Opportunities and risks of digital technology on animal farms: a practical perspective

Janice Siegford

Animal Behavior and Welfare Group

Department of Animal Science

Michigan State University

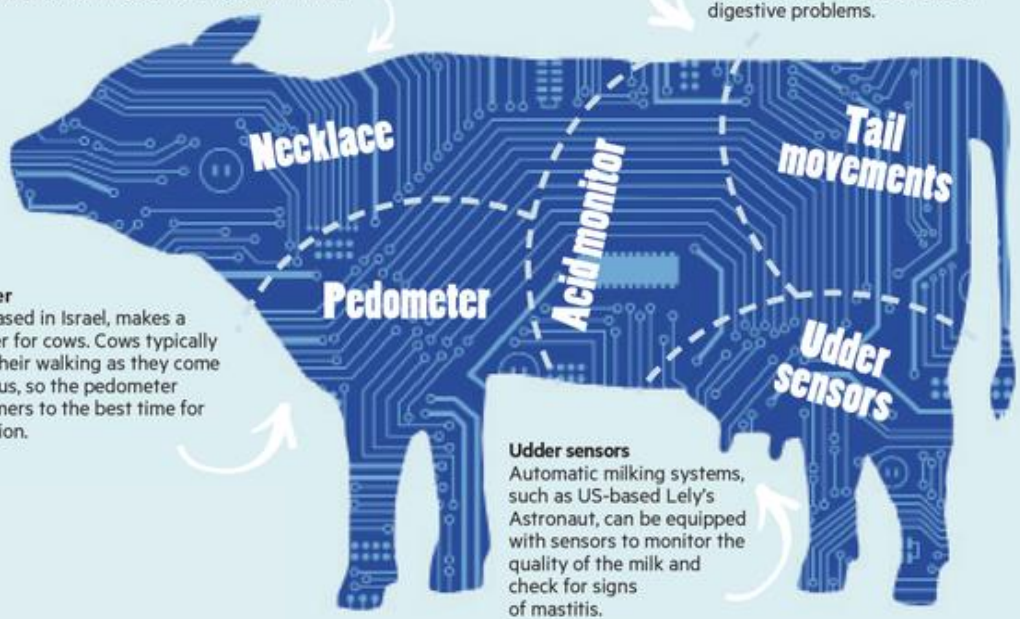
MICHIGAN STATE UNIVERSITY

Rapid proliferation of technology

Sensors, sensors everywhere…

Necklace
Connecterra, a Dutch company, makes Fitbit-style necklaces that monitor a cow's movement and feeding habits. The sensor can be used to detect health problems and to tell when the cow is in heat, so that insemination can happen at an optimum time.

Acid monitor
Well Cow, a British company, has developed a bolus that is inserted into the cow's rumen to monitor acidity levels. This helps detect digestive problems.



Tail movements
Moocall, an Irish company, makes a birthing sensor that attaches to the tail. It measures tail movements triggered by labour contractions, and sends a farmer an SMS alert approximately one hour before a cow is due to calve.

Pedometer
Afimilk, based in Israel, makes a pedometer for cows. Cows typically increase their walking as they come into oestrus, so the pedometer alerts farmers to the best time for insemination.

Udder sensors
Automatic milking systems, such as US-based Lely's Astronaut, can be equipped with sensors to monitor the quality of the milk and check for signs of mastitis.

Picture: iStock

The Livestock Management Process

Traditional vs AI & Sensor Technology Powered

Traditional Livestock Management

Manual Cattle Counting

AI & Sensor Technology Powered Livestock Management

Automated Cattle Counting Using Cameras & Sensors

= Automate tasks

Neethirajan et al., 2023

The Livestock Management Process

Traditional vs AI & Sensor Technology Powered

Traditional Livestock Management	AI & Sensor Technology Powered Livestock Management	
 Manual Cattle Counting	 Automated Cattle Counting Using Cameras & Sensors	= Automate tasks
 Paper-based Record Keeping	 Real-time Health Monitoring with AI Algorithms	= Detect problems

Neethirajan et al., 2023

The Livestock Management Process

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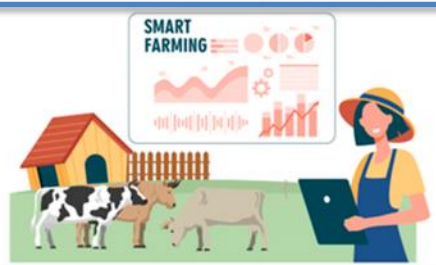
 Manual Health Assessment	 Data-driven Decision Making	= Assist decision making

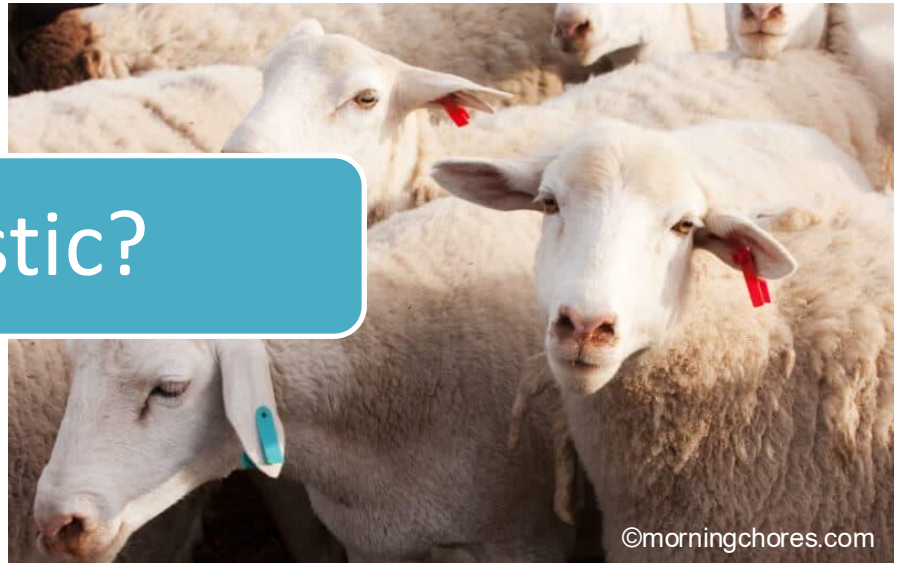
Neethirajan et al., 2023

Potential benefits: For the animal

Life-long

All animals on farm

Holistic?



Potential benefits: For the environment

Better nutrient use

Less wasted

Less downstream

What if automated solutions are pen level?

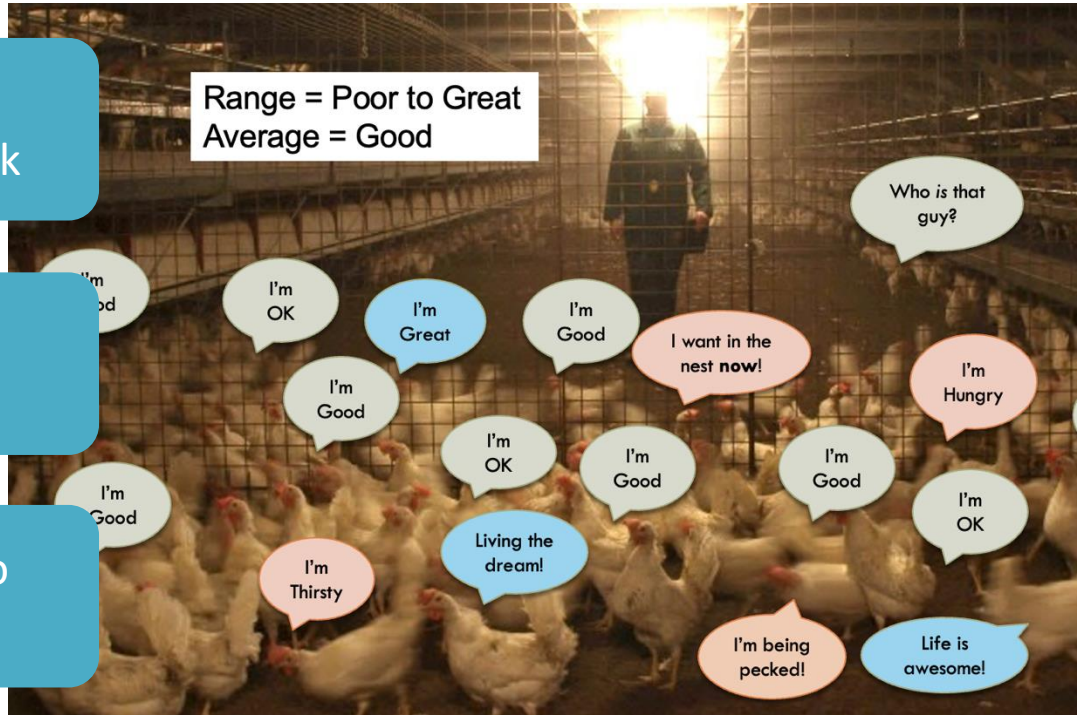
- Management of pigs is aimed at groups (pens or rooms)
- Computer vision and audio solutions typically evaluate pen behavior
- Individual recognition (especially over time) is often not possible

Does group level data capture information about welfare?

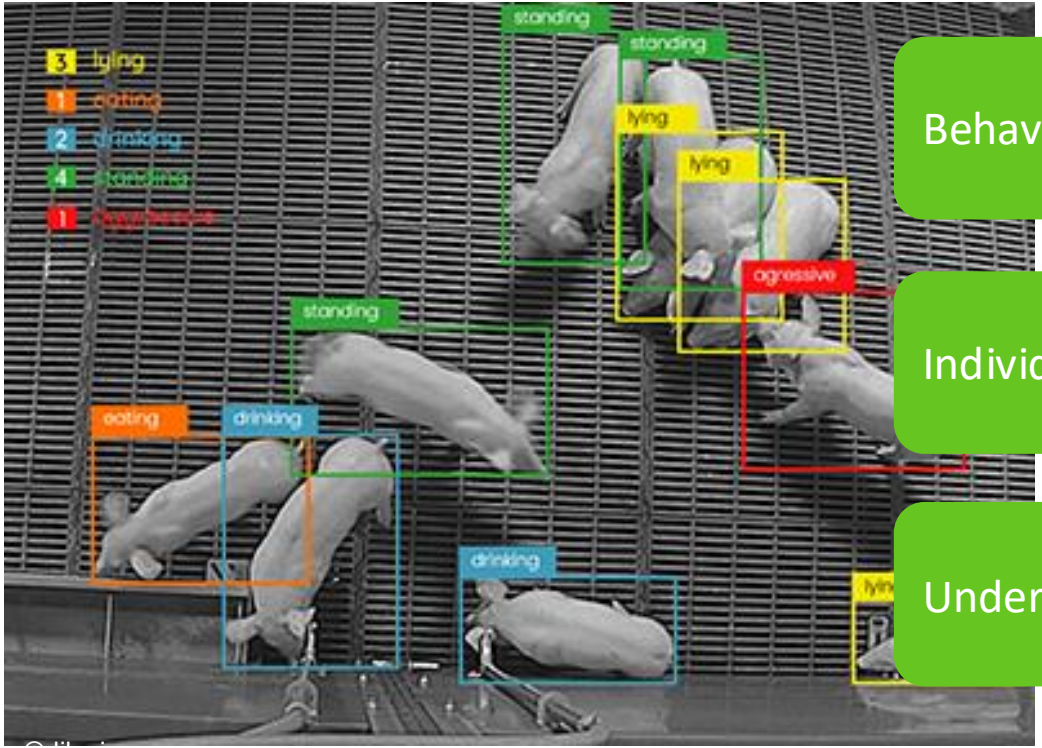
Welfare is the holistic state of the individual laying hen/broiler/turkey/duck

Each bird is a unique combination of genetics, experience, and temperament

Does group level information allow us to understand welfare of a bird?



How about pig level without recognizing the individual?



Behaviors of each pig are detected

Individual pigs are not identified

Understand variation in pigs' responses

Use for human workers' benefit

What if technology is not used for good?

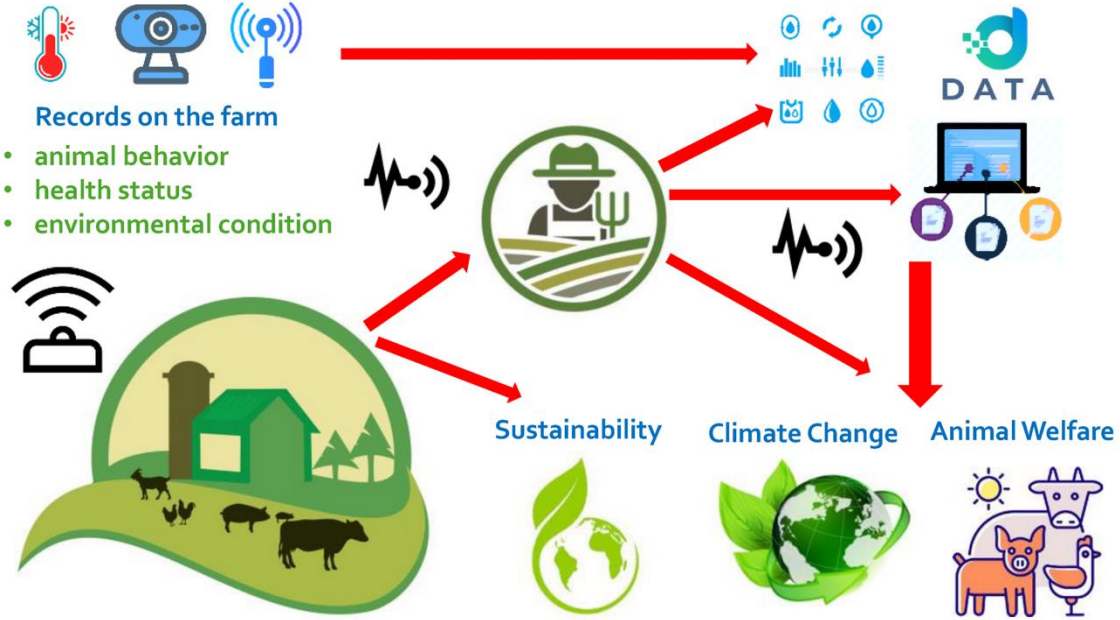


Figure 1. The concept of precision livestock farming (PLF) in modern livestock production.

Papakonstantinou et al., 2024

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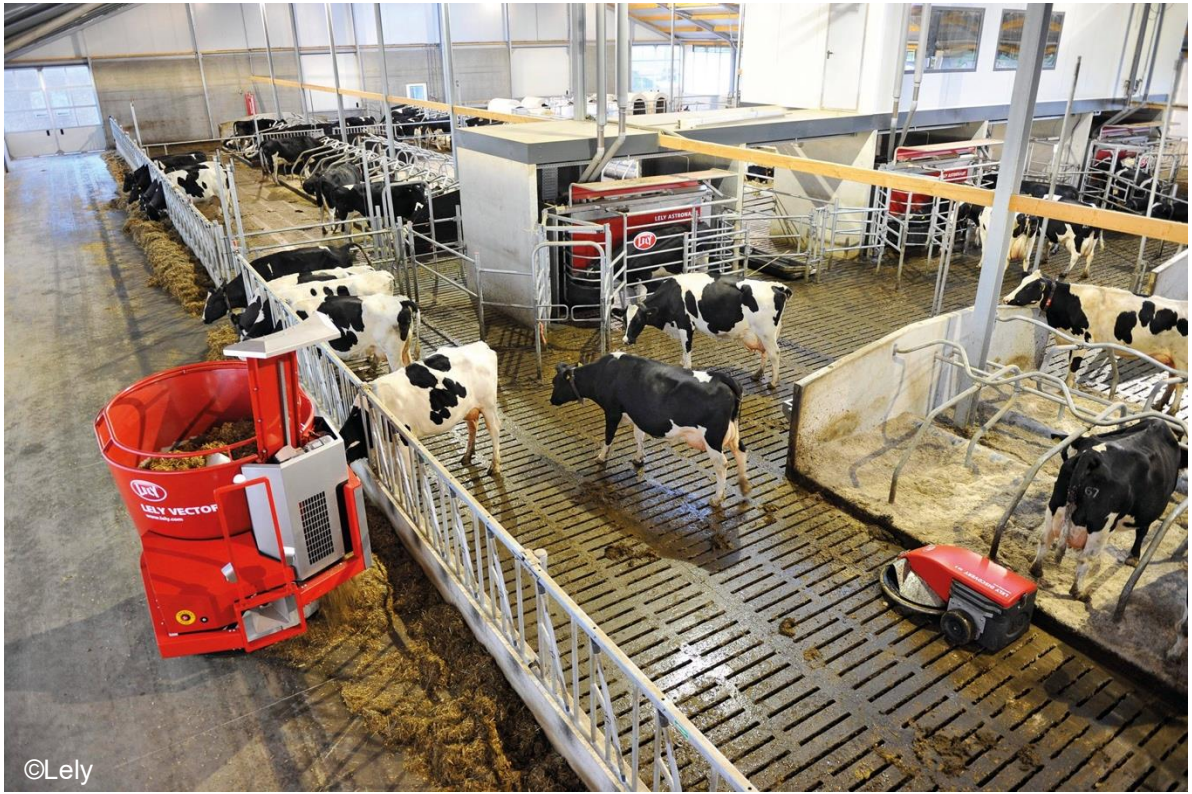
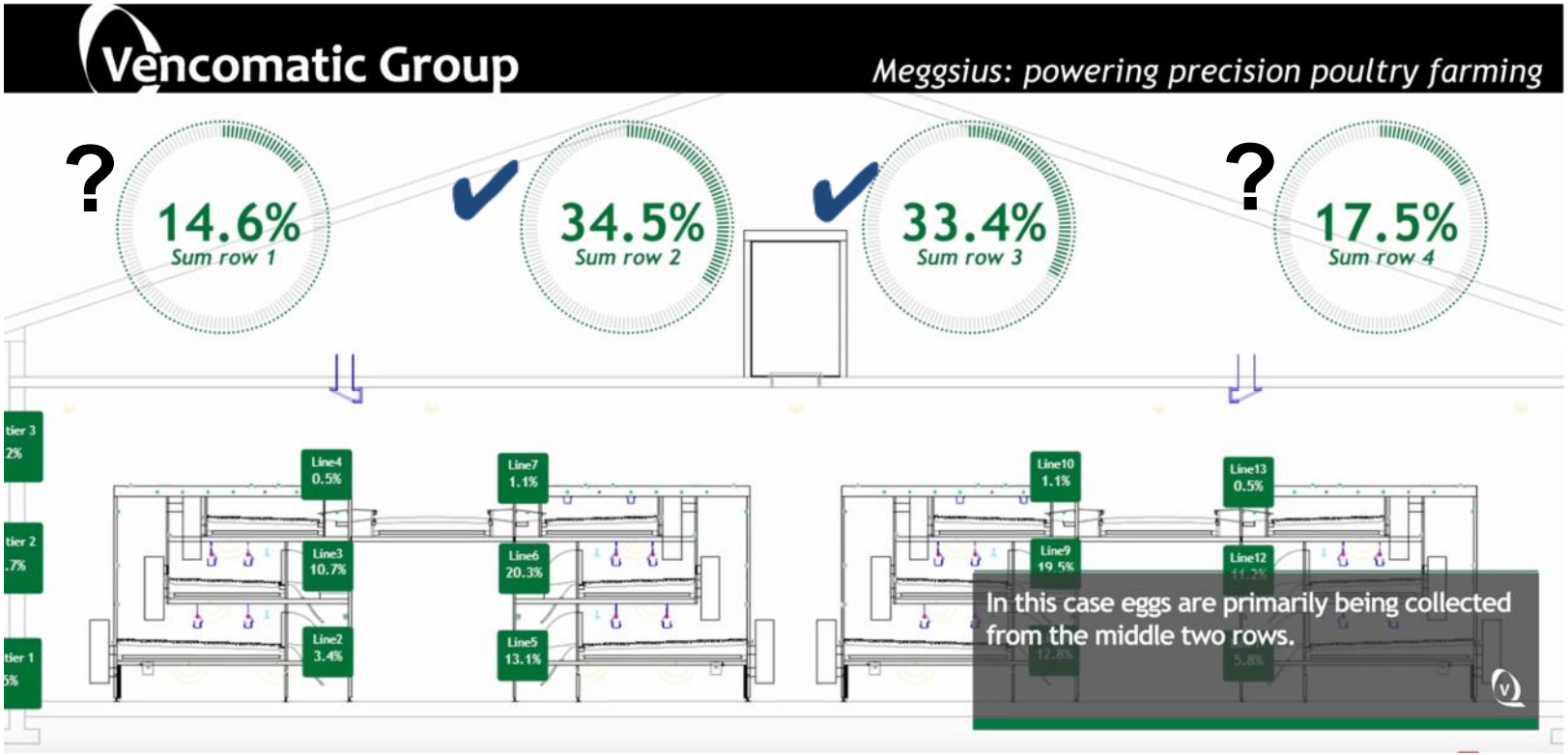


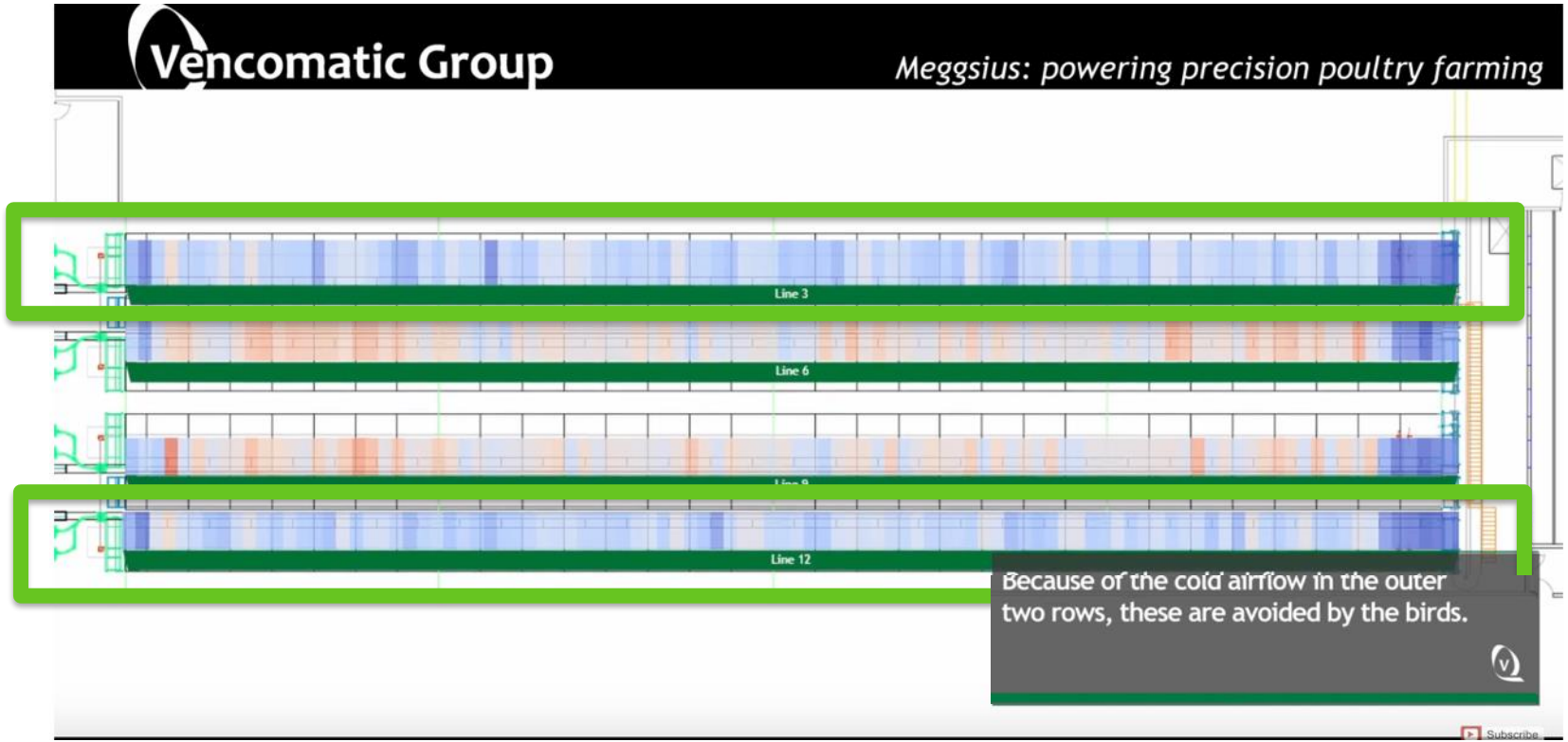
Better use of existing in-barn technology?

- Temperature
- Humidity
- Water use
- Feed disappearance
- Egg number
- Milk volume/quality
- Volume of waste?
- Air quality?

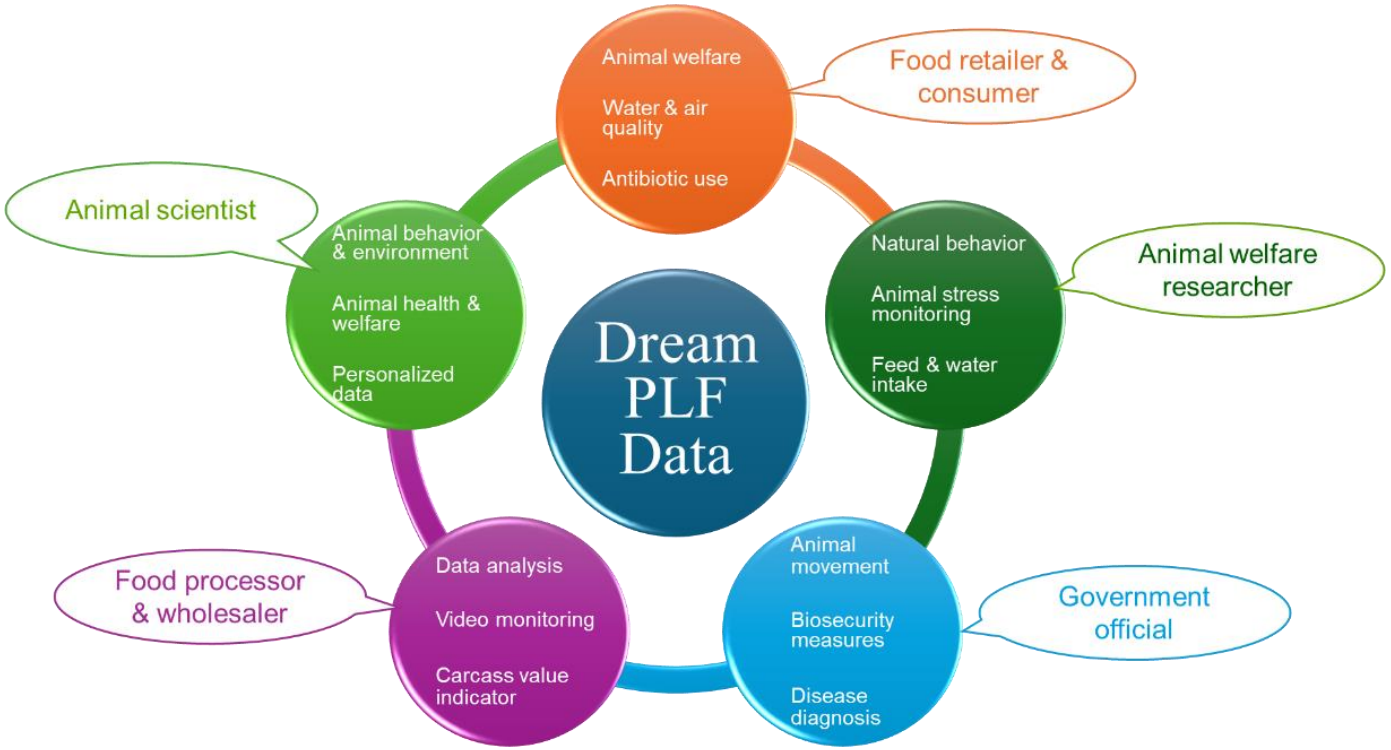
Better use of existing data: **Egg laying location**



Integrating of data streams: Egg laying location **+ temperature**



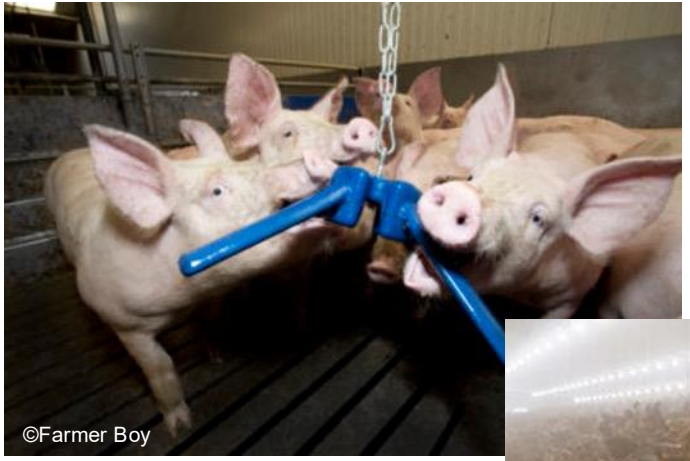
Information from technologies could be useful off farm



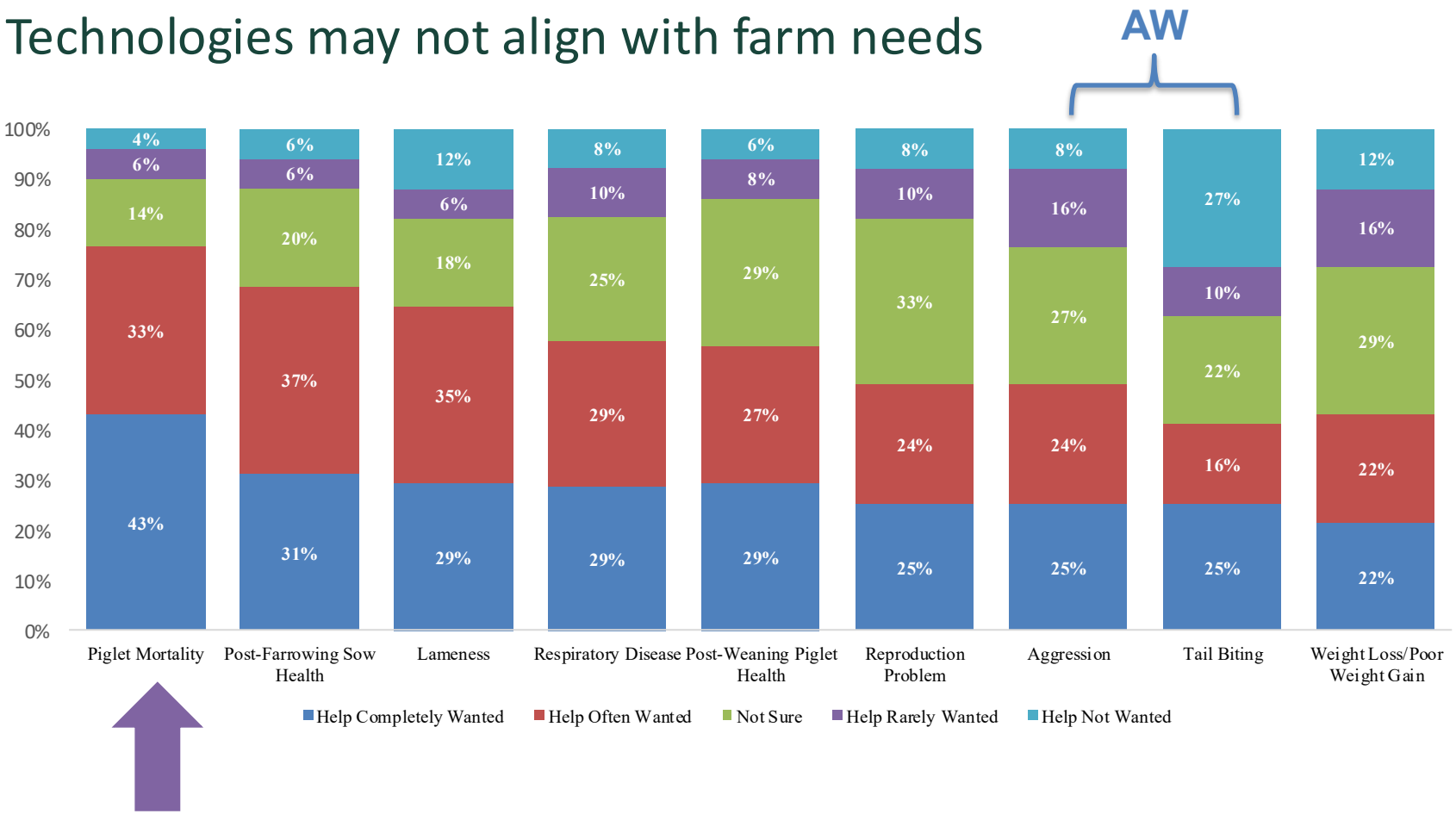
Akinyemi et al., in press

Practical realities

- Tough environments
- Huge groups
- Tight spaces
- New skills
- Poor internet



Technologies may not align with farm needs



Akinyemi et al., 2025

Does detecting a change or problem ensure improvement?

Guhzva et al., 2021

Is collecting a lot of data enough?

Does it matter if technology is currently targeting production parameters? Or problems rather than positive outcomes?

Some problems are hard to solve

What can (should) we do if we detect aggression in pigs?

What can (should) we do if we detect feather pecking?

Opportunities

- Detect issues
- Capture data
- Turn data to actionable information
- Provide transparency and accountability
- Mitigate problems

Risks

- Tech might not address needs
- Wrong scale
- Is it right for the context?
- Is value added?
- Who owns data?
- Is it usable on farm?
- What if it breaks?

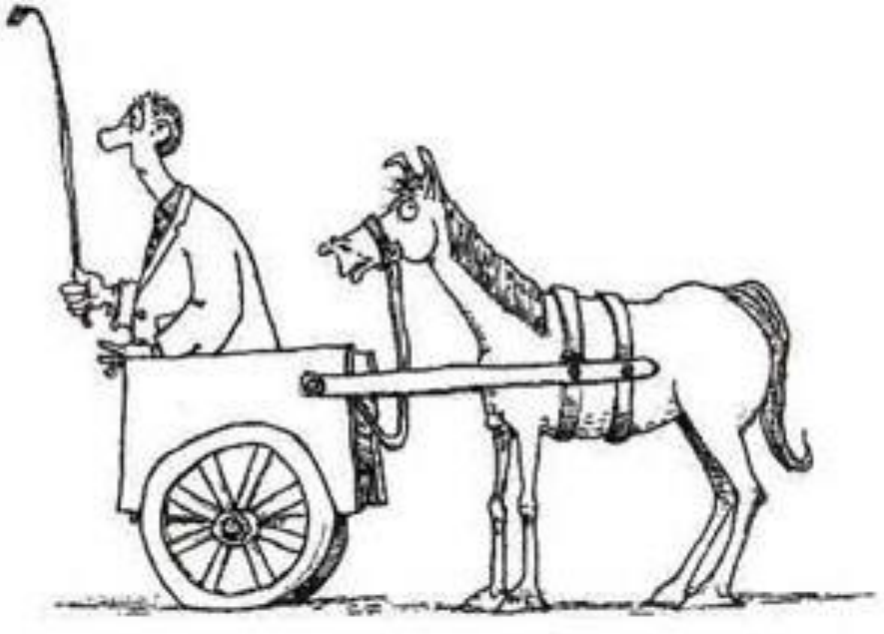
Possible benefits

- Remote monitoring and control
- Data-driven decisions
- Improved animal welfare
- Better use of resources
- More job satisfaction
- Reduced labor

Likely costs

- High initial investment
- Shift in how farm is managed
- People/animals have to adapt
- Infrastructure upgrades
- More tech support needed
- Ongoing expense to maintain

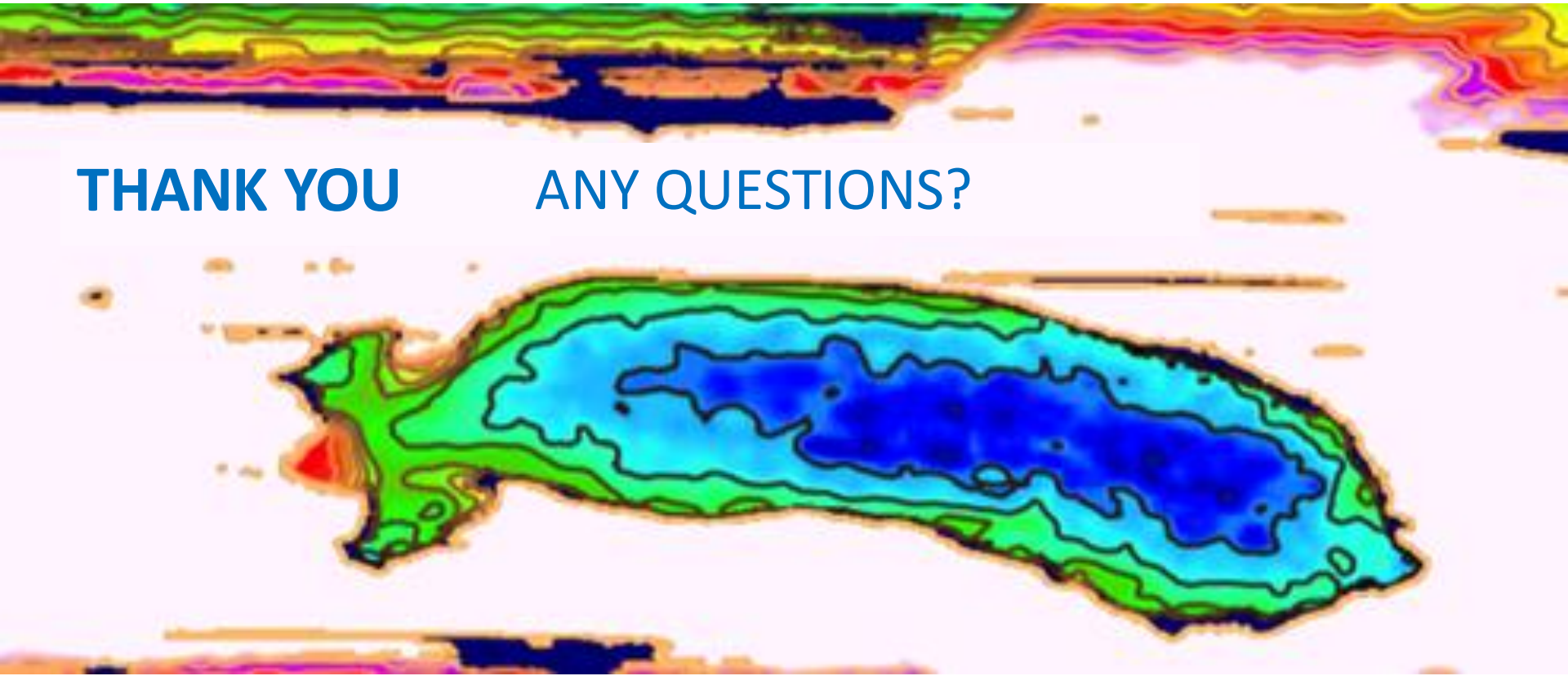
At the end of the day?



Could we?

Should we?

THANK YOU ANY QUESTIONS?



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