

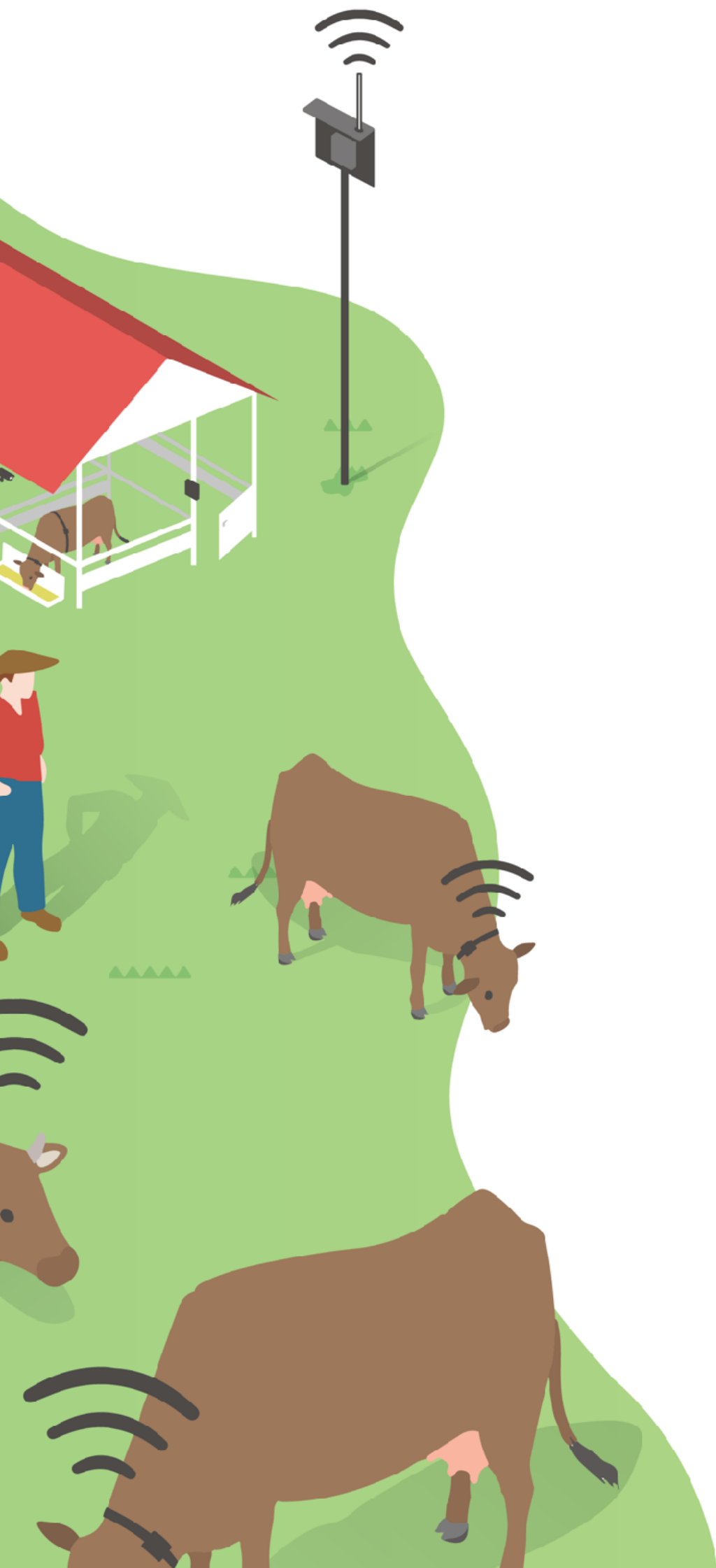


Solusi IoT untuk Optimalkan Peternakan



Andri Yadi
CEO, DycodeX

#ILDEX2019 – ICE BSD City – Sep 19, 2019





About Me

Andri Yadi

Co-founder & CEO of DycodeX

Deputy Chairman, Indonesia IoT Association

[a \(at\) dycodex.com](mailto:a(at)dycodex.com) | <http://andriyadi.com>

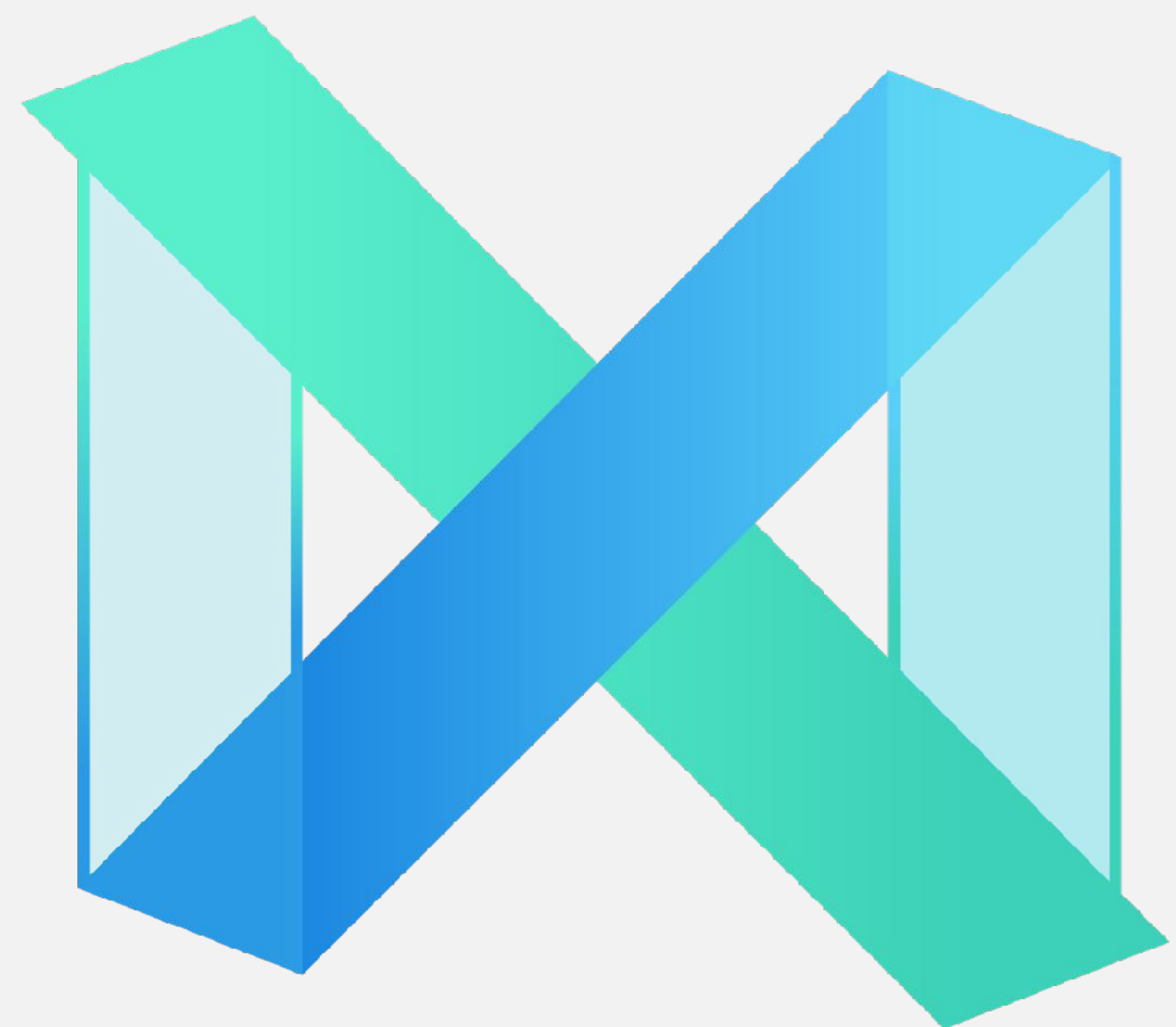
A Physicist, Developer, Maker, Community Guy, Entrepreneur

Microsoft Most Valuable Professional (MVP) of Azure for 12 years

Code for food & passion for 20 years

Break & make electronic stuffs for 22 years

Trying to change the world through entrepreneurship, 15 years now



DYCODEX

PT. DycodeX Teknologi Nusantara

The Company

Our vision is to solve big problems with technology.

Today, we're pioneering and leading in developing end-to-end home-grown **Artificial Intelligence (AI) & Internet of Things (IoT)**-based products & solutions in Indonesia, and enable **maker movement** along the way.

Only a few of startups in the country capable of doing both AI & IoT, in-house!

As seen on

YAHOO!
NEWS

Google

DailySocial^{id}

e27

INFOKOMPUTER

TECHINASIA

CNN
Indonesia

METRO TV

Bloomberg
TV INDONESIA

BERITA SATU

Pikiran Rakyat

SWA

Approach

We approach our solutions to be powered by **AI + IoT**, end to end



Combining **AI + IoT (AIoT)** enables a lot of opportunities!

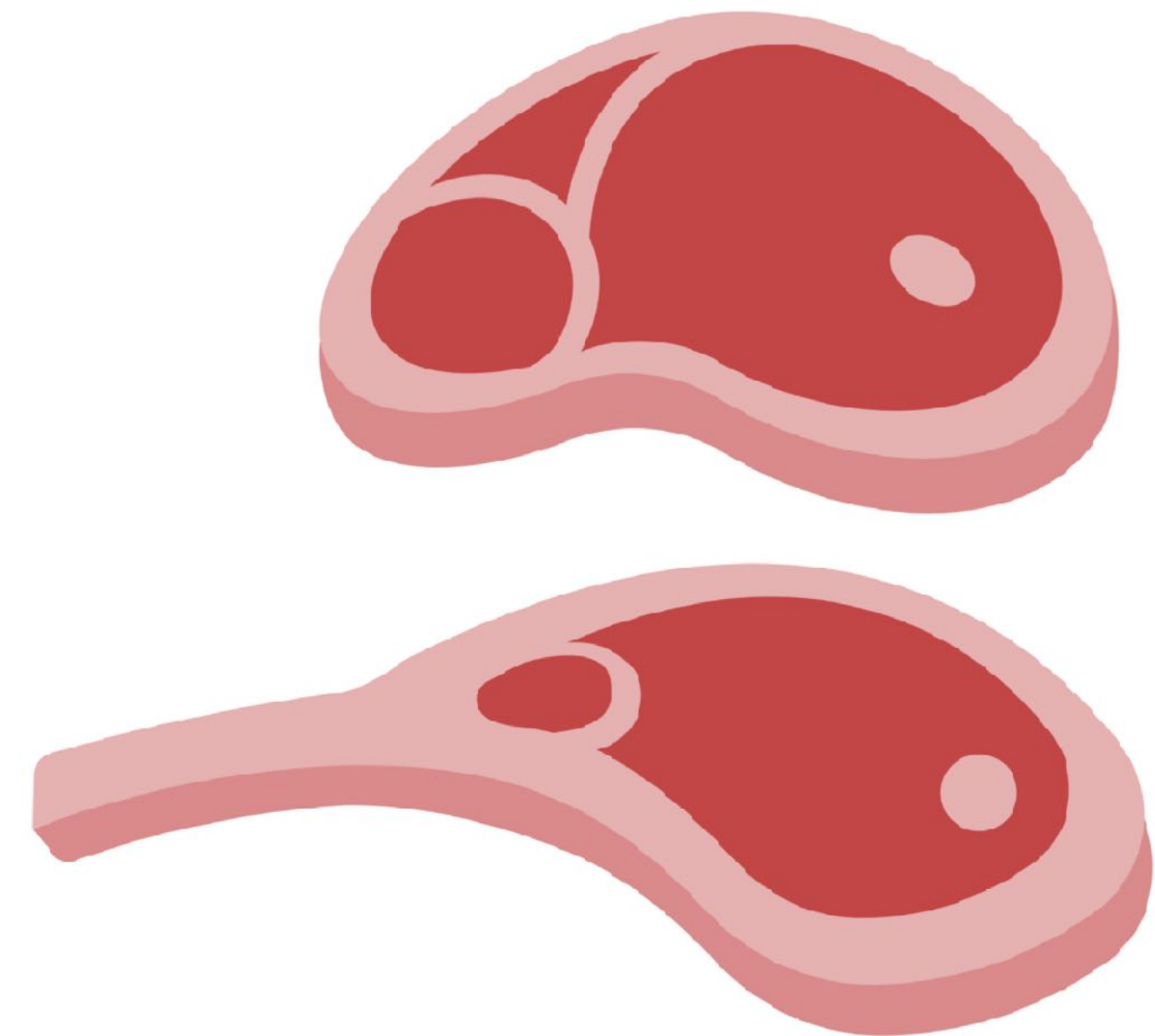
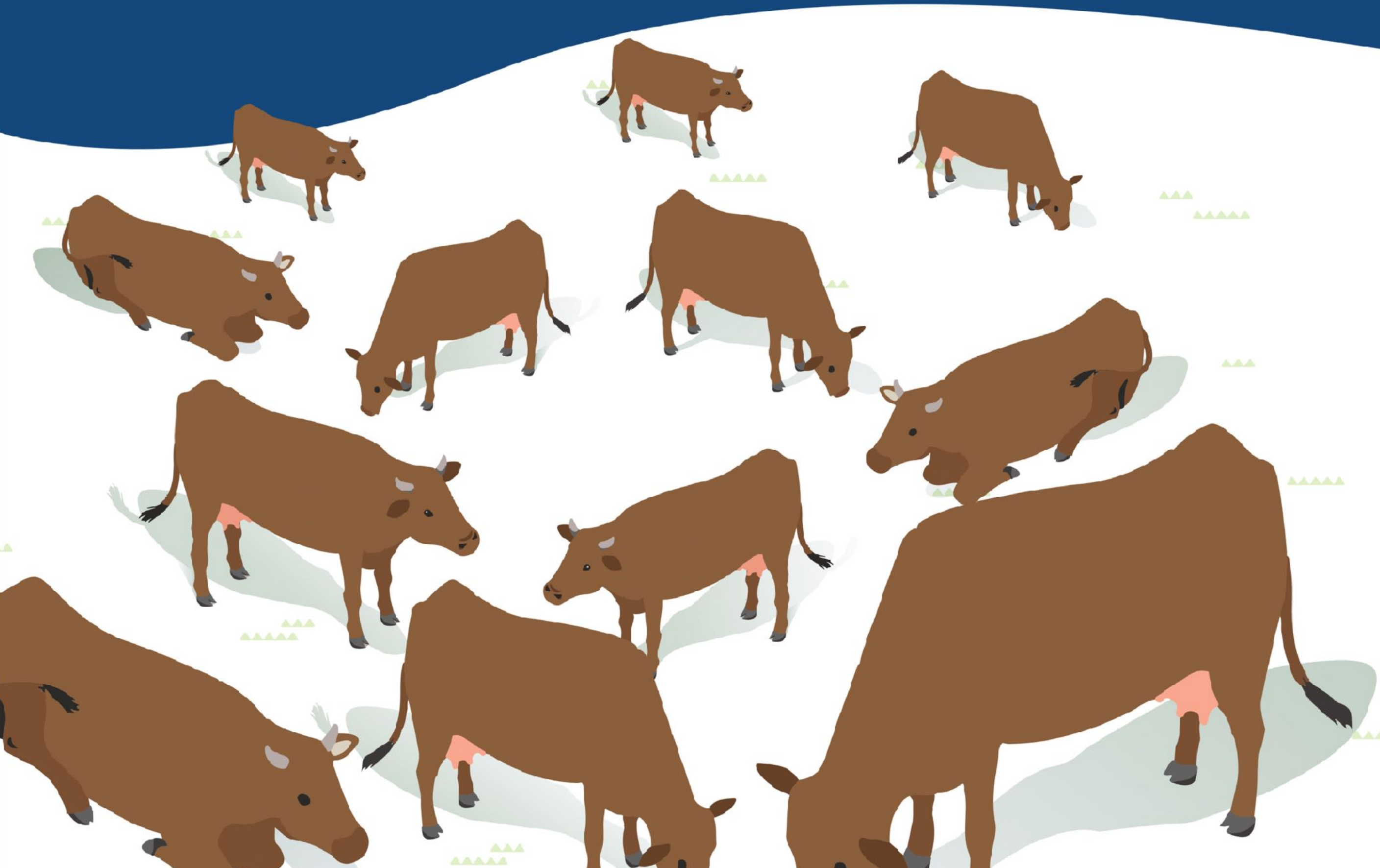
In 2030

8.5 B
People

1.8 B
cattle*

400 M Tones
meat*

1.2 B Tones
milk to produce



*FAO



Food & Agriculture
Organization

“Livestock sector is one of the **fastest growing** parts of the agricultural economy, contributing **40%** of the global value of agricultural output and support the food security of **1.3 billion people**”

”

“Indonesia will be self-sufficient in beef in the next **10 years**”



Ir. Joko Widodo,
President of Indonesia

Program Strategis Kementan

Mempercepat peningkatan populasi sapi di tingkat peternak

Memperkuat aspek pembenihan dan pembibitan

Penambahan indukan impor

Pengembangan Hijauan Pakan Ternak

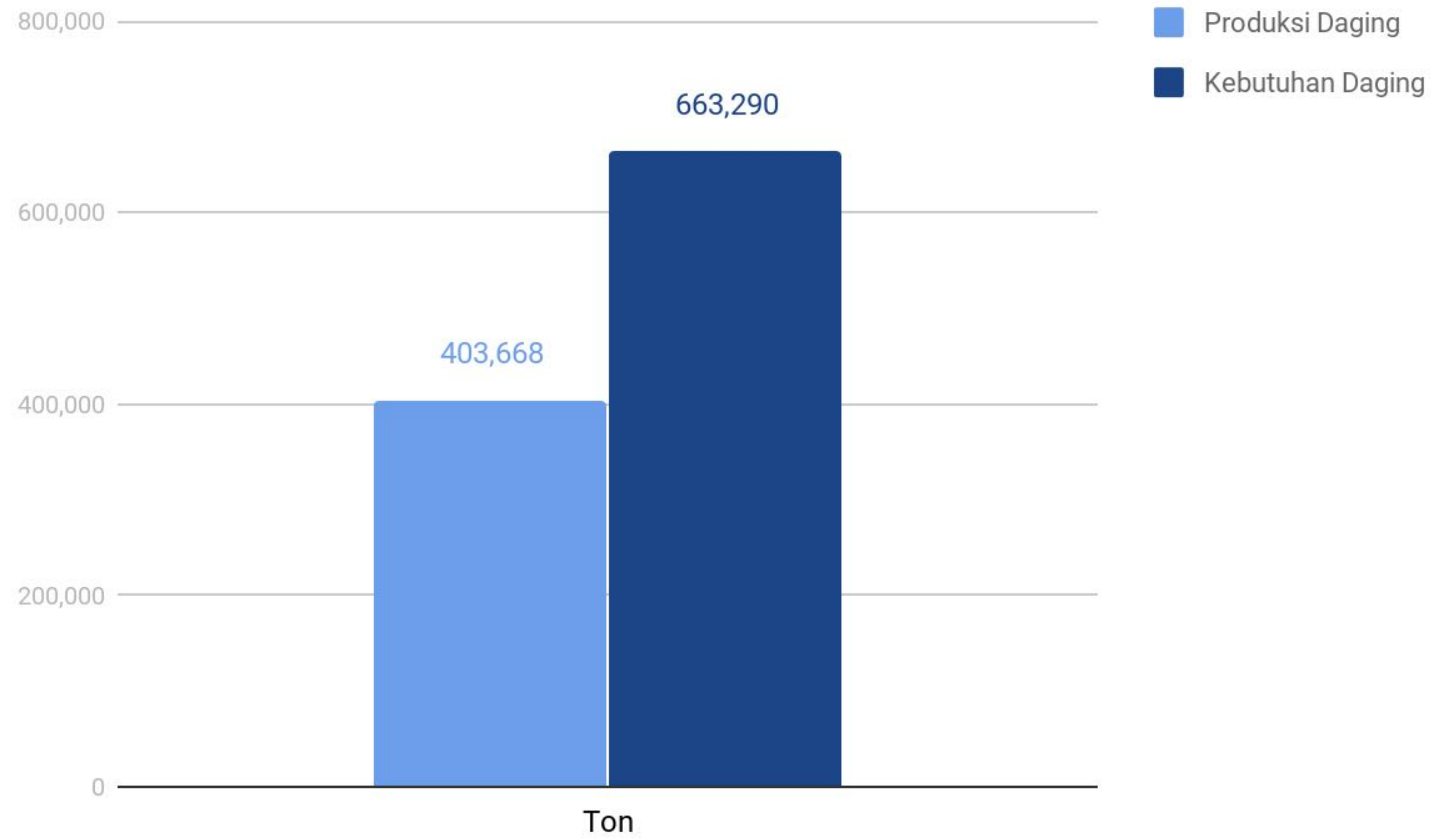
Penanganan gangguan reproduksi

Penyelamatan sapi betina produktif

Penanggulangan dan pemberantasan penyakit hewan

Our Challenges...

Indonesia's beef supply is still less than 60% out of demands



Source: "259.662 Ton Kebutuhan Daging Dipenuhi dari Impor". CNBC Indonesia. Diakses 27 Februari 2019.





Cattle farming still has real world problems

“We have no reliable means to track **feeding behaviour**. Non-eating cows are often found dead after 2-3 days”

A personal farm, Subang - Indonesia
Manages **400+** cows

”

HERD COUNTING

“We often **lose count** when a herd of cows moves from one to another grazing area”

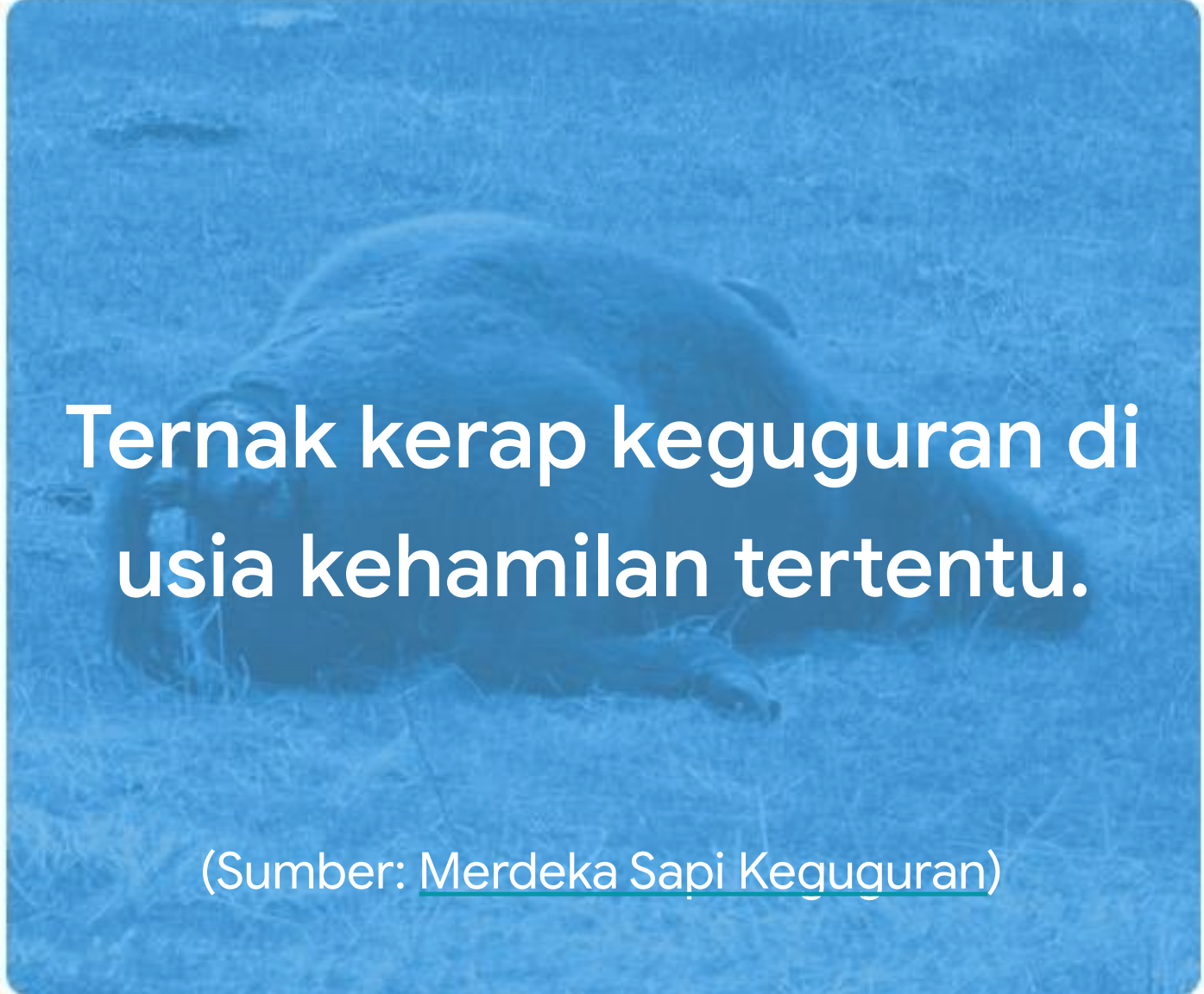
A corporate farm, Indonesia, manages **8000+** cows

OPERATION EFFICIENCY

“We have to **visit hundreds of cows every day**, just to check whether they still move or not”

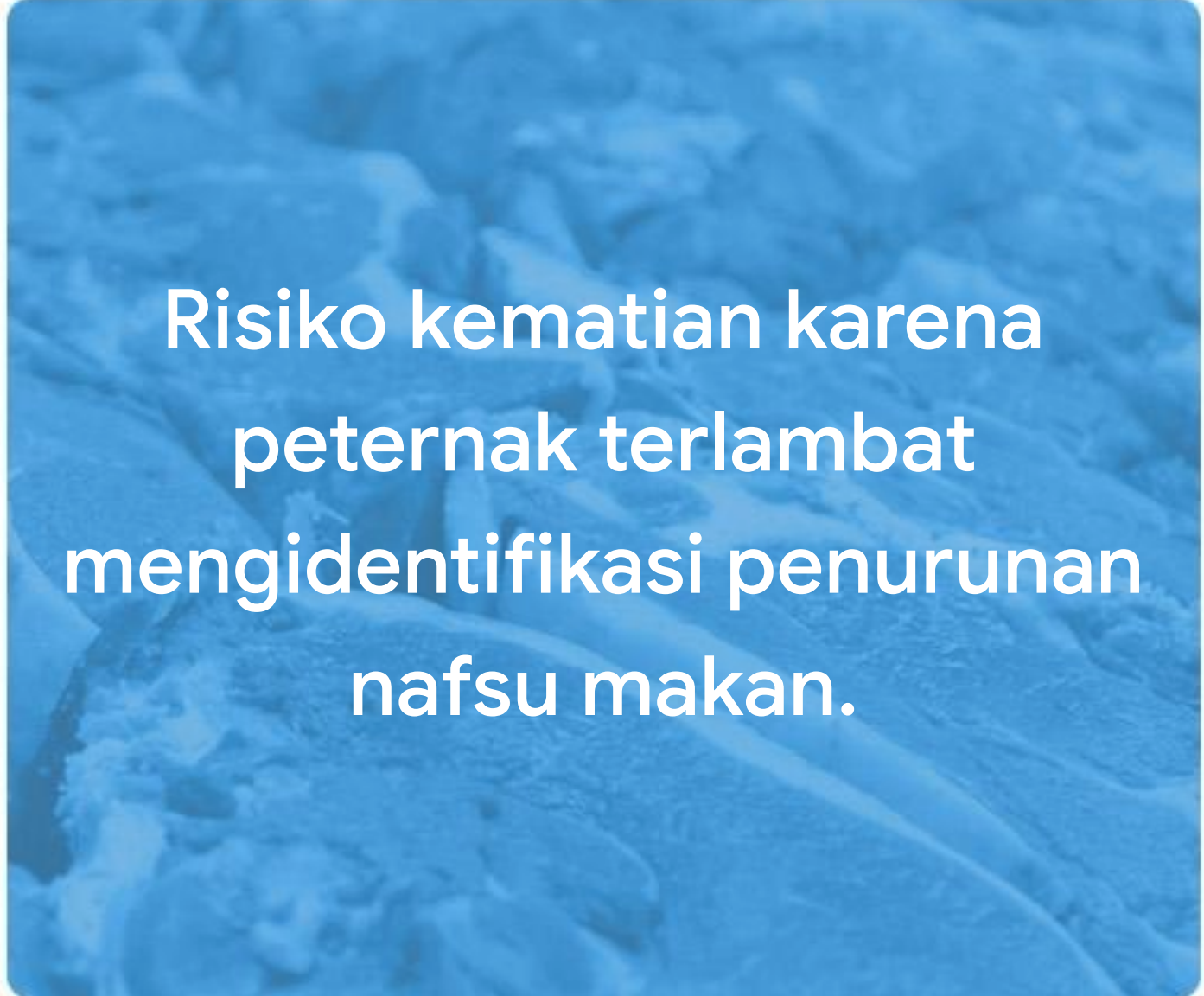
Cattle Breeding Centre - Ministry of Agriculture
Manages **1400+** cows

Other Problems

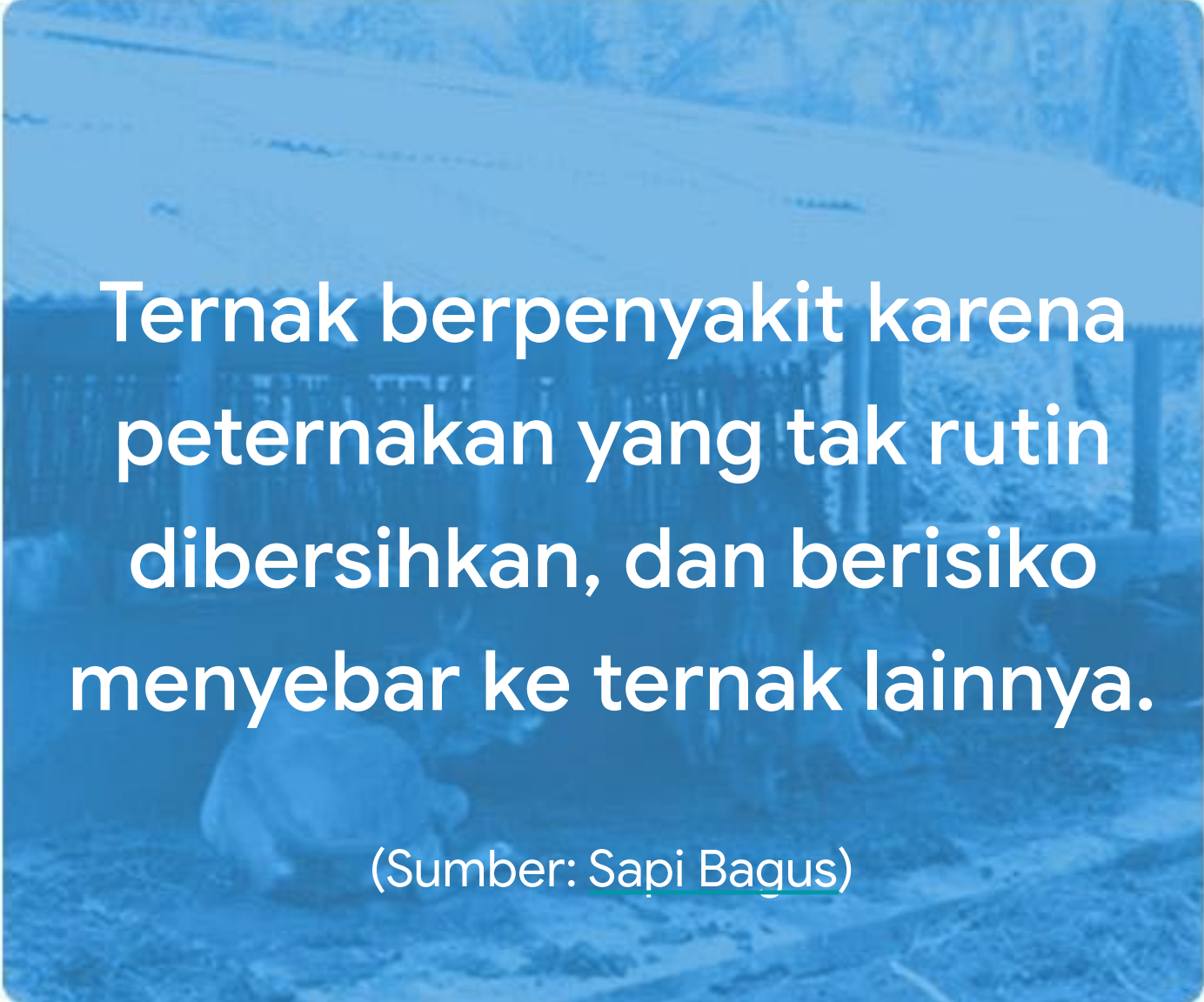


Ternak kerap keguguran di usia kehamilan tertentu.

(Sumber: Merdeka Sapi Keguguran)

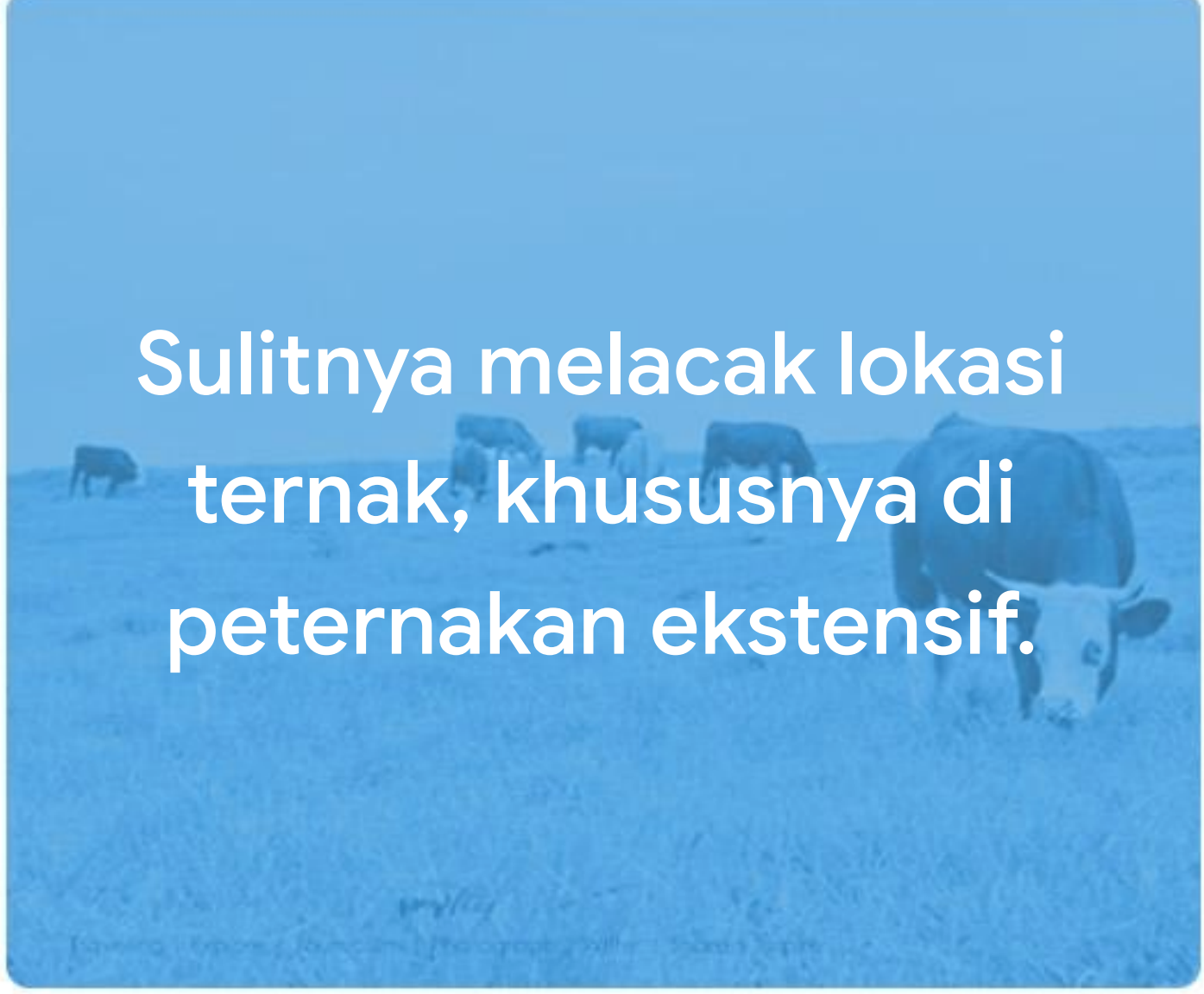


Risiko kematian karena peternak terlambat mengidentifikasi penurunan nafsu makan.

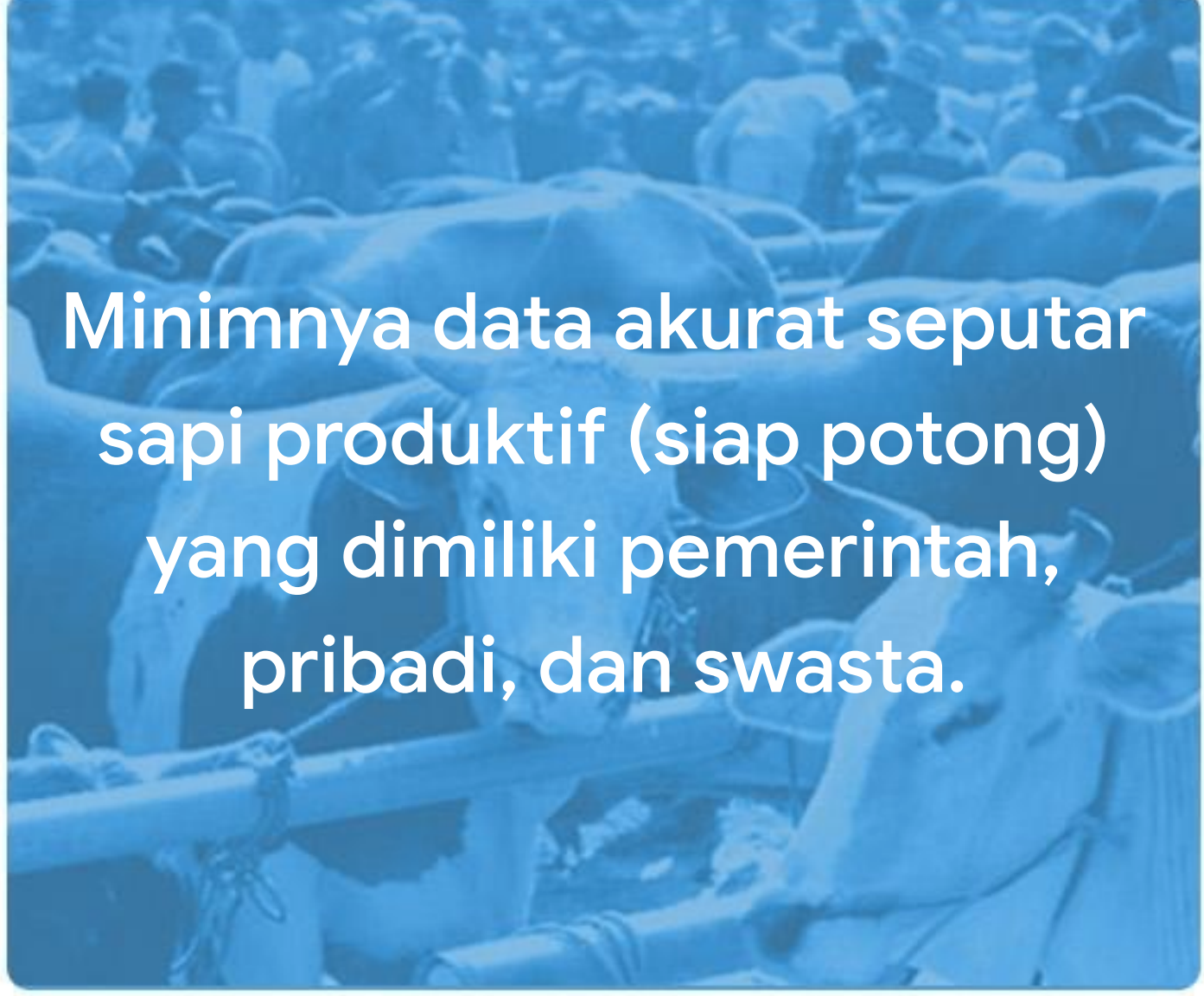


Ternak berpenyakit karena peternakan yang tak rutin dibersihkan, dan berisiko menyebar ke ternak lainnya.

(Sumber: Sapi Bagus)



Sulitnya melacak lokasi ternak, khususnya di peternakan ekstensif.

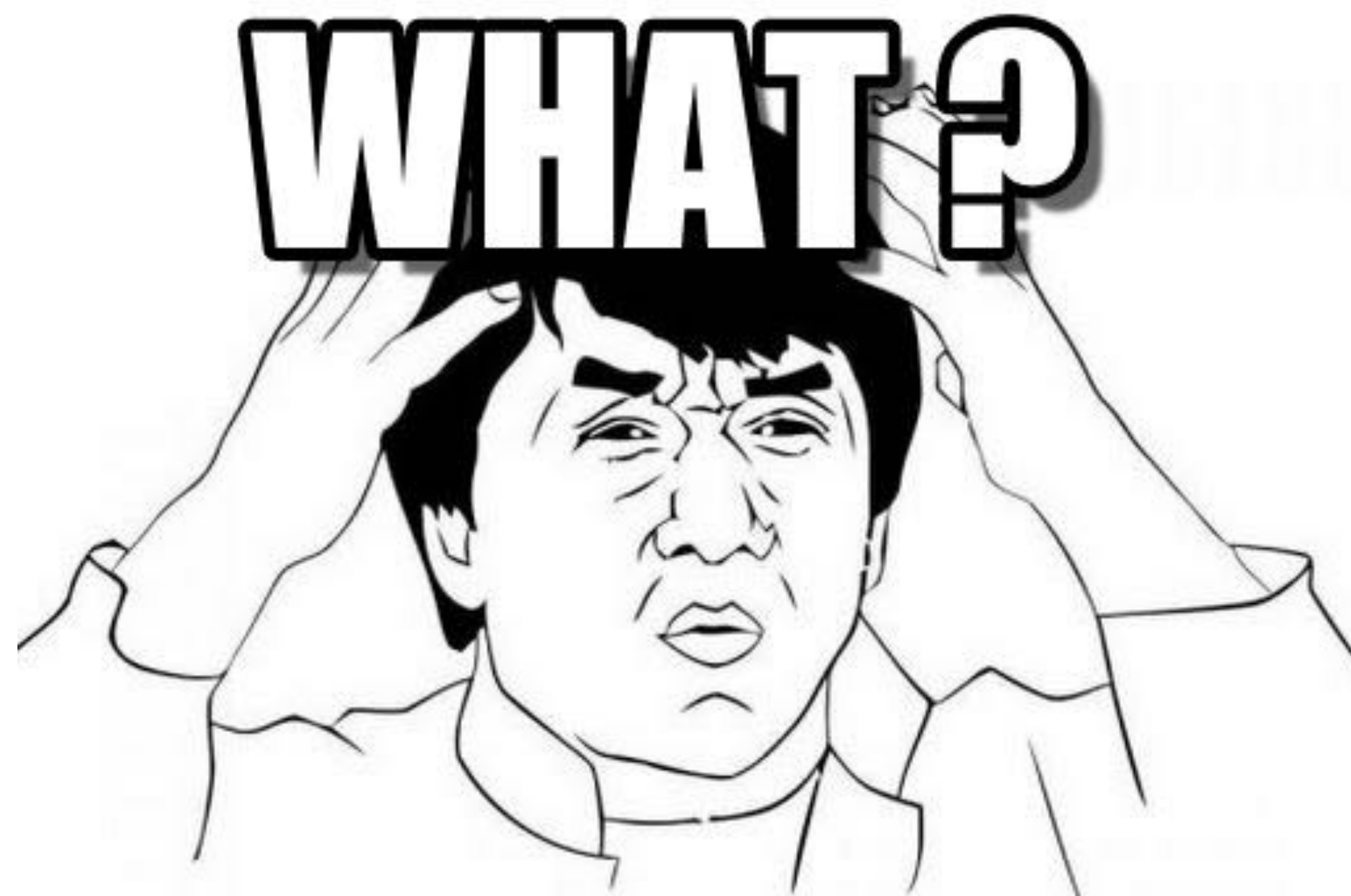


Minimnya data akurat seputar sapi produktif (siap potong) yang dimiliki pemerintah, pribadi, dan swasta.

Let's solve the problems with the
help of "Deep Tech"



But, what is “Deep Tech”?





Artificial Intelligence



Blockchain



Internet of Things

Deep
Tech



Robotics



Chemistry



Life Science



Green Energy

FUTURE FARMS

small and smart

SURVEY DRONES

Aerial drones survey the fields, mapping weeds, yield and soil variation. This enables precise application of inputs, mapping spread of pernicious weed blackgrass could increase wheat yields by 2-5%.

FLEET OF AGRIBOTS

A herd of specialised agribots tend to crops, weeding, fertilising and harvesting. Robots capable of autonomous application of fertiliser reduce fertiliser cost by 99.9%.

Precision Livestock Farming (PLF)

Data-driven management of livestock by continuous automated real-time monitoring of production/reproduction, health and welfare of livestock and environmental impact.

FARMING DATA

The farm generates vast quantities of rich and varied data. This is stored in the cloud. Data can be used as digital evidence reducing time spent completing grant applications or carrying out farm inspections saving on average £5,500 per farm per year.

TEXTING COWS

Sensors attached to livestock allowing monitoring of animal health and wellbeing. They can send texts to alert farmers when a cow goes into labour or develops infection increasing herd survival and increasing milk yields by 10%.

SMART TRACTORS

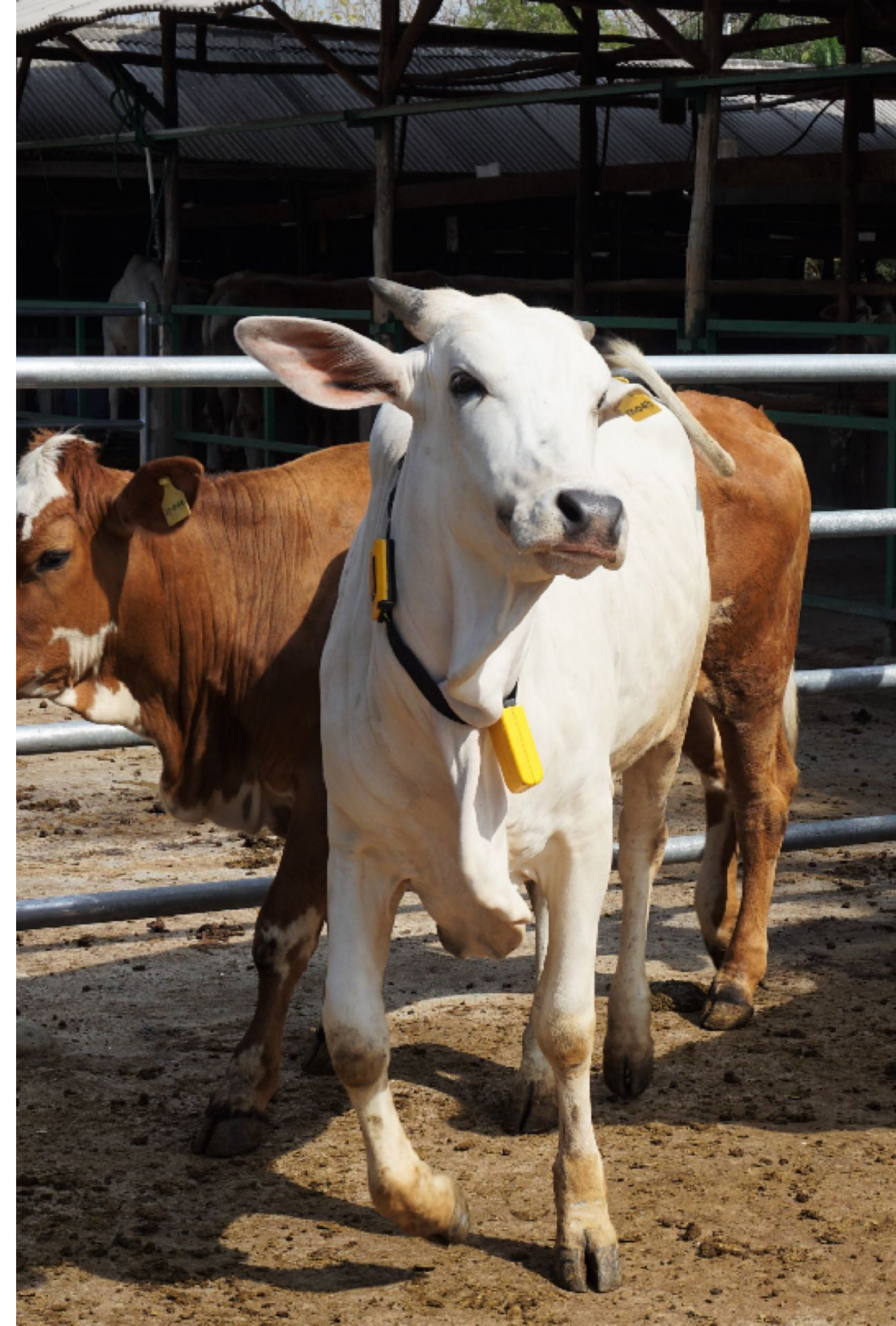
GPS controlled steering and optimised route planning reduces soil erosion, saving fuel costs by 10%.

Introducing...



**Internet of Things & Artificial Intelligence-powered
Cattle-Farm Assistant Platform**

* "Ternak" in SMARTernak means "cattle" in Bahasa Indonesia



SMARTernak: How It Works



DRONE

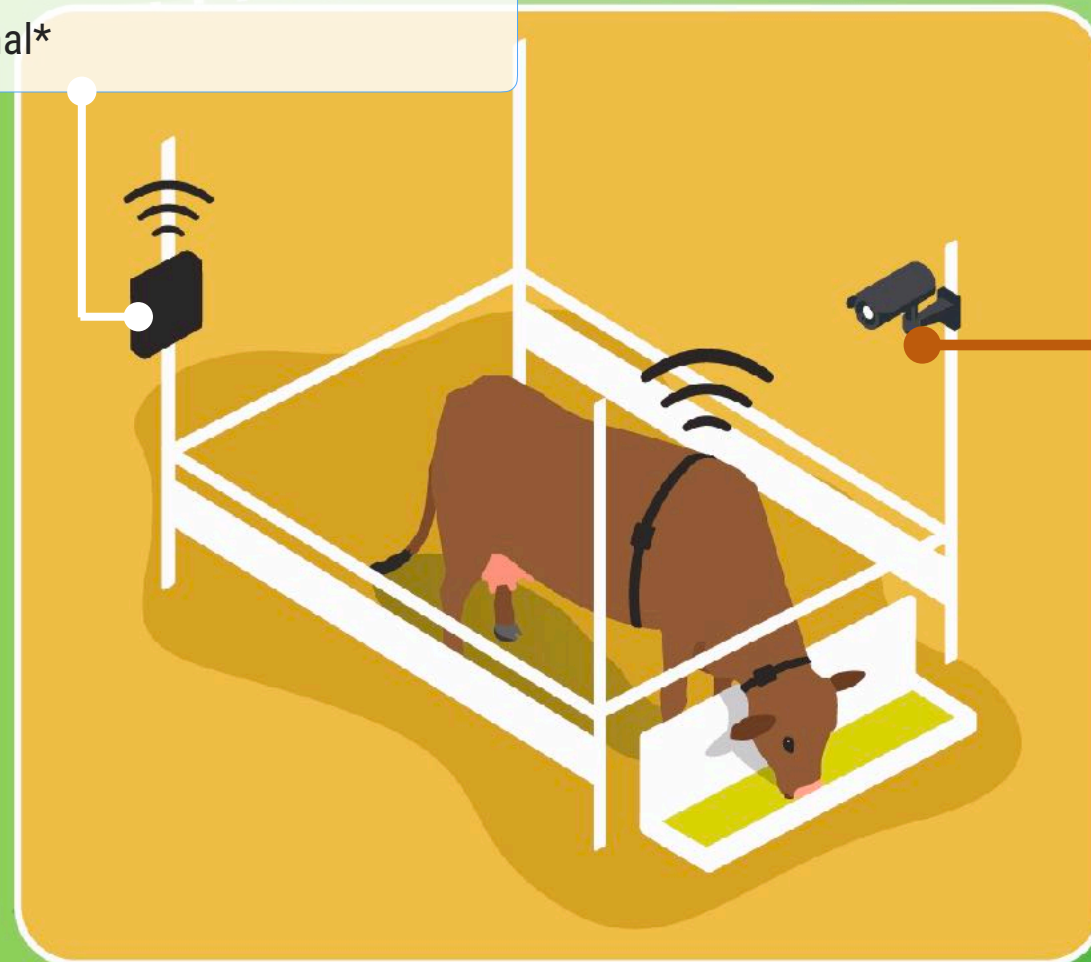
Provide surveillance and help herding.

In development

ENVIRONMENTAL SENSORS

Collection of sensors to monitor environmental

optional



SMART CAMERA

Monitor behaviour of 5 - 10 cattle, count herd, and estimate body weight through **AI-powered Machine Vision.**

**In development*



BASE STATION

5-10 km coverage, 1000+ devices. Connect devices with Cloud.



CLOUD

Where the heavy-lifting happens.

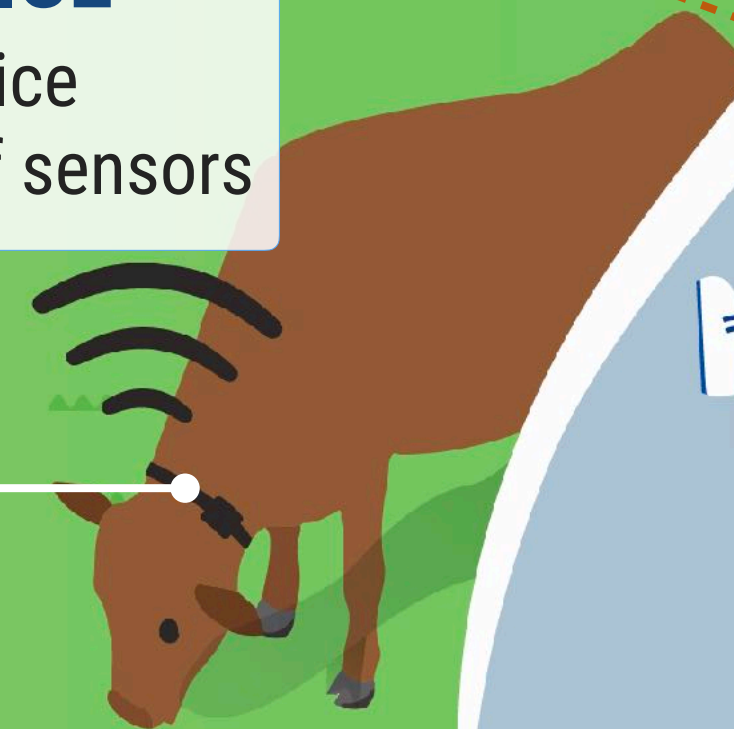


CARETAKER

One farmer/caretaker can easily cover a vast grazing area and hundreds of cattle, with the help of SMARTernak.

WEARABLE DEVICE

Cattle-wearable device contains plethora of sensors



VIRTUAL FENCE

Contain and move cattle without physical posts and wires.



FARM MANAGER / OWNER / INVESTOR

Cattle-wearable Device



SMARTernak is about platform. It's open to 3rd party devices.

**Electronic board is 100% designed
in-house, mass-produced in
Indonesia, by 100% Indonesian**

Dual IoT Connectivity

Short Range: 1 km WiFi, Bluetooth v4.2, BLE
Mesh-supported. High speed, e.g. for firmware update

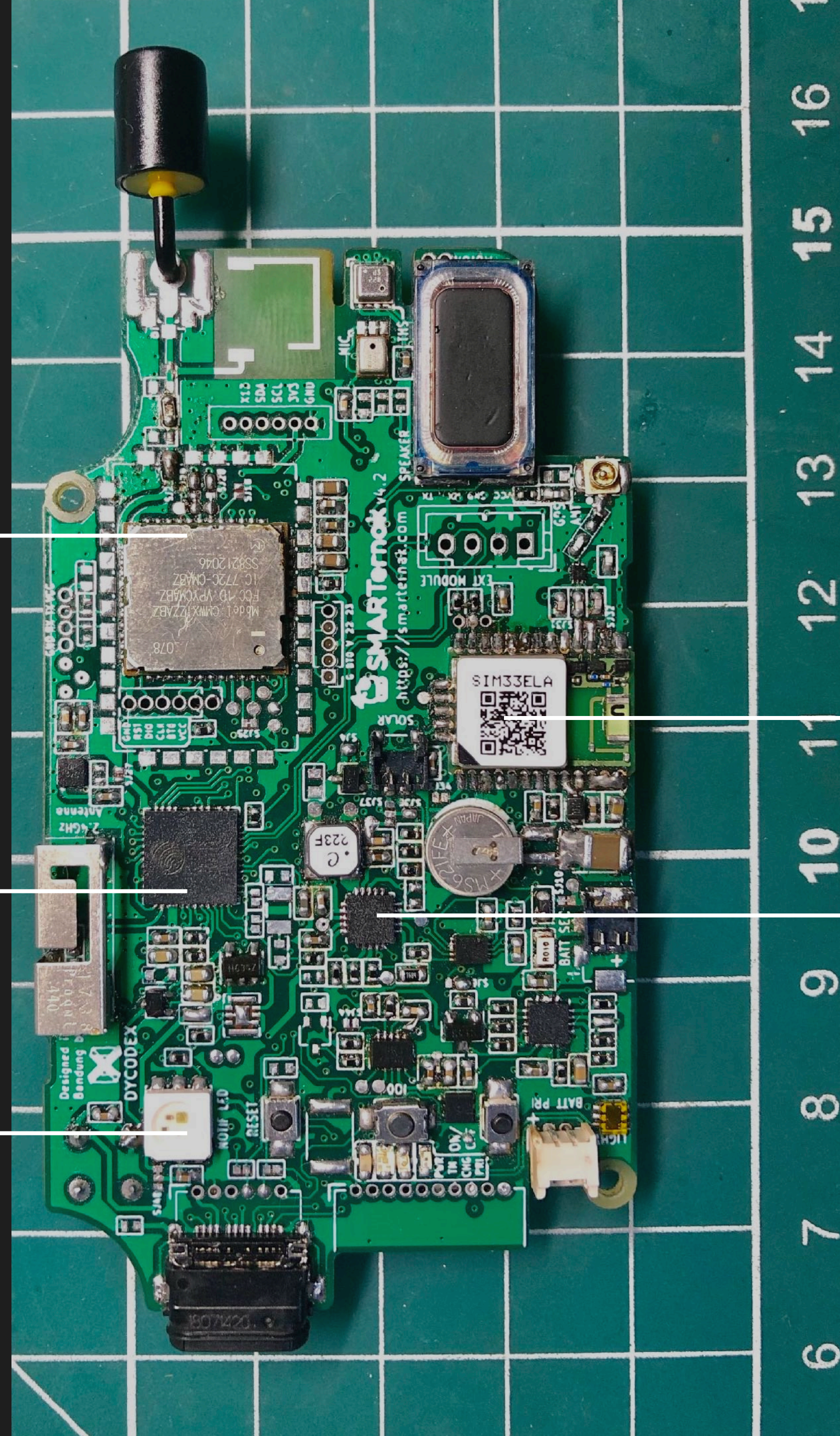
Long Range: **LoRa/LoRaWAN** or **NB-IoT**,
for 5-10km coverage area

Powerhouse

Low Power, Dual Core Microcontroller with on-device ML inference

Actuators

Audio Alert/Speaker Color LED



Packed with Sensors

GPS / GNSS
Accelerometer, Gyroscope
Body Temperature
Ambient Temperature & Humidity
Barometric Pressure
Ambient Light
MEMS Microphone
Device Removal Detector

Smart Energy

Battery Gauge

Solar Energy Harvesting

Smart Switching Between
Main & Backup Battery

Fast Charging from USB Type-C

Firmware-optimised
power consumption

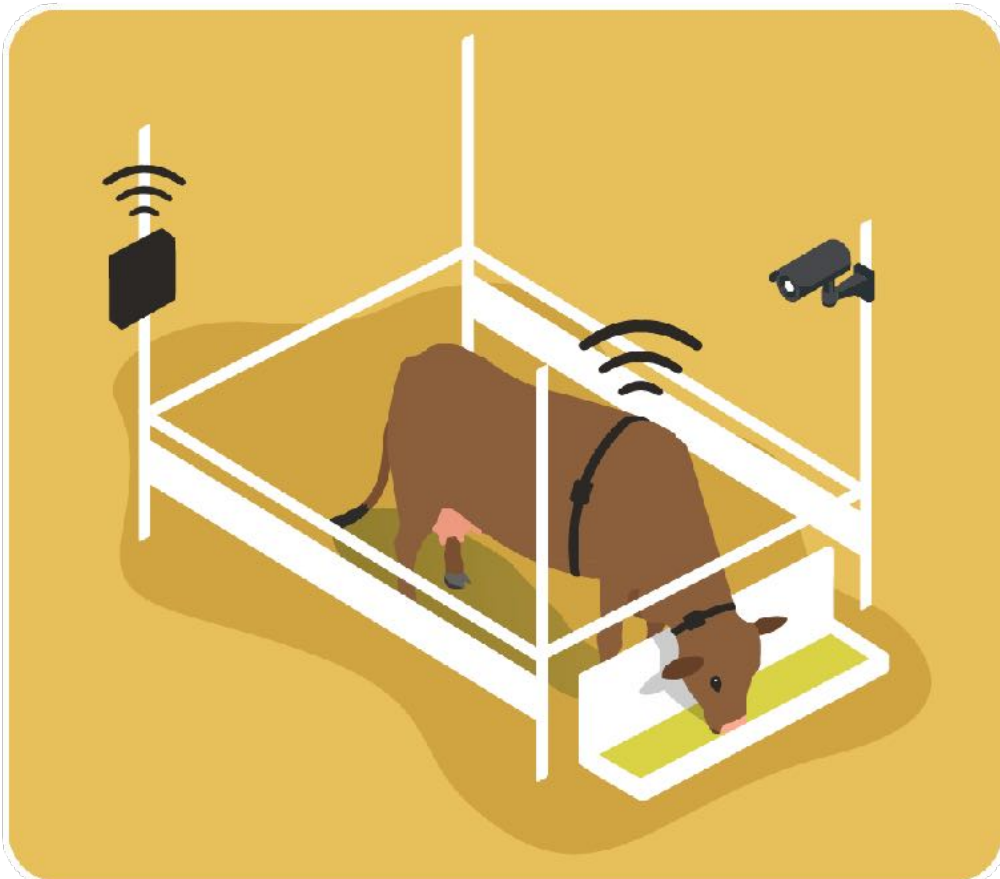
Monitor cattle's where-about & well-being parameters

On-farm Smart Camera:

- Monitor activity of 5 - 10 cattle - focus on group activity,
- Count herd & movement
- Estimate weight*

Environmental Sensors:

Monitor ambient temperature, humidity, and air quality in barn



Cattle-wearable device:

Precisely monitor each cattle for:

Location (latitude, longitude, movement speed, direction)

Body temperature

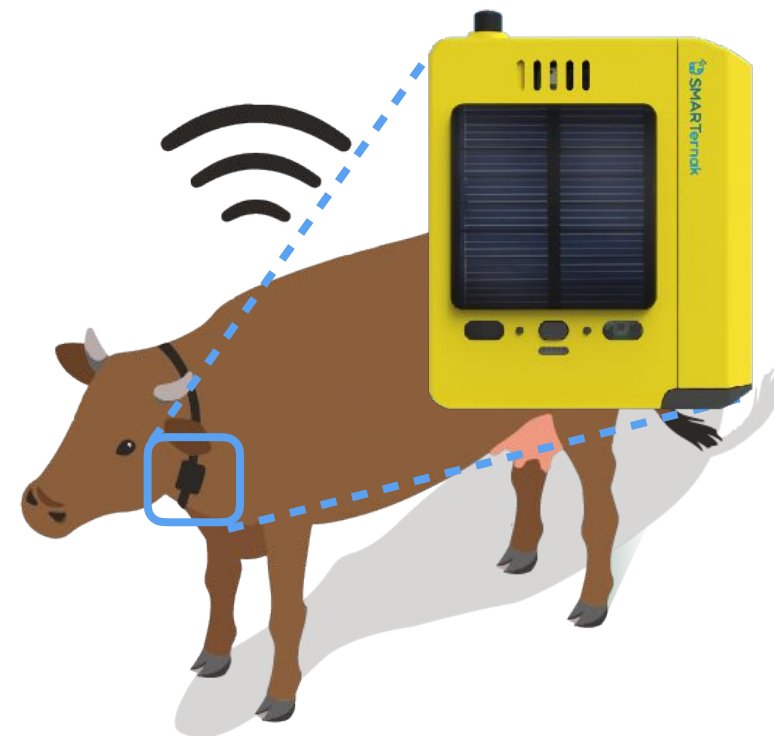
Ambient temperature & humidity

Ambient light & sound

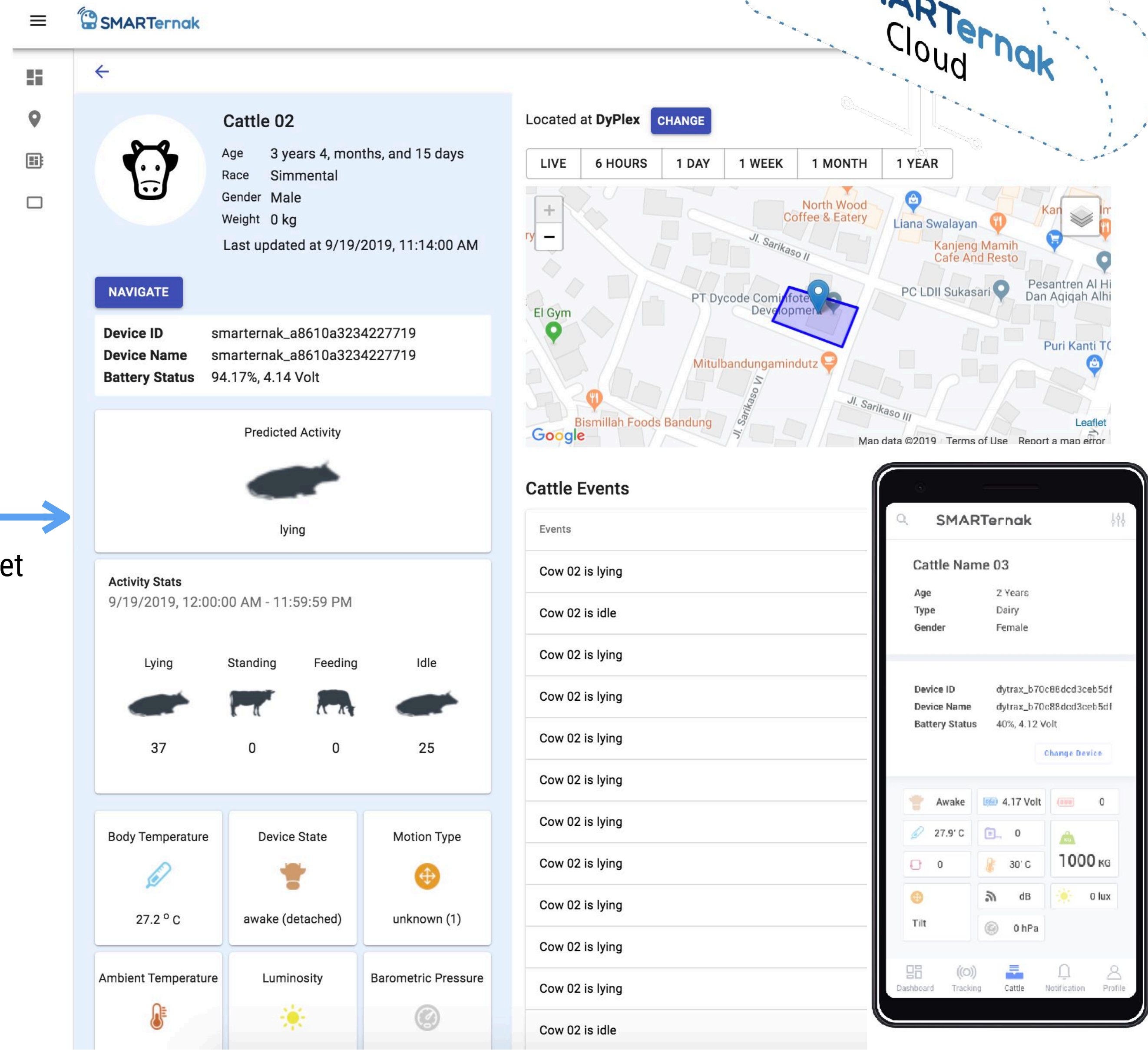
Movement (linear acceleration, angular velocity, direction)

Device removal status

Battery voltage & capacity

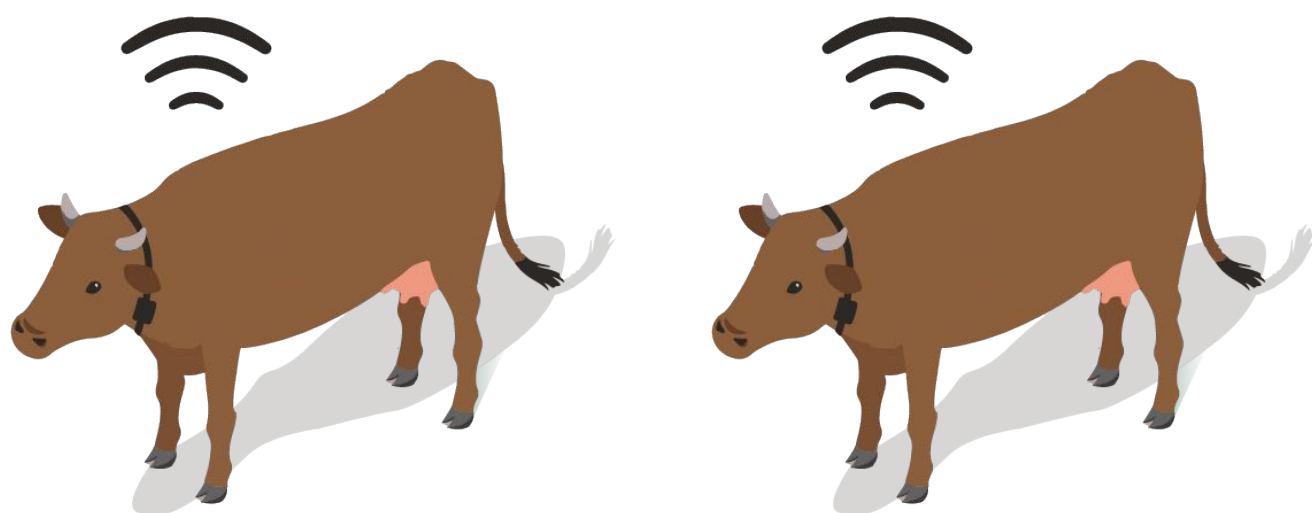
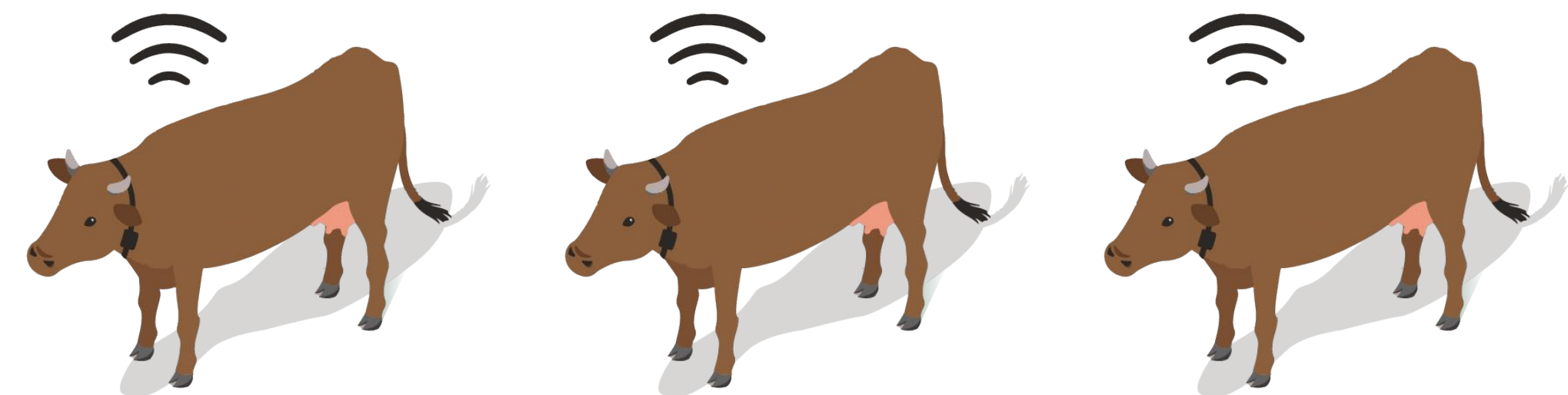


Internet

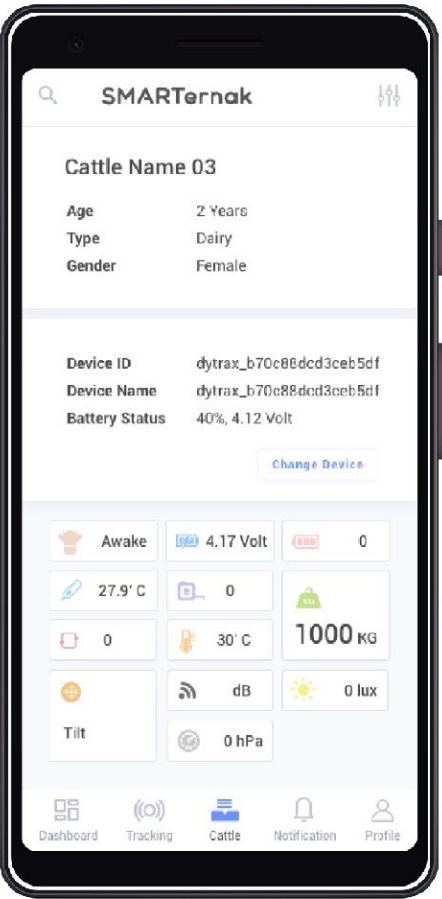
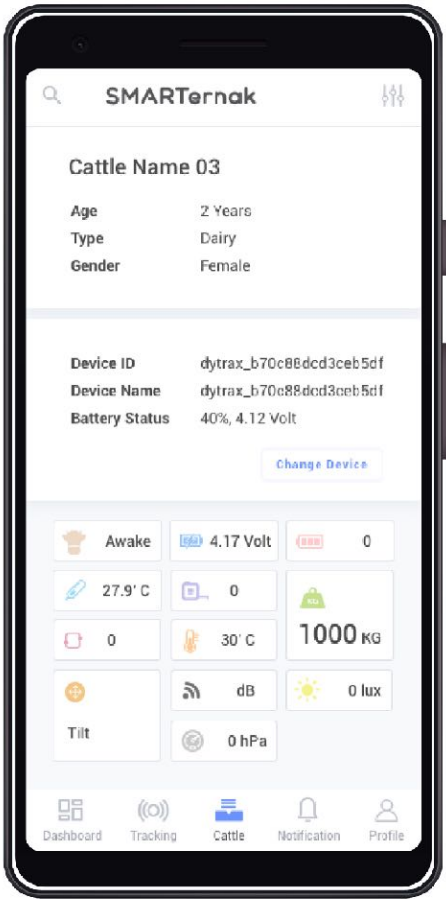
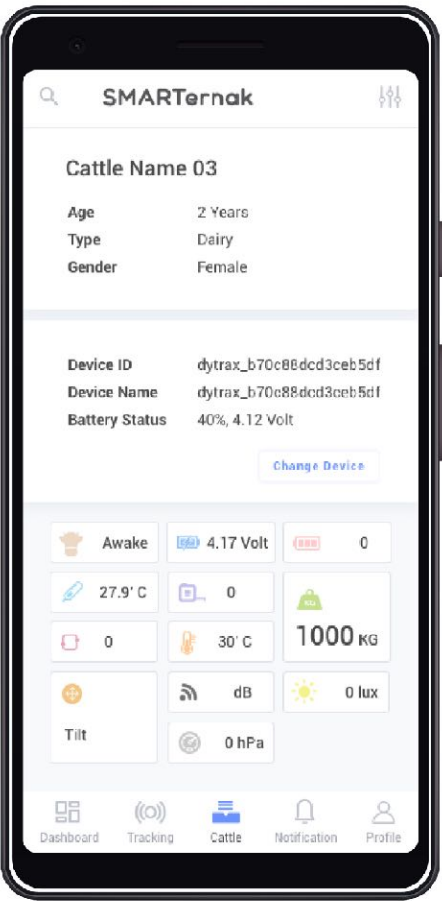
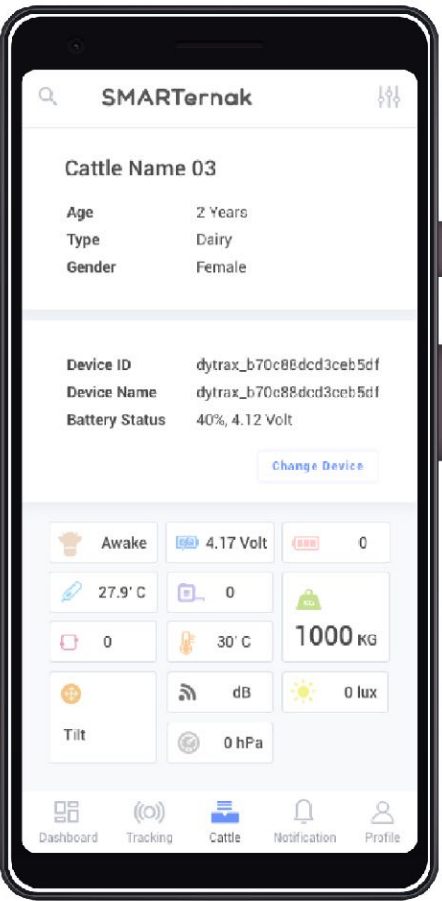
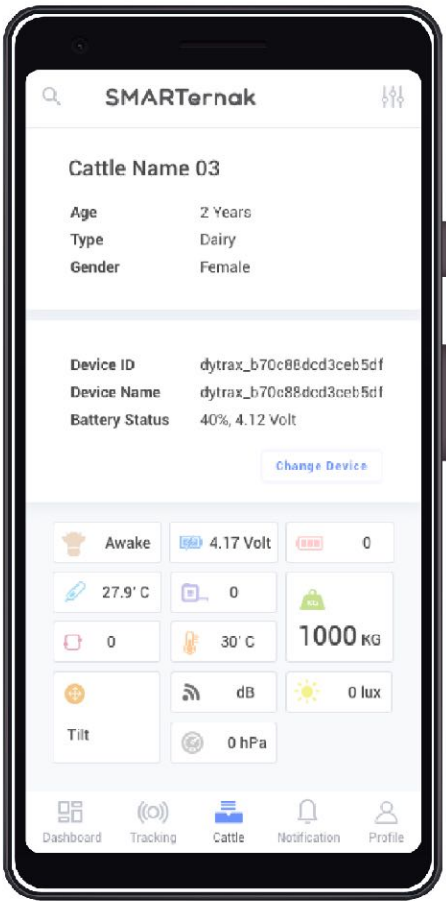


Monitoring

Now imagine...



...10,000 cows

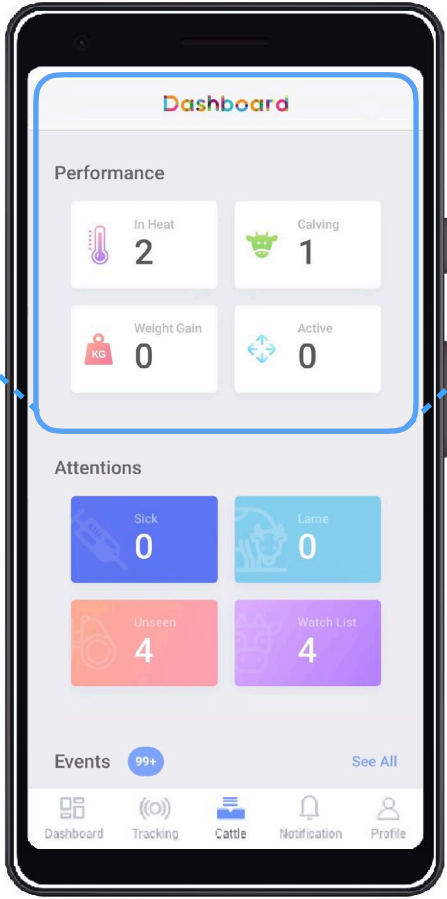
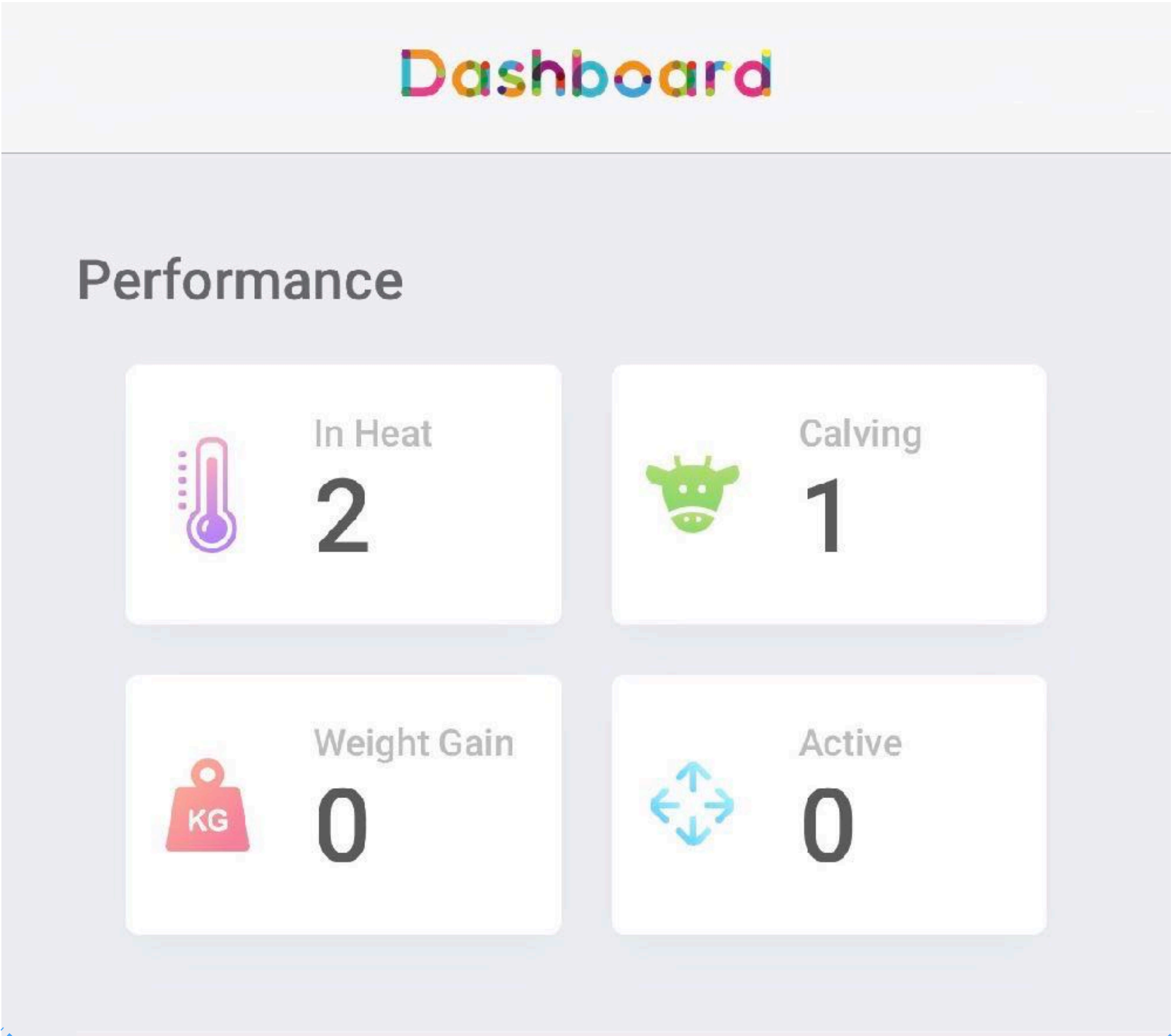
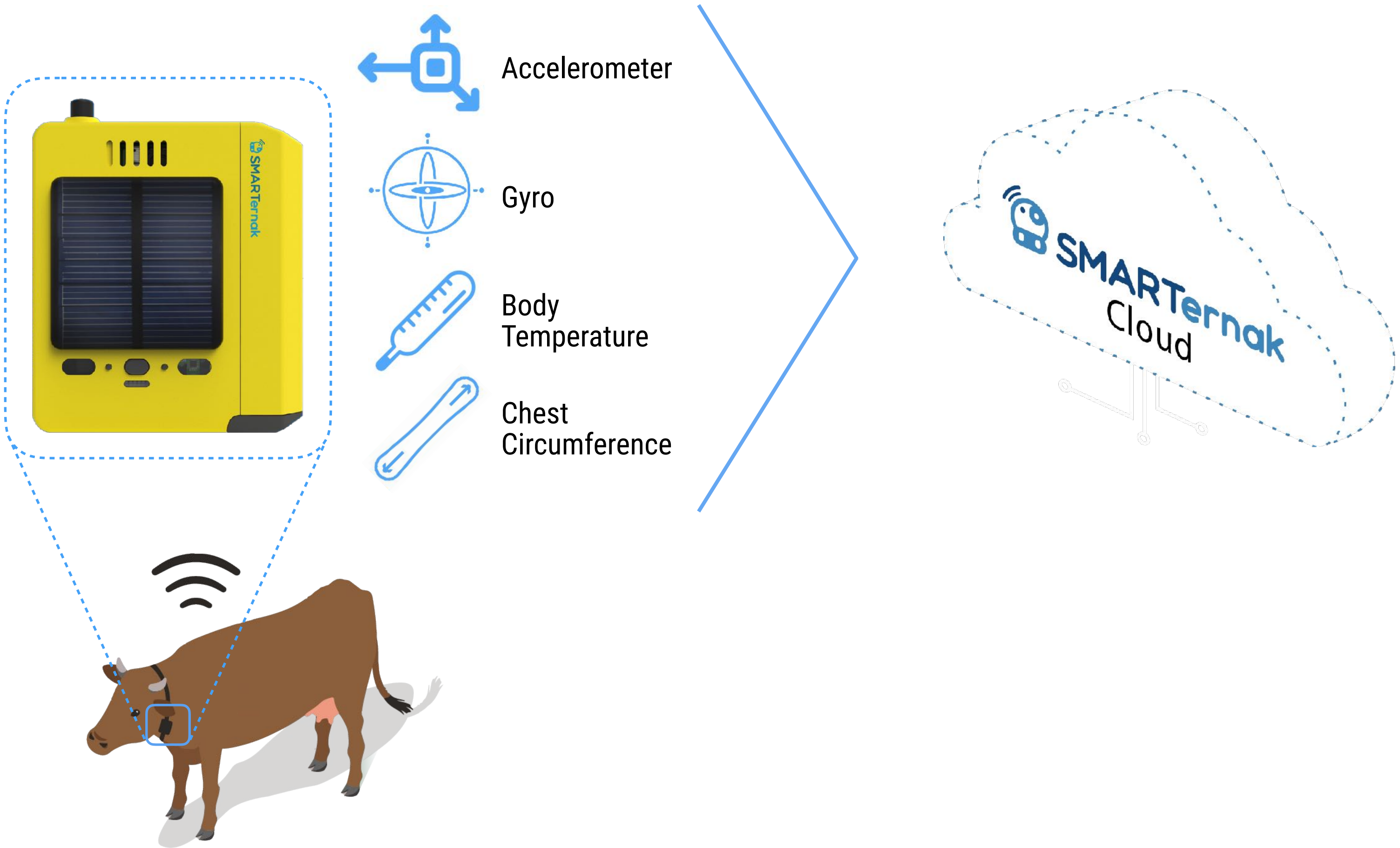


...10,000 views

Farmers may not need or understand raw data!

AI + IoT: Insights

This is where AI helps in SMARTernak.
Because cattle-farmer doesn't care about (raw) data



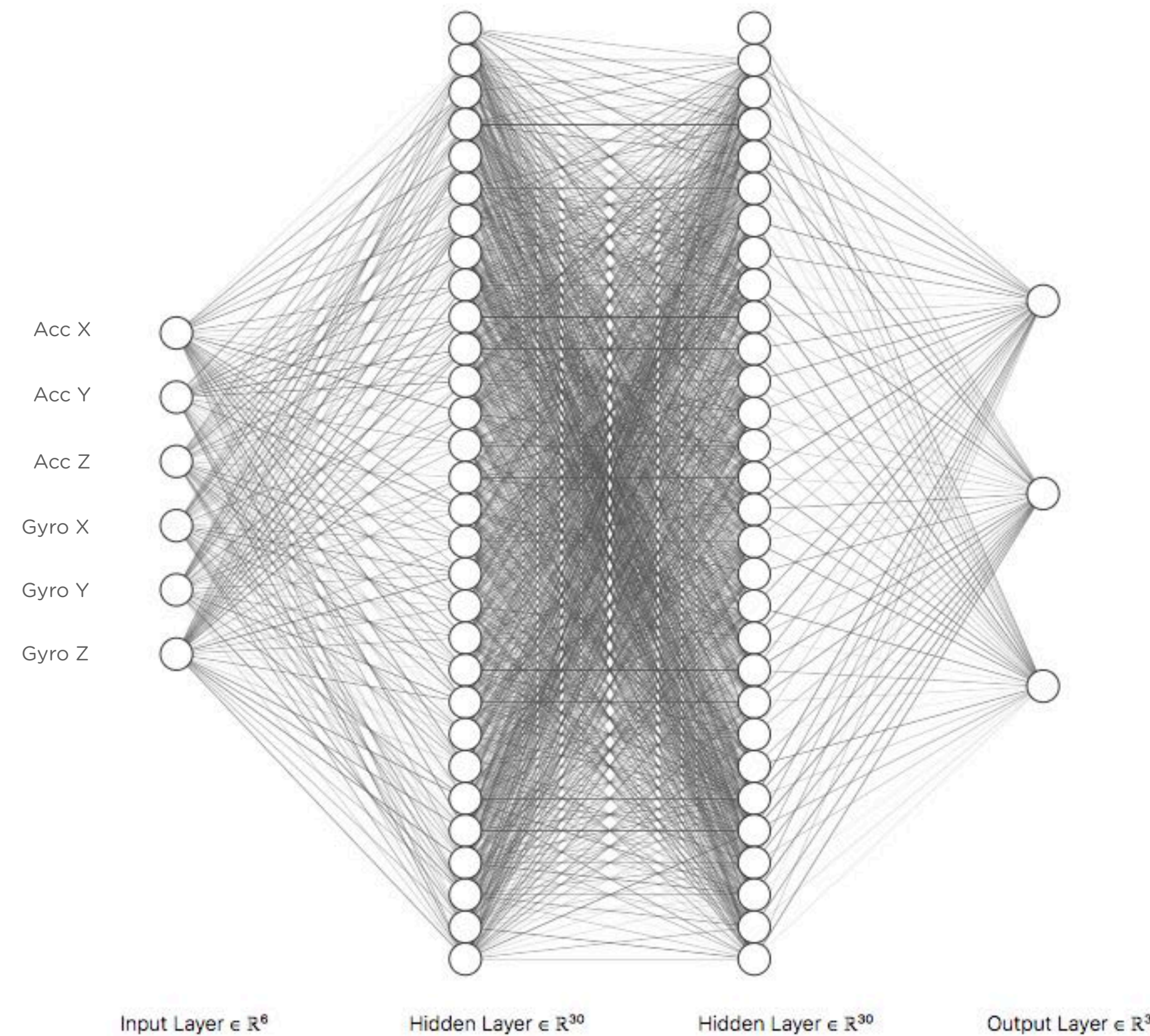
Mobile App

Artificial Intelligence at The Edge

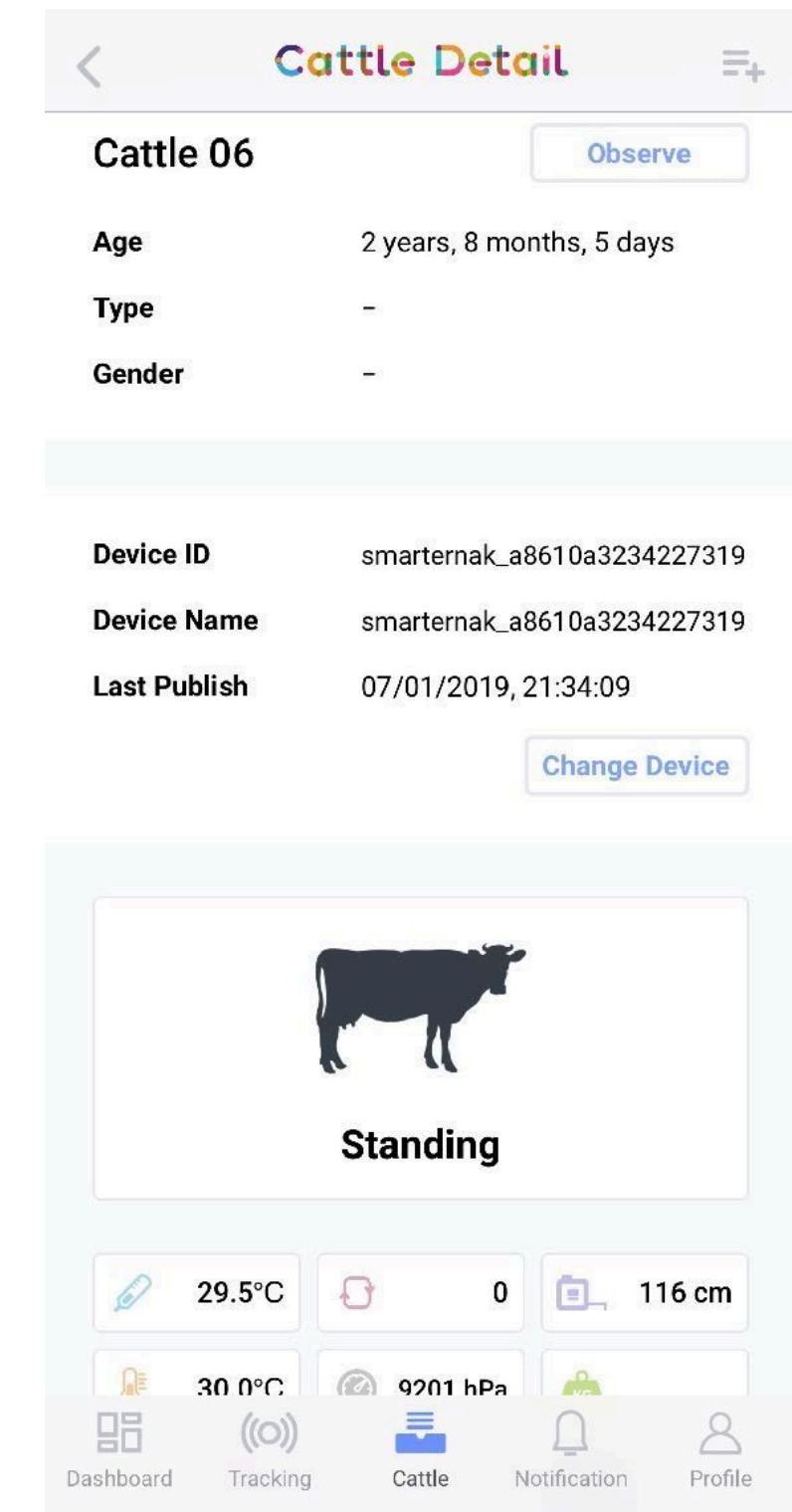
Learn & detect cattle behaviours to tailor actionable insights & recommendation based on sensor data with the help of on-device Artificial Intelligence



IMU sensor



Deep Neural Network



App

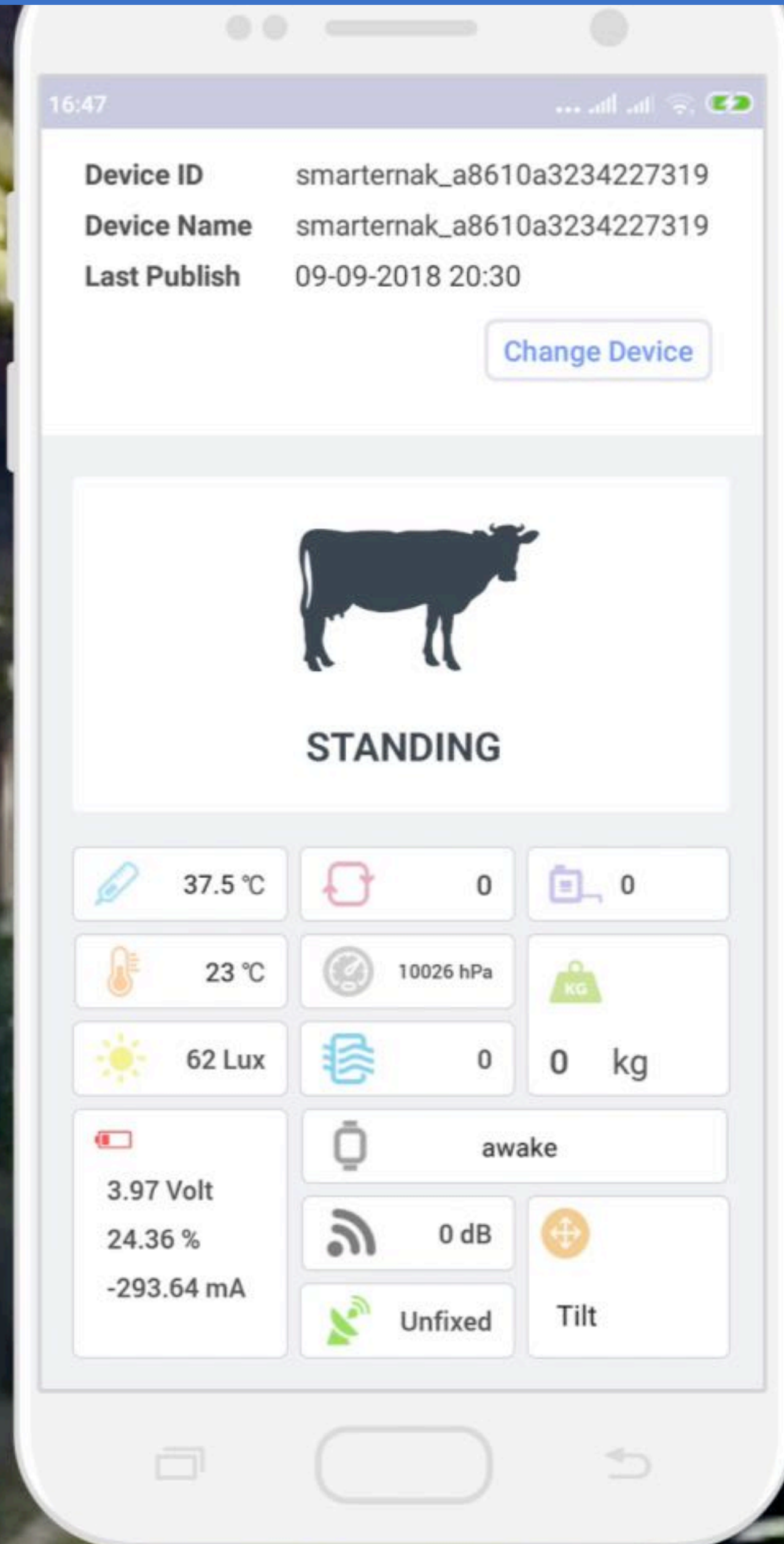
Motion captured by Inertial Measurement Unit (IMU) sensor inside cattle-wearable device

Predicted activity (standing, lying-down, feeding, and more)

On-device Activity Prediction

Using Artificial Intelligence and deep learning with Tensorflow, SMARTernak can detect and learn cattle behaviour and analyze the data into actionable insights and recommendations to improve efficiency and reduce loss.

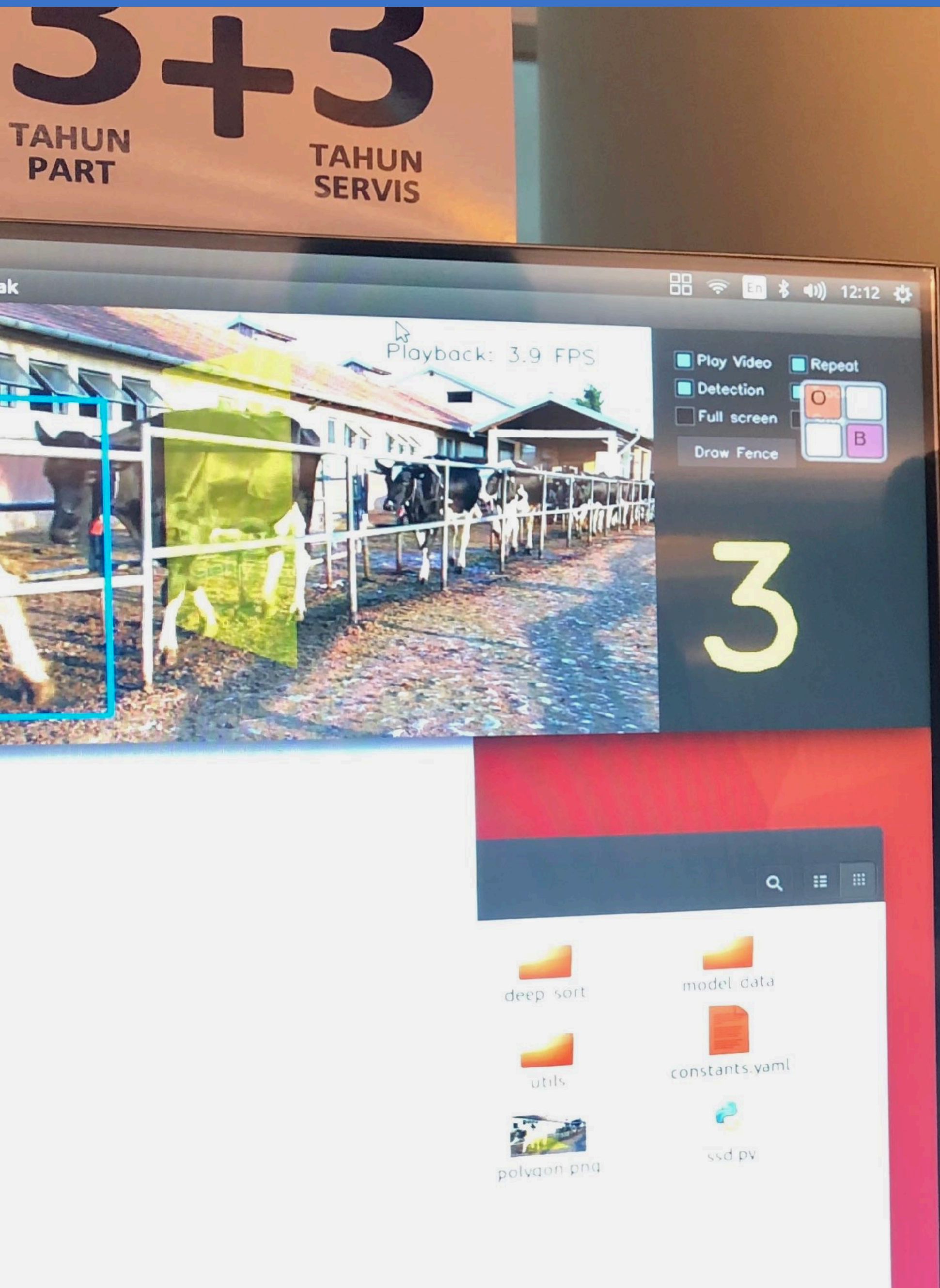
Demo Video: <http://bit.ly/smrtrnk-ai-1>



Actual footage taken from SMARTernak field trial live feed at PT. Sumber Hijau Mandiri on September 9, 2018. SMARTernak smartphone app overlay is an illustration of real-life usage.

On-farm Smart Camera

**In development*

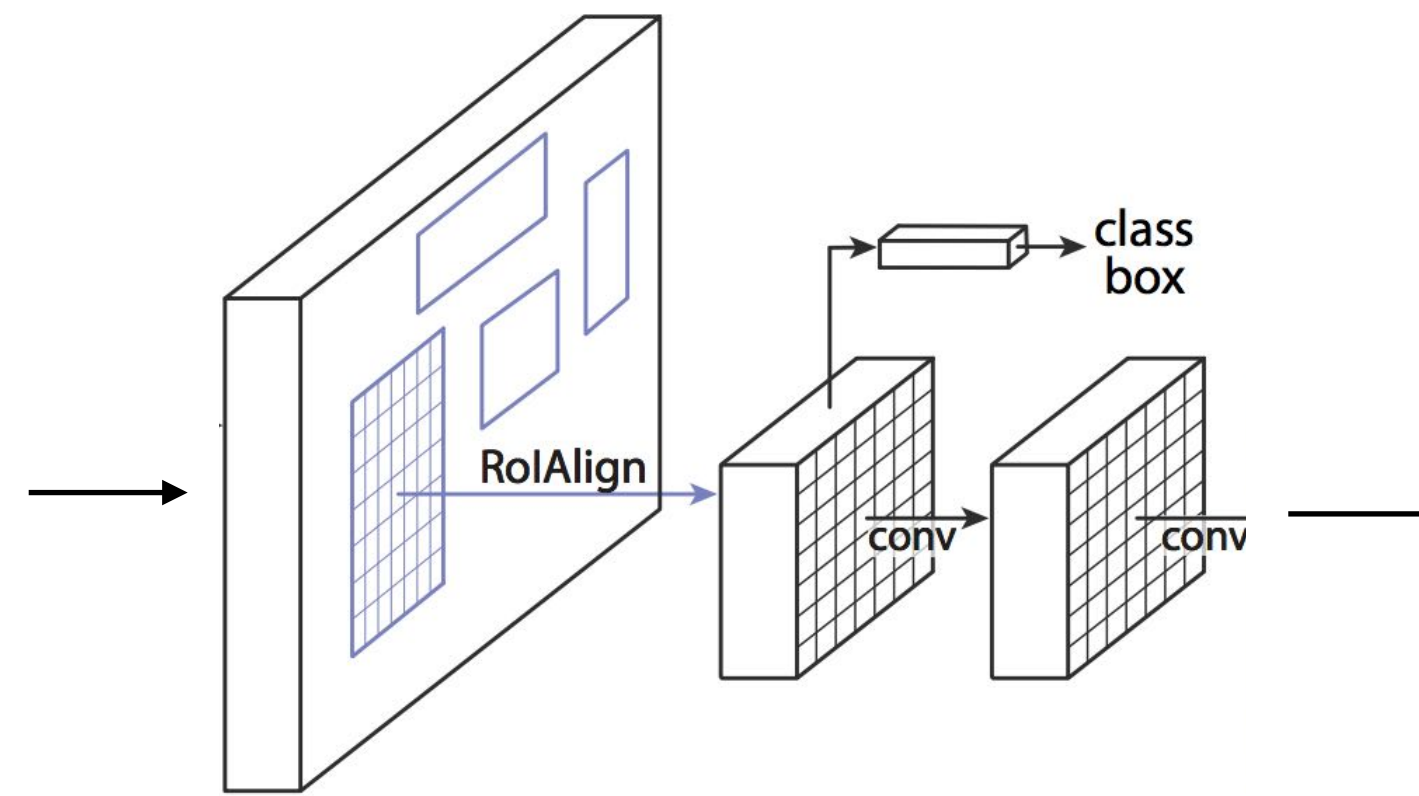


On-farm Smart Camera

Cattle Counting & Behaviour Analysis using on-farm camera
with the help of **Machine Vision & on-device Artificial Intelligence**



Image/video stream from camera

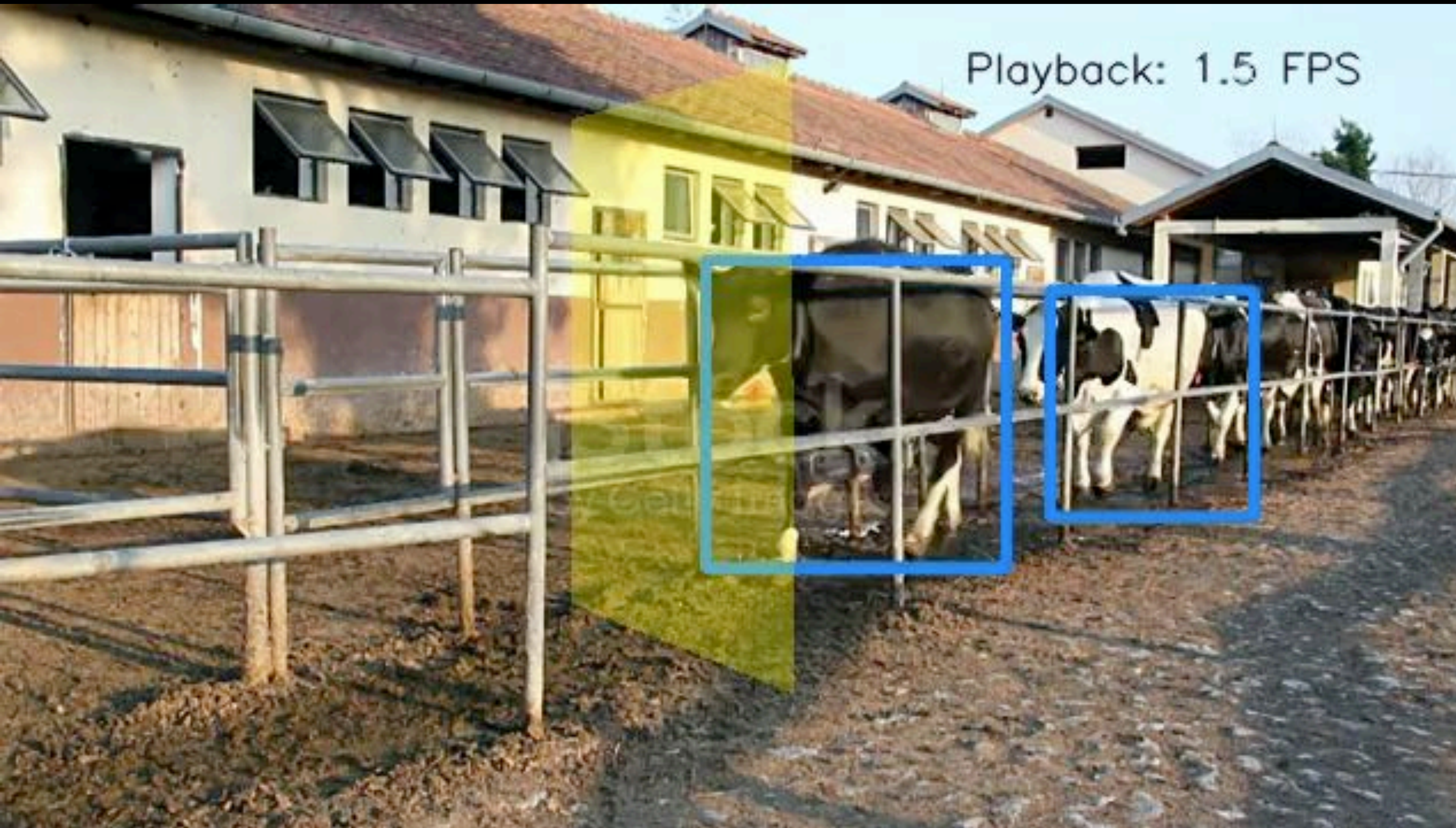


Deep Neural Network
(Instance Segmentation)



Detected cows and predicted activity
(standing, lying-down, feeding, ...)

Smart Camera - Cattle Herd Counting



- ☒ Play Video
- ☒ Repeat
- ☒ Detection
- ☒ Tracking
- ☐ Full screen
- ☒ Save

Draw Fence

0

Demo Video: https://youtu.be/Yk3O_HImSK8

Smart Camera Cattle Activity Recognition - Demo



Demo Video: <https://www.youtube.com/watch?v=hbiJhS3GftU>

SMARTernak Solution - Variants & Features



SMARTernak Ultimate



SMARTernak Tracking

for Extensive Farming

Free-ranging farming where mostly livestock grazes on large rangelands or pastures. Or, mixed crop-livestock farming: livestock grazes in the cropping area, such in integrated oil palm-ruminants system.



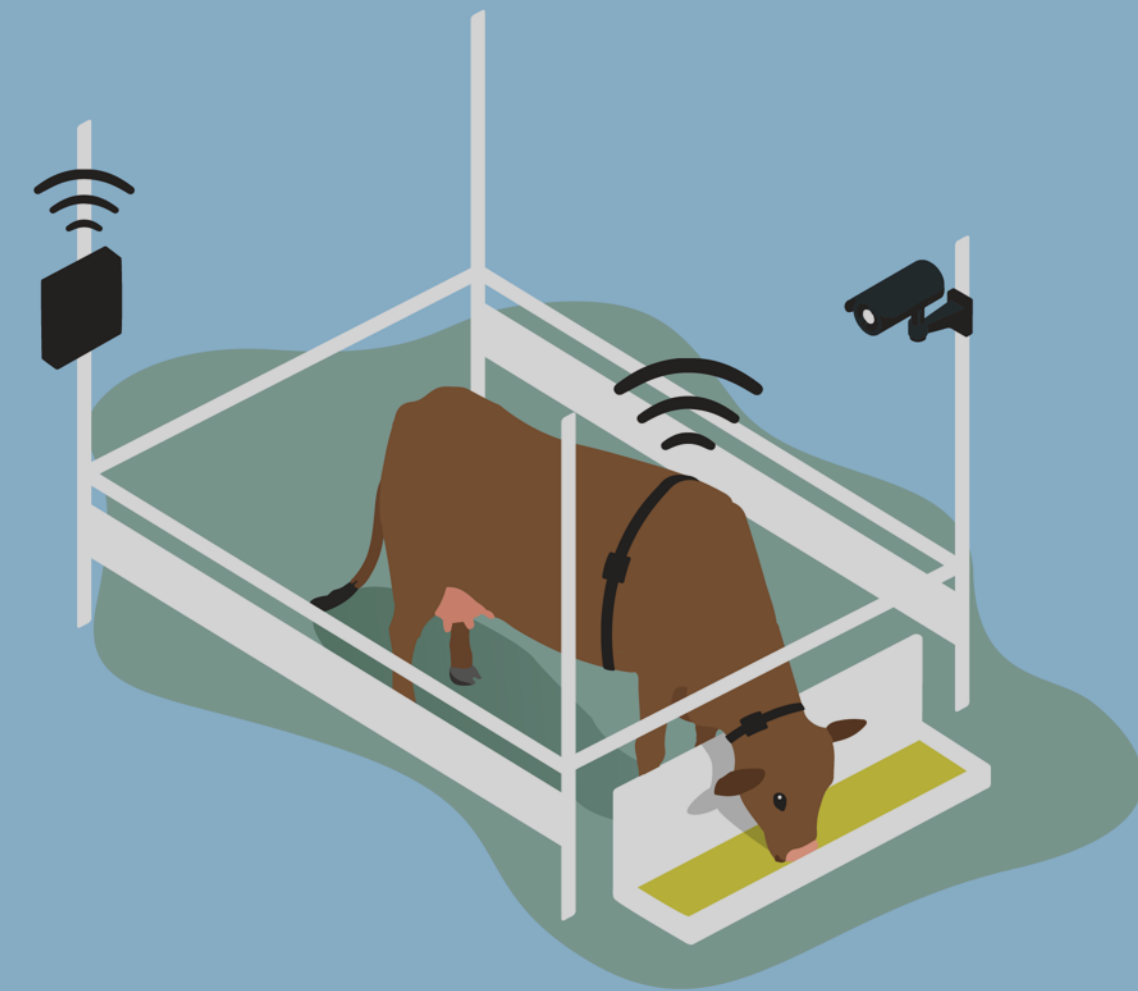
Track location &
behaviour



Herd counting



Virtual fencing



SMARTernak Health

for Intensive Farming

Livestock is confined in shed or barn and eat feed, or semi-confined which some graze in limited/small area in particular season. Mostly focus on fattening, breeding, or producing dairy products.



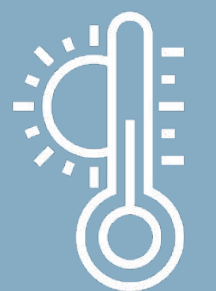
Monitor & alert
health issues



Estimate
weight*



Learn behaviour
(feeding, standing,
walking, etc)



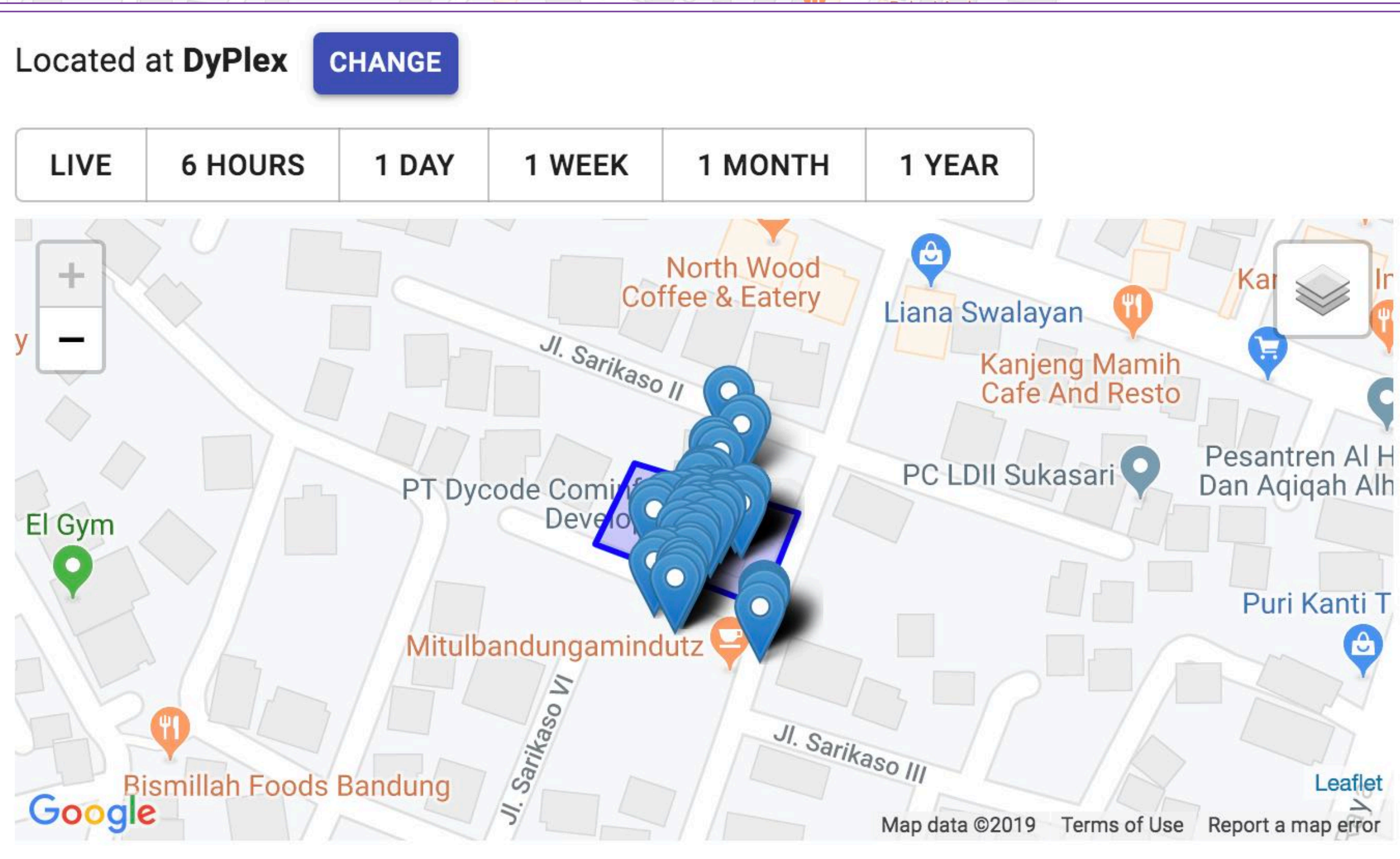
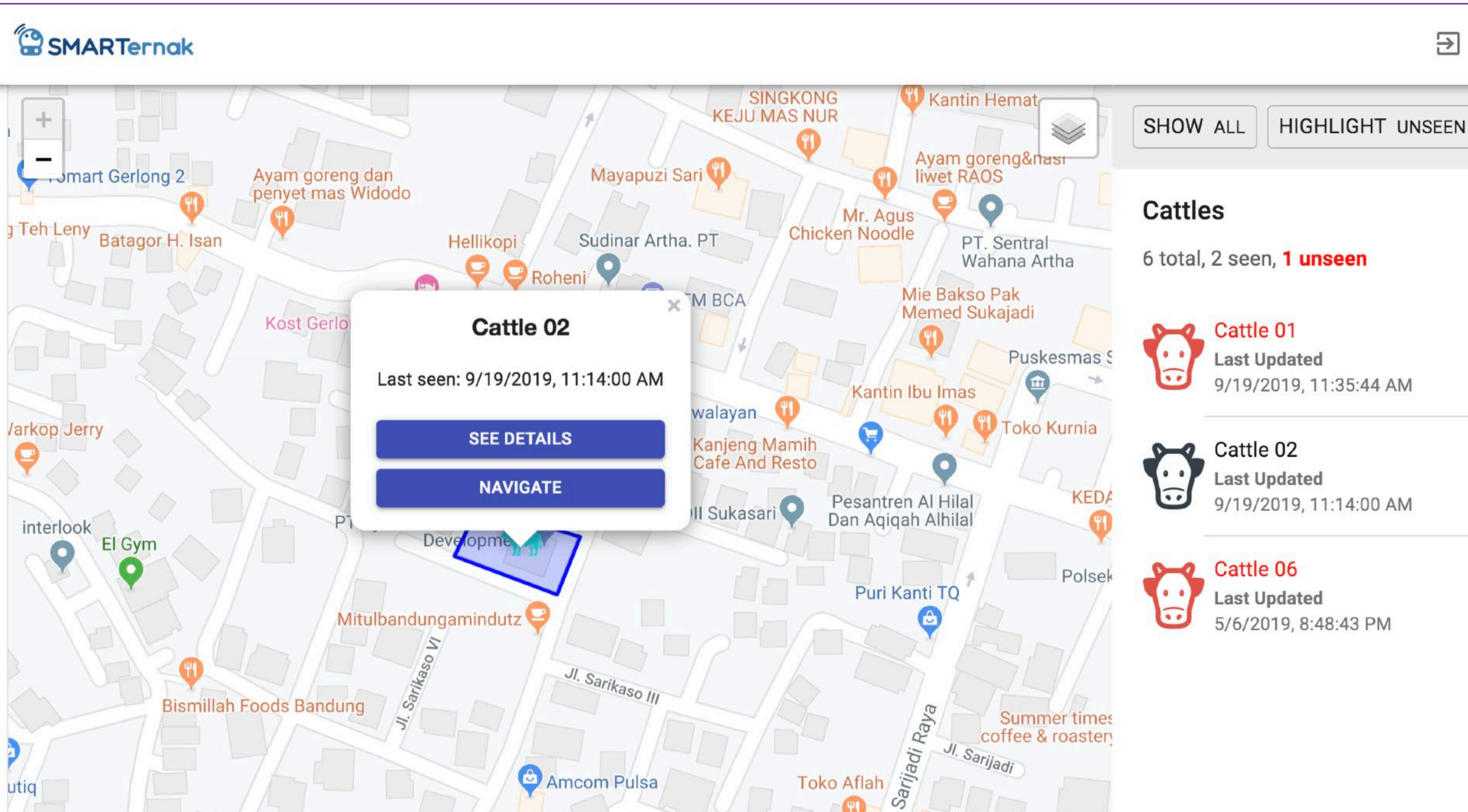
Monitor
environmental
condition

Virtual Fencing Testing



Virtual Fencing Testing





Cattle Location Tracking

Precisely locate cattle position

Monitor the pattern and distribution of grazing activity

Virtual fencing:

Virtual and remote herding

Control grazing pattern

Precise herd counting, no cattle left behind

Tracking - Benefits

Animal welfare

Less or even no need physical fence,
esp. electrical fence that may cause trauma

No risk of cattle stuck in fence

Missing/left cattle can be identified and
found in no time

Tracking - Benefits

Profit

Productivity increase:

No need to visually check cattle. Existing care-takers can handle more cattle, no need to add more.

Grazing pattern is controllable:

Ensure food source is sufficient for healthy cattle.
Give time for grass to grow.

No more missing cattle:

Prevent missing or stolen cattle

Less or not physical fence:

Reduce cost to install and maintain fence



SMARTernak: Live Demo

A Group Farm - Bantul, Yogyakarta, Indonesia



RJ Farm - Subang, West Java, Indonesia



Sumber Hijau Mandiri - Majelengka, West Java, Indonesia



Ministry of Agriculture's Breeding Facility - West Sumatera

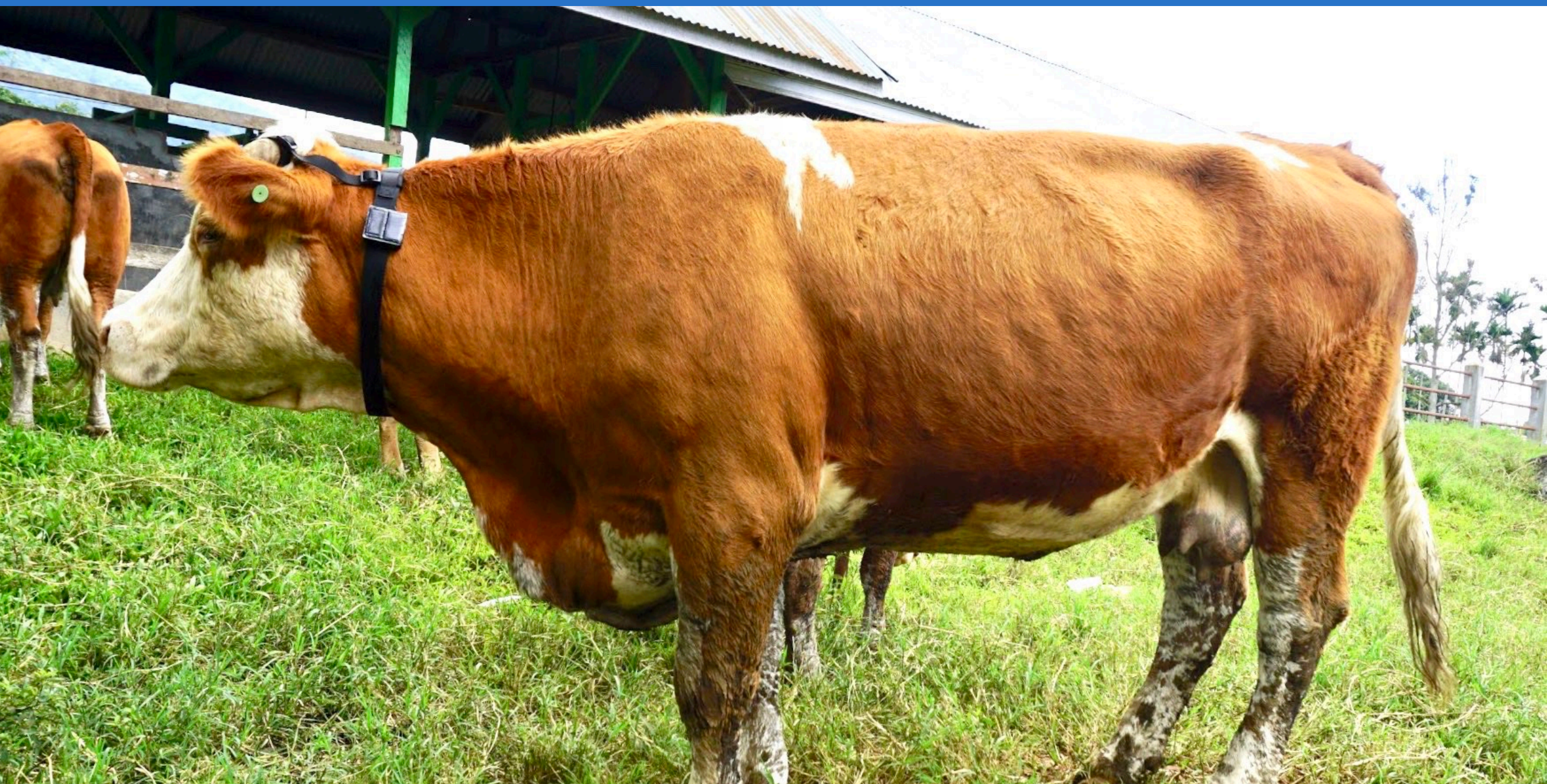


**SMARTernak
Real-World
Implementation**



RJ Farm - Subang, West Java, Indonesia

Ministry of Agriculture's Breeding Facility - West Sumatera, Indonesia



Don't just take our word for it

”

We can reduce the potential death of non-eating cows significantly, by the notification from the app. Now, I can sleep well.

Rahmat

Owner of RJ Farm, Subang, Indonesia

”

We manage 1400 cows with 100 staffs. Now we can bread more cows and increase productivity, without adding more staffs.

Dr. Harry Suhada

Animal Breeding and Genetics Expert
at Ministry of Agriculture, Indonesia

Coverage by Metro TV in Ciawi, Bogor

Watch here: <http://video.metrotvnews.com/start/akWGwjLk-asli-lokal-kualitas-global-1>

START

Pricing

Device Price

+

Subscription



Rp1.39^{*}
Million

or

SMARTernak
Ultimate

*All Tracking + Health features,
in one device*

Rp2.39^{*}
Million



Rp1.39^{*}
Million

SMARTernak
Smart Camera

*Monitor 5 cows at once
(optional, coming soon)*

Rp4.39^{*}
Million

+ Base Station^{**}: **Rp13.99 mil**

Rp83K

per cow, per month ^{***}

Includes:

Access to web dashboard and mobile apps,
and all future updates

Cloud subscription cost

Device warranty and support

* Price for **100+** quantity. MOQ **10 devices** at \$129/device. Get up to **25% discount** for **1000+**. Device is reusable.

** Base Station only needed if using **LoRa connectivity**. Only need one to cover **5km radius**, for **100+** devices.

*** For 100+ devices. Other volume, let's talk.

LET'S DO TRIAL

We understand that before the massive implementation, customers often need to try the solution out first.

Let's discuss.

Implementation Phases

Field Trial

Limited implementation to try out the solution, and identify unique requirements

Device: 5 - 10 pcs

Duration: 1 - 3 months

Lessons-learned & Customization

Collect lessons-learned, feedback, and new requirements

Propose system design that accommodates customisation and improvement needed

Decide GO or NO GO

Develop new system design

Duration: 1 - 3 months

Real Implementation

Real and massive implementation

User assistance is provided

Device: upon request

Duration: 3 - 6 months

Ridwan Kamil, West Java Governor



ridwankamil • Follow



IMPLEMENTASI "DESA DIGITAL" MENERIMA AWARD OF EXCELLENCE 2019 dari OpenGOV, institusi internasional di bidang inovasi pemerintahan. .

INOVASI ini adalah salah satu yang mengangkat 537 desa naik kelas dari desa berkembang menjadi status desa maju dalam waktu 10 bulan.

Award ini didedikasikan untuk semua pihak yang bekerja keras melalui kolaborasi Pentahelix.

MARI SEMANGAT, jika desa juara maka Insya Allah #JabarJuara.

3d



56,804 likes

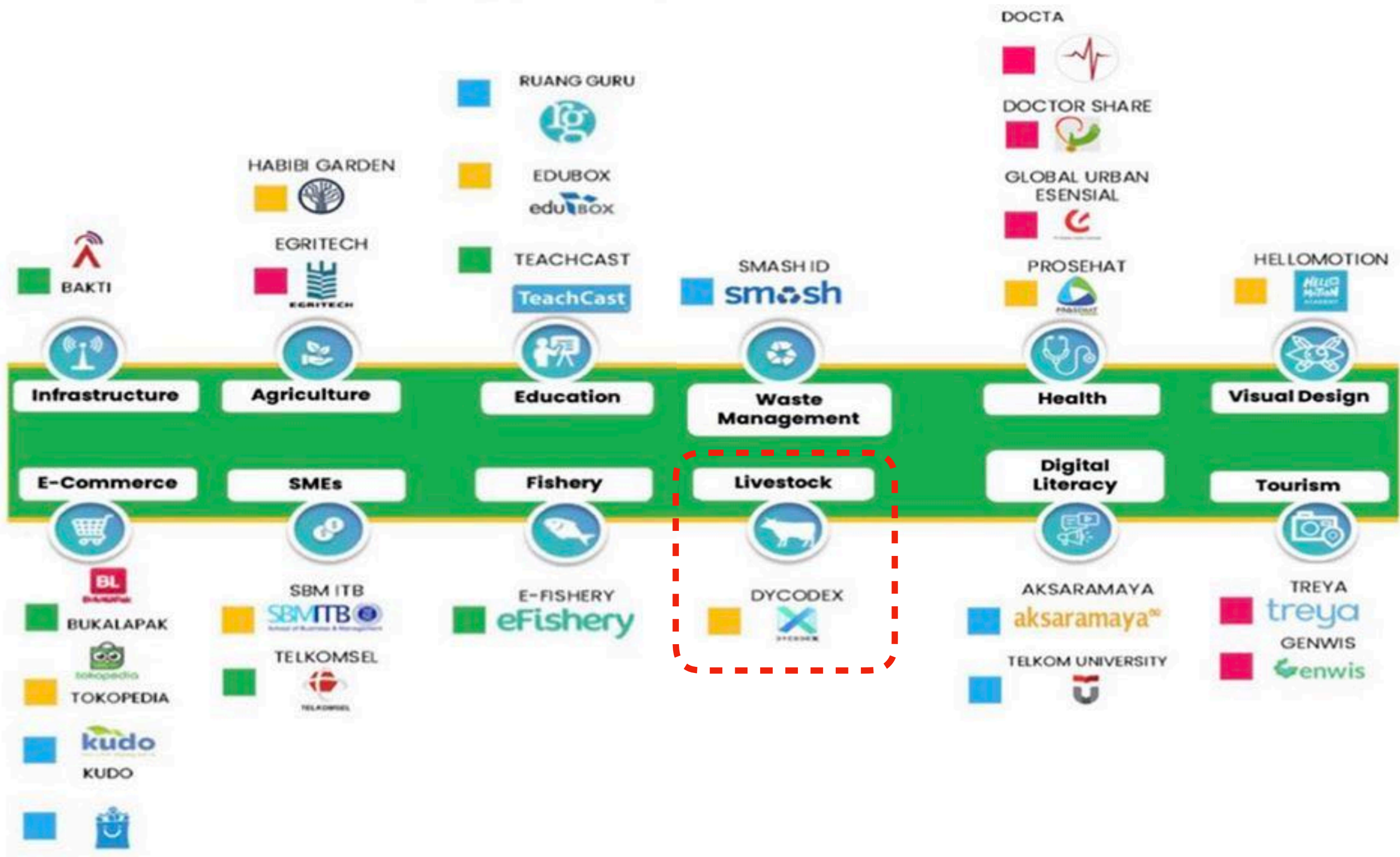
3 DAYS AGO

Log in to like or comment.

Digital Village

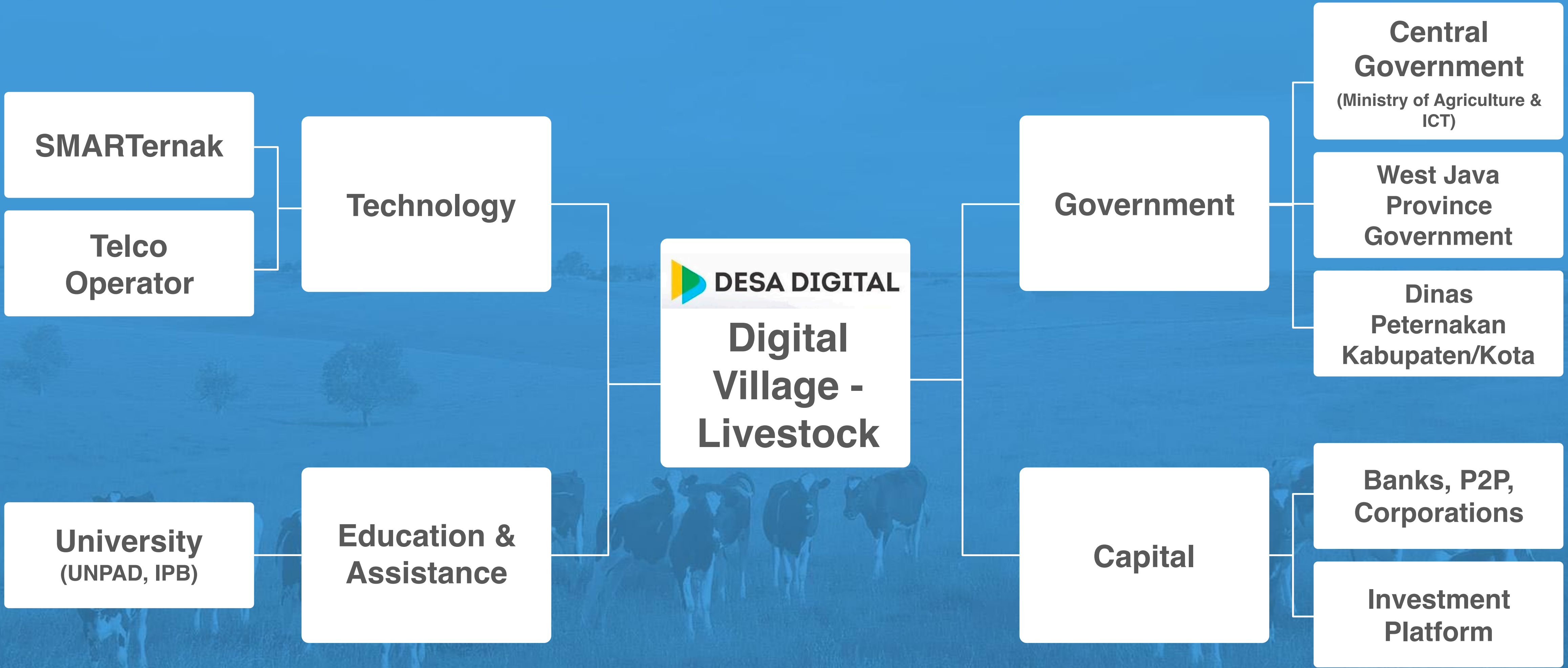


Digital Village Partnerships

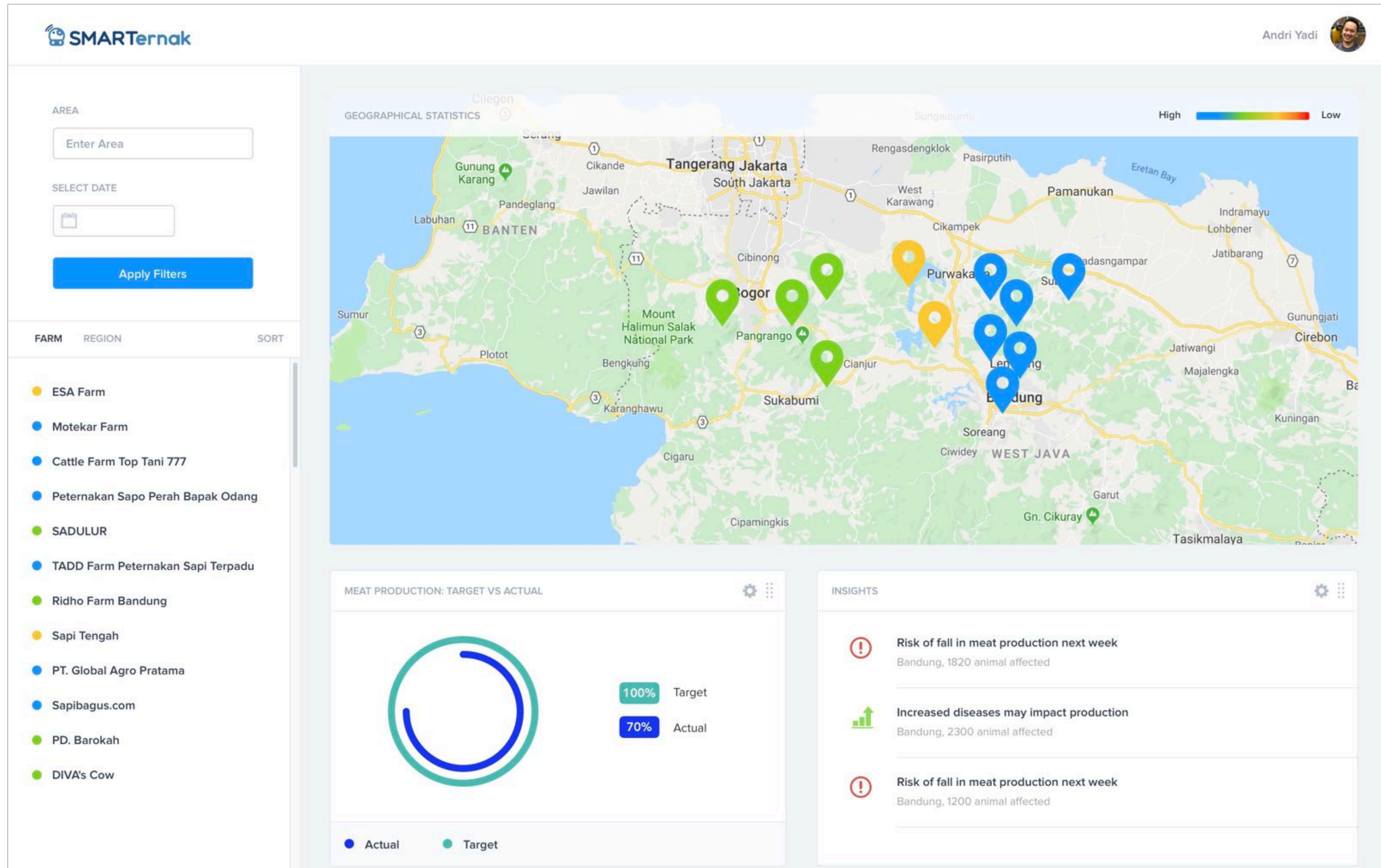


Digital Village - Livestock Farming

In progress to work with **West Java Government** - Digital Service Division, for an initiative of “Digital Village - Livestock” to tap the cattle farming potentials in West Java, which is the **2nd largest** in Indonesia



In the future...



DycodeX is much more than just
SMARTernak and Agricultural space

Products & Solutions Focus

Home-grown AI & IoT-powered devices & platforms



DytraX:
Asset Tracking Platform



Smarterbike:
Bike Fleet Management
(e.g: bike sharing)



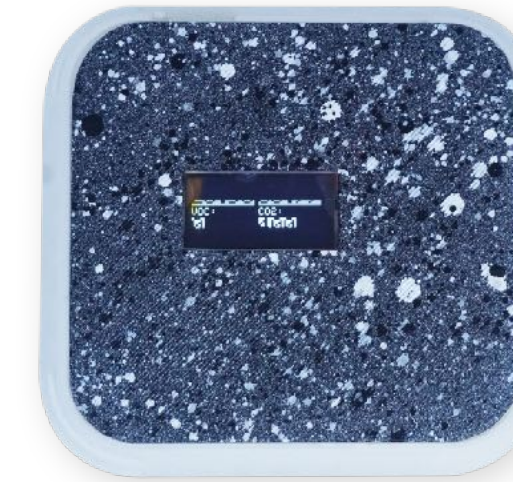
SMARTernak
Cattle-farm assistant



AITrash
Smart Trash Management



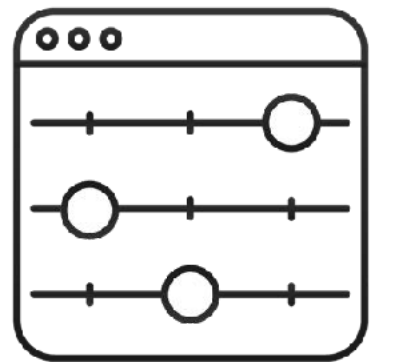
PowtraX
Electricity metering



Alora
Industrial Environmental
Sensing



**Machinery Health
Sensor**



**IoT Prototyping
Platform for
Education, Makers**

**Custom hardware
design:**
already helped 12
companies/startups

**End-to-end AI + IoT
development:**
firmware, cloud, AI,
web & mobile app

Asset tracking

Agriculture

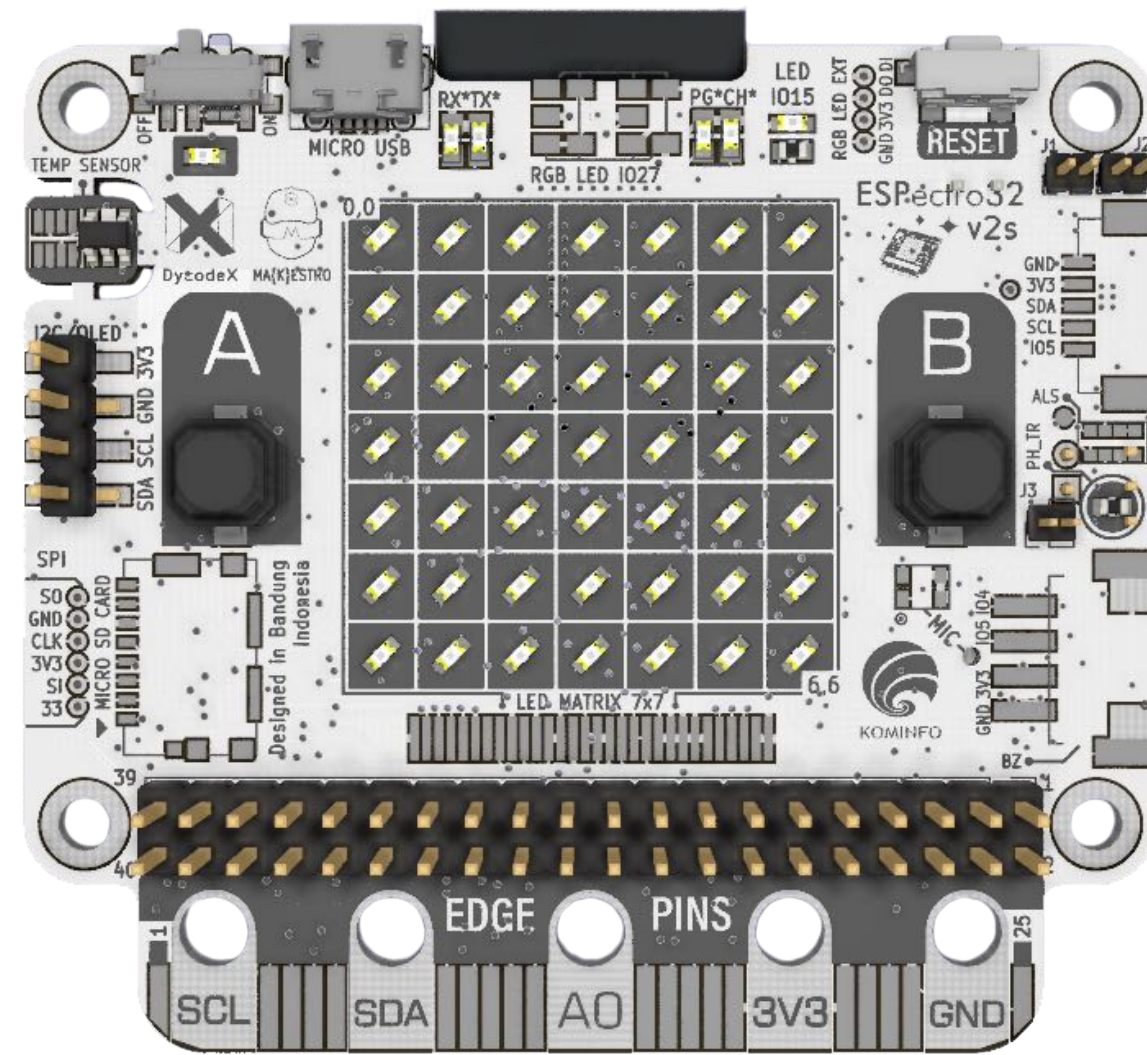
Environment

Energy

Industrial IoT

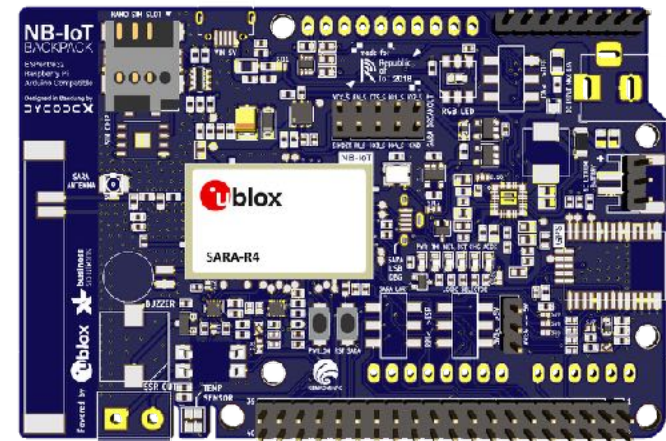
Design House

IoT Prototyping Platform for Education & Makers



ESpectro32

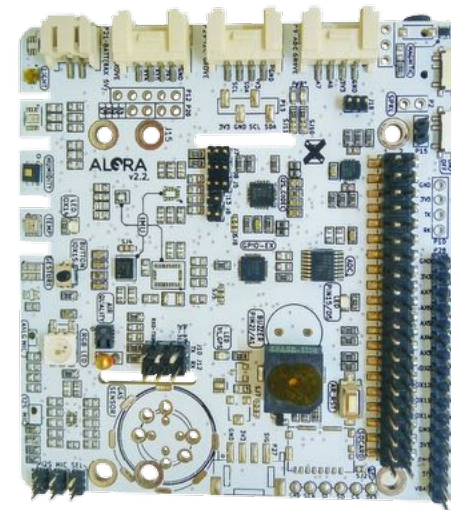
Backpacks



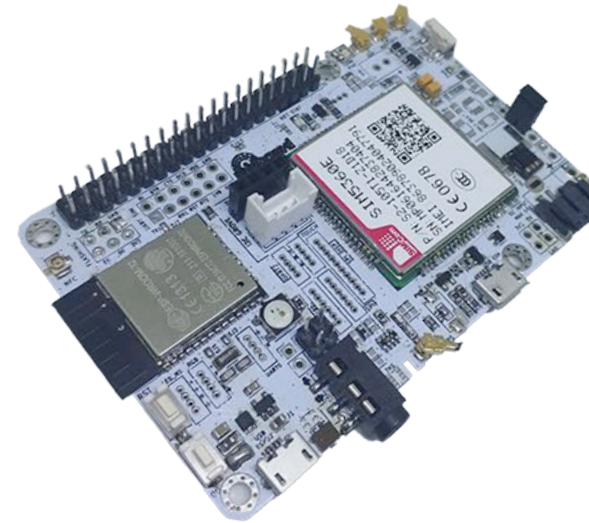
NB-IoT + GPS/GNSS Kit



LoRa/LoRaWAN +
GNSS Kit



Sensors & Actuators Kit
(20+ Peripherals)



3G + GNSS + Sensors

IoT Prototyping Platform

Optimized for learning STEM,
coding & electronics, also for fast
prototyping.

Already sold 1000+

Hardware:

ESpectro32: A development Board
having highly capable, low-power dual-
core Microcontroller, with built-in WiFi &
Bluetooth connectivity

Extensible with Backpacks: NB-IoT/
Cellular, LoRa, Sensor Kits, Motor Driver,
and more

Software:

Arduino Software-compatible, supported
by ready-to-use libraries

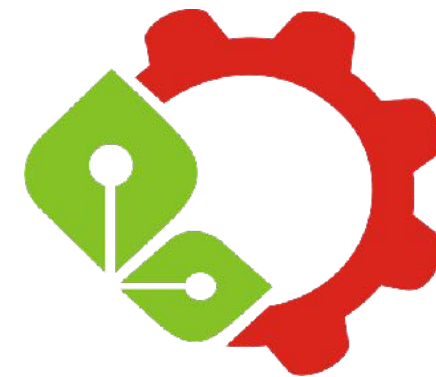
Learn to code with:

Visual drag-and-drop blocks*
Swift Playground*

IoT Cloud: to easily connect IoT devices

Partners

Officially supported by
3 Ministries of Republic of Indonesia



**Kementerian
Perindustrian**
REPUBLIK INDONESIA

Partnering with global brands for IoT R&D,
component supply, mass production, and go
to market



DEMO DAY

Google

SMARTernak terpilih sebagai satu-satunya produk dalam negeri yang mewakili Indonesia di ajang Google Demo Day Asia 2018

Perjalanan panjang Kami:
<https://dycodex.com/milestone/>



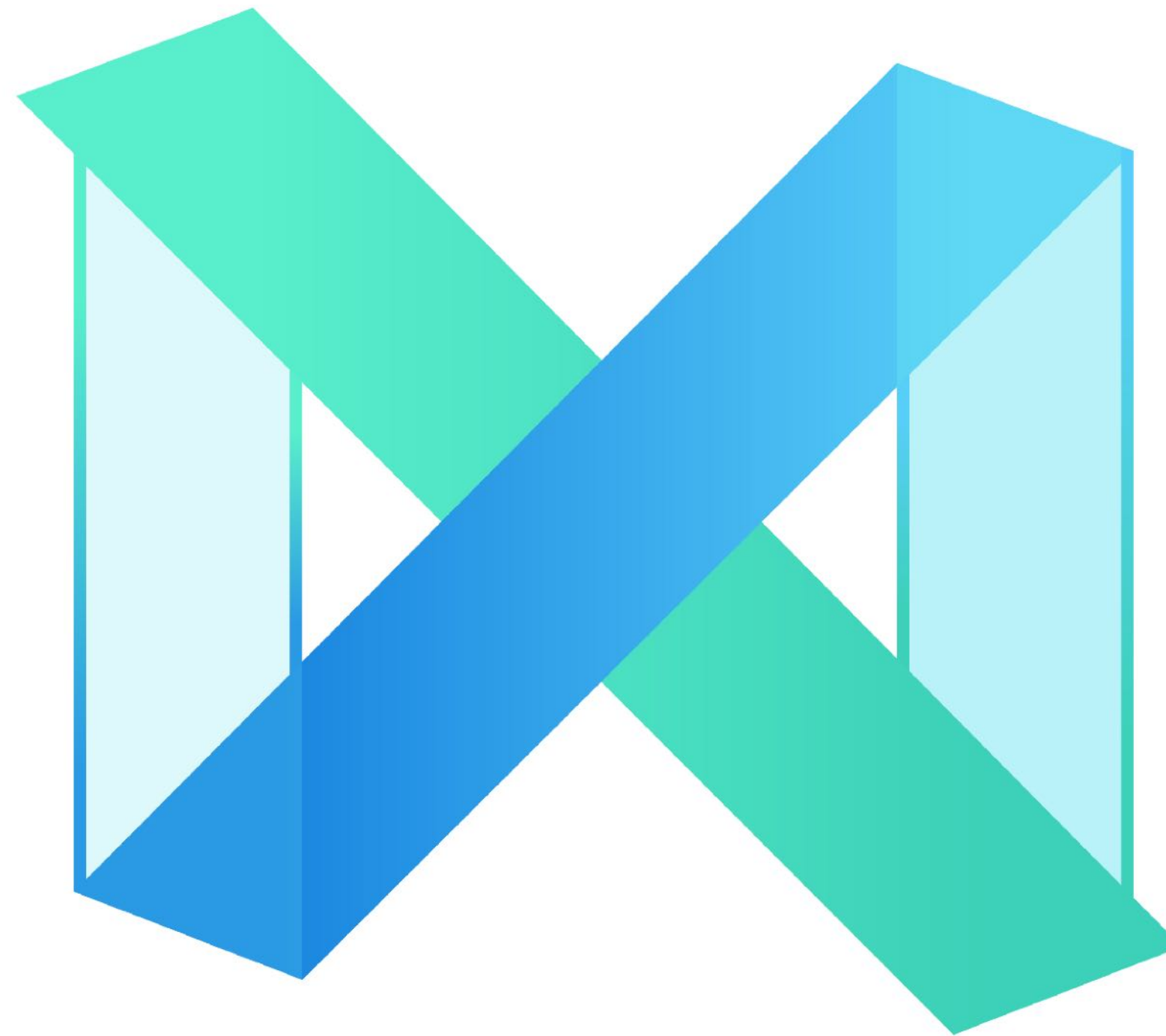
Desa Digital dengan SMARTernak

Sehatkan Sapi, Sejahterakan Negeri

hi@dycodex.com | <https://smarternak.com>



Keep in touch



DYCODEX
AI + IoT enabler

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