Annex 1

Chemical Fact Sheets

Annex 1: Chemical Fact Sheets

Acknowledging the facts already mentioned data sources were used, which are officially respected such as the classification applied regarding to EU Council Directive 67/548/EC and sources which summarise toxicological, chemical, physical data such as "The Pesticide Manual" and the EXTOXNET Pesticide Profile. Since human beings are part of the environment, information on the human toxicity of the Danube priority pesticides is included as well. For Aldrin and some Copper compounds the sources cited below provide none or very little information, therefore no fact sheets were created for those.

For the metals e.g. Copper and Zinc compounds, and pesticides not authorised in any of the DRP countries no chemical fact sheet were created.

Data Sources used in the Chemical Fact sheets

Physical and Chemical Properties

The Pesticide Manual – A World Compendium is published by the British Crop Protection Council and contains information on nomenclature, uses, properties, toxicology for over 800 pesticides.[i]

ARS PPD Compendium - The Agricultural Research Service (ARS) Pesticide Property Database (PPD) is a compendium of chemical and physical properties of 334 widely used pesticides. Information included in the database focuses on 16 of the most important properties that affect pesticide transport and degradation characteristics. The ARS PPD relies on experimentally determined data. Its developers, working with the American Crop Protection Association, have communicated directly with the manufacturers to obtain the original experimental data used to characterize the pesticide properties. The data are augmented with data from the scientific literature.

Extension Toxicology Network (ExToxNet) - toxicology and environmental chemistry with a variety of information about specific pesticides. Developed and maintained by University of California-Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho.

Environmental Health Criteria (EHC) – for some compounds EHC data are used. EHC presents comprehensive data from scientific sources for the establishment of safety standards and regulations. EHC publications are monographs designed for scientists and administrators responsible for the establishment of safety standards and regulations. This series issued by the International Programme on Chemical Safety (IPCS), provides basic scientific risk evaluation of a wide range of chemicals and groups of chemicals.

German Environmental Agency (UBA) – for a number of pesticides additional information from the UBA publication on the estimation of input of agricultural pesticides in Germanys surface water.[ii]

Additional data sources – in some cases no information was found at the sources above. Additional data were taken from other source, which are then cited in the endnotes.

Environmental Toxicity

EU Council Directive 67/548 - In the European Union, the major legislative framework in force dealing with the classification of dangerous substances is Council Directive 67/548/EC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. Classification and labelling involves an evaluation of the hazard of a substance and preparation. This evaluation must be made for any substance manufactured within or imported into the EU and placed on the EU market, and results in

classification of the substance/preparation as dangerous for one or several end-points concerning physical-chemical properties, health or environmental effects.

Extension Toxicology Network (ExToxNet) – see above - used for data on effects on aquatic organisms and other organisms

Pesticide Acute Reference Dose for Birds – an interspecies distribution-based approach using pesticide-specific data available in order to define shape of the distribution through the estimation of a mean and variance for the distribution. The approach in-cooperated a scaling factor for birds body weight to improve cross-species comparisons of toxicological susceptibility, and applied a strategy allowing the consideration of chemicals for which there are insufficient data. The data are believed to be the most scientifically defensible reference values that can be used for assessing the relative acute risks of different pesticides to birds.[iii]

Environmental Health Criteria (EHC) – for some compounds (copper, zinc, aldrin and ethylene dichloride) EHC data are used – see above.

Additional data sources – in some cases no information was found at the sources above. Additional data were taken from other source, which are then cited in the endnotes.

Endocrine Disruption, Persistence, Exposure Potential

European Commission - in 2000, the European Union published a study: Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting. In this study 564 substances were reviewed concerning their potential endocrine disrupting properties. The expert meeting created a list of 147 substances with endocrine disruption classifications. The expert also looked at the persistence of the substances in soil and the exposure concern to those 147, which have been categorised.[iv]

Illinois Environmental Protection Agency - Report on Endocrine Disrupting Chemicals[v]

L. H. Keith - Environmental Endocrine Disruptors: A Handbook of Property Data[vi]

T. Colborn, D. Dumanoski, and J. P. Myers - Our Stolen Future[vii]

C. M. Benbrook - Growing Doubt: A Primer on Pesticides Identified as Endocrine Disruptors and/or Reproductive Toxicants[viii]

Additional data sources – in some cases valuable information was found at the additional sources these are then cited in the endnotes.

Human Toxicity

EU Council Directive 67/548 – see above

World Health Organisation (WHO) - The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification[ix]

International Agency for Research on Cancer (IARC) - evaluates with the assistance of international working groups critical reviews and evaluations of evidence of carcinogenicity.[x]

U.S. EPA Office of Pesticide Programme - maintains a list of chemicals evaluated for carcinogenic potential. This list is a product of the general risk assessment included in the process of the pesticide registration.[xi]

Definitions

The following chapter will shortly explain definitions of the chemical and physical properties.

Partition coefficient K_d: The partition coefficient refers to the sorption of organic compounds in soil. The terms "partition coefficient" and distribution coefficient" are used interchangeably in the literature for the K_d parameter.

The K_d parameter is very important in estimating the potential for the adsorption of dissolved contaminants in contact with soil. As typically used in fate and contaminant transport calculations, the K_d is defined as the ratio of the contaminant concentration associated with the solid to the contaminant concentration in the surrounding aqueous solution when the system is at equilibrium. Soil and geochemists knowledgeable of sorption processes in natural environments have long known that generic or default K_d values can result in significant error when used to predict the absolute impacts of contaminant migration or site-remediation options. Therefore, for site-specific calculations, K_d values measured at site-specific conditions are absolutely essential. However, for the chemical fact sheets ranges for K_d parameter are used to show trends and potentials.

Adsorptions coefficient (K_{oc}): The adsorption coefficient usually refers to the sorption of organic compounds to organic matter (C_{org}) in soil.

High K_{oc} values indicate a tendency for the material to be adsorbed by soil particles rather than remain dissolved in the soil solution. Strongly adsorbed molecules will not leach or move unless the soil particle to which they are adsorbed moves (as in erosion). K_{oc} values of less than 300 indicate little or no adsorption and a potential for leaching.

Octanol/water partitioning (log K_{ow}): The ratio of a chemical's concentration in the octanol phase to its concentration in the aqueous phase of a two-phase octanol/water system.

n-Octanol is an amphiphilic substance, and has both a hydrophobic and hydrophilic piece (the n-alkane and alcohol groups, respectively). This means that it can interact with hydrophilic substances via hydrogen bonding, and with hydrophobic substances..

Solubility of hydrophobic compounds in water; sorption of hydrophobic compounds onto soils organic matter, and the accumulation of hydrophobic compounds in aquatic organisms can be related to the K_{ow}.

A compound with a with high K_{ow} is considered relatively hydrophobic, and would tend to have

- low water solubility,
- large soil/sediment adsorption coefficient,
- large retardation factor
- large bioconcentration factor.

Henry's Law constant: Henry's law expresses the proportionality between the concentration of a dissolved component in a solvent and its partial pressure in the atmosphere above the solvent mixture at equilibrium.

For environmental issues the mixture is typically a lake, river, rain or fog droplet, the ocean, dew on a plant surface, etc.

Henry's law constants (HLCs) are usually determined by measuring the equilibrium partial pressure and dissolved concentration of the compound and then calculating the ratio with eqns 2 or 3. Unfortunately, this is only feasible in a laboratory experiment. The tendency of a contaminant to volatilize from water to air is largely determined by the HLC:

- Chemicals with high HLC favour volatilisation.
- Those with low HLC may persist in surface- or ground-waters, or soil.

2,4-D

Chemical Identification

CAS: 94-75-7	**EC:** 202-361-1	**CIPAC:** 1	**Use Type:** Selective systemic herbicide to control broad-leaved weeds.	**Chemical Class:** Chlorophenoxy acid or ester

Chemical and physical properties

Water Solubility in mg/l (pH 1, 25°C):	311 – 900
Water Solubility in mg/l (pH 5, 25°C):	20031
Water Solubility in mg/l (pH 7, 25°C):	23180
Adsorptions coefficient (K_{oc}) in l/kg:	35 – 79
Partition coefficient (K_d) in l/kg	0,08 -1
Octanol/water partitioning (log K_{ow})	2,83 (pH1) -0,75 (pH7)
Half-life in soil in days:	<7 – 12
Persistence:	Not persistent
Half-life in water in days:	In aquatic environments, microorganisms readily degrade 2,4-D. Rates of breakdown increase with increased nutrients, sediment load, and dissolved organic carbon. Under oxygenated conditions the half-life is 1 week to several weeks.
Vapour pressure in mPa (25°C):	0,02
Henry's Law constant in Pa m^3/mol	$4,5 \times 10^{-10}$ - $1,3 \times 10^{-5}$

Environmental Toxicity

EU Symbol:	none	**EU Risk phrase:**	R52/53: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:	Some formulations of 2,4-D are highly toxic to fish while others are less so. For example, the LC50 ranges between 1.0 and 100 mg/L in cutthroat trout, depending on the formulation used. Channel catfish had less than 10% mortality when exposed to 10 mg/L for 48 hours. Green sunfish, when exposed to 110 mg/L for 41 hours, showed no effect on swimming response. Limited studies indicate a half-life of less than 2 days in fish and oysters. Concentrations of 10 mg/L for 85 days did not adversely affect the survival of adult Dungeness crabs. For immature crabs, the 96-hour LC50 is greater than 10 mg/L, indicating that 2,4-D is only slightly toxic. Brown shrimp showed a small increase in mortality at exposures of 2 mg/L for 48 hours.
Effects on other organisms:	Moderate doses of 2,4-D severely impaired honeybees brood production. At lower levels of exposure, exposed bees lived significantly longer than the controls. The honeybee LD50 is 0,0115 mg/bee.
Hazardous Dose for Birds (HD_5 50%):	132,90

Endocrine Disruption			
European Commission:		Category 2: Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations.	
EPA Illinois		Probable	
Keith:		Yes	
Colborn:			
Benbrook:		Yes	
Exposure Potential:		Not evaluated	
Human Toxicity			
EU Symbol	Xn: Harmful	**EU Risk Phrase:**	R22: Harmful if swallowed. R37: Irritating to respiratory system. R41: Risk of serious damage to eyes. R43: May cause sensitization by skin contact.
Acute Toxicity (WHO)	III; Moderately Hazardous		
Cancer IARC:	Group 2B: The agent is possibly carcinogenic to humans.		
Cancer U.S. EPA:	Unclassifiable, ambiguous data		
Cancer EU			

Alachlor

Chemical Identification

CAS: 15972-60-8	**EC:** 240-110-8	**CIPAC:** 204	**Use Type:** Alachlor is a selective systemic herbicide, absorbed by germinating shoots and by roots. It works by interfering with a plant's ability to produce protein and by interfering with root elongation.	**Chemical Class:** Aniline; Chloroacetaniline

Chemical and physical properties

Water Solubility in mg/l (25°C):	148 – 242
Water Solubility in mg/l (20°C):	148
Distribution coefficient (K_{oc}) in l/kg:	54-209
Partition coefficient (K_d) in l/kg	0,3-3,7
Octanol/water partitioning (log K_{ow})	2,64-2,9
Half-life in soil in days (aerobic):	14-24
Persistence:	Not persistent
Half life in water in days:	Alachlor breaks down rapidly in natural water, primarily due to the action of microorganisms. The breakdown rate is much slower in water with no oxygen.
Vapour pressure in mPa (25°C):	1,86-4,13
Henry's Law constant in Pa m^3/mol	2,1 x 10^{-3}

Environmental Toxicity

EU Symbol:	N; Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:	Alachlor is moderately toxic to fish. The LC50 (96-hour) for alachlor is 2.4 mg/L in rainbow trout, 4.3 mg/L in bluegill sunfish, 6.5 mg/L in catfish, and 4.6 mg/L in carp [1,8]. It is only slightly toxic to crayfish, with a LC50 (96-hour) of 19.5 mg/L [8,37]. The bioaccumulation factor in the channel catfish is 5.8 times the ambient water concentration, indicating that alachlor is not expected to accumulate appreciably in aquatic organisms.		
Effects on other organisms:	Alachlor is not toxic to bees. It is practically non-toxic to earthworms.		
Hazardous Dose for Birds (HD_5 50%):	330,42		

Endocrine Disruption

European Commission:	Category 1: At least one study providing evidence of endocrine disruption in an intact organism. Not a formal weight of evidence approach.
EPA Illinois	Probable

Keith:		Yes	
Colborn:		Thyroid	
Benbrook:		Yes	
Exposure Potential:		High	
Human Toxicity			
EU Symbol	Xn: Harmful	**EU Risk Phrase:**	R22: Harmful if swallowed. R40: Limited evidence of a carcinogenic effect. R43: May cause sensitization by skin contact.
Acute Toxicity (WHO)	III; Slightly Hazardous		
Cancer IARC:			
Cancer U.S. EPA:	Likely to be carcinogenic to humans in high doses. Not likely to be carcinogenic to humans in low doses.		
Cancer EU	Category 3: Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.		

Atrazine

Chemical Identification

CAS: 1912-24-9	**EC**: 217-617-8	**CIPAC:** 91	**Use Type:** Atrazine is a selective triazine herbicide used to control broadleaf and grassy weeds.	**Chemical Class:** Triazine

Chemical and physical properties

Water Solubility in mg/l (20 - 25°C):	29,9-33
Distribution coefficient (K_{oc}) in l/kg:	38-288
Partition coefficient (K_d) in l/kg	0,2-2,46
Octanol/water partitioning (log K_{ow})	2,34-2,80
Half-life in soil in days (aerobic):	146-330
Half-life in soil in days (anaerobic):	15-77
Persistence:	Persistent
Half-life in water in days:	Atrazine is moderately soluble in water. Chemical hydrolysis, followed by biodegradation, may be the most important route of disappearance from aquatic environments. Hydrolysis is rapid under acidic or basic conditions, but is slower at neutral pHs. Atrazine is not expected to strongly adsorb to sediments.
Vapour pressure in mPa (10°C):	0,0076
Vapour pressure in mPa (20°C):	0,04
Vapour pressure in mPa (25°C):	0,038
Henry's Law constant in Pa m^3/mol	2,48 x 10^{-4}

Environmental Toxicity

EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:		Atrazine is slightly toxic to fish and other aquatic life. Atrazine has a low level of bioaccumulation in fish. In whitefish, atrazine accumulates in the brain, gall bladder, liver, and gut.	
Effects on other organisms:		Atrazine is not toxic to bees.	
Hazardous Dose for Birds (HD_5 50%):		408,98	

Endocrine Disruption

European Commission:	Category 1: At least one study providing evidence of endocrine disruption in an intact organism. Not a formal weight of evidence approach.
EPA Illinois	Known
Keith:	Yes
Colborn:	Neuroendocrine-pituitary (depression of LH surge), testosterone metabolism.
Benbrook:	Yes

Exposure Potential:		High	
Additional information on endocrine disruption:		Hayes *et al*. demonstrate that at exposure levels far beneath those found in the lakes, rivers, streams, drinking water and even rainwater, atrazine causes frogs to mature with multiple, mixed gonads and to become demasculinized. These effects occurred at exposure levels 10,000 - 30,000 times beneath levels previously identified as non-toxic to frogs. Atrazine's impact on frogs appears to be caused by this herbicide's ability to promote the conversion of testosterone to estrogen via activity of the enzyme aromatase. This mechanism is found not just in frogs, but other vertebrates as well, including mammals.[xii] [xiii]	
Human Toxicity			
EU Symbol:	Xn, Harmful	**EU Risk Phrase:**	R43: May cause sensitization by skin contact. R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed.
Acute Toxicity (WHO)	U; Unlikely to be Hazardous		
Cancer IARC:	Group 3: The agent is not classifiable as to its carcinogenicity to humans.		
Cancer U.S. EPA:	Category C: Possible human carcinogens, where the data show limited evidence of carcinogenicity in the absence of human data.		
Cancer EU			

Chlorfenvinphos

Chemical Identification

CAS: 470-90-6	**EC:** 207-432-0	**CIPAC:** 88	**Use Type:** Chlorfenvinphos is a broad-spectrum organophosphate insecticide.	**Chemical Class:** Organophosphate

Chemical and physical properties[xiv]

Water Solubility in mg/l (23°C):	145
Distribution coefficient (K_{oc}) in l/kg:	2,45
Partition coefficient (K_d) in l/kg	
Octanol/water partitioning (log K_{ow})	3,806
Half-life in soil in days:	
Persistence:	Not persistent
Half-life in water in days:	
Vapour pressure in mPa (20 – 25°C):	$1,7 \times 10^{-7}$ – $7,5 \times 10^{-6}$
Henry's Law constant in atm m^3/mol	$2,76 \times 10^{-9}$ - $1,53 \times 10^{-8}$

Environmental Toxicity

EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:	Chlorfenvinphos is highly to very highly toxic to fish and aquatic invertebrates. The reported LC50 (Mortality) for Japanese eel (Anguilla japonica) 48h was 38,0 ug/L.[xv] Toxicity (Mortality) to Goldfish (Carassius auratus) and Common carp (Cyprinus carpio) was LC50, 48h: 340,0 ug/L and 270,0 ug/L, respectively.[xvi] The reported LC50 (Mortality) for Stonefly (Pteronarcys californicus) 24h was 5,8-9,2 ug/L and for 96h 0,70-1,10 ug/L. For scud (Gammarus fasciatus) the LC50 (Mortality) 24h was 27,0-41,0 ug/L for 96h LC50 was 9,60-12,7 ug/L.[xvii]
Effects on other organisms:	
Hazardous Dose for Birds (HD_5 50%):	2,73

Endocrine Disruption

European Commission:	
EPA Illinois	
Keith:	
Colborn:	
Benbrook:	
Exposure Potential:	

Human Toxicity			
EU Symbol	T+: Very Toxic	**EU Risk Phrase:**	R24: Toxic in contact with skin. R28: Very toxic if swallowed.
Acute Toxicity (WHO)	Ib; Highly Hazardous		
Cancer IARC:			
Cancer U.S. EPA:			
Cancer EU			

Chlorpyrifos				
Chemical Identification				
CAS: 2921-88-2	**EC:** 220-864-4	**CIPAC:** 221	**Use Type:** Chlorpyrifos is a broad-spectrum organophosphate insecticide.	**Chemical Class:** organophosphate
Chemical and physical properties				
Water Solubility in mg/l (10°C):			0,45	
Water Solubility in mg/l (20 - 25°C):			0,73 – 1,39	
Distribution coefficient (K_{oc}) in l/kg:			6100 - 14000	
Partition coefficient (K_d) in l/kg				
Octanol/water partitioning (log K_{ow})			4,7 – 5,3	
Half-life in soil (aerobic) in days:			30,5	
Persistence:			Not persistent	
Half-life in water in days:			The concentration and persistence of chlorpyrifos in water will vary depending on the type of formulation. For example, a large increase in chlorpyrifos concentrations occurs when emulsifiable concentrations and wettable powders are released into water. As the pesticide adheres to sediments and suspended organic matter, concentrations rapidly decline. The increase in the concentration of insecticide is not as rapid for granules and controlled release formulations in the water, but the resulting concentration persists longer. Volatilization is probably the primary route of loss of chlorpyrifos from water. Volatility half-lives of 3.5 and 20 days have been estimated for pond water. The photolysis half-life of chlorpyrifos is 3 to 4 weeks during midsummer in the U.S. Its change into other natural forms is slow. Research suggests that this insecticide is unstable in water, and the rate at which it is hydrolyzed increases with temperature, decreasing by 2,5 to 3-fold with each 10 C drop in temperature. The rate of hydrolysis is constant in acidic to neutral waters, but increases in alkaline waters. In water at pH 7,0and 25 C, it had a half-life of 35 to 78 days.	
Vapour pressure in mPa (20 – 25°C):			2,3 – 2,7	
Henry's Law constant in Pa m^3/mol			0,743	
Environmental Toxicity				
EU Symbol:	N, Dangerous for the Environment		**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:		Chlorpyrifos is very highly toxic to freshwater fish, aquatic invertebrates and estuarine and marine organisms.Cholinesterase inhibition was observed in acute toxicity tests of fish exposed to very low concentrations of this insecticide. Application of concentrations as low as 0.01 pounds of active ingredient per acre may cause fish and aquatic invertebrate deaths. Chlorpyrifos toxicity to fish may be related to water temperature. The 96-hour LC50 for chlorpyrifos is 0,009 g/L in mature rainbow trout, 0,098 mg/L in lake trout, 0,806 mg/L in goldfish, 0,01 mg/L in bluegill, and 0,331 mg/L in fathead minnow. When fathead minnows were exposed to Dursban for a 200-day period during which they reproduced, the first generation of offspring had decreased survival and growth, as well as a significant number of deformities. This occurred at approximately 0,002 mg/L exposure for a 30-day period. Chlorpyrifos accumulates in the tissues of aquatic organisms. Studies involving continuous exposure of fish during the embryonic through fry stages have shown bioconcentration values of 58 to 5100. Due to its high acute toxicity and its persistence in sediments, chlorpyrifos may represent a hazard to sea bottom dwellers. Smaller organisms appear to be more sensitive than larger ones.	
Effects on other organisms:		Aquatic and general agricultural uses of chlorpyrifos pose a serious hazard to wildlife and honeybees.	
Hazardous Dose for Birds (HD_5 50%):		0,09	
Endocrine Disruption			
European Commission:			
EPA Illinois			
Keith:		Yes	
Colborn:			
Benbrook:			
Exposure Potential:		Not evaluated	
Human Toxicity			
EU Symbol	T: Toxic	**EU Risk Phrase:**	R24/25: Toxic in contact with skin and if swallowed.
Acute Toxicity (WHO)	III; Moderately Hazardous		
Cancer IARC:			
Cancer U.S. EPA:	Category E: Probably not carcinogenic, with no evidence of carcinogenicity in at least two adequate animal tests in different species in adequate epidemiological and animal studies. This classification is based on available evidence and does not mean that the agent will not be a carcinogen under any circumstances.		
Cancer EU			

Diuron

Chemical Identification

CAS: 330-54-1	**EC**: 206-354-4	**CIPAC:** 100	**Use Type:** Diuron is a substituted urea herbicide used to control a wide variety of annual and perennial broadleaf and grassy weeds, as well as mosses.	**Chemical Class:** Urea

Chemical and physical properties

Water- Solubility in mg/l (25°C):	42
Distribution coefficient (K_{oc}) in l/kg:	418-560
Partition coefficient (K_d) in l/kg	2,9-13
Octanol/water partitioning (log K_{ow})	2,8
Half-life in soil in days (aerobic):	372
Persistence:	Not persistent
Half-life in water in days:	Diuron is relatively stable in neutral water. Microbes are the primary agents in the degradation of diuron in aquatic environments.
Vapour pressure in mPa (25°C):	$9{,}2 \times 10^{-3}$
Henry's Law constant in Pa m^3/mol	$3{,}5 \times 10^{-5}$

Environmental Toxicity

EU S-ymbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:	The LC50 (48 hour) values for diuron range from 4.3 mg/L to 42 mg/L in fish, and range from 1 mg/L to 2.5 mg/L for aquatic invertebrates. The LC50 (96-hour) is 3.5 mg/L for rainbow trout. Thus, diuron is moderately toxic to fish and highly toxic to aquatic invertebrates.
Effects on other organisms:	Diuron is non-toxic to bees.
Hazardous Dose for Birds (HD_5 50%):	193,04

Endocrine Disruption

European Commission:	Category 2: Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations.
EPA Illinois	
Keith:	
Colborn:	
Benbrook:	

Exposure Potential:		Not evaluated	
Human Toxicity			
EU Symbol:	Xn, Harmful	**EU Risk Phrase:**	R22: Harmful if swallowed. R40: Limited evidence of a carcinogenic effect. R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed.
Acute Toxicity (WHO)	U; Unlikely to be Hazardous		
Cancer IARC:			
Cancer U.S. EPA:	Known/Likely: This category of descriptors is appropriate when the available tumour effects and other key data are adequate to convincingly demonstrate carcinogenic potential for humans; it includes: Agents known to be carcinogenic in humans based on either epidemiological evidence of a combination of epidemiological and experimental evidence, demonstrating causality between human exposure and cancer. Agents that should be treated as if they were known human carcinogens, based on a combination of epidemiological data showing a plausible causal association (not demonstrating it definitively) and strong experimental evidence. Agents that are likely to produce cancer in humans due to the production or anticipated production of tumours by modes of action that are relevant or assumed to be relevant to human carcinogenicity.		
Cancer EU	Category 3: Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.		

Endosulfan & alpha – Endosulfan

Chemical Identification

Technical endosulfan is made up of a mixture of two molecular forms (isomers) of endosulfan, the alpha- and beta-isomers.

CAS: 115-29-7 **CAS:** 959-98-8 (alpha-isomer) **CAS:** 33213-65-9 (beta-isomer)	**EC:** 204-079-4	**CIPAC:** 89	**Use Type:** Endosulfan is a chlorinated hydrocarbon insecticide and acaricide of the cyclodiene subgroup which acts as a poison to a wide variety of insects and mites on contact.	**Chemical Class:** chlorinated hydrocarbon

Chemical and physical properties

Water Solubility in mg/l (20 - 25°C):	0,1 - 0,53
Distribution coefficient (K_{oc}) in l/kg:	2040 - 200000
Partition coefficient (K_d) in l/kg	
Octanol/water partitioning (log K_{ow})	2,23 – 3,62
Half-life in soil (aerobic) in days:	27
Persistence:	Highly persistent
Half-life in water in days:	In raw river water at room temperature and exposed to light, alpha-endosulfan isomers disappeared in 4 weeks. A breakdown product first appeared within the first week. The breakdown in water is faster (5 weeks) under neutral conditions than at more acidic conditions or basic conditions (5 months). Under strongly alkaline conditions the half-life of the compound is 1 day. Large amounts of endosulfan can be found in surface water near areas of application.
Vapour pressure in mPa (20°C):	0,826
Vapour pressure in mPa (25°C):	0,023
Henry's Law constant in Pa m^3/mol	0,029 – 1,09

Environmental Toxicity

EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:	Endosulfan is very highly toxic to four fish species and both of the aquatic invertebrates studied; in fish species, the reported 96-hour LC50 values were (in ug/L): rainbow trout, 1,5; fathead minnow, 1,4; channel catfish, 1,5; and bluegill sunfish, 1,2. In two aquatic invertebrates, scuds (G. lacustris) and stoneflies (Pteronarcys), the reported 96-hour LC50 values were, respectively, 5,8 ug/L and 3,3 ug/L. The bioaccumulation for the compound may be significant; in the mussel (Mytelus edulis) the compound accumulated to 600 times the ambient water concentration.		
Effects on other organisms:	It is moderately toxic to bees and is relatively nontoxic to		

		beneficial insects such as parasitic wasps, lady bird beetles, and some mites.	
Hazardous Dose for Birds (HD_5 50%):		9,53	
Endocrine Disruption			
European Commission:		Category 2: Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations.	
EPA Illinois		Known	
Keith:		Yes	
Colborn:		Estrogen	
Benbrook:		Yes	
Exposure Potential:		Not evaluated	
Additional information on endocrine disruption:		Park et al. discover that exposure to extremely low levels (5ppb) of endosulfan, interferes with reproduction in the red-spotted newt Notophthalmus viridescens by disrupting the development of glands that synthesize a pheremone used in female-male communication. The disrupted development then leads to lower mating success.[xviii]	
Human Toxicity			
EU Symbol	T: Toxic	**EU Risk Phrase:**	R24/25: Toxic in contact with skin and if swallowed. R36: Irritating to eyes.
Acute Toxicity (WHO)	III; Moderately Hazardous		
Cancer IARC:			
Cancer U.S. EPA:	Not likely: Agents not likely to be carcinogenic to humans because they have been evaluated in at least two well conducted studies in two appropriate animal species without demonstrating carcinogenic effects. Agents not likely to be carcinogenic to humans because they have been appropriately evaluated in animals and show only carcinogenic effects that have been shown not to be relevant to humans (e.g., showing only effects in the male rat kidney due to accumulation of alpha(2u)-globulin). Agents not likely to be carcinogenic to humans when carcinogenicity is dose or route dependent. For instance, not likely below a certain dose range (categorized as likely by another route of exposure). To qualify, agents will have been appropriately evaluated in animal studies and the only effects show a dose range or route limitation, or a route limitation is otherwise shown by empirical data. Agents not likely to be carcinogenic to humans based on extensive human experience that demonstrates lack of effect (e.g., phenobarbital).		
Cancer EU			

Isoproturon				
Chemical Identification				
CAS: 34123-59-6	**EC:** 251-835-4	**CIPAC:** 336	**Use Type:** Pre- and post emergence herbicide to control annual grasses and broad-leaved weeds.	**Chemical Class:** Urea
Chemical and physical properties[xix]				
Water Solubility (20°C) in mg/l:			55 - 72	
Distribution coefficient (K_{oc}) in l/kg:			100	
Partition coefficient (K_d) in l/kg				
Octanol/water partitioning (K_{ow})			177	
Half-life in soil in days:			20 - 40	
Persistence:			Not persistent	
Half-life in water in days:			30	
Vapour pressure in mPa (20°C):			0,003 x 10^{-3}	
Henry's Law constant in Pa m^3/mol				
Additional information:			Isoproturon is highly persistent in the water-sediment environment.	
Environmental Toxicity				
EU Symbol:	N, Dangerous for the Environment		**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:				
Effects on other organisms:				
Hazardous Dose for Birds (HD_5 50%):			313,40	
Endocrine Disruption				
European Commission:				
EPA Illinois				
Keith:				
Colborn:				
Benbrook:				
Exposure Potential:				
Human Toxicity				
EU Symbol	Xn: Harmful		**EU Risk Phrase:**	R22:Harmful if swallowed. R40: Limited evidence of a carcinogenic effect.

Acute Toxicity (WHO)	III; Slightly Hazardous	
Cancer IARC:		
Cancer U.S. EPA:		
Cancer EU	Category 3: Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.	

Lindane

Chemical Identification

CAS: 58-89-9	**EC**: 200-401-2	**CIPAC:** 488	**Use Type:** Lindane is an organochlorine insecticide and fumigant which has been used on a wide range of soil-dwelling and plant-eating (phytophagous) insects.	**Chemical Class:** Organochlorine

Chemical and physical properties

Water Solubility in mg/l (20°C):	6,6-7
Distribution coefficient (K_{oc}) in l/kg:	686-12400
Partition coefficient (K_d) in l/kg	
Octanol/water partitioning (log K_{ow})	
Half-life in soil:	15 months
Persistence:	Persistent
Half-life in water in days:	Lindane is very stable in both fresh and salt water environments, and is resistant to photodegradation. It will disappear from the water by secondary mechanisms such as adsorption on sediment, biological breakdown by microflora and fauna, and adsorption by fish through gills, skin, and food.
Vapour pressure in mPa (20°C):	1,2-5,6
Henry's Law constant in Pa m^3/mol	0,183
Adsorptions coefficient:	
Additional information:	

Environmental Toxicity

EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:	Lindane is highly to very highly toxic to fish and aquatic invertebrate species. Reported 96-hour LC50 values range from 1,7 to 90 ug/L in trout (rainbow, brown, and lake), coho salmon, carp, fathead minnow, bluegill, largemouth bass, and yellow perch. Water hardness did not seem to alter the toxicity to fish, but increased temperature caused increased toxicity for some species and decreased toxicity for others. Reported 96-hour LC50 values in aquatic invertebrates were: in Daphnia, 460 ug/L; in scuds, 10-88 ug/L; and in Pteronarcys (stone flies), 4,5 ug/L. The bioconcentration factor for the compound is 1400 times ambient water concentrations, indicating significant bioaccumulation.
Effects on other organisms:	Lindane is highly toxic to bees.
Hazardous Dose for Birds (HD_5 50%):	10,5

Endocrine Disruption

European Commission:		Category 1: At least one study providing evidence of endocrine disruption in an intact organism. Not a formal weight of evidence approach.	
EPA Illinois		Known	
Keith:		Yes	
Colborn:		Estrogen/Androgen	
Benbrook:		Yes	
Exposure Potential:		High	
Human Toxicity			
EU Symbol:	T, Toxic	**EU Risk Phrase:**	R23/24/25: Toxic by inhalation, in contact with skin and if swallowed. R36/38: Irritating to eyes and skin.
Acute Toxicity (WHO)	II; Moderately Hazardous		
Cancer IARC:	Group 2B: The agent is possibly carcinogenic to humans.		
Cancer U.S. EPA:	Category B2: Known to cause cancer in animals but not yet definitively shown to cause cancer in humans. These chemicals are designated probable human carcinogens. Category B is further split into pesticides for which some evidence exists that it causes cancer in humans (B1) and those for which evidence exists only in animals (B2).		
Cancer EU			

Malathion

Chemical Identification

CAS: 121-75-5	**EC:** 121-75-5	**CIPAC:** 12	**Use Type:** Malathion is a nonsystemic, wide-spectrum organophosphate insecticide.	**Chemical Class:** organophosphate

Chemical and physical properties

Water Solubility in mg/l:	130 – 145
Distribution coefficient (K_{oc}) in l/kg:	93 – 1800
Partition coefficient (K_d) in l/kg	
Octanol/water partitioning (log K_{ow})	2,7
Half-life in soil (aerobic) in days:	< 1
Half-life in water in days:	In raw river water, the half-life is less than 1 week, whereas malathion remained stable in distilled water for 3 weeks. Applied at 1 to 6 lb/acre in log ponds for mosquito control, it was effective for 2,5 to 6 weeks. In sterile seawater, the degradation increases with increased salinity. The breakdown products in water are mono- and dicarboxylic acids.
Vapour pressure in mPa (20 – 25°C):	0,45 – 0,7
Henry's Law constant in Pa m^3/mol	0,00114

Environmental Toxicity

EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Effects on aquatic organisms:	Malathion has a wide range of toxicities in fish, extending from very highly toxic in the walleye (96-hour LC50 of 0,06 mg/L) to highly toxic in brown trout (0,1 mg/L) and the cutthroat trout (0,28 mg/L), moderately toxic in fathead minnows (8,6 mg/L) and slightly toxic in goldfish (10.7 mg/L). Various aquatic invertebrates are extremely sensitive, with EC50 values from 1 ug/L to 1 mg/L. Malathion is highly toxic to aquatic invertebrates and to the aquatic stages of amphibians. Because of its very short half-life, malathion is not expected to bioconcentrate in aquatic organisms. However, brown shrimp showed an average concentration of 869 and 959 times the ambient water concentration in two separate samples.
Effects on other organisms:	The compound is highly toxic to honeybees.
Hazardous Dose for Birds (HD_5 50%):	139,10

Endocrine Disruption

European Commission:	
EPA Illinois	Suspected
Keith:	Yes

Colborn:		Thyroid	
Benbrook:			
Persistence:		Not persistent	
Exposure Potential:			
Human Toxicity			
EU Symbol	Xn: Harmful	**EU Risk Phrase:**	R22:Harmful if swallowed.
Acute Toxicity (WHO)	III; Slightly Hazardous		
Cancer IARC:			
Cancer U.S. EPA:			
Cancer EU			

Simazine				
Chemical Identification				
CAS: 122-34-9	**EC**: 204-535-2	**CIPAC: 22**	**Use Type:** Simazine is a selective triazine herbicide used to control broadleaf and grassy weeds.	**Chemical Class:** Triazine

Chemical and physical properties	
Water- Solubility in mg/l (20 – 22°C):	3,50-6,2
Distribution coefficient (K_{oc}) in l/kg:	103-238
Partition coefficient (K_d) in l/kg	0,48-4,31
Octanol/water partitioning (log K_{ow})	2,1
Half-life in soil in days (aerobic):	91
Half-life in soil in days (anaerobic):	58
Persistence:	Not persistent
Half-life in water in days:	The average half-life of simazine in ponds where it has been applied is 30 days, with the actual half-life dependent on the level of algae present, the degree of weed infestation, and other factors. Simazine may undergo hydrolysis at lower pH. It does not readily undergo hydrolysis in water at pH = 7.
Vapour pressure in mPa (10°C):	$1,2 \times 10^{-4}$
Vapour pressure in mPa (20°C):	8×10^{-4}
Vapour pressure in mPa (25°C):	0,003
Henry's Law constant in Pa m^3/mol	$9,8 \times 10^{-5}$
Additional information:	Simazine is not degradable in the water-sediment environment.

Environmental Toxicity			
EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:		Simazine is slightly to practically nontoxic to aquatic species. The 96-hour LC50 for simazine is >100 mg/L in rainbow trout, 100 mg/L (wettable powder) in bluegill sunfish, 0.100 mg/L in fathead minnows, as well as carp . It may be more toxic to Daphnia and stoneflies. A 96-hour LC50 of >3.7 mg/L is reported in oysters.	
Effects on other organisms:		While many mammals may be insensitive to simazine, sheep and cattle are especially sensitive. Simazine is nontoxic to bees. A soil LC50 in earthworms of >1000 mg/kg has been reported.	
Hazardous Dose for Birds (HD_5 50%):		965,25	

Endocrine Disruption			
European Commission:		Category 2: Potential for endocrine disruption. In vitro data indicating potential for endocrine disruption in intact organisms. Also includes effects in-vivo that may, or may not, be ED-mediated. May include structural analyses and metabolic considerations.	
EPA Illinois			
Keith:		Yes	
Colborn:			
Benbrook:			
Exposure Potential:		Not evaluated	
Human Toxicity			
EU Symbol:	Xn, Harmful	**EU Risk Phrase:**	R40: Limited evidence of a carcinogenic effect.
Acute Toxicity (WHO)	U; Unlikely to be Hazardous		
Cancer IARC:	Group 3: The agent is not classifiable as to its carcinogenicity to humans.		
Cancer U.S. EPA:	Category C: Possible human carcinogens, where the data show limited evidence of carcinogenicity in the absence of human data.		
Cancer EU	Substances which cause concern for humans owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2.		

Trifluralin

Chemical Identification				
CAS: 1582-09-8	**EC**: 216-428-8	**CIPAC:** 183	**Use Type:** Trifluralin is a selective, pre-emergence dinitroaniline herbicide used to control many annual grasses and broadleaf weeds.	**Chemical Class:** dinitroaniline

Chemical and physical properties	
Water- Solubility in mg/l (20 - 22°C):	0,32 – 7,5
Distribution coefficient (K_{oc}) in l/kg:	1200 – 13700
Partition coefficient (K_d) in l/kg	18,6 – 155,6
Octanol/water partitioning (log K_{ow})	3,97 – 5,07
Half-life in soil in days (aerobic):	116 – 189
Persistence:	Persistent
Half-life in water in days:	Trifluralin is nearly insoluble in water. It will probably be found adsorbed to soil sediments and particulates in the water column.
Vapour pressure in mPa (20-25°C):	6,7 – 14,6
Henry's Law constant in Pa m^3/mol	1,53

Environmental Toxicity			
EU Symbol:	N, Dangerous for the Environment	**EU Risk phrase:**	R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Effects on aquatic organisms:	Trifluralin is very highly toxic to fish and other aquatic organisms. The 96-hour LC50 is 0,02 to 0,06 mg/L in rainbow trout, and 0,05 to 0,07 mg/L in bluegill sunfish. The 96-hour LC50 in channel catfish is approximately 1,4 to 3,4 mg/L . Variables such as temperature, pH, life stage, or size may affect the toxicity of the compound. Trifluralin is highly toxic to Daphnia, a species of small freshwater crustacean, with a 48-hour LC50 of 0,5 to 0,6 mg/L. The compound shows a moderate tendency to accumulate in aquatic organisms.		
Effects on other organisms:	At exposure levels well above permissible application rates (100 mg/kg), trifluralin has been shown to be toxic to earthworms. However, permitted application rates will result in soil residues of approximately 1 ppm trifluralin, a level that had no adverse effects on earthworms. It is nontoxic to bees.		
Hazardous Dose for Birds (HD_5 50%):	245,55		

Endocrine Disruption	
European Commission:	
EPA Illinois	Probable
Keith:	Yes
Colborn:	Reproductive/Metabolic

Benbrook:		Yes	
Exposure Potential:		Not evaluated	
Human Toxicity			
EU Symbol:	Xi, Irritating	**EU Risk Phrase:**	R36: Irritating to eyes. R43: May cause sensitization by skin contact.
Acute Toxicity (WHO)	U; Unlikely to be Hazardous		
Cancer IARC:	Group 3: The agent is not classifiable as to its carcinogenicity to humans.		
Cancer U.S. EPA:	Category C: Possible human carcinogens, where the data show limited evidence of carcinogenicity in the absence of human data.		
Cancer EU			

Annex 2

Pesticide Usage in Bosnia and Herzegovina

Annex 2 Pesticide Usage in Bosnia and Herzegovina

2.1 Federation of Bosnia and Herzegovina

Exact data regarding consumption of pesticides on the territory of the Federation of Bosnia and Herzegovina are very difficult to obtain because of the fact that borders are still very porous and permeable. It very often happens that farmers a buying pesticides abroad without any control so it is almost impossible to collect exact data.

However, available sales data on the priority pesticides were submitted, they are presented in Table 1 below.

The table shows that all sales except 2,4-D between 2002 and 2003 so far significantly dropped. The year 2003, however is not over and coming sales might be added.

Concerning 2,4-D in the first half year of 2003 the double amount from the last year is already sold. The question is how many of the pesticide used were reported last year, and if reporting schemes and/or illegal trade have changed.

Table 1: Amounts Priority Data Sold in Federation of Bosnia & Herzegovina

Pesticide	Amounts Sold in 2002 (kg or l ai)	Amounts Sold in 2003 (kg or l ai)
2,4-D	24,000	42,600
Chlorpyrifos	13,038	6,770
Copper hydroxide	1,995	2,750
Copper sulphate (basic)	14,875	1,700
Copper oxychloride	0	550
Trifluralin	816	480
Atrazine	800	250
Endosulfan	4	35
TOTAL	55,527	55,135

Table 2 presents expert estimates on the treated area in Bosnia & Herzegovina. The data show that only a small percentage of the crop area is treated with priority pesticides. Vineyards with 40% treatment account for the highest density.

Table 2: Areas Treated with Priority Pesticides in Bosnia and Herzegovina

Active Ingredients (AI)	Name of Product	Main Crops Applied to	Application Rate (kg or litre per ha)	Number of Applications per Year	% Crops Treated
2,4-D	Deherban A SL	Wheat, Barley, Ray, Maize, Pasture, Meadows	1.5 – 2.5 l/ha	1	20
Atrazine	Gesaprim	Maize	2 – 4 l	1	10
Copper hydroxide	Champion	Vegetables, Stone fruits, Vineyards	4 kg/ha	2, 4	5
Copper oxychloride	Koside B	Vegetables, Stone fruits, Vineyards	4 kg/ha	2, 4	3
Copper sulphate (basic)	Modra galica	Vineyards, Vegetables	7 – 10 kg/ha	4	40 Vineyards, and 20% Vegetable

Active Ingredients (AI)	Name of Product	Main Crops Applied to	Application Rate (kg or litre per ha)	Number of Applications per Year	% Crops Treated
Chlorpyrifos	Dursban E 48	Fruit trees and Soil	2 l for Fruit trees/ha, 2-8 l for Soil	1	2 for fruit trees
	Chromorel D	Potato		2	0.5 for soil
	Chromorel P2	Potato	0.75 – 1 l/ha	2	15
	Dursban G-7,5	Soil	15 –20 kg/ha	1	25
			15 – 60 kg/ha		1,5
Endosulfan	Thiodan – 35	Fruit trees, Vineyards, Oil rape	2.5 – 3.0 l/ha	2	0.05
Trifluralin	Treflan EC	Vegetables, Soya been, Oil rape	1-2.5 l/ha	1	0.02

Problems Associated with Pesticide Use in Bosnia & Herzegovina

The experts state that farmers apply the herbicides 2,4-D and Atrazine not at the best time for an application, that Chlorpyrifos is applied in amounts larger than recommended. The use of copper in fruits causes sometimes phytotoxic effects on the fruit trees.

2.2 Republic of Srpska

Data on the amounts sold and the areas treated with priority pesticides in the Republic of Srpska were submitted by the national experts. Table 3 shows sales by active ingredient, these data were extracted from the products sales data. The detailed information on product sales in 2000 and 2001 can be found in Table 5 in the end on the Annex. Table 3 shows that usage of priority pesticides declined from 2000 to 2001, especially 2,4-D, Alachlor and Malathion and Trifluralin were used much less. These numbers cannot be used for trend estimation, since information on the reporting system, shift to other pesticides, trade issues are not available.

Table 3: Priority Pesticides Sold in the Republic of Srpska 2000 & 2001

Pesticide	2000	2001
	kg or l active ingredient	kg or l active ingredient
Atrazine	71,000	73,037
2,4-D	16,184	5,789
Alachlor	11,040	4,800
Copper sulphate	7,628	4,245
Copper oxychloride	4,000	3,991
Malathion	6,178	3,067
Trifluralin	5,952	2,208
Copper hydroxide	2,500	1,000
Lindan	412	684
Zinc phosphide	100	52
Endosulfan	2,625	0
Isoproturon		0
Simazine		0
Total	129,619	100,873

Table 4 shows the use intensity of priority pesticides by crop. It shows that up to 80% of the field vegetable receive a Trifluralin application, and that 60% of the maize area is treated either with Alachlor and/or Atrazine.

Table 4: Intensity of Use of Priority Pesticides by Crop in the Republic of Srpska

Pesticide	Product Name	Crop	Application Rate	Number of Application per Year	% of Crop Treated
2,4-D	Monosan Herbi	Wheat	2 l/ha	1	50%
Alachlor	Alahlor 480, Alahlor 48-EC	Maize	4 l/ha	1	60%
Atrazine	Atrazin SC, Radazin T-50	Maize	2 l/ha	1	60%
Copper hydroxide	Blauvit	Fruit, field vegetables	5 kg/ha	2	15%
Copper oxychloride	Bakrocid 50, Bakarni krec	Fruit, field vegetables	10 kg/ha	1	15%
Copper sulphate (basic)	Bordovska corba, Plavi kamen	Fruit, field vegetables	10 kg/ha	1	15%
Endosulfan	Tiocid- 35	Fruit	1 kg/ha	2	10%
Lindane (gamma-HCH)	Lindan E-20	Fruit, vegetables	1 kg/ha	2	5%
Malathion	Etiol specijal, Etiol tecni	Field vegetables	1,5 kg/ha	2	30%
Trifluralin	Zupilan, Trefgal	Field vegetables	2 l/ha	1	80%

Problems Associated with Pesticide Use

Only a few problems associated with pesticide use were listed by the national experts.

2,4-D is used not in the appropriate timespan, often too late in the season. Lindane is used for crops it is not registered for, such as vegetables, and application rates of Atrazine often exceed recommendations.

Table 5: Pesticide Registration Data of Pesticide Products Containing Priority Pesticides, and Amounts Sold in the Republic of Srpska

Pesticide	Product Name	% ai	Amount Product Sold kg or l	Amount ai Sold kg or l	Year
2,4-D	Maton	60	600	360	2000
		60	48	29	2001
	Monosan Herbi	46	34,400	15,824	2000
		46	12,400	5,704	2001
	Esteron	56	100	56	2001
Alachlor	Alahlor 480	48	8,000	3,840	2000
		48	10,000	4,800	2001
	Alahlor E- 48	48	15,000	7,200	2000
Atrazine	Atrazin TS	50	12,000	6,000	2000
	Atrazin SC	50	130,000	65,000	2000
		50	90,526	45,263	2001

Pesticide	Product Name	% ai	Amount Product Sold kg or l	Amount ai Sold kg or l	Year
	Radazin WP- 50	50	540	270	2001
	Radazin T- 50	50	47,520	23,760	2001
	Gesaprim 90- WG	90	4,160	3,744	2001
Copper hydroxide	Blauvit	50	5,000	2,500	2000
		50	2,000	1,000	2001
Copper oxychloride	Bakrocid 50	50	8,000	4,000	2000
		50	6,305	3,153	2001
	Bakarni krec	25	3,352	838	2001
Copper sulphate	Bordovska corba	25	10,260	2,565	2000
		25	4,510	1,128	2001
	Plavi kamen	25	20,250	5,063	2000
		25	11,000	2,750	2001
	Kupragin	35	1,050	368	2001
Endosulfan	Tiocid- 35	35	7,000	2,450	2000
	Thiodan E- 35	35	500	175	2000
Lindan	Lindan E- 20	20	2,000	400	2000
		20	3,375	675	2001
	Ksilolin	3	400	12	2000
		3	300	9	2001
Malathion	Radotion E- 50	50	1,000	500	2000
	Etiol tecni	60	6,180	3,708	2000
		60	4,788	2,873	2001
	Etiol prah- 5	5	1,884	94	2000
		5	288	14	2001
	Etiol specijal	1	2,010	20	2000
		1	12,015	120	2001
	Vetiol	40	4,620	1,848	2000
	Vetiol plv 2%	2	384	8	2000
	Malation E- 50	50	120	60	2001
Isoproturon	-	0	-		
Simazine	-	0	-		
Trifluralin	Zupilan	48	10,000	4,800	2000
		48	2,600	1,248	2001
	Trefgal	48	2,400	1,152	2000
		48	2,000	960	2001
Zinc phosphide	Cinkfosfid mamak	2	400	8	2000
		2	1,000	20	2001
	Cinkfosfid prah	84	110	92	2000
	Cinkosan	2	20	0	2001
	Pacomor	2	1,570	31	2001

Annex 3

Pesticide Usage in Bulgaria

Annex 3: Pesticide Usage in Bulgaria

The national experts submitted information on the overall use in Bulgaria, registration data as well as overall usage data by region. The National Service for Plant Protection (NSPP) was the main source of information and delivered data from each of its 29 regions (see Table 6).

0 below shows that total use of formulated products in Bulgaria is about 5 million kg, while import data extracted from the FAO database in 0 indicates that pesticide usage rose between 1995 and 2001 by some 23%. Data on domestic pesticide production are not available.

Detailed usage data by crop and region are also not available. Agricultural data such as hectare by crop by region as well as information on the geographical location of the NSPP region in the Danube basin were not submitted.

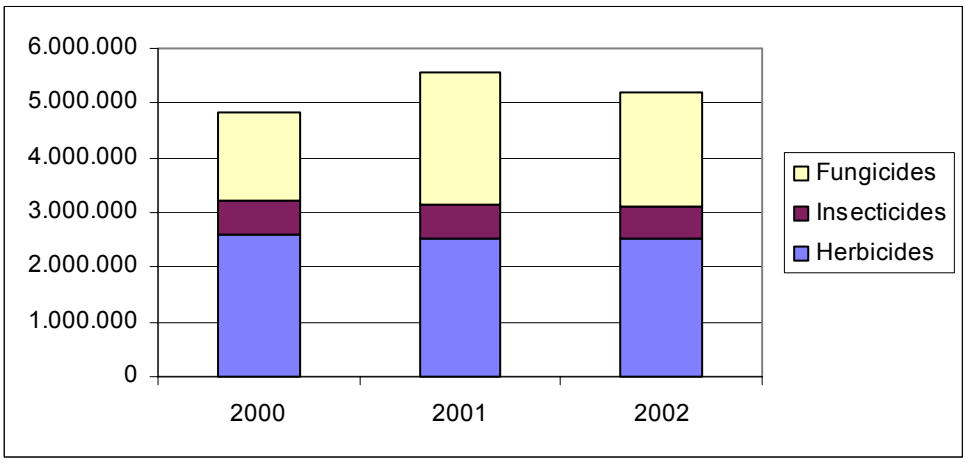

Figure 1: Pesticide Usage in Bulgaria (kg formulated product) 2000-2002

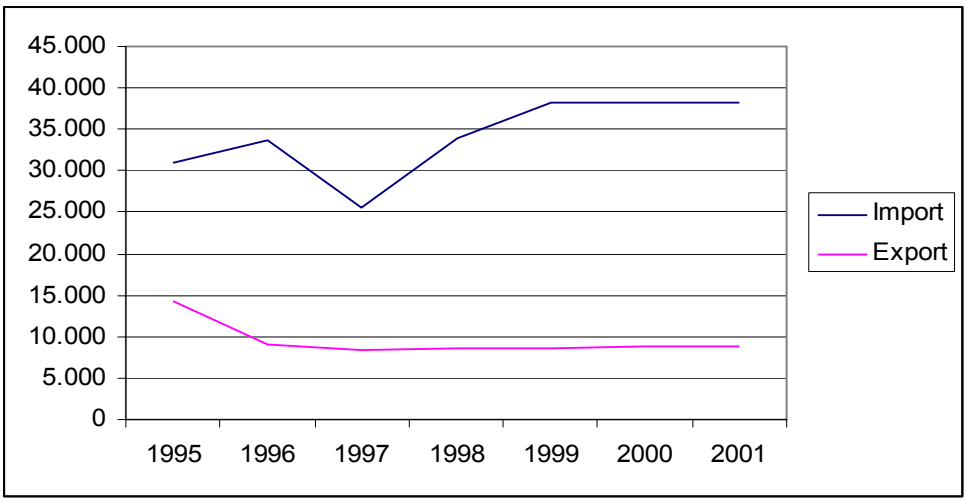

Figure 2: Pesticide Import and Export in Bulgaria (value $1000) 1995-2001

Source: FAO Database

Table 6: Overall Pesticide Consumption in Bulgarian Regions

	Herbicides			Insecticides			Fungicides		
NSPP Regions	**2000**	**2001**	**2002**	**2000**	**2001**	**2002**	**2000**	**2001**	**2002**
Dobrich	486,000	495,000	489,000	79,000	89,000	85,000	129,000	135,000	133,000
Bourgas	147,000	136,000	186,000	23,000	22,000	29,000	321,000	296,000	340,000
Silistra	168,000	162,100	164,300	48,000	53,200	46,800	43,000	41,400	44,200
Rousse	116,751	110,483	154,030	14,315	17,060	25,909	23,228	19,765	42,474
Pleven	188,613	157,690	146,860	35,297	34,268	36,475	60,113	58,825	53,940
Varna	165,500	157,200	142,500	6,400	5,900	5,150	187,500	167,300	154,200
Shoumen	125,300	137,500	132,400	2,010	2,200	1,960	12,700	13,500	14,300
Plovdiv	135,200	120,900	128,300	117,300	111,500	114,400	113,720	110,500	111,000
Vratza	97,685	123,782	104,662	27,371	25,056	10,287	85,719	105,780	136,439
Stara Zagora	139,200	112,400	104,200	19,800	17,900	15,300	67,500	65,800	61,500
Veliko Tarnovo	56,820	52,600	96,100	5,300	6,000	17,970	29,300	32,000	26,500
Razgrad	166,889	154,388	83,732	24,550	12,320	7,793	8,898	24,300	20,697
Yambol	64,600	91,715	81,617	15,200	19,050	14,946	50,100	41,360	50,325
Sliven	113,400	91,200	79,300	14,000	12,300	9,400	102,100	75,500	69,000
Targovishte	74,650	63,000	70,824	2,840	2,260	4,215	36,440	39,650	38,422
Pazardjik	70,000	56,700	61,000	82,000	60,500	58,200	120,000	896,000	496,000
Haskovo	27,820	29,100	52,800	15,100	15,900	16,500	72,340	75,280	76,300
Vidin	31,680	48,760	43,750	4,520	5,080	6,300	12,350	13,120	14,200
Sofia-region	47,150	43,370	42,700	4,520	5,200	3,900	6,100	9,150	7,500
Montana	68,700	56,224	38,600	7,100	6,365	6,200	45,779	65,150	37,500
Lovetch	42,422	40,773	31,610	9,973	8,900	3,600	20,174	20,832	15,687
Pernik	12,490	27,328	28,450	3,272	1,928	1,586	1,642	8,557	10,173
Blagoevgrad	15,400	21,605	27,320	21,750	32,360	27,870	23,500	60,800	75,500
Gabrovo	19,800	19,215	22,500	510	1,612	362	1,610	1,920	1,122
Smolyan	3,000	3,500	7,600	11,310	10,043	12,945	13,400	24,810	34,400
Kustendil	8,477	9,258	7,325	6,626	6,025	5,982	11,458	18,208	18,683
Sofia-town	5,390	5,530	6,980	122	120	106	2,428	2,530	2,825
Kardjali	200	287	930	9,067	18,230	9,030	8,442	8,930	10,237
TOTAL in 1000 kg	**2,598**	**2,528**	**2,535**	**610**	**602**	**577**	**1,610**	**2,432**	**2,096**

Table 7: Pesticide Consumption in Selected Bulgarian Regions

Region	Herbicides	Insecticides	Fungicides	Total
Dobrich	489,000	85,000	133,000	707,000
Pazardjik	61,000	58,200	496,000	615,200
Bourgas	186,000	29,000	340,000	555,000
Plovdiv	128,300	114,400	111,000	353,700
Varna	142,500	5,150	154,200	301,850
Silistra	164,300	46,800	44,200	255,300
Vratza	104,662	10,287	136,439	251,388
Pleven	146,860	36,475	53,940	237,275
Rousse	154,030	25,909	42,474	222,413
Stara Zagora	104,200	15,300	61,500	181,000

The total amounts in Table 6 show that usage was, except for fungicides, stable between 2000 and 2002. Table 7 presents the 10 regions with the highest pesticide use in Bulgaria. Of these, there are 5 regions that completely or partly fall within the DRB catchment – Dobrich, Silistra, Vratza, Pleven and Rousse.

Information on the use of priority pesticide was not submitted.

Detailed information about pesticide products containing priority pesticides in Bulgaria can be found in Table 8 and Table 9 at the end of this Annex.

Problems Associated with Pesticide Use

The national expert listed a number of problem associated with pesticide use.

1. Cases when the recommended dosages are exceeded are rarely observed because of the high prices of the plant protection products. Usually the other case is observed – reduction of the optimum dosages, that has also double negative effect – the soil is polluted without reaching the desired effect.
2. No respect of protection zones when treating with ground techniques and agricultural aviation – some damages could occur on the adjacent areas where different crops are grown.
3. Trade with non-registered pesticides from abroad with unclear contents.
4. The wind velocity during the treatment is overlooked – damages of adjacent areas with other crops is possible.
5. For some pesticides (Isoproturon, Chlorpyrifos, Alachlor and 2,4-D) the accurate treatment periods, recommended by the regional offices of the NSPP are missed, therefore the treatment effect is very low and unjustified.
6. Applied amounts of Atrazine and copper products exceed the recommended application rate. In the case of Atrazine this may affect the following crop, in the case of copper it may affect the same crop.
7. Storages with unused and not usable pesticide products, including priority pesticides such as 2,4-D and Atrazine are a larger problem. The storage houses are damaged and in very bad shape and they are not safe for the environment. Each year new storage houses with pesticides need to be cleaned. In 2002 a number of 493 storage houses for plant protection materials in the country were cleaned.

8. According to the FAO: *"Local pesticide pollution of soils occurs. Inadequate rates of pesticide application, in combination with bad storage, have contributed to pesticide amounts in soils above the maximum, permitted concentrations. The pesticides include some banned chloro-organic insecticides (e.g. hexachloran heptachlor, aldrin, dieldrin and endrin). The amount of pesticides applied decreased sharply between 1994 and 1997 for the same reason as the fertilizer decrease, i.e. prices have been too high. During the land privatization and the liquidation of the old structures, the problem of pesticide storage, protection and controlled application arose, as well as their destruction when they were no longer fit to be used. Cases were recorded in which outdated chemical preparations were removed from their original packaging and offered for sale."*

Table 8 Pesticide Registration Data of Pesticide Products Containing Pesticides in Bulgaria

Name of Product containing Active Ingredients	Main Crops Applied to	Application Rate (kg or litre formulated product per ha)	Typical Number of Applications per Year
2,4-D containing products			
2,4-D amino salt	Maize	1.2 l/ha	1
	Wheat, barley	1.5-2.0 l/ha	1
2,4-D KNE	Wheat	1.0-2.0 l/ha	1
Agro-D-Amin	Wheat	1.6-2.4 l/ha	1
Aminopielik 600 SL	Maize	1.2 l/ha	1
	Wheat, barley	1.5-2.0 l/ha	1
Valsamin	Wheat	1.5 l/ha	1
Dezormon liquid	Maize	1.2 l/ha	1
	Wheat, barley	1.5-2.0 l/ha	1
Dikamin D (from Malayzia)	Maize	1.2 l/ha	1
	Wheat, barley	1.5-2.0 l/ha	1
Dikamin D((from Bulgaria)	Wheat	1.5 l/ha	1
Dikopur F (from Austria)	Maize	1.2	1
	Wheat, barley	1.5-2.0 l/ha	1
Dikopur F (from Bulgaria)	Wheat	1.5 l/ha	1
Diovid 60 SL	Maize	1.2 l/ha	1
	Wheat, barley	1.5-2.0 l/ha	1
DMA 6	Maize	1.2	1
	Wheat	1.5-2.0 l/ha	1
Ester X	Wheat	1.25-1.6 l/ha	1
Luvaram	Maize	1.5 l/ha	1
	Wheat, barley	2.0-2.5 l/ha	1
Maton 600 EK	Maize	1.1 l/ha	1
	Wheat, barley	1.2-1.5 l/ha	1
Mostamin 720 SL	Maize	1.2 l/ha	1
	Wheat, barley	1.6 l/ha	1
Sanafen	Maize	1.2 l/ha	1
	Wheat	1.5-2.0 l/ha	1
Solution 800 SP	Maize	0.6 g/ha	1
	Wheat, barley	0.750 g/l	1
U 46 D Fluid	Maize	1. 4 l/ha	1
	Wheat, barley	1.6-2.4 l/ha	1
Herboxon	Maize	1.5 l/ha	1

Name of Product containing Active Ingredients	**Main Crops Applied to**	**Application Rate (kg or litre formulated product per ha)**	**Typical Number of Applications per Year**
	Wheat, barley	2.0-2.5 l/ha	1
Buktril D	Wheat	0.8-1.0 l/ha	1
Defender SL (from India)	Wheat	0.8-1.0 l/ha	1
Defender SL (from Bulgaria)	Maize	1.2 l/ha	1
Pacific	Maize	1.2 l/ha	1
Weedmaster 646 SL (from Switzerland)	Wheat, barley	0.8-1.0 l/ha	1
	Maize	1.2 l/ha	1
Weedmaster SL (from Bulgaria)	Wheat, barley	0.8-1.0 l/ha	1
Sansac	Wheat, barley	1.0 l/ha	1
Dicopur MP Kombi	Wheat, barley	3.0-4.0 l/ha	1
Duplozan KB Kombi	Wheat, barley	2.5 l/ha	1
Mustang 306,25 SK	Wheat	0.6-0.8 l/ha	1
Lotus D	Wheat, barley	0.75-1.0 l/ha	1
Alachlor containing products			
Alanex 48 EK	Maize, sunflower, soy bean, bean, ground-nut	3.5-4.0 l/ha	1
Alanex Neo 48 EK	Maize, sunflower, potatoes	3.5-4.0 l/ha	1
Alachlor 48 EK-S	Maize, soy bean, sunflower, cotton	3.5-4.0 l/ha	1
Alachlor 48 EK-I	Maize, soy bean	3.5-4.0 l/ha	1
Lasagrin 48 EK	maize	3.5-4.0 l/ha	1
Laso 48 EK	Maize, sunflower, cotton, soy bean, bean, cabbages, potatoes	3.0-4.0 l/ha	1
Sanachlor 48 EK	Maize, soy bean	3.5-4.0 l/ha	1
Cotralin EK	Sunflower	8.0-10 l/ha	1
Alachlor & Atrazine containing products			
Alazin 25/25 CE	Maize	4.0 l/ha	1
Alazin 33/14 CE	Maize	4.0 l/ha	1
Atlas	Maize	4.0 l/ha	1
Lacorn Combi	Maize	5.0 l/ha	1
Atrazine containing products			
Atranex 50 SK	Maize	2.5-3.0 l/ha	1
Atranex 80 VP	Maize	2.0 kg/ha	1
Atranex 90 VDG	Maize	1.0-1.2 kg/ha	1
Gesaprim 90 VG	Maize	1.0-1.2 kg/ha	1
Guardian Extra	Maize	4.0-6.0 l/ha	1
Erunit 720 A	Maize	4.0 l/ha	1
Ladoc	Sorgo	3.0 l/ha	1
	Maize	4.0 l/ha	1
Primextra Gold 720 SK	Maize	2.5-3.0 l/ha	1
Aspect 500 SK	Maize	2.5-3.0 l/ha	1

Name of Product containing Active Ingredients	Main Crops Applied to	Application Rate (kg or litre formulated product per ha)	Typical Number of Applications per Year
Copper containing products			
Vitra 50 VP	Vineyards, potatoes	1.5 kg/ha	1-3[1]
Concentrate of Bordeax mixure CK 11	Vineyards	1%	1-3[1]
Kosaid 101 VP	Vineyards	0.15%	1-3[1]
	Tomatoes	0.3%	1-3[1]
Kosaid DF	Vineyards	0.18%	1-3[1]
Funguran ON 50 VP	Vineyards, tomatoes, peach	0.15%	1-3[1]
	Tomatoes, tobacco	0.3%	1-3[1]
	Potatoes, tobacco	1.5 kg/ha	1-3[1]
Champ Plus	Peach	0.15%	1-3[1]
Magic Cap 60 VP	Vineyards	0.2%	1-3[1]
	Apple	0.25%	1-3[1]
Lactofol Cupro	Vineyards	1%	1-3[1]
Copper oxychloride 50 VP (from Bulgaria)	Vineyards, tomatoes	0.25%	1-3[1]
	Potatoes	2.5 kg/ha	1-3[1]
Copper oxychloride 50 VP (from Germany)	Vineyards, tomatoes	0.25%	1-3[1]
Cupro 50 VP	Vineyards	0.25%	1-3[1]
Cuprol 50 VP	Vineyards	0.25%	1-3[1]
Rumba 35 SK	Vineyards	0.35%	1-3[1]
Forum R 460 VP	Vineyards	0.3%	1-3[1]
Melody Compact 24,5 VP	Vineyards	0.3%	1-3[1]
	Potatoes	4 kg/ha	1-3[1]
Cuprocine Super M	Vineyards	20%	1-3[1]
Axanit CU VP	Vineyards	0.25%	1-3[1]
Armetil S VP	Vineyards	0.25% (2.5 kg/ha)	1-3[1]
Cuproxil 48 VP	Potatoes	2.5 kg/ha	1-3[1]
Corseit R DF	Cucumbers, vineyards	0.25%	1-3[1]
Corseit R VP	Vineyards	0.25%	1-3[1]
	Potatoes	250 g/ha	1-3[1]
Cupronam 320 SK	Vineyards	0.25%	1-3[1]
Cuproseit 45 VP	Tomatoes	0.3%	1-3[1]
	Vineyards	0.4%; 1 tonne/ha solution	1-3[1]
Cuproseit Gold 45 VP	Vineyards, glasshouse tomatoes	0.25% (2.5 kg/ha)	1-3[1]
	Field tomatoes	2.5 kg/ha	1-3[1]
Cuprocin	Tomatoes	0.3-0.4%	1-3[1]
	Vineyards	0.4%	1-3[1]
	Potatoes	3 kg/ha	1-3[1]
	Onion, sugar beet	4 kg/ha	1-3[1]
Cuprocin Super	Vineyards	0.3 %	1-3[1]

[1] No more than 3 treatments with fungicide with the same active ingredients could be applied, since some ressistance of the product could occur

Name of Product containing Active Ingredients	**Main Crops Applied to**	**Application Rate (kg or litre formulated product per ha)**	**Typical Number of Applications per Year**
	Tomatoes, raspberries	0.4 %	1-3[1]
	Potatoes	3 kg/ha	1-3[1]
	Sugar beet	4 kg/ha	1-3[1]
Cuprocin Super Special	Vineyards	0.25-0.4%	1-3[1]
Cuproxat FL	Vineyards, tomatoes, apple	0.3%	1-3[1]
	Potatoes, tobacco	3.0 l/ha	1-3[1]
Blue (copper) vitriol (from Romania)	Vineyards	1% Bordeax mixure	1-3[1]
Blue (copper) vitriol (from Ukraine)	Sugar beet	1.5% Bordeax mixure	1-3[1]
	Whe60 at	2% solution of Blue (copper) vitriol	1-3[1]
Bordozin Super Special 56 VP	Vineyards	0.25%	1-3[1]
Bordozin Combi 76 VP	Vineyards	0.25%	1-3[1]
Bordozin Super 75 VP	Vineyards	0.3%	1-3[1]
Isoproturon containing products			
Arelon 50 EK	Wheat, barley	3.5 ÷ 5.0 l/ha	1
Isoprotusan 500 SK	Wheat, barley	3.5 ÷ 4.0-5.0 l/ha	1
Izor 500 SK	Wheat, barley	3.5 ÷ 4.0-5.0 l/ha	1
Izoflo 500 SK	Wheat, barley	3.5 ÷ 4.0-5.0 l/ha	1
IP-50 Flo	Wheat, barley	3.5 ÷ 4.0-5.0 l/ha	1
IP-830 VG	Wheat, barley	2.1 ÷ 2.4-3.0 l/ha	1
Protugan 50 SK	Wheat, barley	3.5 ÷ 4.0-5.0 l/ha	1
Taifun	Wheat, barley	3.5 l/ha[2]	1
Quartz Super	Wheat, barley	3.0 l/ha	1
Kugar	Wheat, barley	1.5-2.0 l/ha	1
Trifluralin containing products			
Agriflan 24 EK	Strawberries	3 l/ha	1
	Soy bean, beans, sunflower, cabbage, tomatoes, carrots	3.0-4.0 l/ha	1
	Pea nuts, cotton	3.5 l/ha	1
	Vineyards	6.0-10.0 l/ha	1
Valsaflan 48 EK	Sunflower	1.5-2.0 l/ha	1
Eflurin 24 EK	Sunflower	3.0-4.0 l/ha	1
Eflurin 48 EK	Bean	1.5-2.0 l/ha	1
Califort 48 EK	Sunflower	1.5-2.0 l/ha	1
Premerlin 600 EK	Sunflower	3.0-4.0 l/ha	1
	Maize	3.5-4.0 l/ha	1
Tefralin 48 EK	Sunflower	1.5-2.0 l/ha	1
Treflan 24 EK	Cotton, soy beans	3.0-4.0 l/ha	1
	Beans, pepper, carrots, cabbage, tomatoes	3.5 l/ha	1
	Menthe	4.0 l/ha	1
Trifluralin 24 EK-I	Soy bean, sunflower, cotton, tomatoes	3.0-4.0 l/ha	1

[2] Used only during vegetation period – after phase 3 leafs

Name of Product containing Active Ingredients	**Main Crops Applied to**	**Application Rate (kg or litre formulated product per ha)**	**Typical Number of Applications per Year**
Triflurex 48 EK	Soy bean, sunflower, cotton, tomatoes	1.5-2.0 l/ha	1
Triflusan 48 EK	Soy bean, sunflower, tomatoes	1.5-2.0 l/ha	1
Trifunil 48 EK	Sunflower	1.5-2.0 l/ha	1

Table 9: Pesticide Products registered in Bulgaria containing Priority Pesticides

Active Ingredients (AI)	Name of Formulated Product containing AI	%, g/l, g/kg_AI contained in Product (bold ai)
2,4-D	2,4-D amino salt	**600 g/l**
	2,4-D KNE	**600 g/l**
	Agro-D-Amin	**500 g/l**
	Aminopielik 600 SL	**600 g/l**
	Valsamin	**600 g/l**
	Dezormon liquid	**600 g/l**
	Dikamin D (from Malayzia)	**600 g/l**
	Dikamin D((from Bulgaria)	**600 g/l**
	Dikopur F (from Austria)	**600 g/l**
	Dikopur F (from Bulgaria)	**600 g/l**
	Diovid 60 SL	**600 g/l**
	DMA 6	**684 g/l**
	Ester X	**480 g/l**
	Luvaram	**610 g/l**
	Maton 600 EK	**600 g/l**
	Mostamin 720 SL	**600 g/l**
	Sanafen	**600 g/l**
	Solution 800 SP	**800 g/l**
	U 46 D Fluid	**500 g/l**
	Herboxon	**600 g/l**
2,4-D + Bromoxinil	Buktril D	**225 g/l** + 225 g/l
2,4-D + Dicamba	Defender SL (from India)	**360 g/l** + 120 g/l
	Defender SL (from Bulgaria)	**360 g/l** + 120 g/l
	Pacific	**360 g/l** + 120 g/l
	Weedmaster 646 SL (from Switzerland)	**344 g/l** + 120 g/l
	Weedmaster SL (from Bulgaria)	**360 g/l** + 120 g/l
2,4-D + Metosulam	Sansac	**360 g/l** + 5 g/l
2,4-D + MCPP	Dicopur MP Kombi	**100 g/l** + 400 g/l
	Duplozan KB Kombi	**160 g/l** + 360 g/l
2,4-D + Florasulam	Mustang 306,25 SK	**300 g/l** + 6,25 g/l
2,4-D + Cinidon-Etil	Lotus D	**420 g/l** + 50 g/l
Alachlor	Alanex 48 EK	**480 g/l**
	Alanex Neo 48 EK	**480 g/l**
	Alachlor 48 EK-S	**480 g/l**
	Alachlor 48 EK-I	**480 g/l**
	Lasagrin 48 EK	**480 g/l**
	Laso 48 EK	**480 g/l**
	Sanachlor 48 EK	**480 g/l**
Alachlor + Atrazine	Alazin 25/25 CE	**250 g/l** + 250 g/l
	Alazin 33/14 CE	**330 g/l** + 140 g/l
	Atlas	**336 g/l** + 144 g/l
	Lacorn Combi	**33,6%** + 14,4%
Alachlor + Prometrin	Cotralin EK	**23%** + 12%

Active Ingredients (AI)	**Name of Formulated Product containing AI**	**%, g/l, g/kg AI contained in Product (bold ai)**
Atrazine	Atranex 50 SK	**500 g/l**
	Atranex 80 VP	**800 g/kg**
	Atranex 90 VDG	**900 g/kg**
	Gesaprim 90 VG	**900 g/kg**
Atrazine + Acetochlor	Guardian Extra	**180 g/l** + 360 g/l
	Erunit 720 A	**270 g/l** + 410 g/l
Atrazine + Bentazon	Ladoc	**200 g/l** + 200 g/l
Atrazine + S-Metolachlor	Primextra Gold 720 SK	**320 g/l** + 400 g/l
Atrazine + Flufenacetate	Aspect 500 SK	**300 g/l** + 200 g/l
Copper and its compounds		
Copper carbonate, basic		
Copper hydroxide - $Cu(OH)_2$	Vitra 50 VP	**87,7%** (50% Cu)
	Concentrate of Bordeax mixure CK 11	**10-12%**
	Kosaid 101 VP	**770 g/kg** (500 g/kg Cu)
	Kosaid DF	**614 g/kg** (400 g/kg Cu)
	Funguran ON 50 VP	**770 g/kg** (500 g/kg Cu)
	Champ Plus	**360 g/l**
Copper hydroxide + Captan	Magic Cap 60 VP	**450 g/kg** + 150 g/kg
Copper hydroxide + Sulphur	Lactofol Cupro	**150 g/l** + 50 g/l
Copper oxychloride – $Cu_2Cl(OH)_3$	Copper oxychloride 50 VP (from Bulgaria)	**500 g/kg**
	Copper oxychloride 50 VP (from Germany)	**500 g/kg**
	Cupro 50 VP	**880 g/kg** (500 g/kg Cu)
	Cuprol 50 VP	**885 g/kg** (500 g/kg Cu)
	Rumba 35 SK	**350 g/l**
Copper oxychloride + Dimetomorf	Forum R 460 VP	**400 g/kg** + 60 g/kg
Copper oxychloride + Iprovalicarb	Melody Compact 24,5 VP	**35%** (20,3% Cu) + 4,2%
Copper oxychloride + Mancoceb	Cuprocine Super M	**50%** (30% Cu) + 20%
Copper oxychloride + Metalaxil	Axanit CU VP	**400 g/kg** + 80 g/kg
	Armetil S VP	**700 g/kg** + 80 g/kg
	Cuproxil 48 VP	**400 g/kg** + 80 g/kg
Copper oxychloride + Simoxanil	Corseit R DF	**397,5 g/kg** + 42 g/kg
	Corseit R VP	**397,5 g/kg** + 42 g/kg
	Cupronam 320 SK	**40 g/l** + 60 g/l
Copper oxychloride + Simoxanil + Zineb	Cuproseit 45 VP	**290 g/kg** + 40 g/kg + 120 g/kg
	Cuproseit Gold 45 VP	**290 g/kg** + 40 g/kg + 120 g/kg
Copper oxychloride + Zineb	Cuprocin	**29,31%** (17% Cu) + 34%
	Cuprocin Super	**500 g/kg** (370 g/kg Cu) + 150 g/kg
	Cuprocin Super Special	**690 g/kg** (400 g/kg Cu) + 100 g/kg
Copper sulphate (basic) –	Cuproxat FL	**345 g/l** (190 g/l Cu)

Active Ingredients (AI)	**Name of Formulated Product containing AI**	**%, g/l, g/kg AI contained in Product (bold ai)**
$CuSO_4$ $5H_2O$	Blue (copper) vitriol (from Romania)	**98%**
	Blue (copper) vitriol (from Ukraine)	**96-98%**
Copper sulphate + Simoxanil + Zink sulphate	Bordozin Super Special 56 VP	**260 g/kg** + 60 g/kg + 270 g/kg
Copper sulphate + Fluzilazol + Zink sulphate	Bordozin Combi 76 VP	**370 g/kg** + 10 g/kg + 370 g/kg
Copper sulphate + Zink sulphate	Bordozin Super 75 VP	**37%** + 37%
Isoproturon	Arelon 50 EK	**500 g/l**
	Isoprotusan 500 SK	**500 g/l**
	Izor 500 SK	**500 g/l**
	Izoflo 500 SK	**500 g/l**
	IP-50 Flo	**500 g/l**
	IP-830 VG	**830 g/kg**
	Protugan 50 SK	**500 g/l**
	Taifun	**500 g/l**
Isoproturon + Diflufenikan	Quartz Super	**500 g/l** + 50 g/l
	Kugar	**500 g/l** + 100 g/l
Trifluralin	Agriflan 24 EK	**240 g/l**
	Valsaflan 48 EK	**480 g/l**
	Eflurin 24 EK	**240 g/l**
	Eflurin 48 EK	**480 g/l**
	Califort 48 EK	**480 g/l**
	Premerlin 600 EK	**600 g/l**
	Tefralin 48 EK	**480 g/l**
	Treflan 24 EK	**240 g/l**
	Trifluralin 24 EK-I	**240 g/l**
	Triflurex 48 EK	**480 g/l**
	Triflusan 48 EK	**480 g/l**
	Trifunil 48 EK	**480 g/l**

Annex 4

Pesticide Usage in Croatia

Annex 4: Pesticide Usage in Croatia

The registration data, agricultural data and some usage data for major pesticides (Atrazine, 2,4-D and Alachlor) were submitted. Table 10 presents an overview of the number of registered pesticides by type of use. Detailed information on pesticide products containing priority pesticides are listed in Table 12 and Table 13 at the end of the Annex.

Table 10: Number of Pesticides Registered in Croatia

Use	Number active ingredients	Number formulated product
Zoocides	86	201
Fungicides	80	216
Herbicides	90	226
Others	15	26

Table 11 shows that apples are the crops with the highest treatment frequency, followed by grapes and sugar beet. The table also apparently shows that "small" farms apply pesticide less often than "large" farms.

Table 11: Treatment Index for Major Crops in Croatia

Crop	Treatment Index
Apples	33.0
Vineyard	13.0
Sugar beet	6.3
Wheat (large farms)	4.0
Sunflower	4.0
Oilseed rape	3.5
Soy bean	3.5
Maize (large farms)	3.0
Potato	2.5
Wheat (small farms)	1.8
Maize (small farms)	1.2

Atrazine Use

According to the chemical industry, 406 tons of the active ingredient atrazine was used in 2001 in Croatia. If the average dosage was 1,25 kg/ha, then 324,000 ha of maize was treated, which means 87% of all surface under maize production. As atrazine is used in many herbicide combinations, it can surely be assumed that 100% of surface under maize were treated.

Alachlor Use

In Croatia, alachlor is used alone and in combinations. The use of alachlor dropped rapidly in the last years.

In 2001, 37 tons of pure alachlor was used. Average dosage is 2.50 kg ai/ha, what means that about 15,000 ha of maize, soy been, sunflower and oilseed rape was treated with formulated products.

The use of all three acetanilide (metolachlor, acetochlor, alachlor) in Croatia in 2001 was 517 tons, what make them one of the most hazardous groups, concerning the pollution of environment.

2,4-D Use

2,4 D herbicides are used in wheat, barley and maize. In 2001, 120 tons of 2,4-D (active ingredient) was used. Average dosage is 1 l/ha, so almost 100,000 ha of wheat and barley and 20,000 ha of maize was treated.

More detailed usage data by crop or active ingredient are not available.

Problems associated with Pesticide Use

1. Concerning atrazine use, the present situation is showing that water liability with atrazine in Croatia is probably very big and very urgent monitoring measures are needed. After the results with monitoring some restrictions and even prohibitions of atrazine would probably be needed.
2. In the two biggest river basins in Croatia there is approximately 365,000 ha under maize: in Sava basin 215,000 ha and in Drava and Dunav basin 150,000 ha. That means that in Sava basin about 240 tons of atrazine and in Drava-Dunav basin about 160 tons of atrazine is used per year. Part of the soils in Drava basin is more permeable, so on that soils the leaching of atrazine in ground waters can be dangerous.

Table 12: Data on Crops, Application Rate and Number of Applications of Pesticide Products Containing Pesticides in Croatia

Name of Product containing Active Ingredients	Main Crops Applied to	Typical Application Rate (kg or litre per ha)	Typical Number of Applications per Year
2,4-D containing products			
Deherban A	grain crops (not oat)	1.5-2.5 l/ha	1
	corn	1-1.5 l/ha	
	pastures and meadows	2.5-3 l/ha	
Dikocid	"	"	
Diconit	"	"	
Dicopur	"	"	
DMA 6	winter wheat, spring and winter barley	1-1.2 l/ha	
	corn	1 l/ha	
Alachlor containing products			
Lasso Microtech	corn, soy bean, sunflower	4-6 l/ha	1
	oil-seed rape	4-5 l/ha	
Bravo MC	"	"	
Lasso EC	corn, soy been, sunflower	4-5 l/ha	
Alaklor EC 48	"	"	
Bravo Terazin-T	corn	6-8 l/ha	
Alachlor & Atrazine containing products			
Lasso Atrazin	corn	5-8 l/ha	
Bravo Radazin-T SE	corn	5-8 l/ha	
Alazin 33/14	corn	5-8 l/ha	
Atrazine containing products			
Gesaprim 50 WP	corn, sorghum millet	2-3 kg/ha	1
Radazin WP 50	"	"	
Radazin WP 80	"	1.3-1.9 kg/ha	
Atranex 80 WP	corn	1.3-1.9 kg/ha	
	corn in monoculture	2-2.5 kg/ha	
Radazin T-50	corn, sorghum millet	2-3 l/ha	
Atranex 50 CS	corn	2-3 l/ha	
	corn in monoculture	3-4 l/ha	
Gesaprim 500 FL	"	"	
Aflazin 500 tekući	corn, sorghum millet	2-3 l/ha	
Atranit	"	"	
Copper containing products			
Champion WP	potato, onion, tomato, cucumber	0.35%	1-4
	grape vine, hop	0.35-0.45%	
	fruit trees in winter period	0.2-0.25%	
Champion tekući	tomato, potato	0.4-0.45%	
	grape vine	0.45%	
	cucumber, onion	0.3-0.4%	
	fruit trees in winter	0.7%	
Champ formula 2 FL	grape vine, apple	0.2-0.25%	
	potato-Phytophtora	2 l/ha	
	apple,pear-Erwinia	0.07%	
	peach - Taphrina	0.3-0.5%	
Cuproline	grape vine, sour cherry	0.3%	
	hop	0.4%	
	fruit trees in winter	0.6-0.7%	

Name of Product containing Active Ingredients	Main Crops Applied to	Typical Application Rate (kg or litre per ha)	Typical Number of Applications per Year
Cuproxat	hop, onion bean, cucumber, grape vine, olives	0.5-0.75%	
	fruit trees in winter	1 %	
	potato, tomato	5-6 kg/ha	
Kocide DF	grape vine	0.15-0.2%	
	potato, tomato	2 kg/ha	
	olive trees	0.2%	
	apple - Erwinia	0.05%	
	peach	0.3-0.5%	
Bakreno vapno WP 50	potato,tomato,hop,onion,been ,cucumbers, grape vine, olive trees	0.5-0.75% 6-7 kg/ha	1-4
Gypso GD	"	"	
Kupropin		0.5-0.75%	
	fruit trees in winter	1 %	
	tomato, potato	5-6 kg/ha	
Pasta Caffaro	grape vine	3-4 l/ha	
Cuprocaffaro 50 WP		0.5-0.75% 6-7 kg/ha	
Modra galica		0.5-2% 10-12 kg/ha	1-4
Chlorpyrifos containing products			
Dursban E-48	fruit trees, potato, sugar beet, other field crops	0.1-0.15% 1-2 l/ha	1-2
Pirifos EC	"	"	
Finish E-48	"	"	
Pyrinex 25 ME	apples	0.2-0.3%	
	oilseed rape	2 l/ha	
Zlatica pirifos	potato	25 kg/ha	
Reldan 40	fruit trees, grape vine, field crop, cabbage	0.1-0.125% 1.25-1.75 l/ha	
Reldan super	"	0.075-0.1% 1-1.5 l/ha	
	empty warehouse	1 ml/m2	
Chromorel D	fruit trees potato oilseed rape sugar beet s.b. Bothinoderes	0.075-0.15% 0.6-0.9 l/ha 0.75-1 l/ha 1-1.5 l/ha 1.5-2.0 l/ha	
Nurelle-D	"	"	
Herborel D	oilseed rape potato	0.75 l/ha 0.9 l/ha	
Chromorel Z	potato	0.5-1 l/ha	
Chromorel ZP	potato	15-20 kg/ha	
Chromorel P-2	potato sugar beet	15-20 kg/ha 20-25 kg/ha	
Endosulfan containing products			
Thiodan E-35	grape vine, fruit trees	0.1-0.2% 1.2-2.5 l/ha	1-2
Thionex E 35	"	"	
Global E-35	"	"	
Malathion containing products			
Radotion E-50	vegetable, water melon, melons, fruit trees grape vine,	0.15-0.3% 1.5-2.5 l/ha	1-3

Name of Product containing Active Ingredients	Main Crops Applied to	Typical Application Rate (kg or litre per ha)	Typical Number of Applications per Year
	field crops		
Radotion P-50		20-30 kg/ha	
Isoproturon containing products			
Alon 50 disperzija	winter wheat, barley, rye	2.5-3.5 l/ha	1
Tolkan	winter wheat, barley	4-5 l/ha	
	rye pre-em	2.5-3.5 l/ha	
Protugan 50 SC		2.5-3.5 l/ha	
Alon forte	winter wheat and barley	2-2.5 kg/ha	
Alon super	winter wheat and barley	2 kg/ha	
Grodyl plus	winter wheat and barley	1.75-2 kg/ha	
Simazine containing products			
Radokor 50 WP	corn	2-3 kg/ha	1
Radokor T-50	corn	2-3 l/ha	
Simapin T-50	corn	2-3 kg/ha	
Trifluralin containing products			
Treflan EC	sunflower,soy been,oilseed rape, been,cabbage	1.5-2.5 l/ha	1
Triflurex 48 EC	"	"	
Lanos	"	"	
Triflur	"	"	

Table 13: Pesticide Products registered for use in Croatia containing Priority Pesticides

Active Ingredients (AI)	Name of Formulated Product containing AI	% or g/kg or g/l AI contained in Product
2,4-D	Deharban A	464 g/l
	Dicovit	464 g/l
	Dikocid	464 g/l
	Dicopur	464 g/l
	DMA 6	680 g/l
Alachlor	Lasso Microtech	48%
	Bravo MC	48%
	Lasso EC	48%
	Alaklor EC 48	48%
	Lasso Atrazin	34%+14% atrazin
	Bravo Radazin-T SE	33%+14% atrazin
	Bravo-Terazin-T	33,6%+14,4%terbutilazin
	Alazin 33/14	33,6%+14,4% atrazin
Atrazine	Gesaprim 50 WP	50%
	Radazin WP 50	50%
	Radazin WP 80	80%
	Atranex 80 WP	80%
	Radazin T-50	50%
	Atranex 50 SC	50%
	Gesaprim 500 FL	50%
	Aflazin 500 tekući	50%
	Atranit	50%
Copper and its compounds		
Copper hydroxide - $Cu(OH)_2$	Champion	50%
	Champion tekući	24%
	Champ formula 2 FL	35%

	Cuproline	348 g/l
	Cuproxat	19%
	Kocide	40%
Copper oxychloride – $Cu_2Cl(OH)_3$	Bakreno vapno WP 50	50%
	Gypso GD	50%
	Kupropin	50%
	Pasta Caffaro	35%
	Cuprocaffaro 50 WP	50%
Copper sulphate (basic) – $CuSO_4$ $5H_2O$	Modra galica	25%
Chlorpyrifos	Dursban E-48	48%
	Pirifos EC	50%
	Finish E-48	48%
	Pyrinex 25 ME	25%
	Zlatica pirifos	4%
	Reldan 40	40%
	Reldan super	50%
	Chromorel D	50%+5% cipermetrin
	Nurelle-D	50%+5% cipermetrin
	Herborel D	50%+ 5% cipermetrin
	Chromorel Z	45%+30g/l betacipermetrina
	Chromorel ZP	1,8%+0,14% zetacipermetrina
	Chromorel P-2	1,8%+0,2% cipermetrina
Endosulfan	Thiodan E-35	35%
	Thionex E 35	35%
	Global E-35	35%
Malathion	Radotion E-50	50%
	Radotion P-5	5%
Isoproturon	Alon 50 disperzija	50%
	Tolkan	50%
	Protugan 50 SC	50%
	Alon forte	60%+1,5% fluoroglikofen
	Alon super	74%+1% amidosulfuron
	Grodyl plus	60%+1,5% amidosulfuron
Simazine	Radokor 50 WP	50%
	Radokor T-50	50%
	Simapin T-50	50%
Trifluralin	Treflan EC	48%
	Triflurex 48 EC	48%
	Lanos	48%
	Triflur	48%

Annex 5

Pesticide Usage in the Czech Republic

Annex 5: Pesticide Usage in the Czech Republic

The Czech Republic is one of the very few countries globally, which maintain a pesticide use reporting system and a permission system for highly toxic and toxic pesticides. All professional users of pesticides are required to record their pesticide use in detail. Article § 29 on the Handling of plant protection products describe the details:

(3) The use of plant protection products in the framework of commercial activities must be recorded in the way set down in the implementing regulation; the records shall be saved for a period of at least three years.

*(4) The use of plant protection products labelled on the basis of the decision on their registration as **highly toxic or toxic** must be announced by the legal person or natural person using them in the framework of commercial activities to the district public health officer not later than 48 hours[3] before the beginning of their application, with the exception of cases of a sudden attack on the plants by harmful organisms when the sufficient time span for the announcement will be by the beginning of the product application. The use of these plant protection products outside closed objects must also be announced to the locally competent municipality office within the same time limit. In the case of an aerial application, the announcement must be made in writing. The announcement shall include:*

a) the exact name of the municipality and object, or municipality, cadastre and land where the product is to be used,

b) the sort, approximate amount and dosage rate or concentration of the product that is to be used,

c) the purpose of the use of the product,

d) the mode of application,

e) the day and, if possible, the hour of launch of the application,

f) the presumed duration of the activity,

g) the safety measures that will be performed,

h) the name and seat of the legal or natural person performing the application of the product, and the name of, and connection to, the person responsible[4].

Pesticide users have to record:

- entrepreneur using pesticide
- address of headquarter
- identification number of the organisation
- person responsible for record keeping
- identification of the place the pesticide was used by municipality, cadastral district, plot number, location of treated buildings (cereal stores, greenhouses etc.)
- date and hour of use
- commodity, crop
- target organism
- pesticide product number
- dose per unit

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3 National holidays, public holidays, and days of rest (non-working days) are not included in the term of 48 hours as referred to in paragraph4 [3]. In Annex 8 of the act a model of recorded data is presented.

4 Czech Republic, Collection of Laws, Volume 2002, Issue 14 of 30 January 2002: 36/2002 Coll.Act No. 147/1996 Coll., on Phytosanitary Care and Amendments of some Related Acts, as Amended by the Acts No. 409/2000 Coll. and No. 314/2001 Coll.ACT on Phytosanitary Care and Amendments of some Related Acts PART ONE PHYTOSANITARY CARE SECTION I BASIC PROVISIONS

- way of use
- extent of use in hectare or other units
- total quantity
- notes[5]

Farmers with farm larger 10ha are required to report their pesticide use. Only 27.4% of all farms are larger than 10 hectare, but they do cultivate 97.5% of the agricultural land (see Table 14).

Applying the same farm distribution to the Danube Basin in the Czech Republic, pesticide usage data are reported for over 1.1 million hectare in the Czech part of the Danube Basin.

Collected pesticide use specific to active ingredients by crop are available (see Table 15).

The annual report published by the State Phytosanitary Administration also contains information on the hectare infested with individual pest organisms by crop as well as on the use of pesticides by toxicity classification and crop. The annual report, however does not contain information on trends over time or application rate by crop.

The data recently published contain the data set for the year 2002. In 2002 some 4.7 million tons active ingredients were reported to be applied in the Czech Republic.

Sales data by the Czech Crop Protection Association are only available for 2001 and report a number of 4.35 million tons for the year 2001[6]. Reported usage in 2001 was 4.39 tonnes. The difference is most likely due to the fact that farmers used stocks or that not all sales in the Czech Republic are reported to the Czech Crop Protection Association.

Table 14: Distribution of farms by size in the Czech Republic and its parts of the Danube Basin (2000)

Size	Number of holdings Czech Republic	Number of holdings Danube Basin	% Number of holdings	Hectare of agriculture land Czech Republic	Hectare of agriculture land Danube Basin	% of ha
<10 ha	41,012	13,181	72,6	90,259	29,009	2.5
10-50 ha	9,724	3,125	17,2	209,213	67,241	5.7
50-100 ha	1,844	593	3,3	128,596	41,331	3.5
100-500 ha	2,007	645	3,6	444,410	142,833	12.2
< 500 ha	1,900	611	3,4	277,0691	890,497	76.1
Total	**56,487**	**18,155**	**100**	**3,643,168**	**1,170,911**	**100**

5 Annex No. 8 to the Decree No. 91/2002 Collection of Laws, Model of Recorded Data on the Uses of Plant Protection Products in Frame of Business

6 Personal communication with Ivan Dostal, ECPA, Czech Crop Protection Association

Table 15: Pesticide use and intensity of use by crops and crop group

Arable Crops	**kg pesticide use**	**hectare**	**kg/ha**
cereals	1,802,406	1,623,600	1.11
fodder crops	33,148	668,200[7]	0.05
legumes (pulses)	57,694	37,200	1.55
maize	490,222	61,900	7.92
other arable crops	488,053	472,100[8]	1.03
potatoes	228,618	54,100	4.23
rape	777,412	343,000	2.27
sugar beet	294,172	77,700	3.79
Total arable crops	*4,171,725*	*3,337,800*	*1.25*
Specialty crops			
grapevine	151,714	11,300	13.43
hops	163,709	6,100	26.84
orchards	141,766	30,600	4.63
vegetables	51,441	26,000	1.98
Total specialty crops	*508,630*	*74,000*	*6.87*
Pasture and Meadows			
meadows	n.a,	656,600	n.a.
pasture land	n.a,	283,600	n.a.
Total pasture and meadows	*n.a,*	*940,200*	*n.a.*
Total Agricultural Land	4,680,355	4,352,000	1.08

Over the last few years there has been a steady increase in the usage of pesticides in the Czech Republic, in 1993 reported usage was about 3.5 million tonnes. This increase is owed to the fact that after the political change in 1989 pesticide usage in the Czech Republic dropped significantly and is now recovering.

The highest total use is associated with the cultivation of cereals, while the highest intensity is associated with the cultivation of hops.

Table 16 shows the usage of the Top 25 pesticides in the Czech Republic in 2001 and 2002. In 2002 the top 25 pesticides account for 73% of the total use. Seven of the top 25 pesticides (bold) are Danube priority pesticides.

The changes between the two years cannot be interpreted as a trend since climatic conditions and/or changes in crop areas may also be responsible for such changes.

7 Fodder root crops: 6.000ha; annual fodder crops: 288.700ha; perennial fodder crops (hay): 373.500ha

8 Poppy: 33.200 ha; Flax (stems): 6.600ha; Oilseed crops: 432.300ha

Table 16: Usage of the Top 25 Pesticides in 2001 and 2002 in the Czech Republic

	Active Ingredient	2001 Total kg or l	Total 2002 kg or l	% change
1	Chlormequat-chloride	496,862	597,770	20.3
2	Glyphosate-IPA	313,167	293,321	-6.3
3	**Alachlor**	**278,002**	**255,141**	**-8.2**
4	Acetochlor	233,037	241,174	3.5
5	Mancozeb	181,131	186,817	3.1
6	MCPA	189,365	176,619	-6.7
7	**Atrazine**	**131,321**	**144,919**	**10.4**
8	Glyphosate-trimesium (sulfosat)	95,168	131,517	38.2
9	**Isoproturon**	**158,178**	**129,961**	**-17.8**
10	**Copper oxycloride**	**137,126**	**128,757**	**-6.1**
11	**Chlorpyrifos**	**100,900**	**111,031**	**10.0**
12	Carbendazim	92,290	109,516	18.7
13	**Trifluralin**	**88,654**	**99,950**	**12.7**
14	Glyphosate	40,443	95,608	136.4
15	Metazachlor	97,923	89,395	-8.7
16	**2,4-D**	**89,465**	**83,123**	**-7.1**
17	Fenpropimorph	66,844	75,035	12.3
18	Thiram	61,149	74,087	21.2
19	Chlorotoluron	106,736	72,256	-32.3
20	Chloridazon	56,409	64,561	14.5
21	Carboxin	46,437	56,806	22.3
22	Sulphur	51,785	56,078	8.3
23	Pendimethalin	52,864	54,319	2.8
24	Metamitron	49,501	50,120	1.3
25	Dimethachlor	46,462	47,883	3.1
	Total Top 25	**3,261,219**	**3,425,764**	**5.0**

Usage of Danube Priority Pesticides in the Czech Republic and the Danube Basin

The report on pesticide use for the year 2002 presents data about 14 active ingredients which are priority substances. Usage data for two additional compounds, one copper compound Oxine Cu and one compound belonging to the 2,4-D esters 2,4-D-EHE are available as well. Table 17 shows that Alachlor is the compound with the highest total use followed by Atrazine and Trifluralin.

Altogether the priority pesticides represent 22.3% of the total pesticide use in the Czech Republic.

Table 17: Usage of Priority Substance in the Czech Republic in 2002

Priority Substance	kg used in 2002
2,4-D	83,123
2,4-D EHE	5,861
Alachlor	255,141
Atrazine	144,919
Chlorpyrifos	111,031
Copper hydroxide	36,737
Copper oxychloride	128,757
Copper oxyquinolate (Oxine Cu)	43
Copper sulphate (basic)	47,251
Isoproturon	129,961
Simazine	164
Trifluralin	99,950
Zinc phosphide	3,356
Total Usage ICPDR substances	**1,046,294**

Table 18 and Table 19 show the use of priority pesticide by crop. Highest total use is in rape, cereals and hops.

Applying the areas by crop listed in the intensity of pesticide use by crop can be calculated. Because some numbers are very small the unit used is g/ha. Figures below 0.1 g/ha were deleted from the table.

Table 18: Use of Priority Pesticides in Arable Crops in the Czech Republic in 2002 (kg)

Active substance	Cereals	Maize	Sugar beet	Legumes	Potatoes	Fodder Crops	Rape
2,4-D	75,899	6,974				218	
2,4-D EHE	4,434	443				33	
Alachlor	360	2,112		310	36	58	248,790
Atrazine		144,870					
Chlorpyrifos	4,863	68	6,561	2,202	3,454	77	90,354
Copper hydroxide			65		67		
Copper oxychloride			427	125	4,952		
Copper oxyquinolate (Oxine Cu)	43						
Copper sulphate (basic)							
Isoproturon	121,991	3					
Simazine		39					
Trifluralin	58,959	214	346	572		43	14,031
Zink phosphide	1,035	30	1			859	598
Total Use (kg)	**267,584**	**154,753**	**7,400**	**3,209**	**8,509**	**1,288**	**353,773**

Table 19: Use of Priority Pesticides in Specialty Crops in the Czech Republic in 2002 (kg)

Active substance	Hops	Vegetables	Orchards	Vine	Other Crops
2,4-D					26
2,4-D EHE					951
Alachlor		752			2.723
Atrazine					42
Chlorpyrifos		233	638	3	2.577
Copper hydroxide	8,440	1,997	15,584	10,566	18
Copper oxychloride	83,221	3,189	8,556	27,449	837
Copper oxyquinolate (Oxine Cu)					
Copper sulphate (basic)	39,968	30		7,252	
Isoproturon					7,966
Simazine			16	8	101
Trifluralin		3,370	1		22,413
Zink phosphide			32		790
Total Use (kg)	**131,629**	**9,571**	**24,827**	**45,278**	**38,444**

Table 20: Intensity of Priority Pesticide Use in Arable Crops (g/ha)

Active substance	Cereal	Maize	Legumes	Sugarbeet	Potatoes	Forage Crop	Rape
2,4-D	46.7	112.7				0.3	
2,4-D EHE	2.7	7.2					
Alachlor	0.2	34.1	8.1		0.7	0.1	723.0
Atrazine		2.340.4					
Chlorpyrifos	3.0	1.1	57.3	84.3	63.6	0.1	262.6
Copper hydroxide				0.8	1.2		
Copper oxychloride			3.3	5.5	91.2		
Copper sulphate (basic)							
Isoproturon	75.0	0.5					
Oxine Cu (copper oxyquinolate)							
Simazine							
Trifluralin	36.2	0.6	14.9	4.4		0.1	40.8
Zinc phosphide	0.6	3.5				1.3	1.7
Total Intensity (g/ha)	**164.5**	**2500.0**	**83.6**	**95.1**	**156.7**	**1.9**	**1.028.1**

Table 21: Intensity of Priority Pesticide Use in Speciality Crops (g/ha)

Active substance	Hops	Orchards	Vine	Other crops
2,4-D				
2,4-D EHE				0,66
Alachlor				1,88
Atrazine				
Chlorpyrifos		20.8	0.3	1.78
Copper hydroxide	1,383.6	509.3	935.0	0.58
Copper oxychloride	13,642.8	279.6	2,429.1	
Copper sulphate (basic)	6,552.1		641.8	0.55
Isoproturon				
Oxine Cu (copper oxyquinolate)				
Simazine		0.5	0.7	5.50
Trifluralin				
Zinc phosphide		1.0		15.46
Total Intensity (g/ha)	**21,578.5**	**811.3**	**4,006.9**	**26.4**

Copper compounds contribute to the highest use per ha in hops and wine. For these two crops priority compounds contribute to 80% and 86%, respectively, of the total use.

However, the data in Table 20 and Table 22 have to be interpreted with caution. Presumably, not all fields in the Czech Republic received the same amounts, this means that the mean application rates (g/ha) are most likely an underestimation for the treated areas. Pesticide use data, which present only treated fields are so far not available. These data are only available on farm level. Farmers are legally required to list the extent of use in hectares in their spray records.

In order to calculate pesticide use in the Danube Basin, crop areas (Table 22) in the Czech part of the Danube Basin were multiplied with the intensities from Table 20 and Table 21. Actual usage data are not available for the Danube Basin. The pesticide use reporting system in the Czech Republic does not process data on regional level. Theoretically, this should not be a problem, data could be collected/processed by postal code, district or municipality of the reporting farmer to achieve low resolution reporting.

Table 22: Land use in the Czech part of the Danube River Basin

Crop/ Crop group	Total Czech (ha)	DRB (ha)	% share DRB
Speciality crops			
vegetables	26,000	n.a,	n.a.
hops	6,100	1,146	18.8
orchards (fruits together)	30,600	15,801	51.6
Grapevine	11,300	10,735	91.8
Sum specialty crops	*74,000*	*31,782*	*42.9*
Pasture and Meadows			
meadows	656,600	113,105	17.2
pasture land	283,600	72,862	25.7
Sum pasture and meadows	*940,200*	*185,967*	*19.8*
Arable Crops			
maize (grain)	61,900	38,594	62.3
cereals	1,623,600	471,652	29.0
legumes (pulses)	37,200	10,570	28.4
potatoes	54,100	8,350	15.4
sugar beet	77,700	26,869	34.6
rape	343,000	95,022	27.7
fodder crops	668,200	158,918	23.8
other arable crops	472,100	33,545	7.1
Sum arable crops	*3,337,800*	*910,500*	*27.3*
Total agricultural land	**4,352,000**	**1,128,249**	**25.9**
Other land use (gardens)		42,663	

Problems Associated with Pesticide Use

The national expert identified three specific issues:

- Continued use of unauthorised POPs (notably lindane) by farmers, including the unverified claim that some banned POPs (e.g. DDT) are still in use
- Increasing resistance to triazines (atrazine, simazine etc.) notably in Lambsquarters (*Chenopodium album*) a dicotolydenous weed in the *Chenopodiaceae* family that is a particular problem in maize and sugarbeet in the Czech Republic. There is also some evidence of cross-resistance to other herbicide groups
- DDT residues in soil are still reported to be a problem in some areas (Karlovy Vary and Milovice)

Table 23: Pesticide Registration Data of Pesticide Products Containing Priority Pesticides in the Czech Republic

Substance	Products	g/l or %	Maximum application rate active ingredient kg/ha or %
2,4-D	Bluster Lawn Killer	3g/l	n.a.
	Dicopur D	500g/l	0.625
	Dicopur D extra	600g/l	0.66
	Factor 365 EC	360g/l	0.54
	Lancet	450g/l	0.5625
	Mustang	300g/l	0.24
	U 46 D Fluid	500g/l	1
2,4-D EHE	Esteron	850g/l	1.275
Alachlor	Lasso MTX	480g/l	2.88
Atrazine	Atranex 50 SC	500g/l	3
	Gesaprim 500 FW	500g/l	1
	Gesaprim 90 WG	900g/l	0.9
	Guardian Extra	180g/l	1.08
Chlorpyrifos	Dursban 10 G	10%	3
	Dursban 480 EC	480g/l	0.96
	Metanion 48 EM	48%	0.96
	Nurelle D	500g/l	0.3
	Oleokol	30g/l	1%
Copper hydroxide	Modra Skalice	n.a.	1%
Copper oxychloride	Champion 50 WP	77%	3.85
	Curzate K	77,34%	0.3%
	Kuprikol 50	84%	4.2
	Ridomil Gold Plus 42,5 WP	40%	1.6
Copper sulfate (basic)	Cuproxat SC	345g/l	0.75%
Isoproturon	Affinity WG	50%	1.75
	Arelon 500 FW	500g/l	2.25
	Cougar SC	500g/l	0.75
	Foxtar D	300g/l	0.9
	Grodyl Plus	60%	1.2
	Maraton	125g/l	0.5
	Protugan 50 SC	500g/l	0.75
	Tolkan Flo	500g/l	2.25
Trifluralin	Synfloran 48 EC	480g/l	1.44
	Treflan 48 EC	480g/l	1.44
	Triflurex 48 EC	480g/l	1.2
Zinc phosphide	Stutox I	5%	0.5

Annex 6

Pesticide Usage in Hungary

Annex 6 Pesticide Usage Hungary

Hungary is one of very few countries, which maintains a sales reporting system based upon retail sales. Pesticide sales data are collected twice a year from wholesalers and local distributors. These have to submit data on the sales in kg as well as on the monetary amount on the basis individual formulated pesticide products. Sales data are publicly available in an aggregated format.

Sales data by pesticide product and the percentage active ingredient by product were submitted. Table 29 and Table 30 at the end of the Annex lists details about all registered products containing priority pesticides, and the amounts sold. Some of the products were obviously not sold in 2001. In the Annex is also the complete list of pesticide products containing information on crops, application frequency and recommended application rate.

Table 24 lists the result of calculation based upon product sales and percentage active ingredients. The usage of priority pesticide in percent by crop was estimated by the national experts. Based upon the simplifying assumption that 100% of the sold pesticide were used, amounts used per crop were calculated. The results can be found in Table 25 and Table 26.

Table 24: Sales of Priority Pesticides in Hungary 2001

Active Ingredient	Amount Sold in kg
Copper sulphate (basic)	10,093,136
Atrazine	519,569
Copper oxychloride	450,833
2,4-D	407,713
Trifluralin	111,273
Copper hydroxide	109,623
Endosulfan	82,127
Chlorpyrifos	48,371
Diuron	20,894
Alachlor	12,473
Malathion	8,579
Isoproturon	2,508
Zinc phosphide	1,986
Total	**11,869,085**

Table 25: Use of Priority Pesticides in Hungary by Crop 2001 (kg active ingredients)

	Maize	Cereal	Sun Flower	Potato	Arable crops	Alfalfa	Barley	Wheat	Legumes
2,4-D	40,771	366,942							
Alachlor	8,731		2,495						
Atrazine	363,698								
Chlorpyrifos					19,348				
Copper hydroxide				21,925					
Copper oxychloride				90,167					
Copper sulphate									
Diuron						16,715			
Endosulfan						65,702			
Isoproturon							2,006	502	
Malathion					1,716				
Trifluraline			55,637						27,818
Zinc phosphide									

Table 26: Use of Priority Pesticides in Hungary by Crop 2001 (kg active ingredients) (continued)

	Grapes	Vegetables	Orchards	Green Pepper & Tomatoes	Others
2,4-D					
Alachlor					1,247
Atrazine			51,957		103,914
Chlorpyrifos	12,093		14,511		2,419
Copper hydroxide	65,774		10,962		1,096
Copper oxychloride	270,500	40,575	45,083		4,508
Copper sulphate (basic)	8,074,509		1,513,970		504,657
Diuron			2,089		2,089
Endosulfan			8,213		8,213
Isoproturon					
Malathion	1,630	2,145	2,574		86
Trifluraline				27,818	
Zinc phosphide					

In addition to the data above, data on the areas treated with pesticides in the years 1995 - 2001 were provided by national experts as well (see Figure 3 and Figure 4). These data were submitted only by co-operatives and corporations. Data from private farmers are not collected. Figure 3 shows the distribution of farm types over time. The figure shows that the number of co-operative farms declined significantly since 1994, and that since 1997 around 60% of the farms are privately managed.

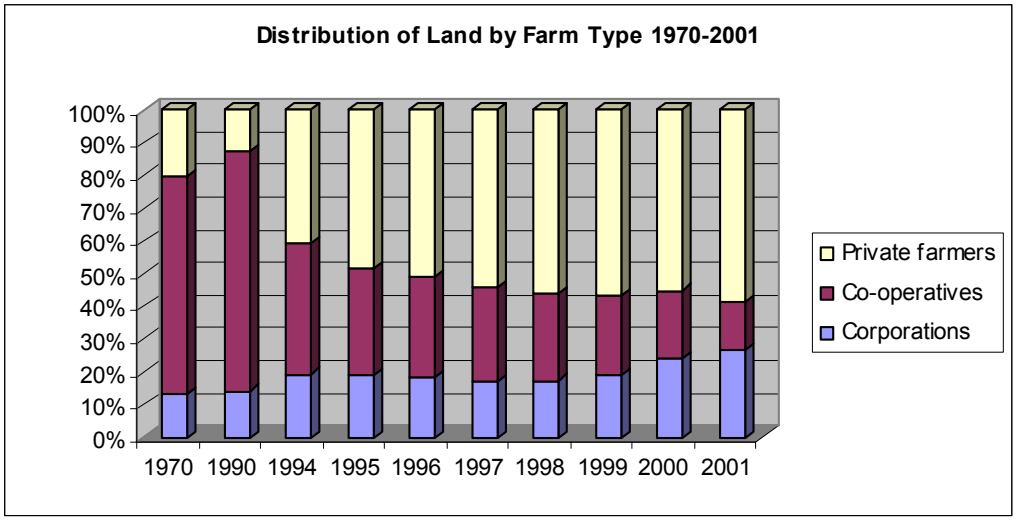

Figure 3: Distribution of land by farm type 1970 – 2001

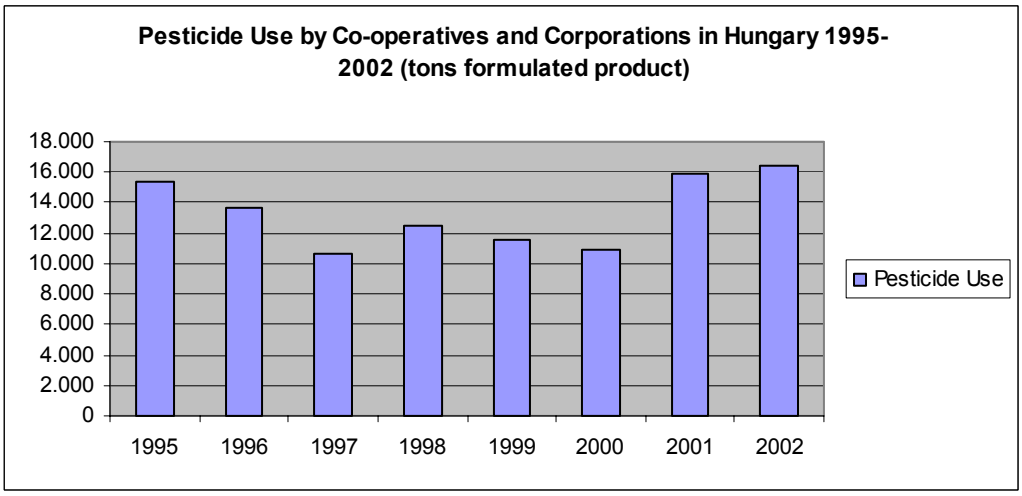

Figure 4 Pesticide use by co-operatives and corporations

Figure 4 shows that pesticide use by co-operatives and corporations between 1997 and 2000 was rather stable and rose between 2000 and 2002 by some 5000 tons of formulated products. This increase may be a consequence of bad climatic conditions, shift in crop areas or of an improved economic situation, which allowed higher usage of agrochemicals.

Table 27: Area (ha) treated with Pesticides in Hungary by Farm Type and Land Use Type in 2001

	Herbicides	Insecticides	Fungicides	Other
Field type by:	**Treated field area (ha)**			
Corporations	997,788	390,859	477,287	179,883
Arable land	977,766	366,377	456,807	170,801
Orchards	9,736	13,390	13,693	5,707
Viticulture	4,812	5,961	6,260	2,657
Meadow	1,142	37	-	202
Fish pond	1	25	10	68
Others	4,331	5,069	517	448

Co-operatives	504,656	164,250	207,714	88,805
Arable land	502,681	161,540	204,950	87,560
Orchards	931	1,501	1,532	400
Viticulture	969	1,158	1,183	794
Meadow	69	-	-	-
Fish pond	-	-	-	-
Others	6	51	49	51

Table 28: Area (ha) treated with Pesticides in Hungary by Land Use Type and Farm Type 2001

	Area 2001	**Treated ha by Corporations 2001**	**Treated ha by Co-operatives 2001**	**Total Treated Area (ha)**
Arable land	4,516,000	1,971,751	956,731	2,928,482
Orchards	97,400	42,526	4,364	46,890
Viticulture	83,500	19,690	4,104	23,794

Table 27 and Table 28 show the treated area of farmland under production by co-operatives and corporations in 2001. It was not indicated if multiple applications are included in these numbers.

The figure 5, 6 and 7 show summarised treated areas for co-operatives and corporations by crop group over the years. The figures show that arable areas treated with herbicides and insecticides declined between 1995 and 2001, while areas treated with fungicides or other pesticides did not change significantly.

Between 1997 and 2001 the treated areas cultivated with orchard and vineyards increased almost four times. Since the previous 4 indicates no increase of the total usage by co-operatives and corporations in the same time (rather a decrease between 1998 and 2000) this indicates that the either the intensity (kg per ha) fell or there were significant reporting errors.

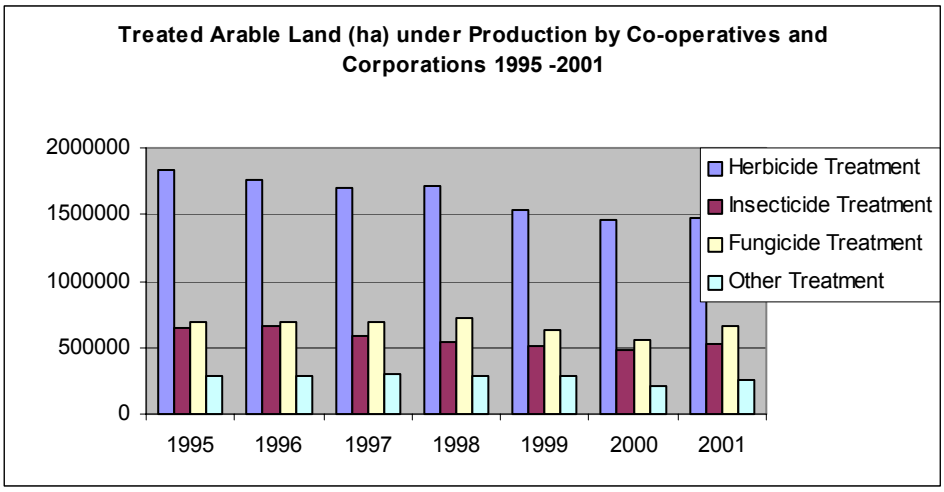

Figure 5 Treated arable land managed by co-operatives and corporations

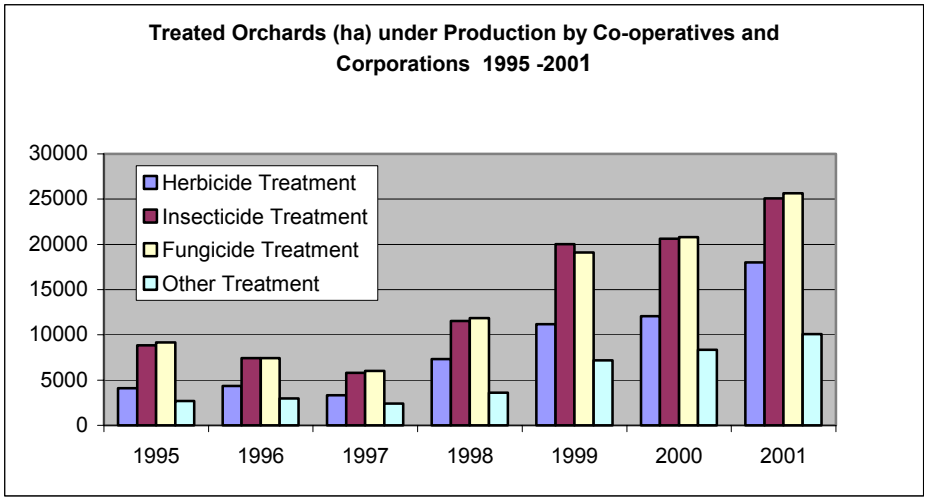

Figure 6 Treated orchards managed by co-operatives and corporations

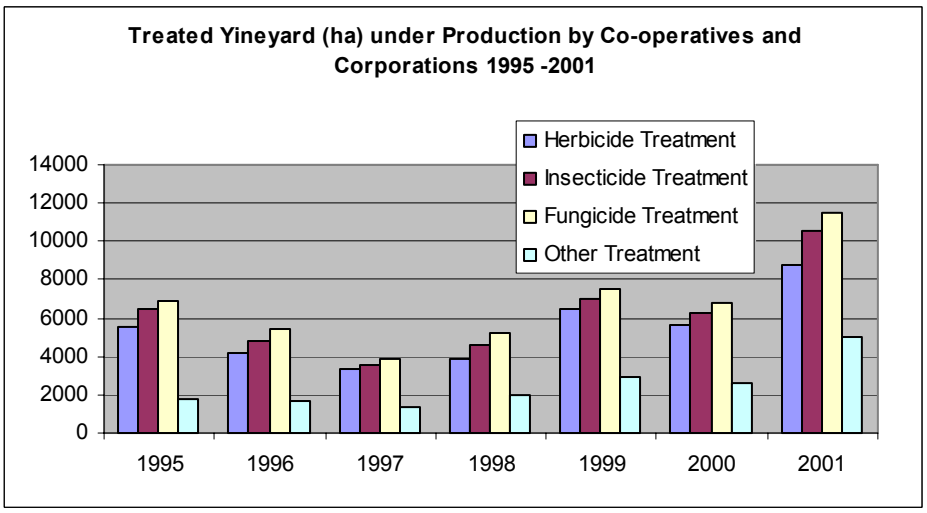

Figure 7 Treated vineyard managed by co-operatives and corporations

Problems Associated with Pesticide Use

The Plant Protection Institute conducted a water monitoring in 12 counties and with 6 water suppliers. Altogether, in 3 years (2000-2002) 14 substances were sampled 346 times in 90 locations. Survey results showed that in over 90% of the collected water sample detectable levels of pesticides were found. Atrazine was detected in 44%, Diazinion in 65%, Acetochlor in 31%, Prometryn in 18% and Terbutryn in 3% of the samples. Trifluralin, carbofuran, metribuzin, phorate and fenoxycarb were also sampled but not detected in any of the samples[9].

More general problems were described by the national experts:

1. Spray drift and unequal distribution problems due to the use of old spraying equipment.

In the early nineties the majority (75%) of the tractor driven sprayers was more than 5 years old. The stock of these machines nowadays about 33,000 pieces, the number of new machines sold is 700-800 pieces / year.

2. Use of old sprayers in the horticulture

[9] Szekasc, A., Ernst, A. Juracsek, J, Darvas, B.(2003): Monitoring Water Polluting Pesticides in Hungary, Presentation at the 7th International HCH and Pesticides Forum in Kyiv, Ukraine, June 5th-7th 2003

The old machines are unable to achieve good penetration rates in the orchards and vineyards, the loss of pesticides is high, 10-25%, at the first (washing) spraying even higher, up to 60-80% if no labour is used to direct the spray to the trees.

3. The knowledge of the farmers is poor concerning the right adjustment and operating the sprayers.
4. Spraying too closely to surface waters e.g. on hilly regions

   There are obligatory distance for defence of the surface waters:
   - pesticides which are dangerous to the waters 200 m;
   - pesticides which are middle dangerous to the waters 50 (200) m;
   - pesticides which are less dangerous to the waters 20 (50) m;
   - pesticides which are not dangerous to the waters 5 (20) m;
5. Poor disposal of containers, unused chemicals

The amount of unused chemicals was calculated 10% of the total purchased amount in the past, which was in the eighties 60-80 t pesticides and 100-120 t containers for pesticides. At present the amounts are much lower, but the old pesticides and wastes stored remain to be an environmental risk.

Table 29: Amounts of Pesticides Products Containing Priority Pesticides and Sold in Hungary 2001

Active Ingredient	Product Name	% AI priority Pesticide	Product sold in kg	Active ingredient sold in kg
2,4-D	Dezormon	60	174,900	104,940
	Dikamin 720 WSC	72	129,284	93,084
	DMA-6	66.8	100,000	66,800
	U 46 D-Fluid SL	50	106,320	53,160
	Mustang	45.2	110,000	49,720
	2,4-D aminsó 450 SL	45	45,000	20,250
	Estreon 60	85	15,000	12,750
	Syrius	50	14,000	7,000
	Maton 600	60	15	9
	Dikamin D	40	0	0
	Mustang SE	45.2	0	0
	Dicopur D Prim	80	0	0
	Dikonirt	80	0	0
	Solution	97	0	0
Alachlor	Lasso	48	25,685	12,329
	Satoklor 480 EC	48	300	144
	Flexenit II. 690 EC	24	0	0
	Flexenit IV. 720 EC	24	0	0
	Atrazine 500 FW	50	219,024	109,512
	Primextra Gold 720 SC	32	300,575	96,184
	Gesaprim 90 FW	90	88,060	79,254
	Erunit Porofi	27	282,729	76,337
	Hungazin PK 500 FW	50	74,760	37,380
	Tropazin Fultime CS	19.2	170,000	32,640
	Atranex 50 SC	45	58,990	26,546
	Hungazin 90 DF	90	27,885	25,097
	Tazastomp SC	20	82,400	16,480
	Maizina 90 WG	90	7,285	6,557
	Gartoxin FW	38	15,805	6,006
	Erunit A 530 FW	20	18,535	3,707

Active Ingredient	Product Name	% AI priority Pesticide	Product sold in kg	Active ingredient sold in kg
	Titus ATG	50	6,781	3,391
	Aspect 500 SC	30	1,600	480
	Guardian Extra	18	0	0
	Laddok FW	20	0	0
	Tropazin	24	0	0
	Century	50	0	0
	Gesaprim 500 FW	50	0	0
	Maizina 500 SC	50	0	0
	Titus AT	50	0	0
	Aktikon 80 WP	8	0	0
	Maizina 80 WP	80	0	0
Chlorpyrifos	Nurelle-D 50/500 EC	50	80,000	40,000
	Pyrinex 48 EC	48	13,030	6,254
	Cyren EC	48	3,200	1,536
	Pyrinex 25 CS	25	2,323	581
	Diabro CS	25	0	0
	Dursban 480 EC	48	0	0
Copper hydroxide	Vegeso R	24	17,500	4,200
	Champion 2 FL	36	3,185	1,147
	Champion 50 WP	77	132,794	102,251
	Funguran-OH 50 WP	77	0	0
	Kocide 101	77	0	0
	Kocide 2000	53.8	0	0
	Kocide Combi	46	0	0
	Kocide DF	61		0
	Rézkénpor	20	0	0
	Vegesol eReS	15	13,500	2,025
Copper oxychloride	Forum R	40	42,730	17,092
	Galben R	33	7,300	2,409
	Kupfer Fusilan WG	83	14,000	11,620
	Mikal C 64 WP	36	55,496	19,979
	Kupfer-Phaltan	15	1,057	159
	Miltox Speciál	36	100,942	36,339
	Kusor 450 FW	44.4	0	0
	Perotox WP	34	12,220	4,155
	Pluto 50 WP	86	101,345	87,157
	Rézkén 650 FW	20	78,867	15,773
	Rézkol 400 FW	40	0	0
	Rézoxichlorid 50 WP	50	167,475	83,738
	Rézoxichlorid 50 WP (Agrospec)	50	0	0
	Rézoxichlorid 50 WP (Alboria)	50	0	0
	Ridomil Gold Plus 42,5 WP	40	29,985	11,994
	Vitra Rézhidroxid	77	14,000	10,780

Active Ingredient	Product Name	% AI priority Pesticide	Product sold in kg	Active ingredient sold in kg
	Astra Rézoxiklorid	88	90,000	79,200
	Axanit Cu 50 WP	40	17,239	6,896
	Cuprosan 50 WP	50	0	0
	Cuprosan Super D	36	32,113	11,561
	Cursate R	70	74,262	51,983
	Fixpol	0.75	0	0
Copper sulphate (basic)	Cupertine M	20	50,028,560	10,005,712
	Bordói Por Bordoeaux	71.1	33,996	24,171
	Cuprofix 30 DG	12	189,000	22,680
	Bordóilé FW	28.5	56,835	16,198
	Bordóilé+Kén FW	17.9	88,351	15,815
	Zetanil R	40	21,050	8,420
	Cupertine F	20	700	140
	Bordómix DG	20	0	0
	Cuproxat FW	35	0	0
	Rézgálic	98	0	0
	Rézgálic (Almalszkij)	98	0	0
	Rézgálic (Blue Stone)	98	0	0
	Rézgálic (Kék Kő)	98	0	0
	Rézgálic (Kistim)	98	0	0
	Rézgálic (Zorka)	98	0	0
	Rézgálic 98	98	0	0
	Scarmagnan Rézgálic	98	0	0
Diuron	Diuron 600 FW	60	24,594	14,756
	Nikesuper Combi 600 FW	22.5	27,278	6,138
	Lucenit 80 WP	80	0	0
Endosulfan	Thiodan 35 EC	35	155,760	54,516
	Thionex 35 EC	35	78,889	27,611
	Nikesuper Combi 80 WP	30	0	0
	Thionex 50 WP	50	0	0
Isoproturon	Protugan 50 SC	50	3,660	1,830
	Galition 5 G	0.3	226,000	678
	Maraton SC	12.5	0	0
	I.P. Flo	50	0	0
	IPU Stefes	50	0	0
	Affinity WG	50	0	0
	Izoguard 75 WG	76.5	0	0
	Izoguard 75 WP	76.5	0	0
Malathion	Fyfanon EW	44	19,000	8,360
	Buvatox 5 G	0.3	72,955	219
	Evershield CM	0.34	0	0
Trifluralin	Olitref 480 EC	48	148,649	71,352
	Triflurex 48 EC	48	51,560	24,749
	Ipifluor 48 EC	48	27,610	13,253
	Treflán 48 EC	48	4,000	1,920
	Triflurex 26 EC	26	0	0
Zinc phosphide	Arvalin-LR	4	49,660	1,986

Active Ingredient	Product Name	% AI priority Pesticide	Product sold in kg	Active ingredient sold in kg
TOTAL			54,487,603	11,869,086

Table 30: Registration Data of Pesticide Products Containing Priority Pesticides

Name of Product containing Active Ingredients	Main Crops Applied to	Typical Application Rate (kg or litre per ha)	Typical No. of Applica-tions per Year	% Crops Grown Treated with Pesticide
				Experts estimate!!
2,4-D containing products				
2,4-D aminsó 450 SL	cereals, maize, pasture	1.7; 1.5; 2.75	1	
Dezormon	cereals, maize	1.2; 1.0	1	
Dicopur D Prim	Silage maize	0.85	1	
Dikamin 720 WSC	cereals, maize, pasture	1.25 2.3	1	Maize 10% Wheat etc. 90%
Dikamin D	cereals, maize, pasture	2.6; 3.0; 4.5	1	
Dikonirt	cereals, maize	1.4	1	
DMA-6	cereals, maize, pasture	1.0 1.2	1	
Estreon 60	cereals, maize, pasture	0.7; 0.8; 1.0	1	
Maton 600	cereals, maize, pasture	0.7; 0.5; 0.85	1	
Mustang	cereals, canary-grass	0.5	1	
Mustang SE	cereals, canary-grass	0.5	1	
Solution	cereals, maize pasture	0.7 1.0	1	
Syrius	wheat, silage maize	1.1	1	
U 46 D-Fluid SL	cereals, maize	1.4	1	
Alachlor containing products				
Flexenit II. 690 EC	maize	11	1	Sunflower 20%
Flexenit IV. 720 EC	maize	7	1	
Lasso	oil rape, mustard, oil radish	5.0	1	maize 70% others 10%
Satoklor 480 EC	maize, sunflower	4.5; 4.0	1	
Atrazine containing products				
Aktikon 80 WP	maize, grape, apples, pears	3.5 3.6	1-2	Orchards 10%
Aspect 500 SC	maize	2.75	1-2	Maize 70%
Atranex 50 SC	maize, sorghum	2.2. 1.75	1-2	
Atrazine 500 FW	maize, grape, apples, pears	2.2	1-2	Others 20%
Century	maize	4.5	1-2	
Erunit A 530 FW	maize	6.0	1-2	
Erunit Porofi	maize	4.2	1-2	
Gartoxin FW	maize, sorghum, non cultivated area	2.25 3.75	1-2	
Gesaprim 500 FW	maize, sorghum	2.2; 1.75	1-2	
Gesaprim 90 FW	maize, sorghum	1.0; 1.1	1-2	
Guardian Extra	maize	5.25	1-2	
Hungazin 90 DF	maize, sorghum	1.15; 1.0	1-2	
Hungazin PK 500 FW	maize, sorghum, grape, apples, pears	1.6; 1.75; 2.5	1-2	
Laddok FW	maize, sorghum	4.5; 4	1-2	

Name of Product containing Active Ingredients	Main Crops Applied to	Typical Application Rate (kg or litre per ha)	Typical No. of Applica-tions per Year	% Crops Grown Treated with Pesticide
				Experts estimate!!
Maizina 500 SC	maize, sorghum, grape, apples, pears	2.2 1.75	1-2	
Maizina 80 WP	maize, sorghum, grape, apples, pears	1.4 1.1 1.4	1-2	
Maizina 90 WG	maize, sorghum	1.75; 1.0	1-2	
Primextra Gold 720 SC	maize, sorghum	3.5; 3.5	1-2	
Tazastomp SC	maize	4.5	1-2	
Titus AT	maize	1.7;	1-2	
Titus ATG	maize	1.04	1-2	
Tropazin	maize	4.0	1-2	
Tropazin Fultime CS	maize	5.0	1-2	
Copper containing products				
Champion 2 FL	vegetables, raspberry, grape; pome fruits, stone fruits, tree nuts, garden tree pome fruits (Erwinia amylovora)	2.5 1.9 2.6	1-4	Grape 60% Orchards 10%/ Potato 20% Others 1%
Champion 50 WP	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits (Erwinia amylovora)	2.5 3.5 3.5	1-4	
Funguran-OH 50 WP	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits Erwinia amylovora)	2.5 3.5	1-4	
Kocide 101	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits(Erwinia amylovora)	2.5 3.5	1-4	
Kocide 2000	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits(Erwinia amylovora)	2.75 1.8 2.75	1-4	
Kocide Combi	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits(Erwinia amylovora)	2.5 3.5	1-4	

Name of Product containing Active Ingredients	**Main Crops Applied to**	**Typical Application Rate (kg or litre per ha)**	**Typical No. of Applica-tions per Year**	**% Crops Grown Treated with Pesticide**
				Experts estimate!!
Kocide DF	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits(Erwinia amylovora)	2.5 3.5	1-4	
Rézkénpor	grape, pome fruits	8.0	1-4	
Vegesol eReS	grape, cucumber, pome fruits, peach, raspberries, gooseberries, currants	4.5 4 5	1-4	
Vegesol R	grape, pome fruits, peach, gooseberries, currants pepper	2.5 3 4	1-4	
Vitra Rézhidroxid	vegetables, raspberries, grape; pome fruits, stone fruits, tree nuts, garden tree sugar-beet pome fruits (Erwinia amylovora)	2.5 3.5	1-4	
Astra Rézoxiklorid	grape; pome fruits, stone fruits, berries, tree nuts, garden tree, tomato, cucumber, onion, potato, sugar-beet pome fruits (Erwinia amylovora) green pepper, bean, peas	2.5 3.5 2.0	1-4	Grape 60% Orchards 10%
Axanit Cu 50 WP	onion, potato, tomato, grape	2.75	1-4	
Cuprosan 50 WP	grape; pome fruits, stone fruits, berries, tree nuts, garden tree, tomato, cucumber, onion, potato, sugar-beet pome fruits (Erwinia amylovora) green pepper, bean, peas cumin bitter-sweet	2.5 6.0 2.0 3.0 4.75	1-4	Vegetables 9% Potato 20% Others 1%
Cuprosan Super D	grape; pome fruits, stone fruits, tree nuts, berries bitter-sweet, marjoram poppy seed	4,25 4,75 4,25	1-4	
Cursate R	cucumber, tomato, Soya bean, peas, hop grape, onion tomato	2.75 3.0 2.25	1-4	
Fixpol	grapes, garden tree, fruit trees	-	1-4	
Forum R	potato, tomato, cucumber, onion, grape	3.25	1-4	
Galben R	onion, cucumber, garden trees, tomato grape potato	3.0 4.5 2.5	1-4	

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				Experts estimate!!
Kupfer Fusilan WG	cucumber, grape, onion Soya bean, peas, potato tomato	2.75 2.5 2.0	1-4	
Kupfer-Phaltan	grape	2,5	1-4	
Kusor 450 FW	grape	3,0	1-4	Grape 60%
Mikal C 64 WP	grape, cucumber, onion, peas, tomato, Soya bean hop potato	3.5 6.0 4.5	1-4	Orchards 10% Vegetables 9%
Miltox Speciál	pome fruits, stone fruit, grapes, vegetables, tomato, green pepper, cucumber, potato raspberry, currants medicinal plants, marjoram, bitter-sweet poppy seed grenadine	0.4 0.35 0.5 0.42 0.35	1-4	Potato 20% Others 1%
Perotox WP	grape, pome fruits, stone fruit, berries, potato, vegetables poppy seed hop bitter-sweet, marjoram, grenadine	4.0 4.25 4.75 5.0 3.5	1-4	
Pluto 50 WP	pome fruits(Erwinia amylovora) pome fruits, stone fruit, berries, tree nuts, cucurbits, tomato, onion, potato, sugar-beet grape green pepper, beans, peas	3.5 2.5 4.75 2.0	1-4	
Rézkén 650 FW	grape, cucumber, apiaceous apple peach	4.5 4.25 5.0	1-4	
Rézkol 400 FW	fruit trees, raspberry, vegetables, green pepper, tomato, cucumber, legumes, grape	2.75	1-4	
Rézoxichlorid 50 WP	grape, cucurbits, potato, sugar-beet, apple, pear, stone fruit, berries, tree nuts, tomato, onion cumin bitter-sweet, cucumber, green pepper, bean, peas pome fruits (Erwinia amylovora)	2.5 3.0 4.75 0.45 2.0 6.0	1-4	Grape 60% Orchards 10% Vegetables 9% Potato 20%

Name of Product containing Active Ingredients	**Main Crops Applied to**	**Typical Application Rate (kg or litre per ha)**	**Typical No. of Applica-tions per Year**	**% Crops Grown Treated with Pesticide**
				Experts estimate!!
Rézoxichlorid 50 WP (Agrospec)	grape, cucurbits, potato, pome fruits, stone fruit, berries, tree nuts, tomato, onion, sugar-beet cumin bitter-sweet, green pepper, bean, peas pome fruits (Erwinia amylovora)	2.5 3.0 4.75 2.0 6.0	1-4	Others 1%
Rézoxichlorid 50 WP (Alboria)	grape, cucurbits, potato, pome fruits, stone fruit, berries, tree nuts, tomato, onion, sugar-beet, raspberry cumin bitter-sweet, green pepper, bean, peas pome fruits (Erwinia amylovora)	2.5 3.0 4.75 2.0 6.0	1-4	
Ridomil Gold Plus 42,5 WP	Soya bean, peas, onion, tomato, potato grapes hop	4.0 3.75 5.0	1-4	
Zetanil R	grapes	3.0	1-4	
Bordói Por Bordoeaux	grape; pome fruits, stone fruits, berries, tree nuts, tomato, cucumber, onion, potato, sugar-beet green pepper, legumes	1 %	1-4	
Bordóilé+Kén FW	winter-wheat, -barley, sugar-beet, potato grape, apple fruit tree cucumber, tomato, green pepper	6.0 10.0 10.0 11.0 9.0 8.0	1-4	Grape 80%
Bordóilé FW	grape pome fruits potato cucumber, bean, peas, green pepper, tomato	9.5 10.0 9.0 0.75	1-4	Orchards 15% Others 5%
Bordómix DG	tomato, green pepper, potato, cucurbits, bean, peas, sugar-beet, grape peach, plums, sour cherry, cherry, apricots, pome fruits	4.5 5.0	1-4	

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				Experts estimate!!
Cupertine F	pome fruits (Erwinia amylovora) pome fruits peach, plums, sour cherry, cherry, apricots peach, plums, sour cherry, cherry, apricots, grapes, tomato, onion, cucumber, potato	5.0 4.5 10.0 2.5	1-4	
Cupertine M	pome fruits (Erwinia amylovora) pome fruits peach, plums, sour cherry, cherry, apricots grapes, tomato, onion, bean, peas, cucumber, potato	5.0 4.5 10.0 4.5	1-4	
Cuprofix 30 DG	grapes, raspberry, potato, sugar-beet, tomato, green pepper, cucurbits, bean, peas, onion Peach, plum, sour cherry, apricot, cherry, pome fruits, tree nuts	3.5 4.0	1-4	
Cuproxat FW	grapes potato, sugar-beet, tomato, green pepper, cucurbits, bean, peas, onion, pome fruits pome fruits (Erwinia amylovora)	4.0 4.5 5.0	1-4	Grape 80% Orchards 15% Others 5%
Rézgálic	stone fruit, pome fruits, grapes potato vegetables	10.0 12.5 1.25 3.75	1-4	
Rézgálic (Almalszkij)	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	
Rézgálic (Blue Stone)	stone fruit, pome fruits, grapes potato vegetables	10.0 12.5 1.75 3.75	1-4	
Rézgálic (Kék Kő)	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	
Rézgálic (Kistim)	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	
Rézgálic (Zorka)	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	Grape 80%

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				Experts estimate!!
Rézgálic 98	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	Orchards 15% Others 5%
Scarmagnan Rézgálic	stone fruit, pome fruits grapes potato vegetables, cucumber, bean, peas, green pepper, tomato	10.0 12.5 1.75 3.75	1-4	
Chlorpyrifos containing products				
Cyren EC	pome fruits grapes maize, sugar-beet, sunflower empty store	1.75 1.0 2.0 0.85	1-3	Orchards 30%
Diabro CS	maize	1.75		
Dursban 480 EC	cereals, sugar-beet maize, sugar-beet(soil pests-spraying) maize, sugar-beet (soil pests line treatment)	1.5 5.5 .0	1-2 1 1	Grape 25% Arable crops 40%
Nurelle-D 50/500 EC	sugar-beet potato peas, cereals apple pear oil rape	1.5 1.0 0.5 0.9 1.42 0.6	1-3	Others 5%
Pyrinex 25 CS	pome fruits grapes	2.5 1.5	2-3	
Pyrinex 48 EC	maize cereals sunflower sugar-beet pome fruits grapes	2.0-5.0 1.5 2.0-5.0 1.5-5.0 2.0 1.5	1-3	Orchards 30% Grape 25% Arable crops 40% Others 5%
Diuron containing products				
Diuron 600 FW	pome fruits, grapes alfalfa non cultivated area	4.01 4.5 7.0	1	
Lucenit 80 WP	alfalfa sainfair raspberry hops gooseberries	1.5-7.0 1.5-3.0 2.0 3.5 1.0	1	Alfalfa 80% Orchards 10% Others 10%
Nikesuper Combi 600 FW	pome fruits non cultivated area	6.01 7.0	1	
Nikesuper Combi 80 WP	pome fruits, grape non cultivated area	5.0 6.0	1	
Endosulfan containing products				

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				Experts estimate!!
Thiodan 35 EC	potato sugar-beet oil rape, alfalfa, cereals pome fruits, berries strawberry, grapes vegetables	0.8 1.01 1.2 1.25 1.0	1-2	Alfalfa 80% Orchards 10% Others 10%
Thionex 35 EC	potato sugar-beet oil rape, alfalfa, cereals, tobacco, pome fruits, berries strawberry, grapes maize	0.8 1.01 1.2 1.6 1.25 2.0	1-2	
Thionex 50 WP	alfalfa strawberry, raspberry, garden trees sugar-beet	1.5 0.9 5.0	1-2	
Malathion containing products				
Buvatox 5 G	vegetables garden-trees maize	30; 2.25 2.25 35	1	Orchards 30% Vegetables 25% Arable crops 25% Grape 19% Others 1%
Evershield CM	maize	1.0	1	
Fyfanon EW	stone fruit, cucurbits, cabbage, peas, green pepper, tomato grapes oil rape, mustard sunflower garden-tree, empty store currant, gooseberries	1.5 1.25 1.2 1.25 0.15 1.0	1-3	
Galition 5 G	garden-tree, pepper, maize, cabbage, legumes	35	1	
Isoproturon containing products				
Affinity WG	winter wheat	2.25	1	Barley 80% wheat 20%
I.P. Flo	winter wheat, -barley	2.75	0	
IPU Stefes	winter wheat, barley	2.75	1	
Izoguard 75 WG	wheat, barley	1.8	1	
Izoguard 75 WP	winter wheat	3.5	1	
Maraton SC	winter wheat	3.0	1	
Protugan 50 SC	wheat, barley	2.75	1	
Trifluralin containing products				
Ipifluor 48 EC	sunflower, bean, green pepper, tomato, soya bean, mustard, bitter-sweet, carrot	1.70	1	Sunflower 50% Green pepper+ Tomato 25% Leguminosae 25%
Olitref 480 EC	green pepper, tomato sunflower, bean, soya bean, mustard, bitter-sweet, oil rape, oil radish	1.9 1.70	1	
Treflán 48 EC	green pepper, tomato sunflower, bean, soya bean, mustard, bitter-sweet, oil rape, oil radish	1.7	1	

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				Experts estimate!!
Triflurex 26 EC	tomato, green pepper, cabbage bean, sunflower bitter-sweet, mustard	3.5 3.4 5.25	1	
Triflurex 48 EC	green pepper, tomato sunflower, bean, soya bean, mustard, bitter-sweet, oil rape, oil radish carrot	1.7 1.5	1	
Zinc containing products				
Arvalin-LR	cultivated area outskirts living area	20-30 g/m^2 2-3 pellet/hole	1-2	