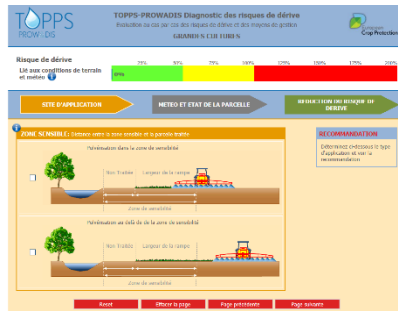
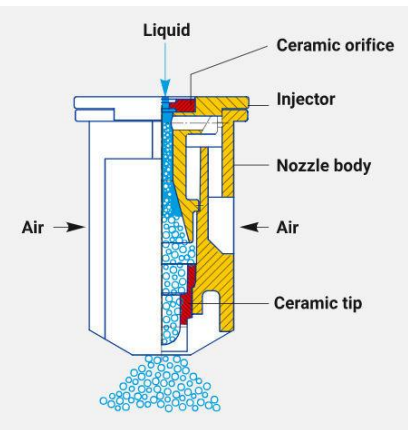


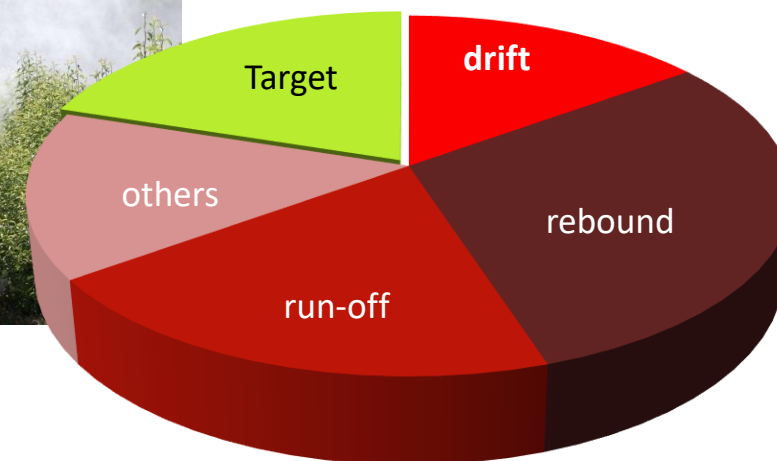
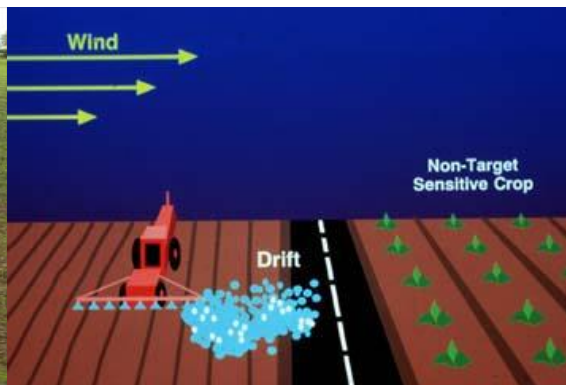
Thematic 2. Spray drift reduction

David Nuyttens



What is spray drift?

= the quantity of PPP that is carried out of the intended spray treatment zone by the action of air currents (wind)



Possible consequences:

- ▶ Damage to sensitive adjoining crops, plants and other susceptible off-target areas
- ▶ Water contamination
- ▶ Health risks for animals and humans
- ▶ Lower dose than intended on the target field and an uneven spray distribution
- ▶ Etc.



Factors affecting spray drift (risk)?

- ▶ Spray application technology
 - Spray quality (nozzle type, spray pressure, etc.)
 - Sprayer factors (air support, tunnel sprayers, etc.)
 - Application rate (variable rate spraying)?
- ▶ Spray liquid properties
- ▶ Climatic conditions
- ▶ Vegetative or artificial drift collectors
- ▶ Crop characteristics
- ▶ Buffer zones or no-spray zones



INNOSETA: Technological innovations to reduce spray drift risk



Field Crops



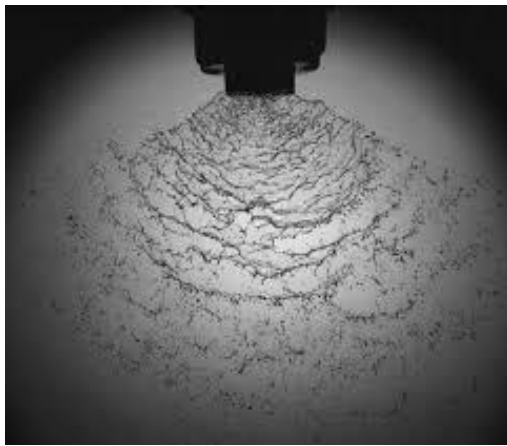
Orchards



Greenhouses

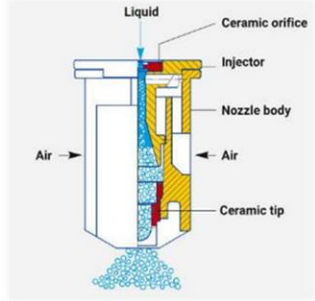


Vineyards





Overview innovations in field crops - spray drift reduction



Drift reducing nozzles



Border nozzles



Shielded spray boom



Air support



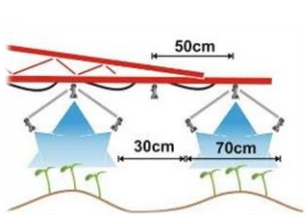
Air injection nozzles



Electrostatic/ magnetic spraying



Droplegs



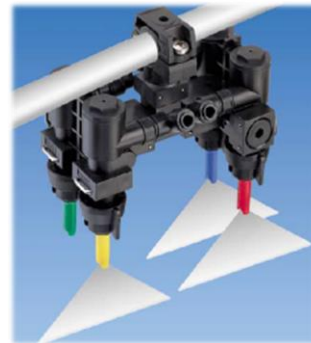
Band spraying



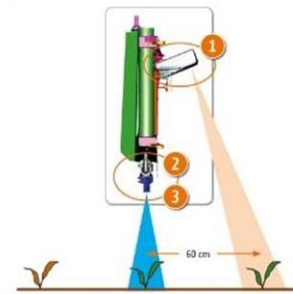
Reduced nozzle distance and boom height



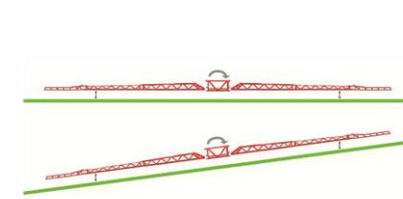
Pulsating (PWM) nozzles



Precision variable rate sprayer



Precision variable rate sprayer with cameras/sensors



Boom stability control system



Automatic boom height control





Overview innovations in field crops - spray drift reduction



Drift-reducing nozzles

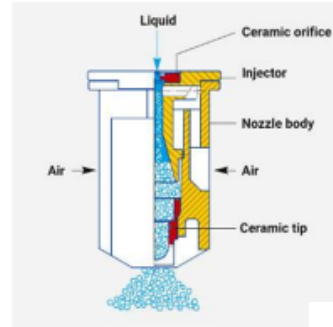
Air injection flat fan nozzles (Hardi Injet, Agrotop TD, Albuz AVI, Lechler ID3, etc.)

Hydraulic nozzles that have a fluid channel with narrowing and two air intake openings.

Because of the venturi effect, the liquid flow mixes with air, producing coarse droplets (filled with air).



Advantage	Downside
<ul style="list-style-type: none"> Lower cost price compared to other techniques High drift reduction up to 90% as of ISO 03 for some specific nozzle types (limited spray volume) In accordance with legislation (IPM & buffer zone regulation) Coarser droplets \Rightarrow better penetration into the crop 	<ul style="list-style-type: none"> More expensive than standard nozzles Larger nozzle sizes are often required for 90% drift reduction Switching between nozzle types Still questions about bio-efficacy (e.g. contact herbicides) Risk of blockages and breakage (long nozzles) \Rightarrow compact air injection nozzles e.g. Lechler IDK mostly used at higher pressure (3-8 bar) \Rightarrow not feasible for "all" devices (exception e.g. CVI: 1,5 – 3 bar)



Lechler IDK - Platform



Air support

Bi-air (Delvano), Twin technology (Hardi), etc.

With the help of one (or more) fans, an air flow is created that blows the droplets into the crop



Advantage	Downside
<ul style="list-style-type: none"> High drift reduction while maintaining a fine(er) droplet size spectrum \Rightarrow bio-efficacy Recognized drift reducing technique in Belgium (min. 75%) Higher deposition and penetration in the crop Higher capacity (lower spray volumes, higher driving speeds) 	<ul style="list-style-type: none"> Cost price, more expensive to maintain Requires expertise to correctly adjust air support in function of conditions and crop stage (fallow ground!) Tractor with more power required, higher weight



Delvano Bi-air



Hardi Twin



SprayVeg (Caffini)

Delvano Bi-air - Platform



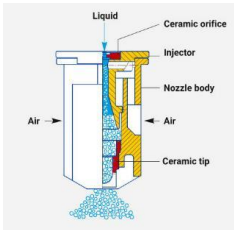
Field crops - spray drift reduction: Main challenges & Issues

- ▶ ‘All’ participants agreed that drift reduction is a challenge of high priority to support environmental protection
- ▶ Need to demonstrate and communicate to farmers, advisors, manufacturers, etc. that drift reducing technologies are effective in reducing drift without penalizing the quality of the application and bio-efficiency
 - Nozzles with high drift reduction (big droplets!) with maximum bio-efficiency and practically achievable spray volumes (quote: 90% drift reduction, 100% efficiency)
 - Need for alternative drift reducing techniques in addition to drift reducing nozzles which are 1. affordable (w/wo subsidies), 2. reliable, 3. user-friendly/fully automatic, 4. Suitable for various crops and problems
- ▶ Importance of clear communication about drift and drift reduction not only to farmers but to all stakeholders and the general public.

Highest ranked innovations in field crops - spray drift reduction



Drift reducing nozzles



Lechler IDK



Albuz AVI



Lechler ID3

- + Lowest cost price
- + High drift reductions
- + Can be mounted on 'every' sprayer



Air support



SprayVeg (Caffini)



Hardi Twin



Delvano Bi-air

- + High drift reduction with finer droplets
- + Improved crop deposition/penetration
- + Increased capacity (higher speed/lower application volume)



Shielded spray boom



Wingsprayer



Dubex



Redball



Varidome

- + High drift reduction with finer droplets
- + Cheaper than air support
- + Improved crop deposition
- + No extra power needed

Field crops - spray drift reduction

Ways to promote top ranked innovations



► Drift reducing nozzles

- Need to develop a communication plan involving all stakeholders (PPP companies, sprayer manufacturers, agricultural development agents, etc.) to promote their use
- Sprayers could be factory fitted as standard with air injection nozzles to encourage farmers to use them
- Demonstration and communication of bio-efficacy of drift reducing nozzles especially for contact products



► Air support

- More tests in practice to demonstrate the added value (cost-benefit) , not only in experimental settings but also in the field of the farmers
- Exchange of positive experiences from countries where air support is frequently used (e.g. The Netherlands)

Field crops - spray drift reduction Collaborations & priorities for (EU) policies

- ▶ Harmonize EU drift regulations because drift reduction classifications (might) differ between countries
- ▶ Drift reduction (regulation & means for drift mitigation) issues should be included in the mandatory training courses that are followed by all professional users, advisors, trainers, etc.
- ▶ Launch a communication campaign to farmers and the general public
 - Present the spraying technologies that are currently in use and that will be adopted in the near future
 - Good spraying practices, such as the use of air injection nozzles, should be explained
 - This communication campaign would also help to promote social acceptability of PPP spraying



Orchards

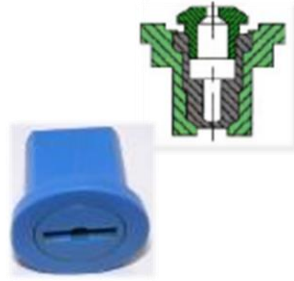
Overview innovations in orchards - spray drift reduction



Orchards



Air inclusion nozzles



Low drift pre orifice nozzles



Single/multi row cross-flow sprayer



Pulsating (PWM) nozzles



Fan air flow control



Micro-injection into the trunk



Recycling/tunnel sprayers



Pneumatic drift reducing sprayer



Electrostatic/magnetic sprayer



Automatic change of nozzle type(s)



Drift shields



Adaptable nozzle positioning acc. to the target



Smart sprayers/spray robots





Vineyards

Overview innovations in vineyards - spray drift reduction



Vineyards



Air inclusion nozzles



Low drift pre orifice nozzles



Smart sprayers/spray robots



Dual fan sprayer



Fan air flow control



Pulsating (PWM) nozzles



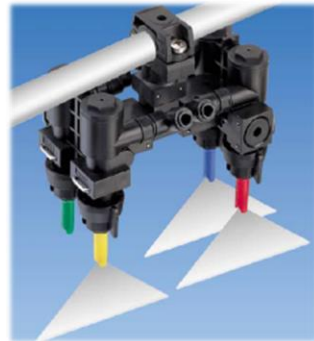
Recycling/tunnel sprayers



Pneumatic drift reducing sprayer



Electrostatic sprayer



Automatic change of nozzle types



Drift shields

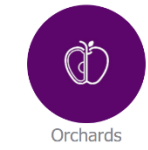


Adaptable nozzle positioning acc. to the target



Section control on narrow vineyard sprayers





Orchards



Vineyards

Orchards & Vineyards - spray drift reduction: Main challenges & Issues

- ▶ Differences in drift and bufferzone regulations between EU countries resulting in a lack of standardization of spraying equipment and practices at EU level
- ▶ Big variety of orchard and vineyard sprayers in use including a lot of sprayers not equipped with drift reducing equipment
- ▶ Difficulties to adopt/apply drift regulations in the field
- ▶ Lack of training courses for farmers & operators about spray drift, drift reducing technologies and practices and how to properly set a sprayer to reduce drift risk
- ▶ Increase the social acceptability of PPP spraying

Highest ranked innovations in orchards - spray drift reduction



Air inclusion nozzles 



Single/multi row cross-flow sprayer 



Adaptable nozzle positioning according to the crop architecture



Fan air flow control 



Highest ranked innovations in vineyards - spray drift reduction

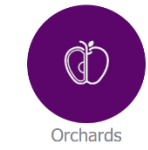


Air inclusion nozzles 



Recycling/shielded sprayers 





Orchards & Vineyards - spray drift reduction

Ways to promote top ranked innovations



► Air inclusion nozzles

- Develop a communication plan involving all stakeholders (PPP companies, sprayer manufacturers, agricultural development agents,...) to promote their use
- Demonstration and communication of bio-efficacy of drift reducing nozzles + include drift reducing nozzles in the efficacy evaluation of PPP



► Single/multi row cross-flow sprayer & recycling/tunnel sprayers

- Adapt the training systems (tree axes or fruit hedges) in order to facilitate the use of cross flow sprayers & recycling/tunnel sprayers efficiently for drift reduction
- Purchase subsidies to promote innovative technologies

► Training

- Involve different actors (farmers & contractors, advisors, sprayer and PPP manufacturers and distributors, etc.)
- Not only focus on 'high tech' innovations but also include sprayer adjustment for drift reduction using their current sprayers
- Need for decision support tools related to drift



Orchards

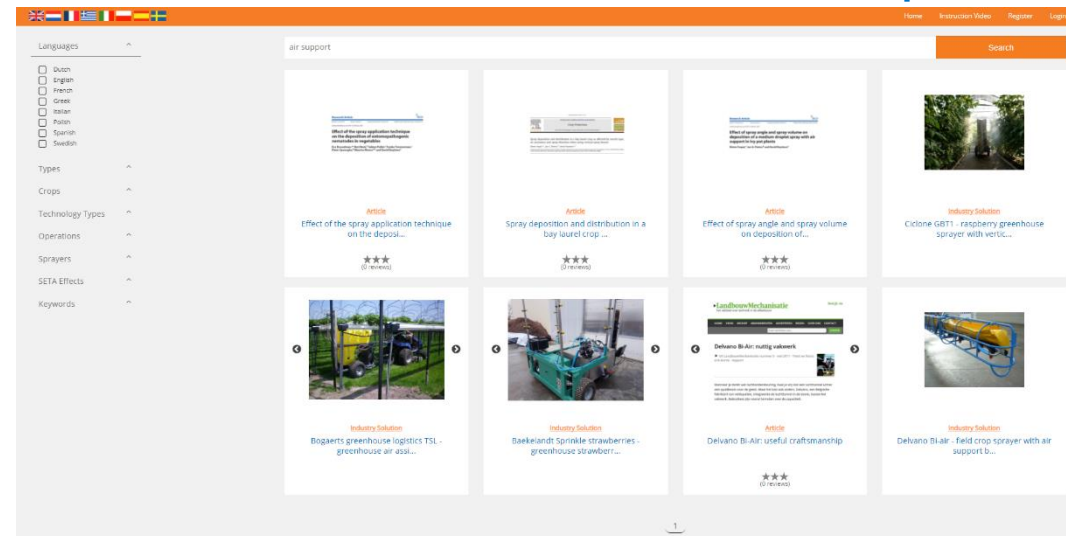
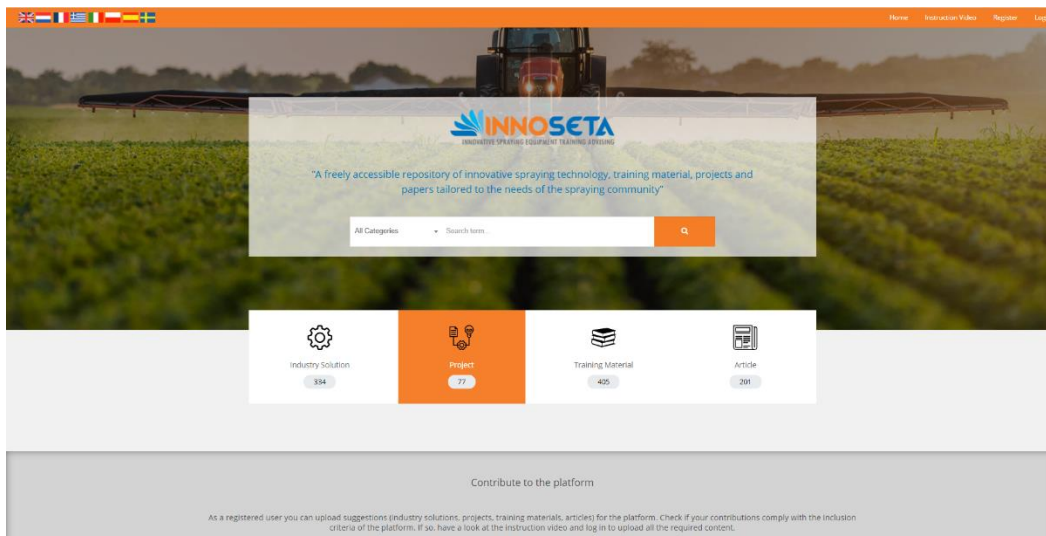


Vineyards

Orchards & Vineyards - spray drift reduction Collaborations & priorities for (EU) policies

- ▶ Adopt/plan a scrappage program for old sprayers and promote (e.g. with purchase subsidies) the step-by-step renewal of the sprayer fleet towards more efficient machines
- ▶ Harmonize EU drift regulations to facilitate the adoption of drift reducing technologies by farmers (e.g. harmonized classification of drift reducing nozzles, buffer zones, etc.)
- ▶ Include good practices for drift reduction in the EU mandatory training courses
- ▶ Launch clear communication campaign towards society/neighborhood to improve social acceptability of PPP spraying (information meeting with residents, alerts to inform neighborhood before spraying, etc.)
- ▶ Improve the accessibility to EU training materials, good practice guides, etc. ⇒ **INNOSETA platform!**

www.platform.innoseta.eu



Thank you for your attention!
Contact: david.nuyttens@ilvo.vlaanderen.be



putting research into practice