

The publication was financially supported by the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety of Germany (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit BMU) and the Federal Environmental Agency (Umweltbundesamt UBA). The English translation is funded by the European Commission, the Sigrid Rausing Trust and the Danish Environmental Protection Agency.

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Acknowledgments

Many thanks to the supporters, and to Kerstin Heiland and Esther Kreutz for providing the images and proof-reading of the German version, and to Reginald Bruhn and Norma Thierfelder for their contributions to the layout.

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Photograph (cover): © Bildagentur Waldhäusl
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Title of the original edition in German: “Für ein Pestizid-Reduktionsprogramm in Deutschland”; translated into English by Richard Isenring on behalf of PAN Europe.

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Preface

Throughout the history of pesticides use unforeseen problems related to their use have occurred. Pesticides appeared as a practical and useful means within the process of industrialisation until the middle of the 20th century, when they proved to be double-edged. Already in 1962 Rachel Carson warned in her book “Silent spring”, on the basis of extensive evidence, that pesticides used in agricultural production can have substantial side effects.[1] As an American biologist who was highly committed, she gave rise to reflection on and discussions about this issue and also brought about lawsuits, which led to the establishment of pesticide regulations. In the early 1970s the earliest prohibitions of pesticides became effective. Subsequently the legislation pertaining to pesticides and their use was extended and strengthened. Analytical instruments and techniques for recognising the undesirable “side effects” or changes in the state of the environment were improved, and the valuation of soil, water and air also changed. Incidents of human poisoning and pollution of the environment with pesticides were documented, which resulted in the withdrawal of certain substances from the market or the restriction of their use, the introduction of new substances and the prohibition of a number of further substances.

Something that still applies today is that, in general, those pesticides that were introduced more recently are said to be less harmful than the older pesticides. However, both former events and current research have regularly shown that after some time of independent research (which is not widespread) of the new pesticides harmful effects are found. These findings may be viewed as the result of a gradual improvement in our ability to recognise the effects caused by pesticides. On the basis of current knowledge it must be concluded that in future it will be necessary to apply the precautionary principle. In chemicals policies this principle has been integrated but it has not been systematically applied in the area of crop protection until now. One of the direct consequences of a precautionary approach is the substitution of toxic pesticides through less hazardous alternatives. Most importantly, however, such an approach favours methods for preventing the establishment of pest organisms more than measures for controlling pests. To bring this about requires changing the system of crop cultivation *and* the way in which agricultural produce is traded and consumed. What we need therefore is an effective programme for the reduction of pesticide use.

The issue of pesticide use reduction in Germany is discussed from different angles in this publication. It was compiled within a project of PAN Germany that presents contributions on pesticide use reduction in Germany and refers to the 'German reduction programme in crop protection' that began in 2005. PAN Germany aims to contribute in a constructive way to this programme by giving information about the positive outcome and shortcomings of the programme. A webpage has been posted on the internet that shows the progress made by the German reduction programme in crop protection. The

[1] Carson RL, Silent Spring, Boston: Houghton Mifflin 1962

progress is visualised by indicators based on specific criteria. The website is accessible at http://www.pestizidreduktion.de.

It is our hope to provide insights, ideas and options for action to everyone interested in strengthening sustainable systems of plant production, sustainable methods of crop protection, and in strengthening sustainable patterns of distribution and consumption of agricultural produce in particular. We hope to provide interesting findings that show why a pesticide use reduction programme is important and may help you with supporting pesticide use reduction in Germany or elsewhere.

Carina Weber
(Executive Director, PAN Germany)

Preface to this edition

One of the concepts that has proven most difficult to accept in chemical crop protection is that of “pesticide use reduction”. Years of industry lobby targeting decision-makers and the general public have shifted the discussion towards risk reduction and established the idea that pesticides remaining on the EU market are harmless. But the current models for risk assessment and risk management are based on a high degree of uncertainty. Therefore the implementation of the precautionary principle is necessary. This can be achieved by pesticide use reduction which would result in a reduction of pesticide exposure and of environmental and health risks.

Despite calls for a Thematic Strategy addressing pesticide dependency and use reduction as early as 1993 in the 5th Environmental Action Programme (EAP), by 2002 the European Commission had not yet presented a proposal. At that time PAN Europe prepared a proposal for a Directive on Pesticide Use Reduction in Europe (PURE). The subsequent campaign gathered the support of more than 90 European and national organisations all over Europe and received substantial attention by the Commission and in Member States.

Today, more than three years later, the European Commission has not yet presented a Thematic Strategy and the current draft fails to address the objectives laid down in 5th and later in the 6th EAP, adopting instead a weak approach based on optional national measures and with no objectives in terms of pesticide reduction. Our PURE campaign continues, with a strong emphasis on raising awareness, producing and disseminating information showing the benefits of pesticide reduction. With this in mind, we decided to translate this publication of PAN Germany into English giving the rationale for pesticide use reduction.

Despite the fact that this publication focuses on the German market and the conditions of pesticide use in Germany, PAN Europe translated this publication for several reasons. Firstly, the arguments supplied counterbalance many of the misleading arguments of the industry claiming, for example, that low residues in food are harmless, or that pesticide use benefits health and the environment.

Secondly, we believe this publication contains useful information for public interest groups and NGOs in any (European) country. Chapters concerning “Pesticides and the environment”, “Pesticides and health” or “Pesticides in the environment and health” provide summaries of the latest scientific research into these issues and findings that will certainly be of use to many other groups.

Thirdly, PAN Germany's demands concerning a national pesticide use reduction plan and calls for changes in crop protection are relevant for many countries in Europe. We believe that other organisations might make the same demands expressed by PAN Germany in the chapters “The German

Reduction Programme Chemical Crop Protection" and "PAN Germany's position".

Further information on the environmental and health effects of pesticides and on less hazardous alternatives are available at the different websites of Pesticide Action Network (http://www.pesticide-residues.org; http://www.oisat.org; http://www.pan-europe.info; http://www.pan-international.org).

Sofia Parente
(Coordinator/Administrator, PAN Europe)

1. Pesticides and the agrochemical industry

Demands for a pesticide use reduction programme have already been made in the 1980s. Since then these demands were often countered with the argument that pesticide use is continually decreasing anyway due to the introduction of new pesticides and new application methods and because integrated pest management (IPM) is being introduced. However, if one looks at the data on the sales and use of pesticides this argument is not corroborated in the least. On the contrary it is found on the basis of available data that the amount of pesticides used has not declined. At the same time a decrescent number of agrochemical companies dominate the pesticide market, which leads to an increasing influence of individual companies on crop protection.

Pesticides: what are they?

A closer look was taken at what the term 'pesticide' means by PAN Germany shortly after its foundation in 1984 and it was defined as follows:
“Pesticides are chemical products that are used systematically for killing or harming organisms that are defined as pests. Besides various groups of substances with a name ending in 'cide' that are used against different organisms (from acaricides to rodenticides) they include attractants, repellents and pheromones (substances for chemical signalling); hormones, germination inhibitors and plant growth regulators (for growth retardation); sterilisants (rendering pest organisms infertile); fumigants and desinfectants; chemicals used for denaturation, for bleaching or treating textiles and conservation agents; chemical toxins for warfare; and also additional ingredients in products such as solvents, surfactants, wetteners, stabilisers, skimming agents, carrier materials, and all impurities from the production process or from packaging” (PAN Germany 1986).

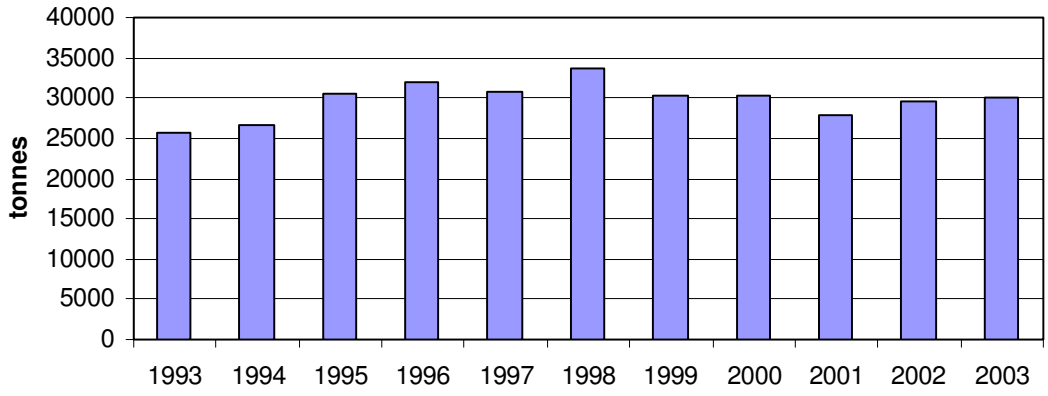
Today the large number of different pesticides are divided into two groups. These are distinguished from each other by their main usage, either in agriculture or for non-agricultural purposes. The reason for this is that the regulations differ for agricultural and for non-agricultural uses, a consequence not so much from the fact that different substances may be used but due to the different application methods. The existing regulations are divided into the crop protection legislation (which refers to the use of pesticides in agriculture, horticulture and forestry or use of herbicides for vegetation control on various areas) and the biocide legislation (applying to all other types of usage).

Taking a look back at pesticide use in Germany

Has pesticide use been reduced over the last years?

In 1993 the Council of European Community (EC) decided in the Fifth Environmental Action Programme as an 'objective of the EC for the year 2000' in agriculture and forestry 'to achieve a substantial reduction of pesticide use per unit of land under production'.(1),(2) Not the least progress has been made towards reaching this objective to date, neither at the level of the European Union nor at the level of the Member State Germany. This is evident both from data on the amount of pesticides sold and from data on the application rates (amount of pesticides used per hectare of cultivated land). A comparison of the application rates in different years shows that it fluctuates but there is no indication of a decreasing trend. The application rate for pesticides in Germany was about 2.8 kg/ha in 1994, 3.2 kg/ha both in 1996 and in 1998, 2.9 kg/ha in 1999, and in the year 2000 it was 3.0 kg/ha.(3)

Figure 1. Sales of active ingredients (in tonnes, without inert gases) in Germany between 1993 and 2003 (4), (5)



Obviously the trend in the application rate for pesticides paralleled the total sales of pesticides in Germany as the latter quantity was used among other information to calculate the application rates. Figure 1 illustrates that the amount of pesticides sold in Germany between 1994 and 2003 did not decrease at all. Attention should be drawn to the fact that the sales and application rates in Germany have remained more or less constant for a relatively long time although new active substances were introduced on the market that are used at very low application doses. In view of this fact it can be surmised that the intensity of pesticide use may have even increased.

Regarding the number of active substances authorised in Germany it was found over the last decade that after an initial increase until the year 2000 it decreased again to about the number in the middle of the 1990s (table 1). For the number of pesticide products authorised and marketed in Germany the trend was similar (table 2 below).

Table 1. Number of pesticide active substances and products authorised between 1994 and 2004 in Germany (6), (7)

Year	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Substances	248	249	257	261	275	271	276	273	269	248	248
Products	939	978	988	1011	1115	1140	1130	975	928	785	932

The number of products differs strongly among groups sold with a different purpose: herbicides used against unwanted grasses and broad-leaved weeds account for the majority, followed by fungicides (for the control of fungal diseases) and insecticides, while only two nematocides (used for controlling nematodes) were authorised; no germination inhibitors were authorised in the years 2002 and 2003 (table 2). The large proportion of herbicides, fungicides and insecticides is evident if one looks at the pesticide sales on the German market (measured by weight, see table 3 below).

Table 2. Number of pesticide products authorised in Germany 1994-2003 (status in December of each year; products with several uses assigned to their major use) (5)

Products used on/as	***1994***	***1995***	***1996***	***1997***	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***
Insects	215	230	228	236	257	267	259	217	197	171
Arthropodes (mites)	10	10	11	8	8	8	7	6	8	8
Nematodes	3	2	2	2	4	1	4	4	3	2
Molluscs (snails)	26	22	19	19	24	24	23	14	18	18
Rodents	64	67	70	80	83	93	94	78	78	53
Fungal diseases	179	177	183	185	216	213	211	201	186	175
Weeds	286	311	315	313	338	352	352	284	287	234
Other pest organisms	3	4	3	7	12	3	3	2	1	1
Seeds (treatment)	47	58	62	58	58	59	59	65	53	43
Repellent	33	35	32	29	28	28	28	27	29	23
Germination inhibitor	4	5	5	4	4	4	4	4	0	0
Plant growth regulator	29	20	22	32	51	56	56	44	33	35
Desinfectant (grafting)	32	29	28	36	30	30	28	27	2	20
Additional ingredients	8	8	8	2	2	2	2	2	2	2
Total number of authorised products	**939**	**978**	**988**	**1011**	**1115**	**1140**	**1130**	**975**	**938**	**785**

In the past only general data on the sales of the different groups of pesticides were available. However, the utilisation of this quantitative data in qualitative evaluations has been questioned repeatedly, however. An alternative source of information is now available since 'NEPTUN' began to compile data.(8), (9), (10)

Table 3. Sales of pesticide active ingredients (tonnes) between 1994 and 2000 in Germany (4), (5)

Active ingredients	***1994***	***1995***	***1996***	***1997***	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***
Herbicides	14834	16065	16541	16485	17269	15825	16610	14942	14328	15350
Insecticides, Acaricides, Synergists	969	861	791	755	1037	953	845	740	742	779
Inert gases (e.g. CO_2)	3037	4064	3006	3941	5239	5172	5266	5778	5147	5591
Fungicides	7698	9652	10404	9397	10530	9702	9641	8246	10129	10033
Other types	3231	3889	4343	4069	4808	3751	3232	3957	4332	4002
Total sales	29769	34531	35085	34647	38883	35403	35594	33663	34678	35755
Total sales *without inert gases*	26732	30467	32079	30706	33644	30231	30328	27885	29531	30164

A statistical survey of application of chemical plant protection products in field crops in Germany conducted in 1999 and 2000 gives a profound insight into current crop protection practice. Under the NEPTUN project, a representative number of farms, randomly distributed over 34 soil-climate regions throughout Germany, were surveyed for crop protection measures. These were recorded with accurate description of the product and dose rates used, dates of treatment, and crop and crop area treated.

The data is suitable for compiling a treatment index representing pesticide use in Germany.

The treatment index represents the number of pesticides used in a crop and a process of standardisation with regard to the crop growing area and to the application rate as stated in the product's authorisation. The process of standardisation is plausibly explained by the following example.

If a farmer treats the total of his wheat growing area with herbicides, the herbicide treatment index of his wheat is 1.0. If he applies herbicides on only half of the area and other measures, for instance mechanical weed control, on the other half, the treatment index is 0.5. If he reduces dosage on the treated half by 30% from the authorised rate, the treatment index is 0.5 x 0.7 = 0.35.

The compilation of NEPTUN data began recently and therefore a comparison of the trends of the treatment index for different crops will be available starting from the year 2005 and only for certain crops. The German "Reduction Programme in Chemical Crop Protection" employs the treatment index as an indicator of the amount of pesticides used. It has so far not been decided which indicators in the programme shall represent the risks associated with pesticide use in Germany as no model is straightforward and easy to communicate, up till now.

Agrochemical market and crop protection knowledge increasingly controlled by few multinationals

Today over 80% of worldwide pesticide sales fall to the share of only six companies. In 2004 three agrochemical companies, each with sales of over $4 billion, together controlled the global market for pesticides. Two of these multinational companies have their headquarters in Germany: Bayer and BASF. By controlling such a large stake of the market these companies have a considerable influence on the way in which plant protection is practised.

Global sales of pesticides in 2004 amounted to $32.2 billion.(11) As in the preceding years Bayer and BASF were positioned among the companies with the highest proportion of global pesticide market.(12) Last year Syngenta was surpassed by Bayer which took over the leading position with regard to turnover; the two companies' sales are very similar with $6.03 and 6.12 billion, respectively.13 BASF's sales were the third largest in 2004 and this company clearly increased the distance to companies with the next largest sales (table 4).

Table 4. Turnover in 2004 of the six leading agrochemical companies (3)

Rank	***Company***	***Turnover (million US$)***
1	Bayer	6,120
2	Syngenta	6,030
3	BASF	4,141
4	Dow Chemical	3,368
5	Monsanto	3,180
6	DuPont	2,211

Who controls the pesticide market?

In 2003 Bayer completed the first fiscal year since it acquired Aventis Crop Science and this was the reason for the increase of sales by 20%. If one looks further back it is noted that globally an enormous concentration in the agrochemical market is taking place. With more than 80% of the global market in the hands of just six companies (table 5) and in view of ongoing market concentration, one issue cannot be evaded: what are the consequences of such a concentration of finances and power on policy development at the national level? As many countries in the same period have cut down on public research in agriculture and on services offering advice to the farmers the large agrochemical companies dispose of knowledge and know-how in crop protection on an increasing scale. More recently this is also the case with seeds.

Table 5. Agrochemical market concentration between 1990 and 2004: companies accounting for 80% of the global pesticide sales (5)

Rank	***1990***	***1995***	***2000*** *(including seeds)*	***2004*** *(including seeds)*
1	Ciba Geigy	Ciba Geigy	Syngenta	Bayer (+ Aventis)
2	ICI	Zeneca	Monsanto	Syngenta
3	Bayer	AgrEvo	Aventis	BASF
4	Rhône Poulenc	DuPont	DuPont	Dow
5	DuPont	Bayer	BASF (+ Am. Cyan.)	Monsanto
6	Monsanto	Monsanto	Bayer	DuPont
7	Dow Elanco	American Cyanamid	Dow	
8	Hoechst/Roussel	Rhône Poulenc		
9	BASF	Dow Elanco		
10	Sandoz	BASF		
11	Schering	Sandoz		
12	American Cyanamid			
13	Shell			

Do the multinationals control crop protection?

Vast domains of this monopoly of information and knowledge cannot be accessed by the public due to the fact that companies can keep information secret that is deemed relevant to production. Independent research on the positive and negative effects of pesticides has been weakened as a result of research shifting from the public domain to free private enterprise.

High external costs from the use of pesticides

Since pesticides first became a ubiquitous component of agricultural production there has been limited research on the question whether the established methods of crop protection are actually worthwhile, i.e. if in relation to the advantages of using pesticides we should put up with the disadvantages. Few studies have analysed the costs and benefits of synthetic pesticides, however, an examination of these studies indicates that substantial costs arise from pesticide use. Moreover these are not paid by the purchaser and could be reduced. Jules Pretty and Herrmann Waibel recently compiled data and examined the external costs resulting from pesticide use in four countries.(14) They estimated that the total external costs per year in Germany were $166 million. Annual external costs from pesticide use in the UK were estimated at $257 million. These amounted to $1,492 million in the US and to $1,398 million on rice alone in China. It was stated that estimates made for Germany and the United Kingdom were consciously based on conservative assumptions, especially regarding chronic exposure of people to pesticides on which there was no data. The authors pointed out that in Germany estimated external costs would be twice as high if the assumptions made in the US about the risk of cancer related to pesticides had been used in the estimation.

Is chemical crop protection worthwhile?

The authors have criticised that earlier studies on the external costs of pesticide use were often oversimplified (e.g. by comparing a constant level of pesticide use with no use at all) and that initiatives for reduced pesticide use, such as projects in integrated crop protection (ICM) and organic agriculture, were not considered adequately. In 26 countries 62 initiatives in ICM were analysed and the authors concluded that there are promising results, which indicate that pesticide use can be reduced without a loss in crop yields.(14) Similar conclusions of a study carried out over a long period of time in Brandenburg, Germany, indicate that reduced pesticide use may increase the profitability of agricultural production.(15) This means that an effective programme for the reduction of pesticides can be advantageous not only for the environment and human health but also for farms and agricultural production, and therefore would be beneficial to the whole of society.

Costs for the development of new pesticides soar

A study commissioned by the agrochemical industry examined the expenditures and time required for the developing a new pesticide up to the stage of production and commercialisation.(16) The study sponsored by Phillips McDougall UK and published in 2003 investigated the following points in question: What was the necessary capital investment for developing a pesticide product between 1995 and 2000? How many different chemical compounds were synthesised and put through testing procedures within the development of a single pesticide product? How much time was required for this process, starting from the first chemical syntheses up till commercialisation? The study examined ten companies and came to the following conclusions: The total costs for 'research and development' of a new pesticide formulation have increased by 21.1%, from $152 million in 1995 to $184 million in the year 2000, or by 8.5% when adjusted to inflation. The expenditures within the development stage of a new product increased most in the area of field trials required for pesticides. Between 1995 and 2000 these have risen by 38.9% up to $25 million. However, the largest expenditures were located in the area of biological research, which during this period have overtaken those of chemical research.

Also the number of new molecules increased that had been synthesised prior to the development stage and were subject to toxicological studies. These are required for the authorisation of a new pesticide active substance. While 52,000 chemical syntheses led to four candidate substances at an advanced level of development and one newly authorised pesticide in 1995, the number of syntheses leading to an advanced stage and authorisation of one product had grown to 139,429 by the year 2000.

Why are costs for pesticide development on the rise?

The period between initial chemical syntheses and a final product ready for being introduced to the market had also increased from an average time of 8.3 years in 1995 to 9.1 years in 2000.

The study estimated that the total expenditures for research on a new pesticide have risen by 30.6% during 1995-2000, from $72 million per product (1995) to $94 million in 2000. It was stated by the authors that the increasing costs were partly due to the stricter requirements within the authorisation procedure for pesticides and also to the fact that companies are searching for substances that can be used in products on a greater number and combination of crops and pest organisms, while another reason for this lies in changes in the development procedures within the companies. One of these changes is the improvement of screening methods for selecting the substances that are of interest for further development and, finally, potential commercialisation.

The conclusions drawn in this study and presented by Phillips McDougall UK are not unexpected. In Germany and the European Union, and also in the US, requirements within the authorisation procedures for pesticide products have become stricter due to the unacceptable consequences of pesticide use. Among other things significant changes in the pesticide market have resulted from this, which have contributed to an increasing competition between the companies and accelerated pace of innovations. One of the drawbacks of this trend is that many companies today are promoting their products more aggressively.

2. Pesticides and the environment

The intensive use of pesticides in agricultural production inevitably leads to residues of these substances in the environment. Pesticide residues can be detected in any of the environmental compartments: air, soil and water (rain, surface and groundwater). In groundwater degradation of these residues is generally very slow. There is reason for concern as pesticides are widespread in the environment and at even low doses may produce harmful effects. Indirect effects of pesticides can continue to have an impact at the level of ecosystems irrespective of the actual presence of pesticides, e.g. by changing the species composition in communities. The following examples can present only a small part of the environmental impact of pesticides, which have often been a surprise even to scientists.

Pesticide levels in groundwater remain unchanged

Wherever the groundwater has been contaminated with chemicals such as pesticides, the negative effects will be felt over a long period. Once pesticides or their metabolites (products resulting from degradation, some of which are persistent) have reached the water table it may take a long time and up to 20 or 50 years until groundwater pollutants are degraded. Degradation rates may be extremely slow. For that reason atrazine, a herbicide that is prohibited in Germany since 1991 as it is degraded very slowly, and the main metabolites of atrazine continue to be at the top of the pesticides detected most frequently in groundwater.

Can pollutants be removed from the groundwater?

When pesticides have reached the water table it is rarely feasible to reduce the level of pollution effectively and in a short time or the required measures are very expensive. In West Germany it was calculated by Waibel and Fleischer (1998) that each year €9 million (Euro) are spent on the removal of pesticide residues from water, while the costs for monitoring water quality amount to about €33 million.(17)

About 74% of the drinking water in Germany is derived from groundwater and this is an important reason for implementing the protection of groundwater for the whole area of Germany. A reference value for assessing the pollution of the groundwater is the drinking-water limit of the Drinking-water Directive (98/83/EC) in the EU: 0.1 µg/l for each individual pesticide and 0.5 µg/l for the sum of all pesticides. (1 microgram (µg) corresponds to 1/1000 mg.) Without carrying out any toxicological and environmental evaluations the drinking-

water limit was established for the first time and so far uniquely with respect to the interests of society and the public opinion that no pesticides should be present in water. The limit of 0.1 µg/l is based on the lowest detectable amount of pesticide (limit of detection) at the time when it was introduced in 1989.

In 2004 the 'Workgroup on Water' of the counties in Germany (LAWA) published the second report on quality of groundwater with respect to pesticides.18 It presents the levels of pesticides measured in the groundwater near to the surface between 1996 and 2000 and compares these to the levels during the preceding period 1990-1995. Most of the data were collected by the German states and by water companies. It shows that the overall situation has not changed significantly. During the first half of the 1990s pesticide residues were measured at 28.3% of the sites where water samples had been taken; in 9.7% of the samples that contained detectable residues the levels were above the limit. Between 1996 and 2000 the proportion of samples with detectable residues was 27.6%, from which 8.6% exceeded the drinking-water limit of 0.1 µg/l.

Eight of the 20 most frequently detected active substances and metabolites are currently authorised pesticides, while the others must be regarded as long-term residues. The groundwater samples contained detectable amounts of pesticides that are degraded quite rapidly in soil, e.g. bentazone or diuron. It is likely that the pollution of groundwater with these pesticides is due to rapid transport, e.g. through the pores or cracks in the soil. These leaching conditions are not adequately considered in tests within the authorisation procedure. Another serious problem is the substitution of an active substance with a chemical that is very similar, as is the case with atrazine. As it has similar physicochemical properties it is not unexpected that terbuthylazine, a substitute for atrazine, is detected more and more frequently in groundwater. In the meantime the government authorities in Germany who are responsible for pesticides have requested for several active substances present in groundwater that the reason for this is clarified. However, preventive measures clearly are much more important. The German Workgroup on Water considers the following aspects to be important for protecting groundwater from pesticides (19):

- Development of new pesticides with improved or optimised physical and chemical properties
- Reduction of the necessary application doses by taking into consideration the economic injury level (i.e. reduce pest population to a level at which further reduction is not profitable)
- Partial assignment of active substances to catchment areas and control of the active substances (lower application rates in catchment areas for problematic substances)
- Modified authorisation procedures for groundwater protection (shorter periods of authorisation and introduction of monitoring after authorisation)

- Reduction of chemical crop protection to the minimum extent that is considered necessary
- Good agricultural practice in crop protection (precise, competent and appropriate application of pesticides)
- Requirement of a permit for applying broad-spectrum herbicides on non-agricultural land (pesticides not to be sold to non-professionals with no certified experience).

A Groundwater Directive referring to the EU's Water Framework Directive will be introduced and the draft report of the European Commission in September 2003 is being discussed. One of the main provisions of the proposed Groundwater Directive is the barring of deterioration of groundwater quality by adherence to good practice regarding the environment, by technical regulations and the obligation to reverse any upward trend in the level of pollutants that is statistically significant. Standards are established for the indicators of groundwater quality regarding pollutants from non-point sources. When these standards are exceeded remedial measures become compulsory. The new directive proposed by the Commission includes the limit of 0.1 µg/l for individual substances (from the Drinking-water Directive) but does not provide a limit for the sum of all pesticides (0.5 µg/l for drinking-water).(19)

PAN Germany believes that in accordance with the Water Framework Directive the protection of ecosystems that depend on groundwater directly or indirectly should have much greater importance as they are much more sensitive than the human organism to certain substances.20 In addition to this the drinking-water directive states that it is a constitutional right to have access to uncontaminated and clean drinking-water and this should also apply to the main resource: groundwater. Therefore a limit for pollutants in groundwater should be established by the new directive at the limit of detection in current analytical methods and a limit for the total amount of pollutants should be included, which takes into account their potential combination effects.

Possible damage of ecosystems from low levels of pesticides in rivers and lakes

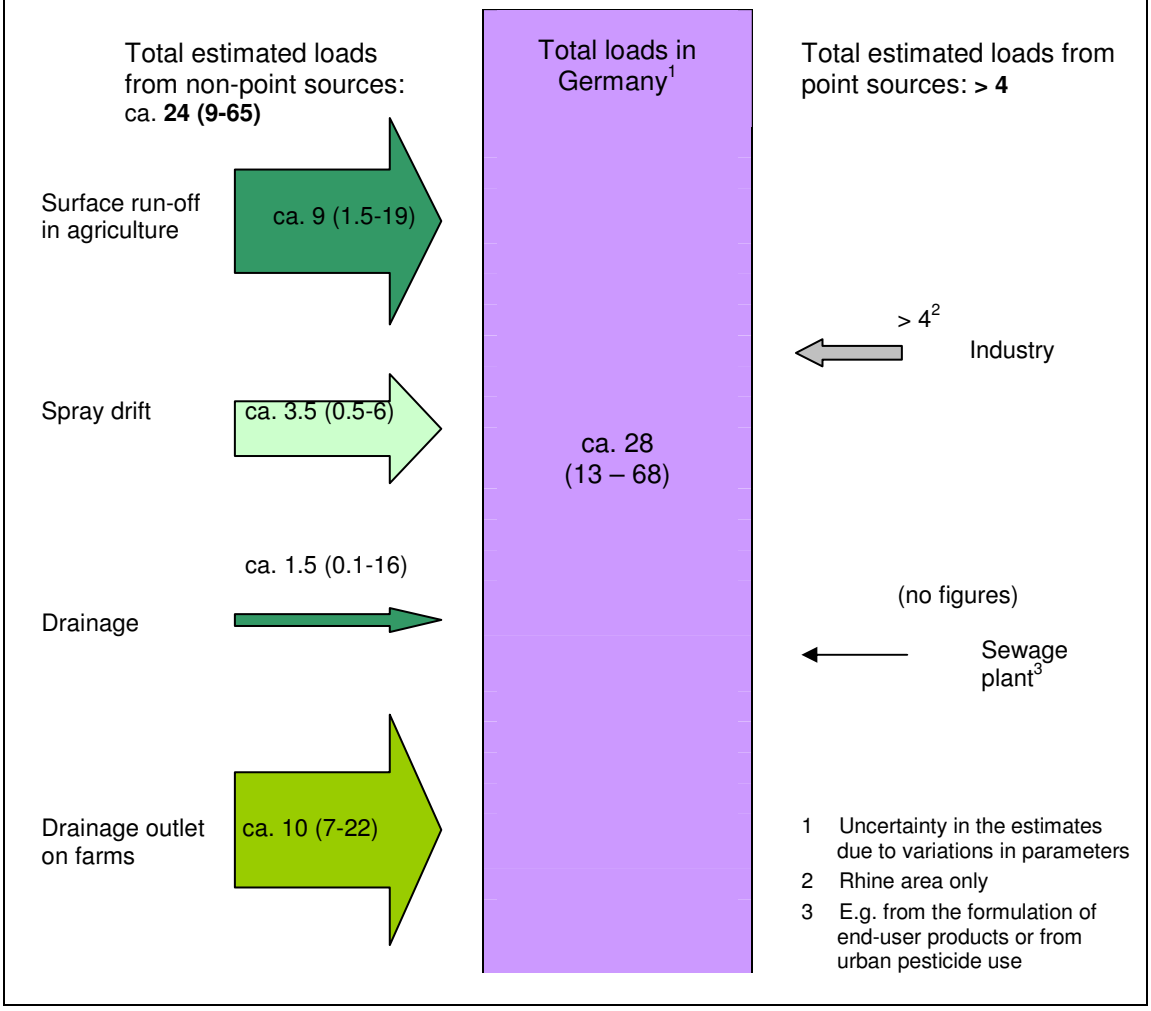
In the year 2000 the German Federal Environmental Agency (UBA) concluded: “Each year approximately 30 tonnes of pesticides enter the lakes and rivers in Germany. This is only about one thousandth of the total amount that is applied. However, these small amounts of pesticides can damage the ecosystems of the surface waters”.(21) On the basis of models using data from 1993-1994 it was calculated in 2000 that about 24 tonnes of pesticides reaching the surface waters in Germany were from non-point sources. This estimate includes pesticide loads transferred to the surface waters from arable land, vineyards and orchards. The proportions found for different transport routes of pesticides were 6.3% for drainage (from tile drains), 14.5% for spray drift, 37.5% through surface run-off and 41.7% via the drainage outlet on farms.(22) By carrying out closer examinations it was found that emissions from drainage outlets on farms due to inappropriate rinsing of spraying equipment or packaging accounted for the major source of pollution of the surface waters with pesticides. Based on measurements it was estimated that from each farm and during one season an average 30 grams of pesticide (active substance) were discharged into the sewerage – and transferred to sewage-works - but also directly into the surface waters. This amount, corresponding to less than a cup for each of the individual farms, is sufficient to contaminate and to render unfit for use the volume of drinking-water that is consumed on a daily basis by two million people.(22)

The Institute for Landscape Ecology and Resources Management at the University of Giessen has developed a model for the Federal Environmental

Agency , which can be used for making a prognosis of the pesticide loads transferred to the surface waters from non-point sources in agriculture.(23) The model “DRIPS” (abridged name for 'Drainage-Runoff-Spray drift Input of Pesticides in Surface Waters') describes the pesticide loads from non-point sources including drainage, surface run-off and spray drift. Any emissions through drainage outlets on farms and crop cultivation systems other than arable land are not covered by this model. For the year 2000 the pesticide loads calculated with DRIPS were the following: 15.0 tonnes through surface runoff, about 0.2 tonnes via drainage (tile drains) and about 0.04 tonnes through spray drift. These data make it clear how the problems caused by pesticides in surface waters may arise. On arable lands runoff from topsoil is the main route of transfer to surface waters and it was found in other studies that this is also the case with viticulture. With specialty crops and orchards spray drift during application also contributes significantly to the total loads transferred to surface waters.(23)

In the state of Niedersachsen (Lower Saxony) the Agency for Ecology (NLÖ) published data on the levels of pesticides in Lower Saxon rivers between 1994 and 2001. It was concluded that “on the course towards sustainable development further efforts are necessary to reduce the pesticide loads in the environment”.(24) Daily, the larger rivers Elbe, Weser and Ems carry pesticide loads on the order of several to dozens of kilograms, and the limit for pesticide concentrations as well as quality standards are still often exceeded. Within the monitoring programme for rivers in Lower Saxony water samples were analysed for 123 pesticides in total, from which 9 were metabolites (degradation products). Out of these, 113 substances were detected at concentrations above their respective limit of detection. The river Elbe continues to carry the largest loads of pesticides but since 1997 these have decreased significantly from 60-90 kg per day to about 25 kg/day. In the other rivers that were analysed the daily pesticide loads were smaller: in the Weser 5-20 kg/day, in the Aller 5-15 kg/day and in the Ems 1-12 kg/day, and the data shows an increasing tendency. However, the water of the Weser and Aller was more contaminated than that of the Elbe as the pesticide concentrations were higher in the former two rivers. 46 substances exceeded the drinking-water limit of 0,1 µg/l at one or more measuring sites.

Fig. 2 Estimated pesticide loads transferred to surface waters in Germany 1993/1994, amounts in tones (t)



(Adapted from: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Wasserwirtschaft in Deutschland, Teil 3: Emissionen in die Oberflächengewässer un Meere, 2001)

Which pesticides contaminate the water?

The following active substances were identified as the "top ten" that most frequently exceeded the drinking-water limit: aldicarbsulfon, isoproturon, diuron, metamitron, desisopropylatrazine, atrazine, chlorotoluron, methabenzthiazuron, amitrole and dimethoate. The most exceedances were measured for aldicarbsulfon, one of the major metabolites of the aldicarb. Aldicarb is a carbamate that is used as insecticide and nematocide and is highly toxic. Its application has been partially prohibited for a long time, while in soil treatment, tree nurseries and strawberry propagation its use was still allowed in Europe until 2003. Since then aldicarb is not authorised any more in the EU (not included in Annex I to the authorisation directive

91/414/EEC).(25) These findings prove that pesticides are used illegally in Saxony that are not authorised in the EU any more and that authorised pesticides are being used inappropriately.

For 38 pesticides that are relevant to drinking-water supplies the German Workgroup on Water (LAWA) established quality targets for pesticides to evaluate the quality of surface waters, to protect the quality of drinking-water and also aquatic organisms and ecosystems. Regarding the protection of drinking-water quality the threshold of 0.1 µg/l applies to all pesticides. About 30% of the German drinking water is obtained from surface waters, e.g. from dammed-up water in rivers. Aquatic ecosystems or communities of aquatic organisms are particularly sensitive to pesticides. Quality targets for the protection of aquatic ecosystems are established for each substance individually on the basis of eco-toxicological tests. During the period between 1996 and 1998 the measured levels for five substances exceeded the quality targets at more than 25% of measuring sites, while levels were sporadically exceeded for 27 substances. Only six substances kept to the quality targets at all measuring sites.(26)

This situation has barely changed over the following years. From 2000 to 2002 only for eight substances were the pesticide levels below the quality targets at all sites where water was analysed by the Workgroup. Five pesticides again exceeded either the quality targets for protection of aquatic ecosystems (A) or the drinking-water limit (D) at over 25% of sites: dichlorvos (A), diuron (A), fenitrothion (A), isoproturon (D) and tributyltin (A).(26) Out of a total of 38 pesticides 25 were detected sporadically. Pollutants were also detected when the pesticides were “applied according to good agricultural practice”.(27)

The European Water Framework Directive aims to achieve until the year 2015 the good ecological status of water bodies, including surface waters. So that the directive can be implemented an inventory of the pollution of surface waters is currently being taken and the effects on the condition of the surface waters are being assessed. The DRIPS model will be employed in this inventory. From 2006 on these assessments shall be supported by monitoring programmes; by the year 2009 measures will be decided and until 2012 they shall be implemented. So as to keep to the quality targets and be able to reach the objectives of the Water Framework Directive action is required in different fields and the causes of pollution need to be tackled at their origin. Measures that are needed for addressing the main problem of improper disposal of the remains of unused pesticide include the improvement of spraying equipment so that spray drift is reduced, better education of farmers and services offering advice, together with improved controls. Additionally, at the stage of authorisation of pesticides already, the authorities need to employ models for estimating the amounts that get into the surface waters. And it is unacceptable that pesticides are transferred to surface waters despite adherence to 'good agricultural practice'.

However, from experience one may not expect too much without making an effort. PAN Germany believes that in future so as to prevent damage the

problems related to crop protection should be dealt with at a much more fundamental level. Guidelines on 'good agricultural practice' should have much greater reference to those methods in agricultural cultivation that enable the use of pesticide to be significantly reduced or even completely stopped. As a result not only the aquatic communities and our water resources will be protected from being contaminated with pesticides but also costs for the agricultural producers and governments will be reduced.

Non-chemical production benefits biological diversity

Numerous studies that compared conventional and organic production have shown that the methods in organic farming clearly benefit the biological diversity of agrarian ecosystems and adjoining communities, e.g. in surface waters. An important reason for this is the complete abolition of synthetic pesticides in organic agriculture.

Species diversity or biodiversity has an intrinsic value that needs to be protected so that it can be maintained. Thus in 1992 the Convention on Biodiversity, an agreement of the United Nations, became effective. Its objectives are to conserve the species diversity and genetic resources. Biodiversity is an essential aspect of stability in ecosystems on which human beings depend. At a conference in 2001 attended by the ministers of environment in Göteborg the European Council decided to introduce an 'European Strategy for Sustainable Development'.28 Under this new policy the Member States of the EU have committed themselves to take measures for bringing the loss of species and of biodiversity to a halt.

Surface waters in catchment areas that are cultivated by organic standards or used extensively as pastures are not contaminated with pesticides or contain significantly lower levels than surface waters with adjoining land that is cultivated by conventional methods. It was found that this had a positive effect on colonization with animals by a group of researchers at the University of Braunschweig who studied the impact of the pesticide levels on invertebrates living on the riverbeds of streams in agricultural areas.(29) In 1996 and 1997 surface waters surrounded by arable land cultivated with methods of integrated production (including use of synthetic pesticides) were compared to surface waters close to land cultivated by organic standards or used as extensive pastures. Measured levels of insecticides, fungicides and herbicides differed. In areas with integrated production pesticides were detected in water samples at 46 measuring sites and at 10 of these sites the water contained insecticides. Surface waters surrounded with land cultivated by organic standards or used as pastures contained one pesticide (epoxiconazol) and only at 3 sites. This fungicide may not be used in organic agriculture and therefore it seems likely that it had been transferred through surface waters from a neighbouring region with conventional production. In 1998 and 1999 water was analysed for pesticides in fourteen small rivers, thirteen of which lay in an area with intensive agriculture, while another river surrounded by meadows that were not cultivated served as a reference. About 75% of water

samples contained detectable levels of fungicides (among others azoxystrobin), herbicides (e.g. isoproturon) and insecticides (e.g. parathion). Active substances that were most frequently detected were three fungicides (azoxystrobin, epoxiconazol, kresoxim methyl) and two herbicides (ethofumesate, chloridazon).(29)

Do pesticides cause reductions in biological diversity?

Biological examinations have also revealed substantial differences. Rivers in areas with organically cultivated land or extensive pastures were colonized by more species typical of natural environments and the water quality was significantly better than in catchment areas surrounded by conventionally farmed land. The species distribution in aquatic communities had adapted to the short-term disturbances from chemical pollutants by shifting towards a greater proportion of less sensitive species. In surface waters that were not contaminated 20 sensitive species were found and their proportion of the overall abundance of species was 70%. In the river that served as a reference the proportion of sensitive species was 90%, while in contaminated rivers only 11 sensitive species were found with a proportion of 47%. Particularly species with a long generation length were found to be sensitive. Species where reproductive activity extends over several years recovered significantly less well than species with a short generation length. In rivers that were contaminated with pesticides no species at all were found that were not annual. This indicated that the pollutants have a large impact. To summarise the species distribution was seen to shift towards species with a shorter generation length (see above) that were less sensitive physiologically in rivers contaminated with pesticides.(29)

It is an important issue whether similar observations can be made in agro-ecosystems. English Nature and the Royal Society for the Protection of Birds have compiled data on this in recent studies in Europe, Canada and New Zealand.(30) In 76 separate studies the changes due to organic farming methods were compared in groups of species (soil bacteria, arthropods, worms, beetles, birds and mammals). The overall conclusion of these studies comparing organic and conventional farming was clear: organic farming had a positive effect on biodiversity in each link of the food chain, from simple bacteria to mammals. E.g. regarding soil organisms, from 99 separate results 66 found that organic farming was beneficial to biodiversity, while only 8 results found the contrary and 25 were inconclusive or found no differences between organic and conventional production. It was concluded by the authors that predominantly the reduced use of pesticides or their abolition in organic farming led to an increase in biodiversity. Factors that also contributed to this result were, among other reasons, the conservation of hedges (as a natural border) and cultivation methods that support wild species.(30)

3. Pesticides and health

Since pesticides were first used it has been known that their use is connected with risks to human health. However, little was known at the beginning about the way in which health is damaged by pesticides. Mainly acute poisoning and the accumulation in body tissues caused concern and led to restrictions and prohibitions of several pesticides that were considered to be particularly hazardous. Recent research has revealed more, previously unknown, facets of negative health effects. The following sections discuss current scientific knowledge and also show the intricate impacts that pesticides can have on human development and health.

Earlier findings on health effects corroborated

“Infertility, impairment of the immune system, premature or still births, abnormal development or behaviour, chronic illnesses of the nerve system and cancer have been associated by a growing number of scientific papers with long-term low intakes of pesticides and also with their proper use. The

spraying of insecticides in general has been classified as probably carcinogenic to humans by the International Agency for Research on Cancer (IARC)".

This statement made by PAN Germany in the preface to a book published over ten years ago summarised the knowledge at that time on the health effects of production systems based on pesticides. It was pointed out that this issue nevertheless only received little attention in the public health policies in Germany.(31) In 2004 a group of researchers presented a review of literature commissioned by the Ontario College of Family Physicians (OCFP), which shows clearly that in view of research over the last decade there is no doubt about the damages caused by pesticides.(32) However, in Germany it appears that health protection regarding the hazards of pesticides has not been adapted to the current knowledge. The Canadian authors reviewed the findings on pesticides and health published in scientific papers between 1992 and 2004 and came to the following conclusions:(30)

- Many studies found a significant association between the exposure to pesticides and the development of cancer of the brain, prostate, kidneys and pancreas.
- 2,4-D and other chlorophenoxy herbicides led to an increased incidence of non-Hodgkin lymphoma.
- Pesticide exposure and leukaemia were found to be significantly associated in the review, and therefore the OCFP deemed immediate action was necessary.
- Scientific papers presented consistent findings regarding the association between certain types of pesticides and illnesses of the nervous system or mental disorders.
- Occupational exposure of parents to pesticides was associated with birth defects, stillbirths and abnormal development of the foetus.
- Children's health was particularly affected by pesticide exposure and also indirectly through the exposure of their parents.

Are we sufficiently protected from Pesticides?

The Ontario College of Family Physicians drew clear conclusions from the results of the studies reviewed. It was urgently recommended to avoid pesticide exposure as far as possible. In addition the recommendation was made to use biological methods for controlling pests and to wear appropriate personal protection (e.g. a respirator during the indoor application of synthetic pesticides!). On the basis of the review it was also recommended that family physicians ask patients whether they could have possibly been exposed to pesticides, particularly if patients complained about non-specific symptoms such as fatigue, dizziness, lack of energy, weakness, sleeping problems, anxiety or depression.

Protection of children's health most important

In the US it was calculated that children may be exposed to and come into contact with 15,000 different synthetically manufactured chemicals including pesticides that have been developed during the last 50 years.(33) This shows that there is a need for applying the precautionary principle in practice, also regarding the use of pesticides.

The exposure to synthetic chemicals or xenobiotics starts early in the mother's womb as these may pass through the placental barrier and enter the foetus' circulation. But exposure also includes the consumption of pesticide-contaminated food, inhalation of pesticides in air (from recently sprayed fields) or biocides (e.g. from indoor use) and skin contact with objects or surfaces treated with pesticides (e.g. sprayed plants in a field, treated wood, etc). On the other hand, allergies have increased among children over the last decades. Diseases that also occur more frequently today include asthma, leukaemia, brain cancer and abnormal development of the brain. Multiple exposure to chemicals is certainly not the only cause of this, but it is an important question which proportion of these diseases is caused by chemicals and how it can be reduced.

Foetuses and children are considered to be groups that are more sensitive towards chemicals. Not only do children react differently to chemicals than grown-ups, but they are also granted more protection by society. Scientific knowledge on the one hand and goals for protecting children's health defined by society on the other must be distinguished from one another. The European Environmental Agency and the World Health Organization have drawn attention to the issue of children's health and during the last ten years more scientists have carried out research on this topic. In Germany it was given particular attention since 1999 within the 'Action Programme for Environment and Health' developed by the Federal Ministry of the Environment (BMU) and the Federal Ministry of Health and Social Security (BMGS) (website at http://www.apug.de). The problem of children's exposure to crop protection chemicals was discussed at the international level in 2001.(34) An overview of the environmental health risks to children (35) and extensive reviews of literature have been published.(36)

Research has made it clear that children are not simply “small grown-ups” but that they present a mixed group that consists of very different individuals. Additionally, it has become evident that so far little is known about the specific effects of chemical substances in the organism of a child, not only in general but also for the individual substance. At the ages between one and five years children eat three to four times as much food and drink about five times as much as grown-ups in relation to their weight. Children consume about nines times the amount of milk during one day per kg body weight as a grown-up. As children also live on a less varied diet, the consumption of apples can be up to twenty times higher for children than for grown-ups. Residues of pesticides that lie below the maximum residue limit can, as a consequence of the particular eating habits of children, lead to an intake of pesticide amounts

above the acceptable daily intake or acute reference dose. An acceptable daily intake (ADI) is established to indicate the chronic hazard that may result from the long-term intake of a chemical in diet, while an acute reference dose (ArfD) characterises the potential short-term hazard.*

Also the breathing frequency differs in children and must be taken into consideration when exposure via inhalation is assessed. Compared to the respiratory volume and the weight of grown-ups an infant breathes in about 1.5 times as much air. Regarding the absorption of substances through skin it must be borne in mind that this proceeds more easily and rapidly in children than in grown-ups and also that the body's surface is larger in proportion to its weight. In the meantime it was shown that an additional intake of substances is due to the fact that children take fingers or foreign objects into their mouths. Another aspect is that, depending on age, the rates of metabolism and excretion are different. Children up to the age of five usually have a higher metabolic rate than grown-ups, while a substance remains for a longer time in the system of infants and babies (up to the age of one year) as the kidneys are still developing.

Are children particularly at risk?

These aspects mean that children are exposed to environmental pollutants to a greater extent than grown-ups, while children at a certain age can metabolise and excrete these substances more rapidly or less well than grown-ups. Additionally a higher metabolic rate can lead to metabolites that are also toxic (eventually more so than the substance). The particular hazard to children is due to the fact that children are still growing and that this process can be disrupted, delayed or altered in other ways by pollutants and residues. The development of organs, e.g. the kidneys, brain or sexual organs, presents a critical stage regarding toxic effects of pesticides and environmental chemicals. During this sensitive phase the structures that are required for providing vital functions are growing. If the cells of an organism are influenced by toxic or endocrine disrupting chemicals during development, or also later during life, there is a risk that irreversible malfunctions occur or that the sensitivity to various chemicals increases. Hormones are substances of the body with a signalling function that can be disturbed by certain chemicals (see below). Depending on the type of organ that is affected in its development the intelligence, behaviour, immune system or reproduction can be impaired.

Children have many years of life ahead, during which further exposure to pollutants or residues occurs and chronic illnesses may appear that can be traced to exposures at an early age. These early exposures, e.g. to pesticides, are more likely to cause illness than a similar exposure later on. It can take years or even decades between exposure and the appearance of symptoms of ill health. This makes it virtually impossible to prove a causal relationship and demonstrate that a particular agent is the cause of a certain effect. Despite the great dissimilarity between individual children, and possibly also in part because of this, the World Health Organization and the European Environment Agency came to the following clear conclusion: “the foetus,

infants and children are more vulnerable, both quantitatively and qualitatively, to pesticides than adults and are also more exposed".(37)

Unfortunately the Action Programme for Environment and Health in Germany does not make such a clear statement. Its position is that children shall be studied further, divided into different age groups, to fill in the gaps of knowledge. On the other hand, it is deemed that current procedures for establishing limits or quality targets for chemicals take children into consideration sufficiently.(35) However, the review by Schneider et al (2002) recommended to consider the differences in the sensitivities between children and grown-ups in the establishment of threshold values; it is not clear why this has not been born in mind. The authors stated: "It is barely possible to consider differences in the sensitivities of organs in a systematic and empirically founded way. A factor for extrapolating toxicodynamic* differences would have to be applied to all age groups of children. It would increase the conservatism and therefore the level of protection (...) Such a factor would be comparable to the optional factor that is applied where the data is insufficient, e.g. on reproduction toxicity" (Schneider et al 2000, p. 197).(36)

The precautionary approach means that measures to reduce the risk are taken also where there are gaps in scientific knowledge, i.e. already on the basis of suspected evidence. One of the measures for this is the revision of current procedures for the establishment of threshold values. The most effective way, however, is to avoid the exposure to synthetic chemicals. In Germany the reduction programme in crop protection presents an opportunity to make the necessary improvements in this area.

Pesticide residues in food from conventional production on the rise

There is an upward trend in the residues of pesticides in plant produce. For particular combinations of plants and pesticides a health risk cannot be excluded. Compared to other countries in the EU the food in Germany contains pesticides at above-average levels. Thus the results can be summarised in the report of the European Commission on the monitoring of pesticide residues in plant- origin foods for the year 2002.(38)

In the EU and the EFTA the proportion of samples of cereals, fresh fruit and vegetables that contained no detectable pesticides decreased from 64% in 1999 to 56% in 2002, as a consequence of monitoring programmes at the national level of the member states. During the same period the proportion of samples with residues below or at the national or the EU's maximum residue limits (MRLs) increased from 32% to 38%. On average, in the EU the proportion with residues above the MRL continued to increase from 3.0% in 1996 to 5.5% in 2002. In the Netherlands residues exceeded the MRL values most frequently (16.4% of samples), followed by France (8.9%) and Germany (8.7%). The German programmes for monitoring and controlling residues found increasing levels of residues in imported food over the last few years. The MRL was exceeded in about 12% of samples in the foreign produce, while in an additional 51% of samples pesticides were detected at the MRL or below. The corresponding figures for German produce were 5.1% and 38.9%, respectively, close to the European average. The upward trend was more pronounced for multiple residues. Since 1999 samples in the EU containing residues of more than one pesticide rapidly increased to 20.7% at an average, which is close to the highest proportion of about 22% found in 1996. Germany and the Netherlands each had the highest proportion of 31% samples with multiple residues. About 1.9% of food samples in Germany contained eight or more different pesticides).(38)

Are residues below the limit harmless?

There appears to be a tendency to avoid exceeding the maximum residue limit of an individual substance by using several pesticides, each at a lower dose. However, this leads to a greater risk of combination effects arising that are mostly unknown until now. It is obvious that the current guidelines for good agricultural practice are unable to control this tendency. However, it is indirectly supported in risk assessments and the establishment of limits by the authorities because of the customary examination of individual substances.

Is there an acute risk from pesticides in food?

At the same time the acute risks to health of consumers are increasing. Referring to the coordinated EU programme for controlling residues the report of the European Commission concluded that "On basis of the results of the acute exposure assessment a health risk cannot be excluded, especially for vulnerable groups".(38) The acute reference dose or ARfD denotes the amount of a substance that can be consumed within a short time (such as a meal or during one day) without that this is expected to present a risk. So far, ARfD values have been established only for a few pesticides. For the produce that has been selected for monitoring in the EU (pears, bananas, beans,

potatoes, carrots, oranges, mandarins, peaches, nectarines and spinach) the estimated intakes of pesticide residues were between 3% and 411% of the acute reference dose for grown-ups and between 10% and 477% of the ARfD for toddlers. It was estimated for infants that the intake in beans of methamidophos was 477% and the intake of methiocarb was 441% of the corresponding ARfD values. Other types of vegetables contained dangerous levels of certain active substances. E.g. for children the ARfD was exceeded for a number of substances and vegetables: methomyl in spinach (456% of the ARfD), oxydemeton methyl in spinach (404% of ARfD), triazophos in oranges (393% of ARfD), methidathion in oranges (125% of ARfD), parathion in peaches (161% of ARfD) and diazinon in carrots (103% of the ArfD).(38)

The most frequent exceedances of the maximum residue limit were found for a group of pesticides that include maneb. These fungicides are from the chemical class of dithiocarbamates and are used against different fungal diseases.

Due to the fact that pesticide residues are found more frequently in food there has been an increase in the reports within the 'rapid alert system' of the EU. This alert system serves to exchange information on measures that need to be taken to reduce health risks of food and animal feeds.(39) Regarding pesticide residues there were 43 alerts in 2002, which were sent to the member states of the EU. On the other hand in 2001 there were “only” 13 alerts and 61 notices to inform member states. An alert signifies that there is a risk to health of the consumers, while notices are exchanged when contaminated produce is not on the market or the risk is considered to be low. Produce from Europe was objected to about twice as often than produce imported from outside of Europe. The most objections were caused by the active substances chlormequat and methamidophos. 27 notices concerned methamidophos, and 9 out of these were alerts, particularly in paprika imported from different countries. High levels of chlormequat in carrots, pears, tomatoes, paprika and in baby food led to 60 notices and 20 alerts.(38)

PAN Germany considers the EU's rapid alert system to be an invaluable tool for addressing short-term problems with food quality. However, the authorities try with all means to play down the increase in pesticide residues detected in food. Attempted explanations in the end do not achieve to reassure the general public. E.g. when the increase of alerts is said to be due to the fact that more use is being made of it by the member states there remains the question, how often contaminated food ended up with the consumers unknowingly in the past and how often this still occurs. Similarly, the argument that measurements are being carried out more extensively and also with a greater sensitivity or that maximum residue limits have been revised over the last years is not convincing. Obviously these aspects must be considered in surveys based on statistical methods, however, the problem does not arise only from closer inspection. In addition it is evident that controls of residues continue to be lacking in Germany and other countries. Food quality is still not monitored sufficiently.

There is a need for government measures. In factual terms this includes extended resources and personnel of the authorities controlling food quality at the national level, improved coordination at the national level and greater transparency. Moreover multiple residues need to be evaluated at the regulatory level and compulsory limits must be established for these due to potential effects from synergistic effects. So as to avoid that multiple residues of pesticides in agricultural produce turn into an increasingly complex cocktail it is necessary to modify the 'good agricultural practice' and change to a “pesticide avoidance practice”, to improve the education of farmers and to promote organic farming more as this presents the best alternative.

4. Pesticides in the environment and health

The use of pesticides causes damage both to human health and to the environment. In this section two different aspects are covered: on the one hand the problem of mixtures of substances and the risks of combination effects (synergistic or additive interactions), on the other one the problem of endocrine disrupting chemicals. These issues show that there are two fundamental problems of risk assessments: the long period between the first findings by research of undesired effects and the implementation of regulatory measures, and a necessity to realise that all potential or actual hazards can never be identified in advance. Both of these are important reasons why pesticide use reduction presents a strategy for preventing damage from occurring.

Combination effects of pesticides and the increased risk of mixtures

Pesticides and other chemicals are not present as the individual substances in the environment but all environmental media (soil, water and air) contain pollutants in mixtures. Between 1990 and 1999 out of nine pesticides sought for in the river Rhine close to Bad Honnef three were detected simultaneously at an average, while up to seven out of nine were detected during peak measurements.(40)

The fact that several substances occur is no coincidence but results from the systematic use of pesticides in agriculture or gardening. Pesticide products for end-use, especially herbicides (weed-killers), often contain several active substances. A close look at the ingredients of herbicides shows that diflufenican, one of the most-sold substances in Germany, is formulated mixed with other substances such as mecoprop, isoproturon, furtamone, flufenacet or ioxynil. Usually a product contains two to three active substances. On top of this it is common in agricultural practice to apply different products in the spray solution, i.e. tank mixtures often contain more than one product. During one season a crop is frequently treated several times and with different pesticides in the sequential treatments. Run-off after rainfall can transfer various pesticide residues into surface waters and leads to the contamination of aquatic organisms with a chemical mixture.

Can pesticides become more hazardous in mixtures?

While it is presumed that the systematic use of several pesticides is more effective in a combination, this aspect is generally not considered by risk assessments. Either it is doubted that scientific methods are available for

assessing the risks of combination effects or the relevance of these effects for the assessment of hazards and risks is questioned. Regarding the latter it is argued that the concentrations of pollutants or residues are low and clearly below the lowest level at which an effect is observable. Although it has been allegedly stated that there was no toxicological evidence of combination effects for pesticides this is contradictory to far-reaching measures such as the halt to sales for 'Lipobay', a medicament against high cholesterol that led to serious damage in combination with other medicaments.. Other less noticed findings include the damage to organisms in sea sediment caused by oil residues, which was due to mixtures of polycyclic aromatic hydrocarbons that were not toxic each individually.

Scientific research has studied the combination effects of chemicals for over 100 years and in the meantime suitable procedures have been developed for assessing future hazards. Some of these procedures are already being applied within risk assessments for regulatory purposes or have been proposed to be used, e.g. by the US Environmental Protection Agency.(41) The following procedure is simple: each limit, threshold or quality target is divided by the number of components in the mixture that are being considered. Thereby the addition of effects caused by several substances is accounted for and it would be feasible to assess the risks from chemical mixtures. However, if a 'combination effect' leads to an intensified overall effect (greater than the sum of the individual effects) then the outcome will be worse than expected. This is due to (synergistic) interactions between the individual substances and cannot be ruled out in principal. E.g. when malathion and alcohol are absorbed at the same time the toxicity of the insecticide is increased.

Low-dose risks from endocrine disrupting pesticides

A considerable number of chemicals used in industry and pesticides are suspected to have hormonal (endocrine) effects. Endocrine disrupting chemicals (or EDCs) give cause for serious concern as they can affect the development and regulation process in humans and the wildlife already at very low doses.

Hormones transmit signals to the body and in an intricate manner regulate the development of the brain and other organs, functions of the body and the behaviour. These functions are necessary for reproduction, development and for maintaining a balance in the body (homeostasis). The potential effects of EDCs are manifold. An EDC can be defined as an extraneous substance that is absorbed by the organism and influences the production, distribution, effects or metabolism of the hormones in the body. The direct effect of EDCs is due to the fact that an organism may not be able to distinguish these from its own hormones, such as sex hormones (estrogens and androgens), and that they may have similar effects. Indirectly they can interfere with these and affect the hormone production or metabolism in the body.

Already since the 1940s, researchers have been studying the disruption of hormonal systems in people or wild animals by synthetic chemicals. Obviously the dimension of the effects of these substances was underestimated for a long time. Pesticides and other chemicals were introduced on the market without being tested systematically on potential endocrine effects. Only about fifteen years ago this problem became widely known among scientists and the general public as a consequence of strange and unexpected observations in various animals, especially species living in the sea.

What are hormonal effects?

E.g. female snails showed masculine characters and even the development of male genitals, resulting in infertility (imposex). Globally more than 120 snail species living in the sea or in freshwater were affected. One of the substances that caused this was tributyl tin (TBT), a biocide that is used as an antifouling agent and growth inhibitor on ships' hulls. Similar organotin compounds were authorised in Germany up till the year 2000 as pesticides. Changes in the function of thyroid glands in fish and birds, decreases in the thickness of eggshells and birth defects among seagulls and swallows have been linked to endocrine chemicals that are degraded slowly in the environment, such as the insecticide DDT and polychlorinated biphenyls (PCBs). DDT and dicofol, another organochlorine insecticide, are suspected to be the cause for abnormal hormone concentrations and malformations in the sexual organs of alligators. These represent a small part of the endocrine effects that have been observed, meanwhile the hormonal effects of chemicals have been reviewed extensively.(42), (43) An upward trend of negative health effects has been observed in the population of Western nations and this has been linked to, among other causes, endocrine disrupting chemicals. For the following health effects EDCs are suspected as the cause (among others):

- Reduced fertility (due to the increase of abnormalities and growths in the ovaries, impaired or reduced number of sperm cells, incomplete development of the testicles)
- Disruption of the thyroid hormone system
- Increasing incidence of cancers of the breast, prostate and testes

It is particularly problematic that endocrine disrupting chemicals can also have an effect at concentrations in the same order of magnitude as the body's own hormones do, i.e. in an order as low as one part per trillion (ppt, or nanograms per kg). This means that even extremely low doses such as those of pollutants present in the environment (the “background pollution”) can affect an organism. E.g. it was found in laboratory studies that atrazine caused the feminisation of frogs at a concentration as low as 0.1 microgram per kg (or part per billion (ppb); one microgram (µg) is one billionth of a kilogram) and at 0.2 µg/kg in frogs living in the wild.44 Although atrazine is not authorised in Germany since 1991 this substance and its metabolites still are among the pesticides detected most frequently in groundwater and surface waters. A study in the US comparing men's health in a rural area of Missouri and in an urban area (Minneapolis) found a significant association between exposure to

pesticides and reduced counts or health of sperm.(45) The association was most significant for the herbicide alachlor, followed by diazinon (an insecticide) and the herbicides atrazine, metolachlor and 2,4-D. As only two of the participants in this study were farmers, the conclusion was drawn that the main source of exposure was the drinking-water.(45)

The foetus, babies and children are particularly at risk to EDCs as crucial development processes controlled by hormones take place at this age, including the development of the brain, immune system and other organs. A review of literature concluded that during these stages an organism exposed to EDCs is rendered more susceptible to other substances that are carcinogenic, while their effects (growth of a tumour) may not become visible until a considerable time (even years) after the exposure.(46) In the year 1999 the European Commission first pointed out to the Council of Europe and the European Parliament that it was necessary to address this issue. In 2000 a list of suspected EDCs was compiled by the European Commission. It contains about 550 chemicals, from which 189 are pesticide or metabolites of these.(47) Out of the suspected pesticides 53 were authorised in Germany in 2001, while 22 additional pesticides that were not authorised continue to be detected in surface waters or food in Germany.(48), (49)

In 2002 €20 million were put aside for a series of projects entitled 'CREDO' ('Cluster of Research on Endocrine Disruption in Europe'). Some projects are addressing the problem of synergistic interactions between EDCs and test procedures are being developed that are consistent and generally accepted and therefore can be applied within regulatory evaluations. This is a prerequisite for making the examination of pesticides regarding potential hormonal effects compulsory within the authorisation procedure.

The issue of EDCs exemplifies that there is a great extent of uncertainty when the negative effects of chemicals are to be recognised and assessed. It also illustrates clearly that it takes a long time until problems that have been recognised as such are included in the regulatory evaluation of substances. However, because no one knows the extent of the effects from an uncontrolled and unwanted long-term “experiment” with people and the environment, there is only one way to prevent potential harm: the reduction of the amount of chemicals entering the environment. With pesticides this goal can only be reached with an effective programme for reducing their use.

5. Trendsetters and advocators for change

It is not new that people are giving second thoughts to the use of toxic chemicals in crop protection. Doubts appeared already at an early stage when chemical methods for pest control were spreading in agriculture but these could not hold up the advance of the chemical methods during half of a century. Over the last decade it has become evident that it is advantageous to avoid the use of chemicals in agriculture and the trendsetters and advocators of the systematic reduction of pesticide use are growing in numbers.

Organic food found to be healthier

Recent studies prove that organically grown food is significantly less contaminated with pesticides and that it is also healthier as it contains more vitamins and minerals than food from conventional production. As a result the consumption of organic food is beneficial to health in many respects.

In 2003 the Austrian Association of Organic Farmers ('Bio Ernte Austria') commissioned a study that compared the quality of food from organic and conventional production.(50) In contrast to earlier studies this study attempted

to be comprehensive and reviewed the results of 175 international studies. Although the authors thought the comparability of food samples was limited in most of the studies and called for the collection of improved data, they could mostly obtain very clear results from the available data. Two aspects were emphasized: food from organic production had a higher content of beneficial minerals and vitamins (such as vitamin C) and also of other compounds (secondary plant metabolites) than food from conventional production. In addition organic food contained significantly lower levels of pesticides, nitrates and food additives. One focus of the study was on the benefit to health from the consumption of organic food. Examinations of mother's milk found that there was a direct relationship between the content of certain compounds and women's diet. Women who ate organic food had increased levels of polyunsaturated omega-3-fatty acids in breast milk, which appear to reduce the risk of cancer and arteriosclerosis. The levels of pesticides in mother's milk decreased when more organic food was consumed. In men on the other hand a greater consumption of organic food led to a 30% increase of sperm counts.(50)

Is organic food analysed for pesticide residues?

Organically grown food is clearly less contaminated with pesticides, while numerous pesticides and other residues were detected in samples of conventional produce. These findings were confirmed recently by another study that measured pesticide levels in organic food.(51) The Federal Association for Organic Food and Commodities in Germany has established a system for monitoring fruit and vegetables in the trade with organic produce. In 2004 during one half-year out of 256 samples of organic food 214 (84%) contained no pesticides at all. In 24 of the samples (9%) traces were detected of pesticides that are not permitted for use in organic production. 7 samples (3%) contained residues of crop protection substances that are permitted in organic production and these residues were below the limit. Especially in fruit and vegetables there is a very large difference between organic and conventional produce. In Baden-Württemberg monitoring of food in 2004 found a significant difference: the average concentration of pesticides in conventionally produced fruit and vegetables was 0.4 or 0.5 mg per kilogram, while in organic food it was only 0.007 mg per kilogram.(520 Eating fruit and vegetables that have been grown conventionally inevitably involves the intake of pesticides, while the background pollution of the environment or drift of pesticide spray does not lead to comparable levels of residues in organic food.

Toxic substances in fungi or mycotoxins present another health hazard. It depends largely on the weather and storage conditions if fungi and mycotoxins develop. E.g. toxins of Fusarium and ergot alkaloids are toxicologically relevant. These substances can cause acute or chronic poisonings and various kinds of damage that can include cancer, deformations or death. It is therefore an important question for the consumer whether organic produce that is grown without synthetic fungicides could be more contaminated with mycotoxins than conventional produce. Recent studies did not confirm this supposition. On the contrary, organic food often came out better. The Biological Research Centre for Agriculture and Forestry

analysed wheat flour sold in the years 1999 to 2003 for Fusarium toxins. The proportion of samples that contained detectable levels of this mycotoxin was 18% lower in organic flour than in flour from conventional production.(53) Another study compared rye and wheat from organic and integrated production over five years (synthetic pesticides are allowed in integrated production). It found that the integrated produce contained detectable levels of toxins from Fusarium more frequently and also at higher levels, some of which exceeded the limit.(54) For the very toxic ergot alkaloids the limit was only exceeded in the whole rye and rye flour from conventional production, while the organic flour contained significantly lower levels in the years 2003 and 2004. A possible reason for this is the prohibition of hybrid crops by some of the organic producers (hybrid strains of are more susceptible to the ergot fungus).(52), (55)

German Advisory Council on the Environment supports pesticide use reduction

In the environmental audit for the year 2004 the German Advisory council on the Environment (SRU) voted clearly in favour of a reduction of pesticide use in Germany.(56) It was suggested by the Advisory Council to reduce the amount of pesticides used by 30% until the year 2008.

In the environmental audit for 2004 the issues of a sustainable use of pesticides and the quality of groundwater and surface waters were discussed, besides political aspects of pesticides. The Advisory Council observed that despite the considerable levels of pesticides and although producers had stated that they would minimize pesticide use in Germany the use has remained at the same high level for over ten years (34,000 tonnes of active substances were used in 2001). It was even estimated in the audit that there had been a “critical” increase in the potency of the applied active substances although the total quantity has decreased. The Advisory Council gave two reasons for this: Up to 30% of the applied amount of pesticides is imported directly (and may not enter the statistics) and modern products may contain new active substances that are effective at lower doses so that one would expect a decrease of the annual pesticide use.

What do the experts recommend?

The Advisory Council also assessed the situation of groundwater quality in Germany. It concluded that due to the continued use of fertilizers and pesticides in agriculture and because evidently the pollutants remained in the soil and groundwater for a long time it could be expected that the pollutant levels in groundwater will increase further. The Advisory Council stated that “a rigorous change in behaviour regarding the use of fertilizers, pesticides as well as veterinary medicaments” was necessary.(56) It also said that there appeared to be not enough willingness among the agricultural producers to introduce such measures on a large scale in Germany.

Pesticide use reduction programme

Current initiatives for a German pesticide use reduction programme and a proposed “Thematic Strategy for a sustainable use of pesticides” in Europe are given much attention. The Advisory Council pointed out the following: “The current regulations within the legislation for crop protection are not adequate to guarantee the safe and minimized use of pesticides. It is a political decision to provide agriculture with a purposeful policy on the basis of a comprehensive strategy for crop protection that clarifies, promotes and strengthens new and already existing possibilities for minimizing the use of pesticides. This strategy needs to integrate the general factors that have an essential influence on the use of pesticides in agriculture (agricultural policy, consumer demands, regulations for environmental protection, competition) in an appropriate way and introduce new factors to encourage innovative and environmental-friendly developments in crop protection”.(56) Although the Advisory Council welcomed the “improvement of crop protection policy” in Germany it criticized that quantitative targets for the reduction within a prescribed period were missing. The demand was made to include the goal of a 30% reduction in pesticide use by 2008 in the German reduction programme, especially in view of the consensus that a reduction can only be achieved within 'good agricultural practice'. As an indicator for reduction the German programme defined the treatment index (established for a number of representative farms) and adherence to the “necessary” pesticide use. According to the Advisory Council this presents a suitable indicator that is compatible with the overall goal of reducing pesticide use. So as to make progress in the pesticide use reduction programme transparent it was considered that reductions in pesticide use that result from the growth of organic agriculture should be communicated separately from the reductions achieved within conventional production. The Advisory Council also pointed to the insufficient consideration given within the EU's Thematic Strategy to different aspects of policy, especially in agricultural policy. It demanded that the EU strategy should prescribe compulsory reduction goals and requirements for national reduction programmes on an EU-wide basis, and that the strategy should also “initiate a course of discussions for defining the criteria for specific crop protection plants in integrated production and integrate the criteria and measures in policy, particularly the EU's common agricultural policy”.(56)

Taxation of pesticides

Regarding the taxation of pesticides, the Advisory Council on the Environment revised its position completely in the environmental audit for 2004. It recommended a levy on pesticides based on the experience gained in a number of countries. The Advisory Council stated that this would “create incentives in the medium- to long-term for developing substances that are less hazardous to the environment”, and that “taxation should be based as far as possible on the environmental hazards of a crop protection product”.(56) Additionally it was demanded to spend the revenue of this levy entirely on research and development of environmental-friendly methods in crop protection and cultivation.

Pesticide authorisation

One of the Advisory Council's main criticisms regarding the current EU Directive for the authorisation of pesticides was that criteria were lacking in the review procedure for accepting or rejecting an active substance. In particular it was pointed out that there were no clear cut-off criteria for hazardous properties such as persistence, toxicity and bioaccumulation, and that the review process did not sufficiently consider the uncertainties in current scientific knowledge (on hormonal effects, combination effects of different active substances or between these and other ingredients and their effect on the environment). It was also stated that when a substance is accepted in the review (and included in annex I of the authorisation Directive 91/414) the “safe” forms of pesticide application were not communicated adequately.

At the national level the Advisory Council focused on the problem of off-label approval. The German crop protection legislation allows pesticides to be authorised also by exceptional proceedings (as provided under §18 'Pflanzenschutz-Gesetz') for other uses than the authorised uses. The Advisory Council deemed that it was not viable to use a pesticide where no other pesticide has been authorised for that use, as due to the fact that pest organisms can become resistant to an active substance or as a consequence of the withdrawal of authorisations the demand for this would appear repeatedly. It thought that the appearance of “gaps” with no pesticide available on the market for a particular use reflected the limited possibilities of chemical crop protection and that the research and development of non-chemical methods of crop protection therefore should be strongly supported.

Moreover the Advisory Council recommended to modify the authorisation procedure for pesticides in Germany with regard to the protection of surface waters, to shorten the period of authorisation (at present 10 years) and introduce the monitoring of new pesticides following authorisation on the market. It also demanded that a prescription should be required for applying broad-spectrum herbicides on non-agricultural areas and that the use of improved application technology with reduced losses of spray solution should be established as a general standard.

Application of pesticides and reduction of use

The Advisory Council stated that current 'good agricultural practice' is not sufficient as a tool for implementing the reduction programme and that good practice needed to meet further requirements, that guidelines for use should be binding and principles of integrated pest management be put into practice to a greater extent. The Advisory Council recommended with regard to the implementation of the reduction programme to provide principles for good agricultural practice on two different levels: regulations for all types of production on a general level (to be presented in a comprehensive way) and specific regulations for the individual crops (i.e. for each crop good practice and integrated methods should be established). The proposed introduction of record-keeping of the amounts of pesticides used on treated plots was supported by the Advisory Council and it considered this as the most important basis for giving advice to the farmers in line with the reduction goals. A scheme for monitoring pollutants in air, soil and surface waters

regularly and at the national level was found to be missing as well as an effective control of compliance with the directions for use of pesticides. In the view of the Advisory Council an essential component of a strategy for a sustainable use of pesticides is the improvement of these monitoring schemes so that the actual extent of pollution with pesticides can be assessed, to guarantee the effectiveness of the programme's tools and to document the progress made towards achieving the reduction goals.

Other countries' experience with pesticide use reduction

Several European Countries realised already years ago that it is necessary to develop policies for reducing use of pesticides so as to protect human health and the environment. Denmark, Sweden and the Netherlands (all three member states of the EU) and Norway together were pioneers in this field. In 2004 the Danish pesticide reduction policy entered into its third phase.

The four states implemented national reduction programmes between 1985 (Norway) and 1991 (the Netherlands). In view of the growing knowledge about environmental and health risks and increasing levels of pesticide residues throughout the environment it was found that a change of policy was necessary. Programmes with different aims, timetable, indicators and measures were developed, depending on the structure of the agricultural production and social and political conditions. It is a common feature of all programmes the presentation of a package of various measures that include the improved education of farmers and agricultural advisers, greater transparency in the use of pesticides and the extent of pesticide residues , promotion of research on alternatives and economic measures such as a pesticide tax. Besides reducing the amounts of pesticides used in agriculture a sequence of progressive risk reduction goals was established and pesticide use was monitored with specific risk indicators in the Netherlands, Sweden and Norway. An overview of the goals, indicators and measures is available in two publications by PAN Europe: “Pesticide Use Reduction is working – an assessment of national reduction strategies in Denmark, Sweden, the Netherlands and Norway” (57) and “Danish Pesticide Use Reduction Programme – to benefit the environment and the health”.(58)

As an illustration, a closer look shall be taken at the Danish programme. The first plan for measures aiming to reduce pesticide use in Denmark began in 1987 and the goal of a 50% reduction until 1997 was defined. Regarding the total amount of pesticides used, this goal was achieved and in the second phase between 1997 and 2002 a new goal was set at 59% reduction (compared to the amount used in 1987). Nearly half the pesticide products were withdrawn from the market or prohibited in Denmark within the Danish reduction programme. In addition to this a tax on pesticides was introduced in 1992. On the other hand, during the same period the amount of active substances used in Germany as well as in the whole of the EU remained nearly constant and at a high level. The intensity of pesticide use cannot be measured simply by determining the total amount of active substances used, however. Many of the newer pesticides are effective at lower doses so that

the application rates (amounts used per hectare) are lower. An additional indicator, the treatment frequency index (TFI), was introduced in Denmark. The TFI represents the average number of times a crop is treated with pesticides (at the recommended application rate). It has proven to be very useful as a significant association was found between the TFI and biodiversity in agro-ecosystems.(59)

The aim to reduce the TFI for arable crops and cereals from 2.6 (during 1981-1985) to 1.34 in 1987 was not achieved by the Danish reduction programme. Therefore further measures were introduced. In the third Action Plan that started in 2004 the objective is to reduce the treatment frequency index to less than 1.7 until the year 2009. The additional measures include compulsory training of agricultural advisers. The advice services regarding crop protection are in a separate unit and independent from the control and monitoring unit. On farms that produce in accordance with the guidelines of the programme other farmers can inform themselves about how to best achieve the reduction goals. In the reduction programme the application doses were targeted and payment was offered to the farmers in compensation for pesticide-free zones, e.g. for protected areas adjoining surface waters.

What can be learnt from the Danish experiences?

In the Danish pesticide use reduction programme three important factors could be identified that were relevant for making progress in pesticide use reduction:

1. Goals for reduction must be thorough and include details at the level of individual farms and different crops, and they need to be made transparent.
2. Farmers need to have access to the latest technological systems that reduce the pesticide use and therefore it is also necessary to offer them expert advice and make available technical information. In addition, the research of non-chemical and integrated crop and pest protection measures should be encouraged.
3. The most important factor in order to gain the acceptance of the farmers is a demonstration that pesticide use can be reduced without financial losses.

In 1999 the Danish Ministry of Environment and Energy commissioned a study that examined the potential advantages of reduced pesticide use in Danish agriculture. The 'Bichel Committee' came to the conclusion that a significant reduction could be achieved without financial loss.(60) A second evaluation in 2003 for the Danish Environment Agency confirmed the findings of the Bichel-Committee and laid the foundation for the third phase of the reduction programme.(61) It concluded that a 30% reduction to a targeted treatment frequency index of 1.3 is possible without financial losses and can be achieved by making use of established application technology without a rotation of crops. It was seen that the actual price of pesticides decreased in spite of the introduction of a pesticide tax. All the same the individual farms' expenses for pesticide application increased (in relation to the profit). Larger

farms (> 100 hectares) had greater expenses than smaller ones. The main conclusion was that it is necessary to continue improving the education of farmers, e.g. to avoid “preventive” or routine treatment, and to introduce and optimize the monitoring of pest infestation and consideration of the economic injury level. Also the practicality of pesticide use reduction should be made clear to farmers, e.g. on visits to other farms.

6. The German “Reduction Programme Chemical Crop Protection”

The preceding chapters presented reasons for why the German Federal Government and all other stakeholders should advocate and support the reduction of pesticide use. The following section recaptures the recent development from the early informal discussions to the deployment of the German “Reduction Programme Chemical Crop Protection” which came into operation at the beginning of 2005.

The long path towards a pesticide use reduction programme in Germany
The first calls for a pesticide use reduction programme were already made in the 1980s. The European Commission included the need for pesticide reduction in the 5th Environmental Action Programme in 1993, while the German Federal Government still refuted the proposition of establishing a national reduction programme in the 1990s. At the beginning of the government period between 2002 and 2006 the Federal Government decided to make an effort to “reduce the use of crop protection chemicals”. The German “Reduction Programme in Chemical Crop Protection” was developed over the following three years and presented to the public in October 2004 by the Federal Ministry of Consumer Protection, Food and Agriculture.(62) The programme became effective in January 2005 and now the task is to organize and implement this programme so that it is effective.

One objective of the 5th Environmental Action Programme of the EU was to reduce the use of pesticides in agriculture “substantially” by the year 2000, however this aim was not achieved. The amounts of pesticides used in the EU even increased slightly. The EU's 6th Environmental Action Programme was launched in 2002 and formulated the aim to reduce the risks of pesticides “significantly” by 2010.(63) So as to achieve this, a “Thematic Strategy on the Sustainable Use of Pesticides is being developed. Like most of the member states of the EU, for a long time Germany did not go much beyond rhetoric when it came to pesticide use reduction. However, after a series of scandals in agriculture, the food processing industry and animal feeds industry the use of pesticides in crop production was added to the political agenda in Germany. The treaty between the coalitions in the Federal Government states in 2002 that “a strategy for reducing the use of pesticides through usage, application method and technology, as well as good agricultural practice” shall be developed.(64)

The “spirit of Potsdam”: progressing towards a German reduction programme

To develop a national strategy for pesticide use reduction the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL) invited over thirty associations to a 'round table conference' in spring 2002 in Potsdam to discuss the guidelines for a future crop protection policy. A second round

table conference took place one year later and addressed specific aspects: the reduction programme, communication and transparency. The statements and results of these conferences in Potsdam were documented and communicated in a transparent way.(65) An external moderator of the discussion was invited and this, although unconventional, was welcomed by most of the participants. Over 60 people attended each conference and due to the impartial moderation an open and genuine discussion developed. This quality soon became known as the “spirit of Potsdam”.

The “spirit of Potsdam” faded away later when the development of a reduction strategy demanded that concrete components of the future programme be decided on. The BMVEL shifted subsequent debates to a smaller panel of advisers, the majority of whom were crop protection specialists, and debates were moderated by personnel of the Ministry. The advisory panel for the reduction programme claimed to give a share to all relevant stakeholders, however in fact the representatives of chemical crop protection dominated the panel. Both the domain of consumer protection and the food retailers were not represented or only partly, although they had been invited. This imbalance in the attendance of stakeholders was due to several factors. The participation in the panel was straightforward for representatives of chemical crop protection as the main topic was central to their work, while for representatives of organic farming the topic was secondary as the use of synthetic pesticides is generally not permitted in organic production. Representatives of the food processing industry, food retailers and consumers, who influence crop protection directly and indirectly, had great difficulty in contributing to the discussions as these focused very much on technical aspects of crop protection. There was no broad debate about social aspects regarding crop protection and its significance in agricultural production systems, its relevance to consumption patterns, the arrangement of food prices, resource management and fostering programmes in agriculture and subsidies.

“Reduction of use” - a controversial phrasing

PAN Germany has demanded that the Federal Government should immediately define the objectives, timetable, indicators and measures for the reduction programme. This demand was comprehensible but by putting it into action different opinions emerged on how the treaty of the government coalition was to be interpreted. The main question was if the term “reduction” denotes a quantitative or a qualitative reduction, i.e. whether the total amount or the pesticides used should be reduced or only individual pesticides with certain toxic properties. Behind these two positions lay different views of the issue of pesticide use in agriculture. The call for a quantitative reduction is based on the opinion that non-chemical methods could be employed in crop protection to a much greater extent even within a short time, and that within the authorisation of a pesticide and the establishment of maximum residue limits not all of the risks were considered (e.g. the effects from combinations of different pesticides). A quantitative reduction is therefore regarded as a consequent realization of the precautionary principle. On the other hand, the supporters of a qualitative reduction presume that generally risks only occur under circumstances where pesticides are not used in an appropriate way. On

the basis of each of these views a different type of reduction programme will be required.

The advocators of a 'quantitative' approach to pesticide use reduction aim to, through structural changes, promote methods of agricultural cultivation that are based on the prevention of pest organisms from establishing themselves. To what extent this can be achieved does not depend only on the farmers' knowledge and practice but also on other factors. E.g. it is important which crop strains are available on the market or demanded by the consumers. Certain strains are more susceptible to pest organisms or may be less suitable for the rotation of crops. On the other hand, the exponents who want to tackle the problem on a 'qualitative' basis assume that the “side effects” of pesticide use are acceptable in general if the pesticides are applied appropriately. And according to this view, the reduction programme should primarily be effective at eliminating any irregularities in the practice of pesticide use.

Crop protection policy versus regulatory controls

Although the two approaches to the problem differ very much and the supporters of chemical crop protection were overrepresented in the advisory panel to the Ministry of Consumer Protection, Food and Agriculture, it was possible within a short time to develop 'Proposals of the advisory panel for a national reduction programme'.(66) These proposals were submitted to the Federal Government in 2003 and included general objectives, measures for the reduction of pesticide use and indicators for monitoring progress of the programme. The advisory panel suggested to reduce pesticide use to the 'necessary minimum' by improving surveillance of the usage of pesticides and monitoring of food residues, by offering advisory services on a larger scale and providing greater transparency in the distribution and sales of agricultural pesticides. It is to be expected that as a result of these measures the amount of pesticides used will be reduced to a certain degree.

However, this approach does not present anything near to a change in the paradigm in pesticide policy. It was unlikely that this could have occurred, as only those factors were included in the advisory panel's proposals that did not meet strong resistance from any of the stakeholder groups. This background is also reflected in the controversial debates on what indicators should be established for monitoring progress in the reduction programme. The panel proposed an indicator that is based on practice in crop protection: the “treatment index”. The treatment index indicates how frequent pesticides are applied on a certain area and is a measure of the intensity of pesticide use. Measuring the intensity of pesticide applications at first is simply a neutral method for monitoring the reduction programme. It obtains a political character only when the reduction goals are established within the programme. The advisory panel could not reach an agreement on a reduction goal and several representatives stated that it was the role of the government to establish such goals.

In the middle-term a risk indicator shall complement the 'treatment index'. So far there is no indicator that describes the risk of pesticide use for the

reduction programme and also satisfies all members of the advisory panel. The proposition was made by PAN Germany to introduce an indicator based on the residues of pesticides in the environment and food. Such an indicator is based on the effects of pesticide use and therefore could serve as a risk indicator. E.g. it would be considered to be an improvement if after the first stage of the programme only 30% of the food samples contained detectable levels of pesticides and not approximately half of them, as is currently the case. The advisory panel appreciated this proposal but the majority of representatives held the view that only the exceedances of the maximum residue limits should be employed as an indicator, and not all detectable residues.

After the proposals of the advisory panel had been submitted to the government in 2003 it was the task of the Federal Government to establish the reduction goals, indicators and timetables. However, the indicator proposed by the panel – exceedance of the maximum residue limits for pesticides in food – brought home a clear message within policy: neither the current system of chemical crop protection nor the procedure of evaluating pesticides were questioned. The indicator only applies to irregularities in food safety, while the exceedance of a MRL is not allowed in any case. PAN Germany therefore held the view that the total number of samples with detectable residues out of a batch of samples should be used as an indicator. What is the reasoning for this? Roughly half of the products of plant origin contains detectable levels of pesticides and this condition reflects the general pollution of the environment with pesticides. Therefore a reduction of the food residues is concomitant with a reduction of pesticide levels in the environment and it results in a reduction of the risks both to people and wildlife. In view of the many uncertainties in the toxicological and ecotoxicological evaluation of pesticides and regarding the effects of mixtures this argument is all the more valid.

With its current indicator 'exceedance of maximum residue limit (MRL)' the “reduction programme” is a regulatory instrument instead of being a pesticide policy. Regarding the indicator 'treatment index' the aim is similarly to eliminate the peaks by tackling the farms that operate with illegal practices or on the border of legality. When the Ministry of Consumer Protection, Food and Agriculture presented the “Reduction Programme in Chemical Crop Protection” in October 2004 it became evident that the programme does not provide any concrete reduction goals.(62) Only 'exceedance of the MRL' is used as an quantitative indicator, while the proportion of all food samples with detectable levels of pesticides (above or below the MRL) is not considered. As a “timetable” the starting date of the programme was defined (2005) but not a target date. With regard to the timetable PAN Germany thinks that the programme urgently needs to be amended.

What did the ministers of agriculture decide in March 2005?

The beginning of the pesticide use reduction programme in Germany signalizes to the States of the German Federation that they must take action as many aspects of crop protection lie within their responsibility. The ministers of agriculture of the states in Germany have committed themselves on paper

at least. The decision made at the conference in March 2005 stated: “[The ministers of agriculture] understand that the use of substances for crop protection can be further reduced by 15% within 10 years in collaboration with the agricultural producers and manufacturers of crop protection substances and allowing for the additional activities of the States. This will lead to a consolidated position of German agriculture on the market and a decrease in the production costs and environmental pollution..”(67)

Following this decision it is now necessary to take action and all stakeholders who can contribute to the reduction of pesticide use are of great importance: farmers, retailers, consumers and the authorities who establish the standards for cultivation methods and produce.

□. PAN Germany's position

For over 20 years PAN Germany has advocated a reduction of pesticide use at the international level, within Europe and in Germany. Since the year 2000 these efforts focused on contributing to an official pesticide use reduction programme in Germany. In the following section three central position papers of PAN Germany (published in 2002 and 2004) are presented. Further information on pesticide use reduction in Germany is available at the website http://www.pestizidreduktion.de (in German).

Three key points for crop protection (Elections for the German Parliament 2002)

The consumers in Germany have experienced a series of food scandals. This will only come to an end when the Federal Government takes concrete steps for detoxifying the system of food production. A reduction in the use of pesticides is essential to achieve this and can be promoted by following three principal key points.

Establish targets to know where we are going!
The 6th Environmental Action Programme of the EU should be considered in pesticide reduction. We demand that all nominees and parties for the election establish clear reduction goals that can be verified, indicators that are comprehensible and practical measures that allow achievement of these goals and include these in the political agenda. Moreover, as pesticides are used under poor working conditions in the developing countries, and people's health and the environment are most affected there, the export of pesticides to developing countries should be made subject to the same reduction goals.

Know what is being used!
In Germany it is not known which active substances are applied to which crops and in which quantity. The new federal law on nature conservation finally provides that the use of pesticides is “documented in accordance with the regulations for agricultural professionals” ('Landwirtschaftliches Fachrecht'). However, this regulation has not become effective so far. We demand that all nominees and parties for the election develop a system for monitoring the use of pesticides immediately. PAN Germany has already presented proposals. Furthermore the export of pesticides must be made more transparent.

Promote research on organic farming!
For years research on conventional and integrated methods of crop protection has been supported by the government. Now the time has come for turning around this trend and promoting organic methods of crop protection from the public purse. After having been set aside for a long time certain problems in this area are slowing down the dissemination of organic farming.

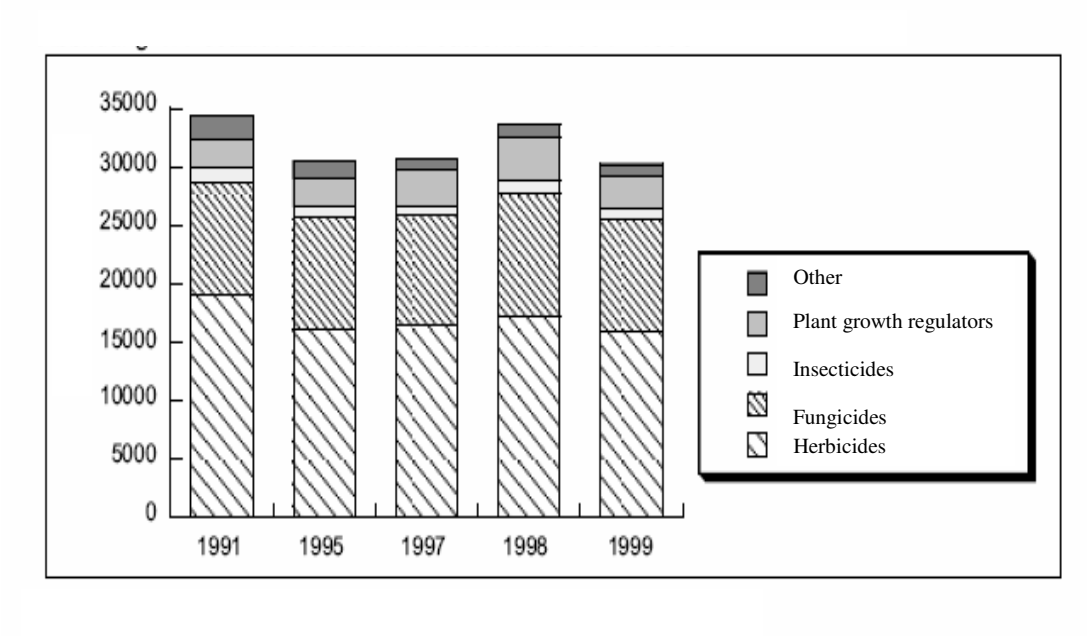
We demand that all nominees and parties for the election add the strengthening of research activities in the field of organic farming to the political agenda and that they continue the policy of changing the agricultural production system in Germany. It is also necessary to protect organic farming better from the effects of conventional production with an intensive chemical use than until now.

On this topic more information is available in PAN Germany's paper with demands for a change in crop protection (68) and the study “From law to field: Pesticide use reduction in agriculture”.(69) In this study PAN Germany showed how intensive chemical crop protection can be reduced at the level of individual crops. Both documents can be obtained from PAN Germany and are available at the website http://www.pan-germany.org/info/pestredukt.htm.

Call for a change in crop protection (February 2002)

Why do we need a change in crop protection?
Now that a change in agriculture in Germany has been announced the policy for crop protection in Germany also needs to be revised. So far the reform was limited to the expansion of organic farming by 20% till the year 2010 and to reforms of standards for keeping animals in conventional animal husbandry. Up to now crop protection is not an issue in conventional production that currently accounts for about 90% or more of the total. Consumers who buy food from conventional production continue to be exposed to the same hazardous levels of pesticides despite the ongoing change. In addition pesticide use leads to considerable hazards to the applicators and the environment. The amounts of pesticides used in Germany have remained at about the same level since 1991 (figure 3). Food and drinking-water, as well as surface waters, still contain many pesticide residues.(70), (71)

Fig. 3 Pesticide use (in tonnes) in Germany between 1991 and 1999



In PAN Germany's study “From Law to Field” data was collected on the residues of pesticides between 1997 and 2001 and these were evaluated on a toxicological basis.(72) Altogether 139 different active ingredients have been detected in food or water (not including the persistent organic pollutants, POPs). Out of a total of 139 pesticides 70 were still authorised in Germany in 2001. The 70 pesticides that are still on the market exhibit the following hazard classification:

- 2 Extremely hazardous and 8 highly hazardous pesticides. (73)
- 19 Substances that are very toxic (T+) or toxic (T) (EU classification). (74)
- 3 Substances that are probably carcinogenic and 18 that are possibly carcinogenic (US EPA evaluation). (75)
- 21 Suspected endocrine disrupting chemicals (EU evaluation). (76), (77), (78), (79)
- 4 Substances that are persistent in the environment.

The study on pesticide residues by PAN Germany demonstrated that the information on this issue is insufficient.(69) E.g. for animal feeds there is no coordinated monitoring of residues except POPs at the national level in Germany. Only part of the different types of food is examined, and in return only part of the authorised pesticides in use are measured in these food samples. The individual states of the Federal Republic often only monitor surface waters used for deriving drinking water and no natural surface waters such as lakes, ponds and streams, although these are valuable ecosystems. No extensive monitoring programme for pesticides in air and soil exists.

The surveillance of pesticide residues should not simply be an end in itself but needs to lead to measures for reducing these residues. The aim should be to strive for food and an environment with no residues. This can only come about if a systematic reduction (based on reduction goals and a timetable) is achieved and if certain active substances are prohibited.
Measures for reducing pesticide use should not be limited to regulations for authorisation or application practices. They need to go beyond the authorities and producers if the condition of food and the environment regarding residues is to be improved. Additional key factors are both the policies of the retailers and the food-processing industries as well as the consumers' choice.

The following demands of PAN Germany contain practical approaches to reducing pesticide use and improved monitoring of the environment. The demands and measures presented below aim to reduce the environmental and health risks caused by pesticides and to reduce the dependence of agricultural production on pesticides. Pesticide use reduction is considered to represent a process that cannot rely on the prohibition or abolition of pesticides only but which promotes the development and establishment of crop protection methods that are compatible with environmental and human health.

Demands by PAN Germany

1. No Authorisation of certain pesticides

On the basis of the precautionary principle, products that contain active ingredients with certain properties shall not be authorised in Germany in future. This applies to substances with the following hazardous properties:

- Persistent substances (slowly degraded in soil or water)
- Substances that accumulate in organisms (bioaccumulation)
- Substances that are possibly endocrine disruptors
- Substances that are possibly mutagens, carcinogens or developmental toxins (e.g. all pesticides with risk phrase 40 according to the EU-Directive 67/548). (80)
- Substances with a high potential of exposure (which are frequently found in food and the environment)

2. Reform and improved transparency in the authorisation of pesticides

Recently the Federal Office of Consumer Protection and Food Safety (BVL) was established and the coordination of pesticide authorisation was transferred to the BVL from the Federal Biological Research Centre for Agriculture and Forestry. Criteria for the authorisation of pesticides – effectiveness, protection of the environment and consumer protection – will be

more clearly separated in future. Environmental and consumer protection are both treated equally and take priority over the effectiveness of a pesticide in the authorisation procedure. Evaluation of the environmental effects of a pesticide will be carried out by the Federal Environmental Agency (UBA) in the future. The results of this evaluation must also be presented to the European Commission and to other EU member states by the UBA independently to enable a competent representation of environmental concerns.

The authorisation procedure should be made transparent in the future so that all data as well as the criteria for evaluating it, criteria for authorising a pesticide, and their relative importance are comprehensible. All procedures should be transparent and open to comments by researchers and organisations for environmental or consumer protection.

3. Requirement of a prescription for the purchase of hazardous pesticides

When pesticides that entail a high hazard to users or the environment are authorised their purchase should be subject to a prescription. This should apply during the whole period of authorisation, e.g. for products that contain active ingredients which are priority substances in the Water Framework Directive 2000/60/EC.(20) A prescription should only be allowed following examination of the conditions on the site where the product is to be applied and assessment of non-chemical alternatives. The prescription would be necessary for purchasing this product and could contain restrictions on its use.

4. Record keeping and information on pesticide use

Currently only data on the amounts of pesticide products sold on the market has been published. This data contains no information of individual active substances except for a summary of the different chemical classes It is totally insufficient for monitoring the environmental fate and evaluating the reduction measures. In accordance with the revised federal law on nature conservation the user of pesticides is required to keep records, as provided in the regulations for agricultural professionals.(81) So far no such regulation has been introduced, therefore the current law needs to be revised accordingly. In addition the data should be collected, evaluated and made accessible to the public. Thereby the criteria of a “transparent product” would be met, as proposed by the Minister of Consumer Protection, Food and Agriculture. Data on the use of pesticides have proven valuable for monitoring the behaviour of pesticides in the environment, epidemiologic studies, the development and evaluation of integrated pest management (IPM), as well as for measures taken for reducing pesticide use.(82)

5. Monitor environmental effects more closely

Each application of pesticides is followed by a sequel of events which can barely be fully surveyed. Active ingredients frequently do not remain on the site but leach into soil and groundwater, get into surface waters through run-off, or are blown away (as spray drift). They are transported through all parts of the environment, enter the food chain and can be found in the tissue of animals and plants. The consequences of the permanent introduction of pesticides into the environment for people and wildlife are difficult to assess in spite of considerable research into this. Record keeping and publicly available information on the amounts used, as demanded above, would help in obtaining this valuable knowledge. In areas with an intensive use of pesticides the surface waters, soil and air could be monitored together with the applied amounts. If a limit is exceeded this may be traced to the source more easily, enabling the taking of measures for the prevention of such exceedances. Information from neighbours of farmers affected by the spray drift could be followed effectively and their potential exposure estimated.(83)

Newly authorised pesticides should be subject to a five-year monitoring of the soil organisms, adjoining ecosystems, groundwater and air in the areas where they are used (the authorisation would be followed mandatory by observation). Treated produce should be systematically monitored for residues and this procedure should be financed by the applicant for authorisation. Independent organisations should carry out monitoring and the data ought to be continuously evaluated by the authorities to enable, if necessary, that regulations for the application are made stricter or the authorisation is withdrawn. An authorisation procedure such as the one proposed would correspond to 'state-of-the-art scientific knowledge'.

6. Improved documentation of food quality monitoring

The monitoring of food is coordinated by the Institute on Protection of Consumer's Health and Veterinary Medicine, BgVV and although the data is published there are some weaknesses. The proportion of samples from imported produce with residues is presented in a summary for individual types of products but not in the detailed tables. Neither do the tables contain exact information which pesticides were found in domestic products and which pesticides were found in imported produce. This data is available and should be included, as it would allow comparison of the quality of produce by its origin.
Also the retailer from whom the sample was obtained should be made public. In the UK data on residues is published together with the site of purchase. Food sold by different retailers was contaminated with residues to a different extent. Initiatives for protecting the consumers led to a change in the policy of several large retailers. Co-op prohibited, on a worldwide scale, that suppliers use 20 pesticides suspected of being particularly hazardous; a permit is required for the use of another 30 pesticides on each individual crop.(84) This example illustrates that retailers can contribute to the reduction of pesticides, provided that the reporting of monitoring data is improved.

It is also important to indicate clearly which analytical method was used and for which reason. The current method for multiple determination (S 19) predominantly detects insecticides of certain chemical classes. However, about 270 active substances are authorised in Germany, and herbicides and fungicides account for the majority based on the amounts used (see table 3 above). In addition, the Directorate-General Health and Consumer Protection (DG SANCO) of the EU listed certain deficiencies of the control system in Germany and these need to be improved.(85) The problem of bound residues that are difficult to detect must be addressed in the monitoring programme.86 Reports of the monitoring should discuss possible deficiencies in chemical analysis.

7. Introduce a levy on pesticides

Germany should introduce a levy on pesticides similar to other countries (e.g. France, Denmark, Norway, Sweden and UK). While in the UK pesticides sold by the industry and outlet stores are taxed only on the basis of the amount, the levy depends on the properties (e.g. environmental fate) of the active substances in Norway.(87) As a result of the taxation the amount of pesticides used may decrease, depending on the levied tax.(88),(89) Due to the higher price, farmers used lower amounts, while those using pesticides sometimes may even abandon the use completely. Today, for many farmers the use of chemical crop protection is more profitable than, e.g., soil cultivation or the rotation of crops although pest species and weeds can generally be reduced to tolerable levels with these means. The returns of the pesticide levy should be spent on effective reduction programmes, research on non-chemical alternatives and record keeping of the amounts used on individual crops and different plots of land.

8. Realize good agricultural practice and integrated pest management

The federal law on crop protection states that: “Crop protection may only be carried out according to good agricultural practice. (...) This includes that the principles of integrated pest management (...) are considered” (§2a 'Pflanzenschutzgesetz'). In 1998 the Federal Ministry Food, Agriculture and Forestry presented the guidelines for good agricultural practice in crop protection.90 These general guidelines contain no mandatory new regulations besides compliance with the existing regulations. To reduce the undesired effects of chemical crop protection at least it would be necessary to revise these guidelines and define methods in integrated crop protection for each crop individually. The guidelines for good agricultural practice can be divided in two parts: A first part with general information and a complete compilation of the regulations for all areas of production and a second part with specific regulations for the different crops. In addition to crop-specific regulations, the methods for good agricultural practice should be defined and methods that have proven successful in organic farming should be highlighted.91 For all types of crops instructions should be given that state what good agricultural practice and integrated pest management entail. It has been shown that this is

feasible, can be realized and is also useful, in PAN Germany's study “From Law to Field: Pesticide Use Reduction in Agriculture - From Pesticide Residue Analysis to Action”.(92)

9. Inform the farmers about alternatives

The government should initiate a database with alternatives to pesticide use that is freely available on the internet. Information on alternatives needs to refer to specific crops and pest species and should include various non-chemical methods of crop protection together with an estimate of the yield, returns or contributions to expenses that are not covered. A web-based forum could be provided additionally to enable farmers to share their experiences.

10. Certification of pesticide users and advisers

Pesticides often enter the environment due to the inappropriate application and/or inappropriate rinsing of spray equipment. Many cases of groundwater pollution have been caused by cleaning equipment or containers in an unsuitable way on farms. It is evident that the current requirements in good agricultural practice are insufficient and therefore it is necessary to extend the requirements for obtaining a certificate. These should include knowledge in the following areas:

- Integrated crop management and good agricultural practice
- Non-chemical methods of crop protection
- Appropriate methods for pesticide application and personal protection
- Appropriate methods for cleaning spray equipment
- Record keeping of the amounts of pesticide applied

Users who have passed an examination should obtain a certificate that permits the application of pesticides. The certificate ought to be valid for 3 years; its extension should be made subject to the attendance of training in one of the areas listed above. If holders cannot prove that they have participated in training or if they have not carried out record keeping, the certificate should not be renewed and withdrawn. For advisers in crop protection it should be required that they attend additional training and pass an exam to obtain a certificate. Annual education in non-chemical crop protection should be made obligatory for advisers.

11. Strengthen implementation and controls

So as to guarantee an efficient implementation of the regulations as well as effective controls of practices among users and monitoring of residues the required facilities and personnel need to be provided not only at the national level (in the Federal Office of Consumer Protection and Food Safety, BVL).

Especially the executive power in the states (agencies or committees for the environment and for agriculture) as well as in the communities (laboratories and offices for examining food quality or the authorities for public health) need to be equipped with improved capacities so that they can perform these tasks more effectively and comprehensively.

12. Improve information for the consumers

The Federal Government should inform the consumers about the changes in the agricultural production system, crop protection and alternatives. Consumers should realize that their decisions when buying food and other commodities also bring about decisions in the management of the production system and the quality of the environment. An increased interest of the consumers in the conditions under which food is produced is essential to change production systems in agriculture to socially and environmentally compatible patterns. A greater demand for products that are organically grown and certified ('kontrollierter biologischer Anbau', kbA), particularly food of animal origin (and based on cereals) such as milk, eggs and meat, not only benefits the animals due to the stricter standards but entails an essential contribution to the reduction of pesticide use. One of the main cereals used as animal feeds in Germany is wheat and when it is organically grown no pesticides at all are used. This information needs to reach the consumers.(93) Another important factor is the choice of plant strains. Among the new and old strains of crop plants some are more resistant than others towards certain pest organisms. By growing these strains the amount of pesticides used can be largely reduced and consumers also need to be informed about these particular strains.(94)

13. Protect biological diversity

Pesticides use can be decisively detrimental to biological diversity and this hazard needs to be prevented by a change in crop protection methods. Programmes for this should include the protection and support of biodiversity in their general objectives.

14. Prohibit the export of hazardous pesticides

A change in the production system must consider the responsibility of Germany at an international level, both in the trade with agricultural produce, as well as in the export of agrochemicals. The export of pesticide products and active substances that are prohibited, not authorised, restricted or have been withdrawn from the market in Germany on the basis of environmental and health reasons, should be prohibited in general. Exemptions from this prohibition should be possible if the importing country has previously given approval in writing and the import is in accordance with pertinent international agreements such as the Rotterdam (PIC) Convention.

15. “Green” biotechnology is not an alternative

Genetically modified organisms in agriculture or “green” biotechnology does not present a viable alternative to conventional chemical crop protection. On the contrary, it is a tangible threat to organic agriculture. Genetically modified crops (GM crops) could contaminate organic produce and seeds by an uncontrolled genetic transfer. Resources that are spent on research in GM technology and the necessary controls are not available to the research on biological methods of pest control and their implementation.

PAN Germany position on the German Reduction Programme in Crop Protection (December 2004)

Summary

Bearing in mind

- that about half of the food products of plant origin in Germany was found to contain residues of pesticides and in over 8% of samples the limit was exceeded, and that pesticide levels in drinking-water, groundwater and surface waters exceeded the target goals and limits;
- that almost one third of foodstuffs contain residues from more than one pesticide, while the risk of combination effects due to the intake of pesticides in food cannot be assessed and the precautionary principle is nevertheless not applied;
- the objectives formulated in the EU's 5th and 6th Environmental Action Programmes;
- the Communication of the European Commission on a “Thematic Strategy on a sustainable use of pesticides”;
- the treaty between the coalitions in the German government 2002-2006;
- the initiatives of the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL): Workshop I on “Guidelines for a future crop protection policy” (Potsdam, May 2002), workshop II on “Guidelines for a future crop protection policy: Reduction programme, communication and transparency” (Potsdam, March-April 2003), and
- the proposals of the advisory panel for the national reduction programme (15 October 2003),

the Minister of Consumer Protection, Food and Agriculture presented a “Reduction Programme Chemical Crop Protection” on 29 October 2004. According to this, the Federal Government intends to “reduce the use of chemical crop protection substances more strongly than at present to the necessary minimum, so that unnecessary applications of these crop

protection substances are omitted and the use of non-chemical methods in crop protection is promoted" (BMVEL 2004, p. 13).(95)

The current reduction programme of the Ministry of Consumer Protection, Food and Agriculture aims to achieve the following:

1. A reduction in the potential risk and the intensity of the use particularly of chemical crop protection substances, whereby

- the use of chemical crop protection substances above the necessary minimum of pesticide use is to be substantially reduced and
- an appreciable proportion of chemical methods in crop protection is to be substituted by non-chemical measures, and

2. a reduction in the proportion of exceedances of the maximum residue limits (MRLs) for domestic agricultural produce below 1% in all food categories.

PAN Germany welcomed the general aim of the Federal Government to minimize the use of pesticides and promote non-chemical methods in crop protection. However, it holds that the current reduction programme is clearly insufficient to achieve an effective reduction in the intensity of pesticide use, in particular use of chemical substances, and also fails to substitute a substantial proportion of these through non-chemical measures so as to significantly reduce the total of residues in food and environmental pollution with pesticides, for the following reasons:

1. The programme did not establish any goals for the reduction in the frequency of pesticide applications (treatments) on crops, apart from a reduction in the proportion of exceedances of the maximum residue limits;
2. no timetable was defined to achieve the reduction goals or implement measures;
3. the aim of the programme to reduce residues only when the MRLs are exceeded in more than 1% of the food samples is not far-reaching enough (any exceedance is an illegality);
4. the programme does not sufficiently take into account the problem of residues in imported foodstuffs;
5. the programme does not aim to substantially reduce the increasing total amount of residues and the high proportion of multiple residues in food;
6. in many aspects the programme represents a system of regulatory controls, while any illegal state of affairs is already subject to regulatory measures and lies within the responsibility of the state;
7. a new strategy is therefore lacking in the programme's policy for consumer protection and environmental protection as well as in agricultural policy that would be required for

a. minimizing the dependence of agricultural production on pesticide use effectively and
b. allowing for a precautionary approach in view of the presence of multiple residues in food and water and the fact that these cannot be toxicologically assessed so far;

8. the programme has not presented a solid financial basis.

Background

In its 5th Environmental Action Programme (1993) the European Commission already formulated the aim to substantially reduce pesticide use in agriculture.(96) This aim was not achieved. If one looks at the European pesticide market as the only available basis for assessing the trend, there appears to have even been a slight increase in the pesticide sales in the European Union and in Germany.(97) Currently over 50% of the food samples that were analysed in Germany contained detectable residues.(98) Pesticides pollute surface waters, groundwater and drinking-water at levels that are frequently above statutory limits or the quality values that were defined. It is known that pesticides lead to a loss in biodiversity and often also entail high expenses for the agricultural producers as was pointed out by the reduction programme.
The German Advisory Council on the Environment concluded in its environmental audit in 2004 that in spite of the substantial pollution with crop protection substances, and a statement made by agricultural producers that they would minimize the use of these substances, for over ten years sales have remained at the same high level (34,000 tonnes in 2001). It is even assumed that a “critical” indirect increase has taken place because about 30% of the pesticides used were imported by the producers themselves and as the newer products contain active substances that are highly effective and should actually result in a decrease of the amount used.(99)

The Communication of the European Commission on the 6th Environmental Action Programme states that there is sufficient evidence that the problems related to food residues and environmental pollution with pesticides are serious and increasing.(100) In the 6th Environmental Action Programme a number of measures were proposed in 2002 to “significantly” reduce the use of pesticides including, among other measures, the development of a “Thematic Strategy on the Sustainable Use of Pesticides”.(101) The current draft proposal for a “Thematic Strategy” provides that plans for reducing the hazards and risks of synthetic pesticides, and the dependency on these, are to be established at the national level.102 In Europe discussions on policies are adopting the same method of approach as in reduction programmes at the national level (existing in Denmark and in Sweden since 1987, in the Netherlands since 1990/1991, and in Norway since 1984).(103)

The “Reduction Programme in Chemical Crop Protection” presented by the Ministry of Consumer Protection, Food and Agriculture is the result of an agreement in the treaty between coalitions of the German government within

the context of a revised pesticide policy in the EU. In the treaty from 2002 ('Koalitionsvertrag' 2002-2006) it was agreed to develop a "strategy for the reduction in the use of crop protection substances by means of usage, methods and technology and good agricultural practice".(104) To develop the German reduction programme further, the advisory panel to the Ministry of Consumer Protection was formed in 2003. The advisory panel included various stakeholders, among others the non-governmental organization PAN Germany. In October 2003 it submitted a final report on the reduction programme to the Federal Government.(105)

Comments on individual aspects of the reduction programme

Define quantitative reduction goals and a timetable

PAN Germany holds that the implementation of a reduction programme which lacks clear statements regarding the quantitative goals for reduction and the timetable is not binding and raises doubts about the willingness to reduce the use of pesticides. As long as the programme is not developed more thoroughly, the monitoring of progress and organization of measures that need to be implemented within the programme will be hindered. At the two conferences in Potsdam and in the advisory panel it was stated repeatedly that the purpose of these assemblies was not to define the reduction goals and timetable for the programme. The Federal Office gave the impression that it considered it as its task to define the goals and the timetable. It is therefore inexplicable and unacceptable that a programme has been published now that contains no specifications with regard to this.

There is a broad consensus among scientific experts that a reduction by 30% in the use of pesticides can be achieved even within the conventional production system by improving advice and technology based on current guidelines for good agricultural practice.(106) Also the German Advisory Council on the Environment criticised that reduction goals and a timetable were missing, and recommended in its environmental audit to define a reduction goal of 30% (based on the total amount of pesticides used in 2004) until the year 2008. The demand for reduction goals that was made by PAN Germany during the development of the reduction programme is confirmed by the Advisory Council.

Figures are presented by the reduction programme in explanatory comments without defining these as binding, however. By introducing new spraying equipment (with 'recycling' technology) the use of pesticides can be reduced by 20-30% on average (see chapter 5.7.3 in the reduction programme).(107) And referring to state-of-the-art technology the following statement is made: "Long-term studies show that if the methods of integrated pest management are practised in the cultivation of arable crops, and also in the growing of fruit and vegetables, the amount of crop protection substances can be reduced by at least 20% when compared to conventional farms that adhere to standards of good agricultural practice" (BMVEL 2004, chapter 5.9.2).

Provide a secure financial basis

The financial basis of the reduction programme is not secured so far. The availability and the extent of resources play a vital role in the implementation and progress of the programme. However, options on how to finance the programme that were previously discussed (allocation of federal and state funds, establishment of a foundation or the levy of pesticides) are not mentioned and only a general statement is made that this is the responsibility of the Federation and the states, respectively. There appear to be no separate funds for the programme despite the fact that it is likely that an effective reduction programme could contribute to saving expenses that otherwise would result from undesired “side effects” of pesticide use.

PAN Germany supports a levy on pesticides and spending the returns on the programme exclusively. It welcomes the fact that the German Advisory Council on the Environment clearly recommended a levy for pesticides and stated that thereby “medium- to long-term incentives to develop and use substances that are less harmful to the environment are induced” (SRU 2004, p. 303).(108) PAN Germany also shares the opinion of the Advisory Council that the rating for products should be based as far as possible on the environmental damage caused by the product and that returns should be spent on improved advisory services within the reduction programme, as well as on research and development of non-chemical or integrated measures of crop protection and cultivation. Additionally PAN Germany would like to point out that applied research in the field of social sciences should enter into the programme, such as research on mechanisms that lead to the adoption by agricultural producers of measures that have proven to be effective, or how other branches (such as food processing industries and retailers) can contribute to minimizing the use of pesticides.

Establish the “necessary minimum” of pesticide use as a policy goal

According to the Ministry of Consumer Protection, Food and Agriculture the main component of the reduction programme is the 'necessary minimum' of pesticide use. Various measures have been formulated to ensure that the farmers keep to this minimum, while other measures aim to reduce the 'necessary minimum' itself, e.g. through the development of effective non-chemical methods for pest control. The following definition has been given by the Ministry of Consumer Protection, Food and Agriculture: “In using crop protection substances the necessary minimum denotes the intensity of application that is necessary to ensure cultivation of crops, particularly with regard to profitability. It is taken for granted that all other practicable possibilities for the defence and control of pest organisms have been exhausted and consumers’ interests and the environment, as well as workers' protection, have been sufficiently considered” (BMVEL 2004, p. 10).(109) The Ministry concluded that “the necessary minimum is insufficiently considered in practice with regard to integrated pest management as defined in the law on

crop protection” (p. 11), and that “the necessary regulatory framework is available to provide a sustainable form of crop protection and to address deficiencies that have been identified in the implementation of regulations” (p. 10).

The aim of the reduction programme consists of reducing illegalities in the usage of pesticides, while the laws and regulatory instruments lie outside the scope of the programme. PAN Germany believes that compliance with current regulations, as delineated as “necessary minimum” by the Ministry of Consumer Protection in the reduction programme, is the rule according to existing regulations. This approach clearly falls short of a policy to minimize the risk and use of pesticides, aiming to develop a system of agricultural production that protects the environment, considers consumers' health and is cost-effective for the whole of society. On this point PAN Germany endorses the view of the Advisory Council on the Environment: “The current regulations within legislation for crop protection are insufficient to guarantee the safe and minimized usage of crop protection substances” (SRU 2004, p. 308).(110) It concluded that the task of policy is to “provide new perspectives for the practice in agricultural production with a comprehensive strategy for crop protection” by “introducing a new framework of standards in crop protection that enable an innovative process and take the environment into consideration” (SRU 2004, p. 292). However, this is clearly missing in the Ministry’s programme.

PAN Germany thinks it is necessary to introduce several new general standards in policy so as to achieve the aims of the reduction programme.

Define clear and mandatory standards within good agricultural practice

The current definition of the 'necessary minimum' of pesticides in agriculture is based on the principles of integrated pest management and the Ministry of Consumer Protection, Food and Agriculture believes that these principles have been defined clearly enough in the legal framework. PAN Germany disagrees on this issue. The federal law on crop protection (that became effective in May 1998) states: “Crop protection may only be practised according to good agricultural practice. (...) Good agricultural practice entails that the principles of integrated crop management (...) are taken into account” (§2a 'Pflanzenschutzgesetz'). However, these principles have not been elaborated in the official “Principles for good agricultural practice” (referred to as “Principles” in the following). Additionally, current principles largely represent recommendations for the agricultural producers and they are not binding guidelines. Therefore no scale for the 'necessary minimum' is manifest that is legally binding at the moment.

Already in 1999, and again in 2004, PAN Germany made critical comments on the Principles and pointed out that deficiencies could be amended.(111), (112) Besides formulating principles of integrated crop and pest management that are made compulsory, the Principles should contain regulations and

binding guidelines defined for each crop. Directions for agricultural practices have already been prepared in programmes aimed at improving crop protection and will be provided in the reduction programme through various measures such as the development and promotion of new or improved non-chemical or integrated methods of pest control. Minimum standards for different crops also need to be developed and introduced in practice.

As mentioned above, the Advisory Council on the Environment has concluded that the current concept of good agricultural practice is insufficient as a tool for implementing the reduction programme.
PAN Germany holds that the German government should also work towards a more thorough and binding definition of good agricultural practice at the level of the European Union. The compendium on crop protection provided by the reduction programme could present the basis for a definitive good agricultural practice.
Good agricultural practice is the centrepiece of national programmes for pesticide use reduction and of a future European Directive, and it is an essential component of the EU's Thematic Strategy on the Sustainable Use of Pesticides. In the setting of maximum residue limits for pesticides residues in food good agricultural practice is considered. A directive is being developed in the European Union that will regulate the harmonized setting of maximum residue limits (MRLs) in Europe. German MRLs for pesticide residues will be replaced by the unified European regulations and MRLs.(113) It is in the interest of the protection of the consumers and the environment in Germany, as well as in the other member states of the European Union, to develop agricultural practices which ensure that the levels of residues in food and pollutants in the environment are decreased.
Agriculture is an important area of policy. Within the reform of the European Common Agricultural Policy (CAP) subsidies should be made subject to the adoption of preventive methods in crop protection and methods should be defined for individual crops. However, in cross-compliance binding regulatory tools need to be developed that are more thorough than current regulations. Additionally in the definition of the 'necessary minimum' PAN Germany recommends to leave away the limitation “particularly with regard to profitability”. The basis for this recommendation is the definition of the principles of integrated crop management in the 'Principles for good agricultural practice'. A draft version in 2004 states in principle two: “The concept of integrated crop management equally includes the ecological, economical and social interests, so as to ensure that practices remain within the limits of ecological capacity and to ensure sustainability”.(114)

Adapt the regulations on professional knowledge to the policy aims

In the current reduction programme the item on “Stricter requirements within good agricultural practice” provides measures with regard to professional experience. The aim is to achieve compliance with the current regulations on expert knowledge ('Sachkunde-Verordnung') and to improve the offers in further training.

However, PAN Germany considers these measures to be insufficient. The principle that all professional users must have sufficient special knowledge is already required by the current regulations and it cannot be presented as the aim of a reduction programme. Naturally, the professional knowledge required by the law must be guaranteed. But it is decisive for the reduction programme to guarantee that pesticide users improve their knowledge of preventive crop protection. Only by adopting preventive measures can the amount of pesticides used be reduced and new measures are necessary to achieve this. Therefore PAN Germany proposes an adaptation of the regulations that limits the validity of a certificate of expert knowledge to two years and makes its extension subject to the participation in further training. Within such a procedure it would be required that pesticide users participate at least every two years in training courses in accordance with the objectives of the reduction programme.

Increase transparency

Obligation to report pesticide sales

At present only one binding regulation in Germany requires the reporting of pesticide sales. The law on crop protection obliges manufacturers and traders of pesticides to report the quantities of pesticides marketed in Germany and the quantities imported or exported (§19 'Pflanzenschutz-Gesetz'). Product names, quantities and recipients have to be reported to the Federal Office of Consumer Protection and Food Safety (BVL) but the data are not available to the public. Information that is published on quantities is restricted to the subtotals for groups of active ingredients that were sold, imported or exported. Together with the 'necessary minimum', which is measured on the basis of treatment indices, such data could help monitor the progress of the reduction programme. However, the data that are not publicly accessible are being withheld from the general public and cannot be used; this presents a waste of taxes. Therefore, PAN Germany recommends to amend §19 within the next revision of the law on crop protection so that the sales of the individual active substances are made available to the public. Providing access to these data serves to reach the objective of reducing pesticide use.

Record keeping of pesticide use on individual plots of land

PAN Germany welcomes the measure to implement record keeping of the amounts of pesticides used on different plots of land and to include this as an obligation in the Principles for good agricultural practice. Regular agricultural production is defined in the revised federal law on nature conservation from 2001 (§5 'Bundesnaturschutzgesetz').
Accordingly record keeping of pesticide use at the level of individual plots of land forms part of regular agricultural production. Until now the regulations for agricultural professionals do not provide record keeping of the pesticide use on separate plots of land. But the rule (established in the law on nature conservation three years ago) will finally be implemented within the impending

revisions of the federal law on crop protection ('Pflanzenschutzgesetz') and the Principles for good agricultural practice. PAN Germany considers that the ‘treatment index’ is generally a suitable and useful indicator for measuring the intensity of pesticide use when it is based on representative data (available today with NEPTUN data). However, on the longer-term record keeping at the level of plots of land under cultivation should be drawn upon so that the data collected by the authorities is complete.(115) In the establishment of standards for record keeping and development of administrative tools (such as IT programmes or printed forms) this option should be considered already now. In this respect PAN Germany has analysed the possibilities to monitor the use of pesticides, and options for this were presented in a study and discussed at a technical workshop in 2003.(116)
The advantage of record keeping over surveying representative farms is that this is more detailed and complete. Data collected on this basis, together with data of geographic information systems (GIS), would be useful for models in the environmental risk assessment of pesticides. Such models identify pesticide use related to activities in certain areas and periods that lead to increased risks. This would be required for assessing and dealing with “hot spots” as provided for by the reduction programme.

Exceedance of maximum residue limits for pesticides

The aim to reduce the proportion of food where the maximum residue limits (MRLs) for pesticides are exceeded should be supported with greater transparency in this area. The reduction programme provides for the compilation of a report about the monitoring of food residues in Germany. With regard to the overall aims, however, this does not represent an active measure, although the protection of consumer's health is a very important part of the reduction programme. Therefore PAN Germany pleads for the naming of the retailers and the sites from wher food samples with residues above the limits were obtained. Names of the retailers could be published online. This is feasible and has already been put into action in other European countries such as the UK. The Ministry of Consumer Protection, Food and Agriculture should also examine if information of the rapid alert system could be used (this exchanges information on measures addressing health risks resulting from food or animal feeds). Naming of the retailer and the sites of origin of food that exceeds the MRLs would be an efficient way to reduce the proportion of exceedances, through the demands of consumers, traders and retailers. The retailers would have a greater motivation to oblige their suppliers in Germany and abroad to keep to the prescribed limits and to support producers in the change of cultivation methods. This proved successful in the UK where naming of the involved companies resulted in the cooperation between farmers and retailers to eliminate the use of certain pesticides that were particularly problematic.

Link the treatment index with reduction goals and a timetable

PAN Germany considers that the treatment index, established in the reduction programme, is a suitable indicator of the intensity of pesticide use among individual producers for different crops and regions in Germany. This indicator can depict progressive changes during a stepwise reduction of pesticide use. So far in the project NEPTUN data have been compiled for arable crops, fruit and hops and treatment indices were calculated from this data. However, the reduction programme does not list further crops intended for surveillance. It also provides no timetable until when data should be collected and how often the treatment index should be estimated. Additionally there is no binding requirement to estimate the treatment index on a regular basis. Without the obligation to regularly update the indexand, as there is no financial basis for this, a key indicator of the programme is lacking.

At the regional level the 'necessary minimum' of pesticide use is defined within a target range approaching the average treatment index for the crop. According to the programme the width of this range is established by convention. PAN Germany holds that the width of this range will strongly influence the reduction programme's outcome and determine whether it succeeds or fails. What is considered to be very problematic is the fact that the programme has defined exceptions for farmers who are allowed to use greater amounts than provided by the target range. E.g. this applies to certain crops cultivated by contract or to certain methods of cultivation. As a result, the opportunity is missed to oblige the producers and retailers to make improvements and the programme is in danger of failing due to a number of exceptional regulations and discussions about these. Transparency in the assessment of exceptional regulations and in decisions on these questions will be very important.

Minimize all pesticide residues in food

One of the aims of the reduction programme is to reduce the proportion of domestic food samples with residues that exceed the maximum residue limit below 1%. Within the development of the reduction strategy, PAN Germany suggested that 'pesticide residues in food' should be used as an indicator of risk to health. The indicator proposed by PAN Germany expressly includes the sum of all samples with detectable residues and those with multiple residues, not only the proportion of samples that exceed the MRLs. In 2002 among food analysed in Germany (from domestic and imported produce), residues were detected in 53.7% of the samples. Out of the samples with detectable residues 8.7% exceeded the MRLs. In 45% of samples the residues were below the MRLs (the average in the EU is 37%). The proportion of samples with multiple residues was 31.1% in Germany and in the EU it was 20.7% on average.117 Contrary to the demands made by PAN Germany, the reduction programme did not formulate the aim and present measures to reduce the too large extent of contamination with pesticides. In the view of PAN Germany a strategy for a policy that aims to reduce the intensity of pesticide use and the health risks should strive to generally reduce the 'background contamination' in Germany and the exposure of consumers.

With respect to the precautionary principle this aim should be implemented and this is necessary for the following reasons:

• The evaluation of risks to health and the setting of maximum residue limits is performed for each substance individually. However, the effects of different substances in a mixture can add up and each of these substances can potentially interact with other substances in a synergistic manner that leads to a greater than additive effect. This risk is particularly relevant when people or animals are exposed to several active substances simultaneously, e.g. to organophosphates which all have the same mechanism of toxic action. Between 1998 and 2002 the proportion of food of plant origin that contained residues of more than one pesticide has risen from 14.0% to 20.7% within the EU and from 11.1% (in 1999) to 31.1% in Germany.(118) This upward trend is problematic and reflects a new trend among the producers to use a greater number of pesticides on the same crop. As a result the residues of individual substances remain mostly below the maximum residue limit. In spite of enabling a decrease below 1% in the proportion of samples exceeding the limit, the health risk could remain the same or even increase. No method is available in the EU so far that allows to estimate cumulative exposure to different pesticides that affect the organism in the same way and no risk assessment is carried out for this.(119) In the US, on the contrary, the regulations require that this risk is assessed.(120)

At the moment procedures are also insufficient for the risk assessment of hormonally active pesticides (endocrine disruptors). These can influence the development of the brain and of reproductive organs, fertility, behaviour or cancerous growth even at extremely low concentrations. The current authorization Directive in the EU for pesticides (91/414) provides no binding standards for assessing and evaluating the risk of endocrine disruption.

• The World Health Organization has pointed out that the foetus, babies and children are more susceptible to pesticides than adults.(121) So far this problem is considered in a precautionary approach only for processed baby food. In the EU a stricter MRL of 0.01 mg per kg applies to processed baby food and certain pesticides are prohibited. However, when parents choose to bring up their children on fresh fruit and vegetables from conventional production, additionally or alternatively to processed baby food, this protective measure no longer holds.

The reduction programme confined its aim to a reduction below 1% in the proportion of domestic food with residues exceeding the MRLs, however, this is totally insufficient to provide a precautionary approach to the protection of consumers and (indirectly) the environment. The programme has limited itself to the existing regulations in this area and even fails to exhaust the scope of these regulations, as it has not formulated the aim to work towards the adherence to the established limits (corresponding to 0% exceedances). It is incomprehensible how the Ministry of Consumer Protection, Food and Agriculture can legitimize its decision to tolerate a breach by 1% of the federal law on food and consumer goods ('Lebensmittel- und Bedarfsgegenständegesetz'). In disregard of the recommendation of the

advisory panel the reduction programme's aims have been limited to domestic produce. For a risk reduction indicator this omission is inexplicable as the imported produce contributes to a considerable proportion of the exceedances of MRLs. In fact it is not impossible for the Federal Government to take action in this domain and it can have an influence in various areas of policy. Two basic prerequisites for this are that the export of pesticides becomes transparent, as PAN Germany has demanded, and that the exact origin of food samples with residues is made clearly visible.(122)

The high and growing proportion of food with multiple residues, which entails largely unknown effects on health, particularly for more vulnerable groups of the population, needs to be counteracted at all levels.
PAN Germany welcomed the plan of the Ministry of Consumer Protection, Food and Agriculture to improve the coordination between the monitoring of food and the advisory services in crop protection. In case it is suspected that a producer is not keeping to good agricultural practice this would allow examining the quality of food from that particular producer. The Ministry's view is shared by PAN Germany that representative surveys are currently missing that could help estimate the total potential exposure to pesticides through food among the population. There is an urgent need to carry out a study that accounts for the total diet in Germany so that the risk evaluation is based on current scientific knowledge. PAN Germany demands that the study of total diet, which the reduction programme refers to, is made promptly and that significant improvements are made so that food can be traced back to the producer (see chapter 5 above, Demands: item 4).

Communicate the 'index of progress'

The reduction programme provides that a new index of crop protection in Germany (PIX) shall be introduced which combines the three indicators (treatment index, exceedance of the MRL, and a risk indicator) to depict the overall trend. However, a system for evaluating the trend of these indicators (based on points) needs to be developed. Calculations of a combined index and a risk indicator have not been published so far. PAN Germany holds the view that (1) trends of each indicator should be represented in a comprehensible way, and that (2) the values of the indicators in a representation of the overall trend should be based on common consent. It is desirable that various stakeholders participate and PAN Germany welcomed the establishment of a forum for debate about the reduction programme. At the same time it should be borne in mind that it was probably the external moderation at the conferences in Potsdam organised by the Ministry of Consumer Protection, Food and Agriculture (a novelty in the drafting of a new policy) that brought about the conducive "spirit of Potsdam".

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