Sugar beet: Digital phenotyping in the trial fields – Field vision technology

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Maribo Seed International

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Maribo Seed, Holeby Denmark

Sugar beet seeds

MARIBO trial field

Christianssæde, Denmark

PPT – Sugar beet seed technology field trials

- Field trials with focus on **seed quality** and **yield** improvement:
  - Seed production (maturity, seed yield)
  - Seed processing (sorting, cleaning, seed recovery...)
  - Seed enhancement (priming, pelleting, coating, treatment)

Field Vision Technology – Drivers

- Field emergence trials: Up to 10.000 plots/location, counted 2-4 x/year
- Currently spends >400 man-days per year on manual plant counting
- High labour costs:
  - Limits the frequency of plant countings
  - Forces some of the sowings to be done outside the optimal season

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- **2004**: Initiated joint-development project with local engineering partner (Frank Poulsen Engineering Aps) to automate plant counting to reduce costs of trials and to improve the quality of the data obtained
- **Today**: Uses digital phenotyping data (LAI) as an integrated part of the trial evaluation to help decision taking for seed treatments

Maribo Field Vision Technology

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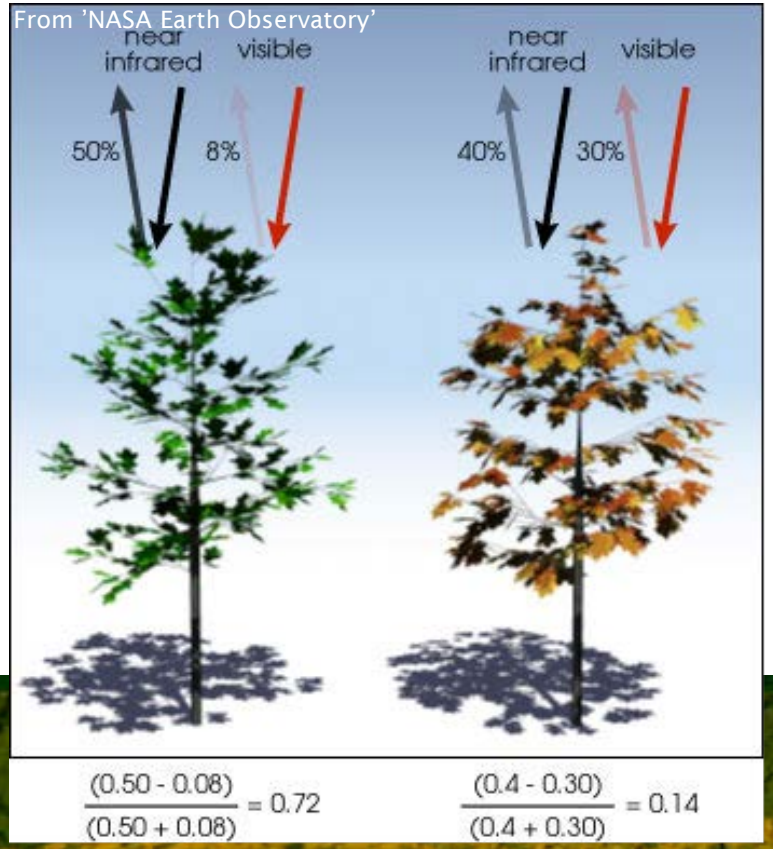
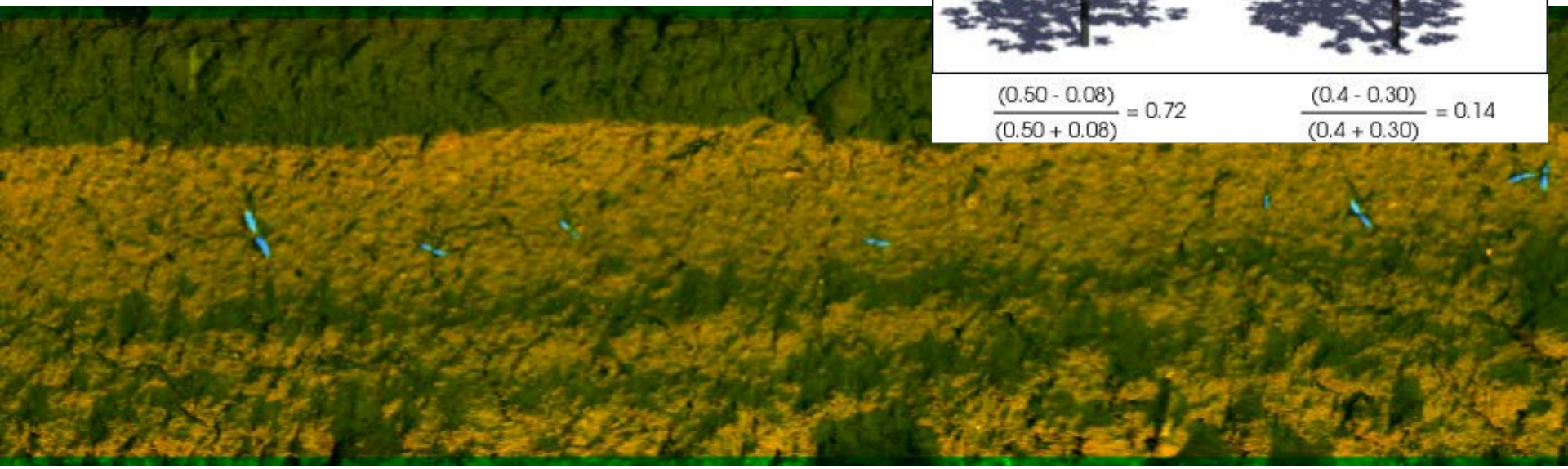
Principle

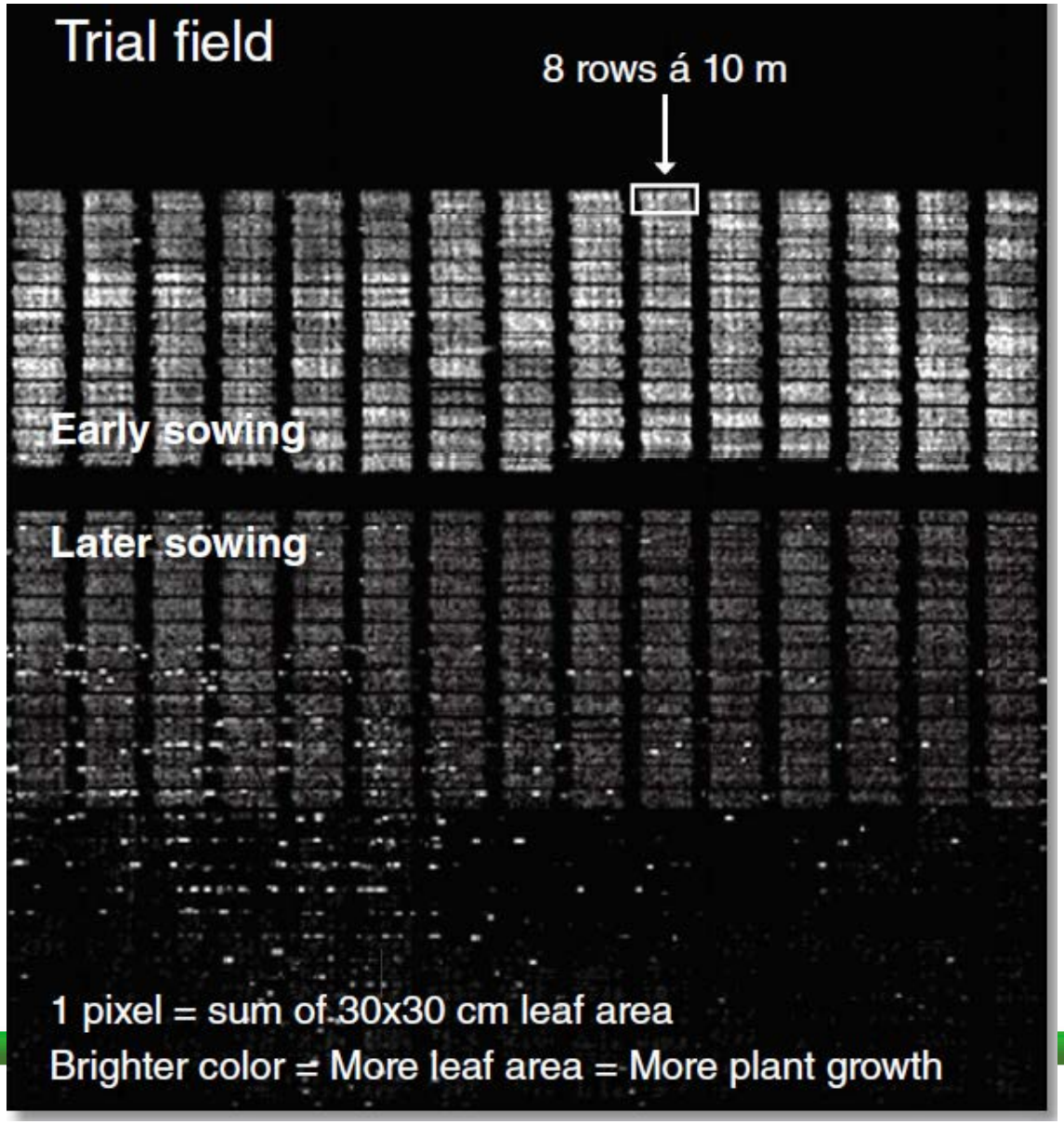
$$\text{NDVI} = \frac{NIR - Red}{NIR + Red}$$

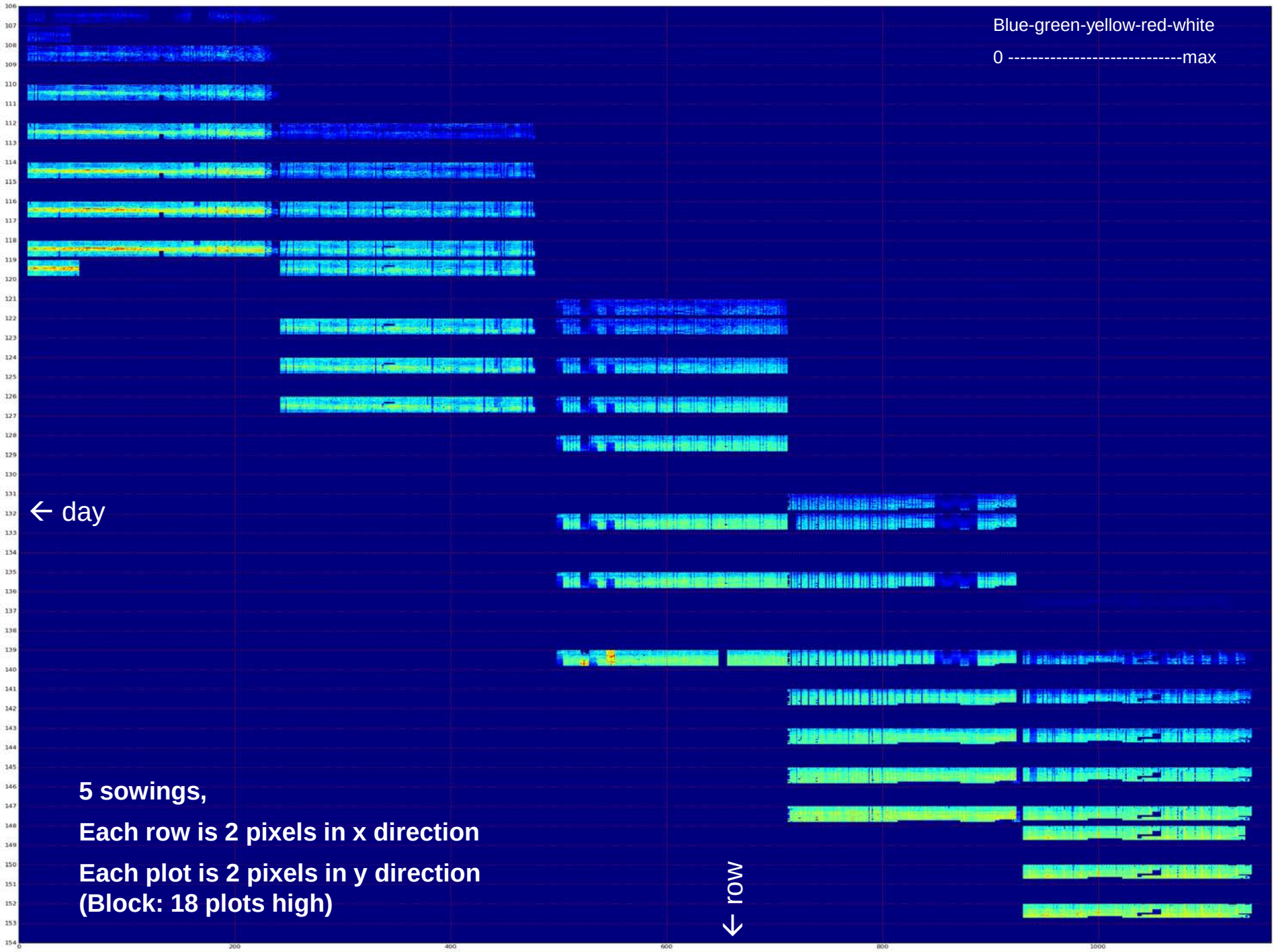
Normalized Difference Vegetation Index





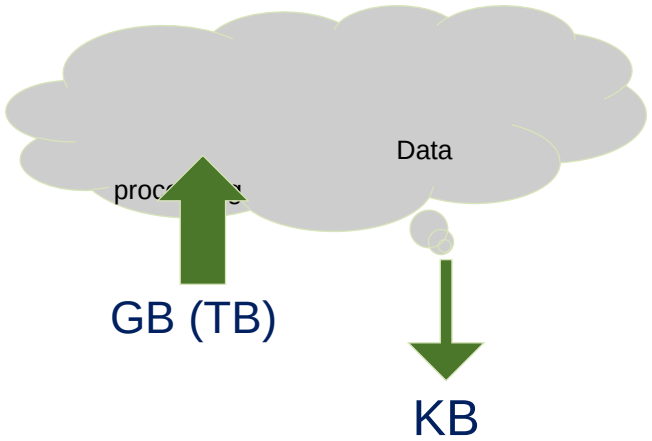
FVT


Trial field
8 rows á 10 m
Early sowing
Later sowing
1 pixel = sum of 30x30 cm leaf area
Brighter color = More leaf area = More plant growth


Blue-green-yellow-red-white
0 ----------max
← day
5 sowings,
Each row is 2 pixels in x direction
Each plot is 2 pixels in y direction
(Block: 18 plots high)
← row

Data upload/download

http://www.visionweeding.com/index.html



F. POULSEN ENGINEERING
- an engineering company specializing in advanced technical solutions

The Fieldvision Countserver at http://countserver.visionweeding.com enable you to manage processing of your datasets recorded by the F.P. Engineering Field vision scanner.

Plot leaf area

Delivered as csv-file in one long column → Excel:

Data mining and validation before use

Row	Range	Pixels
160	13	122.463
159	13	140.578
158	13	109.893
157	13	92.260
156	13	55.735
155	13	62.122
154	13	63.879
153	13	53.217
160	12	109.073
159	12	117.492
158	12	78.984
157	12	59.459
156	12	102.799
155	12	95.054
154	12	1.589
153	12	4.507
160	11	69.752
159	11	73.196
158	11	107.193
157	11	90.782
156	11	53.829
155	11	35.036
154	11	1.012
153	11	1.006
160	10	63.154
159	10	85.617
158	10	74.900
157	10	65.238
156	10	62.523
155	10	62.855
154	10	243
153	10	1.671
160	9	114.049

Empty plot

Empty plot

Row	Range	Pixels
153	2	98962
160	1	81.460
159	1	79.699
158	1	88.048
157	1	54.981
156	1	94.594
155	1	91.934
154	1	75.170
153	1	61.406
161	1	86.850
162	1	117.490
163	1	75.627
164	1	61.924
165	1	103.591
166	1	97.746
167	1	83.009
168	1	73.601
161	2	127.539
162	2	132.908
163	2	92.116
164	2	88.379
165	2	87.871
166	2	74.366
167	2	73.823
168	2	71.258
161	3	116.565
162	3	130.046
163	3	96.368
164	3	91.093
165	3	117.785
166	3	106.574
167	3	89.348
168	3	95.256

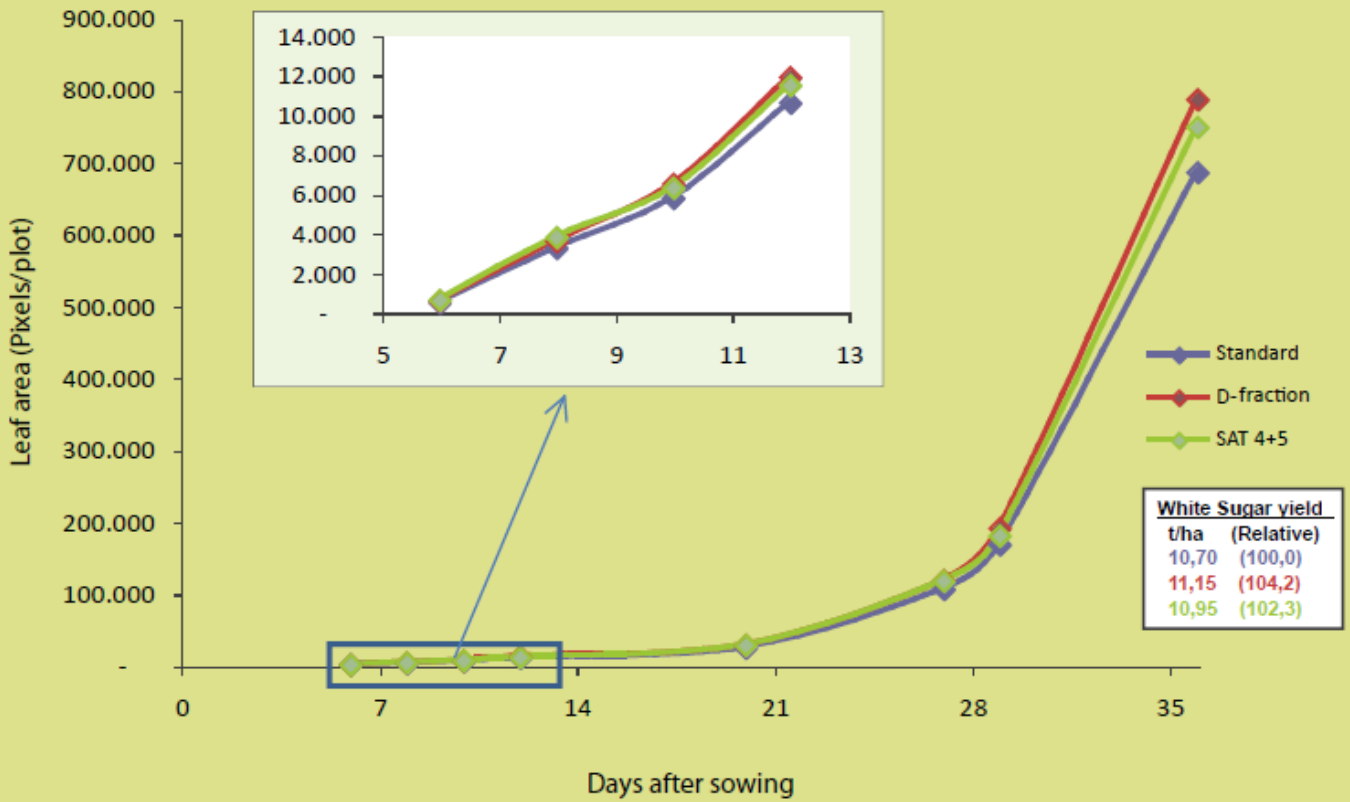
Tractor turns

8 cameras:

8 rows = 4 plots

FVT: Evaluation of effect of seed sorting

Example: Effect of specific seed treatments on leaf area development and sugar yield.



Single seed selection (D-fraction) and maturity optimization (SAT4+5) results in faster growth as well as higher sugar yield.

MARIBO®
your partner in sugar beet...

FVT: Evaluation of pellet applied insecticides

Effect of pellet applied insecticides on field emergence (FE) and leaf development (LA) in sugar beet.

Three different main insecticides (A, B and C) in different formulations.

Trial: HCP09FE031
Location: Dansted DK

				Pixels/plot (200 seeds)					
		100=	*93,1%*	*2.377*	*10.498*	*20.667*	*67.913*	*174.972*	*619.916*
			Final FE	**LA2r**	**LA3r**	**LA4r**	**LA6r**	**LA7r**	**LA8r**
Avg (3 varieties)	**No**		***100,0***	***100***	***100***	***100***	***100***	***100***	***100***
	Low	**A**	**98,4**	**96**	**95**	**92**	**91**	**88**	**88**
		B	**99,0**	**82**	**90**	**88**	**91**	**90**	**93**
	Medium	**A**	**99,7**	**66**	**79**	**79**	**78**	**78**	**82**
		B	**98,1**	**90**	**84**	**79**	**81**	**80**	**82**
		C	**98,7**	**81**	**82**	**87**	**83**	**81**	**84**
	High	**B**	**99,0**	**80**	**85**	**77**	**78**	**77**	**80**
		B2	**98,2**	**80**	**85**	**77**	**78**	**76**	**80**
		C	**98,2**	**63**	**72**	**66**	**72**	**70**	**76**
	Yes (avg)		**98,6**	**80**	**84**	**81**	**81**	**80**	**83**

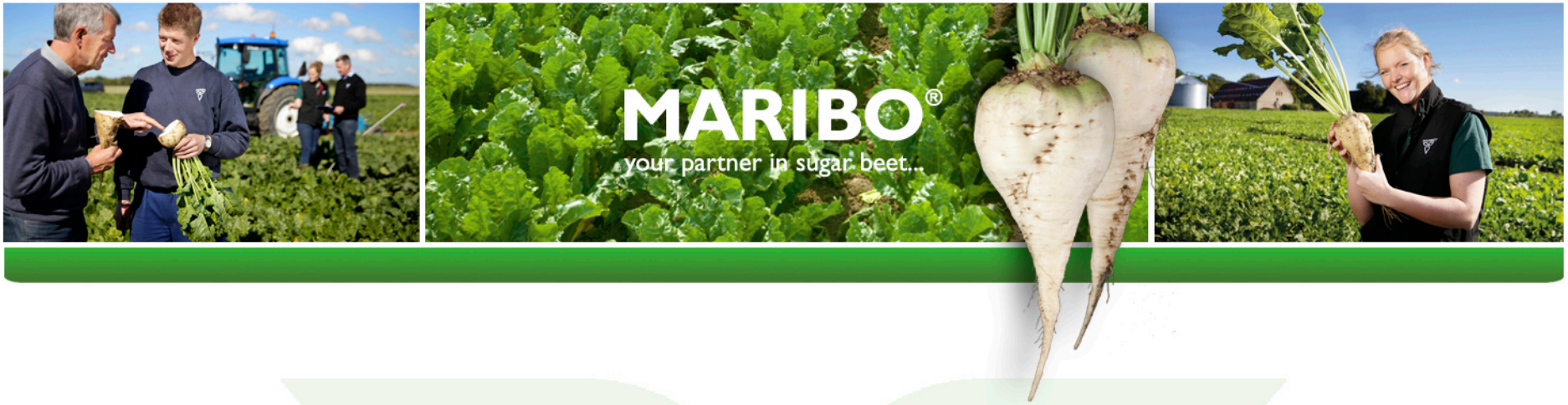
Plant stages:

Very early
Mid emergence
Full emergence: cotyledon stage
First pair of true leaves formed
Leaves starts to overlap

Field Vision Technology – Digital phenotyping

Field Vision Technology is a useful tool for...

- Evaluation of effect of seed treatments
- Determination of phytotoxic effects of chemicals
- Phenotyping
- Determination of vigor
- Evaluation of biotic and abiotic stress levels and tolerances in the field



Thank you

for your attention!