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New spraying technologies and their impact on sprayer inspection

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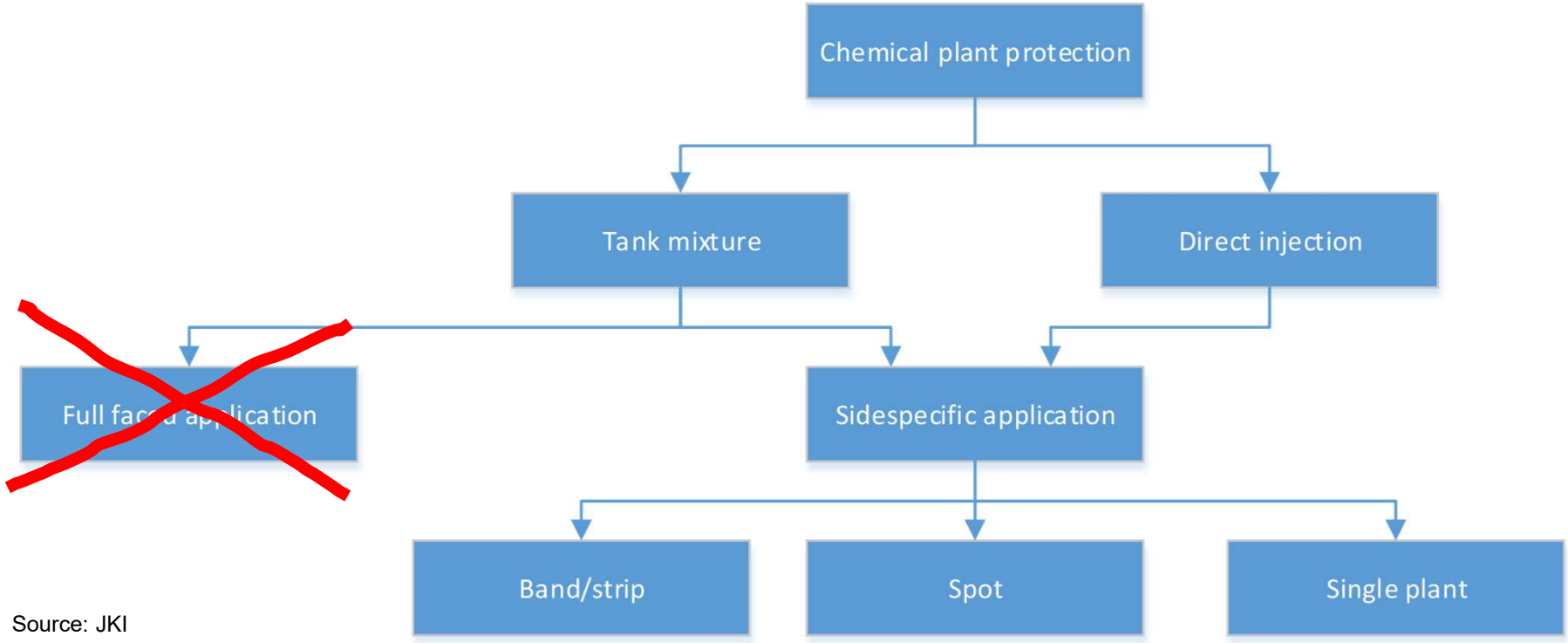
SPISE 8, World Horti Center, Den Haag, The Netherlands, 4. May 2023

Where will the journey end up?

Farm to Fork: SUR => 50% reduction of pesticides / risks???

Plant protection methods

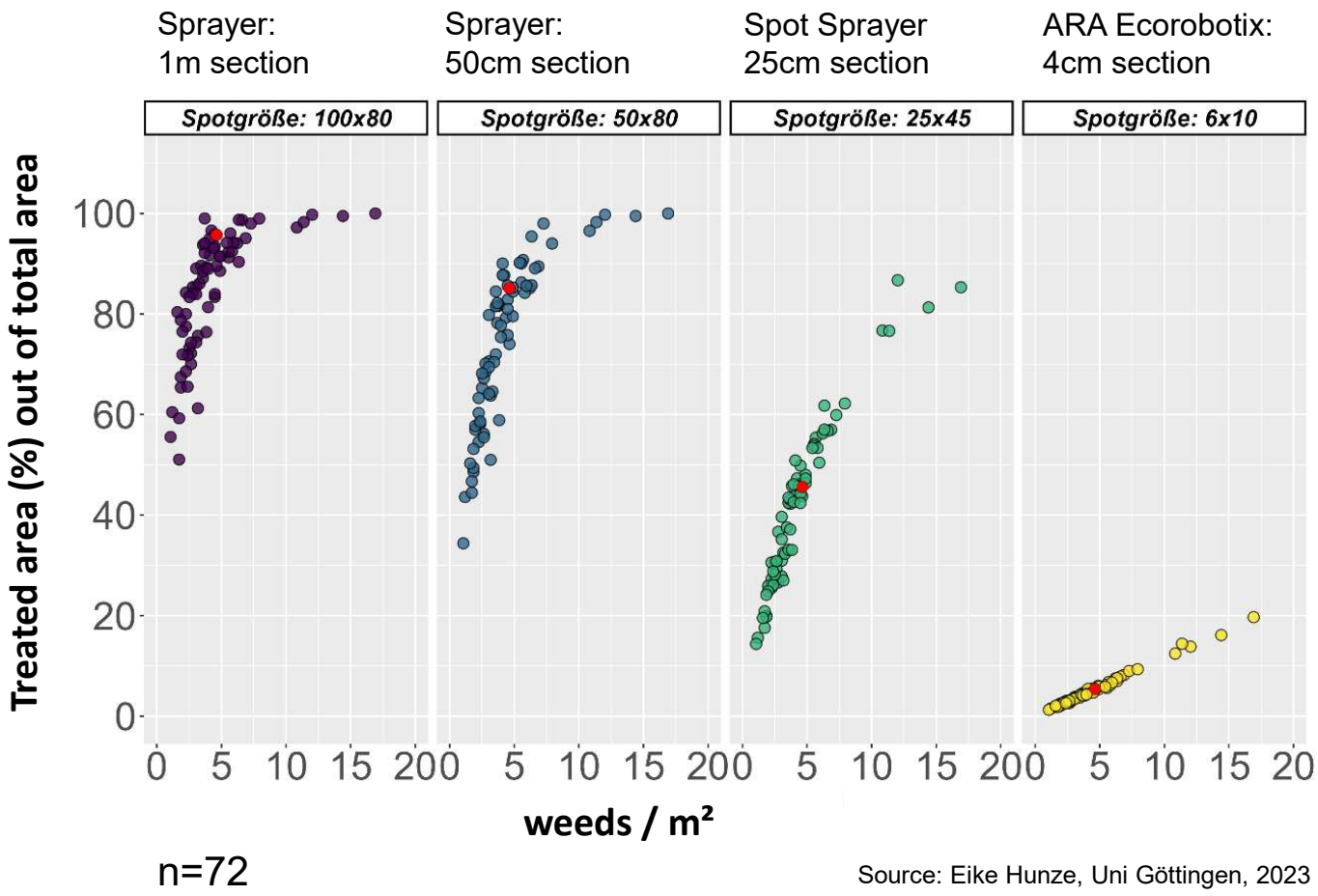


Source: JKI

Source: Amazone

Source: Ecorobotix

Savings of different technologies



n=72

Source: Eike Hunze, Uni Göttingen, 2023

The requested savings can only be achieved with new technologies!!!

Favoured technologies

Which technologies will be favoured through the SUR???

- Band spraying in combination with mechanical weeding
- Pulse Width Modulation
- Smart Spraying
- Variable rate application
- Direct injection with descision support system
- UAV
- Autonomous robots for high precise spraying
- Sensing technologies
- Digital Tools (e.g. drift radar, OPAL)

Challenges: PWM

Control of PWM:

Experiences in Germany from testing and controlling

- Failure of valves due to wear and tear => massive problems with cross distribution. How to handle within the control rythm of 3 years?
- Actual approach: Measurement of cross distribution without and with (DC 50%) PWM. If cross distribution with PWM is to poor, than there is a problem with the valves. In this case the sprayer gets the sticker with a record, that the PWM system does not work properly. Farmer needs to contact producer.

What experiences are there in other MS?

How are the problems handled there?

Challenges: Smart Spraying

Inspection of sensing technolgies:

On modern field crop sprayers / orchard sprayers sensing systems are used for e.g.

- weed detection
- gap detection in foliage wall
- tree row detection for switching on/off

Topic of inspection?

Methods?

Challenges: UAV

Inspection of UAV:

Germany: Appropriate UAV with spraying device for practical use are listet after testing by JKI

- There is a JKI-guideline (4-1.2) and a check-list for the inspection of these spraying devices:
  - Which measures have to be inspected
- The guideline is based completely on inspection measures for aerial spraying – no new or extra measures
- Furthermore, there is a step by step instruction, written by Harald Kramer, for the workshop staff

Problem: There are just a few UAV (~10) and there are only very few workshop (~1) at the moment, offering the inspection of UAV => lack of knowledge, training needed

Challenges: autonomous robots

Autonomous field crop spraying robots

Germany: Actually, there has not yet been a test case, but it probably will come soon.

- ARA Ecorobotix tractor implement has been testest at JKI so far, there is also a robot version
- Further spraying robots may enter the market

Are there any experiences in other MS for the inspection of spraying robots?

Challenges: Variable rate application

Variable rate application

- Authorization: Farmer can reduce the authorized dosis per m². It is not allowed to exceed the authorized amount within a zone/spot of the field.
- How to inspect the functionality of variable rate dosing?
- PWM
- Zweistoffdüsen
- Druck

- Generel problem of PWM with tear and wear of valves

Challenges: Weather stations

Weather station on sprayers

- Some sprayers are equipped with weather station on board in order to document the weather conditions during application
- Functional test necessary for inspection purposes?
- Conditions on sprayer during forward movement are not similar to wind speed in the field. There are nautical weather station being able to consider forward speed while measuring the wind speed => calibration necessary? How to consider this in the context of inspection?

Digital tools – drift radar

Example: Drift Radar

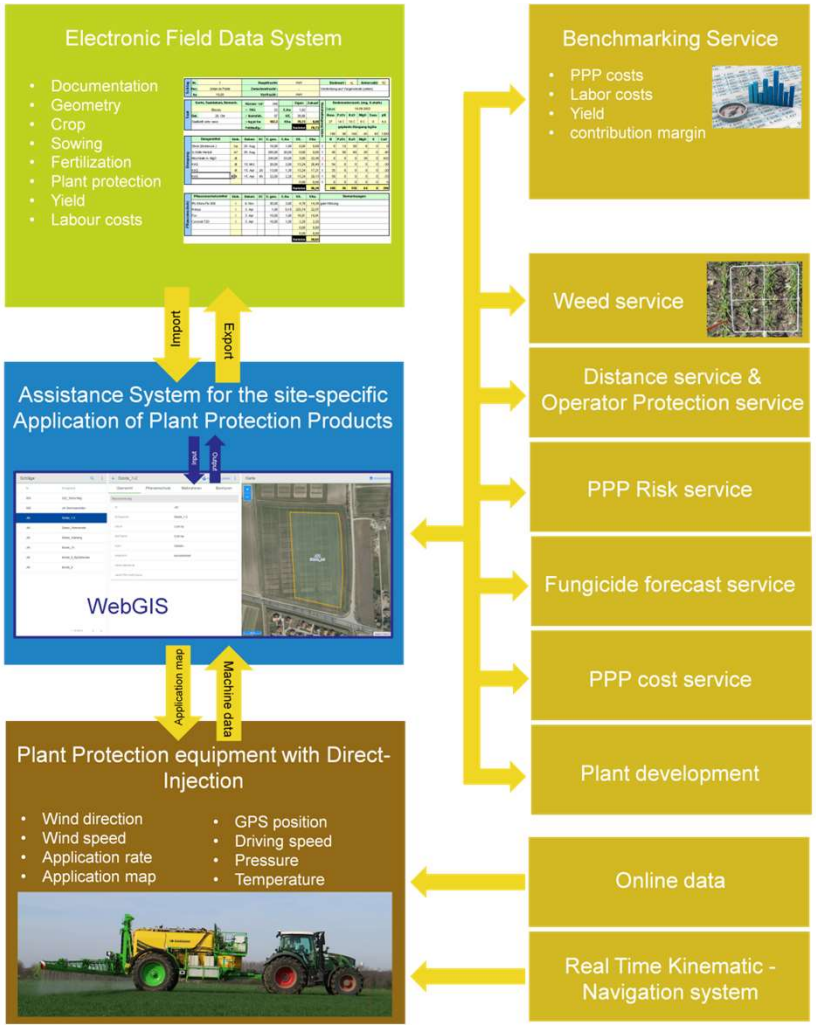
Drift radar is a digital tool with the aim of reducing risks at one hand side and reducing buffer zones on other hand side.

It works on basis of a nautical weather station on board of a field crop sprayer in order to measure wind speed and wind direction.

On field sides with incomming wind buffer zones can be minimized, because drift is not leaving the treated area.

- Topic for inspection?
- Methods?

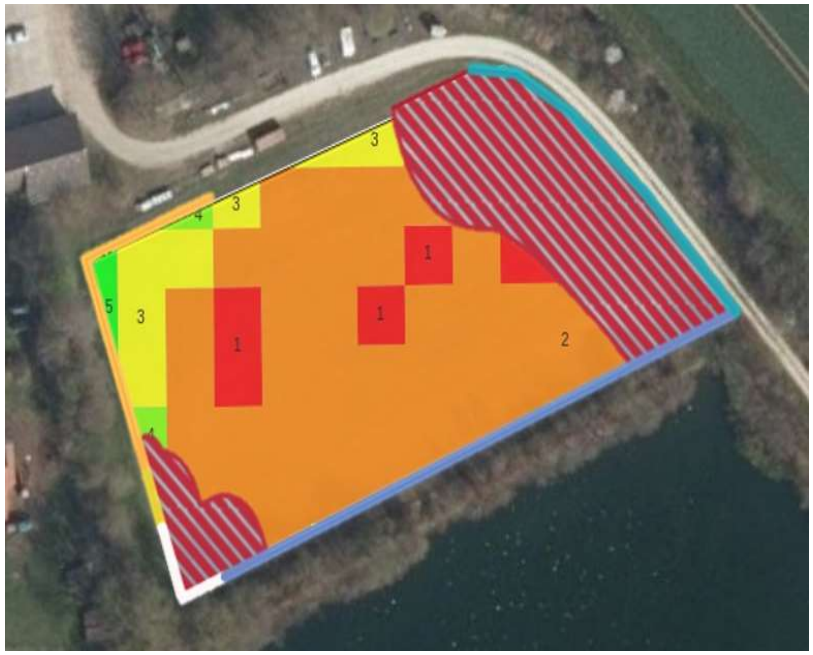
Digital tools: Descision support system OPAL



Quelle: JKI

Digital assistance through the whole process:

- planing
- loading and mixture
- application
- documentation



ISO-XML Application map containing all information:

- different PPP
- type of nozzles
- application rate
- pressure
- distance requirements to field borders

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Challenges: ISOBUS

ISOBUS / alternatives

- Problem: Application maps can be uploaded via ISOBUS onto the sprayer. Not all ISOBUS are able to process the external data
- Some companies (e.g. Bayer Crop Science) are working on alternatives to upload the application maps bypassing the ISOBUS
- Is this a topic for inspection?

Conclusion

- There will be lots of new questions
- New technologies can be inspected using already available advices and norms in many cases.
- In some cases, we have to set up new advices on how to inspect special devices
- Training of workshop necessary
- We have a huge gap between the number of emerging technologies and the capacities for setting up the conditions in inspection, training etc.

Thank you for your attention

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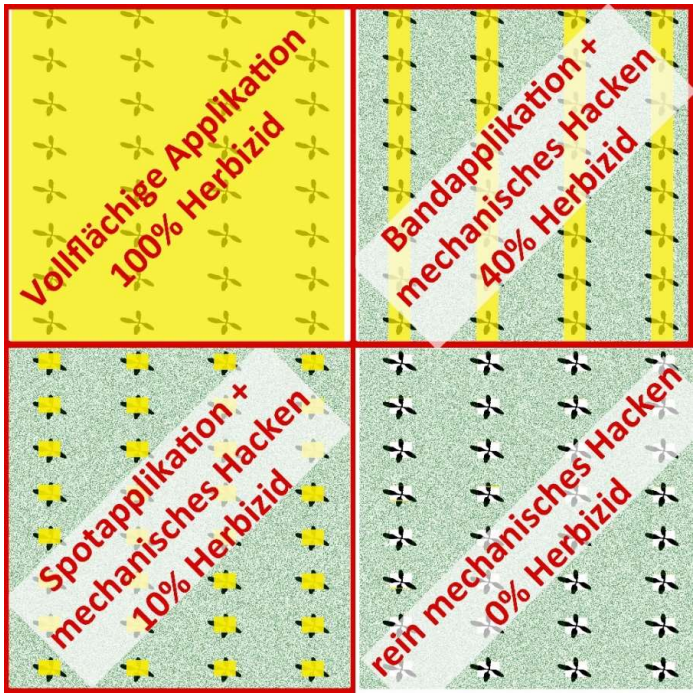
Applikationstechnik

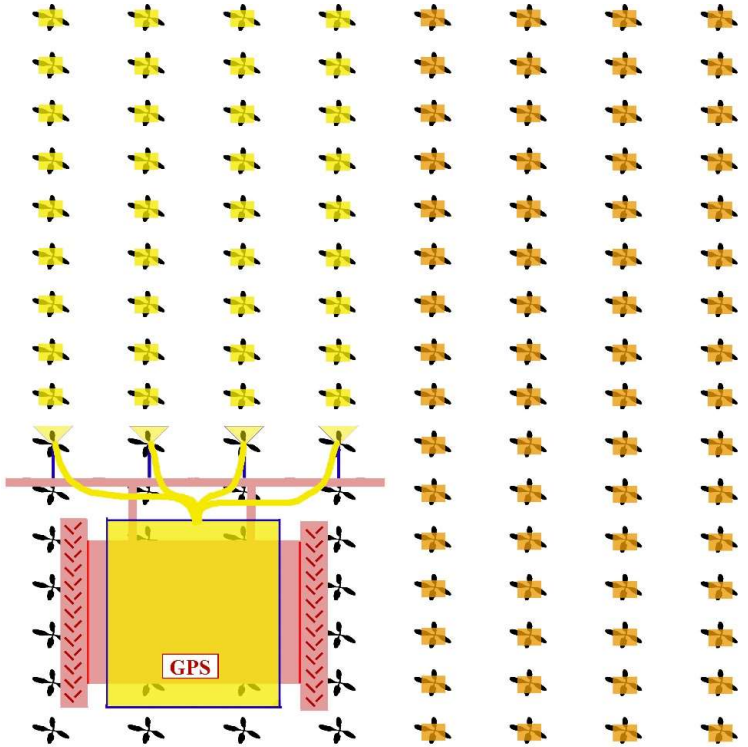
Technische Universität Braunschweig

JKI

Spot Applikation zur Reduzierung des Herbizideinsatzes
Spot Applikation zur Reduzierung des Düngebedarfs?



Potenzial der Herbizideinsparung bei verschiedenen Verfahren



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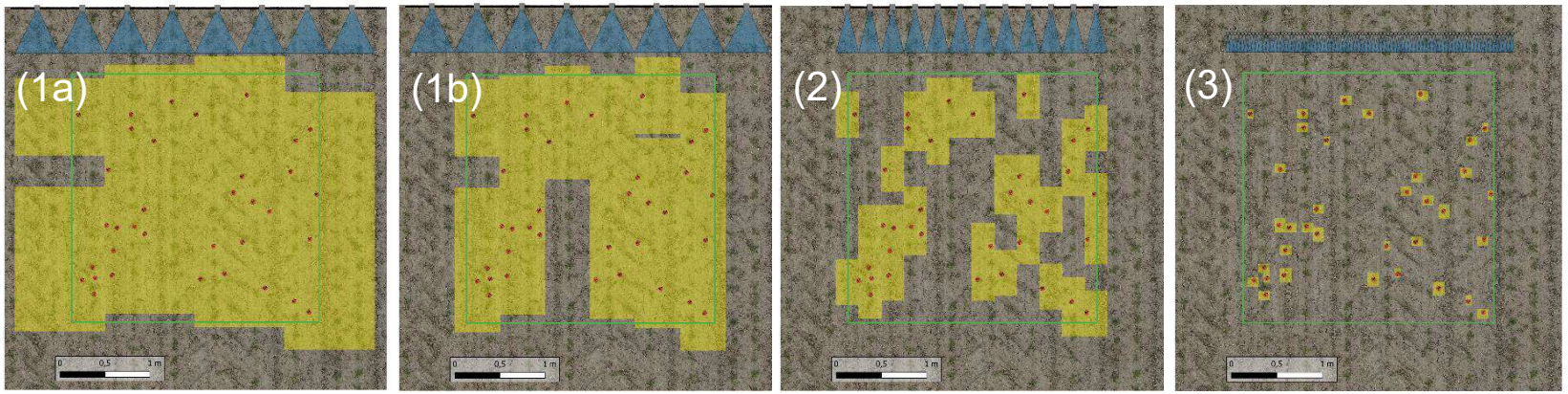
Einsparpotentiale verschiedener Varianten

Technik	Teilbreite	Spotgröße minimal
Feldspritze (1a)	1,0m	100x80cm²
Feldspritze (1b)	0,5m	50x80cm²
Amazone Smart Sprayer (2)	0,25m + PWM	25x45cm²
ARA Ecorobotix (3)	0,04m	6x10cm²

Quelle: Eike Hunze, Uni Göttingen, 2023



Quelle: Eike Hunze, Uni Göttingen, 2023

Boniturfenster

Applikation

Bonitierte Unkrautstandorte

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Foto: Lohrberg

Foto: Hunze

Foto: Neufeldt

Einsparpotenzial abhängig von

- Unkrautdichte
- Unkrautverteilung
- Technische Auflösung
- Fahrgeschwindigkeit