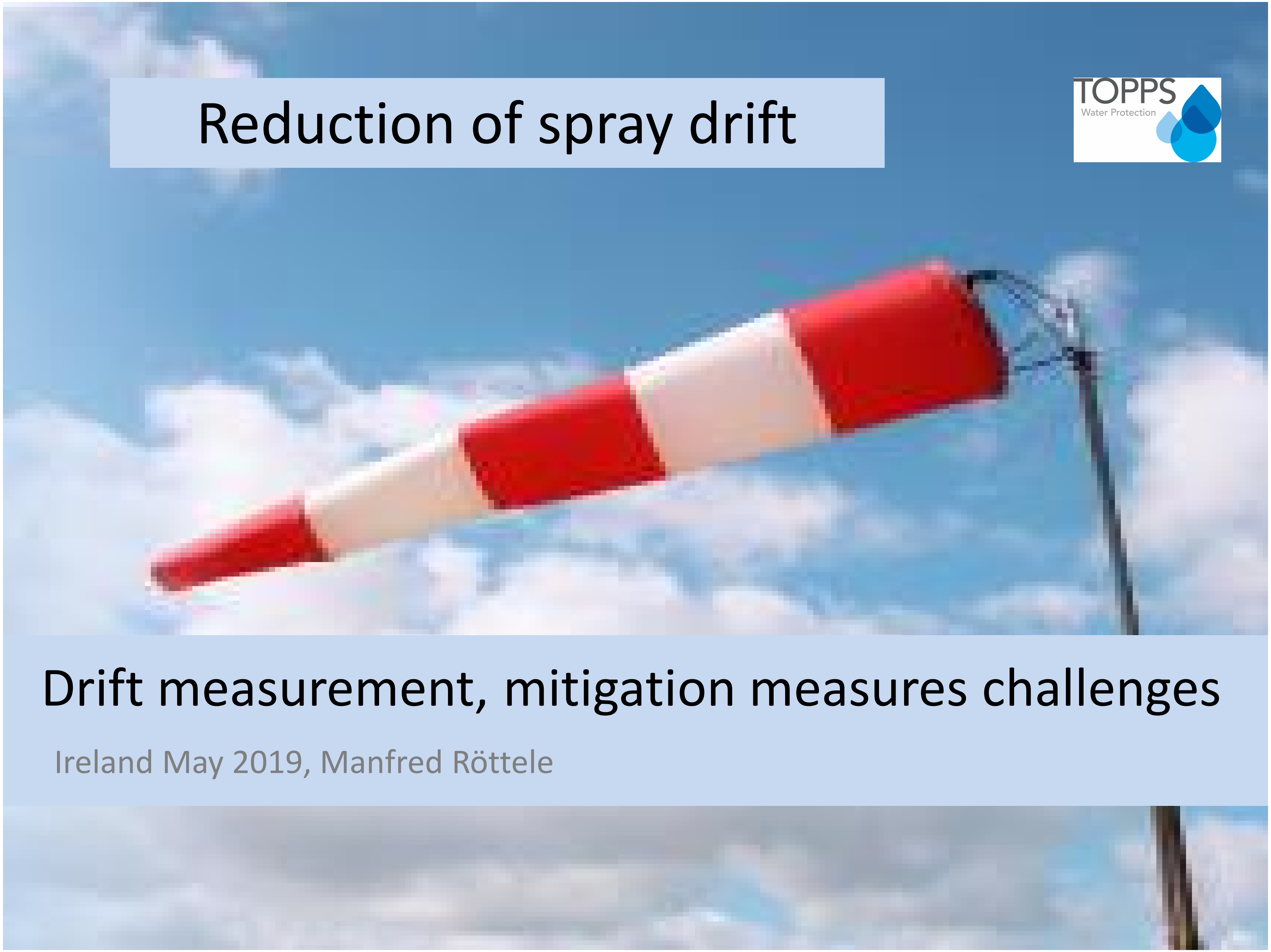
Reduction of spray drift



Drift measurement, mitigation measures challenges

Ireland May 2019, Manfred Röttele

Content

Spray drift is always there but we can strongly reduce it

Åknowledge on application technique
Åbetter optimized sprayers
Åbetter planning and execution of applications

TOPPS Water Protection

SPRAY DRIFT:"Quantity of plant protection product (PPP) that is carried out of the sprayed (treated) area by the action of air currents during the application process" (ISO 22866)

*How **farmers** perceive the significance of drift as entry route into water*

Ranking of diffuse pollution risks
(Farmer survey 2008 / pilot areas)

Ranking of diffuse source contamination risks					
Country	**BE**	**FR**	**DE**	**IT**	**DK**
Drift	**1**	**1**	**2**	**1**	**1**
Runoff	**2**	**3**	**1**	**2**	**2**
Erosion	**3**	**5**	**3**	**3**	**4**
Leaching_Drain	**4**	**4**	**5**	**4**	
Leaching Soil	**5**	**2**	**4**	**5**	**3**

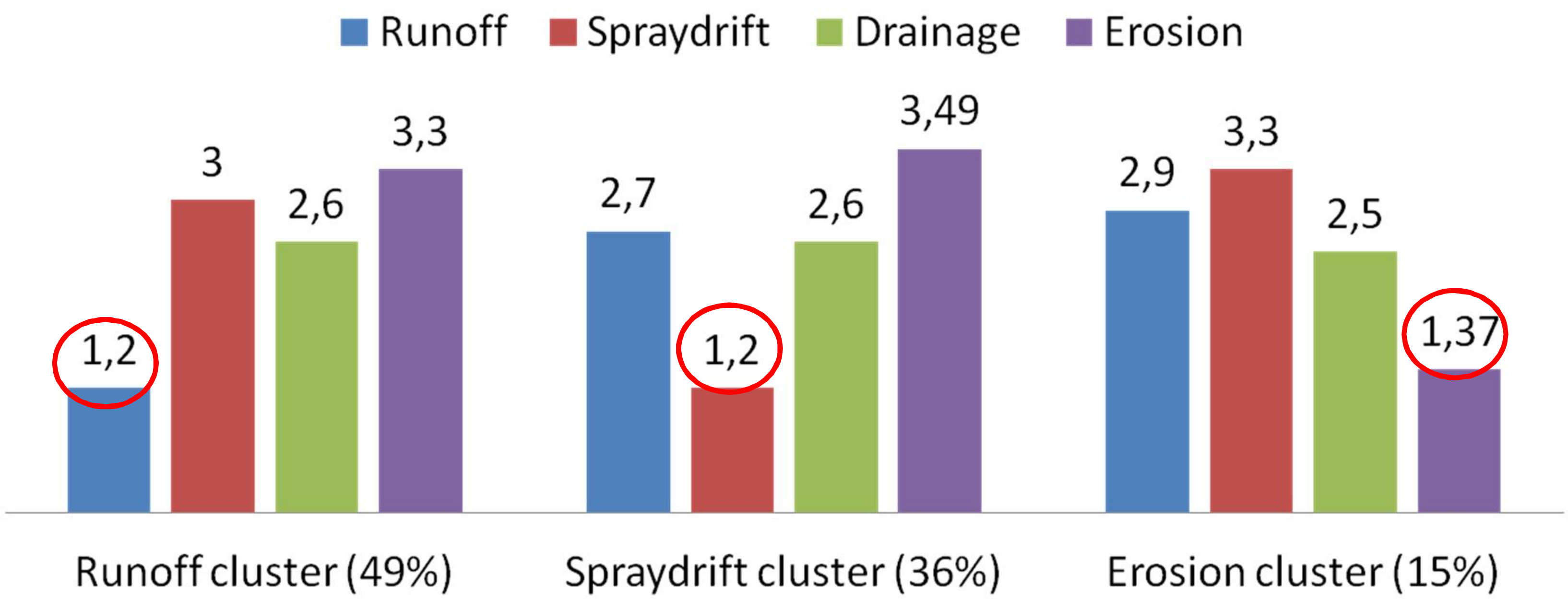
- ***Drift is considered in most countries as the main source for diffuse pollution***
- ***Runoff seen high in DE***
- ***Soil leaching in second position in FR***

PERCEPTION ON SIGNIFICANCE DIFFER WIDELY

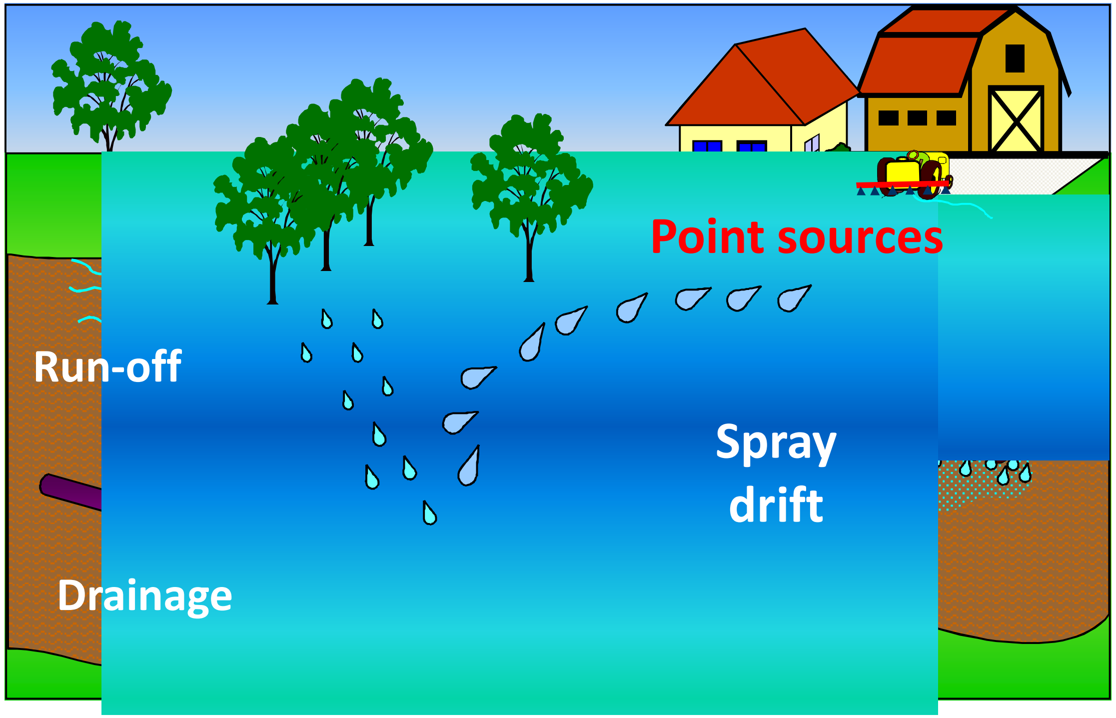
Stakeholder survey 2011/2012 in 7 countries

Cluster analysis separates three different groups of respondents in their evaluation of main diffuse sources

Average ranks in clusters (1 most important …. 5 least important)



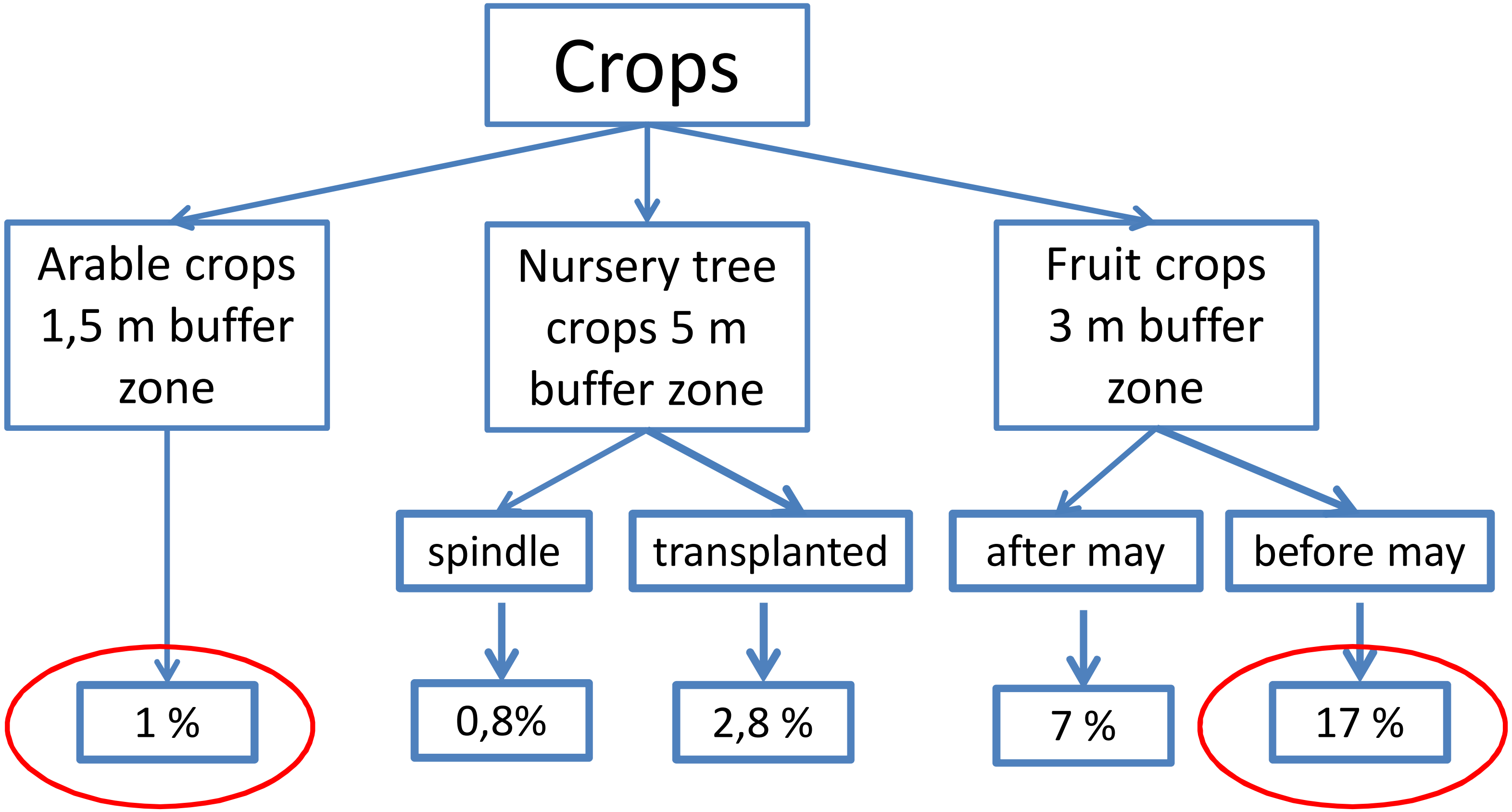
Significance of the entry routes of PPP to water.
Perceptions are still not always reflecting the facts



5 % Drift 35 % Run-off	**Diffuse sources from the field** **Can be reduced**
> 50 % Point Sources	**Point source from farmyards** **Can be avoided**

…. Drift is the least important entry route to water but the most visible

Authorisation procedure of PPP based on spray drift values for surface water exposure - Netherlands

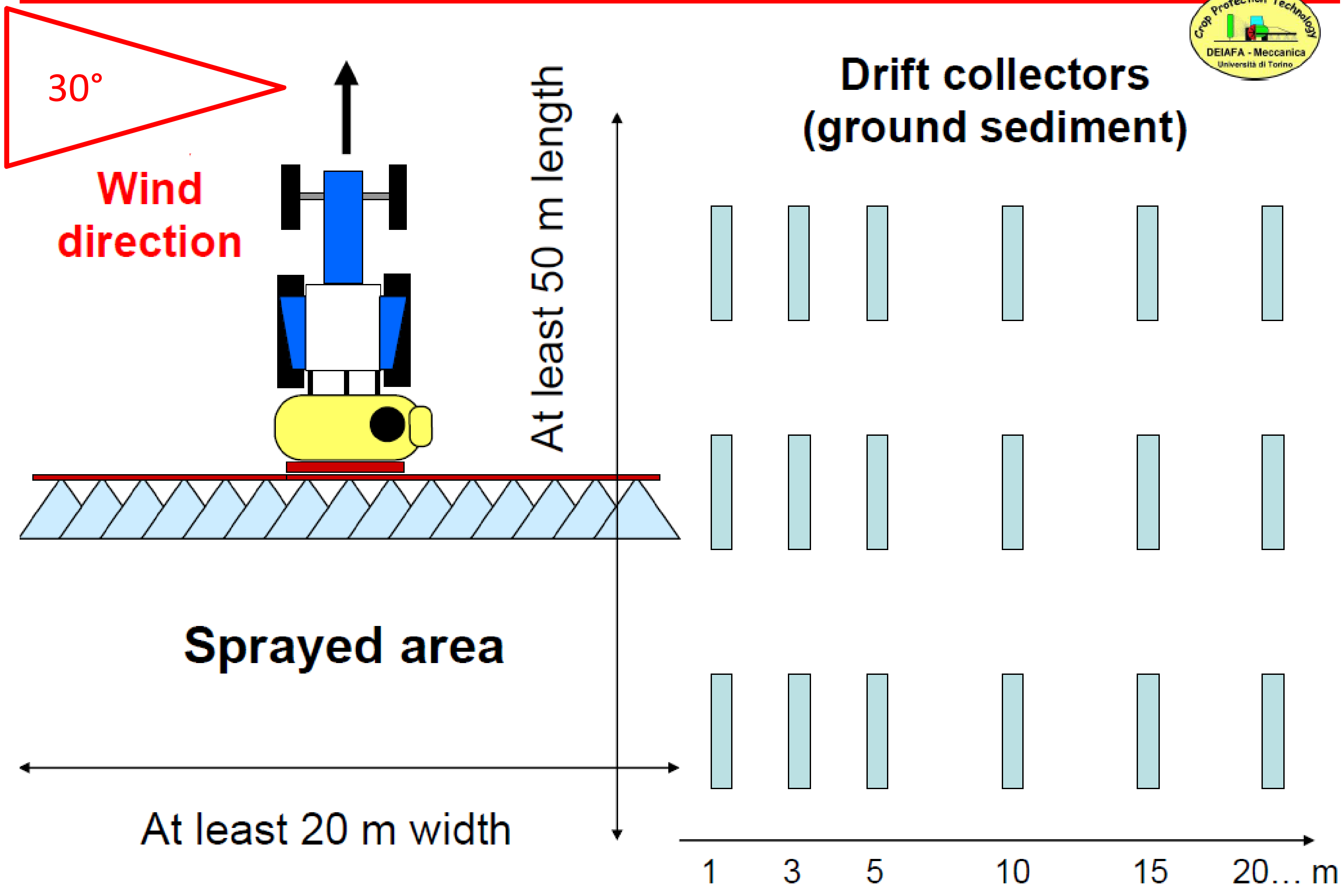


Source: Plant Res Int Wageningen UR
Report 419 , 2012

Spray drift measurement

Drift is measured in the field in absolute values compared to a reference

FIELD DRIFT MEASUREMENT (ISO 22866)



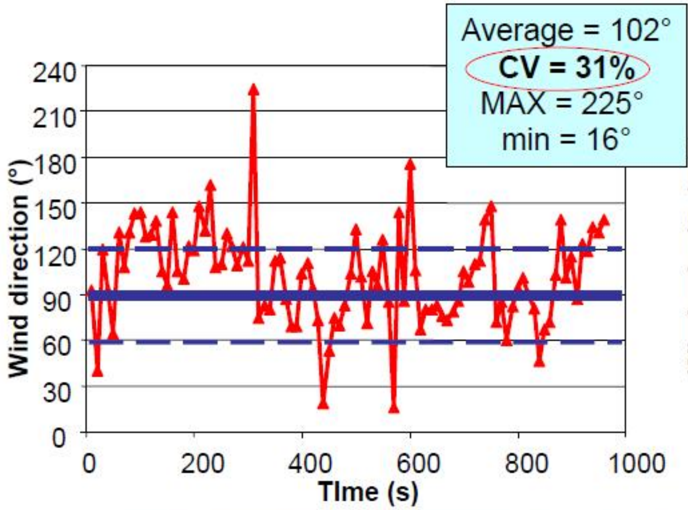
Field measurements of drift are costly and depend a lot on not controlable conditions

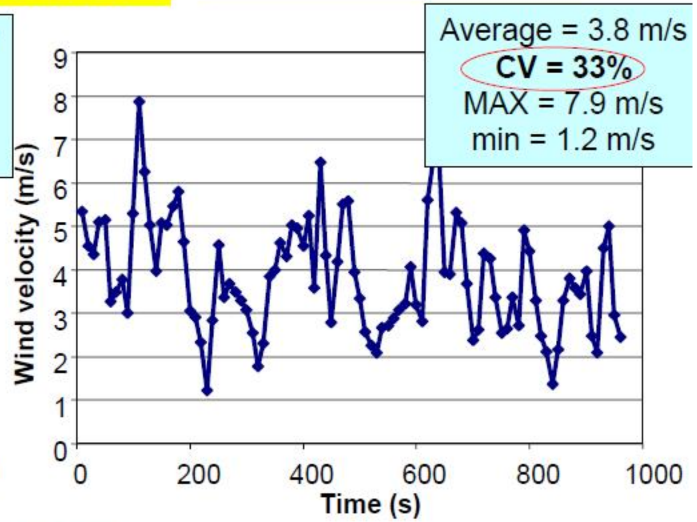
LIMITS OF ISO 22866 METHODOLOGY

WIND DIRECTION

Big variation of meteorological data during the test

WIND VELOCITY

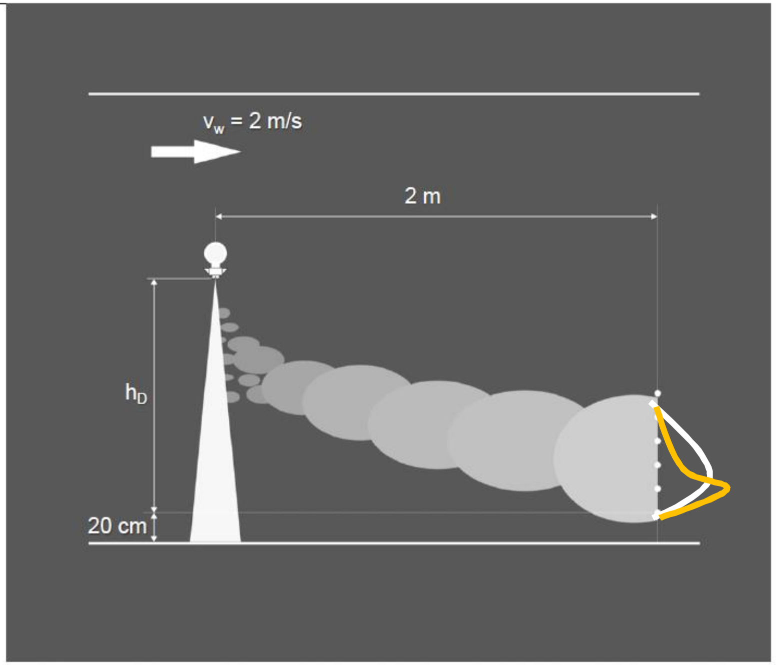




A complete test may require even some days of work. Costs are proportional to the time spent.

„Drift measurement“ under more controlled conditions Windtunnel (Drift potential Index)

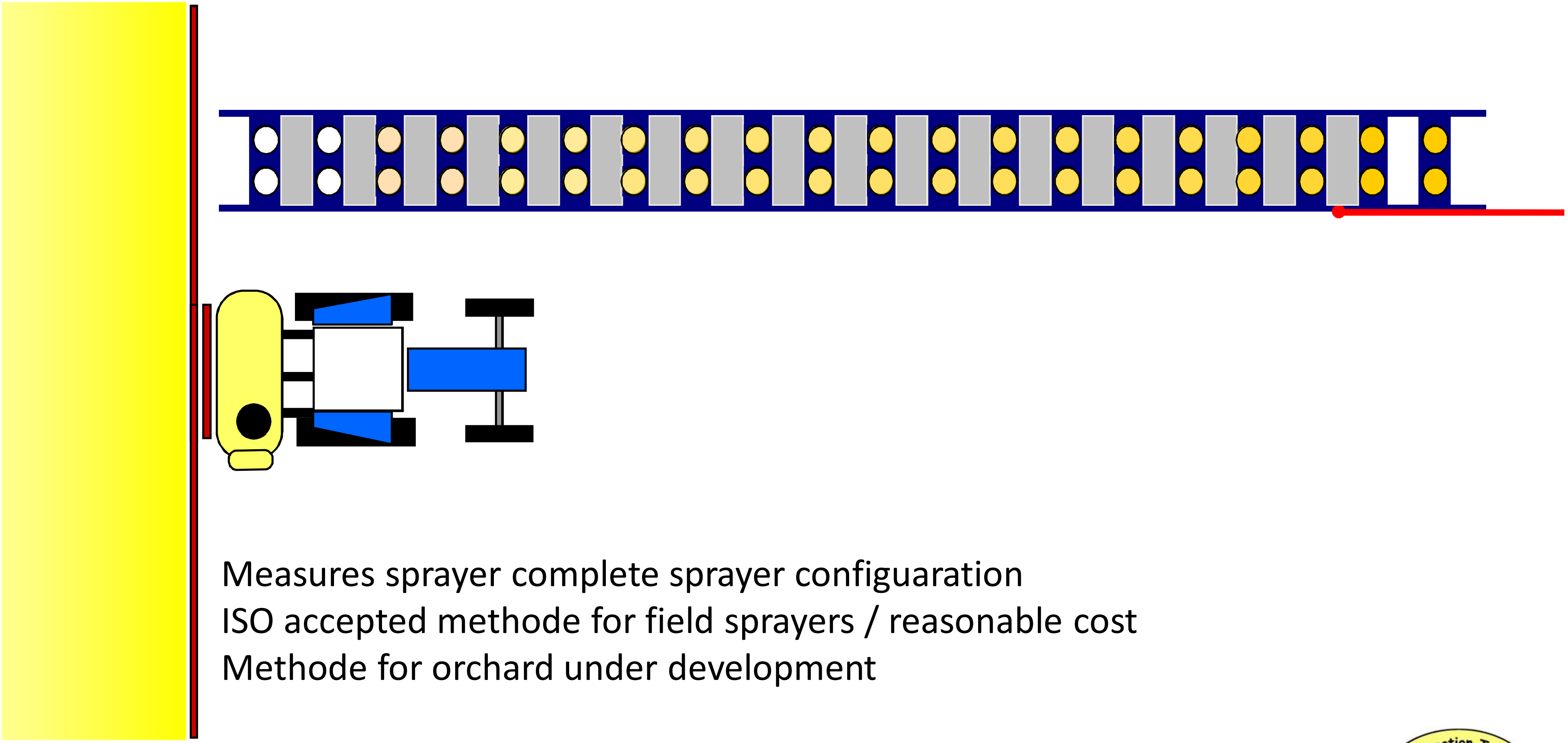
Side view of wind tunnel arrangement



Andreas Herbst, Institute for Application Techniques in Plant Protection, Braunschweig

- Windtunnel measures spray drift only for nozzles not the whole sprayer (DIX – Drift potential Index)
- Windtunnel measurements are used in many countries to classify Drift Reducing Techniques (DRT - comparing to a reference)
- Investment in wind tunnel and repective measurement equipment is high

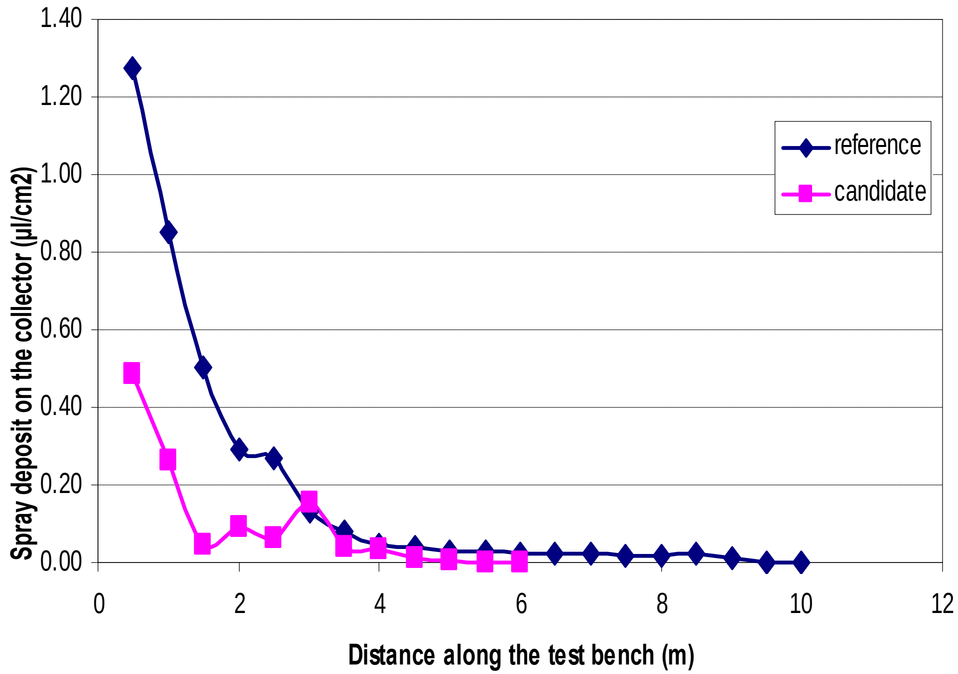
Measurement of potential drift all relevant factors being tested: Nozzle, Speed, Boom height (DPV – Drift potential value)



Measures sprayer complete sprayer configuaration
ISO accepted methode for field sprayers / reasonable cost
Methode for orchard under development

TOPPS
Water Protection

Methode to classify sprayers on their drift reduction potential



Crop Protection Technology
DEIAFA - Meccanica
Università di Torino

Drift risk assessments based on drift curves

Currently in the NL and some other countries, national specific drift data are used for PPP authorization

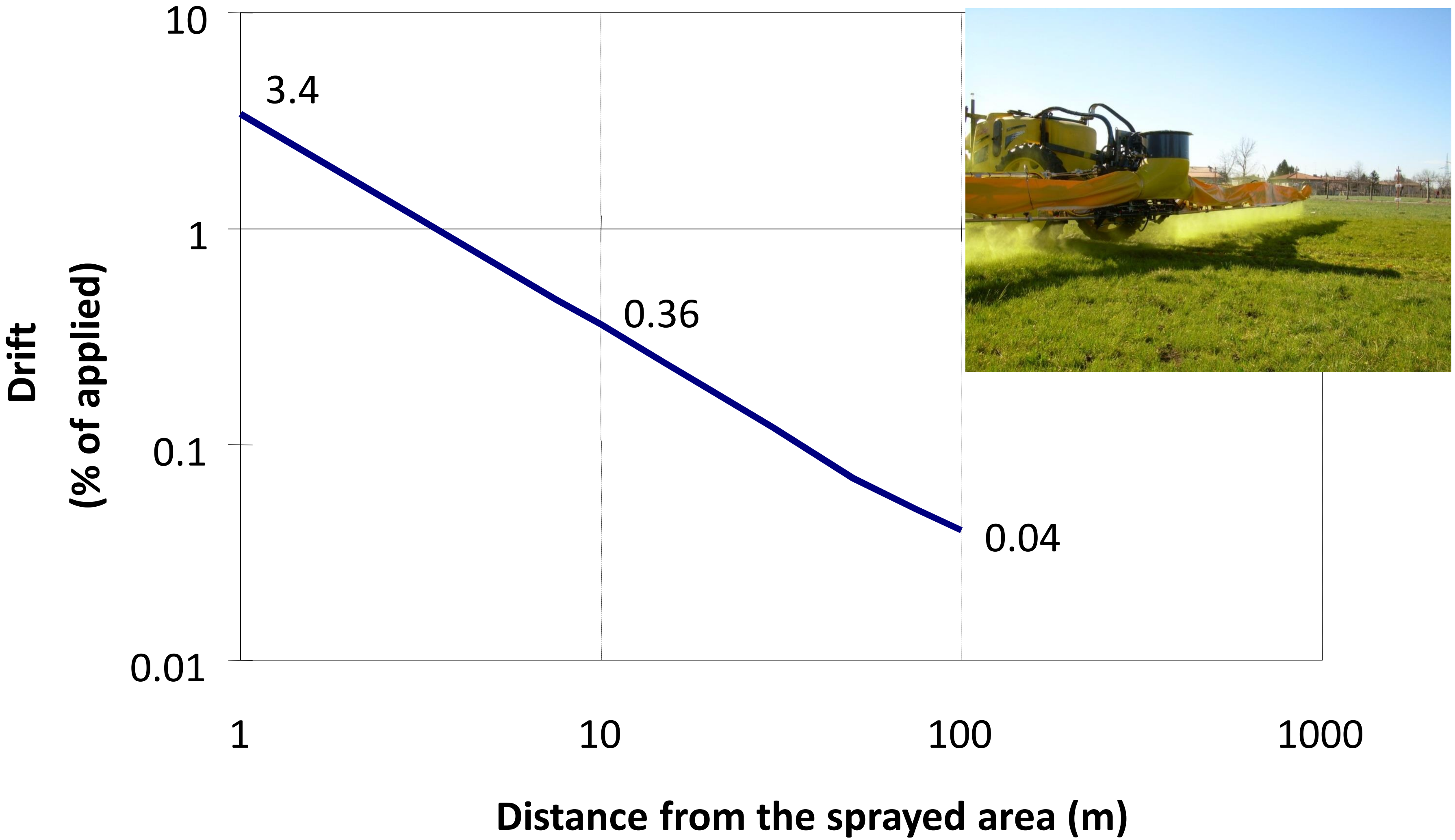
ÅMost countries refer to the German drift curves (Drift curves available for e.g. arable, orchards, vine, nursery trees, hops, home gardens, railway tracks)

ÅThere are activities ongoing to harmonize drift curves across EU.

ÅSouthern countries have not developed own drift curves

AMOUNT OF DRIFT IN FIELD CROPS

Drift curves – basis for risk assessments



(German Basic Drift curves- Ganzelmeier et al. 2000)

Drift measurement approaches vary between countries in EU (South and East at the beginning)

(Report*: Joined spray drift curves for boom sprayers in The Netherlands and Germany)

Table 1. Summary table reference boom sprayer.

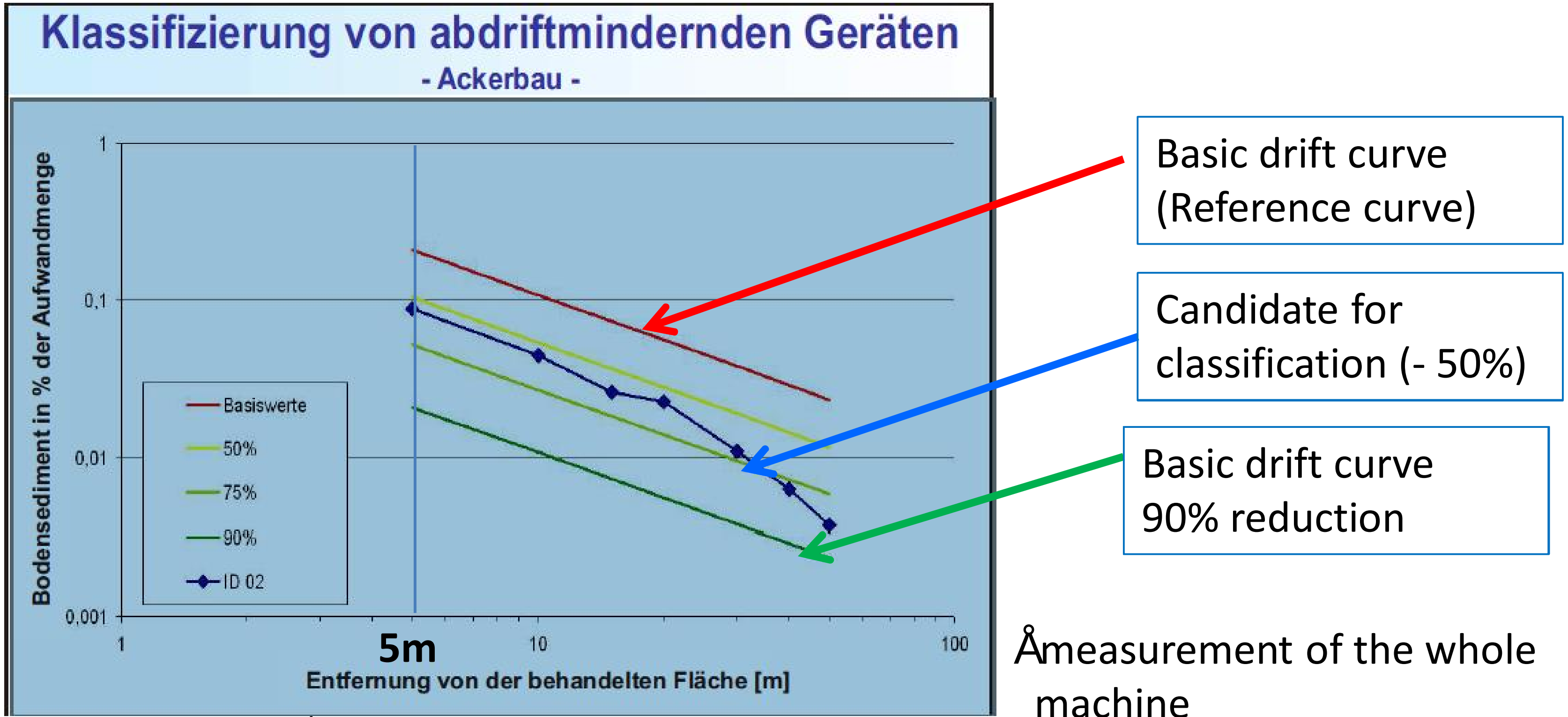
Item/country	NL	DE	UK	FR	PL	BE	SE
Nozzle	XR11004	FF 03, 04*)	FF110/1.2/3.0	FF11002	FF03	FF03	F, M. C
Spray pressure (bar)	3	2.0 – 5.0	3	2.5	-	3	-
Spray volume (l/ha)	300	150 - 300	Speed dependent	-	-	-	-
Sprayer speed (km/h)	6.5	6-8	6-12 [12,16]†	8	-	-	7.2
Boom height (m)	0.50	0.50	0.5 [0.7, 1.0]†	0.70	0.50	0.50	0.25, 0.40, 0.60
Sprayed surface	Potato, bare soil	Bare soil, Short grass	Short grass – crop	-	-	-	Short grass
Crop height (m)	0.50 / 0.10	0.10	0.05-2.0	-	-	-	-
Sprayed width (m)	24	20	48	-	-	-	96
Temperature range (°C)	5-25	10-25	-	-	-	-	10, 15, 20
Wind speed range (m/s)	1.5-5.0	1-5	2.5 [2.5, 3.5]†	-	-	-	3.0, 4.5
Wind speed height (m)	2.0	2.0	3	-	-	-	2.0

*) *Basic drift curve contains data from measurements with other flat fan (FF) nozzle types and sizes (coarser sprays – lower drift).*

† *Values in square brackets are recently proposed (not yet adopted) for bystander/resident assessments.*

* J.C. van de Zande, D. Rautmann, H.J. Holterman & J.F.M. Huijsmans.- Plant Research International, part of Wageningen UR Report 526

Classification of spray drift reducing technologies (SDRT) (Example DE)



Source JKI, Braunschweig

- measurement of the whole machine
- Nozzles (Boom sprayers)

TOPPS Water Protection

Spray drift reduction technique and buffer zone (Example BE)

Belgian buffer zone widths to be respected with field sprayers as a function of spray application technique and label recommendations (www.phytoweb.fgov.be)

Spray application technique	Buffer zone on the label						
	2 m with standard application technique	5 m with standard application technique	10 m with standard application technique	20 m with standard application technique	20 m with 50% drift reducing technique	20 m with 75% drift reducing technique	20 m with 90% drift reducing technique
Standard	2 m	5 m	10 m	20 m	30 m	40 m	200 m
50% drift reduction	1 m	2 m	5 m	10 m	20 m	30 m	40 m
75% drift reduction	1 m	2 m	2 m	5 m	10 m	20 m	30 m
90% drift reduction	1 m	1 m	1 m	1 m	5 m	10 m	20 m

TOPPS Water Protection

Spray drift reduction technique and buffer zone (Example NL)

Intensive treated arable crops
ÅStandard 14 m buffer zone
+ 50% drift reducing nozzle
+ end nozzle
+ Boom height 50 cm

Å1,5 m non treated buffer zone

+ air assistence
Å1,0 m
or + Windbreak / hedge
Å1,0 m
or + tunnel sprayer (bed crops)
Å1,0 m

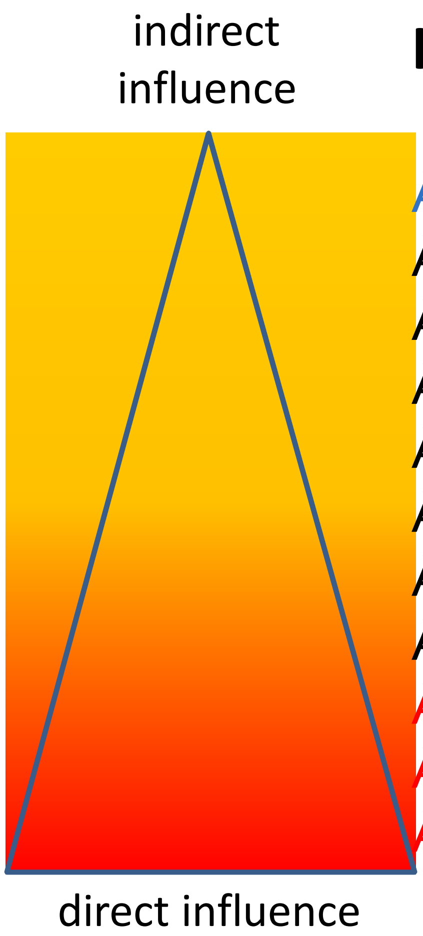
From 14 m buffer to 1.5 m buffer

Minimum non treated crop free zone
0,25 m e.g Cereals
0,50 m e.g.Maize. Sugar beet, Rape
0,75 m e.g Potatoes, flower bulbs

Source: Plant Res. Int. Wageningen Report 419, 2012

Factors influenceing spray drift

Factors we can influence and some are out of direct control



Key factors

ÅWind speed
ÅWind direction
ÅTemparature
ÅAir humidity
ÅProximity to water
ÅProximity sensitive area
ÅCrop treated
ÅAdjacent area
ÅDroplet size
ÅApplication technique
ÅAdjustment of sprayers

HOW TO REDUCE SPRAY LOSSES DUE TO DRIFT?

MEASURES TO PROTECT ENVIRONMENT FROM DRIFT

DIRECT

Reducing drift at source

Use of Spray Drift Reduction Technology (SDRT)

- **Application equipment**
- **Adjustment of sprayers**
- **Application parameters**
- **Application scenario**

Regulatory activities

INDIRECT

Reducing exposure to drift

No spray zones
Buffer zones
Natural vegetative strips
Windbreaks, hail nets, etc.

- **Fixed buffer zones**
- **Adjustable buffer zones (depending on spray application technology)**

Key parameters to reduce the spray drift risk

Field applications

ÅDroplet size

ÅDistance to target

ÅForward speed

Orchard applications

ÅDroplet size
ÅDistance to target
ÅAir volume
ÅAir speed
ÅAir direction

Most important is the correct adjustment of the sprayer

TOPPS
Water Protection

Drift reduction

Control droplet size !
(in drift sensitive areas
avoid droplets < 100 µ

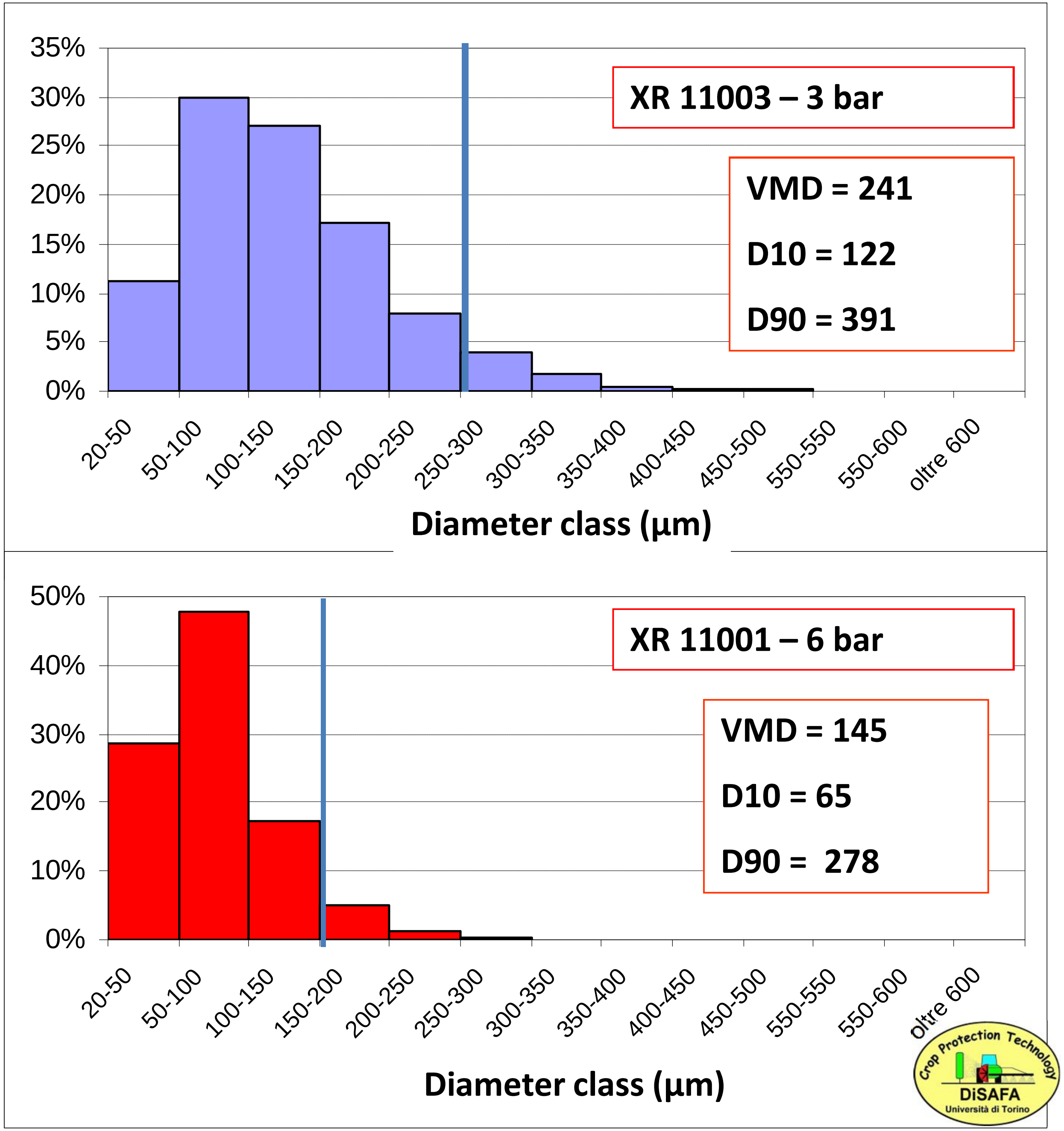
Nozzles produce a spectrum of droplets

Definitions:

Å**VMD = Volume Median Diameter (volume 50% above/50% below value)**

Åd 10 = droplet diameter under which 10% of the sprayed volume is contained

Åd 90 = droplet diameter under which 90% of the sprayed volume is contained

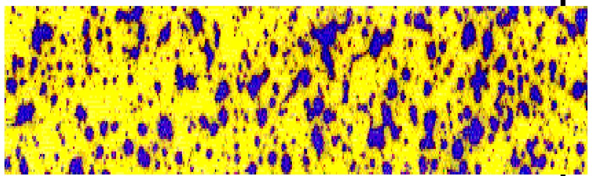


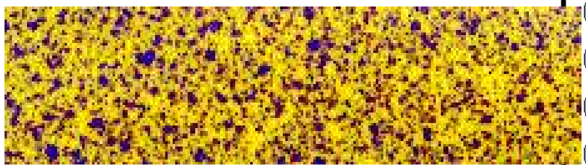
Consider droplet size!!!

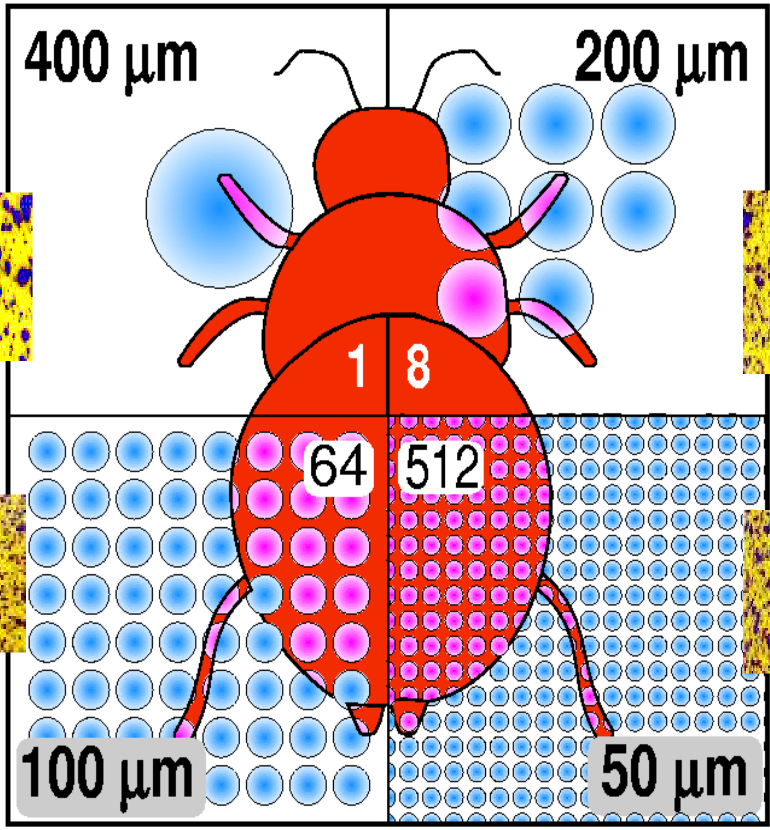
BCPC Specification	Droplet size	**MVD** -Mean Volume Diameter	**Coverage**	**Penetration canopy**	**Drift risk**
Very fine VF		125 µm= 0,12 mm			
Fine F		250 µm= 0,25 mm			
Medium M		350 µm= 0,35 mm			
Coarse C		450 µm= 0,45 mm			
Very coarse VC		575 µm= 0,57 mm			

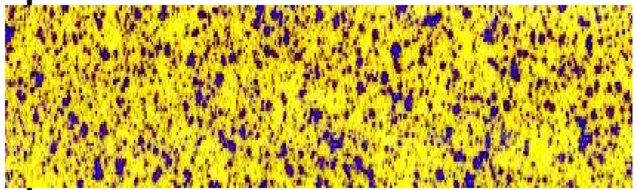
COVERAGE

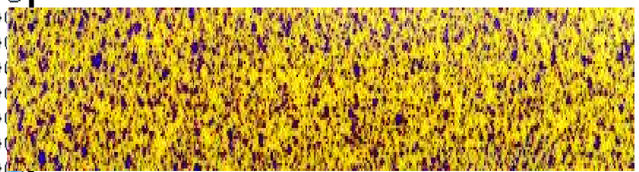
Small droplets can cover more area / cm² but how many reach the target?









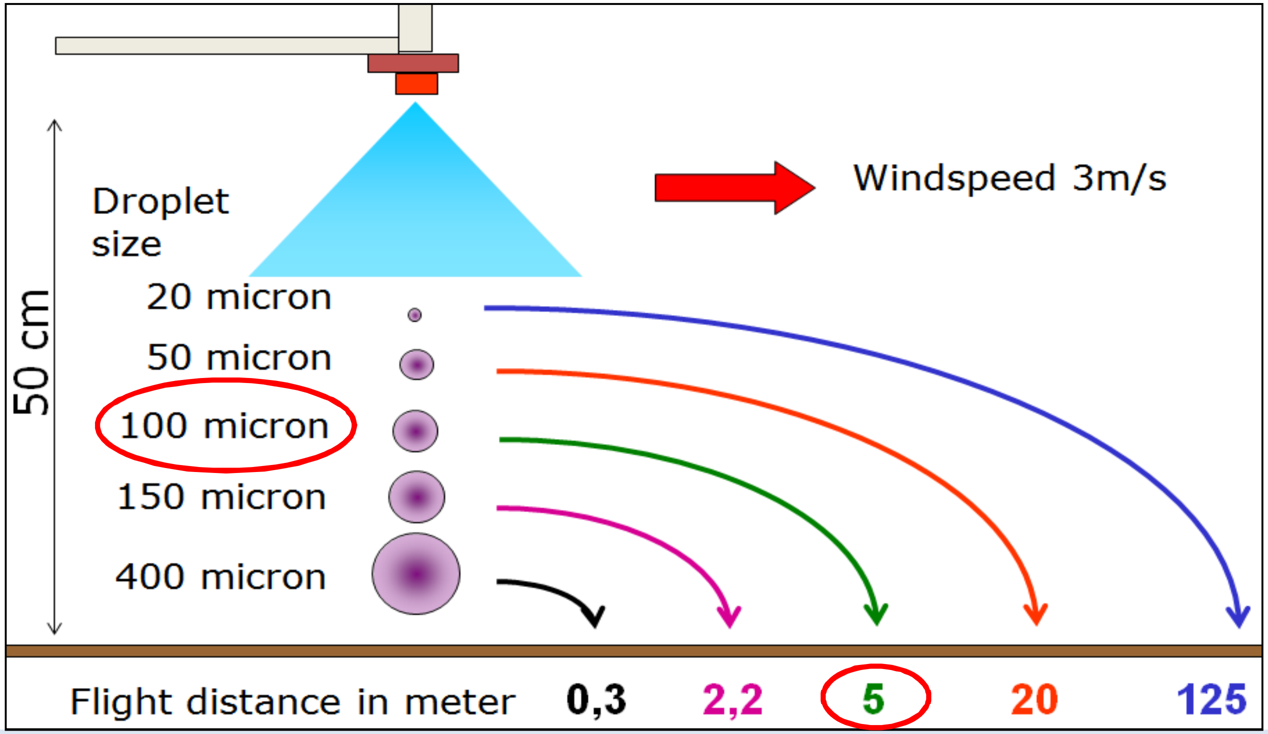


Biological activity depends on what is actually reaching the target and on the properties of the Plant Protection Product (small droplets often do not reach the target)

In drift sensitive areas small droplets should be avoided

DROPLET SIZE:

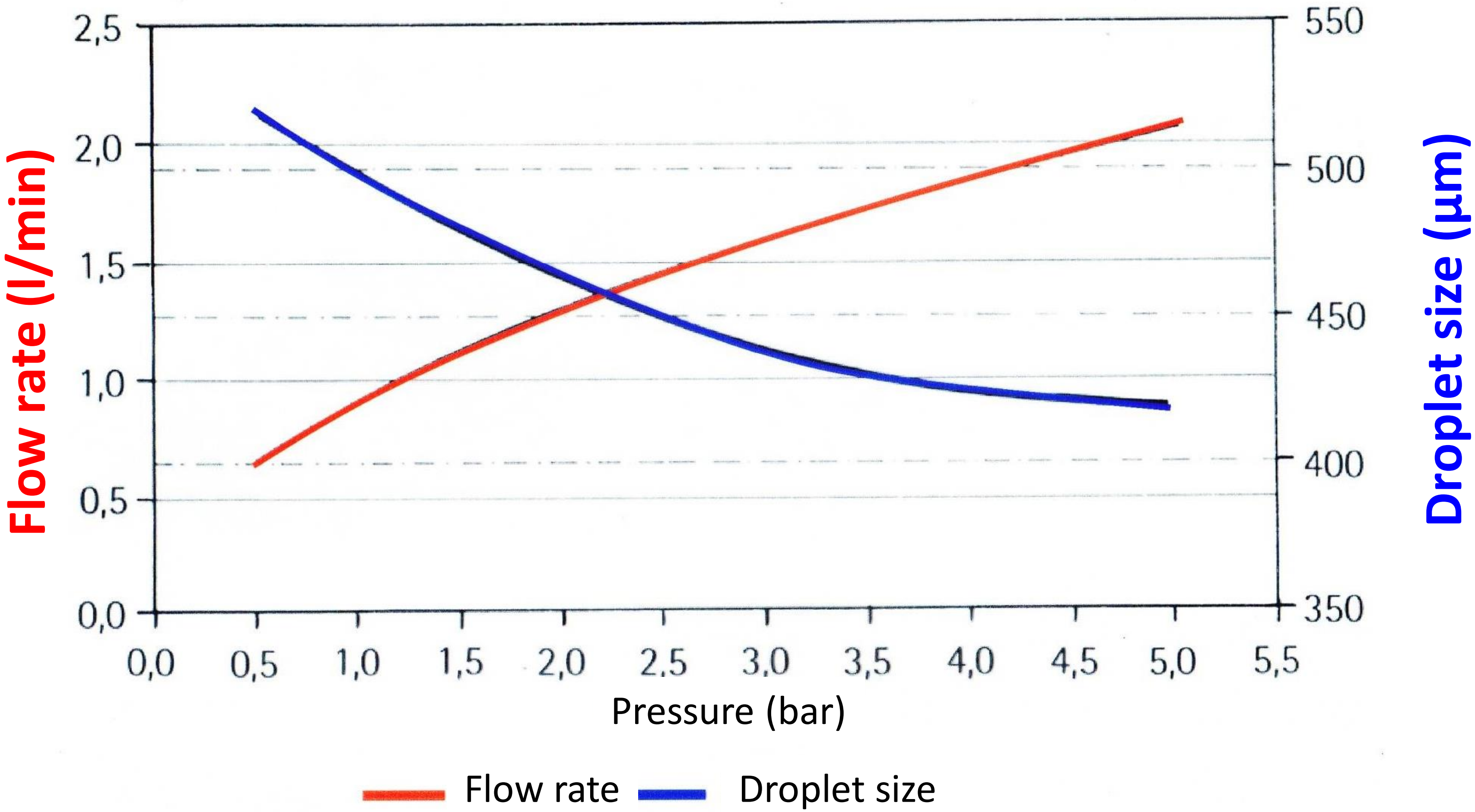
Small droplets are more sensitive to wind and increase the drift risk (Model)



Avoid droplets < 100µ

We have good solutions to influence the droplet spectrum – low drift nozzles

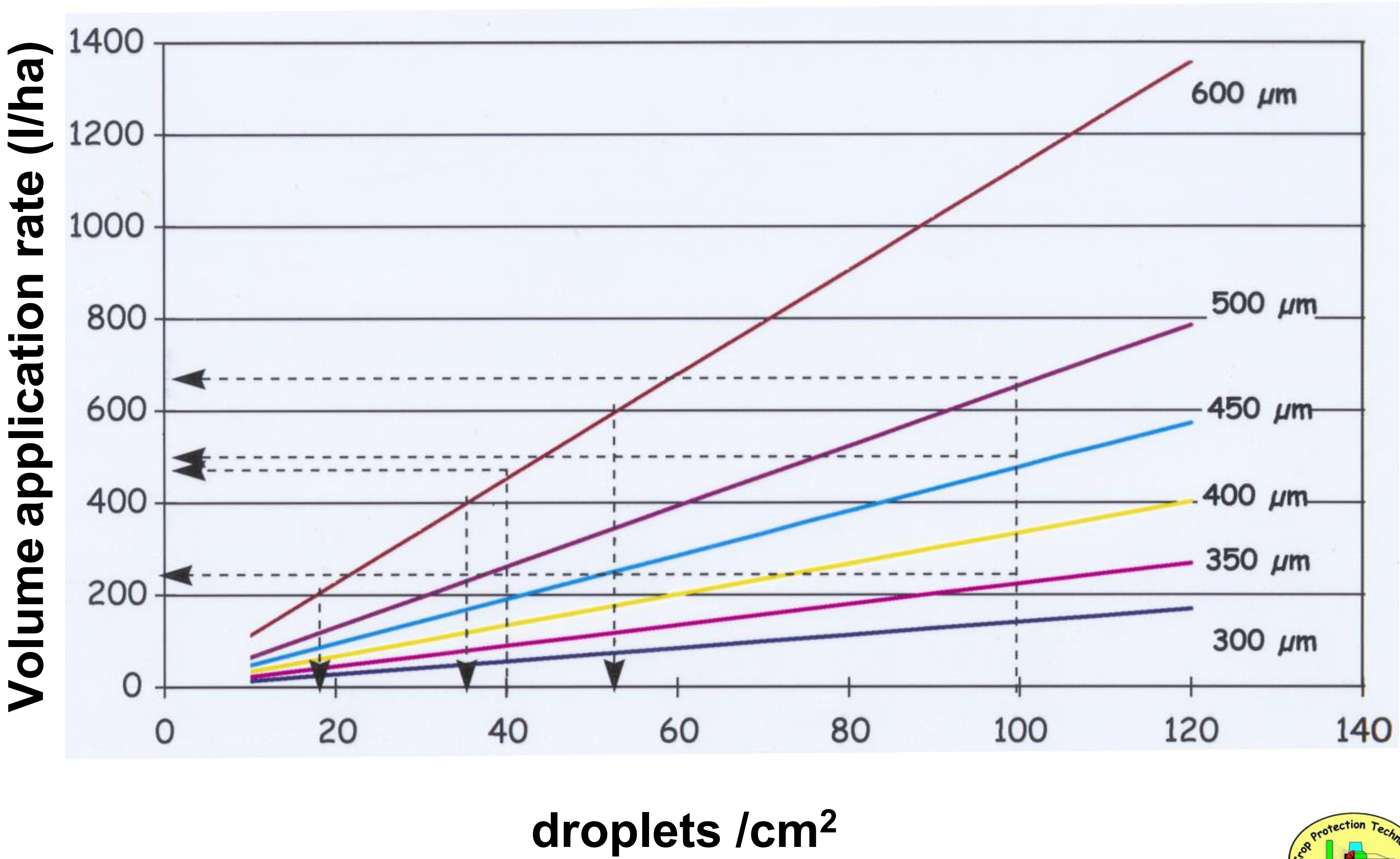
CORRELATION BETWEEN NOZZLE FLOW RATE, PRESSURE AND DROPLET SIZE



RECOMMENDED DROPLET SIZE FOR DIFFERENT PESTICIDE CATEGORIES

Droplet size (µm)	Product type	Droplets / cm²
150÷-250	Fungicides	min 50÷70 droplets /cm²
200÷250	Insecticides	min 20÷30 droplets /cm²
200÷600	Herbicides	min 20÷40 droplets /cm²

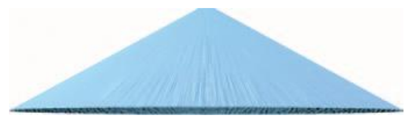
CORRELATION BETWEEN DROPLET SIZE, DROPLET/cm² AND VOLUME RATE



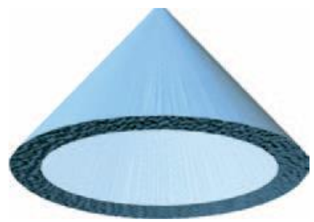
Hydraulic nozzles types

⇦ **Flatfan** ⇨

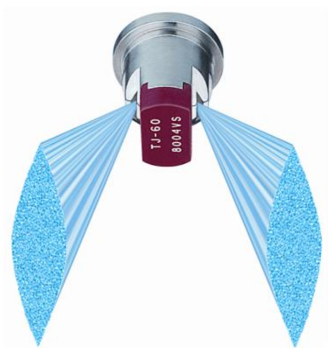
⇦ **Deflector nozzle** ⇨



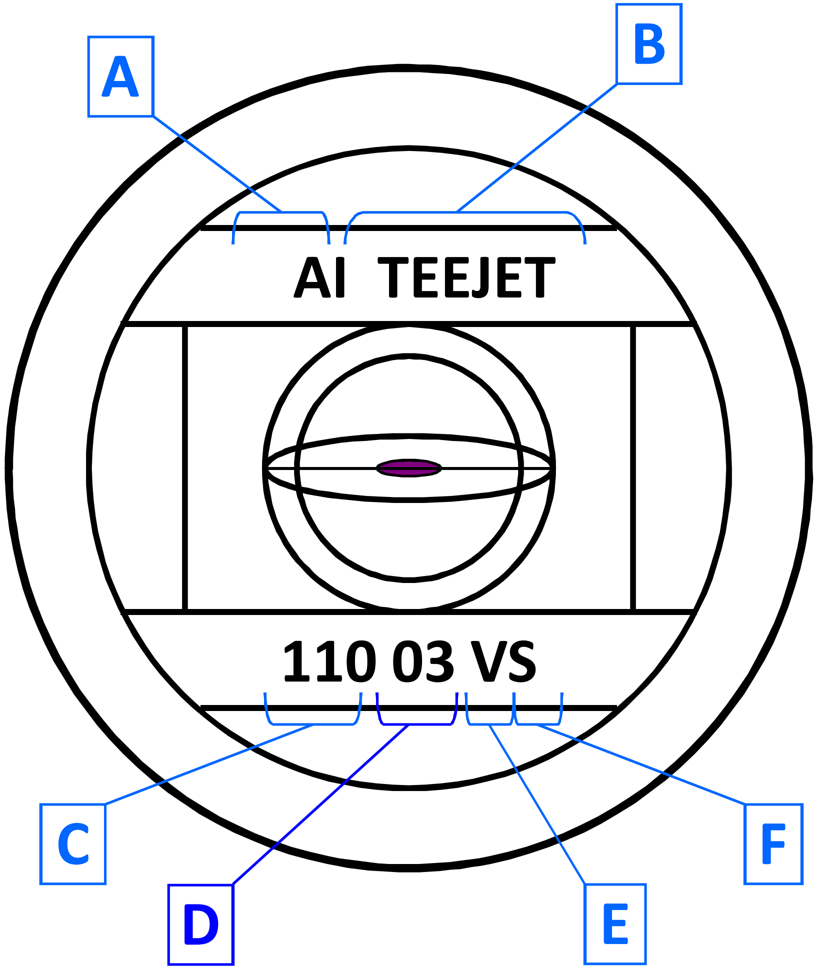
⇦ **Hollow cone** ⇨



⇦ **Double flatfan** ⇨



Codeing of nozzles (Standard)



A: Nozzle type
(here AI = Air Induction)

B: Trade name
(here: Teejet)

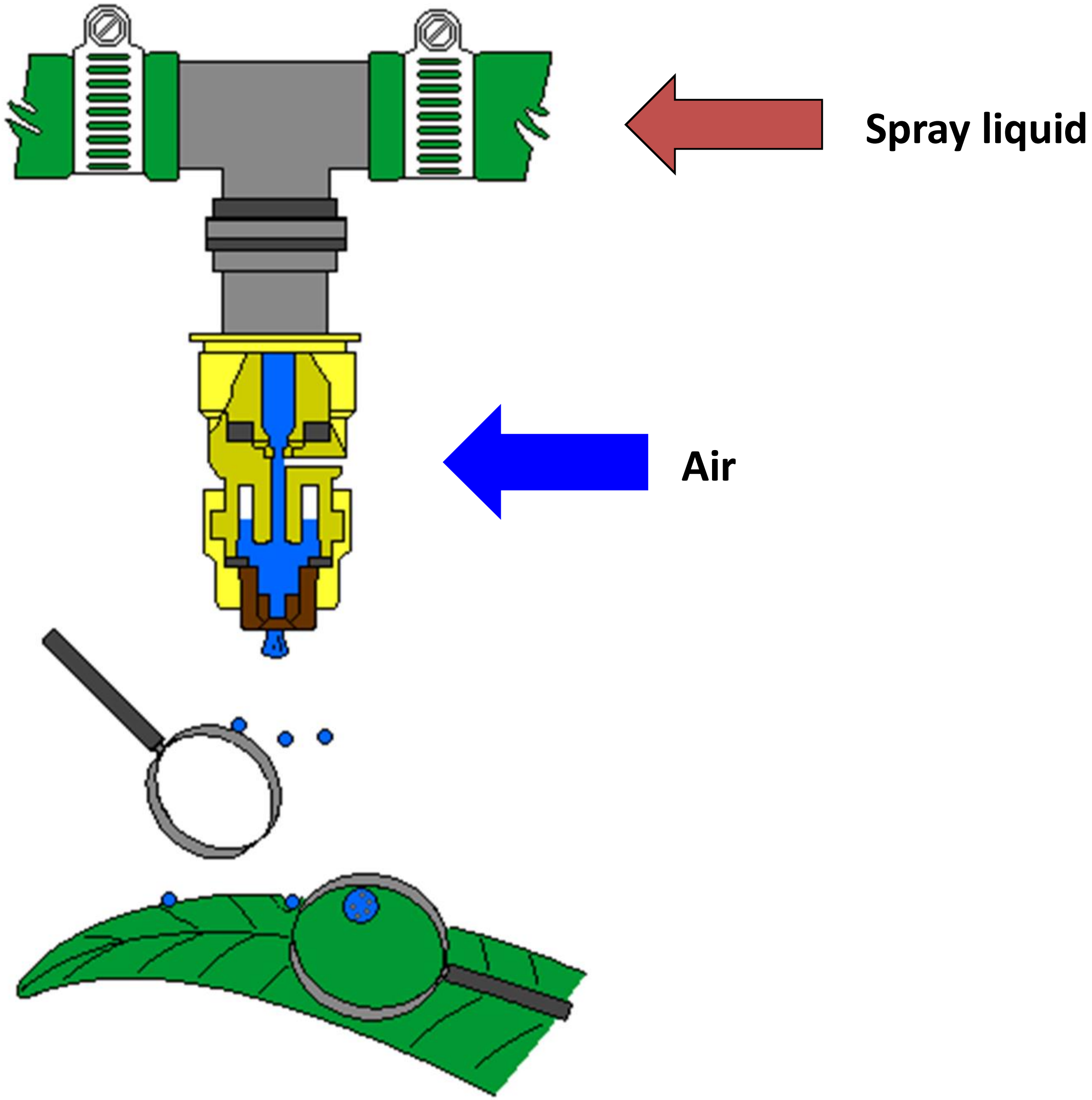
C: Spray angle
(here: 110°)

D: Nozzle output
(here: 0,3 Gallonen/min. at 40 psi;
= 1,1355 Liter/Min. at 2,8 bar)

E: Colour code (related to the flow rate)
(V = VisiFlo-Code [ISO-Norm])

F: Nozzles material
(here: S = stainless steel),

Air induction nozzle – Droplets with air inclusions



Source: Agrotop

Kompakte Injektordüsen - Sortiment

Air injector nozzles reduce amount of small droplets and can work in a wider range of pressures

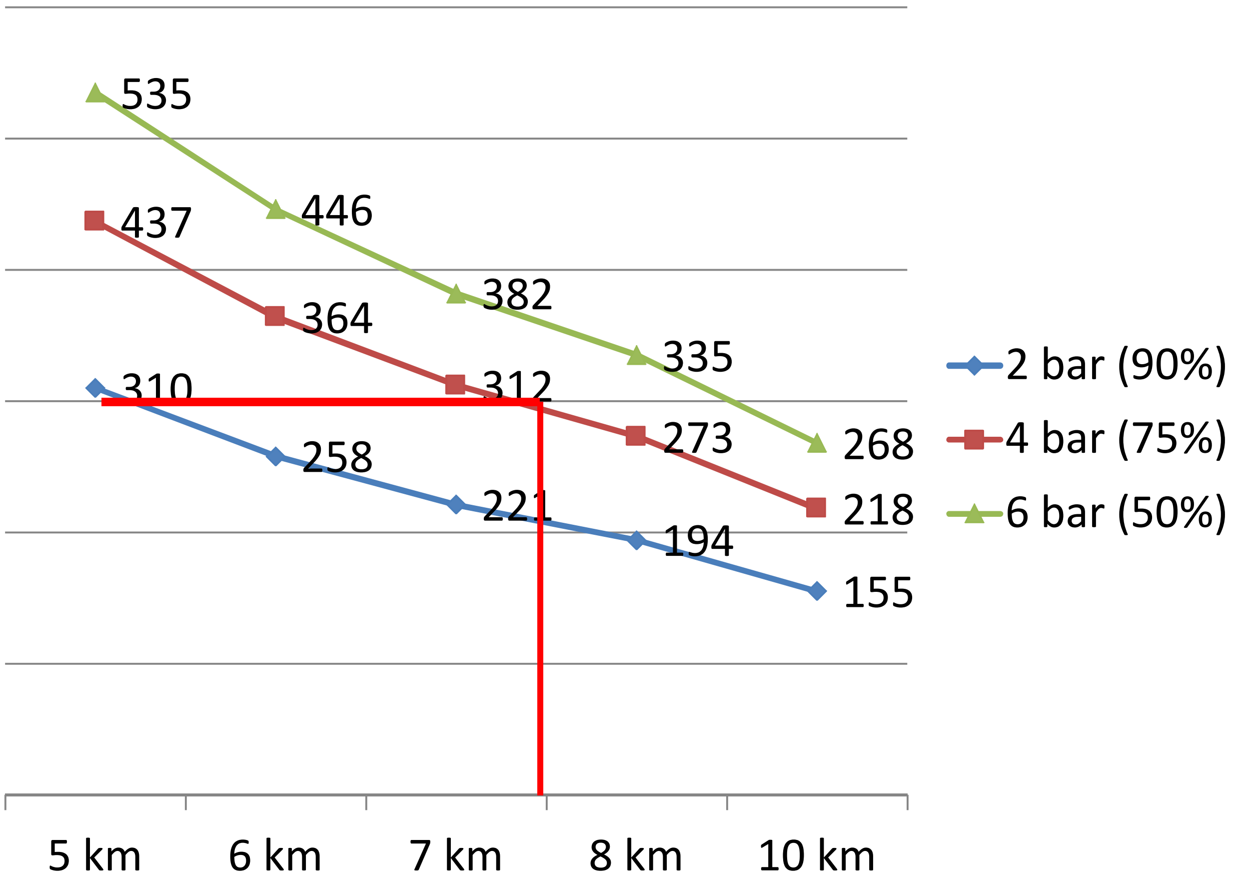
TWO Basic Models

a) Air injector compact (2 cm) operational between **1.5 to 3 bar** (6 bar)

b) Air injector long (4 cm) operational between (2) and **4 to 8 bar**

Driftreduktion Classification			
Air injector compact	90% -	75% 1 bar	50 % 2 bar
Air injector long	90% 2-3 bar	75% 3-4 bar	50 % 4 -8 bar

Spray volume l / ha for Airinduction nozzle (ID 120 – 04) depending on pressure and driving speed (Example)



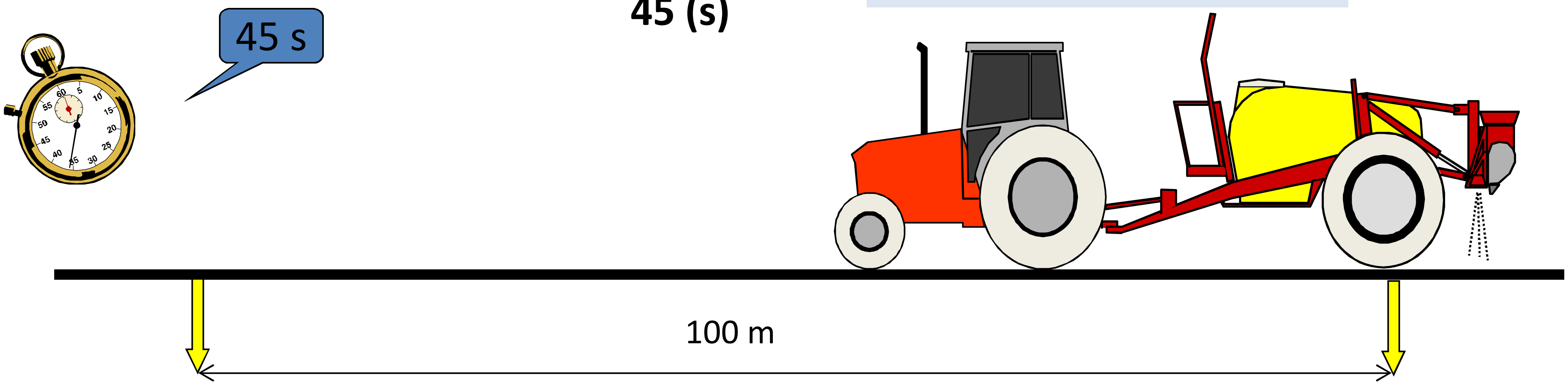
CHECK THE TRACTOR SPEED

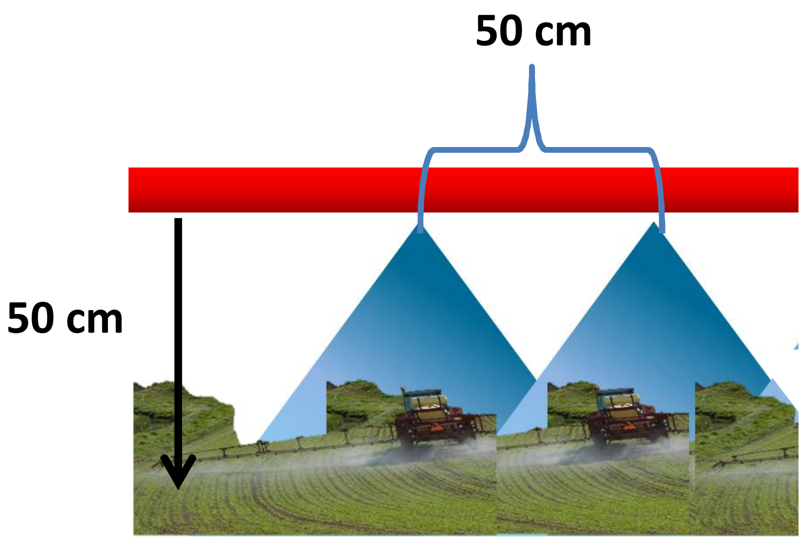
Sprayer half filled !

$$\frac{\text{Distance (m)} \times 3.6}{\text{time (s)}} = \text{Speed (km/h)}$$

Example

$$\frac{100\ \text{(m)} \times 3.6}{45\ \text{(s)}} = 8\ \text{(km/h)}$$





Volume /ha x nozzle spacing /m) x speed km/h
600
= Nozzle flow rate / l

Example:

230 l/ha x 0,5 m x 8 km /h
600
= 1,53 l/min

TOPPS Water Protection

UNIVERSAL TABLE FOR BOOM SPRAYERS WITH A NOZZLE SPACING OF 50 cm

Speed km / h (under Water l / ha) — Pressure bar (under Nozzle size)

Water l / ha										Flow	Nozzle size									
100	125	150	175	200	225	250	300	400	500	l/min	-01	-015	-02	-025	-03	-04	-05	-06	-08	-10
10.8	8.6	7.2	6.2	5.4	**4.8**					0.90		6.8	3.8	2.4	1.7					
11.4	9.1	7.6	6.5	5.7	**5.1**					0.95		7.5	4.2	2.7	1.9	1.1				
12.0	9.6	8.0	6.9	6.0	**5.3**	4.8				1.00		8.4	4.7	3.0	2.1	1.2				
12.6	10.1	8.4	7.2	6.3	**5.6**	5.0				1.05		9.2	5.2	3.3	2.3	1.3				
13.2	10.6	8.8	7.5	6.6	**5.9**	5.3				1.10		10.1	5.7	3.6	2.5	1.4				
13.8	11.0	9.2	7.9	6.9	**6.1**	5.5				1.15			6.2	4.0	2.8	1.5	1.0			
14.4	11.5	9.6	8.2	7.2	**6.4**	5.8	4.8			1.20			6.7	4.3	3.0	1.7	1.1			
15.0	12.0	10.0	8.6	7.5	**6.7**	6.0	5.0			1.25			7.3	4.7	3.3	1.8	1.2			
15.6	12.5	10.4	8.9	7.8	**6.9**	6.2	5.2			1.30			7.9	5.1	3.5	2.0	1.3			
16.2	13.0	10.8	9.3	8.1	**7.2**	6.5	5.4			1.35			8.5	5.5	3.8	2.1	1.4			
16.8	13.4	11.2	9.6	8.4	**7.5**	6.7	5.6			1.40			9.2	5.9	4.1	2.3	1.5	1.0		
17.4	13.9	11.6	9.9	8.7	**7.7**	7.0	5.8			1.45			9.9	6.3	4.4	2.5	1.6	1.1		
18.0	14.4	12.0	10.3	9.0	**8.0**	7.2	6.0			1.50			10.5	6.8	4.7	2.6	1.7	1.2		
19.2	15.4	12.8	11.0	9.6	**8.5**	7.7	6.4	4.8		1.60				7.7	5.3	3.0	1.9	1.3		
20.4	16.3	13.6	11.7	10.2	**9.1**	8.2	6.8	5.1		1.70				8.7	6.0	3.4	2.2	1.5		
21.6	17.3	14.4	12.3	10.8	**9.6**	8.6	7.2	5.4		1.80				9.7	6.7	3.8	2.4	1.7		
22.8	18.2	15.2	13.0	11.4	**10.1**	9.1	7.6	5.7		1.90					7.5	4.2	2.7	1.9	1.1	
24.0	19.2	16.0	13.7	12.0	**10.7**	9.6	8.0	6.0	4.8	2.00					8.3	4.7	3.0	2.1	1.2	
	20.2	16.8	14.4	12.6	**11.2**	10.1	8.4	6.3	5.0	2.10					9.2	5.2	3.3	2.3	1.3	
	21.1	17.6	15.1	13.2	**11.7**	10.6	8.8	6.6	5.3	2.20					10.1	5.7	3.6	2.5	1.4	
	22.1	18.4	15.8	13.8	**12.3**	11.0	9.2	6.9	5.5	2.30						6.2	4.0	2.8	1.5	1.0
	23.0	19.2	16.5	14.4	**12.8**	11.5	9.6	7.2	5.8	2.40						6.7	4.3	3.0	1.7	1.1
	24.0	20.0	17.1	15.0	**13.3**	12.0	10.0	7.5	6.0	2.50						7.3	4.7	3.3	1.8	1.2
		20.8	17.8	15.6	**13.9**	12.5	10.4	7.8	6.2	2.60						7.9	5.1	3.5	2.0	1.3
		21.6	18.5	16.2	**14.4**	13.0	10.8	8.1	6.5	2.70						8.5	5.5	3.8	2.1	1.4

ID / IDTA / IDK / IDKN / IDKT / DF / LU / AD / ST / SC

ENGINEERING YOUR SPRAY SOLUTION

LECHLER

Nozzle	bar	l/min	l/ha 5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	16.0 km/h	20.0 km/h	25.0 km/h	30.0 km/h
-01 ID (60 M) IDK LU ST (80 M)	1.5	0.28	67	56	48	42	34	28	21	17	13	11
	2.0	0.32	77	64	55	48	38	32	24	19	15	13
	2.5	0.36	86	72	62	54	43	36	27	22	17	14
	3.0	0.39	94	78	67	59	47	39	29	23	19	16
	3.5	0.42	101	84	72	63	50	42	32	25	20	17
	4.0	0.45	108	90	77	68	54	45	34	27	22	18
	4.5	0.48	115	96	82	72	58	48	36	29	23	19
	5.0	0.51	122	102	87	77	61	51	38	31	24	20
	6.0	0.55	132	110	94	83	66	55	41	33	26	22
	7.0	0.60	144	120	103	90	72	60	45	36	29	24
	8.0	0.64	154	128	110	96	77	64	48	38	31	26
-015 ID IDK (60 M) IDKT LU AD ST (80 M)	1.5	0.42	101	84	72	63	50	42	32	25	20	17
	2.0	0.48	115	96	82	72	58	48	36	29	23	19
	2.5	0.54	130	108	93	81	65	54	41	32	26	22
	3.0	0.59	142	118	101	89	71	59	44	35	28	24
	3.5	0.63	151	126	108	95	76	63	47	38	30	25
	4.0	0.68	163	136	117	102	82	68	51	41	33	27
	4.5	0.72	173	144	123	108	86	72	54	43	35	29
	5.0	0.76	182	152	130	114	91	76	57	46	36	30
	6.0	0.83	199	166	142	125	100	83	62	50	40	33
	7.0	0.90	216	180	154	135	108	90	68	54	43	36
	8.0	0.96	230	192	165	144	115	96	72	58	46	38
-02 ID IDK LU/AD ST (60 M) IDKT IDTA DF (80 M)	1.0	0.46	110	92	79	69	55	46	35	28	22	18
	1.5	0.56	134	112	96	84	67	56	42	34	27	22
	2.0	0.65	156	130	111	98	78	65	49	39	31	26
	2.5	0.73	175	146	125	110	88	73	55	44	35	29
	3.0	0.80	192	160	137	120	96	80	60	48	38	32
	3.5	0.86	206	172	147	129	103	86	65	52	41	34
	4.0	0.92	221	184	158	138	110	92	69	55	44	37
	4.5	0.98	235	196	168	147	118	98	74	59	47	39
	5.0	1.03	247	206	177	155	124	103	77	62	49	41
	6.0	1.13	271	226	194	170	136	113	85	68	54	45
	7.0	1.22	293	244	209	183	146	122	92	73	59	49
	8.0	1.30	312	260	223	195	156	130	98	78	62	52
-025 ID IDTA IDK IDKT LU SC (60 M)	1.0	0.57	137	114	98	86	68	57	43	34	27	23
	1.5	0.70	168	140	120	105	84	70	53	42	34	28
	2.0	0.81	194	162	139	122	97	81	61	49	39	32
	2.5	0.91	218	182	156	137	109	91	68	55	44	36
	3.0	0.99	238	198	170	149	119	99	74	59	48	40
	3.5	1.07	257	214	183	161	128	107	80	64	51	43
	4.0	1.15	276	230	197	173	138	115	86	69	55	46
	4.5	1.22	293	244	209	183	146	122	92	73	59	49
	5.0	1.28	307	256	219	192	154	128	96	77	61	51
	6.0	1.40	336	280	240	210	168	140	105	84	67	56
	7.0	1.52	365	304	261	228	182	152	114	91	73	61
	8.0	1.62	389	324	278	243	194	162	122	97	78	65

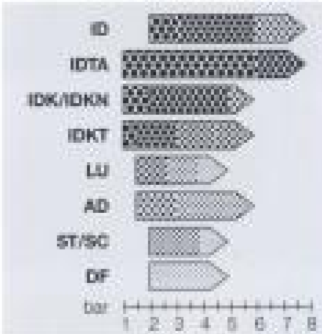
2 x l/ha (0.5 m) = l/ha (0.25 m)

Nozzle	bar	l/min	l/ha 5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	16.0 km/h	20.0 km/h	25.0 km/h	30.0 km/h
-03 ID IDTA IDK/IDKN IDKT LU AD/ST SC (60 M) DF (80 M)	1.0	0.69	166	138	118	104	83	69	52	41	33	28
	1.5	0.84	202	168	144	126	101	84	63	50	40	34
	2.0	0.97	233	194	166	146	116	97	73	58	47	39
	2.5	1.08	259	216	185	162	130	108	81	65	52	43
	3.0	1.19	286	238	204	179	143	119	89	71	57	48
	3.5	1.28	307	256	219	192	154	128	96	77	61	51
	4.0	1.37	329	274	235	206	164	137	103	82	66	55
	4.5	1.46	350	292	250	219	175	146	110	88	70	58
	5.0	1.53	367	306	262	230	184	153	115	92	73	61
	6.0	1.68	403	336	288	252	202	168	126	101	81	67
	7.0	1.81	434	362	310	272	217	181	136	109	87	72
	8.0	1.94	466	388	333	291	233	194	146	116	93	78
-04 ID IDTA IDK/IDKN IDKT LU AD ST/SC DF (60 M)	1.0	0.91	218	182	156	137	109	91	68	55	44	36
	1.5	1.12	269	224	192	168	134	112	84	67	54	45
	2.0	1.29	310	258	221	194	155	129	97	77	62	52
	2.5	1.44	346	288	247	216	173	144	108	86	69	58
	3.0	1.58	379	316	271	237	190	158	119	95	76	63
	3.5	1.71	410	342	293	257	205	171	128	103	82	68
	4.0	1.82	437	364	312	273	218	182	137	109	87	73
	5.0	2.04	490	408	350	306	245	204	153	122	98	82
	6.0	2.23	535	446	382	335	268	223	167	134	107	89
	7.0	2.41	578	482	413	362	289	241	181	145	116	96
	8.0	2.58	619	516	442	387	310	258	194	155	124	103
-05 ID IDK LU ST/SC (25 M) IDTA IDKT DF (60 M)	1.0	1.14	274	228	195	171	137	114	86	68	55	46
	1.5	1.39	334	278	238	209	167	139	104	83	67	56
	2.0	1.61	386	322	276	242	193	161	121	97	77	64
	2.5	1.80	432	360	309	270	216	180	135	108	86	72
	3.0	1.97	473	394	338	296	236	197	148	118	95	79
	3.5	2.13	511	426	365	320	256	213	160	128	102	85
	4.0	2.28	547	456	391	342	274	228	171	137	109	91
	5.0	2.55	612	510	437	383	306	255	191	153	122	102
	6.0	2.79	670	558	478	419	335	279	209	167	134	112
	7.0	3.01	722	602	516	452	361	301	226	181	144	120
	8.0	3.22	773	644	552	483	386	322	242	193	155	129
-06 ID IDK LU ST (25 M) IDTA IDKT DF (60 M)	1.0	1.36	326	272	233	204	163	136	102	82	65	54
	1.5	1.67	401	334	286	251	200	167	125	100	80	67
	2.0	1.93	463	386	331	290	232	193	145	116	93	77
	2.5	2.16	518	432	370	324	259	216	162	130	104	86
	3.0	2.36	566	472	405	354	283	236	177	142	113	94
	3.5	2.55	612	510	437	383	306	255	191	153	122	102
	4.0	2.73	655	546	468	410	328	273	205	164	131	109
	5.0	3.05	732	610	523	458	366	305	229	183	146	122
	6.0	3.34	802	668	573	501	401	334	251	200	160	134
	7.0	3.61	866	722	619	542	433	361	271	217	173	144
	8.0	3.86	926	772	662	579	463	386	290	232	185	154
-08 ID/LU/ST (25 M) IDTA (60 M)	l/ha = -04 x 2											

ID	01-015:	3.0 - 4.0 - 8.0 bar
ID	02-08:	2.0 - 4.0 - 8.0 bar
IDTA	02-08:	1.0 - 4.0 - 8.0 bar
IDK	01-03:	1.5 - 3.0 - 6.0 bar
IDK	04-06:	1.0 - 3.0 - 6.0 bar
IDKN	03-04:	1.0 - 3.0 - 6.0 bar
IDKT	015-025:	1.5 - 3.0 - 6.0 bar
IDKT	03-06:	1.0 - 3.0 - 6.0 bar
LU:		1.5 - 2.5 - 5.0 bar
AD:		1.5 - 3.0 - 6.0 bar
ST/SC/DF:		2.0 - 3.0 - 5.0 bar

0.5 m

80°/90° h = 60 - 75 - 90 cm
110°/120° h = 40 - 50 - 70 cm



Apple
Android

230 l/ha
8 km/h

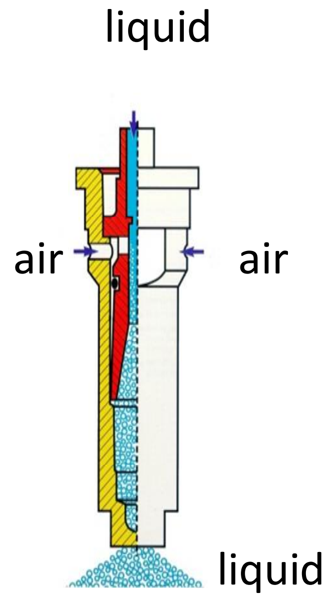
$$\frac{230\ l/ha \times 0.5\ m \times 8.0\ km/h}{600} = 1.53\ l/min$$

→ ID-120-03 (5.0 bar)

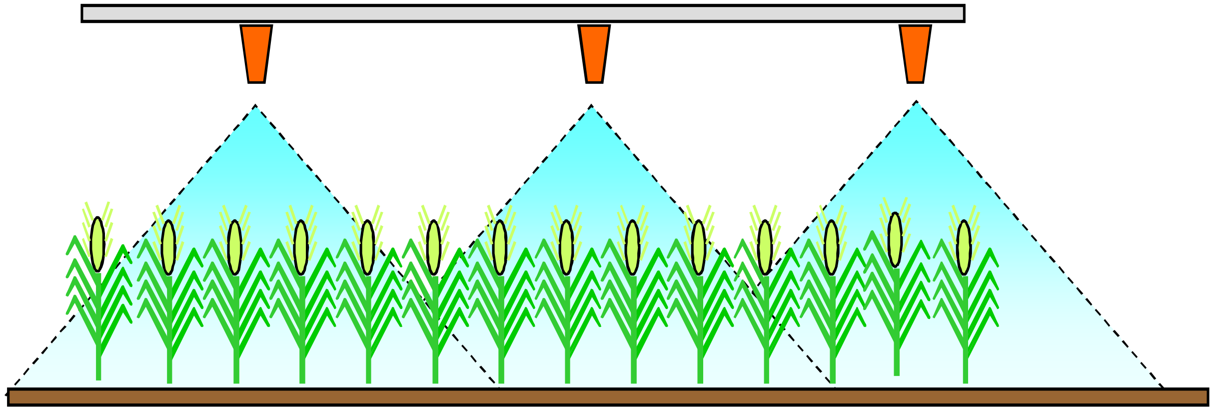
60 sec. = 6.0 km/h
45 sec. = 8.0 km/h
36 sec. = 10.0 km/h

THE PRESENT SITUATION IN EUROPE CONCERNING SPRAY DRIFT REDUCING TECHNIQUES

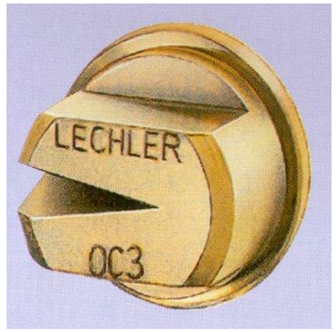
- **AIR INDUCTION NOZZLES** ARE THE MOST SPREAD DRIFT REDUCING TECHNIQUE ON SPRAYERS
- THEY ARE **MORE COMMON ON FIELD CROP SPRAYERS**, ESPECIALLY IN NORTHERN EUROPEAN COUNTRIES
- STILL **POORLY USED ON AIR-ASSISTED SPRAYERS** IN ORCHARDS AND VINE APPLICATIONS

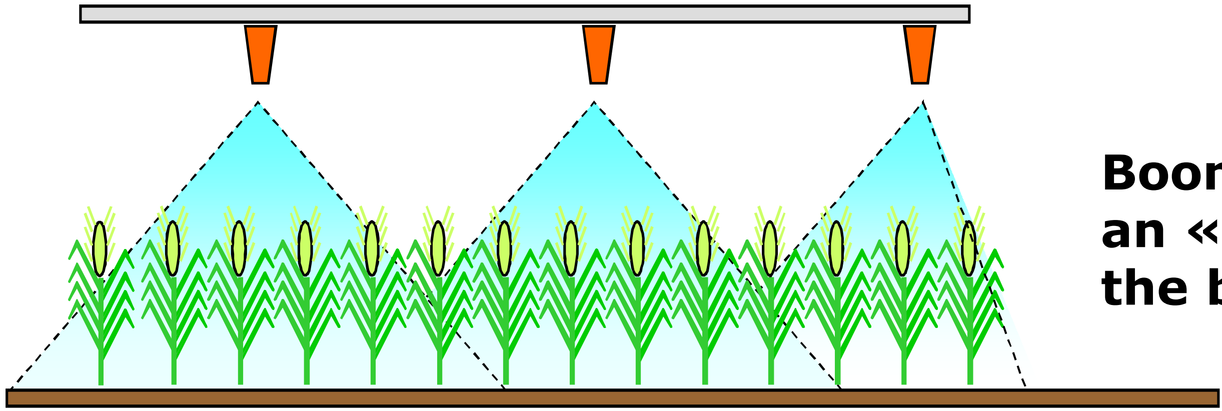


END BOOM NOZZLES



Traditional boom





Boom equipped with an «asymmetric jet» at the boom end

Drift reduction = 10-20%

Selection of the right nozzle
Consider

- Crop
- Droplet size
- Environmental requirements
- Spray volume
- Weather conditions
- Driving speed
- Pressure
- PPP

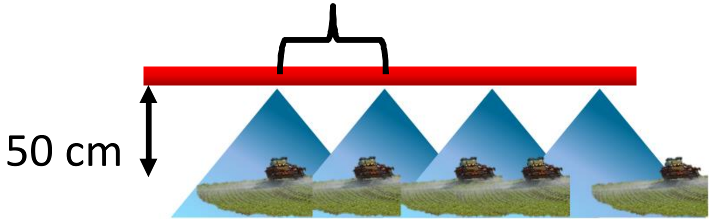
Drift reduction

reduce the distance to the target

lower chance for the wind to interfere

Boom height at spraying is often to high

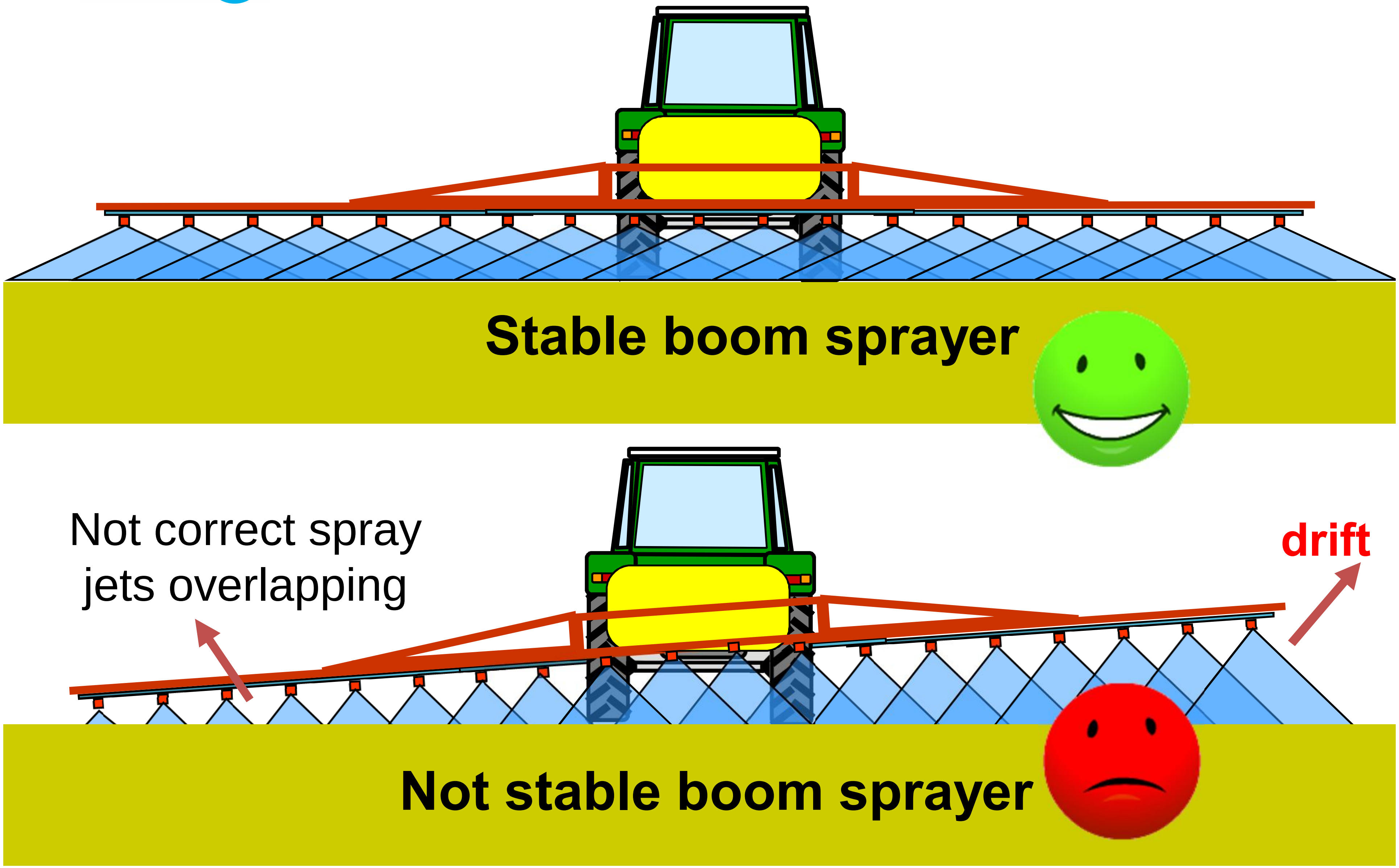
Nozzle spacing
50 cm



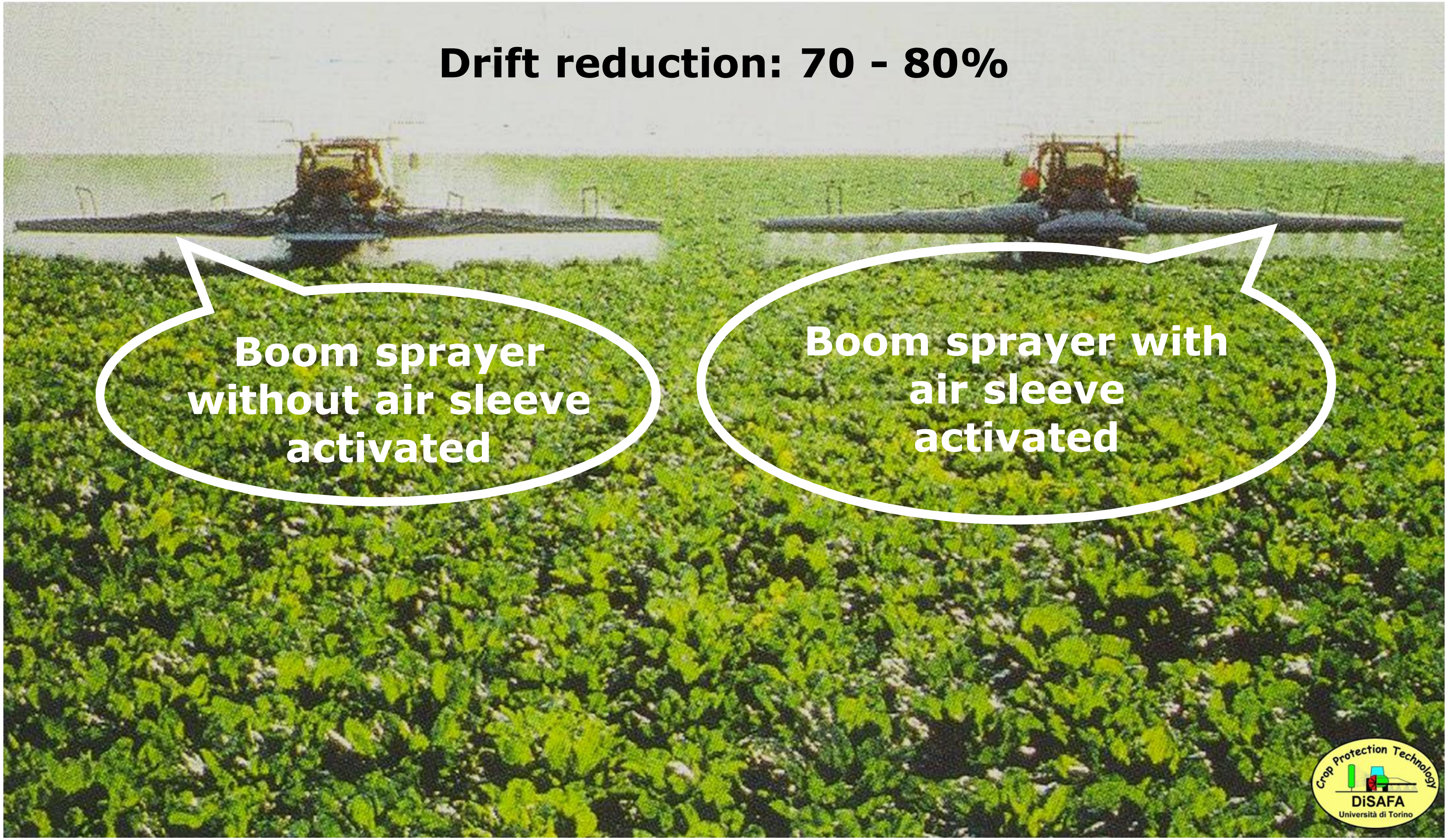
.... It is easy visible if the boom is to high !

Drift risk at 70 cm boom height is 100% bigger than with 50 cm boom height

Pay attention to boom stability to reduce the spray drift risk



In often windy areas air support could help to reduce spray drift



Droplegs reduce the distance to the target

SHIELDED BOOM SPRAYERS

Drift reduction: 80 - 90%

TOPPS
Water Protection

Drift reduction

reduce the forward speed

lower chance for the wind to interfere

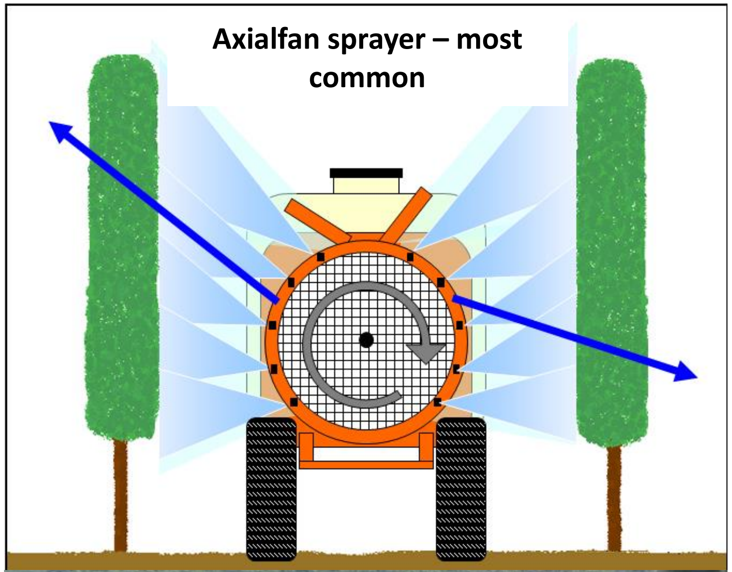
Driving Speed for spraying along sensitive areas should not exceed 8 km/h

8 km / h is the reference speed for nozzle drift classification (DE)

HOW MUCH DRIFT CAN BE REDUCED BY JUST CORRECT ADJUSTMENT OF SPRAYERS ?

Not correct adjusted vertical profile and air flow rate

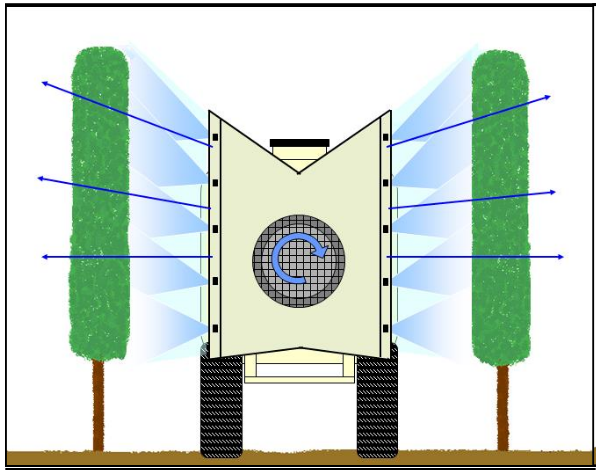
Orchard / vine sprayers transport droplets by air to the targets



- Most commonly used are sprayers with axial fans
- Produce unsymetric air flow (deflectors)
- Distances to the target for the droplets vary strongly
- Spray profil must be adapted according the training system of the crop and the different seasonal development.

General observation:
Often applications are done with to much air volume.
More easy technical adjustment possibilities on sprayers would be beneficial
Sprayers are often not well adjusted.

Sprayer types which reduce the distance from droplet generation to traget

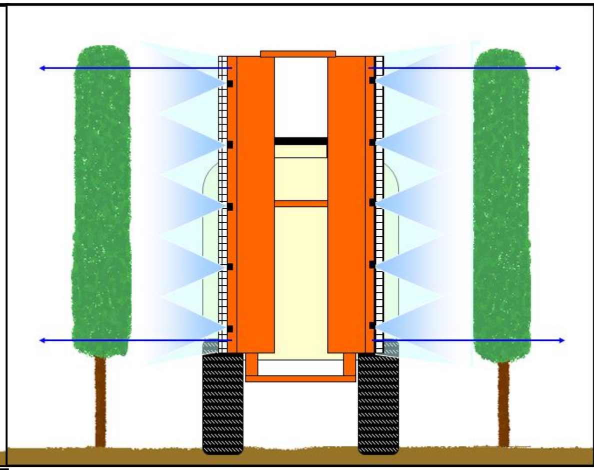


Axialfan sprayer with crossflow installation

Ådistance to target more equal

ÅAir directed to canopy

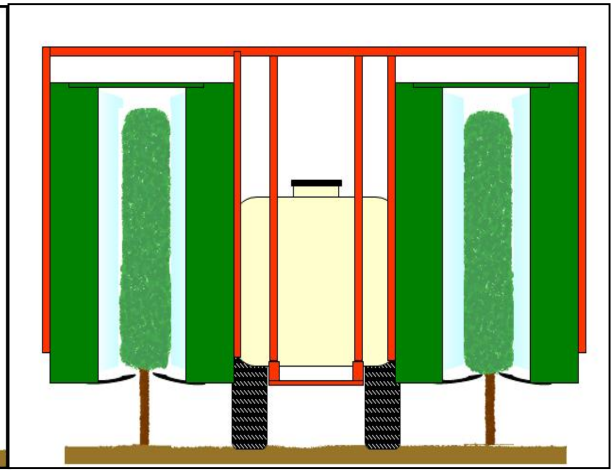
Pictures: Ipach DLZ-Rheinpfalz



Tangential- fan sprayer

Ådistance to target more equal

ÅAir directed parallel to canopy



Tunnel sprayer

Ådrift is collected by shields

ÅSpecial training of crop is necessary / cannot operate everywhere

Measurement of drift reduction concentrates on complete sprayer and its configuration ï a challenge for drift classifications

Indirect spray drift reduction measures

- Buffer zones
- Untreated zones
- Hedge rows catching the spray
- Hail nets

Different regulations in EU !

Some countries link buffer zones with drift reducing techniques

Future requirements: ? label information on distance requirements concerning drift depend on drift classification of spray equipment

Summary: Key parameters to manage the spray drift risk in arable applications

Direct measures

- Reduce fine droplets (use spray drift reduction techniques)
- Spray with the correct boom height
- Spraying speed < 8 km /h along sensitive areas
- Plan application carefully, consider weather forecast, be especially aware when spraying along sensitive areas.

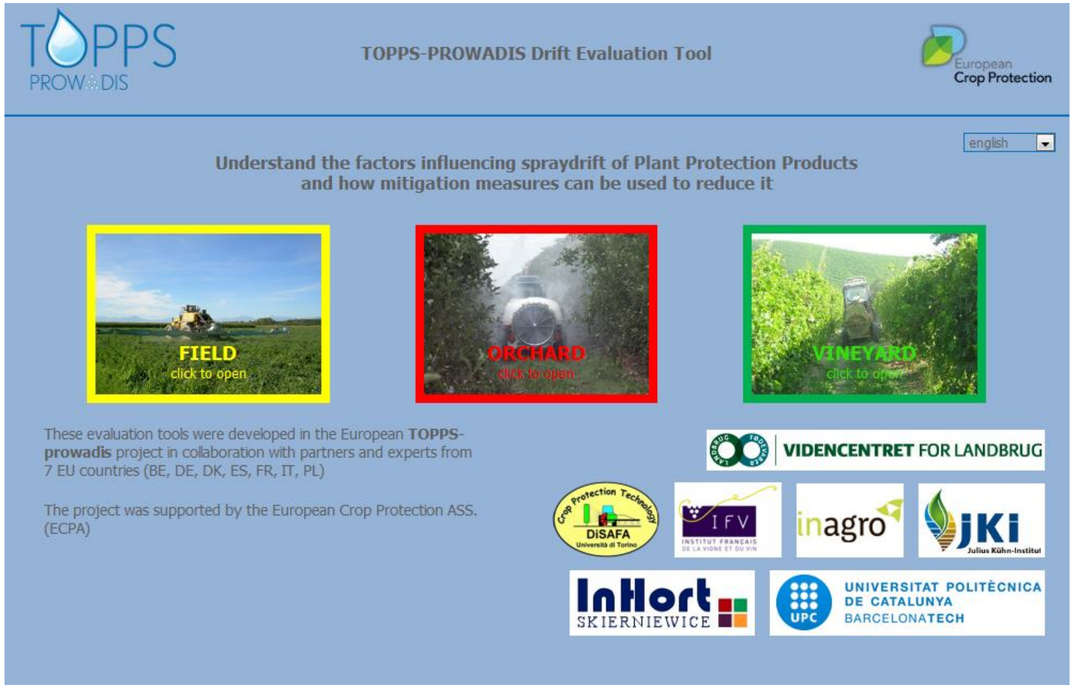
Indirect measures

- Hedgerows catch spray drift
- Consider buffer strips / untreated zones

TOPPS
Water Protection

Understand more about drift risks and drift reduction

www.TOPPS-drift.org



Field crops / Orchards / Vine – 8 languages
Education and awareness