Department of Agricultural Sciences

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

Jesper Rasmussen,

Michael Nørremark* & Bo Martin Bibby*

* University of Aarhus, Denmark

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

5th International Weed Science Congress, Vancouver, British Columbia 2008

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

5th International Weed Science Congress, Vancouver, British Columbia 2008

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

5th International Weed Science Congress, Vancouver, British Columbia 2008

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

Not harrowed
Leaf cover index: 0.33
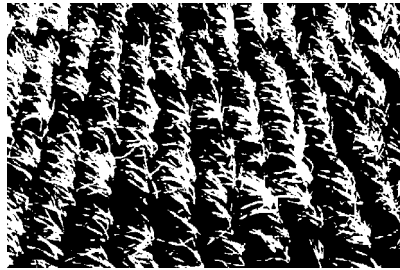
Harrowed
Leaf cover index: 0.12

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

5th International Weed Science Congress, Vancouver, British Columbia 2008

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)

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)

Harrowing – three different row distances

| 5 cm | 12 cm | 24 cm |

Resistance – barley
Increasing intensity of harrowing –
different row distances
- three different parameters
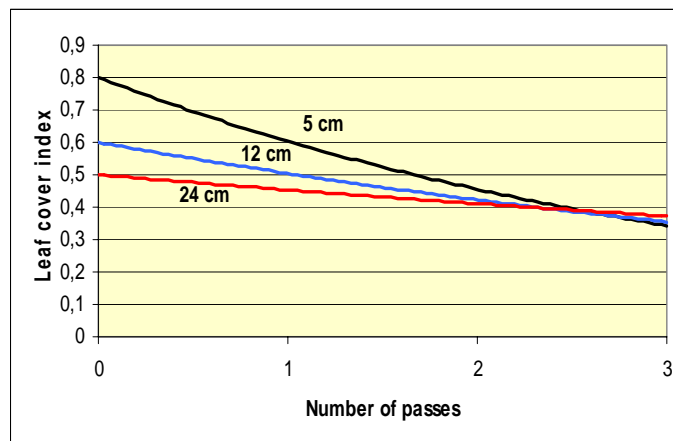
6

Resistance – weeds
Increasing intensity of harrowing –
different row distances
- one common parameter
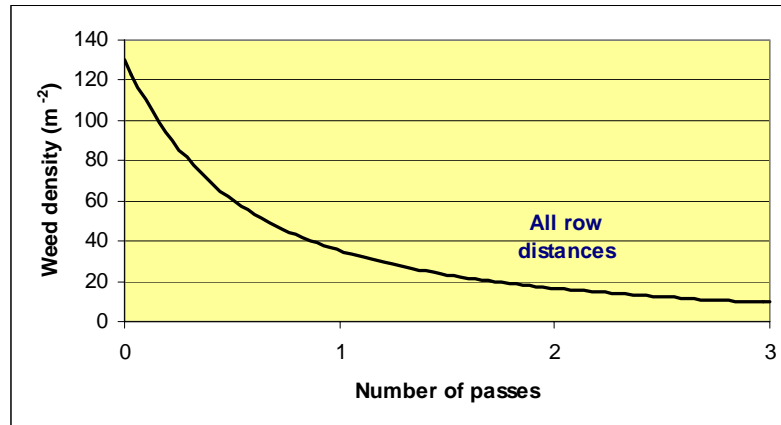
Selectivity
Estimated from resistance parameters
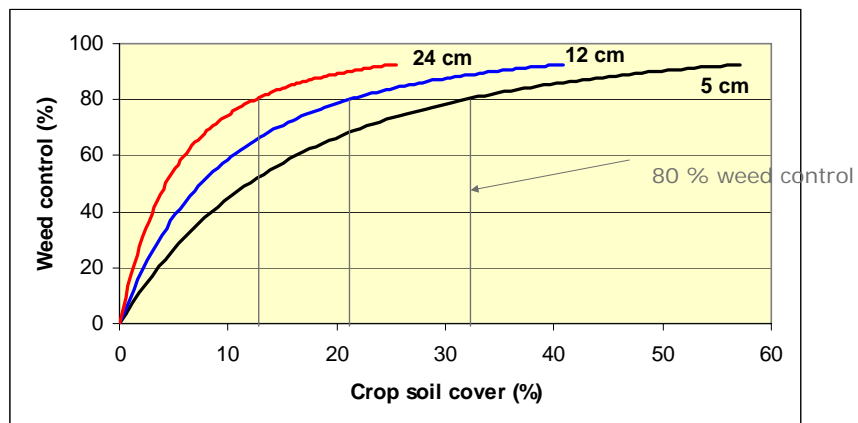
Low selectivity
- digital image analysis

High selectivity
+ digital image analysis

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

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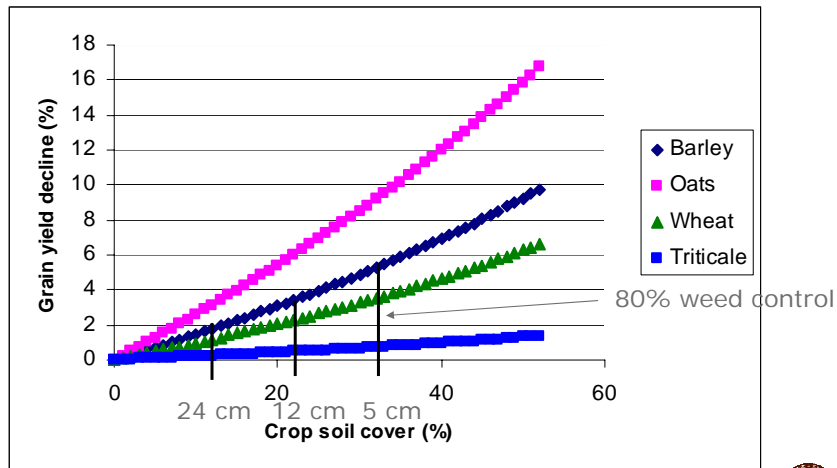
Conclusion

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