Precision weeding
- using weed sensors for efficient weed control -

Hermann Leithold, Head of Crop Protection
Precision weeding: using weed sensors for efficient weed control

Agenda:

1. Company Introduction
2. How can we differentiate between crops and weeds?
3. How can we use the H-Sensor for weed control?
4. What are the first results?
   1. Winter Wheat (triticum aestivum)
   2. Oil Seed Rape (brassica napus)
   3. Corn (zea mays)
   4. Soy Bean (glycine max)
5. Conclusion
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AgriCon GmbH - overview

- Full service provider in precision farming
- Consulting – Sales - Service
- biggest private held precision ag company in europe
- manufacture independent & farmers focussed
- transforming R&D into farming practice
- 18 years experience in precision farming
- 80 + employee
- 2/3 agricultural engineers
- Own R&D Department
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How can we differentiate between crops and weeds?

- Plants and residues can be discriminated by their absorbance of PAR

- Straw, Soil, Stones and even algae can be eliminated from the pictures

- Resulting images only consists of crops, weeds and grasses

- Intelligent and adaptable analyzation software recognizes each object
H-Sensor – Technical Fact Sheet

- First weed ID camera worldwide
- Distinguishes:
  - Crop
  - Broad-leaved weed
  - Grass weed
- Agronomic section control
- Up to 10 fps, Up to 12 kmh (online)
- 0.5 x 0.5 mm pixel resolution
- Independent of ambient light
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How can we use the H-Sensor for weed control?

<table>
<thead>
<tr>
<th>Stage</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergence herbicide</td>
<td>Full dose</td>
</tr>
<tr>
<td>Post-emergence herbicide</td>
<td>Full dose</td>
</tr>
</tbody>
</table>

BBCH | Aussaat
---|---
10  | 11  | 13  | 15  | 17  |
How can we use the H-Sensor for weed control?
How can we use the H-Sensor for weed control?
How can we use the H-Sensor for weed control?

- **What can be recognized depends on Crop Type and weed occurrence**

  1st Step:
  - crops – weeds - grasses

  2nd Step:
  - weeds – problem weeds (depending on crop)

![Diagram showing crop types and weed categories](image-url)
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First results – Winter wheat (Triticum Aestivum)

![Bar chart showing accuracy percentages for different categories.](chart.png)

- **DICOT**: 88.90%
- **MOCOT**: 71.50%
- **TRZAW**: 94.80%
- **GESAMT**: 92.80%

Correct classified pixel: 11.10%
Incorrect classified pixel: 28.50%

Spring 2014; 77 Bilder; 4134 Segment
First results – Oil seed rape (Brassica Napus)

Autumn 2014; 70 Bilder; 3248 Segmente
First results – Corn (Zea Mays)

**Diagram:**
- **Users' Accuracy [%]:**
  - DICOT: 85.77, correct: 14.23, incorrect: 19.81
  - MOCOT: 80.19, correct: 9.27, incorrect: 12.29
  - ZEMAX: 90.73, correct: 9.27, incorrect: 12.29
  - GESAMT: 87.71, correct: 12.29, incorrect: 12.29

**Note:**
Spring 2015; 75 Bilder; 2523 Segmente
Results from farmers fields

Chamomilla Matricaria

Galium Aparine

12th May 2015, Saxony, Farm Gruhl, 12 ha, Crop: ZEAMX
First results – Soy bean (Glycine Max)

- **DICOT**: 63.42%, 36.58%
- **MOCOT**: 87.17%, 12.83%
- **GLXMA**: 86.40%, 13.60%
- **GESAMT**: 84.49%, 15.51%

Spring 2015; 85 Bilder; 5176 Segment
First results – Soy bean (Glycine Max)
First results – Soy bean (Glycine Max)

I. Allgemeines
Versuchsansteller: Agricon GmbH
Versuchsort: Paulínia/SP [Brasilien]
Betrieb: Bayer CropScience
Versuchsanlage Parzellen
Kultur/Sorte: Soja/MonSoy 7908 RR
Aussaat: 23.04.2015

II. Versuchsglieder
H-Sensor Bonitur: 19.05.2015
Anbauhöhe: 100 cm
BBCH: 14

III. Ergebnisse
MOCOT
DICOT
GLXMA
Gesamt
Deckungsgrad [%]
Image 0929.bmp
0,0675
9,080
13,618
22,763
First results – Soy bean (Glycine Max)
First results – Soy bean (Glycine Max) – Crop identification
First results – Soy bean (Glycine Max) - Dicots identification
First results – Soy bean (Glycine Max) – Mocots identification
First results – Soy bean (Glycine Max) - Summary
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Summary

- H-Sensor is the first Sensor capable of differentiating crops, weeds and grasses
- For major crops classifiers have been developed
  - Accuracy is above 80-90 % depending on crop type
- Intelligent training system enables adaption to new crops, weeds and situations
- weed patches can be measured in high resolution
- Research Kits are available for institutes
- Full Market availability worldwide in Autumn 2016
Thank you for your attention

For further discussions.

10:00-10:15
Q&A with Ray Gaesser, Richard Smith and Hermann Leithold

10:15-10:45
Coffee break