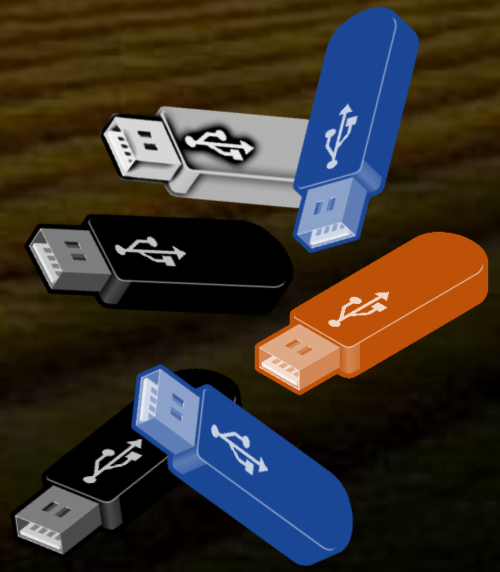
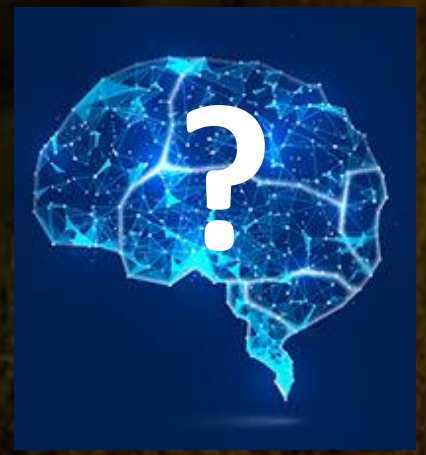
Fueling the Agriculture Decision Engine with data & AI

Claudia Roessler
Director Agriculture Strategic Partnerships
Microsoft

A system out of balance

Evolution of Agriculture decision making





Where Data & Artificial Intelligence scales

- ✓ Complex variables
- ✓ Automation
- ✓ Simulation
- ✓ Visualization
- ✓ Customer Experience
- ✓ Continuous monitoring and alerts
- ✓ Decision support
- ✓ Decision tracking

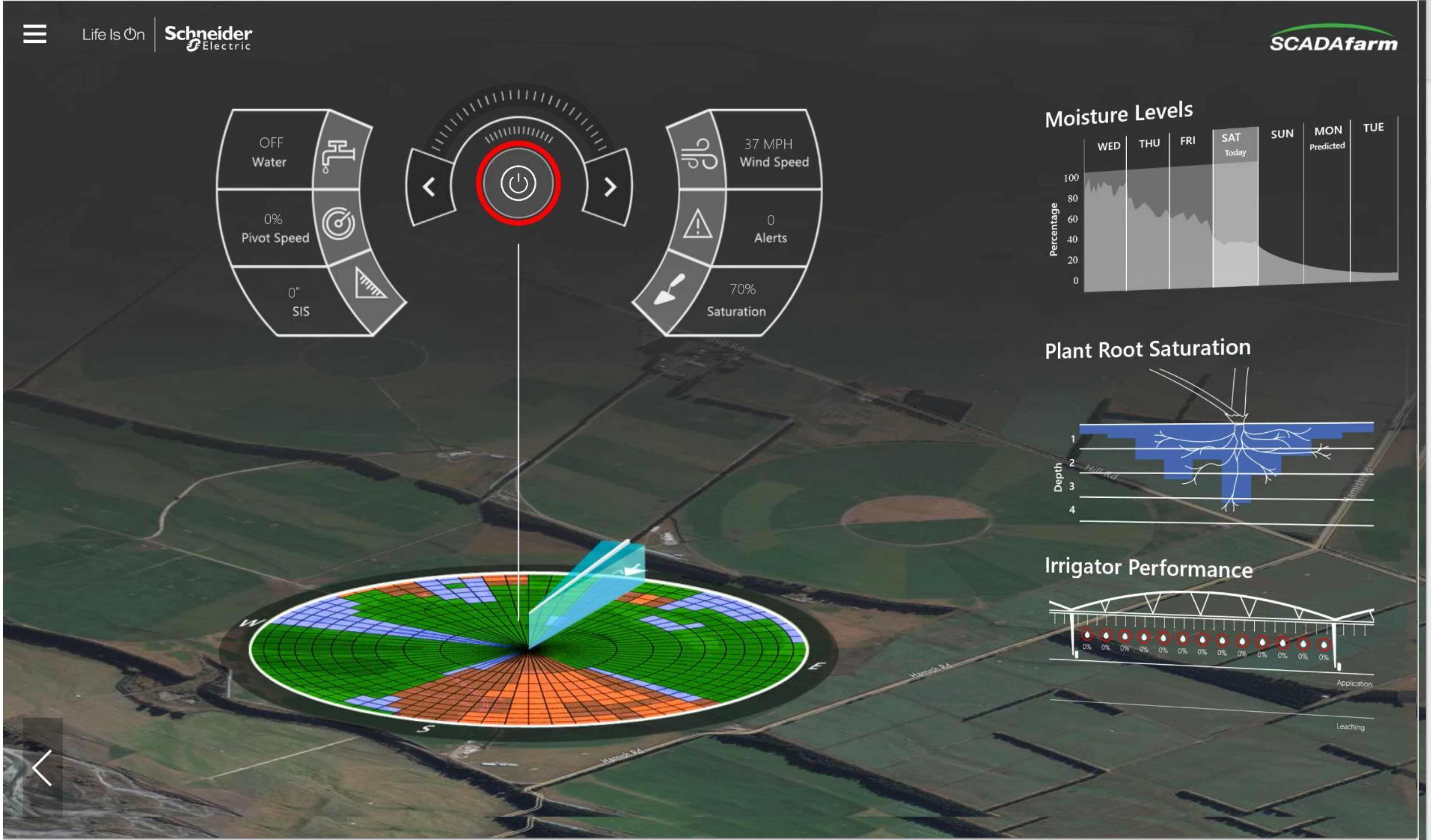
- ✓ From descriptive to predictive analytics

Silvia Terra – using AI to mapping the future of our forests

Video link

Robotics & Automation

- ✓ Remote monitoring
- ✓ Predictive maintenance
- ✓ Fleet Management
- ✓ Track decisions
- ✓ “See and spray”
- ✓ Digital Twin
- ✓ Autonomous



Life Is On
Schneider Electric
SCADAfarm
OFF
Water
0%
Pivot Speed
0°
SIS
37 MPH
Wind Speed
0
Alerts
70%
Saturation
Moisture Levels
WED
THU
FRI
SAT
Today
SUN
MON
Predicted
TUE
Percentage
100
80
60
40
20
0
Plant Root Saturation
Depth
1
2
3
4
Irrigator Performance
Application
Leaching
W
E
S

Autonomous Greenhouses Challenge

Learn a policy that can optimally control indoor farms

1	Heating setpoint	°C
2	Ventilation setpoint	°C
3	Minimum rail pipe temperature	°C
4	Minimum growing pipe temperature	°C
5	Minimum Leewvent opening	°C
6	Minimum Windwvent opening	°C
7	Humidity deficit sepoint	gram/kg
8	Energy screen position	0-100%
9	Blackout screen position	0-100%
10	Artificial illumination	0 or 100%
11	CO_2 setpoint	ppm
12	Time between last and next irrigation turn	minutes
13	duration of an irrigation turn	seconds

Table 2. List of control settings that teams can *write* through the REST API.

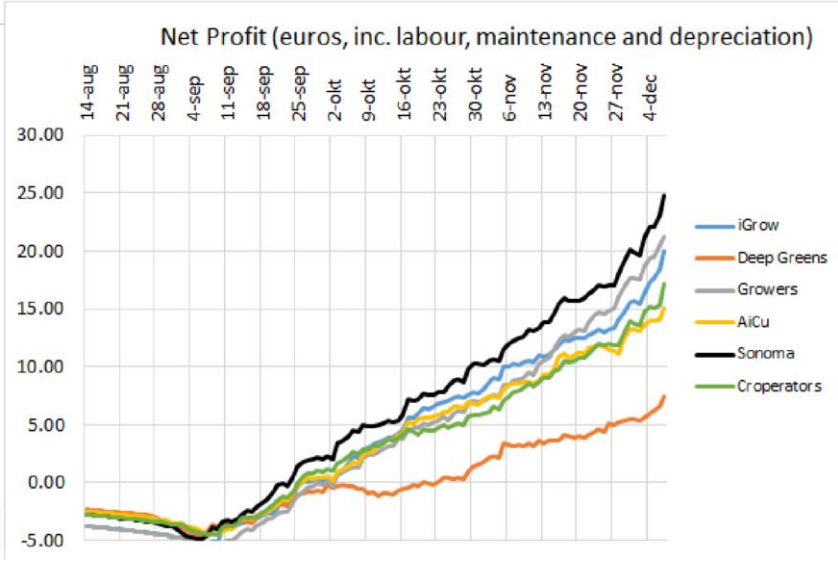
Result: AI beats the expert growers

Sustainability factors

	iGrow	deep_ greens	Growers	AiCU	Sonoma	The Croperators
Kg CO_2/ Kg cucumber	0.20	0.47	0.20	0.26	0.20	0.29
kWh electricity/ Kg cucumber	3.12	4.39	3.02	3.17	3.59	3.82
kWh heat use/ Kg cucumber	2.94	13.61	3.20	3.13	2.49	4.87
L water use/ Kg cucumber	5.89	5.87	5.52	7.62	4.91	5.98
mL pesticide/ Kg cucumber	0.39	0.49	0.34	0.48	0.35	0.35

Weighing factor by jury:
0.25 for electricity, heat, water
0.125 for CO_2, pesticides

Net profit



Improve food quality and safety

Bühler's LumoVision solution is a data-driven optical grain sorter that is connected to Azure for data analysis. It uses powerful cameras and ultraviolet lighting to hunt for hidden infections, sorting good corn from bad corn.

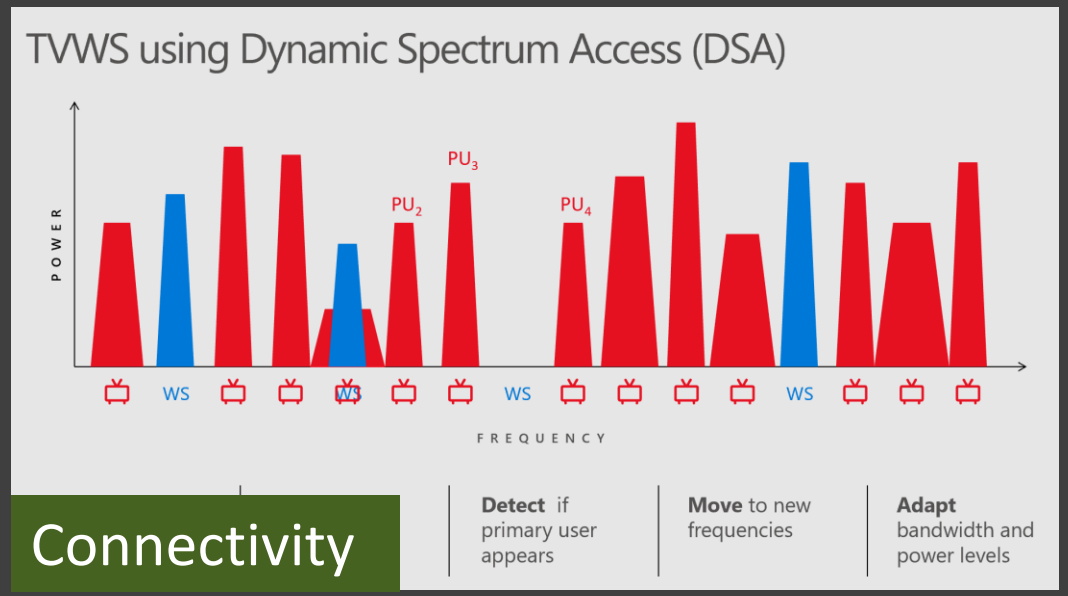
Lumovision processes up to 15 tons of product an hour

BÜHLER

▷ Watch

Large Scale Monitoring & Farm Level Predictions

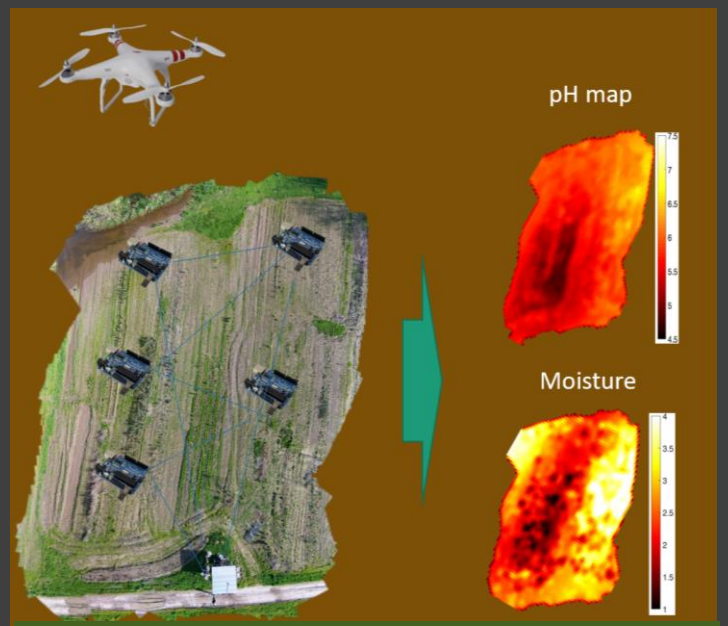
- ✓ Field monitoring/scouting
- ✓ Pest/Disease/yield predictions
- ✓ Variable rate application
- ✓ Land Cover mapping
- ✓ Simulation



Connectivity

Less cloud dependency

Sensor/Image fusion



Predictions

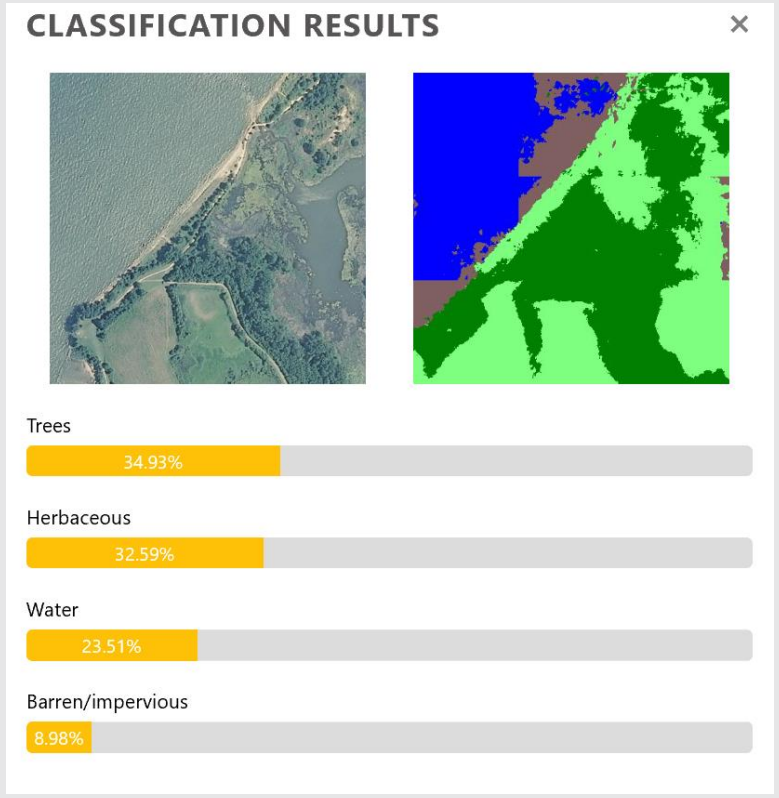
Microsoft FarmBeats

@Dancing Crow Farm

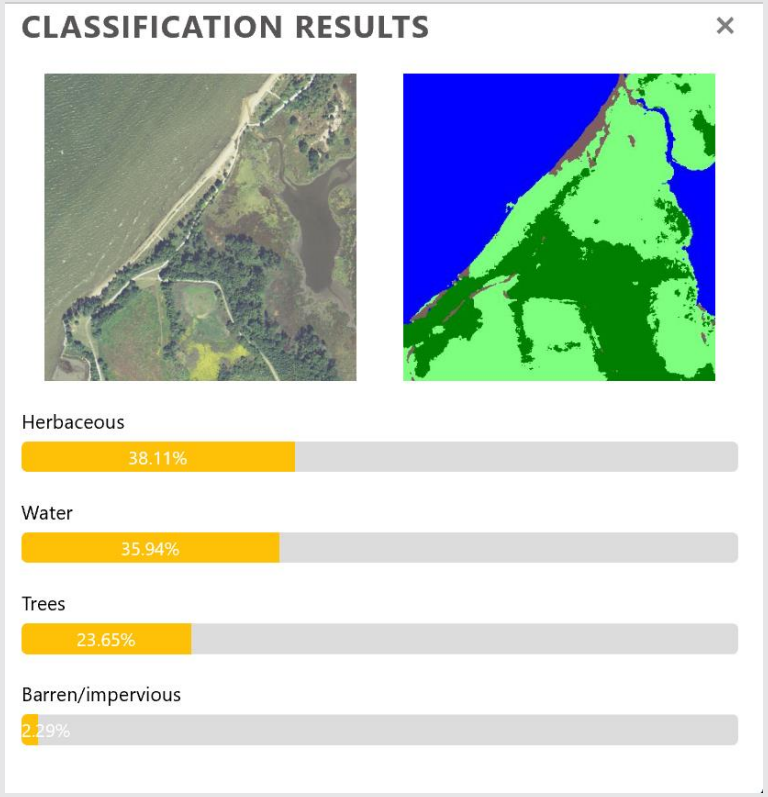
- 30% less water for irrigation
- 44% less lime to control soil pH
- Moisture level determine planting of seeds
- Identify inadequate drainage impacting produce quality
- Flooding control and patterns

©images by Gates Notes

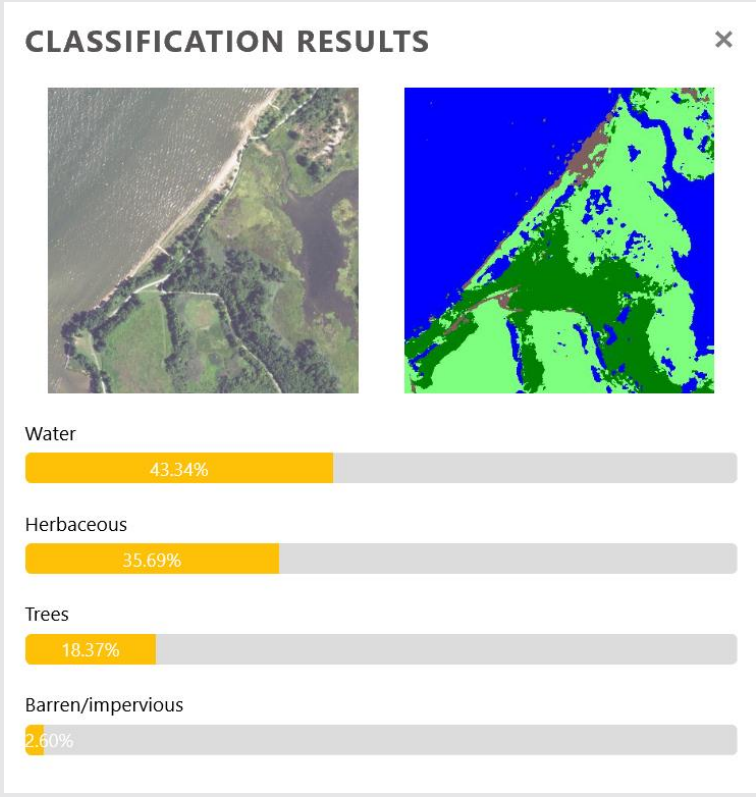
Land Cover Mapping



Kent Island 2011

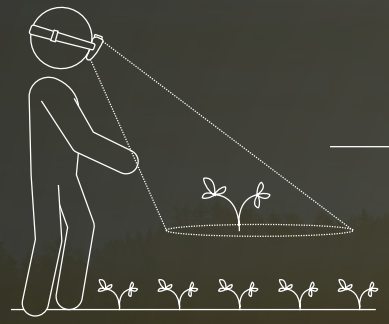


Kent Island 2013



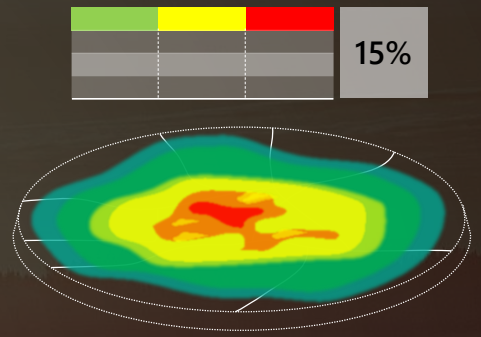
Kent Island 2015

Pre-season planning



AGGREGATED INSIGHT

Creating a mixed reality view of your farm with the ability to visualize pH and soil types

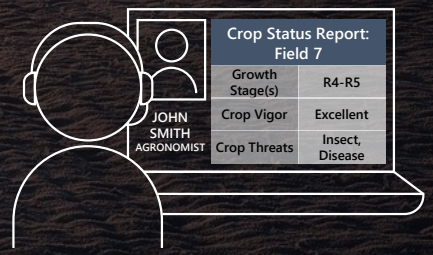


SIMULATION AND PREDICTION

Leveraging predictive insights and simulation data to inform planning decisions

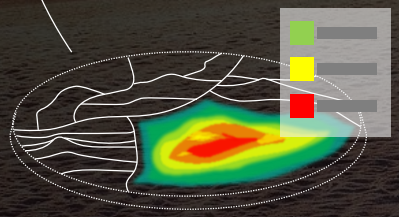
REMOTE SUPPORT

Collaborating with an agronomist to monitor growth stages, identify crop threats, and deliver recommendations



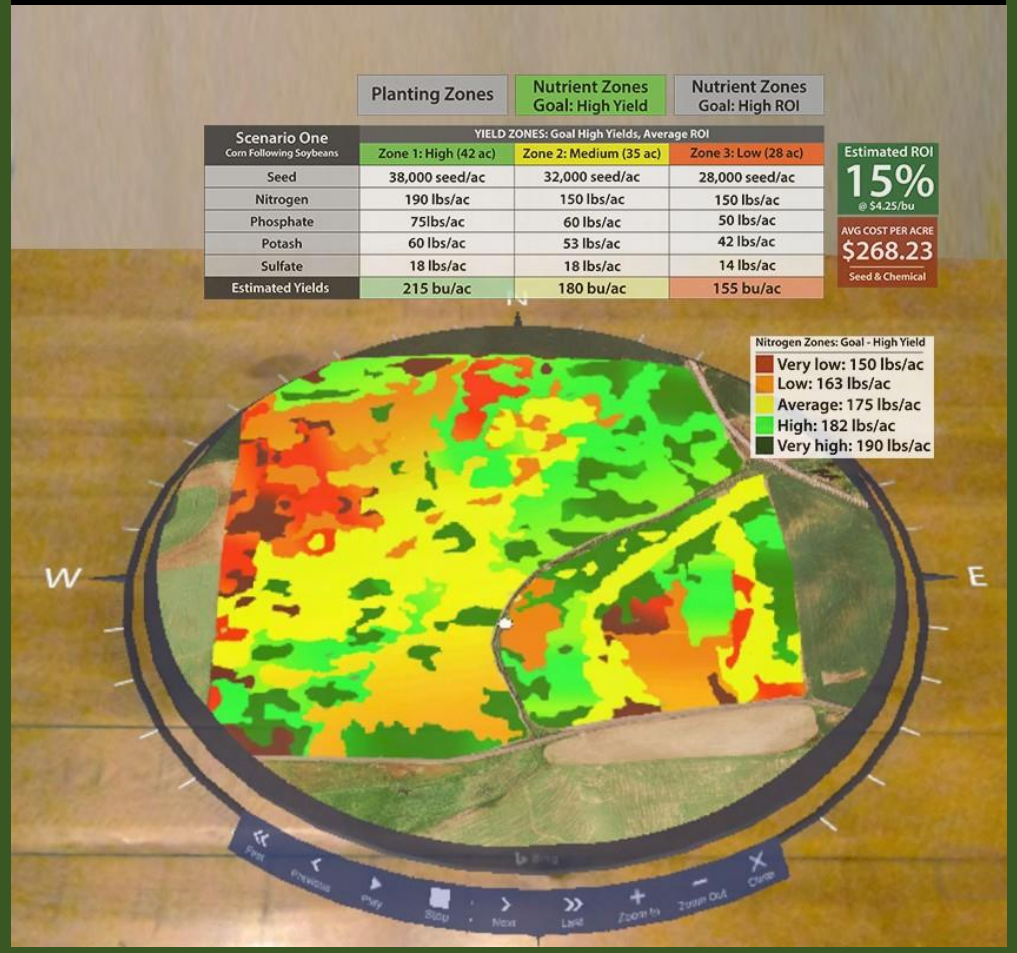
YIELD ANALYSIS

Leveraging agronomist recommendations to influence future farming seasons

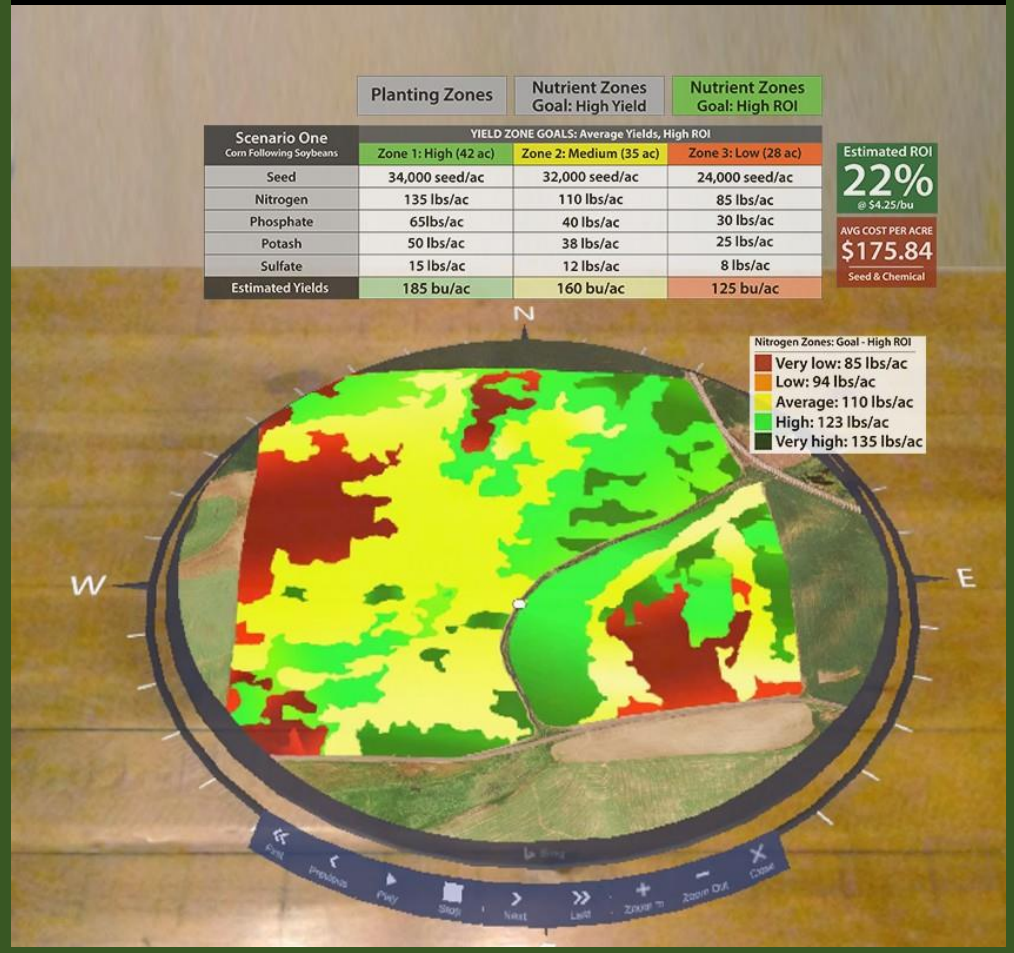


Simulation and Prediction

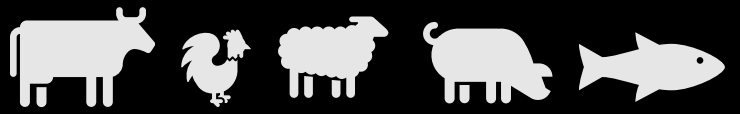
Scenario One: High Yields, Average ROI

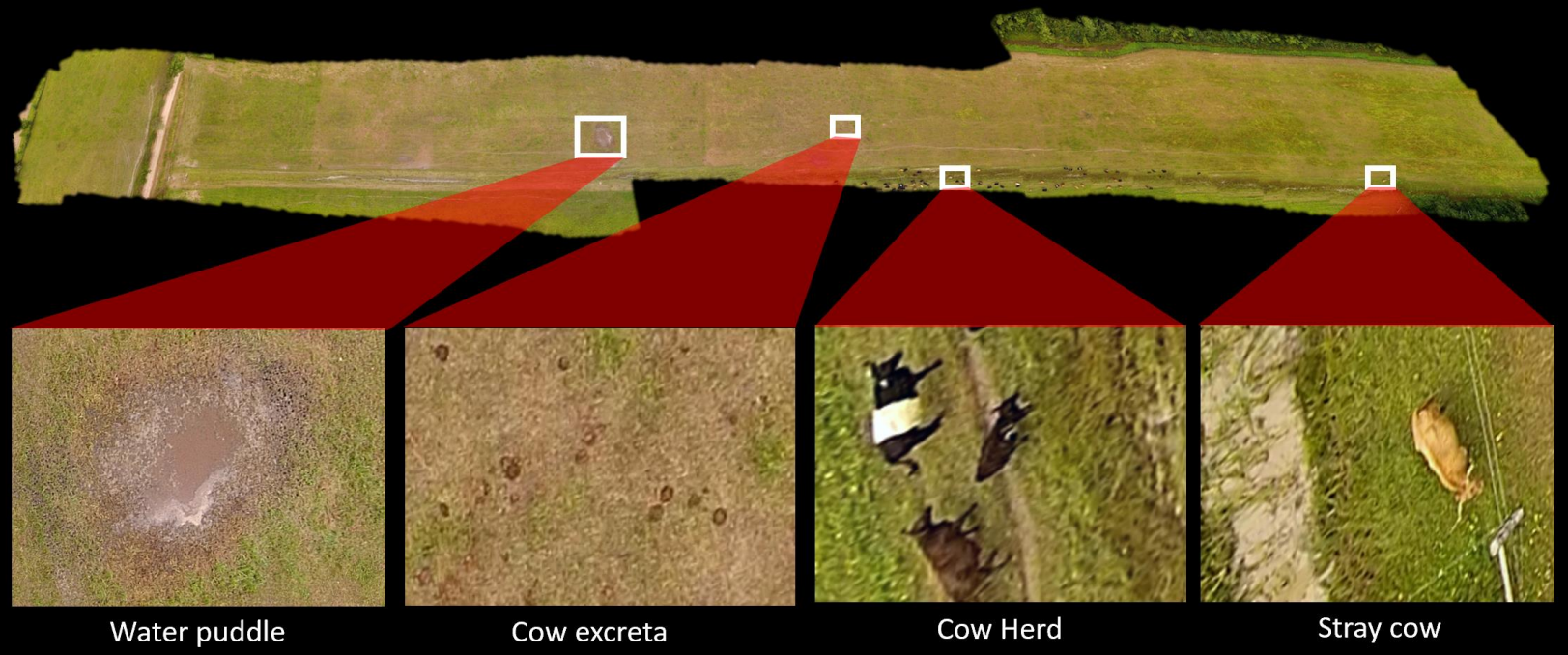


Scenario Two: Average Yield, High ROI

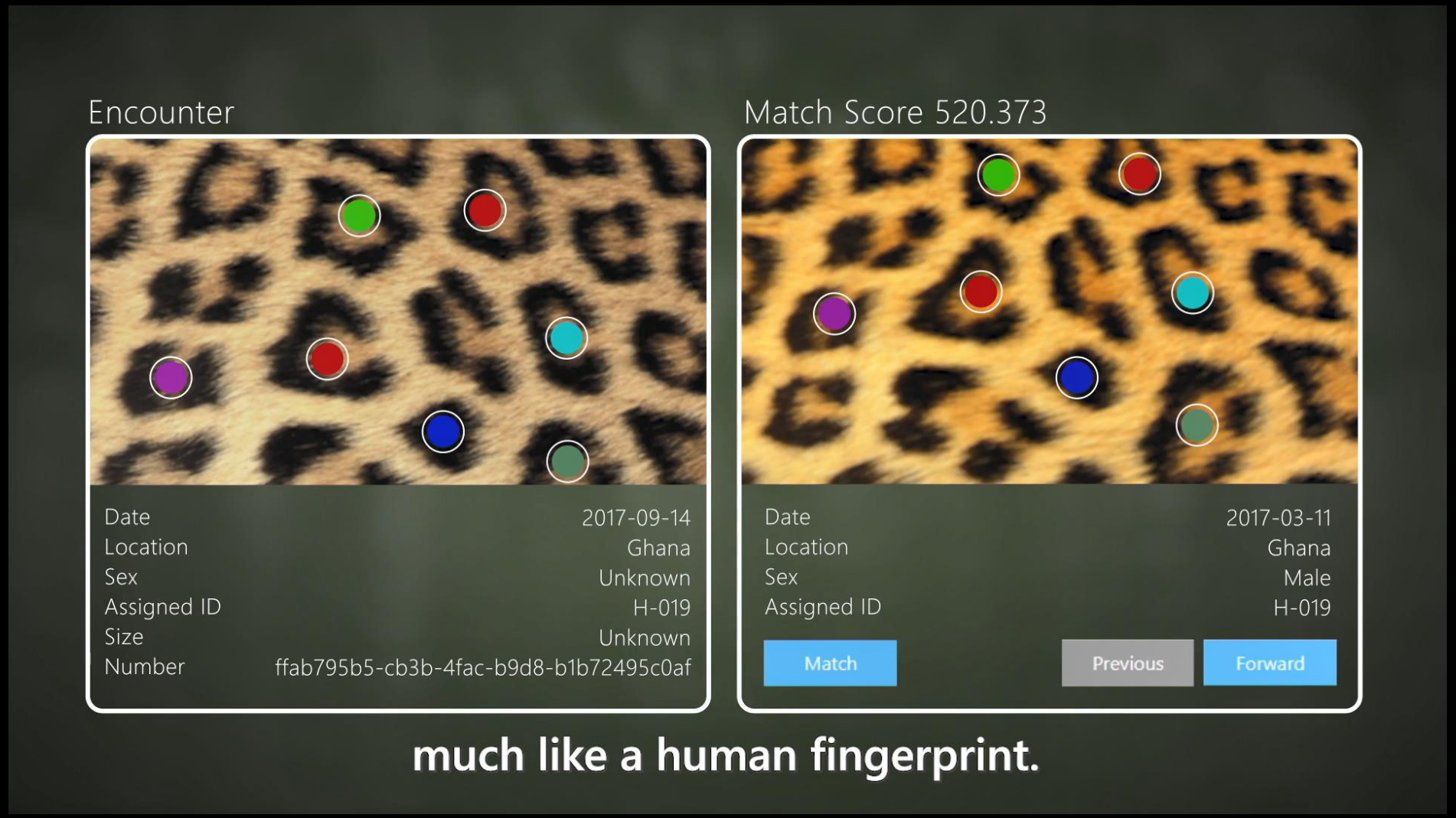


Animal monitoring

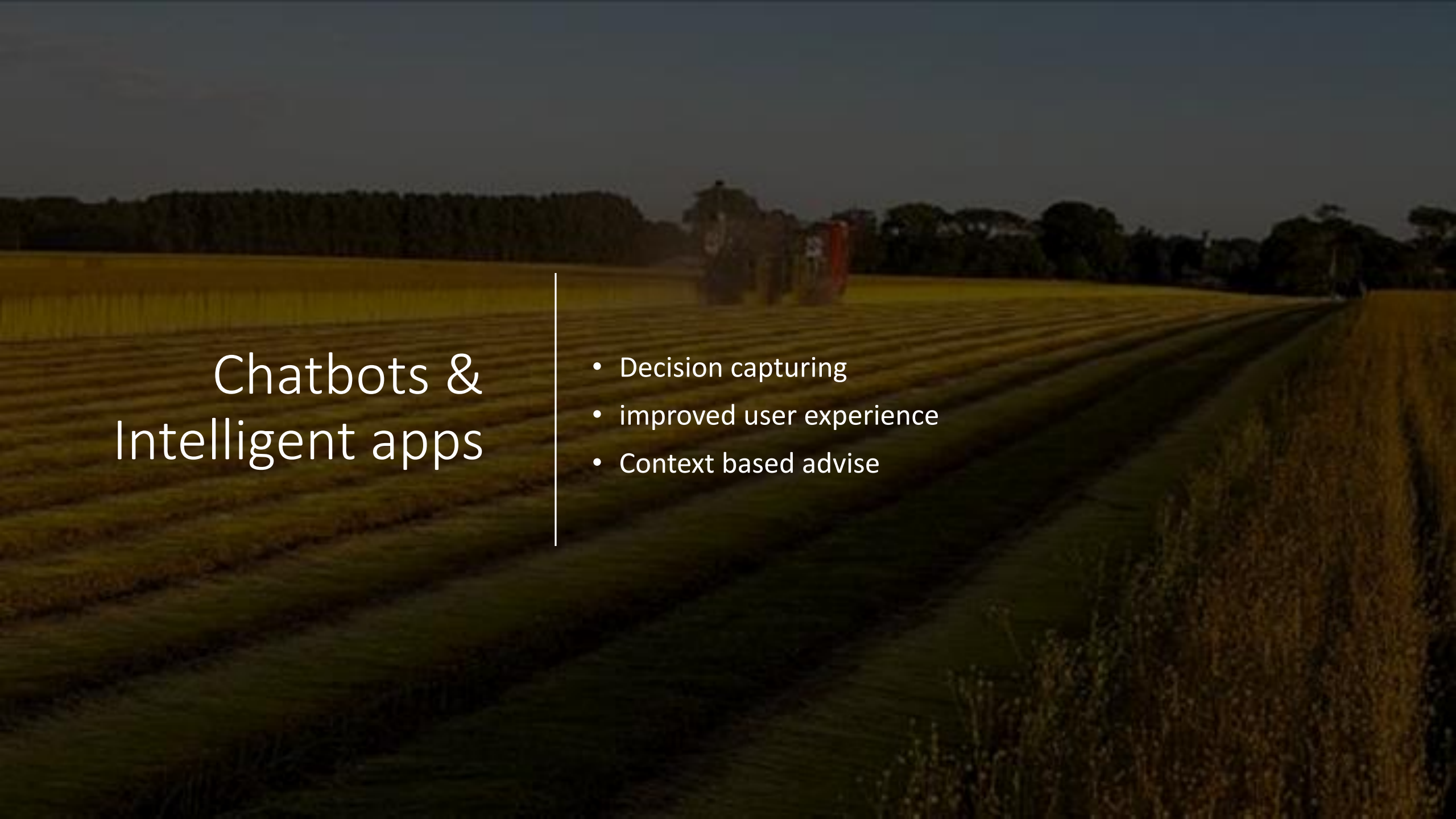




Fighting extinction with citizen science

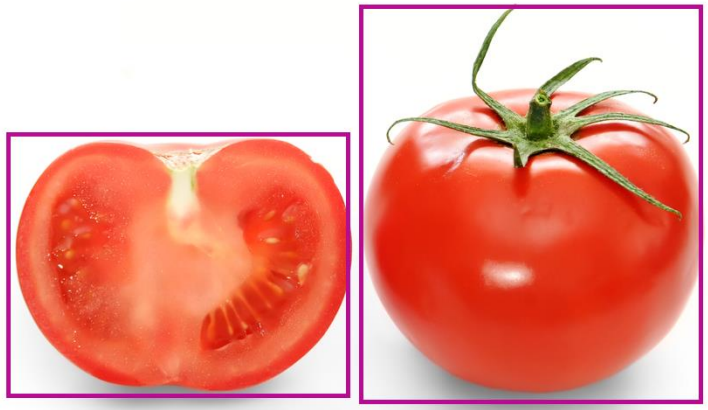


Video [link]



Chatbots & Intelligent apps

- Decision capturing
- improved user experience
- Context based advise



FEATURE NAME:	VALUE
Objects	[{ "rectangle": { "x": 798, "y": 82, "w": 677, "h": 769 }, "object": "Tomato", "parent": { "object": "Vegetable", "parent": { "object": "Food", "confidence": 0.833 }, "confidence": 0.805 }, "confidence": 0.728 }, { "rectangle": { "x": 115, "y": 333, "w": 670, "h": 517 }, "object": "Food", "confidence": 0.752 }]
Tags	[{ "name": "tomato", "confidence": 0.9561183 }, { "name": "vegetable", "confidence": 0.8946861 }, { "name": "plant", "confidence": 0.597619653 }, { "name": "fruit", "confidence": 0.0343686 }, { "name": "food", "confidence": 0.02278873 }]
Description	{ "tags": ["tomato", "table", "indoor", "bowl", "sitting", "red", "small", "food", "fruit", "plate", "orange", "counter", "white", "vase", "board"], "captions": [{ "text": "a close up of a tomato",

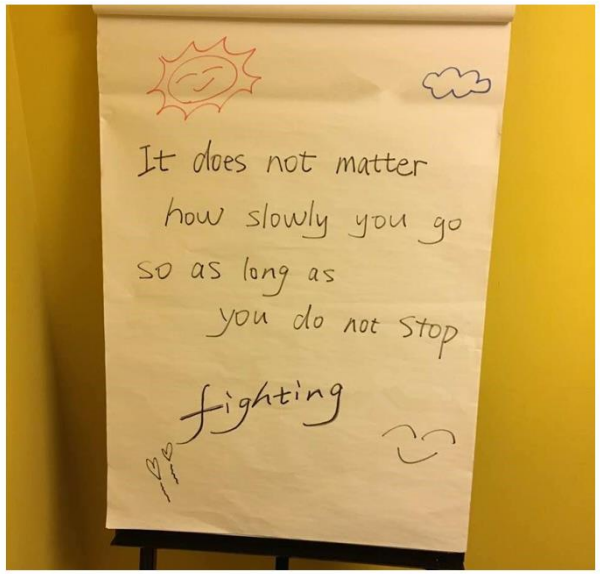


Image URL

Submit

Browse

Preview | JSON

It does not matter

how slowly you go

so as long as

you do not Stop

Fighting

Farmers in India are using AI to increase crop yields

- Planting decision
  - Sowing Date
  - Pest Alert
  - Price Forecast
- 10 planting advisories
- automated voice calls or text
- average of 10-30% yield increase

Microsoft

Success criteria

- Creating digital feedback loops
- Protect Security & Privacy needs
- Build an ecosystem