Finding New Technologies in the Pork Industry

Towards Precision Farming or just High-Tech Hype?

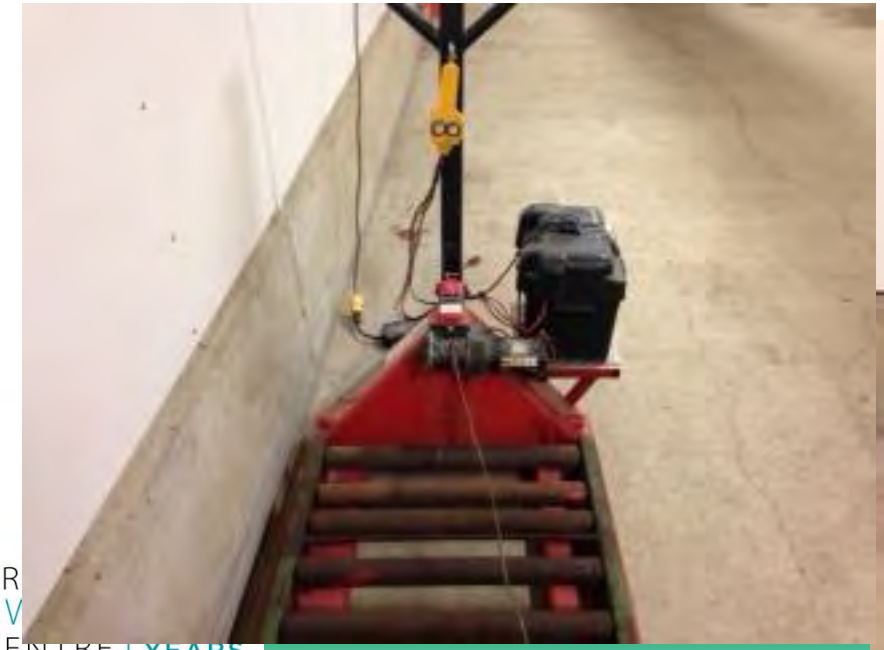
Lee Whittington, President/CEO

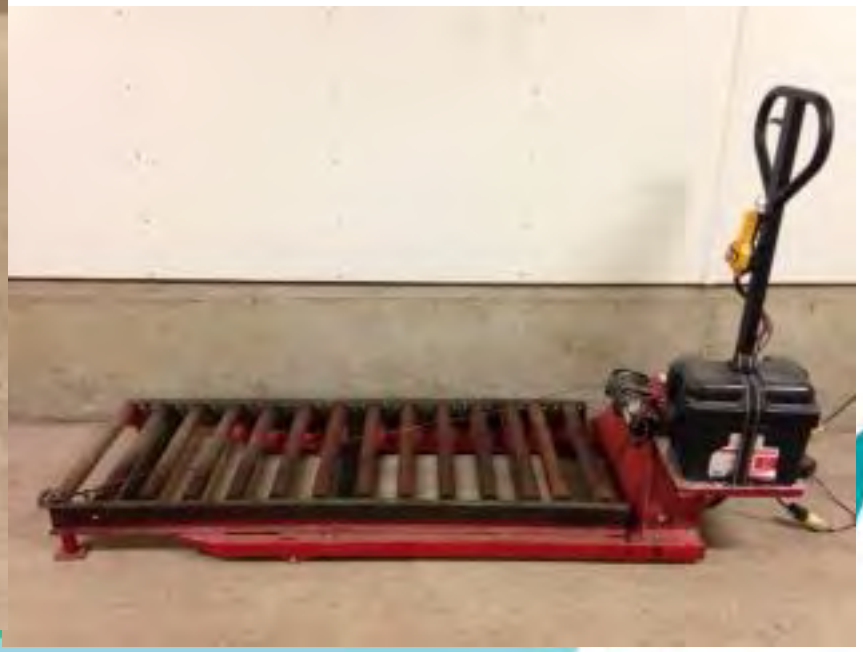
How Many Meals in a Pig?

- Guess -Write it down
- 130KG BW
- 70% yield
- 8 oz serving (generous)
- 400 servings
- Have you served the “pork message” today?

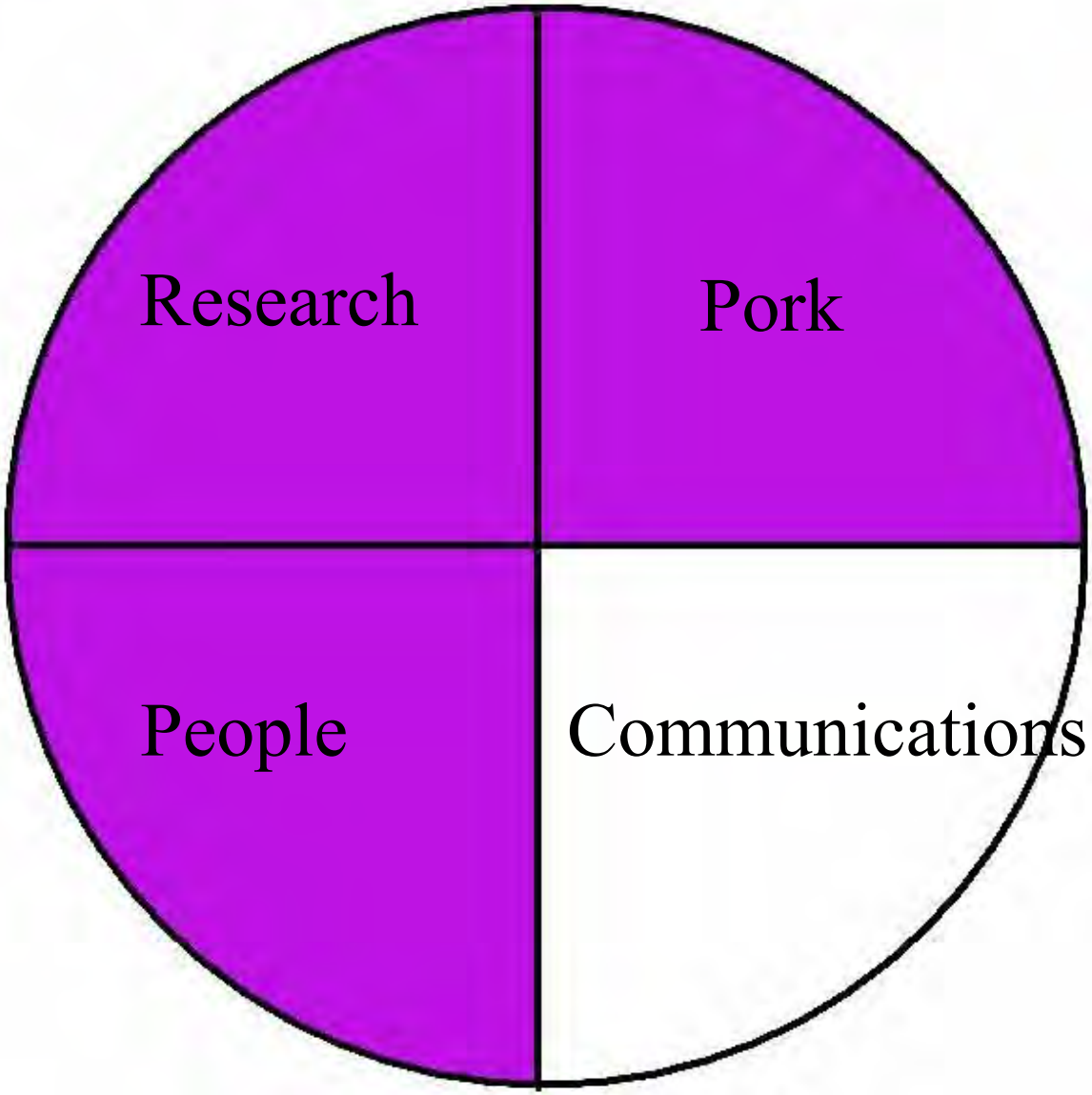
Safety Tip

- Be careful lifting > 15% of your BW
- Avoid heavy carry over 15 meters
- Safety innovation – sow removal





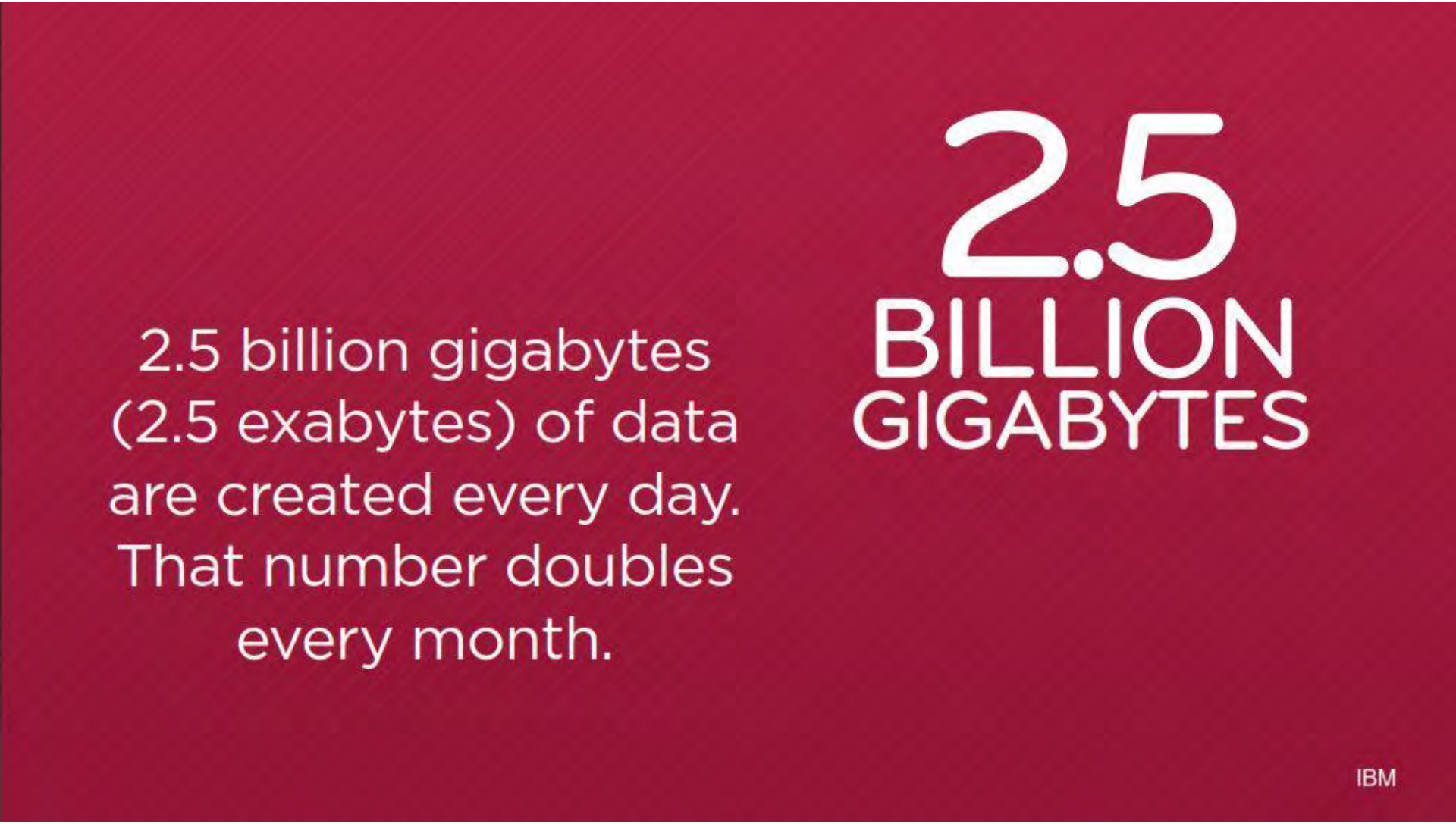
Key Outputs Model



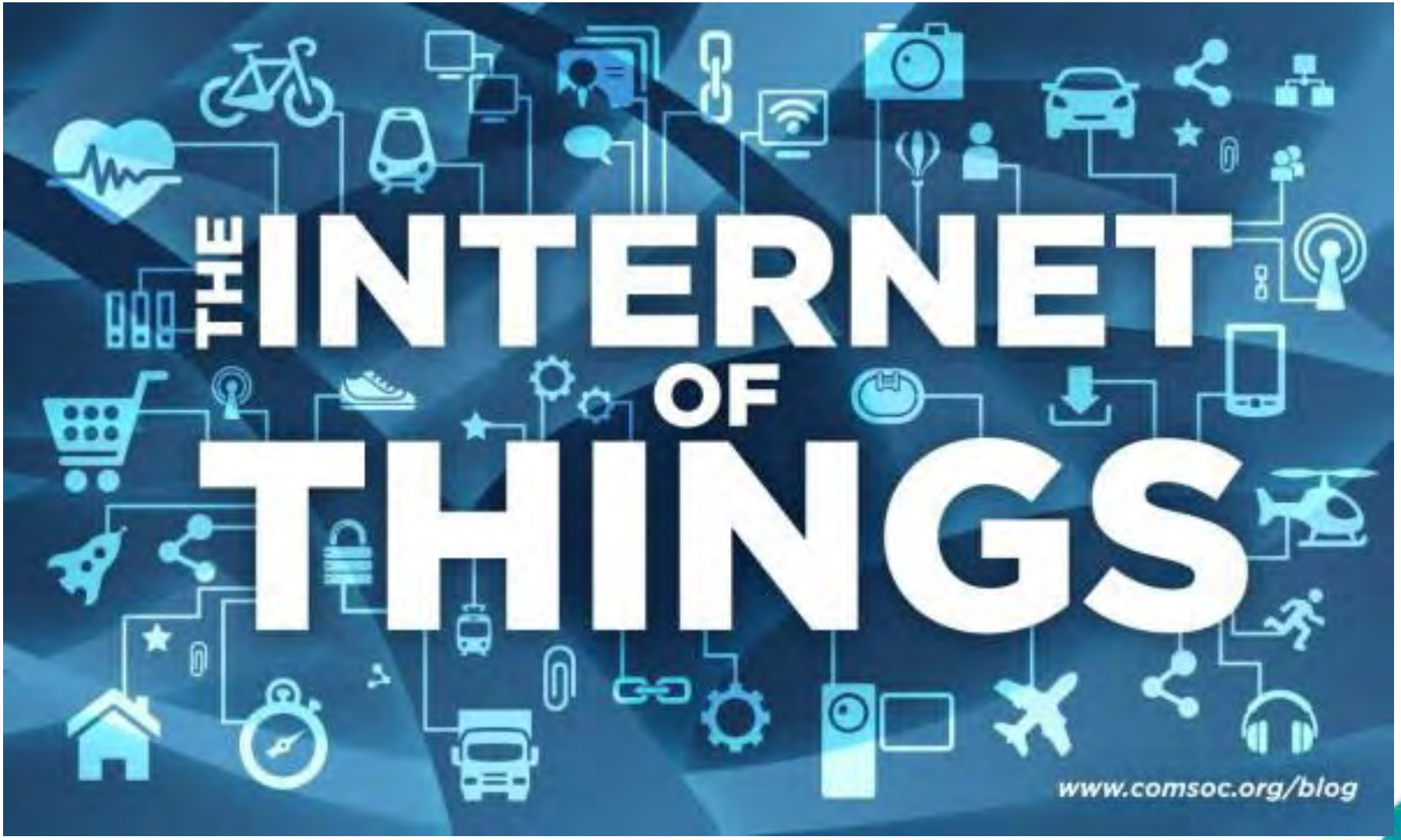
PRAIRIE SWINE CENTRE

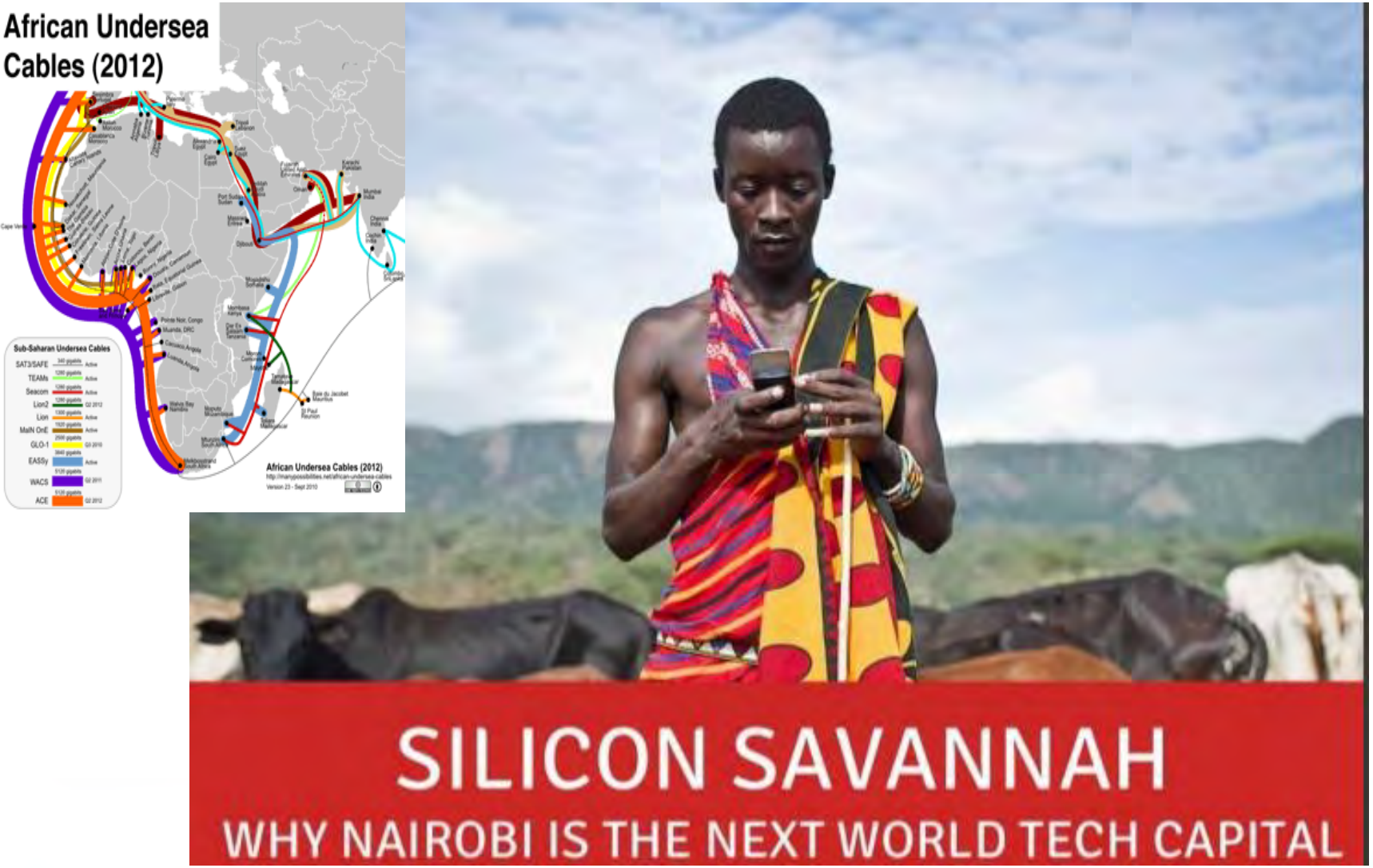
Defining what is really an innovation - it will contribute value to our businesses, to the welfare of the animals or the environment.

PRAIRIE SWINE CENTRE 2 YE



Our future partnerships/hiring need to be data specialists to support our animal scientists and engineers


THE INTERNET OF THINGS
www.comsoc.org/blog


African Undersea Cables (2012)
Sub-Saharan Undersea Cables
SAT3/SAFE
TEAMs
Seacom
Lion2
Lion
MaIN OnE
GLO-1
EASSy
WACS
ACE
African Undersea Cables (2012)
SILICON SAVANNAH
WHY NAIROBI IS THE NEXT WORLD TECH CAPITAL

Sensors will drive the future of hardware

Speed
Temperature
Nutrient Load
Moisture
Displacement
Carbon Monoxide
Distance Travelled
Barometric Pressure
Pressure
Proximity
Sodium
Blood Pressure
Light Colour
Estrus
Irradiance
Humidity
Torque
Glucose
Air Quality
Flow
Bend
Electrical Conductivity
Inclinometer
Wearables
Position
Vibration
Fuel Consumption
Gyroscope
Heartbeat

WesternBeef DEVELOPMENT CENTRE
PAMI
Westrest

Automated Disease Detection

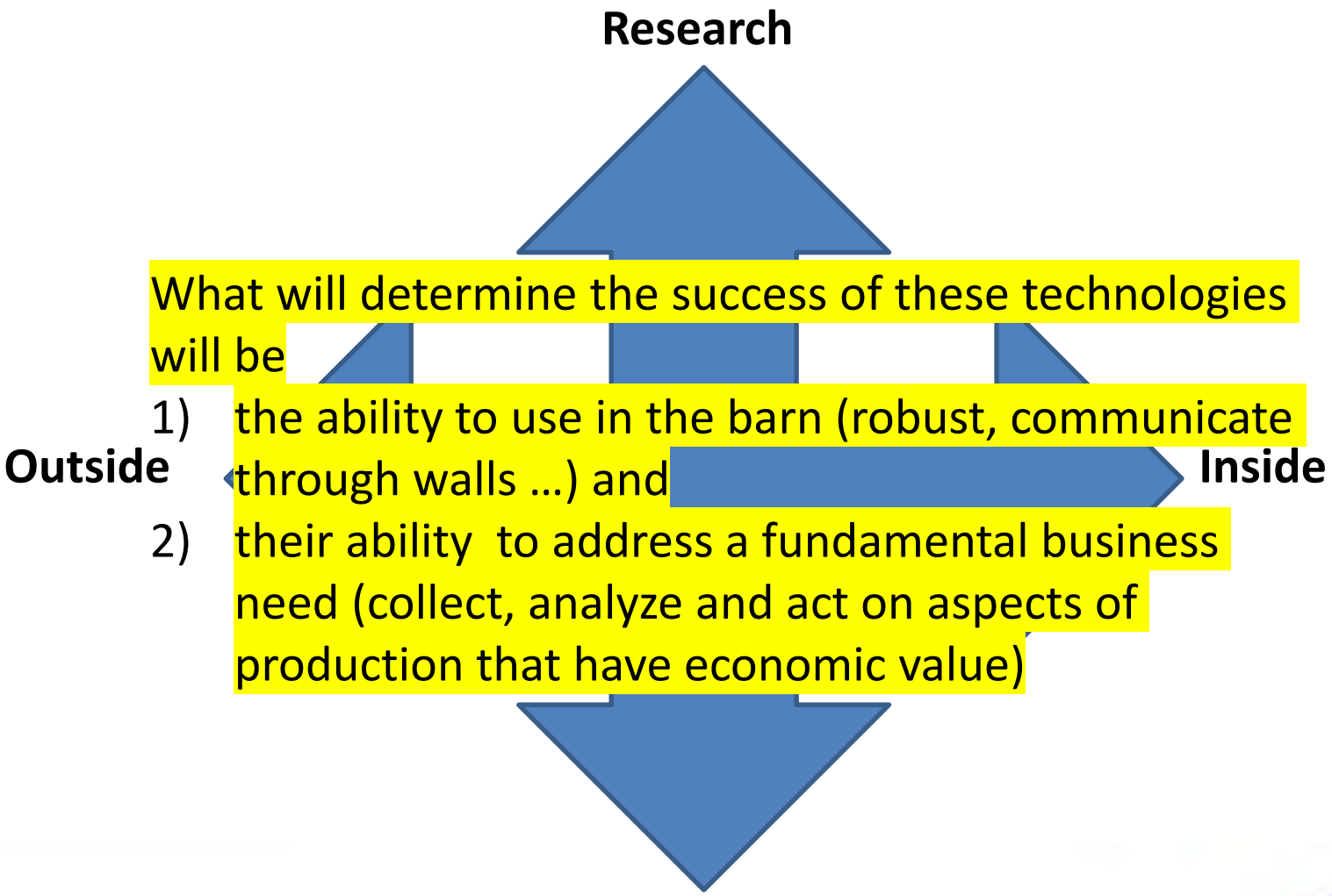
Website Jan 2018, estimating costs as low as $3 per sensor

Kerry O'Donnelly and Angela do Manzanos : Fungi Alert

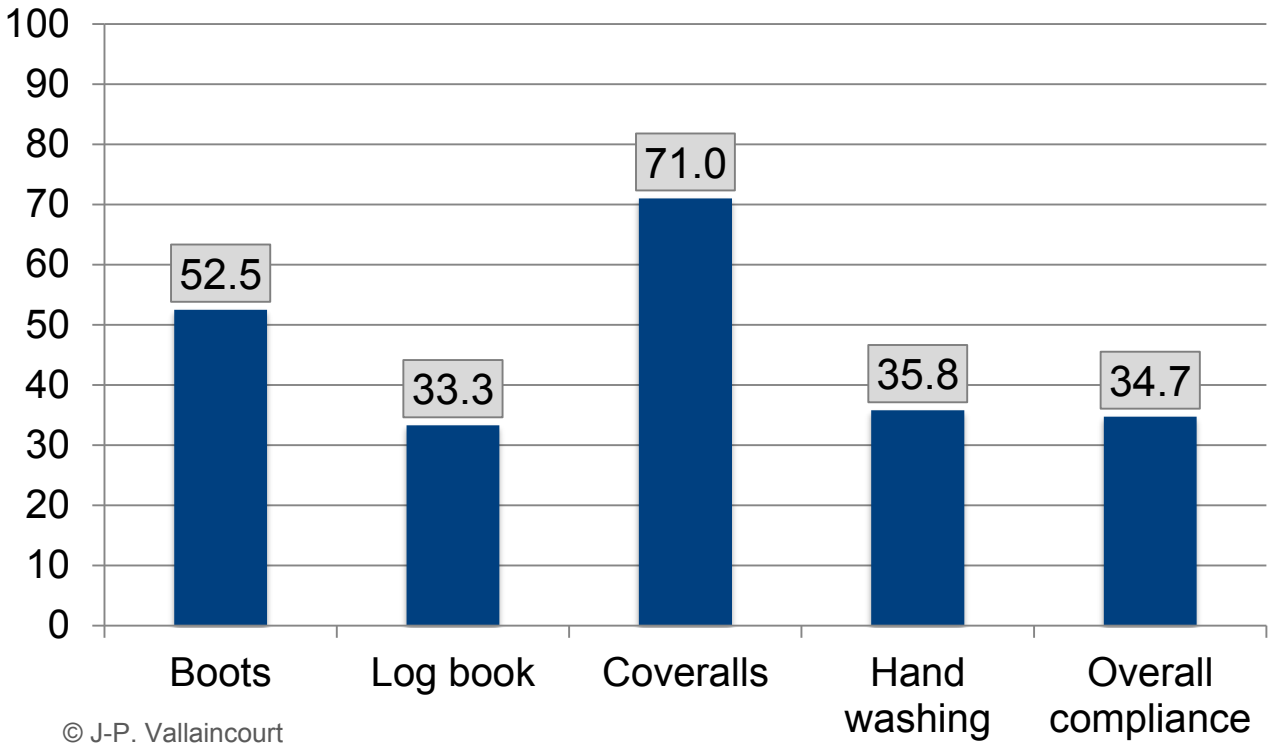
- Early in situ detection.
- Focused on when spores become motile.
- Low cost ~ $25.00/unit.
- Focused on Oomycota.
- Fusarium is a oomycete
- Supports forecasting and timely application of fungicides.

PAMI

Page down


Research
What will determine the success of these technologies will be
1) the ability to use in the barn (robust, communicate through walls …) and
2) their ability to address a fundamental business need (collect, analyze and act on aspects of production that have economic value)
Outside
Inside
Commercialization

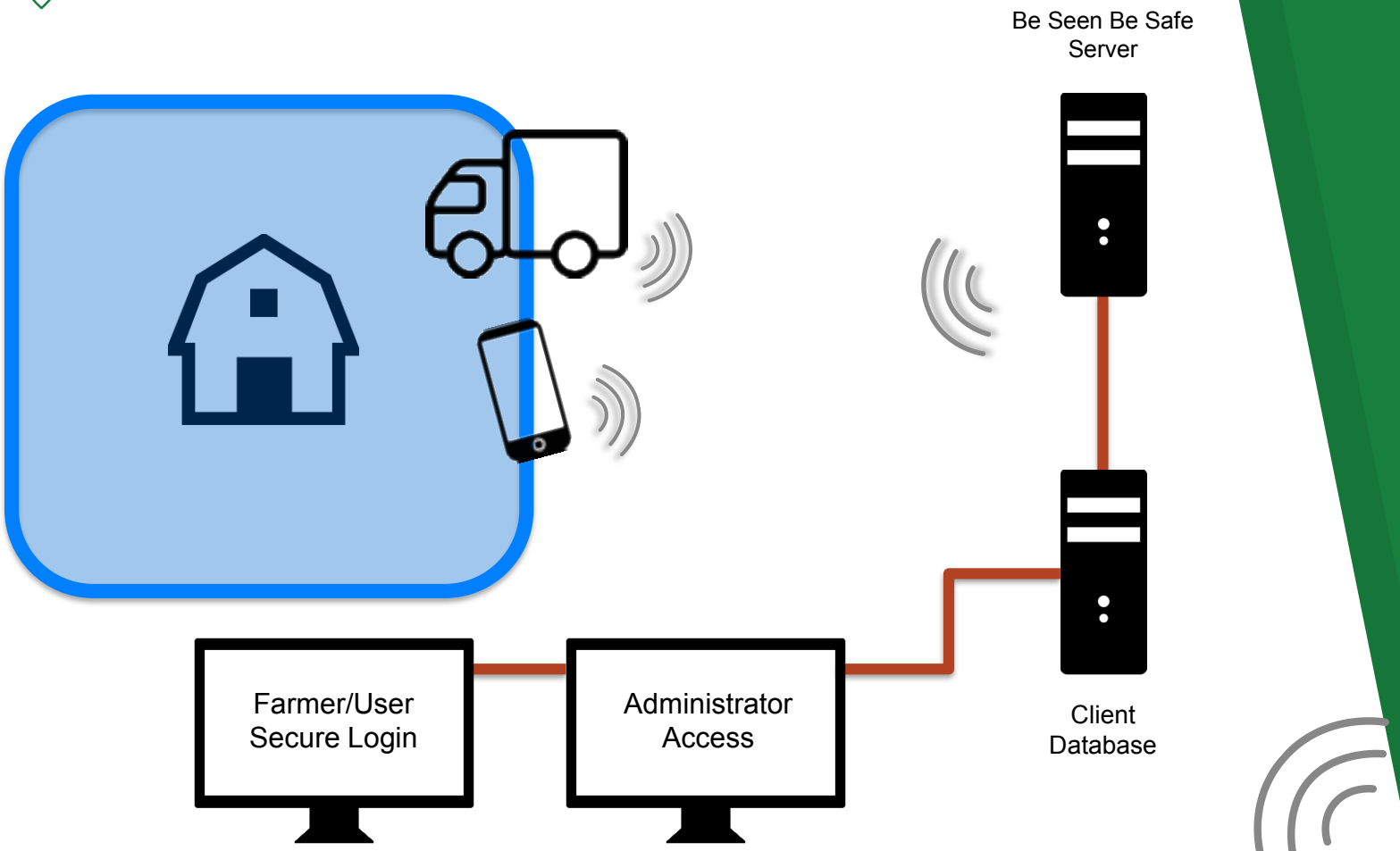
Biosecurity Compliance

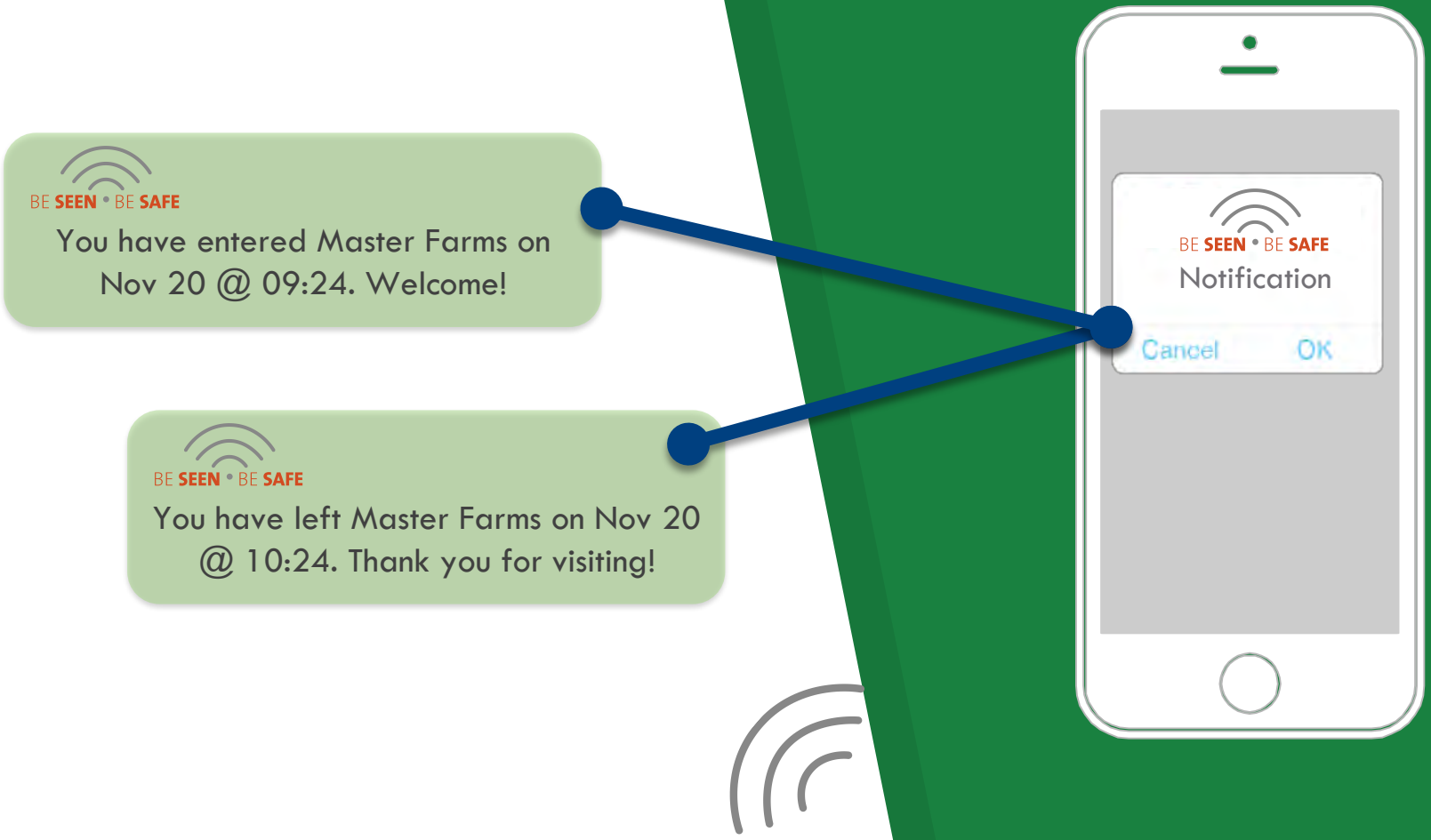


BE SEEN BE SAFE

Confidential monitoring of disease movement.

Be Seen Be Safe




BE SEEN • BE SAFE
You have entered Master Farms on Nov 20 @ 09:24. Welcome!
BE SEEN • BE SAFE
You have left Master Farms on Nov 20 @ 10:24. Thank you for visiting!
BE SEEN • BE SAFE
Notification
Cancel
OK

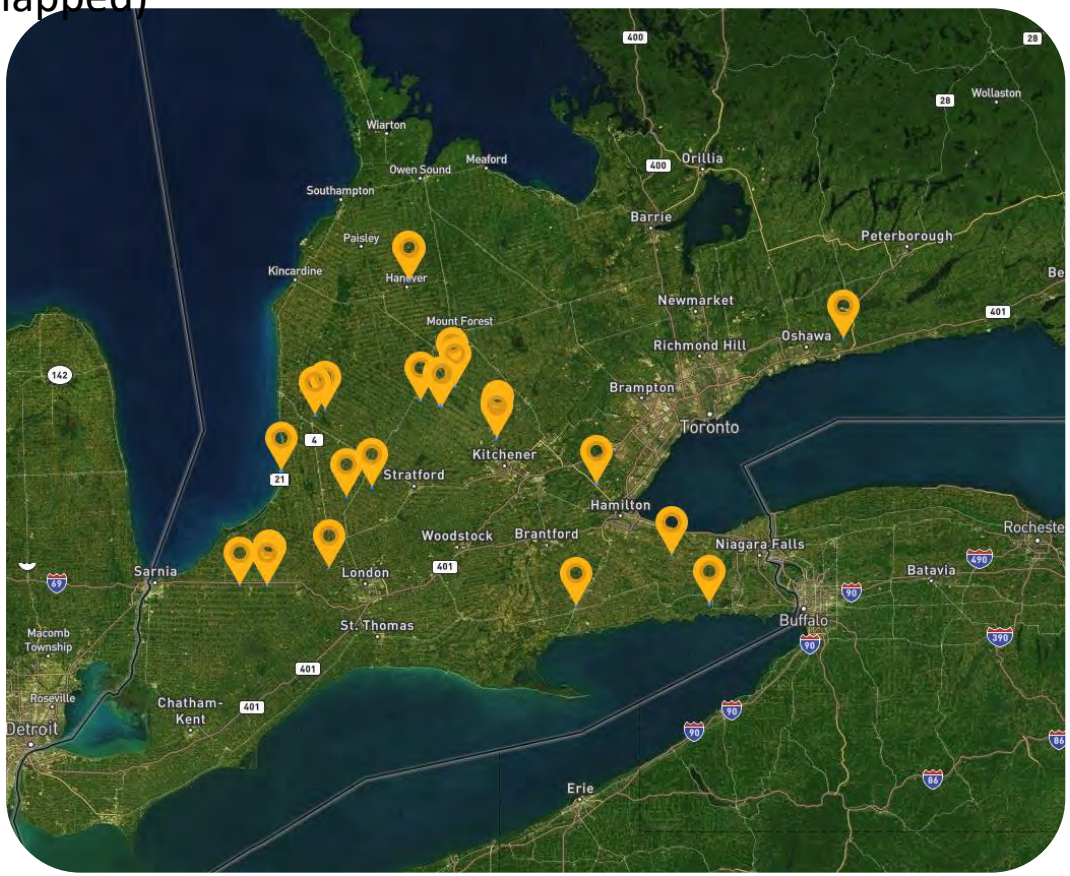
Other Systems

Farm Health Monitor

- Available 2018
- Uses clinical signs to provide alerts in time to reduce the impact of a disease threat
- Allows service representatives, field officers, and producers to report clinical signs of disease within the farm's network before official diagnosis
- Allows for proactive action

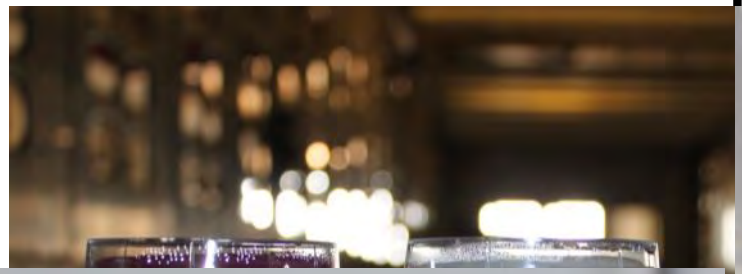
FARM HEALTH MONITOR

Potential Disease Spread Report (mapped)

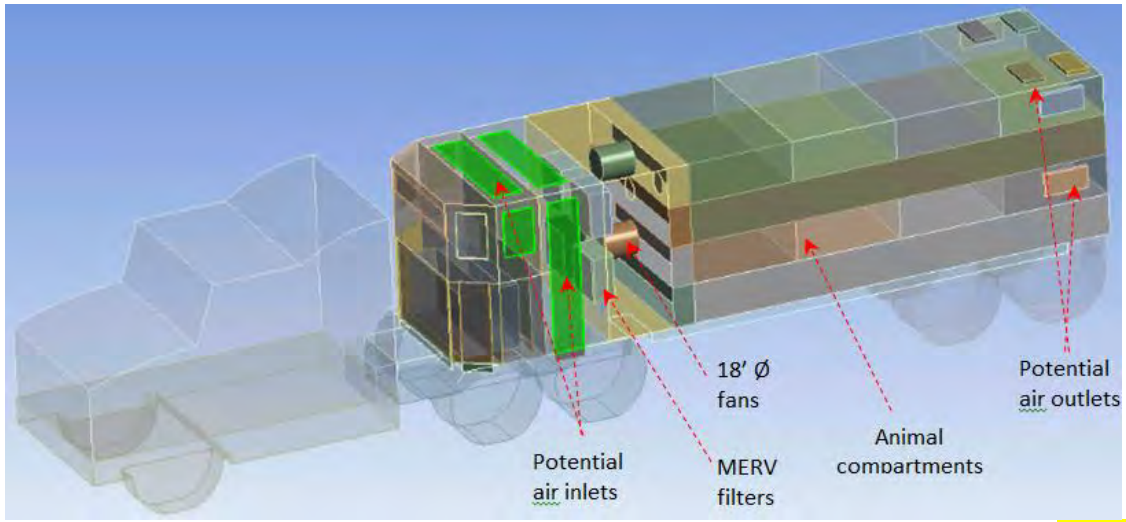


Castene
Trailer Manufacture & DrySist

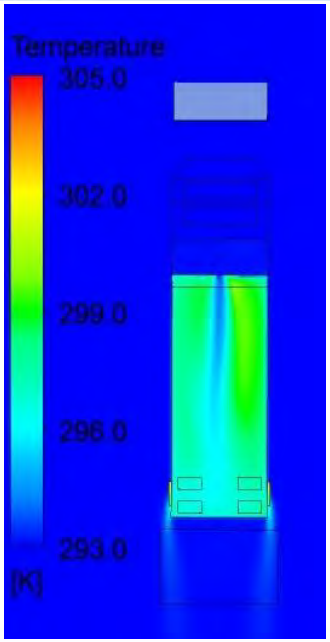
Assessing cleanliness of trailers

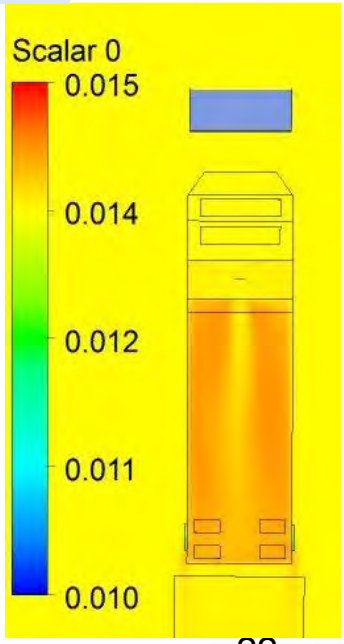


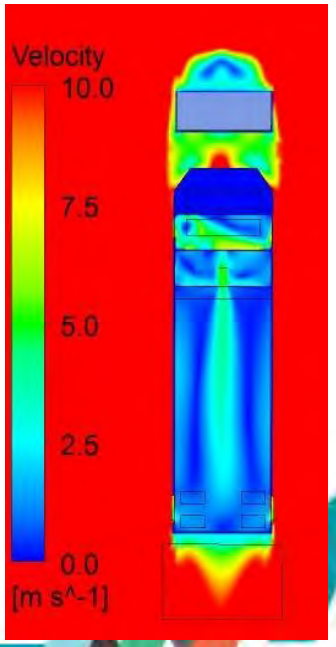
Activities: Simulation Work



- started _____ and completed February 2017
- recommended the S2 – S4 (2 front air inlets and 4 rear air outlets) design configuration as the best design option

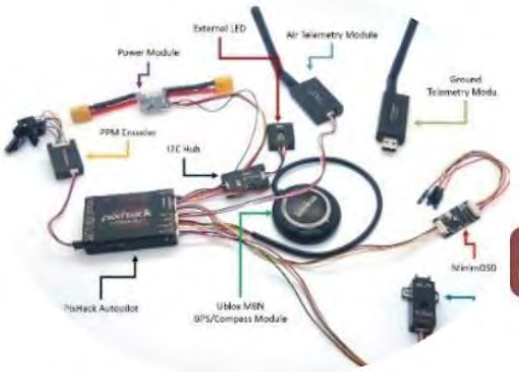


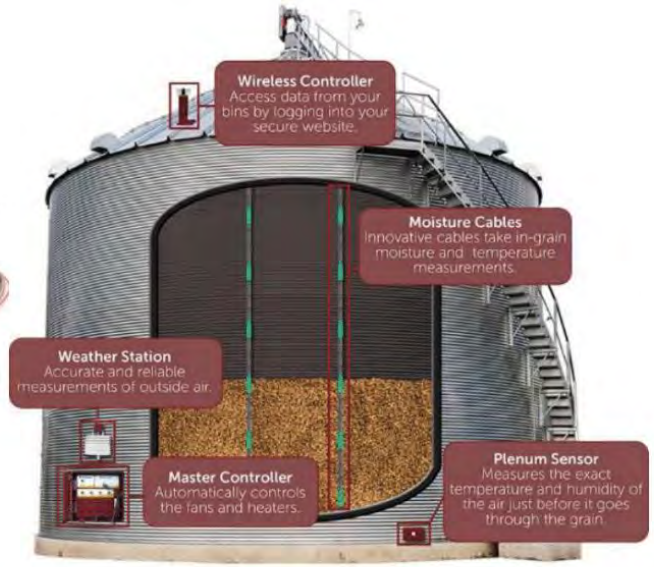


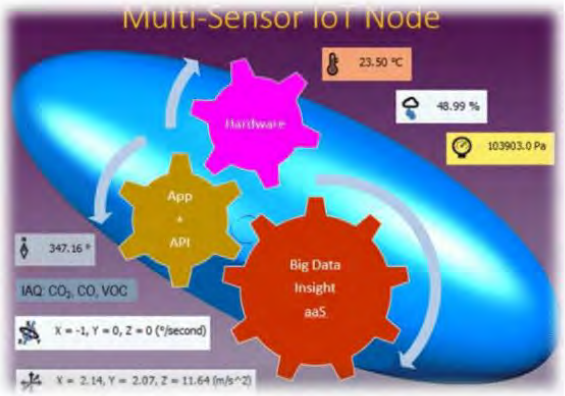


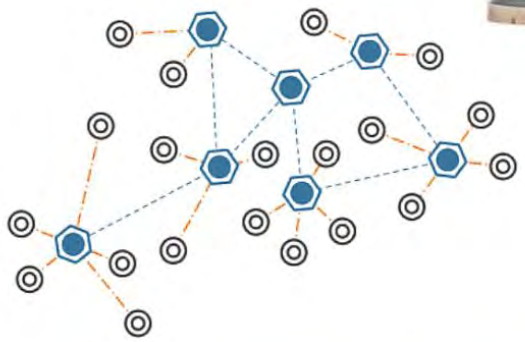
Activities: Moving of the Trailer

Sensor Motes









Every bean measures temperature, humidity, air quality including VOCs, air-pressure, altitude, orientation and movement - all useful in bulk-storage facilities.

PAMI Westrest

Secure | https://www.amazon.ca/s/?ie=UTF8&keywords=raspberry-pi&tag=googcana-20&index=aps&hvadid=208380738475&hvpos=1t1&hvnetw=s&hvrand=13315650884...

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- 8 to 13 Years
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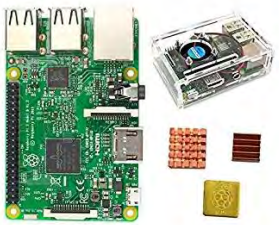

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LANDZO Raspberry Pi 3 Model B with Acrylic Case and Heatsink

by LANDZO

CDN$ 55.88

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by LANDZO

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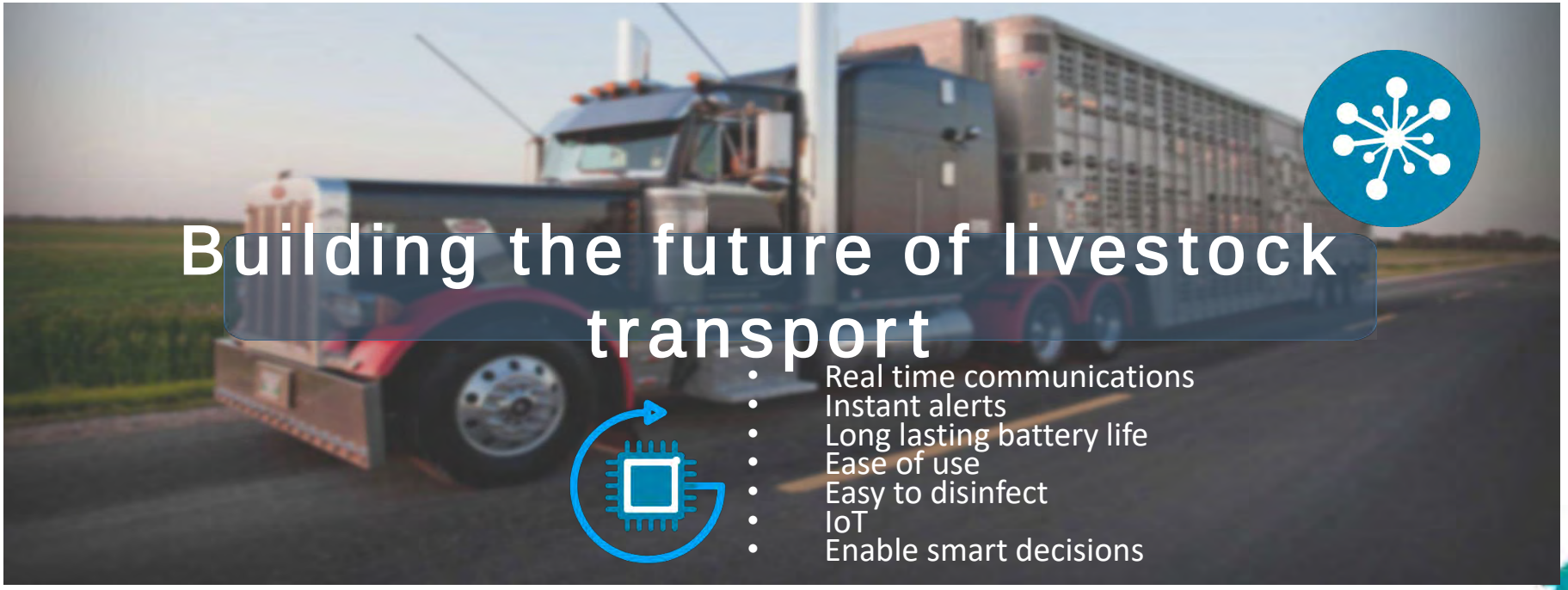
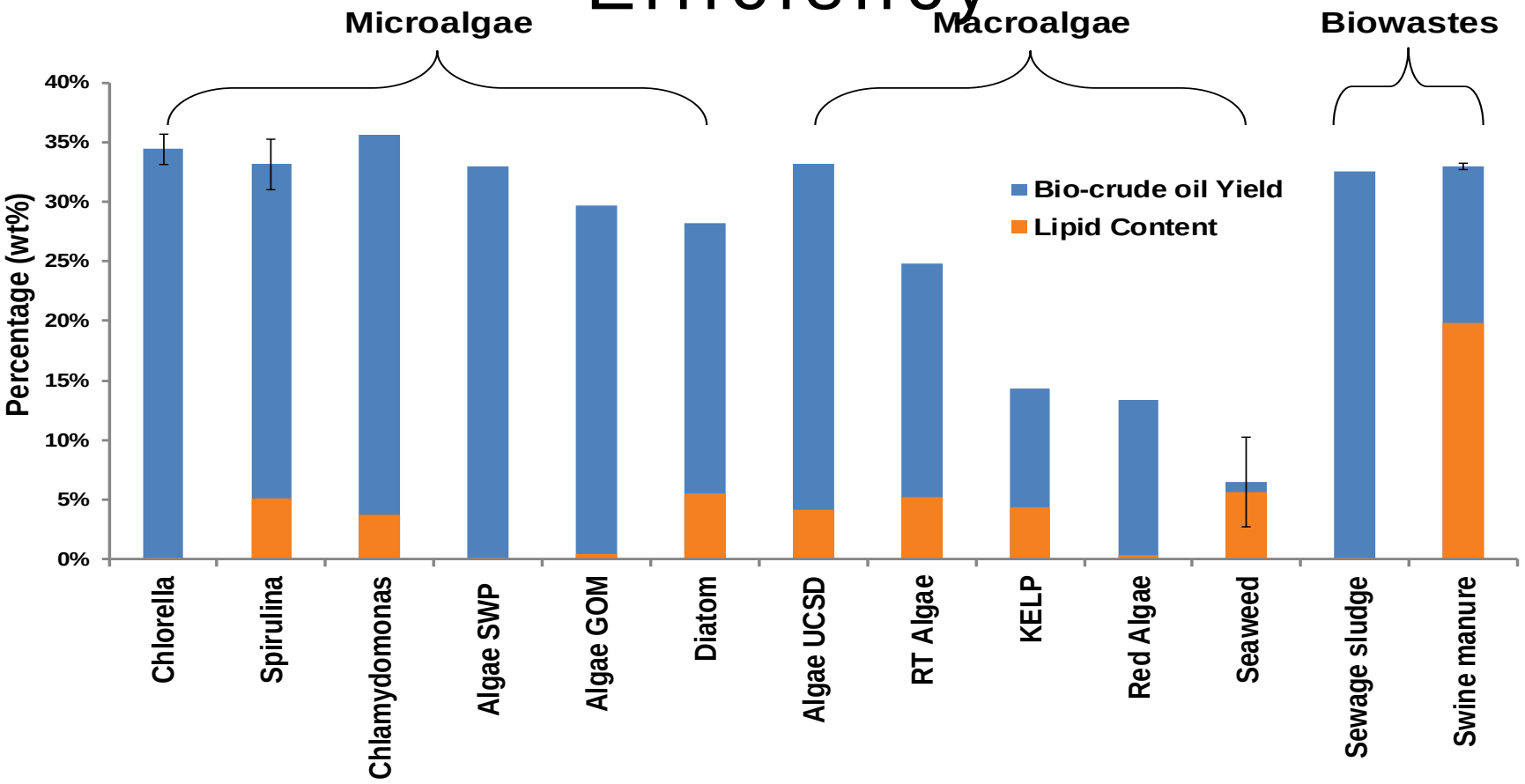
PRAIRIE SWINE CENTRE 25 YEARS

TRANSPORT GENIE

WHAT WE DO

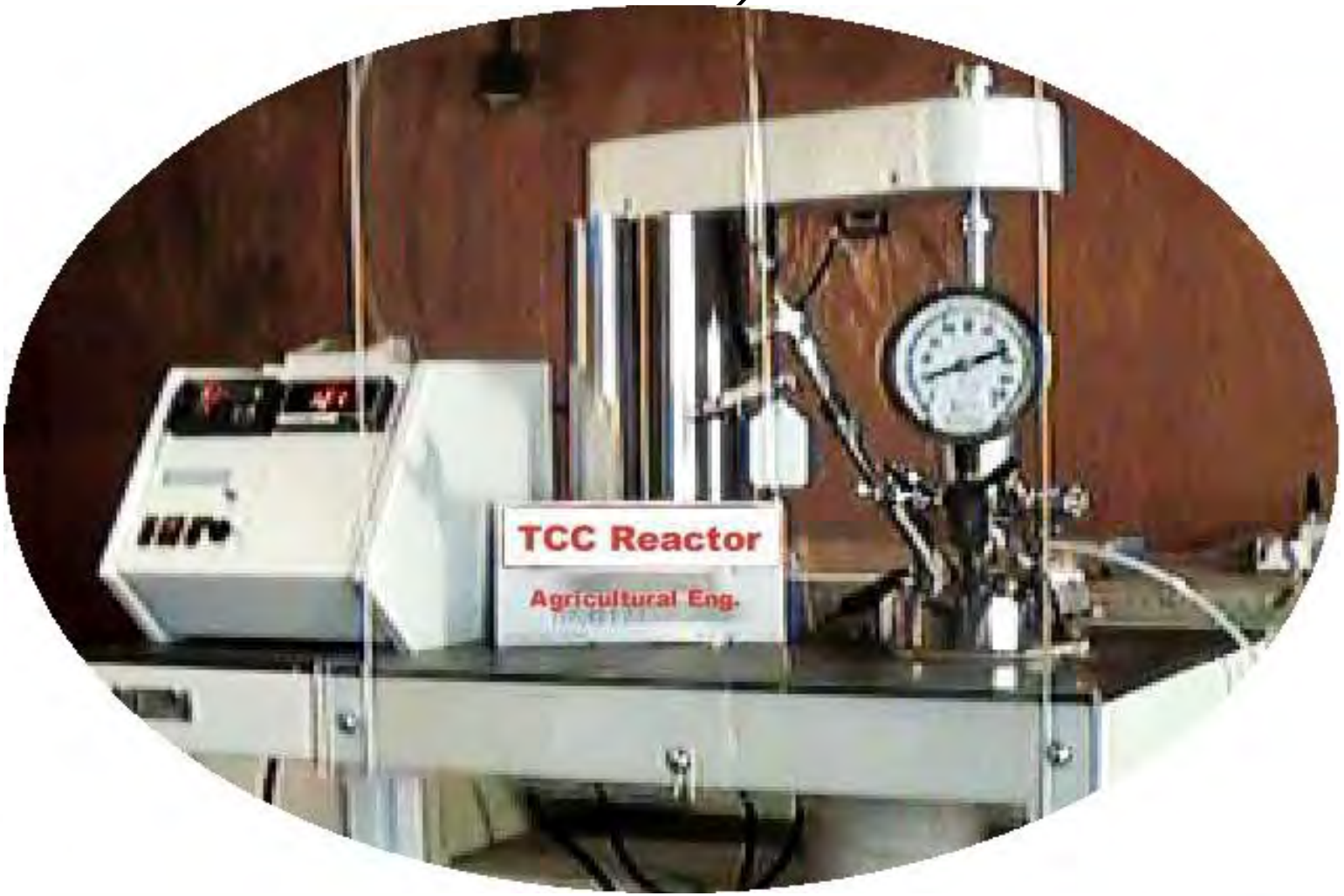

Building the future of livestock transport
Real time communications
Instant alerts
Long lasting battery life
Ease of use
Easy to disinfect
IoT
Enable smart decisions

Algae to Biocrude Conversion Efficiency



Initial lipid content and HTL oil conversion efficiency for different feedstocks. Energy recovery ratio is 3~11 to 1. Note that the HTL can convert the very low-lipid algae into crude oil – ***a paradigm shift from 'extracting' to 'converting'***.

Batch Reactor, 1998 *(He et al, 2000)*



$E_{out} : E_{in} = 3:1$; without heat recovery

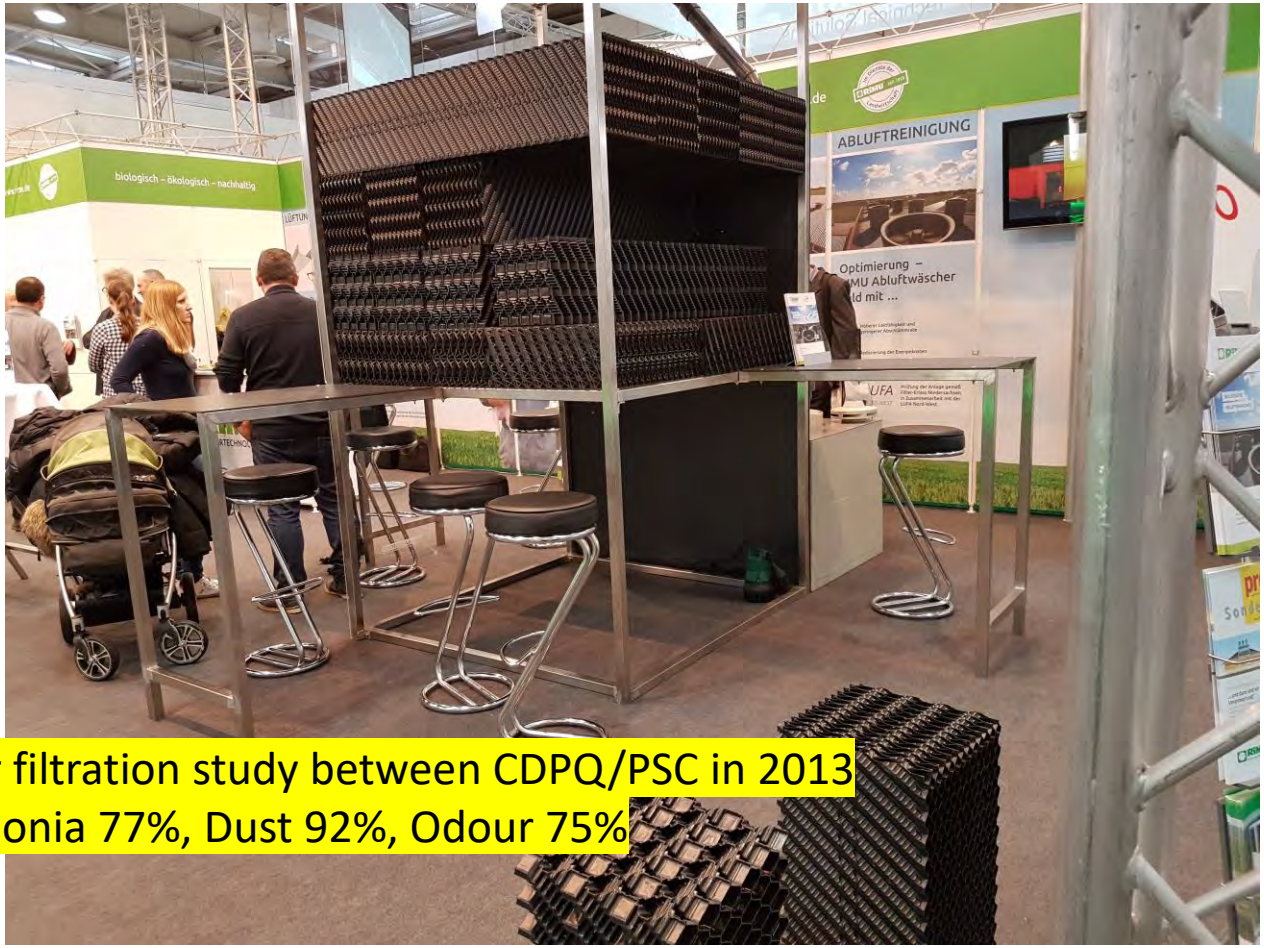
Pilot Plant, 2007 (40 barrel/day, Houston, Texas)

$E_{out} : E_{in} = 11:1$; with heat recovery

Commercial Plant

(160 barrel/day, Park Hill, SC, 2010)

Air Scrubbers
'Make Good Neigbours'



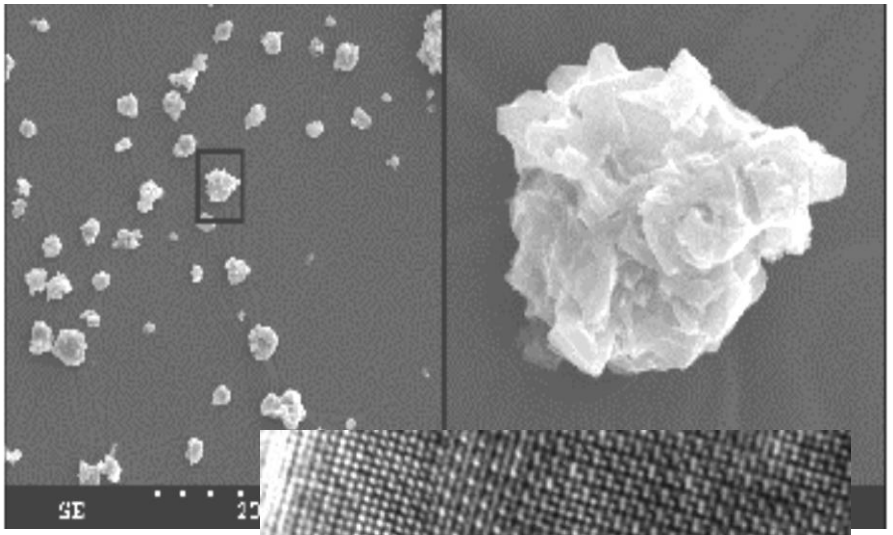
Biotrickling air filtration study between CDPQ/PSC in 2013
Reduced ammonia 77%, Dust 92%, Odour 75%

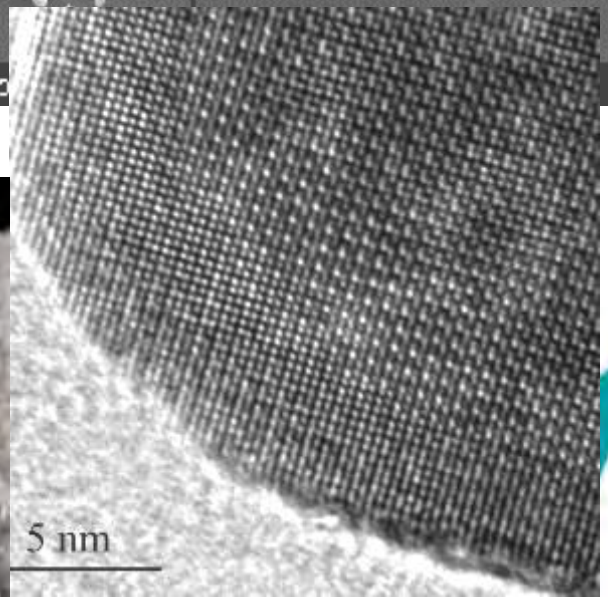
Move Inside the Barn

Use of nanoparticles

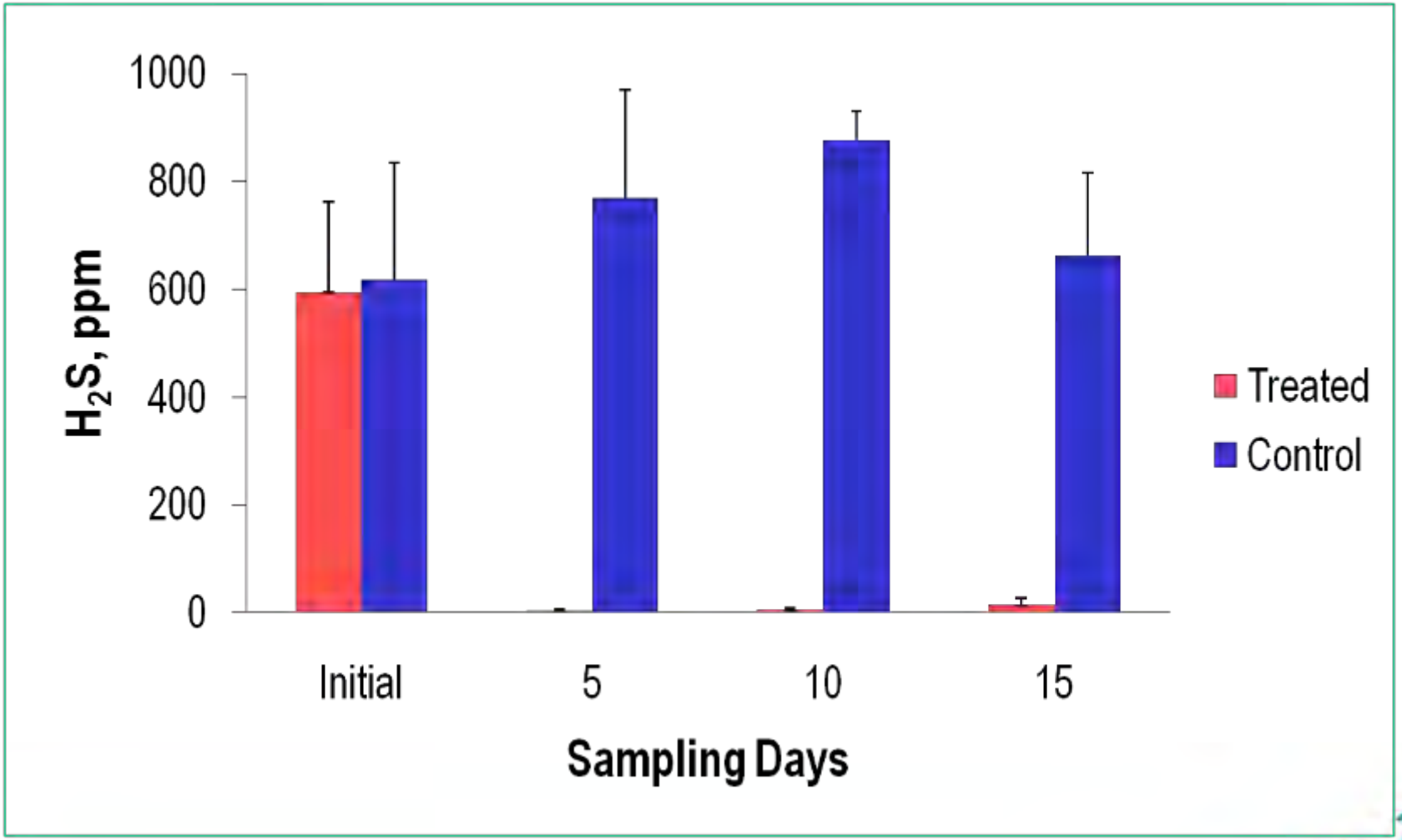
- To assess impact of nanoparticles on manure gases and determine best deployment mode

- To test various deployment modes:
  - Embedded in filter
  - Dispersed in headspace
  - Mixed with slurry





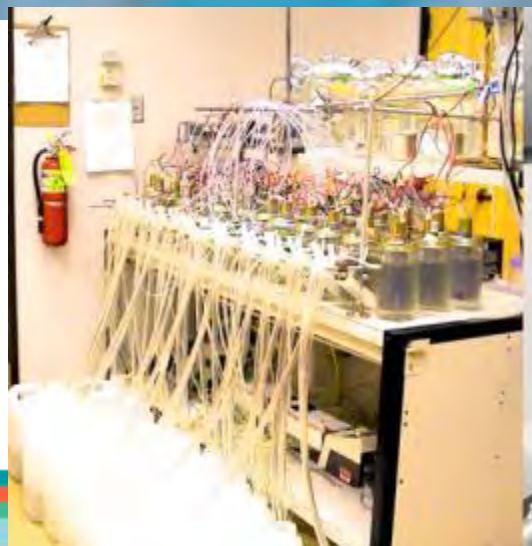
Mixing – effect on H_2S levels



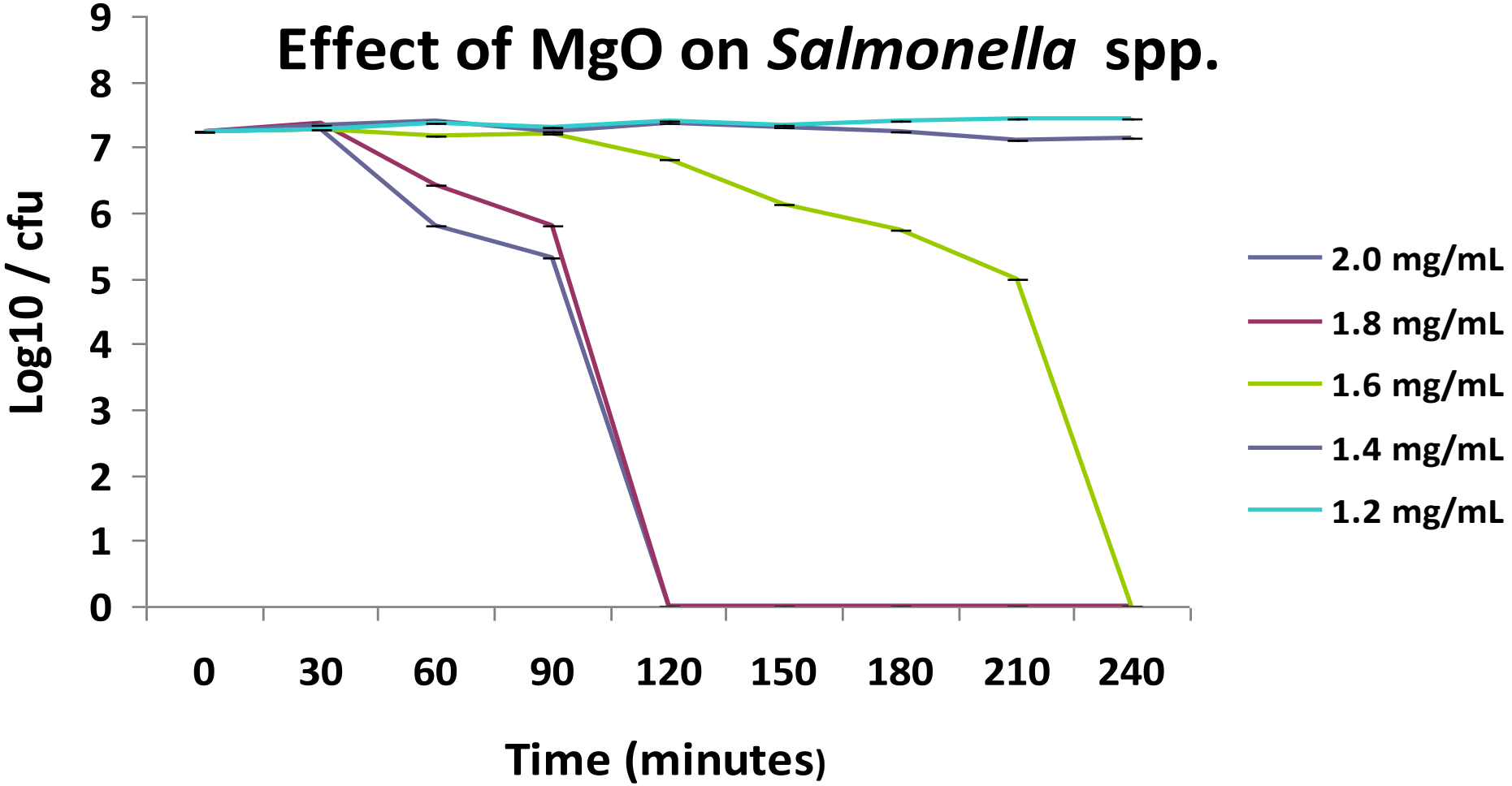
Maximum reduction rate: 99%

Antimicrobial properties of nanoparticles

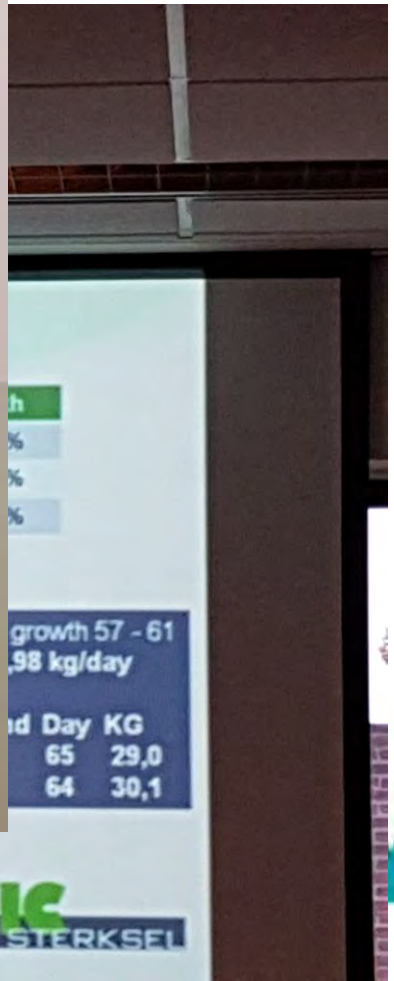
- Surface treatment to control pathogens



Antimicrobial properties of nanoparticles



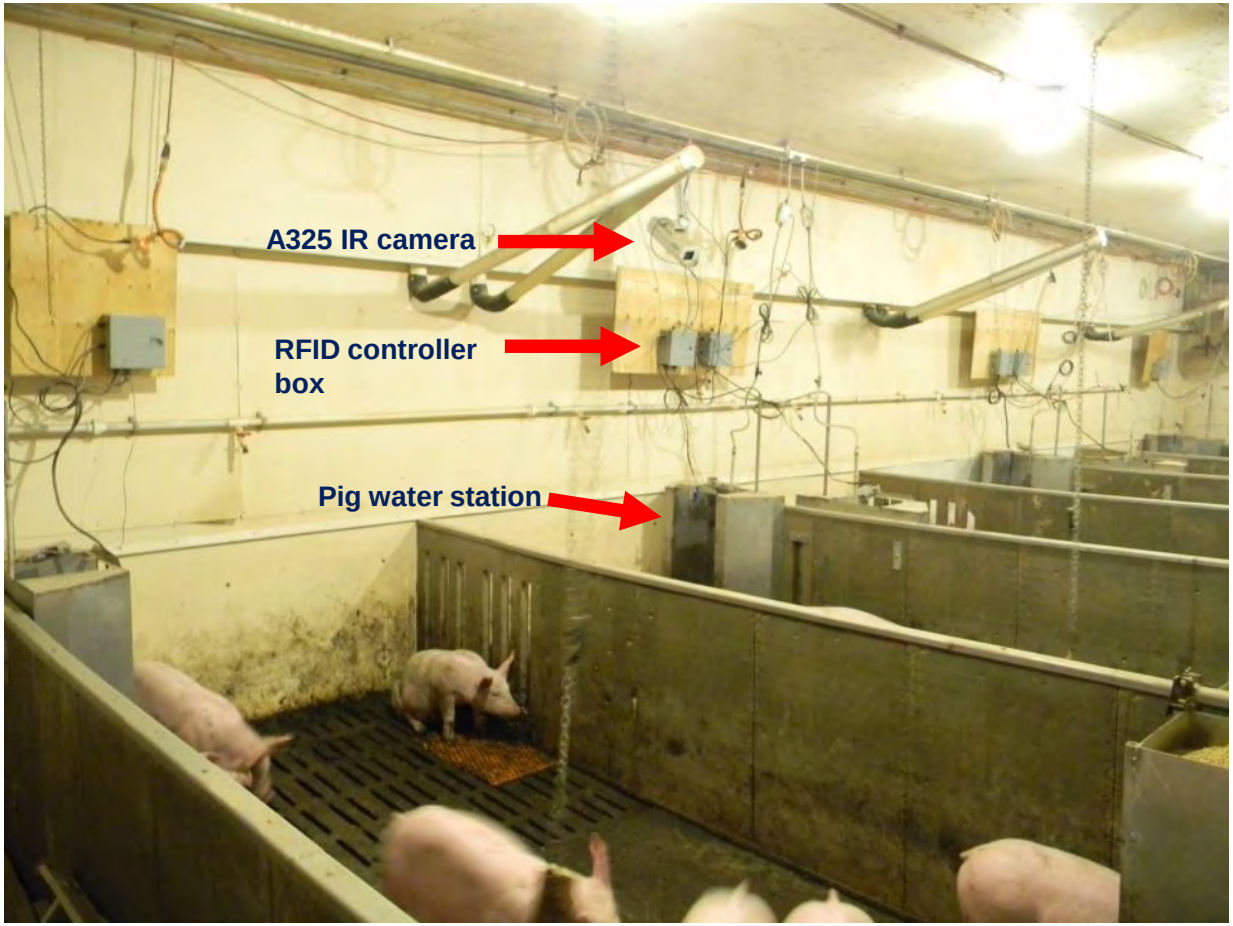
Cleanliness and Performance



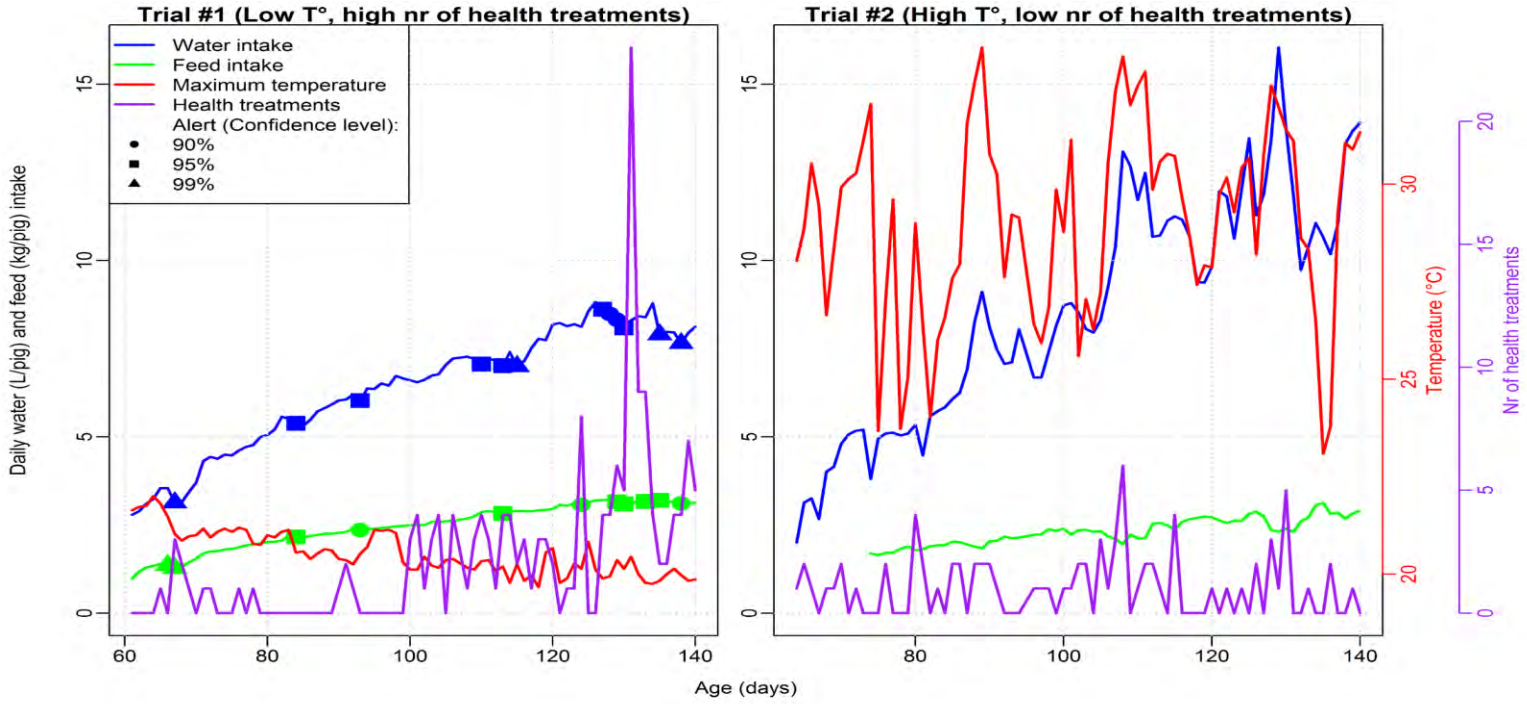
PRAIRIE SWINE CENTRE 25 YEARS

Water

- Use of endoscope to look in pipes for grunge caused by iron-loving bacteria
- Water pH ,4.0 desirable use of organic acids. Acid treated water good for gut health


A325 IR camera
RFID controller box
Pig water station

Prediction of health problems



Daily water and feed intakes at the barn for trials #1 and #2 along with daily maximum temperature inside the barn and the number of individual treatments (used as a proxy of sanitary status). Three different alerts levels, based on daily variations of water and feed intakes, were used to predict health treatments for trial #1. For trial #2, high temperatures prevent the prediction of health issues.

CDPQ
Centre de développement du porc du Québec inc.

SuperSow – PigChampPro Europa

- > 15 born alive first parity;
- 26 more born alive lifetime productivity

Microsoft Word

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Paragraph

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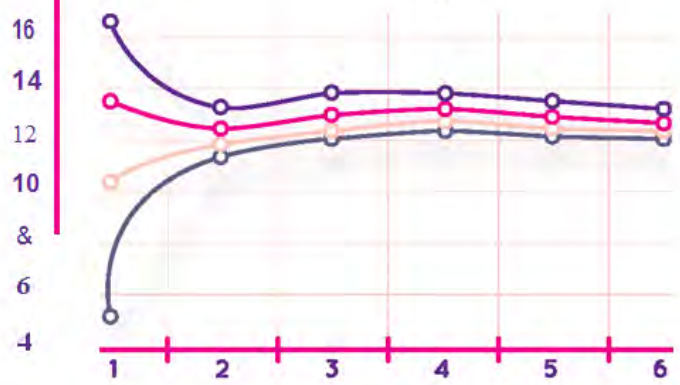
BA / parity lifetime based on BA parity 1



- <7BA
- 8-11 BA
- 12-14 BA
- >15 BA

In addition to this, high performing SUPERSOWS have a farrowing rate 6% higher than the rest , especially in the three first parities. This good productivity from the beginning of their reproductive lives has an immediate consequence: The

Page: 8 of 18 | Words: 1,199 | 150%

PigChamp Pro Europa

Developed by PigChamp Pro Europa based on records of over 1,000,000 matings.

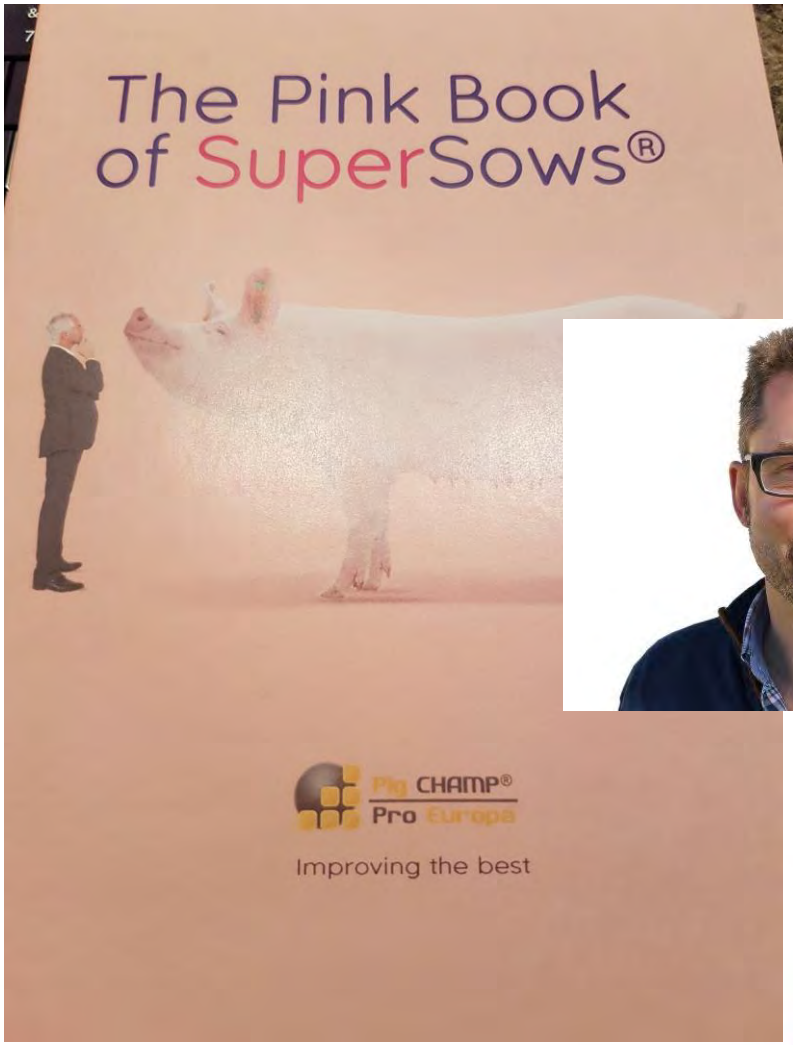
- 1st litter >15 born alive
- These sows have 6% higher farrowing rate, produce 26 pigs more lifetime than herdmates.

All starts with selection of gilt reject animals with birth wt <1.2kg (53% vs, 1.13kg.92% survive).

This method of selection is reducing COP of 20kg pig by $6 USD

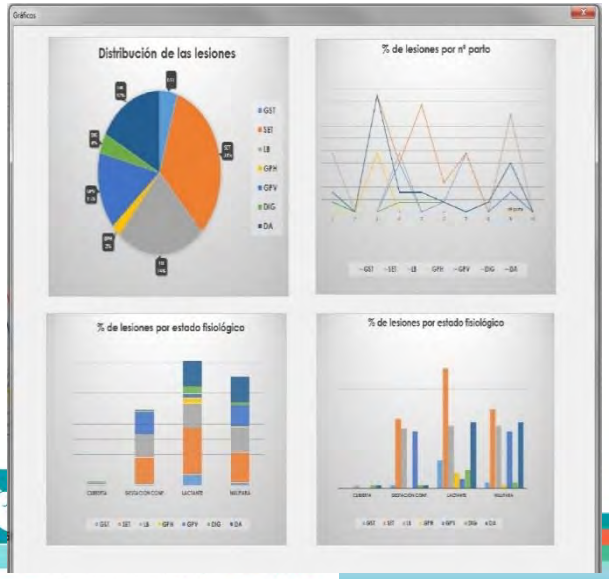
When we create super sows we need super stock people.

- Long-term goal is determining what data will allow us to move to predictive analytics.



PigTRAX®

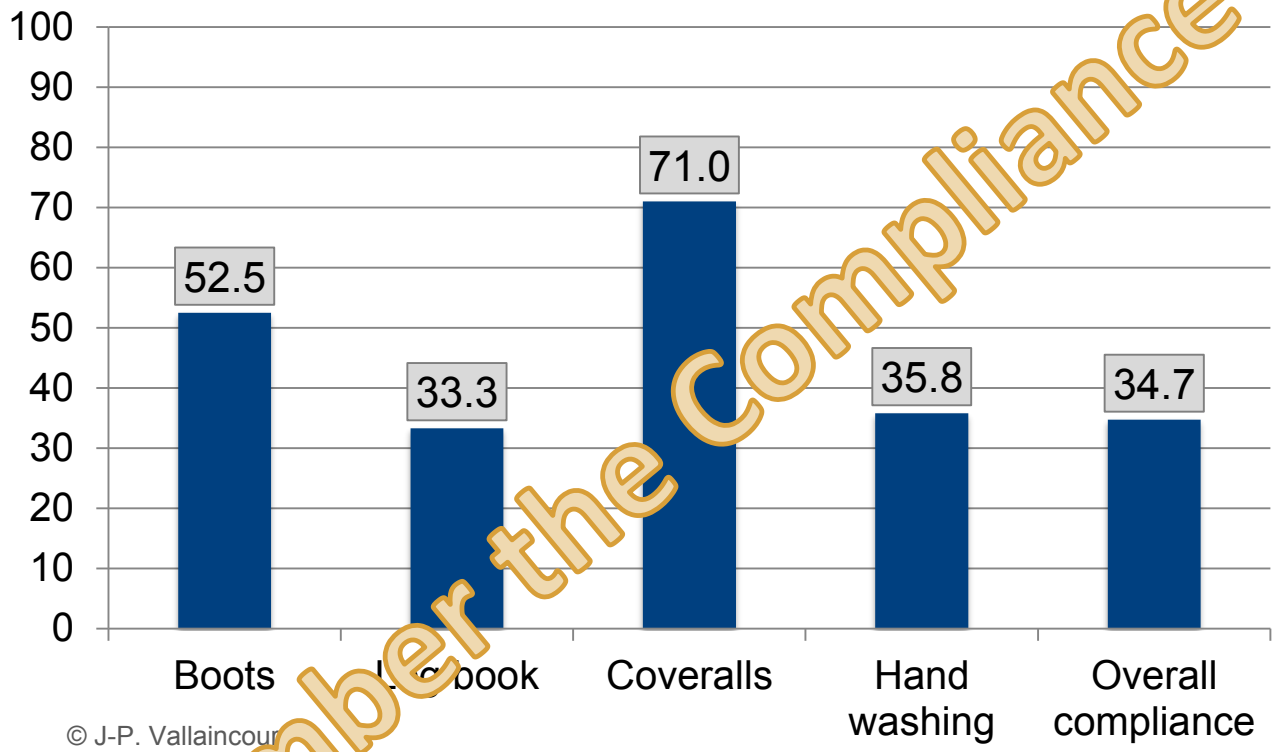
The pattern of dots surrounding this letter "a" uniquely identifies its location.



Web based data / Digital Pen Data collection

Analysis – Monitoring

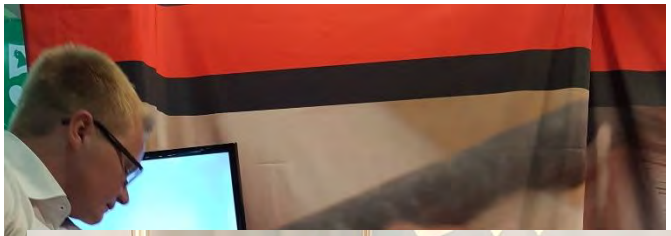
Biosecurity Compliance

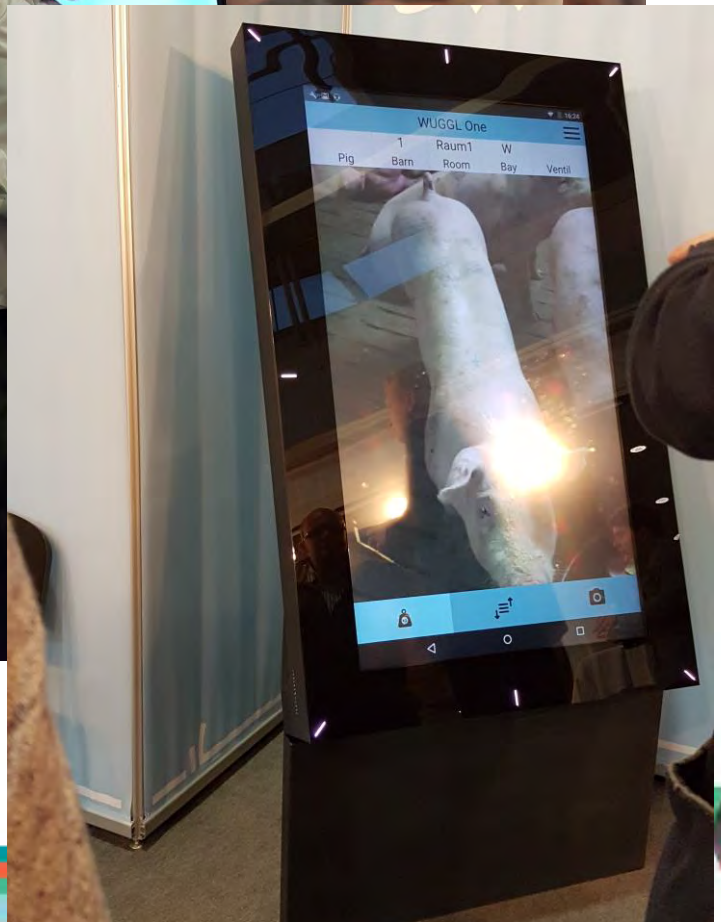


Remember the Compliance Challenge

PRRSons Project

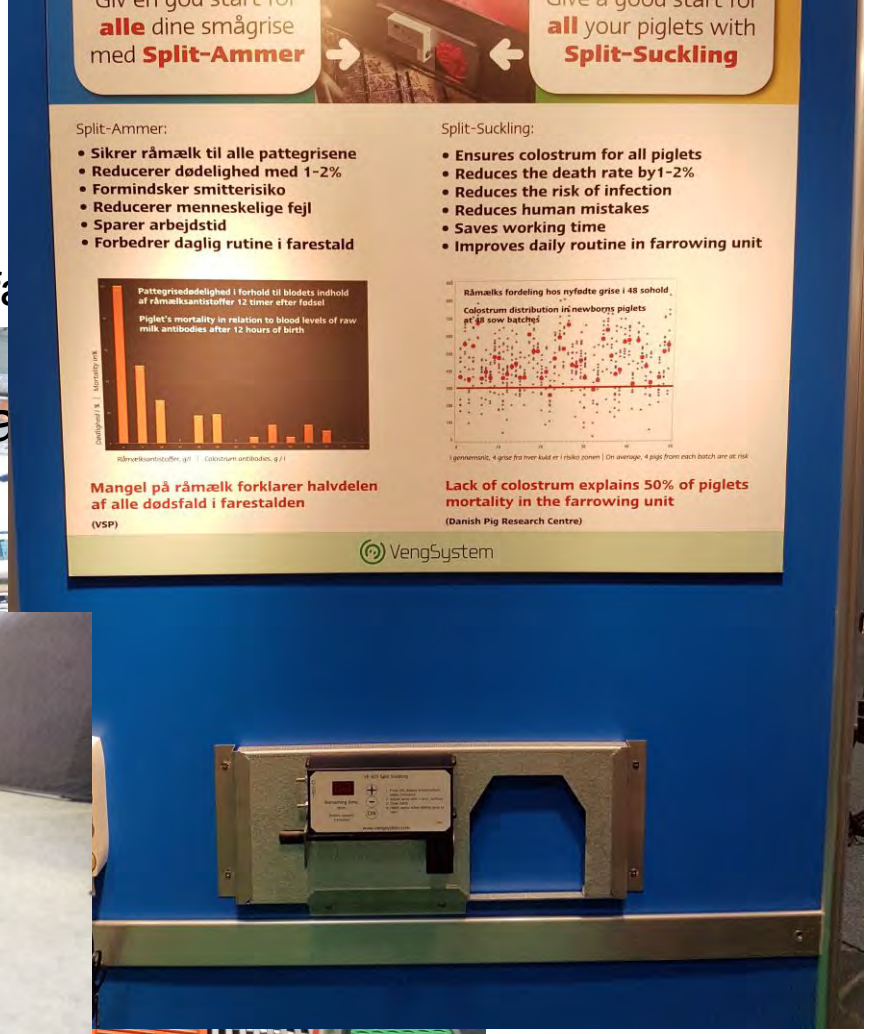
Data Gathering & Management
Body Weight





Other Inno

- Burlap sheet in farrowing crate
  - Nest building, calm the animal, reduce fa
    gilts?
- PigNap – general anesthesia at ca



JYGA Lactation Feeding System

Influence of a modified lactation feeding system on sow and piglet performance

L. Kelln[1], M. Young[2], A.D. Beaulieu[3], and D.A. Columbus[1]

[1]Prairie Swine Centre, Inc., Saskatoon, SK, Canada
[2]Gowans Feed Consulting, Wainwright, AB, Canada
[3]Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada

INTRODUCTION

- Electronic feeding systems for lactating sows have multiple advantages over manual feed delivery including collection of feed intake data, controlled delivery of fresh feed, and reduced feed wastage, however, these feed systems are costly to install and maintain
- A modified feeding system was developed which consists of a feed drop tube which extends to just above the base of the feeder and requires the sow to manipulate the tube to release feed
- The modified system provides the advantage of delivery of fresh feed to the sow without the expense of the electronic feeding system

OBJECTIVE & HYPOTHESIS

- The objective of this study was to compare the impact of manual feeding, an electronic feeding system, or the modified feeding system on sow and piglet performance during lactation.
- It was hypothesized that the modified feeding system would result in similar animal performance as the electronic system and, therefore, be a viable option for

METHODOLOGY

Animals and Treatments

- A total of 45 sows and litters were randomly assigned to treatments over 3 blocks (15 sows/block)
- Treatments were 1 of 3 feeding systems:
  - A. Manual feeding (MNL; n=15; fed large meals by hand)
  - B. Electronic feeding system (EFS; n=15; delivery of small meals as requested by sow)
  - C. Modified feeding system (MOD; n=14; feed drop tube above feeder requiring sow manipulation for delivery of feed)
- Sows were moved into farrowing crates approximately 7 days prior to expected farrowing date
- Within 24-h of farrowing piglets were cross-fostered to equalize number of piglets/sow

METHODOLOGY

Measurements

- Sow body weight (BW), backfat thickness, and body condition score (BCS; 1-5) were recorded at 7-d pre-farrowing and 21 d post-farrowing
- Sow feed intake was recorded on a daily basis and adjusted for feed wastage (removal of feed due to spoilage or feed refusal due to presence of fines)

RESULTS

Table 1: Sow characteristics and performance

	MNL	EFS	MOD	SEM	P-Value
Initial BW, kg	286.7	272.9	288.3	10.3	0.49
Final BW, kg	263.7	241.3	257.3	10.8	0.31
Initial BCS	3.1	3.3	3.2	0.12	0.71
Final BCS	2.7	2.7	2.8	0.14	0.80
Initial backfat, mm	16.8	17.0	16.9	0.39	0.90
Final backfat, mm	15.4	14.7	15.5	0.57	0.54
Live born	14.8	13.0	13.3	0.80	0.21
Feed intake, kg/d					
d 0 to 7	5.13[a]	3.46[b]	2.68[b]	0.32	<0.001
d 8 to 14	6.80[a]	5.55[b]	5.12[b]	0.35	<0.01
d 15 to 21	5.95	5.40	5.87	0.32	0.41
d 0 to 21	5.69[a]	4.80[b]	4.49[b]	0.29	0.01

[a,b]Means within a row without a common superscript differ significantly ($P < 0.05$)

Table 2: Litter performance

	MNL	EFS	MOD	SEM	P-Value
Litter size at d 0	12.6	12.6	12.4	0.2	0.71
Litter weight, kg					
d 0	18.1	17.9	17.4	1.02	0.87
d 7	32.1	30.7	29.8	1.74	0.63
d 14	54.6	52.0	52.8	2.75	0.78
d 21	72.2	70.1	67.6	3.56	0.65
Litter weight, kg/pig					
d 0	1.46	1.42	1.40	0.08	0.87
d 7	2.74	2.51	2.49	0.12	0.26
d 14	4.73	4.44	4.50	0.16	0.39
d 21	6.51	5.91	5.91	0.24	0.12
Litter ADG, g/pig/d					
d 0 to 7	170.0	149.7	148.6	12.3	0.37
d 8 to 14	277.5	266.0	274.1	11.2	0.74
d 15 to 21	292.8[a]	253.6[b]	260.5[ab]	12.2	0.05

[a,b]Means within a row without a common superscript differ significantly ($P < 0.05$)

RESULTS

Sow Characteristics and Performance (Table 1)

- Initial body weight, backfat thickness, body condition score, and total piglets born alive were similar across all treatment groups
- Feed system had no impact on final body weight, backfat thickness, or body condition score, which all decreased during lactation
- Sow feed intake was significantly higher when manually fed when compared to either the electronic or modified feeding system in week 1, 2, and overall
  - The difference in feed intake was greatest during the first week post-farrowing
  - There was no effect of feeding system on sow feed intake in week three post-farrowing

Litter Performance (Table 2)

- Litter average daily gain (g/pig/d) was higher with manual feeding compared to electronic feeding during the third week post-farrowing
- There was no impact of dietary treatment on total litter weight or litter weight on a per pig basis.
- There was no treatment effect on piglet mortality (data not shown)

DISCUSSION & IMPLICATIONS

- All three feeding systems evaluated resulted in similar performance of the sow and litter
- Both the electronic sow feeding system and the modified feeding system resulted in lower feed intake during the first two weeks of lactation. This is most likely the result of decreased feed wastage as there was no difference in sow or litter performance.
- The reduction in feed intake would result in approximately $8.50 savings per 21-d lactation compared to manual feeding
- The modified feeding system is, therefore, a viable option for feed delivery to sows during lactation

ACKNOWLEDGEMENTS

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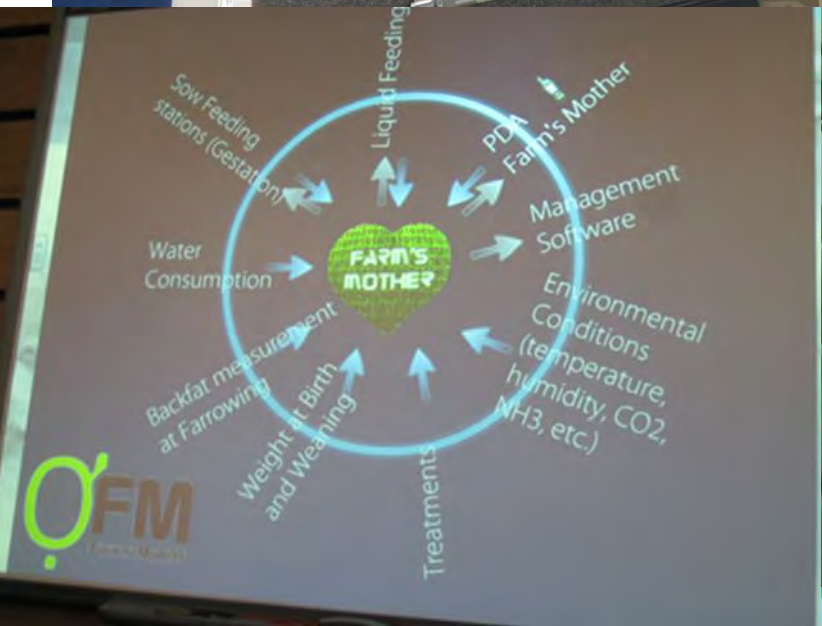
Optimal Pork Production, Lleida, Spain

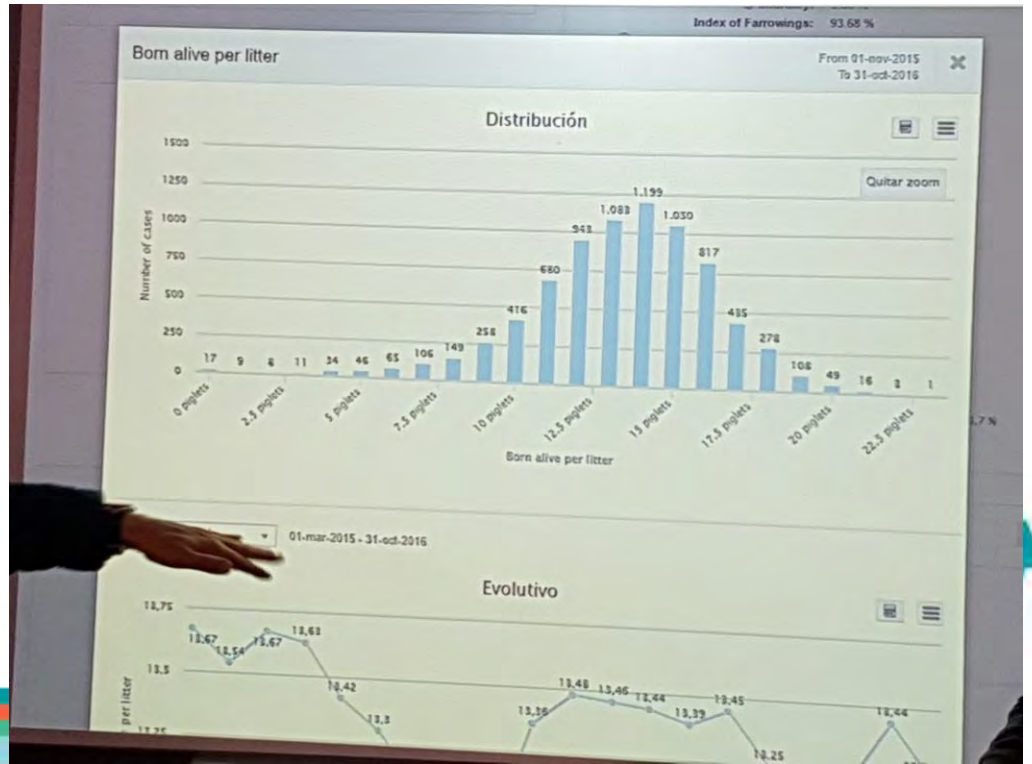
3400 sow research barn.

320,000 sow, 8M finisher system


Sow Feeding stations (Gestation)
Liquid Feeding
PDA
Farm's Mother
Management Software
Water Consumption
FARM'S MOTHER
Environmental Conditions (temperature, humidity, CO2, NH3, etc.)
Backfat measurement at Farrowing
Weight at Birth and Weaning
Treatments
QFM

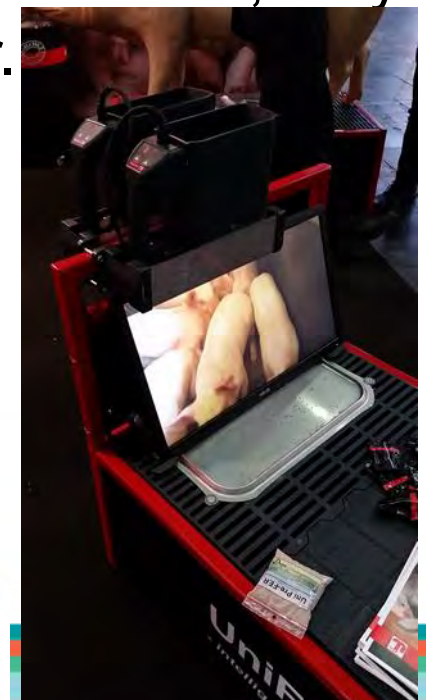
Data Analysis

- Big Data is upon us
- Culling decisions based on FE of offspring and total sow/litter performance, not just feet and legs and sow reproductive performance.
- In large herds analytics allows you to identify, find and manage the individual, The data is a welfare tool.



Automation

- Saw the originator of this, a ‘flapper’ at Agromek 2009. still looks like prototype
- Creep feeder, also added iron supplementation, feed curves drops just what is needed.
- Automated milk delivery for ever increasing litter size supplementation, only one system shown in 2016 Eurotier.



Farm
Innovation's
LISA LIfeSaver
Farrowing
Monitoring
Device

Microfluidic
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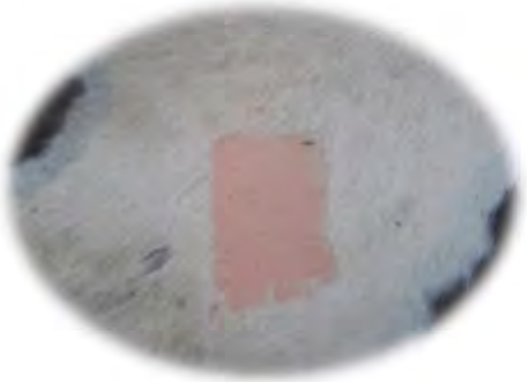
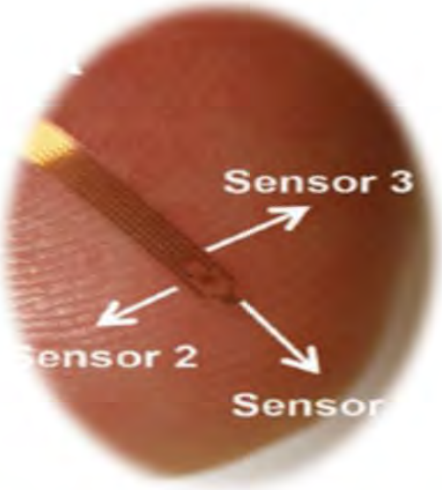
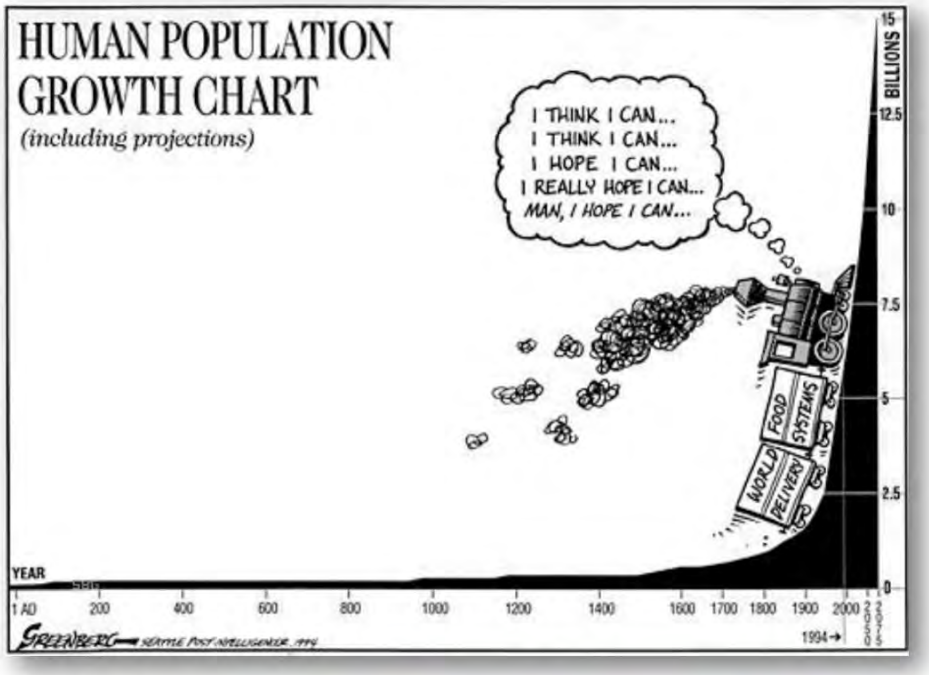




The 9 Billion People Question

Can modern mechanized agriculture be sustainable?



PAMI Westest

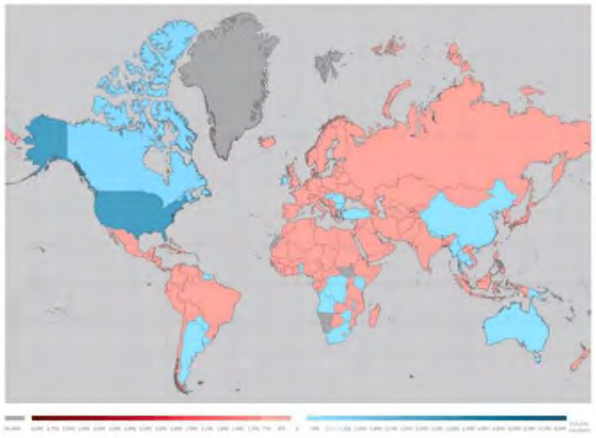
Calorie Production Deficits

In the next 10 years...we will be facing a 214 trillion calorie gap.

That's equal to 379 billion Big Macs for China and Africa

The World 40 Years Ago: Limited Surplus Regions

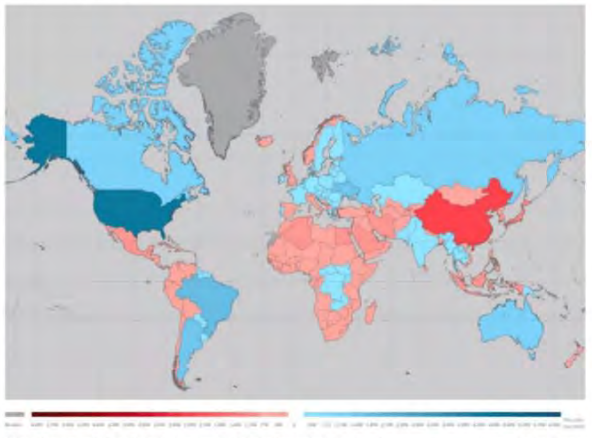
Global Calorie Gaps (1968 to 1977)



Calorie Production Deficits (Calories Consumed – Calories Domestically Produced) Source: Gro Intelligence

The World Transforms: Brazil, India, and Europe Emerge

Global Calorie Gaps (2008 to 2017)

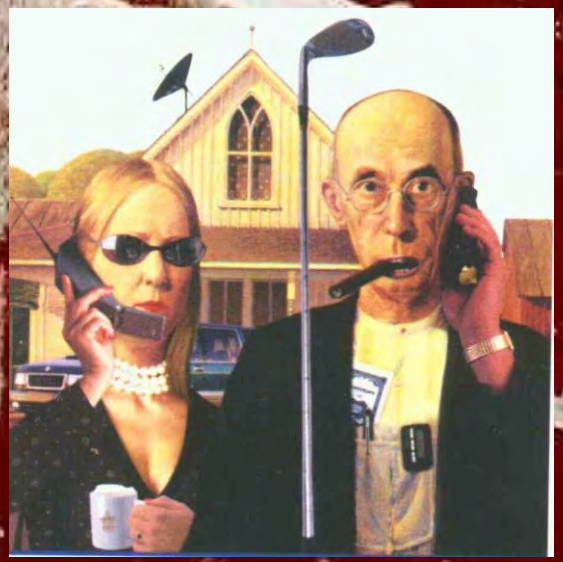


Calorie Production Deficits (Calories Consumed – Calories Domestically Produced) Source: Gro Intelligence

PAMI Westest

"In today's marketplace it is organizational capability to adapt that is the only sustainable competitive advantage"

- Willie Pietersen, Reinventing Strategy



7 Habits of Highly Effective Research Organizations

1. Issues not Disciplines will engage your client
2. Industry driven mandate, and stay connected to the customer
3. Professional management; free researcher from administration
4. Be a catalyst - share facilities and collaborate
5. Develop people who will make a difference
6. Global vision, plus a BHAG
7. Quantify benefits - ROI, IRR. $ per pig marketed

Adapted from Source: Steven Covey, 7 Habits of Highly Successful People
Independence; be proactive, begin with end in mind, put first things first
Interdependence; win-win, seek first to understand then be understood, synergize/teamwork
Continuous improvement; sharpen the saw

Prairie Swine Centre – A Regional Initiative A National Resource

University of Saskatchewan

Saskatchewan Ministry of Agriculture

Alberta Pork

PR Swine Centre 25 Years

Sask Pork

Manitoba Pork Council

Ontario Pork