# Patch and band spraying

May | 2022



Factsheet about integrated weed management

## Introduction

Patch and band spraying can help to reduce the use of herbicides. Apart from the benefits for the environment, a major reason to reduce herbicide use is to prevent herbicide resistance. If no selective herbicides are available, inter-row application of nonselective herbicides may pose an alternative in combination with mechanical tools capable of intra-row weeding (see mechanical weeding). Site-specific herbicide application/ precision spraying also offers an opportunity for further reductions in herbicide use<sup>1</sup>, but these technologies are still under development.

## Applicability

In theory, patch and band spraying can be applied in all crops. Patch spraying can be done based on mapped weed densities in the field or using image processing or weed detection in the field. For band spraying, a fixed band width is sprayed, often being the crop row. The band width, nozzle types and crop row distance need to be adequately combined.

#### Main reasons for growers to adopt band spraying<sup>2</sup>:

- Savings from reduced quantities of herbicides (table 1)
- Time savings by making several interventions at the same time (e.g. spraying, hoeing, fertilizing)
- Reducing environmental risks / impact
- Reducing the amount of water used for spraying
- Reducing soil compacting by combining interventions, thus the number of passages.

Table 1 | Percentage of soil area that is treated with banded herbicide application for different band widths and row distances of 75 cm.

band width (cm)	soil area treated
20	27%
25	33%
30	40%
38	50%

#### Equipment

Patch spraying requires scouting of the actual weed population, whether this is beforehand or directly realtime. Manual scouting is, however, highly time consuming and requires knowledge of weed species in very early developmental stages. This can be a barrier for the adoption of patch spraying and the possible use of decision support systems (DSS). Machine vision combined with image analyses through machine learning can take over the scouting task and several initiatives are under development with either airborne remote sensing or ground-based observations<sup>3</sup>.

When band spraying, combinations with other cultivations are often possible. The combination of banded herbicide application and mechanical weeding between the rows is often used. Three main configurations for band spraying can be used:

- A modified conventional spraying boom.
- Cultivator / hoe equiped with a sprayer.
- Seeder equiped with a sprayer.



- San Martín, C., Andújar, D., Barroso, J., Fernández-Quintanilla, C., & Dorado, J. (2016). Weed Decision Threshold as a Key Factor for Herbicide Reductions in Site-Specific Weed Management. Weed Technology, 30(4), 888-897. doi:10.1614/ WT-D-16-00039.1
- 2| Tessier, M.-C., & Leroux, G. D. (2010). Banded herbicide applications. In Q. Universit é Laval (Ed.): Centre de r efference en agriculture et agroalimentaire du Qu efebc (CRAAQ).
- 3| Behmann, J., Mahlein, A. K., Rumpf, T., Römer, C., & Plümer, L. (2015). A review of advanced machine learning methods for the detection of biotic stress in precision crop protection. Precision Agriculture, 16(3), 239-260. doi:10.1007/s11119-014-9372-7



#### **Core results**

Band-spraying combined with interrow hoeing in maize results in good and partial weed control along and between maize rows respectively. In three European trials, weed control along the weed rows was found to be ranging from 87-90%, whereas weed control between the rows ranged between 51-81%<sup>4</sup>. With full field application, this ranged from 79 to 95% overall. Yield and economic returns were maintained during the trial period.

# **Extra information**

See <u>https://iwmpraise.eu/publications/</u> for all crop diversification strategies and their definitions, and for more information on integrated weed management and the following inspiration sheet:

• Prototype of camera controlled/guided postemergence inter-row cultivator combined with herbicide band application (along the crop rows).

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4) Vasileiadis, V. P., van Dijk, W., Verschwele, A., Holb, I. J., Várnos, A., Urek, G., . . . Sattin, M. (2016). Farm-scale evaluation of herbicide band application integrated with inter-row mechanical weeding for maize production in four European regions. Weed Research, 56(4), 313-322. doi:https://doi.org/10.1111/wre.12210