



Reducing **Carbon Emissions**  
and  
Finding the **Tastiest Steak**



20  
YEARS  
OF ICBF



# Our Vision

*“Empowering sustainable farming through collaboration and excellence  
in genetics and big data solutions”*



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# About ICBF

Next generation of animals are more environmentally and economically sustainable than the last.

World-leading (research => implementation).

- 2<sup>nd</sup> in world to launch dairy genomics.
- Beef Genomics => largest cattle genomics project globally.

Genetic Gain



Carbon Efficient



Sustainable Farming



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# Irish Industry: Overview and Challenges



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# Overview

## Irish Agriculture accounts for:

- 7.6% of Ireland's economy-wide GVA (Gross Value Added)
- 10.7% of Ireland's exports
- 8.4% of total national employment



Source: CSO Trade Statistics 2016



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“Irish Agri-food and drink exports target €19 bn by 2025”

# Dairy

- Grass based seasonal
- 1.5m dairy cows
- 17,000 herds
- Avg herd size: 80 cows
- Export 90% of milk produced



# Overview



# Beef

- Grass based seasonal
- 0.95m beef cows
- 66,000 herds
- Avg herd size: 14 cows
- Export 90% beef



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# Overview

## Average Farm Income



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“Average Irish farmer aged 56”

# Who contributes to Irish Agriculture?

**AIM**  Department of Agriculture, Food and the Marine  
An Roinn Talmhaíochta, Bia agus Mara

**Farmer** 

**National Programmes**  **NAHI**  
Animal Health Ireland.ie

**Farm Advisory**  **Teagasc**  
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

**Marts** 

**Abattoirs** 

**Vets & Vet Labs** 

**Teagasc Research** 

**Consumer** 

**Herd Books** 

**Milk Recording** 

**Co-ops** 

**AI Orgs** 



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# Overview

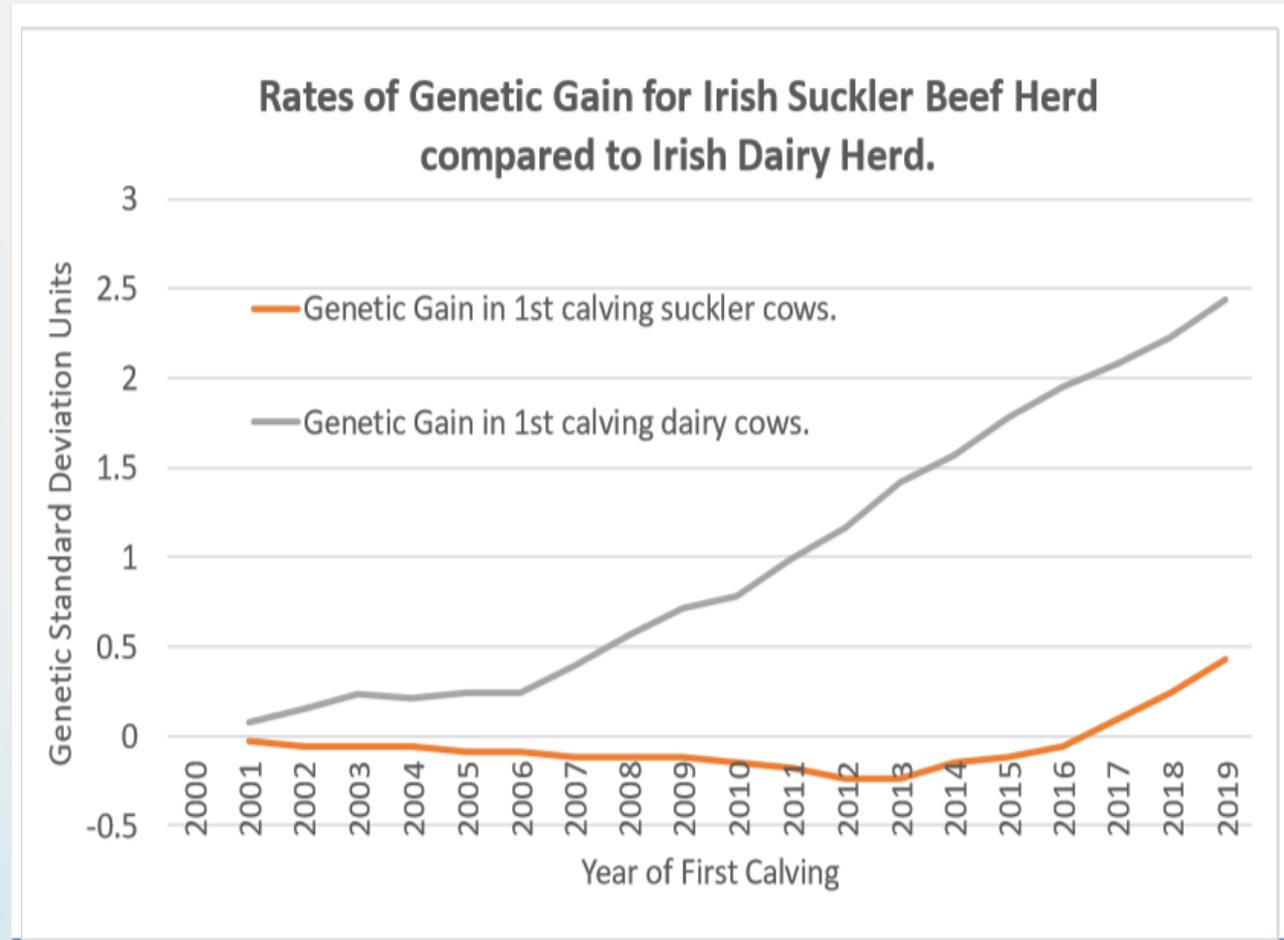
## Genetic Trends in Dairy & Beef

Sustained 0.25 genetic std deviation gain in Dairy

- €1.5bn to Dairy Industry

2016 BDGP - Beef

- €100m to Beef Industry
- €600m by 2030
- 10% drop in GHG – 300k tonnes



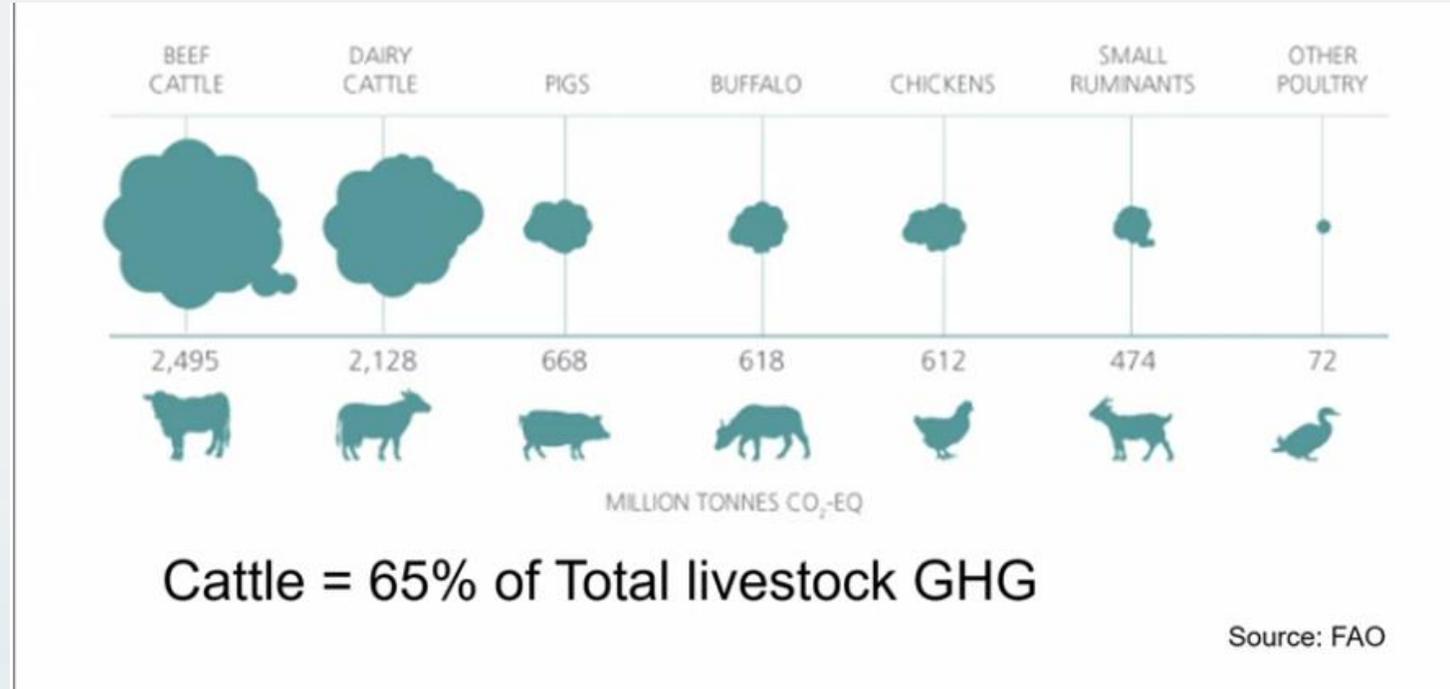
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# Challenges

# Animal GHG Emissions

- Global GHG Emissions from Agriculture is 12%
- EU average is 10%
- In Ireland it is 33%
  
- Total Irish GHG output is ~20Million tonnes
- Irish Ag action plan to drop to ~18Million
  - ~300k Beef
  - ~500k Dairy



Environmental Solution

**Cut our cattle herd**

Irish Solution

Breed more sustainable animals

(BDGP 2015-2020)

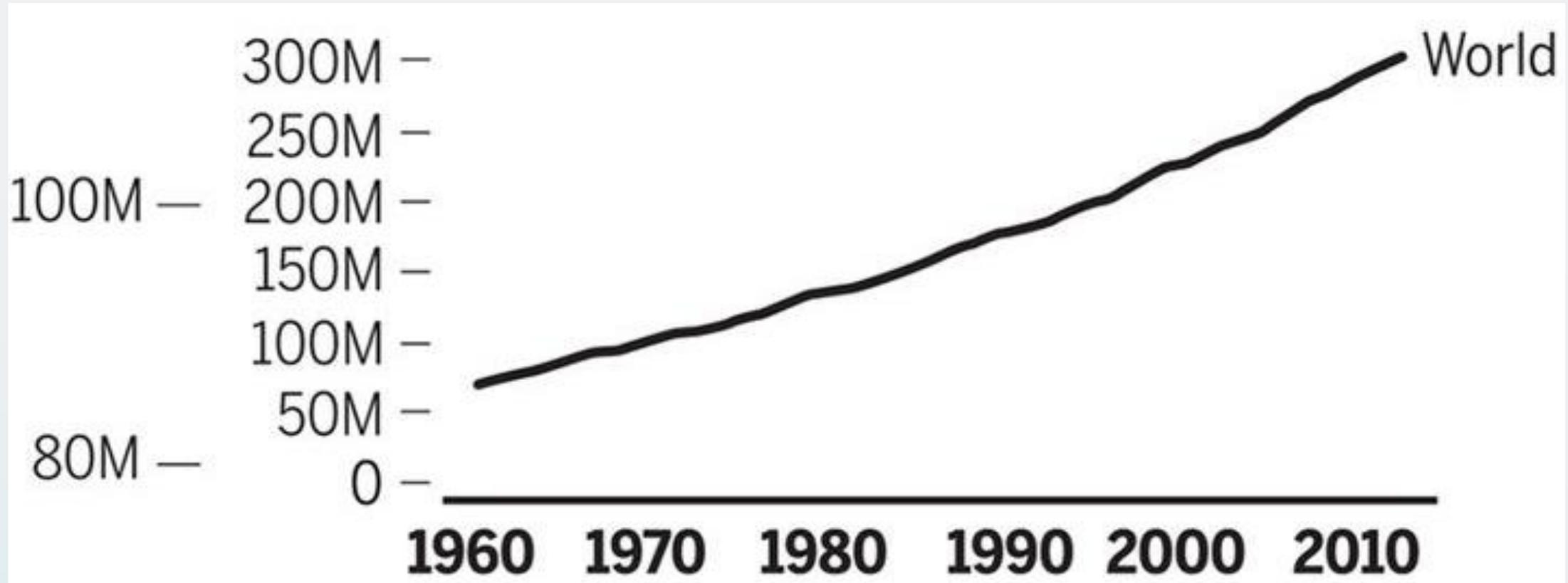


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# Global Overview

## World Beef Consumption Trend



Source:- H Charles, J Godfrey et al. Science 2018;361

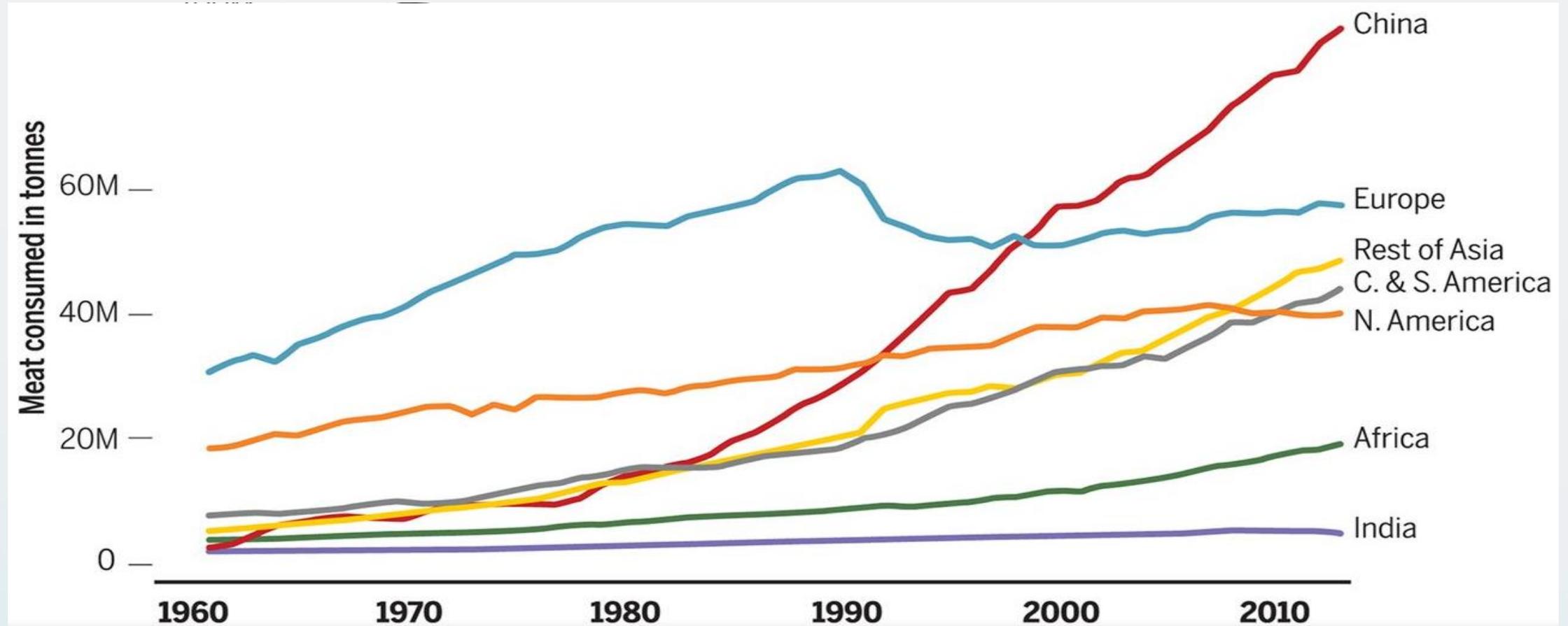


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# Global Overview

## Meat Consumption in Tonnes



Source:- H Charles, J Godfrey et al. Science 2018;361



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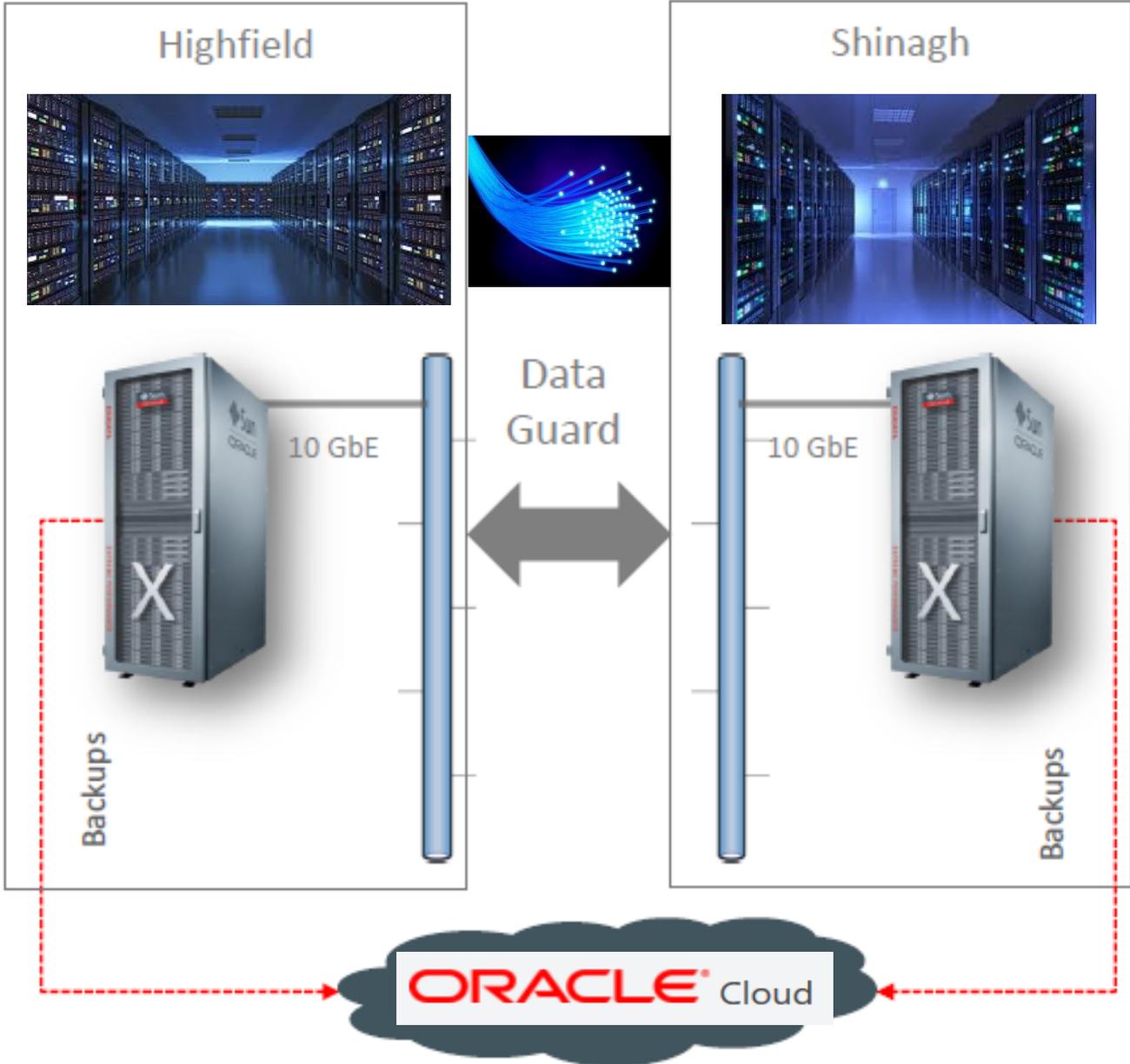
# Tech Stack:



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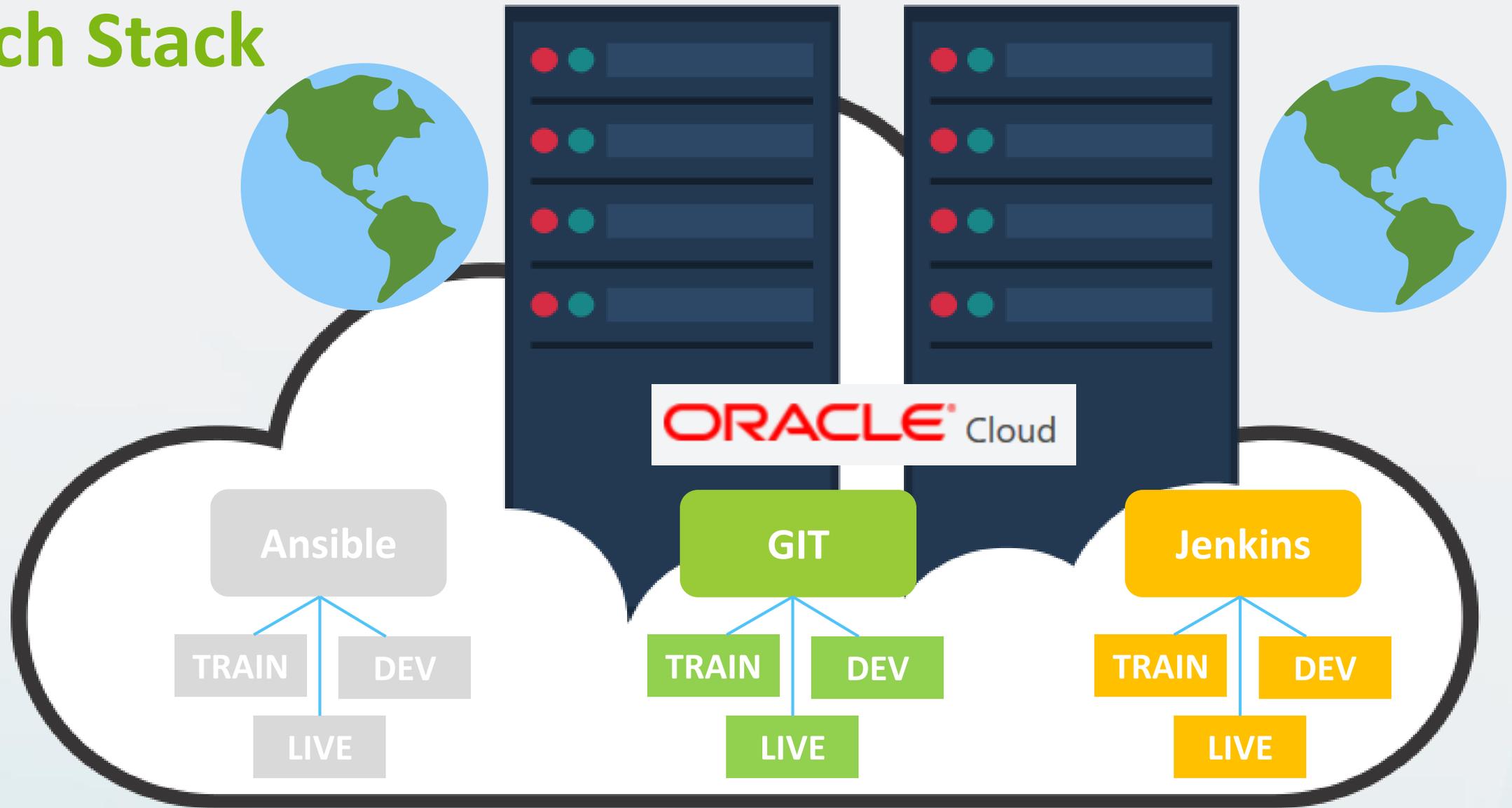
# Tech Stack



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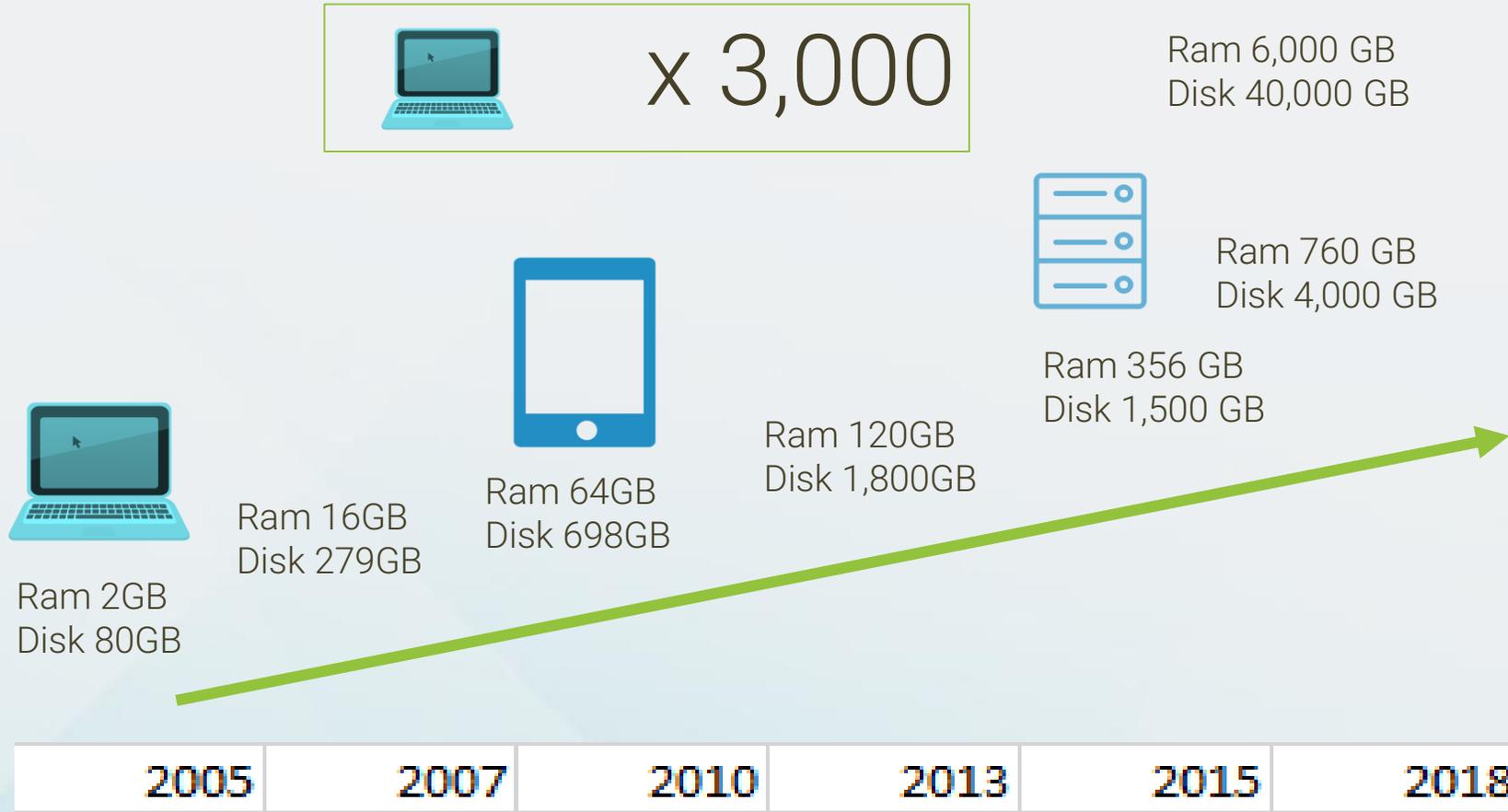
# Tech Stack



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# Evaluation Compute



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# Yearly Data Figures



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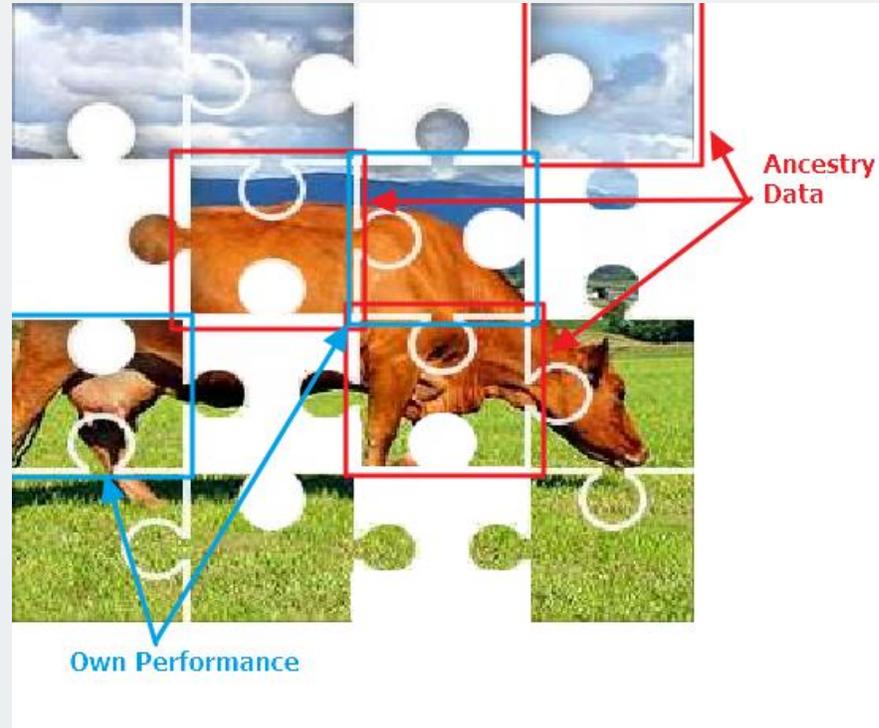
# Genomics:



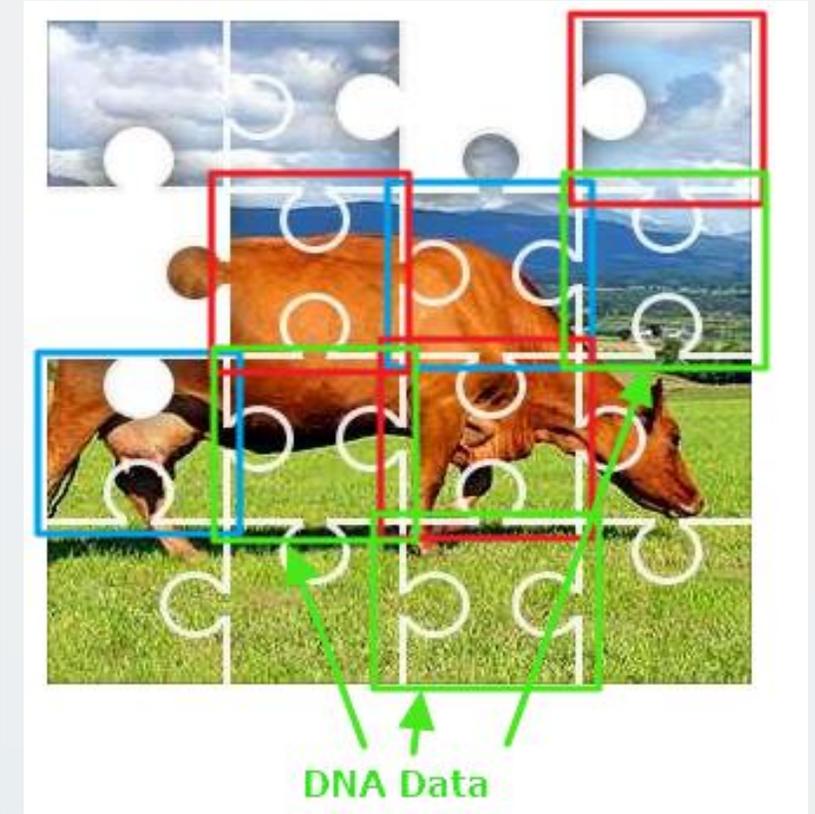
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# Genomics



**Non-Genomic Index**



**Genomic Index**



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# Genotype Data Sets

## Bovine Genome

- Contains 3 billion nucleotides
- Scientists have discovered 40 million SNPs

3 billion rows of data per animal

## Ireland Genotypes

380k animals per year on a 54k SNP Chip

First full genome sequence cost \$300 million

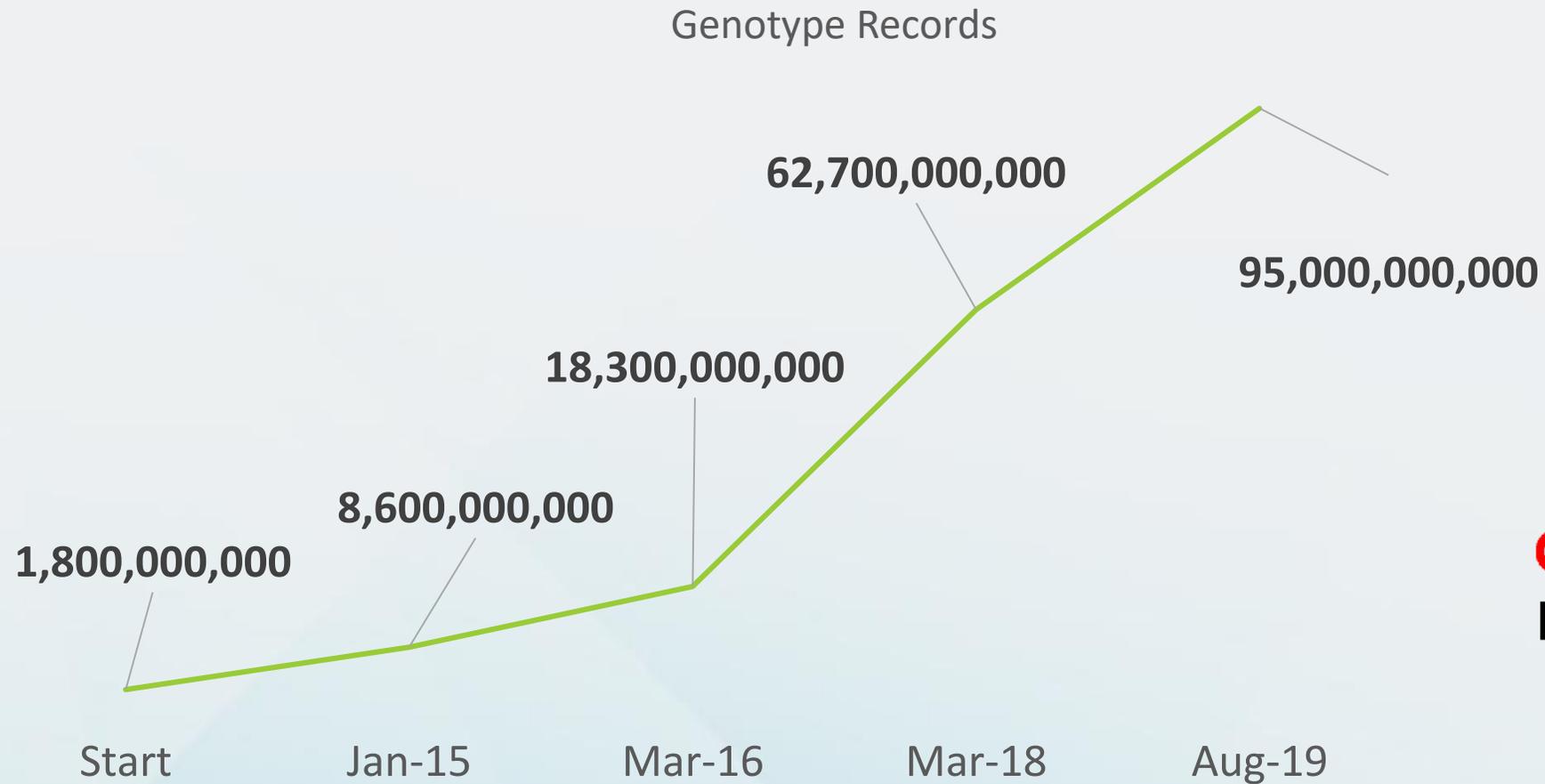
Today costs = \$1,000



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# Genotype Data Sets



**ORACLE**<sup>®</sup>  
Exadata



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# DNA Calf Registration



DOB



Geno DB  
Sire  
Dam  
Sex  
Sire Breed

Output (within 28 days)  
Registration  
Parentage  
Major Genes  
Genomic Evaluation



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# Greenbreed Project

**20.2MT CO2**

Agricultural emissions in Ireland

**15% - 20%**

GHG output difference between  
Individual animals

**10% Reduction**

By altering slaughter profiles  
by 2 months

**Opportunity to breed even more climate efficient cows for the future.**



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# Farm of the Future

## IoT & Big Data

- IoT devices in agriculture will reach 75M in 2020
- Growing 20% annually

## Geofencing & tracking

- Smart sensors
- Smart tractors

## Blockchain

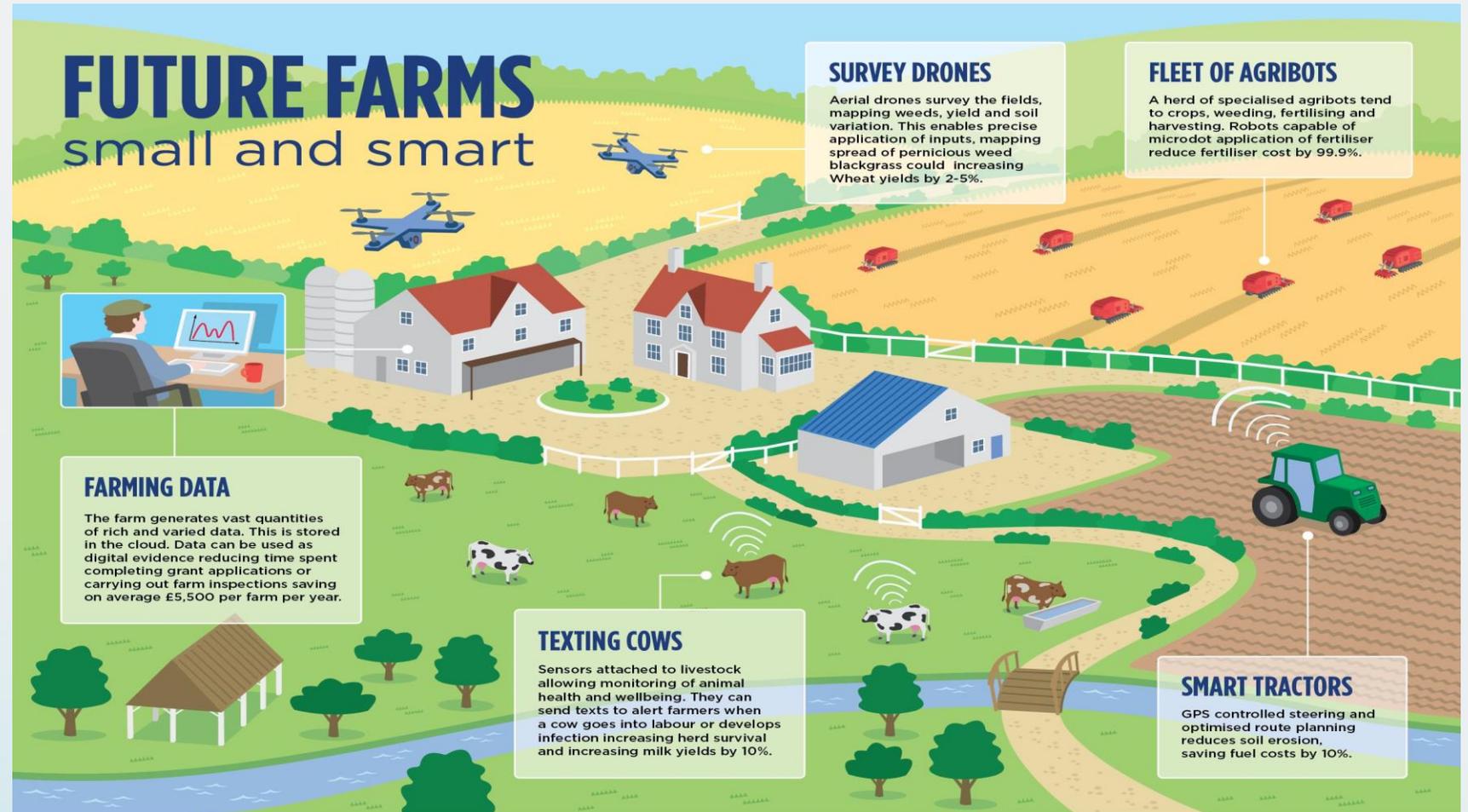
- Traceability
- Consumer Feedback

## Climate & Environment

- Low carbon cows
- Sustainable farming



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# Meat Eating Quality: Breeding for a Tasty Steak



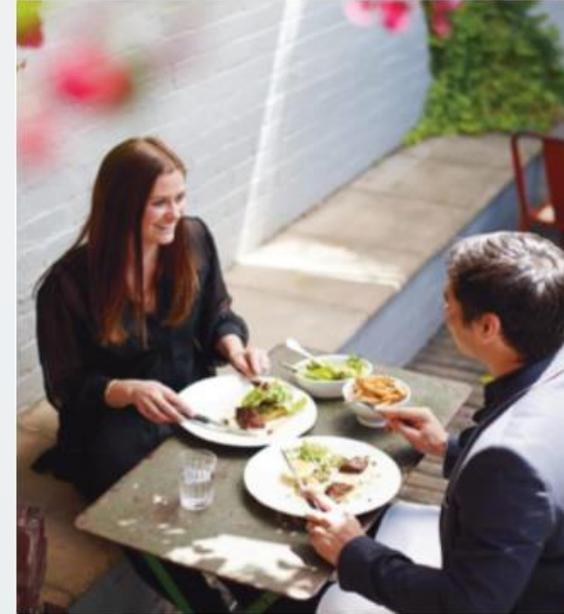
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# Breeding for Tasty Steak

Important to the consumer

- Tenderness
- Juiciness
- Taste
  
- Traceability
- Environmental Impact



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# Breeding for Tasty Steak (Meat Eating Quality)

- Sensory testing with trained panellists to generate breeding values.
- Partnerships with Eolas, Teagasc, Industry through MTI.
- Already being used in a “structured way” by Meat & Livestock Australia (MSA grading).
- Can we use consumer data in a more “unstructured” way?



Can consumer pick the difference?

How does the consumer compare with trained panellist?



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# Partners & Collaboration



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# ORACLE Cloud

# VERSION 1



In Partnership with

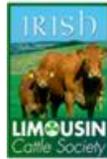


THE ABERDEEN-ANGUS CATTLE SOCIETY



Department of Agriculture, Food and the Marine

An Boinn Talmhaíochta, Bia agus Mara



THE GLOBAL STANDARD FOR LIVESTOCK DATA



GREENBREED



# How does Blockchain impact ICBF?



Enable **Farm to Fork traceability** using Blockchain technology to include additional parties involved in the supply chain.

# Who benefits?

## Consumer

Increased understanding, visibility, trust & transparency

Informed purchase decision (buy local / buy green / buy tasty.

## ICBF

In line with strategic mission

Enabler of current programs:

- ❖ Meat tasting => crowd source!
- ❖ GHG Emissions => increased consumer awareness

## Industry

Enables surgical like recalls

Further enhances Ireland's already stellar agri image, adding value to the industry as a whole

# Is there a precedent?



THE WALL STREET JOURNAL

TECH

BeefChain: <https://beefchain.com>

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## As 'Cold Chains' Heat Up, Blockchain and IoT Provide Needed Framework



AgTech-It's in our DNA Ireland Becomes an International Laboratory for Blockchain Projects in Ag-Tech

By Special Guest  
Maeve Cowley, VP, New Forms of Investment, IDA Ireland

March 22, 2019

Insights  
Beefing up Blockchain  
Blockchain Transform the Irish Beef Supply Chain

Contact us

Submit RFP

# Blockchain Platform Selection

Approach

Permissionless

vs

Permissioned



Platform



Ethereum

vs



**HYPERLEDGER  
FABRIC**



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# Blockchain as a Service Vendor Selection

Why?



Reduce cost



Rapid deployment



Reduce risk

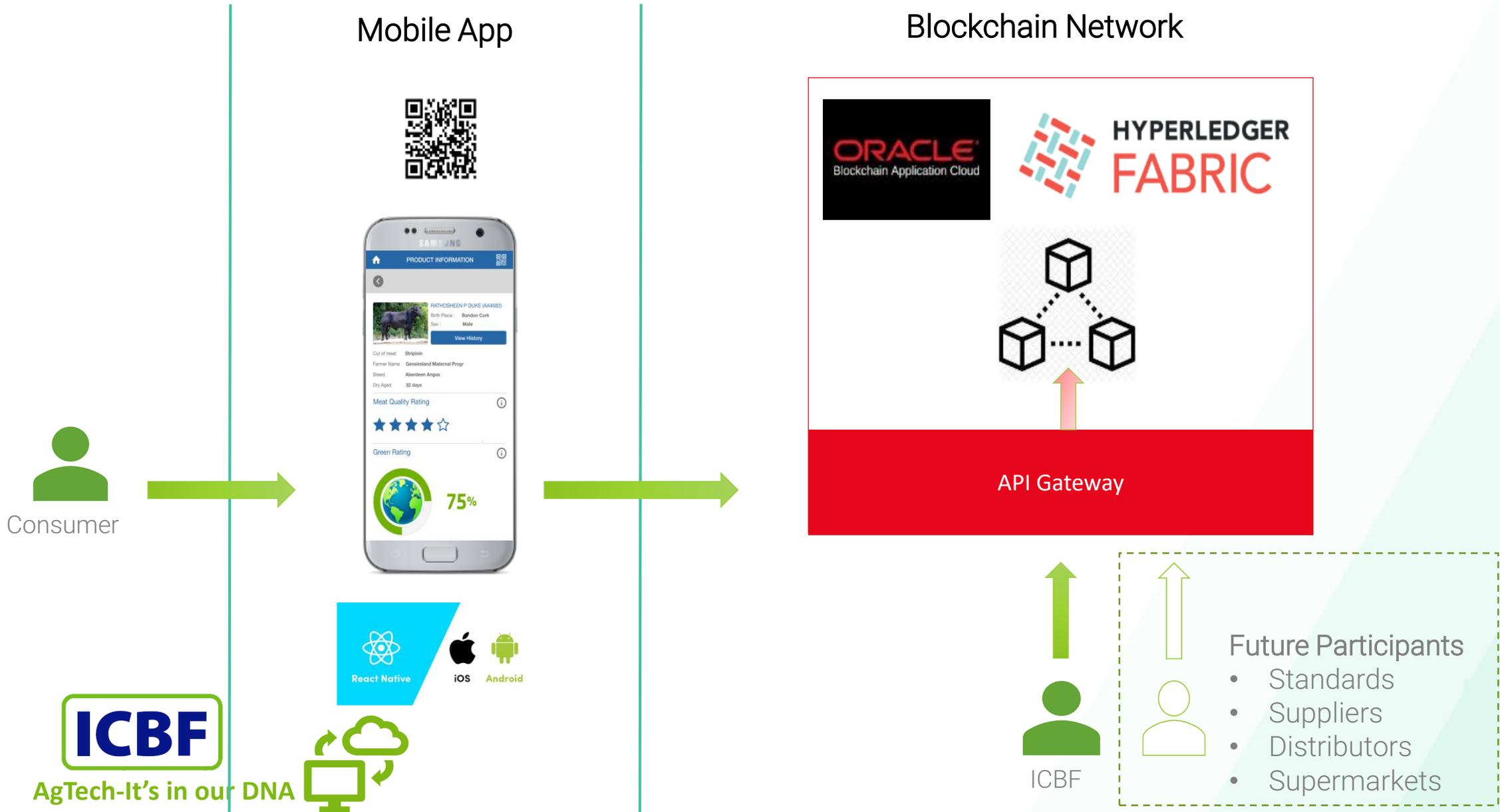


Accelerated development

Who?



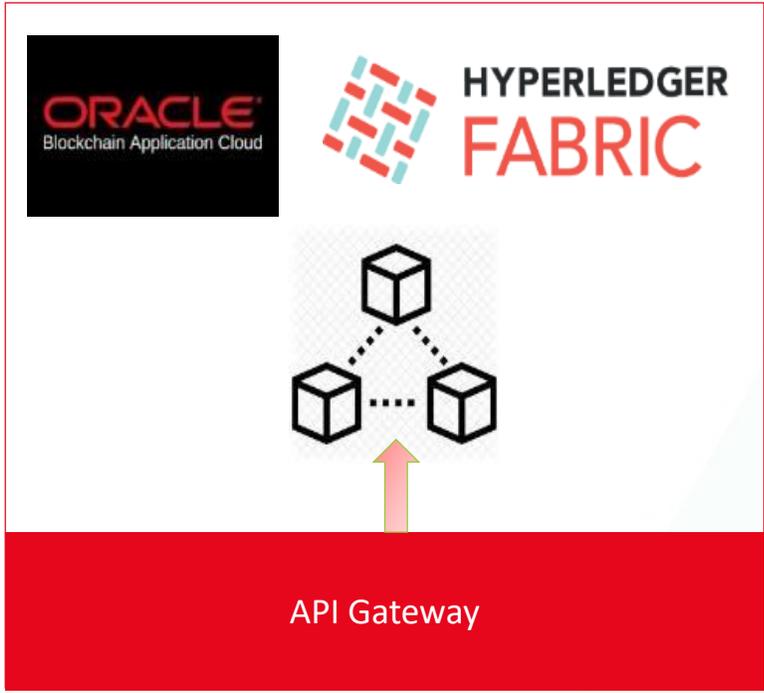
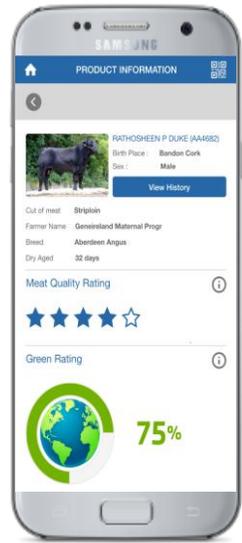
# Solution Overview



Mobile App

Blockchain Network

Consumer



API Gateway



Future Participants

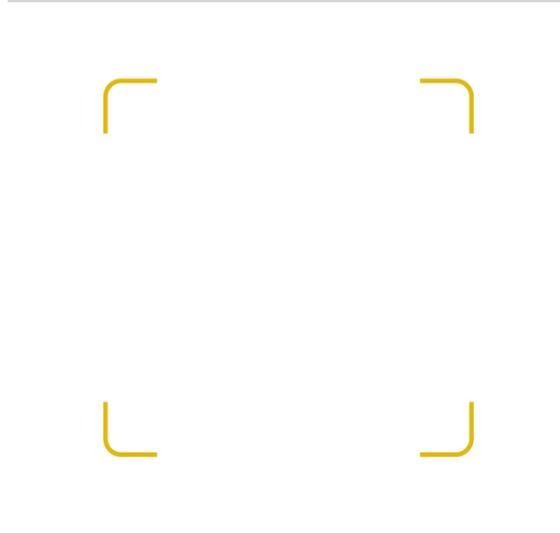
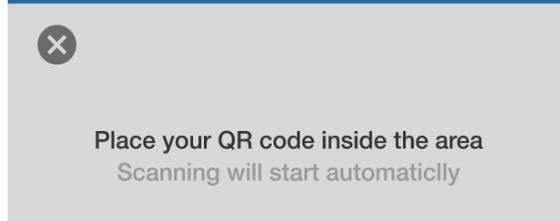
- Standards
- Suppliers
- Distributors
- Supermarkets

ICBF

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# Mobile App





#WeBreedInnovation



Thank you for listening

