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ACUAES
AGUAS DE LAS CUENCAS DE ESPAÑA SA

Air quality monitoring and weather forecast to reduce impacts on communities

Alex Mateo
Senior Key Account Manager Envirosuite

Agenda

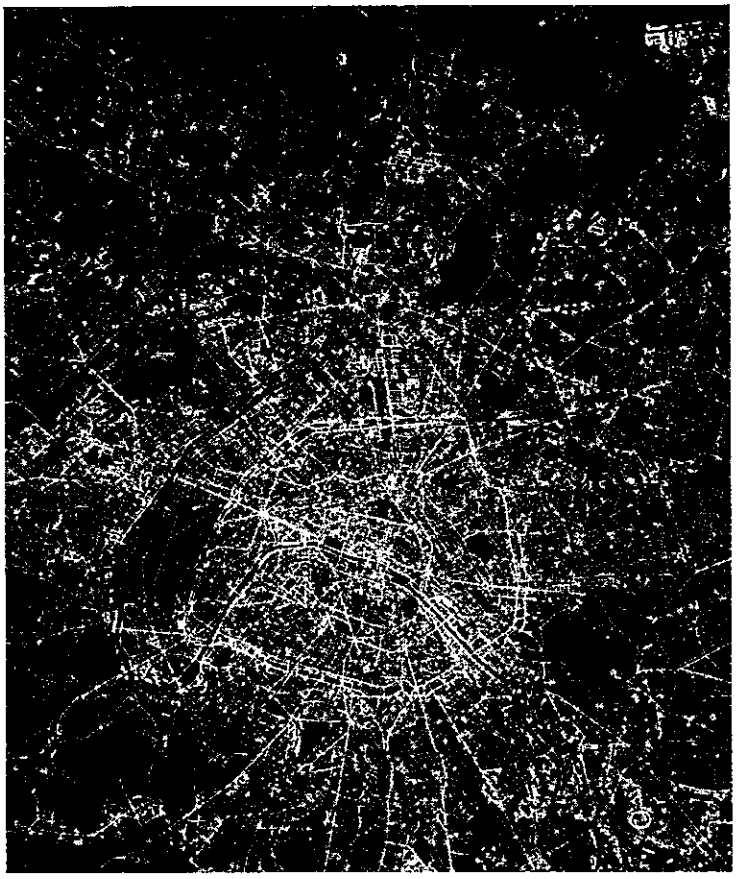
- Who we are.
- Lagares case study.
- IoT solutions for air quality:
  - Real-time monitoring.
  - Impact forecasting.
  - Past incidents investigation.
- Demo.
- Questions and answers.

The world gets smaller and better connected every year. As population grow, industries and communities increasingly collide.

This means regulations are only getting tighter, risks higher, and scrutiny more public. Now, thanks to social media, reputations built over years are destroyed overnight.

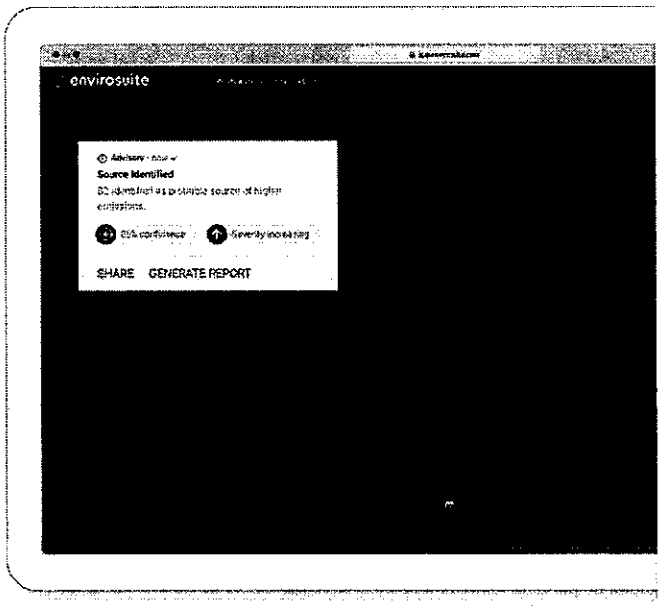
It means getting to the source of environmental issues fast is no longer a "nice to have" – it´s a must. Not knowing is no longer good enough.

That´s why we´ve built Envirosuite, the most intelligent real-time environmental management system.



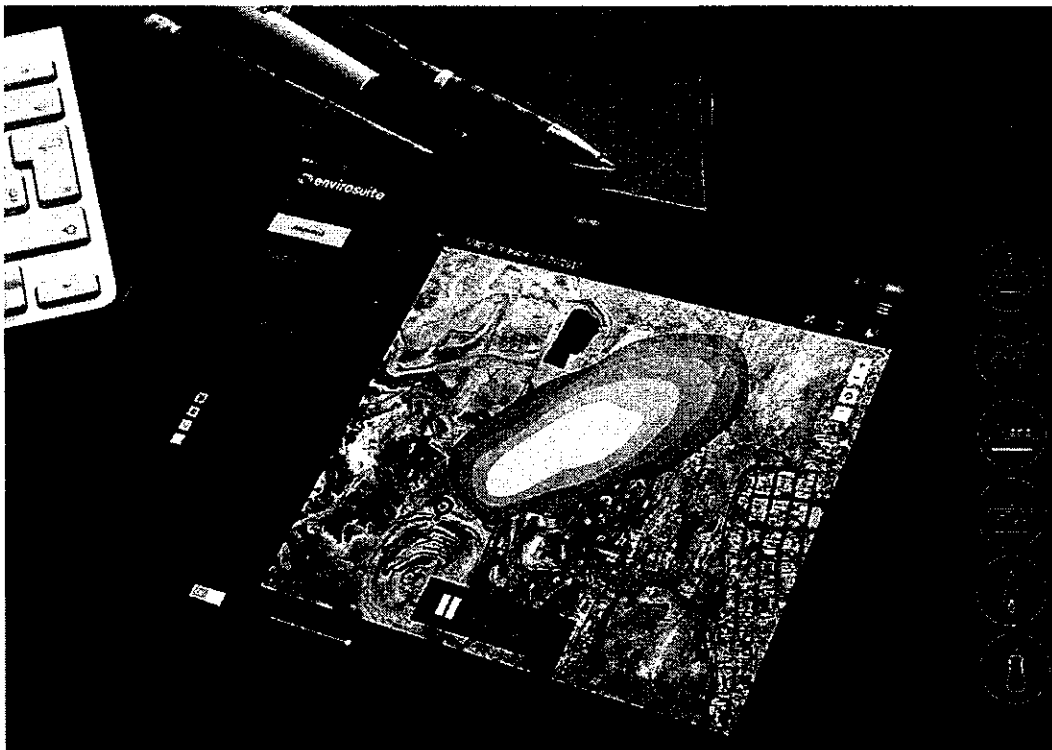
Envirosuite: who we are

- Developed by Pacific Environment, environmental consultants.
- Providing technological solutions *ad hoc* since late 90s.
- First clients with scalable product in 2010.
- Offices in Australia, Canada, US, Colombia, Chile, UK and Spain.
- Listed on ASX stock exchange.



Some of our customers

VEOLIA
ACUAES
Centennial Coal
AQMD
FMG Fortescue
YorkshireWater
Thames Water
United Utilities
mzi resources
RioTinto
PILBARA PORTS AUTHORITY
PORT AUTHORITY
QUEENSLAND ALUMINA LIMITED
VALE
Clean Energy Group
IDEMITSU
AMB
AngloAmerican
YANCOAL AUSTRALIA
seqwater
Broken Hill
BHP
newgold
stanwell



...ors

Public sector

Wastewater treat. plants

Ports

Mining

Oil & Gas

Heavy industry

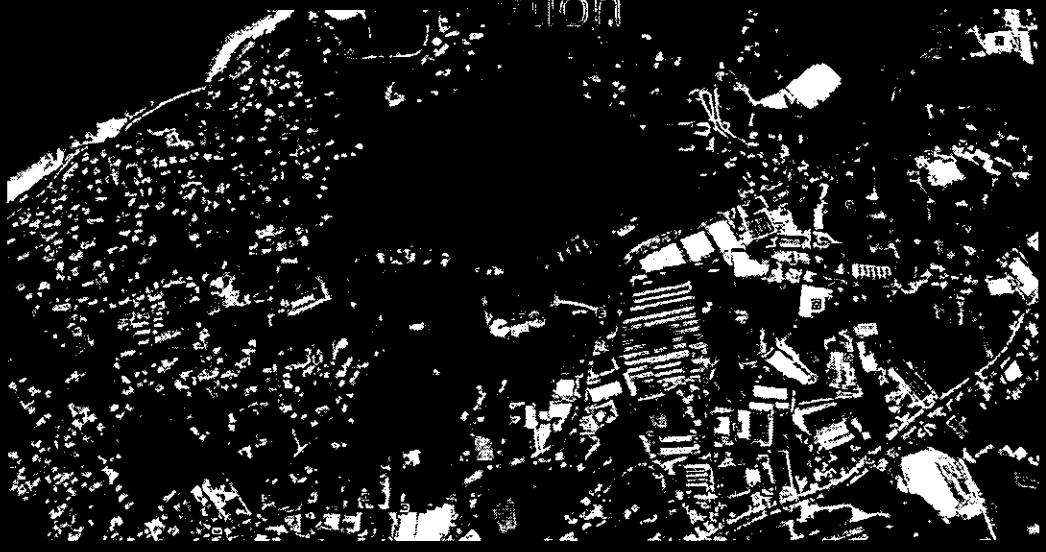
suite provides

A cloud-based software platform that for real-time environmental impacts monitoring, forecasting and investigation.

It allows:

- Quick problem identification.
- Quick response to complaints (or avoid them).
- Risks forecasting that allows operational changes.
- Automatic reporting to comply with environmental legislation.

/WTP: initial tion

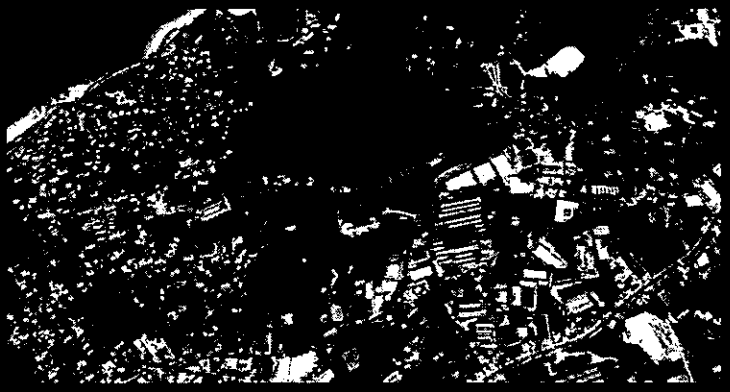


Social rejection

Neighborhood suffering bad smell problems during 15 years…

Situation

...arison



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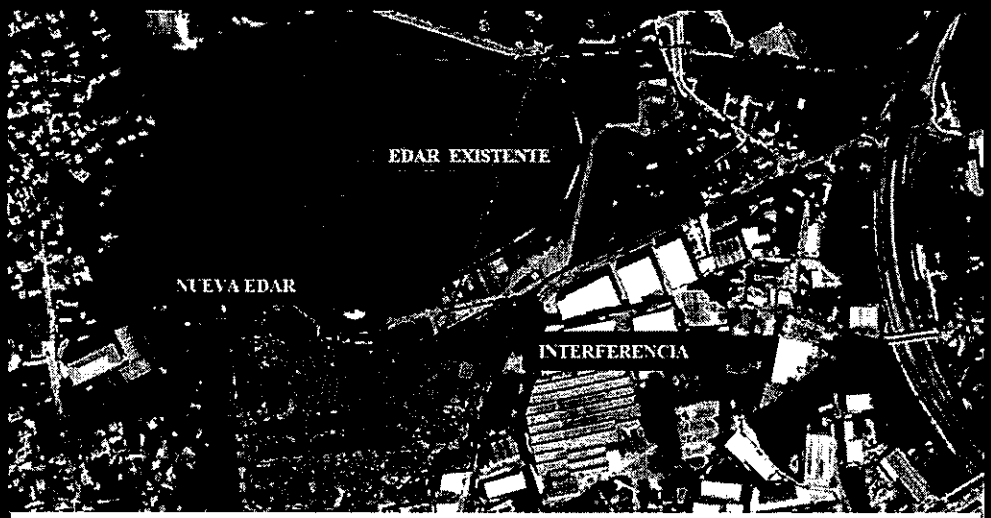
...phases



New WWTP in the same place as old plant: bigger, more capacity and…¿less environmental impact?

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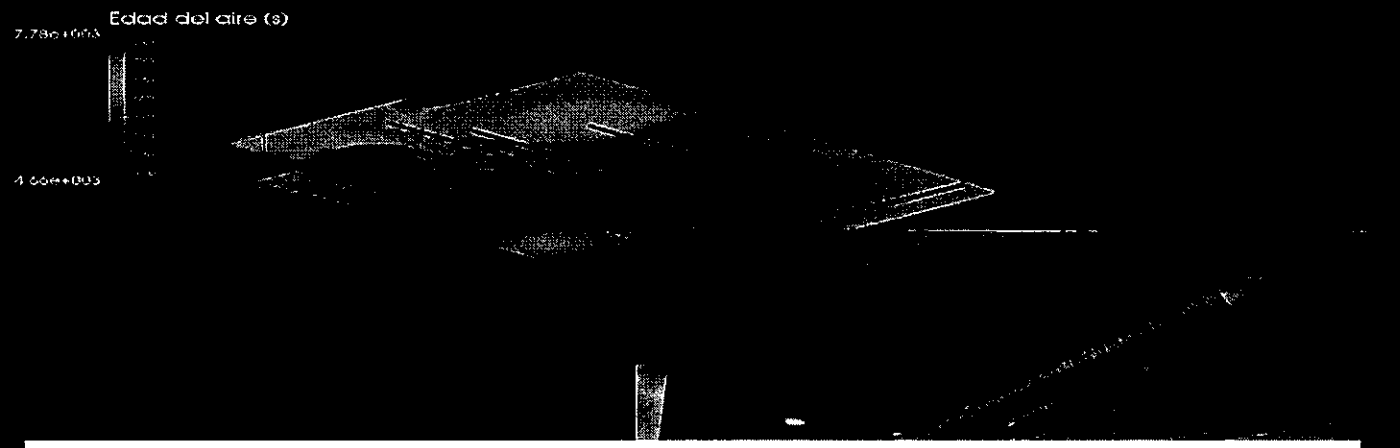
WTP design



New plant solution: powerful odour treatment facilities + odour management tool

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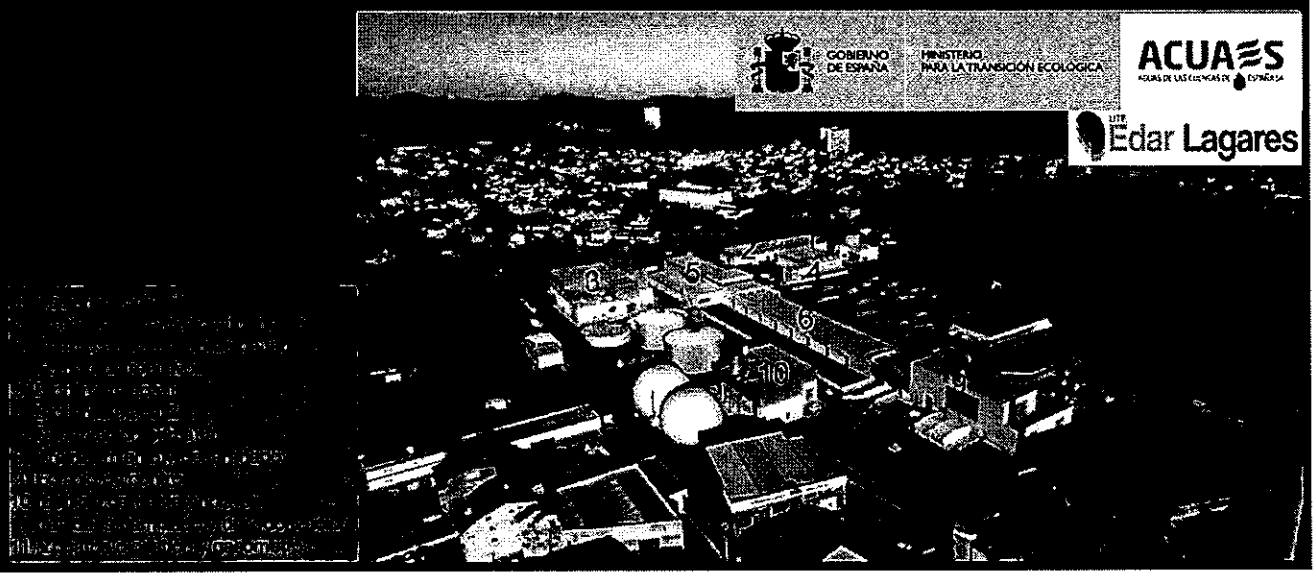
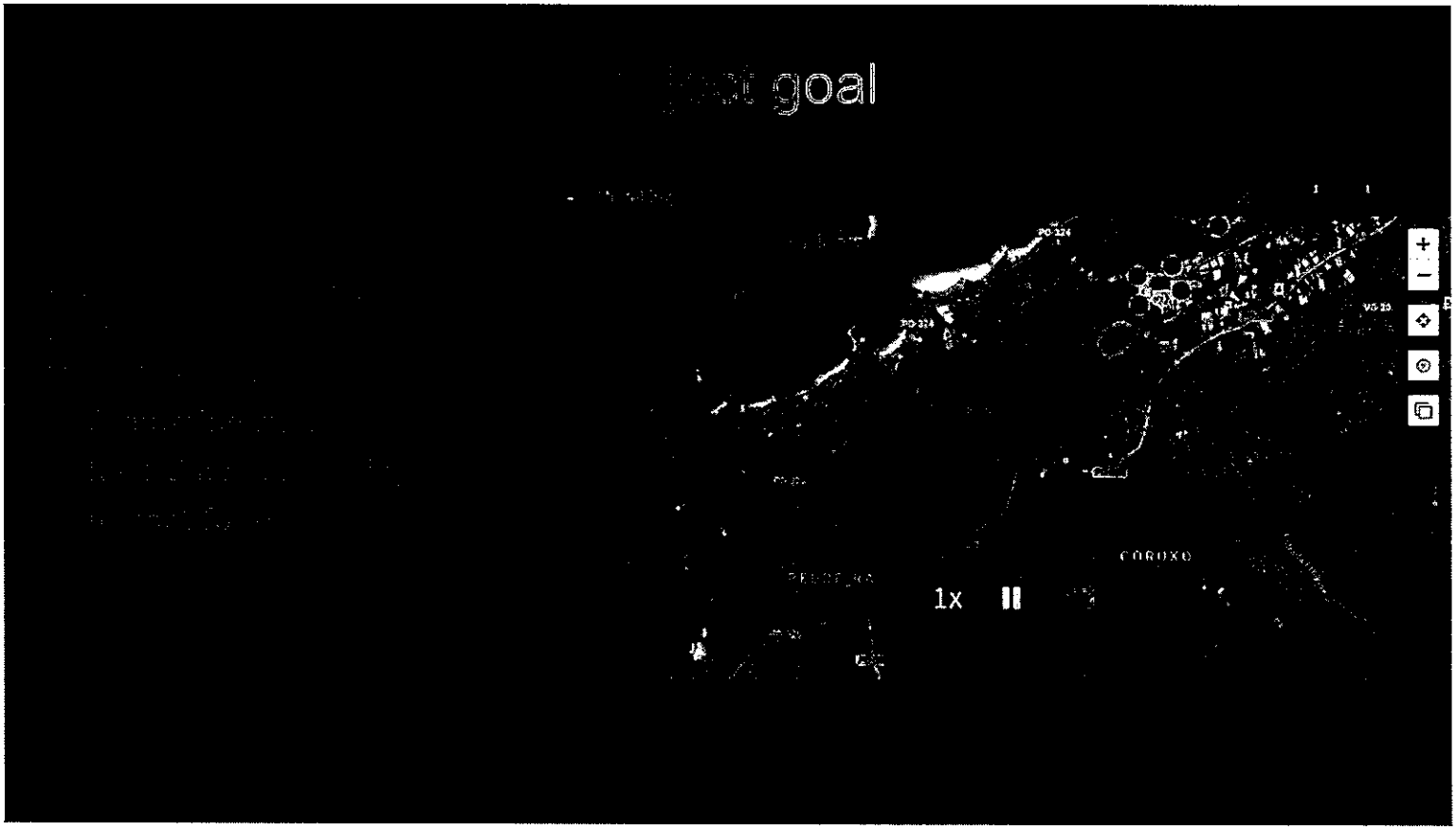
Technical specifications

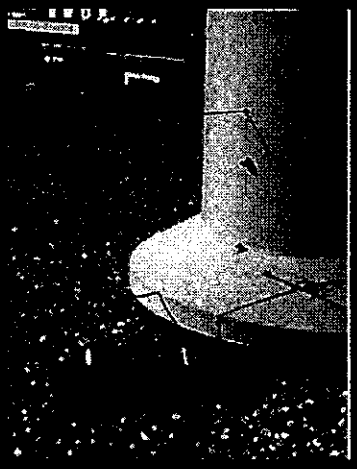


[illegible] specifications (II)

[illegible] goal

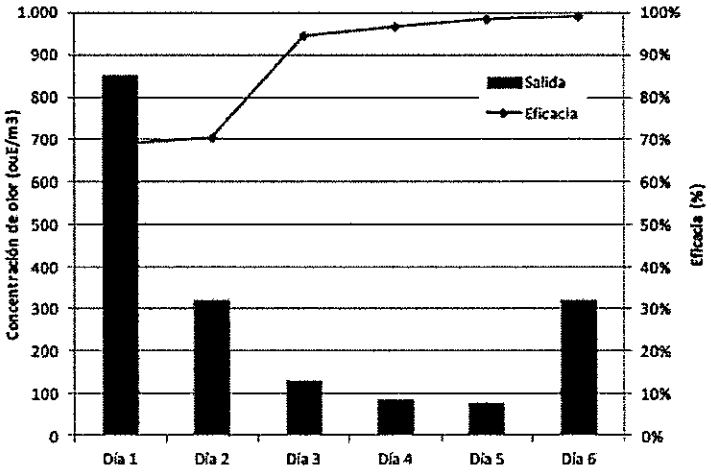


[illegible] phase

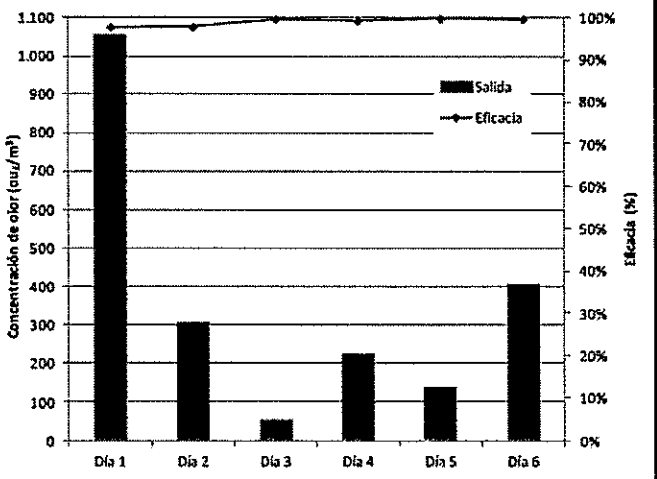


[illegible] results

Pre-treatment

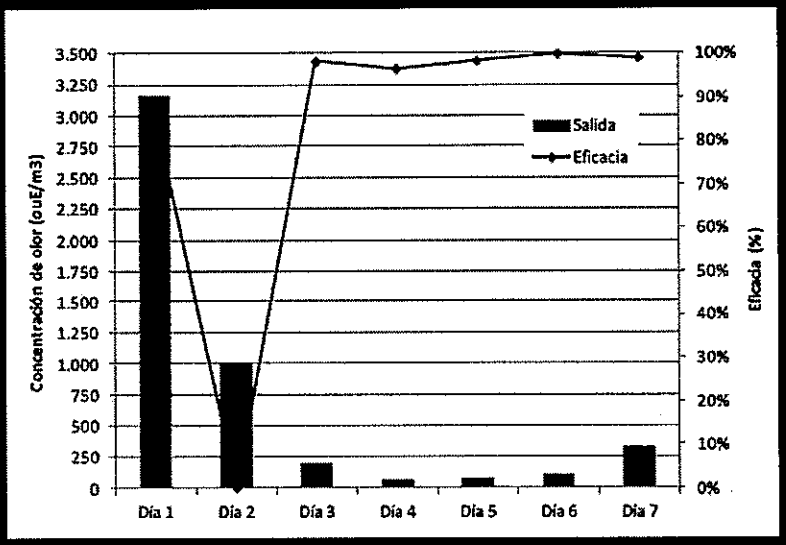


Biological treatment



Results (II)

Sludge termal drying phase



Odour concentration

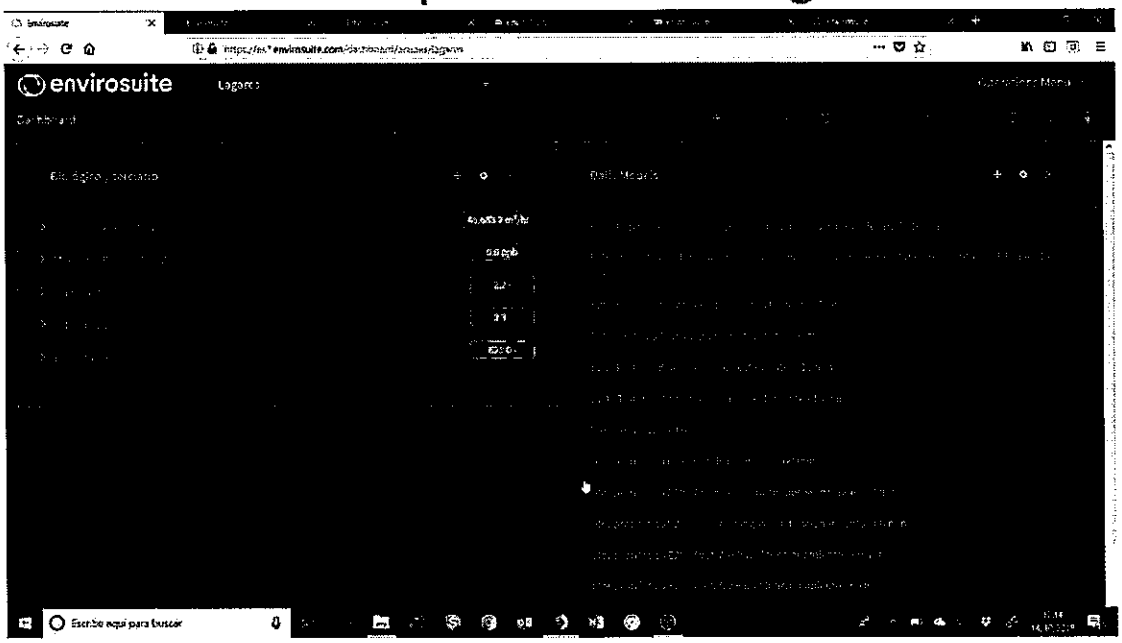
Deodorization BTK

500-1,500 ou_E/m^3

Without deodorization

10,000-15,000 ou_E/m^3

Envirosuite platform in Lagares

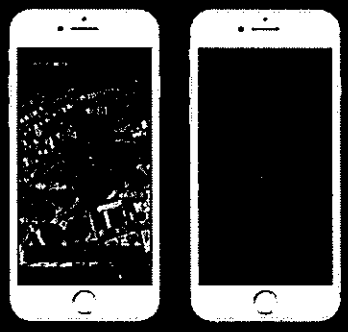


Real-time monitoring

81 ppb Odour monitor 5

74 ppb Odour monitor 6

Focus investigation here



Alerts sent by SMS or email

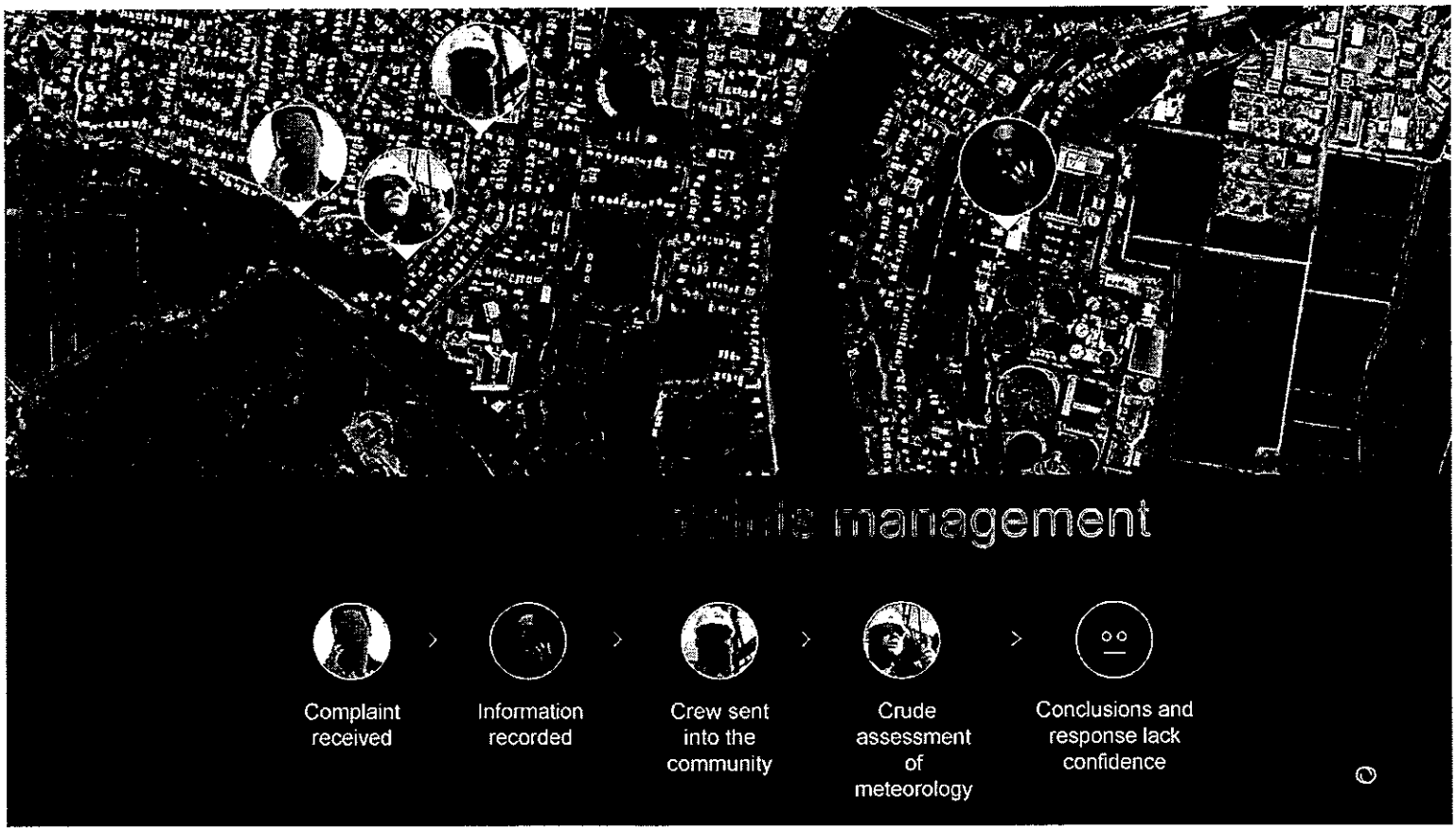
[illegible] analysis

Anyone can quickly understand

1. Is there a problem?
2. Source identification

→

1. Rapid response.
2. Prevention of incidents.



[illegible] management

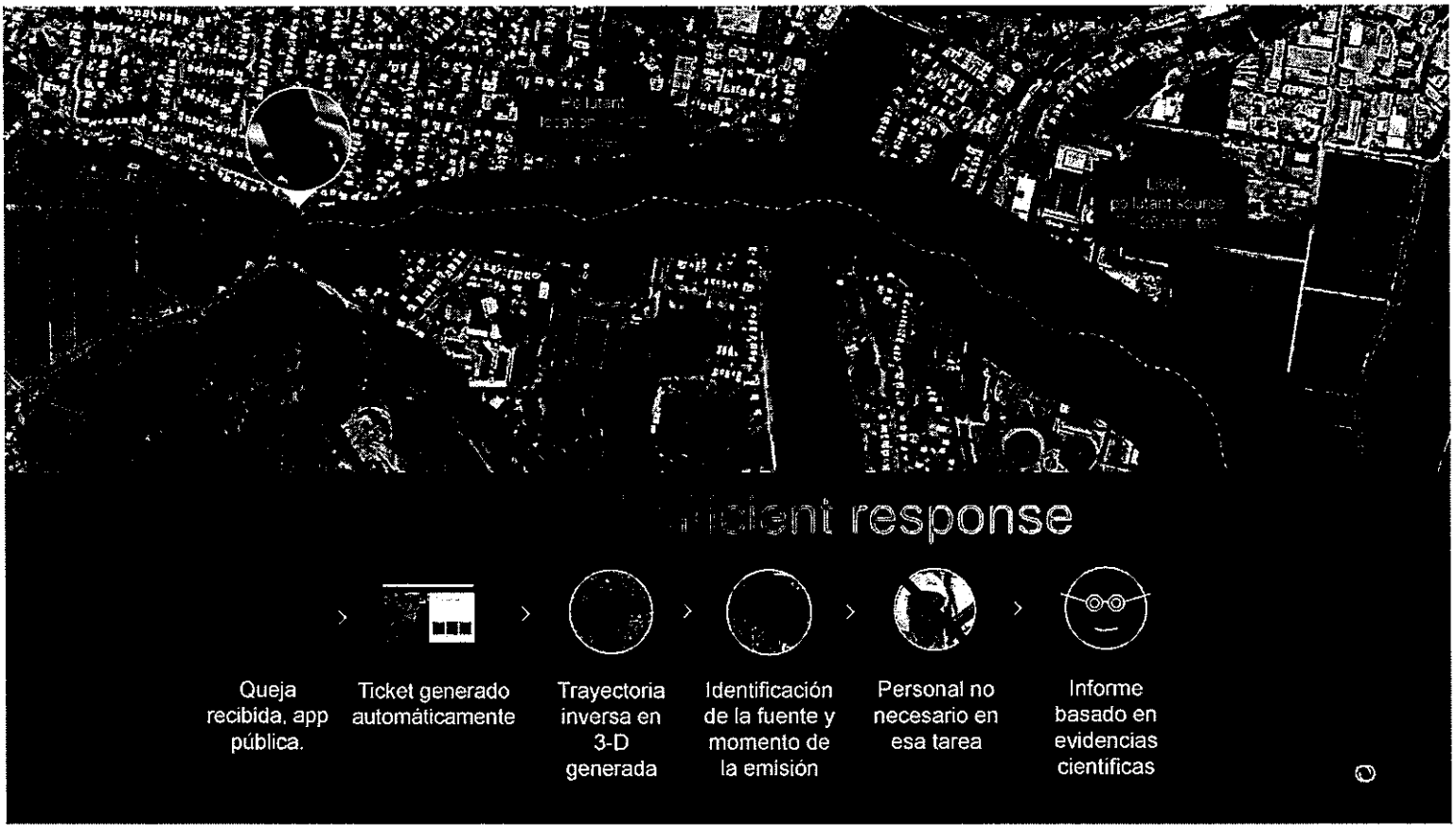
Complaint received

Information recorded

Crew sent into the community

Crude assessment of meteorology

Conclusions and response lack confidence



[illegible]cient response

Queja recibida, app pública.

Ticket generado automáticamente

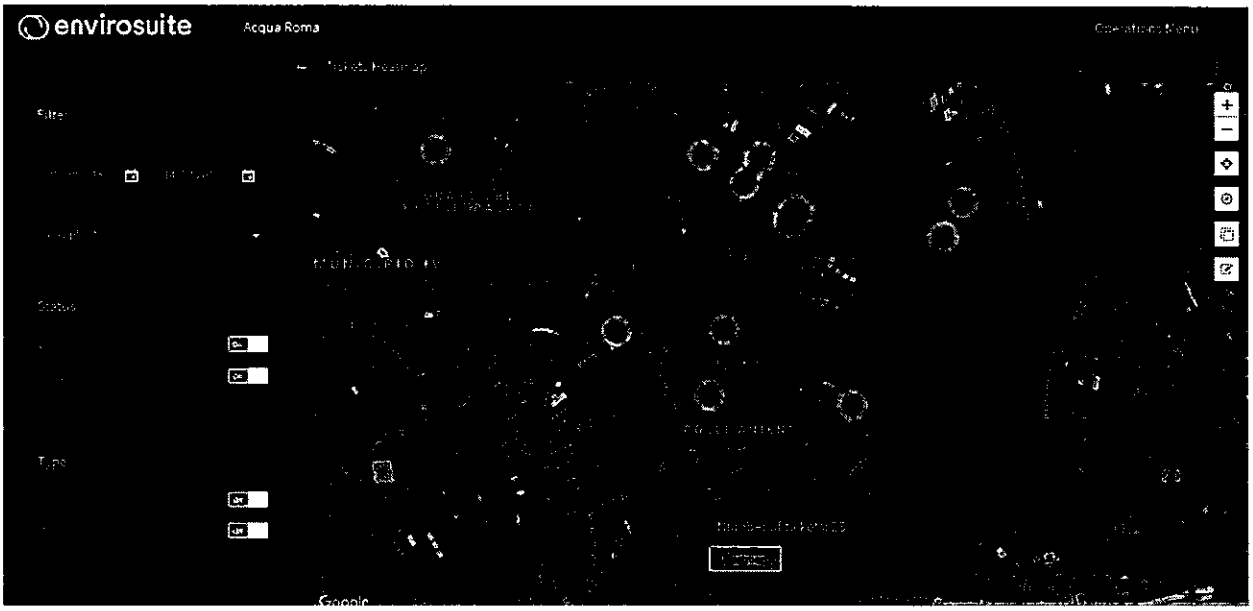
Trayectoria inversa en 3-D generada

Identificación de la fuente y momento de la emisión

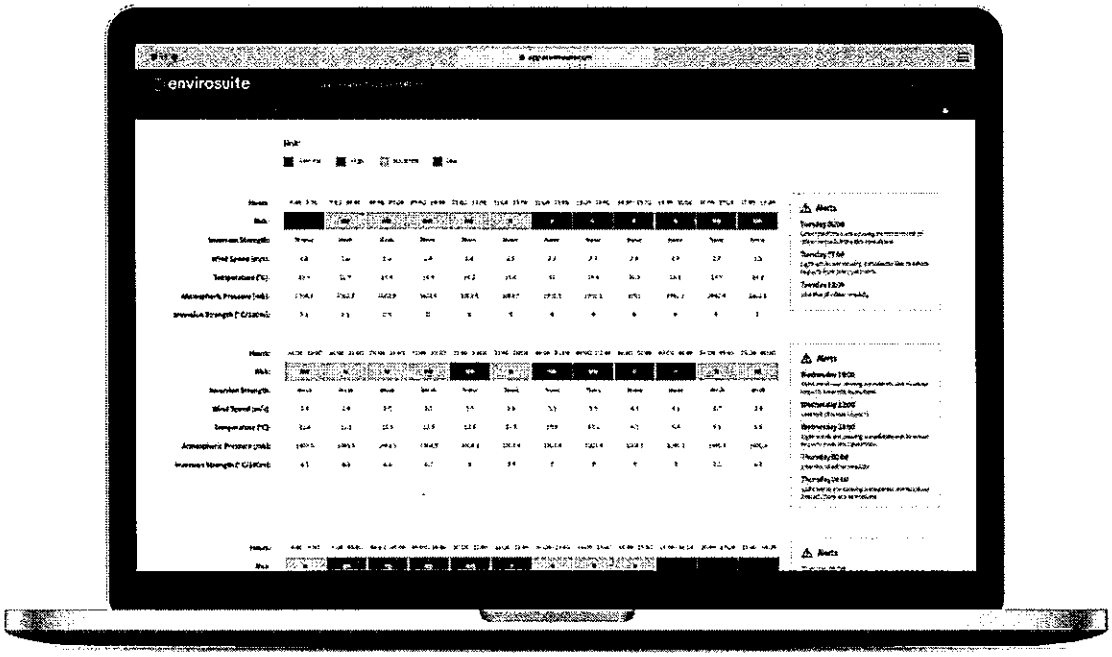
Personal no necesario en esa tarea

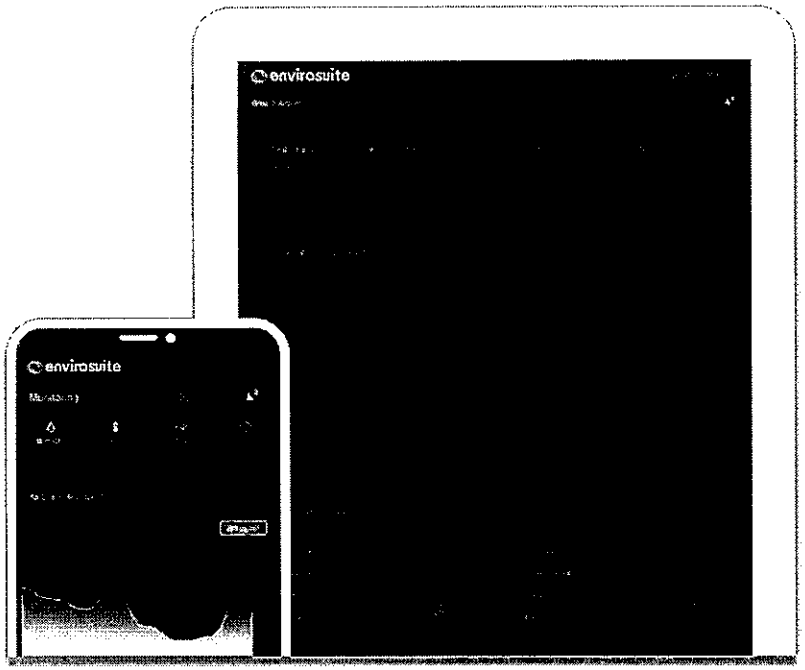
Informe basado en evidencias cientificas

Complaint management



Operations planning





Reports

Around 50 types of pre-defined reports with information about weather conditions, weather forecasts, air quality thresholds breaches, alerts, trends, etc.

Our work with sewage treatment plants has found seven areas of costs related

1. Unnecessary investment in expensive control technologies.

£550,000

six months

5. Lawsuits from regulators, community groups and developers.

7. Regulatory penalties related to odour management.

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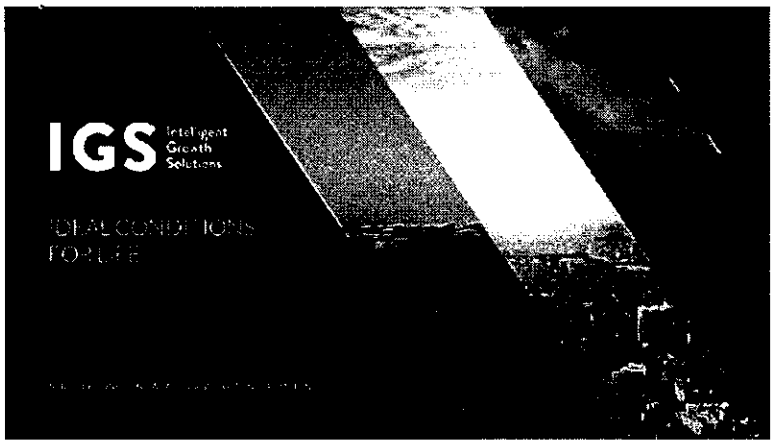

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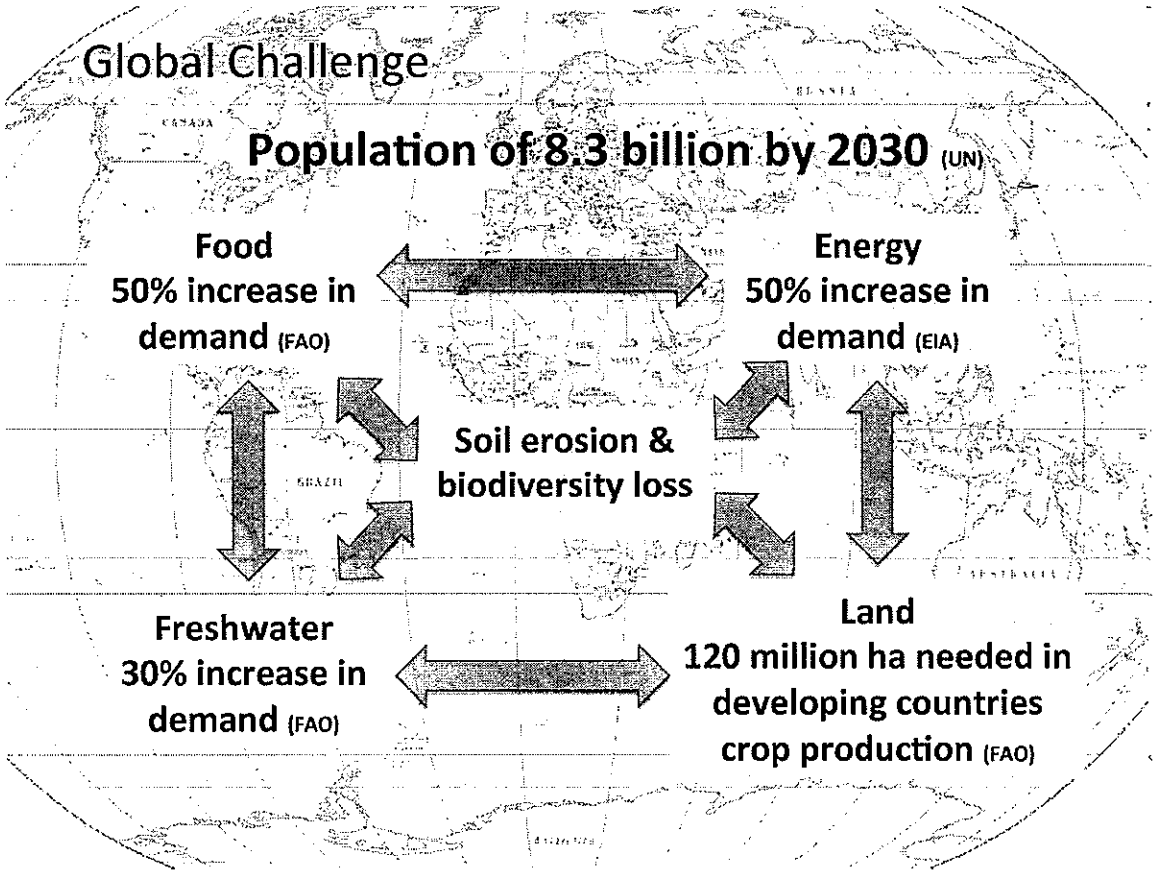
The Role of IOT in Vertical Farming for global food resilience

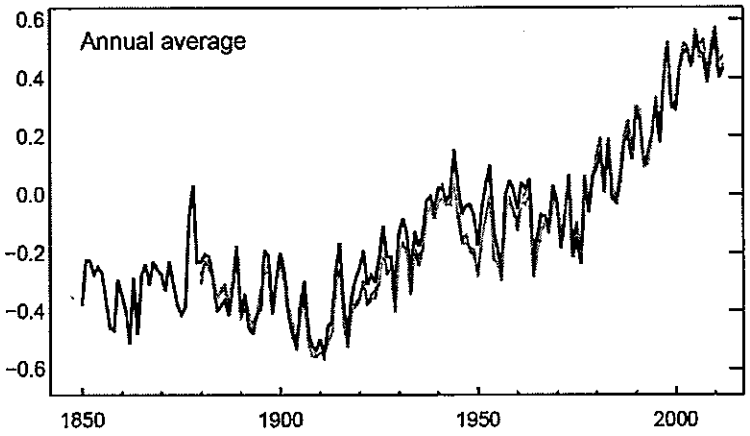
David Farquhar, CEO, Intelligent Growth Solutions

Prof. Derek Stewart, The James Hutton Institute



Humans are changing the climate

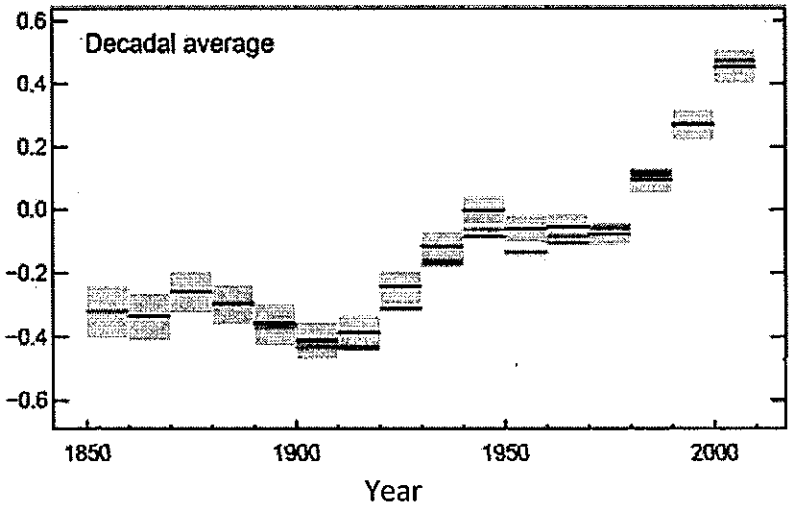
It is extremely likely that we are the dominant cause of warming since the mid-20th century



Globally averaged combined land and ocean surface temperatures

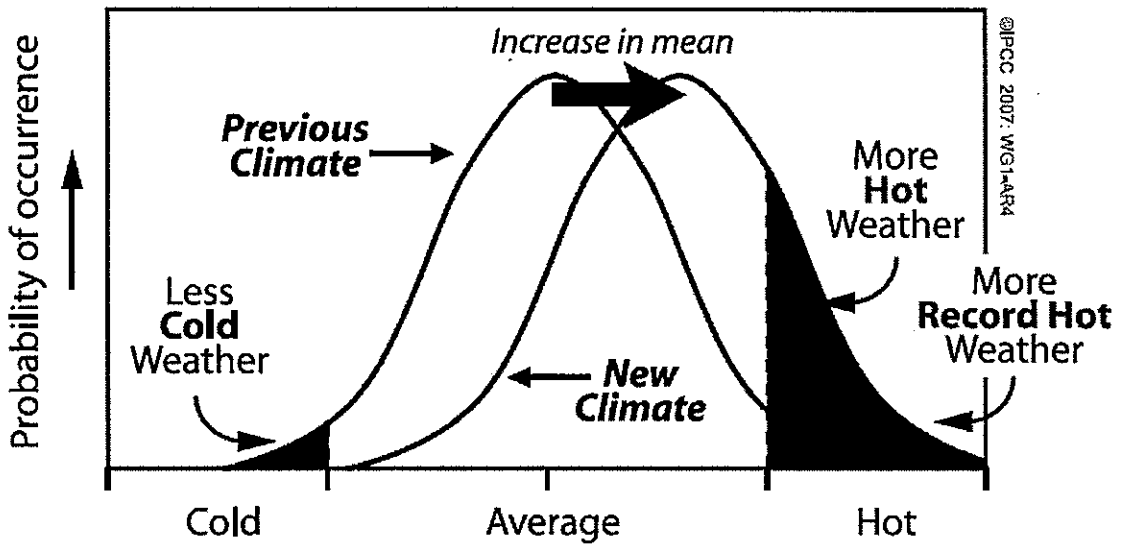
Temperatures continue to rise

Each of the past 3 decades has been successively warmer than the preceding decades since 1850



Globally averaged combined land and ocean surface temperatures

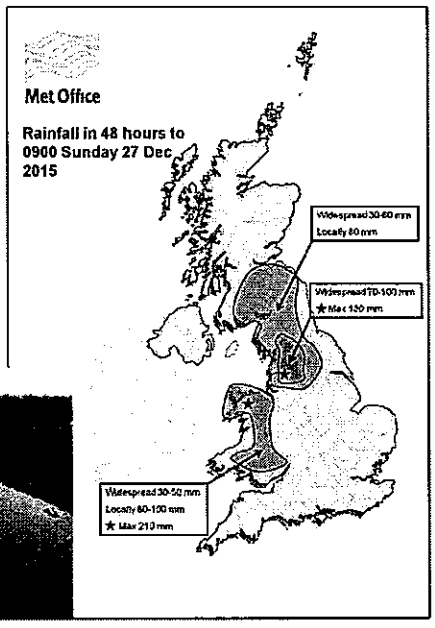
Probability of extreme weather events

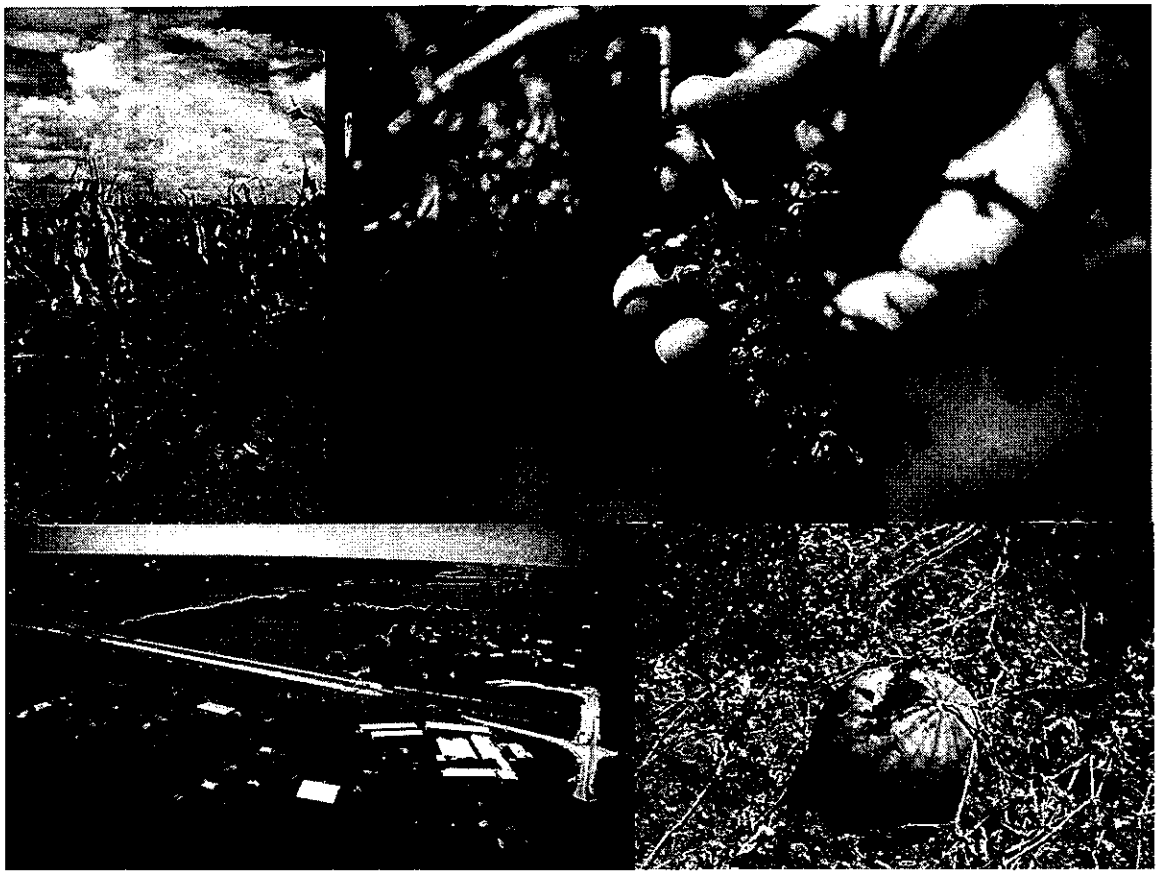


ipcc

Impacts are already underway

The impacts at the immediate local level were more than apparent in late 2015





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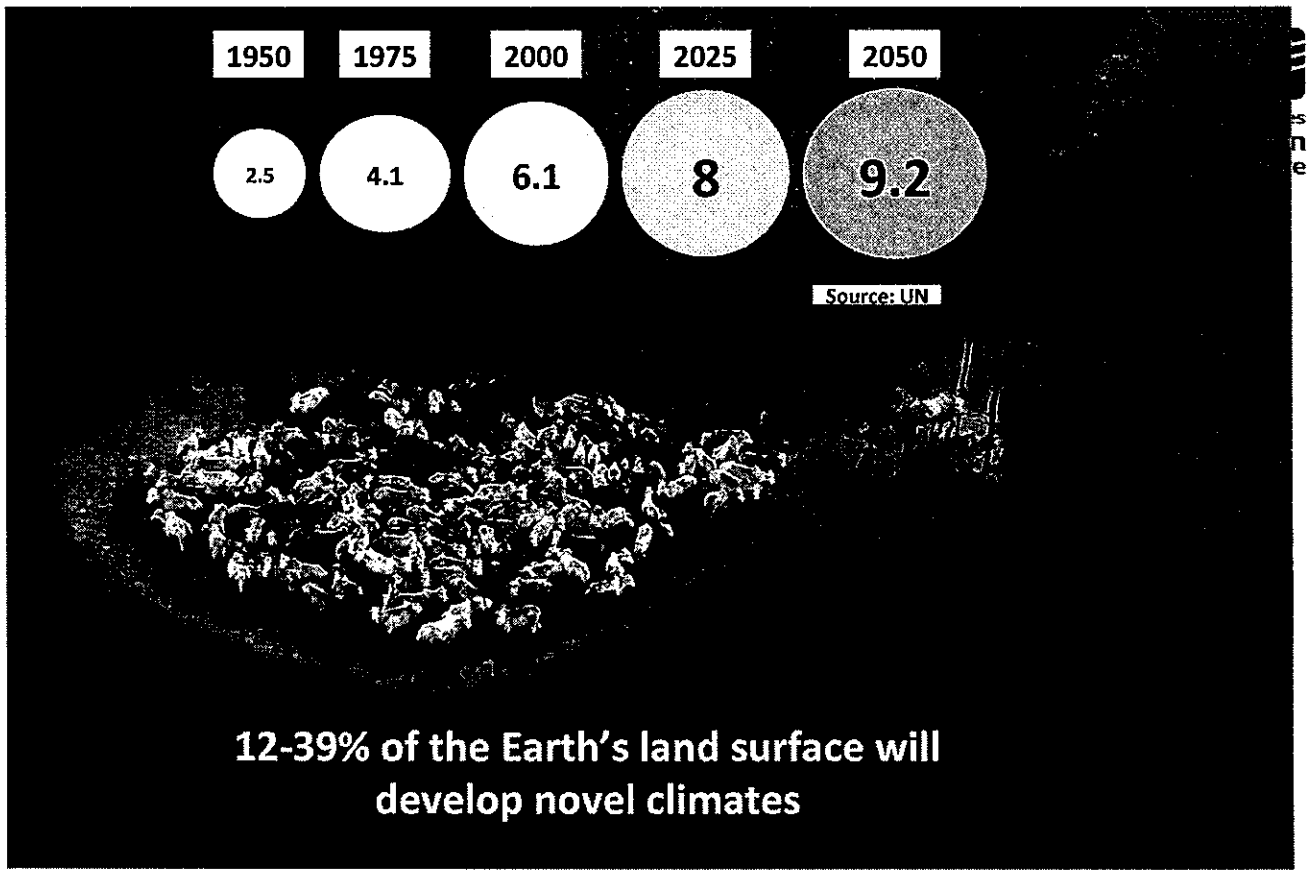

Climate Change Poses Risk for Food Production

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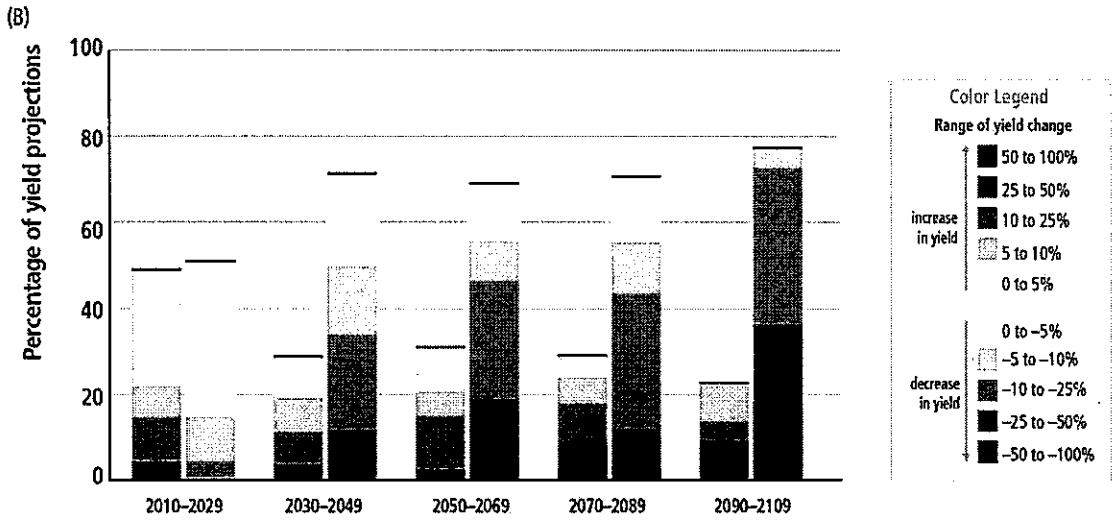

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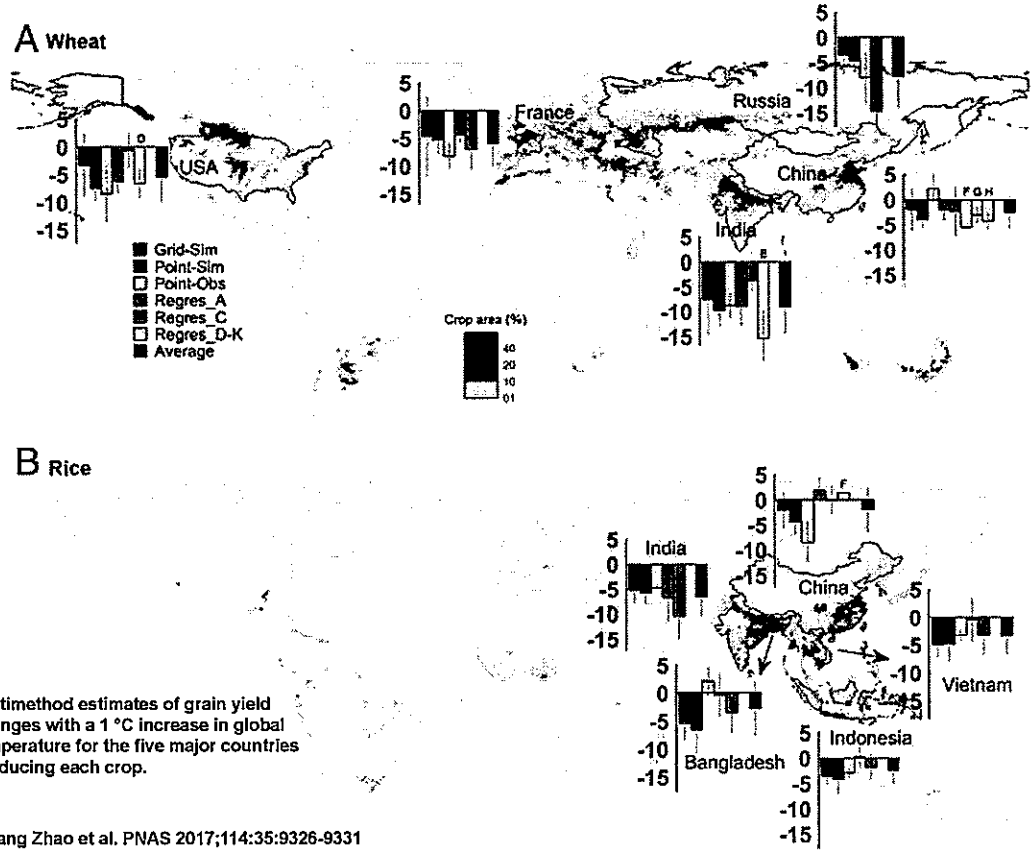
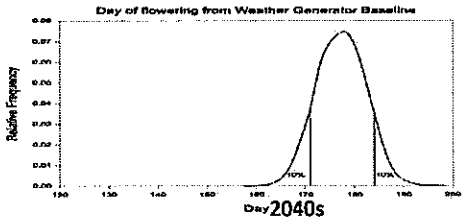


Multimethod estimates of grain yield changes with a 1 °C increase in global temperature for the five major countries producing each crop.

Chuang Zhao et al. PNAS 2017;114:35:9326-9331

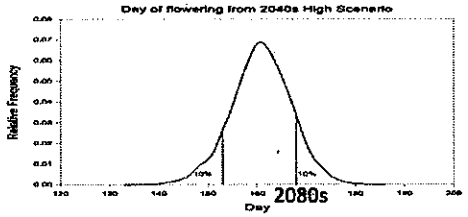
Changes in Barley Flowering Date

Present



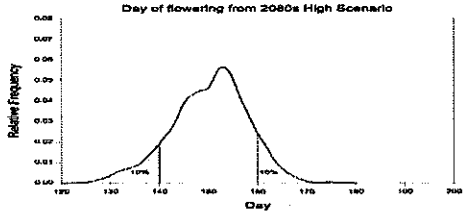
c. 27th June

2040s



c. 11th June

2080s



c. 2nd June

Increasing variability requiring adaptive responses

Climate Change will hit the staple crops and then the consumer

IMPACTS OF CLIMATE CHANGE

By 2030, nine out of 10 of the major crops will experience reduced or stagnant growth rates, while average prices will increase dramatically as a result, at least in part, due to climate change.

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dis

- Curre
  1. *Phy* ... te
     bli
  2. *Glo* ... odes.'
  3. *Pe* ... potato
     bla
- Poten
  4. *Esc* ... food
     po

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US & Canada

Five people die in US romaine lettuce E. coli outbreak

1 June 2018 Share

AFP/GETTY

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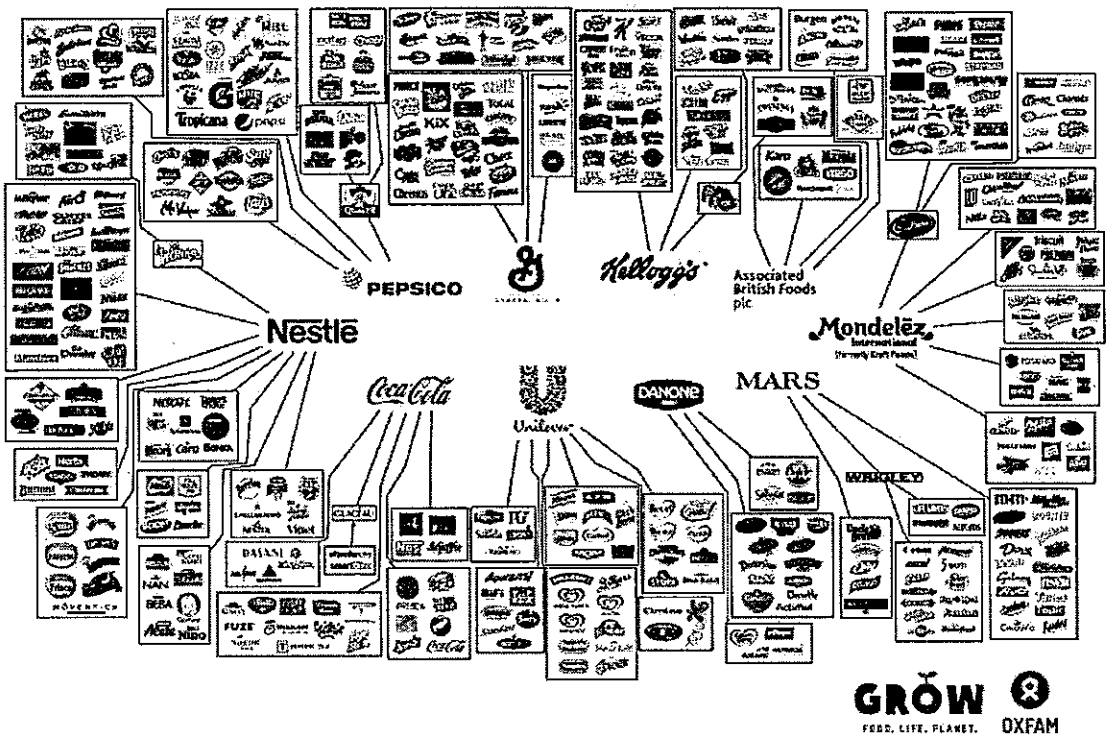
Global Food Companies & Climate Change



GROW FOOD. LIFE. PLANET. OXFAM

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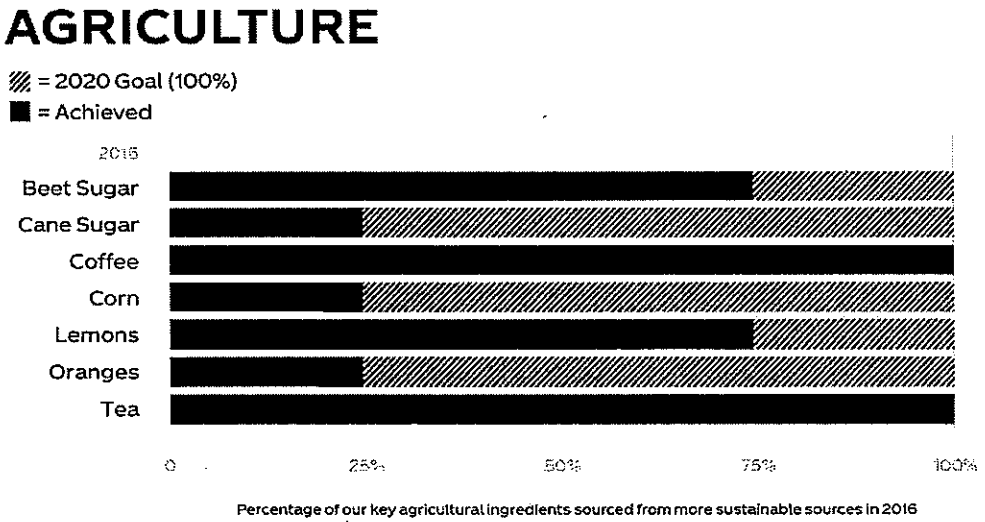
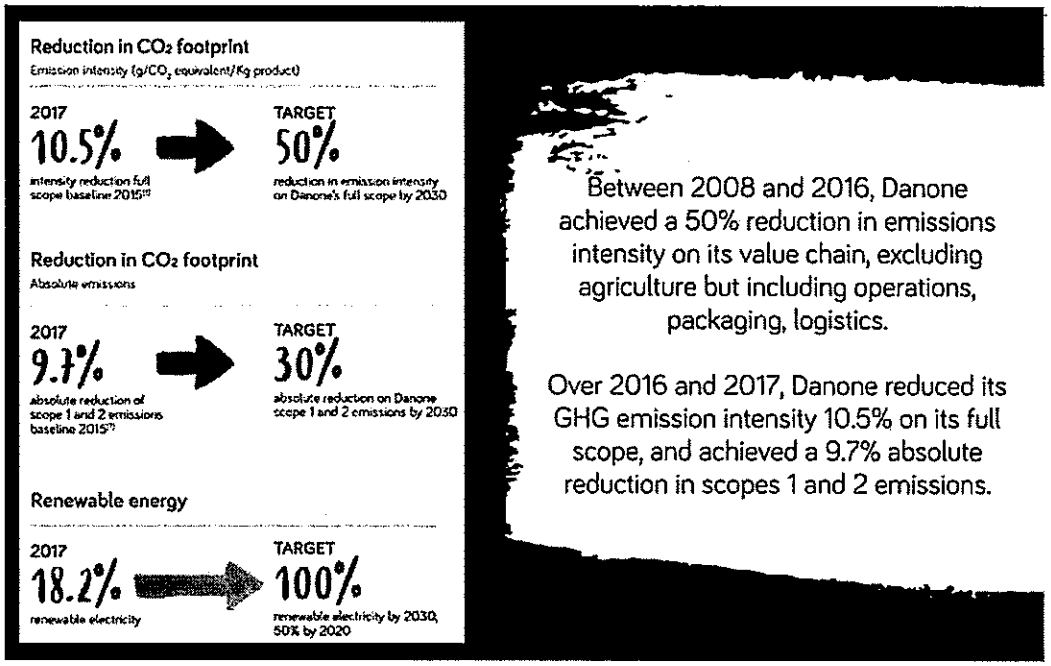
Global Food Supply – Kelloggs

Global Food Supply – Coca Cola



Global Food Supply - Danone



Global Food Supply - PespsiCo

SCOPE 3 EMISSIONS INCLUDE INDIRECT EMISSIONS THROUGHOUT OUR VALUE CHAIN FROM THINGS LIKE:

- AGRICULTURE
- EMPLOYEE COMMUTING
- MANUFACTURING OF PACKAGING
- BUSINESS TRAVEL
- THIRD-PARTY LOGISTICS AND DISTRIBUTION
- CONSUMER USE OF SOLD PRODUCTS

OUR PROGRESS

7% PROGRESS TOWARDS OUR TARGET REDUCTION AMOUNT, WHICH EQUALS MORE THAN A 2 MILLION METRIC TONNE REDUCTION IN 2017

These results were driven largely by replacing older vending and cooler equipment with higher-efficiency machines and continuing to transition to hydrofluorocarbon (HFC)-free refrigerants.

EUROPE: All company-owned vending/cooler equipment is HFC-free

NORTH AMERICA: Our goal is for all company-owned vending/cooler equipment to be HFC-free by 2020

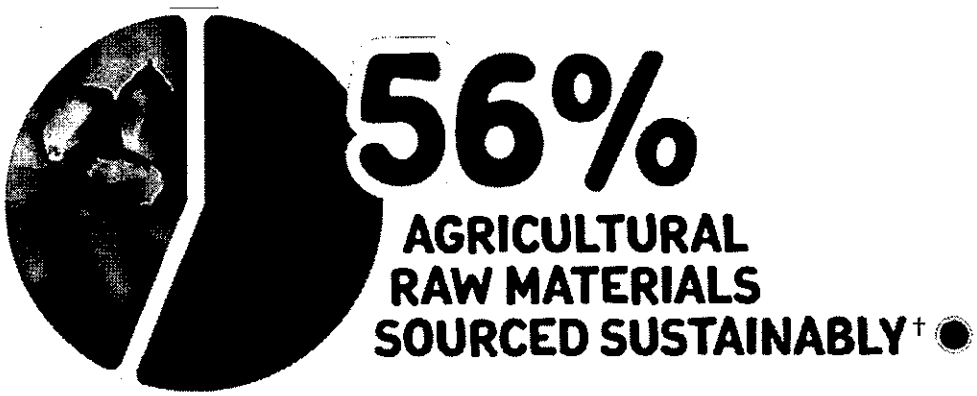
OUR EFFORTS

OUR PLAN TO REDUCE SCOPE 3 EMISSIONS INCLUDES:

- CONTINUING TO IMPROVE vending and cooler efficiencies
- INCREASING RECYCLED CONTENT in packaging materials
- DEVELOPING alternative packaging materials
- REDUCING GHG EMISSIONS in our agricultural supply chain
- INCORPORATING ENVIRONMENTALLY CONSCIOUS DESIGN into our product development process

Global Food Supply - Unilever

The James Hutton Institute



Pathways From Inadequate Food Access To Multiple Forms Of Malnutrition

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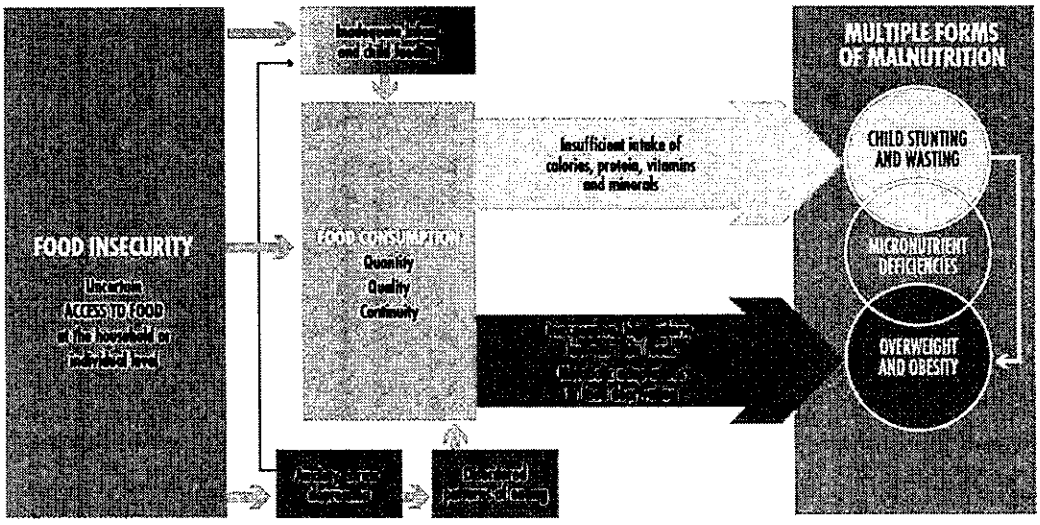
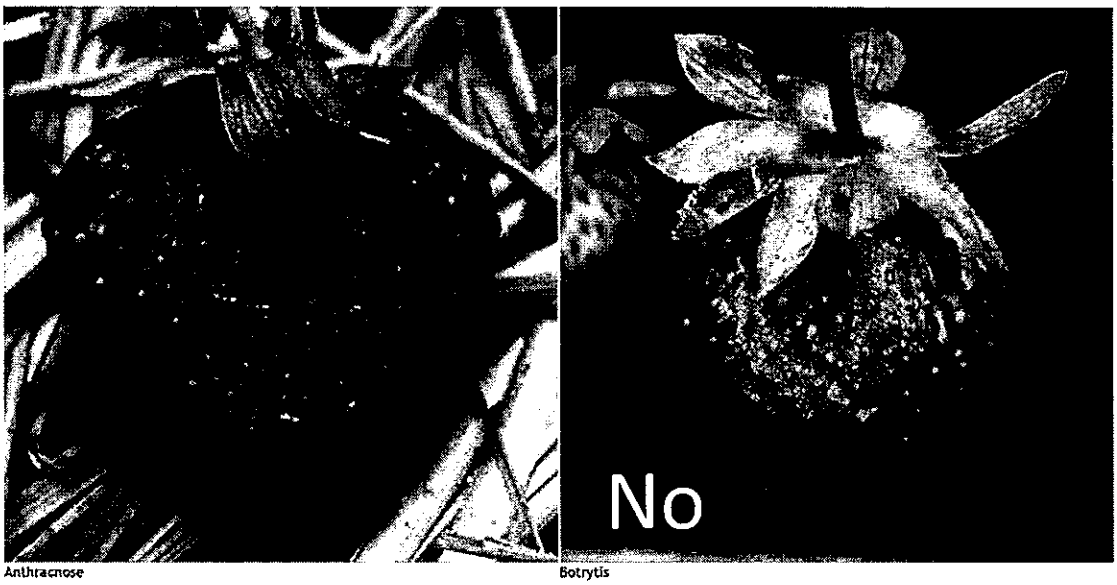


Undernutrition pathway Obesogenic pathway

SOURCE: Created by FAO Statistics Division for this report.

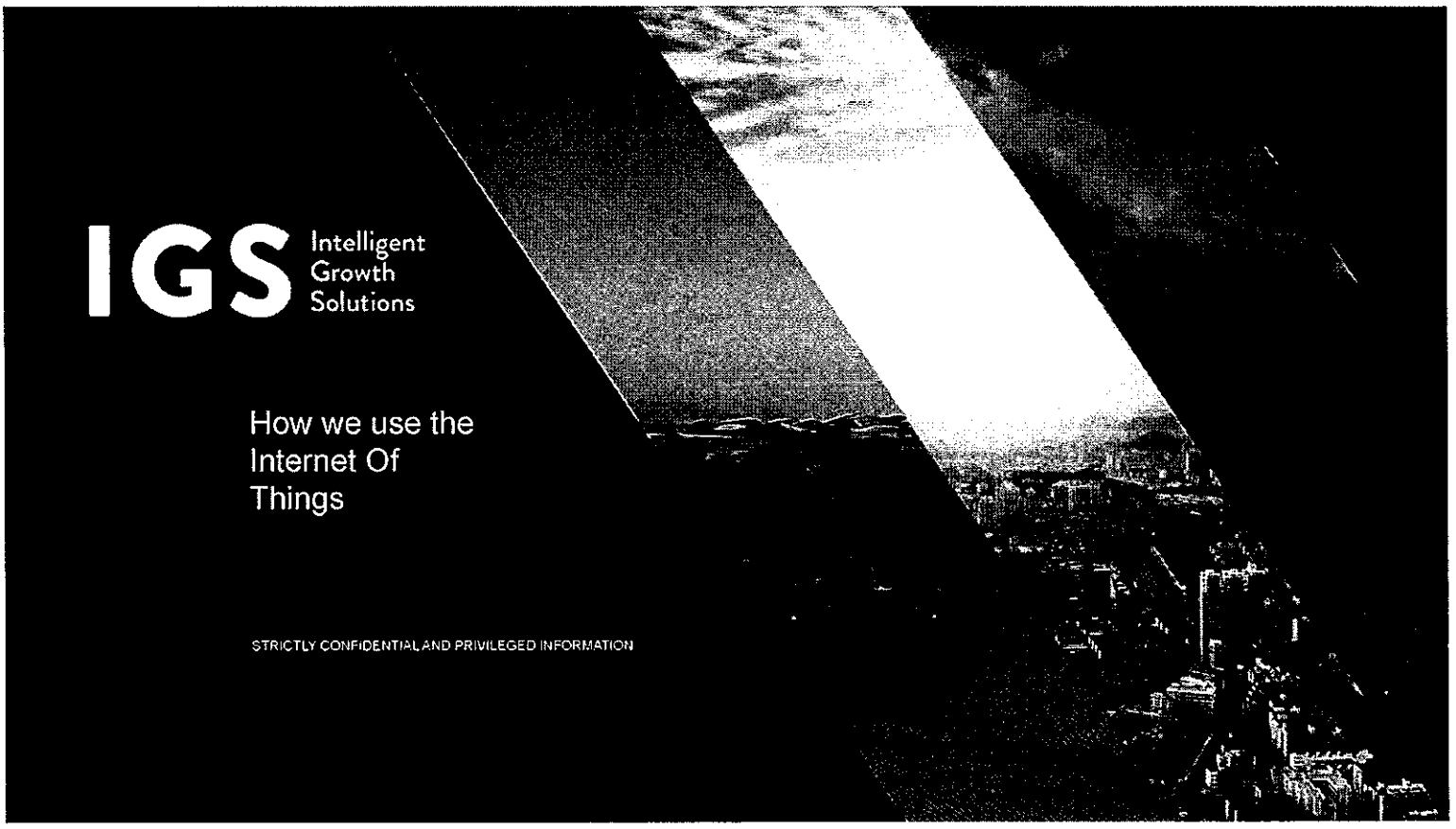
Strawberry Fields Forever?

The James Hutton Institute



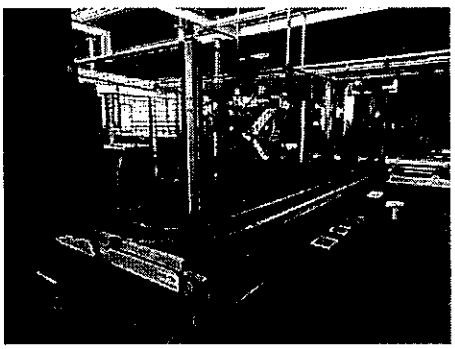
Anthracnose

Botrytis

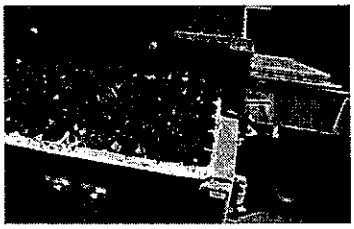


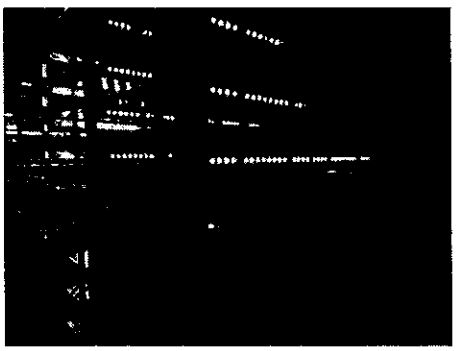
IGS is a 5-year old Agritech innovator designing and selling a revolutionary controlled-environment growth system.

Built on a patented Power & Communications Platform and a patented Growing Platform, 100% Internet of Things ("IOT") enabled and powered by a 3-tier Artificial Intelligence ("AI") back-end, IGS' Totally Controlled Environment Agriculture ("TCEA") delivers dramatic productivity benefits: 2-3x yield with quality and consistency, using 50% less energy and 80% less labour.



TODAY GROWING **SOME** CROPS IN **SOME** PLACES IS PROFITABLE AT INDUSTRIAL SCALE



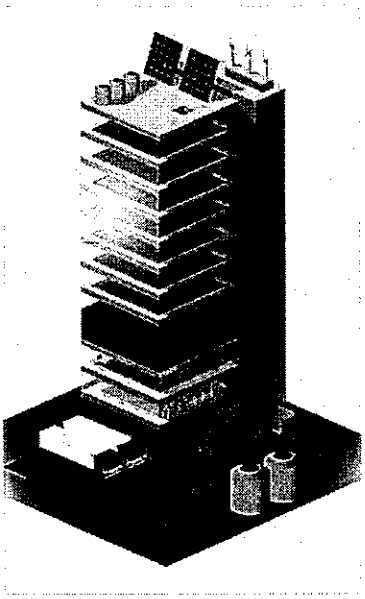


MOST INDOOR FARMING IS ECONOMICALLY INEFFICIENT DUE TO THE HIGH POWER COSTS

OUTSIDE THE DEVELOPING WORLD LABOUR COSTS ARE PROHIBITIVE

PRODUCTIVITY IS HAMPERED BY THE INABILITY TO DELIVER TOTALLY CONTROLLED ENVIRONMENT AGRICULTURE

Vertical farming brings a whole new set of challenges.



STACKING GROWING SPACE REQUIRES **POWER- HUNGRY** AUTOMATION & MECHANICS

MONOCULTURE OPERATION REQUIRES TIGHT, BALANCED **ENVIRONMENTAL CONTROL**

LIGHTING / VENTILATION **OFFSET** DRIVES **POWER COST** EVEN HIGHER BY THE BETWEEN

LOTS OF ATTENTION & INVESTMENT BUT PROFITABILITY **REMAINS ELUSIVE**

So we've built revolutionary Power & Comms and TCEA platforms.

50%LESS POWER We've solved the power problem.
Patented 3-phase Power & Communications platform to collapse energy costs, using IOT to manage Lighting, Ventilation, Gases and Water (TCEA).

+

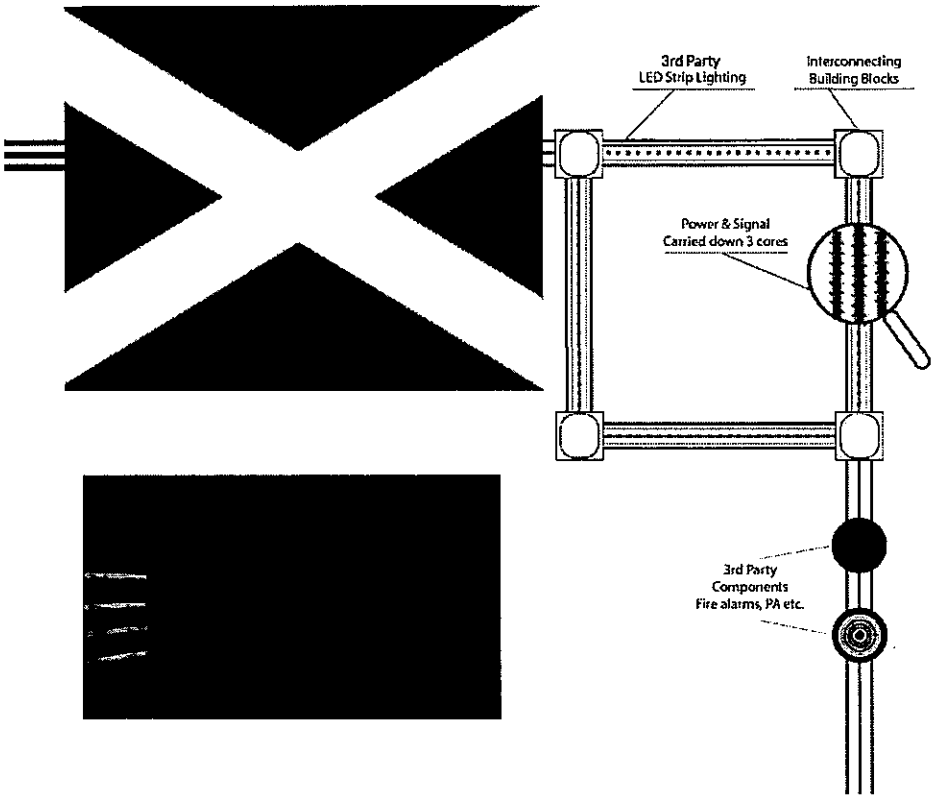
80%LESS LABOUR We've solved the labour problem.
Patented Tower Automation platform to manage stacks of growing trays, handled by robots for germination and propagation.

+

2X–3X YIELD We've solved the productivity problem.
Using Artificial Intelligence our SaaS app lets growers find optimal growing "recipes" using our platforms, including our patented Ventilation System.

Product Strategy

GROWTH TOWER PLATFORM (Vertical farm)	GROWTH STATION PLATFORM (Horizontal farm)	SMART LIGHTING PLATFORM (Agricultural)	SMART LIGHTING PLATFORM (Commercial)
POWER & COMMS PLATFORM			
SOFTWARE & DATA PLATFORM			



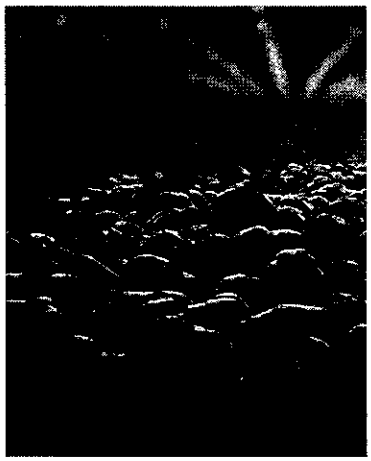
Power:
Works with international 3-phase power variations
Transformer proven safe & reliable

Distribution:
Vastly cheaper than copper wiring
Self-supporting
Removes cable tray / conduit
Combined power and data

Communications:
2-way addressable comms
Low cost per node
Full duplex communications possible
Nodes can be dynamically grouped to respond to commands

Fully IOT-enabled

No Cables. No Computers. No Capacitors.



Radical cost savings: power, installation, maintenance

Supports LED dimming, pulsing and colour-mixing

No loss of efficiency

Power factor ≈ 1 @ dimming range 100%-15%

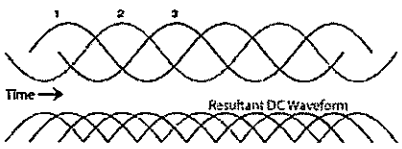
Almost no harmonics: balanced phases

Giving significantly greater productivity: yield, quality, consistency

Communications makes every device addressable / IOT-enabled

Enables remote control of every device

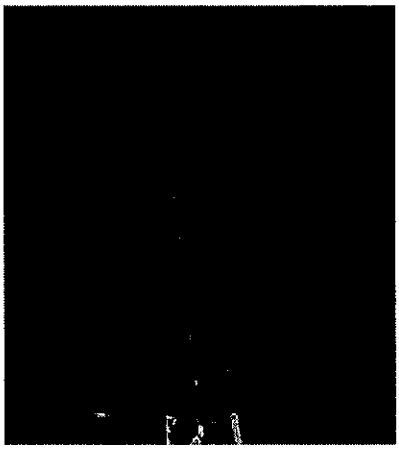
Data capture enables "growth recipe" optimisation



DISRUPTIVE.
PATENTED.
PRODUCTIVE.

GRID → TRANSFORMER → TUBULAR BUSBAR → CONTROLLER

Powering
Totally Controlled Environment Agriculture.
For real.



Manages Light, Temperature, Water/Nutrients & Gases

Fully automated Growth Tray systems support all these variables

100% robotic handling

Closed-loop water and air management

In-tray Ventilation delivers <1°C variation across the crop

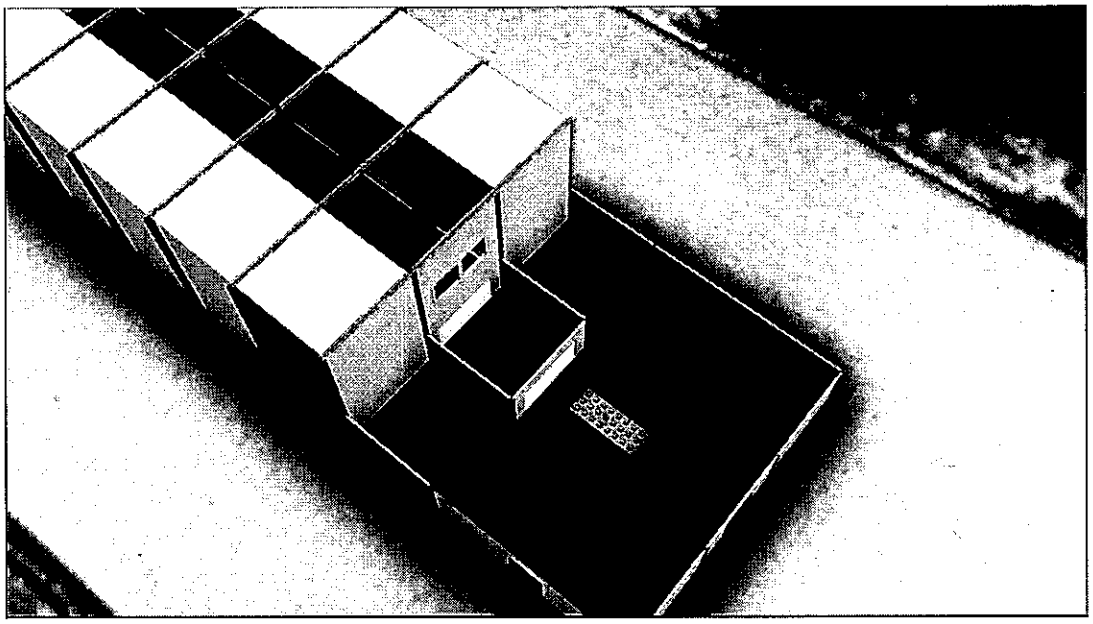
Artificial Intelligence enables recipe experimentation and optimisation

IOT enables remote monitoring and control of all systems

Controls enabled at farm/tower/tray/LED strip level 24/7/365

Designed to operate anywhere, globally

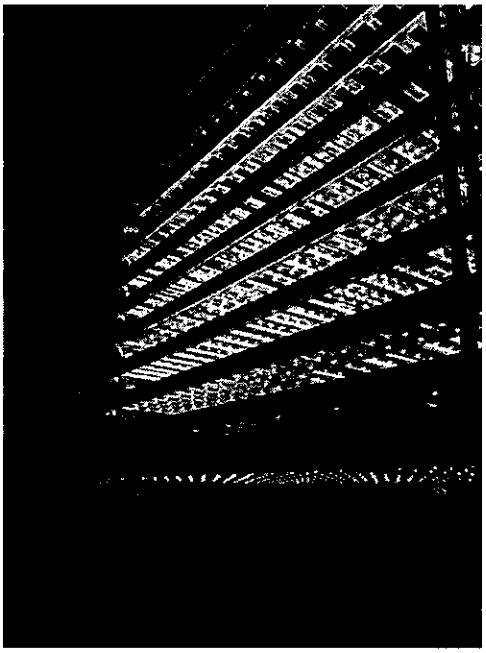
Concept video



Drone video

Growth Tower Platform

Power & Comms platform enables real-time control of all tower variables via seamless cloud integration.



Dynamic lighting utilised on each LED strip

Flexing the lights per LED strip, per tray, per tower, whole farm

Full closed-loop watering control

Full closed-loop air sterilisation and conditioning control

Humidity harvested, UV filtered and re-used

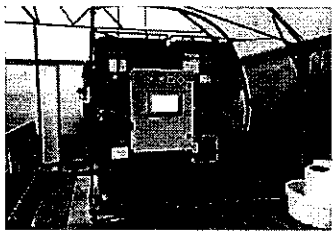
CO_2 / O_2 continuously balanced

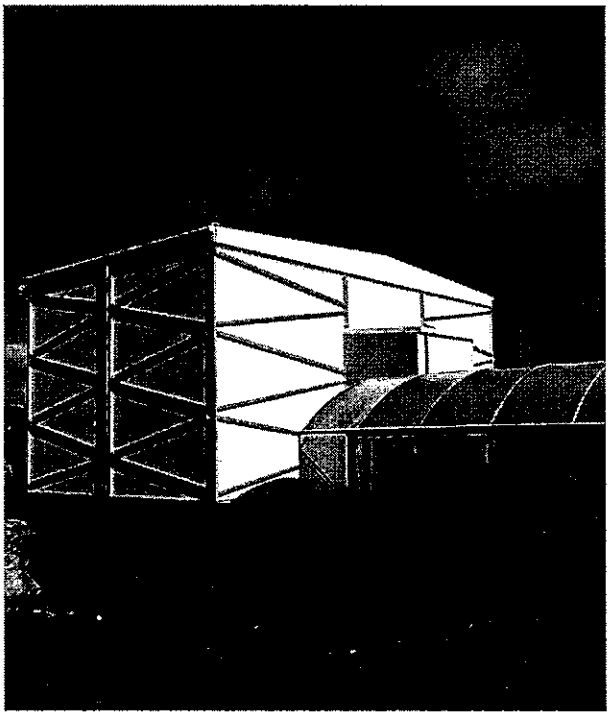
Manual or AI-driven recipe creation

Plants monitored for reaction to recipe changes

Data capture direct to SaaS platform

Exception detection and automatic re-set





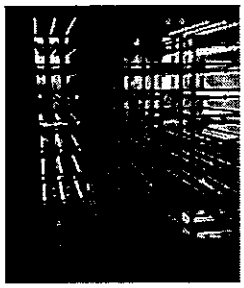
Robot Operated
Picks
Places
Waters
Inspects
Samples
Monitors

Modular Design
Built in Pairs of Towers
60 trays/360m^2 growing area per tower

Month 1 metrics (basil)
18-23 days to harvest weight vs 28-35 range for greenhouse
➔ 18 growth cycles per annum vs 12: 50% more
61kg yield per m^2 vs 40kg industry standard: 50% greater

= 225% yield / m^2

@50% Power consumption = 450% yield / watt



Dynamic lighting utilised on each LED strip

Flexing the lights per LED strip, per tray, per station, whole farm

Direct ventilation per tray

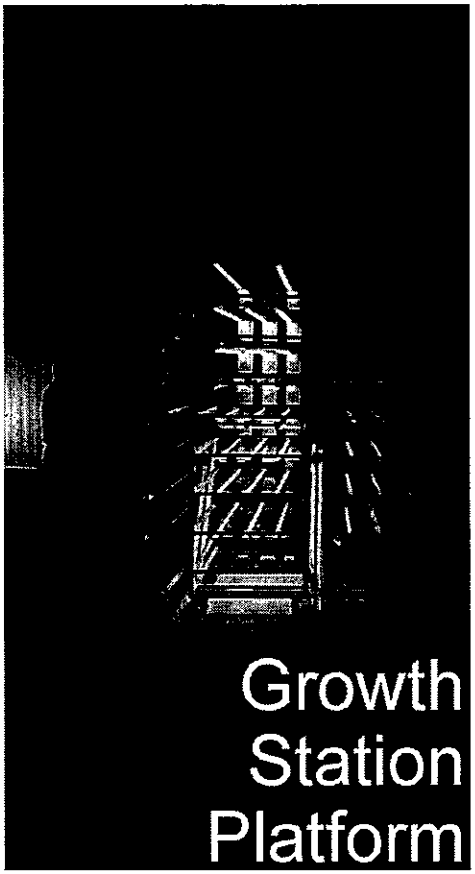
Allows single storey retro-fit

Manual handling

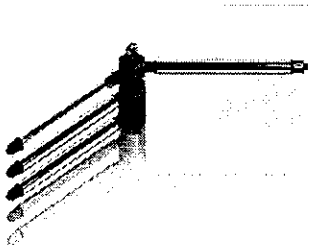
Manual or AI-driven recipe creation

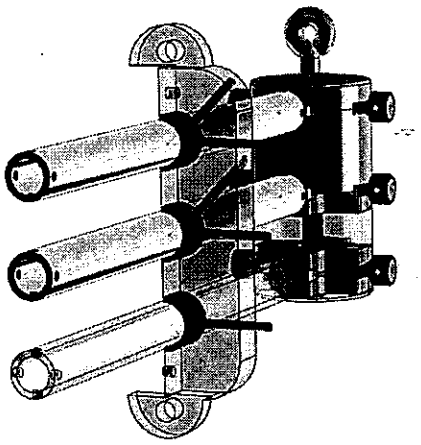
Plants monitored for reaction to recipe changes

Data capture direct to SaaS platform



Smart Lighting Platform





90% less power than conventional lights

No electrician required (33% install cost)

No trunking / cable trays

Modular for different building layouts

Elegant, minimalist design

Controllable ambient and accentuated lighting

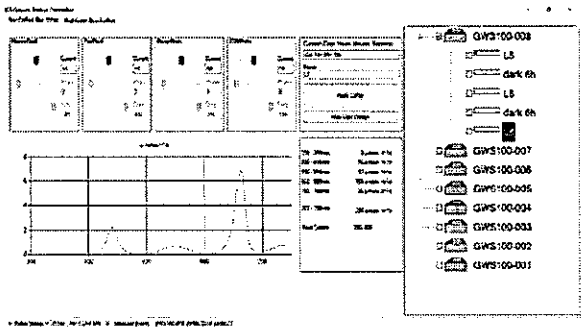
IOT capability supports Cameras, People Tracking, Sensing

Comms capability enables dynamic shelf edge labelling, etc.

Vastly better quality of light (no flicker)

Supplementary greenhouse lighting

Controlled by our SaaS Software & Data Platform.

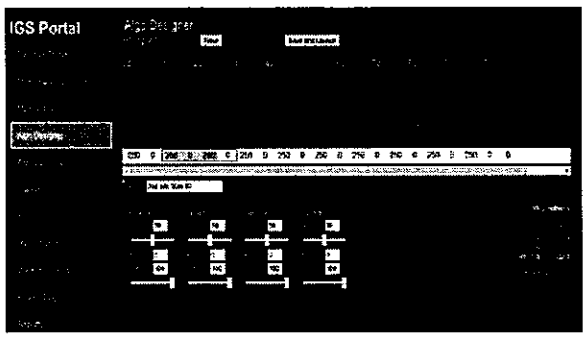


Growth Station Controller app:

Easy to use with little or no training

Direct control of the lights

User can build arbitrarily complex sequences of lighting



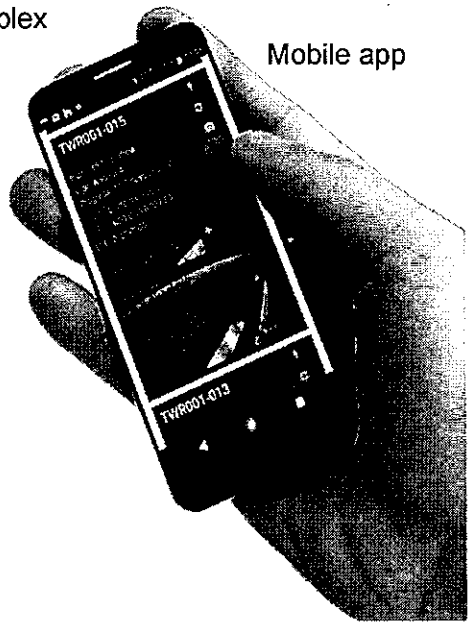
IGS Portal web interface:

Richer functionality

Facility management

Supports both production and experimentation

Mobile app



The big prize is Data.

Machine Learning Platform Road Map

24/7 real-time data from 1,000's of data points, measuring everything from soil moisture to regional power conditions.

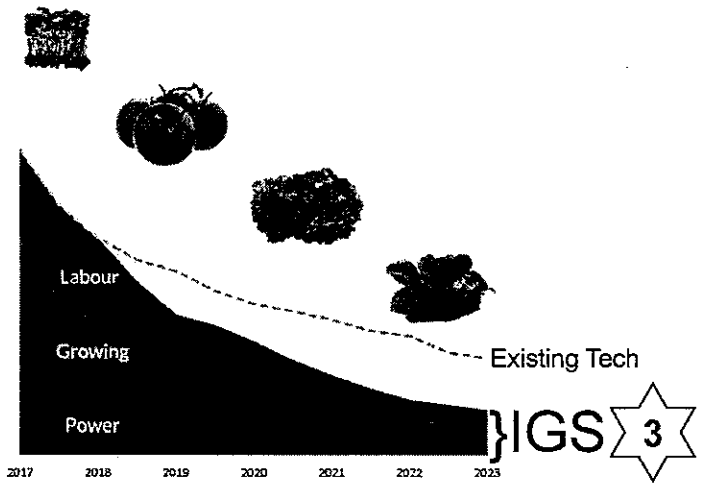
IGS leverages a scalable, high performance AI platform architected for large volume spatio-temporal data (IOT, stress sensing, imagery analysis, etc.) to optimize operational efficiency, crop profiles and even supply chain demand management.

Real-Time Operations	Growth Recipes	Supply Chain
Monitoring data (environmental, lighting, watering, HVAC)	Dynamic Recipes: all growing attributes can be planned for each crop family and variety	Forecast customer demand based on actual historical to predict optimal crop management and planting schedules*
Operational data (timing of all events, tasks scheduled and actioned)	Recipe Timing: can be run on different trays, at same or staggered timing. A time machine for scientists and market flexibility for production	Leverage across 100s or 1000's of geographically disparate vertical systems and markets*
Comparing planned events vs actual events vs risk	Rapid Experimentation correlated to target outputs (taste, growth cycle, shelf-life, etc) by controlling all TCEA inputs	Empower large scale growers to flex crop capacities seamlessly*
Predictive maintenance enabled throughout	100's of experiments per tower	
Managing overall lighting, ventilation, irrigation, operational efficiency	Optimising growth cycles, nutrient content and specific taste profiles*	
Optimising power consumption and growing conditions		
Flexing with the grid to deliver demand side response*		

* work in progress

Making Indoor Ag Profitable

IGS' unique technology drives costs down and yield up, further than any competing system

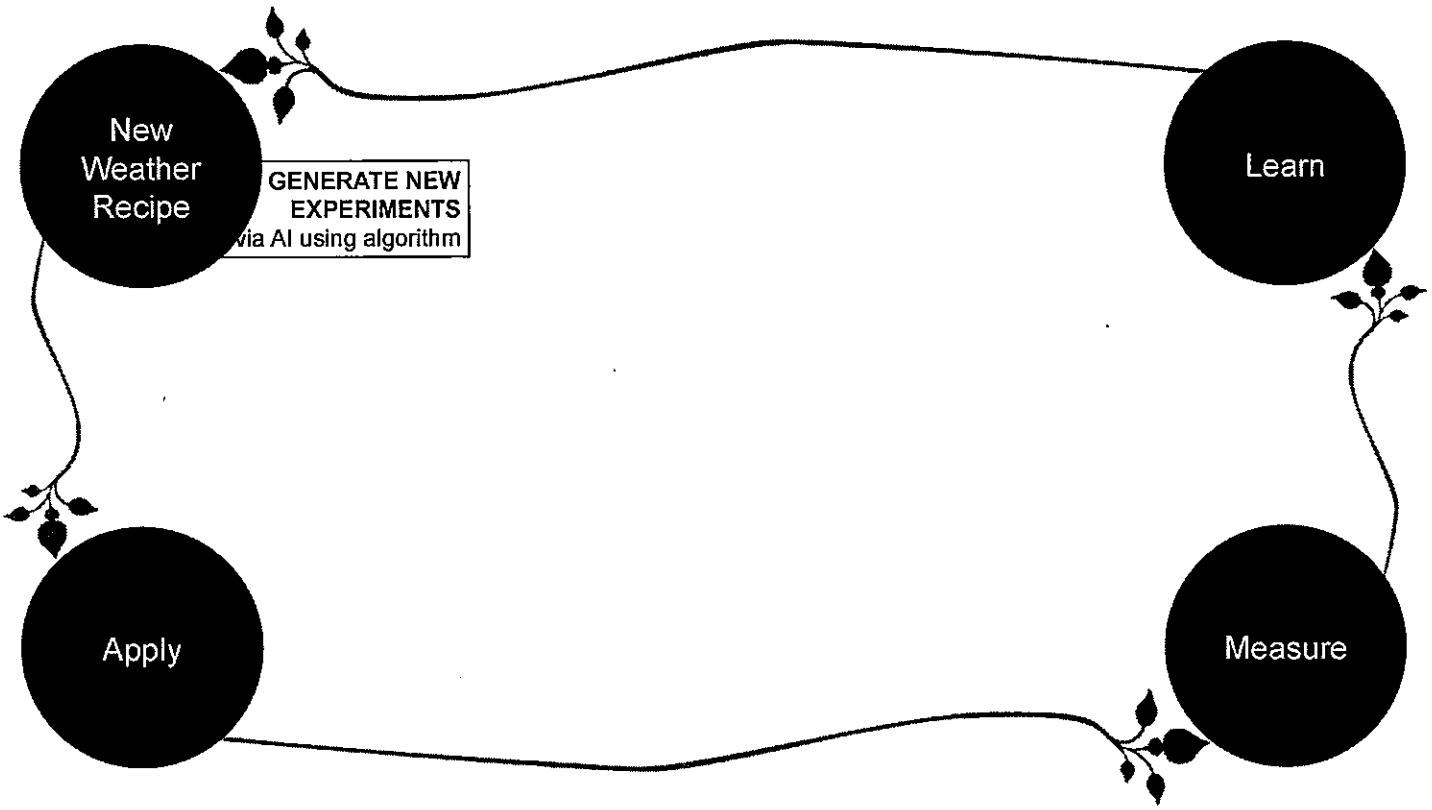


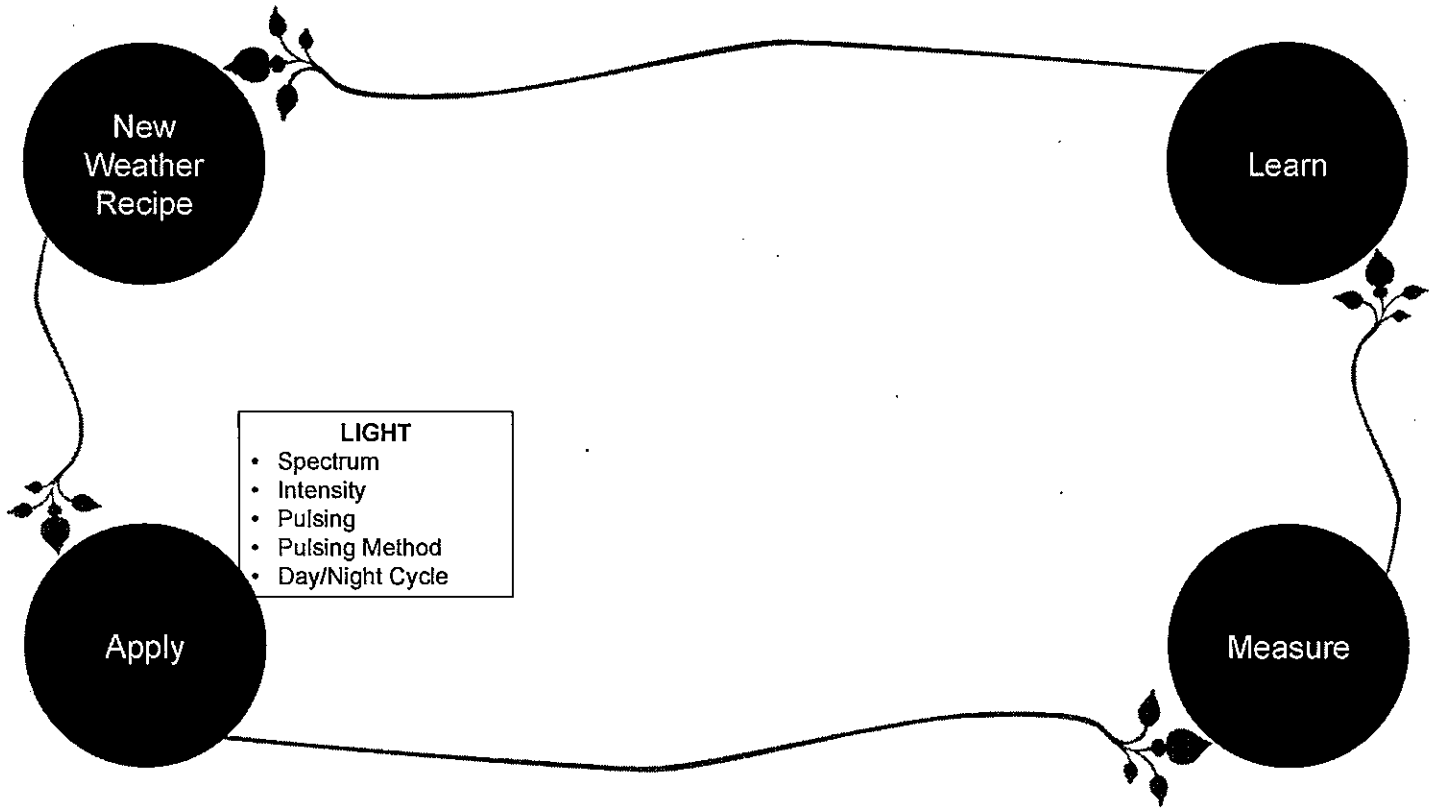
Reduce Power costs with
Photon Optimisation
Smart Power Management

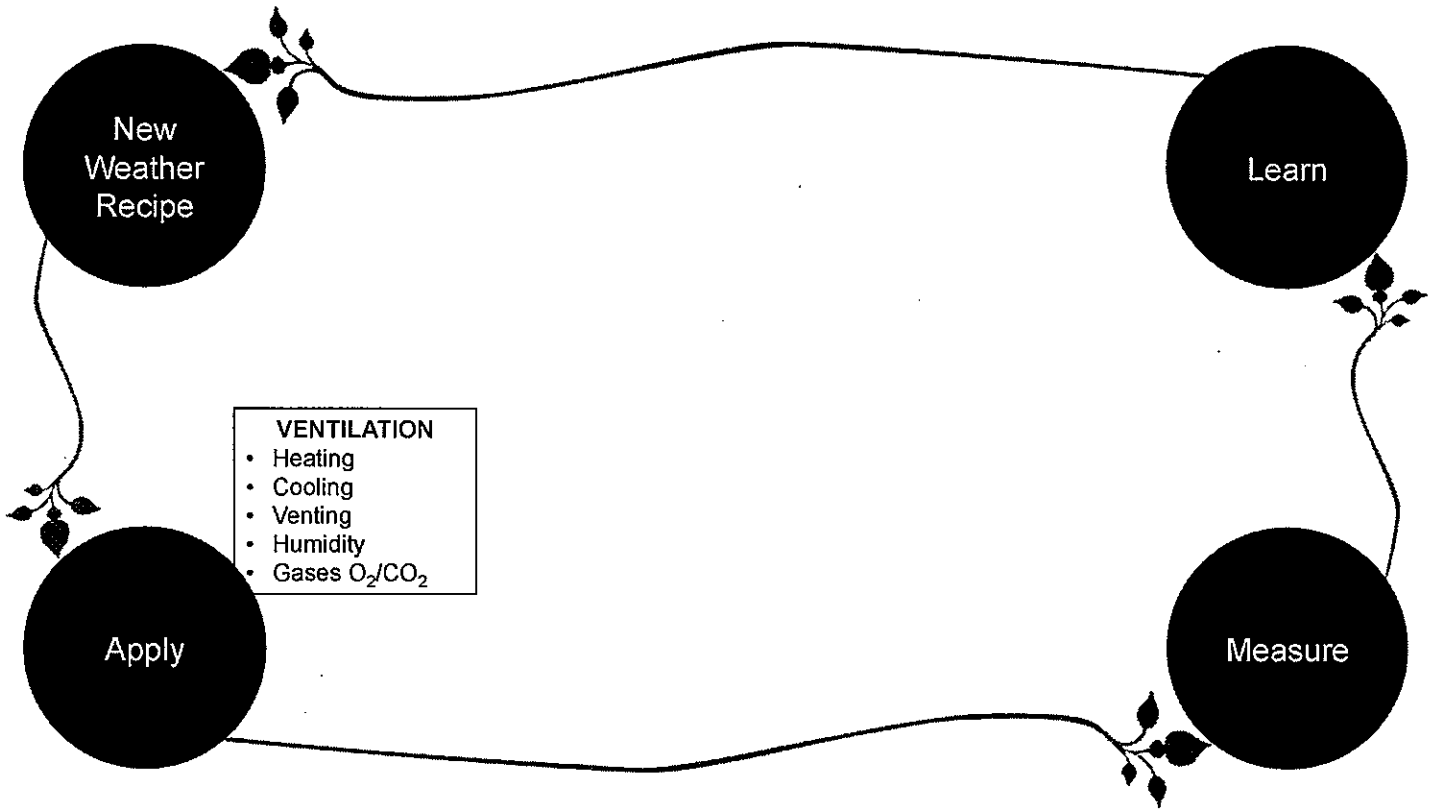
Reduce Labour costs by
Automating
Scaling

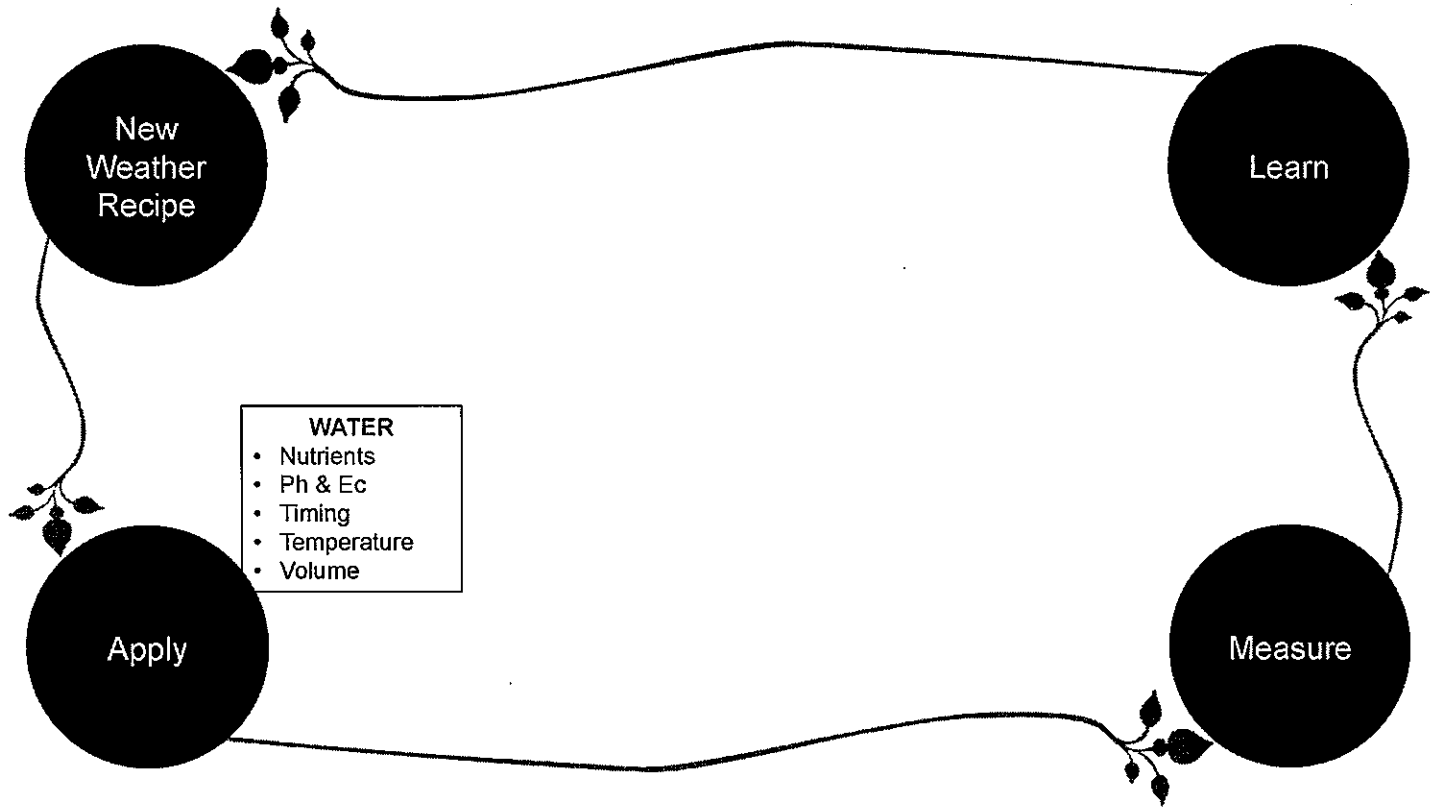
Tech & plant science will deliver
Higher yields
Better quality
Greater consistency

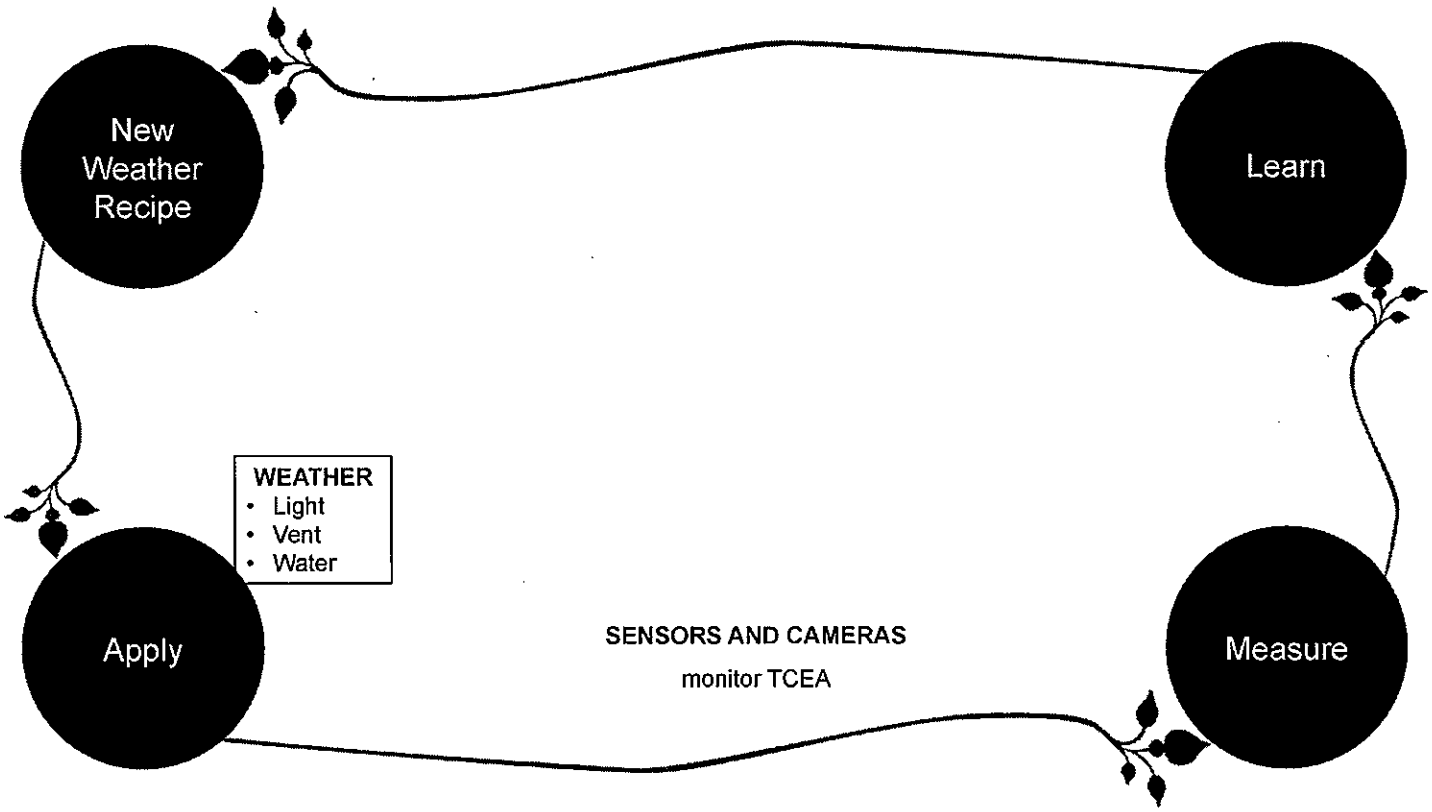
The James Hutton Institute

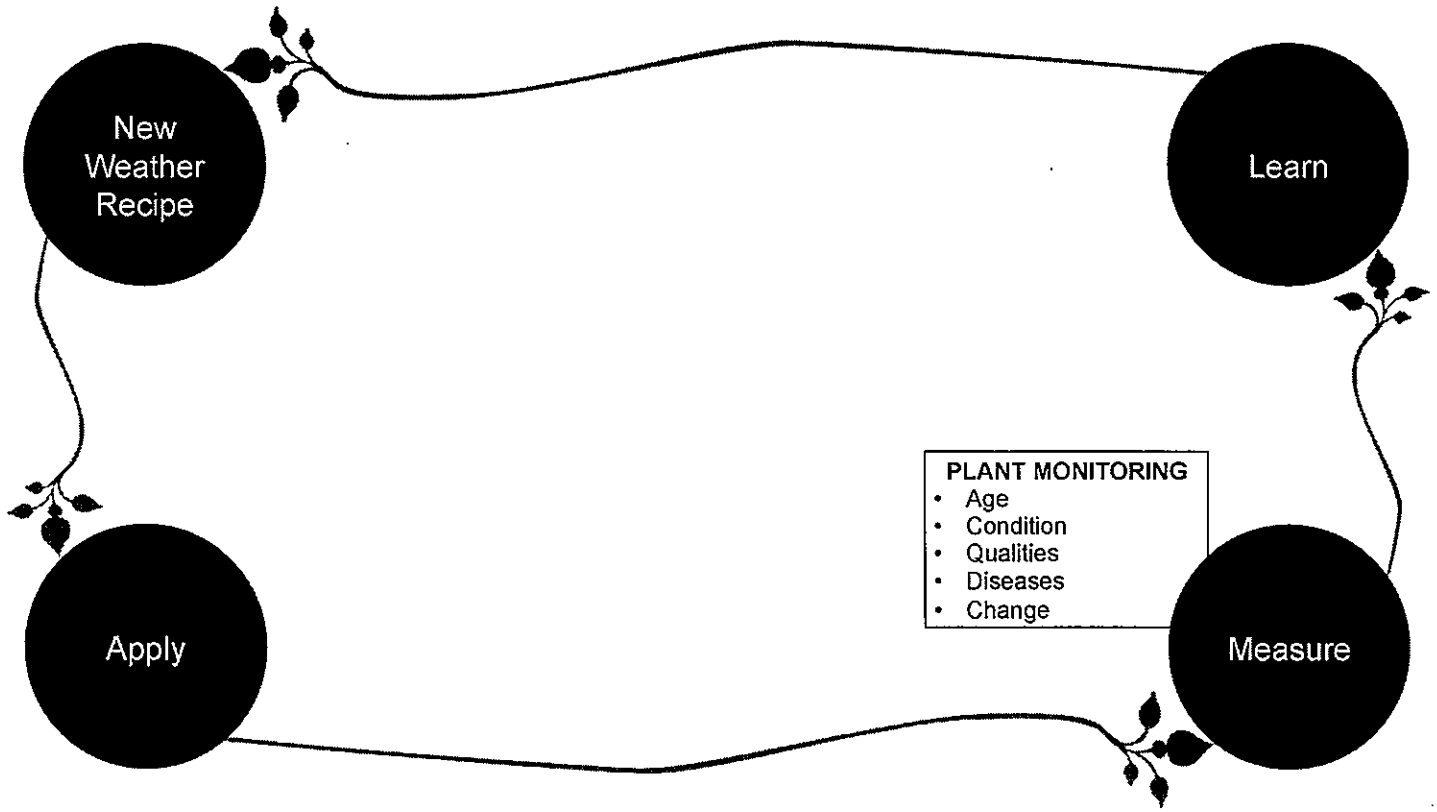

New Weather Recipe
GENERATE NEW EXPERIMENTS
via AI using algorithm
Learn
Apply
Measure

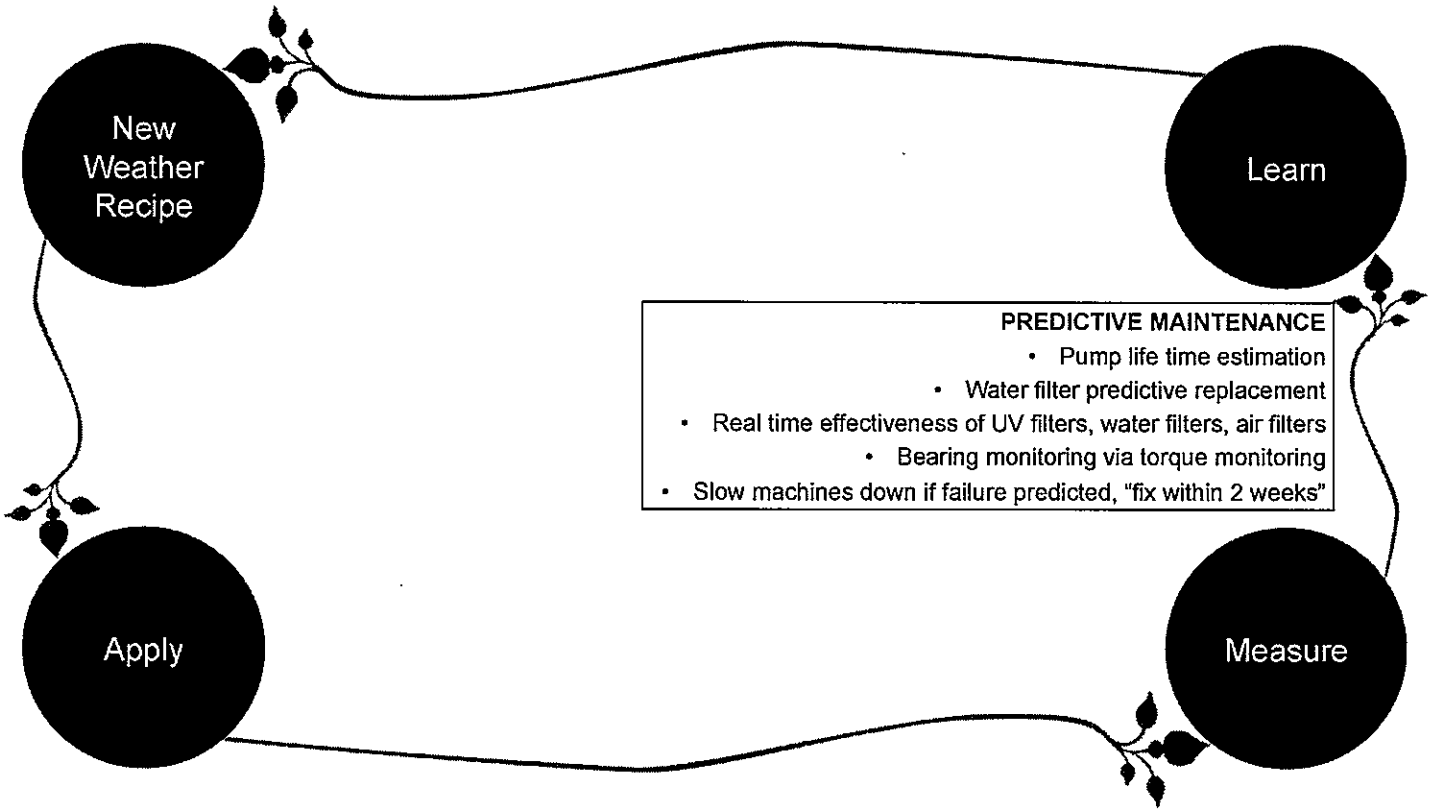

New Weather Recipe
LIGHT
• Spectrum
• Intensity
• Pulsing
• Pulsing Method
• Day/Night Cycle
Learn
Apply
Measure

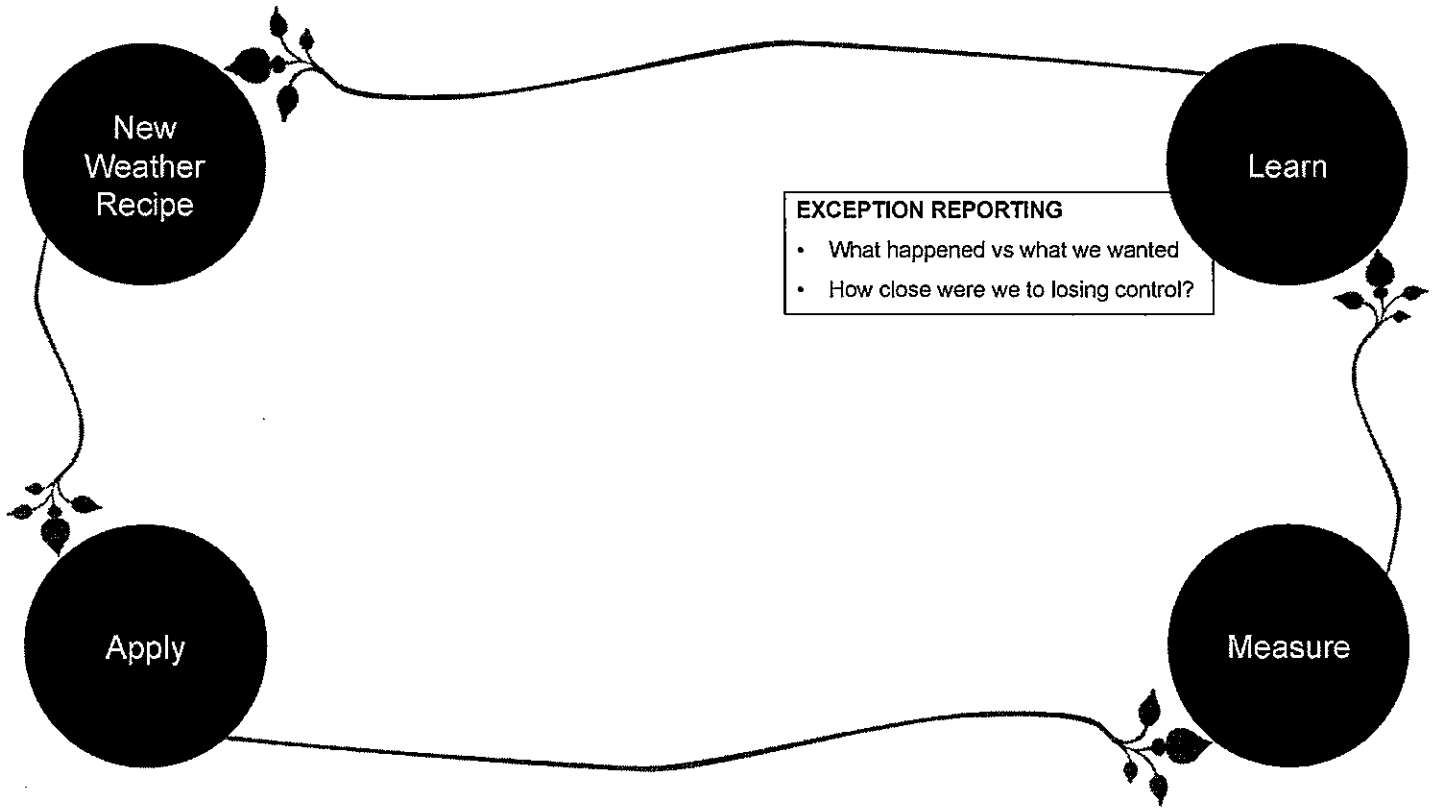

New Weather Recipe
Learn
VENTILATION
• Heating
• Cooling
• Venting
• Humidity
• Gases O_2/CO_2
Apply
Measure

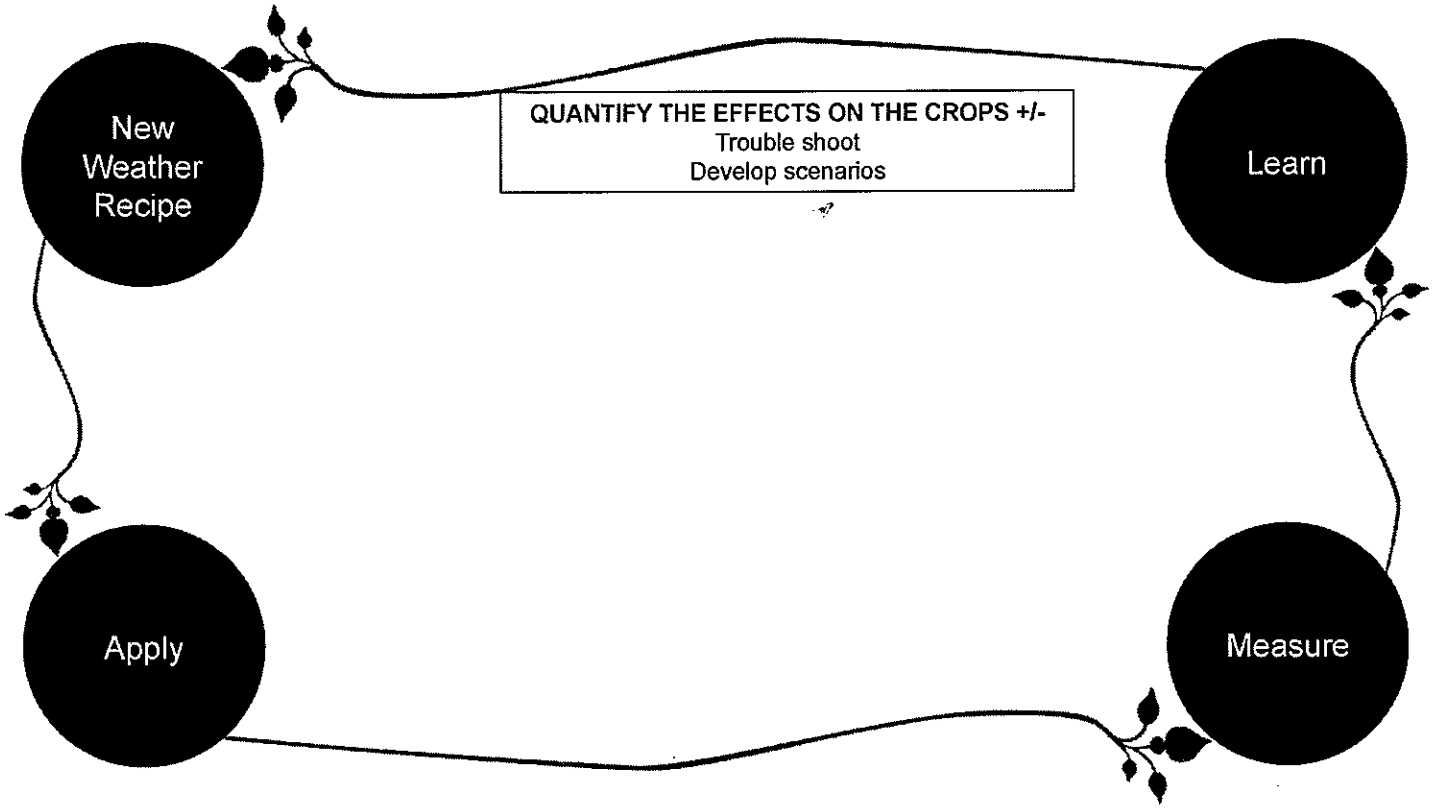

New Weather Recipe
Learn
WATER
• Nutrients
• Ph & Ec
• Timing
• Temperature
• Volume
Apply
Measure

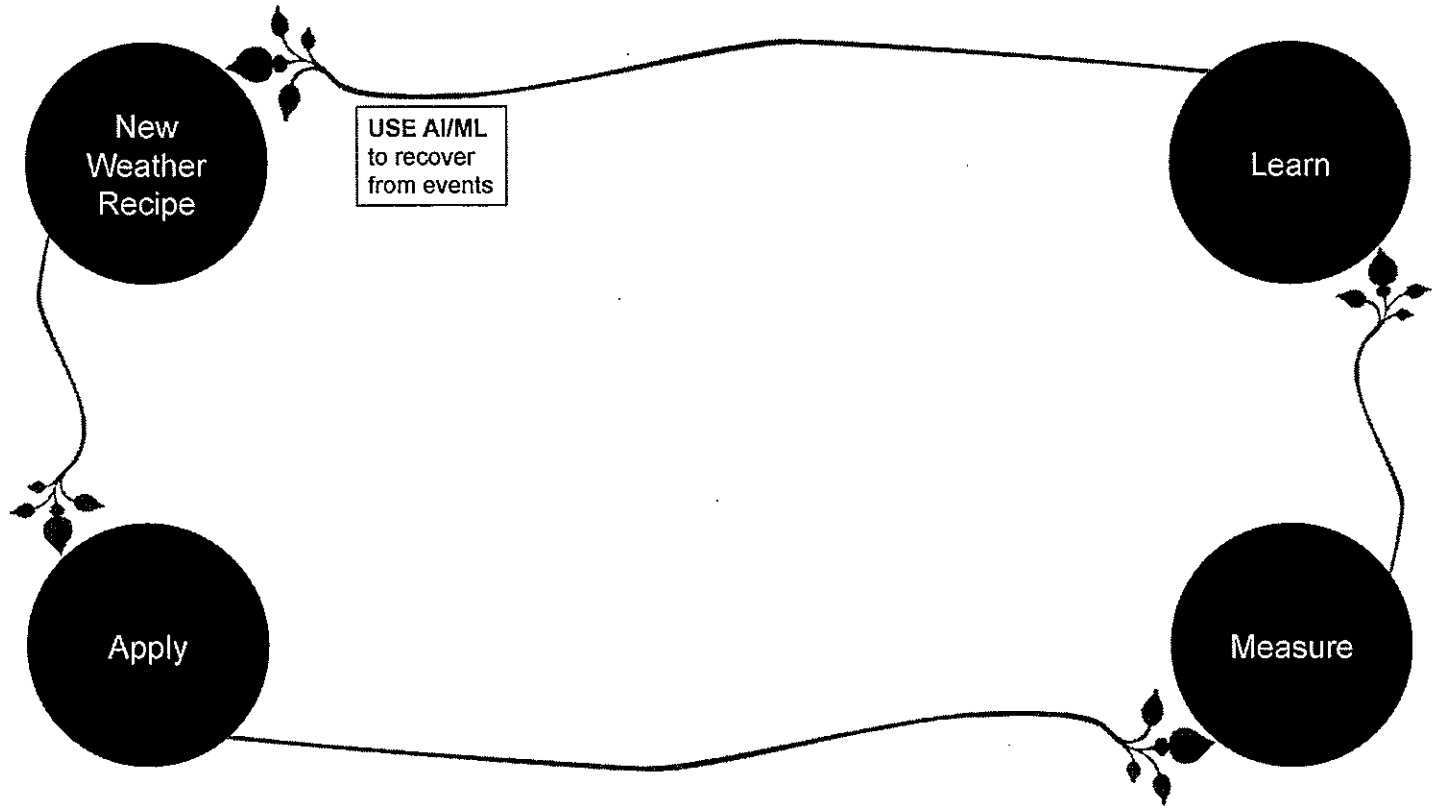

New Weather Recipe
Learn
WEATHER
• Light
• Vent
• Water
Apply
SENSORS AND CAMERAS
monitor TCEA
Measure


New Weather Recipe
Learn
PLANT MONITORING
• Age
• Condition
• Qualities
• Diseases
• Change
Apply
Measure


New Weather Recipe
Learn
PREDICTIVE MAINTENANCE
• Pump life time estimation
• Water filter predictive replacement
• Real time effectiveness of UV filters, water filters, air filters
• Bearing monitoring via torque monitoring
• Slow machines down if failure predicted, "fix within 2 weeks"
Apply
Measure


New Weather Recipe
Learn
EXCEPTION REPORTING
• What happened vs what we wanted
• How close were we to losing control?
Apply
Measure


New Weather Recipe
QUANTIFY THE EFFECTS ON THE CROPS +/-
Trouble shoot
Develop scenarios
Learn
Apply
Measure

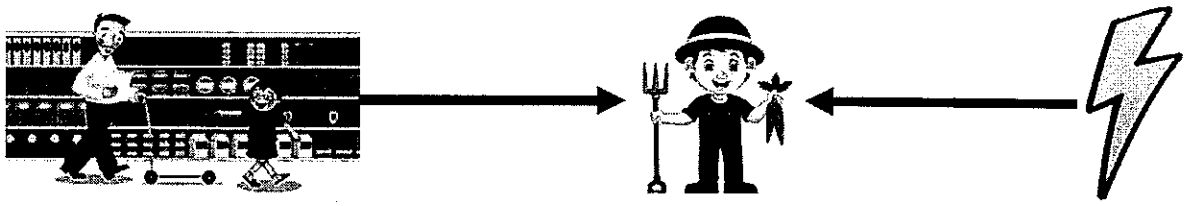

New Weather Recipe
USE AI/ML
to recover
from events
Learn
Apply
Measure

RESPOND TO MARKET REQUIREMENTS

Let the buyer tell you what to grow

Allow operators / scientists across locations to compare results

Flex light and nutrients at different points in growth cycle

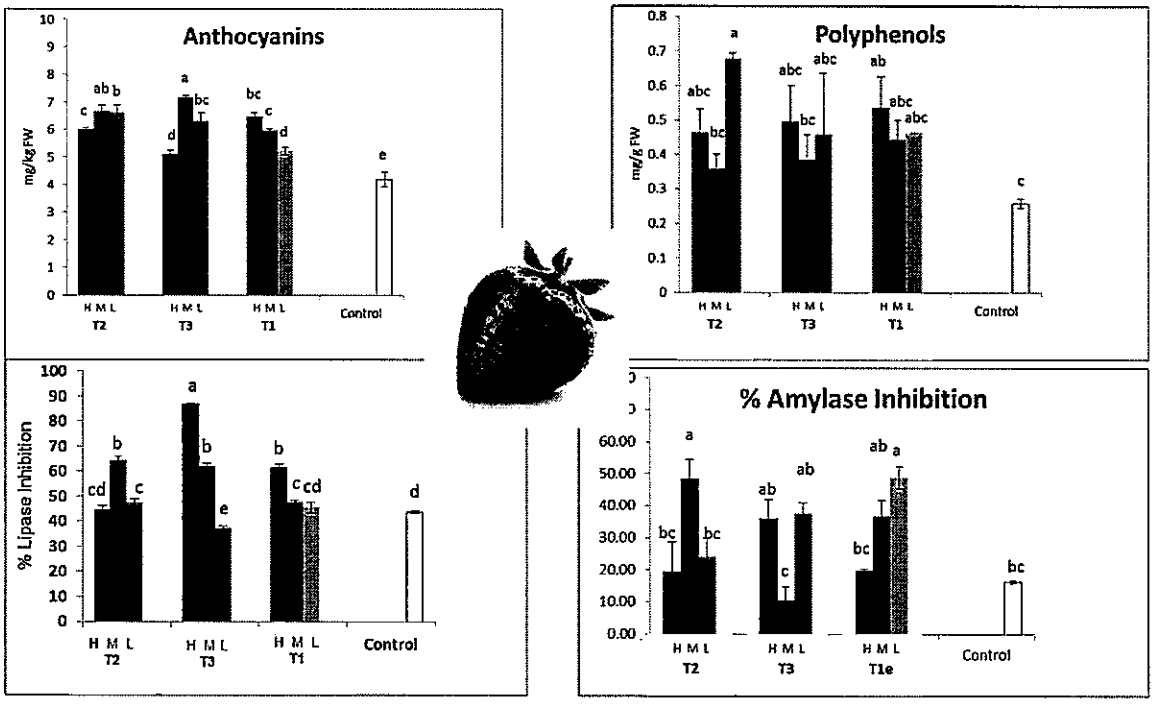


FLEX POWER WITH THE GRID

Slowdown/speed up growth with minimal impact on crop yield, quality, consistency and economics

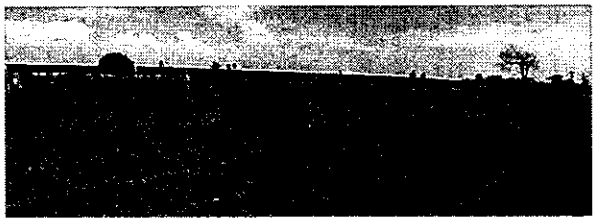
Manipulation of fruit quality health benefits by light modulation

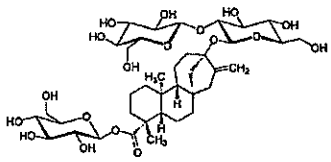
The James Hutton Institute



Added Value Products: Stevia

Stevia Market Size Worth $553.7 Million By 2024 | CAGR 6.1%





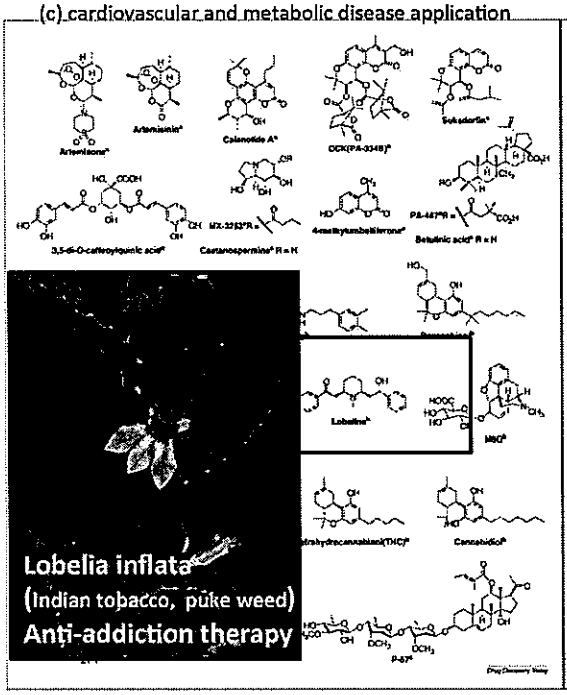
Steviol glycosides
30 to 150 times the sweetness of sugar

Needs warm temperatures with minimal frost, adequate rainfall, and lots of sunshine.

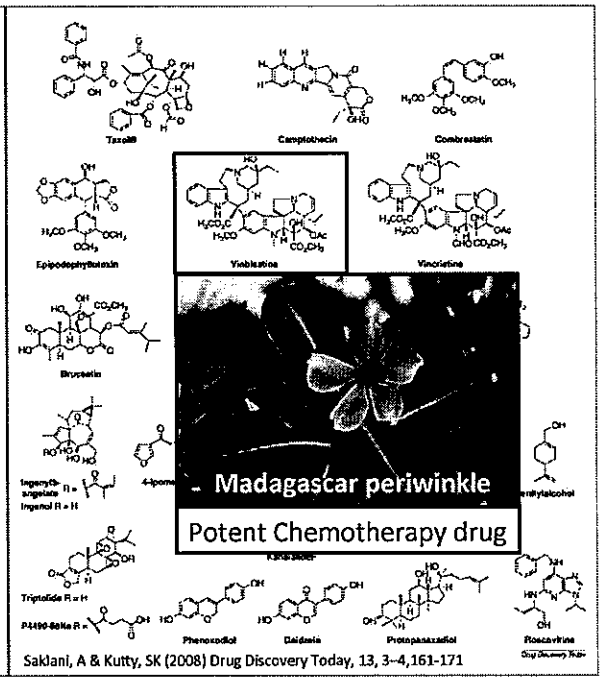
- Yield impacted by temperature, drought, over-watering and nutrient levels
- Needs optimisation
- Increase yields 3-5 fold.

Plant-derived compounds launched in clinical trials.

(a) Infectious and parasitic disease application
(b) pain and neurological disease application
(c) cardiovascular and metabolic disease application



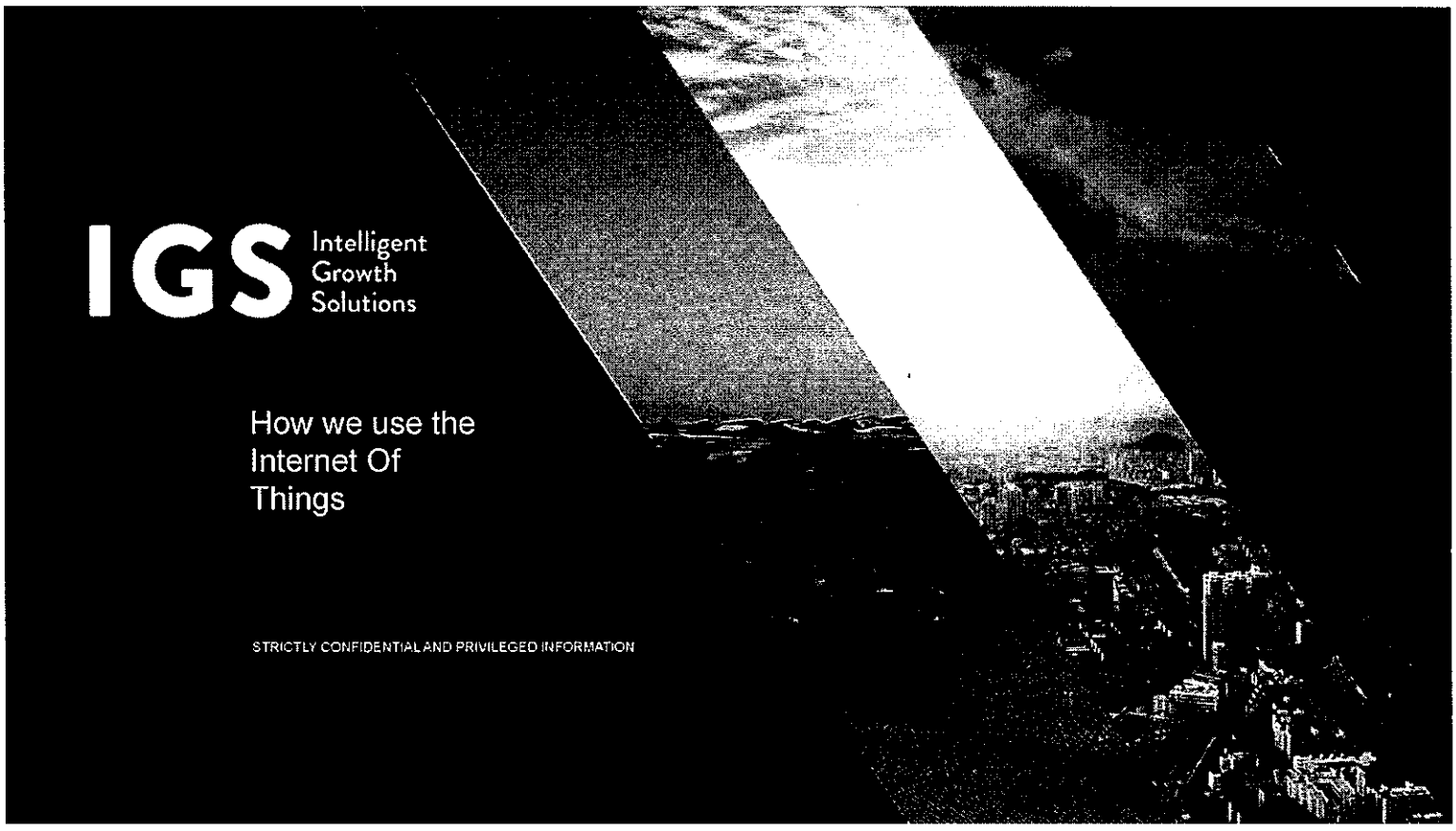
Anticancer drugs



Saklani, A & Kutty, SK (2008) Drug Discovery Today, 13, 3–4,161-171

Conclusions

- Food Security is becoming a crucial issue.
- The treats of climate change and extremes are evident and increasing.
- A game change is required in food and crop product production
- The IGS vertical farming system ***IS*** that game change
- The IGS system can both produce food (and products) and be used to breed climate resilient varieties for conventional agriculture.
- The system software, energy management and light control makes sustainable profitable production assured.



wipro

Realizing Business Outcomes with IoT

Jayraj Nair
VP, Global Head IoT

Oct 17 2018

A successful global business

$8 billion in revenue with 160K employees in 62 countries

- **2017** Launched new Brand Identity and rearticulated the "Sprit of Wipro"
- **2014** Launched "Wipro Digital"
- **2000** Listed in the NYSE and enters the BPO business
- **1990** Wipro enters the IT Software business
- **1986** Entry to outsourced R&D business
- **1982** Entry to IT hardware business
- **1945** Incorporation of Western India Vegetable Products Ltd

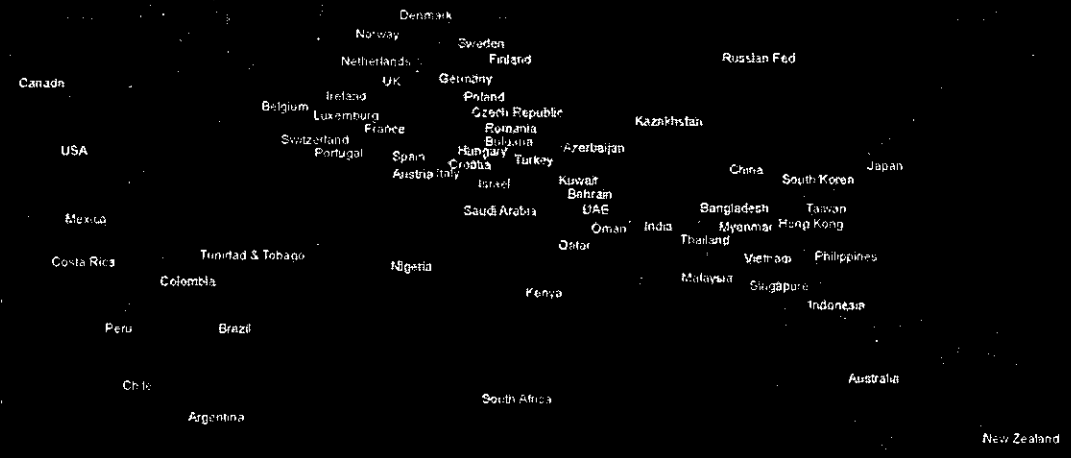
business units & service lines

Banking, Financial Services & Insurance	Manufacturing & Technology	Consumer	Healthcare, Life Science & Services	Energy, Natural Resources & Utilities	Communications
Modern Application Services	Cloud Infrastructure Services	Business Process Services Cyber Security & Risk Services	Industrial & Engineering Services	Data, Analytics and Artificial Intelligence	Digital & Consulting *

*Digital & Consulting Revenues are part of the Service line ecosystem

Our global presence

One Global Team

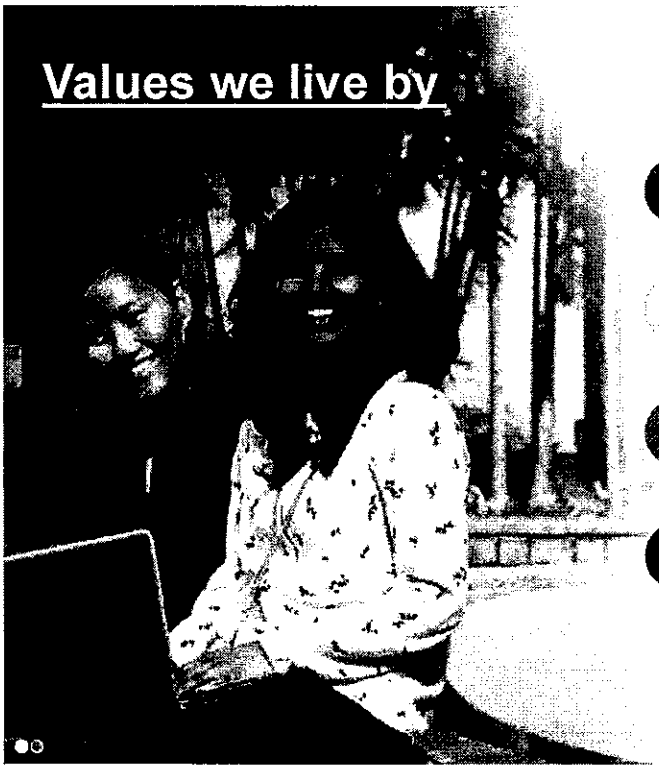


Digital Pods

Aarhus, Barcelona, Berlin, Copenhagen, Lima, London, Madrid, Medellin, Munich, New York, Oslo, San Francisco, Stockholm, Riyadh, Tokyo, Melbourne, Gdansk, Sydney, Bangalore, Mountain View, Dublin, Edinburgh

*As of FY Q1 2018-19

Values we live by

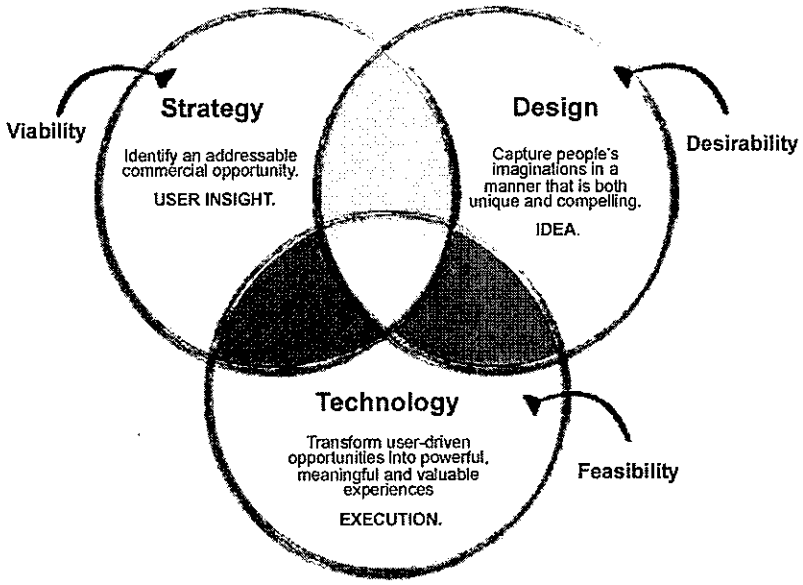


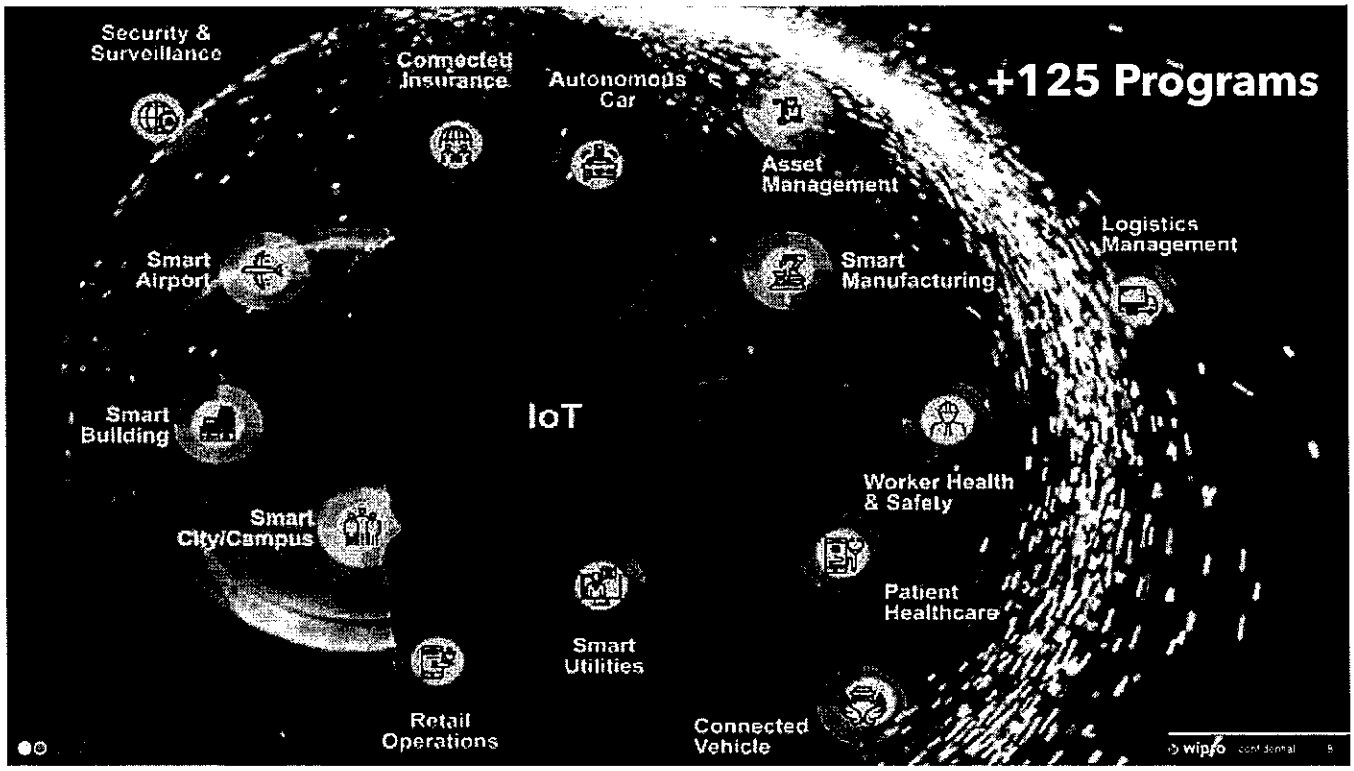
- e passionate about clients' success
- Treat each person with respect
- Be global and responsible
- nyielding integrity in everything we do

Digital transformation & internet of things

Curating value at the intersection of Strategy, Design and Technology to deliver outcomes.

Focus on business outcomes, experiences





Digital transformation

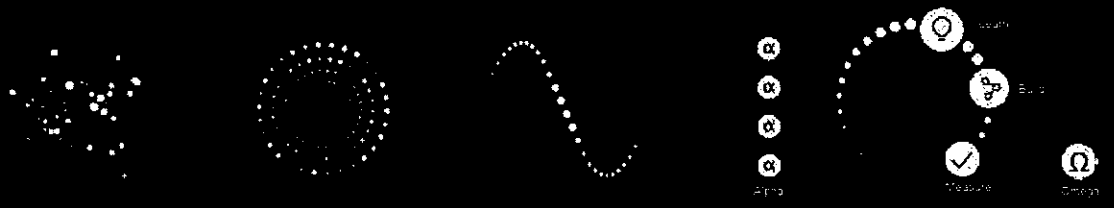
Primacy on…

Agility over Agile	&	Velocity over Certainty	&	Collective Symphony over individual theatrics	&	Ecosystem Capability over intrinsic capability only
blur & work across organizational boundaries		time arbitrage over cost arbitrage		talent at the intersection of design, strategy and technology cultivate differentiated culture & mindset		also rely on partners and crowd for talent & execution speed

We needed a different way of working – Agile, Beyond Silos, Outside In

Designit

Agile led, collaborative



Disruptive insights	Future vision	Experience roadmap	Experience design	Continuous delivery
Research & opportunities	Direction & experience concept	Business Transformation Roadmap & Future customer journey	Solution & prototyping	Development & Implementation

PORTFOLIO CONSTRUCTION — **PORTFOLIO EXECUTION**

Relevance across the value chain

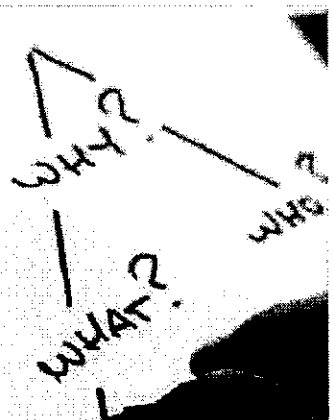
"Think it – Design it – Build it – Run it"

Business Outcome
discover & quantify winning value chains

Experiments at Scale
agile, experience led connected systems engineering

Governance
Method, model, mindset organizational design

It's an ecosystem play



Microsoft, Amazon, Google, Siemens, PTC, National Instruments, RTI, GE, IBM, Intel, SAP, Oracle, Salesforce, Software AG, Altizon, HP, Cisco, Dell Technologies, others…

industrial internet CONSORTIUM

WORLD ECONOMIC FORUM

PLATTFORM INDUSTRIE4.0

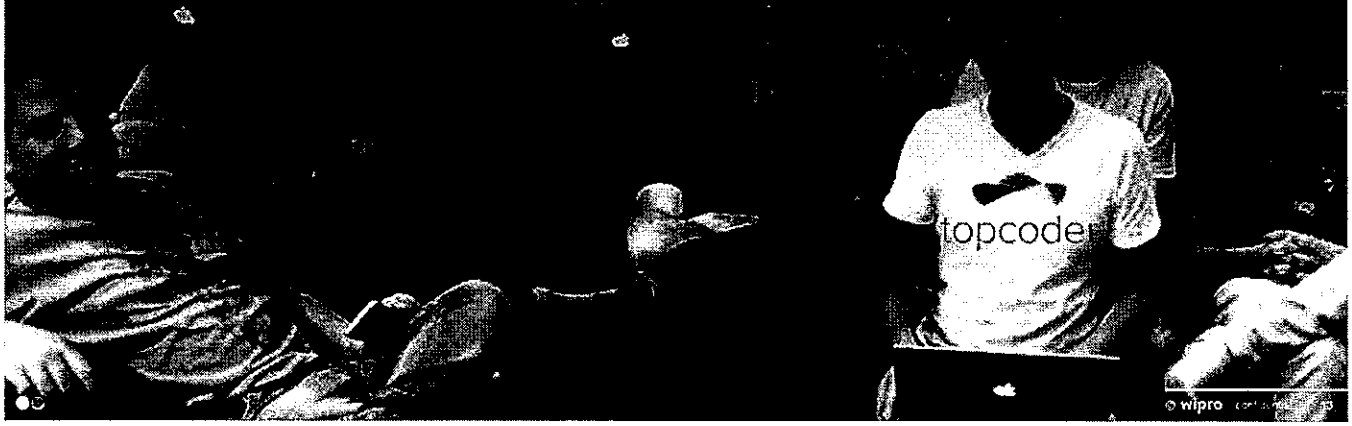
Richard Soley, Chairman & CEO, Executive Director, Industrial Internet Consortium
Jeff Merritt, Head of IoT and Connected Devices, WEF Center for the Fourth Industrial Revolution

Innovate - Embrace crowd-first culture

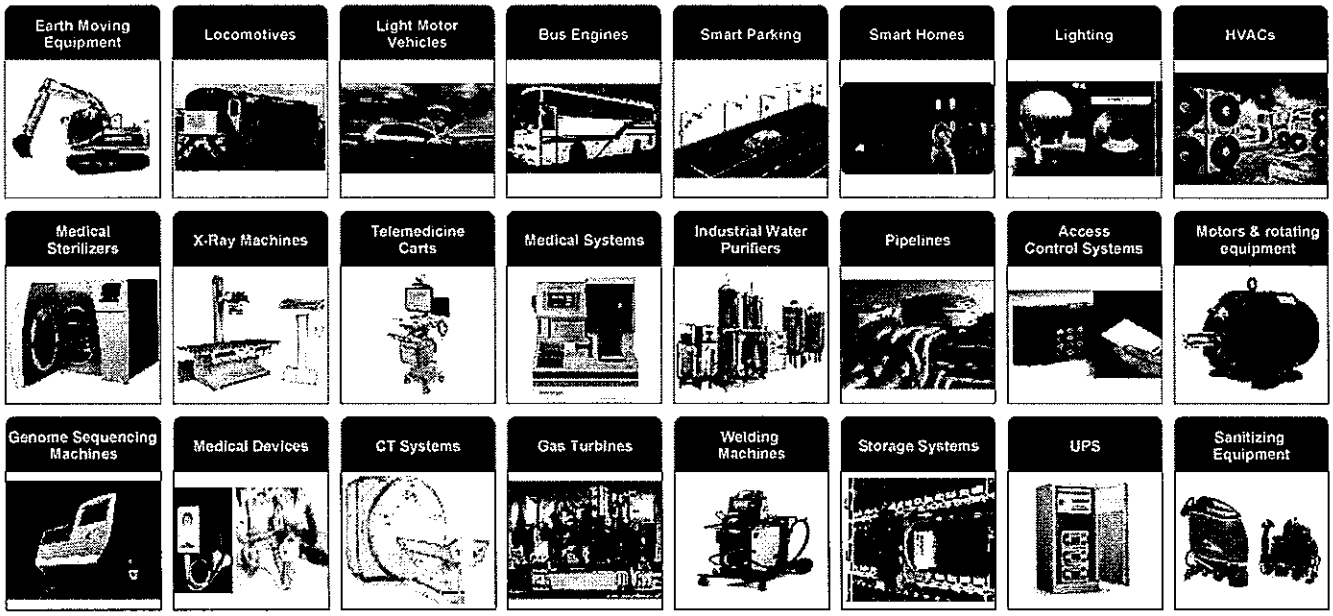
enterprise grade hybrid crowd sourcing

over 1 Million Members 7K+ Crowdsourcing challenges

Areas: Design and rapid prototyping, App dev, Analytics



Asset Management & Operations

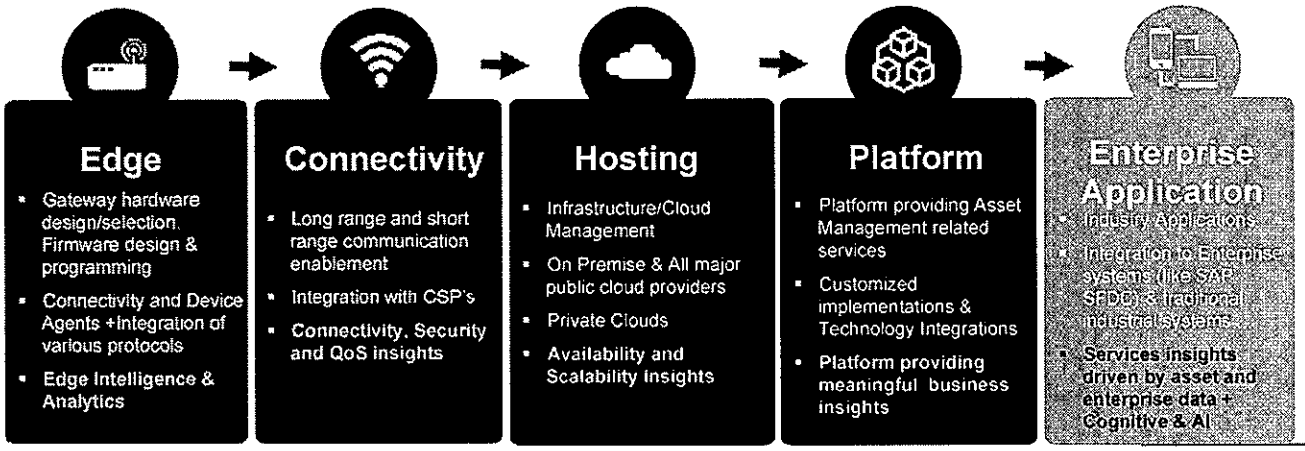


IoT solutions World Congress 2017

Weatherford dish Roche

IoT solutions World Congress 2018

SULZER lyv ELCITA xylem Let's Solve Water JCB



IOT SOLUTIONS WORLD CONGRESS | THE LEADING IOT INDUSTRY EVENT

BARCELONA 16-18 OCTOBER 2018

xylem Let's Solve Water

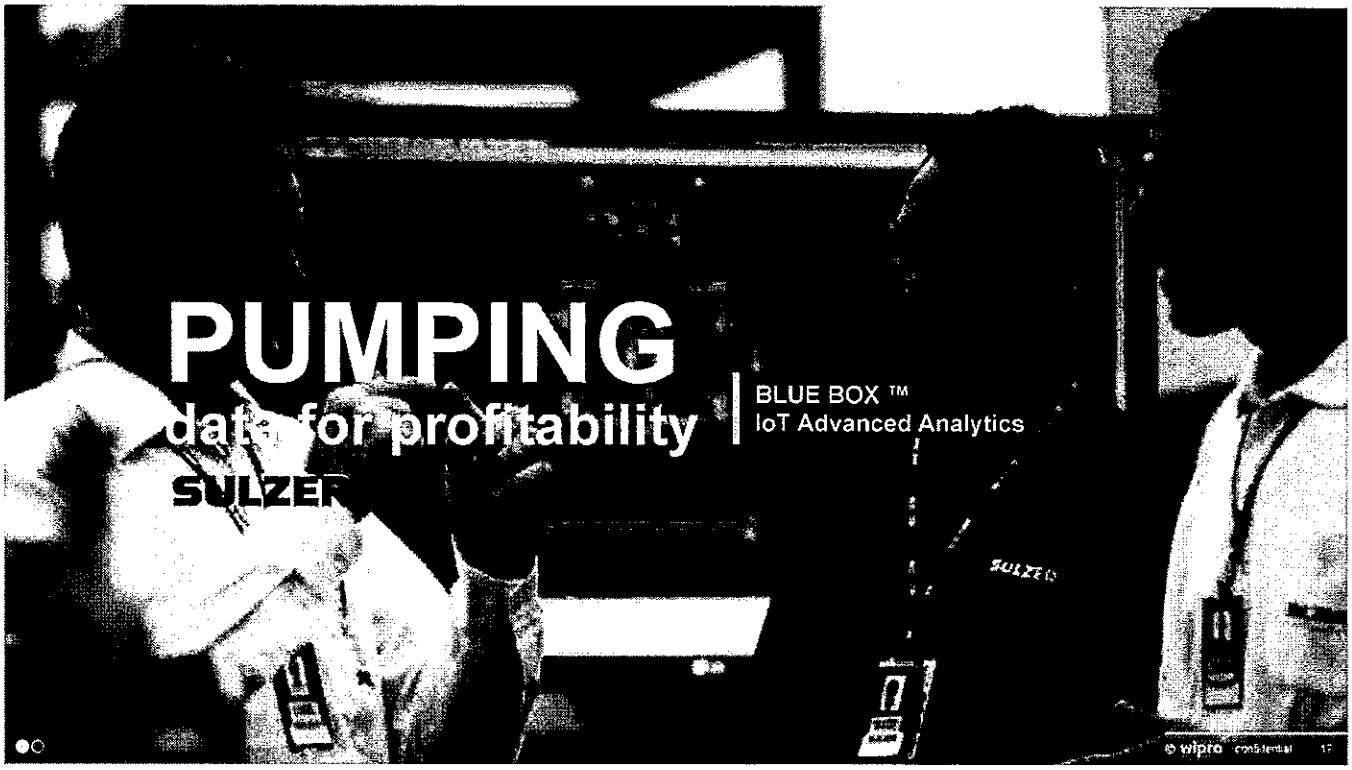
Peter Nilsson
Manager, Systems & Digital Services at Xylem Inc. Stockholm, Sweden

lyv

Brendan de Graaf
Directeur bij Lyv smart living BV
Eemnes, Utrecht Province, Netherlands

ELCITA

Rama N.S
CEO at ELCIA
Bengaluru Area, India


PUMPING
data for profitability
BLUE BOX ™
IoT Advanced Analytics
SULZER
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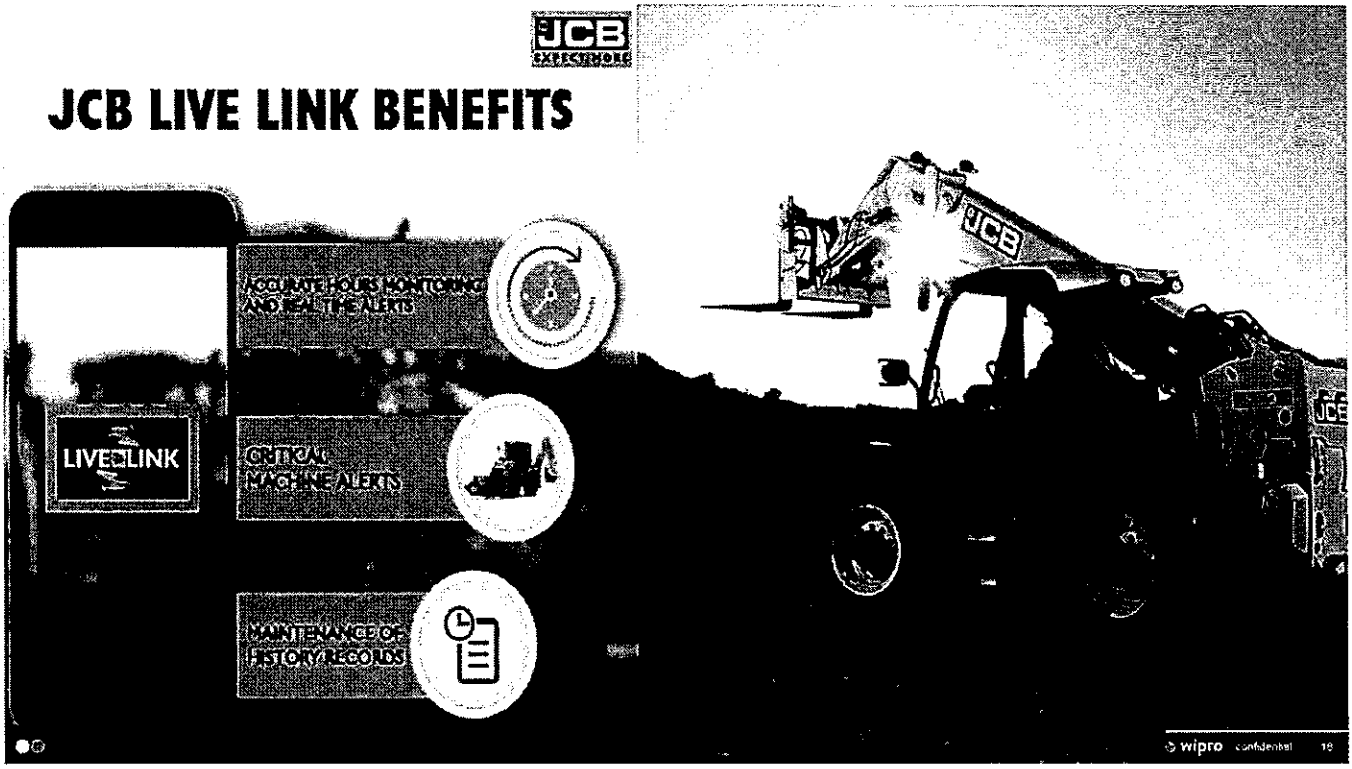
JCB
EXPERTS FOR LIFE
JCB LIVE LINK BENEFITS
ACCURATE HOURS MONITORING AND REAL TIME ALERTS
LIVELINK
CRITICAL MACHINE ALERTS
MAINTENANCE OF HISTORY RECORDS
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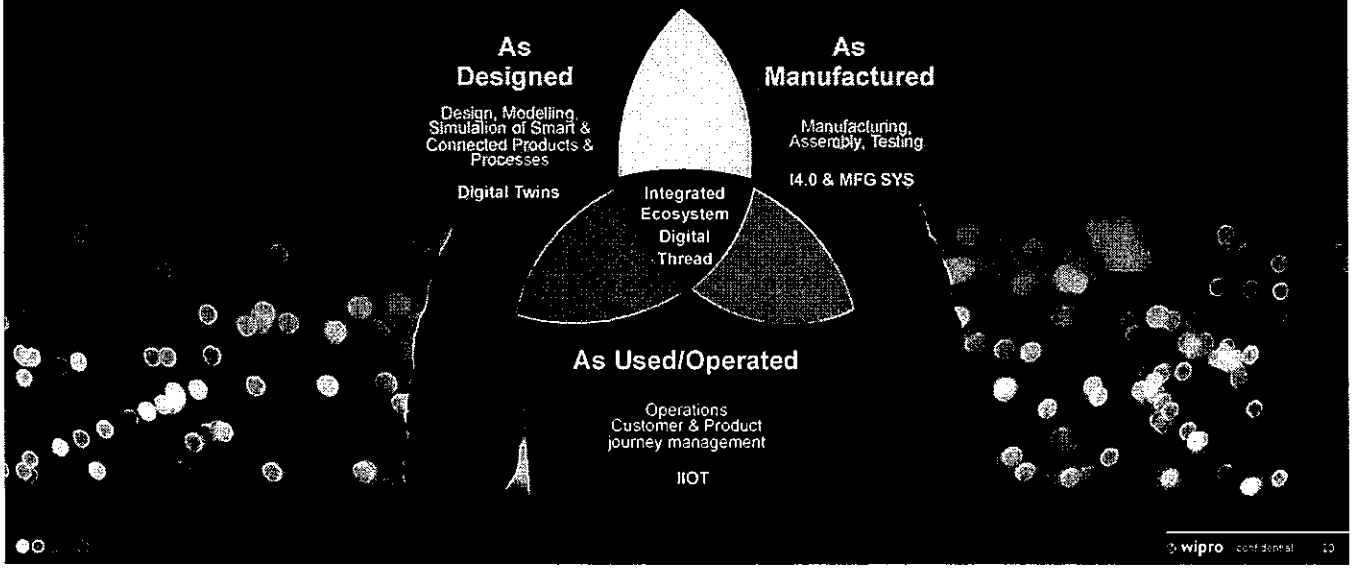
"...hoice for scale deployments!"

Strategy, Architecture (Technology & Domain)	IoT Platform Development	Hosting Cloud Technology
End to end Security implementation	Testing Services	Sensor, Gateway Edge Development
Security Operations	Analytics, Visualization & Design	Command Centre

Where is the puck headed 2020?



Connected Worker Safety, Productivity and Operations Testbed

Come experience how IoT can improve Worker Safety, Productivity and Enterprise Operations

wipro

GUARDHAT

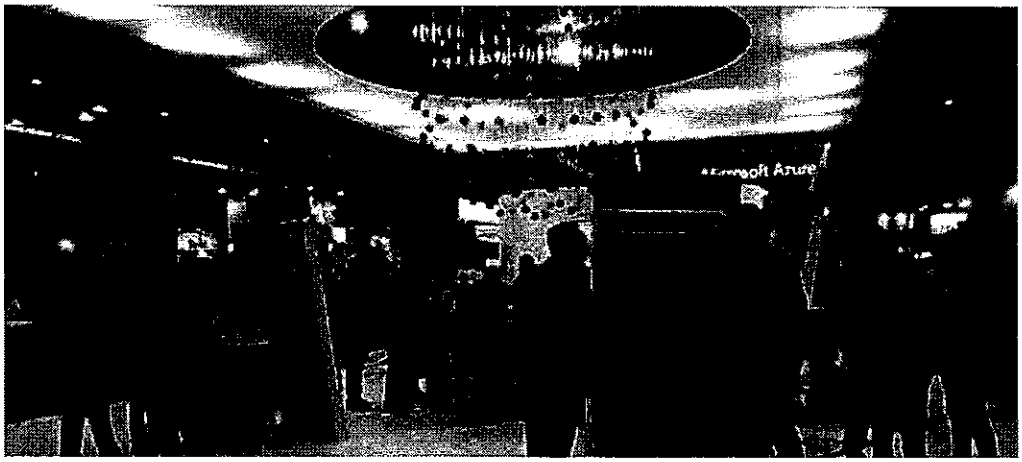
Hewlett Packard Enterprise

aruba
a Hewlett Packard Enterprise company

Gold Partner
MindSphere

SIEMENS

Experience Enterprise Grade IoT solutions!



- Intelligent Asset Management
- Connected Spaces
- Cognitive Energy Intelligence
- Topcoder Enterprise Grade Crowdsourcing
- Smart Cold Chain
- Connected Vehicle

Wipro sessions at IoT SWC 2018

Panel: Why Edge First in Oil & Gas?
• • •
Time: 10:25 – 11:10, Oct 16
Gopakumar Nair
GM & Global Sales Head of IoT, Wipro

Evolving Manufacturing Customers for Newer Revenue Models through Smart Connectedness and Improved Operations
• • •
Time: 13:20 – 14:05, Oct 16
Sharmila Paranjpe
VP, Manufacturing, Wipro

Generating Business Value and Insights for IoT
• • •
Time: 16:25 – 17:10, Oct 16
Geetha Gopalakrishnan
GM & Global Delivery Head of IoT, Wipro

Monetizing Digital & Process Twins: From the Component to the Operational to the Process Level
• • •
Time: 17:20 – 18:05, Oct 16
Anita Ganti
SVP & Global Head, Product Engineering Services, Wipro

Keynote: Realizing Business Outcomes With IoT
• • •
Time:10:25 – 11:10, Oct 17
Jayraj Nair
VP & Global Head, IoT, Wipro

Command Control and Managed Shared Services for Smart Cities, Smart Campuses and IoT Systems
• • •
Time: 11:30 - 12:15, Oct 17
Ashish Khare
GM, Cloud Infrastructure Services, Wipro

Solving Industry problems with AI & IoT
• • •
Time: 12:25 - 13:10, Oct 17
Santhosh Madathil
GM, IoT Solutions Engineering, Wipro

Panel: Closing the Loop: Using Digital Thread/Digital Twin to Connect the Factory and the Field
• • •
Time: 13:20 – 14:05, Oct 17
Calvin Smith
Director & Head of Partner Engineering, Wipro

Product to Service Transformation through Human-Centric Design: Next Gen Services for Smart Pumps
• • •
Time: 18:15 – 19:00, Oct 17
Adam Hassan
Managing Director, Designit

Panel: IoT in Finance
• • •
Time: 13:20 – 14:05, Oct 18
Gopakumar Nair
GM & Global Sales Head of IoT, Wipro

wipro

Thank You
ধন্যবাদ
ಧನ್ಯವಾದ
Obrigado
Gracias
Gràcies
Danke
Grazie
Merci
شكر
Tack
谢谢