LOCALIZED SPRAYING IN OILSEED RAPE CROP WITH A CONVENTIONAL BOOM SPRAYER

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01 BACKGROUND AND PROJECT OBJECTIVES

BACKGROUND. As a part of ECOPHYTO plan established by the French government to reduce the use of chemical plant protection products (PPP), specific spraying equipments are needed. Often these devices have small spray boom widths and they are very expensive.

OBJECTIVES. The project "PLEVOP" (development of in-row sprayer in oleaginous crops and protein crops), proposed by the technical Institute Terres Inovia, aims to define the conditions for successful localized post-emergence spraying for the herbicide applications on the row using large width devices, on rapeseed crop and sunflower, and completed by hoeing between the rows.

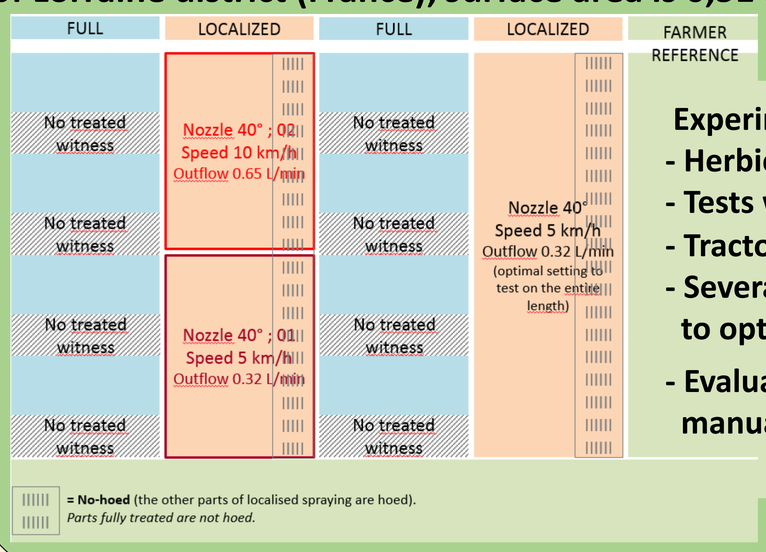
This work is carried out in connection with a manufacturer of agricultural equipment (the Marechal company), an agricultural cooperative (CAL) and a French public Institution of Higher Education (AgroSup Dijon).

02 MATERIALS AND METHODS

Specific sprayers are already used on sugarbeet for a local treatment on the row. In this projet, we have tested the use of a single conventional sprayer with a spray boom of 16 m for a full and localized herbicide treatment thanks to a GPS-RKT type guidance system.

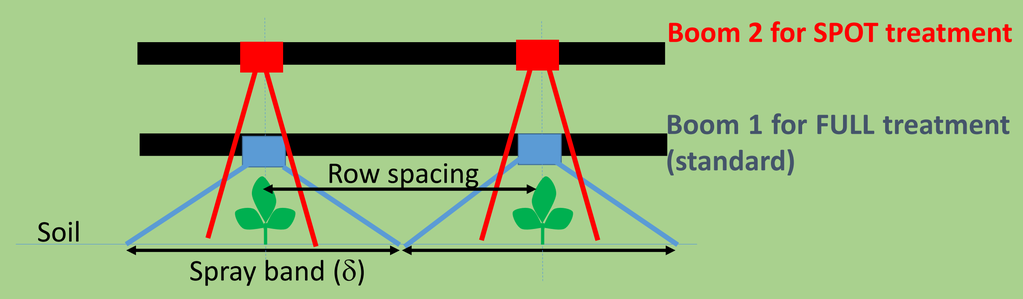
Agronomic experience: rapeseed trial Herbicide treatment- 2017-18

The experiment took place in an experimental site of Lorraine district (France); surface area is 0,514 ha.



Experimental conditions:
- **Herbicide: Cleravis (0,25l/ha)**
- **Tests with or without hoeing**
- **Tractor GPS guidance system**
- **Several settings were tested to optimize spraying**
- **Evaluation of efficiency with manual weed counting**

Useful formula for band spraying



SVPH : Spray volume per hectare (l/ha)

$$SVPH = \frac{600 \times Q}{v \times \delta}$$

Q: spray nozzle flow rate (l/min)
v: sprayer speed (km/h)
δ: Spray band(cm)

Specific spraying equipment

During sowing period, driller was coupled to GPS-RTK system
Boom width = working width of the sowing = 16 m

FLAT FAN NOZZLE : uniform liquid distribution

Decision-support tool for spot spraying

Engin:
- Nozzle angle
- Spray band
- Speed
- Flow rate (hl/min)

Field:
- Surface
- Row spacing

Spraying:
- Herbicide dose

INPUTS → D.S.T. → OUTPUTS

Benefits:
- Environmental: IFT, Health, …
- Economic: €

Spraying:
- SVPH
- High work output (ha/h)

Engin:
- Boom Height

03 PRELIMINARY RESULTS

→ Concerning this first agronomic trial, preliminary results confirm that this technique is interesting in terms of reduction of herbicide using (**Treatment Frequency Index : TFI**) and spray efficiency on crop row. Results were encouraging, demonstrating that "localized treatment on the crop row then hoeing" is as efficient as "full treatment" modality.

→ During experiences, the spraying settings had to be changed for the automatic calculations of herbicide and water quantities. Overall, we developed a decision support tool (DST) in order to assist farmers in the volume calculations of whatever their spraying settings. Environmental benefits have been added to sensitize the farmer to the positive effects of herbicide reduction.

Decision-support tool for spot spraying: an exemple

Surface area =0,514 ha, Tractor speed = 10 km/h, Flow rate= 0.65l/min, Herbicide =0,25l/ha

	Inputs:				Outputs:	
Examples of treatment	Angle (°)	Spray band (δ in cm)	Boom height (H in cm)	water | product Volume (l)	SVPH l/ha	Rate of used Herbicide (TFI)
Full	110	45	15.8	45|0.13	87	1
Spot	40	20	27.5	45|0.06	195	0.44

2,25

In this exemple, a herbicide reduction of 56%

04 CONCLUSIONS AND OUTLOOK

→ Finalize the decision support tool with an economic cost estimation.
→ Test guidance system with a camera interface has to be evaluated as well.
→ Need to confirm these agronomic results on other crops : sunflower and protein crops for example and using other phyto-pharmaceutical products.

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