VistaMilk

A World Leading SFI Research Centre

Science Foundation Ireland SFI For what's next

Technology connecting animals, people and the environment

Dr. Francis Kearney

Hannah Dairy Research Foundation 22/11/2021

HOST INSTITUTION

teagasc

Agriculture and Food Development Authority

PARTNER INSTITUTIONS

DCU icbf Insight NUI Galway OÉ Gaillimh Tyndall UCD UCC WALTON

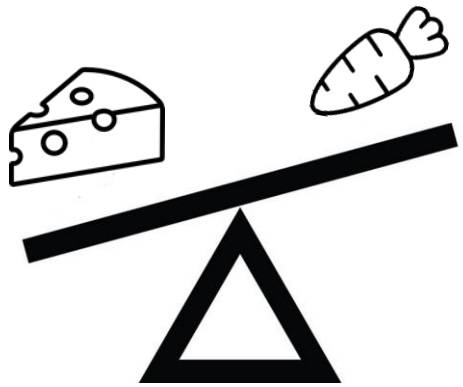
FUNDED BY:

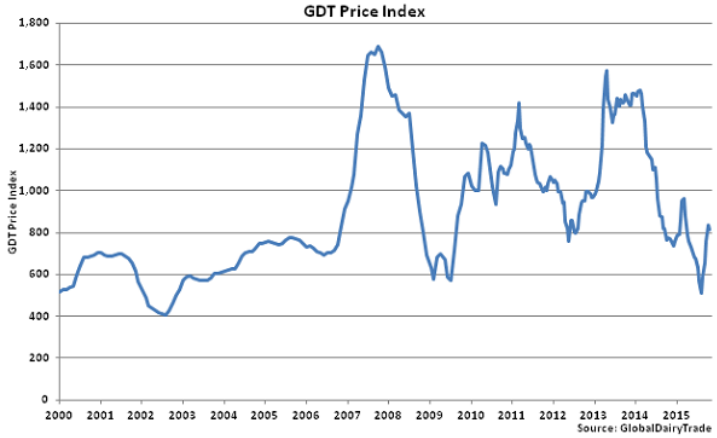
An Roinn Talmhaíochta, Bia agus Mara Department of Agriculture, Food and the Marine

Science Foundation Ireland SFI For what's next

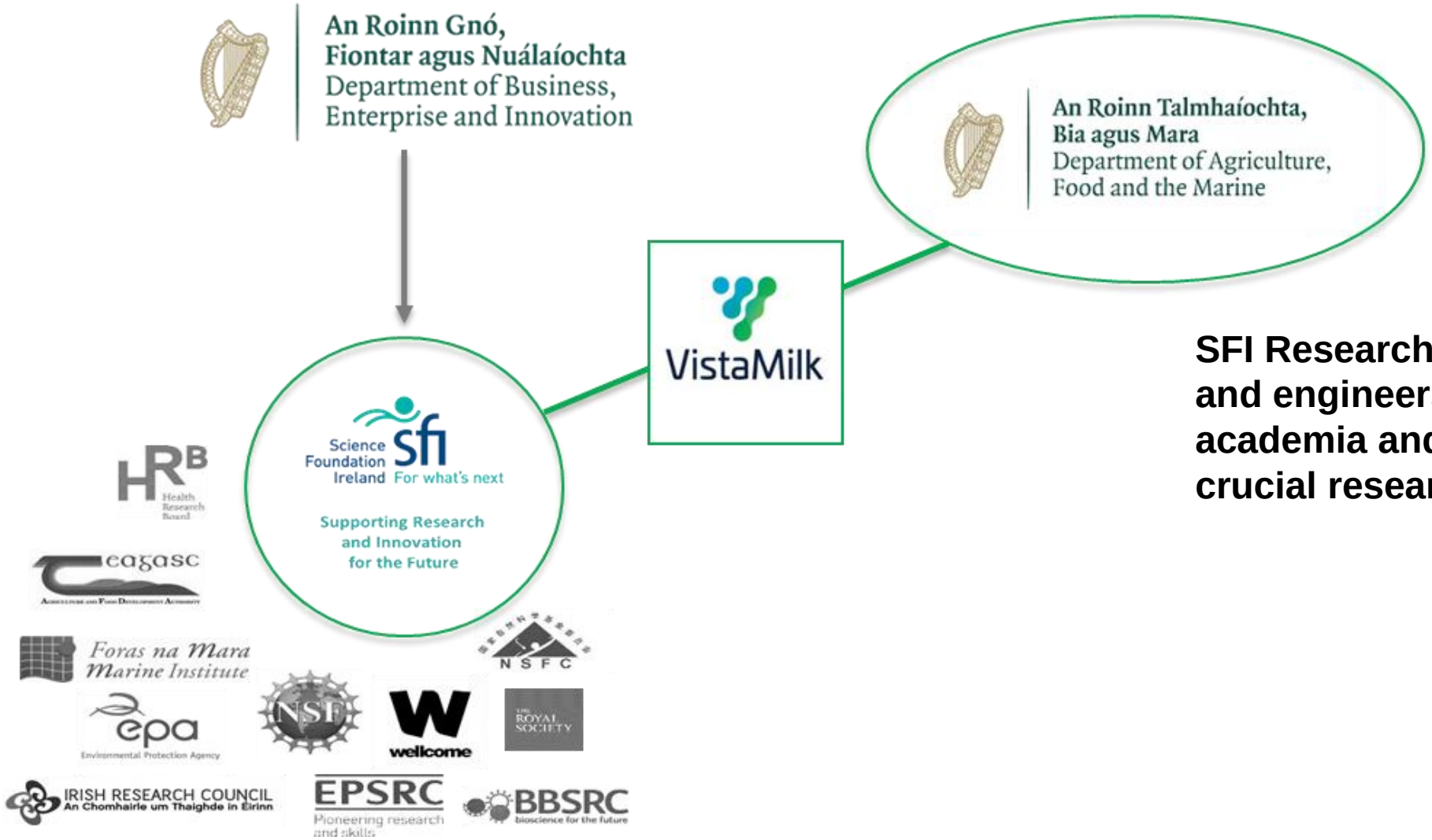
Challenges

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11




GDT Price Index
GDT Price Index
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Source: GlobalDairyTrade

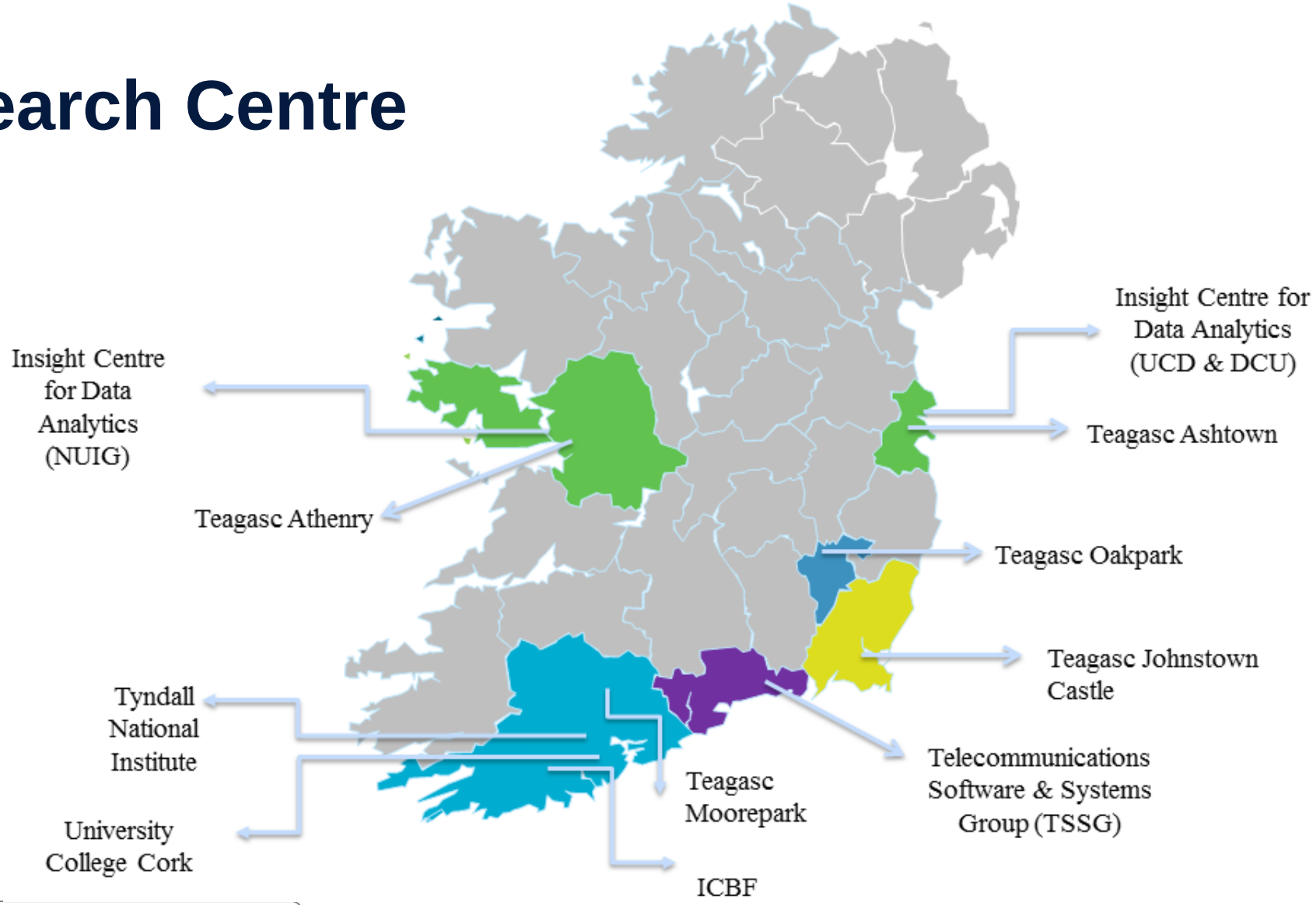
SFI Co-Funded Research



SFI Research Centres link scientists and engineers in partnerships across academia and industry to address crucial research questions.

SFI VistaMilk Research Centre

124 members of staff in VistaMilk



HOST INSTITUTION

Teagasc
Agriculture and Food Development Authority

PARTNER INSTITUTIONS

DCU · UCD Dublin · NUI Galway OÉ Gaillimh · Waterford Institute of Technology · Tyndall National Institute · ICBF.com · UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh · TSSG · Insight

FUNDED BY:

An Roinn Talmhaíochta, Bia agus Mara Department of Agriculture, Food and the Marine · Ireland's European Structural and Investment Funds Programmes 2014-2020 Co-funded by the Irish Government and the European Union · European Union European Regional Development Fund · Science Foundation Ireland sfi For what's next

VistaMilk

Agriculture and Food Development Authority

To support science-based innovation in the agri-food sector and wider bioeconomy so as to underpin profitability, competitiveness and sustainability.

509 ac & 880 dairy cows

PastureBase IRELAND

One Database, Many Partners less duplication and cost for farmers

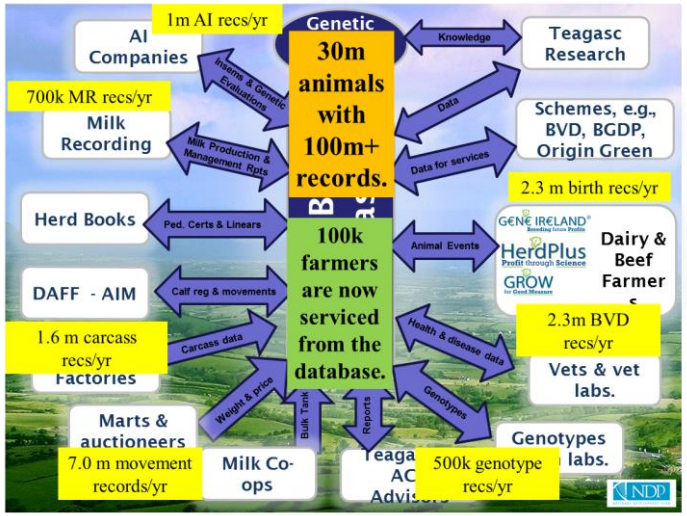
AI
Munster AI
1 - Dairygold
2 - Kerry
3 - SWS
4 Progressive Genetics
5 Dovea AI

Milk Recording
1 Dairygold
2 Kerry
3 SWS
4 Progressive Genetics
6 Arrabawn
7 Tipperary
8 Connacht Gold

Farm Organisations
9 IFA
10 ICMSA

Herdbooks
Holstein Friesian 11
Belgian Blue 12
Angus 13
Aubrac 14
Blonde d'Aquataine 15
Charolais 16
Hereford 17
Limousin 18
Normande 19
Parthenais 20
Piedmontese 21
Shorthorn 22
Simmental 23
Jersey 24
Kerry 25
MRI 26
Montbeliarde 27
Rotbunt 28
Saler 29

ICBF 30



Digitalising Dairy

VistaMilk

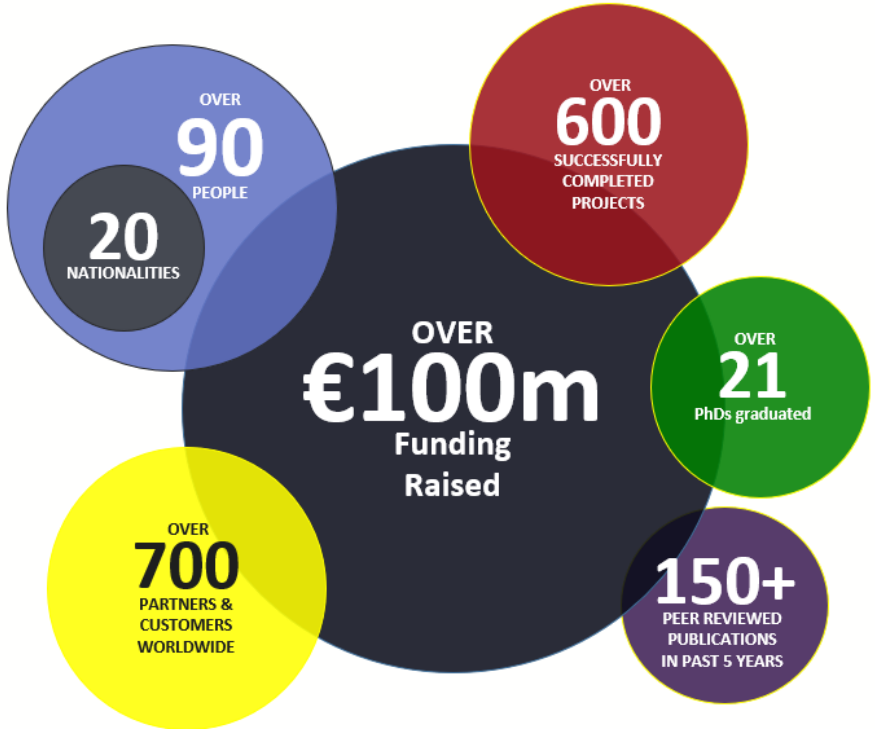
WALTON
Institute for Information and Communication Systems Science

Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

- International Research Institute hosted by WIT.
- Founded in 1997. Has 90+ staff and 100% self funded.

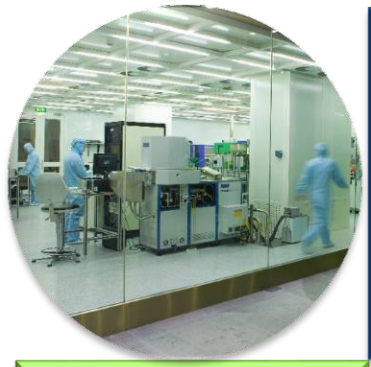
Fundamental Expertise

- Communications networks and wireless systems
- Machine Learning and AI
- Emerging Communication Technologies
- Pervasive Environments and Computing



Tyndall National Institute
Institiúid Náisiúnta

UCC
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland



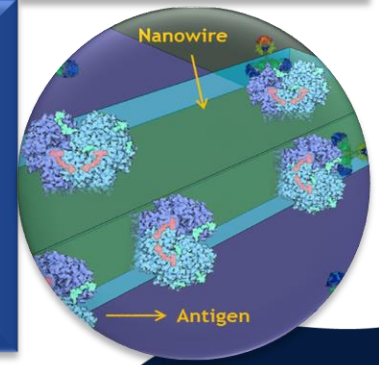
600
researchers, engineers, and staff

€250m
Infrastructural investment

ISO 9001
ISO 50001

€40m
Income per year

250
peer-reviewed publications each year



NUI Galway
OÉ Gaillimh

Insight

DCU

UCD DUBLIN

4
Co-Lead Universities
4 partner institutions

Built on **14** years of research in Data Analytics and AI

450+
Academics, Postdocs, PhDs, RAs

1500+
Scientific conference and journal papers

90+
Funded collaborations with industry partners

300+
Research Awards over 4 years

8
Spin out companies
57 license agreements

60+
H2020 consortia, 580+ collabs., 40 countries

1,137+ **school visits,** 28,000 students

250+
PhD students graduated,

Vision

Agent of responsible growth for the Irish dairy and Agri-Tech industry by being a world leader in fundamental and translational research for precision pasture-based dairying.

- Surge in sustainable competitiveness
- Cement and build academic-industry relationships
- Address societal challenges
- Create a new Agri-Tech industry populated with highly trained staff

VistaMilk

- **9** Research Performing Organisations
- **50+** Industry partners
- **130+** Researchers
  - **8** Principal investigators
  - **24** Funded investigators
  - **27** Postdoctoral researchers
  - **51** PhDs
  - **22** Operations and support staff

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teagasc

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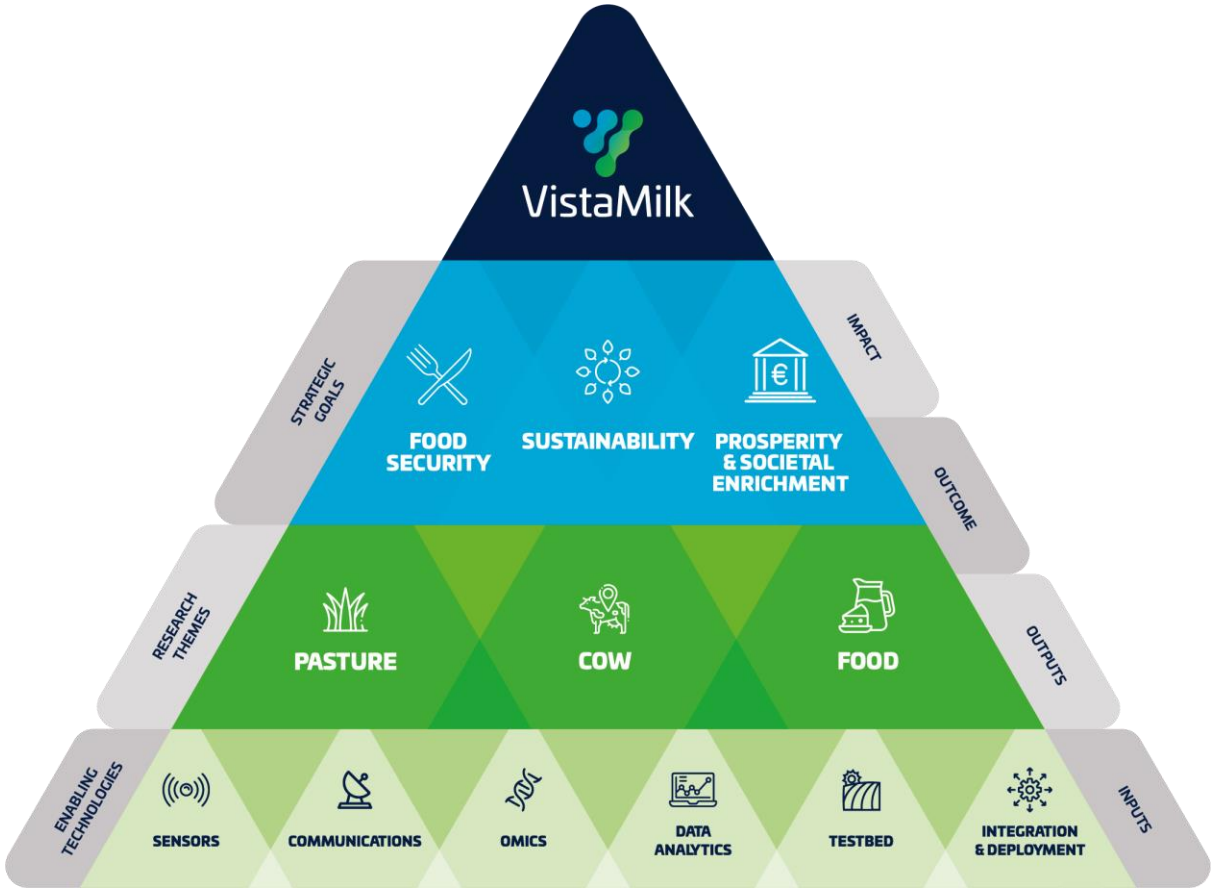
Science Foundation Ireland sfi For what's next

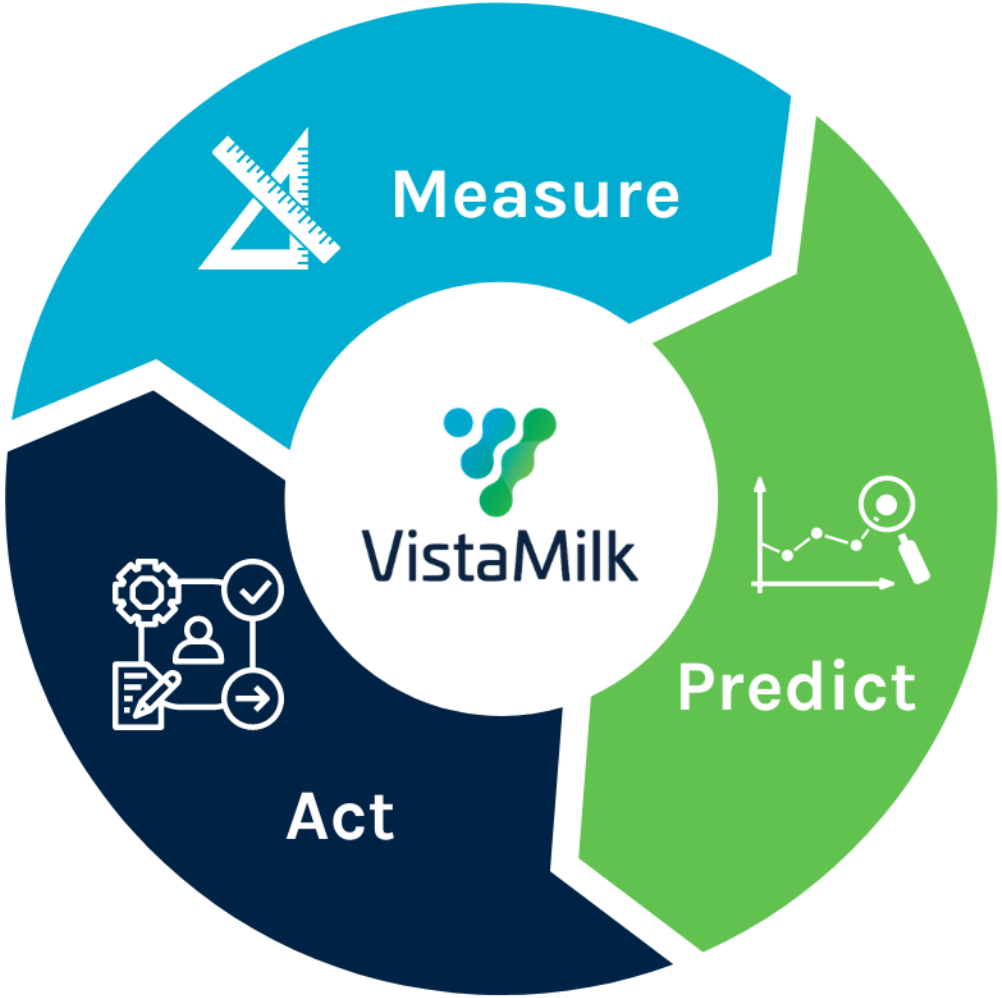
Research

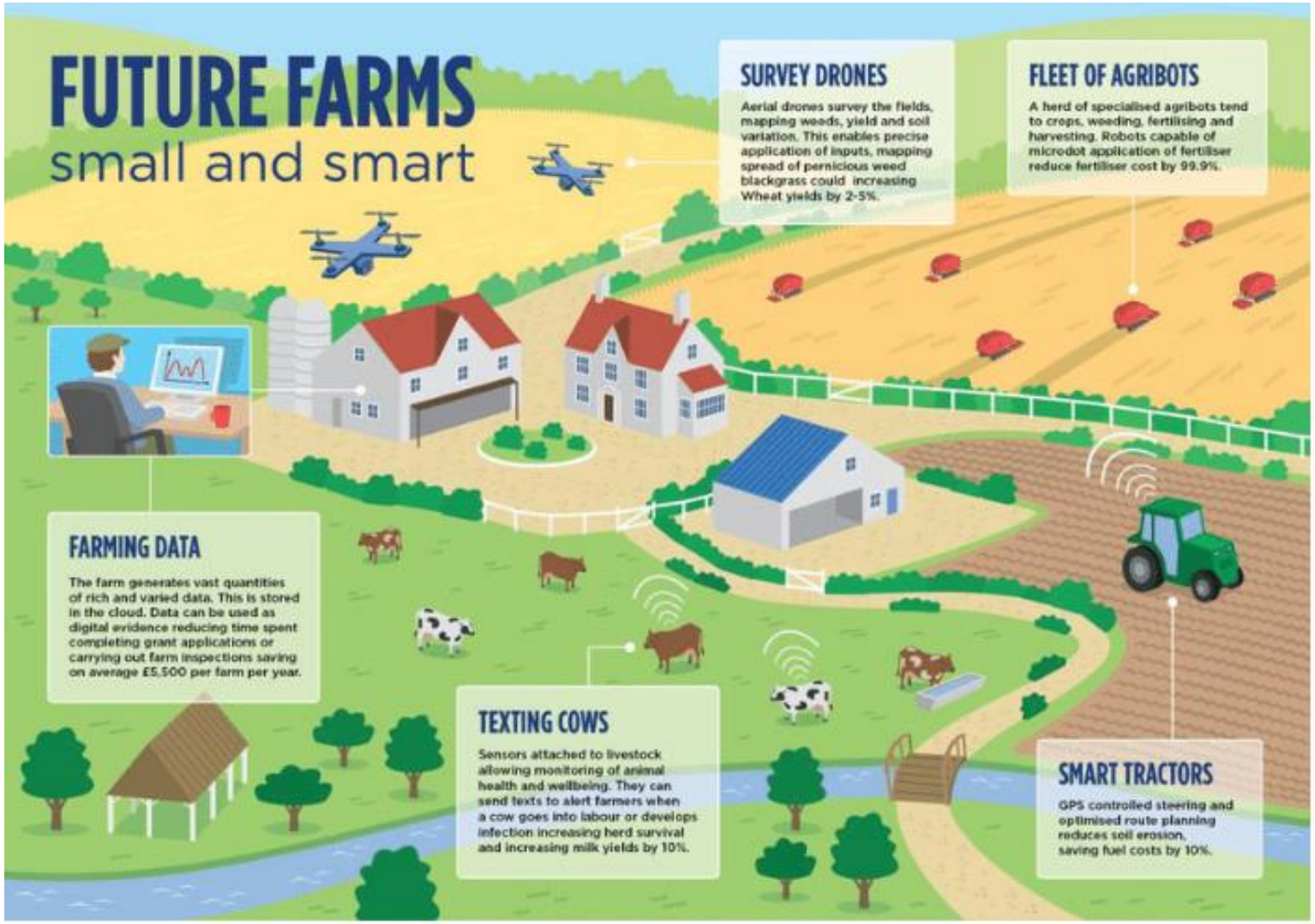

VistaMilk
STRATEGIC GOALS
IMPACT
FOOD SECURITY
SUSTAINABILITY
PROSPERITY & SOCIETAL ENRICHMENT
OUTCOME
RESEARCH THEMES
PASTURE
COW
FOOD
OUTPUTS
ENABLING TECHNOLOGIES
SENSORS
COMMUNICATIONS
OMICS
DATA ANALYTICS
TESTBED
INTEGRATION & DEPLOYMENT
INPUTS

ANIMAL NUTRITION
ANIMAL HEALTH
ANIMAL BREEDING
PROSPERITY & SOCIETAL ENRICHMENT
SUSTAINABILITY
COW
PASTURE
FOOD
PASTURE BREEDING
MILK PROCESSING
PASTURE MANAGEMENT
DAIRY PRODUCTION DIGESTION
SOIL NUTRIENT DYNAMICS
NUTRI-FUNCTIONAL MILK
FOOD SECURITY

Industry partners

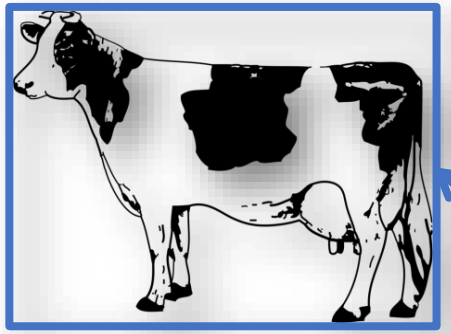
Guiding principles





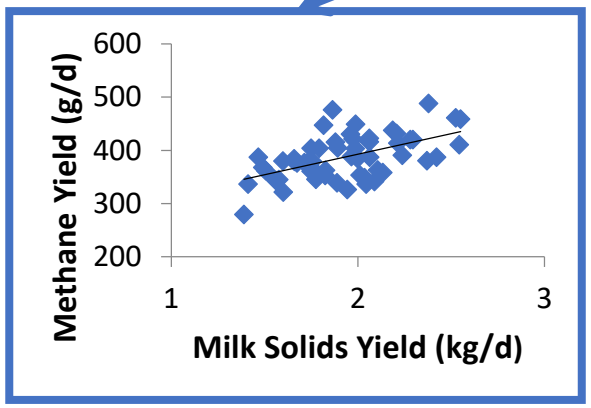
Future of farms (Norris and Bland, 2015)

Methane



Animal factors

Sward factors



Prediction models

Feed additives

IRISH FARMERS JOURNAL

SEARCH

BEEF DAIRY SHEEP AGRIBUSINESS MACHINERY TILLAGE PEDIGREE BUILDINGS PROPERTY

Trial shows cow methane output overestimated by 30%

The research team hopes to be able to present a more accurate estimate of the amount of methane produced by dairy cows.

Niall Hurson
NEWS > NEWS
14 July 2021

The team measured the cows to be producing just 256g of methane per day on average, almost 30% less than estimated. \ Donal O'Leary

Early stage trials at Teagasc Moorepark have indicated that the amount of methane produced by dairy cows grazing at pasture is greatly overestimated.

The work, which has been conducted by VistaMilk postdoctoral researcher Ben Lahart, has shown there is a disparity between the measured emissions in field and the current estimate used by the national inventory.

	Calculation	Measured	Difference
March	338 g	277 g	+ 61
April	361 g	272 g	+89
May	357 g	278 g	+79
June	323 g	322 g	+1

Grass Imaging

- Grass-only, grass-white clover grazing plots
- Camera and iPhone
- 4,700 images; 2,100 with ground truth data
- Initial accuracy 95%
- Results to date have been very promising
- Now looking at herbage mass and sward height
- Initial trials have been extended with more images and data collected in 2021

Dairy Beef Index

- Breeding goal
  - harnesses industry collected data
  - identifies best genetics
- Breed better beef animals from the dairy herd
- 50:50 split on desirable dairy : beef traits
- DBI = (calving difficulty * economic weight) + (gestation * economic weight) + …. (carcass weight * economic weight)

Rank	Code	Name	Breed	DBI €	DBI Rel %	Calving Value SI €	Beef Value SI €
1	AU4460	DAUPHIN	AU	147	80	52	95
2	LM2014	EWDENVALE IVOR	LM	144	95	-6	149
3	DPZ	DESPAGNOU	AU	140	83	8	131
4	SA2189	ULSAN	SA	137	87	46	91
5	AU4683	TURLOUGHMORE MAGNIFICENT	AU	130	70	7	123
6	AU2470	CESAR	AU	128	82	16	113
7	AZL	ROSS ALO (ET)	BB	127	88	-45	173
8	AU4836	TURLOUGHMORE MAJESTIC	AU	126	61	22	104
9	SA4604	KNOTTOWN ROY	SA	125	80	31	94
10	AA4818	GABRIEL PETE 2074	AA	124	69	62	62
11	AA4743	KEALKIL PRIME LAD	AA	123	70	67	57
12	AU4627	MADISON	AU	120	61	28	93
13	BZC	BOHERARD CIAN (ET)	BB	112	92	-23	134
14	EBY	ELDERBERRY GALAHAD	LM	112	96	-2	113

J. Dairy Sci. 102:10056–10072
https://doi.org/10.3168/jds.2019-16912
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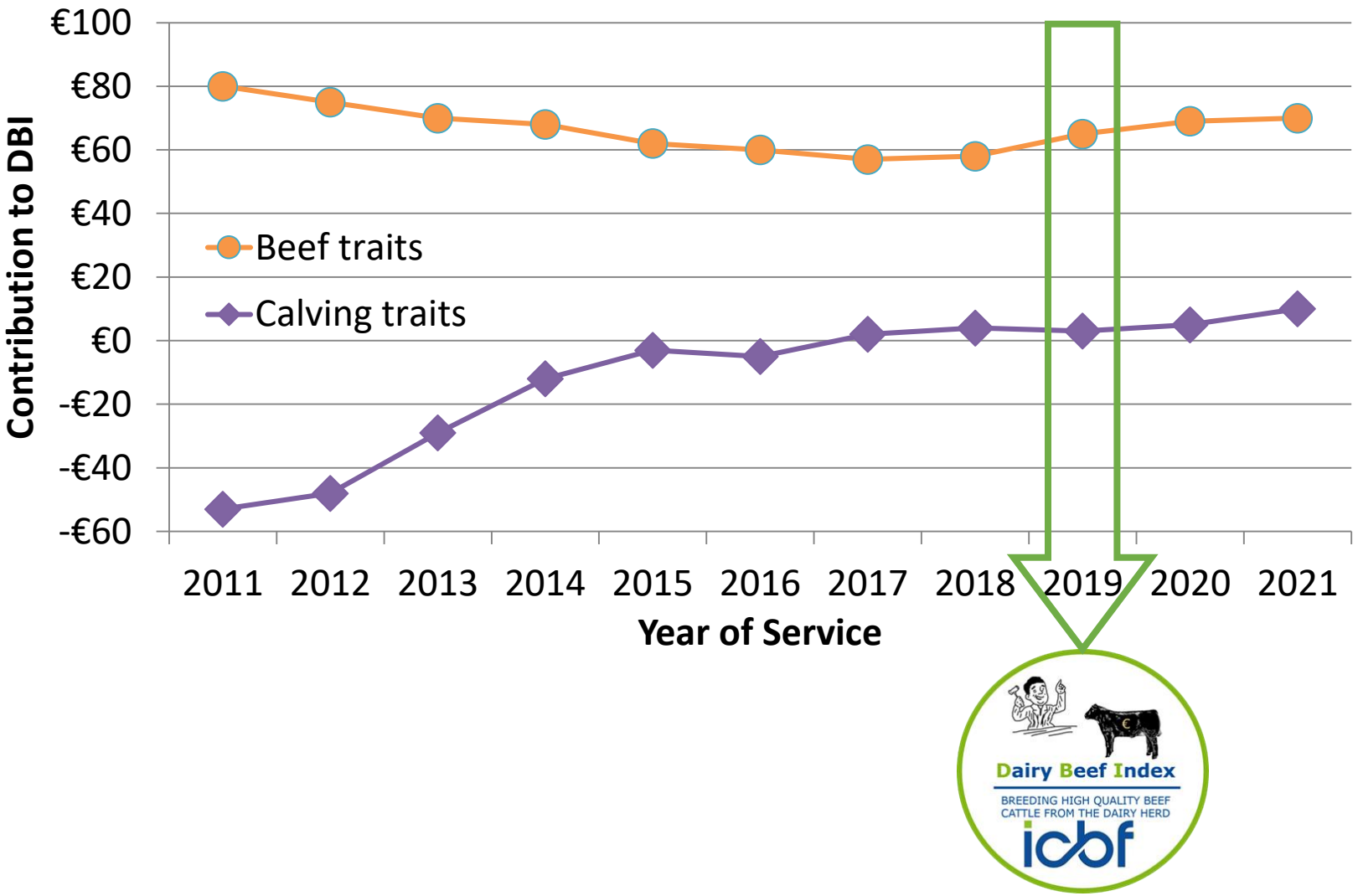
A breeding index to rank beef bulls for use on dairy females to maximize profit

D. P. Berry,[1]* P. R. Amer,[2] R. D. Evans,[3] T. Byrne,[2] A. R. Cromie,[3] and F. Hely[2]
[1]Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy P61 P302, Co. Cork, Ireland
[2]AbacuBio Ltd., Dunedin 9016, New Zealand
[3]Irish Cattle Breeding Federation, Highfield House, Shinagh, Bandon P72 X050, Co. Cork, Ireland

Dairy Beef Index

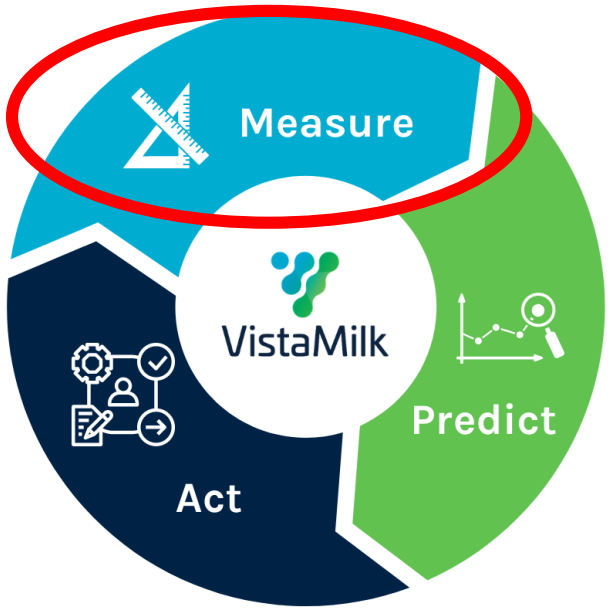


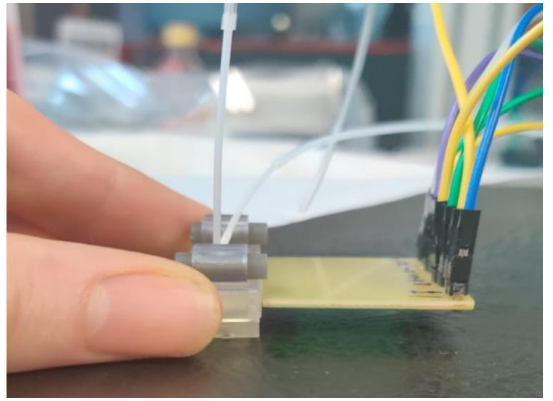
- DBI improving €6/yr since 2019
  - €4/yr previously
  - Big win is improvement in the beef traits
- More substantial improvements can be achieved:
  - Greater engagement from end users
  - Improvements & new traits
  - Tailored mating advice

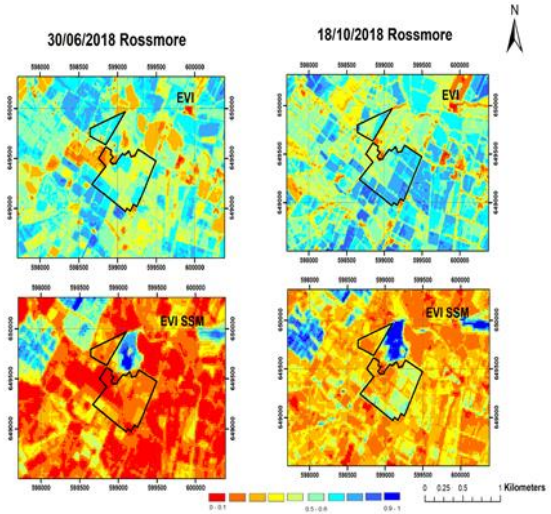
Dairy Beef Index
BREEDING HIGH QUALITY BEEF CATTLE FROM THE DAIRY HERD
icbf

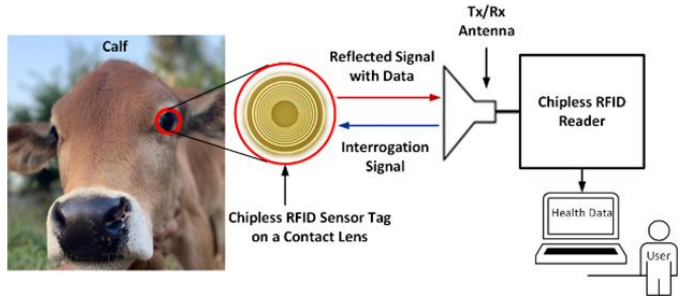
Sire Advice

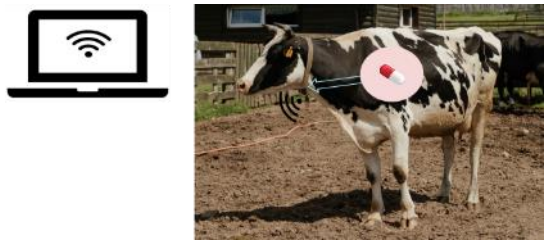
Measuring


Measure
VistaMilk
Predict
Act

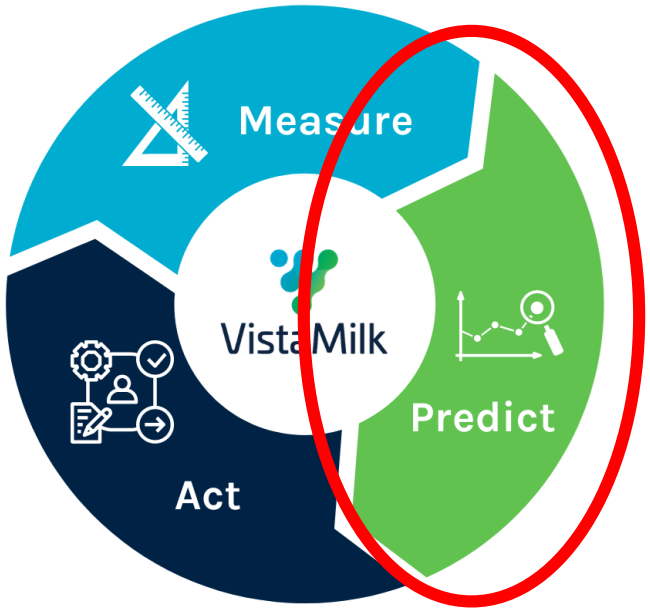



30/06/2018 Rossmore
18/10/2018 Rossmore
EVI
EVI
EVI SSM
EVI SSM
N
0 0.25 0.5 1 Kilometers


Calf
Tx/Rx Antenna
Reflected Signal with Data
Interrogation Signal
Chipless RFID Reader
Chipless RFID Sensor Tag on a Contact Lens
Health Data
User



Artificial Intelligence – adding value to data



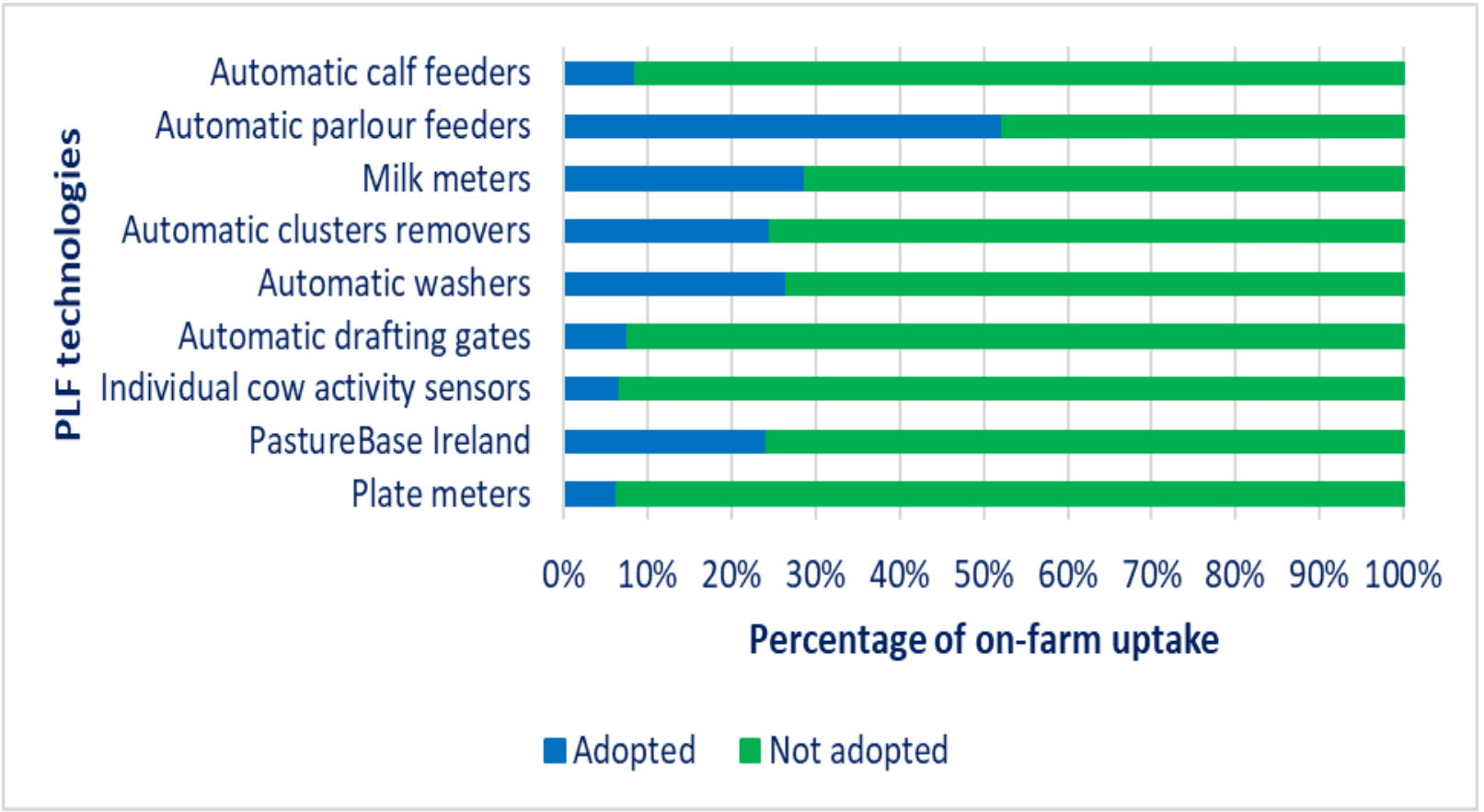
- Milk Supply Forecasting
- Digital Milk Map
- Mastitis Detection

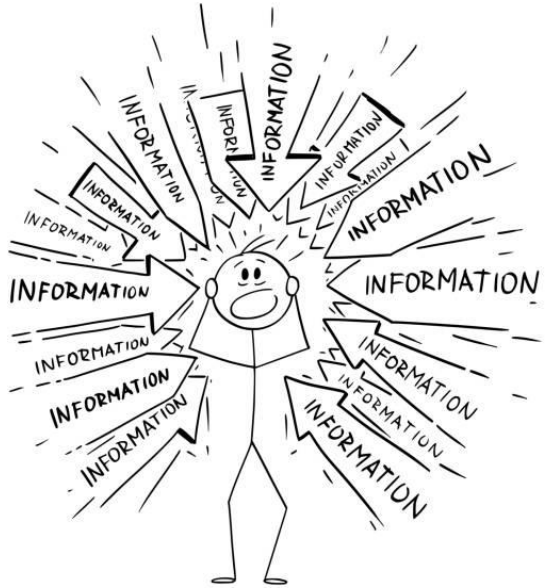
- Grass Growth Prediction
- User Trust
- Recommender Systems

- Sustainability
- Resource Management
- Future Planning

A Centre Wide Collaboration

Technology adoption





VistaMilk

Demonstrating the use of technology on farms

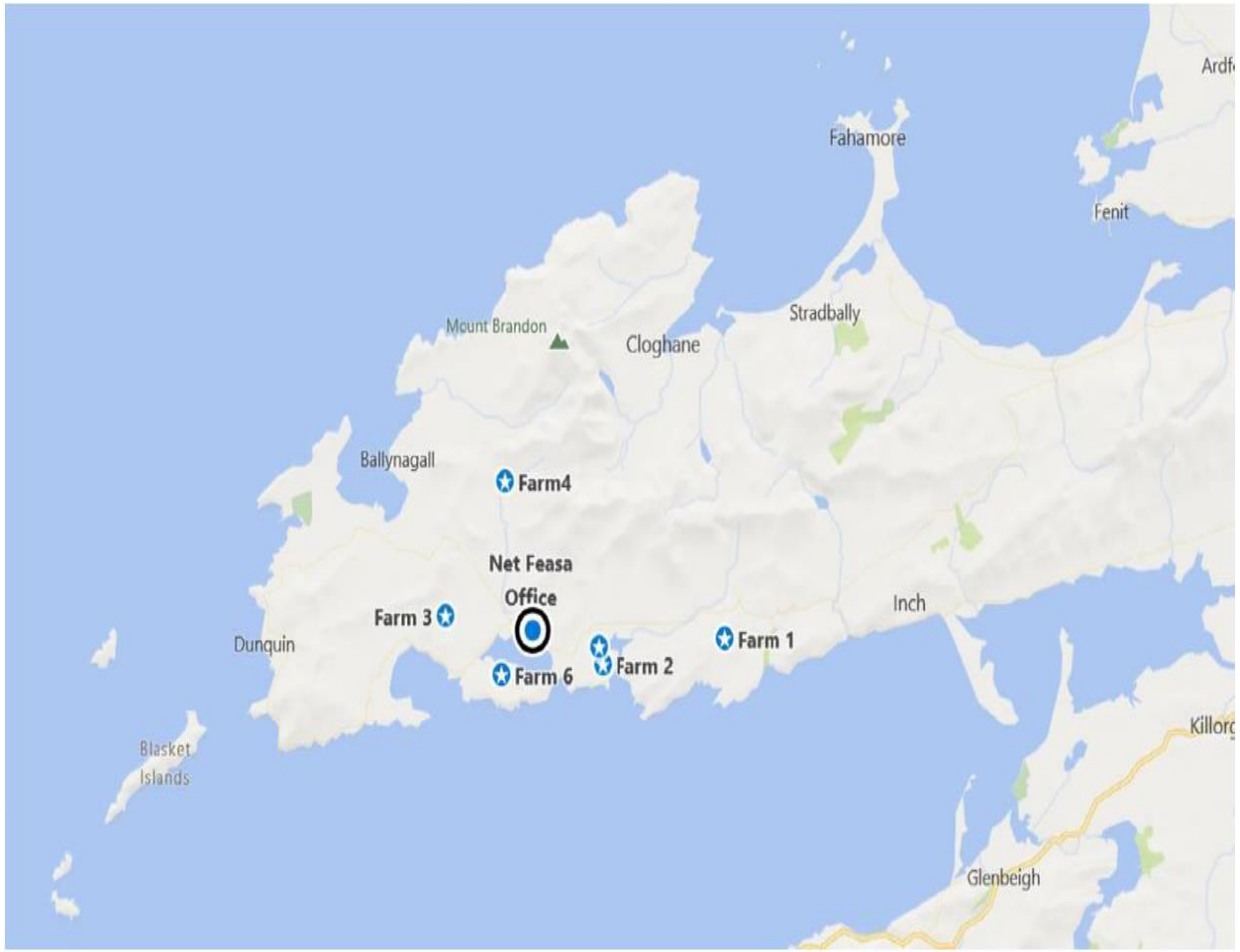


Figure 1 Map of Dingle Penninsula with farm locations highlighted.

- Six pilot farms selected to act as ambassador farms in their community.
- Integration of sensors on farms (milk tank, slurry, soil moisture, weather)
- Working with stakeholders to collect, asses, develop and analyse sensor data
- Provide data and interpretation to farmers to allow best practice knowledge based decisions

Engagement at VistaMilk

"Promote an understanding and appreciation of the role of ICT and other sciences in the sustainable delivery of consistently high quality, safe dairy products through engagement with stakeholders and the general public"

VistaMilk's "people"

PUBLIC

SCHOOLS

Researcher Community

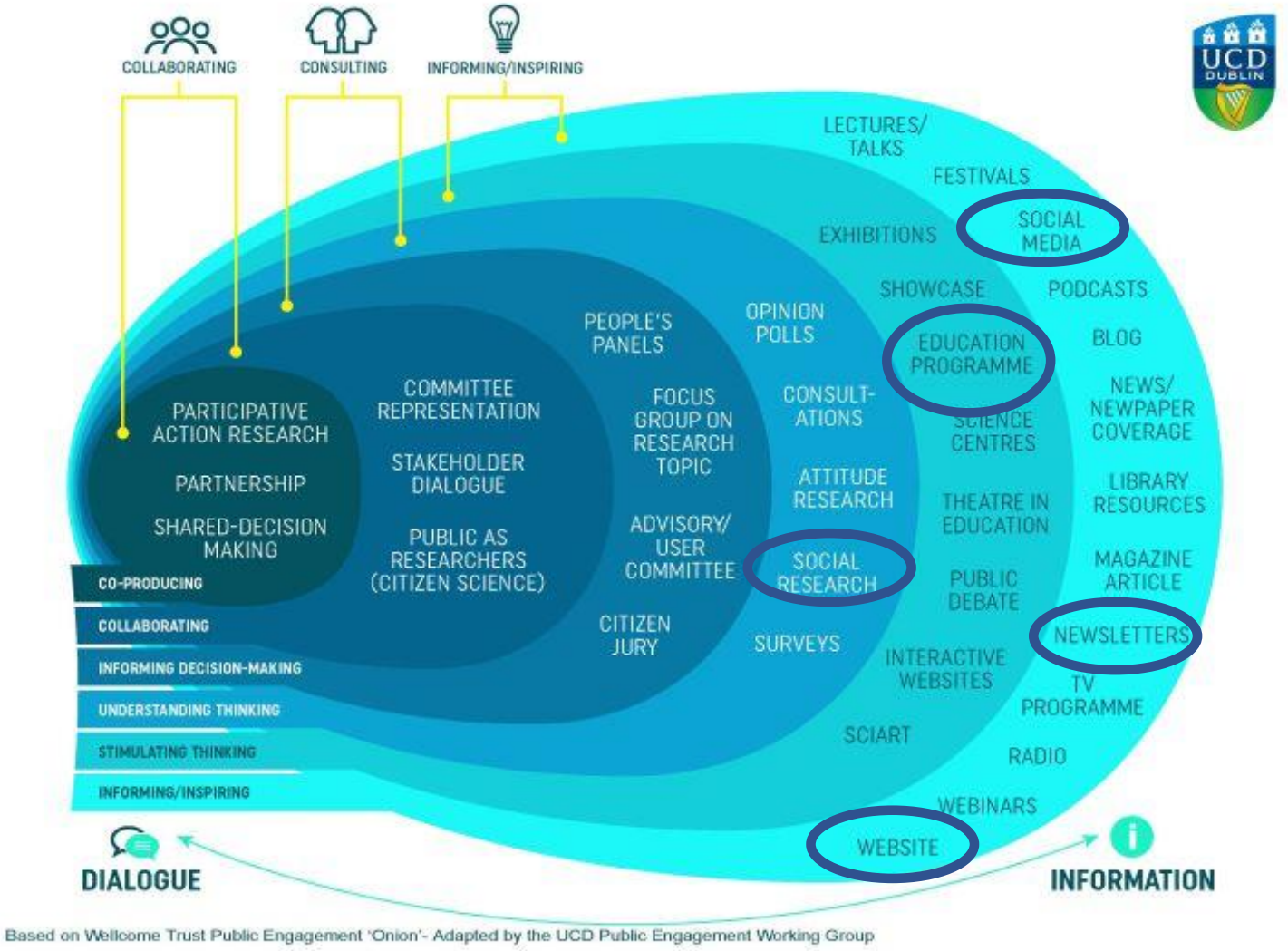
AGRI-FOOD & AGTECH INDUSTRY

GOVERNMENT AND POLICY

FARMING COMMUNITIES

VistaMilk

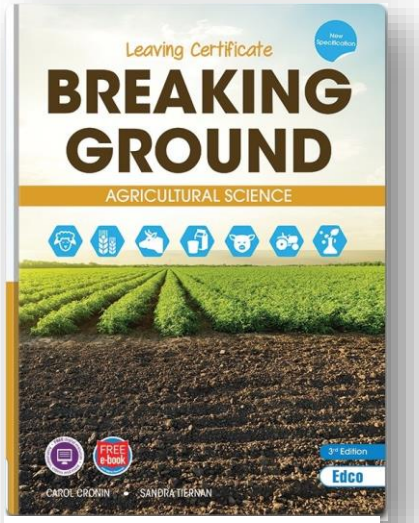
Engagement at VistaMilk



Based on Wellcome Trust Public Engagement 'Onion'- Adapted by the UCD Public Engagement Working Group

Pipeline to Research

The next generation of agri-tech professionals



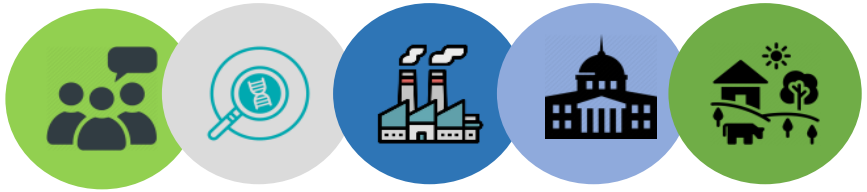
Curriculum

- Primary schools outreach
- Secondary schools outreach
  - Transition year experience programme
- Internship programme
- Internal training

Influencing Policy

Keeping #DigitalisingDairy on the agenda

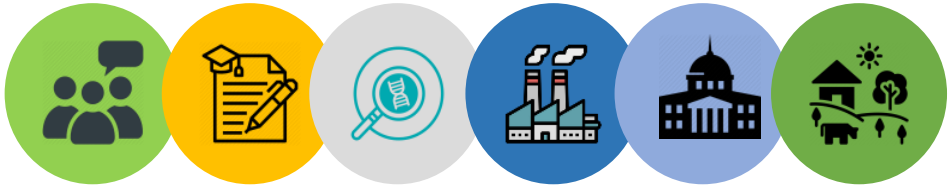
- Creation of engaging reference material
- Networking opportunities
- Promoting future interactions



Culture of EPE at VistaMilk

Building our culture

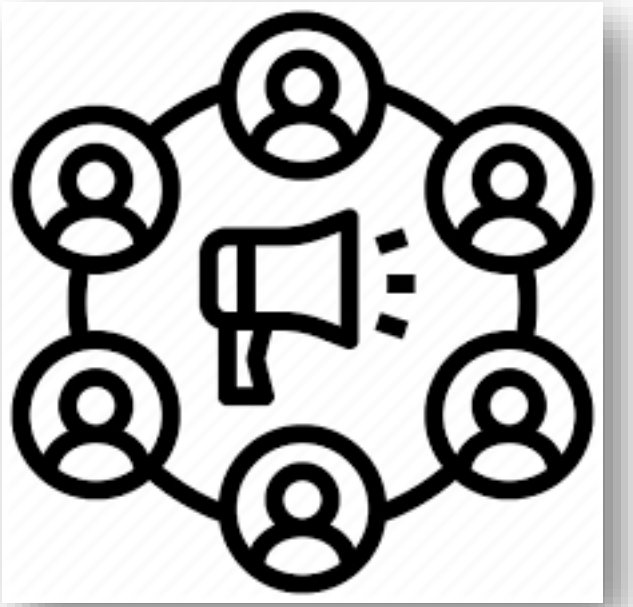
- Induction
- Dedicated EPE training
- EPE workshops
- EPE opportunities
- Networking opportunities at EPE events
- Annual EPE ambassador award



Communications

1st
Journal
Publication

2nd
Impact Piece



3rd
Dissemination
(website, social media, newsletter, press release)

Communications

Communications Strategy

VistaMilk

OBJECTIVES

1. **Engaging Employees and Stakeholders**
2. **Fostering future research**
3. **Increased engagement**
4. **Avenue for feedback and dialogue**

INTERNAL COMMUNICATIONS

Email

Monthly zoom call

Monthly Update

EXTERNAL COMMUNICATIONS

Newspaper

Website

Social Media

TV and YouTube

Conclusions

- More technologies are being developed – why? For who?
- Do these solve a problem or are they looking for problem?
- What is the return on investment
- Increasing focus on environment and climate
- Need to interact with people at all levels