



Photo by Chris de Wit on Unsplash

# ***TOPPS Water Protection Methodology and Decision Support Tools***

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***TOPPS Chairman, November 2018***



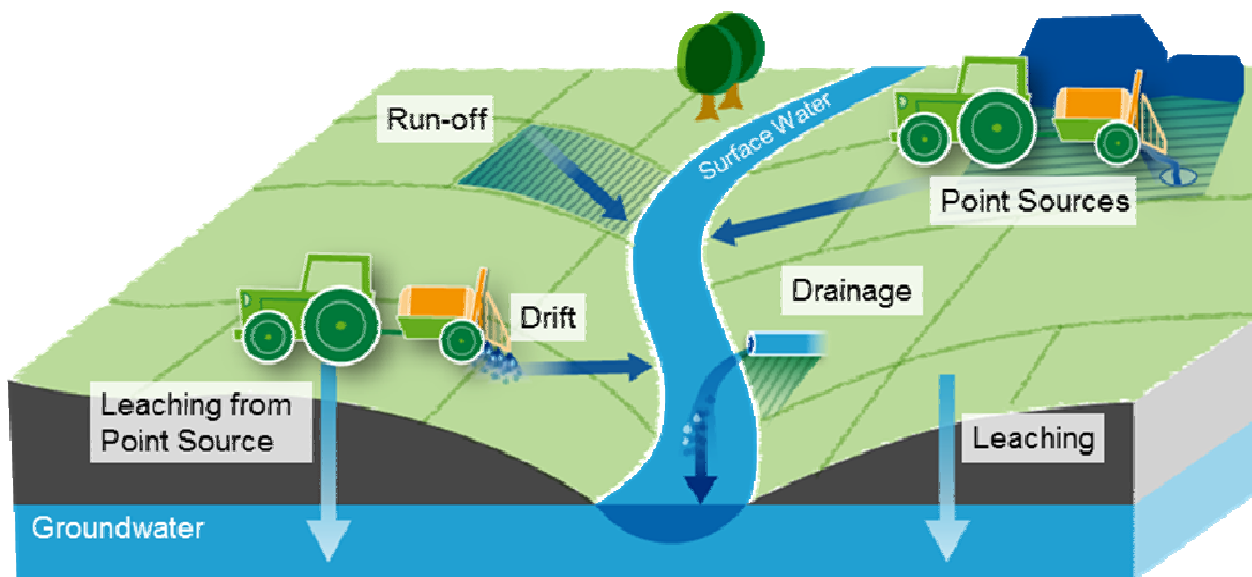
# Basic Methodology I

- Multi-partner development of toolboxes of **EU-wide recognized BMPs\*** for water protection in agriculture
- Achieve a holistic water protection concept at catchment level, **covering all key pollution sources & pathways**
- Promote a **multi-stakeholder approach** to come to solutions, which are **acceptable and economically viable for farmers**



# Basic Methodology II

## Water Contamination Pathway Analysis



### Point sources

- Handling on farm (filling, cleaning, remnant management)
- Before/after spraying in the field

Easy to avoid



### Diffuse sources

- Surface runoff
- Spray drift
- Drainage
- Leaching

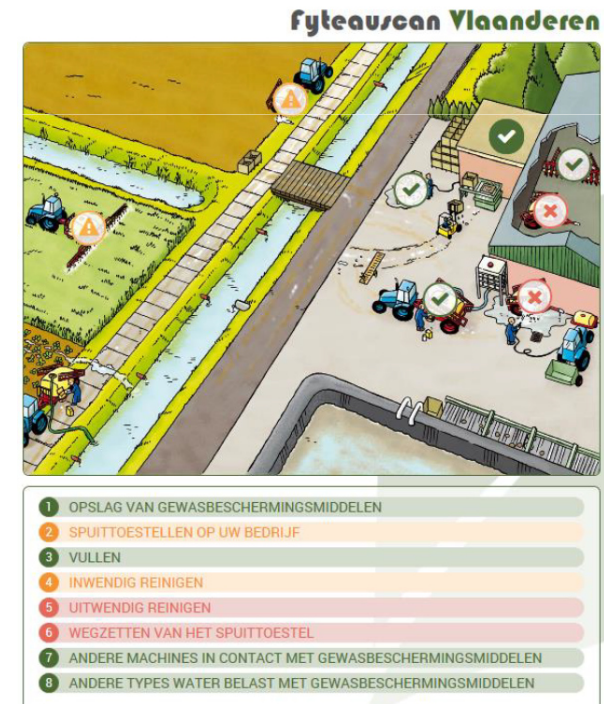
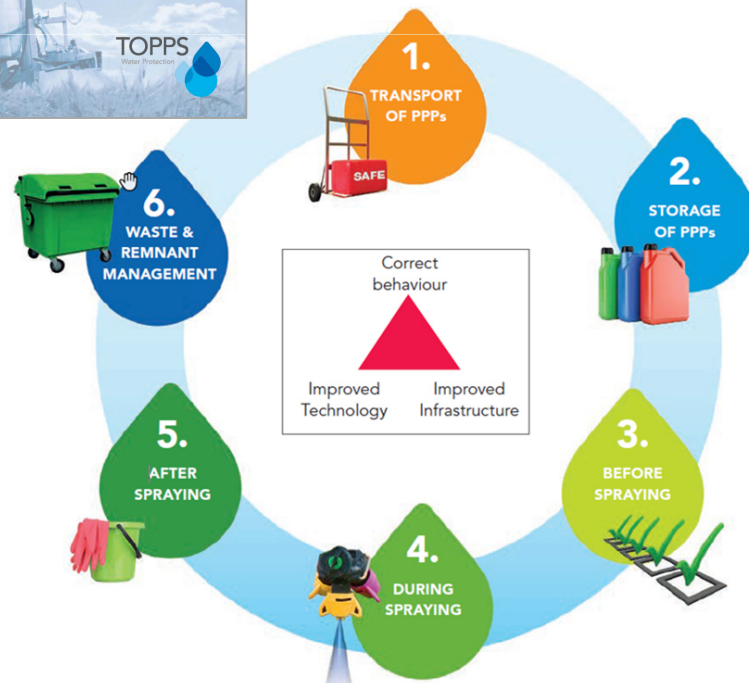
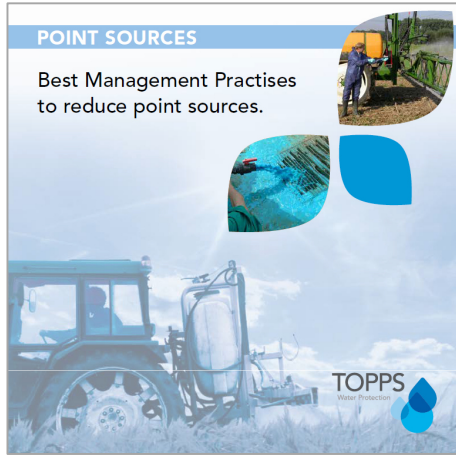
Can be minimized



- Identification of relevant pathways
- Specific risk diagnosis and mitigation

# Methodology: Point Sources

## Structured diagnosis and DST\*

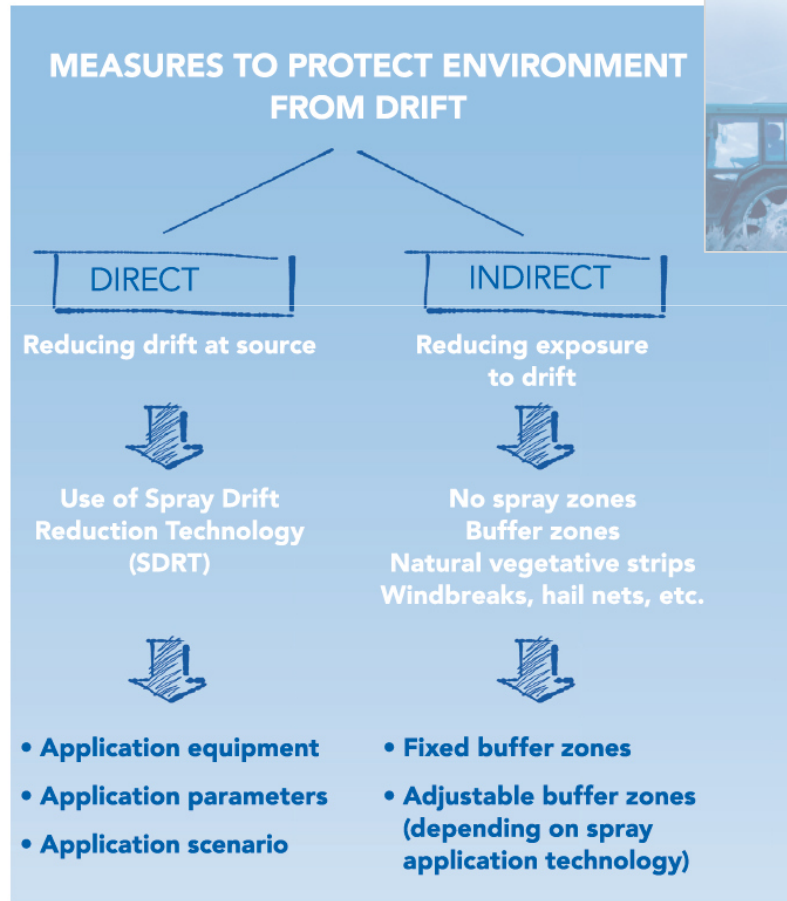


## Farmyard Emission Scan

\* Decision Support Tool



# Methodology: Diffuse Sources Spray drift risk analysis and DST



Spraying within the zone of awareness



HOME | **SPRAY APPLICATION SITE** | MITIGATED & FIELD CONDITIONS | DRIFT RISK MITIGATION

**Drift Risk Value** 0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%

Situation **1.00%** LOW MEDIUM HIGH

Mitigation **1.00%** LOW MEDIUM HIGH

**MITIGATED & FIELD CONDITIONS**

WIND	AIR	FIELD
Direction: ?	Temperature: ?	Crop height: ?
Velocity: ?	Humidity: ?	Adjacent vegetation: ?

**RECOMMENDATION:**

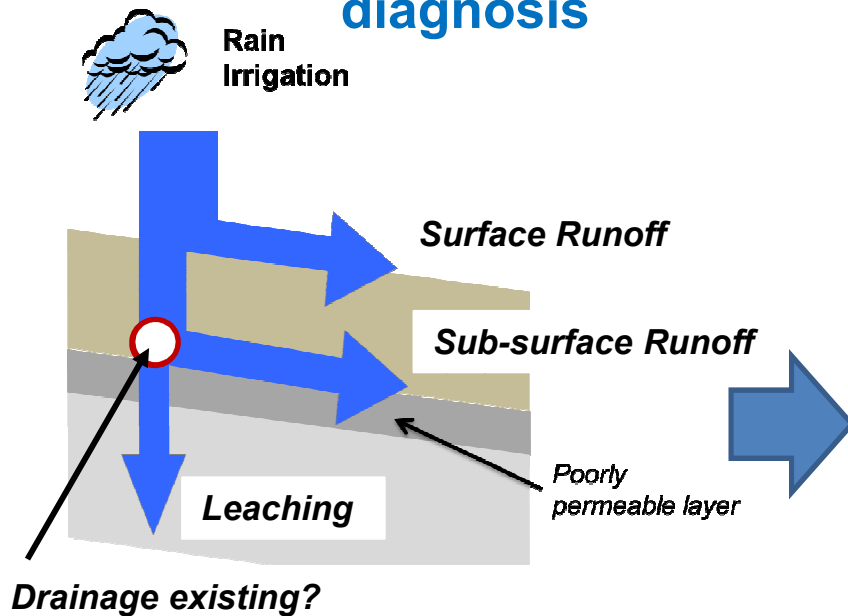
HIGH risk of water contamination by drift. Do not spray unless SDRT is used and/or drift reducing application parameters are set. Follow the local regulations and the label recommendations for buffer zones.

BACK CONTINUE

CONDITIONS	
<b>FIELD</b>	<b>Crop height</b>
	BARE SOIL
	EMERGING CROP
	<b>LOW &lt;10 cm</b>
	MEDIUM 10-50 cm
	HIGH >50 cm
<b>Adjacent vegetation</b>	<b>BARE GROUND</b>
	MEADOW
	HIGH VEGETATION, WINDBREAK
	HIGH >50 cm
SETTING OF SPRAYER	
	<b>Driving velocity</b>
	3-5 km/h
	<b>5-7 km/h</b>
	7.1-10 km/h
	10.1-15 km/h
	>15 km/h

# Methodology: Diffuse sources Water flow analysis and DSTs

## Field diagnosis



## Drainage & Leaching risk decision dashboards

## Runoff risk decision dashboards

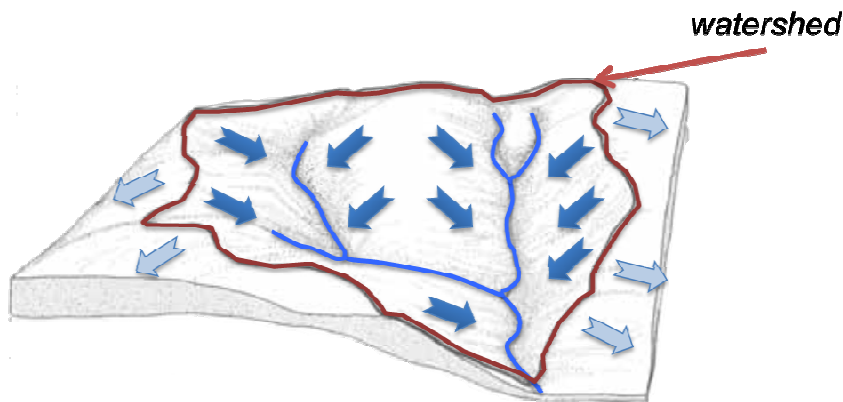


Proximity to Surface Water	Drainage Status	Topographic Position	Subsoil Permeability	WHC*	Risk Class & Scenario	
Field Adjacent to Water Body	Not Artificially Drained	Bottom of slope (concave)/Valley bottom (see scenario A)	Plough pan + Permeability disruption	ALL WHCS	S 4	1 2 3 4 5 6 7 8 9 C 10 C 11
			Plough pan OR Permeability disruption	<120 mm	S 4	
			Plough pan OR Permeability disruption	>120 mm	S 3	
		Upslope/Continuous slope	No plough pan & Permeability disruption	<120 mm	S 3	
			No plough pan & Permeability disruption	>120 mm	S 2	
			Plough pan + Permeability disruption	ALL WHCS	S 4	
	Artificially Drained	All Positions	Plough pan + Permeability disruption	<120 mm	S 3	
			Plough pan OR Permeability disruption	>120 mm	S 2	
			Plough pan OR Permeability disruption	>120 mm	S 1	
		All Positions	Plough pan + Permeability disruption	ALL WHCS	SD 3	
			Plough pan OR Permeability disruption	<120 mm	SD 3	
			Plough pan OR Permeability disruption	>120 mm	SD 2	
Field not Adjacent to Water Body	All soils: If drained see also SD-Scenario advice	Transfer of run-off to downhill field?	YES	Run-off reaches water body?	YES	T 3
				Run-off reaches water body?	NO	T 2
			NO		T 1	
		Run-off strongly concentrated	Gully in talweg	High infiltration soil in buffer		C 10
				Low infiltration soil in buffer		C 11

# Methodology: Diffuse sources

## Catchment diagnosis and risk maps

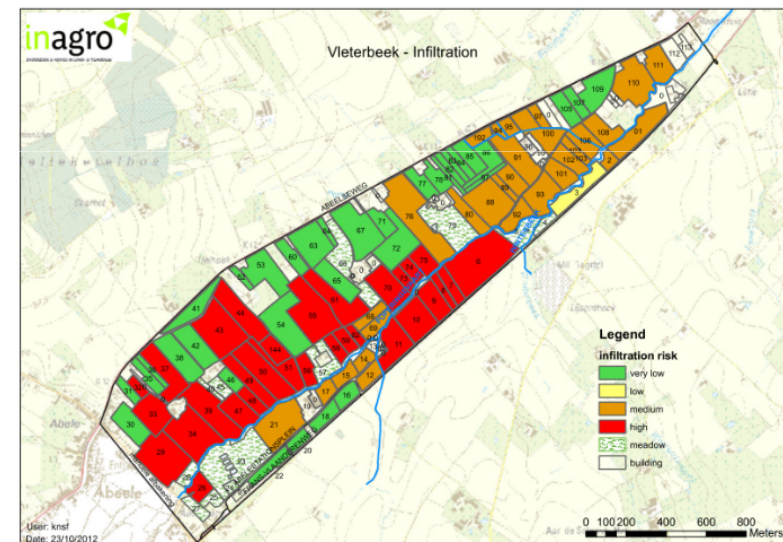
### Catchment diagnosis: Water flow pathway analysis



- Water output from field?
  - Does runoff reach surface water?
  - Do vulnerable areas for groundwater exist?
- Field visit necessary

### Catchment risk maps: e.g.

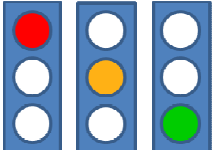
- Infiltration restriction runoff

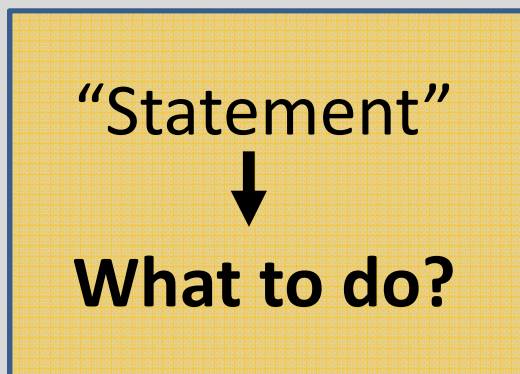


- Saturation excess runoff
- Concentrated runoff
- Drainage
- Leaching

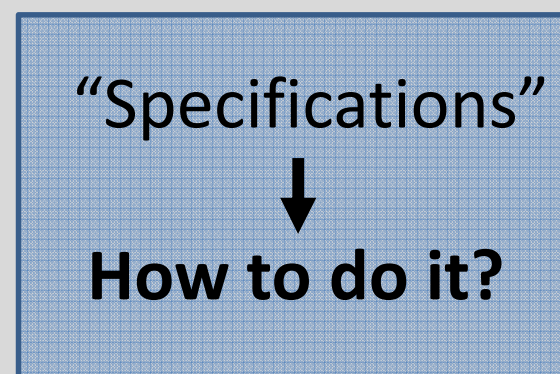
# General Structure of BMPs and Measures

## Harmonized Approach

**BMP** = Risk diagnosis  + adapted **mitigation measure(s)**



### Measure



A clear communication in form of a general recommendation statement, which will form the core of the harmonized EU BMP measure.

A detailed description of requirements, materials, conditions, and parameters to consider in order to realize the recommendation goal  
(Country-specific modifications in national BMP toolboxes)





# Example: Runoff BMP Measure Soil Management

## Objective: Stop runoff at source

### Prepare rough seedbed

- Establish a rough seedbed with soil clods (do not roll over after seeding)
- Slows down water flow
- Increases infiltration



### Establish mini-dams in the field (e.g. potato)

- Small bunds are created in between rows at seeding
- Height and spacing of bunds needs to be adapted to local conditions
- Minimization of runoff and erosion





# Example: Runoff Mitigation Measures Toolbox for Flexible Mitigation

## Soil management

- Reduce tillage intensity
- Manage tramlines
- Prepare rough seedbed
- Establish in-field bunds
- Manage surface soil compaction
- Manage subsoil compaction
- Do contour tilling/disking

## Cropping practices

- Use crop rotation
- Do strip cropping
- Enlarged headlands
- Use annual cover crops
- Use perennial cover crops
- Double sowing

## Vegetative buffers

- Use in-field buffers
- Establish talweg buffers
- Use riparian buffers
- Use edge-of-field buffers
- Manage field access areas
- Establish hedges
- Establish/maintain woodlands

## Retention structures

- Use edge-of-field bunds
- Establish vegetated ditches
- Establish retention ponds/wetlands
- Build fascines

## Adapted use of pesticides

- Adapt application timing
- Optimize seasonal timing
- Adapt product and rate selection

## Optimized irrigation

- Adapt irrigation technique
- Optimize irrigation timing and rate

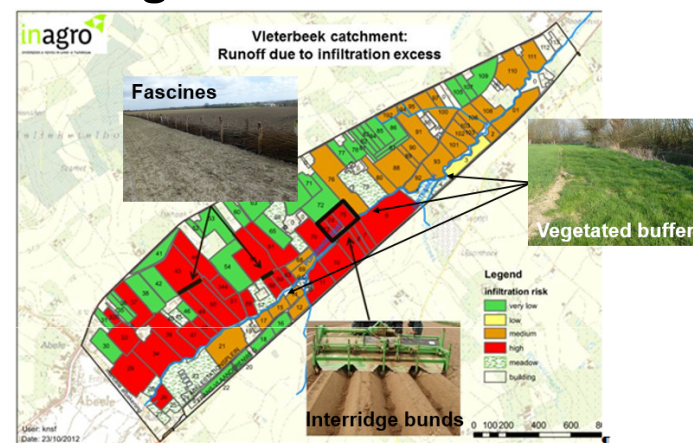
# Best Practice at Catchment Level

## Analysis ⇒ Diagnosis ⇒ Mgmt Plan



Example:  
Run-off risk  
diagnosis (BE)

### Management Plan



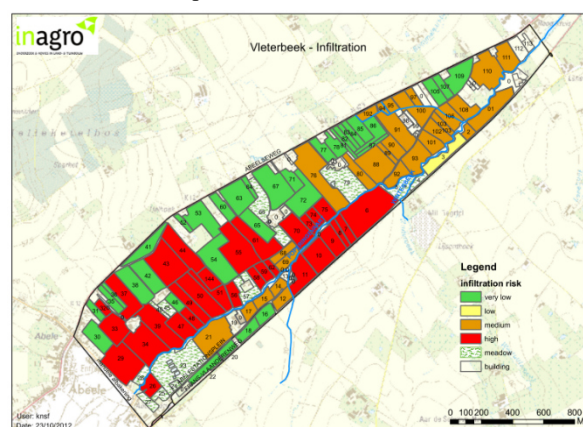
Meeting with  
farmers



Analysis and diagnosis  
in the field



### Risk Map

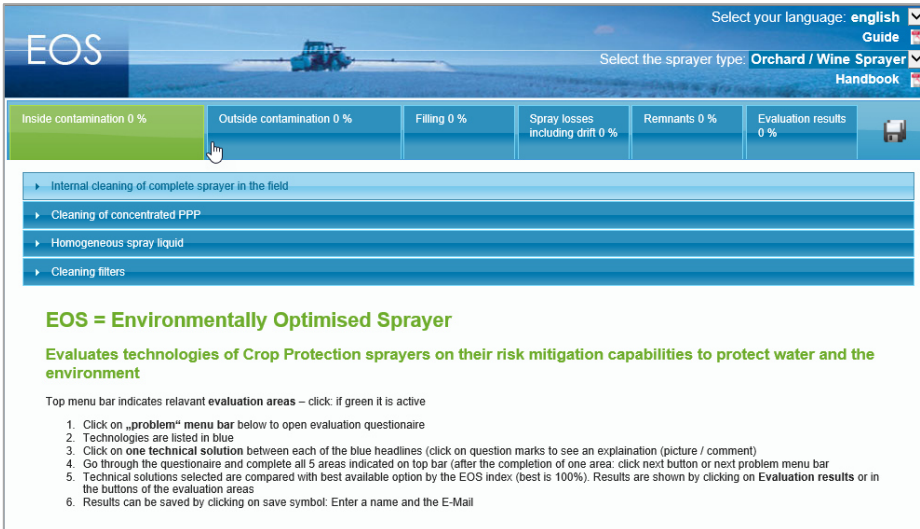




# Further Decision Support Tools Enabling Farmers

## Web-based sprayer configuration tools

### EOS



The screenshot shows the EOS web application interface. At the top, there is a navigation bar with the EOS logo, a language selector set to 'english', and a 'Select the sprayer type' dropdown menu currently set to 'Orchard / Wine Sprayer'. Below the navigation bar is a horizontal menu with five evaluation areas: 'Inside contamination 0 %', 'Outside contamination 0 %', 'Filling 0 %', 'Spray losses including drift 0 %', and 'Remnants 0 %'. The 'Inside contamination 0 %' area is highlighted in green. Below the menu is a list of technical solutions, including 'Internal cleaning of complete sprayer in the field', 'Cleaning of concentrated PPP', 'Homogeneous spray liquid', and 'Cleaning filters'. A green heading reads 'EOS = Environmentally Optimised Sprayer', followed by a description: 'Evaluates technologies of Crop Protection sprayers on their risk mitigation capabilities to protect water and the environment'. A 'Top menu bar indicates relevant evaluation areas - click: if green it is active' is noted, followed by a numbered list of six steps for using the tool.

[www.topps-eos.org](http://www.topps-eos.org)

### Step-Water



The screenshot shows the Step-Water web application interface. It features a background image of a golden wheat field. At the top, the text 'Healthy Crops, Clean Water' is displayed on both sides. A circular logo on the left contains the text 'Good Spray Application for Healthy Crops + Clean water'. On the right, a portrait of a man is shown next to the quote: '„Find out how I improved my sprayer with STEP Water“'. At the bottom, there are logos for CEMA (European Agricultural Machinery) and European Crop Protection, along with the text 'ONLINE WATER PROTECTION EVALUATION FOR CROP SPRAYERS'.

[www.step-water.org](http://www.step-water.org)



## Conclusions

- TOPPS methodology is science-based and developed in a broad EU-wide multi-stakeholder approach:
  - ⇒ **Pollution pathway analysis**
  - ⇒ **Specific risk diagnosis**
  - ⇒ **Selection of BMP measures**
  
- Web-based decision support tools aim to empower many farmers to take decisions standalone
  
- Further web-based TOPPS DSTs to come to
  - increase the outreach to farmers
  - reduce complexity for decision making



Photo by Gregory Hayes on Unsplash



**Thank you for your attention!**



[www.topps-life.org](http://www.topps-life.org)