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How to mitigate pesticides point sources pollution at the EU level

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Abstract

Best Management Practices (BMPs), to reduce point source pollution with PPPs, (Plant Protection Products) have been defined in the EU project TOPPS. The correct behaviour of operators, technique and infrastructure has been recognised as the key points to mitigate point source risks. Stakeholder Surveys at the EU scale (10 countries) and Farmer surveys in selected Pilots Catchments (6) reflect current practices and show how to improve behavior, equipment, infrastructure and organization to reduce risks. Whilst these needs for improvements can now be recognized a sustainable approach to reduce point sources can now be proposed and further discussed. Key elements are correct behavior of operators and improvements of equipment and infrastructure.

Keywords

Pesticides Point Source Pollution Reduction, Stakeholder Decision, Surveys, Upscaling Process

Introduction

In recent years, pesticides have been found in a number of rivers and urban and rural wells. Pesticides are widespread and concern a wide diversity of human activities: PPPs are used by farmers, the public in homes and gardens, local authorities and leisure developments. However Plant protection products (PPP) are used mostly for agricultural purposes. Farmers use pesticides to maintain or further increase the amount and quality of yield by a particular crop.

Pesticides can be harmful to non-target organisms and can have adverse effects on human health, wildlife and the environment. Such adverse effects can be strongly reduced if recommendations on the correct use of PPP and respective risk mitigation tools (Technique and infrastructure) are used. Monitoring results across countries show that the levels of contaminations have decreased over the years [ref]. Reasons are bans of products like Triazines or Urea herbicides and additional risk mitigation measures like Buffer zones, Antidrift nozzles, etc.

According to the European water supplier's organisation, pesticide contamination of raw water is very severe in lowland rivers. A high proportion of this water is contaminated beyond the 0,1 µg/L threshold value and has to undergo pesticide removal treatment before it can be distributed as drinking water [ref].

Pesticide fluxes reduction should now be made and not only where it is possible or the easiest. Moreover, the better dissemination of usable information to agricultural producers **could empower farmers to practice science-based high value agriculture** to meet policy goals by encouraging environmentally beneficial actions,

The aims and objectives of the TOPPS project fit closely with a wide variety of EU environmental legislation and programmes. These EU measures are intended to set the framework for future actions at the EU level (fig.1).

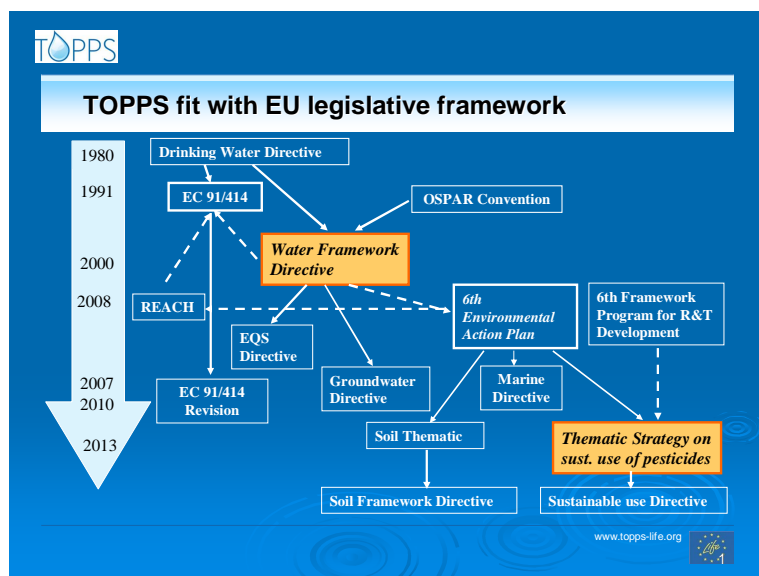


Fig.1 - Schematic representation of Key EU measures

The TOPPS project is most closely associated in two specific European actions:

- The Water Framework Directive (WFD)
- The Thematic Strategy (TS) on Sustainable Use of Pesticides, and the related envisaged Directive on the Sustainable Use of Pesticides

(i) The initiatives launched in the WFD are especially relevant for the TOPPS project:

- The establishment of a “catalogue of measures” which Member States may, inter alia, use as a basis for the agriculture related elements of their river basin “Programmes of Measures” as required by the WFD. The TOPPS Best Management Practices (BMPs) form a useful input for those aspects of the catalogue of measures dealing with reducing pesticide losses to water.
- There is an ongoing effort to identify how CAP and Rural Development Regulation (RDR) funds could be made available to support the implementation of measures relevant to the achievement of the agriculture related objectives of the WFD.

With its aim of improving water quality, TOPPS will contribute to the objective of reducing required purification treatment. However, the general good practices which TOPPS seeks to promote will also contribute to the objective of protecting surface and groundwater (e.g. through avoiding over-spraying wells, and by better remnant* management).

(ii) The key aspects of the Thematic Strategy / future Directive are:

- National Action Plans (NAPs) to reduce risks and dependence on pesticides which Member States are required to establish. Stakeholders will be involved in the establishment and implementation of NAPs (envisaged in article 4 of proposal for a framework Directive)
- Creation of appropriate trainings and certificate systems for professional users, distributors and advisers (envisaged in article 5)
- Regular and compulsory inspection of application equipment (envisaged in article 8)
- Specific measures to enhance protection of the aquatic environment: notably creation of buffer zones where there can be no application or storage (envisaged in article 10)
- Reduction of pesticides in sensitive areas, such as special conservation areas. (envisaged in article 11)
- Handling and storage of packaging and remnants of pesticides (envisaged in article 12)
- Article 13 on the promotion by Member States of Integrated Pest Management (IPM) schemes (envisaged in article 13)

The TOPPS project has delivered information and demonstration tools aimed at increasing awareness of the need to protect water, and provides suitable training tools and best management practices that can be implemented in practice (by farmers) at a European scale. The exercise of establishing, promoting, and disseminating the TOPPS point-source related Best Management Practices has already begun under the TOPPS project within the given project's resources.

Perception on the issues at stake, Pilot Catchments Status

61% of the Stakeholders (experts from 10 countries interviewed by mailing on point source pollutions) think they could be confronted more and more with PPP water contamination concerns in the next years. Most of the reasons put forward are an increase of environmental issues and the implementation of the water legislation. They think as well they will have a general awareness of the population on this topic.

Generally speaking a majority of farmers think that point source pollution is an important source of water contamination and the easiest source to prevent as well. This is in line with the perception of the stakeholders, where a big majority in the Nordic saw point sources as the main entry route of PPP into water. French farmers are the only one to think diffuse source is the most important source of water contamination. Perceptions of operators can be seen as a reflection of the advice and information they have received and it is clear that a stronger focus on water protection could induce positive change.

The physical characteristics of the Topps catchments are quite close (fig.2). Soils are dominated by clays and sands.. The climate is temperate with quite gentle temperatures and rainfalls. Nevertheless, if the PPP are not used correctly, in south as in north, climatic events during autumn and spring can improve the risks.

The size of the catchments varies from 138 km² (IT) to 1365 km² (BE). Drinking water is extracted in all the catchments except in the French and Italian ones. Surface water is used for drinking only in the Belgium and German catchments. Monitoring of surface water exists in all the catchments but the conditions are different according to the catchments. Thus, at the present time the characterization of the water quality is not the same and it is difficult to make comparisons.

In all the catchments the main activity (in term of surface used) is agriculture. The agricultural surfaces vary from 42% (IT) to 86% (FR) of the catchments surface. The main crops are cereals, except in the Italian catchment where nearly ¾ of the cropping pattern is vineyards. The number of farmers varies from 100 (DK) to 7000 (PL). This variation can be linked with the size of the catchments and the surface of farms (an average of 79 ha in DK and 7.6 ha in PL). At last, the Danish catchment is the only one to have a majority of part-time farmers (2/3 of them). This characteristic is important in term of spraying practices and equipments. For example, the Danish part-time farmers have in general older sprayers without equipments for cleaning the sprayer.

* Remnant: contaminated liquids remaining in sprayers after termination of spray operations or washing water from filling, cleaning or maintenance of sprayers on farm

		BE - Yser	DE - Stever&Haltern	DK - Bygholm	FR - Yser	IT - Alba	PL - Utrata
Catchment area	Size	1365 km ²	800 km ²	180 km ²	381 km ²	138 km ²	792 km ²
Land use & Farmers	Main activity	Other	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
	Agricultural surface	75%	64%	60%	86%	42%	69%
	Average surface of farms	22 ha	?	79 ha	40 ha	4,22 ha	7,6 ha
	Cropping pattern	34% cereals 27% feed 15% potatoes 13% industry crops 11% vegetables	50% cereals 30% maize 10% grassland 10% oil seed rape	winter-wheat/barley oil seed rape maize spring barley grass	37% cereals 20% potatoes 12% vegetables 12% pastures 5% sugar beets 5% feed 9% others	70% vineyards 15% nut orchards 15% others	76% arable lands 10% meadows 7% orchards 7% pastures
	Farmers number	4732	3000	274 with a legal status as farms but only 100 with an actual agricultural activity	~ 800	1367	7000
	Place of farming in the activity	80% full-time 20% part-time	67% full-time 33% part-time	1/3 full-time 2/3 part-time (based on the more realistic estimation: 100 farmers)	>95% full-time <5% part-time	68% full-time 32% part-time	80% full-time 20% part-time

Fig.2 - Topps Catchments Characteristics

For each catchments the different status were analysed: (i) BMPs implementation, (ii) behaviour, (iii) equipments and infrastructure (iv), education (farmers, advisers) (v), key people (who, what, how) and (vi) control processes.

To sum up the main information: farmers agree to search information and training but see problems to invest in equipments and infrastructures without incentives. Beyond the regulation aspects, applying BMPs is mainly driven by their responsibility as for environment than health protection. In these conditions the challenge for information and advice is to ensure that a maximum of farmers are well informed about BMPs. This requires the development of efficient tools and organisation. In the proposal for a sustainable strategy key findings of the TOPPS surveys are used. This will be a type of good recipe mentioning minimum requirements and best requirements (most effective approach) to develop and implement BMPs:

- dealing with water protection
- based on current scientific and technical knowledge
- based on surveys with stakeholders and farmers
- based on organisational analysis in pilot catchments reflecting puzzle pieces at the EU scale

Gap Analysis

This analysis is focused on data of the awareness and technical surveys (Pilot areas) which supply information on farmers' practices (concerning risky or safe practices for surface water). Decision rules have been used to build criteria of risky or safe practices. These data are ordered by process and sub-process and linked to BMP (i.e. fig.3 on PPPs filling process).

ID.	Process	Sub-Process	From	Risky practices	Safe practices	BMP ref.
13	Filling	Place to fill	Farmer Awareness Survey	Filling in the field less than 10 meters from a water point ; filling on farm on grass place at less than 10 meters from a water point ; filling on farm on hard surface without collection of water	Filling in the field at more than 10 meters from a water point ; filling on farm on grass place at more than 10 meters from a water point ; filling on farm on hard surface with collection of water for treatment in a biobed	3360 3350

Fig.3 – Practices Analysis

In the same way, the farmer's practices are considered versus the local and/or national regulations (i.e fig.4 on residues management).

ID	Process	Sub-process	Local (or national) regulation conformity						
			BE	DE	DK	FR	NL	IT	PL
4	After spraying	Farmer must manage his remaining spray liquid correctly	YES (Left over must be diluted and sprayed out in the treated field)	YES (General recommendation to leave remnant in the field are given NO (specific regulation)	No (Dilution of the remaining spray and spraying it out in the field is expected to be mandatory within a year or so)	YES (Dilution of the remaining spray and spraying it out in the field and management on the farm are authorized with certain restriction)	YES	NO	

Fig.4 - Regulation conformity

How to close the Gap

Pesticides point sources pollution depends mainly on farmer's behaviour and the availability of risk mitigation devices on the equipment and infrastructure used.. According to stakeholder's point of view, strongest impact for improvements is expected by changing operator's behaviour and improved technology. The BMPs were developed by applying the perspectives of correct behaviour and by proposing the technical improvements for equipment and infrastructure. Implementation of the BMPs therefore will address both aspects relevant: Behaviour and Technology to enable risk mitigation.

TOPPS BMPs are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. Importance of local legislation is stressed. Guidelines should be dynamic, regularly updated and should deal with all relevant working processes. Particularly with those posing the most risks: Filling, Cleaning and remnant management.,

Behaviour and the use of **improved technology** are having the biggest impact on point source reduction:

- reducing surface water and ground water contamination by PPPs
- promoting BMPs for a good management of PPPs

Achieving these objectives, some key aspects need to be considered to implement cost-efficient approaches and stimulate farmers to change their practices and techniques.

Knowledge transfer and the chances for adopting innovation remain a complex issue: policies contexts, people and objectives at stake and involved organisations are critical factors to success. There is not only one solution of knowledge transfer: implementation of innovation must be understood as a process, geographically localised, where interaction between, farmers, advisers, stakeholders and policy makers are the key success factors.

In terms of scenarios of evolution, the aim is to give a good definition of the objectives for the behaviour, equipment and infrastructure elements. Different levels of priority are possible:

- ★★★★★ Very High Priority: Do it without waiting
- ★★★★☆ High Priority: Do it in the next 1 year
- ★★★☆☆ Normal Priority: Plan it in the next 3 years
- ★★☆☆☆ Low Priority: Envisage it in the 5 years
- ★☆☆☆☆ Very Low Priority: Envisage it in the 10 years

Conclusion

Best Management Practices (BMPs), to reduce point source pollution with PPPs, (Plant Protection Products) have been defined in the EU project TOPPS. Correct behavior of operators, adapted techniques and infrastructures are the key points to mitigate these risks. Reflecting current practices and opinions, through 10 European countries and 6 Pilots Catchments, the Stakeholder Surveys and Farmer surveys has shown the possibilities of improvement. A sustainable approach to reduce point sources is proposed.

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