



Temadag: Brug af droner i landbruget
Centrovic 28/11-2016



**Temadag: Brug af droner i landbruget
Centrovic 28/11-2016**

Disposition

Gode / dårlige erfaringer

Erfaringer

Barriere for anvendelse

Software løsninger

Økonomi

Landbrugsmæssige

anvendelser - trends

Om

- Medejer af planteavlsbedriften Tokkerupgaard I/S
- 2002 agronom
- 2003-13 rådgiver ved DHI
- 2013 indehaver af Spectrofly ApS
- 2014 indehaver af Agrohydrologerne Aps



Barriere

- Lovgivning - VLOS
 - Professionalisering og omkostninger
- Internet
- Areal kapacitet
- Hardware
- Få business cases
- Workflow
- Integration i beslutningsprocesser



Reguleret arealkapacitet

Erfaringer

- Et "fag" som så meget andet
- Planlæg i fht. kamera/lysforhold/overlap vigtige for en god smertefri processering
- Flyvhøjde - højt generelt lettere
- Processering svær uden geotag
 - Husk dato/tid på billeder
- Batteriers tilstand bør håndteres og kontrolleres

Krav og kompetencer

- Forståelse af kundernes problemer / behov
- Tid, interesse og økonomi
- Flyveerfaring
- Dronebevis
- Lovgivning
- Forståelse af billeder som datakilde
- GIS / kortprogrammer

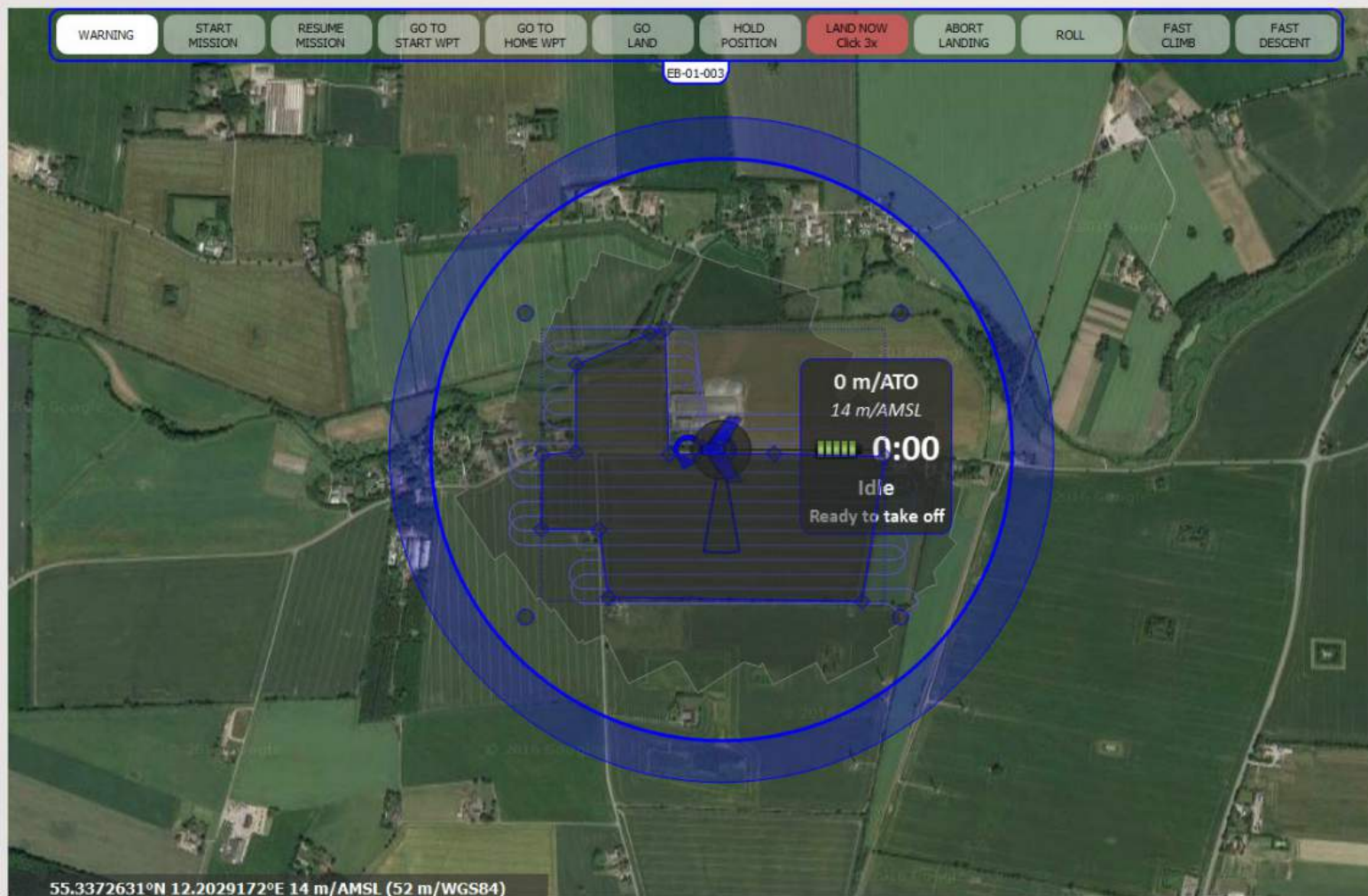


Barriere

- Lovgivning - VLOS
 - Professionalisering og omkostninger
- Internet
- Areal kapacitet
- Hardware
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- Integration i beslutningsprocesser



- Et
- Plan
- for
- Flyv
- Proc
- Hu
- Batte
-



Camera model: S110 RGB

Mapping and mission parameters

Difficult terrain | Easy terrain

Mission area: Polygonal

Camera: S110 RGB

Ground resolution: 3.5 cm/px

Desired altitude: 100.1 m/ATO

Use elevation data to set absolute waypoint altitudes

Lateral overlap: 75%

Longitudinal overlap: 75%

Generate perpendicular flight lines

Reversed flight direction

Save parameters as default for S110 RGB

Advanced parameters

Starting waypoint: 1 | After previous

Wind estimate: 0° | 0.0 m/s

Use current wind estimate

Max flight time: 40 min

Upload

Resulting flight characteristics

Number of flights: 1

Simulator

Wind: 4.9 m/s | 75°

Begrænset arealkapacitet

Erfaringer

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- Flyvhøjde - højt generelt lettere
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- Batteriers tilstand bør håndteres og kontrolleres
-



arealkapacitet



Fotogrammetri software



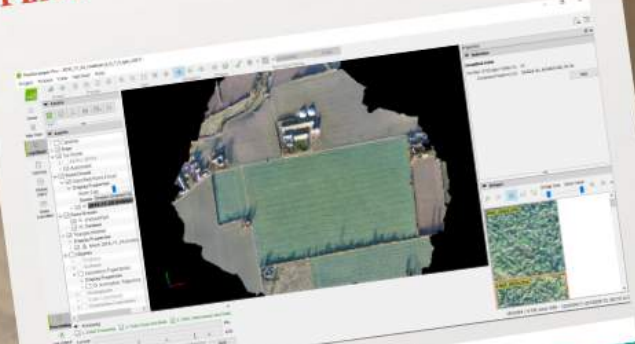
Små 100 programpakker

DroneDeploy



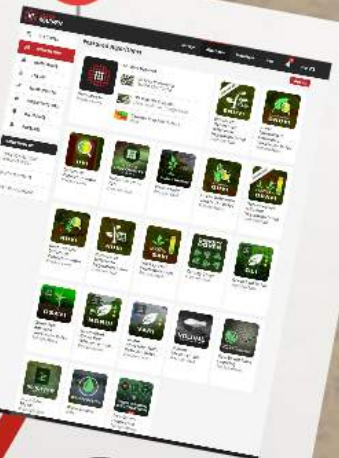
7.000-21.059 dk/år

Pix4D



Plan	Pris	Pris pr. år
Basic	55.500 kr	22.500 kr / år
Advanced	22.400 kr	9800 kr / år

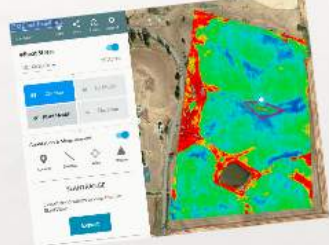
Datamapper



Cloud /desktop
Fra 6.700 - 31.600 kr/år
Pris pr. analyse

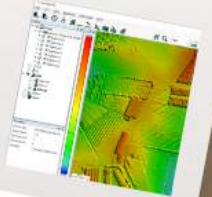
Plan	Pris	Pris pr. år
Basic	6.700 kr	31.600 kr / år
Advanced	31.600 kr	128.000 kr / år

Slantrange



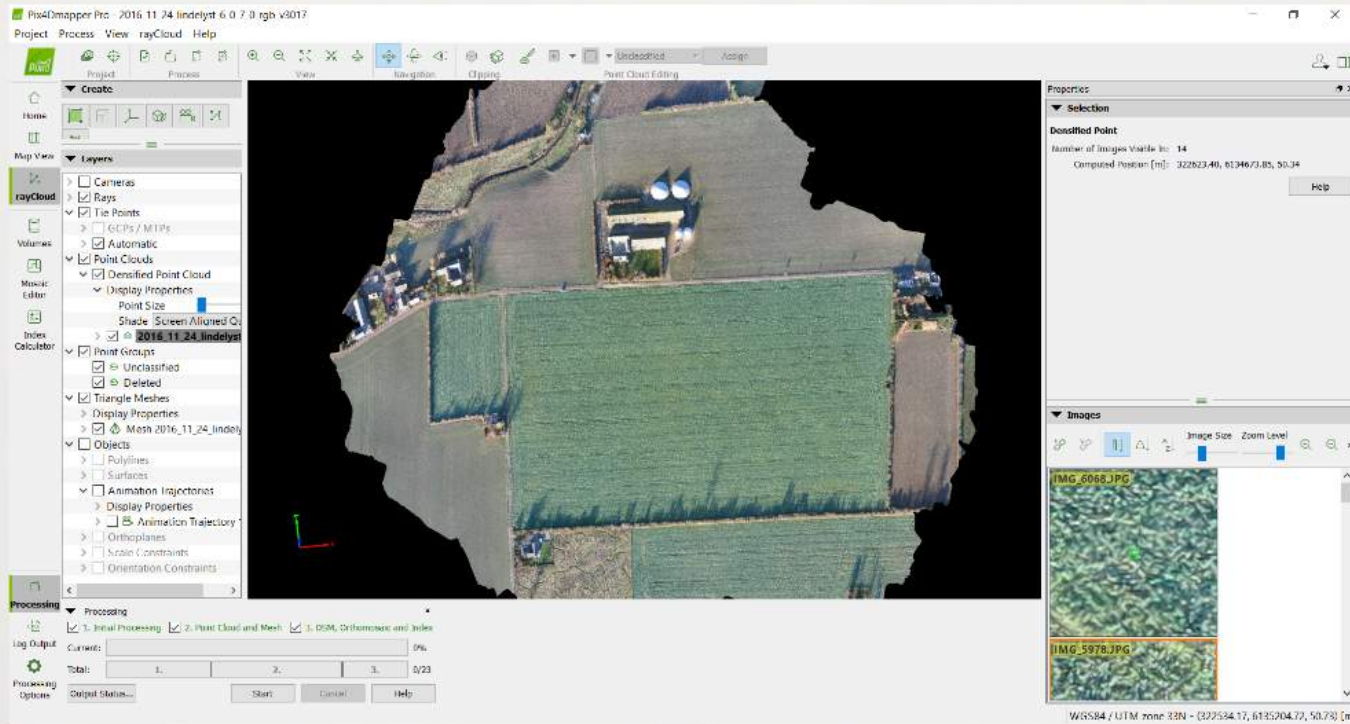
Cloud service
31.600 dk/år

CORRELATOR3D UAV



Fra 18.595 kr/år
- Desktop
- Ubegrænset
- hurtig
- Hurtig
- Begrænset
- pc krav

Pix4D



Pix4Dmapper Pro
Professional drone-based mapping, purely from images

Subscription		Perpetual	
Yearly	3200 CHF <small>Get 2 free months, save 640 CHF</small>	Perpetual	7900 CHF
Monthly	1 Month 320 CHF		
BUY NOW		BUY NOW	
✓	Rent for 1 Year or 30 Days	✓	Perpetual Desktop software
✓	Unlimited processing*	✓	Unlimited processing*
✓	Desktop + Cloud	✓	Desktop + Cloud
✓	Support & Upgrade included	✓	Support, Upgrade & Cloud included for 1 Year (optional as of 2nd year)

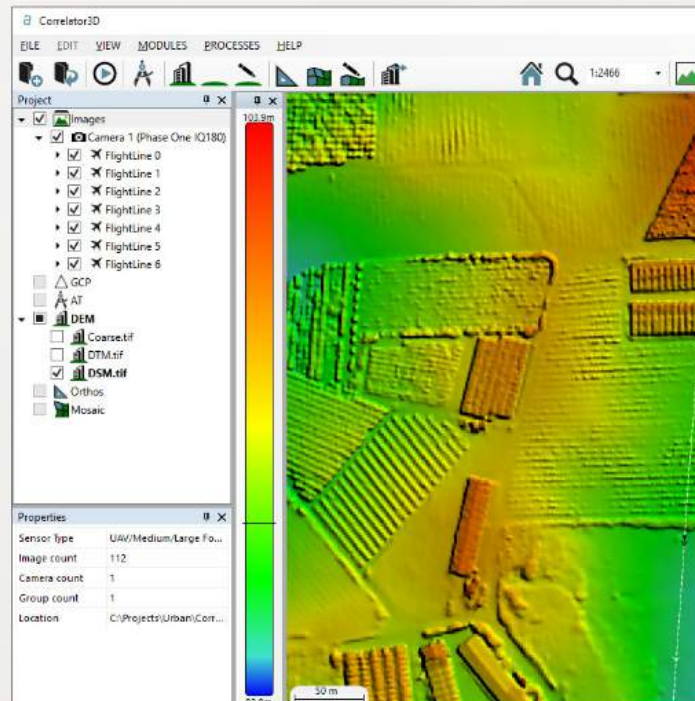
55.500 kr eller 22.500 kr /år

Pix4Dag
Drone mapping software for precision agriculture

Subscription		Perpetual	
Yearly	1399 CHF <small>Get 2 free months, save 278 CHF</small>	Perpetual	3190 CHF
Monthly	1 Month 139 CHF		
BUY NOW		BUY NOW	
✓	Rent for 1 Year or 30 Days	✓	Perpetual Desktop software
✓	Unlimited processing*	✓	Unlimited processing*
✓	Desktop + Cloud	✓	Desktop + Cloud
✓	Support & Upgrade included	✓	Support, Upgrade & Cloud included for 1 Year (optional as of 2nd year)

22.400 kr eller 9800 kr /år

CORRELATOR3D UAV



BUY CORRELATOR3D UAV

Includes all modules and tools. Supports cameras up to 50 megapixels.

MONTHLY

One license for 30 consecutive days
Support and software updates included

250 EUR/month

SUBSCRIBE

YEARLY

One license for 365 consecutive days
Support and software updates included

2,500 EUR/year

SUBSCRIBE

PERMANENT

One permanent license
Support and software updates included for one year (optional maintenance renewal cost 750 EUR/year)

5,000 EUR

BUY

PERMANENT FLOATING

One permanent floating license
Support and software updates included for one year (optional maintenance renewal cost 818 EUR/year)

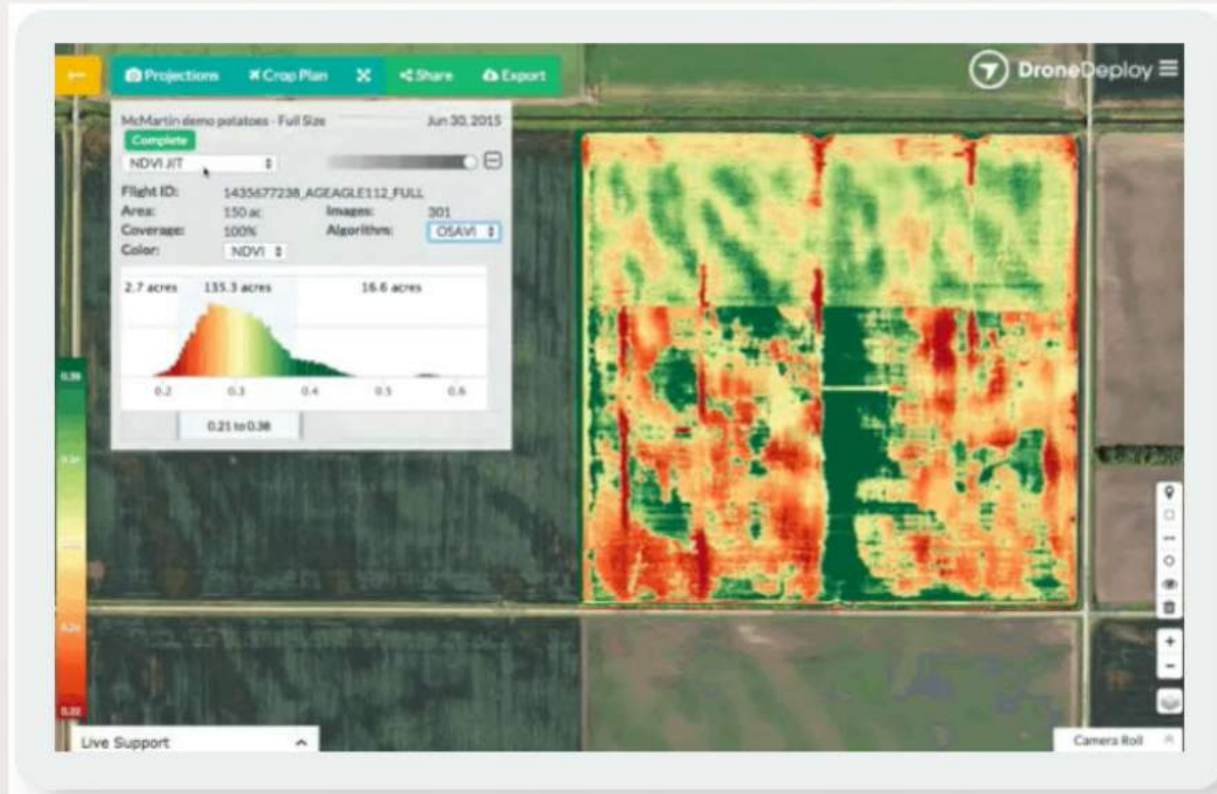
5,450 EUR

BUY

Fra 18.595 kr/år

- Desktop
- Ubegrænset processing
- Hurtig
- Begrænsede pc krav

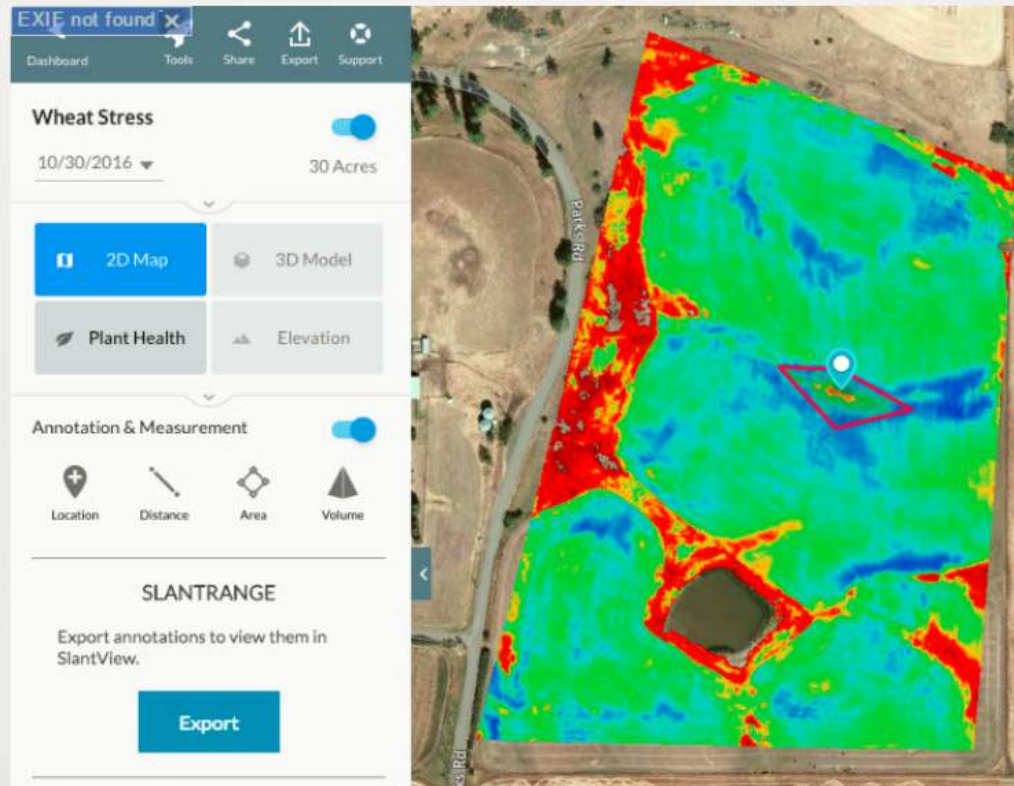
DroneDeploy



	Explorer	Pro	Business <small>TRIAL</small>
	Free	\$999 /yr <small>16% Savings</small>	\$2999 /yr <small>16% Savings</small> <small>\$3999/yr for a full 30-day trial</small>
	Sign Up Now	Start Free Trial	Contact Us
Map + 3D Model Processing	5 / month	Unlimited	Unlimited
Max Photo Upload per Map	500	1,000	3,000
Max 2D Resolution	5 cm/pixel	2 cm/pixel	1 cm/pixel
Processing Priority	+	++	+++
Support	Community	Email + Chat	Email + Chat
Android + iOS Mobile App	✓	✓	✓

7.000-21.059 dk/år

Slantrange



2. PICK YOUR SLANTVIEW PLAN

Select one of the SLANTVIEW plans below. All of our plans include unlimited processing, no per acre charges, no per crop charges, unlimited installations, all software updates, and full customer support.

Select an option...



6 Month Plan
for SLANTRANGE 2p

6 Months - 2p
\$2,550

BEST VALUE



12 Month Plan
for SLANTRANGE 2p

12% savings

12 Months - 2p
\$4,500

Cloud service
31.600 dk/år

Scouting og mapping



**Målrettet rådgivning og driftsledelse
Tilsyn med højværdiafgrøder**

Datamapper

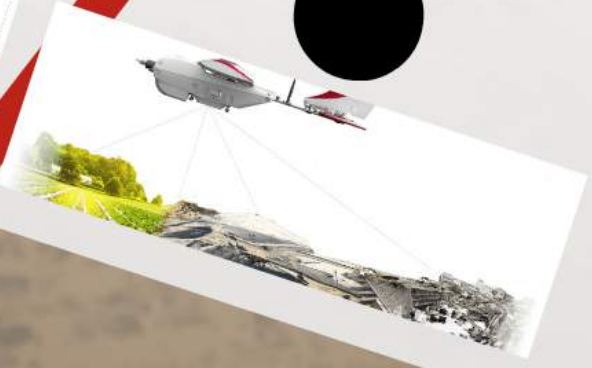


Cloud /desktop
 Fra 6.700 - 31.600 kr/år
 Pris pr. analyse

	LITE \$490/år	STANDARD \$950/år	STANDARD+ \$2400/år	BUSINESS \$4500/år
Cloud-based software	✓	✓	✓	✓
Support	✓	✓	✓	✓
Online	✓	✓	✓	✓
Web-based	✓	✓	✓	✓
Mobile app	✓	✓	✓	✓
Hardware	✓	✓	✓	✓
Hardware maintenance	✓	✓	✓	✓
Hardware price	✓	✓	✓	✓

Featured Algorithms

- Output Operators
- 2D Map Processing
- 2D Map File Output
- Custom Map File Output
- ENDVI
- Green Normalized Difference Vegetation Index
- Normalized Difference Vegetation Index
- Plant Health
- Green Difference Vegetation Index
- Normalized Difference Vegetation Index
- SAVI
- Soil Adjusted Vegetation Index
- Canopy Cover
- GLI
- Green Soil Adjusted Vegetation Index
- Normalized Green Leaf Difference Index
- VARI
- Vegetation Anomaly Ratio
- VOLUME
- Volume Measurement
- Plant Coverage
- ScoutView
- Waterlogging
- Tree Crown Detection



	Free	\$999/år	\$2999/år
Cloud-based software	✓	✓	✓
Support	✓	✓	✓
Online	✓	✓	✓
Web-based	✓	✓	✓
Mobile app	✓	✓	✓
Hardware	✓	✓	✓
Hardware maintenance	✓	✓	✓
Hardware price	✓	✓	✓

EXIF not found

Wheat Stress

20/05/2016

2D Map

Plant Health

Annotation & Measurement

Location

Draw

SLANTR

Export annotations to SlantView

PICK YOUR SLANTVIEW

Select an option

6

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Featured Algorithms

[View All](#)

Orthomosaic
PrecisionHawk

Output Options

2D Map Processing
GeoTiff, KML Tile Set

3D Map File Outputs
Point Cloud - .las, Triangle Mesh

Contour Map File Output
DSM



Enhanced
Normalized
Difference
Vegetation Index
PrecisionHawk



Green
Normalized
Difference
Vegetation Index
PrecisionHawk



Difference
Vegetation Index
PrecisionHawk



Field Uniformity
Tool
PrecisionHawk



Plant Height
PrecisionHawk



Green Difference
Vegetation Index
PrecisionHawk



Optimized Soil
Adjusted
Vegetation Index
PrecisionHawk



Renormalized
Difference
Vegetation Index
PrecisionHawk



Normalized
Difference
Vegetation Index
PrecisionHawk



Soil Adjusted
Vegetation Index
PrecisionHawk



Canopy Cover
PrecisionHawk



Green Leaf Index
PrecisionHawk



Green Soil
Adjusted
Vegetation Index
PrecisionHawk



Normalized
Green Red
Difference Index
PrecisionHawk



Visible
Atmospherically
Resistant Index
PrecisionHawk



Volume
Measurement
PrecisionHawk



Row Based Plant
Counting
PrecisionHawk



ScoutView
Report
PrecisionHawk



Waterpooling
ADM



Tree Crown
Delineation
PrecisionHawk

p
500 kr/år
e



1

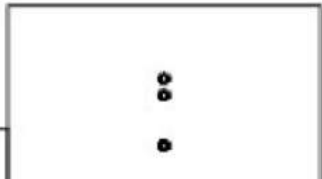
2

3

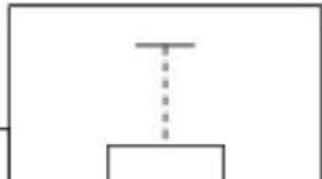
4



0.9



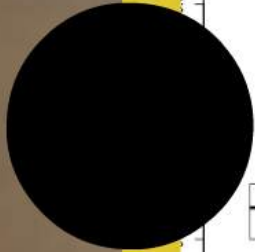
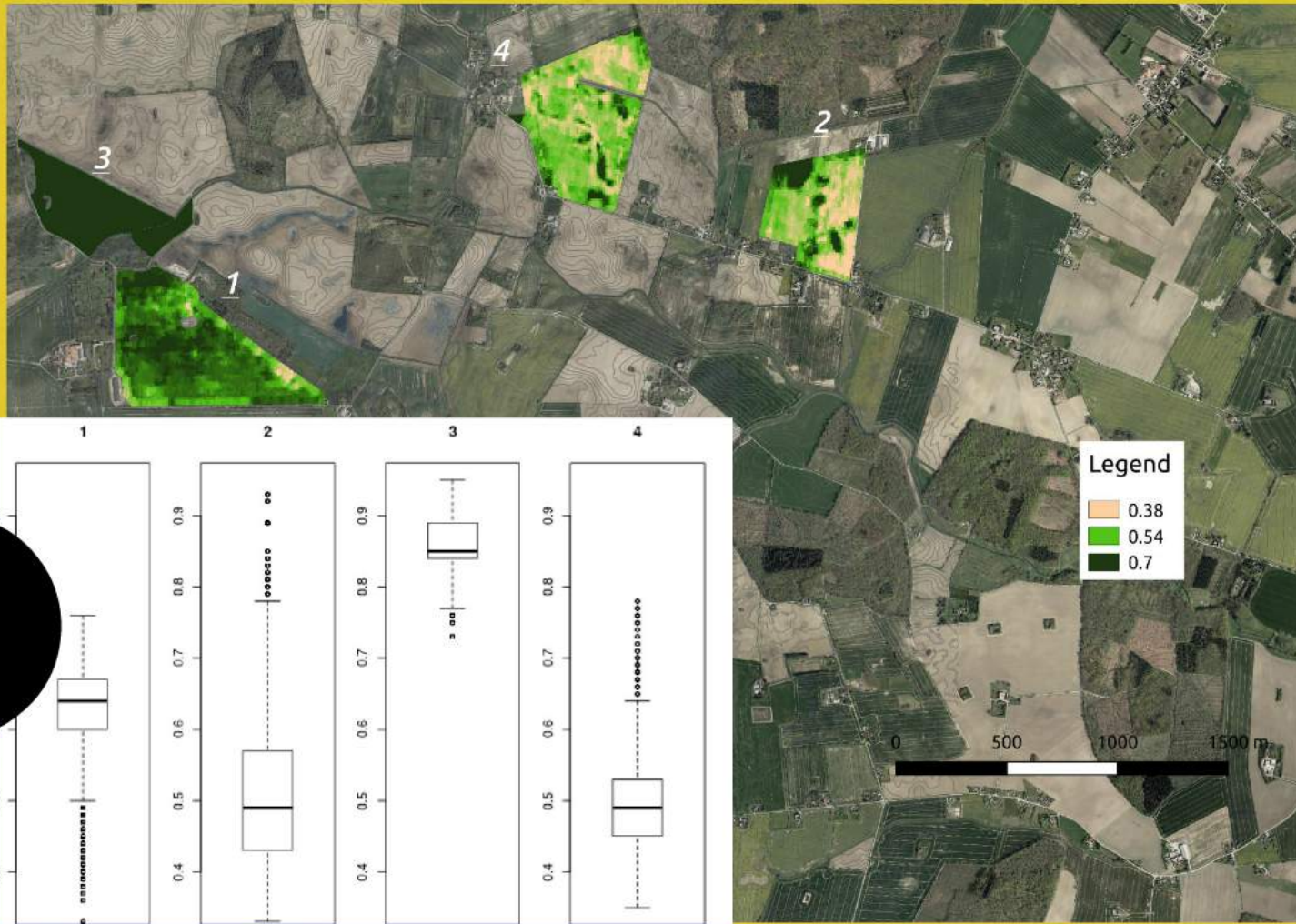
0.9



0.9

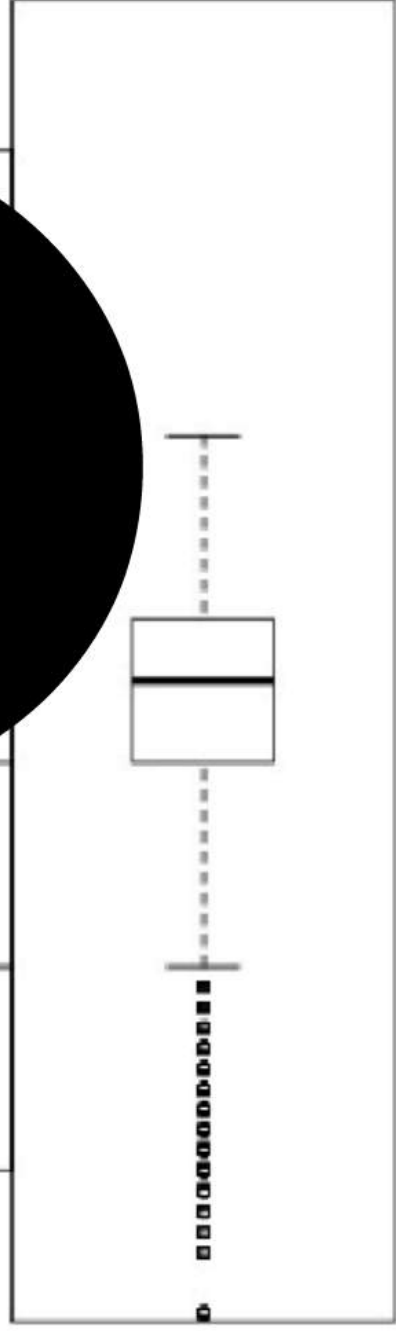


Hvornår er der variation nok til den er økonomisk interessant?

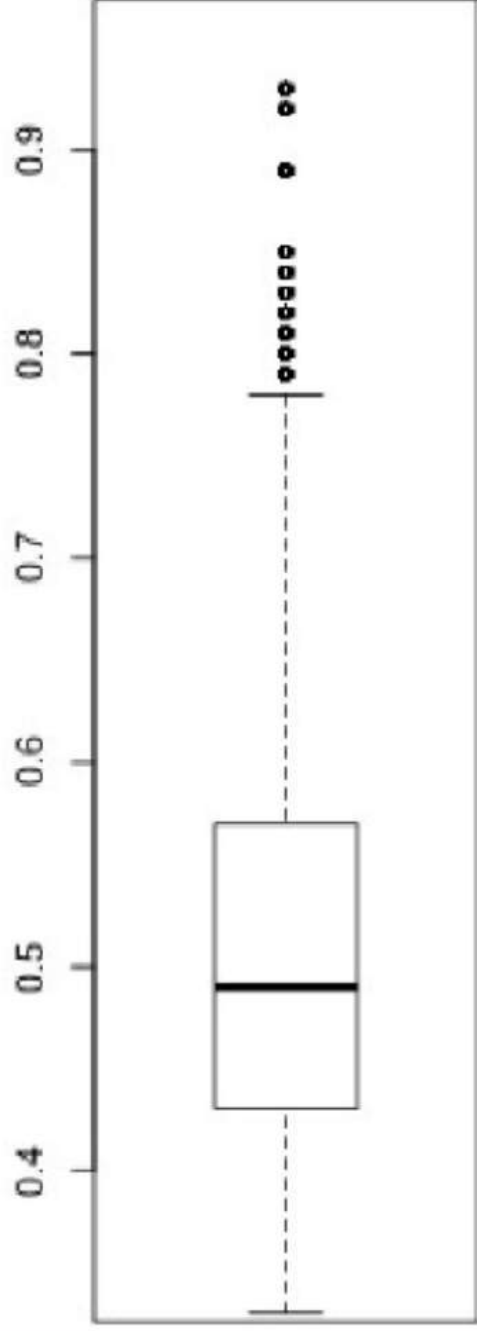




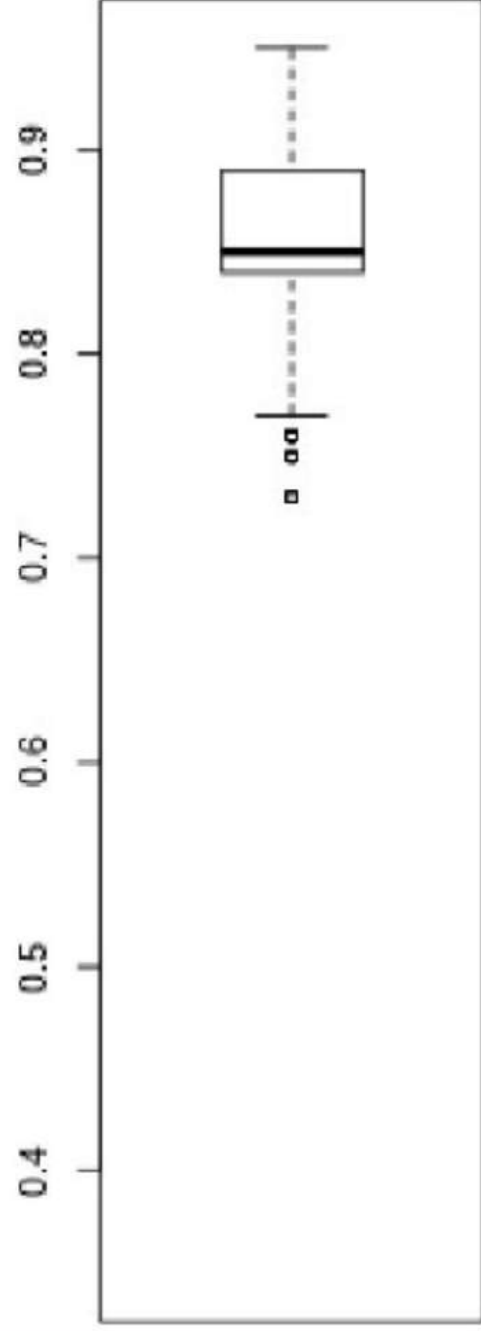
1



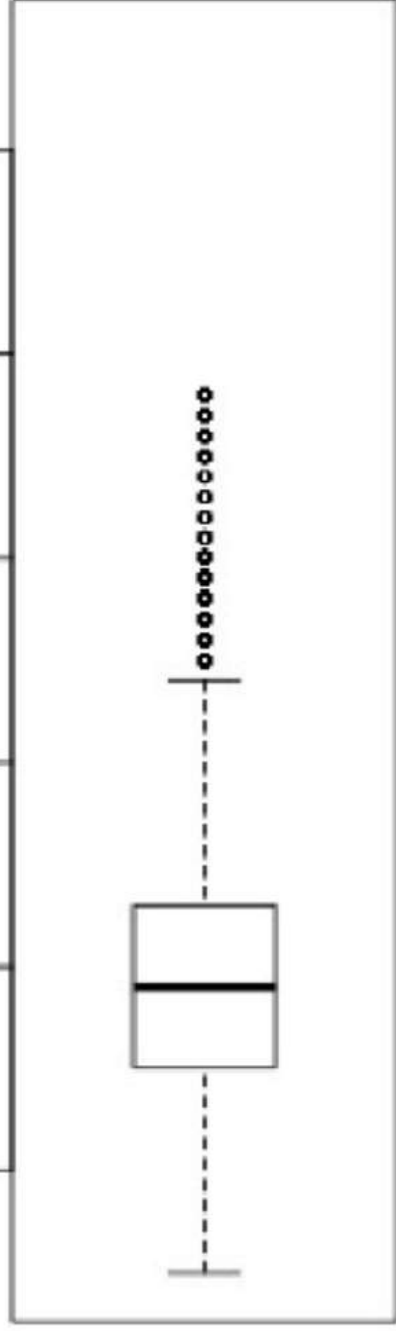
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3



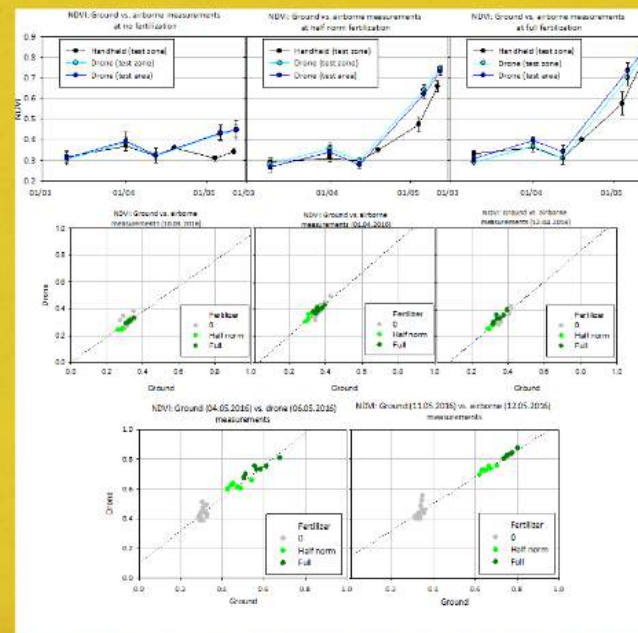
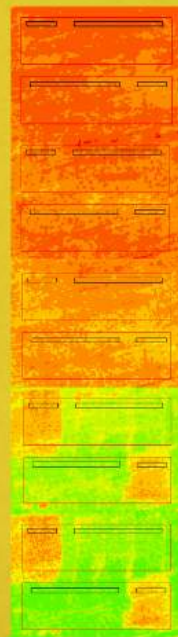
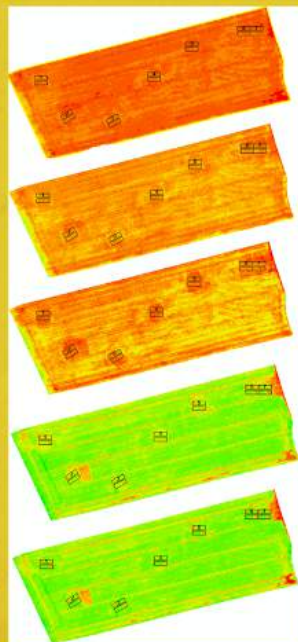
4



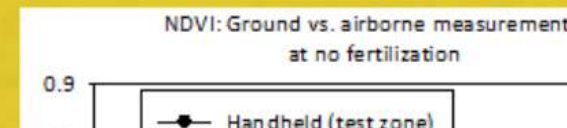
Hvor gode er målinger fra luften?

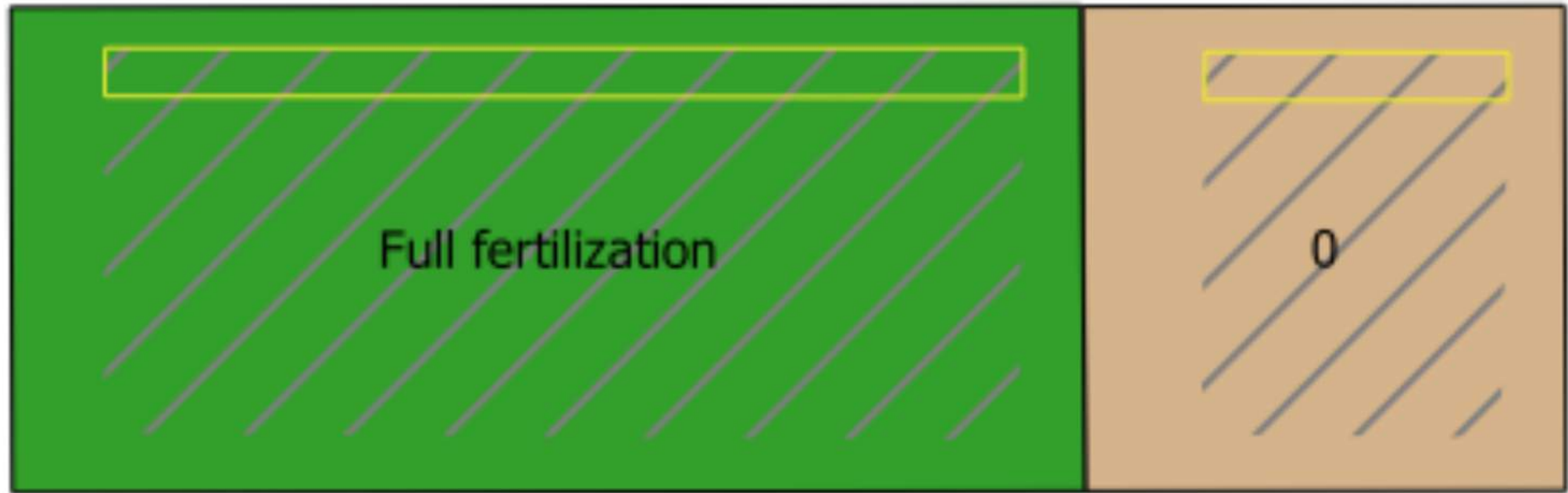
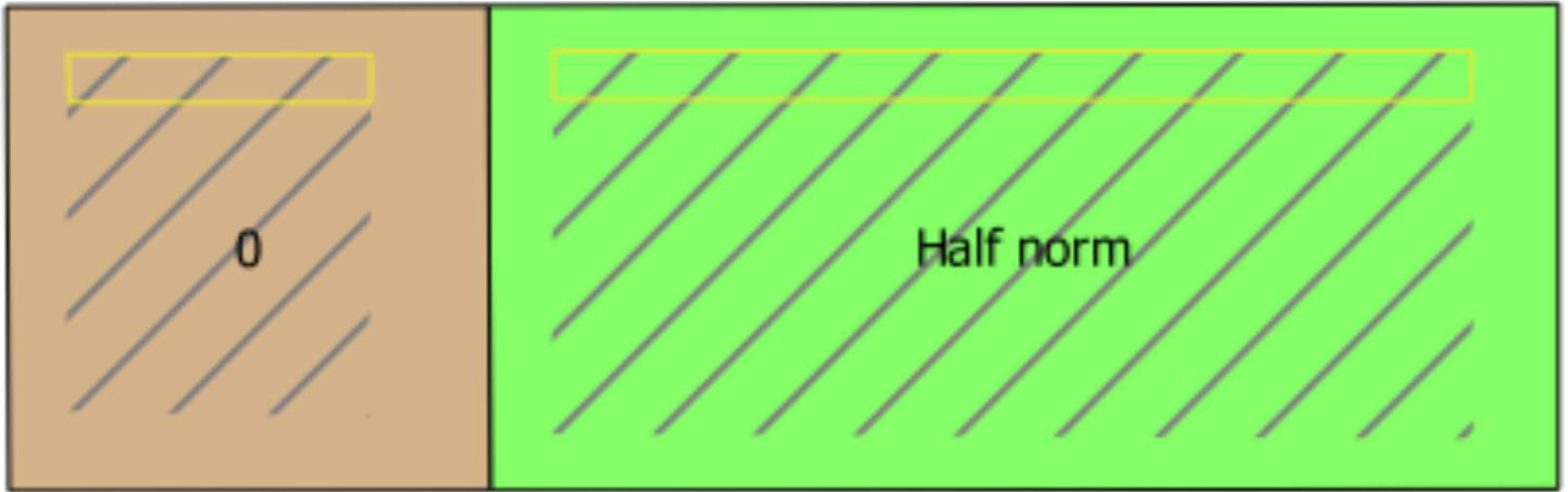
Resultater afvandingsforsøg i Tokkerup

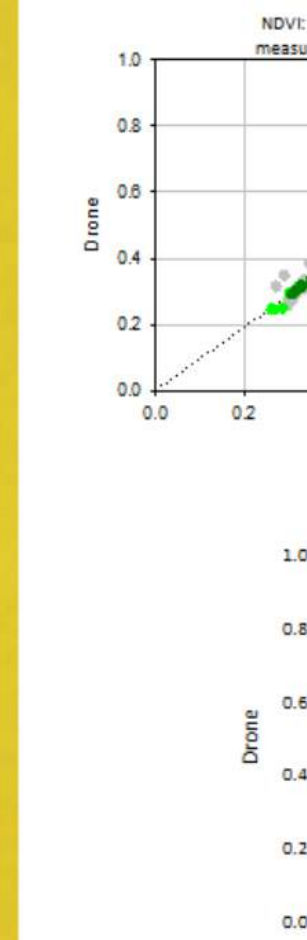
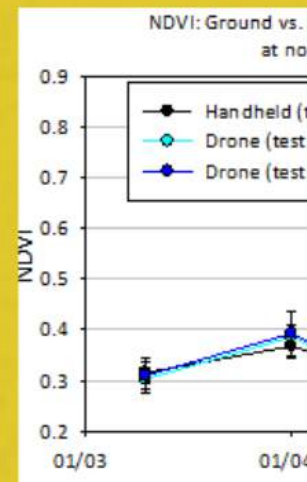
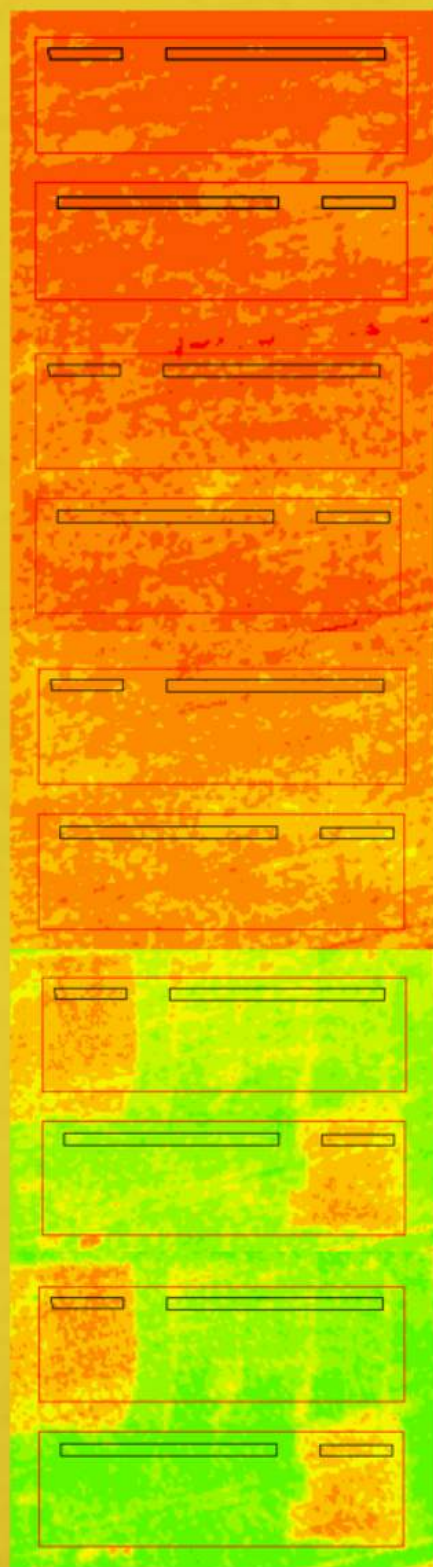
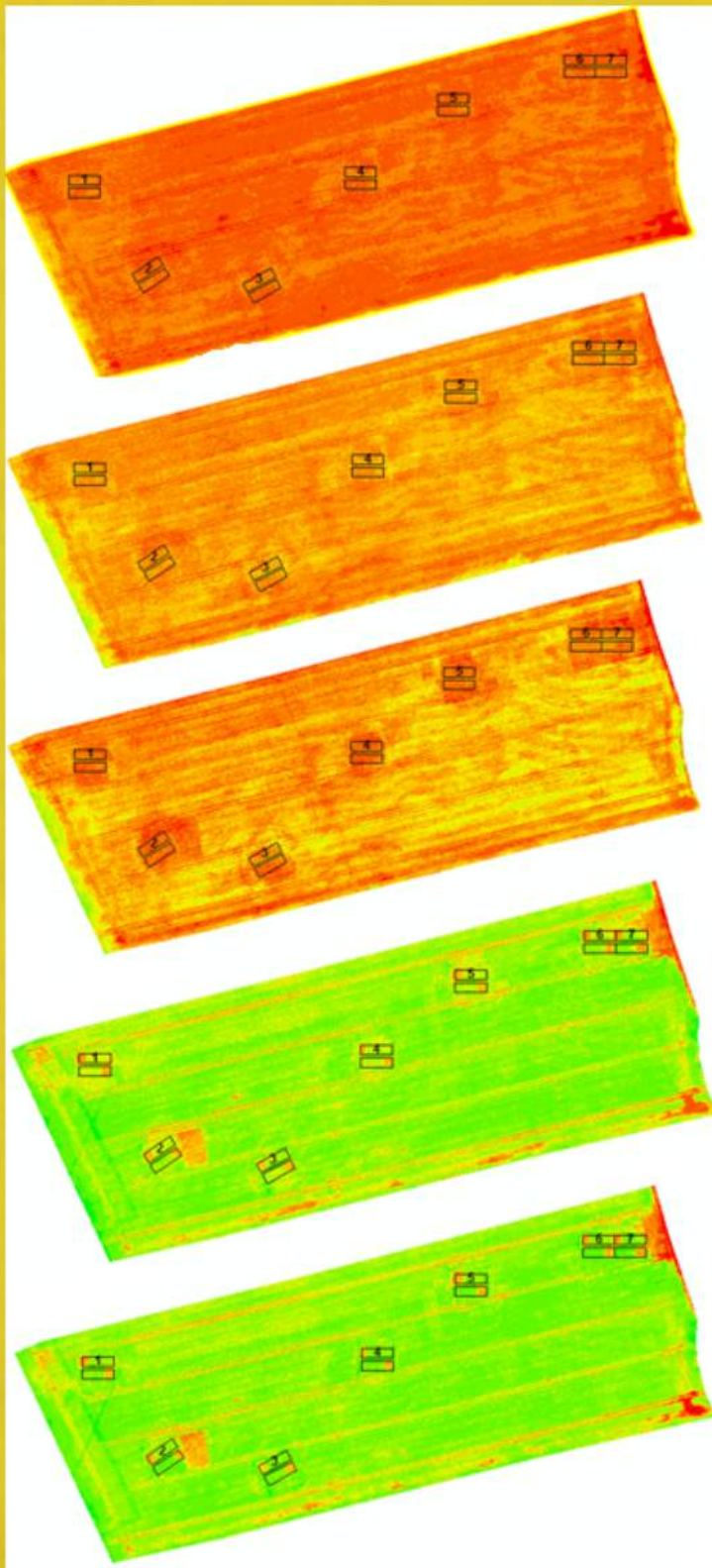
- Sammenligning af reflektansmålinger målt håndholdt og fra luften

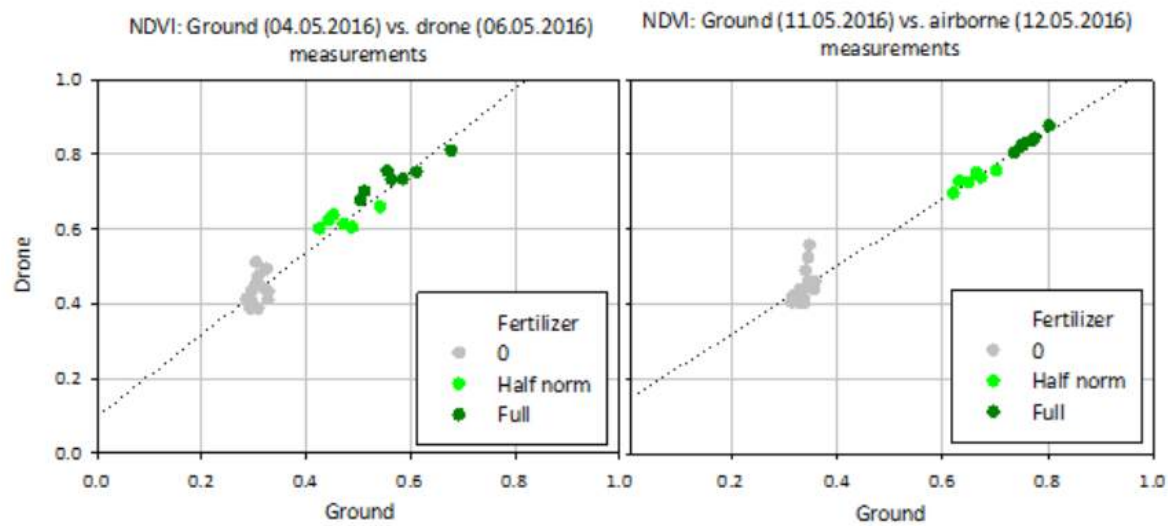
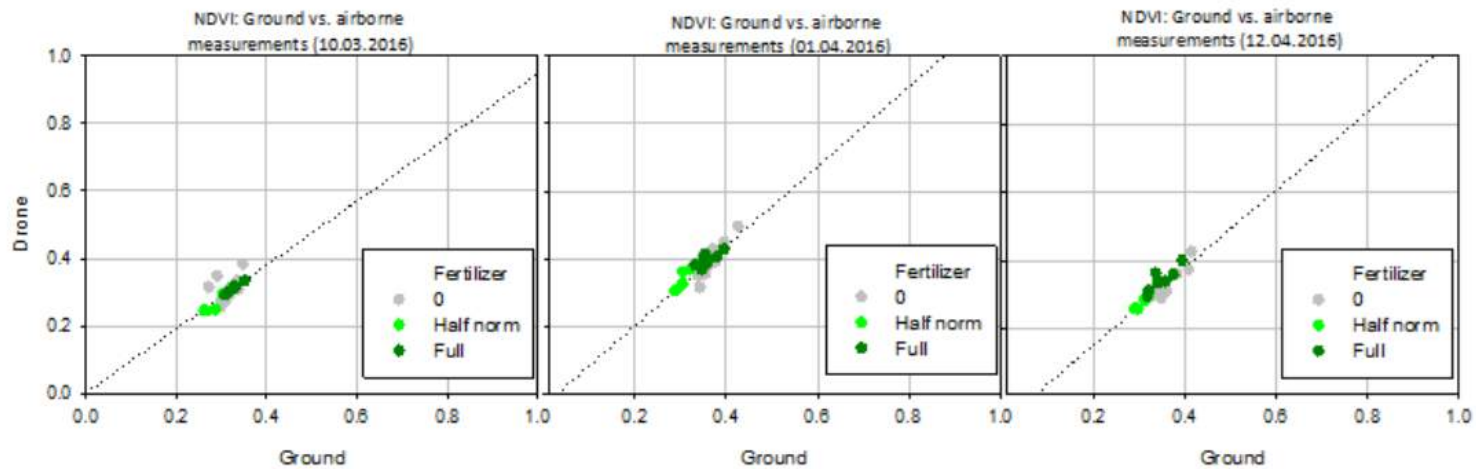
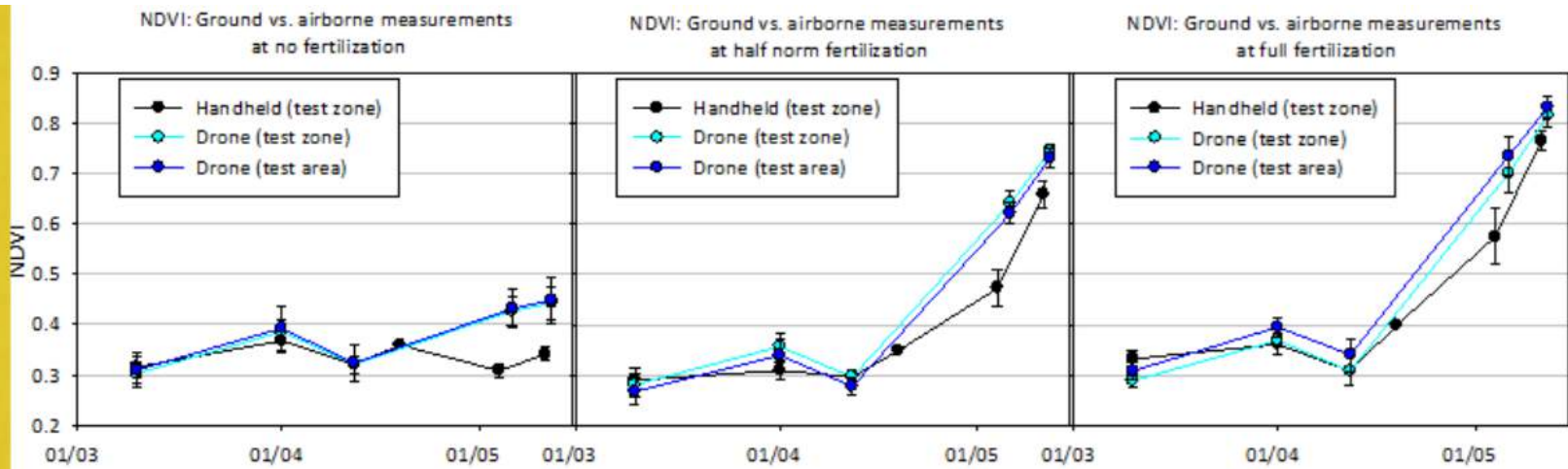


målt håndholdt og fra









Simple tildelingskort



Cropsat: 11/6 & 24/7



100 timers flyvning service (3 år)

15.000 dkr

- Motor
- Servos
- Pietotube
- Højdemåler
- Antenne



Batteriforbrug på 100 timer: 10 stk

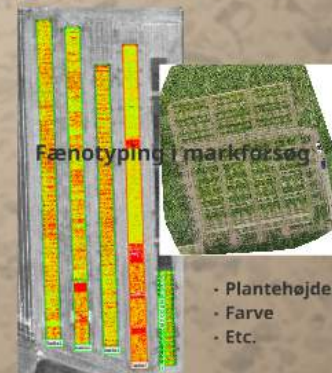
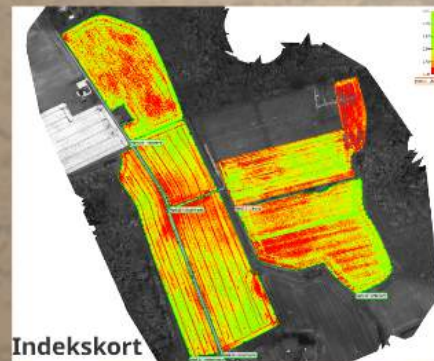
US survey

11000 landmænd adspurgte om de vil købe en drone eller købe en service.

36 % Købe

49 % Service

Landbrugsmæssige anvendelser



s år)
dkr
r: 10 stk

Res
• S
m



Scouting og mapping



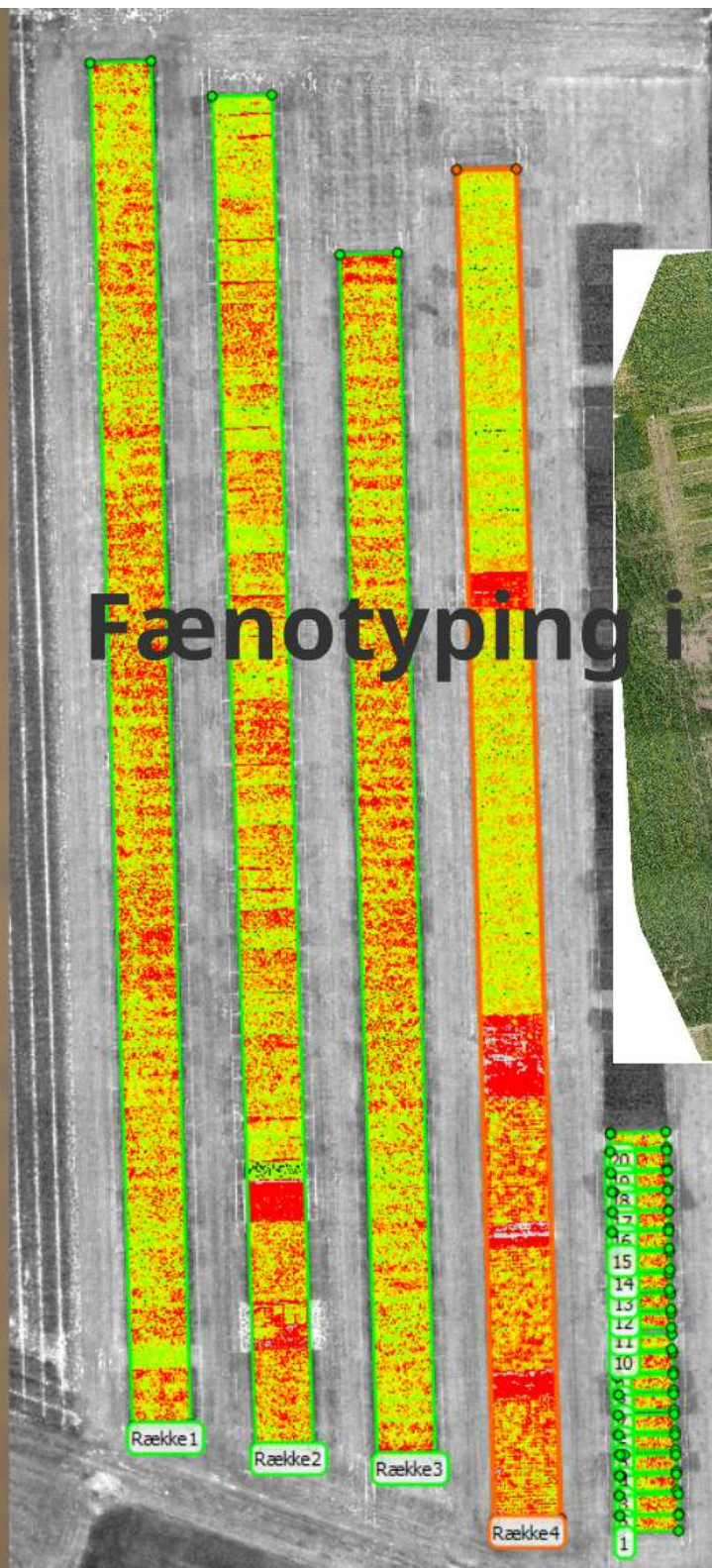
**Målrettet rådgivning og driftsledelse
Tilsyn med højværdiafgrøder**

An aerial orthomosaic of a field showing a network of dark lines representing drainage, traffic tracks, and spray patterns. The field is divided into several large sections by these lines. At the top, a road labeled 'Køgevej' is visible. The text 'Orthomosaic opacity:' is in the top right corner.

Dokumentation

Kortlægning af dræn, trafikskader, sprøjteskader, kabler

Fænotyping i markforsøg



- Plante højde
- Farve
- Etc.

Indekskort



Sygdomsovervågning

