

## An attempt to use image analysis to capture growth dynamics in mixed crops stands

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## Background

Demand for organically grown winter oilseed rape.

Problems with pests, nutrient supply and weeds

## Growing winter oilseed rape in a living mulch of white clover

- To reduce the problems with pests
- To reduce the need for separate green manure crops
- To introduce a "friendly" weed competitor

## Hypotheses on rape part of the project (short)

- Larger yields, N-yields
- Rotary strip seeding reduces variation
- "Brushing" increases rape biomass and yield
- Exist a LAI shifting point among species (image analysis)



## Conventional ploughing and seed-bed preparation

April 11, 2006



### Rotary strip-seeding

April 11, 2006



### Stubble cultivation and seeding

April 11, 2006



We would like to use image analysis to separate:

- Bare soil and plant debris
- Rape
- White clover
- Weeds

Bonesmo, H. Et al. 2004. Evaluating an image analysis system for mapping white clover pastures. Acta Agric. Scand., Sect.B, Soil and Plant Sci. 54: 76-82



2005-08-30



2005-09-07





2005-09-15



2005-09-22



2005-09-29



2005-10-06



2005-10-13



2005-10-21



2005-10-27

**Frame:**

$$I(x,y) = R(x,y) + G(x,y) + B(x,y)/3$$

R, G, B = red, green, blue

Converts to grey. 0 = black, 255 = white, >170 = 1 = frame

**Bare soil, plant debris:**

$$I_{RG}(x,y) = g(x,y)/(r(x,y) + 1)$$

r, g = red, green divided by image intensity, I.

Threshold  $I_{RG}$ , default 0,6.

Reducing  $I_{RG}$  means less bare soil

**Model assumption:**

Clover coverage – clover leaves are larger and more circular than grass leaves.

**Step 1**

Transform to grey image by carrying out a PCA-analysis and retaining the first component.

**Step 2**

The edges are computed using the Sobel method with a user defined gradient threshold.  
Clover = open areas, grass = many edges.

**Step 3**

Eroding (when many edges) and dilating (when few edges) the combined (with binary soil image) edge analysis.

User defined number of erosions.

The resulting area may also include weeds.

**Step 4**

Separate clover from weeds by using thresholds for smallest and largest weed area, respectively

## Conclusions – image analysis

- Frame easily separated
- Bare soil and plant debris can be separated from living plants (few tests)
- Plant form is not a suitable parameter to use when trying to separate rape from dicot weeds and white clover