

Department of Agricultural Sciences



*New technologies call for new
research priorities in physical weed
control with low selectivity*

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Focus and concepts

Focus on post-emergence weed harrowing
– **but general to most low selectivity
methods**

Low selectivity implies that high degrees
of weed control are associated with
significant crop damage

Selectivity is defined as the relationship
between weed control and the
associated crop damage immediately
after treatment



What is new?

Free and user-friendly software to analyse the immediate crop impacts

www.imaging-crops.dk

Web-based software to assess weed density and/or weed leaf cover

<http://turbo.uni-hohenheim.de/index.en.php>



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Use of digital image analysis to estimate the immediate crop response to post-emergence weed control



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Not harrowed



Harrowed



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IMAGING Crop Response Analyser

Images

Image folders

Change password

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About the programme

Images

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Cereals

Upload multiple files

[Export this view to CSV](#)

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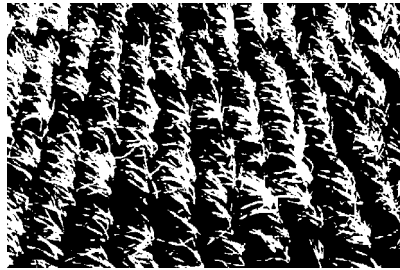
Image	Monochrome Image	Image File Name	Leaf Coverage	
		Before.jpg	0.33030	Show images
		After.jpg	0.11709	Show images

- Images are uploaded and analysed
- Leaf coverage (leaf cover index) is the proportion of green pixels

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Not harrowed
Leaf cover index: 0.33



Harrowed
Leaf cover index: 0.12



Difference = Crop soil cover = $100 * (1 - 0.12 / 0.33) = 64\%$

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Use of digital image analysis to estimate the immediate weed response is possible but counting is still preferred



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What should be prioritised in future research?

1. Investigation of factors that influence
 - The resistance parameters
 - Crop and weeds
 - The selectivity
 - The recovery parameters
 - Crop and weeds
2. Predictions of the optimal intensity and timing of soil cultivation
- (3. Interactions between soil cultivations in different growth stages)

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What is a resistance parameter and how is it estimated?

A parameter that describes the relative decline in leaf cover or plant density relative to the intensity of soil cultivation

The parameter reflects the ability of the plants to resist harrowing

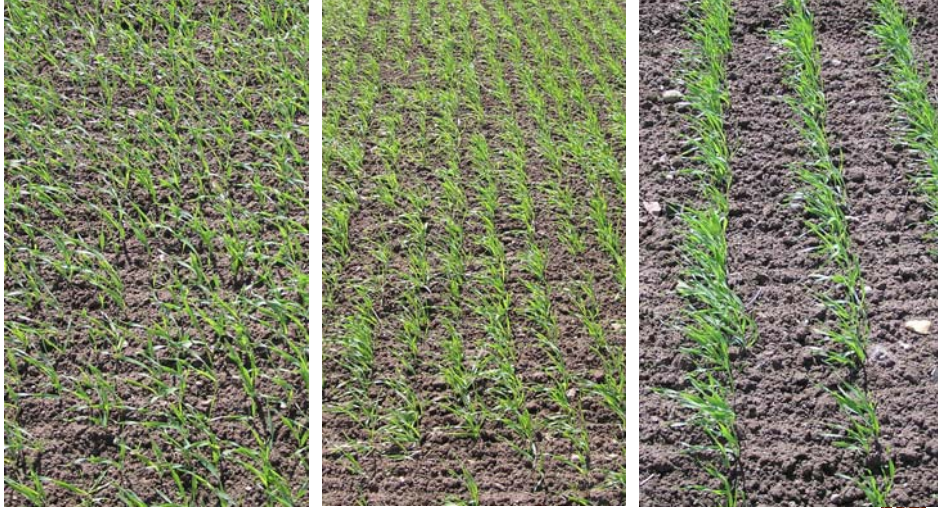
- Models and statistics are described in a new paper:
 - Rasmussen et al. (2008) Investigating the selectivity of weed harrowing with new methods. Weed Research (accepted)

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Harrowing – three different row distances

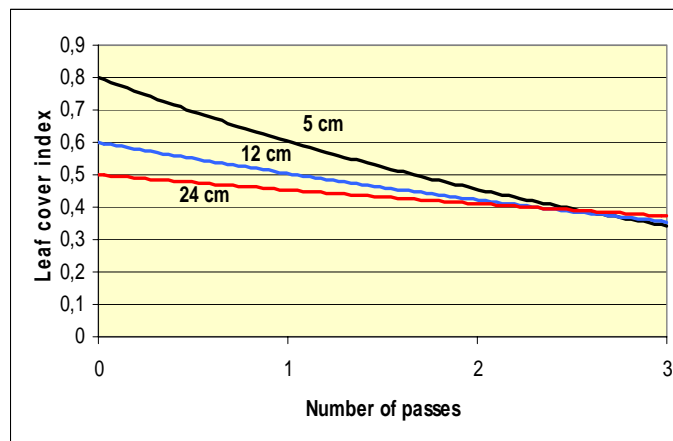
5 cm 12 cm 24 cm



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Resistance – barley

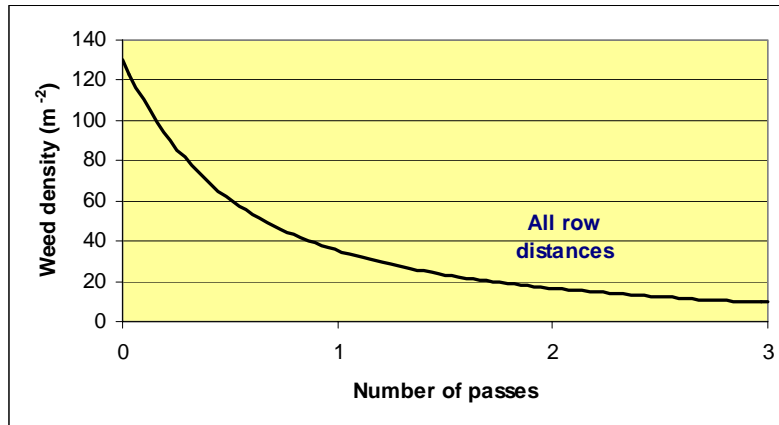
Increasing intensity of harrowing –
different row distances
- three different parameters



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Resistance – weeds

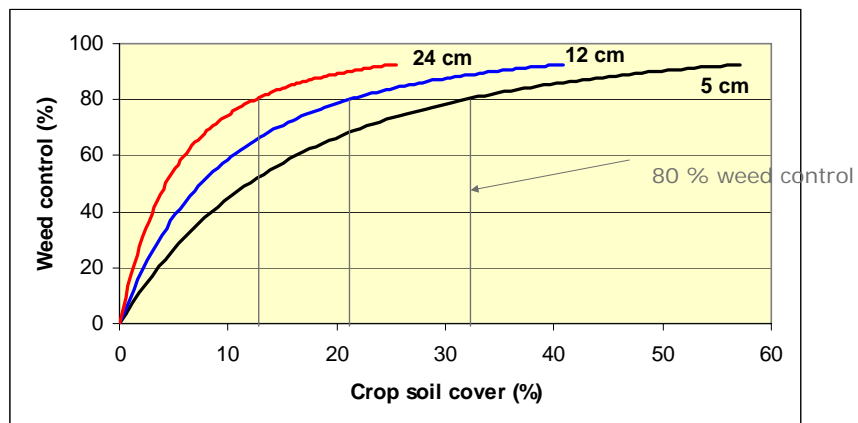
Increasing intensity of harrowing –
different row distances
- one common parameter



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Selectivity

Estimated from resistance parameters



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Low selectivity
- digital image analysis



High selectivity
+ digital image analysis



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What is a (crop) recovery parameter
and how is it estimated?

A parameter that describes the relative
decline in (grain) yield relative to (crop)
soil cover

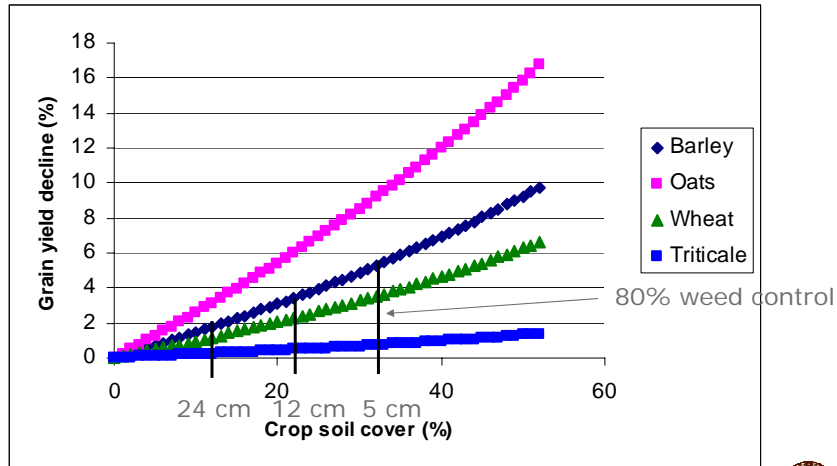
The parameter reflects the ability to
recover from (crop) soil cover

- Models and statistics are described in a submitted paper:
 - Rasmussen et al. (2008) Post-emergence weed harrowing – tolerance and selectivity parameters for different species and cultivars of cereals

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Four species of cereals – four recovery parameters (average of two years)



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Conclusion

1. Digital image analysis software
2. Experimental designs with graded levels of treatment
3. Statistical models with unifying parameters

are all available and useful in research to develop decision support to physical weed control with low selectivity

Experiments are needed to estimate reliable resistance and recovery parameters

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