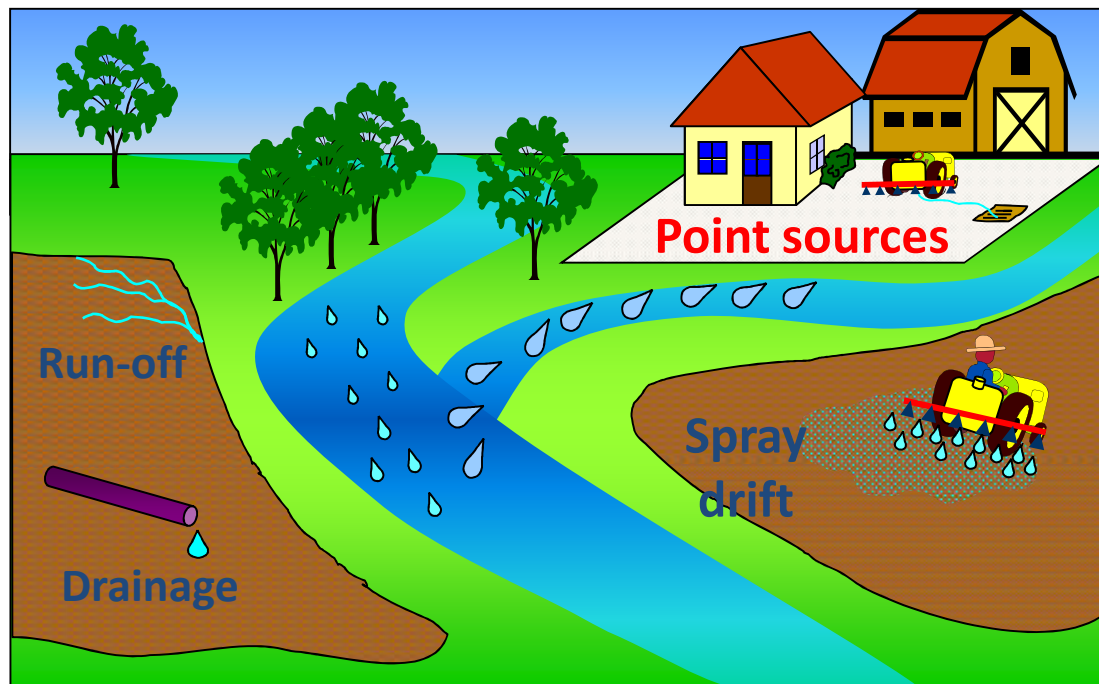


TOPPS - Water Protection Stakeholder Survey 2016





TOPPS stakeholder survey Realization and thanks

- Questionnaire developed in the TOPPS network with local partners and respective translations based on English questionnaire (Partners/CPA*)
- Transfer of questionnaire in internet compatible format Mrs. Montse Gallart University Polytechnica Barcelona (UPC)
- Distribution of questionnaire to stakeholders through partners and CPA by electronic mail.
- Start of the survey February 2016 to April 2016
- Data collection and management through UPC.
- Analysis and reporting Manfred Roettele

We thank all for the contributions to this survey and especially those which helped us by shareing their opinions and perceptions on key aspects related to reduce losses of Plant Protection Products (PPP) to water

* CPA = Crop Protection Associations



Content

- Key messages
- Sample structure
- About water protection (opinions / perceptions)
- Implementation of measures
- Application techniques
- TOPPS - academy



Key messages

- Perception of main contaminants from agriculture to water differ a lot by country and cluster
 - Organic fertilizer + Plant protection products (PPP) Cluster (32%)
 - Mineral fertilizer + PPP Cluster (32%)
 - Veterinary + Other Chemicals + PPP Cluster (20%)
 - Other Chemicals + Mineral fertilizer Cluster (16%)
- Point sources emissions are equally important compared with diffuse sources
- Perception on significance of spray drift shows highest variation
High significance in South – more Tree & Bush Crops (BTC) ?
- Highest potential to reduce losses of PPP to water is to focus on point sources :
Remnants, Sprayer cleaning, Spray drift reduction in BTC.
- Runoff mitigation measures need additional support for implementation.
- Best return on investment to improve water quality: Invest in optimized sprayers, farm infrastructure and awareness.
- Implementation support: Demonstrations to farmers & integration in education system
- Big differences in countries on advise for farmer to correctly adjust sprayers
Big need for improvements!
- Stakeholder interest in intensive theory + practise training course is high



Sample structure

- Sample was targeted to stakeholders and in total 1161 persons contributed to this survey. Respondents represent 12 EU countries. Sample sizes varied between countries. We assume that a sample size of 50 will show the major trends in these countries. 40% of the respondents indicate that they work in the private, 52% in the public service sector. Analysis are mainly based on country results (Tab1).
- About 34% of the respondents work in the area of farm advice, 19% in control / monitoring functions, 16% in research & development. Others are persons from commercial activities mainly sales and marketing functions in various organizations (10%)(Tab 2)
- 63% of respondents have at least one farmer contact per week; 15% one contact per month. We can assume that these two groups (78%) are directly exposed to farming practice. Remaining respondents may be more active in administrative or scientific areas. (Tab.3,4)
- In Table 5 the cluster membership per country is shown based on the ranking of listed main pollutants (pesticides, veterinary products, org. fertilizers, mineral fertilizers, other chemicals). Cluster analysis is a method to group respondents, which have more similar opinions and it is a way to reduce the variability of the sample. It can be seen that the cluster membership is different by country. This may reflect political discussions or specific local concerns. Further interpretation in the following chapters.



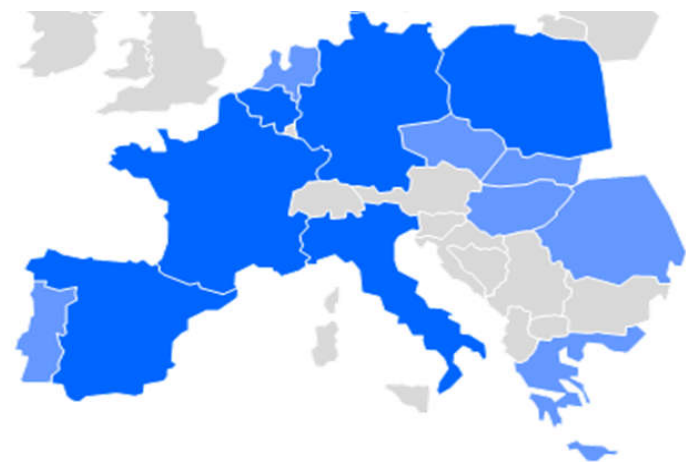
Sample Structure – representation of organizations by country

Tab.1 Structure of the sample by business organization				
	privat	pubic service	semi privat	Total n
Total n	465	599	97	1161
%	40,05%	51,59%	8,35%	100,00%
PL	11,83%	82,80%	5,38%	279
DE	13,45%	80,67%	5,88%	119
GR	29,31%	68,97%	1,72%	58
RO	31,37%	64,71%	3,92%	51
NL	44,12%	47,06%	8,82%	34
BE	55,10%	32,65%	12,24%	98
IT	55,56%	31,75%	12,70%	63
ES	58,96%	33,58%	7,46%	134
SK	58,96%	33,58%	7,46%	82
HU	68,00%	17,33%	14,67%	75
FR	74,36%	8,55%	17,09%	117
PT	76,47%	19,61%	3,92%	51

The respondent numbers vary by country . Most responses were received from Poland, lowest numbers from the Netherlands. The samples are sufficient to get a trend information on the perceptions.

52% of persons are representing official and 40% private organizations

Highest share of official respondents are received from Poland, lowest from France.





Sample Structure – representation of subject areas by country

Tab. 2: Respondents by subject area

Q2 /Q4	Research / Dev %	Farm advice %	Educatio n %	Control/ Monitor %	Regulatio n %	Stewards hip %	water quality %	Applicati on tech %	Politics %	Others	Total n	%
BE	13	8	2	2	12	9	19	13	17	8	98	8
FR	14	12	7	0	8	23	19	7	8	7	116	10
DE	9	16	11	6	12	13	9	6	17	0	119	10
GR	4	2	14	0	25	13	0	0	42	7	58	5
HU	5	12	2	0	5	5	3	3	8	9	75	6
IT	12	7	5	1	7	3	0	3	0	1	63	5
NL	0	1	0	2	13	2	25	3	0	10	34	3
PT	1	6	11	3	8	5	0	0	0	6	51	4
PL	20	22	20	50	3	3	0	33	0	13	279	24
RO	6	3	2	8	0	2	3	3	0	8	51	4
ES	13	8	23	5	7	20	6	28	0	19	135	12
SK	3	3	2	22	0	3	16	1	8	12	82	7
Total n	185	393	44	220	60	64	32	69	12	107	1161	100
%	15,93%	33,85%	3,79%	18,95%	5,17%	5,51%	2,76%	5,94%	1,03%	9,22%	100,00	

Highest participation with 34% is from farm advice, followed by control/monitor functions (19%) and Research/Development (16%). The high participation of control/monitoring is strongly influenced by polish responses.



Sample Structure – interactions with farmers by country

Contact intensity with farmers / country (Tab. 3)

Q3	regular contact	in contact	few contact	no contact
BE	66%	15%	15%	3%
FR	52%	25%	21%	3%
DE	60%	18%	15%	8%
GR	62%	17%	14%	7%
HU	65%	16%	13%	5%
IT	49%	14%	29%	8%
NL	44%	18%	29%	9%
PT	65%	10%	16%	10%
PL	71%	13%	11%	5%
RO	61%	18%	16%	6%
ES	69%	12%	9%	10%
SK	55%	7%	21%	17%
Total	63%	15%	16%	7%
n	727	174	180	80

Regular contacts (at least once / week) have on average 63% of the respondents .

15 % say they are in contact with farmers at least once / months
 Few contacts (few times/year) have 16% and 7 % have no contacts to farmers.

If we add the two first categories we have nearly 80% of the respondents which have intensive contacts to farmers, that we can assume that the sample reflects a good understanding of real agriculture.



Sample Structure – professional background and farmer interaction intensity

Tab. 4: Subject area and farmers interaction intensity					
Q2/Q3	reg contact	in contact	few contact	no contact	Total
Research Dev (n)	52	48	64	21	185
	28,11%	25,95%	34,59%	11,35%	100
Farm advice (n)	326	41	19	7	393
	82,95%	10,43%	4,83%	1,78%	100
Education (n)	20	9	10	5	44
	45,45%	20,45%	22,73%	11,36%	100
Control/Monitor (n)	162	23	25	10	220
	73,64%	10,45%	11,36%	4,55%	100
Regulation (n)	19	8	17	16	60
	31,67%	13,33%	28,33%	26,67%	1
Stewardship (n)	32	17	9	6	64
	50,00%	26,56%	14,06%	9,38%	100
Water quality (n)	8	5	13	6	32
	25,00%	15,63%	40,63%	18,75%	100
Application tech (n)	47	11	9	2	69
	68,12%	15,94%	13,04%	2,90%	100,00%
Politics (n)	5	1	4	2	12
	41,67%	8,33%	33,33%	16,67%	100,00%
Others (n)	56	11	10	5	82
%	68,29	13,41	12,20	6,10	100
Total	727	174	180	80	1161
%	62,62%	14,99%	15,50%	6,89%	100,00%

Farm advice and Control/monitoring have the highest interaction intensity with farmers.

Others (distribution, PPP industry, food marketing), Application techniques and Stewardship are the next subject areas which are in intensive contact with farmers



Sample Structure – representation by cluster and country

Country/cluster Tab. 5	1	2	3	4	Total
BE	28	20	29	21	98
	28,57%	20,41%	29,59%	21,43%	100,00%
FR	25	8	30	53	116
	21,55%	6,90%	25,86%	45,69%	100,00%
DE	18	17	61	23	119
	15,13%	14,29%	51,26%	19,33%	100,00%
IT	8	21	25	9	63
	12,70%	33,33%	39,68%	14,29%	100,00%
PL	32	129	64	54	279
	11,47%	46,24%	22,94%	19,35%	100,00%
ES	10	53	65	7	135
	7,41%	39,26%	48,15%	5,19%	100,00%
GR	11	32	9	6	58
	18,97%	55,17%	15,52%	10,34%	100,00%
HU	15	41	15	4	75
	20,00%	54,67%	20,00%	5,33%	100,00%
NL	6	7	16	5	34
	17,65%	20,59%	47,06%	14,71%	100,00%
PT	5	12	21	13	51
	9,80%	23,53%	41,18%	25,49%	100,00%
RO	7	14	15	15	51
	13,73%	27,45%	29,41%	29,41%	100,00%
SK	23	15	25	19	82
	28,05%	18,29%	30,49%	23,17%	100,00%
Total	188	369	375	229	1161
	16,19%	31,78%	32,30%	19,72%	100,00%

The clusters are described and discussed in more detail in the water protection section.

We have identified 4 clusters based on Question 5 (ranking of most important water pollutants from agriculture).

The table shows the cluster membership by country.

The clusters separate groups which differ in perceptions and reduce variance compared to the total sample.

It is obvious that the cluster membership varies by country, which may reflect different levels of knowledge or different political views in countries.

The yellow marked boxes show the majority cluster memberships. Main clusters are 2+3 but with distinct differences among countries. Belgium shows a rather high membership of cluster 1 and France of cluster 4

About Water protection (1) (*PPP plant protection products)

- On average the respondents rank the listed pollutants very clear. PPP* is number 1 followed by Mineral fertilizer (Tab.6). It looks different if we see the results by country. Eight out of 12 countries see PPP as the number1 pollutant. France and Portugal sees Veterenary products , Germany organic fertilizers and Hungary mineral fertilizers as number 1 pollutants. (Tab 7).
- The importance of the main pollutants change by the 4 clusters identified. In cluster 1 Veterenary and PPP are the least important pollutants (16% of respondents) . Cluster 1 ranks the category other chemicals highest . This may be an indicator that water pollution will adopt a broader focus on more pollutants. Highest membership in this cluster (nearly 30%) have BE and SK followed by FR and HU.
Cluster 2 can be charactericed by „Agrochemicals“ with Mineral fertilizers No 1 followed by PPP: This cluster is very dominat in PL 46% and > 50% in GR and HU.
Cluster 3 is the Organic fertilizer cluster followed in second place from PPP. Highest membership to this cluster shows DE > 50% followed by ES,NL, PT and Italy. These results may highlight the specific situations in countries, especially in connection with Nitrate problems in the groundwater.
Cluster 4 can be characterized as the „synthetic chemicals cluster: No 1 is Veterenary products, other chemicals and PPP (Fertilizers org. / minearal are ranked very low) . FR shows a especially high percent of members (46%) in this cluster compared to all other countries (Tab 8). Contrary to the average result PPP never reaches the number one position as a pollutant in the different clusters (Graph 1)

About Water protection (2)

- On average the key areas for PPP water contamination comes out of orchards and vine applications. It seems that this evaluation is strongly influenced by perceptions related to spray drift. (Tab. 9). Arable and mixed farms are the next important areas for PPP losses to water. Home & Garden, Urban and Golf course uses are considered the least important areas (Tab. 9). If we see the data by country Orchard/Vine is consistently in the top three pollution areas. In NL, ES and PT Glasshouses are mentioned in the top three relevant areas. In Belgium Home & Garden uses are among the top three. FR and DE mention railways as second most important area for PPP water contamination (Tab 10)
- On average the significance of the different entry routes of PPP (point / diffuse source) to surface water are estimated equally important (Tab.11). In BE, DE, GR, NL and ES point sources significance is seen > 50% . Diffuse sources in SK and HU are seen > 60%. Compared to previous surveys a more balanced perception can be seen on the evaluation of the significance of point versus diffuse sources (Graph 2).
- The ranking of the diffuse source: Runoff, spray drift and drainage show the perceived most important source in runoff and erosion, followed by spray drift and drainage. In IT and ES spray drift is seen higher or on the same level as runoff. Spray drift is ranked lowest in DE and SK. Spray drift is often overestimated probably because of the visibility of spray drift compared to other entry routes. Drainage is perceived as second most important in DE,GR, RO and SK. (Tab. 12)



About Water protection (3)

- In Question 9 we asked about the best potential areas to reduce losses of PPP to water. Very consistent came the problem of remnants management, followed by sprayer cleaning and the reduction of spray drift in bush and tree crops. Sprayer filling is only among the top three criteria in FR, DE and HU. We can see that countries with relative big areas of bush and tree crops perceive spray drift reduction as a rather high potential to reduce water contamination (IT,NL,PL, ES) (Tab. 13)
- If we ask about the efficacy of measures to reduce runoff we can see that there are less clear ideas on how to mitigate runoff. The spread of the ratings may also be an indicator on the unsecurity of judgements. It seems there is a certain preference for buffer strips and reduced tillage. Interesting to note is that in BE the in-field bunding reached the highest ranking (techniques used mainly in potatoe) . These techniques were promoted in BE, obviously with good success (Tab.14).
- Table 15 (Q11) shows the challenges if we expect farmers to implementation runoff mitigation measures on a voluntary basis. Best implementation chances are seen for changing tillage practices, PPP application timing (pre / post) and the use of cover crops. We also can see that the ideas on measures in the different countries vary a lot. (Tab. 15). Graph 3 compares the efficacy of runoff mitigation measures with the likelihood for voluntary implementation.



About Water protection (4)

- Opinions on the efficacy of reducing spraydrift in field applications are much more clear and very consistent across countries . Most effective is the use of antidrift nozzles. Air support , shielded sprayer and the correct boom height. The fact that the ratings show a wide spread indicate that measures to reduce spray drift are better known compared to runoff measures. There is also no such big variation among countries, which show that the basic measures can be applied in a general manner (Tab.16). The question remain: Why do we see such huge variation in the actual use of antidrift nozzles in practise (more in the North less in the South? Less in bush & tree crops more in field applications ?).
- Spray drift reduction in bush and tree crops (BTC) is much more significant and more difficult compared to field application. Non the less we know that mitigation measures in these use areas are less implemented compared to field applications. In BTC also antidrift nozzles came up as first rated mitigation measure. Tunnel sprayers and crossflow sprayers are rated second and third. There wider use would require sprayer adapted training systems of the crops (Tab 17).

Ranking of the main agricultural pollutants

Tab. 6: Main pollutants for surface water pollution originating from agriculture

rank 5 most important ,rank 1 least important

Q5	Mean	Std dev	N
PPP	3,65	1,19	1161
Mineral Fertilzer	3,29	1,28	1161
Org Fertilzer	3,01	1,39	1161
Veterinary	2,59	1,35	1161
Other Chemicals	2,46	1,49	1161

On average PPP are perceived as most important pollutant, followed by Mineral fertilizer and Organic fertilizers.

Standard deviation is quite high which shows the huge variance of the answers.

In the scientific discussion the fertilizer aspect is closely related to the Nitrate concentrations in groundwater, which is mostly associated with intensive animal production (organic fertilizers)



Ranking of the main agricultural pollutants by country

Tab.7: Ranking of agricultural pollutants by country (rank: 5 most important, 1 least important) (Question 5)

Country	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
PPP	3,82	3,24	3,11	4,14	3,64	3,67	3,97	3,27	3,77	3,98	3,88	3,51	3,65
Mineral Fertilizer	2,96	2,7	3,02	3,81	4,07	3,33	3	3,08	3,48	2,92	3,65	3,01	3,29
Org Fertilizer	2,95	2,56	3,77	2,45	3,21	3,19	3,06	3,06	2,61	2,78	3,65	3,06	3,01
Veterinary	2,33	3,54	2,67	2,21	2,04	2,49	2,71	3,43	2,68	2,63	2,09	2,26	2,59
Other Chemicals	2,95	2,97	2,43	2,43	2,04	2,32	2,32	2,16	2,45	2,69	1,73	3,07	2,46

8 countries rank PPP as main contaminants to water.

Hungary sees mineral fertilizer, Germany organic fertilizer as main pollutants.

France and Portugal see veterinary products number 1 pollutants

Ranking of the main agricultural pollutants by cluster

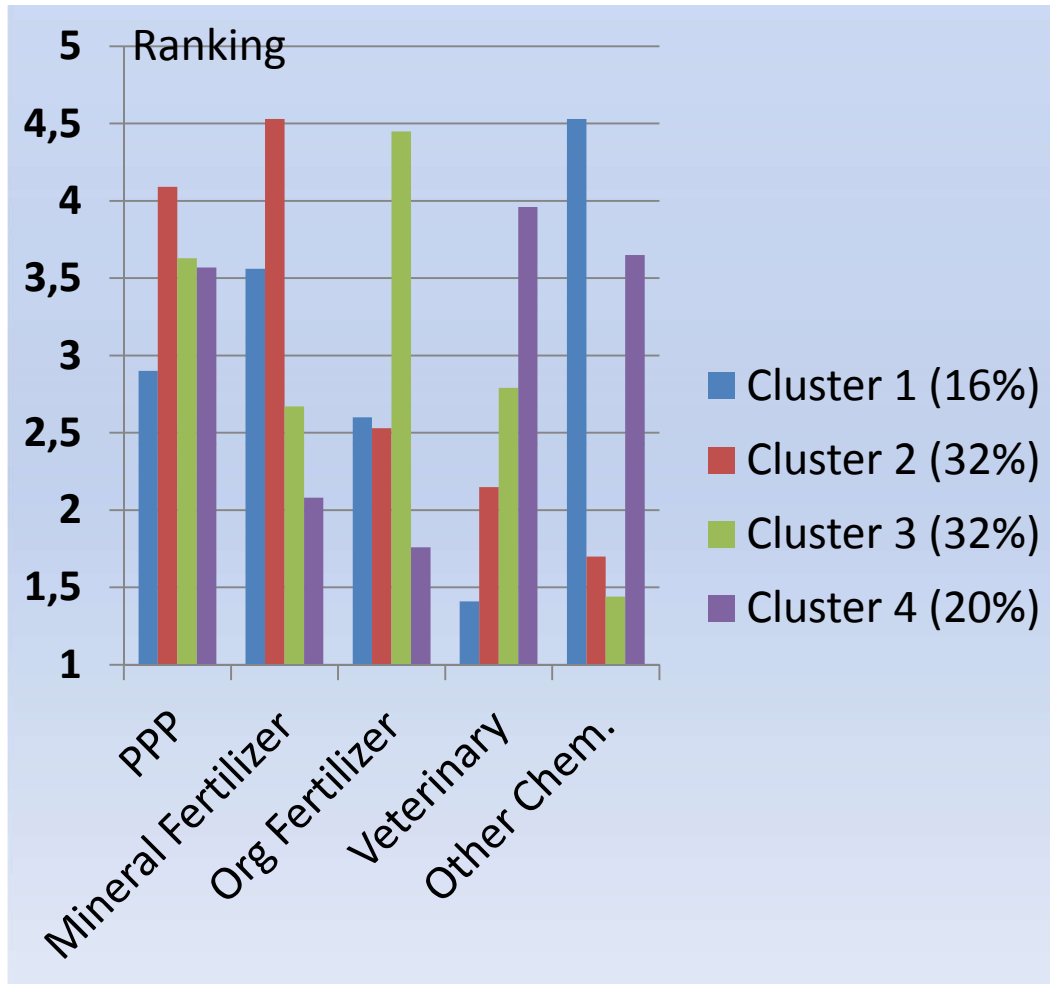
Tab.8: Rankings of agricultural pollutants by clusters (Ranking: 5 = most important, ... 1 = least important)

Cluster	1	2	3	4	Mean
PPP	2,90	4,09	3,63	3,57	3,65
Min Fertilizer	3,56	4,53	2,67	2,08	3,29
Org Fertilizer	2,60	2,53	4,45	1,76	3,01
Veterinary	1,41	2,15	2,79	3,96	2,59
Other Chemicals	4,53	1,70	1,44	3,65	2,46
n	188	369	375	229	1161
%	16,19%	31,78%	32,30%	19,72%	100%

If we compare the cluster membership by country we can see a certain patterns:
 PL,GR,HU are belonging mainly to the Cluster 2 (Agchem Cluster)
 DE,ES,NL and PT belong mainly to the Organic fertilizer + PPP cluster (Cluster 3)
 BE, SK show two main clusters (1+3): Other chemicals and Organic fertilizer + PPP
 IT has two main clusters 2+3 (70%): Agchem cluster and Organic fertilizer + PPP cluster
 FR is special: 48% belong to the „Synthetic chemicals cluster“ .



Water protection section- Ranking of the main agricultural pollutants by cluster



Graph 1:

Contrary to the average, PPP never has the top ranking among the pollutants presented in the survey.

We can describe following clusters

Cluster 2: Ag-chem

Cluster3: Organic Fertilizer+PPP

Cluster4: Synthetic chemicals

Cluster 1: Other chemicals

*(Rank 5 most important ...
Rank 1 least important)*

How do you estimate the significance of use areas for PPP water contamination ?

Tab. 9: Importance of different use areas contributing to PPP water pollution. Rate 5= very important ... 1 least important

Q6	Mean	Std Abw	N
Orchard /Vine	4,01	1,02	1161
arable crops	3,79	1,09	1161
mixed farms	3,47	0,98	1161
Glasshouses/ Covered	3,14	1,22	1161
mainly livestock	3,13	1,17	1161
Railways	2,84	1,28	1161
Home&Garden	2,77	1,31	1161
Urban use	2,76	1,27	1161
Golf courses	2,56	1,24	1161

On average orchards / vine is considered most important use area for PPP losses to water, followed by arable crop farms and mixed farms.

Perception of the significance of PPP use areas for water contamination by country

Tab. 10: Importance of different use areas contributing to PPP water pollution. Rate 5=very important,....1 not important

Q6	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Orchard /Vine	3,85	4,33	4,11	3,93	3,51	4,13	4,56	4	4,21	3,84	3,84	3,55	4,01
arable crops	3,8	3,59	3,8	4,07	4,03	3,6	3,56	3,43	3,9	4,12	3,59	3,88	3,79
mixed farms	3,3	3,13	3,5	3,74	4,08	3,73	2,94	3,24	3,3	3,86	3,82	3,3	3,47
Glasshouses/ Covered	2,83	3,17	2,37	3,72	3,04	3,46	4,47	3,69	2,84	3,67	3,68	2,96	3,14
mainly livestock	2,68	2,65	3,08	2,66	3,31	3,52	2,62	3,29	3,37	3,49	3,33	3,01	3,13
Railways	3,35	3,71	3,84	1,86	2,83	3,22	2,65	2,57	2,36	2	2,66	2,68	2,84
Home& Garden	3,6	3,29	3,72	2,16	2,91	2,13	3,44	2,25	2,24	3,2	2,46	2,55	2,77
Urban use	2,86	3,16	3,56	2,09	2,19	2,52	3,59	2,9	2,53	3,2	2,88	1,89	2,76
Golf courses	2,66	3,07	3,2	2,07	2,17	2,78	2,74	3,41	1,74	1,94	3,23	2,74	2,56



How would you estimate the significance of the two entry routes into surface water in % ?

Tab. 11: How would you estimate the significance of the two entry routes into surface water in %

Country /Q7	Point	Diffuse
BE	59,06	40,37
DE	55,76	44,03
GR	55,09	46,98
NL	51,32	46,91
ES	49,57	49,61
RO	48,84	47,82
PT	46,57	50,78
FR	45,92	54,08
IT	45,1	53,87
PL	42,27	53,6
SK	36,99	61,79
HU	35,88	63,05
Mean	47,2	51,3

On average the entry routes from point sources (farmyard) and diffuse sources (from field) are rated equally significant.

If the problems are known it is possible to act on it !

Ranking on the significance of diffuse entry routes

Tab. 12: How would you rank the significance of diffuse sources ? Rank 3 = most significant, ... 1= least significant (Q8)

Q8	Runoff / Erosion	Spray drift	Drainage
BE	2,27	2,16	1,57
FR	2,35	1,88	1,78
DE	2,38	1,78	1,84
GR	2,29	1,83	1,91
HU	2,63	1,88	1,49
IT	2,06	2,14	1,79
NL	2,41	1,82	1,76
PT	2,25	1,92	1,82
PL	2,49	2,11	1,4
RO	2,33	1,82	1,84
ES	2,07	2,04	1,89
SK	2,57	1,71	1,72
Mean	2,36	1,96	1,68

The most important entry route is runoff / erosion on average. Big variance exist in the judgements of the entry routes.

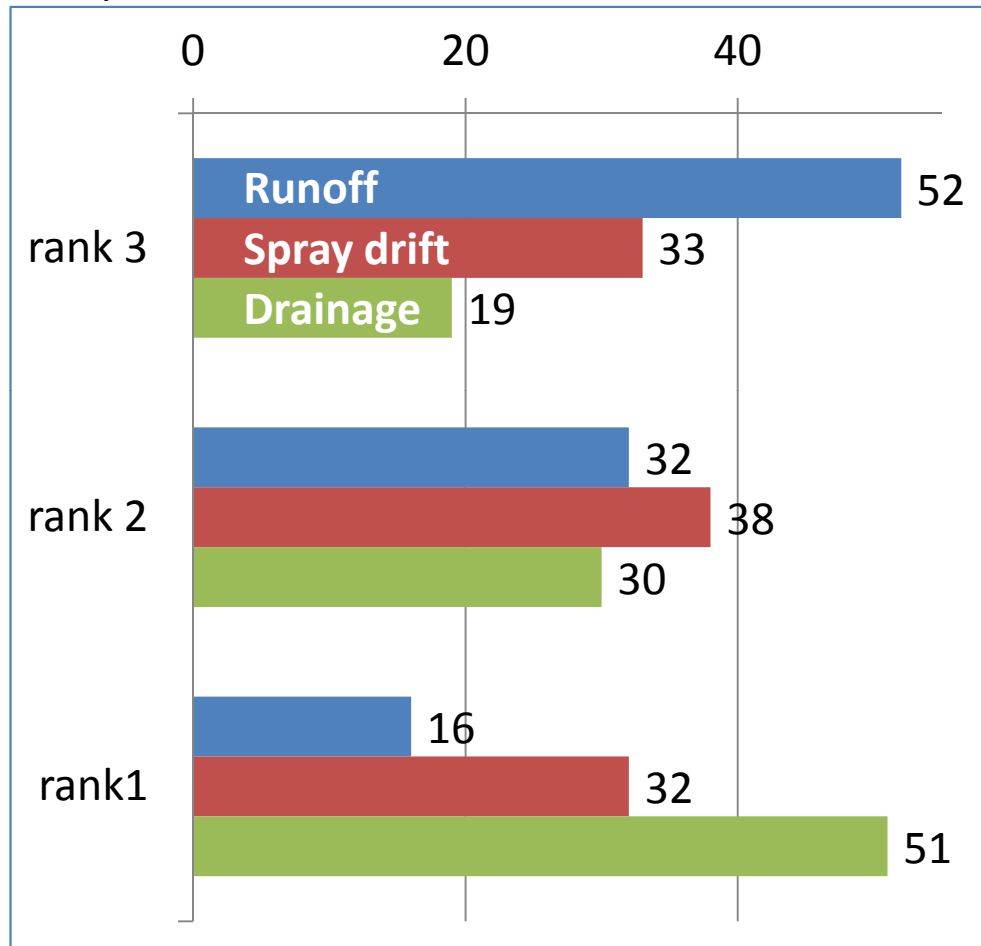
Spray drift rankings come very close to runoff in some countries. We can assume that we can find specific clusters which see either spray drift or runoff as most important diffuse entry. In case of Italy spray drift is seen as number one diffuse source.

Drainage is seen in DE,GR,RO and SK as the second most important entry route.



Frequency distribution % - Ranking of the significance of diffuse entry routes (Q8)

Graph 2



Frequency distribution of ranking answers:
rank 3 most important
rank 2 second most important
rank 1 third most important

The ranking of the significance of Runoff follows a clear hierarchy: In the case of drift we see a very unclear picture of about 1/3 of the respondents represented in each rank. This shows that the significance of drift is judged with a lot of variability. In the case of drainage we see a more distinct ranking.



How would you estimate the potential to reduce PPP entries into water if BMPs are being implemented?

Tab.:13: Rate the potential to reduce PPP entries into water. Rate 5= high potential,... 1= very low potential

Country / Q9	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Remnants	4,29	4,37	4,33	4,36	3,32	4,3	4,06	3,88	3,97	3,69	4,21	3,57	4,06
Sprayer cleaning	4,08	4,24	4,49	4,1	3,25	4,24	4,09	3,92	3,85	3,84	4,02	3,55	3,98
Spray drift Orchard	3,7	4,08	3,94	3,76	3,09	4,25	4,21	3,8	3,9	3,47	4,05	3,32	3,83
Spraydrift field	3,35	4,06	3,72	3,83	3,13	3,98	3	3,73	3,79	3,63	4	3,29	3,70
Sprayer filling	3,67	4,1	4,12	3,71	3,31	3,94	3,29	3,29	3,43	3,59	3,61	3,17	3,62
Runoff	3,44	3,72	3,64	3,55	3,28	3,54	4,06	3,71	3,49	3,71	3,92	3,63	3,61
Erosion	3,28	3,23	3,55	3,36	2,85	3,05	2,88	3,2	3,07	3,16	3,37	3,48	3,22
Drainage	2,4	2,72	2,86	3,21	2,92	3,21	3,15	3,25	2,74	2,98	3,41	2,85	2,91

Remnants management comes up as the highest reduction potential consistently, followed by sprayer cleaning and spray drift reductions in orchards/vine crops. Reduction potentials from drainage / erosion is seen less promising.

It highlights the prime focus for quick wins is on point source reduction



How would you rate the efficacy of mitigation measures to reduce PPP transfer to water from runoff?

Tab 14: How would you rate the efficiency of mitigation measures to reduce PPP transfers to water due to runoff / erosion? Rate 5 = very efficient .. 1 = not efficient (* VFS = vegetative filter strip)

Q10	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
VFS watercourse*	3,81	4,24	3,16	4,19	3,67	2,4	4,15	3,88	3,97	3,8	3,85	3,84	3,78
Tillage practice	3,23	3,25	2,9	3,71	3,88	2,76	3,79	4,12	3,75	4,31	4,15	3,88	3,62
Cover crop	3,3	3,74	2,98	3,91	3,93	2,75	3,47	3,86	3,71	3,63	3,94	3,56	3,59
VFS edge of field	3,35	3,7	3,1	3,95	3,56	2,68	3,71	3,65	3,79	3,69	3,79	3,54	3,57
Contour farming	3,27	3,28	2,96	3,98	3,81	2,87	2,88	3,86	3,6	3,88	3,55	3,79	3,48
PPP application timing	3,2	3,45	2,98	4,05	3,33	2,65	3,18	3,65	3,57	3,51	3,89	3,6	3,45
Dose reduction PPP	3,07	2,97	3,04	3,47	3,17	2,24	3,82	3,76	3,63	3,78	3,8	3,5	3,37
In field bunding	4,04	3,16	2,94	3,81	3,29	2,11	3,41	3,02	3,41	3,39	3,24	3,22	3,28
Break subsoil	3,36	3,33	2,89	3,28	4,05	2,76	2,97	3,24	3,16	3,67	3,56	3,24	3,28
Crop selection	3,1	2,88	3,02	3,03	3,85	2,75	2,18	2,8	3,47	3,59	3,13	3,59	3,2
Forbid arable farming	2,38	2,92	3,1	3,52	3,73	2,75	2,85	3,14	3,21	3,88	3,59	3,52	3,2
Retension structures	2,84	3,34	3,03	3,24	3,09	2,33	2,71	2,84	3,29	3,1	3,47	2,67	3,09

Runoff is a rather new area of attention. VFS* along water courses are seen mostly as a main measure, but the perceptions between countries on measures is very variable. This variability may be a consequence of different environmental and structural differences, it also shows a very big variations in judging different measures

How would you rate the chance of voluntary implementation of measures to reduce PPP transfer to water from runoff by farmers?

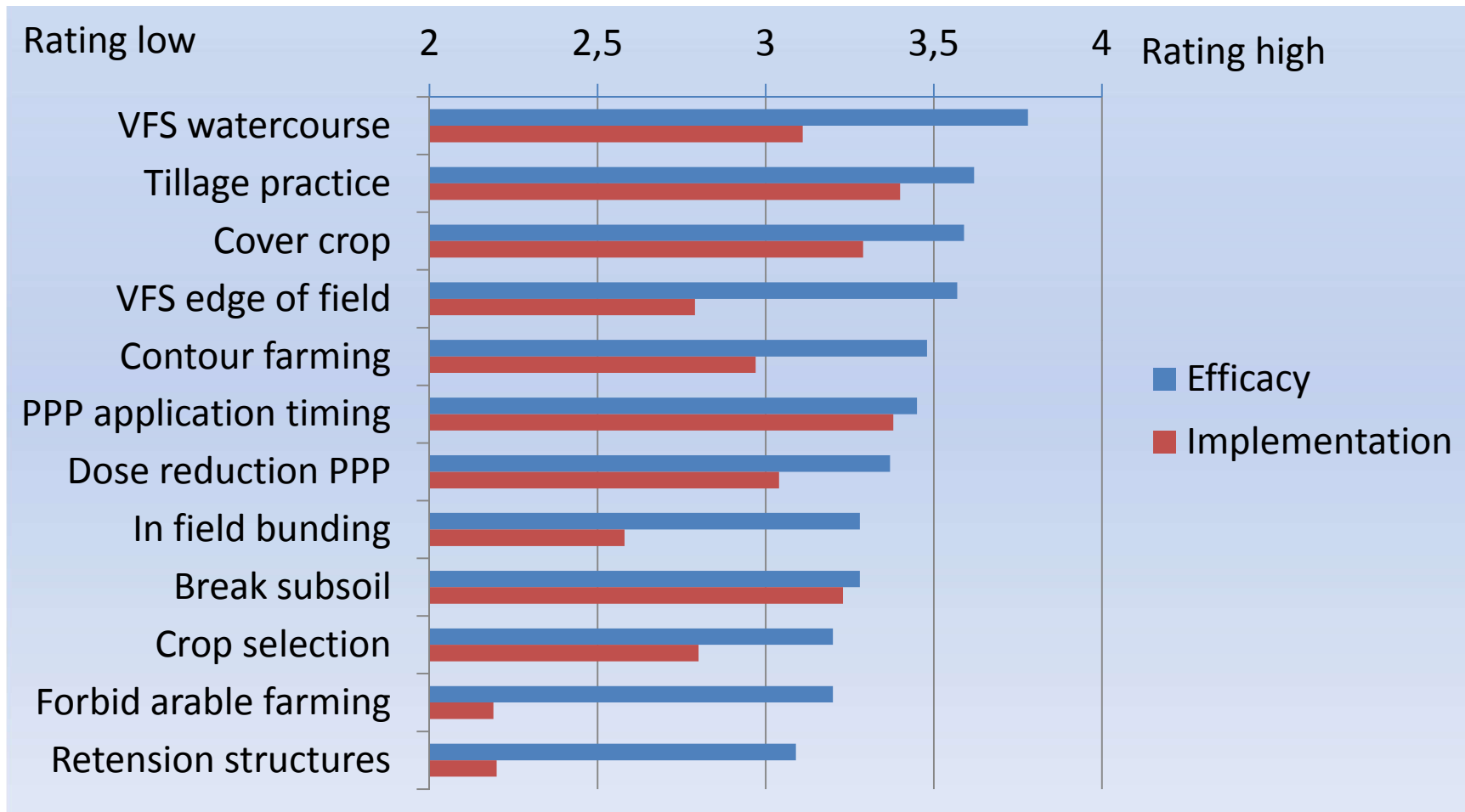
Tab. 15: Which mitigation measures listed have the chance to be implemented by farmers on a voluntary basis? 5 = very high chance...1 = no chance

Q11	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Change tillage	3,15	3,35	2,92	3,38	3,59	3,6	3,5	3,73	3,33	4,06	3,41	3,68	3,4
PPP application type pre/post	3,11	3,48	2,83	3,52	3,4	3,87	3,29	3,61	3,34	3,33	3,51	3,63	3,38
Cover crop	3,27	3,63	2,77	2,97	3,51	2,98	3,5	3,49	3,41	3,86	2,96	3,4	3,29
Break compaction	3,67	3,29	2,79	2,74	4,16	3,46	3,06	3,37	3,27	3,67	2,85	2,83	3,23
VBS_along water course	3	4	2,7	2,83	3,16	3,21	3,12	3,43	3,08	3,47	2,61	3,23	3,11
PPP dose reduction	2,61	2,91	2,57	2,78	2,75	3,37	3,76	3,75	3,13	3,41	3,16	3,16	3,04
Contour farming	3,08	2,54	2,9	2,98	2,91	2,87	2,5	3,61	3,02	3,53	2,59	3,57	2,97
Crop Selection	2,23	2,34	2,38	2,48	3,47	3,11	1,35	3,27	3,08	3,96	2,42	3,34	2,8
VBS edge of field	2,2	2,81	2,5	2,79	2,99	2,49	2,85	3,41	2,92	3,43	2,58	3,06	2,79
Bunding	3,67	2,22	2,16	2,48	2,29	1,95	2,94	3,61	2,5	2,76	2,49	2,66	2,58
Retention structures	1,96	2,09	1,85	1,79	2,09	2,11	1,88	3,37	2,46	2,47	2,17	2,06	2,2
Forbid arable farming	1,38	1,72	1,23	2,24	2,25	3,35	1,38	3,14	2,49	3,33	2,01	2,46	2,19



Rating of measures efficacy and chance for implementation (Q10/Q11)

Graph 3



VFS= vegetative filter strip



Which mitigation measures would you consider efficient to reduce spray drift to water in field applications?

Tab 16: Which of the listed mitigation measures would you consider efficient to reduce PPP transfer to water from spray drift? % very efficient.., 1 not efficient

Q12	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Antidrift nozzle	4,57	4,22	4,62	3,95	4,11	4,52	4,68	4,41	4,22	4,29	4,52	3,96	4,33
Shielded sprayer	3,53	3,59	3,78	4,03	4,04	4,17	4,24	3,8	4,19	4,06	4,05	3,65	3,94
Air support	3,72	3,58	3,79	3,43	3,84	4,16	4,56	4,12	4,23	3,51	4,01	3,88	3,93
Boom height < 50 cm	4,01	3,59	4,17	3,62	3,77	4,17	4,32	3,88	3,85	3,65	3,7	3,88	3,86
No spray zone	3,5	3,81	3,68	4,05	3,55	3,76	4,09	3,71	3,55	3,45	4	3,57	3,69
Forward speed < 8km/h	3,53	3,21	3,9	3,66	3,32	3,65	3,91	3,63	3,67	3,73	3,7	3,77	3,63
Specific adjuvants	3,49	3,4	2,82	3,66	3,65	3,46	3,35	3,49	3,7	3,71	3,59	3,5	3,5
Vegetative Hedge row	3,1	3,7	3,4	3,69	3,73	3,46	3,47	3,69	3,44	3,27	3,51	3,27	3,47

Consistently antidrift nozzles come up in top position, followed by shielded sprayer and and air support. Ratings use a broader range of differentiations indicating that the respondents are more sure in their judgements.

Which mitigation measures would you consider efficient to reduce spray drift to water in orchard /vine spraying?

Tab.17: Rating of efficiency of mitigation measures in orchards / vine (Q13): Rate 5= very efficient, 1= not efficient (Top three criteria marked orange)

Q13	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Antidrift nozzle	4,14	3,88	4,11	3,91	3,83	4,4	4,44	4,24	3,94	4,39	4,27	3,99	4,07
Tunnel sprayer	3,91	4,02	4,24	3,4	4,27	4,3	4,18	3,76	4,3	3,63	4,18	3,71	4,07
Crossflow sprayer	3,65	3,84	3,88	3,67	3,69	4,13	3,53	3,82	4,06	3,98	3,96	3,96	3,9
Shield to shut off air	3,81	3,82	3,66	3,72	4,04	4,25	3,88	3,96	3,81	4,24	4,18	3,68	3,89
Adjust spray profile	3,46	3,84	3,85	3,69	3,47	4,29	3,91	4,16	3,88	4,04	4,31	3,7	3,88
Adjust airflow profile	3,33	3,57	3,76	3,93	3,91	4,1	3,62	3,98	3,92	3,92	4,39	3,6	3,85
Sensor spraying	3,53	3,66	3,65	4,14	4,07	4	3,97	3,75	3,75	4,1	4,24	3,8	3,85
No spray zone	3,5	3,69	3,62	3,6	3,37	3,63	3,85	3,39	3,45	3,71	3,99	3,59	3,6
Vegetative barrier	3,61	3,55	3,48	3,81	3,41	3,48	3,76	3,47	3,37	3,71	3,44	3,3	3,48
Specific adjuvant	3,33	3,28	2,79	3,53	3,61	3,43	3,35	3,37	3,47	3,67	3,56	3,46	3,39
Shaping orchard to technique	3	3,13	2,93	3,67	3,37	3,24	3,47	3,18	3,59	3,31	3,69	3,18	3,35
Hail net	2,62	2,81	2,38	2,98	2,87	2,71	2,68	2,78	2,99	3,06	2,93	2,77	2,82



Implementation of measures

- Implementation of mitigation measures in practise is the big challenge. What it means for a farmer is that he may need to invest money and or additional resource of time. Point source can be largely reduced, diffuse sources are only partially controllable due the weather influence. Incentive programs may help but often these programs only last for a limited time (often to short to achieve what is intended).
- The question where would you invest money in order to improve water quality came with a very consistent and clear response: Invest in improved sprayers, invest in awareness and invest in infrastructure on farm. Two of these main measures target directly point source reduction the fastest wins we can get (Tab.18)
- What would be the best way to support implementation of Best Management Practises (Q15)? All countries rate demonstrations to farmers in the first place except the NL. Demonstrations require person which can present the theory and the practise (which is not always easy to find). In second position comes the integration of BMPs to protect water in the education system. Third is the traditional meeting with farmers. Netherland seems different from the responses received: They prefer to concentrate on vulnerable areas, on incentive linked to achieved targets and on joint meetings with farmers, farm advisers and water managers . Respondents indicated that special visits with farmers in order to make a risk audit may be a good tool to support implementation (Tab. 19).



Where would you see best return on investments to reduce PPP water contamination?

Tab 18: If you were responsible to make investments to reduce PPP entry into water where would you see the best return on investment? Rate 5= most effective, ... not effective

Q14.	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
invest in sprayers	4,02	4,13	4,07	4,31	4,27	4,37	3,94	4,33	4,29	4,45	4,33	4,28	4,23
Invest in awareness	3,98	3,71	4,36	4,26	4,29	4,41	4,15	4,33	4,17	4,24	4,45	3,95	4,18
infrastructure farm	4,04	4,17	4,19	4,05	3,95	4,02	4,03	4	4,03	4,25	4,19	3,88	4,07
incentivate env. programs	3,76	3,03	3,84	3,91	3,84	3,64	3,15	3,78	4,21	3,98	4,28	3,52	3,85
infrastructure field	3,34	3,84	3,91	3,29	3,81	3,51	3,82	3,53	3,62	3,78	3,66	3,65	3,65
Stricter regulations	2,44	2,55	2,59	3,29	3,13	2,29	3,09	2,98	3,08	3,71	3,56	2,52	3,36
Stricter enforcement	3,4	2,95	3,24	3,81	3,59	3,37	3,56	3,39	3,33	4	3,51	2,82	2,93

There is a broad consensus that investments in sprayers, awareness and improving farm infrastructure would be efficient investments to reduce PPP losses to water. It also shows the high importance to avoid point sources. On average sprayers improvements are number 1 and awareness number 2 key investment areas. Also the rating concerning measures in the field seems to get more attention compared with previous surveys.



What would be the best way to implement Best Management Practices?

Tab. 19: What do you think is the best way to get BMPs implemented to improve water quality? Rate 5 = very efficient, ... 1 = not efficient

Q15	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Demonstration of BMPs to farmers /advisers	4,07	3,82	4,34	4,33	4,07	4,08	3,76	4,2	4,03	4,47	4,3	4	4,11
Integrate BMPs stronger in education programs	4,03	3,58	3,76	3,97	3,65	4,17	4,09	3,86	4,05	4,31	4,07	3,63	3,93
Water issues addressed at farmers meetings	3,82	3,78	4,08	3,79	3,69	3,98	4,06	3,45	3,9	4,08	4,03	3,71	3,88
pers. visits on farm to identify risks	3,94	3,74	4,05	3,6	4,08	3,78	3,97	3,98	3,77	4,29	4,02	3,54	3,87
Concentrate on vulnerable catchments	3,99	3,53	4,04	3,93	3,95	3,6	4,21	3,69	3,68	4,04	3,83	3,51	3,79
incentives linked to achieved targets	3,8	3,91	4,02	4,07	3,55	3,81	4,29	3,82	3,73	3,82	3,73	3,37	3,79
Conduct audits on farm to identify risk areas	3,57	3,66	3,46	3,83	3,84	3,78	3,85	4,27	3,62	3,92	3,95	3,13	3,69
Farmer adviser meetings with water managers	3,43	3,5	3,44	3,69	3,33	3,86	4,12	3,24	3,49	3,65	3,96	3,52	3,57
Publish BMPs (farm press/ journals)	3,45	2,93	3,38	3,31	3,11	3,14	3,53	3,35	3,59	4,16	3,13	3,49	3,37

Demonstrations are in all countries (exception NL) most important for the implementation of measures. From TOPPS experience we realize that persons available to combine theory and practise in demonstrations are not easy to find.

Application techniques

- In Crop protection conferences (EU) experts often complain about the lack of resources to provide quality advice to farmers on application techniques. We therefore have included three questions to get a broader impression on opinions related to this aspect
- We asked if farmers get sufficient advise to adjust their sprayers correctly. On average 55% of the respondents think that farmers get not sufficient advise. If we analyse the situation in countries 65 to 82% of the respondents from Southern Countries have the impression that farmers do not get sufficient advise on how to adjust their sprayers correctly. The high figures may be explained with a lot of Orchard and Vine cultivation in these countries.

Correct adjustment of sprayers is probably a very efficient mitigation measure to reduce spray drift! (Tab.20, 21,22)

- Who would be in the best situation to deliver application advice to farmers (Q17)? Application technique advisers come up in the first place followed by PPP advisers, in third position come Sprayer manufacturer, nozzle manufacturers and in the case of FR and BE market organisations (Tab.23)

- The next question focussed on the perception of the development of application techniques advice in the last 5 years in the region (Q18). In 8 out of 12 countries > than 50% of the respondents indicated that the availability of application technique advice increased in the last 5 years. In three countries 40 to 50% respondents showed an increase in the availability of application advice. In Germany 25% respondents indicated an increase in advise compared to a 32% decrease of availability of advice (Tab.24).

We need to further investigate the situation. If respondents think that up to 80% of farmers do not get sufficient advise to adjust sprayers correctly, how much increases in available advise is needed to change this?



Do farmers get sufficient advise on correct adjustment and use of sprayers?

The respondents indicate one of the most important challenges:

- correct adjustment and
- use of sprayers.

Correct use of sprayers and their correct adjustment is probably a very important aspect to reduce PPP losses to water.

Stakeholders express that in their opinion farmers are not getting enough advise on the correct use of sprayers. Especially in the Southern countries this perception is very high and more intensive advise and training is needed. This may go together with a higher share of orchard and vine crops, which require higher efforts in sprayer adjustment and advice.

Slovakia has a very large structured agriculture with relatively low number of farmers.

Tab. 20: Do you think farmers get currently sufficient advice on the correct adjustment and use of sprayers ?

Q 16	YES	NO	Dont know	Total
SK /n	47	19	16	82
%	57,32%	23,17%	19,51%	100,00%
DE /n	53	40	26	119
%	44,54%	33,61%	21,85%	100,00%
NL /n	13	13	8	34
%	38,24%	38,24%	23,53%	100,00%
PL /n	100	141	38	279
%	35,84%	50,54%	13,62%	100,00%
BE /n	33	39	26	98
%	33,67%	39,80%	26,53%	100,00%
PT /n	16	30	5	51
%	31,37%	58,82%	9,80%	100,00%
RO /n	14	36	1	51
%	27,45%	70,59%	1,96%	100,00%
HU /n	16	44	15	75
%	21,33%	58,67%	20,00%	100,00%
FR /n	24	76	16	116
%	20,69%	65,52%	13,79%	100,00%
GR /n	10	45	3	58
%	17,24%	77,59%	5,17%	100,00%
ES /n	21	109	5	135
%	15,56%	80,74%	3,70%	100,00%
IT /n	8	52	3	63
%	12,70%	82,54%	4,76%	100,00%
Total	355	644	162	1161
%	30,58%	55,47%	13,95%	100,00%



Do farmers get sufficient advise on correct adjustment and use of sprayers judged by persons with different intensity of farmer interaction (Q3/Q16)

Tab 21: Do farmers get sufficient advice on adjusting sprayers? Evaluation from respondents based on their interaction intensity with farmers (%)

Q3 /Q16	yes	no	dont know	n
reg contact	35	57	9	727
in contact	22	58	20	174
few contact	26	54	20	180
no contact	23	42	34	80
Total	31	55	14	1161

Respondents with 1 weekly contact with farmers (reg contact) have the lowest dont know responses (%) but do not differ much in their justment that farmers are not getting sufficient advice on the correct adjustment of sprayers.

Reg contact= once /week
 In contact = once / month
 few contacts = few times/Year



Do farmers get sufficient advise on correct adjustment and use of sprayers judged by persons with different professional background (Q2/Q16)

Tab 22: Do farmers get sufficient advice on adjusting sprayers? Evaluation from respondents based on their professional background (%)

Q2/Q16	yes	no	dont know	n
Control/Monitor	37	50	12	220
Farm advice	35	54	11	393
Stewardship	34	56	9	64
Application tech	32	61	7	69
Water quality	19	31	50	32
Education	18	73	9	44
Regulation	15	65	20	60

The analysis by professional backgrounds has in some categories less than 50 respondents and should only be considered as a trend information.

Interesting to note: Respondents from application technique, education and regulatory indicate the highest need for farmers to receive sufficient advice to adjust their sprayers.



Who would be in the best position to deliver application techniques advice to reduce PPP losses to water?

Tab 23: Who would be in the best position to give application technique advice? Rate 5=very good position,... 1 = very weak position

Q17	BE	FR	DE	GR	HU	IT	NL	PT	PL	RO	ES	SK	Mean
Application tech. advisers	4,2	4,36	4,66	3,81	4,23	4,48	4,53	4,51	4,07	4,29	4,61	3,99	4,29
PPP advisers	3,74	4,05	3,97	3,97	4,28	3,3	4,41	4,43	3,72	4,61	4,37	3,56	3,96
Spec Universities/Institutes	3,94	2,86	3,39	3,71	3,64	4,19	2,97	3,18	3,65	4,25	4	2,93	3,58
Nozzle manufacturers	3,56	3,12	3,64	3,33	3,79	3,14	3,5	3,12	3,29	3,78	3,29	3,23	3,37
Sprayer manufacturers	3,42	3,22	3,52	3,38	3,16	3,24	3,41	3,22	2,82	3,92	3,19	3,66	3,24
PPP manufacturers	3,32	3,02	3,27	3,52	3,37	3,16	3,29	2,96	3,14	4,16	3,22	3,12	3,24
Sprayer dealers	3,28	3,33	3,37	3,29	2,4	2,95	3,32	3	2,79	4,2	3,42	3,91	3,19
PPP retailers	3,23	3,38	3,22	3,71	3,05	2,73	4,26	2,69	2,91	3,49	3,2	2,36	3,11
Market organizations	2,95	3,78	2,98	3,83	2,63	3,22	3,41	3,59	2,43	3,33	3,82	2,6	3,08

Best position to give advise on application techniques is seen by specialized application techniques advisers.

TOPPS experience across Europe also discussions in international conferences indicate that such advisers are rare and being reduced.

Tab.24: If you consider your region: How has the availability of quality advice on application techniques for farmers developed in the last 5 years?

Q18	increased	decreased	remained stable	dont know	Total
BE	50	4	23	21	98
%	51,02%	4,08%	23,47%	21,43%	100,00%
FR	56	3	30	27	116
%	48,28%	2,59%	25,86%	23,28%	100,00%
DE	30	36	35	18	119
%	25,21%	30,25%	29,41%	15,13%	100,00%
IT	49	0	12	2	63
%	77,78%	0,00%	19,05%	3,17%	100,00%
PL	182	7	63	27	279
%	65,23%	2,51%	22,58%	9,68%	100,00%
ES	79	11	30	15	135
%	58,52%	8,15%	22,22%	11,11%	100,00%
GR	25	5	17	11	58
%	43,10%	8,62%	29,31%	18,97%	100,00%
HU	30	11	19	15	75
%	40,00%	14,67%	25,33%	20,00%	100,00%
NL	20	1	8	5	34
%	58,82%	2,94%	23,53%	14,71%	100,00%
PT	30	3	13	5	51
%	58,82%	5,88%	25,49%	9,80%	100,00%
RO	31	4	14	2	51
%	60,78%	7,84%	27,45%	3,92%	100,00%
SK	45	2	20	15	82
%	54,88%	2,44%	24,39%	18,29%	100,00%
Total	627	87	284	163	1161
%	54,01%	7,49%	24,46%	14,04%	100,00%

How did the availability of quality application technique advice develop in your region in the last 5 years?

- on average the availability of application advice increase by 54 %
- Germany is in the last position with only 25 % respondents indicated a increase in advice availability.
- Highest increase is percieved in IT, PL , RO

It would be worth to further evaluate the situation as in international conferences often complaints can be heard, that advise focussing on application techniques is generally reduced and more difficult to get compared to the past.



TOPPS academy

Questions on a intensive water protection training offer were included in the survey to get information on the general interest among stakeholders.

TOPPS plans to organize the TOPPS academy course together with TOPPS partners at the University of Turin on 24th to 28th of October 2016.

- In general we can see a high interest in a TOPPS academy course (average 77%)(Tab.25)
- If we asked on the interest of such course and carrying their cost for travel and accomodation the interest drops to an average of 32% (except in the NL where those interested see the value)(Tab.26)
- Some Eastern countries show a bigger gap between the interest in a course and the willingness / ability to pay a contribution (Graph 4)
- Persons working in Stewardship, Water quality, Regulation and Education are to a higher extend willing to pay a contribution for an intensive water protection course (Graph 5).



Interest in participating in a intensive one week course on water protection concentrating on theory and practise

- On average willingness to participate in an intensive course is 78%.
- Highest interest is in southern (PT, RO, ES) and eastern countries (HU, PL)
-
- Lowest interest is indicated in SK and NL.

Tab 25: If one week training is offered to advisers / stakeholders, covering all BMPs relevant for water protection:- Would you be interested to attend such training?

Q19	yes	no	Total
PT /n	49	2	51
	96,08%	3,92%	100,00%
RO /n	47	4	51
	92,16%	7,84%	100,00%
ES /n	124	11	135
	91,85%	8,15%	100,00%
GR /n	52	6	58
	89,66%	10,34%	100,00%
HU /n	61	14	75
	81,33%	18,67%	100,00%
PL /n	212	67	279
	75,99%	24,01%	100,00%
BE /n	76	22	98
	77,55%	22,45%	100,00%
FR /n	89	27	116
	76,72%	23,28%	100,00%
IT /n	45	18	63
	71,43%	28,57%	100,00%
DE /n	85	34	119
	71,43%	28,57%	100,00%
SK /n	50	32	82
	60,98%	39,02%	100,00%
NL/n	15	19	34
	44,12%	55,88%	100,00%
Total /n	905	256	1161
	77,95%	22,05%	100,00%



Interest in participating in a intensive one week course on water protection concentrating on theory and practise if travel & accomodation needs to be payed by participants

- NL shows the highest willingness to pay a contribution to the course
- Lowest willingness to pay a contribution is indicated for PL, RO and SK.
- Rather high willingness to pay for such course can be seen in ES,FR and IT

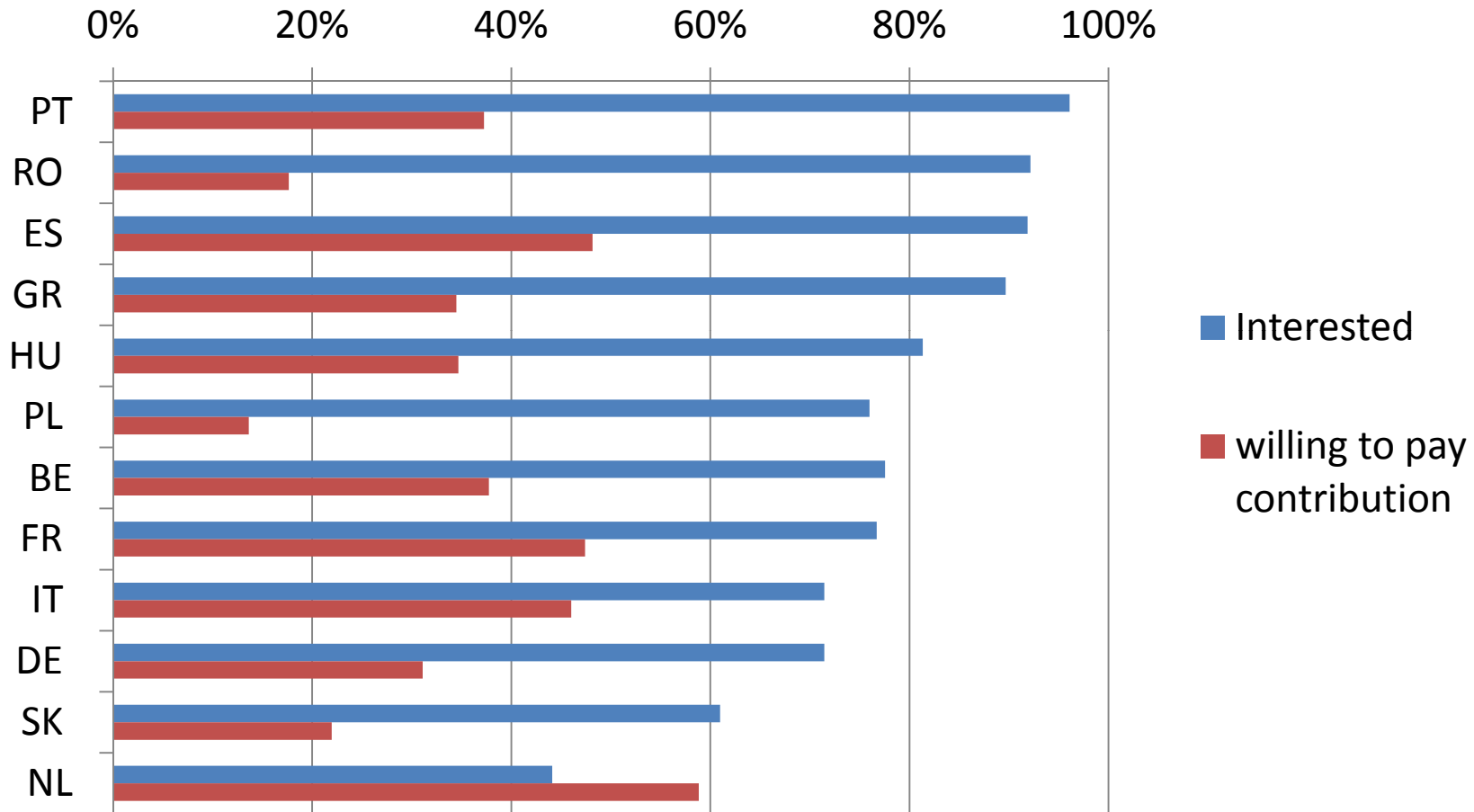
Tab 26: Would you be willing to pay the cost for your travel and accomodation for such training? (% /n)

Q20	yes	no	Total
NL	20	14	34
	58,82%	41,18%	100,00%
ES	65	70	135
	48,15%	51,85%	100,00%
FR	55	61	116
	47,41%	52,59%	100,00%
IT	29	34	63
	46,03%	53,97%	100,00%
BE	37	61	98
	37,76%	62,24%	100,00%
PT	19	32	51
	37,25%	62,75%	100,00%
HU	26	49	75
	34,67%	65,33%	100,00%
GR	20	38	58
	34,48%	65,52%	100,00%
DE	37	82	119
	31,09%	68,91%	100,00%
SK	18	64	82
	21,95%	78,05%	100,00%
RO	9	42	51
	17,65%	82,35%	100,00%
PL	38	241	279
	13,62%	86,38%	100,00%
Total	373	788	1161
	32,13%	67,87%	100,00%



Indicated interest to participate in TOPPS water protection course vs change in interest if a contribution for travel and accomodation is asked for (Q19/20)

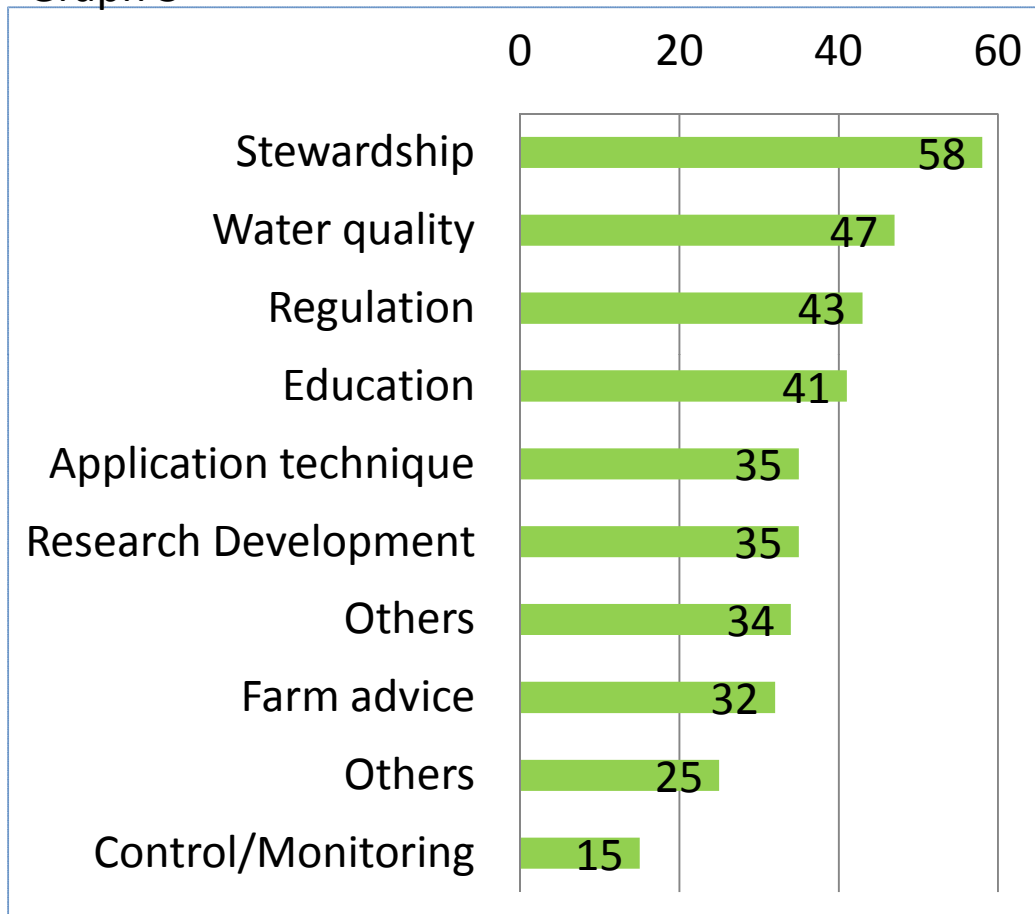
Graph 4





Indicated interest to participate and to contribute to the cost by professional background (%)

Graph 5



We can notice a distinct difference in the valuation of intensive water protection training.

Stewardship , water quality and regulation show highest interest.

Farm advise shows lower interest may be they are already well prepared to give good advice on water protection.