Topic: IBDP Group 4 Subjects Project

AgriBots

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AgriFly by AgriBots

Content

- The worldwide problem in the agricultural industry which we aim to address: the detrimental “insecticide”
- The effects and damages this problem causes on the environment
- Background information about our research and our findings: Diatomaceous Earth
- Our solution for the specificity problem of insecticides: the AGRIFLY

Introduction to the Problem we are Facing Today

Nowadays' agricultural industries benefit from millions of types of pesticides in order to produce agricultural products much faster.

- Pesticides
- Insecticide: contains ovicide and larvicide
- Why are these chemicals harmful?

-Acute toxicity: a biological term that refers to adverse effects occurring after administration of a substance.

- What is the main problem we are facing today?

-Target organism specificity degree is highly controversial.

Harms of the Excessive Usage of Insecticide on the Biotic Environment

The dangers of insecticide usage in agriculture and its impacts on environment:

- Pollution of soil, water, turf, and other vegetation
- General biodiversity
- Human health:
- Short-term impacts and long-term impacts
- Neurological effects

Background Information

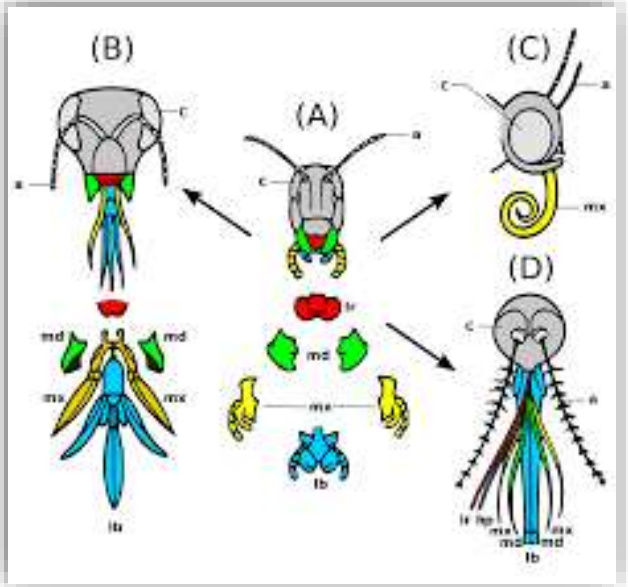
- Pesticides are used to get rid of many types of pests and mites which harm the agricultural growth of many plants such as fruits and vegetables.

Our insecticide alternative needs to have:

- Safety: will it harm the farmer or not, what kinds of precautions are needed?
- Effective against pests: pesticide needs to be toxic against pests
- Less toxic: toxicity is one factor which harms the plants, because of this the yield the plants produce also decrease

Our Alternative Chemical Solution Proposal

- After looking through countless databases and research, we found an interesting compound called diatomaceous earth.
- It is an organic powder which is mixed with water
- Effective against pests: pesticide needs to be toxic against pests
- It comes from the fossilization of tiny remains of aquatic animals also known as diatoms.


(B)
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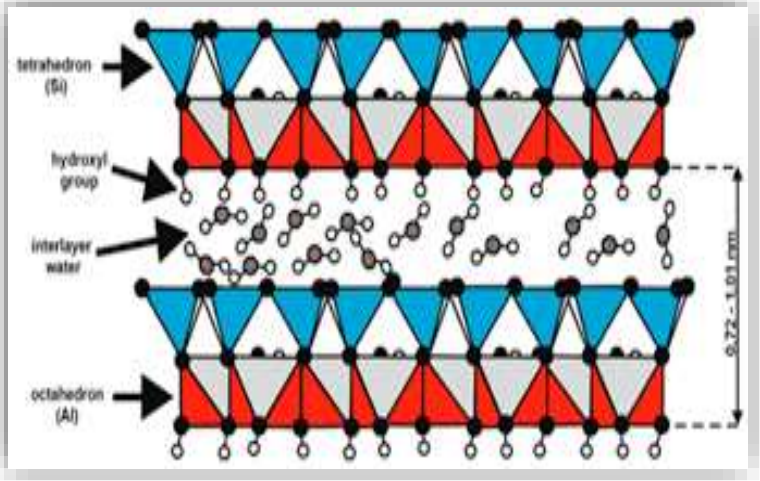
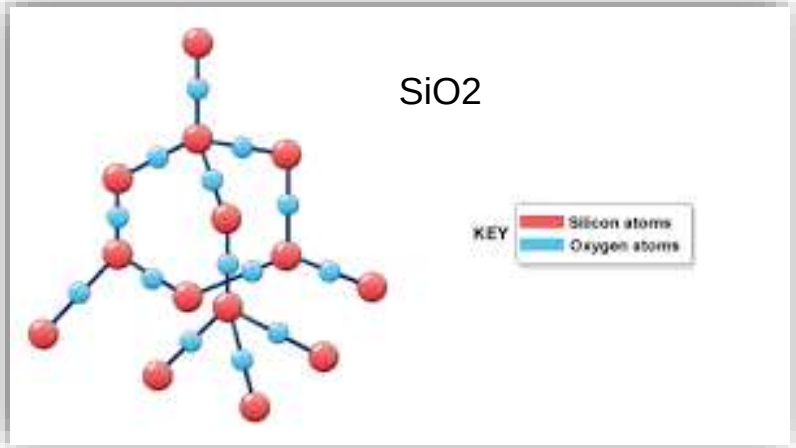

tetrahedron
(Si)
hydroxyl
group
interlayer
water
octahedron
(Al)
0.72 - 1.01 nm


SiO2
KEY
Silicon atoms
Oxygen atoms

Types of Diatomaceous Earth

- Diatomaceous earth has two different types:
- Food-grade: used for gardening at home, or to treat high cholesterol levels as medicine
- Filter-grade: used for industrial purposes such as filtering pools and production of plastics (the one we will be using)

Final Thoughts on Diatomaceous Earth

- Overall Diatomaceous earth is extremely good as its negatives are rash on the skin, and coughing.
- Easily preventable by using masks, protective outfits and gloves.
- Since we will be using a drone the farmers would not be affected as much.
- The benefits are just as good as the best pesticides out there.

Electronics Onboard

- 6 high thrust motors with carbon fiber propellers
- 6 brushless motor ESCs
- 6 high efficient spraying motors
- 360 deg lidar sensor
- 2 litres pesticide tank
- Transparent canopy

- 3 axis gimbal
- 6 axis gyroscope
- Pixhawk flight controller
- Raspberry Pi Raspbian Linux based computer
- 2 4 celled lithium polymer batteries
- Satellite transmitter module
- ±1m accurate GPS
- Seed Dispenser
- Altum agricultural sensor by MicaSense®

170KV T-Motor Tiger U10 Plus Brushless Motors

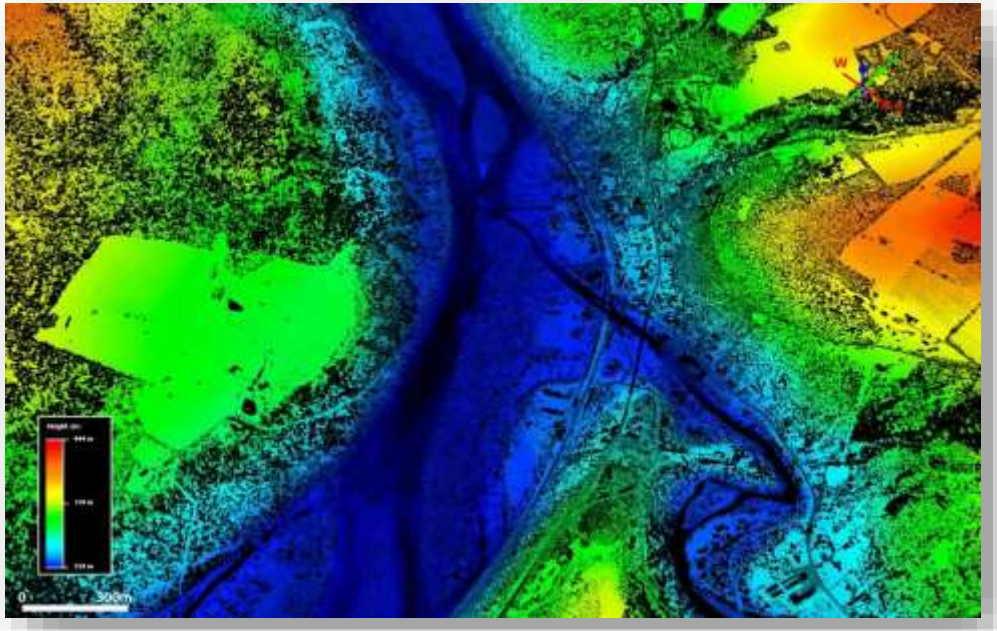
Throttle	Amps (A)	Watts (W)	Thrust (G)	RPM	Efficiency (G/W)	Torque (N*m)	Operating temperature(℃)
50%	1.9	45.6	785	1247	17.21	0.254	37℃
55%	2.2	52.8	878	1317	16.63	0.283	
60%	2.5	60	994	1396	16.57	0.316	
65%	3.6	86.4	1136	1493	13.15	0.36	
75%	4.1	98.4	1470	1694	14.94	0.475	
85%	5.9	141.6	1928	1922	13.62	0.544	
100%	9.3	223.2	2719	2283	12.18	0.825	

50A Electronic Speed Controller (ESC)

Carbon Fiber Propellers

Foldable

Lidar Sensor



Pesticide Tank

3 axis gimbal stabilizer

Pixhawk Flight Controller

Raspberry Pi 4

Satellite Transmitter Module

Lithium Polymer Batteries

16,000 / 15,820 ≈ 1 hour

2 batteries have a total of 16,000mAh capacity

Components	Current	Quantity	Total Current
One Motor on 50% thrust	1.9A	6	11.4A
Raspberry Pi	600mA	1	600mA
Pixhawk	500mA	1	500mA
Spraying pump	70mA	6	420mA
Other Components Estimated		-	2.9A
		Total Current	≈ 15,820 mAh

Seed Dispenser

Motor generates air flow through the Venturi Mechanism, which increases air particles' velocity and decreases the pressure. Then the air flow pushes the seeds outside to the field.

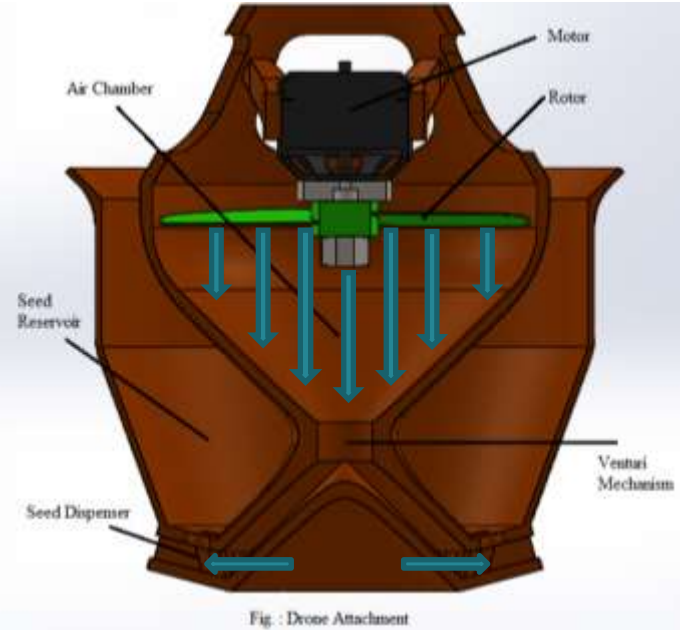
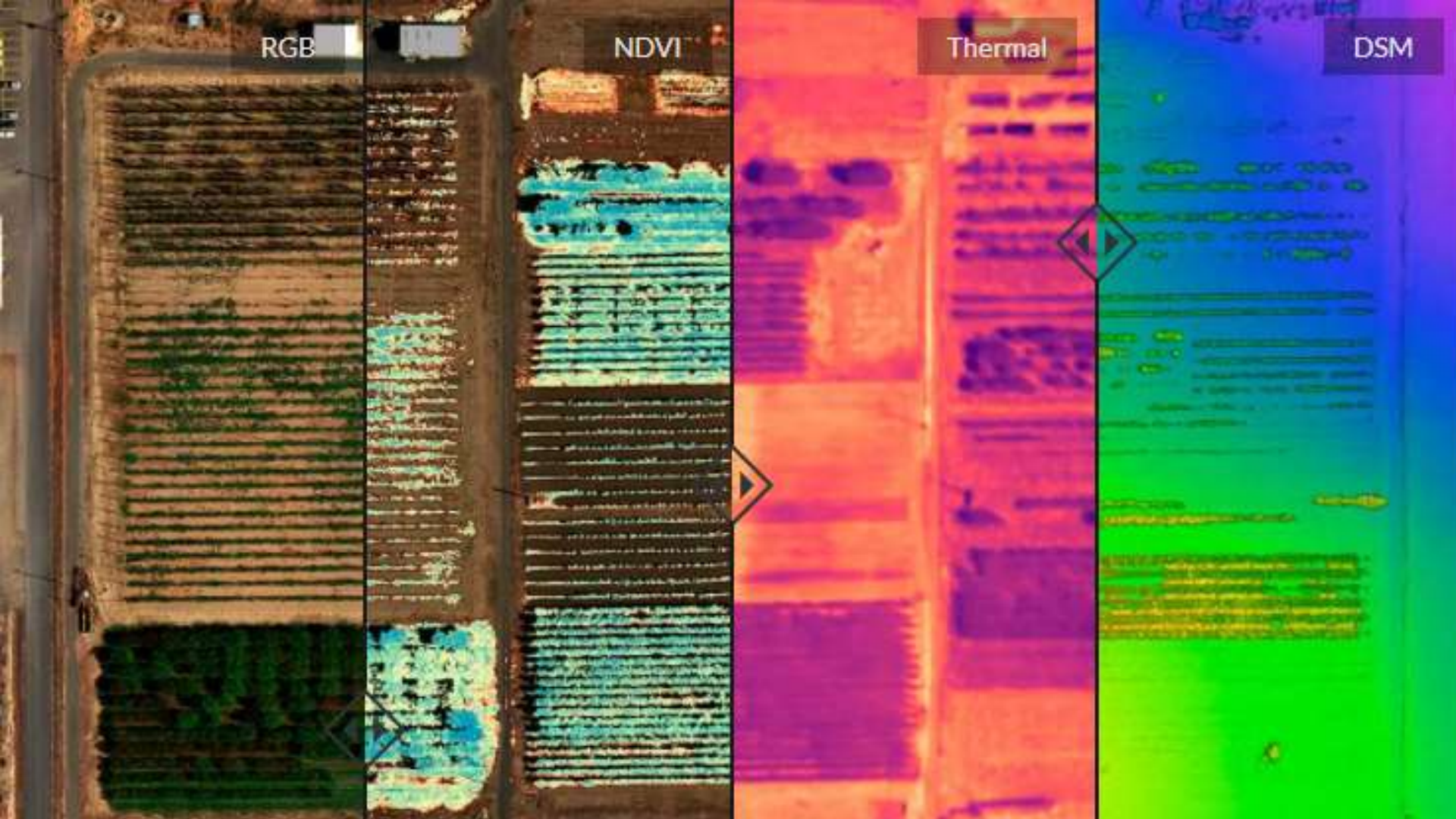
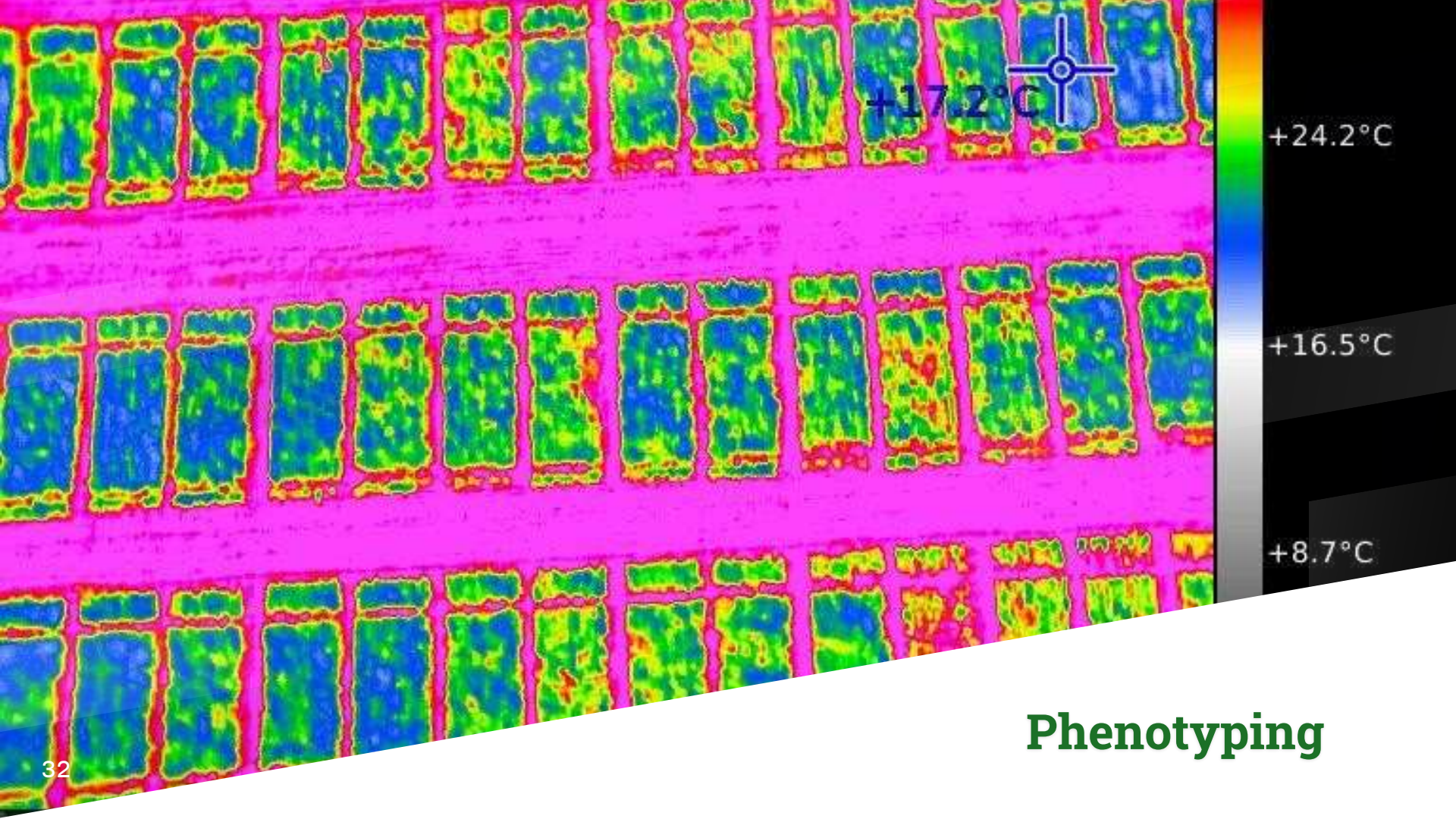


Fig. : Drone Attachment

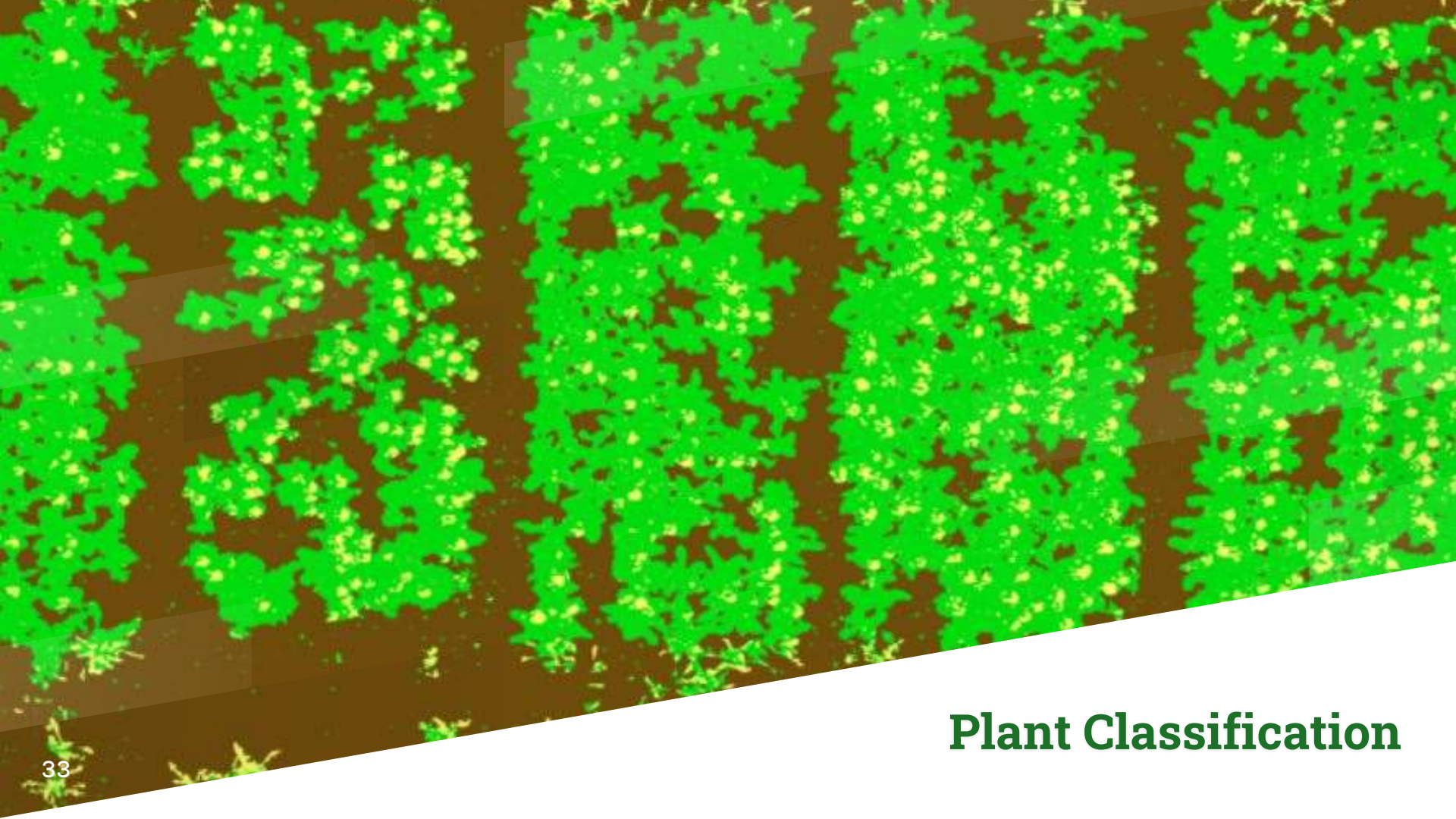
Altum Agricultural Sensor


RGB
NDVI
Thermal
DSM

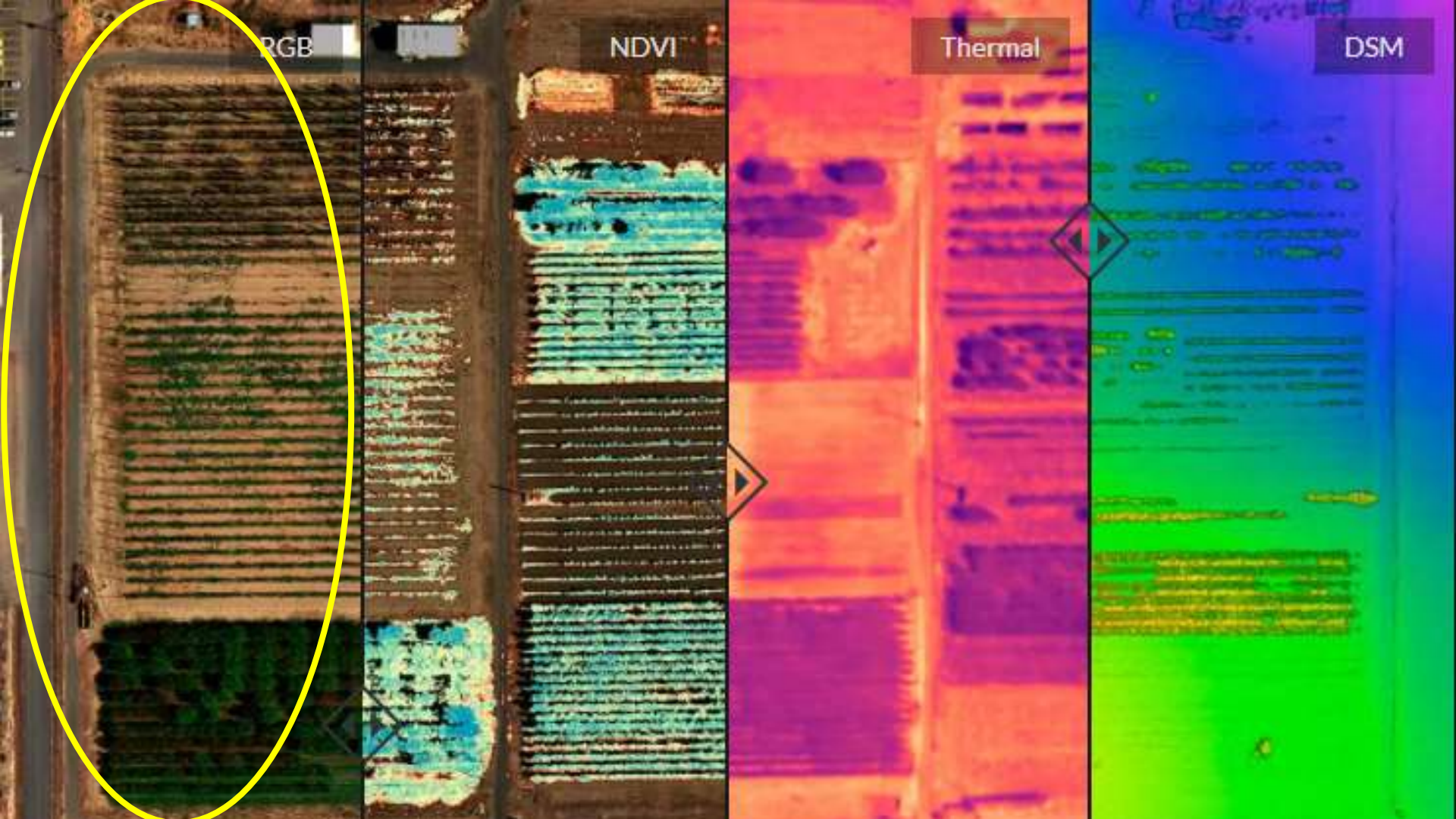
Phenotyping	Plant Classification
Crop Health Mapping	Species Differentiation
Water Management	Plant Counting
Leak Scouting	Weed Detection
Fertilizer Management	Advanced Crop Scouting
Disease Identification	Terrain Modeling



Phenotyping



Plant Classification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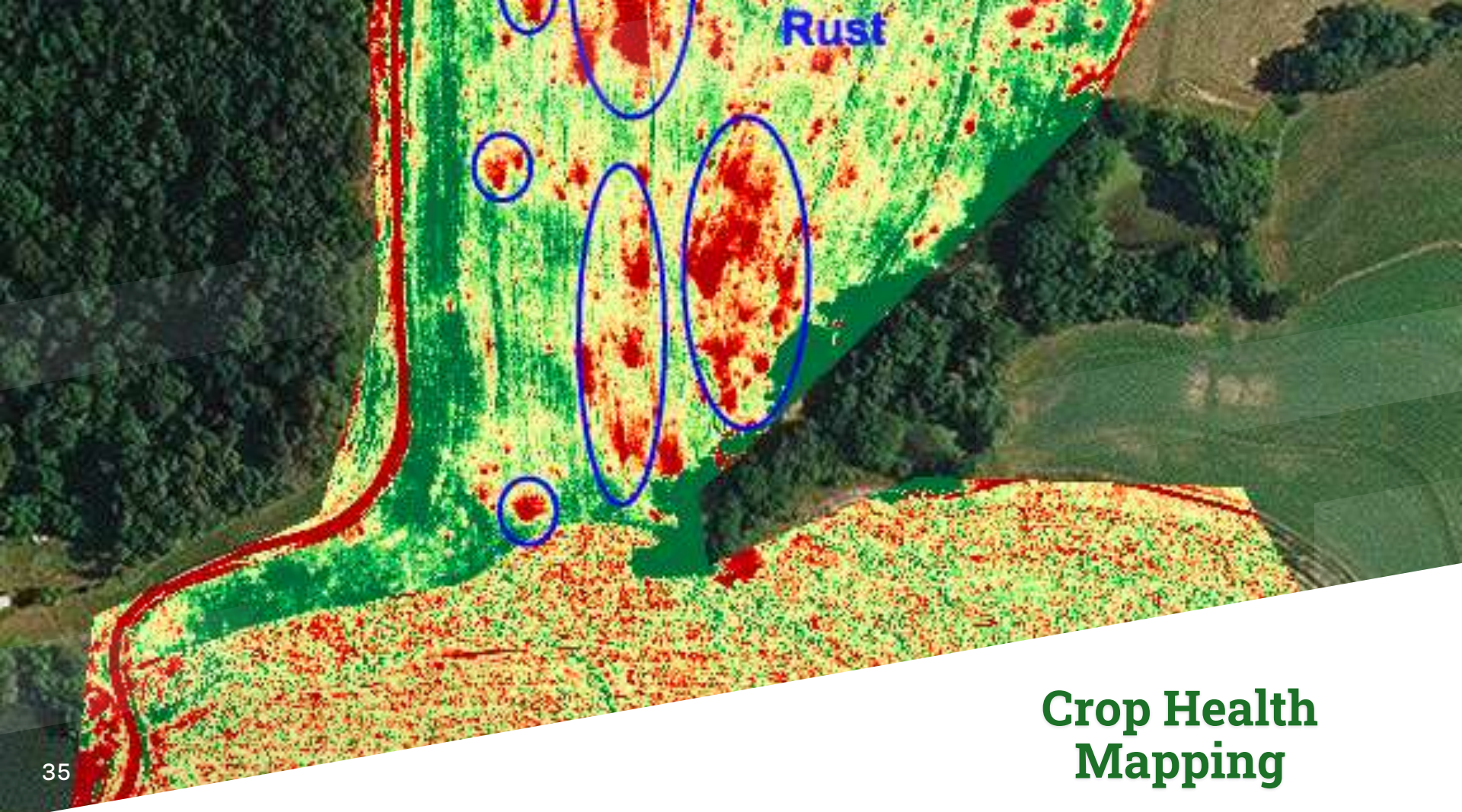
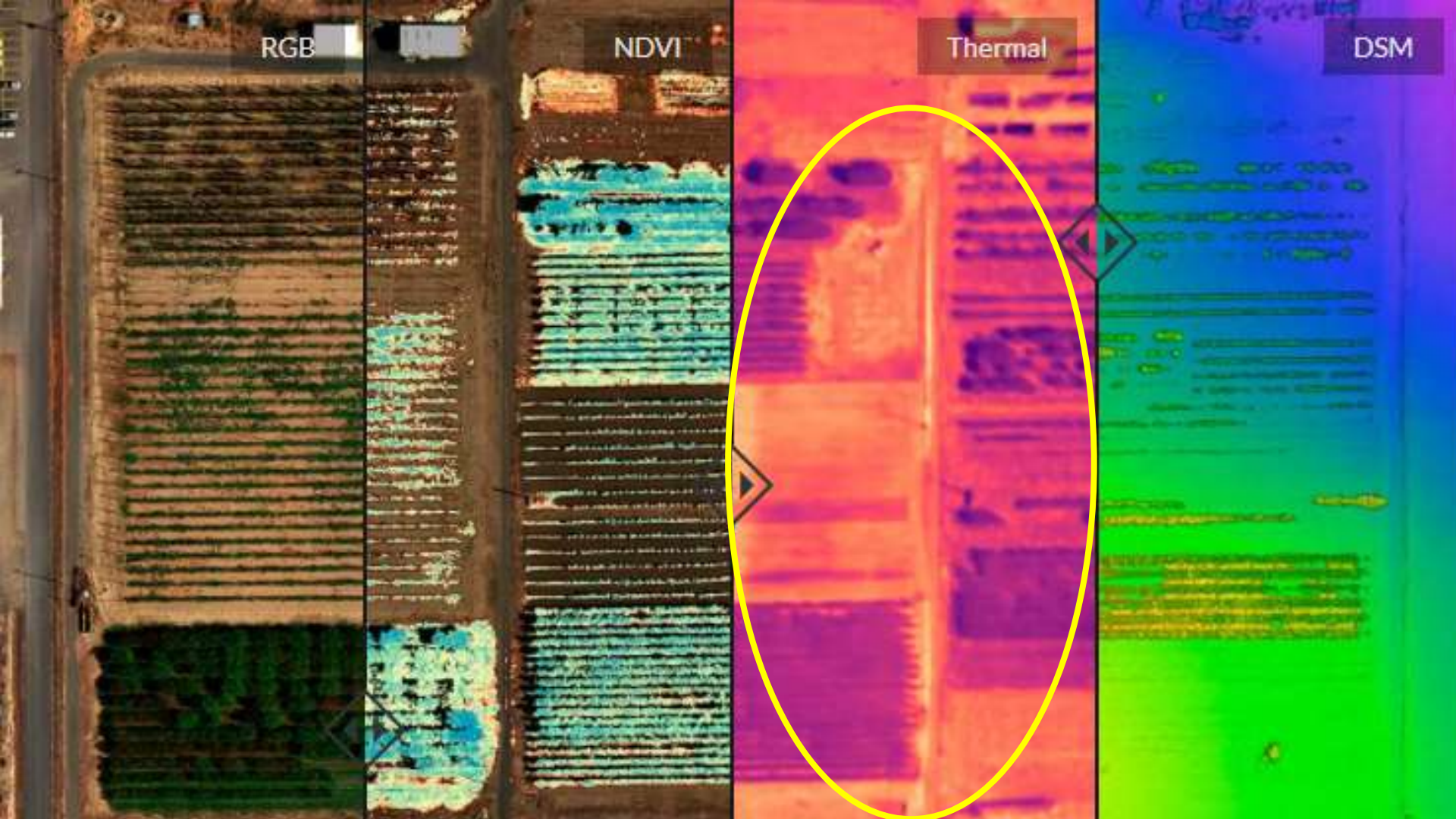


Crop Health Mapping

Visible to Non-visible Light Spectrum Range Represented (400 nm - 900 nm)

Non-Visible Light Range Represented (8000 nm - 14,000 nm)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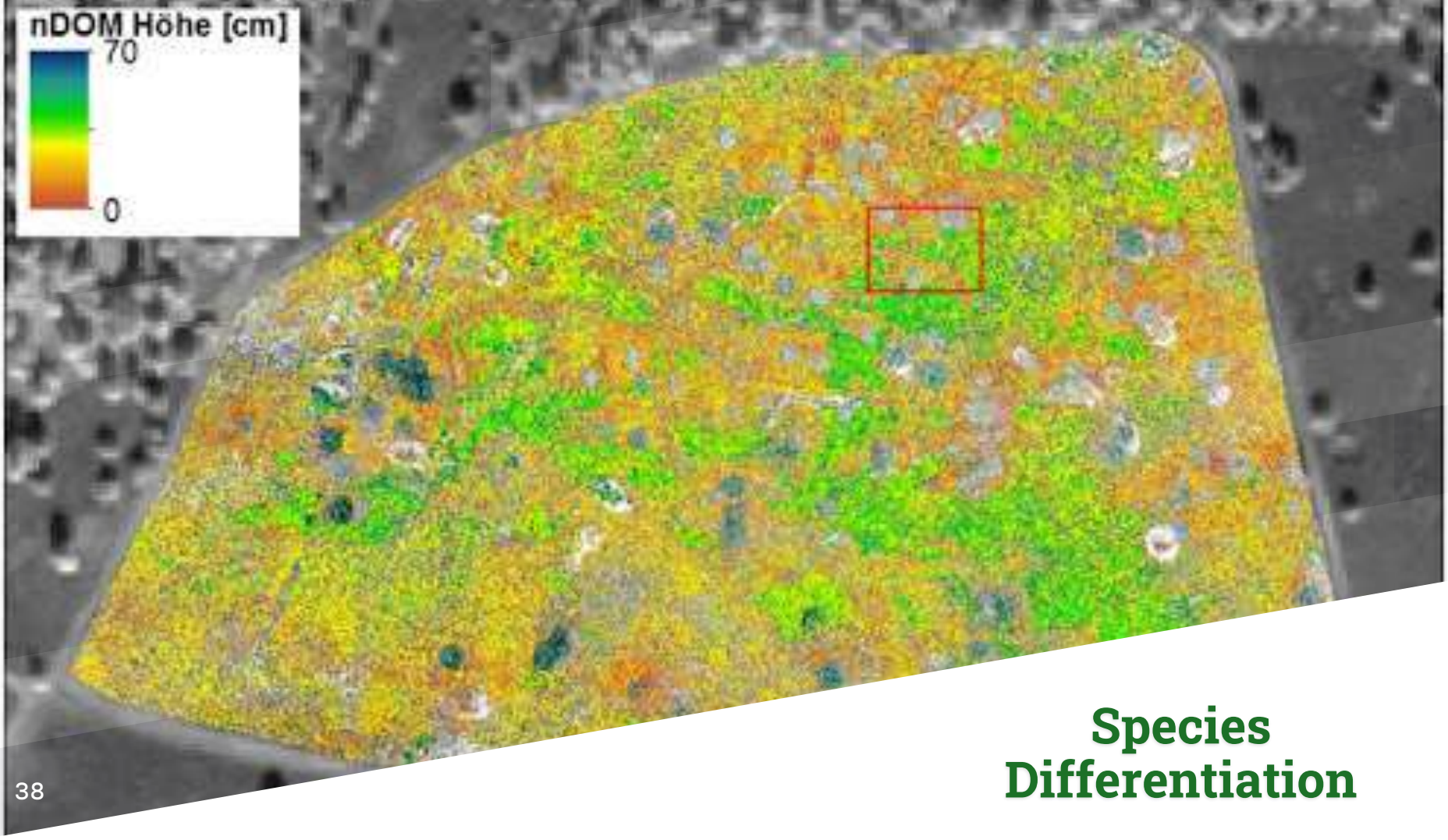
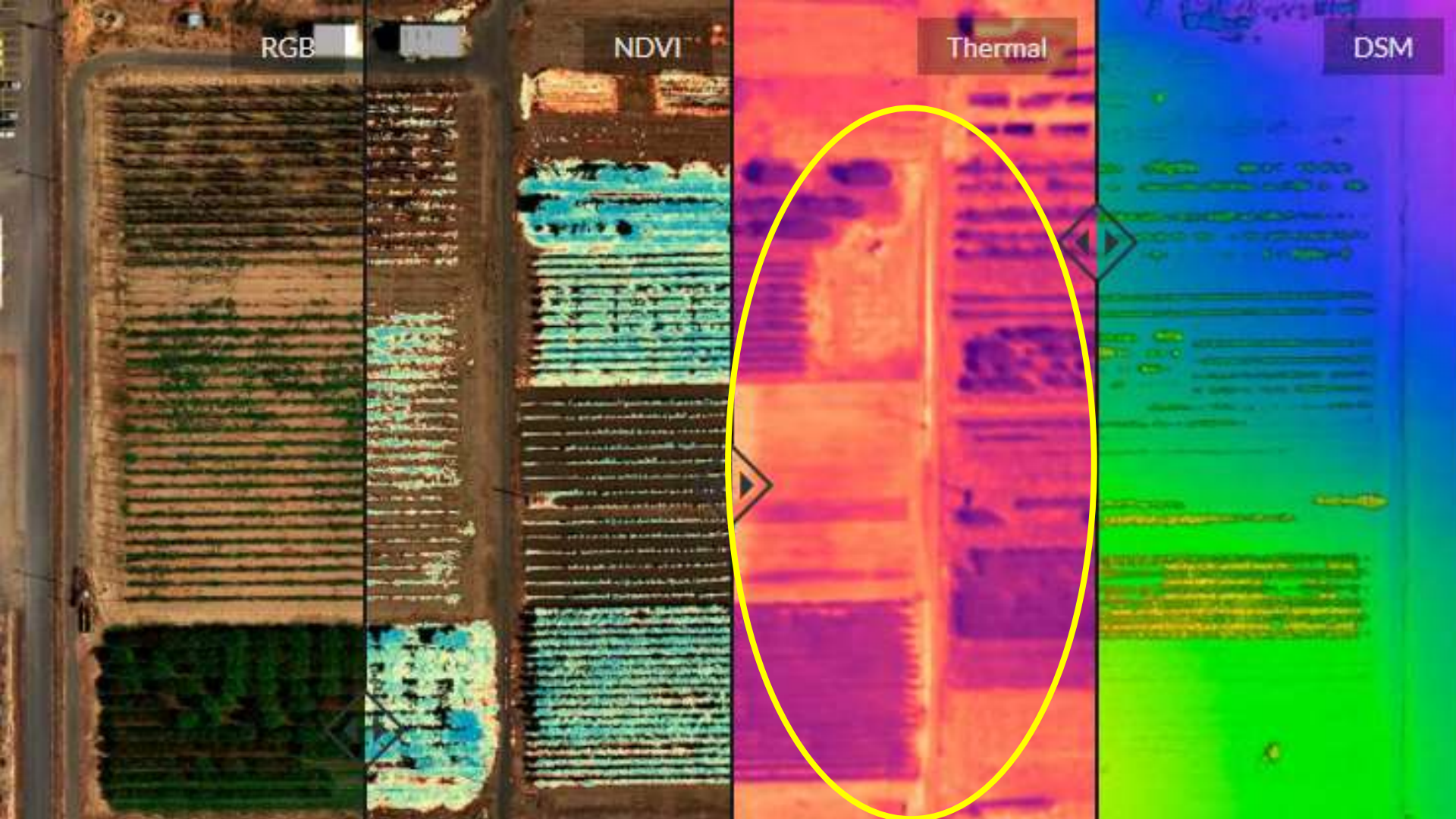


Species Differentiation

Water Management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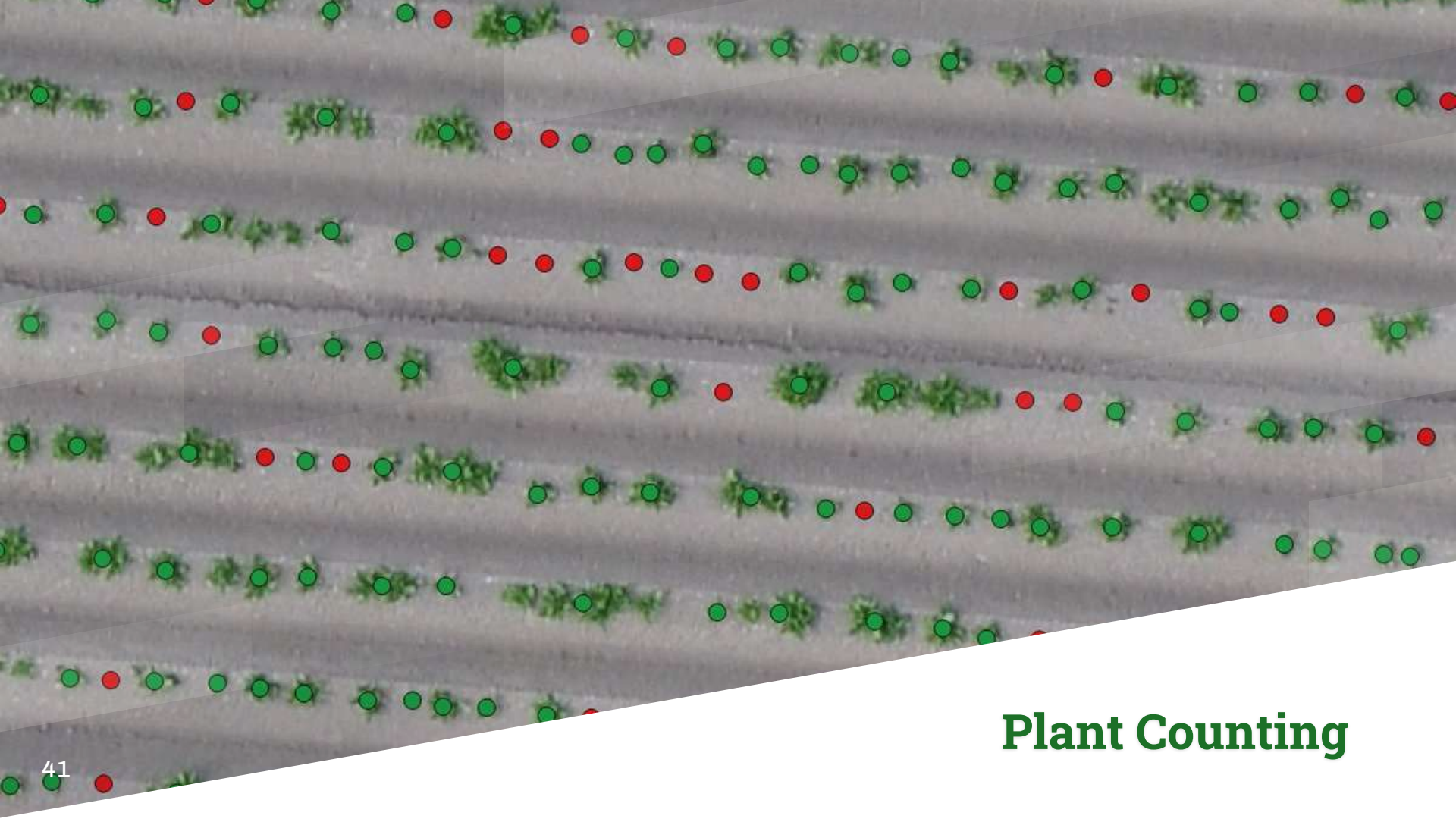
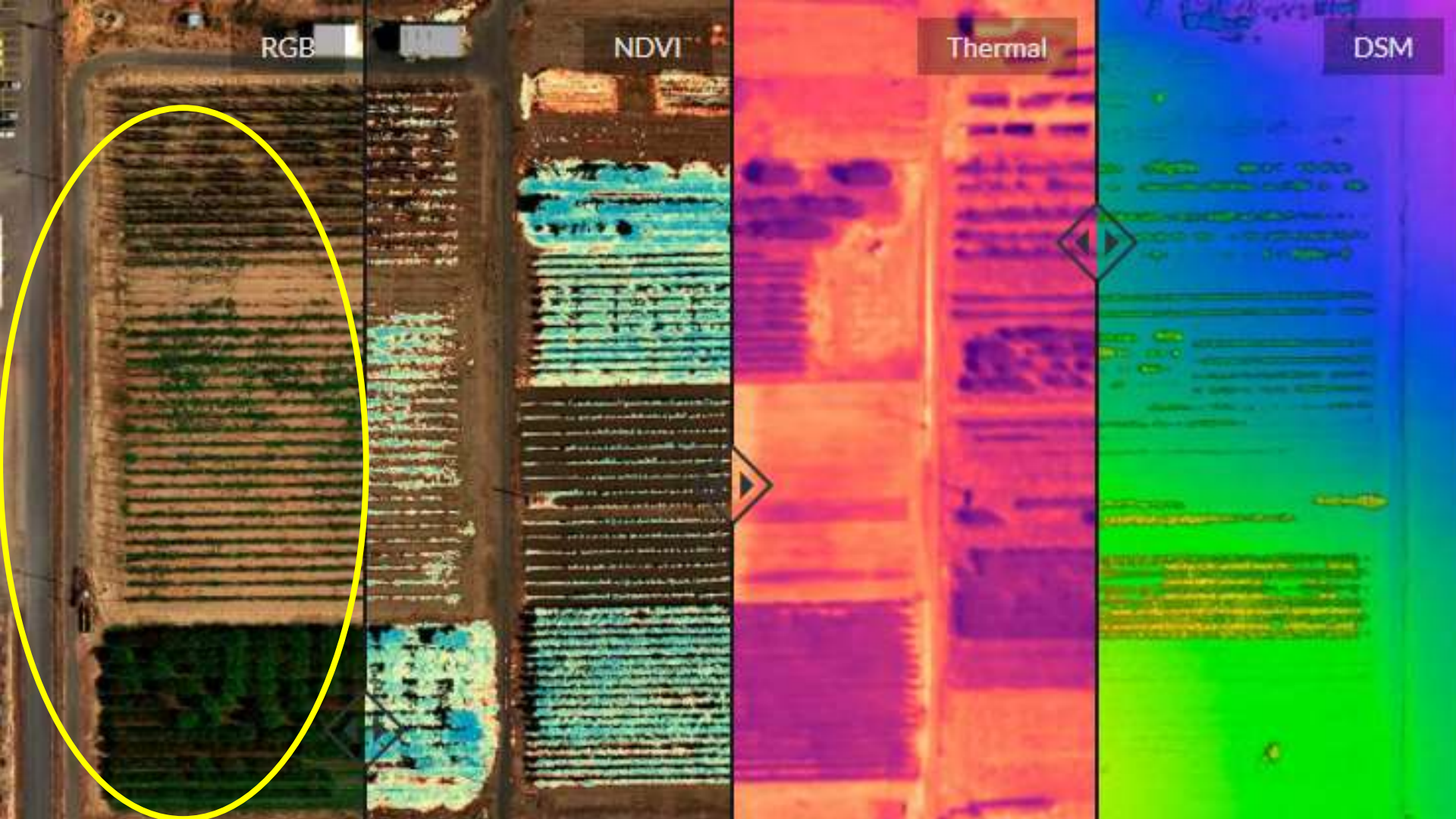


Plant Counting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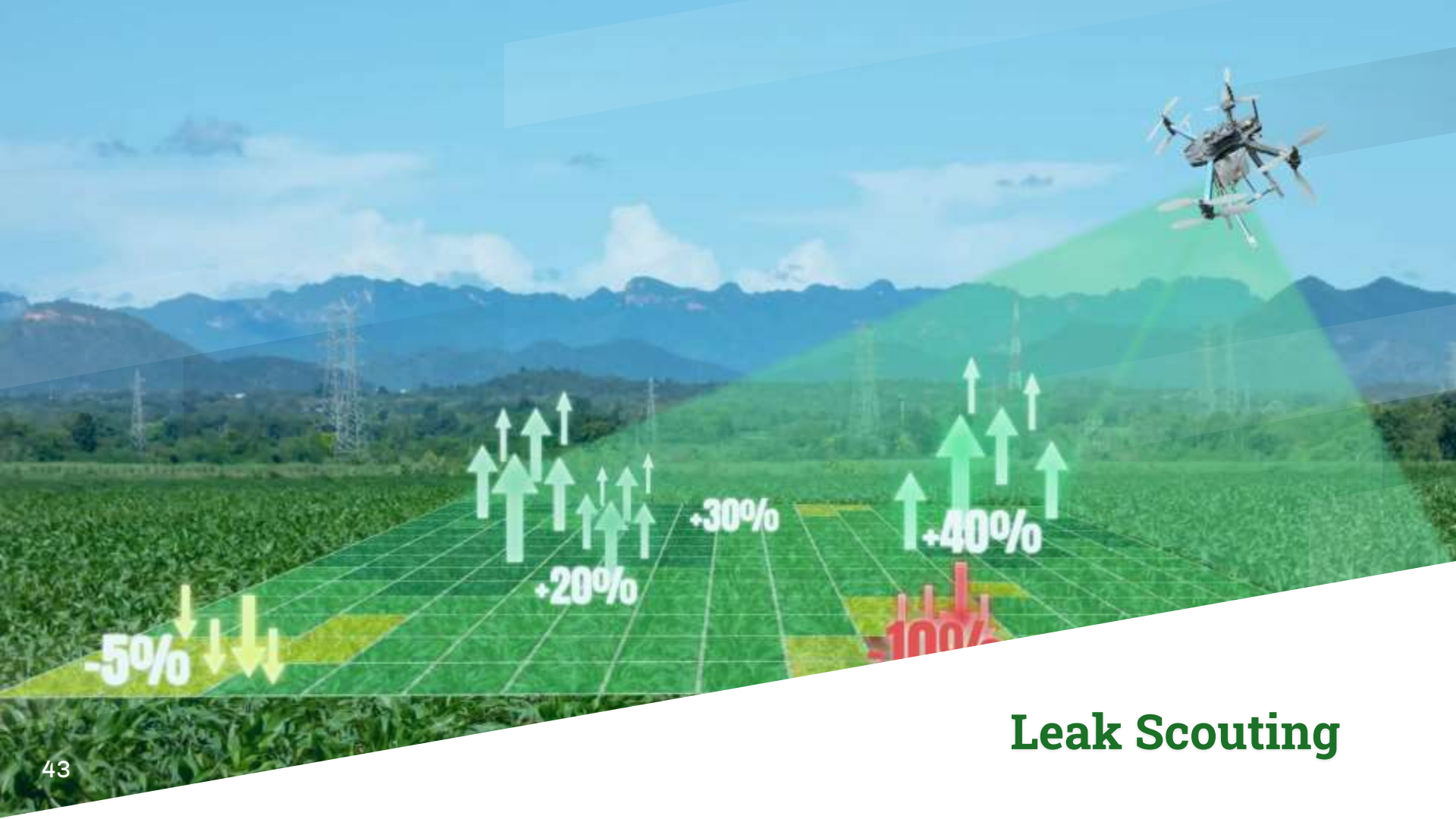
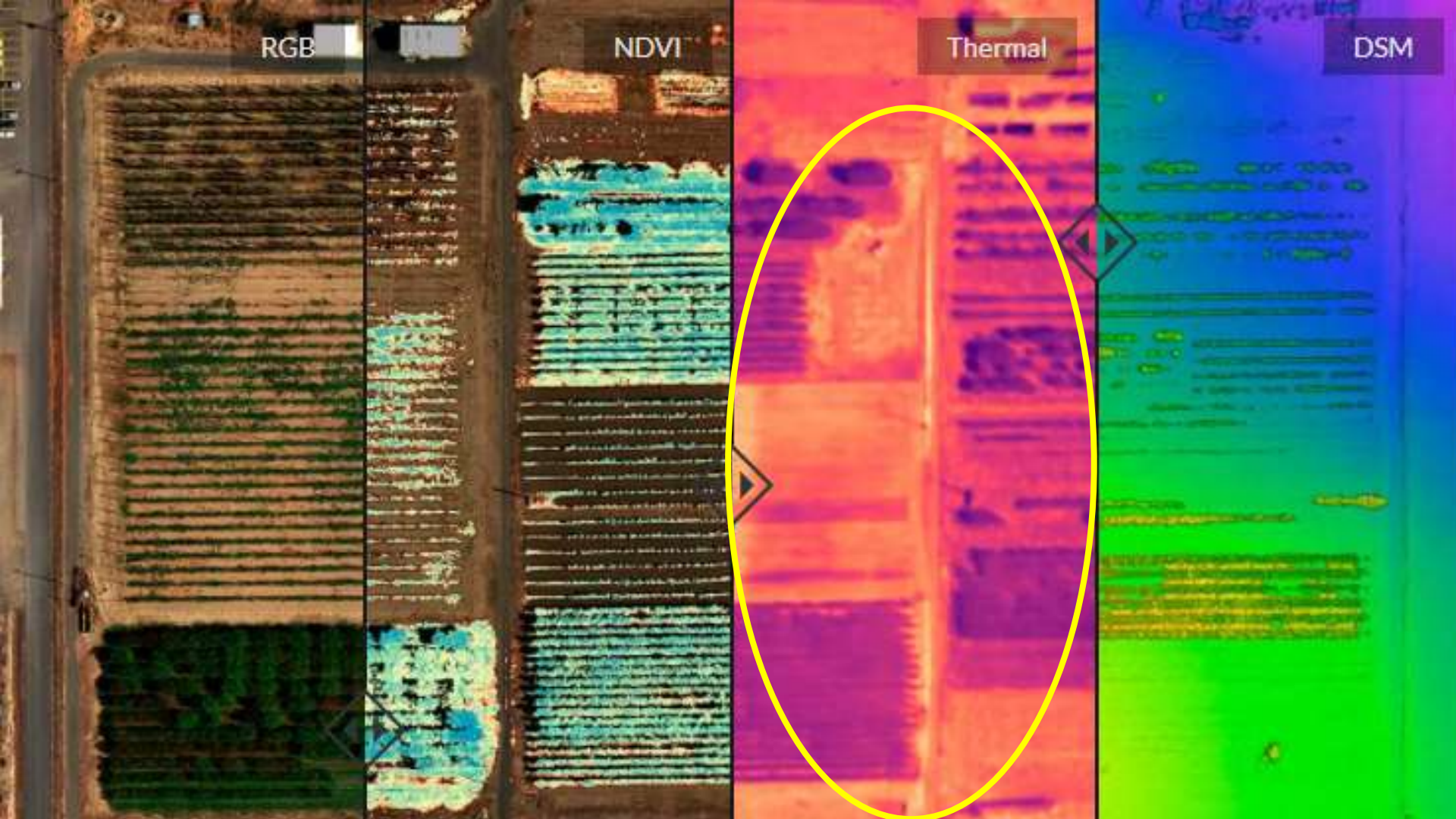


Leak Scouting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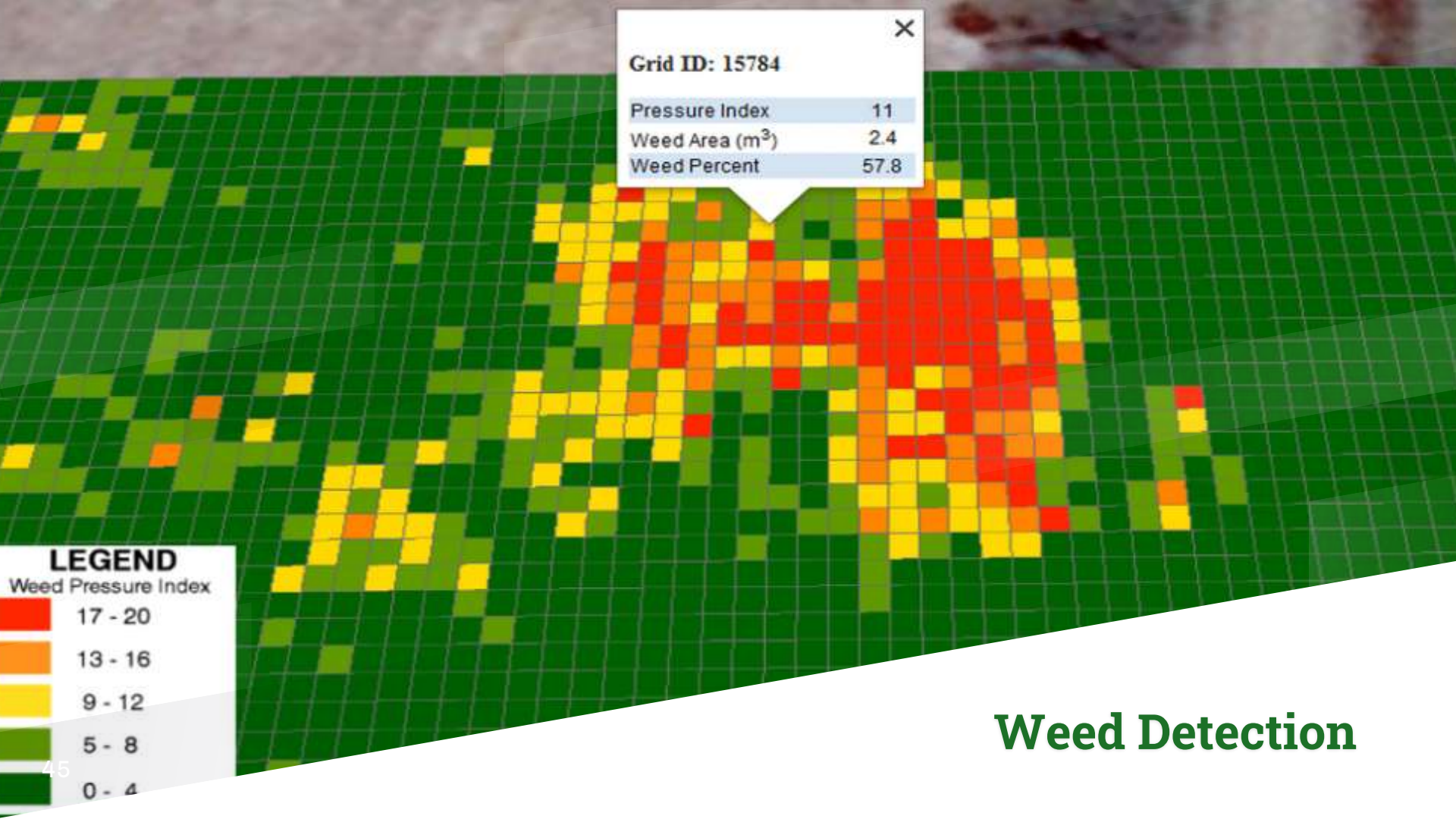
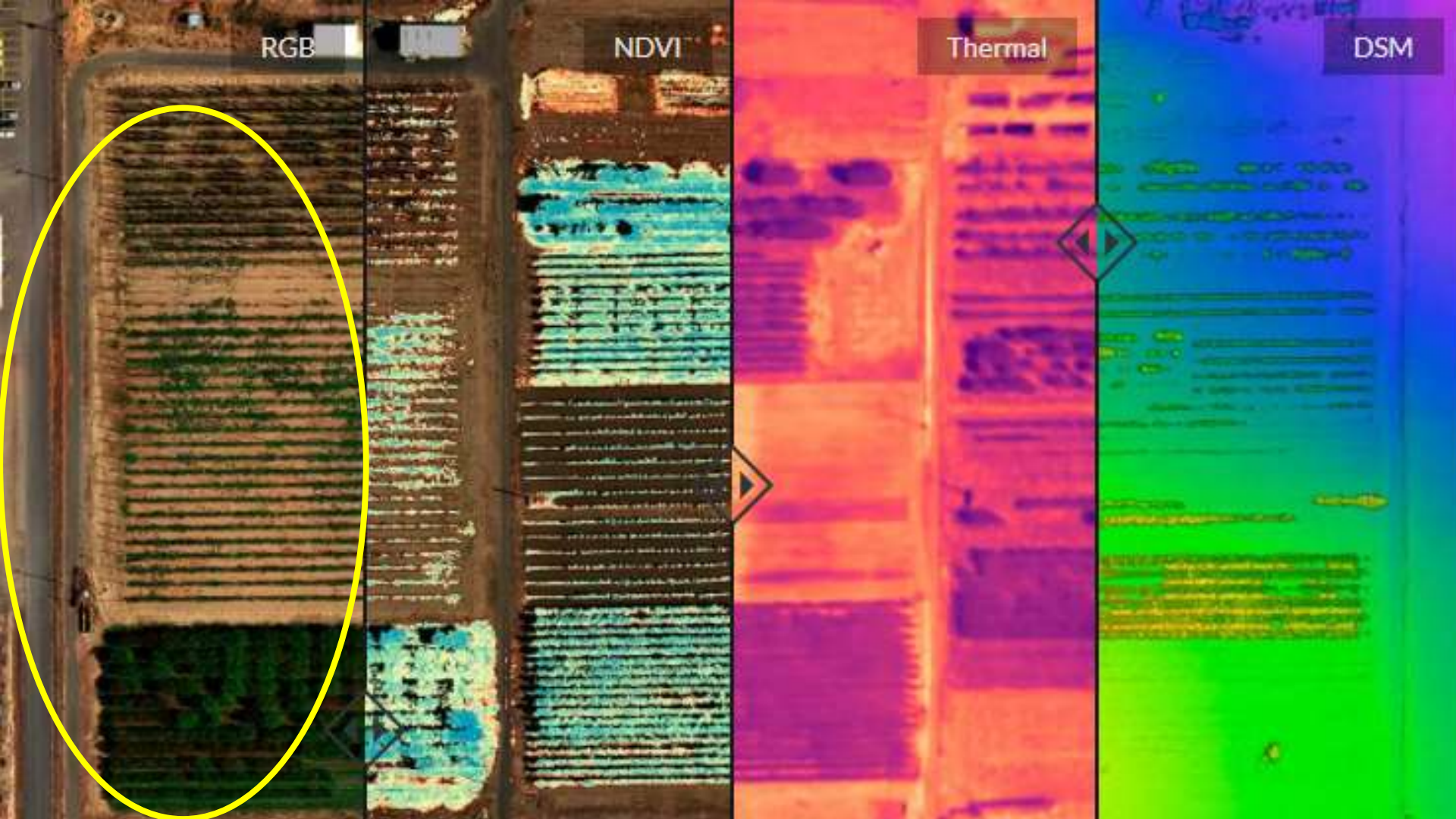


Weed Detection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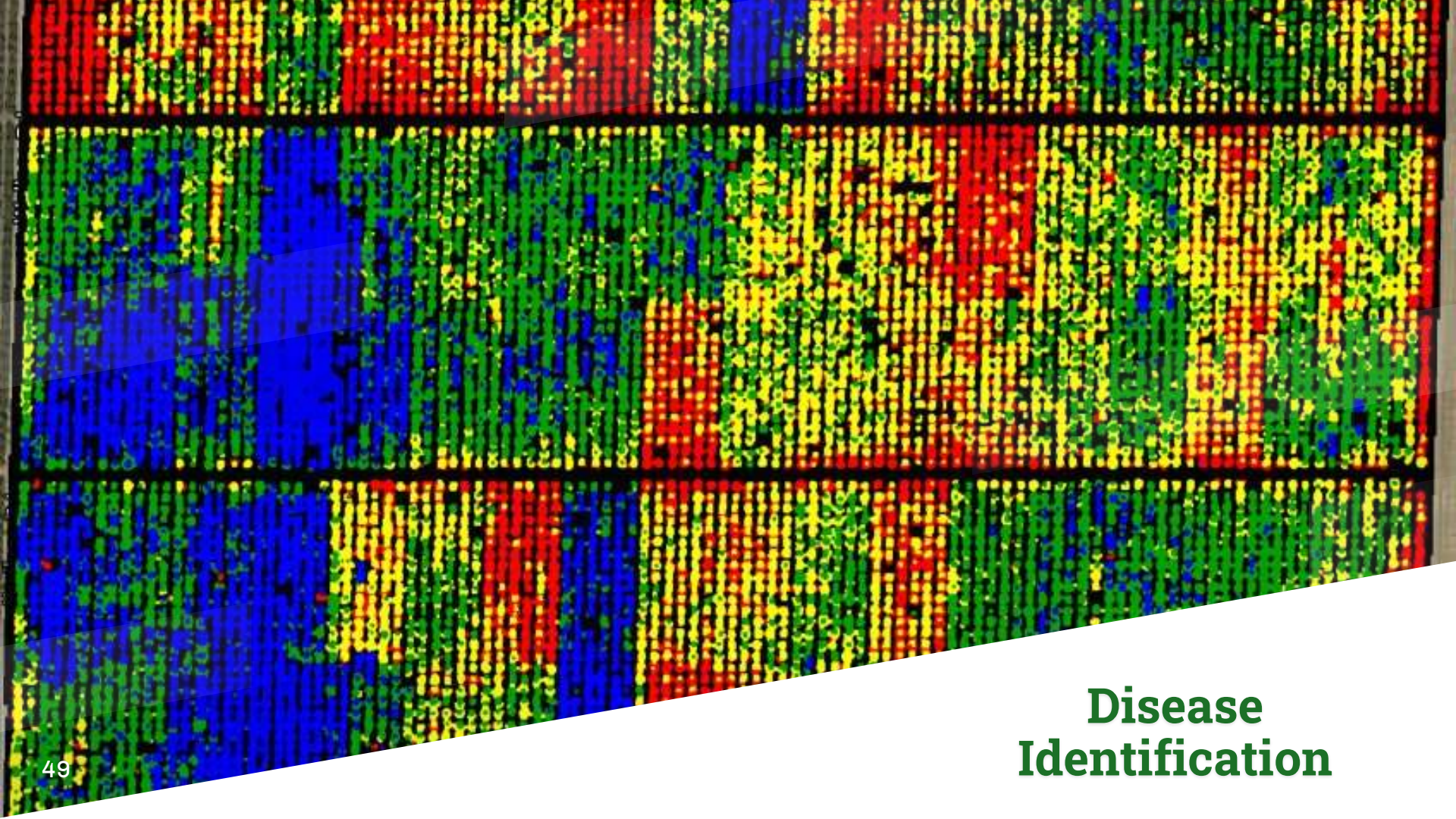
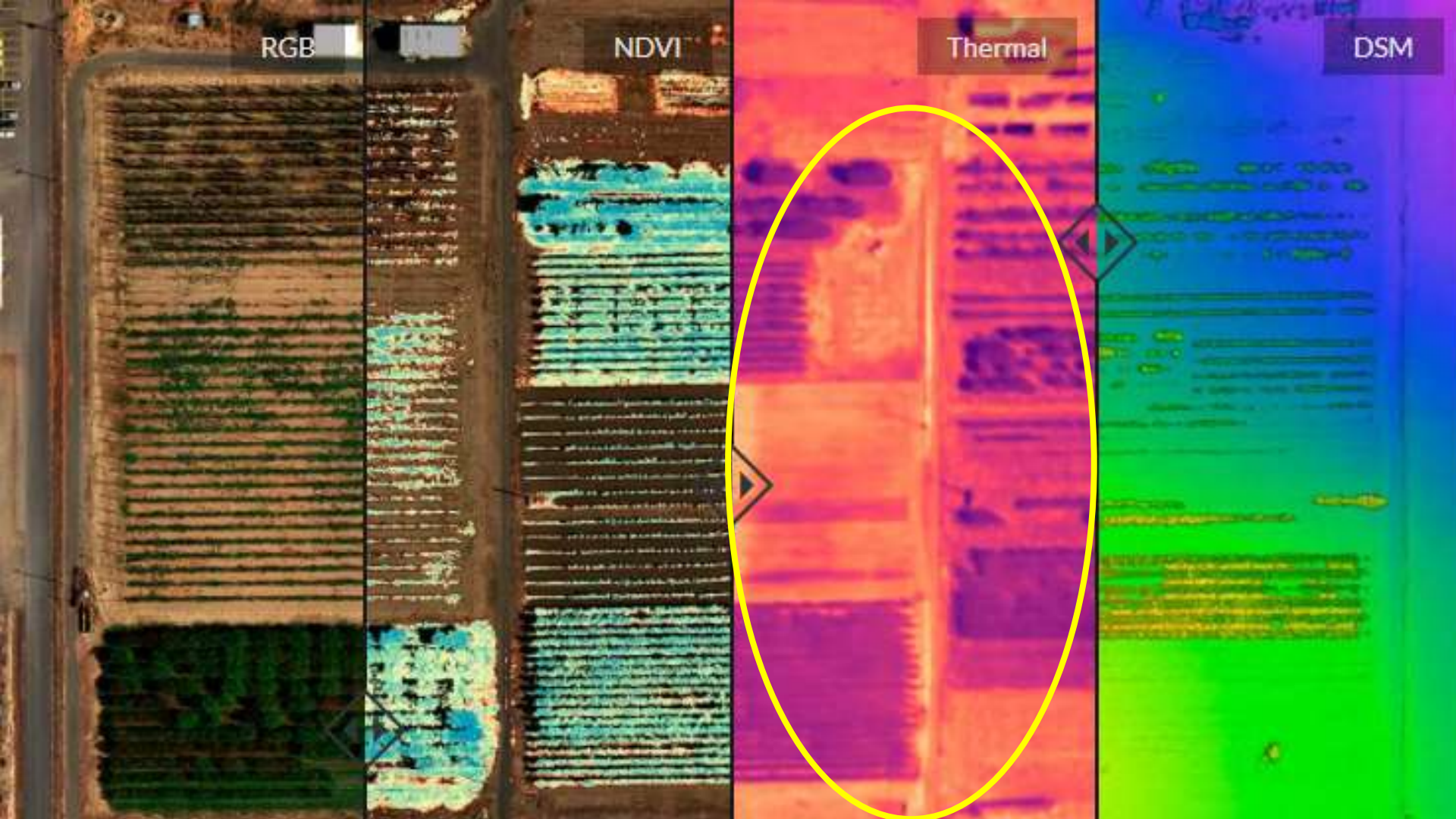
Fertilizer Management

Advanced Crop Scouting



Disease Identification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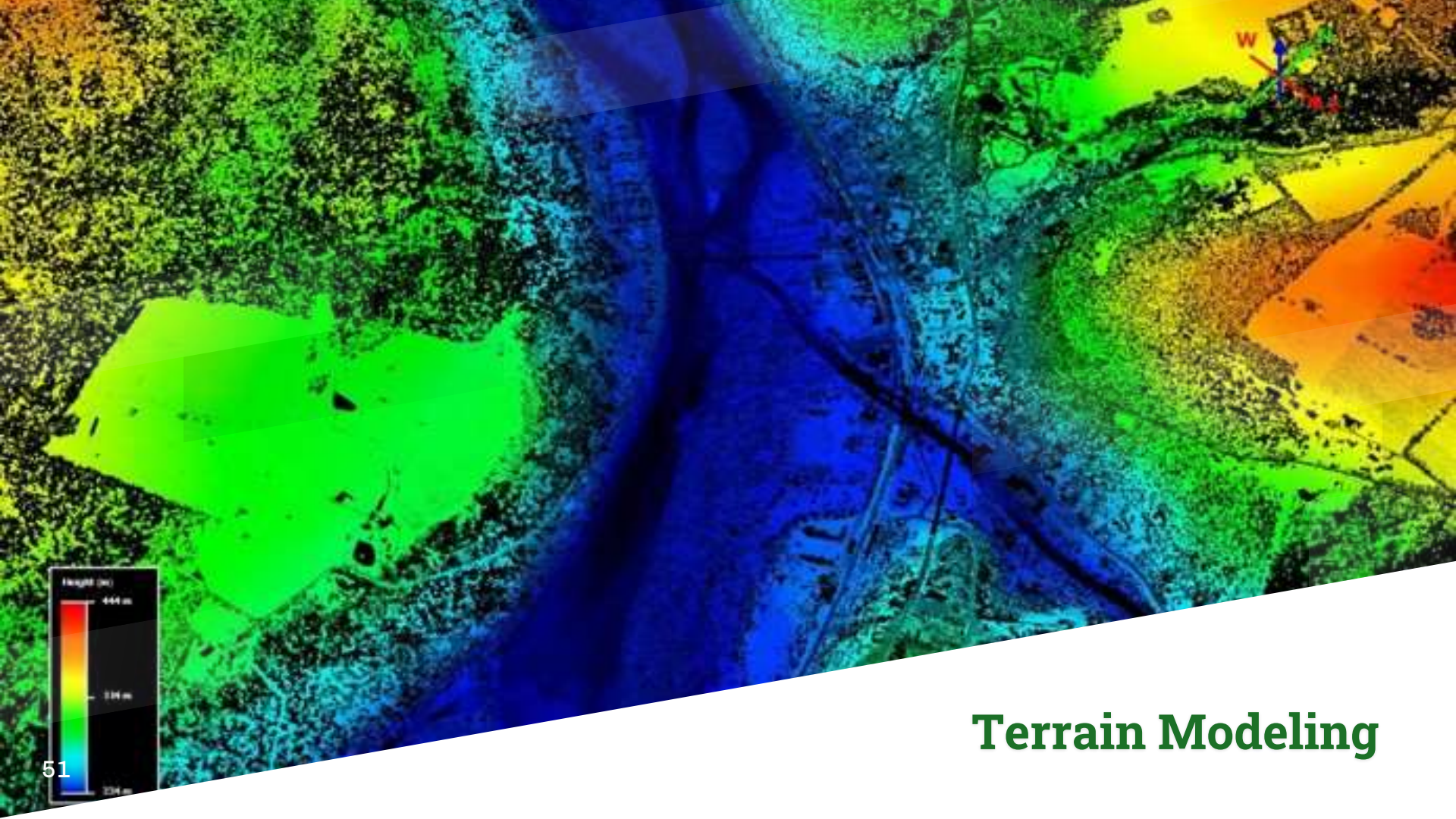
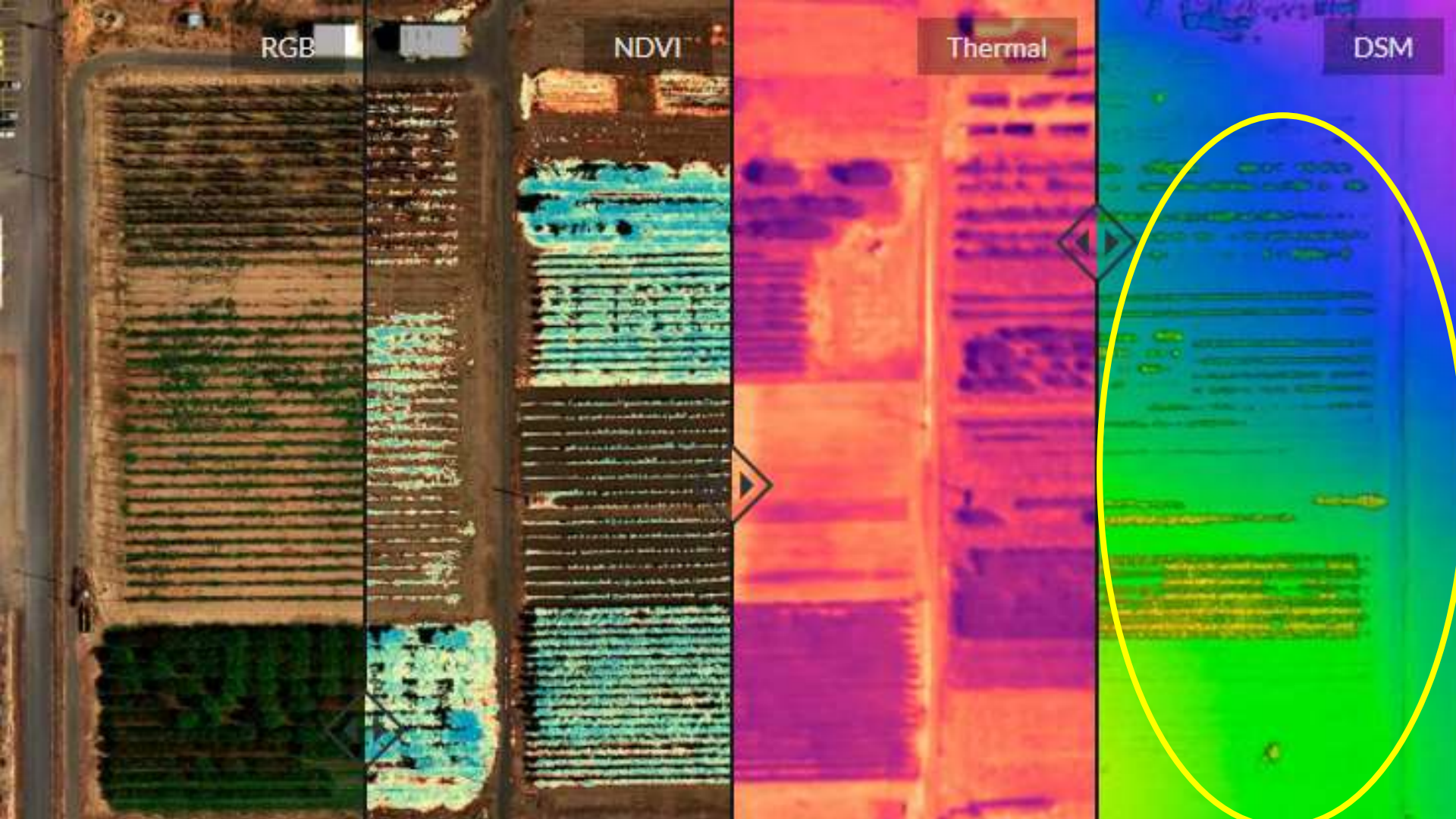


Terrain Modeling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Price Compared to the Market

AgriFly by AgriBots
(≈$4.5 components imported from HK)

MG-1P by DJI ($20k in US market)

Thank you very much for attending our presentation and listening to our project with patience

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