Dedicated Analytical Solutions

KETOSIS SCREENING IN THE FRAME OF DHI TESTING – USABILITY AND EXPERIENCE FROM AROUND THE GLOBE

Dr. Daniel Schwarz, FOSS, Denmark

27 October 2016

ICAR Chile 2016

ICAR THE GLOBAL STANDARD FOR LIVESTOCK DATA

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KETOSIS – THE PROBLEM

- Negative energy balance
- Incidence: 25 to 60%
- Costs per case: $289

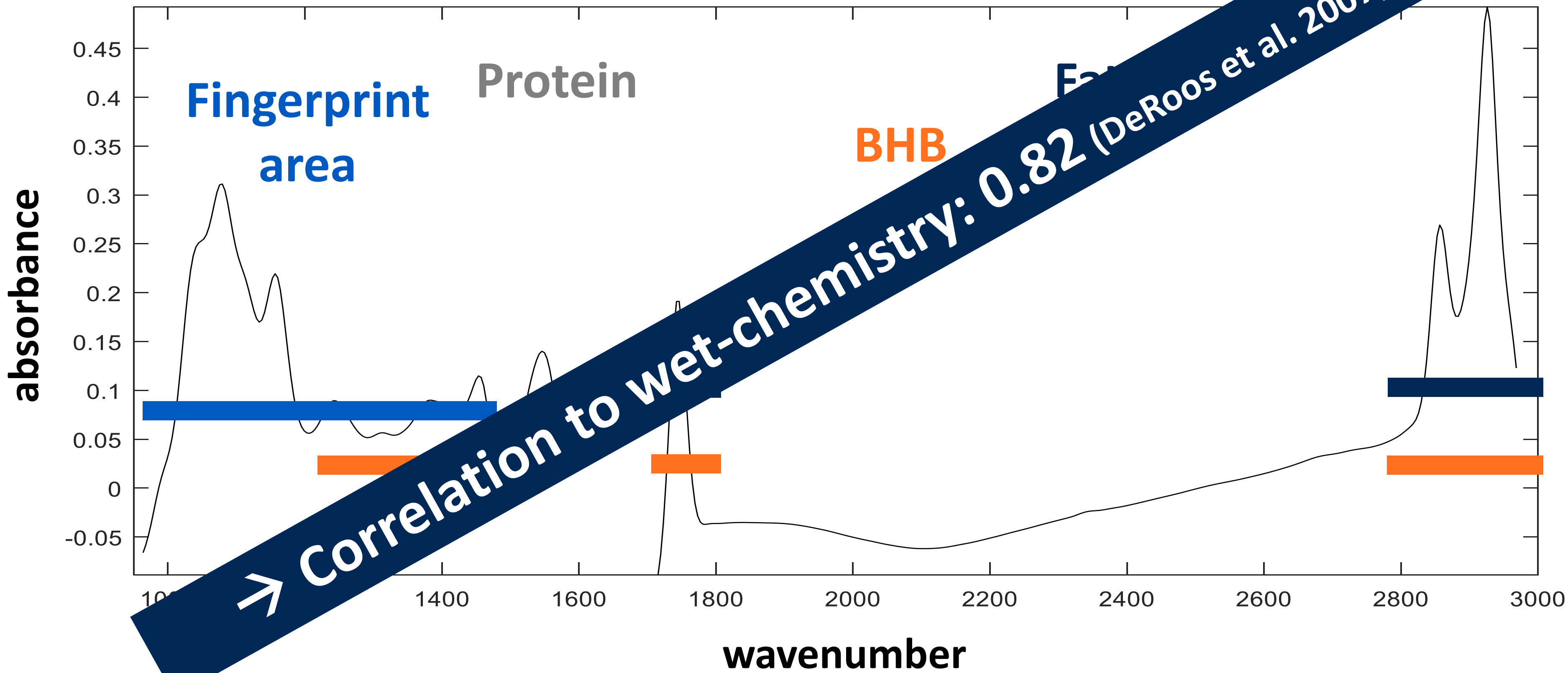
Mc Art et al., 2013, 2015; Mahrt et al., 2015

KETOSIS – DEFINITION & TESTING

- Ketone bodies elevated in blood
- Cow-side tests labour-intensive
- Availability of DHI samples and FTIR technology

FTIR – BHB PREDICTION MODEL

Indirect calibration developed:



→ Correlation to wet-chemistry: 0.82 (DeRoos et al. 2007)

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KETOSIS SCREENING – KEYS TO SUCCESS

1) Performance of laboratory analysis

2) Communication of results to dairy farmers

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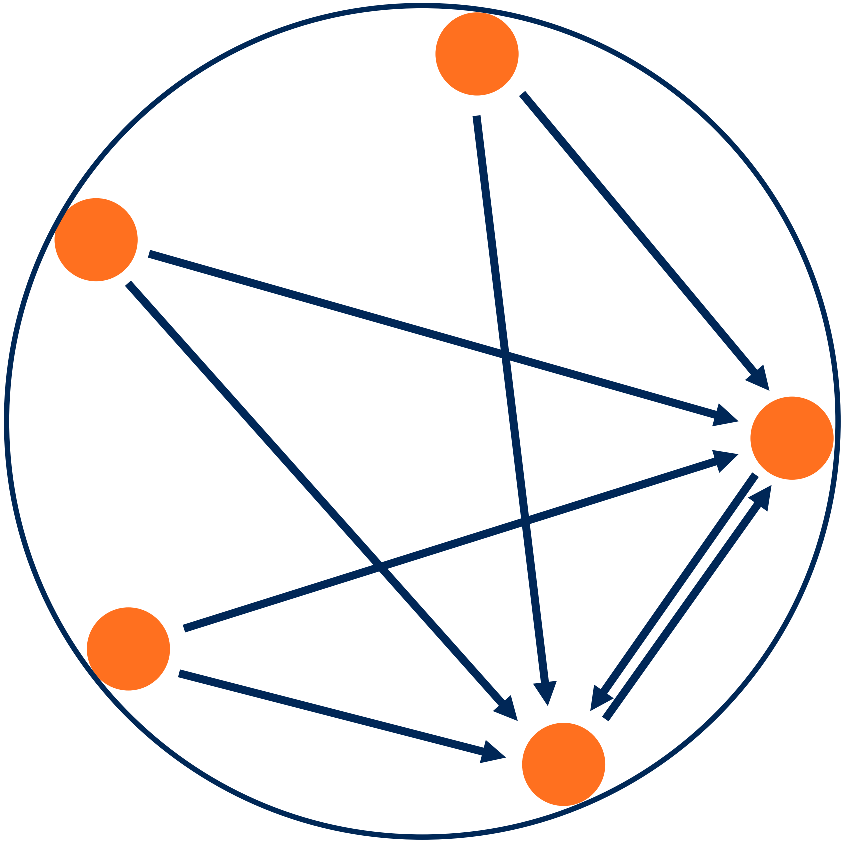
QA PROGRAMME IN CANADA

- All laboratories offering ketosis screening participate in QA programme:



Valacta, reference results (wet chemistry method) for 100 random samples
Provision of BHB pilot samples

Frequency: 1/month

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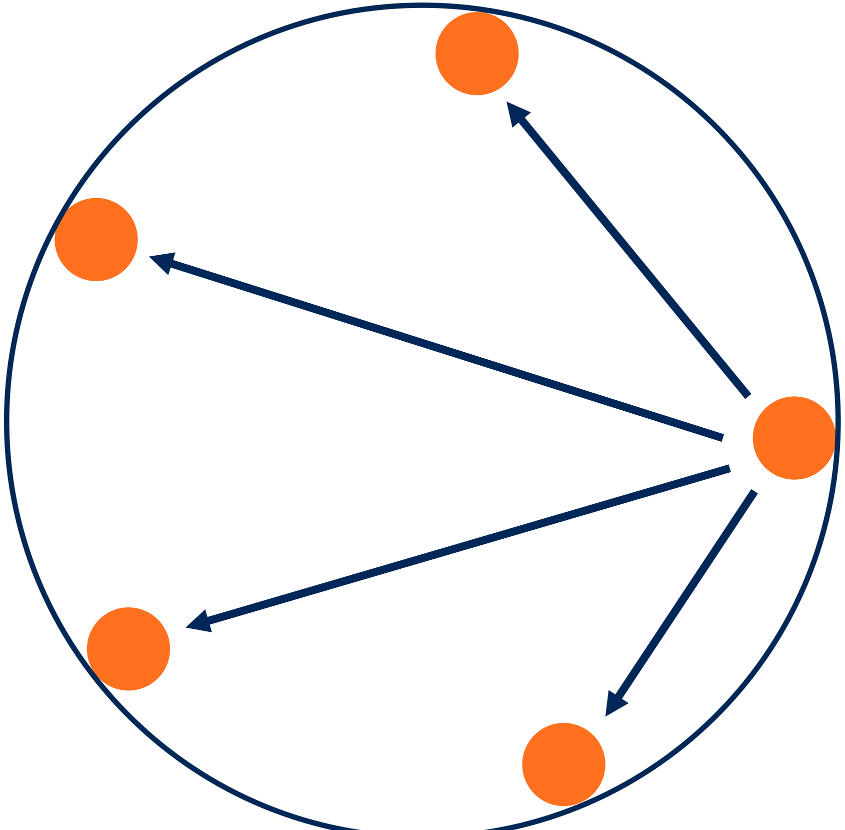
QA PROGRAMME IN FRANCE

- All laboratories offering ketosis screening participate in QA programme:



Reference laboratory, wet chemistry method
10 reference samples for BHB (0.05-0.25 mmol/l) and 5 samples for acetone (0.10-0.20 mmol/l)

Frequency: 1/month

IDF GUIDELINE

- Action Team S03b:

  New applications of IR spectrometry

- New guideline to be published in 2017

COMMUNICATION OF RESULTS

BHB (and Ac)

Cow-related data (e.g. DIM)

+ other parameters, e.g. %fat

+ cow-site test

Ketosis:
- yes/no
- risk group (e.g. 1-5)
- index (e.g. K!)

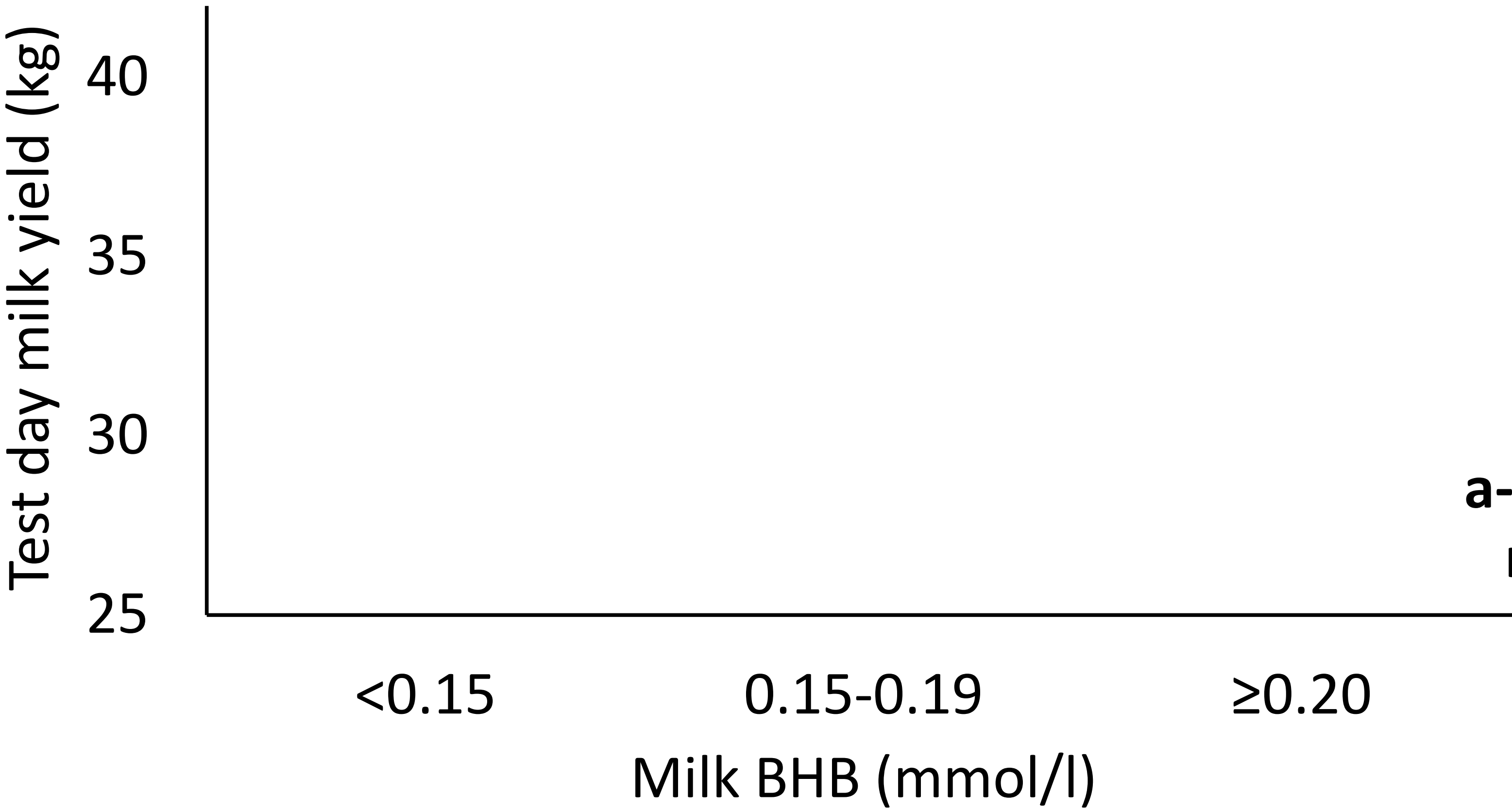
COMMUNICATION OF RESULTS

VS.

- No consensus on correlation

e.g., Dodds et al., 1981; Enjalbert et al., 2001; Denis-Robichaud *et al.*, 2014

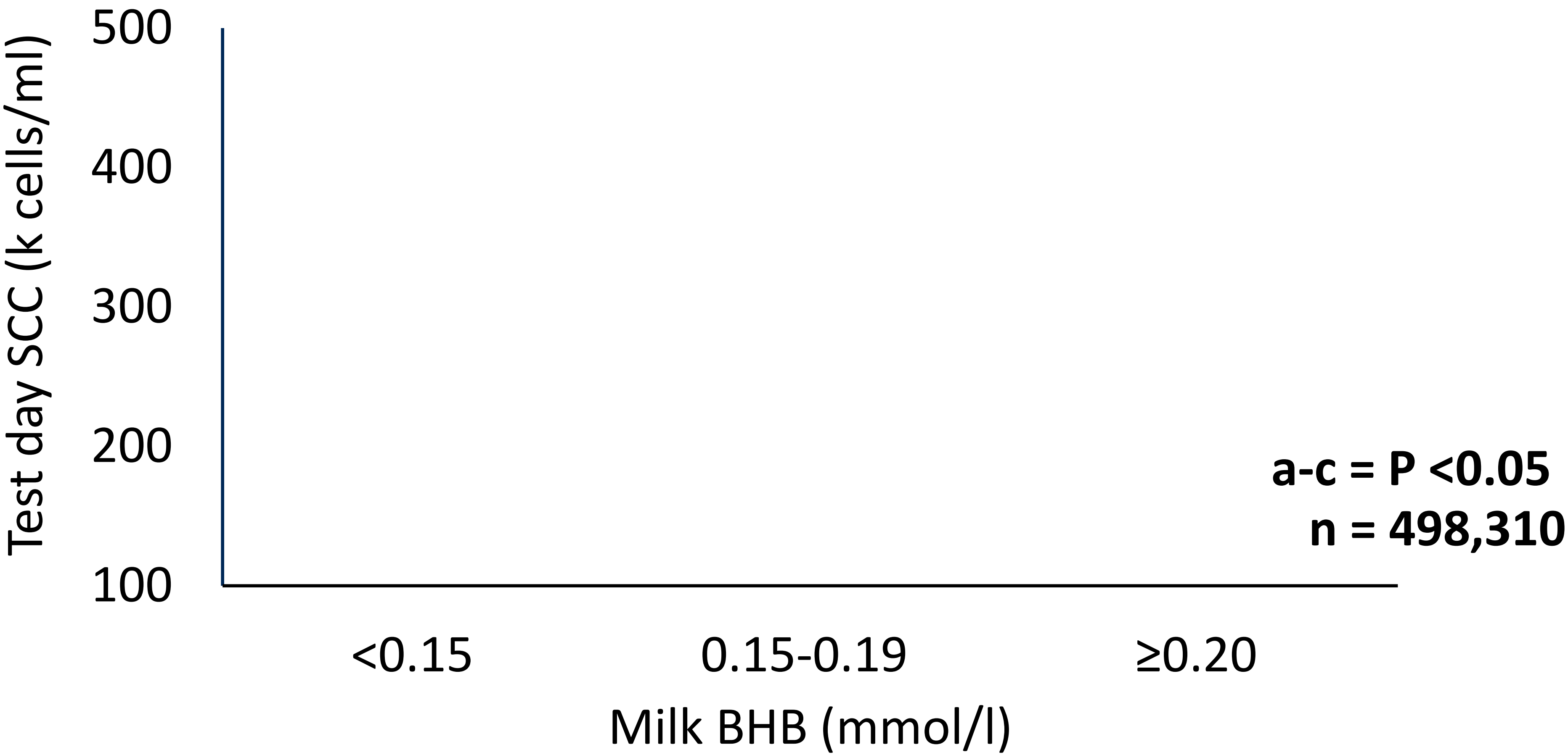
MILK BHB AND MILK YIELD



a-c = P <0.05
n = 498,310

Santschi et al. 2016

MILK BHB AND MASTITIS



Santschi et al. 2016

FARMER'S COMMENT

Mike Larson, general manager of Larson Acres (2,400 dairy cows)

PROGRESSIVE DAIRYMAN

Cooperative Resources International CRI

AgSource Laboratories

A Subsidiary of Cooperative Resources International

"We were surprised to learn just how many of the cows in our herd had subclinical ketosis. Since there were no symptoms, the condition went otherwise undetected and untreated."

"It has helped us to not only understand the frequency of subclinical ketosis in our herd but also the patterns behind the subclinical cases. This allowed us to focus on those challenge areas."

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A MESSAGE TO TAKE HOME

- Simple, practical, rapid and inexpensive tool
- Keys to success in establishment: QA and communication
- Evidence of success of ketosis screening in various countries

@SchwarzD123 @FOSSAnalytical

B+LNZ Genetics + ICAR

Agenda

- B+LNZ Genetics Background
- New Zealand Livestock Farming
- B+LNZ Genetics & Beef
- B+LNZ Genetics & Sheep
- Why B+LNZ Genetics + ICAR?

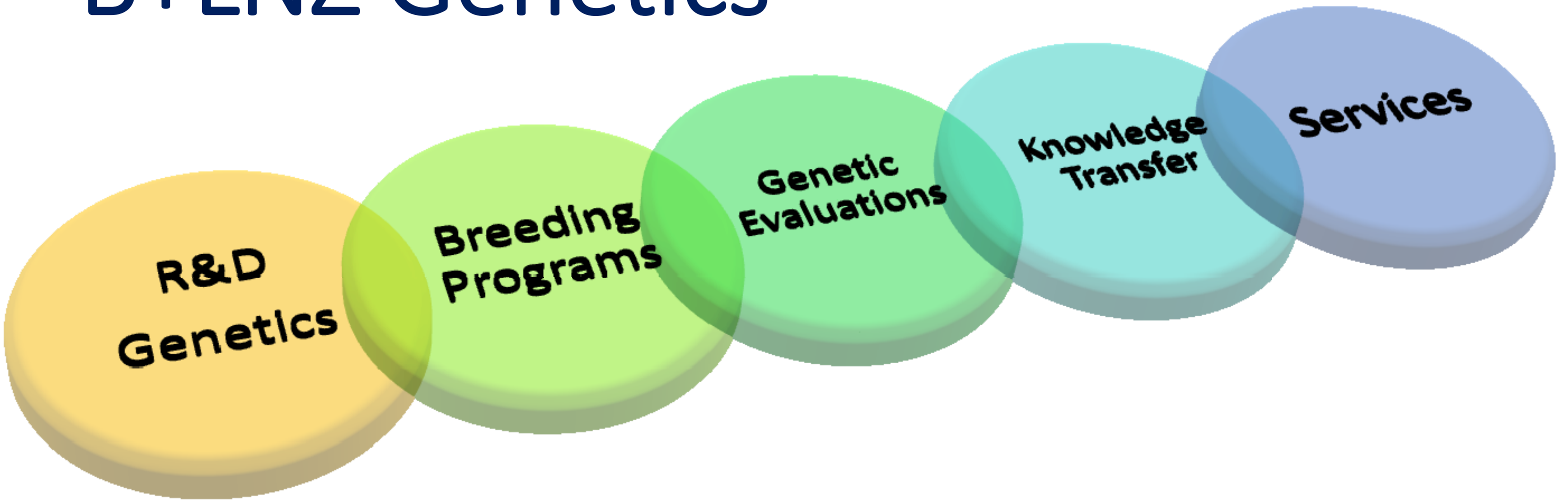
Partnership >

Government
+
Sheep & Beef Farmers

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

beef+lamb new zealand

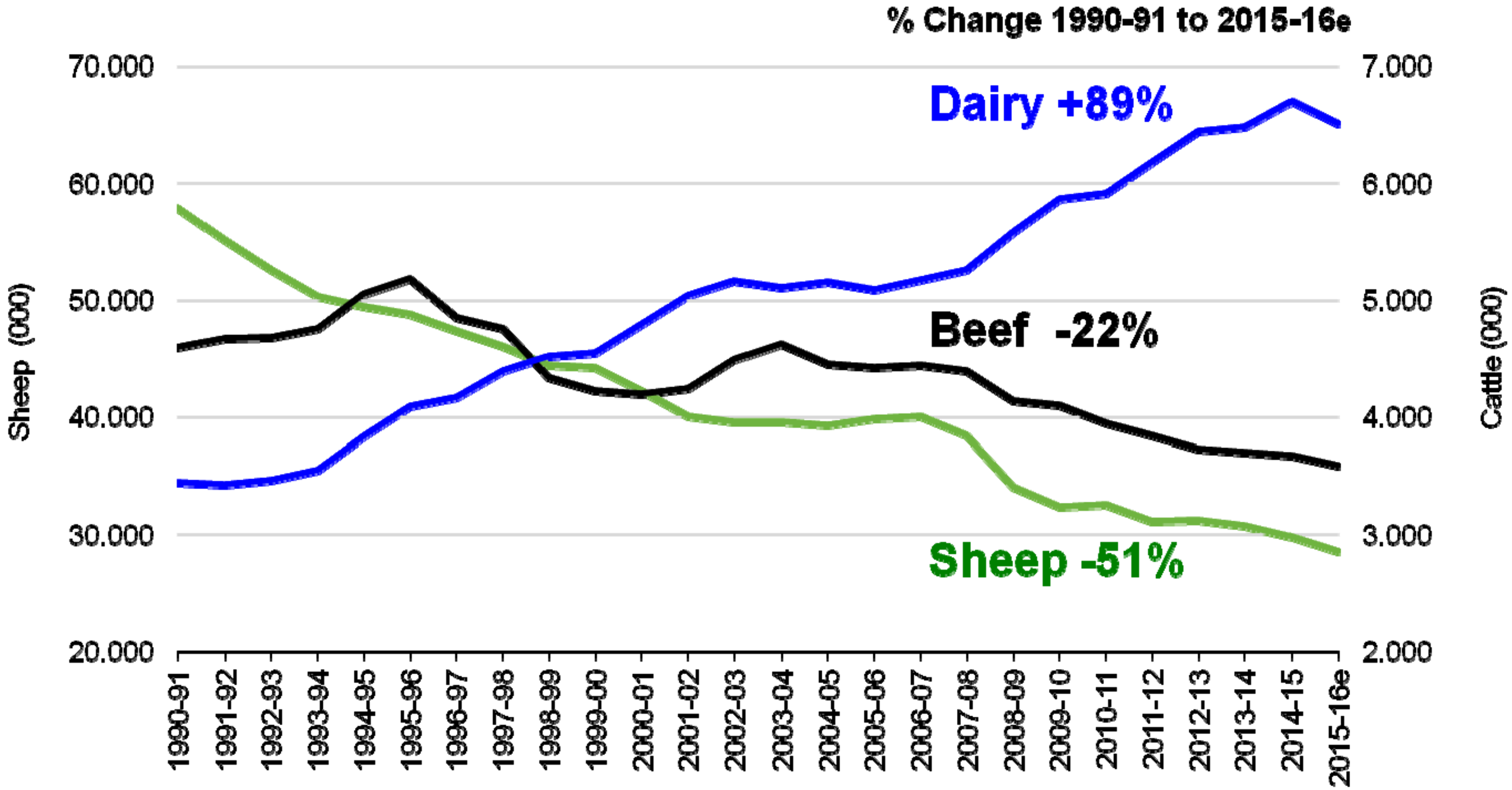
B+LNZ Genetics



PURPOSE

Provide the Information Infrastructure for Breeders, Farmers and Industry to make profitable breeding choices

NZ Sheep, Beef & Dairy Numbers



Source: Beef + Lamb New Zealand Economic Service
Statistics New Zealand

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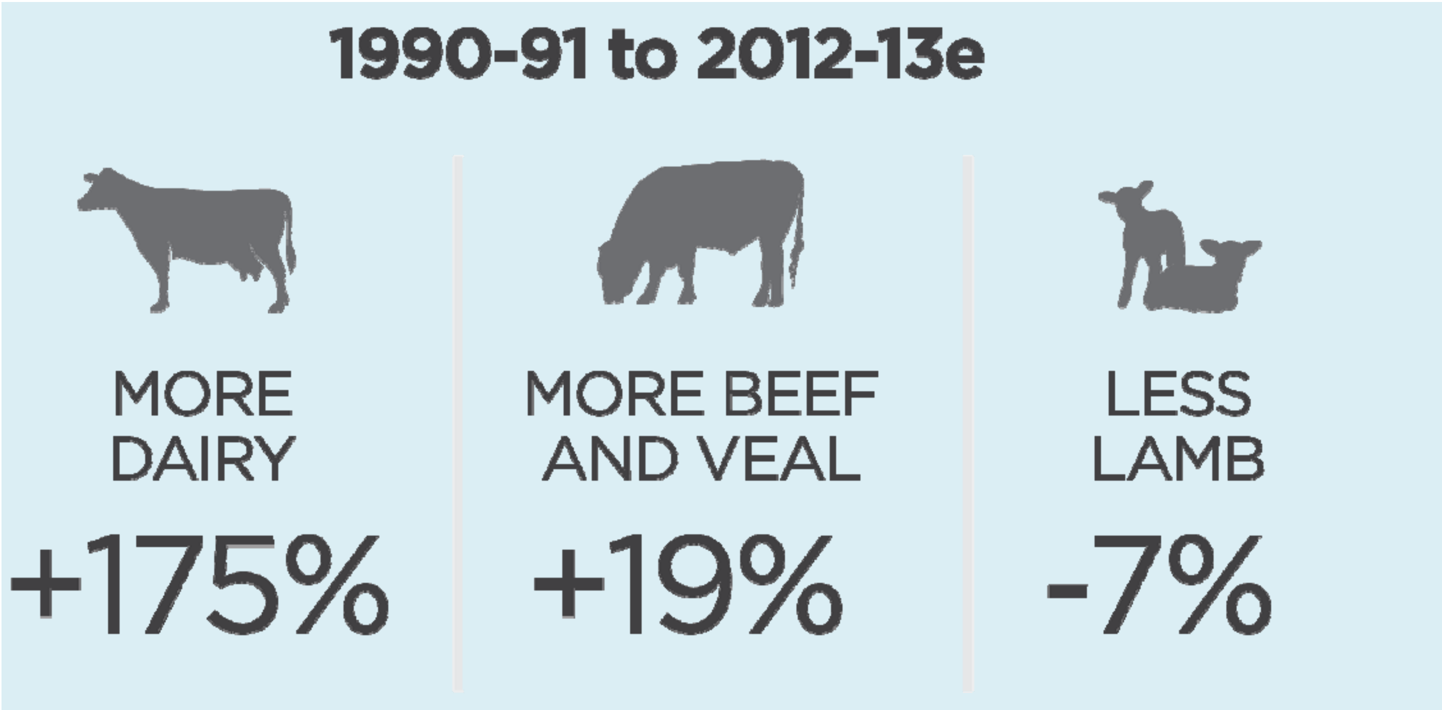
NZ Production Changes



But -51% fewer Sheep

B+LNZ Genetics: Beef

beef+lamb GENETICS

Challenges & Opportunities

- Sheep & Beef Farming System
  - Beef provide more value than a lawn mower?
  - Describe & Select Genotypes specifically for NZ?

beef+lamb GENETICS

Challenges & Opportunities

- NZ Dairy Farming No 1 source of NZ Beef
  - – Describe specific Genotypes for Dairy-Beef versus traditional Beef System?

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NZ Beef Genetic Evaluations > Australia

B+LNZ Genetics: Sheep

NZ Genetic Evaluation: Scale

	Within-Flock	Across-Flock
Unique animals	14 million	8.3 million
All flocks	1,135	
Current active flocks‡	564	
2015 born (NAI*)	330,649	
eBV's stored	22 billion	416 million

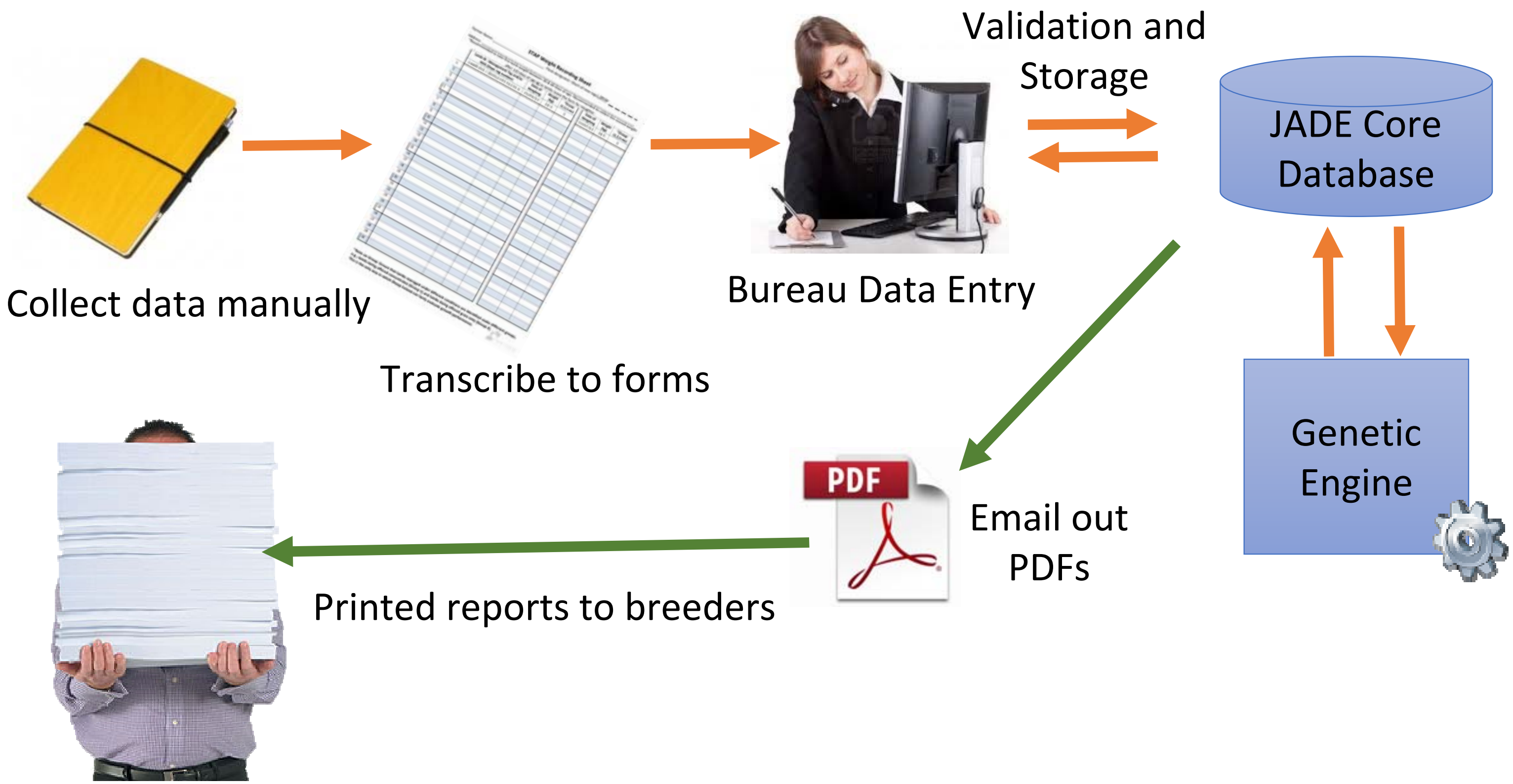
**NAI = new animal indicators*
‡Flocks selling rams
- Base Year 1995

Figures from Aug 2016

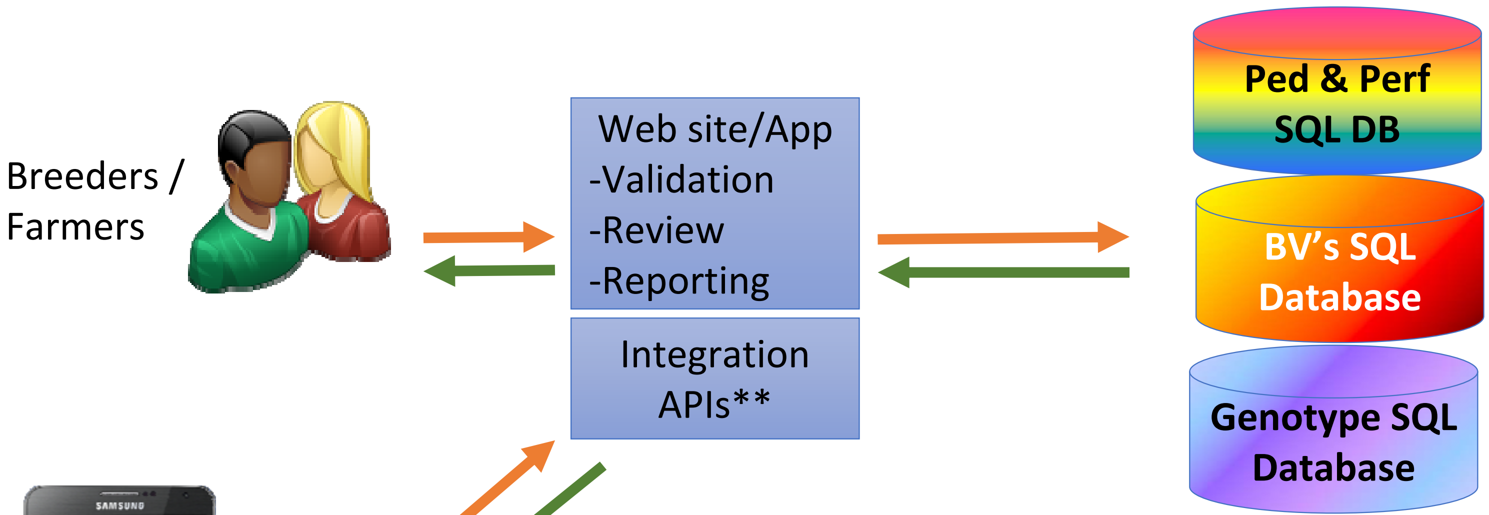
2016: Genetic Engine Upgrade (SIL)

Analysis	Flocks	Animals	ASREMEL	MIX99
Perendale	57	653,826	33 hours	**1½ hours**
Texel	79	491,988	15 hours	**0.5 hours**
Coopworth	101	1,612,649	48 hours	**4 hours**
Multi-Breed Across flock	456	5,348,205	>1 week •multiple computers •simplified models	**26 hours**
NZGE (Weekly)	1,135	**14,387,346**	Not Possible	31.5 hours

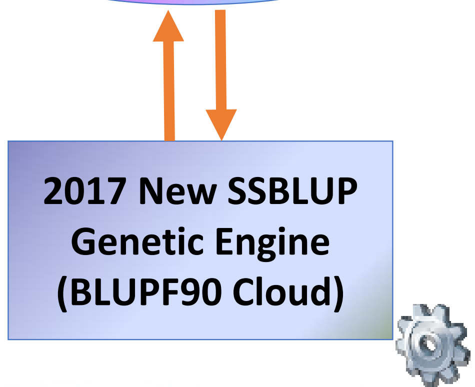
GE System Upgrade : Pre – 2016



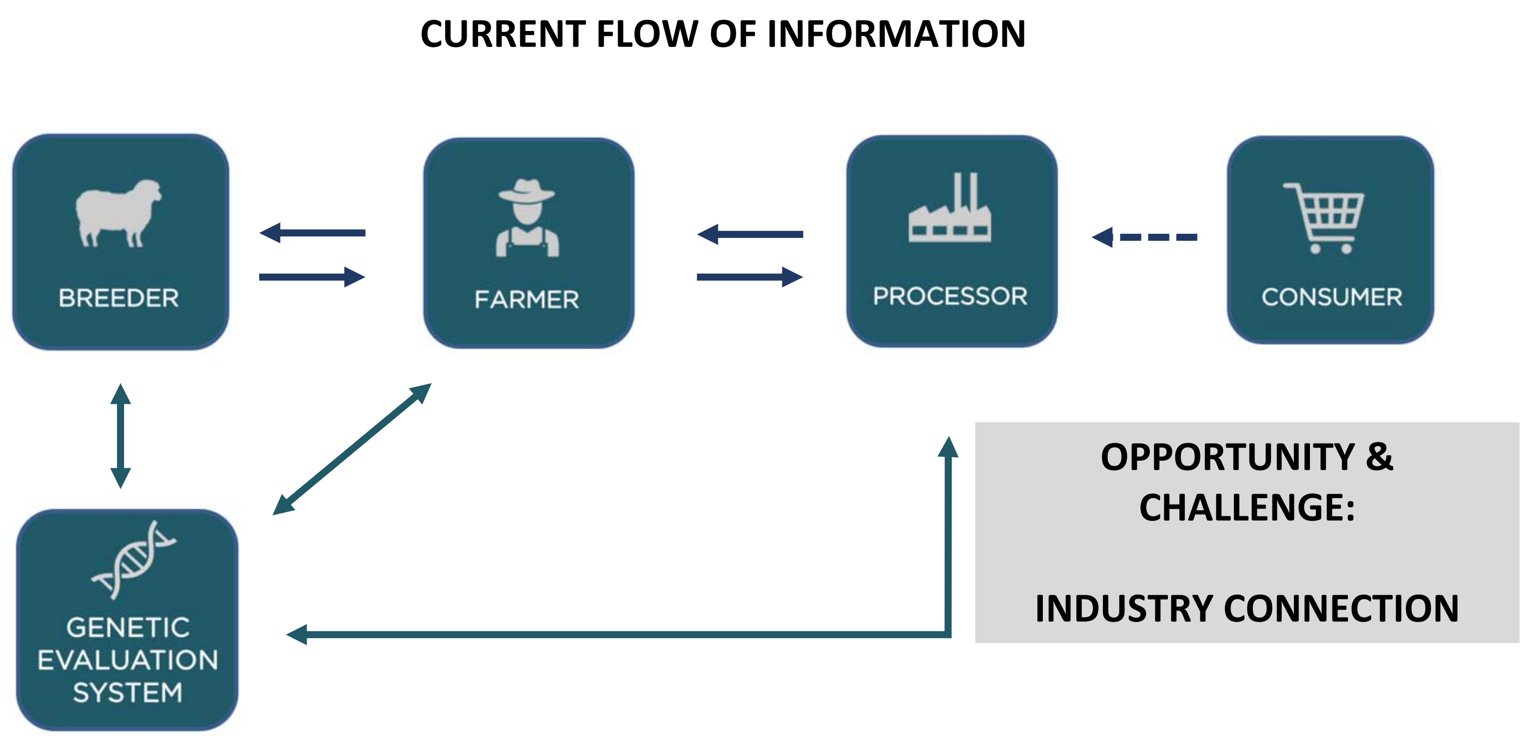
GE System Upgrade : 2016 -2017



- In-field data capture
- Decision support tools
- Integration with other farm systems & industry via API's

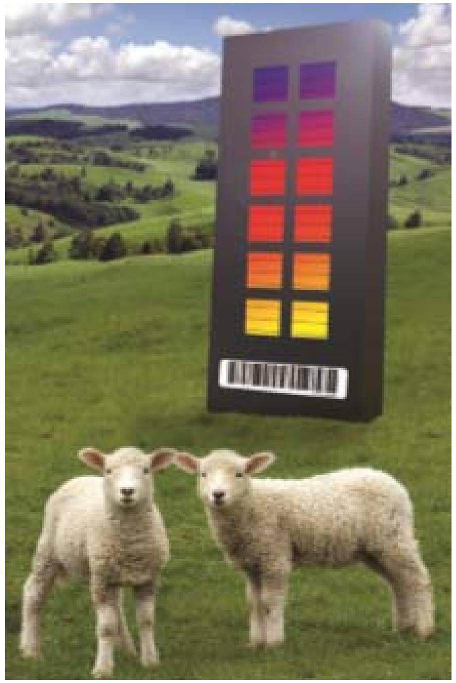


Genetic Evaluation Data Flow



Sheep Genotyping & Genomics

- SNP Parentage
  - Current 80,000 animals / year & growing
  - € 13.00 Euro
- Genomics
  - 36,170 in training: (50k & HD) & 10,000 p.a. genotyped LD
  - € 40.00 Euro
- **Challenge & Opportunities**
  - **Parentage: < € 5.00 Euro**
  - **Genomics: < € 15.00 Euro**
  - **Transition from totally Parentage > Genomics**

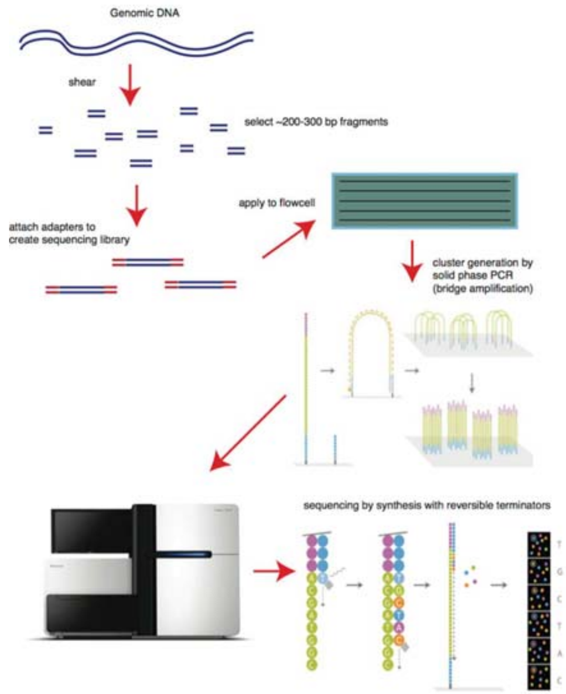


Sheep Genomic Predictions

Trait		Trait	Romney 2016	Coopworth	Perendale	Composite
Production	Number of Lambs Born	NLB	64%	54%	43%	47%
	Lamb Weaning Weight	WWT	63%	67%	60%	45%
	Weaning Weight Maternal	WWTM	47%	46%	41%	40%
	Live Weight 8 months	LW8	61%	61%	53%	45%
	Live Weight 12 months	LW12	58%	53%	51%	49%
	Carcase Weight	CW	58%	60%	46%	43%
	Ewe Live Weight	EWT	51%	55%	42%	45%
	Eye Muscle Area	EMAc	57%	59%	49%	39%
Meat Yield	Fat Yield	FATY	47%	67%	40%	43%
	Hind Qtr Yield	HQLY	45%	62%	42%	50%
	Loin Lean Yield	LNLY	44%	62%	42%	49%
	Shoulder Lean Yield	SHLY	50%	62%	41%	47%
	Lean Yield	LEANY	47%	62%	42%	49%
Health	Facial Eczema	GGT21	63%		46%	
	Lamb Dag Score	LDAG	48%	62%		59%
	Adult Dag Score	ADAG	52%	58%		53%
	Feacal Egg Count	FEC1	61%	68%	53%	61%
	Feacal Egg Count	FEC2	52%	50%	41%	44%
	Adult Ewe Faecal Egg Count	AFEC	46%	45%	34%	39%
Wool	Fleece Weight 12m	FW12	51%	69%	50%	54%
	Lamb Fleece Weight	LFW	34%	31%	28%	31%
	Ewe Fleece Weight	EFW	42%	26%	25%	27%

BLG Sheep Genomic Pipeline

1. HD Genotype key Sires with good phenotypes
2. Impute to Sequence
3. GWAS: Causative Mutations & QTL
4. Add SNPs to Panel to improve accuracy for Genomic Selection

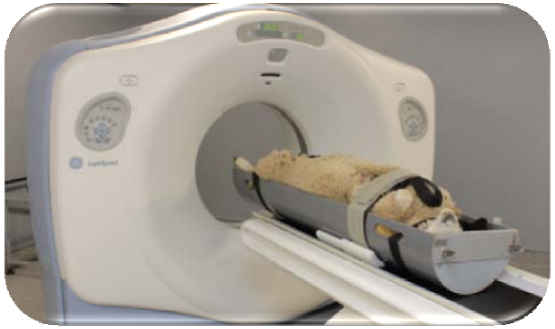


Challenge: ROI on GWAS vs. Phenotypes & Genotypes

Main Areas Sheep Research

Feed Efficacy (RFI)

Meat Yield & Shape



BCS

Maternal Ewe

Meat /Eating Quality

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Challenge> Knowledge Transfer (KT)

1. KT of R&D outcomes onto Farms
2. Assist Seed Stock producers to increase Genetic Merit of flock/herd

B+LNZ Genetics + ICAR > Sheep

Why BLG + ICAR?

- Identifying /implementing key traits of economic value across countries
- Dialog on standardisation / guidelines /codes of practice for the recording of these traits
- The standardisation between countries of nomenclature (IDs, names, units and abbreviations)

Why BLG + ICAR?

- Sharing/access to hard/expensive to record phenotypes (e.g. RFI)
- Opportunities stimulate across country evaluations/progeny tests and exchange of germplasm
- Exchange and use of data including genomic data for gene discovery and evaluations

beef+lamb new zealand GENETICS


ICAR
THE GLOBAL STANDARD
FOR LIVESTOCK DATA
Via Savoia 78, 00198, Rome, Italy
CERTIFICATE OF QUALITY
Beef+Lamb New Zealand Genetics
for Identification and production recording in dairy cattle; Laboratory analysis
(milk samples); Data processing
Hans Wilmink
President
Rome, 10 October 2016
Certificate number: 2016/10
Valid up-to: April 2018

The End

Connectivity needs of French dairy farms

Clément ALLAIN

ICAR 2016 – Puerto Varas

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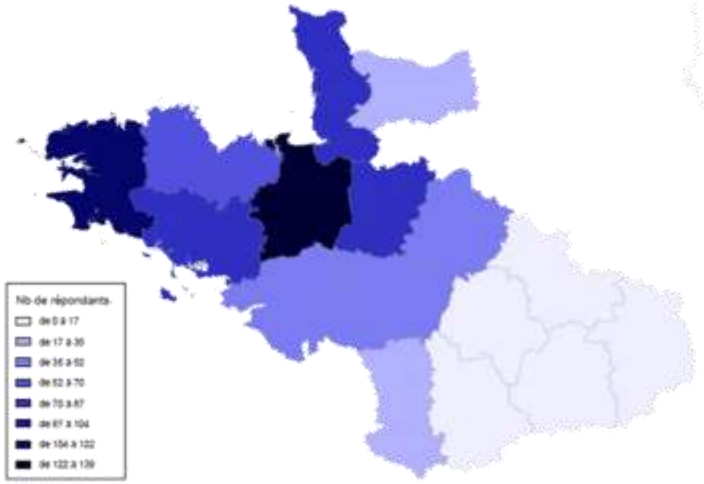
Context

- Important development of precision livestock farming
- New connectivity needs for the dairy farmers
- New possibilities and challenges for their partners

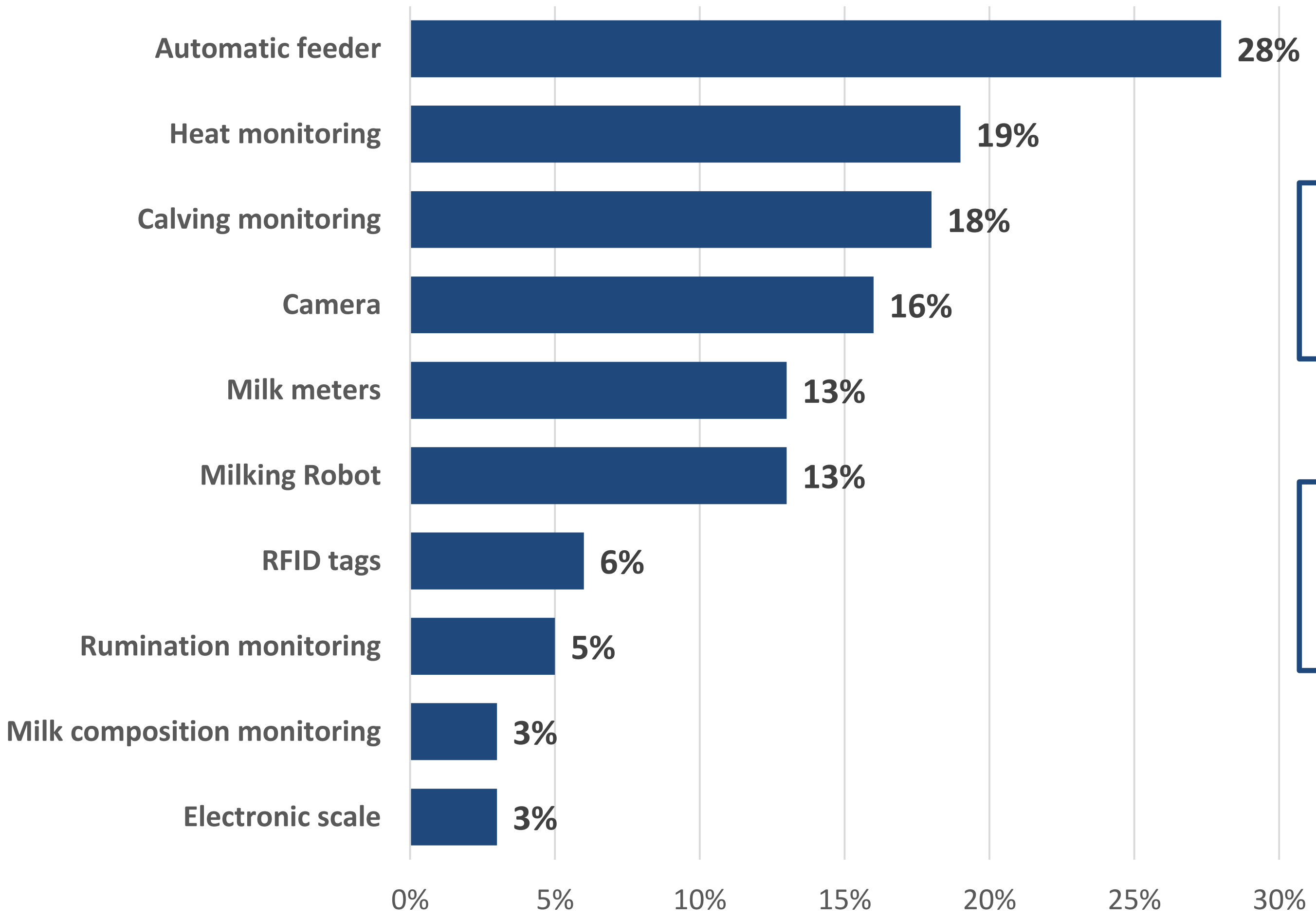
→ **Goal of the study:** assess the connectivity landscape of the French Dairy Farms ?

Survey methodology

- January → March 2015
- 4000 dairy farmers contacted by e-mail **– 772 answers**
- **Western and center of France**
- **Survey with 53 questions :**
  - Farm and farmer characteristics
  - Connected devices (farm + telecom)
  - Use practices of those equipments
  - Satisfaction regarding connectivity
  - Expectations on farm and equipment



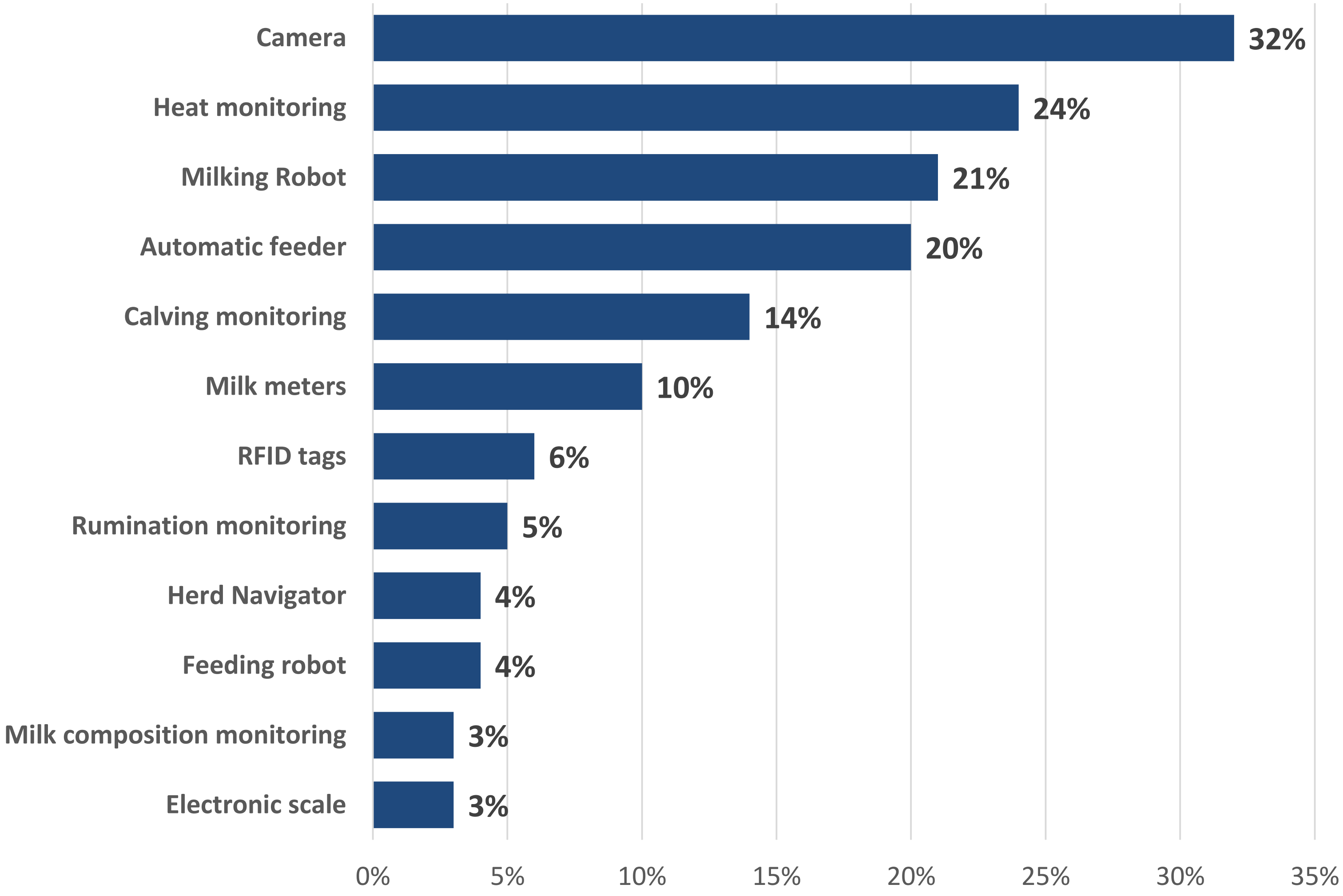
Sensors and Robots: Important penetration in Dairy farms



67 % have at least 1 connected device
(87% in herds>100 cows)

38 % of the non equipped expect to invest in a short term

Sensors and Robots: Short term investment perspectives



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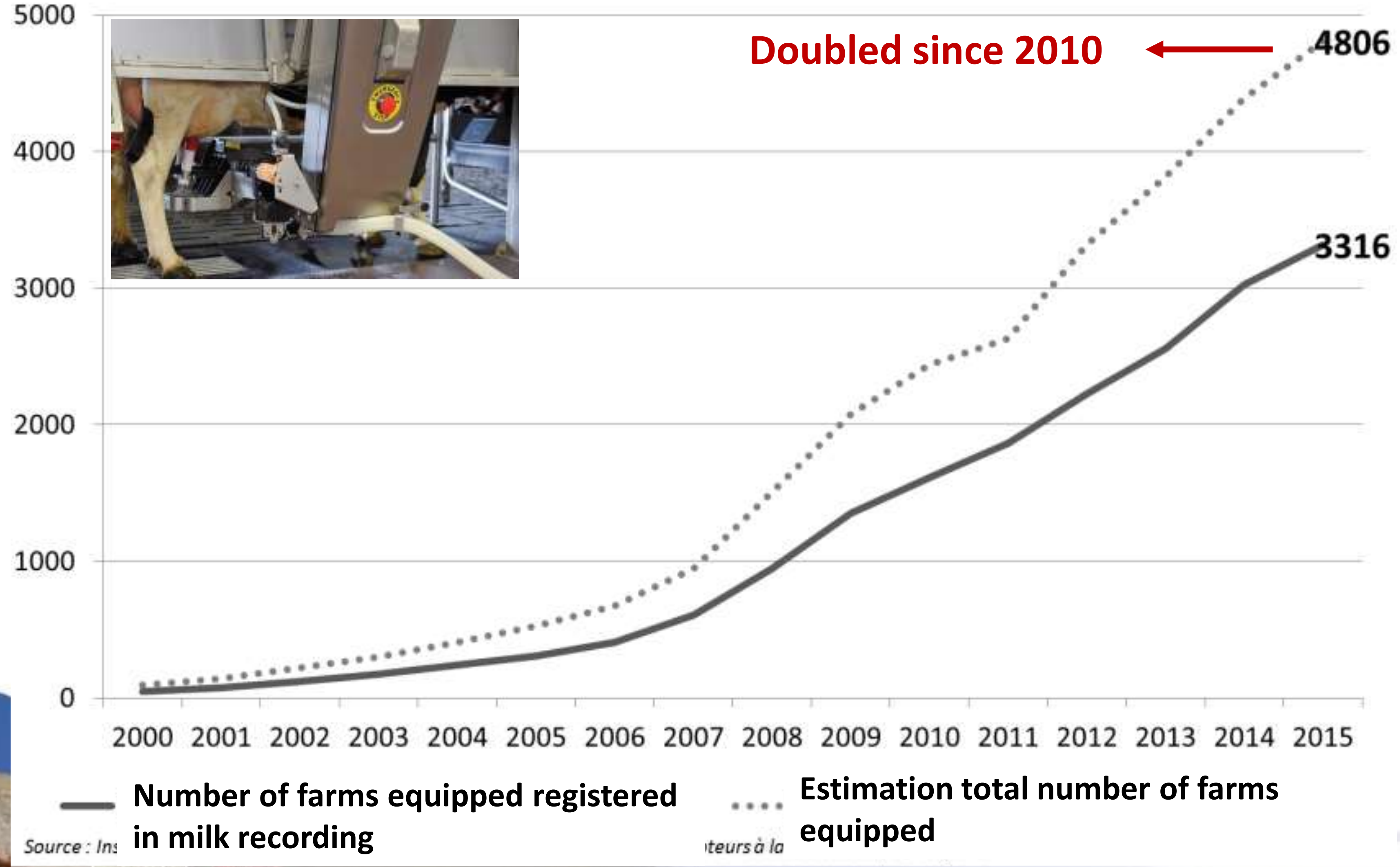
Growth tendancy: example of AMS



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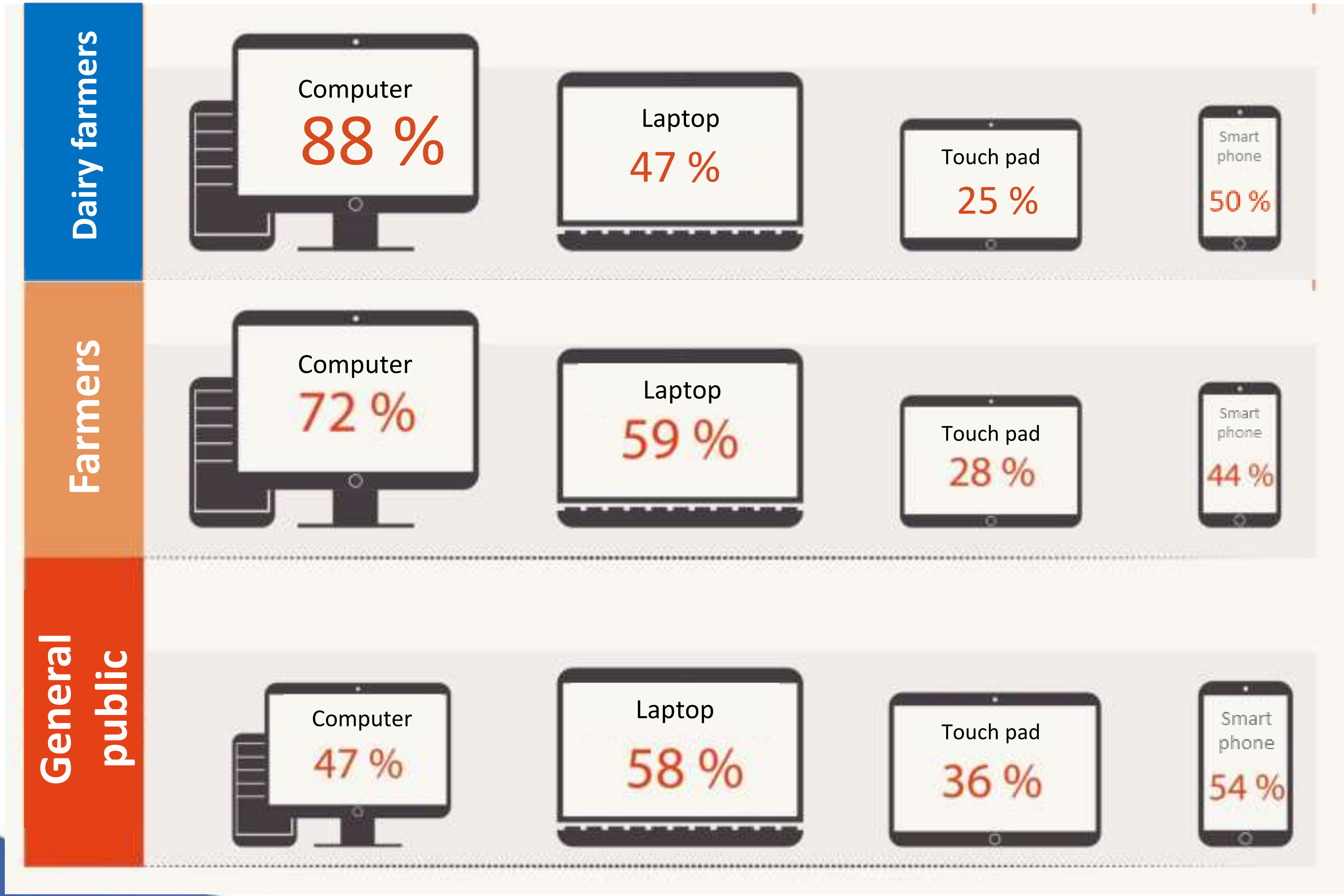
Computers and mobile devices



Sources : étude agrinautes – agrisurfeurs 2015 (TICAgri/BVA) + étude Idele, Orange, Evolution 2015

Who are the connected farmers ?

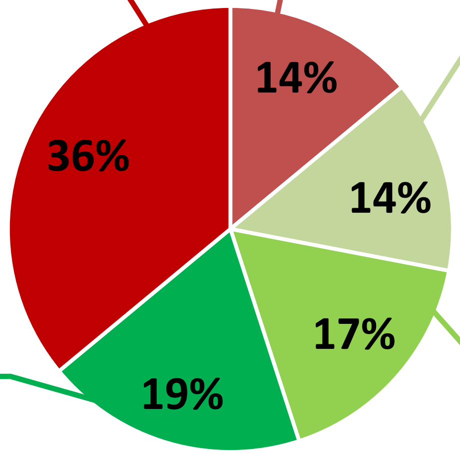
- **Methodology: FMA and hierarchical clustering**
- **5 different classes**

« Not concerned »

- « old » farmers (50 et +), no studies
- Small herds
- Low equipment rate with connected devices

« Fixed internet mostly»

- Small grazing herds
- Low equipment rate with connected devices / Fixed internet
- No interest for mobile internet



« Grazing and connected »

- Studies > 2 years, Small grazing herds
- Very connected with mobile devices (SP)
- Interested for new technologies in the future

« Technophile demanding »

- Young farmers, studies >2 years
- Big Herds / No grazing
- Very equipped and expect to invest
- Very demanding regarding connecivity

« Already equipped, cruising »

- Very eqquiped with connected devices
- Satisfied of their connectivity

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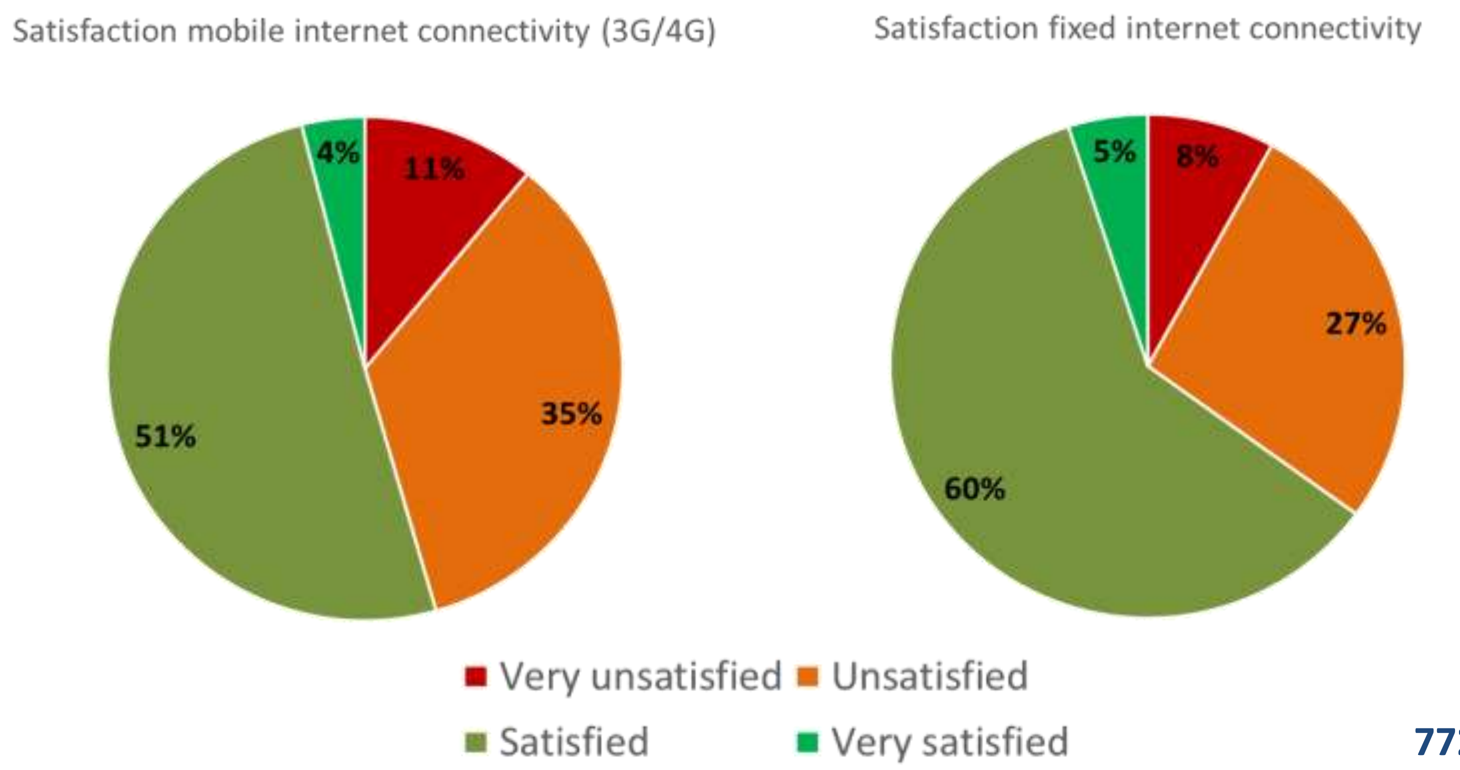
Satisfaction with connectivity

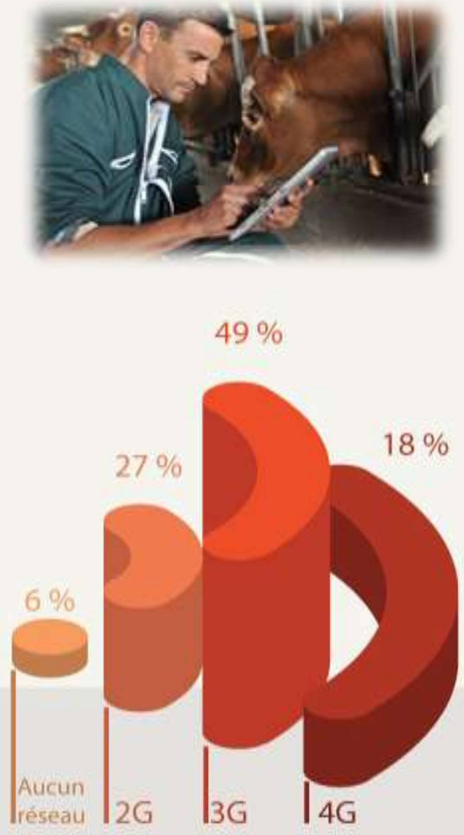


772 answers

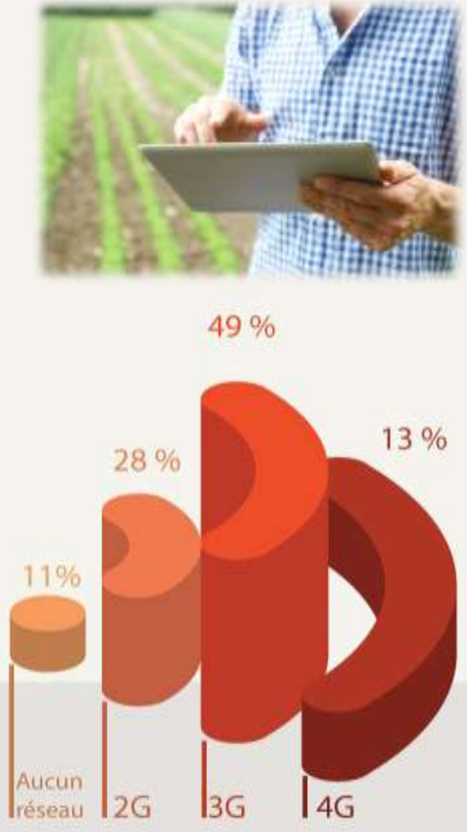
- **35 %** of the dairy farmers are **unsatisfied** with the fixed internet network
- **46 %** are **unsatisfied** with the mobile internet network.

Why are they unsatisfied ?

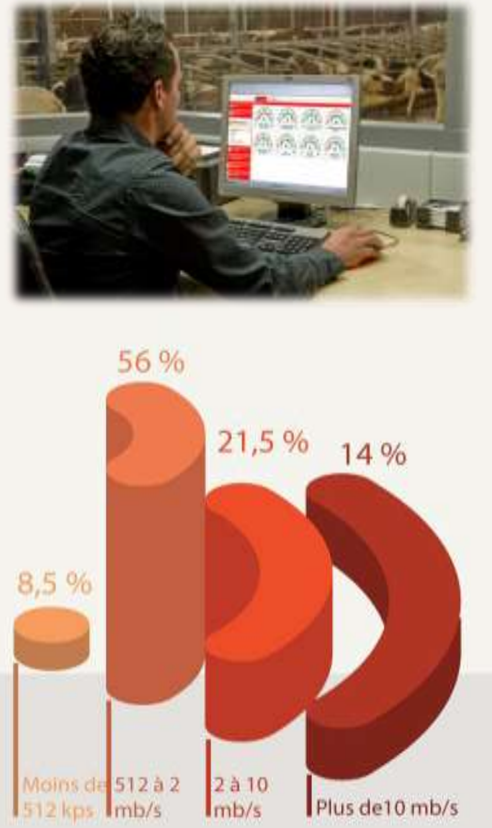
Mobile internet network on farm (office, barns)



Mobile internet network in the fields

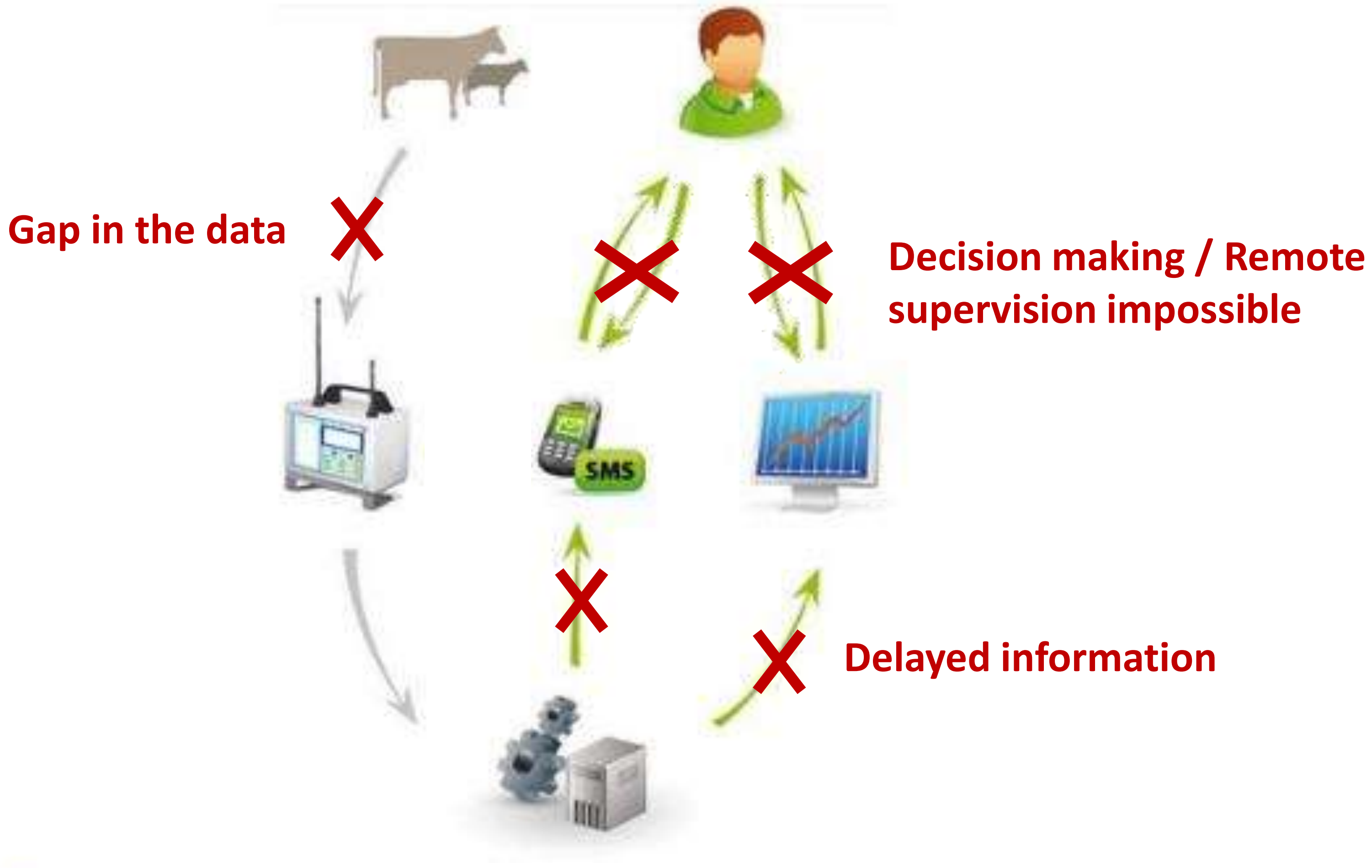


Fixed internet network on farm (office, barns)



Source: étude Agrinautes 2016

Connectivity issues



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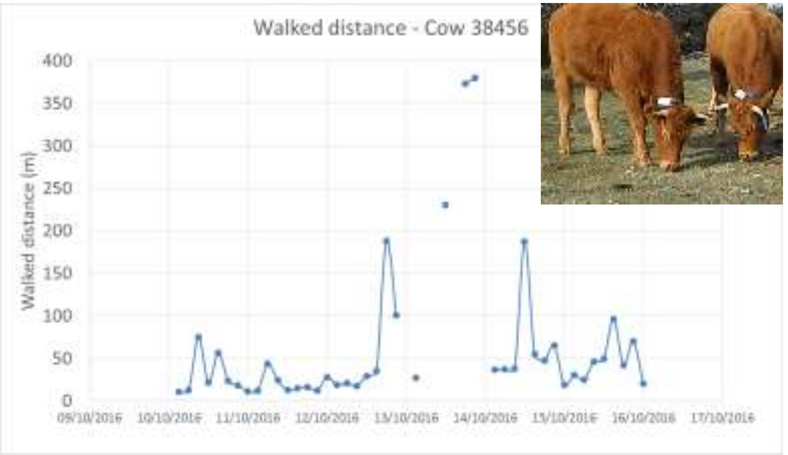
Consequences for farmers and their partners



Data Exhaustivity

- Important consequences on decision making
- Unusable for advisory services and genetic evaluation ?

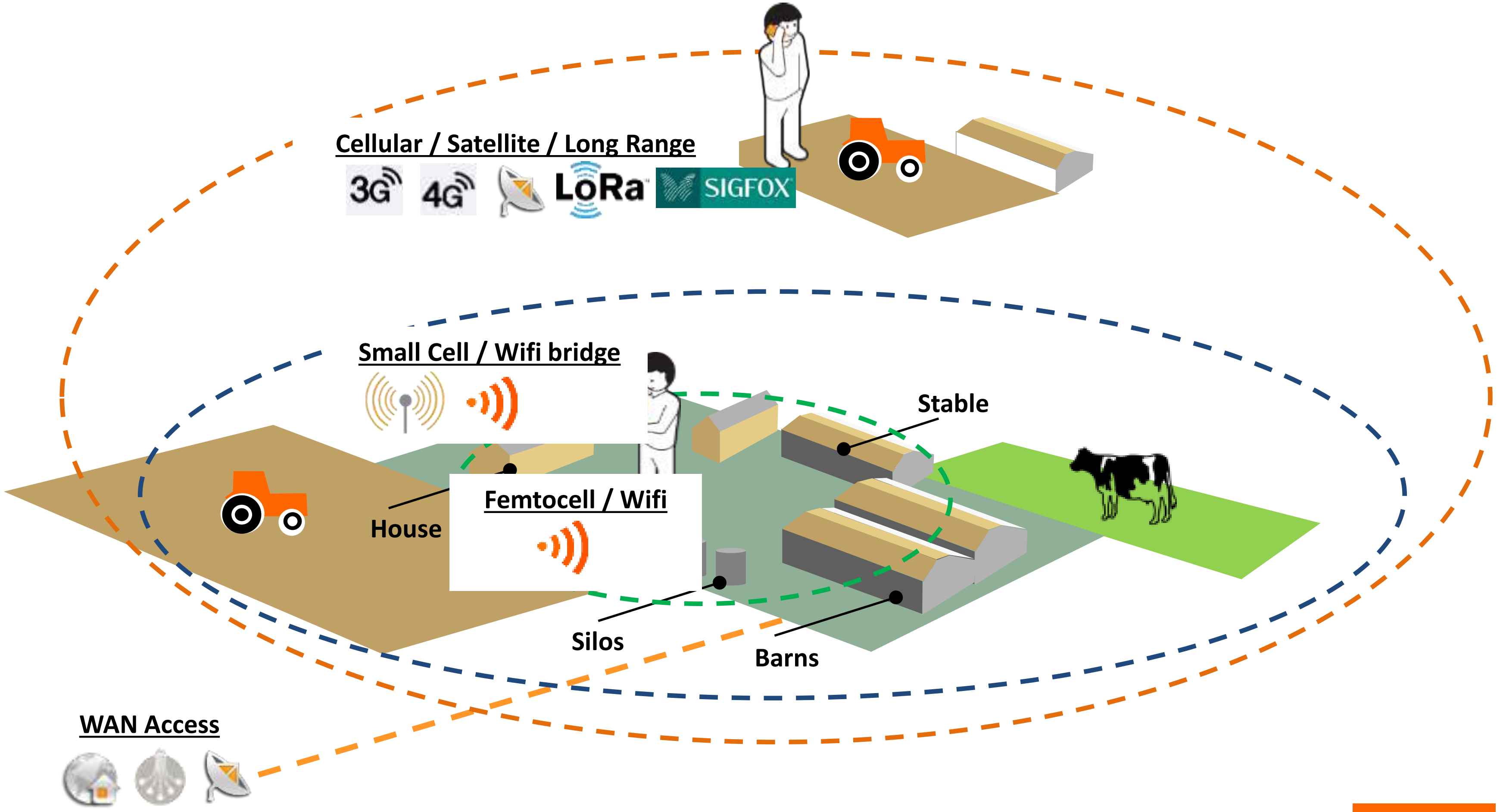
Delayed information

- Still useful for decision making ?
- Problem for services (milk recording, advisory services, AI,…)

Remote control / supervision / maintenance

- Mobile network: remote control difficult when outside of the Wifi network
- Fixed network: remote maintenance (milking robots) possible?

Solutions to improve farm connectivity



Solutions to overcome the lack of connectivity

- Off line software and devices

- Take advantage of « traceable » technologies

- Use the new IoT networks : long range/low flow (Sigfox, LoRa)

- Fixed monitoring ~~vs. mobile monitoring~~

Take home message

- **Strong interest of dairy farmers for digital applications**
  - **80% of surveyed farmers** are equipped with connected tools (67%) or will be short-term (13%)
  - This represents **around 48 000 dairy farms** in France
  - **Strong diversity** of the connected farmers → not only the big and intensive farms

- **This involves new connectivity needs ...**
  - Farmers: farm management
  - For their partners: data exchange and their potential use
  - **Who should handle (and finance) the connectivity improvements: state, farmer, private telecom companies, farm partners (MRO, AI, feeding companies)?**

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Questions ?

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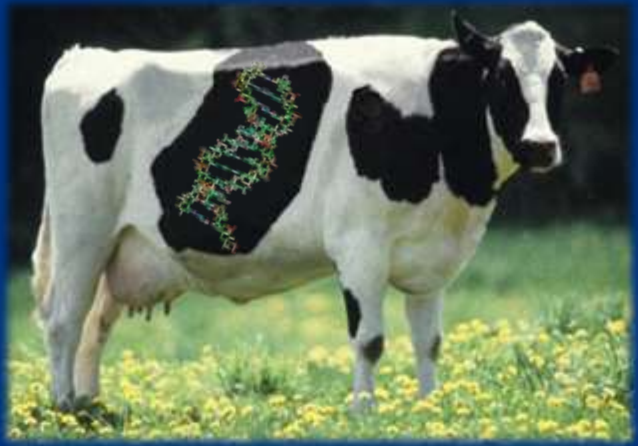
Updated guidelines for the recording, evaluation, and genetic improvement of udder health in dairy cattle



J.B. Cole,[1,*] C. Egger-Danner, A.J. Bradley, N. Gengler, B. Heringstad, J.E. Pryce, and K.F. Stock

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Beltsville, MD 20705-2350

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Introduction

- A healthy udder is free from mastitis, which is the most costly disease of dairy cattle (Seegers et al., 2003)
- Udder health has declined in many breeds because of unfavorable correlations with production (Ødegård et al., 2003)
- Poor udder health increases costs, results in higher rates of involuntary culling, decreases revenue, and harms animal welfare
- Genetic selection for improved udder health is an important part of dairy cattle breeding programs (Schutz, 1994; Heringstad et al., 2003)

Existing ICAR guidelines

International Agreement on Recording Practices

SECTION 7.3 - GUIDELINES FOR RECORDING, EVALUATION AND GENETIC IMPROVEMENT OF UDDER HEALTH

7.3.1 General concepts

7.3.1.1 Reader instructions

These guidelines are written in a schematic way. Enumeration is bulleted and important information is shown in text boxes. Important words are printed **bold** in the text.

The aim of these guidelines is to provide dairy cattle breeders involved in breeding programmes with a stepwise decision-support procedure establishing good practices in recording and evaluation of udder health (and correlated traits). These guidelines are prepared such that they can be useful both when a first start to the breeding programme is to be made, or when an existing breeding programme is to be updated. In addition, these guidelines supply basic information for breeders not

What do we want in guidelines?

- Best practices
  - What data should be recorded? Who should collect them? How?
- Concision
  - Include only necessary information
  - Current guidelines are 27 pages…
- Do not repeat work already done!

Udder health phenotypes

Type	Measure[1]	Reference	Type	Measure	Reference
Direct	Clinical mastitis	Bramley et al. (1996)	Indirect	Changes in SCC patterns	De Haas et al. (2008)
	Subclinical mastitis	Bramley et al. (1996)		Differential SCC	Schwarz et al. (2011)
Indirect	SCC	Schukken et al. (2003)		Electrical conductivity	Norberg et al. (2004)
	Milkability	Sewalem et al. (2011)		Lactoferrin content	Soyeurt et al. (2012)
	Udder conformation	Nash et al. (2002)		Pathogen-specific mastitis	

[1] The indirect measures listed in italics were added to the revised guidelines.

Phenotype considerations

- Udder health data originate from various sources which differ considerably with respect to information content and specificity
- The data source should be clearly indicated whenever information on udder health status is collected and analyzed
- When data from different sources are combined, these origins must be taken into account

Clinical and subclinical mastitis

- Clinical mastitis results in altered milk composition, and is accompanied by a painful, red, swollen udder (Bramley et al., 1996)
- Subclinical infections do not change the appearance of the milk or the udder, but milk composition is altered
- Subclinical mastitis is most commonly detected based on elevated SCC

Traits – milking speed

- Milking speed data are routinely collected by milking systems and stored in on-farm computer systems
- Genetic correlations of SCS with milking speed generally are moderate and antagonistic
- Selection for faster milking also may reduce risk of mastitis
- Where is the optimum?

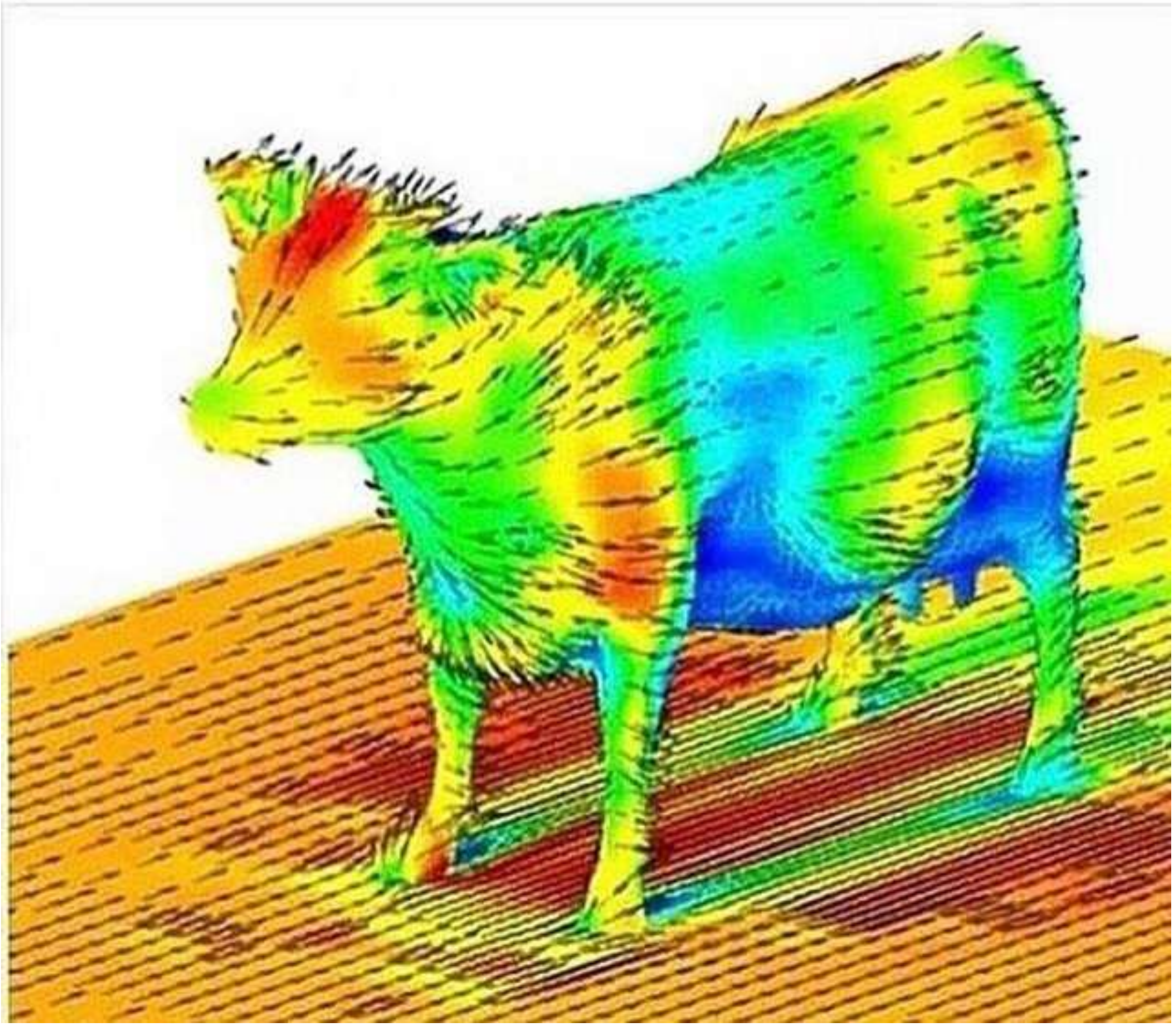
Traits – electrical conductivity

- Electrical conductivity is measured by most modern milking systems
- Cows with mastitis produce milk with increased milk conductivity (Norberg et al., 2004)
- Conductivity measurements at milking can be compared with previous measurements to identify changes consistent with subclinical mastitis

Traits – Lactoferrin content

- Lactoferrin is an iron-binding glycoprotein naturally present in milk.
- It also is released by neutrophils during inflammation, which is consistent with its role in host defense inflammation
- Soyeurt et al. (2012) showed that MIR spectroscopy can cheaply and rapidly predict milk lactoferrin content

New phenotypes are regularly suggested



Applications – Herd management

- Benchmarking supports successful farming
- Comparing cows to herdmates identifies individuals performing beyond expectations
- Cohort summaries permit benchmarking of farms against contemporaries
- Important when milk pricing schemes include differential payment based on milk quality

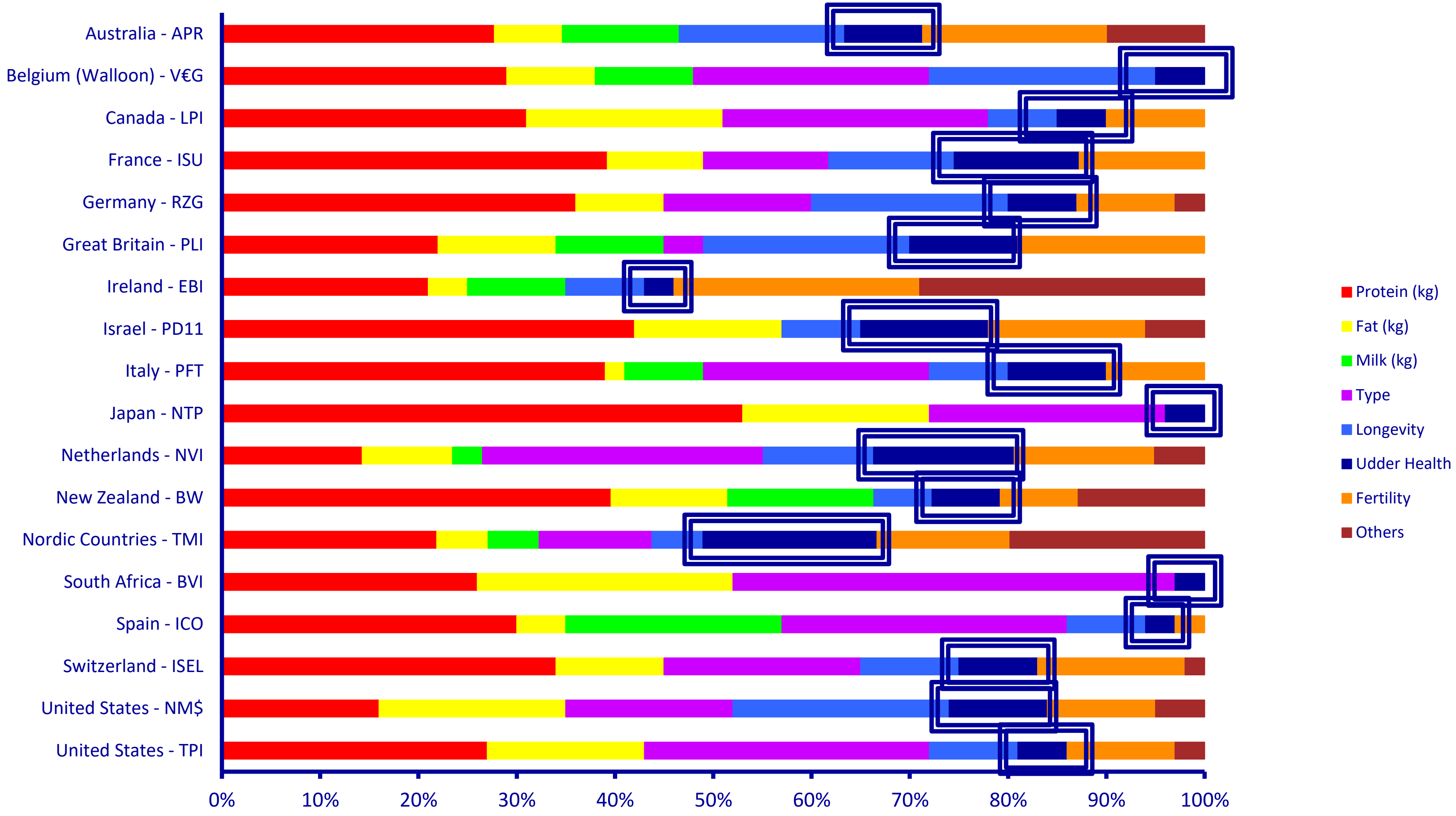
Applications– Population health

- National monitoring programs must meet the demands of authorities, consumers, and producers
- Farmers benefit from increased consumer confidence in safe and responsible food
- Disease surveillance is important to protect integrity of national herds

Applications – Genetic evaluation

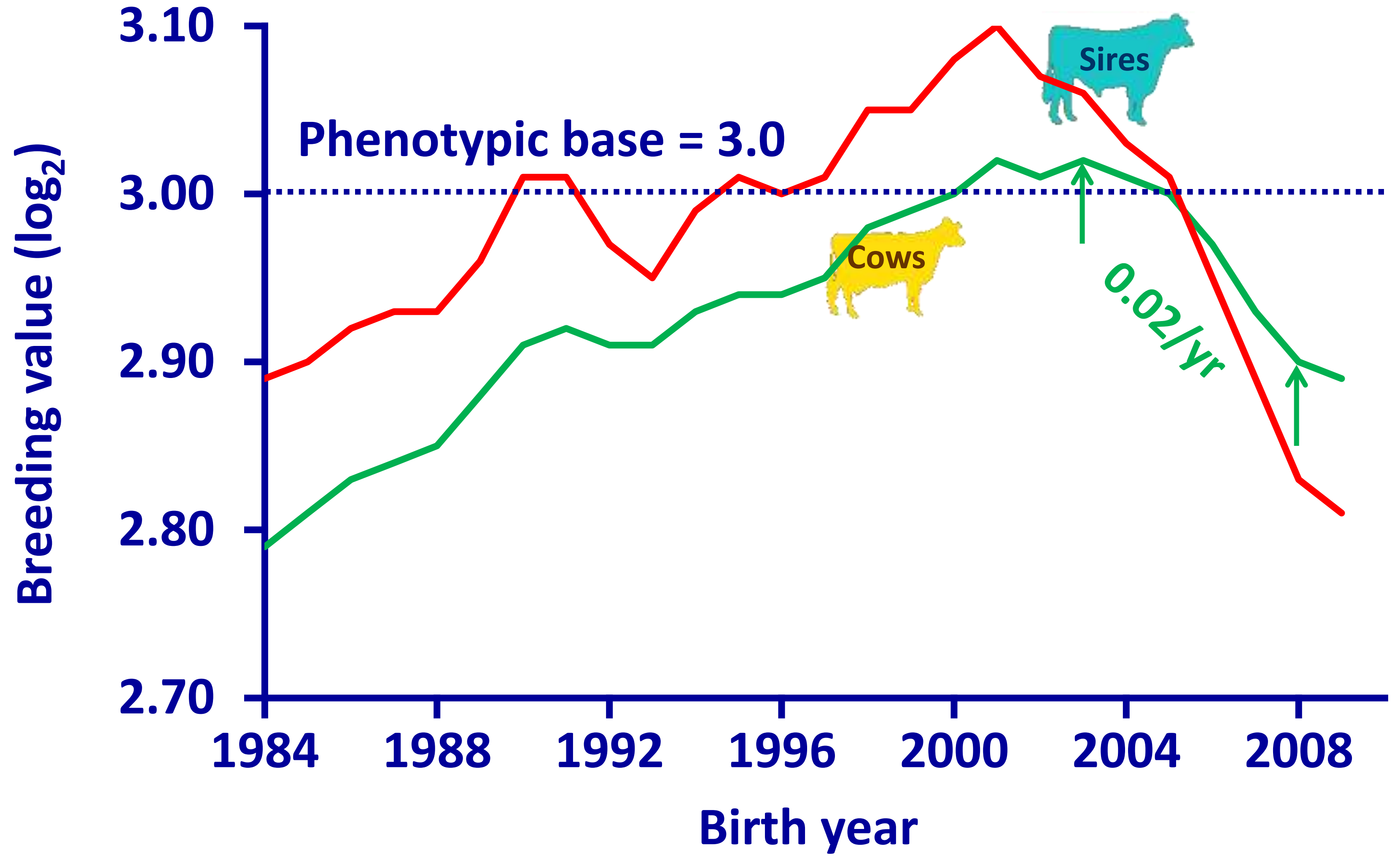
- Breeding values for udder health traits of marketed bulls should be published routinely
- Total merit indices should include an udder health sub-index
- Udder health sub-indices may include both direct and indirect predictors of udder health
- A combination of direct and indirect information maximizes the accuracy of selection

Selection indices include many traits…



Source: Miglior et al. (2012)

Holstein somatic cell score (log_2)



Conclusions

- Udder health guidelines will continue to evolve
  - Technology available for monitoring cow performance will improve
  - More precise phenotypes will become available for lower costs
- The goal remains to provide farmers with tools for making decisions

Affiliations

- C. Egger-Danner, ZuchtData EDV-Dienstleistungen GmbH, Vienna, Austria
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- B. Heringstad, Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, Ås, Norway
- J.E. Pryce, Department of Economic Developments, Jobs, Transport and Resources and La Trobe University, Agribio, Bundoora, VIC, Australia
- K.F. Stock, IT Solutions for Animal Production (vit), Verden, Germany

Questions?

FTWG web site:

http://www.icar.org/index.php/technical-bodies/working-groups/functional-traits-working-group/

Holstein and Jersey crossbreds graze on American Farm Land Trust's Cove Mountain Farm in south-central Pennsylvania

Source: ARS Image Gallery, image #K8587-14; photo by Bob Nichols

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ICBF.com

IRISH CATTLE BREEDING FEDERATION

The benefits of genotyping at farm level & the impact across the wider dairy herd in Ireland



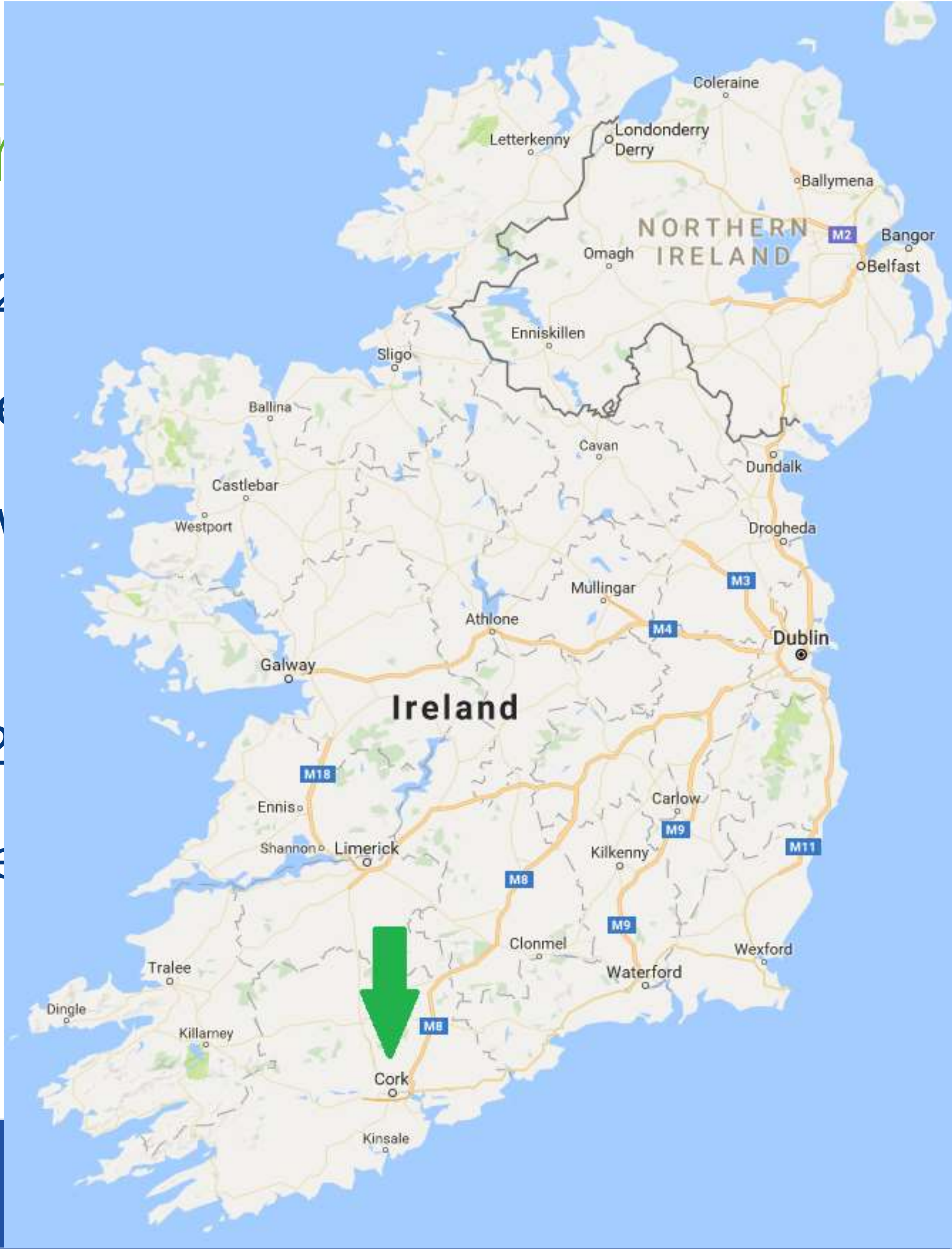
Kevin Downing

27th October, 2016

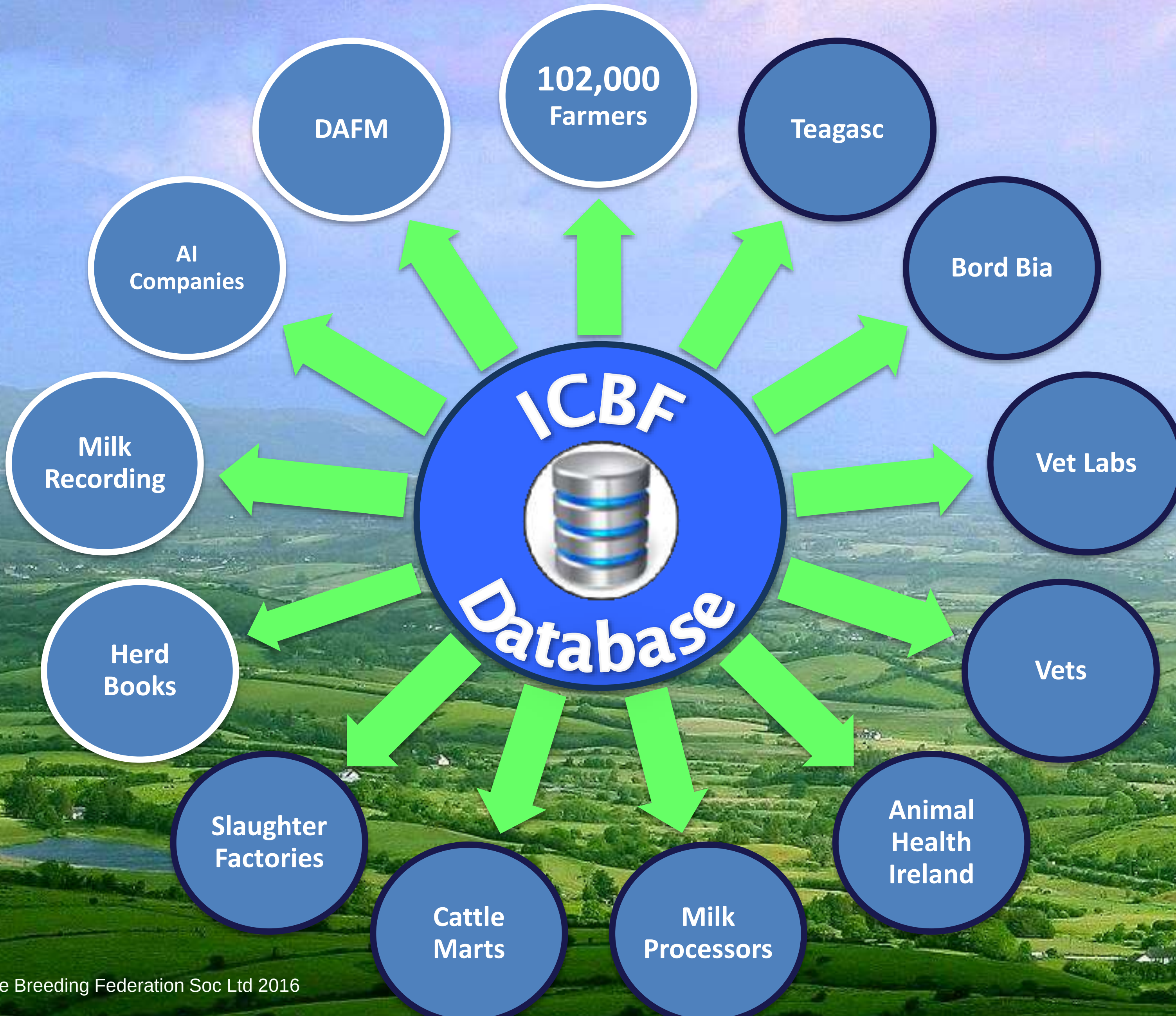
NDP
National Development Plan
Transforming Ireland

Intr

- Working with ICBF since 2
- Owner of 145 cow Pedigre
- Producing ~560kg MS/yr w
- Milk Recording & AI
- Genotyping males since 2
- To date we have genotype

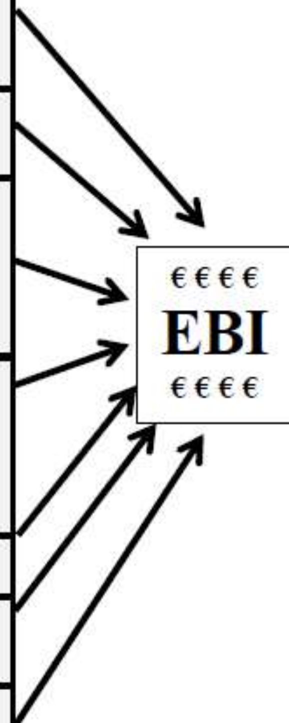


ICBF Database - 2016



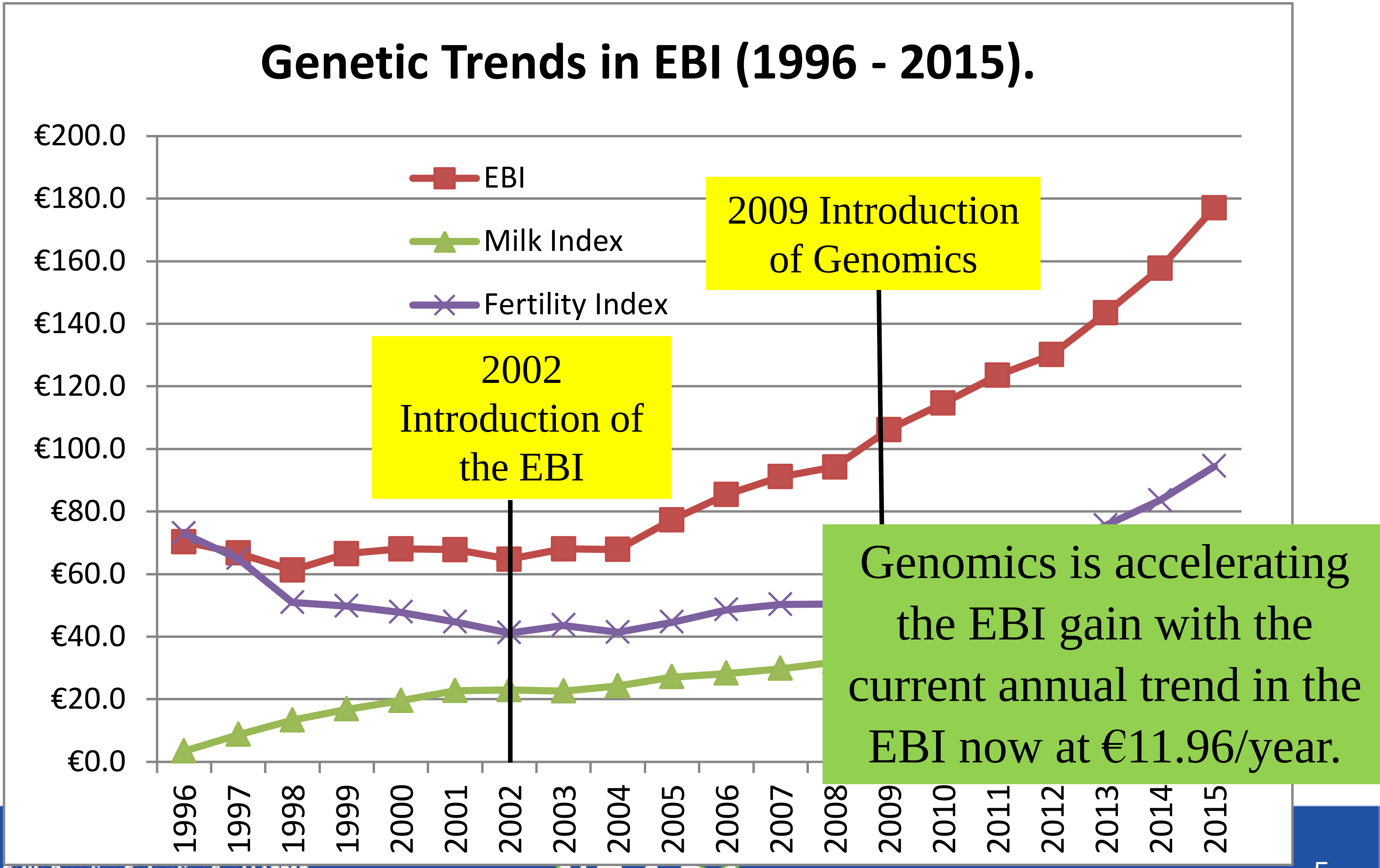
The Irish Breeding Index - EBI

2014 Economic values and % emphasis for traits in the EBI				
Sub-Index	Trait	Economic Weight	Trait Emphasis	Overall Emphasis
Production	Milk	-€0.09	10.6%	33%
	Fat	€1.04	3.4%	
	Protein	€6.64	18.9%	
Fertility	Calving Interval	-€12.43	24.0%	35%
	Survival	€12.01	10.9%	
Calving	Direct Calving Difficulty	-€3.52	2.8%	9%
	Maternal Calving Difficulty	-€1.73	1.3%	
	Gestation Length	-€7.49	4.1%	
	Calf Mortality	-€2.58	1.0%	
Beef	Cull Cow Weight	€0.15	0.7%	9%
	Carcass Weight	€1.38	5.1%	
	Carcass Conformation	€10.32	1.7%	
	Carcase Fat	-€11.71	1.1%	
Maintenance	Cull Cow Weight	-€1.65	7.2%	7%
Management	Milking Time	-€0.25	2.1%	4%
	Milking Temperament	€33.69	1.9%	
Health	Lameness	-€54.26	0.6%	3%
	SCC	-€43.49	1.8%	
	Mastitis	-€77.10	0.8%	



- Converting data (millions of records!) into an "estimate" of genetic merit => profit index.
  - EBI (Economic Breeding Index for dairy Cattle.
  - Strong focus on Fertility which is a key driver of output and profit in Ireland.
  - More traits will be added in 2017 as data becomes available

Trend in EBI



Genetic Trends in EBI (1996 - 2015).
€200.0
€180.0
€160.0
€140.0
€120.0
€100.0
€80.0
€60.0
€40.0
€20.0
€0.0
EBI
Milk Index
Fertility Index
2009 Introduction of Genomics
2002 Introduction of the EBI
Genomics is accelerating the EBI gain with the current annual trend in the EBI now at €11.96/year.
1996
1997
1998
1999
2000
2001
2002
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2004
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2006
2007
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2009
2010
2011
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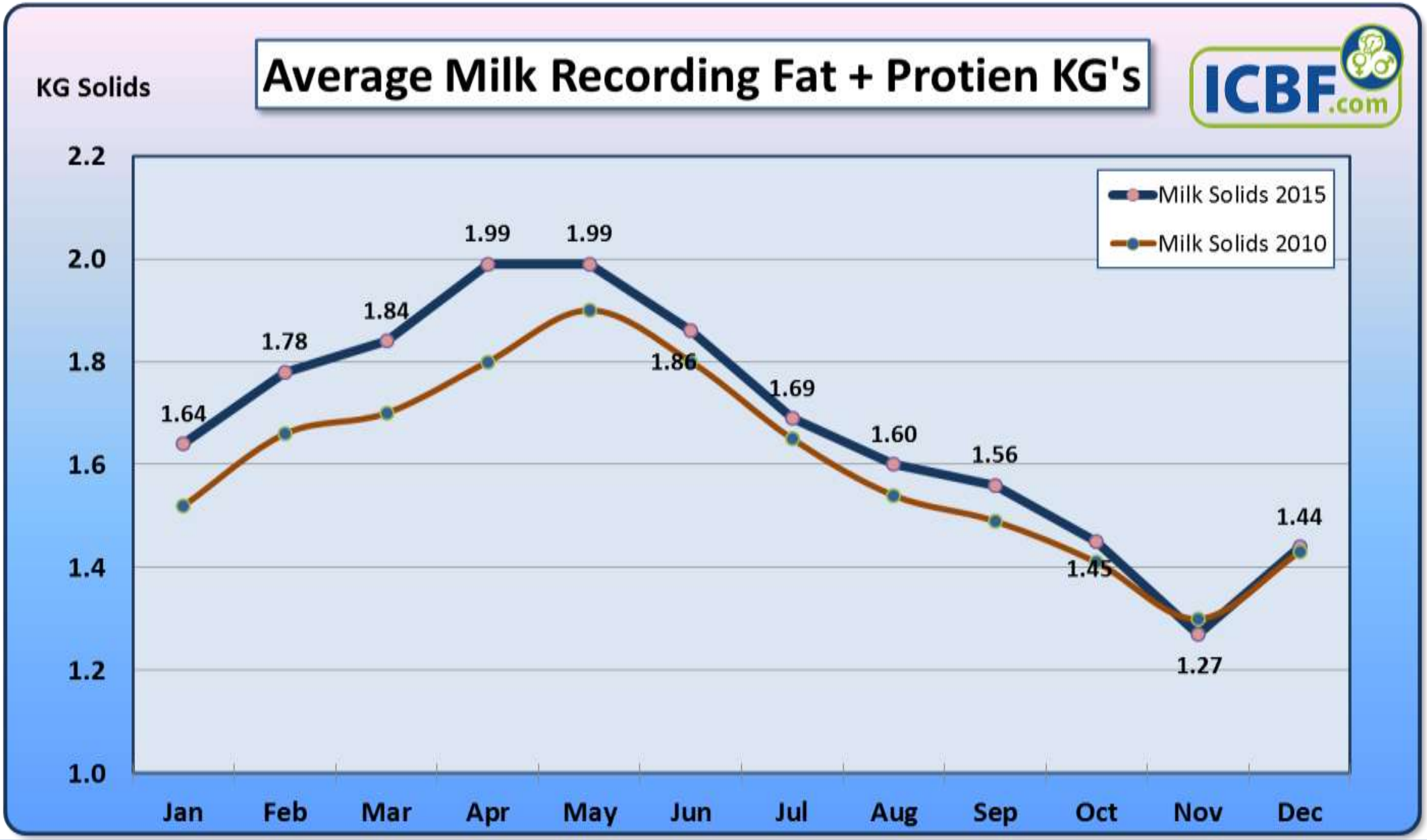
2014
2015

National Milk Recording - 2010 V's 2015



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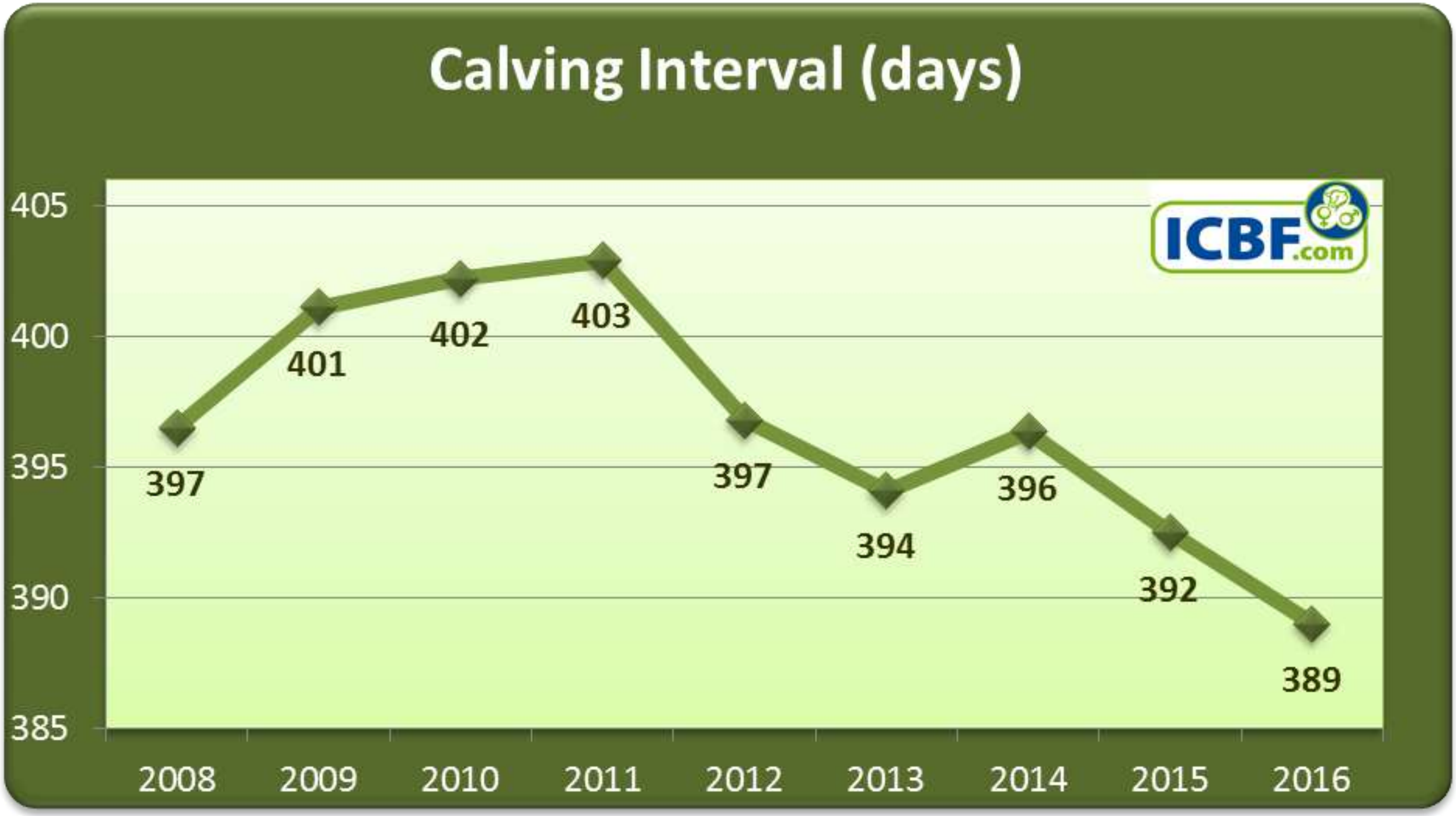
National Fertility Data (~14,000 herds)



Impact of Genomics in AI

- In Ireland AI companies are genotyping ~6,000 males calves/yr
- Another 5,000 Pedigree registered bulls are genotyped
- => ~11,000 bulls available as selection candidates
- ~50 are purchased and produce semen
- Used in ‘Gene Ireland’ program @1 yr of age
- Returned to widespread AI @ 2yrs of age depending on calving difficulty and absence of genetic defects.

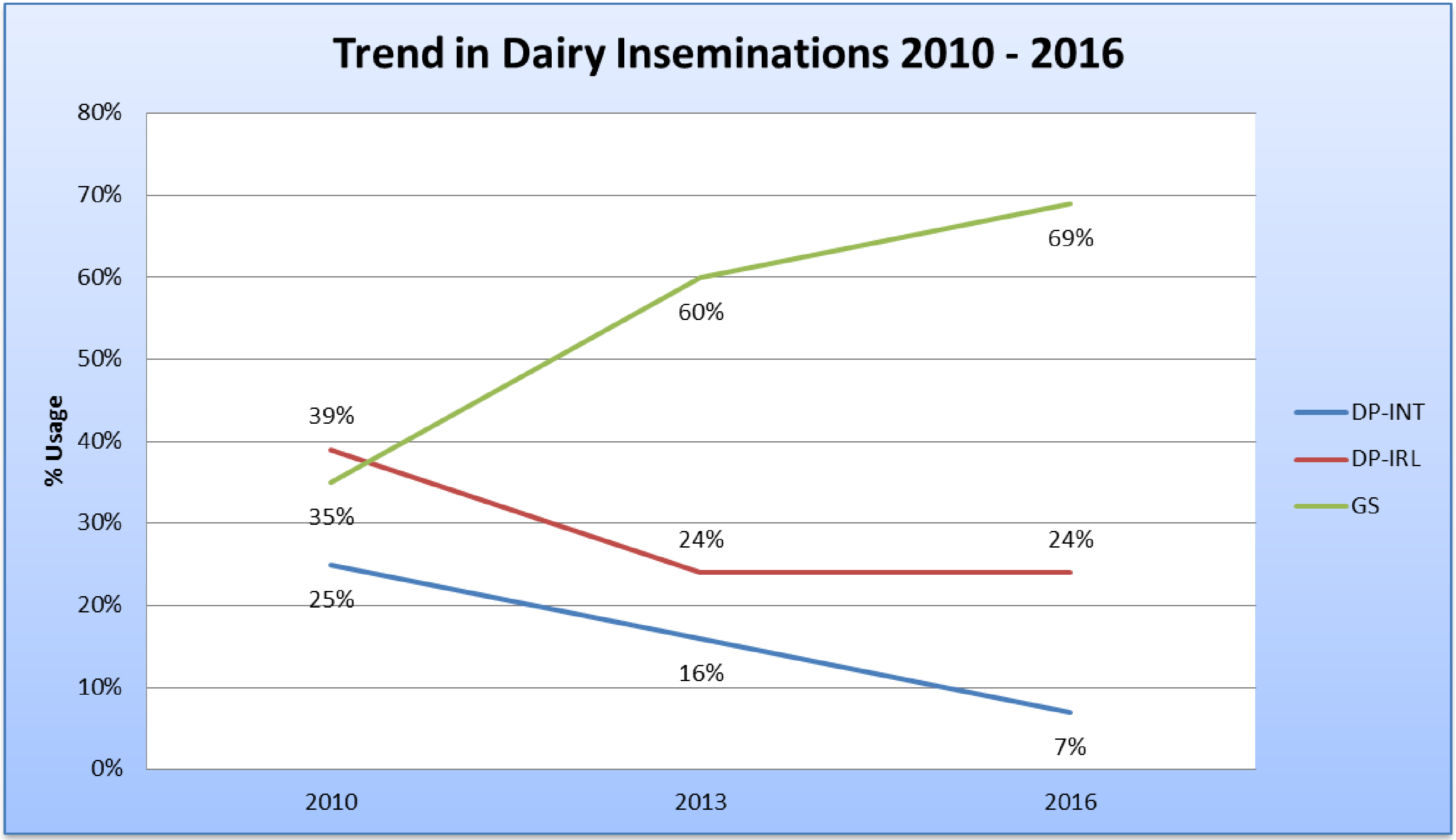
ICBF Active Bull List

ICBF active dairy bull list - autumn 2016

Bull Details							EBI Details			EBI Sub Indexes						
Rk	Code	Name of Bull	Sire	Breed	Status	HO%	EBI	Rel%	Proof	Milk	Fert	Calv	Beef	Maint	Mgmt	Health
1	FR2056	(IG) MODELIGO WHISPER	WLY	HO	SRM	63	€311	57%	GS	€63	€190	€55	-€8	€13	€3	-€5
2	YAB	(IG) BARTLEMY ANDREW	WLY	HO	SRM	78	€298	58%	GS	€67	€168	€47	-€21	€23	€5	€8
3	FR2053	KILDARRA MAESTRO	WLY	HO	SRM	66	€294	56%	GS	€88	€146	€52	-€14	€20	€5	-€2
4	FR2005	(IG) KEALFINCHEON NORMAN	WLY	HO	SRM	66	€292	56%	GS	€71	€151	€52	-€5	€10	€6	€6
5	ZRL	CURRA ROYAL LAURENCE	DGC	HO	PED	72	€285	62%	GS	€49	€201	€44	-€18	€10	-€2	€1
6	YKG	IMLEACH LUCKY GLOSS	WLY	HO	SRM	63	€283	54%	GS	€60	€183	€45	-€12	€8	€3	-€4
7	FR2079	(IG) MODELIGO LUKE	AKZ	HO	SRM	56	€278	53%	GS	€87	€147	€45	-€22	€23	€4	-€6
8	FR2024	(IG) CLOHANE VANDIKE	ABO	HO	SRM	75	€269	52%	GS	€78	€144	€56	-€24	€20	€0	-€4
9	FR2084	MONEEN MIAMI	WLY	HO	SRM	69	€268	52%	GS	€61	€151	€46	-€2	€7	€2	€3
10	FR2051	CURRA ALFIE	DGC	HO	PED	84	€267	60%	GS	€51	€171	€54	-€8	€0	€1	-€1
11	FR2032	(IG) OAKGLEN HARRY	JKF	HO	PED	88	€267	57%	GS	€75	€157	€46	-€7	-€3	€3	-€5
12	FR2041	CURRA ROYAL CONOR	CTK	HO	PED	69	€267	50%	GS	€39	€187	€45	-€19	€13	-€1	€2
13	GZY	GADDAGH CUDDY REEKS	LHZ	HO	PED	81	€263	61%	GS	€81	€164	€18	-€11	€7	€1	€3
14	FR2007	(IG) NEXTGEN BRIGADE	GXY	HO	SRM	75	€262	53%	GS	€62	€159	€37	-€8	€10	€4	-€2
15	LWR	(IG) LONGVIEW RELIABLE	ABO	HO	PED	75	€261	57%	GS	€92	€125	€50	-€11	-€3	€2	€5
16	FR2034	(IG) GABRIEL GOLIATH	WLY	HO	SRM	72	€260	58%	GS	€82	€126	€30	-€5	€12	€7	€8
17	OMG	(IG) MODELIGO GRAND MAN	BGJ	HO	SRM	69	€258	63%	GS	€32	€167	€50	-€10	€12	€8	€0
18	FR2040	CURRA ROYAL STEVIE	ABO	HO	PED	72	€257	56%	GS	€61	€152	€43	-€19	€15	-€1	€7
19	WLY	IMLEACH LUCKY WHISTLER	MWH	HO	SRM	63	€257	87%	DP-IRL	€62	€147	€43	-€12	€10	€6	€0
20	FR2031	(IG) TISAXON ELMO	ABO	HO	PED	84	€257	59%	GS	€62	€124	€59	-€10	€10	€5	€7
21	FR2129	NODSTOWN CHAMPION	ABO	HO	PED	88	€256	63%	GS	€45	€181	€43	-€4	-€10	-€1	€2

- 2001 - 2 (3%) Irish bulls on ICBF Active Bull List
- 2016 – 74 (99%) are Irish Born
- Trend started in 2009 on the back of Genomics

Dairy Inseminations



Dairy Inseminations 2016

Type	Average EBI	Total Num serves	Avg Num Bulls Used
DP-INT	€57	46,735	2.6
DP-IRL	€67	147,239	1.9
GS	€194	431,747	4.5
		625,721	

- DP-INT – Daughter Proof with Foreign daughters
- DP-IRL – Daughter Proof with Irish daughters
- GS – Genomically selected with no daughters
- Farmers listening to industry advice by using more GS bulls to spread their risk.

Use minimum of 5 bulls – use them equally

Validation of Genomic for Sires

- 190 bulls who had a genomic evaluation and now are daughter proven.

	Parental Average	Blended Genomic	Daughter Proven	Correlation with Daughter Proven	
				Parent Avg.	Genomic
Milk Kg	168	108	116	0.71	0.79
Fat	11.9	10.2	10.4	0.55	0.70
Protein	9.6	7.7	7.8	0.63	0.75
Calving Int	-3.1	-3.7	-4.5	0.6	0.63
Survival %	1.52	1.7	2.01	0.41	0.63

- Results showing genomics as a better predictor
- Parental average proofs over predicted for production

Validation of Genomics for Females

HIGH EBI DELIVERS

Will a high EBI herd deliver better fertility? Yes is the answer so far in Cork

JACK KENNEDY
DAIRY EDITOR
jkennedy@farmersjournal.ie

The Elite high EBI herd in the Teagasc Kilworth farm is outperforming the

what is the diet.

Both genetic herds are divided into three groups on three different feeding treatments. The three Elite herds (EBI €244) on average are yielding 18.0 kg, at 4.94 F%, 3.96 P% (1.57 kg MS/day),

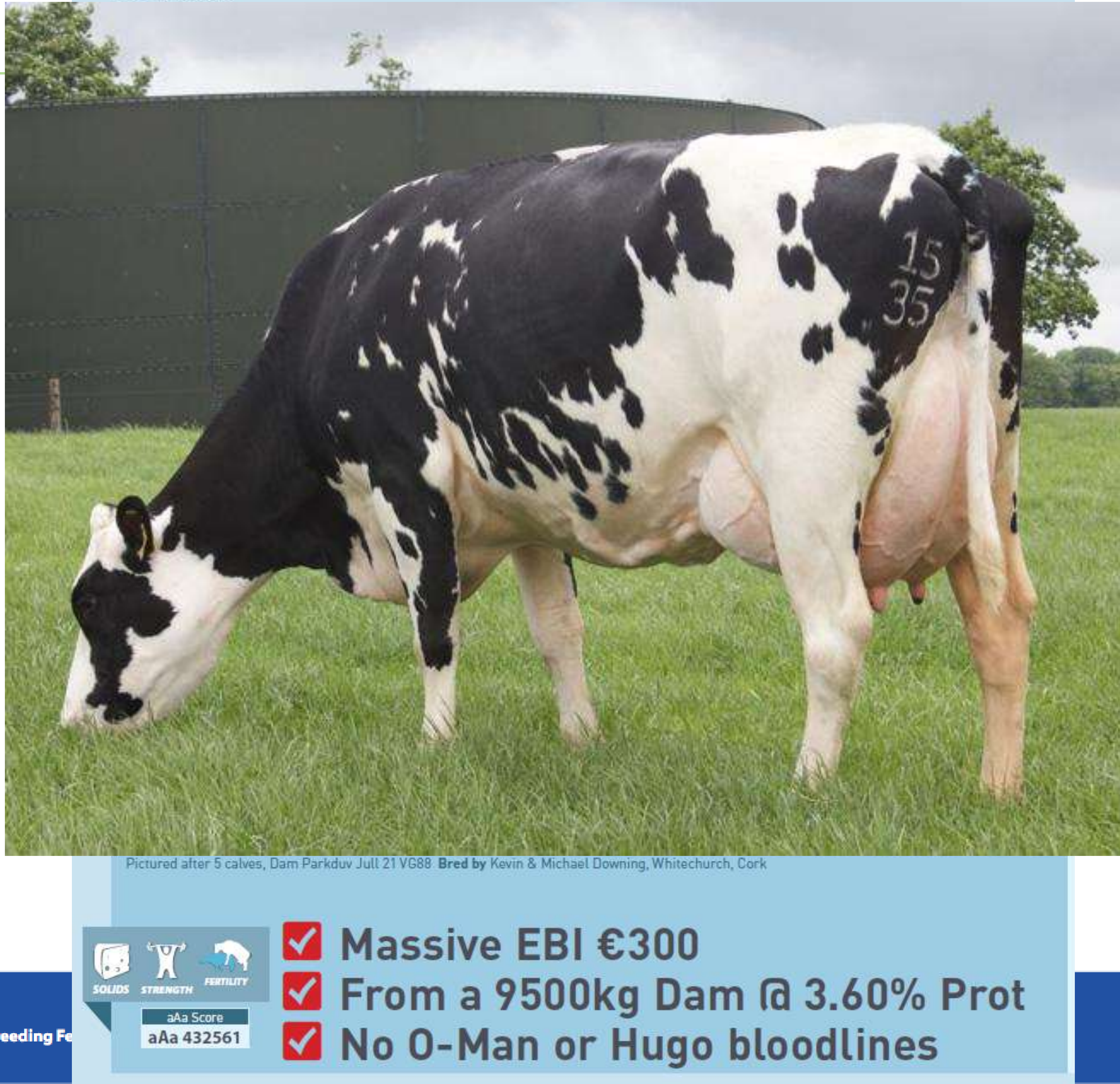
- Results from Teagasc 'Next Generation' Dairy Herd
  - Established in 2013 to validate the EBI & Genomics

Teagasc Next Generation Herd Results

	Elite	Nat Ave	Diff
Predicted at birth based on genomic EBI			
EBI (€/lactation)	€249	€133	**€232**
Milk Solids (€/lactation)	€69	€49	
Fertility (€/lactation)	€169	€63	

Actual performance (1 & 2 lactations only)			
Milk Solids (Fat + Protein kg/lactation)	397	390	**€301**
Calving Interval (days)	370	379	
Survival (% from lact to lact)	90%	76%	

- Yes, EBI works in Irish Research Herd


15
35
Pictured after 5 calves, Dam Parkduv Jull 21 VG88 **Bred by** Kevin & Michael Downing, Whitechurch, Cork
SOLIDS
STRENGTH
FERTILITY
aAa Score
aAa 432561
Massive EBI €300
From a 9500kg Dam @ 3.60% Prot
No O-Man or Hugo bloodlines

re

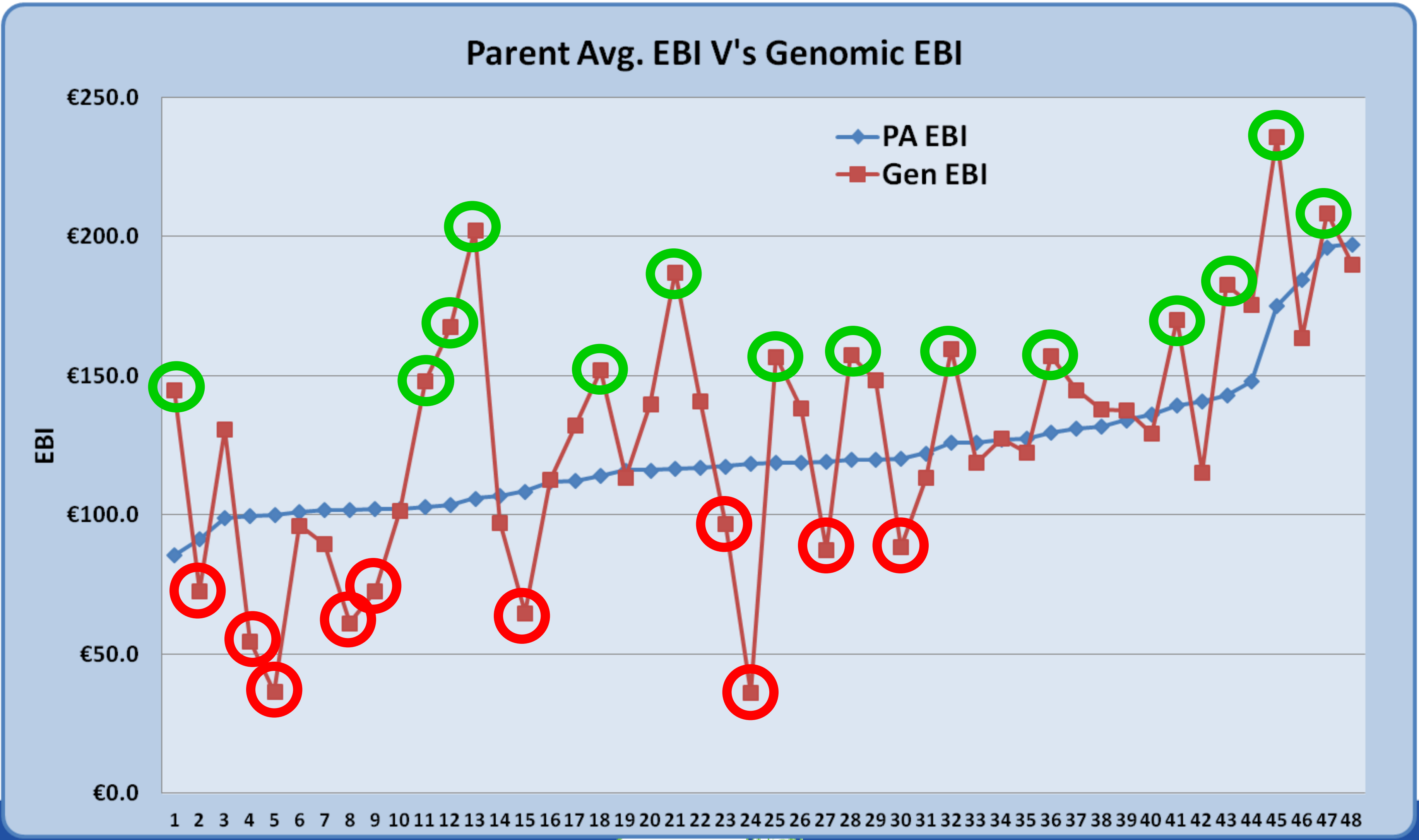
48 Parkduv Heifers Genotyped in 2011

Genomic Evaluation Report

Jumbo	1281	**Lact. No**	
Tag	IE151013721281	**Sex**	F
Name		**Sire**	KSI (€ 122)
DOB	09-Jan-2010 1y 2m	**Dam**	IE151013771105 (€ 122)
Breed	HO (97%), FR (3%)	**Dam's Sire**	HFL (€ 150)
Date of Evaluation	29-Mar-2011		

Index	**Official Genomic Evaluation**	**Reliability**	**Weighting on Genomics**	**DNA Value**	**Parent Average Evaluation**	**Reliability**	**Diff.from Parent Avg**	**Increase In Reliability**
EBI €	**147**	**53%**	32%	127	122	31%	+25	22%
Milk Sub Index €	**52**	**63%**	41%	51	42	37%	+10	26%
Fertility Sub Index €	**91**	**43%**	26%	73	74	23%	+17	20%
Calving Sub Index €	**19**	**54%**	28%	17	20	36%	-1	18%
Beef Sub Index €	**-14**	**49%**	26%	-14	-17	31%	+3	18%
Maintenance Sub Index €	**3**	**44%**	23%	3	4	27%	-1	17%
Health Sub Index €	**-4**	**58%**	41%	-4	-3	30%	-1	28%

Lots of change and re-ranking



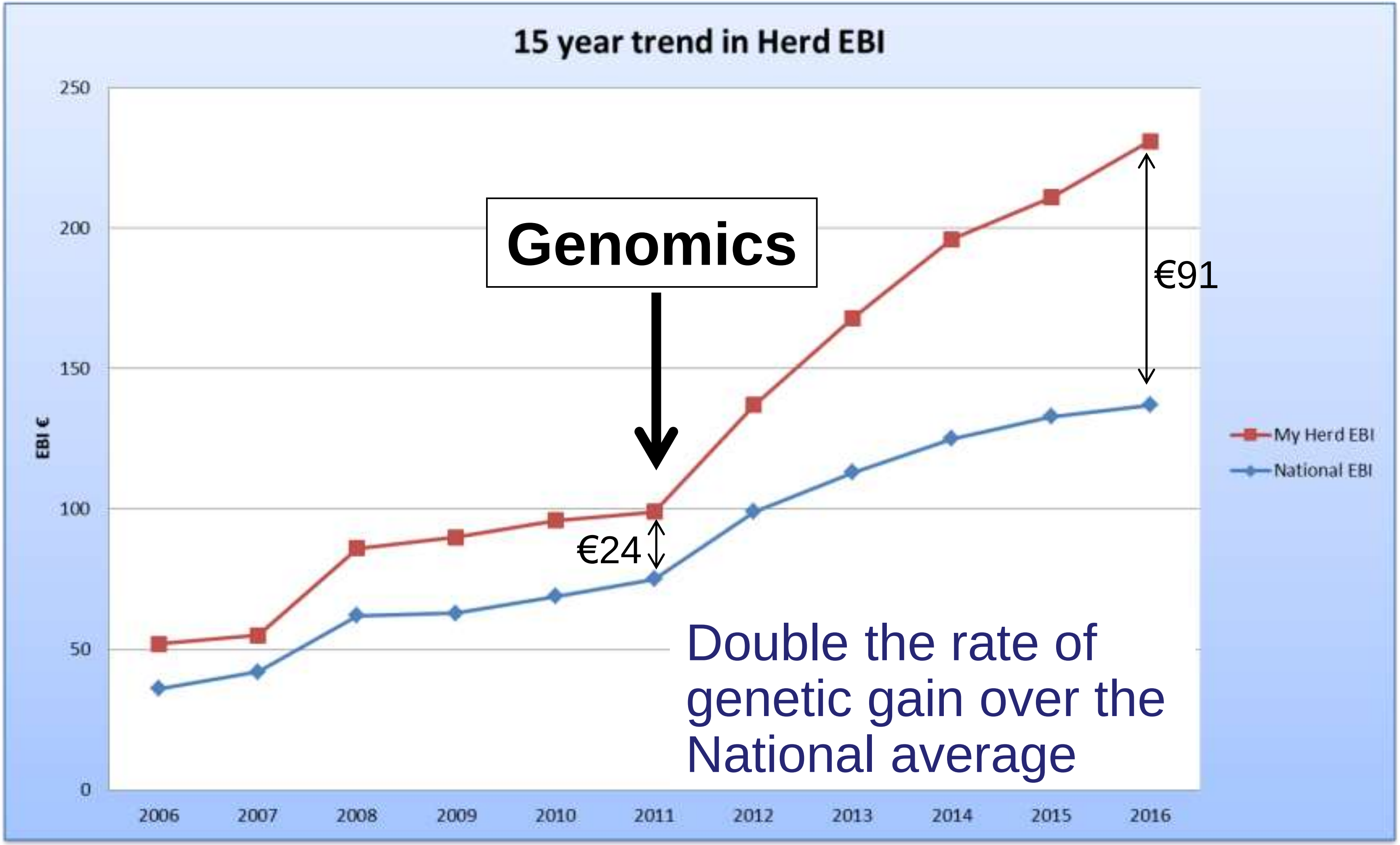
Role of Genomics in Parkduv Herd

- My breeding strategy is to keep highest EBI replacements and sell the lowest ones, where possible e.g. Calving date may effect decision.

- 48 female replacements in 2011
  - Replacement group 24 (to maintain 20% replacement rate)
  - Surplus Stock 21 (advertised online www.parkduv.com)
  - Not pregnant 3 (slaughter factory)

- As a result of genotyping the 48
  - Six I previously intended for sale were kept.
  - Six I previously intended to keep were sold.

Trend in EBI - Parkduv V's National



Added benefit - ICBF Top 200 Herds List

HerdPlus
Profit through Science

Top 200 HerdPlus Herds Ranked on EBI (>30 Cows) - Apr '16

Rnk	NAME	ADDRESS 1	ADDRESS 2	ADDRESS 3	EBI	MILK	FERT	CALV	BEEF	MAINT	MGMT	HEALTH	CHANGE
1	KIERAN HEARNE	BALLINACURRA	CARRICK-ON-SUIR	CO WATERFORD	€239	€66	€138	€33	-€14	€14	€2	€0	↑ 1
2	JAMES MURRAY	DERRINSALLAGH	BIRR	CO OFFALY	€234	€61	€138	€33	-€13	€13	€0	€1	↑ 6
3	PATRICK FLYNN	COOLMOHAN	KILWORTH	CO CORK	€234	€19	€181	€26	-€14	€21	-€1	€2	↓ 2
4	JIM DELAHUNT	BALLYKINASH	CARRIG	BIRR CO TIPPERARY	€232	€53	€141	€38	-€10	€10	€1	€0	↑ 1
5	TIMOTHY FITZGERALD	GREEN ROAD	BALLYROAN	PORTLAOISE CO LAOIS	€232	€56	€136	€37	-€7	€3	€4	€3	↑ 2
6	KEVIN DOWNING	FARANASTIG	WHITECHURCH	CO CORK	€231	€73	€121	€34	-€6	€5	€3	€1	↑ 8
7	VINCENT O'CONNOR	COOLEANIG	BEAUFORT	KILLARNEY CO KERRY	€227	€67	€122	€39	-€12	€12	€1	-€1	↑ 10
8	LIAM O LEARY	BALLYBRIDE	CONNA	CO CORK	€226	€71	€120	€34	-€14	€13	€2	€0	↓ 5
9	ROBERT SHANNON	GURTEENAKILLA	BALLYDEHOB	CO CORK	€225	€80	€102	€38	-€9	€8	€4	€3	↑ 15
10	SEAN RING	DOON	KISKEAM	MALLOW CO CORK	€223	€73	€110	€29	-€26	€32	€6	€0	↓ 5
11	DONALD THOMAS SCULLY	CHERRY HILL HOUSE BALLYHYLAND	PORTLAOISE	CO LAOIS	€222	€50	€136	€34	-€9	€7	€2	€3	↓ 3
12	TREVOR BEAMISH	CLONEEN	CARRIGTWOHILL	CO CORK	€222	€72	€115	€34	-€10	€10	€1	€0	↑ 23
13	KEVIN HEGARTY	BALLYDEROWN	KILWORTH	CO CORK	€220	€68	€114	€37	-€7	€4	€3	€1	↑ 3
14	MICHAEL RYAN	DEANSGROVE	CASHEL	CO TIPPERARY	€220	€68	€112	€38	-€11	€9	€3	€0	↑ 29
15	DAVID FITZGERALD	LISNABRIN	CURRAGLASS	MALLOW CO CORK	€220	€59	€128	€33	-€11	€11	€2	€0	↑ 12
16	TEAGASC NEXT GENERATION HER	TEAGASC	MOOREPARK	FERMOY CO CORK	€218	€65	€114	€34	-€21	€23	€3	€0	↑ 4

- Herd steadily moving up the list since we began genotyping.

Summary

- EBI is taking us towards a more fertile, robust, healthier cow, who is capable of producing increased milk solids.
- As more economically important traits becomes available they will be added to EBI.
- Genomics is working for farmers and having a big impact on farm profitability.
- Genomics will greatly accelerate the improvement in EBI.
- At €22/female, I’d expect to see more herds genotyping next year.

Acknowledgements

- ICBF
  - John McCarthy
  - Francis Kearney
  - Ross Evans
  - Andrew Cromie
- Teagasc
- Department of Agriculture, Food and Marine

twitter.com/HerdPlus **facebook.com/HerdPlus**

Thank you for your attention

Integration of Farm Oriented Research Projects in Breeding Evaluation

Bianca Lind[a], Inga Schiefler[b]

[a]German Cattle Breeders' Federation

[b]Association for Bioeconomy Research

Bonn, Germany

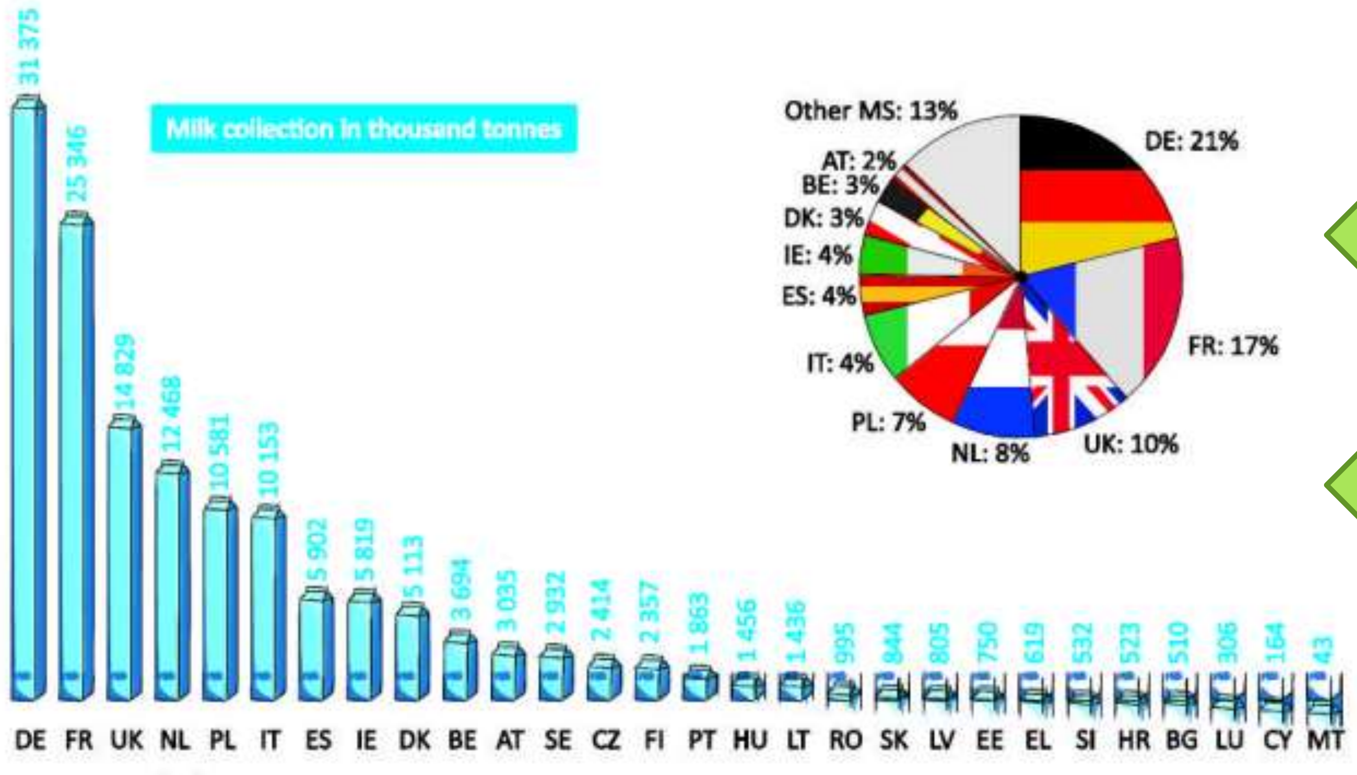
Cattle Production in Germany

Animal husbandry is the main source of income

- in Germany half of the farms are specialised in livestock
- main group (> 25 %) are dairy farmer
- through the sale of products from livestock enterprises, 60 % of revenues in German agriculture are generated

Federal Ministry of Food and Agriculture, 2010

What do we produce in 2015?



Quelle: EPRS (2015).[3]

32.6m t
milk production

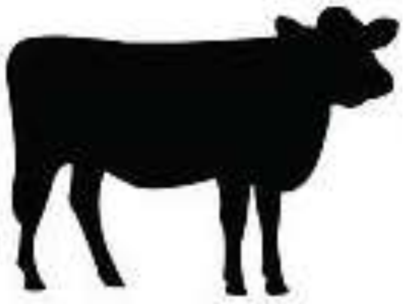
31.5m t
delievered to
creamery

0,29 EUR per kg
milk

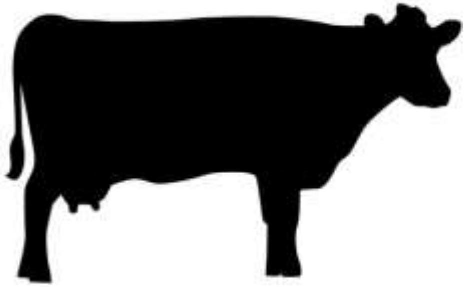
Source: ADR, 2015

Cattle production in Germany

12.6m cattle



4.3m dairy cows



70.000 dairy farms

Source: ADR, 2015

Research and Innovation

Structure of associations

Umbrella association

Breeding and AI organisation
Milk recording organisation



farmer

From farmer to research

Joint research activities for cattle and pig

farmer

The future of agriculture in Germany

„We can only improve measurable things!“

Dr. Jürgen Oldeweme
Senior Vice President Global Product Safety and Regulatory Affairs, BASF Crop Protection

Carl-Albrecht Bartmer
Präsident, DLG e.V. (Deutsche Landwirtschafts-Gesellschaft)

Farmers: „Brown Swiss calves have suckling weakness“

Farmers‘ observation

- no suckling
- weak suckling
- suckling
- strong suckling

Farmers: „Brown Swiss calves have suckling weakness“

Farmers‘ observation

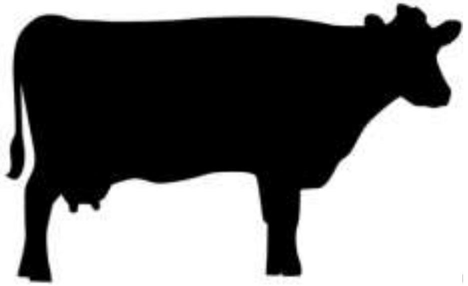
- no suckling
- weak suckling
- suckling
- strong suckling

Need help to solve the problem

Is there a genetic influence?

Research project initiated by farmers

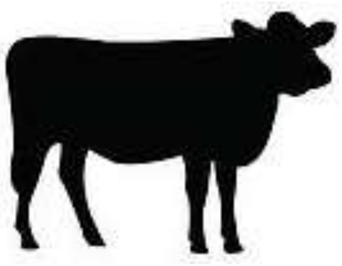
250 Brown Swiss farms



18.000 dairy cows

Start with the calf

- Observation by the farmer of
  - ➢ suckling weakness after birth calving weight
  - ➢ calving ease
  - ➢ diseases
  - ➢ feeding
- Genotyping of all calves in the farm by staff of breeding organisation



Suckling weakness has an incidence of 8 %

2016

- Results of 9.700 Brown Swiss calves
- 8 % of all calves have suckling weakness
- The evaluation is going on to provide a genical influence

Application

For all Brown Swiss farmers

- ✓ Breeding for new traits
- ✓ Prevention of genetic defects

For AI and breeding organisations

- ✓ Be a player in international competition (bovine semen, breeding cattle, bovine embryo)
- ✓ Better quality of products
- ✓ Close customer relationship
- ✓ Elimination of AI bulls with weakness in some traits (e. g. claw disorders)
- ✓ Improvement of animal welfare

For farms integrated in the project

- ✓ Improved selection for calves, heifers and dairy cows in the herd
- ✓ Prevention of genetic defects
- ✓ Genomic information for female calves

Ask the farmers what they are looking for!

- In the area of milk recording the MRO staff collects data
- In the area of new traits the farmer has to collect data or he has to provide his data
- It is important to motivate the farmer to participate
    - ➢ collecting data
    - ➢ using data for management
    - ➢ using data for mating selection

Our way is the common research!

- In the area of milk recording the MRO staff collects data
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    - ➢ using data for mating selection

Directions in Milk Recording – the Challenge of Low Milk Prices

Wayne McNee
Chief Executive

Our Strategy - Toward 2025

Our Vision

To improve the prosperity and productivity of our farmers

Strategic Themes

- Genetics and information to create superior livestock
- Information to improve decision making to enable superior livestock performance
- Hardware and systems to improve productivity and decision making
- LIC International - adding value for our shareholders, focussing on key markets

Integrity | Innovation | Spirit of co-operation | In tune | Passion

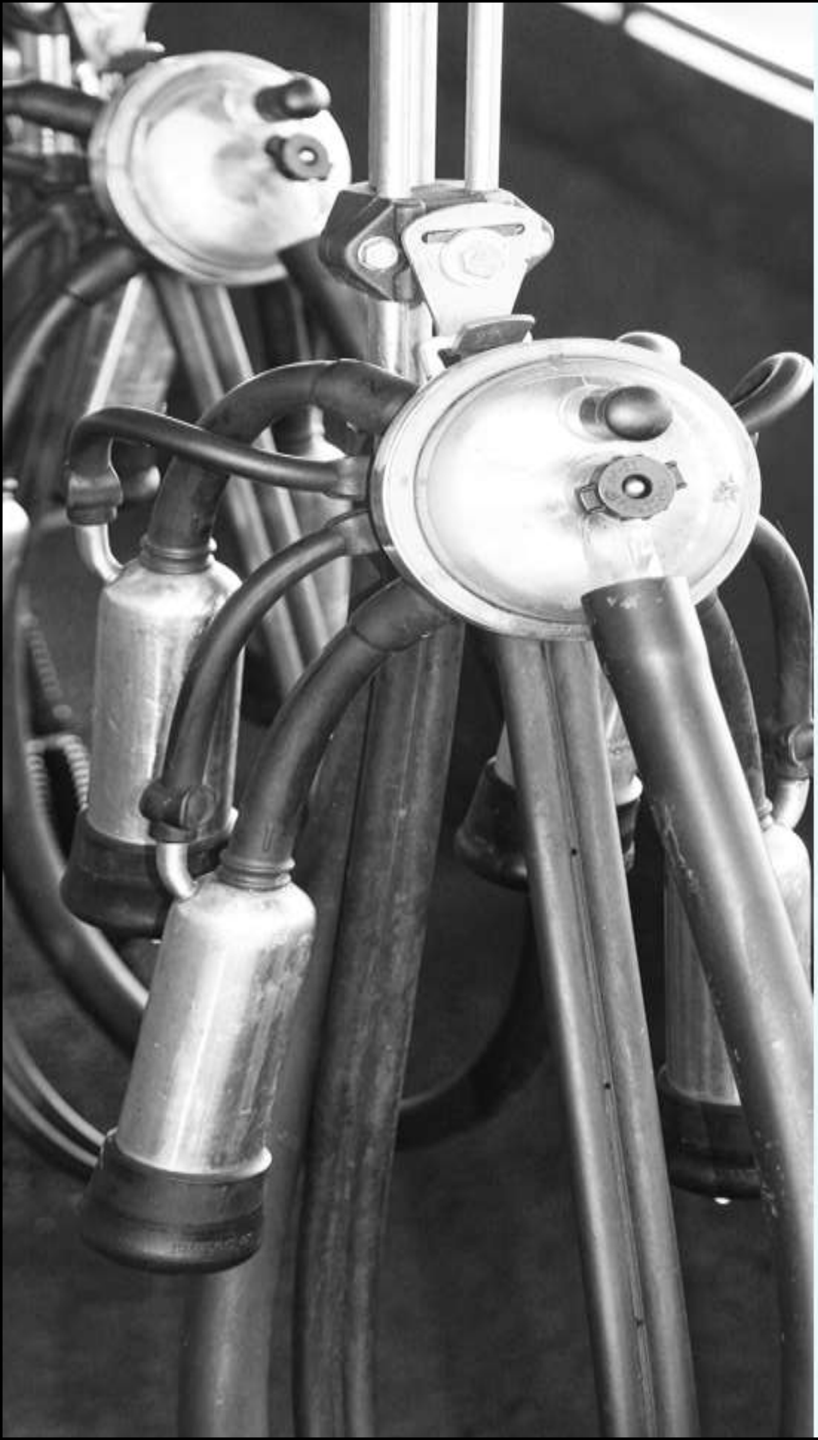
LIC at a Glance

Farm Information

- Dairy animal recording (MINDA)
- Herd testing (milk) – dairy & goats
  - Milk analysis centres (2)
- Ear tags
- Dairy cows, goats and sheep recording and traceability
- Industry statistics

Farm Systems

- Automation products - Protrack
- Heat detection devices – EZ Heat
- On-farm consultancy – FarmWise



LIC at a Glance

Dairy genetics

- 2000 bulls screened (including genomics)
- 180 bulls progeny tested
- Liquid and frozen semen technology
- Extensive nation-wide field service

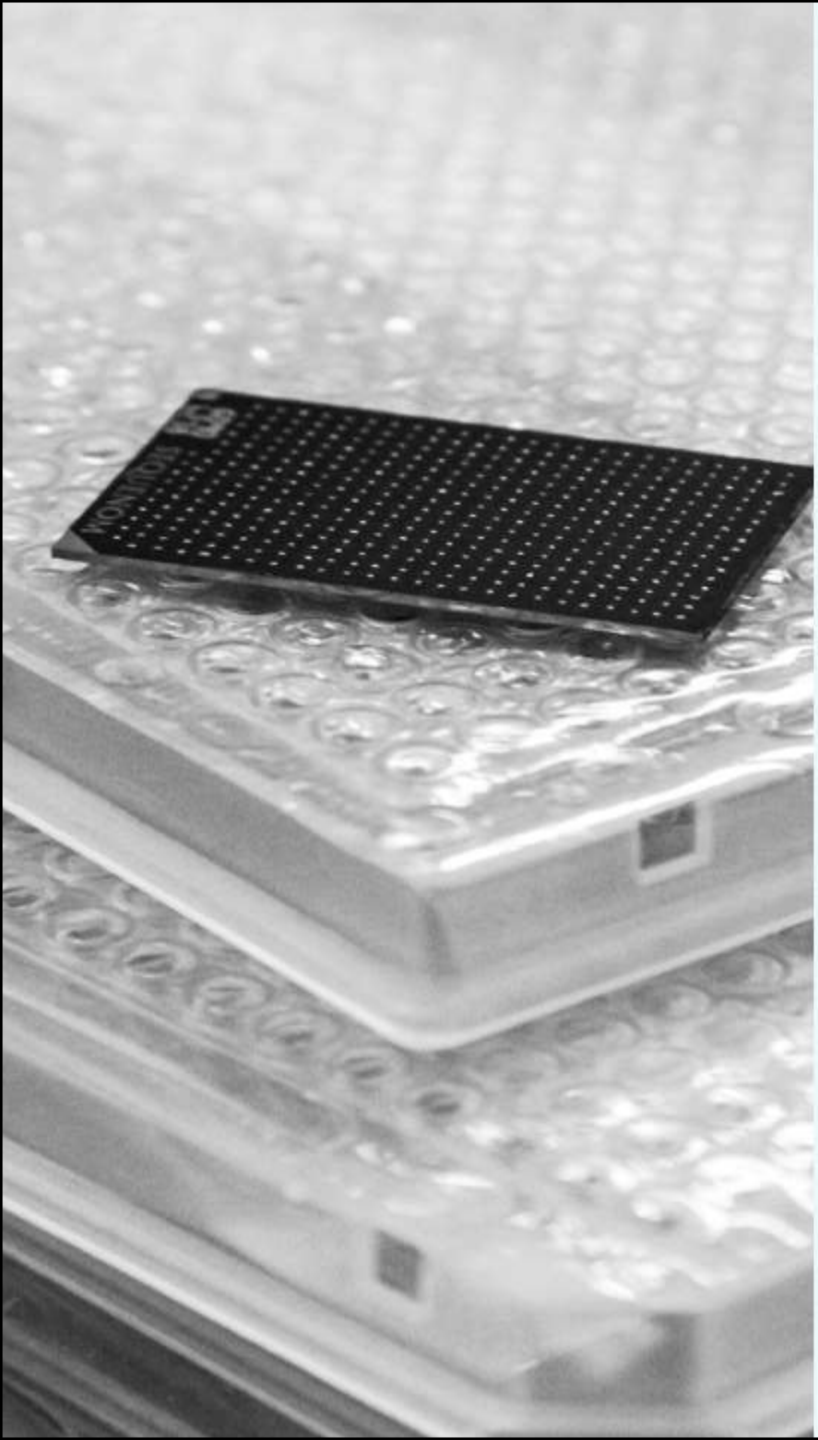
International business

- Chile, Argentina, Uruguay, Brasil, UK, Ireland, China, Australia, South Africa and others

Deer genetics (venison)

Diagnostics

- DNA analysis
- Animal health testing and management



Operational Overview

Inseminations - NZ	4,300,000
Inseminations – International	800,000
Data transactions	100,000,000
Active Animal records	6,000,000
Electronic software customers	10,500
Milk sample analysed	8.2 million
DNA tests	260,000
Automation systems	2000
AI technicians	950
Field sales team	100

LIC: Innovative history

1910	Small regional milk testing Co-ops
1930s	Milk testing throughout New Zealand
1940s	Artificial insemination of dairy cows begins
1960s	Sire proving scheme introduced, Milk meters introduced
1980s	Herd records computerised
2000	KiwiCross™ semen available
2003	Protrack solutions launched
2004	LIC issues investment shares and lists NZAX
2008	Genomics used to assist sire selection
2014	Protrack EZ Heat launched and breakthrough in SGL achieved
2015	LIC Automation formed (incorporating Protrack, DAL, and Lely Sensortec)

Delivering on our Strategy

Where will growth come from?

- New product launches
- Domestic acquisitions
- International growth (genetics, automation, software)
- International acquisitions

LIC Contribution to Value on Farm

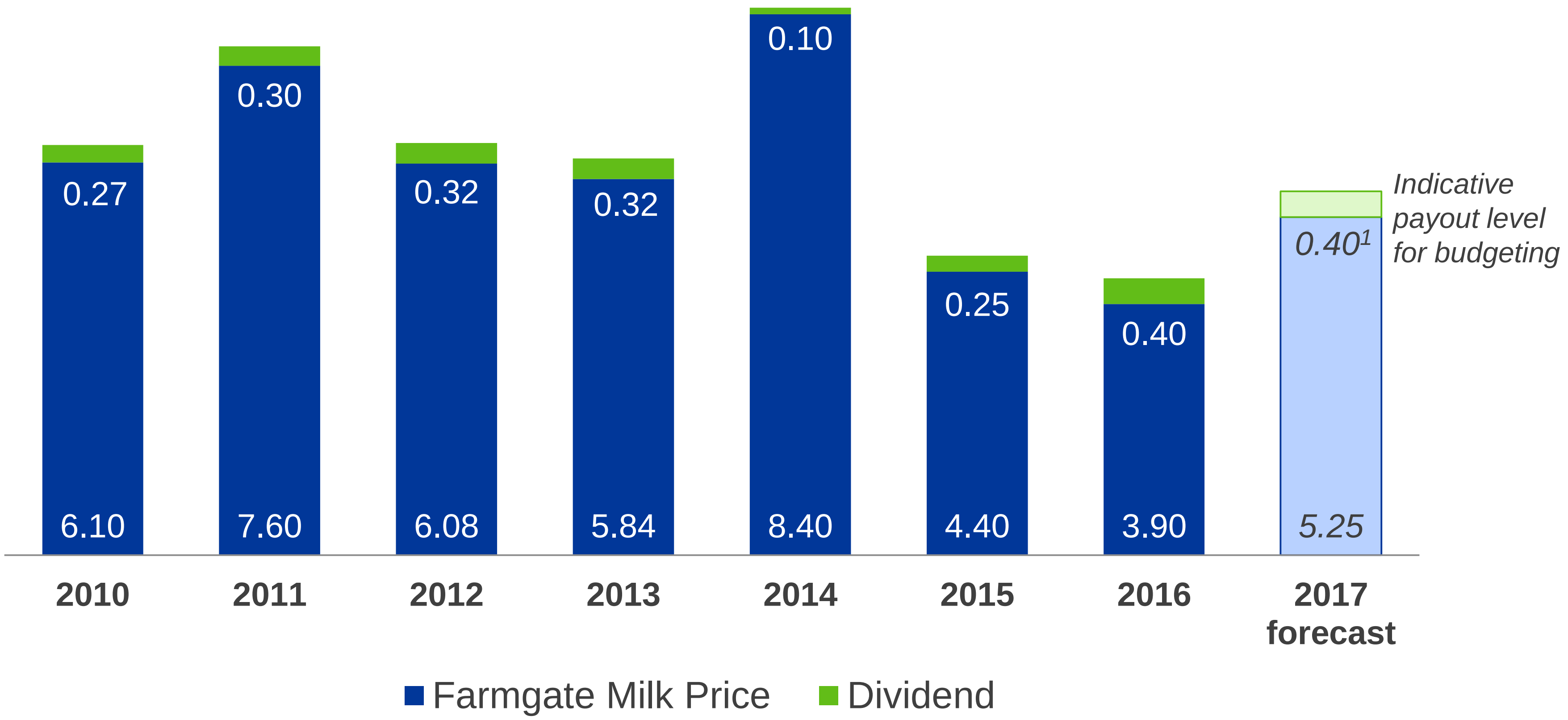
STRATEGIC THEMES

- Genetics and information to create superior livestock
- Information to improve decision making to enable superior livestock performance
- Hardware and systems to improve productivity and decision making
- LIC International - adding value for our shareholders, focussing on key markets

Value On Farm

	2014/15	2015/16	
Genetic Merit	$312m	$317m	$322m
Health	$1.7m	$2.2m	
Reproduction	$35m	$39.5m	$45.5m
Production	$40m	$43m	

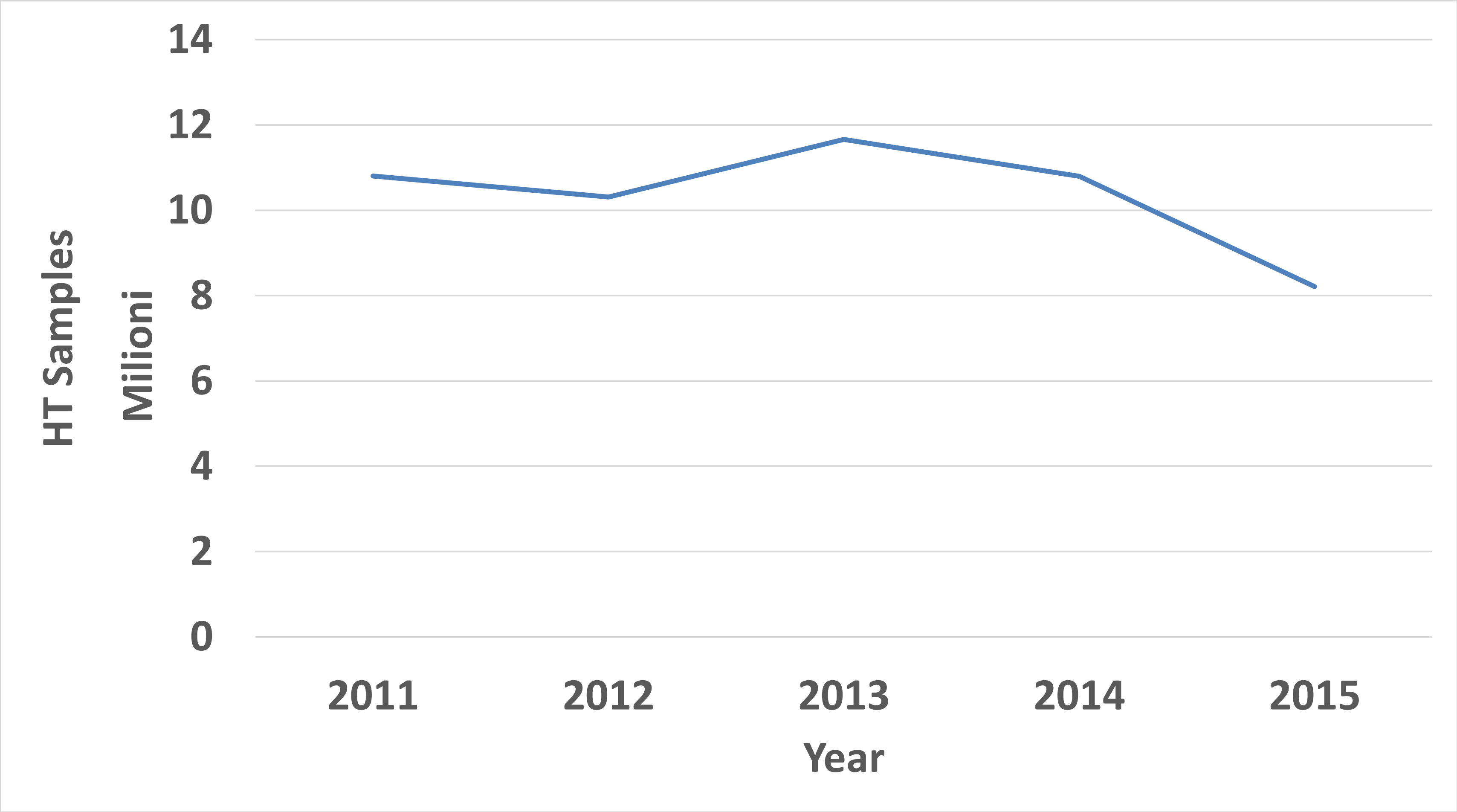
Fonterra milk price payout (NZ$/kgms)



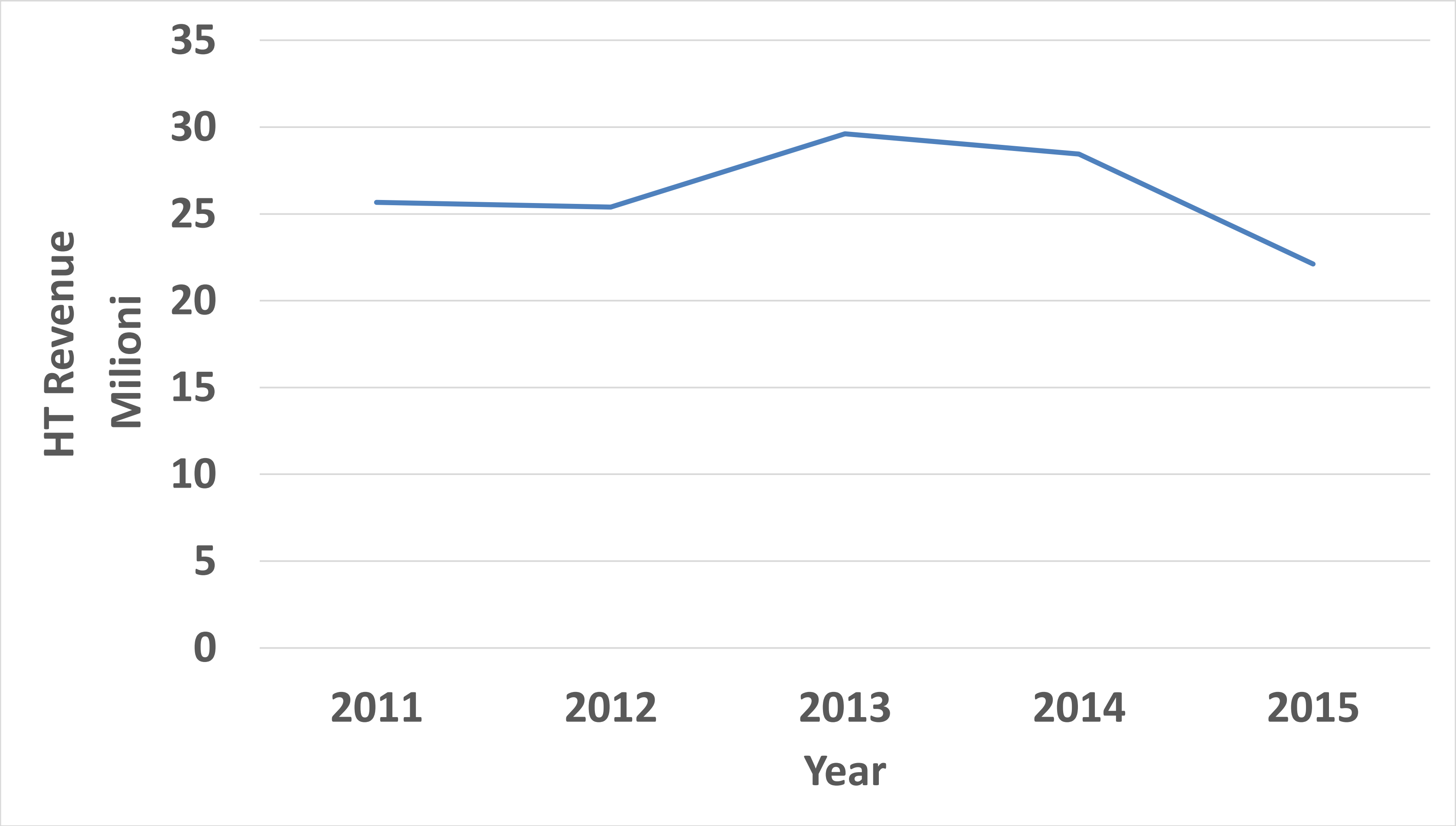
1. For farm budgeting purposes a 40 cent dividend is assumed (based on FY17 EPS forecast 50-60 cents) – this is consistent with Fonterra policy of paying out 65-75 per cent of adjusted net profit after tax over time

Note: Farmgate Milk Price: $ per kgMS; Dividend: $ per share

Herd Test Samples



Herd Test Revenue



What has this meant for LIC?

- Falling volumes with high fixed costs = loss making service

- Overall business made a loss for the first time in 2015/16

- After taking substantial cost out (including significant redundancies) business will be profitable in 16/17, and orders are now increasing

What has this meant for LIC?

- Improving efficiency of collection processes (GIS route mapping)
- Working with farmers to flatten out peaks
- Looking to automate weigh stations
- Sweating assets
- Accelerating development of alternatives

What are the alternatives?

CellSense

- CellSense® is a sensor for the detection and measurement of subclinical mastitis.
- CellSense is an automated California Mastitis Test using non-toxic CellGel® reagent.
- CellSense is installed inline with the milking point and reports the individual cow SCC result in less than 2 minutes from the start of milking.

LIC™ Automation

CellSense

CellSense can be used for:

- Frequent monitoring of individual cow SCC to pick up early lactation infections and act on them before they get out of hand and result in BMSCC penalties.

- For identifying those sub-clinical cows not obvious to the farmer, and because SCC can fluctuate considerably from milking to milking, may not be identified by a herd test or by blanket CMT testing.

- To monitor the herd for high SCC cows and take them out of the vat hence avoiding BMSCC penalties in late lactation.

- In preparation for drying off, recording of results can be combined with information on those cows with a history of clinical infections to make decisions on which cows will receive DryCow Therapy (DCT) at drying off and which cows are to be culled.

- When farmers feel they need to, e.g. when BMSCC increases or there are signs of clinical mastitis in the herd.

LIC™ Automation

YieldSense

- YieldSense® utilises full flow measuring technology meaning that milk flow is not disrupted due to complex moving parts or flow restrictions.

- YieldSense® provides the following outputs:
  - Yield
  - Fat, Protein & Lactose percentages
  - Bloody and watery milk, blocked air admission detection
  - Milking statistics
  - Wash performance data

Improvement. It's in our nature.
It's in our name.

Effects of genetic gains in the Irish beef Maternal Replacement Index on greenhouse gas emissions

Cheryl Quinton, Tim Byrne, Fiona Hely, Peter Amer, Andrew Cromie

ICAR/Interbull October 2016, Puerto Varas, Chile

Greenhouse Gas and Beef

- Beef cattle farming is a significant contributor to global greenhouse gas (GHG) production
- Selection to improve production efficiency can also reduce GHG emissions per animal and GHG intensity

$$System\ GHG\ intensity = \frac{system\ emissions\ (kg\ CO_2e)}{system\ production\ (kg\ meat)}$$

Beef Data and Genomics Program (BDGP)

- Aims to breed more profitable, sustainable, carbon efficient cows in Ireland
  - Tagging, data collection, genotyping, breeding requirements
  - €uro-Star Maternal Replacement and Terminal Indexes

  Cromie, ICAR 2016, *Beef Genomics Developments*

- Genomics with increased use of AI and elite animals → Potential to increase rates of genetic gain by 400%

  Hely et al, EAAP 2016, *A benefits model for a maternally focused beef breeding program in Ireland*

Objectives

- Predict improvements in GHG emissions intensity expected from genetic progress in Maternal Replacement Index and BDGP breeding strategies

1. Develop system model to quantify effects of trait change on kg CO_2e emissions and kg meat produced by average breeding cow

2. Predict industry-level long-term effects of index selection and BDGP breeding schemes

€uro-Star Maternal Replacement Index

Calf (Market Offspring) Traits 29%	Cow Traits 71%
Calving Difficulty	Cow Survival
Gestation Length	Calving Interval
Mortality	Age at First Calving
Carcass Weight	Maternal Weaning Weight
Carcass Conformation	Maternal Calving Difficulty
Carcass Fat	Cow Live Weight (maintenance)
Feed Intake	Heifer Live Weight (replacement)
Docility	Cull Cow Carcass Weight
	Docility

Approach

1. Estimate effects of change in each Index trait on **gross GHG emissions** = kg CO_2e / cow / year / trait unit

2. Estimate effects of change in each Index trait on system **GHG emissions intensity** = kg CO_2e / kg meat / cow / year / trait unit

3. Estimate **change in overall GHG emission intensity due to genetic gain** = kg CO_2e / kg meat / cow / year / € Replacement Index value

4. Predict **industry-level change in GHG emission over time** resulting from proposed BDGP beef breeding strategies

1. Trait effects on Gross GHG

- Estimate how change in each trait affects feed intake and resultant CO_2e emission

Feed Intake +1 kg DM	**Emissions** **+0.58 kg CO_2e**		
Cow Live Weight +1 kg	Maintenance feed required +3.20 kg DM	**Emissions** **+1.86 kg CO_2e**	
Calving Interval +1 day	Calves produced -0.0025	Feed required -2.11 kg DM	**Emissions** **-1.23 kg CO_2e**

2. Trait effects on GHG intensity

Calf trait gross GHG × N market calves/cow → Calf emissions

Heifer trait gross GHG × N replace heifer/cow → Replacement emissions

Cow trait gross GHG → Cow emissions

$$\text{System Emissions Intensity (per cow)} = \frac{\text{Calf emissions} + \text{Replacement emissions} + \text{Cow emissions}}{\text{Calf meat} + \text{Cull Cow meat}}$$

Calf trait kg meat × N market calves/cow → Calf meat

Cow trait kg meat → Cull Cow meat

Trait effects on GHG & system

	Trait (unit)	Gross GHG kg CO_2e/trait unit
Calf	Feed Intake (kg DM)	0.583
	Carcass Weight (kg)	
	Carcass Conformation (score)	
	Carcass Fat (score)	
	Mortality (%)	
Cow	Heifer Live Weight (kg)	5.483
	Cow Live Weight (kg)	1.864
	Cull Carcass Weight (kg)	
	Age at First Calving (d)	3.167
	Calving Interval (d)	-1.232
	Survival (%)	

Trait effects on GHG intensity

	Trait	DGE/y	GHG intensity (kg CO_2e/kg meat/trait unit)
Calf	Feed Intake	0.54	0.0011
	Carcass Weight	0.54	-0.0250
	Carcass Conformation	0.54	-0.1483
	Carcass Fat	0.54	0.1086
	Mortality	1.1	0.1452
Cow	Heifer Live Weight	0.614	0.0038
	Cow Live Weight	2.204	0.0234
	Cull Carcass weight	0.288	-0.00001
	Age First Calving	0.614	0.0111
	Calving interval	2.204	0.0643
	Survival	2.204	-0.2072

Emissions Intensity Index

3. Replacement Index effects on System-wide GHG intensity

	Trait	DGE/y	GHG intensity (kg CO_2e/kg meat/trait unit)	Trait response to Index selection (trait unit/€ index)	GHG intensity response to Index selection (kg CO_2e/kg meat/€ index)
Calf	Feed Intake	0.54	0.0011	0.0005	0.000001
	Carcass Weight	0.54	-0.0250	-0.0205	0.00051
	Carcass Conformation	0.54	-0.1483	-0.0017	0.00025
	Carcass Fat	0.54	0.1086	0.0013	0.00015
	Mortality	1.1	0.1452	-0.0023	-0.00033
Cow	Heifer Live Weight	0.614	0.0038	-0.1147	-0.00044
	Cow Live Weight	2.204	0.0234	-0.1147	-0.00268
	Cull Carcass weight	0.288	-0.00001	-0.0777	0.0000004
	Age First Calving	0.614	0.0111	-0.0454	-0.00050
	Calving interval	2.204	0.0643	-0.0283	-0.00182
	Survival	2.204	-0.2072	0.0193	-0.00400
					Total = -0.0089

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BRIDGING SCIENCE & BUSINESS

Index effects on System-wide GHG intensity

- Summing all Maternal Replacement Index trait responses, **GHG intensity reduced by 0.009 kg CO_2e/kg meat/breeding cow/year/€ index value**
  - both age- and weight-constant slaughter systems
  - Gross GHG reduced 0.810 kg CO_2e/breeding cow/year/€ index value

- Similar approach to estimate effects of Terminal Index
  - Calf (market offspring) traits only
  - **GHG intensity reduced by ~0.02 kg CO_2e/kg meat/breeding cow/year/€ index value**
  - Gross GHG reduced 0.018 kg CO_2e/breeding cow/year/€ index value

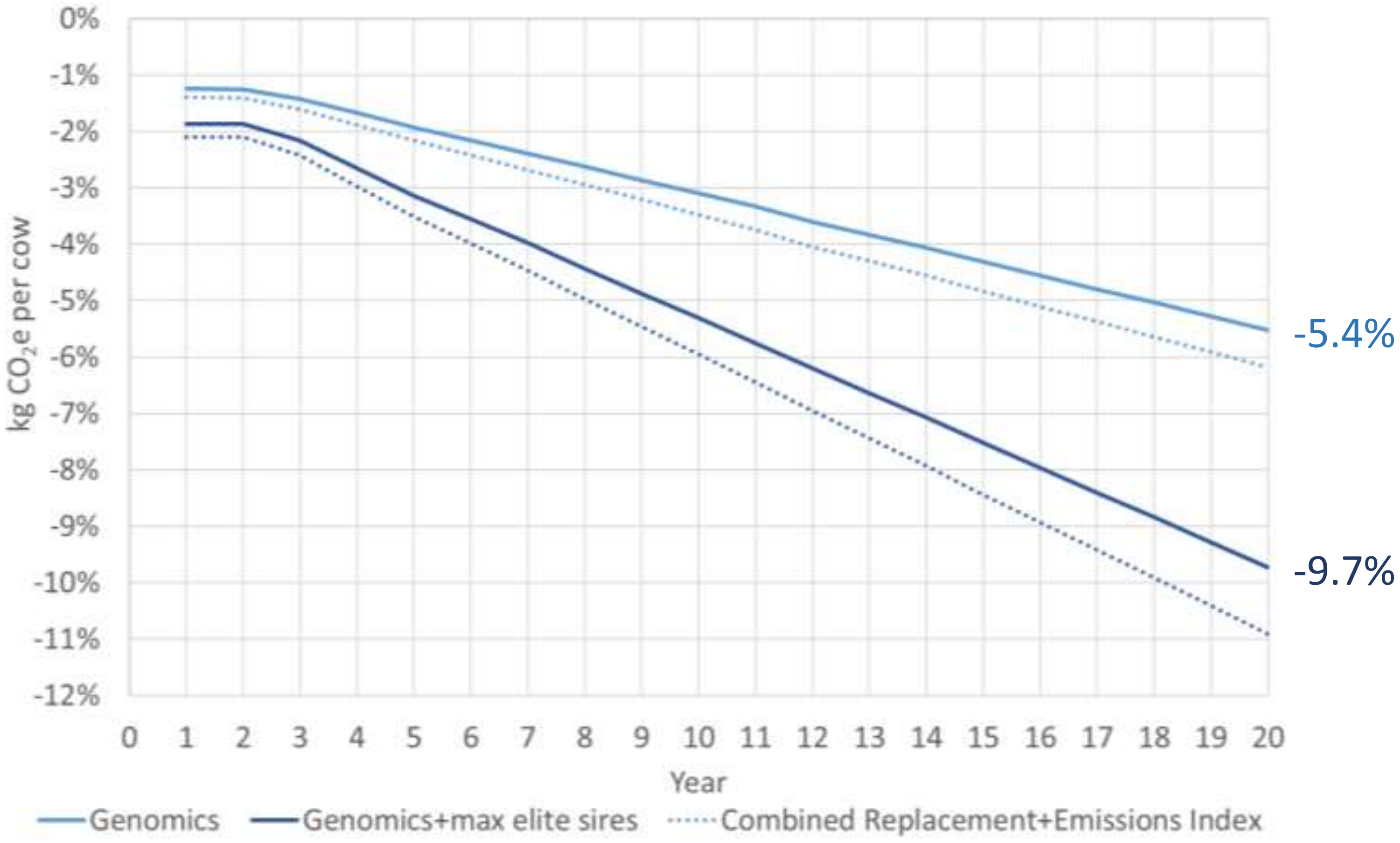
4. Industry-wide effects of BDGP breeding strategies

- For a constant level of meat production:

- Genomic selection with Replacement index
  - Average Index progress +5 €/year
  - **Total GHG reductions 229 kt CO_2e after 5 years, 1952 kt CO_2e after 20 years**

- Genomic selection plus maximum use of elite Replacement Index bulls by AI in pedigree herds
  - Average Index progress +9.5 €/year
  - **Total GHG reductions 350 kt CO_2e after 5 years, 3335 kt CO_2e after 20 years**

Industry CO_2e reductions



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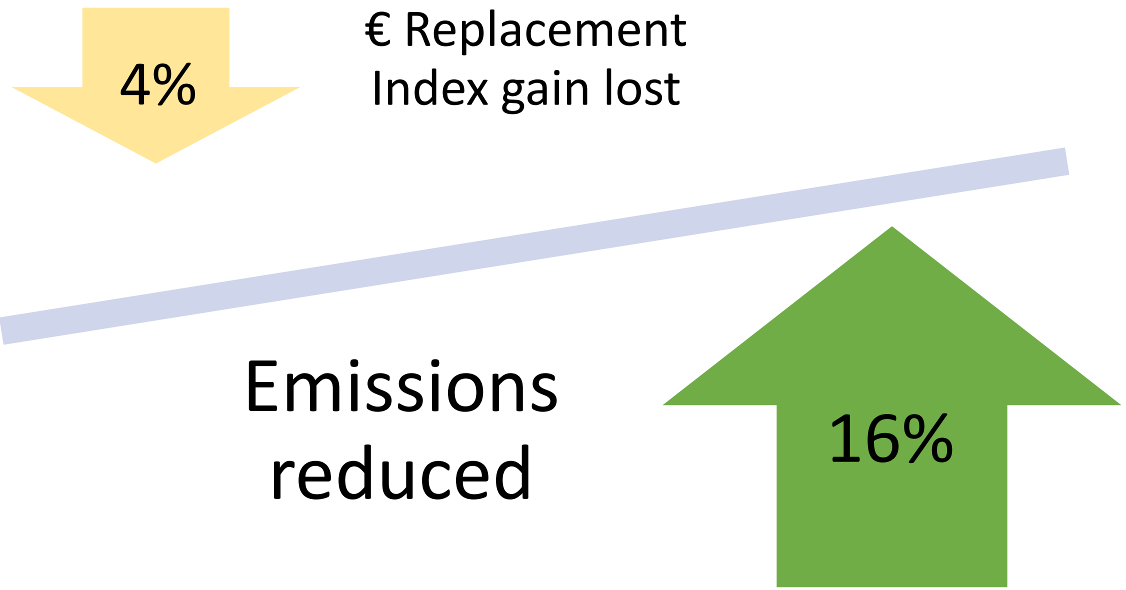
Selection for reduced GHG

- Combined Replacement + Emissions Index can balance trade-off of production vs. GHG reduction



Conclusions

- Genetic selection and genomics are effective tools to mitigate greenhouse gases in beef systems

- ICBF beef Maternal Replacement and Terminal Indexes can reduce industry-wide GHG emissions
  - Can improve production and further reduce GHG emissions intensity by combining production indexes with Emissions Index

- BDGP strategies to increase use of elite genetics through genomics and AI can improve genetic progress and associated GHG reduction
  - For a fixed product amount, total CO_2e reduced 5 - 10% after 20 years

Acknowledgements

Funding

- EU Rural Development Program
- Irish Department of Agriculture, Food and the Marine

Thank you!

Trazabilidad Bovina
Experiencia en Uruguay

Puerto Varas – Octubre 2016

1. Reseña histórica de la trazabilidad en Uruguay

Datos de Uruguay

Más de 3 millones de habitantes

17 millones de hectáreas

12 millones de cabezas Ganado bovino

4 vacunos por habitante

Pastoreo sobre Campo Natural

2006 Obligatorio el registro e identificación de Bovinos

Ley 17.997

Sistema de Identificación y Registro Animal (SIRA)

Sistema Nacional de Identificación Ganadera (SNIG)

Sistema de información

Objetivo: Asegurar la trazabilidad del ganado vacuno desde el establecimiento de origen hasta el frigorífico, individualmente como por grupos de animales.

07

cación y
SIRA)

Sistema Nacional de Identificación Ganadera (SNIG)

Sistema de información

Objetivo: Asegurar la trazabilidad del ganado vacuno desde el establecimiento de origen hasta el frigorífico, individualmente como por grupos de animales.

AGOSTO 2016

Se cumplieron 10 años de la **Ley de Trazabilidad** individual Bovina Obligatoria

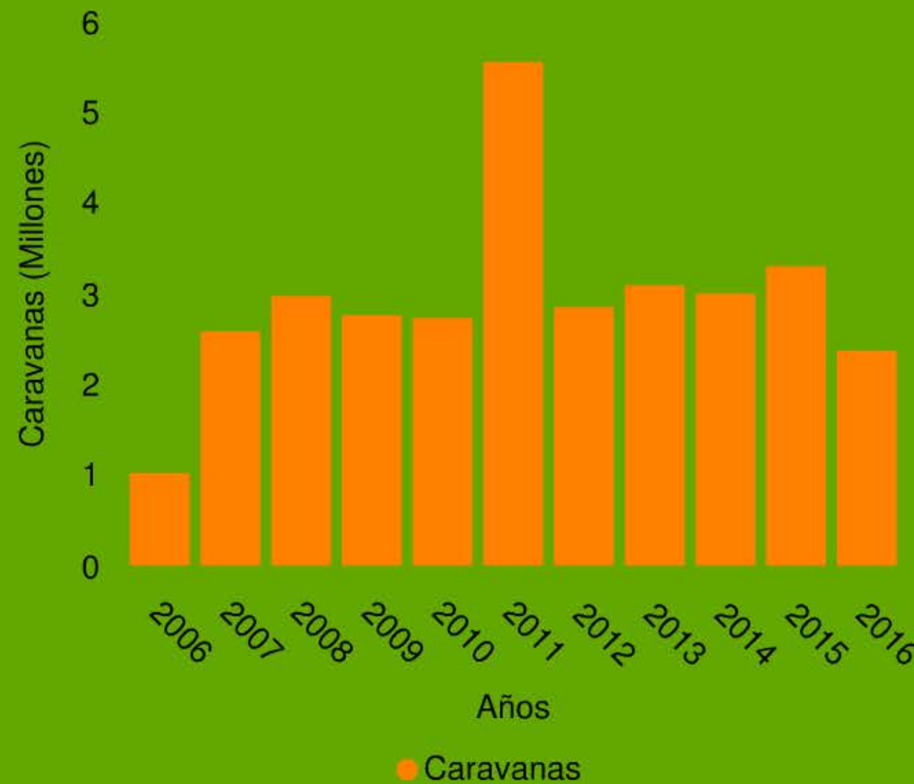
Registro de Bovinos (base de datos animal)

Capacitación a productores

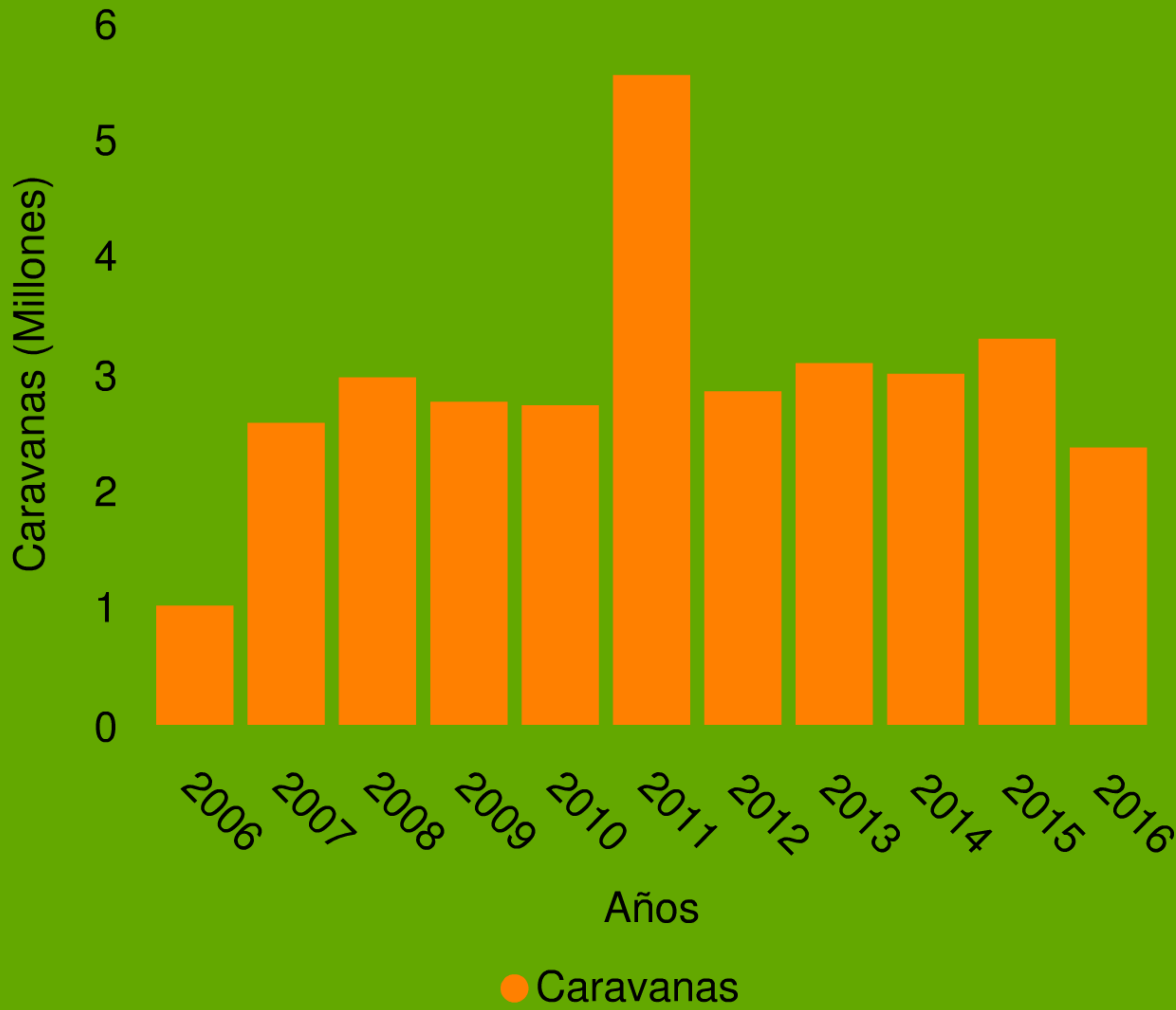
Cursos de capacitación y formación de Operadores

Registro de Operadores (base de datos de usuarios)

33.000.000
de dispositivos distribuidos de forma Gratuita para el usuario

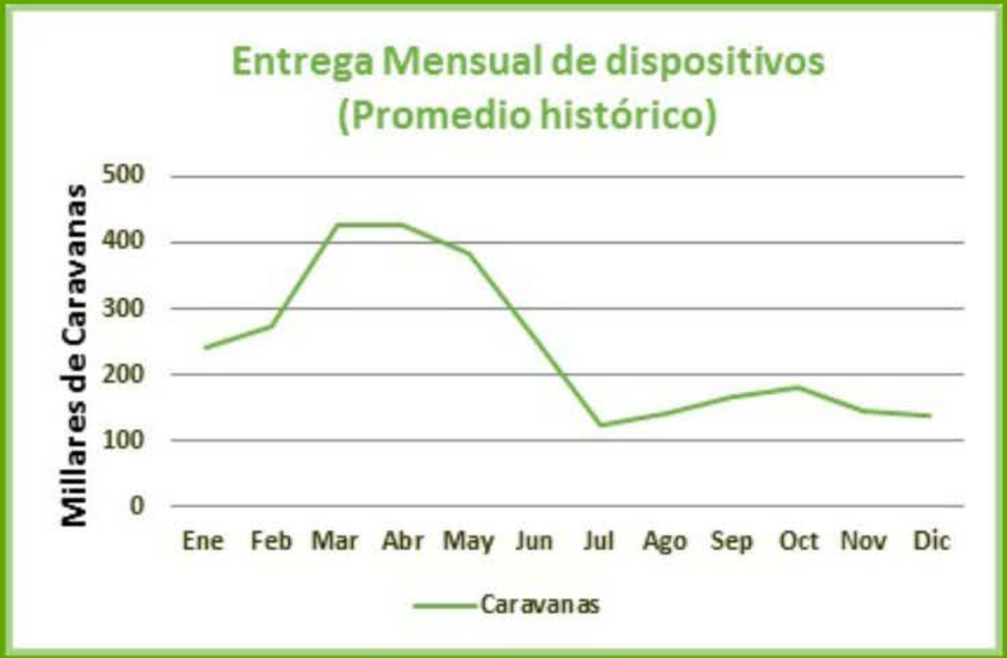


* **Media anual : 3 Millones de dispositivos**



6
5
4
3
2
1
0
Caravanas (Millones)
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Años
Caravanas

Nacimientos Primavera
Entregas concentradas en Otoño



Los mayores volúmenes de entregas se concentran a fines del **verano** y principios del **otoño**.

Dichas entregas, atienden la demanda de las pariciones de la primavera del año anterior.

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TRANSCURRIDOS 10 AÑOS DE LA OBLIGATORIEDAD DEL REGISTRO
DE BOVINOS URUGUAY TIENE REGISTRADO EL 100% DE SU RODEO

Apostando a una mejora contínua de los procesos

El Ministerio adquiere dispositivos mediante **licitaciones públicas internacionales**

Para adquirir de forma eficiente es fundamental:

- *Monitoreo permanente de las entregas*
- *Obtener indicadores que reflejen demanda por parte de los usuarios*
- *Interoperabilidad con el resto de las instituciones*

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Membresía MGAP SNIG - ICAR

Desde **Octubre de 2015** el Ministerio de Ganadería Agricultura y Pesca **(MGAP)** es **miembro titular** del **Registry International Committee for Animal Recording Practices (ICAR)**

Obtención de la membresía:

- Refuerza las garantías para las compras de dispositivos
- Oportunidad de continuar con la integración.
- Mostrar la experiencia de Uruguay en cuanto a la certificación de procesos productivos.
- **Enriquecer al Sistema con nuevos conocimientos y experiencias.**

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Valorizar la produ

Intensificarla de maner
(en todas sus dimen

Garantizar inocu

Simplicar operativa a

2. Certificación de procesos
Certificación de procesos

Por el camino de lo electrónico

Proyectos de mejora contínua con varios propósitos:

- ✓ Valorizar la producción

electrónico

Proyectos de mejora contínua con varios propósitos:

- Valorizar la producción
- Intensificarla de manera sostenible (en todas sus dimensiones)
- Garantizar inocuidad
- Simplicar operativa a usuarios

EJEMPLO ESPECÍFICO:
CERTIFICACIÓN ELTRÓNICA A FANEA

MARZO 2015

Objetivo: Certificación Electrónica de animales a ser faenados en Plantas habilitadas para la exportación

Ventajas de la certificación electrónica

Optimizar tiempos

- Reducción en cuanto a kilómetros recorridos
- Simplicar la operativa
- Capacitación obligaoria de todos los actores (estandarización)
- Menor uso de papeles


Proceso de Certificación Bovinos
1
Inicia
Solicitud de certificación
VP
2
Aprueba
Firmando el certificado Oficial
VO
3
Inspecciona y lee los animales
Envia la lectura
Firma el certificado particular
VP
4
Autorización de embarque
Lee animales y aparta no certificados
Envia Lectura
Genera Guia electrónica S3
VP
Prepara Inspección

1

Inicia
Solicitud de certificación

VP

2

Aprueba
Firmando el certificado Oficial

VO


3
rueba
ficado Oficial
Inspecciona y lee los animales
Envía la lectura
Firma el certificado particular
VP
Autorizació
Lee animales y ap
Envía
Genera Guía
VP
VO
Prepara Inspección

ales

ular

4

Autorización de embarque
Lee animales y aparta no certificados
Envía Lectura
Genera Guía electrónica S3

VP OM

Resultado
Certificacion de los animales que viajan a plantas habilitadas para exportacion
Desde marzo 2015
Información que simplifica la operativa
Modalidad electrónica
MENOR USO DE PAPELES
Menos traslados
Autorización de un VO
Certificado Oficial
Inspección clínica Veterinario particular (en campo)
Certificado particular
Solicitud de Código de Autorización (previo al movimiento)
Emisión Guía Electrónica
(animales certificados)
Movimiento a planta de faena
Notificación de faena
Segregación
de carcasas IVO
Certificación Electrónica a Faena

Por el camino electrónico

Certificación Electrónica a Faena

MINISTERIO DE GANADERÍA AGRICULTURA Y PESCA

Sistema Nacional de Información Ganadera

CERTIFICACIÓN ELECTRÓNICA DE BOVINOS CON DESTINO A ESTABLECIMIENTOS DE FAENA HABILITADOS PARA EXPORTACIÓN

CONSTANCIA DEFINITIVA - Certificado Particular

DATOS DEL CERTIFICADO

Número: **4167**

Fecha de lectura: **10/09/14 15:30 hs**

Fecha de firma del Veterinario Oficial: **10/09/2014**

Fecha de firma del Veterinario Particular: **10/09/2014**

Certificación vigente hasta: **12/09/2014 15:30 hs**

Electrónica a Faena

MINISTERIO DE GANADERÍA AGRICULTURA Y PESCA

Sistema Nacional de Información Ganadera

CERTIFICACIÓN ELECTRÓNICA DE BOVINOS CON DESTINO A ESTABLECIMIENTOS DE FAENA HABILITADOS PARA EXPORTACIÓN

CONSTANCIA DEFINITIVA - Certificado Particular

DATOS DEL CERTIFICADO

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Fecha de firma del Veterinario Particular: **10/09/2014**

Certificación vigente hasta: **12/09/2014 15:30 hs**

Tipo de transacción: **A faena desde campo**

DICOSE A: **021067547**

DICOSE B:

DICOSE C: **021067547**

DICOSE D:

Veterinario oficial:

Veterinario particular:

Nro. de registro en MGAP -

Teléfono:

Correo Electrónico:

ANIMALES CERTIFICADOS

1) 858000014825552
2) 858000018784402
3) 858000018784404
4) 858000018784406

Cantidad de Animales Certificados: **4**

Nota: Recuerde que la vigencia de la certificación es de 48 horas a partir de la lectura de los animales.

Movimiento
a planta de faena

Notificación de faena

Segregación

de carcasas IVO

plant

Resultado

Certificación de los animales que viajan a plantas habilitadas para exportación

Desde marzo 2015

o

aena

faena

s

Información que
simplifica la operativa

Ma
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MEN

Modalidad electrónica

MENOR USO DE PAPELES

a Faena


ON DESTINO A
A EXPORTACIÓN

a 858000018784404

ra de los animales.

Menos traslados

Autorización de un VO

Certificado Oficial

Inspección clínica
Veterinario particular
(en campo)

Certificado particular

Inspección clínica
Veterinario particular
(en campo)

Solicitud de
Código de
Autorización
(previo al
movimiento)

Ce
po

Emisión
Guía Electrónica

(animales certificados)

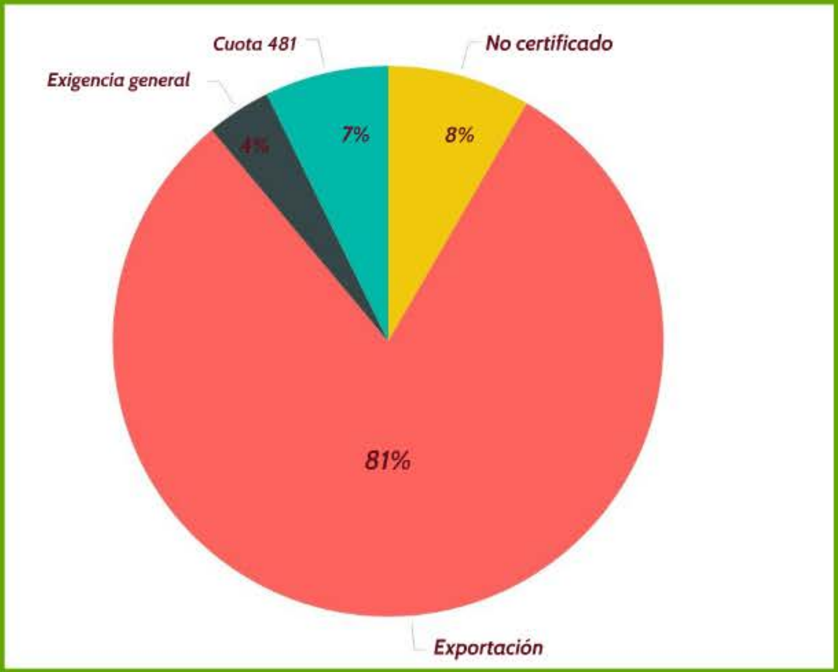
Movimiento
a planta de faena

Notificación de faena

Segregación
de carcasas IVO

plant

Animales faenados en 2015



Cuota 481 – 135.087 animales *7%*

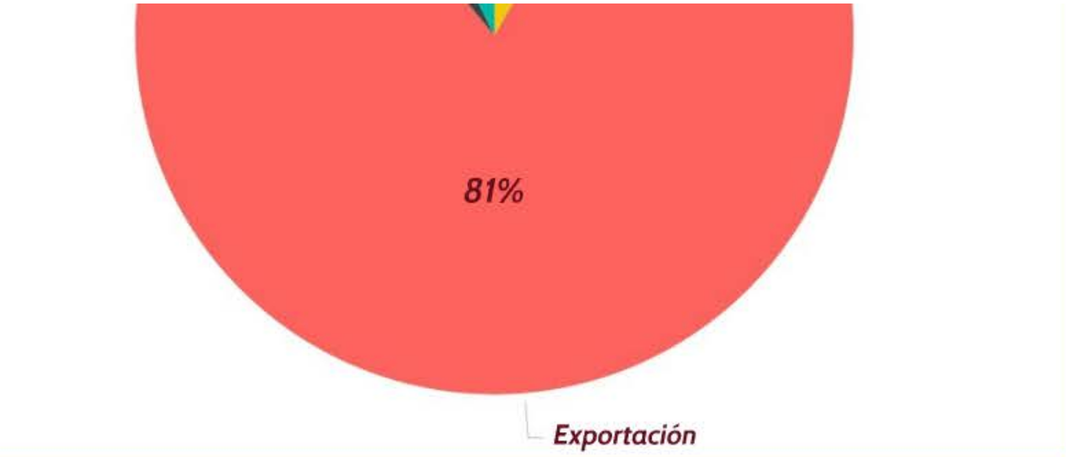
**Perído Marzo - Diciembre*

Exportación – 1:496.566 animales *81%*

Exigencia General – 70.692 animales *4%*

No Certificado – 155.899 animales *8%*

Total: 1:858.244 animales



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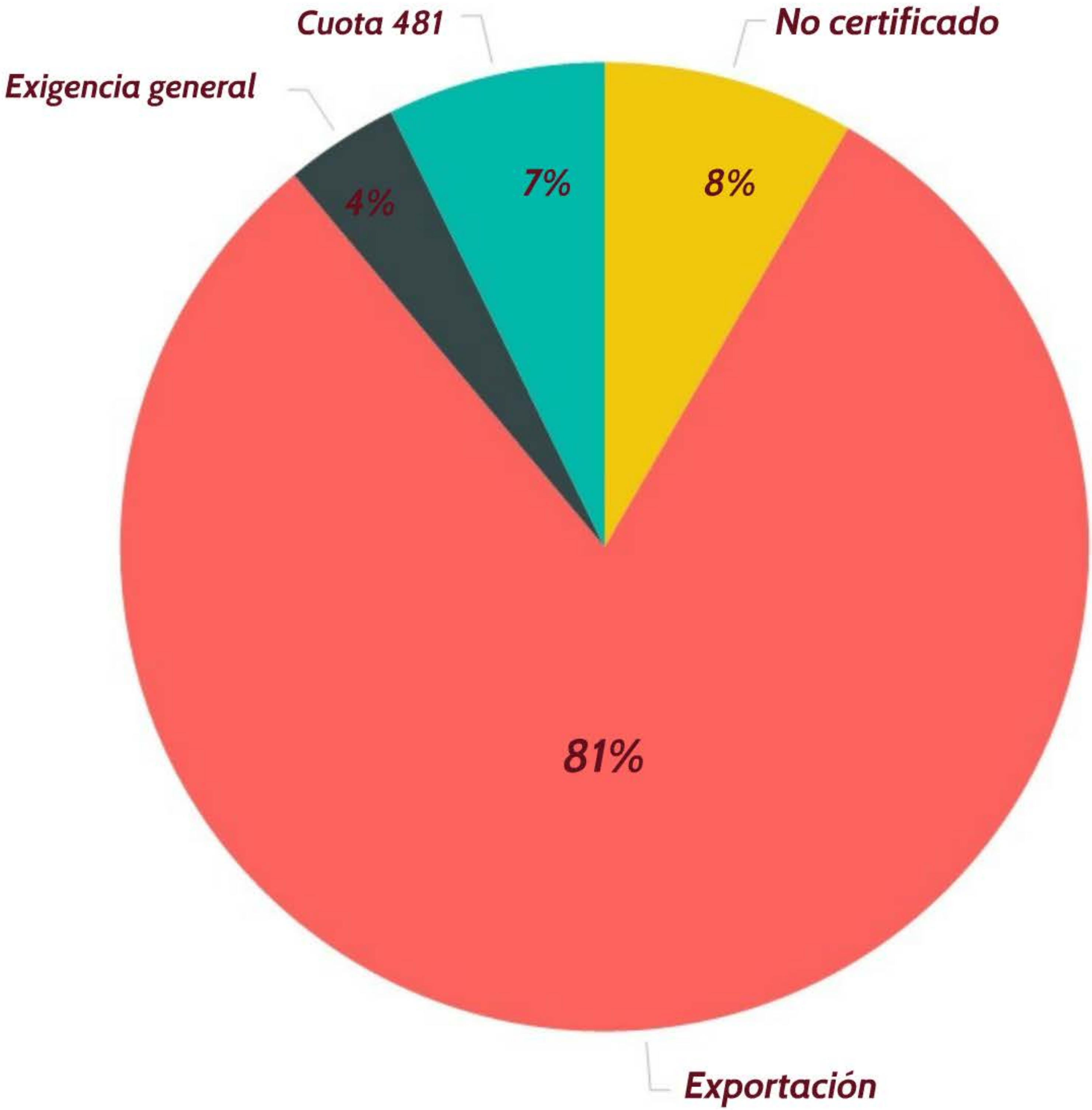
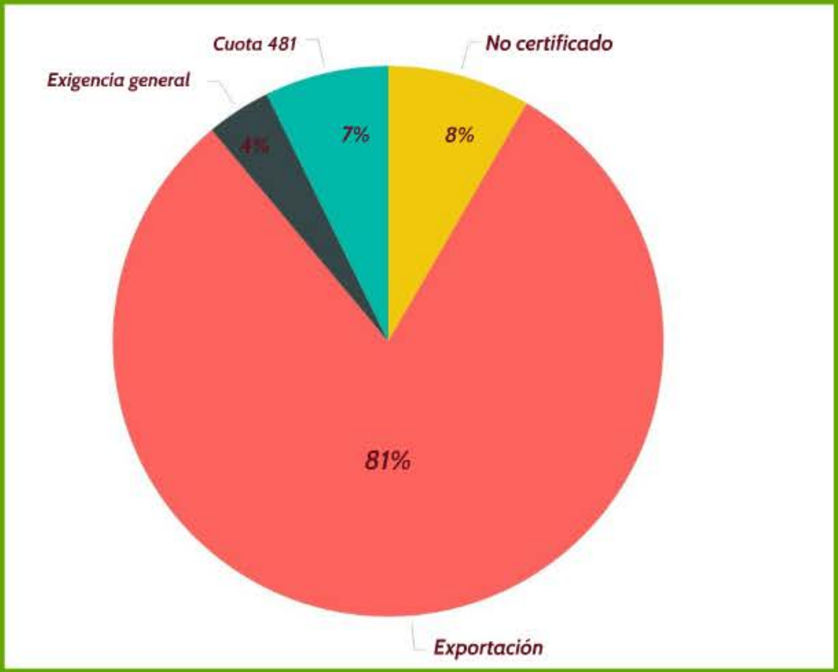

Cuota 481
No certificado
Exigencia general
7%
8%
4%
81%
Exportación

Animales faenados en 2015



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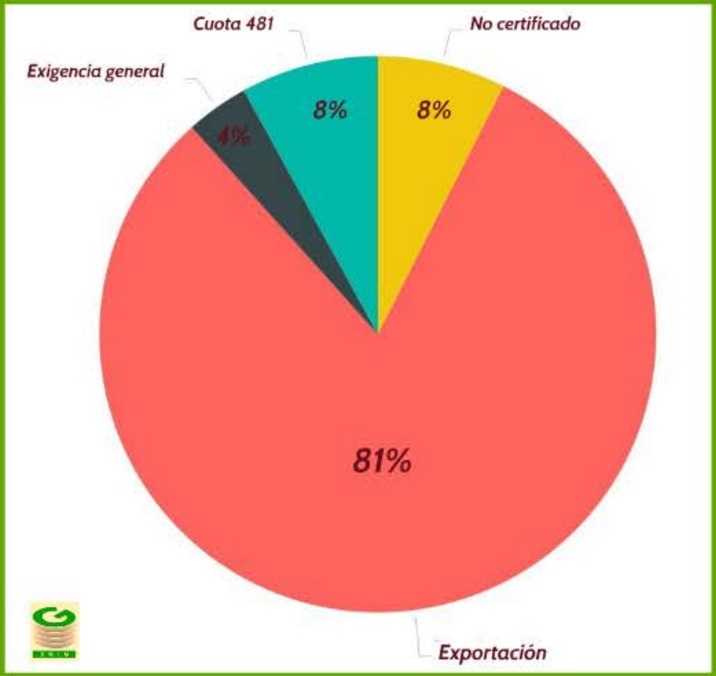
Total: 1:858.244 animales

**Perído Marzo - Diciembre*

Animales faenados en 2016



Cuota 481 – 96.882 animales *8%*

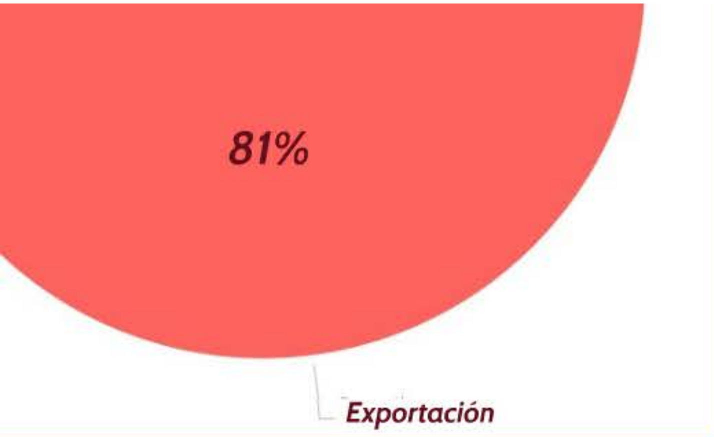
**Perído Enero - Agosto*

Exportación – 980.549 animales *81%*

Exigencia General – 44.338 animales *4%*

No Certificado – 90.462 animales *8%*

Total: 1:212.231 animales



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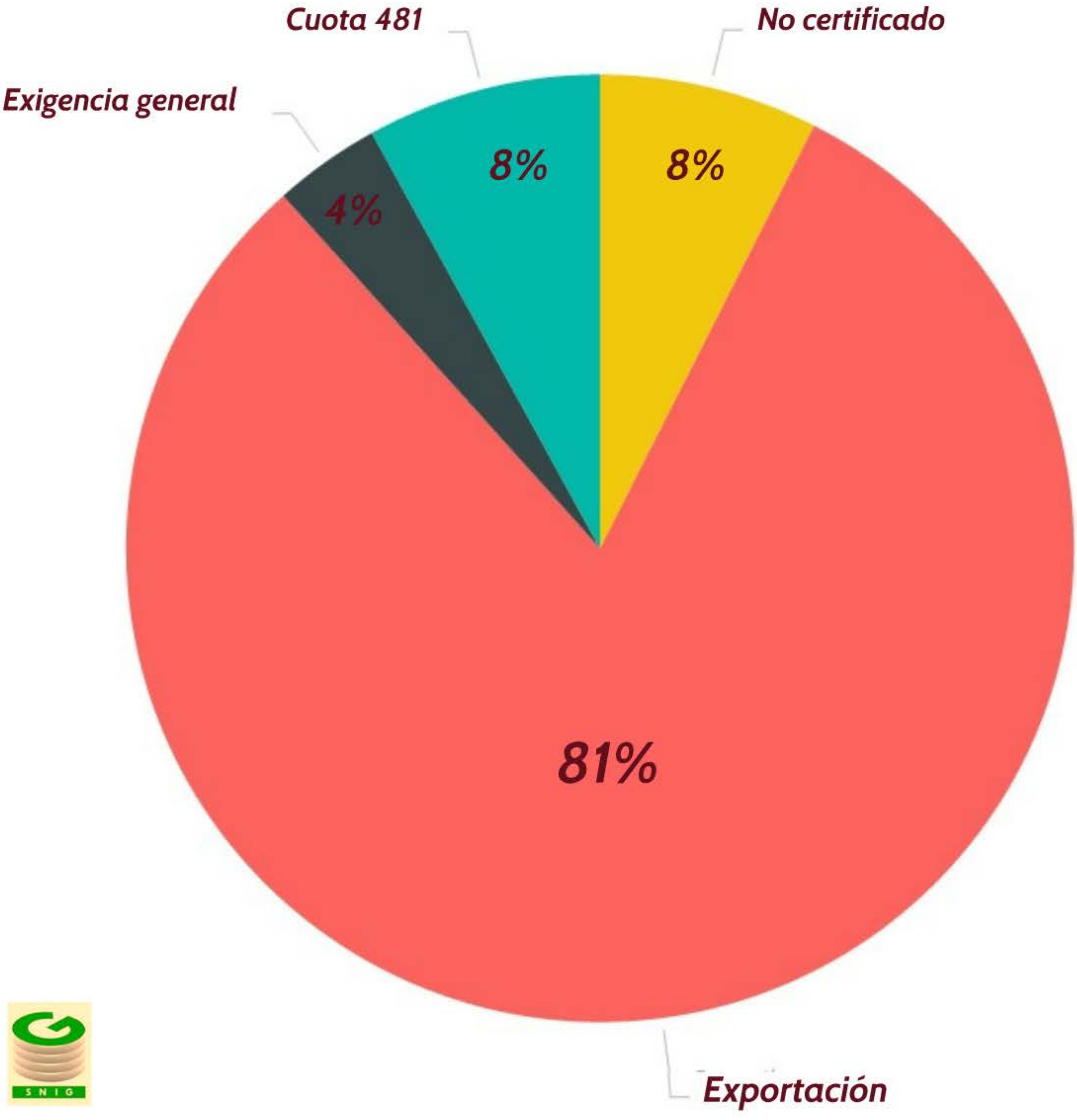


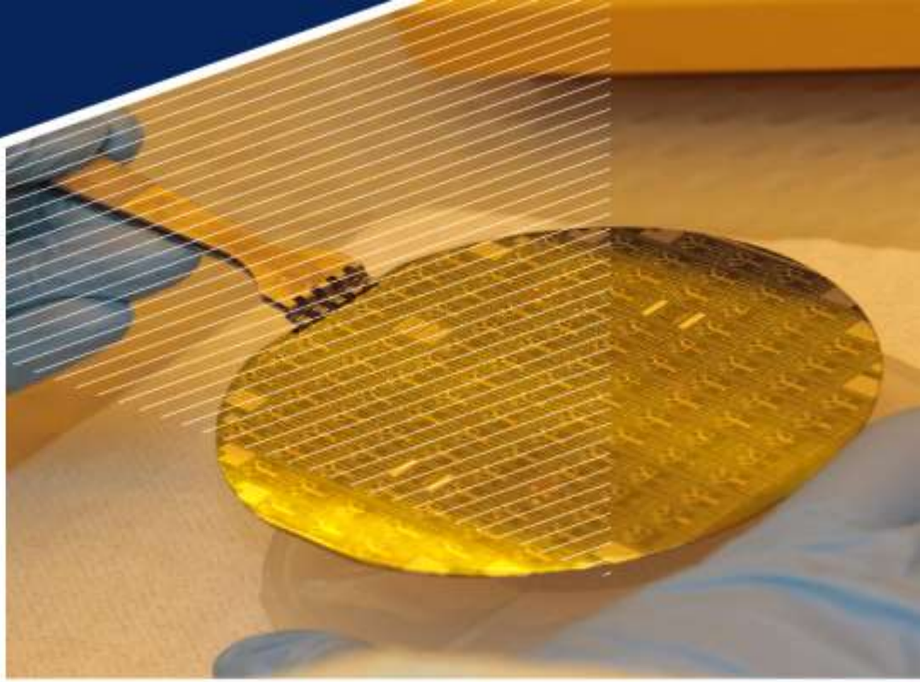
Cuota 481
No certificado
Exigencia general
8%
8%
4%
81%
Exportación

¡Muchas Gracias!

Dra. María Nela González
magonzalez@mgap.gub.uy

www.snig.gub.uy

INTI



REDLAT

RED DE LABORATORIOS LACTEOS DE IBEROAMERICA Y EL CARIBE

Lic. Gabriela Rodríguez
INTI Lácteos

Presidencia de la Nación | Ministerio de Producción

INTI Lácteos

Centro de Investigaciones Tecnológicas de la Industria Láctea

Presidencia de la Nación | Ministerio de Producción

El Centro INTI-Lácteos fue creado en el año 1968 en San Martín Provincia de Buenos Aires.

En 1983 se inauguran las Instalaciones de la Sede Rafaela de INTI Lácteos en la provincia de Santa Fe

Sus promotores originales fueron

CIL — JUNTA INTERCOOPERATIVA DE PRODUCTORES DE LECHE

Contamos con dos sedes ubicadas en las zonas productoras de leche más importantes de la República Argentina

Parque Tecnológico Miguelete Pcia. Buenos Aires

Rafaela Pcia. Santa Fe

Misión

INTI Lácteos tiene como principal misión *"Asistir técnicamente para el desarrollo tecnológico de la cadena agroalimentaria de la Leche".*

Líneas Estratégicas – Campos de Acción

Investigación y desarrollo

Asistencia y Transferencia Tecnológica

Metrología química

Generación de Ensayos de Aptitud

Materiales de referencia

Desarrollo regional de cuencas lácteas

Control de Calidad: Materia prima, insumos y productos

Capacitación y entrenamiento

INTI- LÁCTEOS
Laboratorio Nacional de Referencia

- de la Red de laboratorios Lácteos, que provee **Ensayos de Aptitud (Interlaboratorios)**

REDELAC
RED DE LABORATORIOS LÁCTEOS
ARGENTINA

- del Sistema Centralizado de Calibración de equipos, que provee **Materiales de Referencia**

SICECAL
Sistema Centralizado de Calibración

- del **Sistema de Pago** de Leche por Calidad
- para **leche y derivados lácteos**

INTI Lácteos
Centro de Investigaciones Tecnológicas de la Industria Láctea

Los laboratorios necesitan
asegurar la calidad de sus mediciones

Ensayos de aptitud

REDELAC
RED DE LABORATORIOS LÁCTEOS
ARGENTINA

Materiales de Referencia

SICECAL
Sistema Centralizado de Calibración

SICECAL

Con la finalidad de que los laboratorios puedan calibrar sus equipos automáticos o ajustar sus métodos de medición asegurando **trazabilidad internacional**, INTI Lácteos ha creado el **SICECAL** (Sistema Centralizado de Calibración)

Produce **Materiales de Referencia** en matrices lácteas siguiendo la normativa internacional vigente:

ISO Guide 34:2009: General Requirements for the Competence of Reference Material Producers

ILAC-G12:2000: Guidelines for the Requirements for the Competence of Reference Material Producers

El Laboratorio de Materiales de Referencia de INTI Lácteos asiste a los laboratorios de la Industria desde hace ya más de 25 años

- 20 usuarios fuera de Argentina (Ecuador, Colombia, Venezuela, Paraguay, Uruguay, Bolivia, Brasil, Chile, etc)

- 75- 80 usuarios en Argentina (lab. de industrias, lab. privados, lab. de Universidades, etc.)

El Laboratorio realiza todas las etapas de la producción de los Materiales de Referencia:

- Preparación y envasado
- Test de homogeneidad y estabilidad
- Asignación de valor
- Distribución y servicio post-distribución
- Asistencia al laboratorio

Evaluación de pares (PEER REVIEW)


CERTIFICATE OF APPROVAL OF QUALITY MANAGEMENT SYSTEM

CERTIFICADO DE APROBACIÓN DEL SISTEMA DE GESTIÓN DE LA CALIDAD

INSTITUTO NACIONAL DE TECNOLOGÍA INDUSTRIAL

REFERENCE MATERIALS IN MILK

¿Cuál es el Rol de la REDELAC?

"Red Argentina de Laboratorios Lácteos de Calidad Asegurada"
REDELAC

* **Armonizar** las mediciones químicas de los lab's lácteos y de alimentos asegurando la calidad y confiabilidad de sus resultados.

* **Diseminar trazabilidad** a través del Laboratorio Nacional de Referencia a los lab's nacionales, en el territorio de la República Argentina, y a toda Latinoamérica, contribuyendo a la comparabilidad de las mediciones, para asegurar la equidad en el comercio a nivel nacional, e internacional.

* **Asistir** a los lab's en la implementación de Sistemas de Gestión de Calidad, de acuerdo a normas internacionales y en sistemas-herramientas de aseguramiento de la calidad de los resultados.

¿Cómo está conformada la REDELAC?

77 laboratorios nacionales y **55** laboratorios latinoamericanos de empresas lácteas, laboratorios de productores de leche, laboratorios privados y de entes nacionales y provinciales

Desde 2004 estamos acreditados de acuerdo a la **norma ISO/IEC 17043** siendo el 1er Proveedor de Ensayos de Aptitud por comparaciones interlaboratorios acreditado en Latinoamérica, actualmente acreditado con el Organismo Argentino de Acreditación

INTI | Presidencia de la Nación | Ministerio de Producción

Concentración de Laboratorios que conforman la REDELAC, en la República Argentina

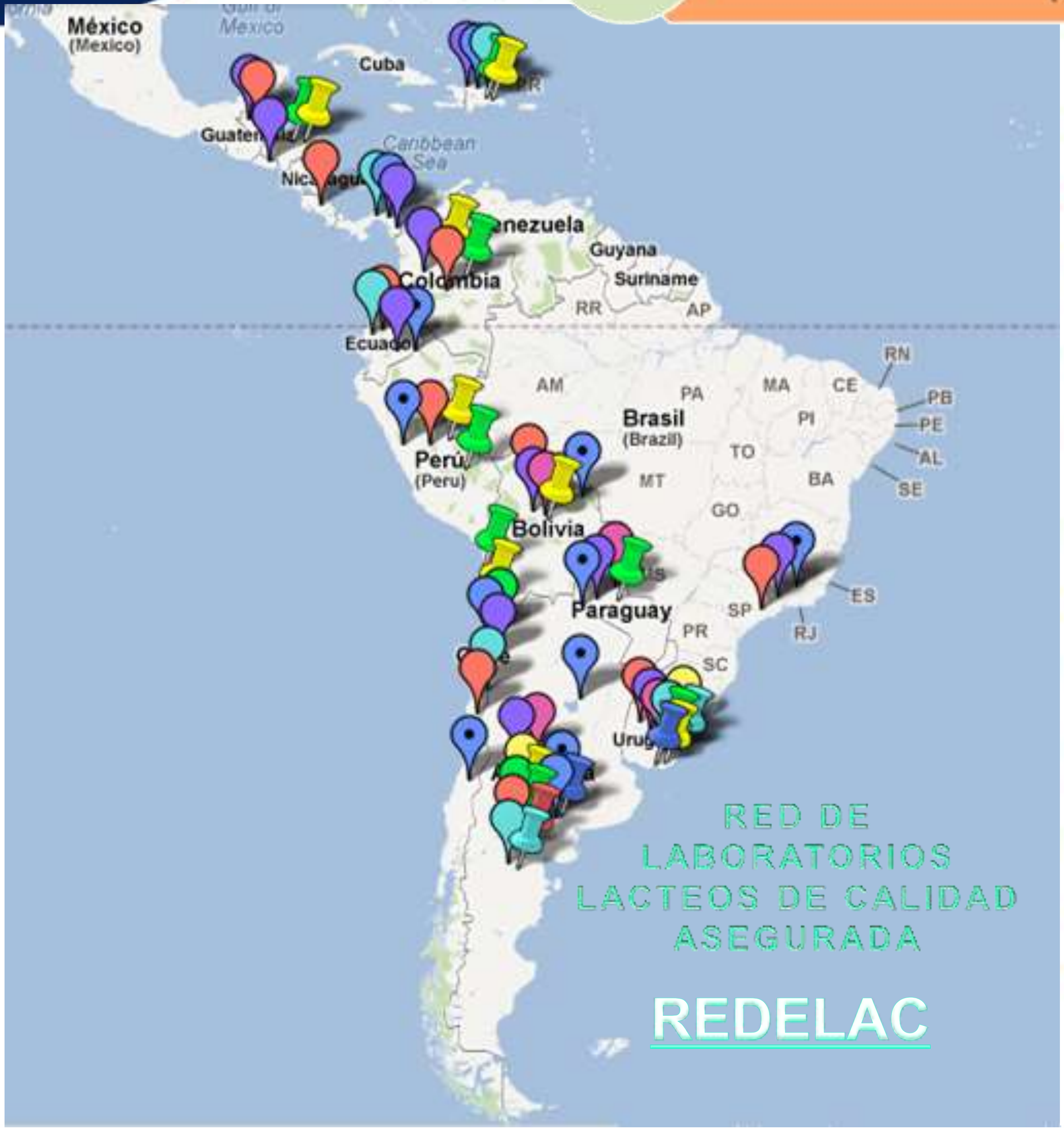
Concentración de Laboratorios en la Cuenca Lechera

REDELAC
RED DE LABORATORIOS LACTEOS
ARGENTINA

Presidencia de la Nación | Ministerio de Producción

INTI

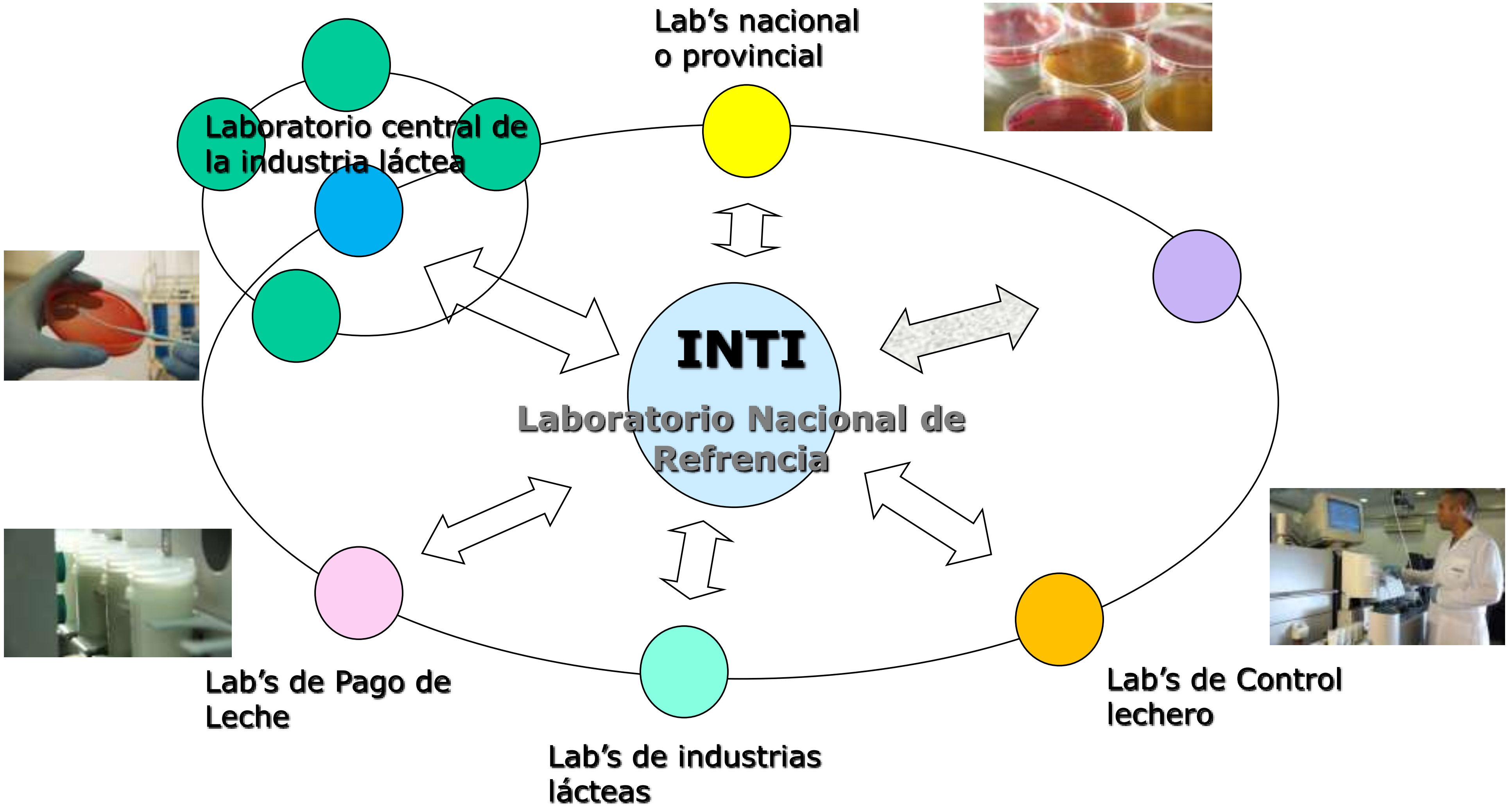
Aseguramiento de la Calidad desde la REDELAC



REDELAC
RED DE LABORATORIOS LÁCTEOS
ARGENTINA

- Leche UAT
  Leche UAT
- Leche Fluída
  Leche Fluída
- Leche en Polvo
  Leche en Polvo
- Quesos
  Quesos
- Control Mensual de Leche Cruda
  Control Mensual de Leche Cruda
- Control Mensual de Equipos para Recuento de Microorganismos
  Control Mensual de Equipos para Recuento de Microorganismos
- Listeria spp y monocytogenes
  Listeria spp y monocytogenes
- Salmonella spp en Leche en Polvo
  Salmonella spp en Leche en Polvo
- Salmonella spp en Carne
  Salmonella spp en Carne
- Vitaminas y Minerales en Leche en Polvo
  Vitaminas y Minerales en Leche en Polvo
- Ácidos Grasos en Leche en Polvo
  Ácidos Grasos en Leche en Polvo
- Dulce de Leche
  Dulce de Leche
- Pesticidas en Aceite vegetal/Solvente orgánico
  Pesticidas en Aceite vegetal/Solvente orgánico

¿Cómo opera la REDELAC?



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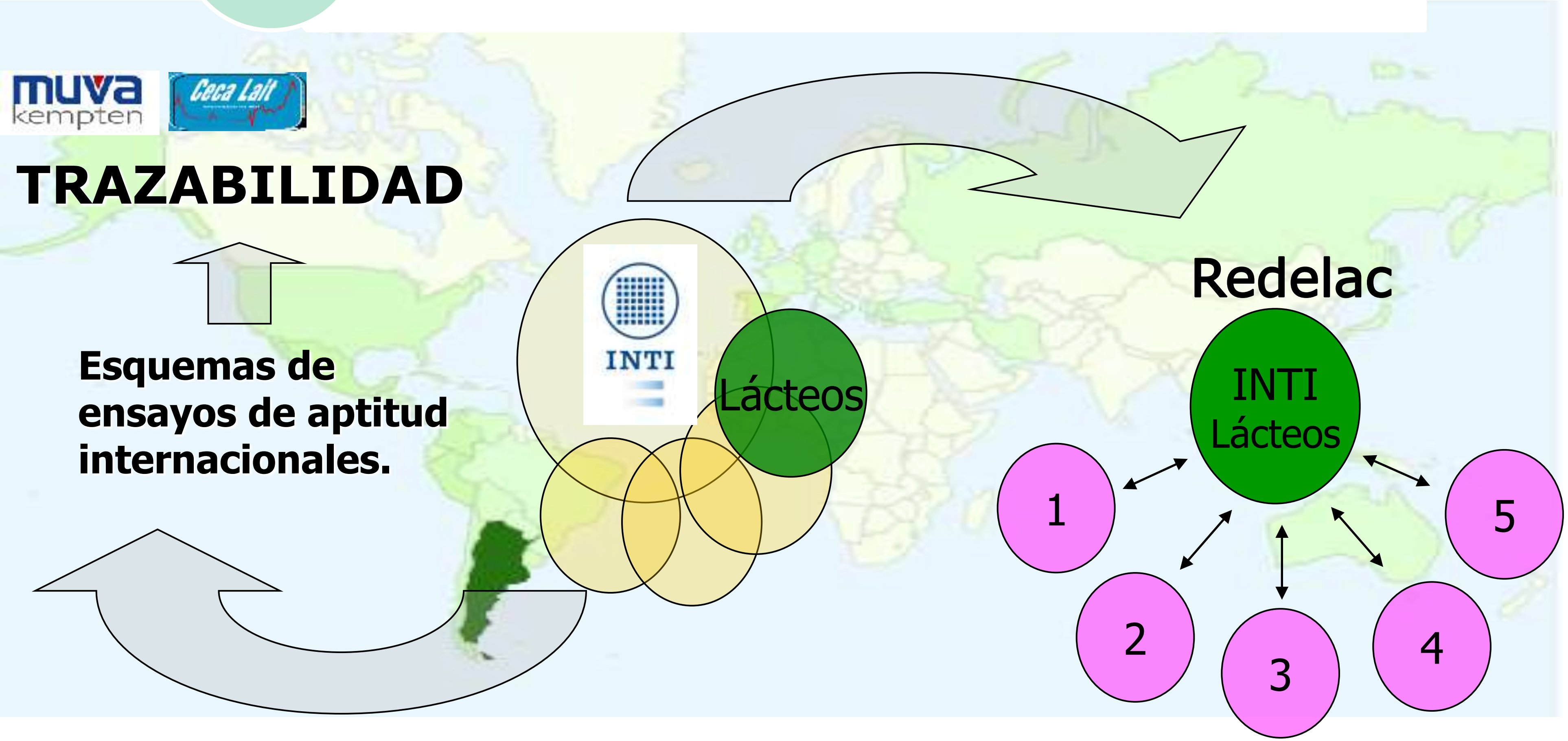


INTI- Lácteos 1º "Proveedor de Ensayos de Aptitud por comparaciones interlaboratorios" acreditado en Latinoamérica.

Ensayos de Aptitud brindados desde REDELAC

Ensayo de Aptitud	*Frecuencia*	*Matriz*	*Cantidad Parámetros/ Analitos*
Control mensual Leche Cruda	**Mensual**	**Leche cruda**	**9**
Control instrumental de Recuento de Microorganismos	**Mensual**	**Leche cruda**	**1**
Ensayo Interlaboratorio Leche Fluida	**Semestral**	**Leche fluida**	**7**
Control Periódico Leche en Polvo	**Semestral**	**Leche en polvo**	**10**
Control Periódico en Queso	**Semestral**	**Queso**	**8**
Ensayo Interlaboratorio SALMONELLA y LISTERIA	**Anual**	**Leche en polvo**	**3**
Ensayo Interlaboratorio ACIDOS GRASOS	**Bienal**	**Leche en polvo**	**7**
Ensayo Interlaboratorio VITAMINAS y MINERALES	**Anual**	**Leche en polvo**	**10**

Ensayos de Aptitud brindados desde REDELAC

Interlaboratorios	*Frecuencia*	*Matriz*	*Cantidad Parámetros/ Analitos*
DULCE DE LECHE	**Bienal**	**Dulce de leche**	**5**
LECHE UAT	**Anual**	**Leche UAT**	**5**
EIL PESTICIDAS	**Bienal**	**Solvente orgánico**	**6**

REDELAC
hacia un sistema integral

Este esquema metrológico a través de los ***ensayos de aptitud por comparaciones interlaboratorios*** y los ***materiales de referencia***, le permite a los laboratorios, mantener **trazabilidad metrológica** con el **Laboratorio Nacional de Referencia**, quien a su vez se traza con laboratorios y/o instituciones internacionales reconocidas.

REDELAC
RED DE LABORATORIOS LÁCTEOS
ARGENTINA

SICECAL
Sistema Centralizado de Calibración

REDLAT . Extensión a Sudamérica y el Caribe

Con la idea de generar una red de laboratorios a nivel sudamericano y del Caribe, se presentó un proyecto de creación de Red a la Convocatoria Redes CYTED

PROGRAMA IBEROAMERICANO
CYTED
CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO

EL PROYECTO FUE APROBADO Y COMENZÓ A DESARROLLARSE EN EL AÑO 2015

INTI

Presidencia de la Nación | Ministerio de Producción

OBJETIVOS DE LA RED

El objetivo general era la ***conformación de una red de laboratorios lácteos*** cuyo ámbito de funcionamiento sea la región ***latinoamericana y del Caribe para el fortalecimiento de sus capacidades analíticas y de gestión de calidad relacionados con la calidad composicional e higiénico sanitaria de la leche***, con fines de pago diferenciado por calidad, de control lechero, de control veterinario (brucelosis/tuberculosis/aftosa) o de control de productos lácteos elaborados.

REDLAT

Red de Laboratorios Lácteos Latinoamericanos

OBJETIVOS ESPECIFICOS

✓Crear una forma de comunicación entre los laboratorios lácteos de la región latinoamericana y del Caribe.

✓Facilitar la asistencia técnica y consultas en metodologías analíticas y gestión de la calidad.

✓Dictar cursos de capacitación, virtuales o presenciales en las temáticas de muestreos, metodologías y aseguramiento de la calidad de los resultados.

✓Armonizar las metodologías de análisis para el muestreo y análisis de la leche y productos lácteos.

✓Identificar y promover laboratorios de referencia en cada uno de los países participantes.

REDLAT
Red de Laboratorios Lácteos Latinoamericanos

✓Crear y mantener un sistema de trazabilidad nacional e internacional de los resultados entre los países miembros.

✓Establecer reuniones técnicas periódicas (presenciales y vía internet) entre los laboratorios miembros.

✓Promover el pago diferenciado de la leche según su calidad composicional e higiénico sanitaria y el control lechero en la región.

✓Organizar un Taller de Laboratorios Lácteos Latinoamericanos, con sedes que se alternan privilegiando la problemática regional en los aspectos relacionados con la capacitación técnica, la gestión de calidad y el desarrollo armónico de las regiones.

INTI

Presid... de la ...

ESTRUCTURA MAESTRA **REDLAT**

COORDINACIÓN GENERAL REDLAT

Dra. Graciela Muset

COORDINACIÓN TECNICA REDLAT

Centro de Investigaciones Tecnológicas de la Industria Láctea

REPRESENTANTE POR PAIS

ARGENTINA- BOLIVIA-BRASIL-CHILE-COLOMBIA-CUBA-ECUADOR-EL SALVADOR-ESPAÑA-PANAMA-PARAGUAY-URUGUAY

12 PAISES

INSTITUCIONES SOCIAS

FOSS S.A.	CENLAC
LABROB	UPS
ESALQ/USP	AGROCALIDAD
FEPALE	FUSADES
INTA	LAS
COOPRINSEM	LILCYL
OBENS	IEA
UBLIBRE	FECOPROD
CNLM	INAN
COLANTA	INIA
CORPOICA	LATU
UdeA	

12 PUBLICAS

6 PRIVADAS

1 ONL

2 COOPERATIVAS

21 INSTITUCIONES

Página WEB
http://www.redlat-cyted.com/

REDLAT
Red de Laboratorios Lácteos Latinoamericanos

INTI

INDUSTRIA ARGENTINA
ORGULLO NACIONAL

¡¡ MUCHAS GRACIAS!!

Lic. GABRIELA RODRIGUEZ

gabirod@inti.gob.ar

Pregnancy & Disease Detection from Milk Samples

A Global Overview - ICAR Chile 2016 - 25 October, 11.20-11.40

RUMINANTS
WIEDERKÄUER
RUMINANTS
RUMIANTES
反刍动物
反芻動物

Test With Confidence™ IDEXX

Agenda

- The Milk Sample
- Diagnostic Solutions
- IDEXX Milk Pregnancy Test:
  - What have we learned since the launch?
- Global Overview of Milk Pregnancy Testing Services
  - Europe
  - North America
  - Australia
  - Latin America

The Milk Sample

- Cattle, Sheep, Goat, Buffalo, ...
- Native, skimmed, conserved
- Multiple information:
  - Milk quality parameters
  - Mastitis, SCC
  - Disease: antibodies, antigen, DNA, RNA
  - Pregnancy-associated glycoproteins
  - Progesterone
  - More?
- Easy to collect sample
- Not so easy to store...getting sour easily
- Conserving milk helps stabilize the sample for use in the lab
- Tends to build flocks upon multiple freeze/thaw cycles

Fresh milk

Soured milk

Diagnostic Solutions: Adding Diagnostic Value

- More results from every milk sample
- Milk is a simple, accurate medium for regular disease testing
  - Bulk tank, individual milk
- Simplified collection and logistics
- Offer veterinarians and producers greater value with every result
- Antibody disease testing:
  - BVDV (bulk tank and individual)
  - IBR (bulk tank and individual)
  - EBL (BLV) (bulk tank and individual)
  - Brucellosis (bulk tank and individual)
  - Johne’s (individual)
  - Fasciolosis (bulk tank)
  - Q Fever (individual)
- PCR:
  - RealPCR BVDV RNA Test
  - RealPCR MAP DNA Test (in validation)

IDEXX Milk Pregnancy Test

- From 28 days post breeding (cows and goats)
- Coming soon:
  - Water Buffalo: from 30 days post breeding
  - Sheep: from 60 days post breeding
- ELISA test designed for large scale testing in DHI laboratories

IDEXX Milk Pregnancy Test

IDEXX Milk Pregnancy Test – Lab-Based Milk Test

Value Proposition

- The IDEXX Milk Pregnancy Test helps labs, veterinarians and producers detect pregnant and open cows accurately as early as 28 days post breeding and throughout gestation with the first milk-based laboratory test in a cost-effective and time-efficient manner which allows re-breeding of open cows to improve reproductive efficiency.

- Dairy producer benefits
  - Shorter calving intervals, improved calving rates, increased milk production
  - Save $3-5 per day open
  - Easy to collect routine samples
  - Less animal handling, cow comfort benefit
- Veterinarian benefits
  - Optimize on-farm time for investigating open cows and providing more value added services
  - Systematically capture pregnancy data to improve long-term reproductive management
- Laboratory benefits
  - New value-added service addresses top producer need using existing milk samples
  - Easy-to-run, familiar and trusted, high-throughput ELISA platform

Test With Confidence™ IDEXX

IDEXX Milk Pregnancy Test Performance

- **Early and simple:**
  - From 28 days post breeding and throughout gestation
  - Test for pregnancy from routine DHI milk samples
  - Bovine and caprine milk
    - Whole or skim
    - Fresh or preserved
  - Performance (bovine milk):

Sensitivity = 98.7% (LCL: 98%)*
Specificity = 94.4% (LCL: 92%)*
Rechecks: 3% of total tested (2% pregnant and 1% open)

		Palpation / Ultrasound	
		pregnant	**open**
IDEXX Milk Pregnancy Test	**Pregnant**	1,121	36
	Recheck	45	20
	Open	15	602

*See IDEXX Milk Pregnancy Test validation report for complete performance data. Excluding IDEXX Milk Pregnancy Test recheck results.

Test With Confidence™

IDEXX Milk Pregnancy Test Worldwide

- Mainly introduced to DHIs that service different dairy production systems
- Adoption of pregnancy diagnosis service in milk
  - Logistics: use routine samples from existing flow to lab and also use individual samples anytime
  - Install new testing parameter besides milk quality, mastitis PCR testing
    - IDEXX recommends instruments (shaker-incubator) and supports with all facets of installation (many DHIs are new to ELISA testing)
  - Recommended: participate in regular proficiency tests
  - Reporting: website (login), e-mail, SMS, fax and letter rare
  - Invoicing: routine, mostly on monthly basis for DHI members
  - Promotion:
    - Advertisements, producer events
    - Leverage regular presence of DHI technicians on farm
    - Examples of successful collaboration between DHI, breeding associations and genetic companies
  - Technical challenges
    - Carry over
    - The dip
    - Decline of PAGs after early embryonic death (EED) and abortion
    - Optional recheck zone

Carry Over Contamination

- There is a technical risk of carry-over contamination* for the IDEXX Milk Pregnancy Test
  - Carryover of <1% does not present a significant risk for false positive or recheck sample
  - 2.5- 5% carryover may increase # of recheck results but low risk of false positives
  - >10% carryover could significantly increase number of recheck and false positive results

- However, in reality, we see very few 'field-based' issues of carryover contamination
  - >2000 samples tested from routine DHI collections with very few false positive samples that could have been attributed to carryover contamination
  - Specificity in field trials and validation testing exceptionally high (>97%)

- In order to mitigate the risk of carryover contamination, IDEXX has the following recommendations included in the test protocol:

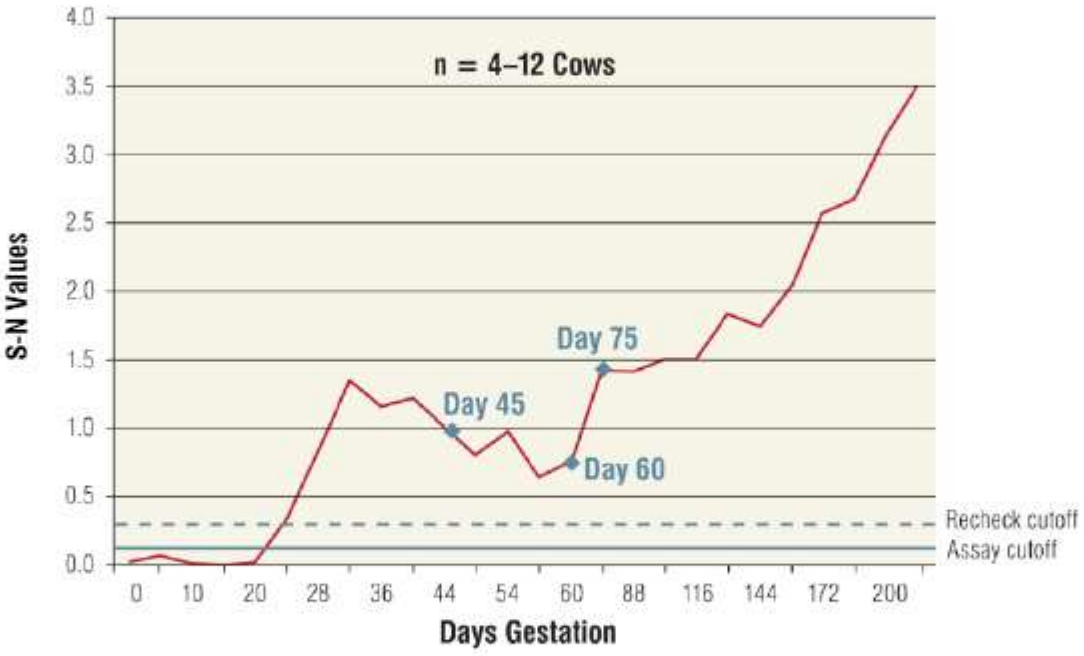
  Sample Quality and Handling

  - Care should be taken to minimize the likelihood of milk carryover from cow to cow during sample collection, particularly when using samples collected for routine herd recording.

*Data from laboratory –based dilution studies, not field samples

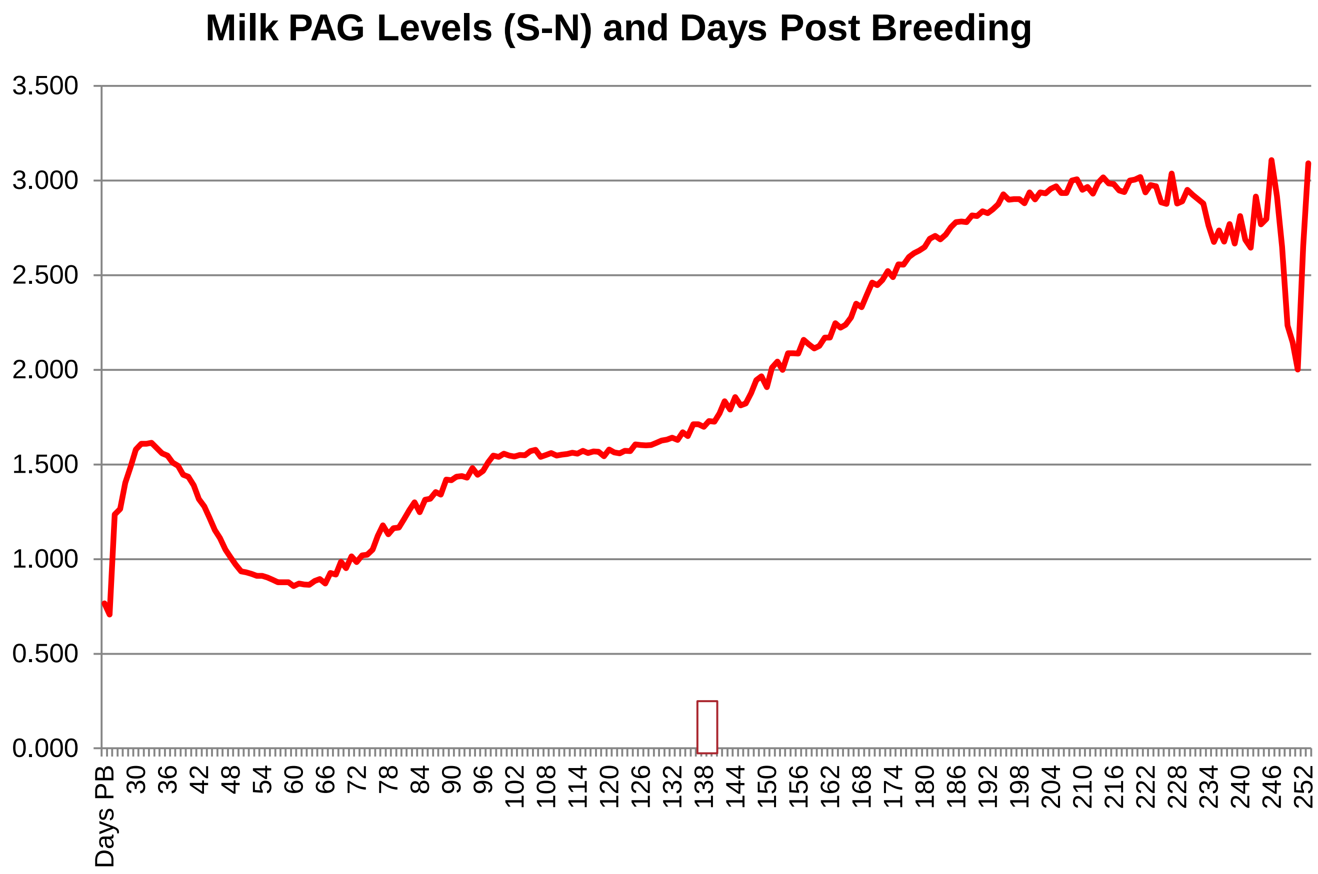
The Dip

- Pregnant cows show rapid increase of PAGs up to day 32 post breeding. Levels decline above cut-off and increase again to day 70 post breeding creating a dip.
- Similar findings in published study (Ricci et al.)
- Conclusion: there is a dip between 32 and 70 days post breeding resulting in lower PAG levels. However, test performance remains at high levels.



Milk PAG Levels in Danish Milk recorded Cows 2013-2016

294.584 positive results in Holsteins, Jersey, Red Nordic, and Cross breed



Cut-off (S-N)
0.100-0.250

(1) Pregnancy Test in Denmark 2016 (2013-2016) Lars Fast Hansen, Niels Henning Nielsen, Aarhus 22 July 2016

Decline of PAGs after EED or Abortion

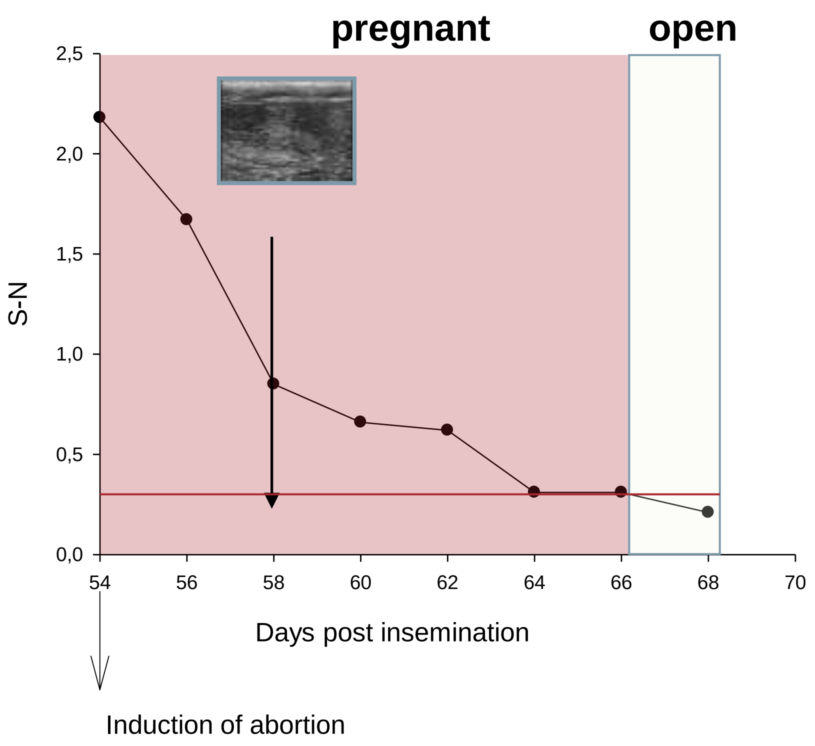
- PAGs are produced by trophoblast cells in the placenta. If placenta loses functionality due to early embryonic death (EED)/abortion PAGs will not be produced anymore and concentration of PAGs in blood and milk will decline over time.

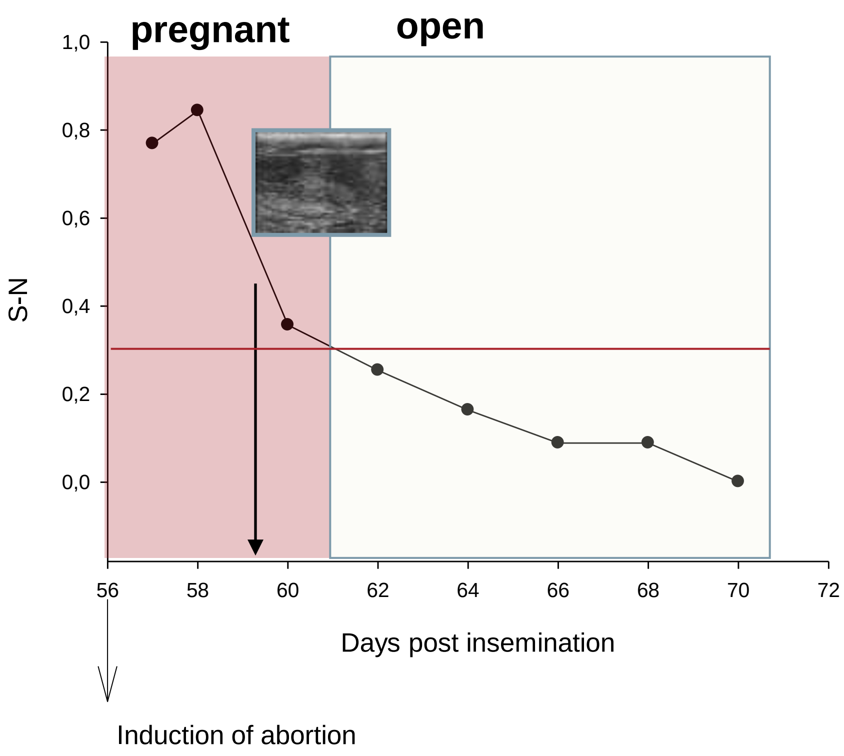
Time of loss	Estimated (1) duration of PAG decline in blood
28-60 days of pregnancy (EED)	Up to 10 or more days
> 60 days of pregnancy (abortion)	Up to 60 days

(1) no exact data available yet. IDEXX is collecting data to learn more about it.

Decline of PAGs after EED or Abortion

- Study at University of Hannover, Germany with IDEXX Bovine Pregnancy Test:





Test With Confidence™

Optional Recheck Zone

- To summarize overall sensitivity and specificity for the IDEXX Milk Pregnancy Test on bovine milk samples using the optional method for interpretation of results for cows over 45 days postbreeding. With this method, cows more than 45 days postbreeding are considered pregnant if the S-N is greater than 0.10 (there is no recheck zone).

	Standard Interpretation (0.10–0.25 Current Recheck)				Optional Interpretation (0.10 Cutoff and No Recheck)		
	Performance				Performance		
Days Bred	Cows	Se	Sp	% Recheck	Cows	Se	Sp
28–34	524	99%	90%	2%	n/a	n/a	n/a
35–45	132	98%	91%	2%	n/a	n/a	n/a
46–55	125	97%	100%	13%	125	97%	92%
56–65	167	96%	100%	15%	167	97%	100%
66–75	62	98%	100%	3%	62	98%	89%
76–85	34	97%	100%	0%	34	97%	100%
86–95	54	100%	100%	2%	54	100%	100%
96–105	66	100%	100%	0%	66	100%	100%
>105	411	100%	92%	0%	411	99%	85%
Overall	1,839	99%	94%	3%	1839	99%	93%

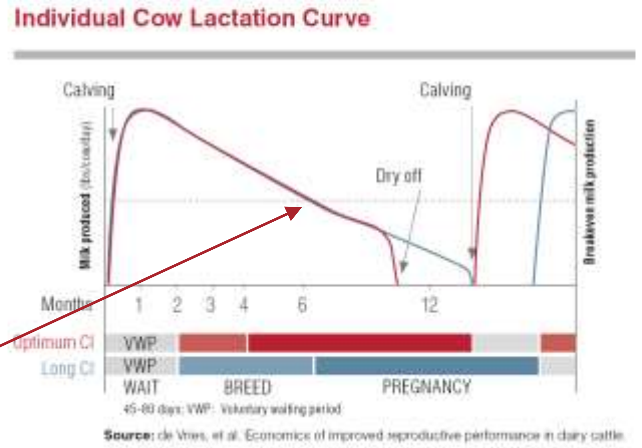
*See IDEXX Milk Pregnancy Test validation report for complete performance data.
Excluding IDEXX Milk Pregnancy Test recheck results.

Test With Confidence™ IDEXX

Recommended Times to Assess Pregnancy Status

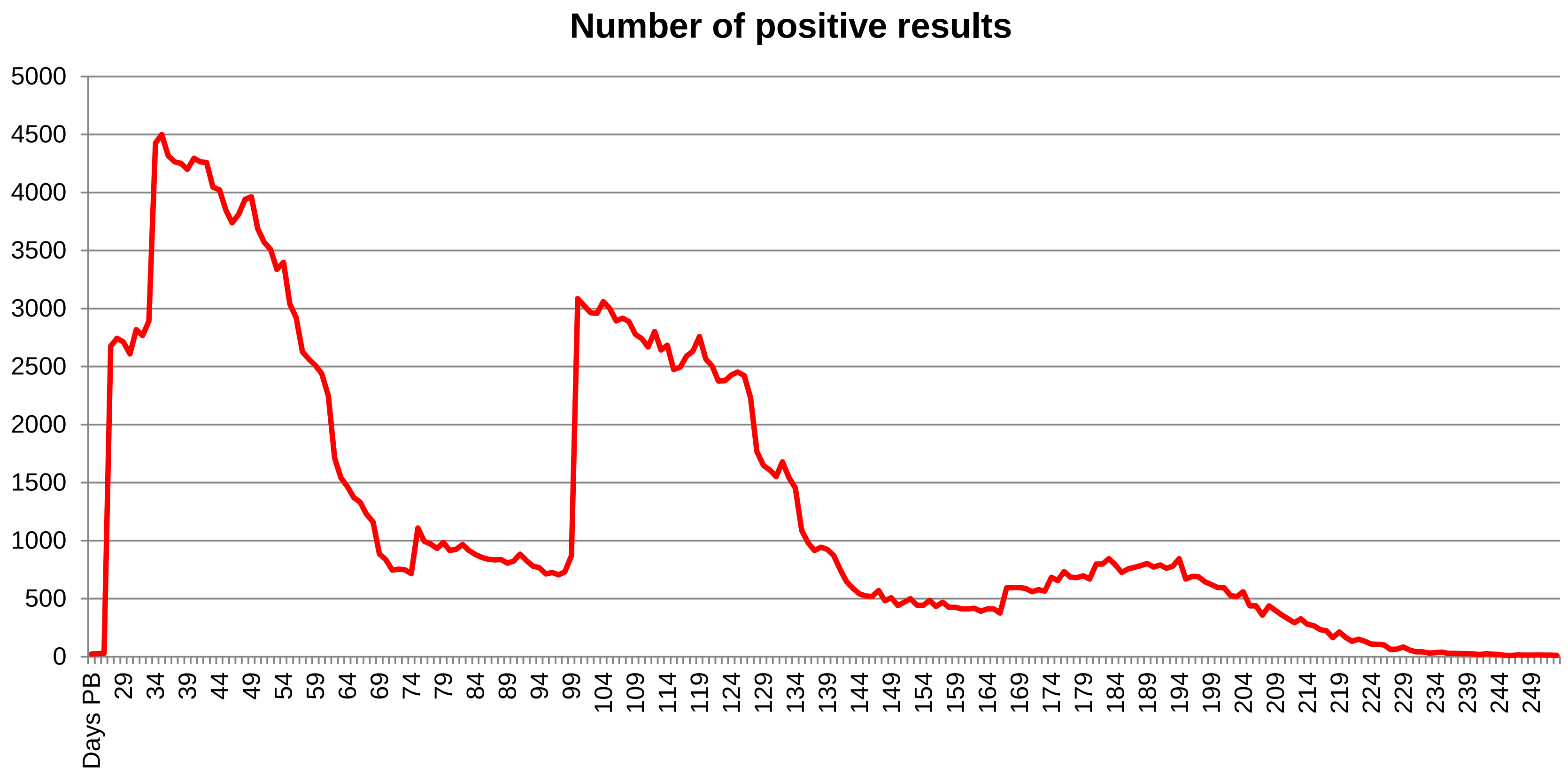
With IDEXX Milk Pregnancy Test

- P1: 28-35 days in gestation (post AI)
  - The opportunity to find non-pregnant (open) cows
  - Estrous Synchronization programs allow these cows to re-enter the program quicker
- P2: 45-70 days in gestation
  - Peak period of Early Embryonic Death (EED)
  - Best practice management programs
- P3: 90-110 days of gestation
  - Early Embryonic Death (EED) peak is now past
  - Cow approaching break-even phase of lactation curve
- P4: 200-230 days of gestation (dry-off)
  - Although uncommon, pregnancy loss can occur between 100-230 days
  - Important decision point for culling after finishing lactation



Frequency of Positive Pregnancy Checks

Danish milk recorded cows, between day 25 and 254 postbreeding



(1) Pregnancy Test in Denmark 2016 (2013-2016) Lars Fast Hansen, Niels Henning Nielsen, Aarhus 22 July 2016

Global Overview of Milk Pregnancy Testing Services

- Germany
  - Milchprüfring Bayern e.V.Routine DHI (https://www.mpr-bayern.de/eng)
    - One of the largest independent milk testing laboratories for automated analyses of payment and DHI samples worldwide.
    - 275.000 pregnancy tests since launch two years ago
    - Routine DHI samples and individual samples for members and also non-members
    - Shortly available: mpr-App «mpr-mobil» for online reception of results.
  - Animal Health Bavaria
    - www.tiergesundheit.bayern.de
    - Do not slaughter high pregnant cows!
    - Test options recommended:
      - PD by vet or technician
      - PAG test using blood or milk

Dead unborn calf in abbattoir, “0.6% of high pregnant cows have been slaughtered in Bavaria in first half of 2016.” Information leaflet tiergesundheit.bayern, Sept 2016

Global Overview of Milk Pregnancy Testing Services

- Switzerland
  - The only Swiss DHI lab, Suisselab offers pregnancy testing services (www.fertalys.ch) together with breeding associations and swissgenetics (Swiss semen company), results via e-mail or SMS
  - Easy contact options: fertalys@suisselab.ch
  - Online order options for sample kits
  - Currently establishing program to promote 2nd sample from same cow (confirmation)

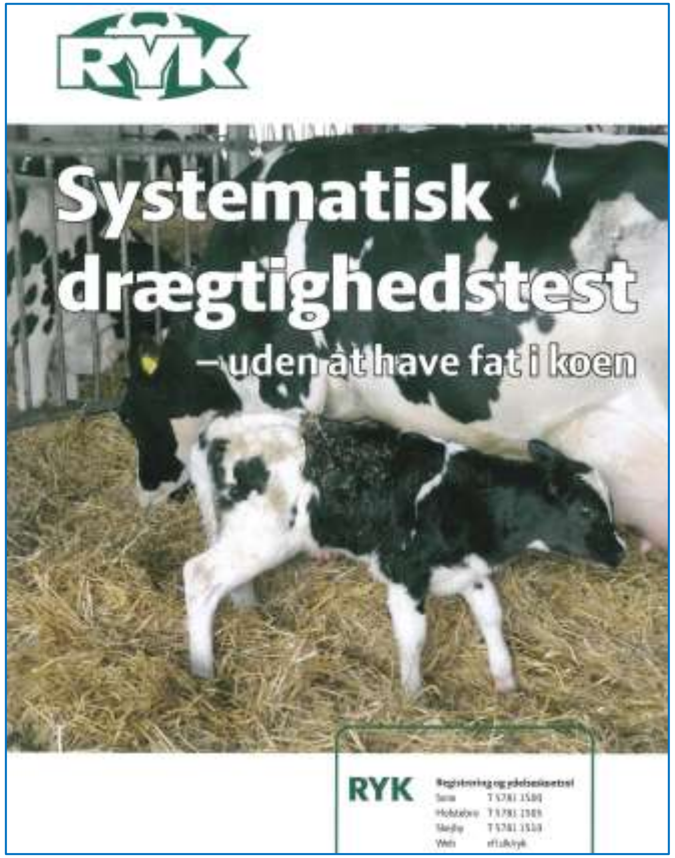
Fertalys: advertisement

Fertalys: Result via text message (SMS) to farmer

Test With Confidence™

Global Overview of Milk Pregnancy Testing Services

- Denmark
  - RYK - Eurofins Steins, www.vfl.dk/ryk
    - Great experience with samples from robot units



Testimonials

Promotional folder

Test With Confidence™ IDEXX

Global Overview of Milk Pregnancy Testing Services

- France
  - Clasel, French DHI lab
    - http://www.clasel.fr/clasel-nos-prestations/offre-medria-copie.html
    - Gestadetect, a reliable, simple pregnancy indicator

Gestadetect: the five advantages making the difference

- United Kingdom
  - National Milk Recording (NMR)
    - https://www.nmr.co.uk/breeding/pregnancy-testing
    - Why use?
      - It's accurate, flexible, easy, cost-effective, pays a check, pays a dry-off check
  - The Cattle Information Service – CIS
    - http://www.thecis.co.uk/theCIS/CIS_PregCheck.aspx
    - Managing the reproductive cycle on your farm

Test With Confidence™ IDEXX

Global Overview of Milk Pregnancy Testing Services

- Antelbio USA, a division of NorthStar Cooperative
  - http://www.northstarcooperative.com/pregnancy/
  - Collaborated to validate the first milk pregnancy test
- USA, Dairy One
  - http://dairyone.com/analytical-services/pregnancy-testing/
  - Dairy One Ithaca Lab, routine samples and individual samples (free shipping), sample transportation system, FAQs,
  - BOTH OPTIONS *Now Offering free "RECHECK's*
- The Dairy Authority, Colorado, USA
  - http://www.dairymd.com/lab.php
  - A vet clinic, offering Milk Preg Test 24 hrs TAT

AntelBio and IDEXX collaborated to validate the first milk pregnancy test. It is the only milk-based test for improving efficiency of reproductive programs in dairy herds.

Test With Confidence™ IDEXX

Global Overview of Milk Pregnancy Testing Services

- Heart of America DHIA
  - http://www.hoadhia.com/lab.html
  - ELISA submission form for Pregnancy and Johne's

- Lancaster DHIA
  - http://www.lancasterdhia.com/
  - *"Let us help you find open cows"*
  - Routine and individual samples, „call your local DHI technician" offer a mailing box, members and non-members

Lancaster DHIA sample kit

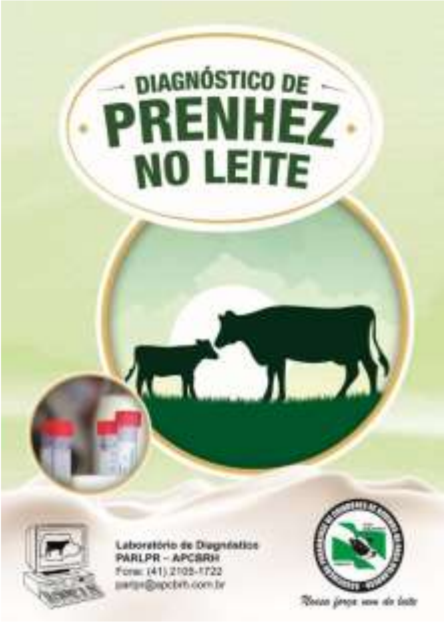
- Texas DHIA
  - http://www.texasdhia.com/SERVICES.html
  - Our milk pregnancy test is 96% accurate and the results are collected within 6 hours of receiving the samples.
  - This is the industry leading test for reducing invasiveness and unnecessary stress on the animal.
  - Milk pregnancy testing eliminates the need for additional animal sorting, restraining, and sampling. It also allows for better time management between the producer and veterinarian.

Global Overview of Milk Pregnancy Testing Services

- Canada
  - Valacta (www.valacta.com) DHI, Quebec:
    - Gestalab, now available every day (since 3rd October 2016)
      - With sampling kits
      - In collaboration with CIAQ (www.ciaq.com, a semen company)
  - CanWest DHI (www.canwestdhi.com)
    - Accurate, easy & cost-effective
    - Use as 1st check, Recheck and dry-off check
- Australia
  - http://www.nationalherd.com.au/herd_recording/pregnancy_testing
  - IDEXX Pregnancy Test, 28 Day Milk Pregnancy Testing

Global Overview of Milk Pregnancy Testing Services

- Brazil
  - Clinica do Leite (http://www.clinicadoleite.com.br/fazenda/B2B-FazendasLocaweb/Clinica/Inicio.html
    - Promoting P-CHECK
  - APCBRH, Parana http://www.apcbrh.com.br/



Global Overview of Milk Pregnancy Testing Services

- Chile
  - Cooprinsem (http://cooprinsem.cl/home/)

Test With Confidence™

What Customers Are Saying

- "Our producer clients are really seeing the benefits of getting a pregnancy test milk sample in the parlor without the extra efforts of having to lock up or sort cows. The process is efficient and eliminates potential delays in breeding programs, which saves valuable time."
  Bruce W. Hoffman, DVM President, Animal Profiling International, Inc., USA
- "Testing milk samples for pregnancy during our DHI test is a lot easier, and it's on my schedule every month."
  Mark Bontekoe, Touchdown Dairy, LLC, USA

2013 Dairy Herd Management Innovation and People's Choice awards winner

Test With Confidence™

Animal Welfare Program of Chilean Dairy Consortium

Danitza Abarzúa B.
Animal welfare program coordinator
dabarzua@consorciolechero.cl

Consorcio Lechero

bienestaranimal
Consorcio Lechero

Introduction

- Since 2012 animal welfare became a priority subject for the Chilean Dairy Consortium (CDC).

- Why was it declared as a priority issue?

  ✓ **Chilean Law No. 12.380 on animal protection**

  ✓ **the increasing consumer awareness and demands for sustainability issues**

  ✓ **the isolated efforts of different institutions in Chile working on animal welfare**

  ✓ **to progress forward with the work that links the CDC to the International Dairy Federation (IDF)**

Consorcio Lechero

Introduction

- CDC invited to national experts in the field to join a committee on Animal Welfare

Committee on Animal Welfare:

- ✓ ***Universidad de Chile***
- ✓ ***Universidad de Concepción***
- ✓ ***Universidad Austral de Chile***
- ✓ ***Instituto de Investigación Agropecuaria -INIA Remehue***
- ✓ ***Servicio Agrícola y Ganadero (SAG)***

- With the task to define technical guidelines and goals for an Animal Welfare Program for the Chilean dairy sector

Consorcio Lechero

Animal Welfare Program

Main Objetive

- ***“To install Animal Welfare (AW) as one of the main pillars in milk production in the dairy sector”***

Consorcio Lechero

Animal Welfare Program

- **Project:**

"It was conducted with the aim of disseminating the concept of animal welfare through the dairy chain and increasing the awareness about the importance of this issue in milk production"

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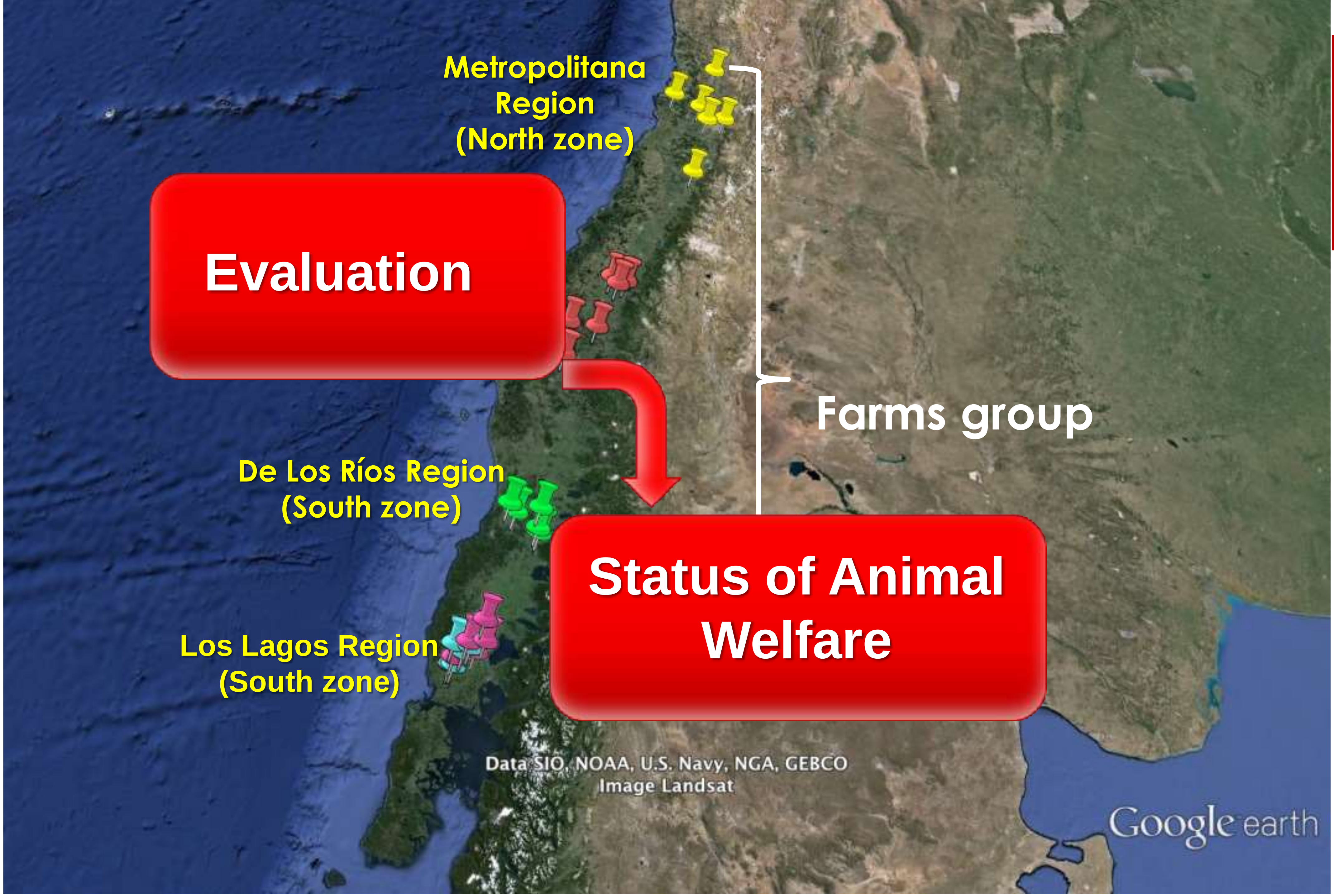
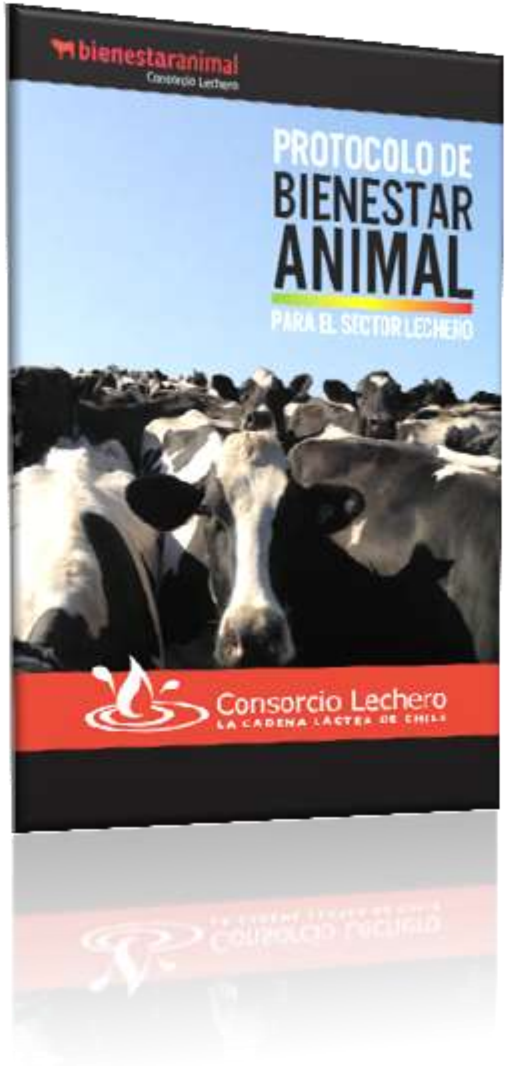


Metropolitana Region (North zone)
Evaluation
Farms group
De Los Ríos Region (South zone)
Status of Animal Welfare
Los Lagos Region (South zone)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Google earth

Animal welfare Protocol for Chilean dairy farms



- This protocol was based on other existing protocols such as the Welfare Quality ® and APROCAL, but adapted to the needs and characteristics of Chilean dairy farms.

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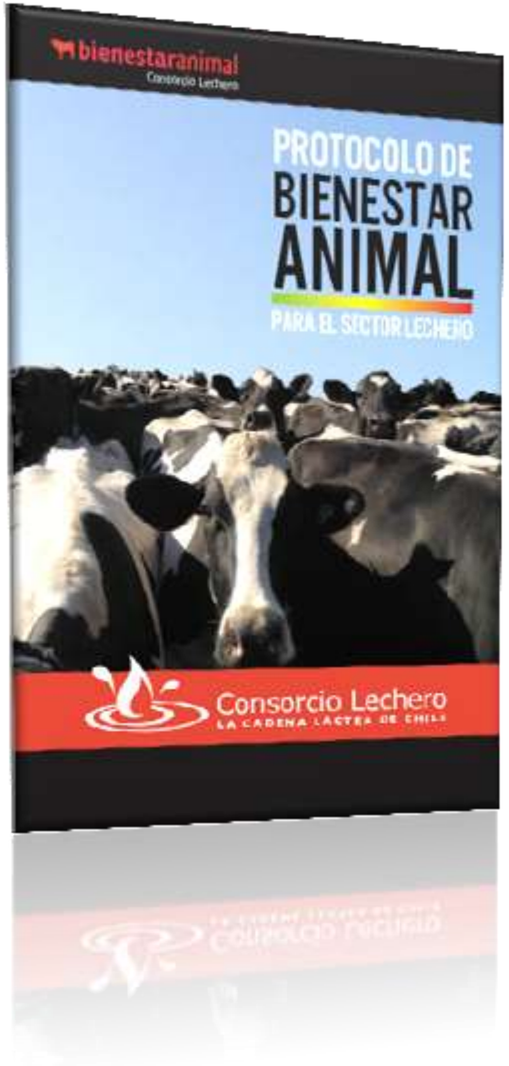
Animal welfare Protocol for Chilean dairy farms



- **The protocol consists of :**
- **4 Principles:**
  - 1. Adequate Food
  - 2. Adequate Housing
  - 3. Adequate Health
  - 4. Appropriate Behavior
- **12 Criteria**
- **36 Indicators**

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Animal welfare Protocol for Chilean dairy farms

36 Indicators (fast diagnosis of animal welfare conditions)

11 Direct Indicators: based on the animal

25 Indirect Indicators: based on the resources and infrastructure provided to the dairy herd.

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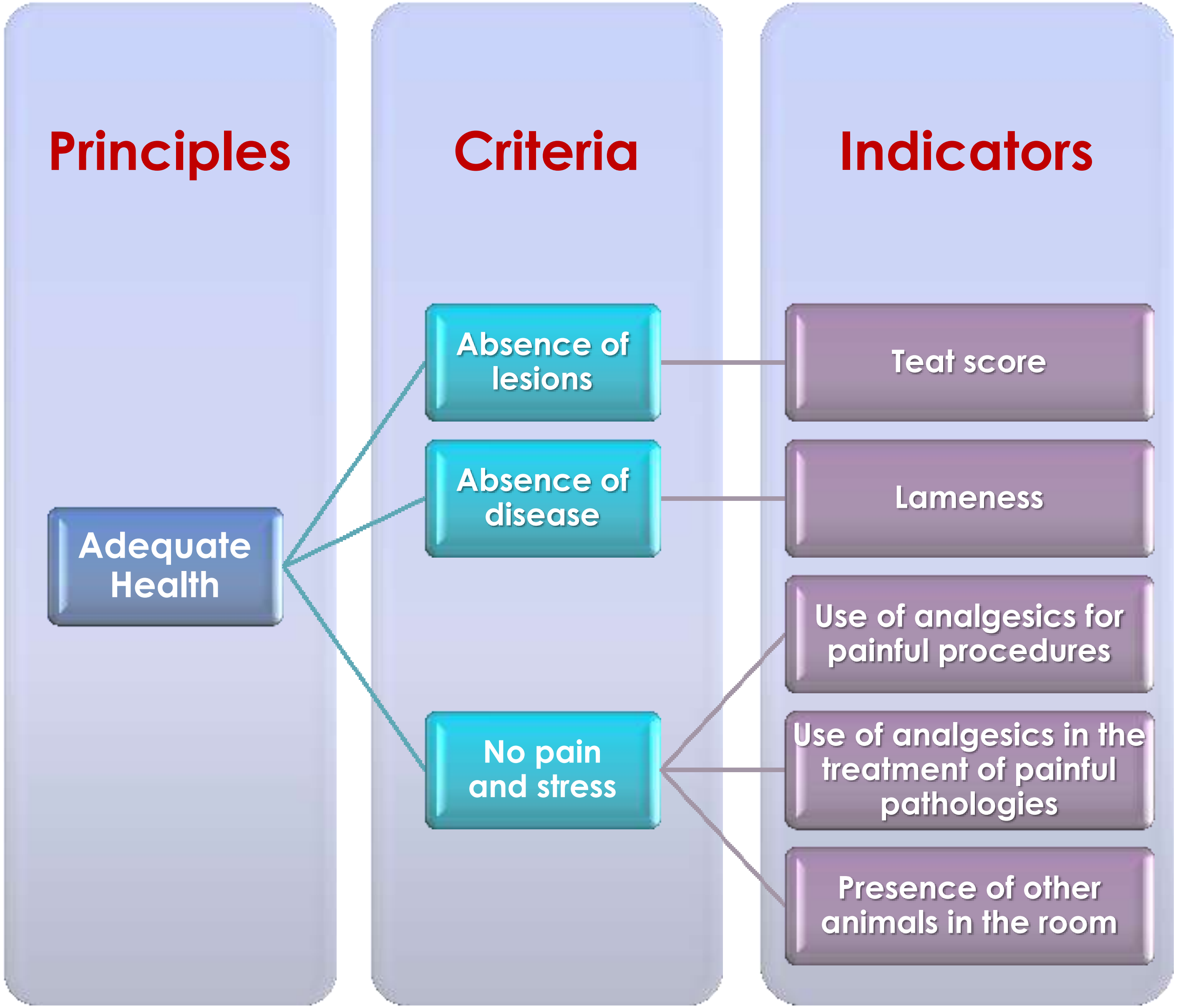
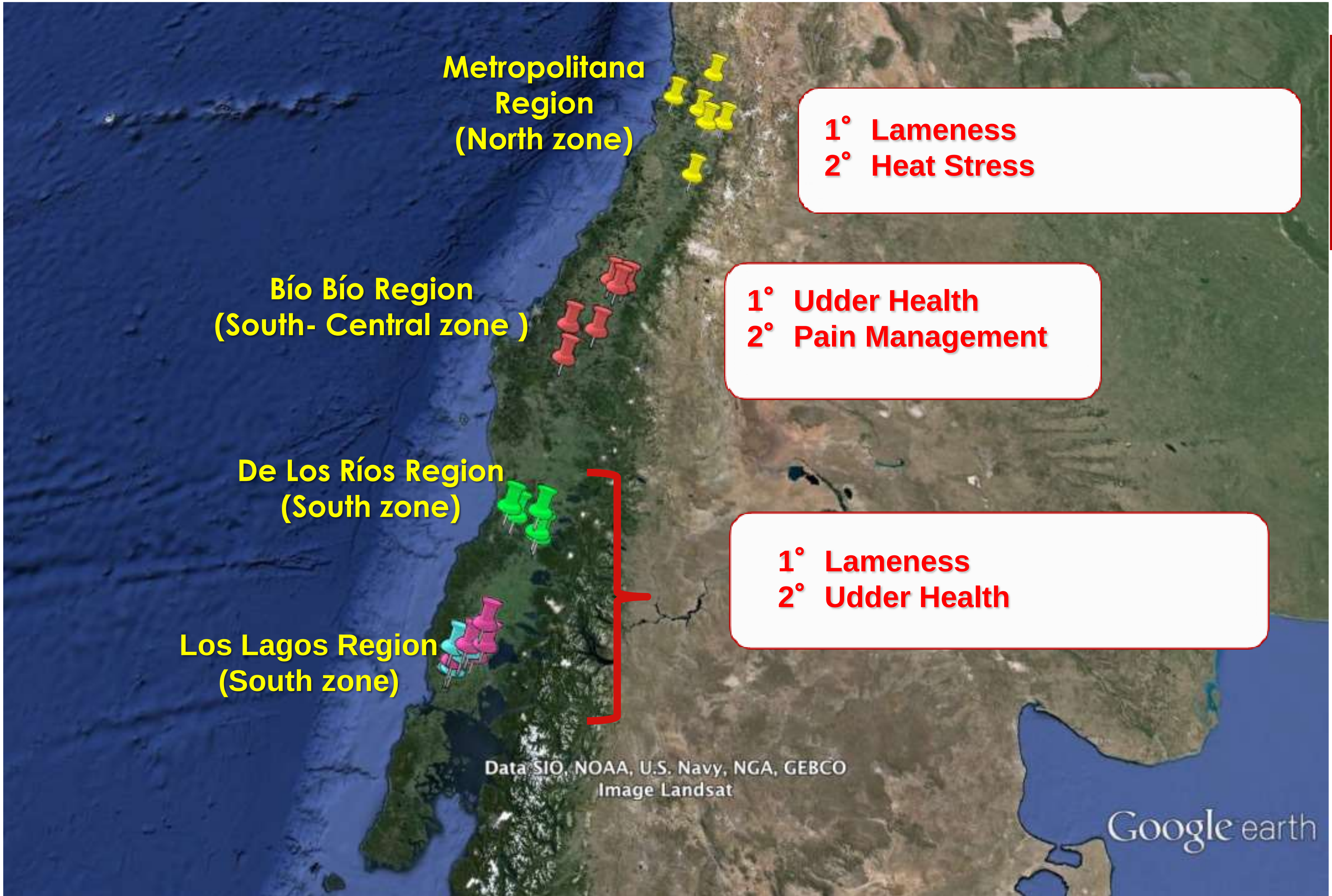
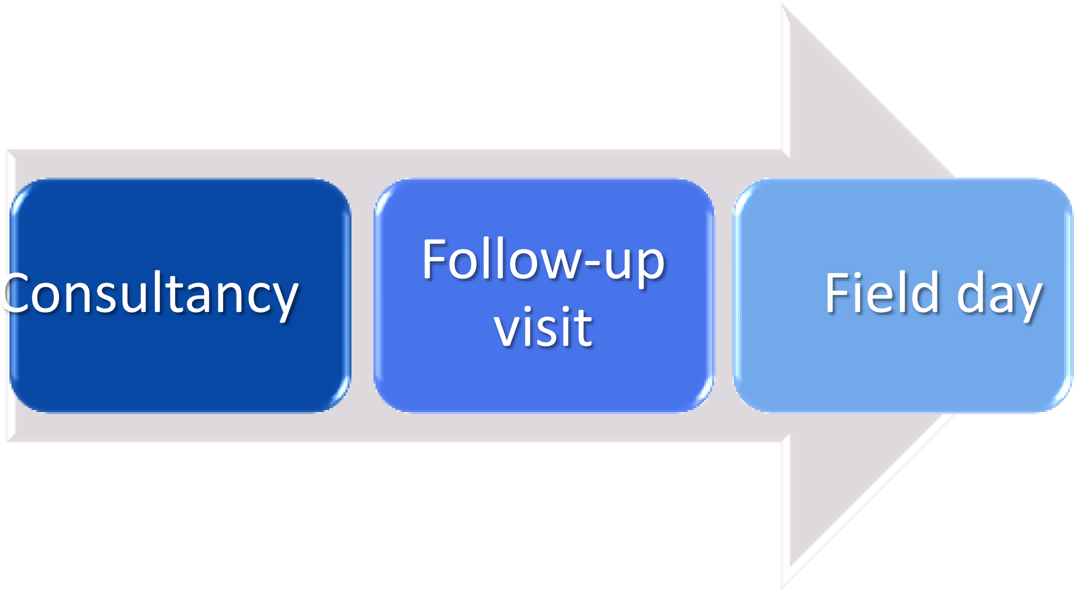
Example


Principles
Criteria
Indicators
Adequate Health
Absence of lesions
Absence of disease
No pain and stress
Teat score
Lameness
Use of analgesics for painful procedures
Use of analgesics in the treatment of painful pathologies
Presence of other animals in the room


Metropolitana Region (North zone)
1° Lameness
2° Heat Stress
Bío Bío Region (South- Central zone)
1° Udder Health
2° Pain Management
De Los Ríos Region (South zone)
Los Lagos Region (South zone)
1° Lameness
2° Udder Health
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Google earth

Technology Transfer Plan



- **Objective:** training farmers, consultants and employees to resolve each one of the priority topics.

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Re-evaluation of the dairy farms

- At the end of this stage, a re-evaluation of the dairy farms was conducted with the animal welfare protocol, which allowed to asses the project's impact.

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Results

- **Principles:**

1. **Adequate Food and Housing**

✓ Not changes were observed after the project

2. **Adequate Health and Appropriate Behavior**

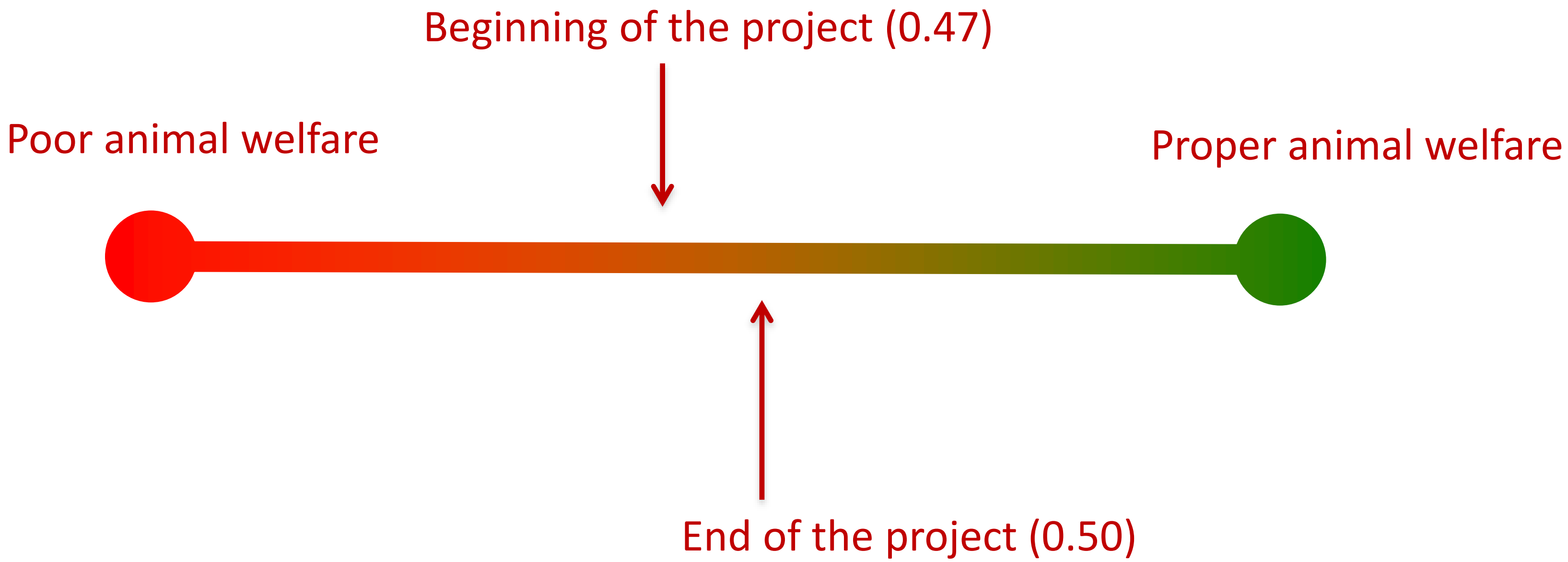
✓ On these principles major changes were observed

✓ Several associated indicators can be improved through management practices, which do not require for a large investment

✓ Continuous staff training is an important tool for improving animal welfare

Results

- Some improvements in the visited dairy farms were observed. However, there is still plenty of room to continue working and improving the welfare of dairy cows in Chile.



Products obtained

- Protocol

- Manuals

- Bulletins

- Video

- Factsheets

Animal Welfare Program of Chilean Dairy Consortium

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bienestaranimal
Consorcio Lechero

University *of Ljubljana*
Biotechnical Faculty

Estimation of dispersion parameters for test-day milk traits of the Bovec sheep in Slovenia

M. Simčič, M. Štepec, J. Krsnik & K. Potočnik

ICAR THE GLOBAL STANDARD FOR LIVESTOCK DATA

ICAR Chile 2016

Puerto Varas, Chile, October, 24-28, 2016

Introduction

Jezersko-Solčava Sheep

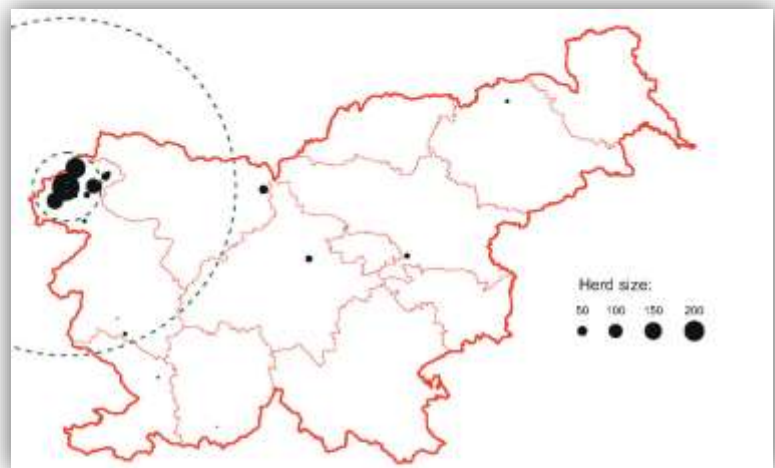
Istrian Pramenka

Bovec Sheep

Bela Krajina Pramenka

Bovec sheep

- Indigenous breed in Slovenia
  - Alpine region – extensive production
- Adapted on mountain grazing during summer time
- Population size = 3.300
- Breeding program since 2005



Bovec sheep

- Small body frame
- Different colour (white, black, black and white)
- Seasonal fertility
- Good milk production in poor environmental conditions

Bovec cheese

- Milk is processed into Bovec cheese
- Protected designation of origin

PROTECTED DESIGNATION OF ORIGIN

The objective

to estimate genetic and environmental dispersion parameters for

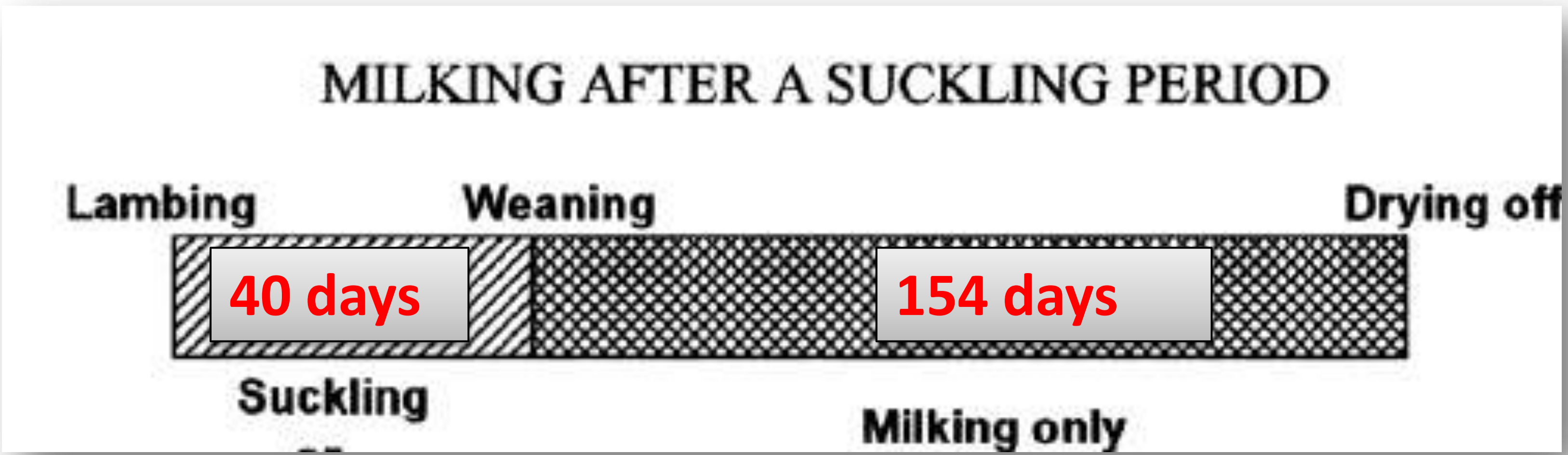
- Daily milk yield (DMY)
- Daily fat yield (DFY)
- Daily protein yield (DPY)

- Fat content (FC)
- Protein content (PC)
- Lactose content (LC)

using test-day records of the Bovec sheep ewes

Milk recording

- ICAR regulations
- AT4 method



Material

- Central Database for Small Ruminants in Slovenia
- 79,470 test-day records (AT4 method)
- 4,837 ewes
- 51 flocks
- From the years 2001 to 2016
- Pedigree information

Descriptive statistics

Trait	n	Average	SD
DMY (g)	79470	**1003**	603.0
DFY (g)	78890	**62.23**	33.62
DPY (g)	78918	**53.39**	29.08
FC (%)	78890	**6.64**	1.57
PC (%)	78918	**5.61**	0.99
LC (%)	78838	**4.50**	0.45

Pedigree structure

- 4,837 animals with records
  - 5 generations of progenitors known
- 6,078 animals in total in the pedigree file
- both parents were known for 73.5%

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Model

Single-trait repeatability test-day animal model

- DMY
- DFY
- DPY

Single-trait test-day animal model

- FC
- PC
- LC

Models

	FIXED EFFECTS				RANDOM EFFECTS		
	Stage of lactation	Parity	Litter size	Breed	Flock-year-season	Permanent environment	Additive genetic effect
DMY	√	√	√	√	√	√	√
DFY	√	√	√	√	√	√	√
DPY	√	√	√	√	√	√	√
FC	√	√	√	√	√		√
PC	√	√	√	√	√		√
LC	√	√	√	√	√		√

Methods

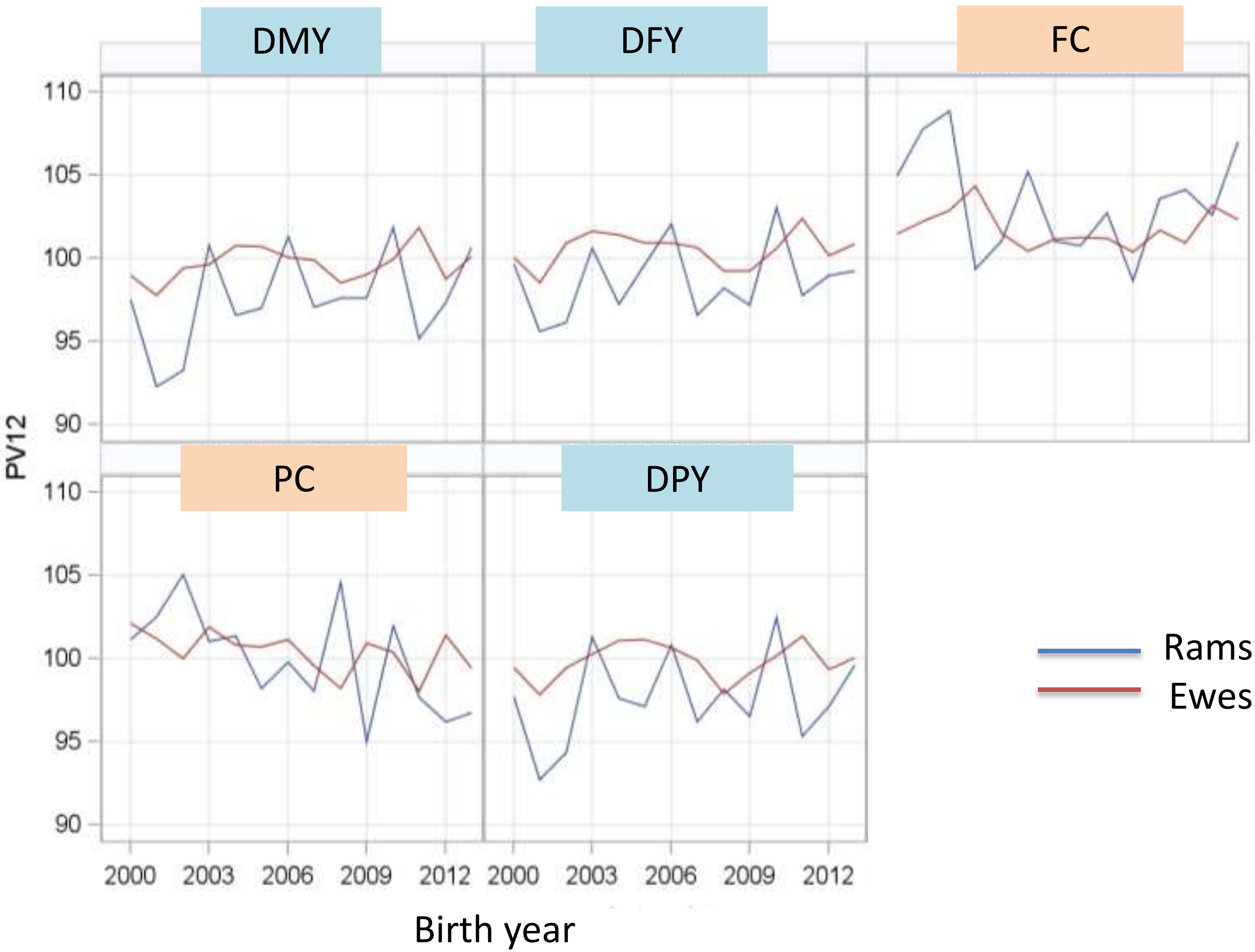
- Fixed effects
  – SAS/STAT – GLM procedure
- Variance components estimation
  – Residual Maximum Likelihood (REML) method
  – implemented in the VCE-6 program

Results

Dispersion parameters

Trait	Additive genetic effect (h^2)	Flock-year-season	Permanent environment	Residual
DMY	0.13	0.27	0.05	0.54
DFY	0.10	0.25	0.05	0.60
DPY	0.12	0.28	0.05	0.55
FC	0.17	0.09		0.74
PC	0.25	0.09		0.67
LC	0.23	0.10		0.66

Genetic trends



Conclusions

- Dispersion parameters are actually used in the breeding value prediction
- Breeding value prediction is applied for milk traits of the Bovec sheep for more than 10 years
- Heritabilities for milk traits were in expected range, similar than reported in the literature

Thank you for your attention!

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

The ICAR Brand Story

ICAR 40th Conference

Puerto Varas, Chile

October 26th, 2016

What do we mean by 'ICAR's Brand'?

- ICAR's Brand, like any other organisation's, is much more than a logo and a strapline. Instead it is the set of features and attributes that come to mind when people hear our name

- The Brand encompasses the way we think and feel about ICAR's work with members, manufacturers and users.

- The way our partner and stakeholders at every level perceive who we are and what we do !

Why does ICAR need a brand ?

- The short answer is that we have a brand, whether we need one or not. So we need to actively manage the impression we make in order to more readily achieve our goals.

- Research tells us that the more people learn about ICAR, the more positively they view us and it makes for better engagement. Branding builds on these favorable impressions.

- By consulting with a range of ICAR colleagues and outside experts, we have worked in 2016 to sharpen the brand, focusing on what makes ICAR unique.

ICAR's Values

ICAR’s core products and services

- Guidelines
- Evaluation Services
- Certification Services
- Seminars and workshops

for

ANIMAL IDENTIFICATION

ANIMAL RECORDING

ANIMAL EVALUATION

ANIMAL DATA MANAGEMENT

ICAR Mission Statement

Mission of ICAR is to be the leading global provider of Guidelines, Standards and Certification for animal identification, animal recording and animal evaluation.

ICAR wants to improve the profitability, and sustainability of farm animal production by:

- Establishing and maintaining guidelines and standards for best practice in all aspects of animal identification and recording.
- Certifying equipment, and processes used in animal identification, recording and genetic evaluations.
- Stimulating and leading: continuous improvement, innovation, research, knowledge development, and knowledge exchange.

What's behind the ICAR 'strapline'?

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

The new Strapline '**The Global Standard for Livestock Data'** captures the essence of our role, which is to facilitate worldwide standards for data relating to livestock animals.

What's behind the ICAR 'logo'?

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

The new logo represents the core ideas of;

International cooperation, the regional overlapping circles forming one large circle (the world- our network).

The stylized double helix as a symbol of our role in facilitating genetic improvement of farm animals being enclosed in a circle to signify expression in the whole phenotype

Summary 5 key messages behind the ICAR Brand Story

1. **ICAR is an international organisation with a collaborative attitude**. We have a head for business and a desire to cooperate. When we talk about investing and sharing the knowledge, this is what we mean.

2. **ICAR invests in results for our stakeholders**. By working together on standards we are creating a world in which our stakeholders can achieve more.

3. **ICAR is independent and unique**. We are the only international organisation focused on standards and guidelines for livestock data. We exploit technology to facilitate economic gain for farmers, to overcome barriers, to build flexibility and to sustainably improve animal productivity.

Summary 5 key messages behind the ICAR Brand Story

4. **ICAR is positive, aspirational and trusted**. These are qualities that define us as an institution. By supporting livelihood opportunities that empower our stakeholders in the animal production sector we promote the aspirations, dignity and value of every sector in the production chain.

5. **ICAR is already well respected by our partners and members**. By playing our part in sharpening the brand, each of us can build on the goodwill and achievements that ICAR has generated over the years. At the same time, we are positioning ourselves to make even greater progress in the years ahead.

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

Thank you !

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fax : +39 - (0)623 315 553
e-mail: martin@icar.org
www.icar.org

Lessons Learned From The Analysis Of Nucleic Acids In Milk

Todd Byrem, Ph.D.

NorthStar Cooperative

Lansing, MI

NorthStar Cooperative INC.

AntelBio DHI

ICAR THE GLOBAL STANDARD FOR LIVESTOCK DATA

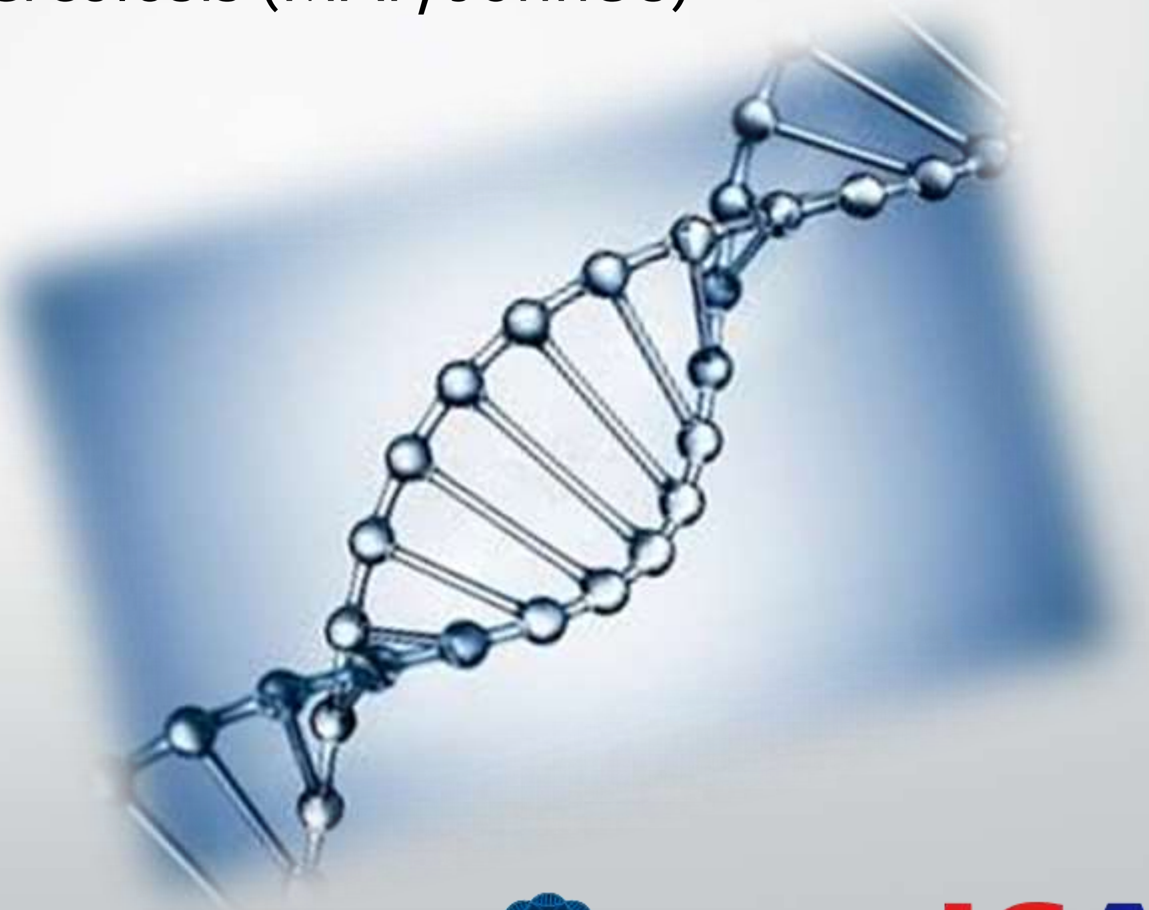
ICAR Chile 2016

Milk (Milk Recording) Dirty Diagnostic

- Historical reluctance to work with milk
  - Food
  - Variable pool size
  - Composition
    - Fat
    - Ca^{2+}
  - Contamination

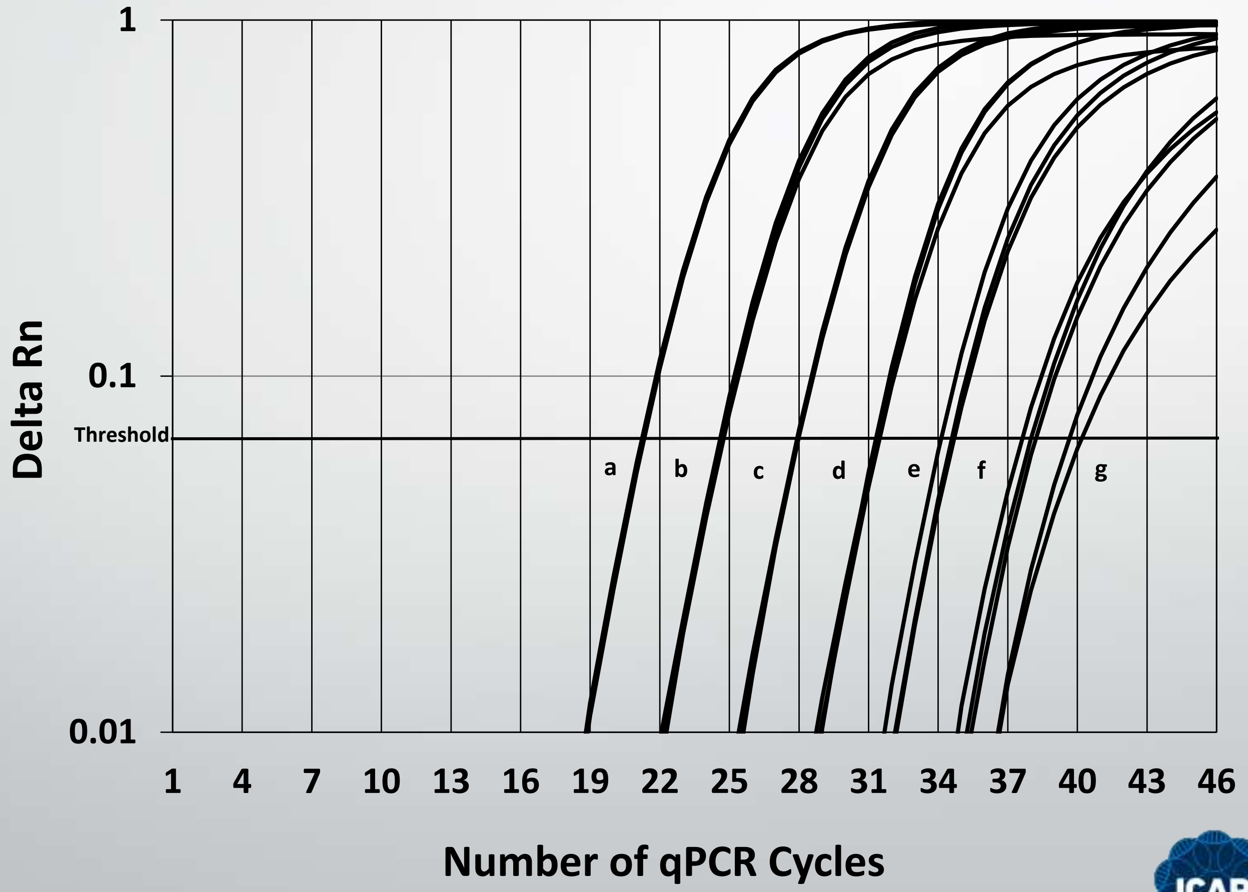
Commercial Nucleic Acid Tests

- Mycobacteria avium paratuberculosis (MAP, Johne's)
  - Feces
  - Milk
- Bovine Viral Diarrhea Virus
  - Tissue
  - Milk
- Mastitis Pathogens
  - Milk
  - Bedding



Nucleic Acid Analysis

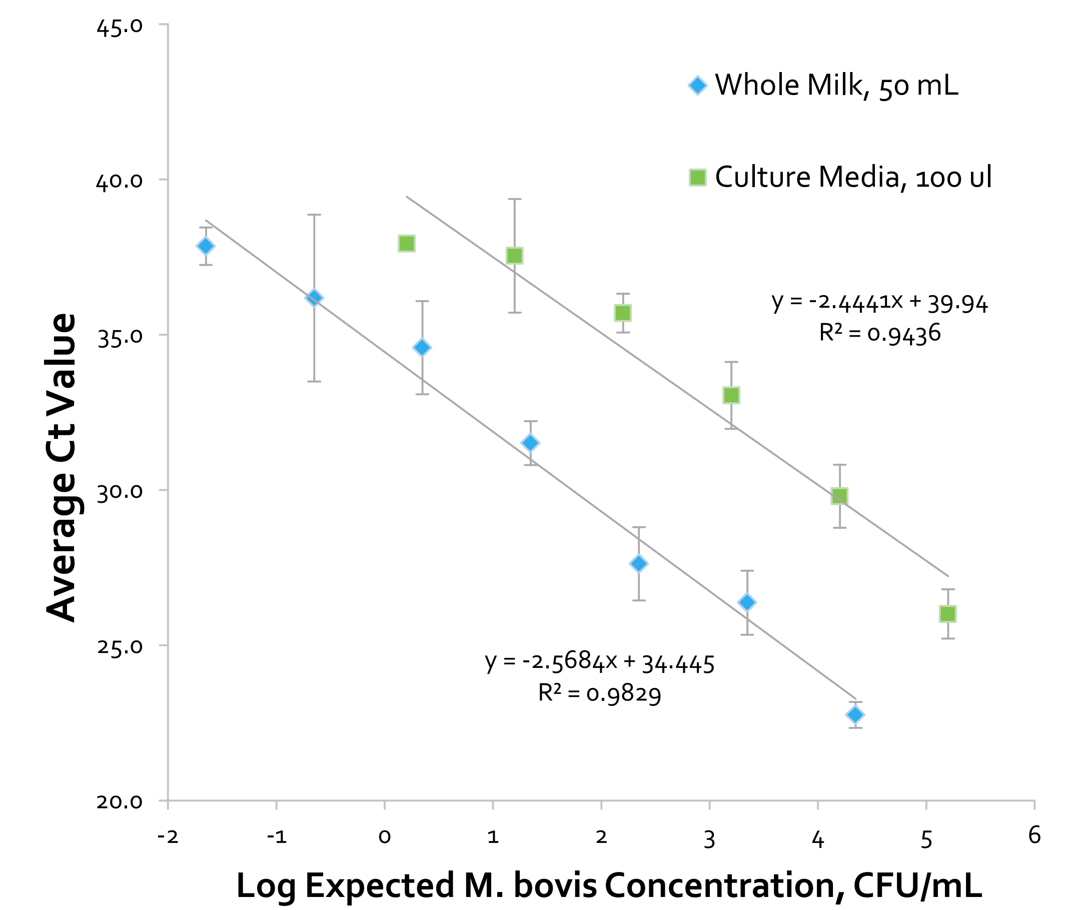
- Real-Time PCR or q PCR (Taqman)



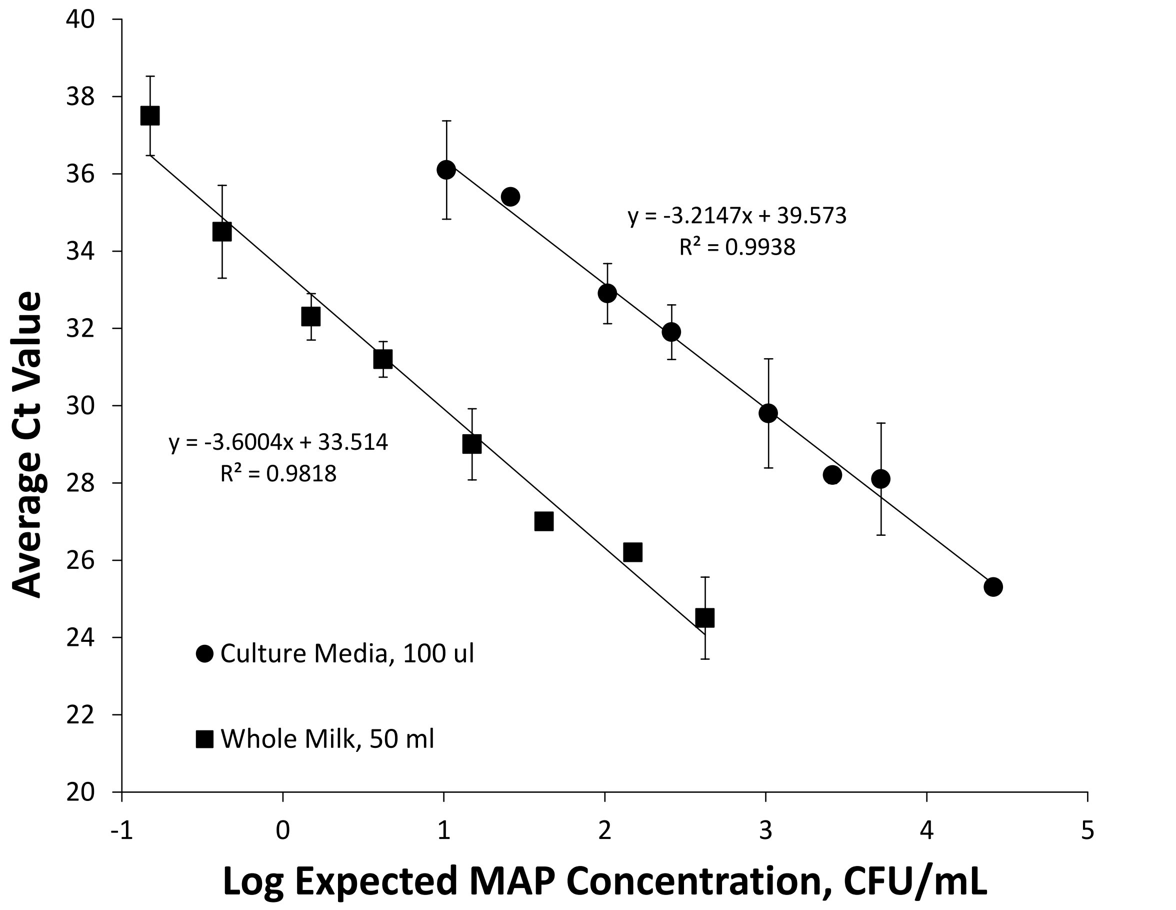
Mycobacteria avium paratuberculosis (MAP) and bovis (TB) qPCR assays

- Bulk Tank Screen

USDA/NVSL Mycobacterium bovis (TB)



APHIS/NAHMS Mycobacterium a. paratuberculosis (MAP)



Mycobacterium bovis (TB)

Table 6. Performance of bulk tank qPCR compared to herd TB status as determined by TB history in Michigan and Mexico.

		Herd TB Status		
		Positive	Negative	Totals
qPCR	Positive	48	5	53
	Negative	76	211	287
	Totals	124	216	340

Se=39%

Se=98%

Mycobacterium a paratuberculosis (MAP)

Table 2. Bulk Milk qPCR Compared to Composite Environmental Fecal Culture for MAP.

		Composite Environmental Fecal Culture		
		Positive	Negative	Total
Bulk Milk qPCR	Positive	153	8	161
	Negative	231	123	354
	Total	384	131	515

Se=40%

Se=94%

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Individual Animal Samples

Table 7. Comparison of qPCR performance in individual milk samples from cows in TB-positive dairy herds and positive on the caudal fold TB test.

		Animal TB Status		
		Positive	Negative	Total
qPCR	Positive	0	0	0
	Negative	70	0	0
	Total	70	0	70

Where are bulk tank mycobacteria (MAP and TB) coming from?

Parentage Verification

- Animal Identification
- 17% error rate
- Select Sires

SNP Genotyping (Sequenom)

Sample ID	118	1	2	3	…	16	17	…	22	23	24	25	26
AB000001	114		C/C	G/G	A/A	C/C	C/T	C/G	C/T	A/A	T/T	T/T	C/C
AB000002	113		C/C	G/G	A/A	C/C	C/T	C/G	C/T	A/A	T/T	T/T	C/C
AB000007	116	C/C	C/C	G/G	A/A	C/C	C/T	C/G	T/T	A/A	T/T	T/T	C/C
AB000008	114	C/C	C/C	G/G	A/A	C/C	C/T	C/G	T/T	A/A	T/T	T/T	C/C
AB000013	118	C/G	C/C	A/G	A/A	C/C	C/T	C/G	C/C	T/T	C/C	T/T	T/T
AB000014	118	C/G	C/C	A/G	A/A	C/C	C/T	C/G	C/C	T/T	C/C	T/T	T/T
AB000019	117	C/C	C/C	G/G	A/A	C/C	C/T	C/G	C/T	A/T	C/T	T/T	C/T
AB000020	118	C/C	C/C	G/G	A/A	C/C	C/T	C/G	C/T	A/T	C/T	T/T	C/T

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Sire Verification

Table 1. Comparison of Sequenom genotyping results between tissue and milk DNA on the 96-SNP bovine parentage panel.

	SNP Count				Correct
Animals[a]	Tissue[b]	Milk[b]	Shared[c]	Discordant[d]	Sire ID[e]
34	3086 (91)	3069 (90)	3089 (95%)	0	34
10	886 (89)	810 (81)	740 (77%)	67 (7)	10
44	3972 (94%)	3879 (92%)	3829 (87%)	67 (2%)	44

[a]Animals were sampled by Typifix ear tags (tissue) and DHIA (milk) in the same week. Animals were divided into 2 categories based on agreement between tissue and milk DNA; absolute (n = 34) and satisfactory (n = 10).

[b]Total calls (average per sample or percent of total) for all available SNPs.

[c]SNP sites (percent of total) with identical results between tissue and milk DNA, including sites that were not called.

[d]For called SNP sites, the number of sites (average per sample or percent total) with different calls.

[e]Number of animals whose sires were correctly verified by milk DNA analysis.

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ICAR Chile 2016

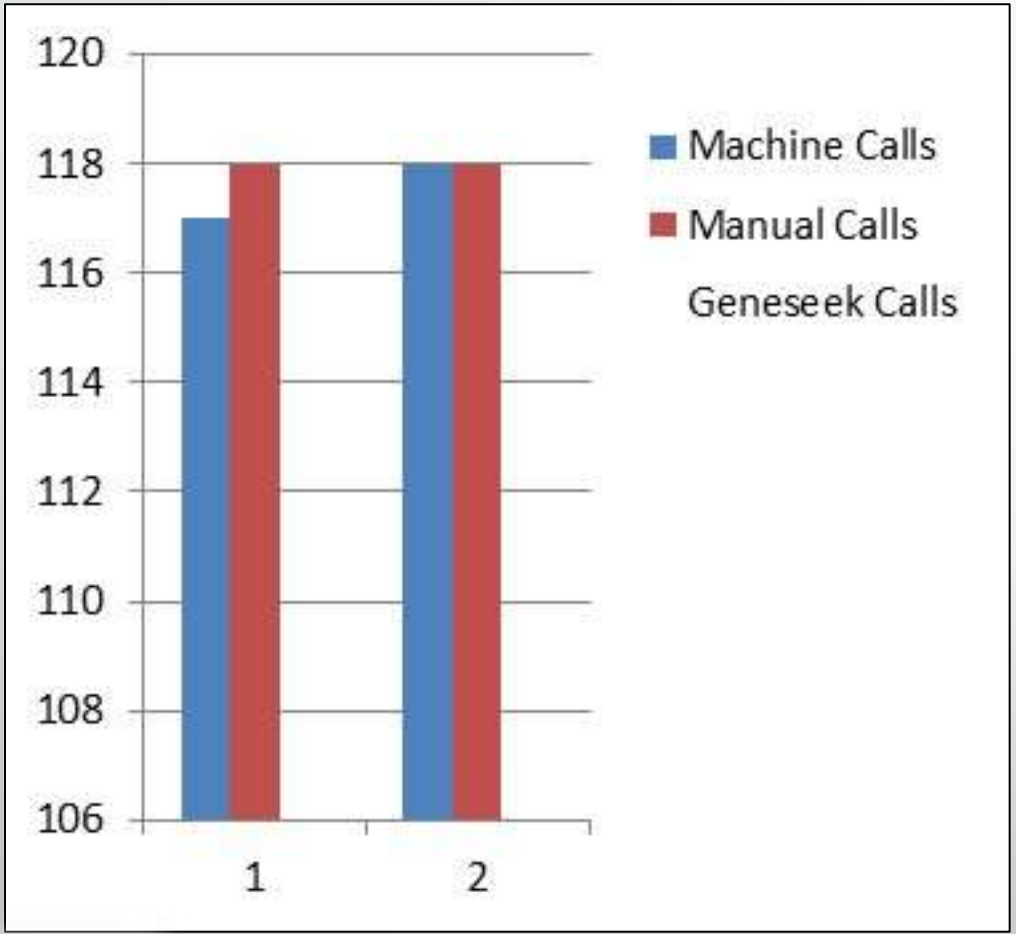
Sire Discovery

Table 2. Sire discovery[a] with the Sequenom 96-SNP parentage panel in freshened heifers using milk samples or tissue samples (Typifix Ear Tags) in a commercial dairy[b].

		Tissue DNA		
		Yes[c]	No[d]	Total
Milk DNA	Yes[c]	67	12	**79**
	No[d]	11	30	**41**
	Total	**78**	**42**	**120**

[a]Sire discovery was performed by comparing genotypes from heifers to genotypes from potential sires (n=1034) in the genotyped database.
[b]Inconsistent breeding and heifer records required this PGA herd to use sire discovery to identify likely (>80% probability) sires for genetic evaluation.
[c]A likely sire was discovered in the database using the respective DNA source.
[d]A likely sire was not discovered in the database using the respective DNA source.

Oops!

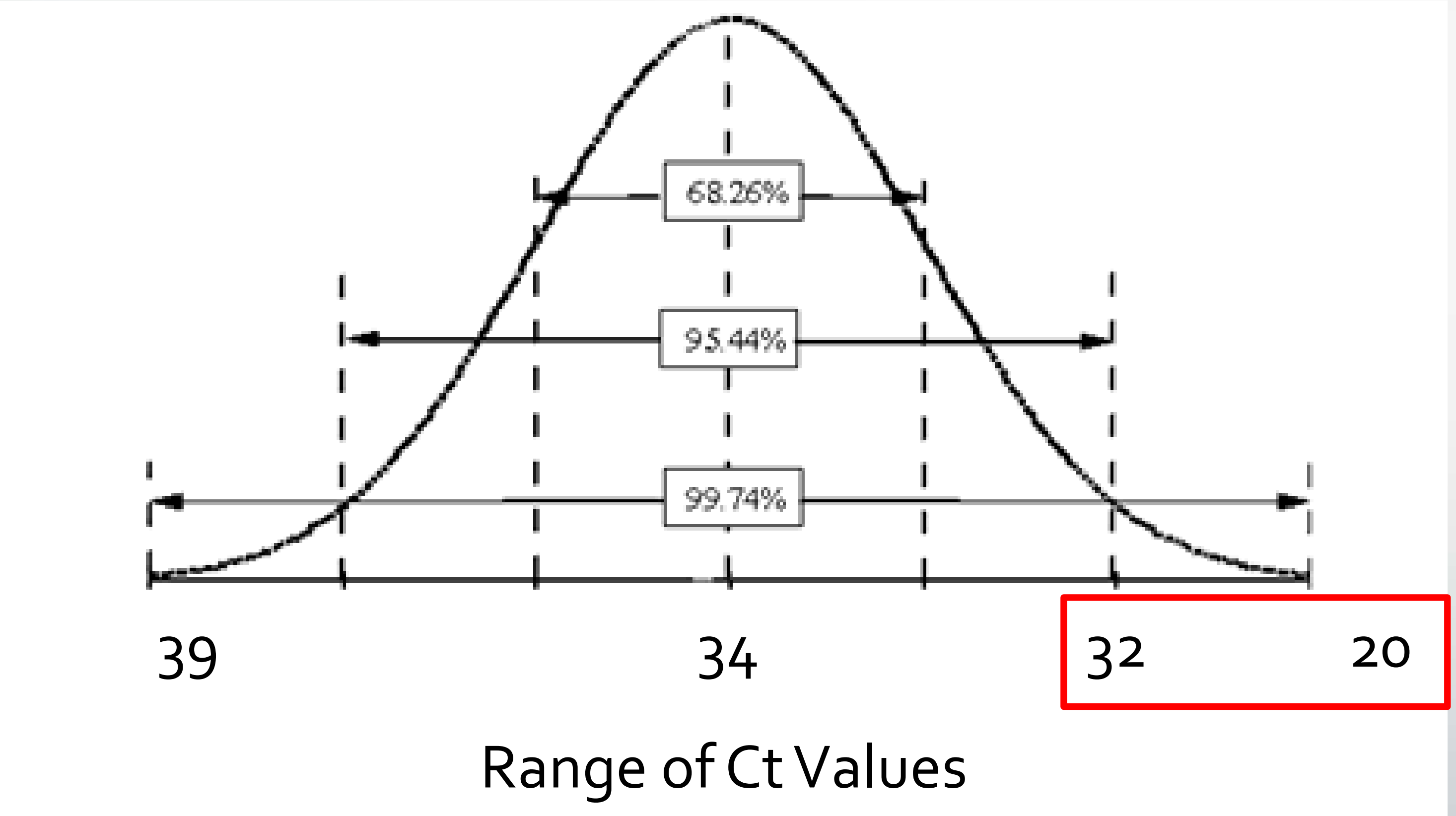


Is milk really a dirty matrix for nucleic acid analysis?

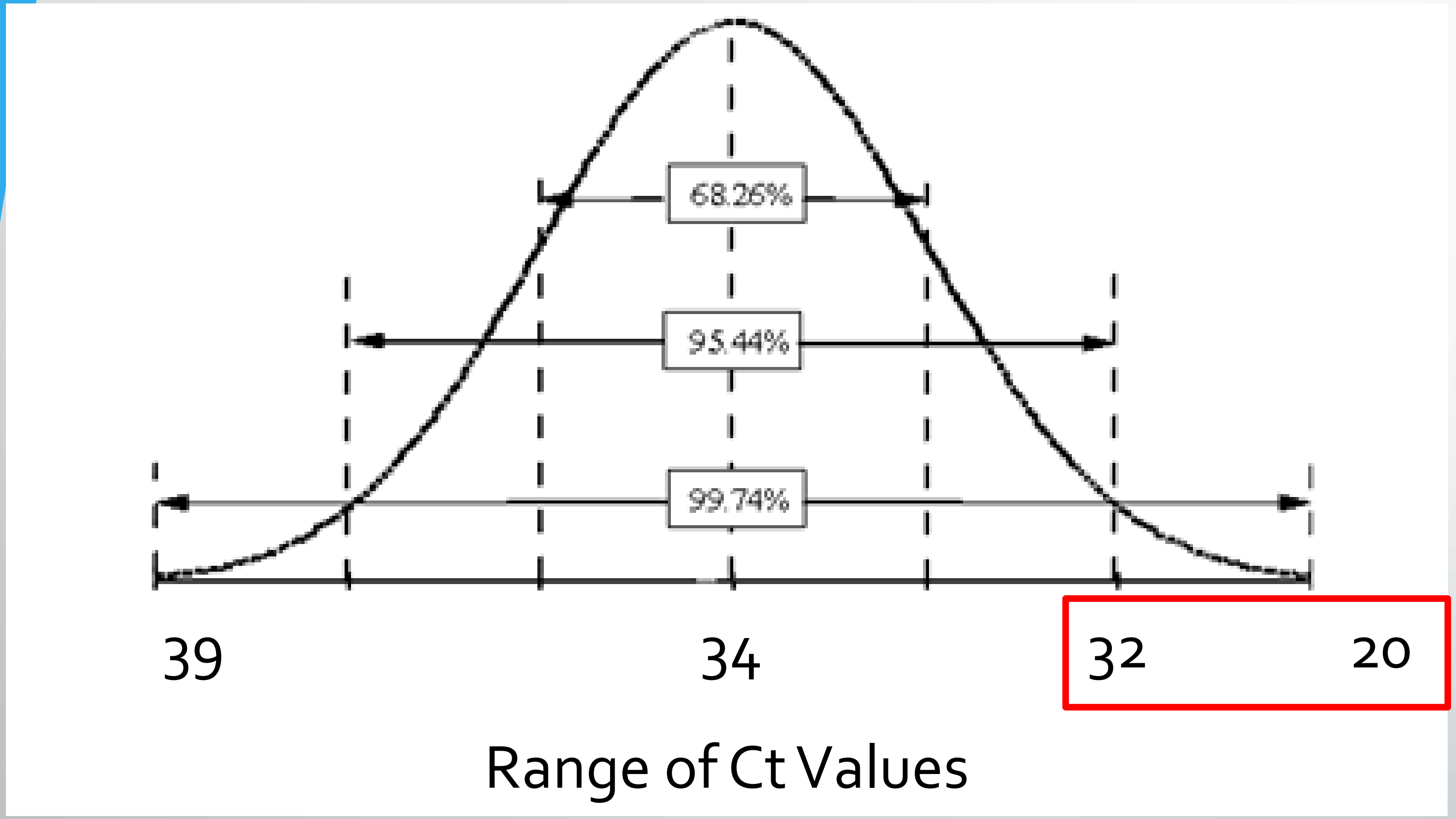
Mastitis PCR for Strep Agalactiae

- Large Dairy
- >10,000 cfu/mL
- Pool DHI sample 5:1 for PCR

Compensating For Carryover



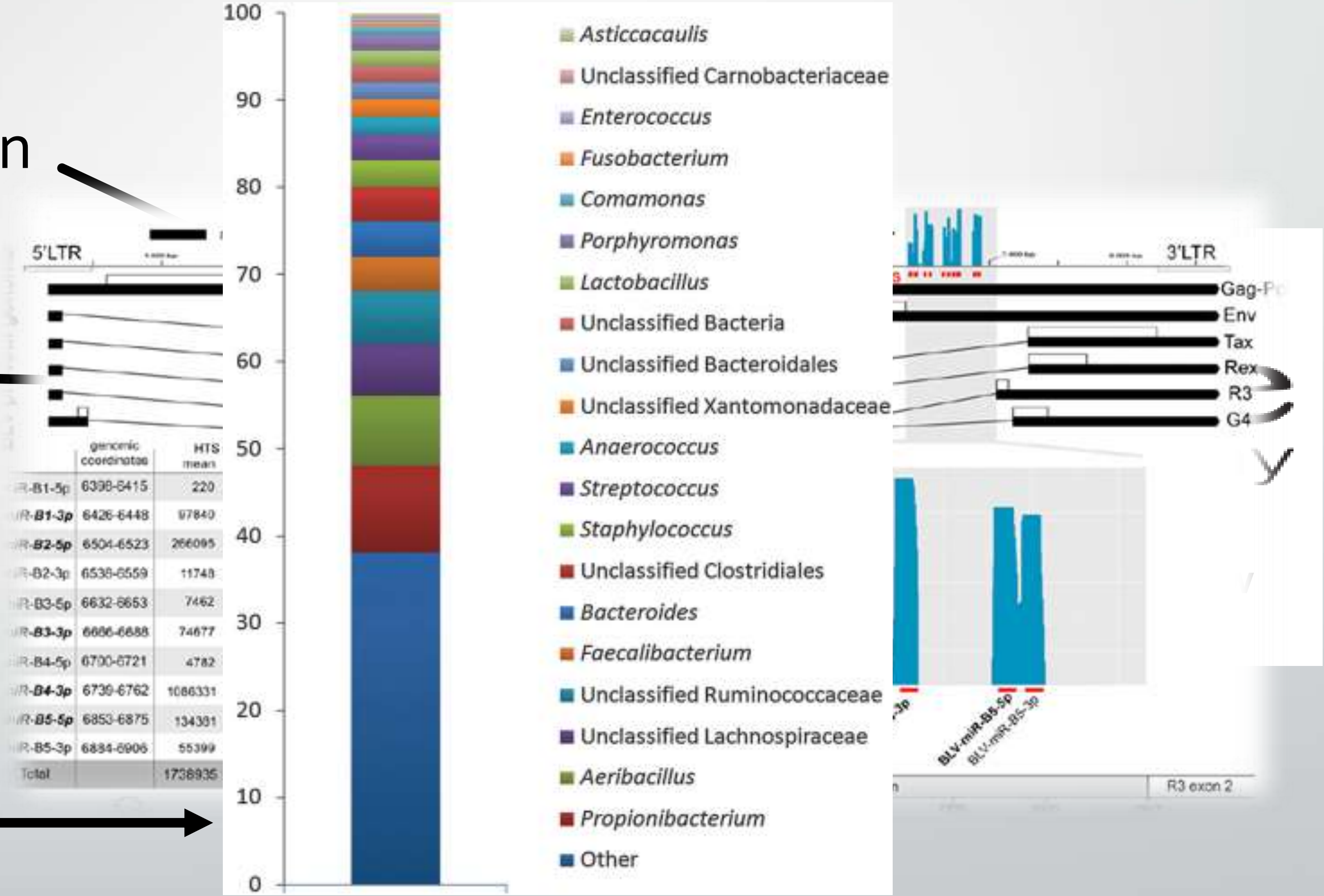
Next Several Bulk Tank Cultures



Is carryover only a number?

Milk Analysis: What's Next?

- Sample ID Verification
- Fetal DNA
- MicroRNA
- Udder Microbiome



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ICAR THE GLOBAL STANDARD FOR LIVESTOCK DATA

ICAR Chile 2016

Thank You

Introducing ICAR

ICAR 40th Conference

Puerto Varas, Chile

October 24th, 2016

Content

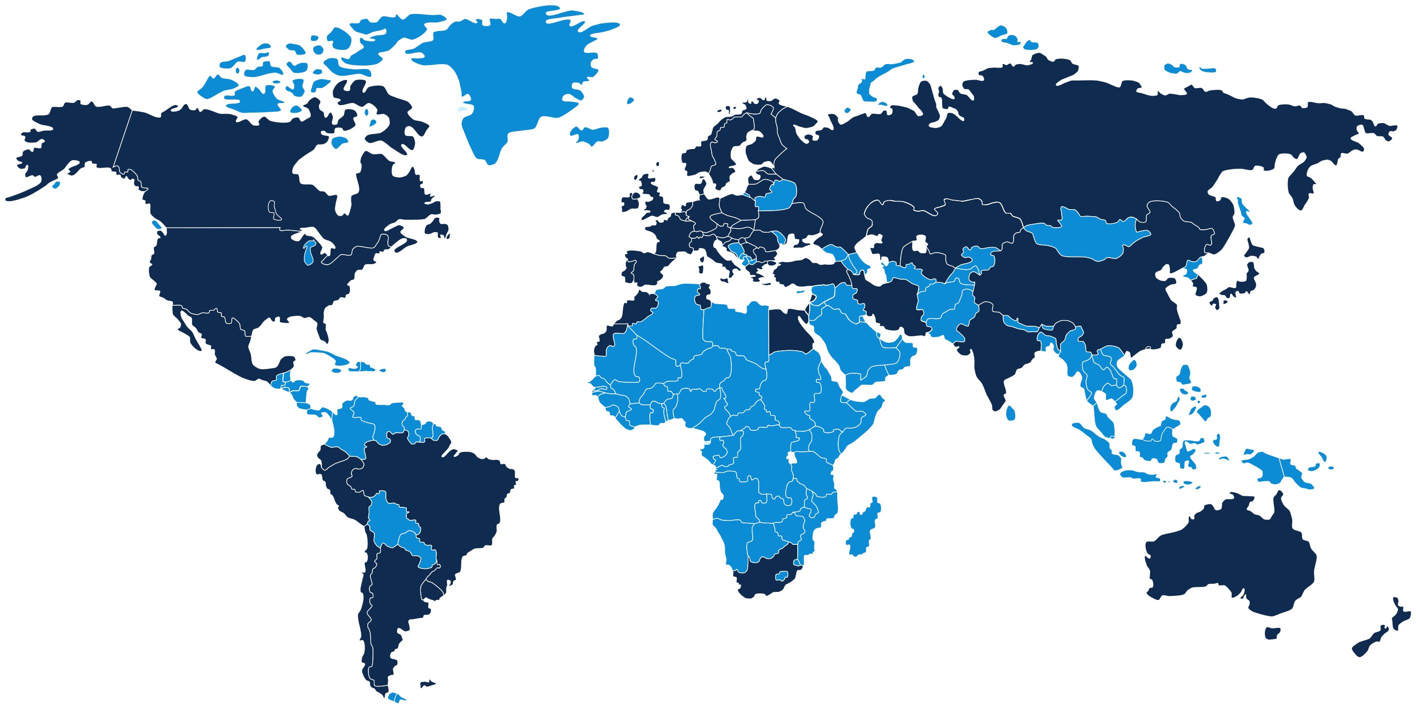
- ICAR Facts
- ICAR Structure & Group activity
- ICAR Services
- ICAR 2016 and beyond

ICAR fact sheet

- ICAR: The International Committee for Animal Recording
- International Non-Governmental Organization (INGO)
- Formed on March 9th, 1951, in Rome
- ICAR is composed of 117 Members from 59 countries;
  87 Full Members, 30 Associate Members.

ICAR's members

ICAR has 117 members (87 Full members + 30 Associate members) in 59 countries



Countries (in dark blue) with at least one organisation as ICAR Member

ICAR Mission Statement

Mission of ICAR is to be the leading global provider of Guidelines, Standards and Certification for animal identification, animal recording and animal evaluation.

ICAR wants to improve the profitability, and sustainability of farm animal production by:

- Establishing and maintaining guidelines and standards for best practice in all aspects of animal identification and recording.
- Certifying equipment, and processes used in animal identification, recording and genetic evaluations.
- Stimulating and leading: continuous improvement, innovation, research, knowledge development, and knowledge exchange.

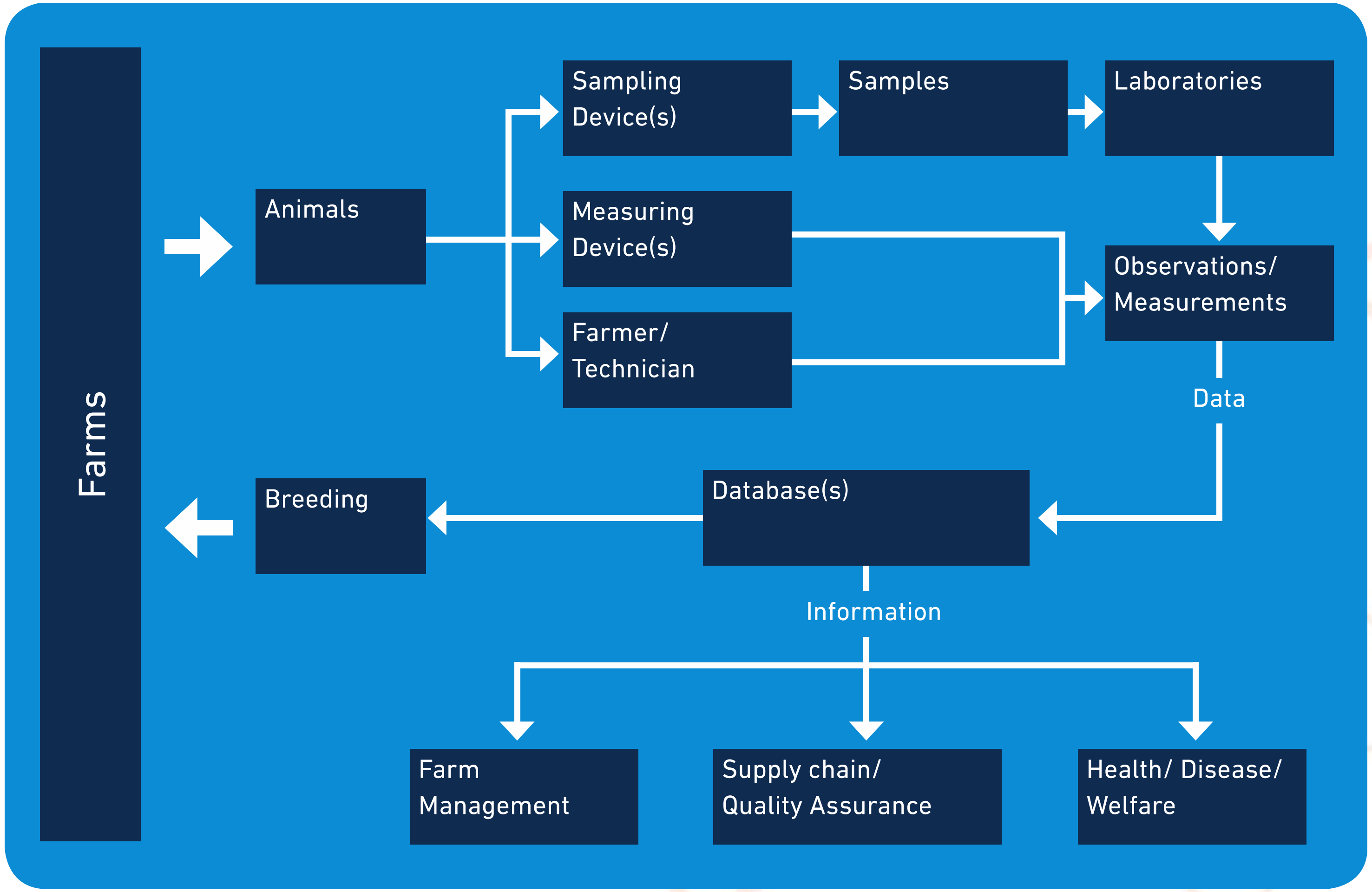
ICAR’s focus

- **For our members**
  - ICAR is there for its members: farm and breeding organizations facilitating ‘their’ local farmers in data-recording and evaluation of production animals.
- **Help to make reliable farm management decisions**
  - Farmers need to be able to rely on data, in order to make management (including breeding) decisions.
  - Their aim is our aim: produce healthy, safe and sustainable food in a valuable way.
- **In close cooperation with associate members**
  - ICAR cooperates closely with those organizations that provide products and services to our members in the recording and genetic process and in farm management information.

Content

- ICAR Facts
- Structure & Group activity
- ICAR Services
- ICAR 2016 and beyond

Where ICAR operates



ICAR’s 4 Permanent Building Blocks

- ID (“Foundation Stone”)
- Performance Recording
- Lab
- Genetic Evaluations

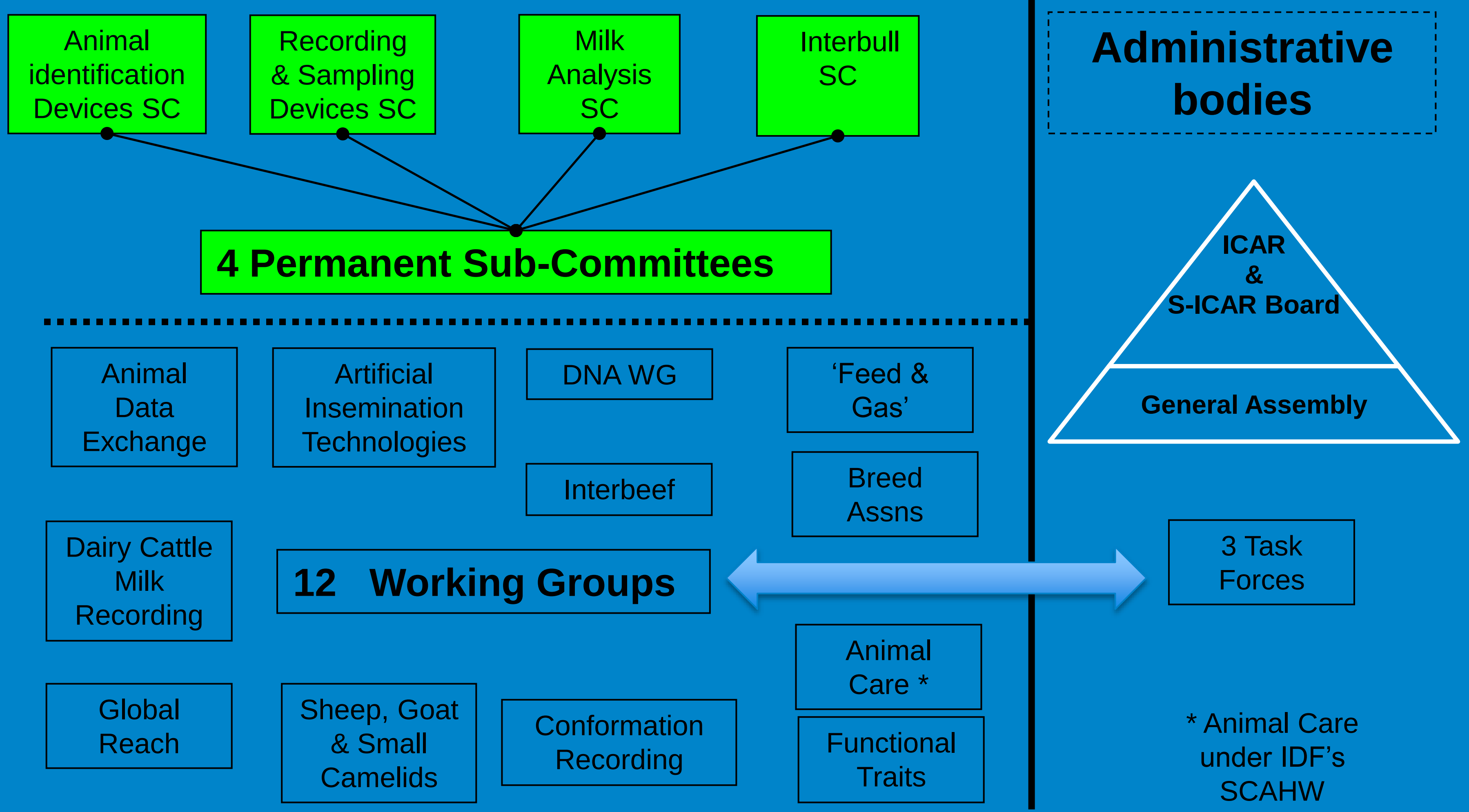
Central Livestock Database

ICAR Stucture

- ICAR is “The” international reference guideline for animal identification, recording systems, data analysis and genetic evaluation.

- The ICAR activities are managed by ;
  - 4 Permanent Sub-Committees (SCs)
  - 12 Working Groups (WGs) plus 3 Task Forces and various Expert Advisory Groups which support the SCs & WGs

ICAR Current Technical Organisation



ICAR Guidelines and Standards

- Results of the work of the ICAR Sub-Committees and Working Groups are the “ICAR RECORDING GUIDELINES”
- The Guidelines is a “living being” of amendments/updates, according to new technologies, tools and developments
- Every year new text of RG is proposed to GA for approval

Content

- ICAR Facts
- Structure & Group activity
- ICAR Services
- ICAR 2016 and beyond

ICAR's core products and services

- Guidelines
- Certification Services
- Evaluation Services
- Seminars and workshops

for

ANIMAL IDENTIFICATION

ANIMAL RECORDING

ANIMAL EVALUATION

ANIMAL DATA MANAGEMENT

ICAR's (Independent) Services;

- **Identification Tag Test and Certification**
  - ICAR and ISO have together developed test procedures, protocols and guidelines through which compliance of RFID systems with the ISO standards can be verified.
  - Since 2007, ICAR is the Registration Authority for ISO in respect to ID devices conforming to ISO Standards 11784 / 11785.
  - Working with our Industry stakeholders ICAR has in 2016 introduced a QA system for ID, namely; Certification, 5Yr Retest, DCN, Field Validation Services.

ICAR's (Independent) Services ;

- **Recording Device Test and Certification**
  - Evaluates, tests and certifies milk recording and other animal recording/sampling devices in the market for compliance with stipulations of the latest ICAR Recording Guidelines. (Section 11)
  - In 2016 ICAR convened a Task Force to review Sensors in Recording. The goal of this ICAR Sensor Task Force is to provide guidelines/methodology to help classify and qualify Sensors and Sensor data.

ICAR's (Independent) Services;

- **Milk Analysis Proficiency Testing (PT)**

  – Provides an international Inter-laboratory Proficiency Test programme for member laboratories. The participation in ICAR's twice yearly PT Test complies with analytical quality assurance requirements in ISO 17025.

  – The ICAR PT parameters considered are: fat, protein, urea, somatic cell, lactose, Beta-Hydroxybutyric (BHB), PCR and Pregnancy Associated Glycoproteins (PAG).

ICAR's (Independent) Services ;

- **DNA Laboratory Accreditation**
  - Provides Accreditation for laboratories who analyse biomaterial to produce DNA Genotypes (DNA Data). For this accreditation, applicants (so called wet labs) have to provide a valid ISAG membership number. ICAR maintains a list of accredited laboratories on its website.
- **DNA Interpretation Centre Accreditation**
  - ICAR has developed a new Accreditation for DNA Data Interpretation Centres who take the DNA Data from the 'wet labs' above and interpret the data for the purposes of Animal Identification, Parentage Verification and Parentage Discovery. (so called dry labs).

ICAR's (Independent Services) ;

- **International Genetic Evaluations**
  - The **INTERBULL Sub Committee** is responsible for coordinating the research and development of methods for international evaluation of the genetic merit of dairy cattle on behalf of ICAR members.
  - Likewise, the **INTERBEEF Working Group** is responsible for international genetic evaluation of beef cattle.
  - This international evaluation work is done by the **Interbull Test Centre** at our strategic partner, the Department of Animal Breeding & Genetics in the **University of Uppsala in Sweden (SLU)**.

ICAR's (Independent Services);

- **Parentage SNP Exchange ('GenoEx' PSE)**
  - ICAR & INTERBULL are offering a new genotype exchange service. This is to facilitate the work of organisations in charge of parentage certification by sanctioning the establishment of a database for storage and exchange of SNP data at the Interbull Centre in SLU.
  - The goal of ICAR is to identify the needs and also sanction the stepwise build-up of a system that meets the requirements of using SNPs in parentage validation and recording.

Content

- ICAR Facts
- Structure & Group activity
- ICAR Services
- ICAR 2016 and beyond

THE GLOBAL STANDARD FOR LIVESTOCK DATA

- **ICAR 2016 Focus for ICAR Team**
  - ICAR Brand Project – modernised brand
  - ICAR Proficiency Test – global under ICAR
  - ICAR Certificate of Quality – New Consultative Review and Audit Schedule
  - Group Review - update and consolidate.

THE GLOBAL STANDARD FOR LIVESTOCK DATA

- **2017 Focus for ICAR Team**
  - ICAR Guidelines - Refresh Access/Navigation.
  - ICAR 'Global Reach' - bringing ICAR to all parts of the globe

ICAR's Values 2016 & Beyond;

Summary of Benefits – 7 Reasons to work with ICAR

1. An open platform for best practices and shared development
2. A shared system for the benefit of all in quality based livestock production
3. Helping to keep up with speed of innovation
4. Certification Services to validate quality and to stimulate open markets
5. A neutral body for open international markets and a level playing field
6. Working for equal opportunities for all, also in emerging markets
7. A roadmap to professional breeding programs

THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

Muchas Gracias !

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www.icar.org

Standardised Labeling for Genetic Trait Coding

Suzanne Harding

on behalf of the WHFF Registration Working Group

Contents

- WHFF Registration Working group
- Why Standardise?
- Genetic Traits
- Gene Test Differences
- Expression Codes
- Reporting Procedure
- Conclusions

World Holstein Friesian Federation Objectives

- ***Harmonise*** technical and administrative matters with regard to the Holstein Breed
- ***Represent*** the common interest of breeders worldwide in developing and promoting the Holstein Breed
- ***Exchange Information*** on important issues concerning the breed
- ***Assist*** emerging herdbook associations
- ***Co-operate*** with Research Centres and other recognised International Organisations involved in animal improvement

Members of WHFF Registration Working Group

- Linda Markle (*Chair*)
- Christa Kühn
- Peter Cole
- Liliana Chazo
- Jiri Motycka
- Suzanne Harding
- Tom Lawlor

Members of WHFF Registration Working Group

Assigned Tasks

- Harmonize a process for the categorization / recognition of major recessives.
- Standardize labeling nomenclature and codes – tested carrier, tested free and not conclusive.
- Publishing haplotypes and standardize the way they are reported.

Why Standardise?

- Easy for all organisations to reference the same Genetic Traits

- Useful on farm when making breeding decisions
    - Farmers can choose to minimise the impact or increase the likelihood of the effect

- Recommended to report on official documents

- Harmonization of codes and nomenclature is imperative for overall accuracy and international data exchange.

Genetic Trait Names

Gene Name	Description	Gene and Expression Code
BLAD	**Bovine Leukocyte Adhesion Deficiency** (deficiency of a normally occurring protein needed for white blood cells or leukocytes, which are body's infection fighters)	**BLC** = tested carrier of BLAD **BLF** = tested non-carrier of BLAD
Mule foot	**Mule-Foot** (toes of foot are joined, giving animal a single hoof, instead of cloven ones)	**MFC** = tested carrier of Mule foot **MFF** = tested non-carrier of Mule foot
DUMPS	**Deficiency of Uridine Monophosphate Synthase** (one of many enzymes contributing to normal metabolic processes)	**DPC** = tested carrier of DUMPS **DPF** = tested non-carrier of DUMPS
CVM	**Complex Vertebral Malformation** (causes still-born calves, abortions, and early embryonic losses)	**CVC** = tested carrier of CVM **CVF** = tested non-carrier of CVM
Factor X1	**Factor X1** (blood clotting disorder)	**XIC** = tested carrier of Factor X1 **XIF** = tested non-carrier of Factor X1
CIT	**Citrullinemia** (accumulation of ammonia and other toxics in blood in baby calves)	**CNC** = tested carrier of Citrullinemia **CNF** = tested non-carrier of Citrullinemia
	Brachyspina (causes abortion and	**BYC** = tested carrier of Brachyspina

Genetic Trait Names

Coat Colour Carrier Gene	Description	Gene and Expression Code
Red	Red gene	RDC = carrier of red gene RDF = tested non-carrier of red gene
Red	Variant Red gene	VRR = not tested/determined by lineage VRS = tested true (homozygous) VRC = VRC =tested carrier (heterozygous) VRF = tested free
Black/Red	Black/red gene	BRC = carrier of black / red gene
Black	Black gene	BKC = carrier of black gene

Gene Test Differences

- Direct gene test:
  - reliability: very close to 100%, excluding technical errors / issues
  - are marker-based tests
  - result from presence of mutated allele
- Indirect gene test:
  - reliability: very high, can be as high as 98%
  - risk of false positive / false negative results
  - does not detect causal allele; are looking for alleles in close proximity to causal nucleotide / genome variation

An Example of a direct test code

- Cholesterol Deficiency
  - Originally indirect test
  - Causal mutation found so direct test available
  - Naming can be completed

An Example of an indirect test code

- Haplotypes?
    - Only indirect test available for HH2 - Still looking for causal mutation
    - HH1, HH3, HH4 now have direct tests
    - HH5 recently detected

Expression Codes

- For many years WHFF has adopted two Alpha characters assigned for monogenetic inherited traits
- New proposal will facilitate the differentiation between direct and indirect traits
- Codes to be used following the WHFF two (alpha) characters
- No previously named traits will be renamed
- Naming of traits will continue to evolve as research continues

Expression Codes

- Codes to be used following the WHFF two (alpha) characters assigned for the monogenetic trait.

Direct Tests			Indirect Tests	
F	Tested Free		0	Tested Free/non-carrier.
C	Tested Carrier / Heterozygous		1	Tested Carrier/Heterozygous/Confirmed with pedigree info.
S	Tested / Homozygous		2	Tested True/Homozygous/Confirmed on both sides of pedigree.
			3	Additional Characteristics e.g. suspect carrier origin could not be confirmed from pedigree.
			4	Additional Characteristics e.g. suspect homozygous origin could not be confirmed from pedigree.
			5	As required should an additional characteristic be identified.

An Example of naming a direct test code

- Cholesterol Deficiency

- CDF – tested non-carrier / free of cholesterol deficiency
- CDC – tested carrier of cholesterol deficiency (heterozygous)
- CDS – tested true carrier of cholesterol deficiency (homozygous)

An Example of naming an indirect test code

- Currently there are no common codings of indirect tests using the WHFF recommended nomenclature
- Each country has named using their own coding

Reporting Procedure

- Industry partner advises WHFF that there is a newly discovered Genetic Trait

- Fill in ‘Request for information’ form
  - Describe new genetic trait
  - What is the evidence
  - Who is reporting
  - When was it first observed?
  - Which animal / family was it observed in
  - Additional information
  - Contact details

- Send back to WHFF (worldholstein@gmail.com)

- Four weeks later the WG will deliver the standardised label for coding.

BUT…..

- Practical problem of informing all herd books of genetic codes
- Proposal from WHFF President Jos Buiting to ICAR for better dissemination of Bulls genetic codes
- New procedure:
  - Every herd book sends genetic codes for all bulls to Interbull when send evaluation data
  - Interbull can then send this data back to members
  - Could link in with plans to add data to the Interbull data exchange
- Procedure standardized Internationally
- ICAR / Interbull considering proposal

Conclusions

- Important to promote nomenclature to scientific community
- Talk to ICAR with regard to proposing new Guidelines
- Encourage reporting of new genetic traits
- Communicate new genetic traits
- Harmonisation reduces farmer and industry confusion
- Farmer can choose to use when breeding
- WHFF proposal to ICAR for automatic data dissemination
- www.whff.info for full list of Holstein Genetic Traits

Thank you for your Attention.

Any Questions ?

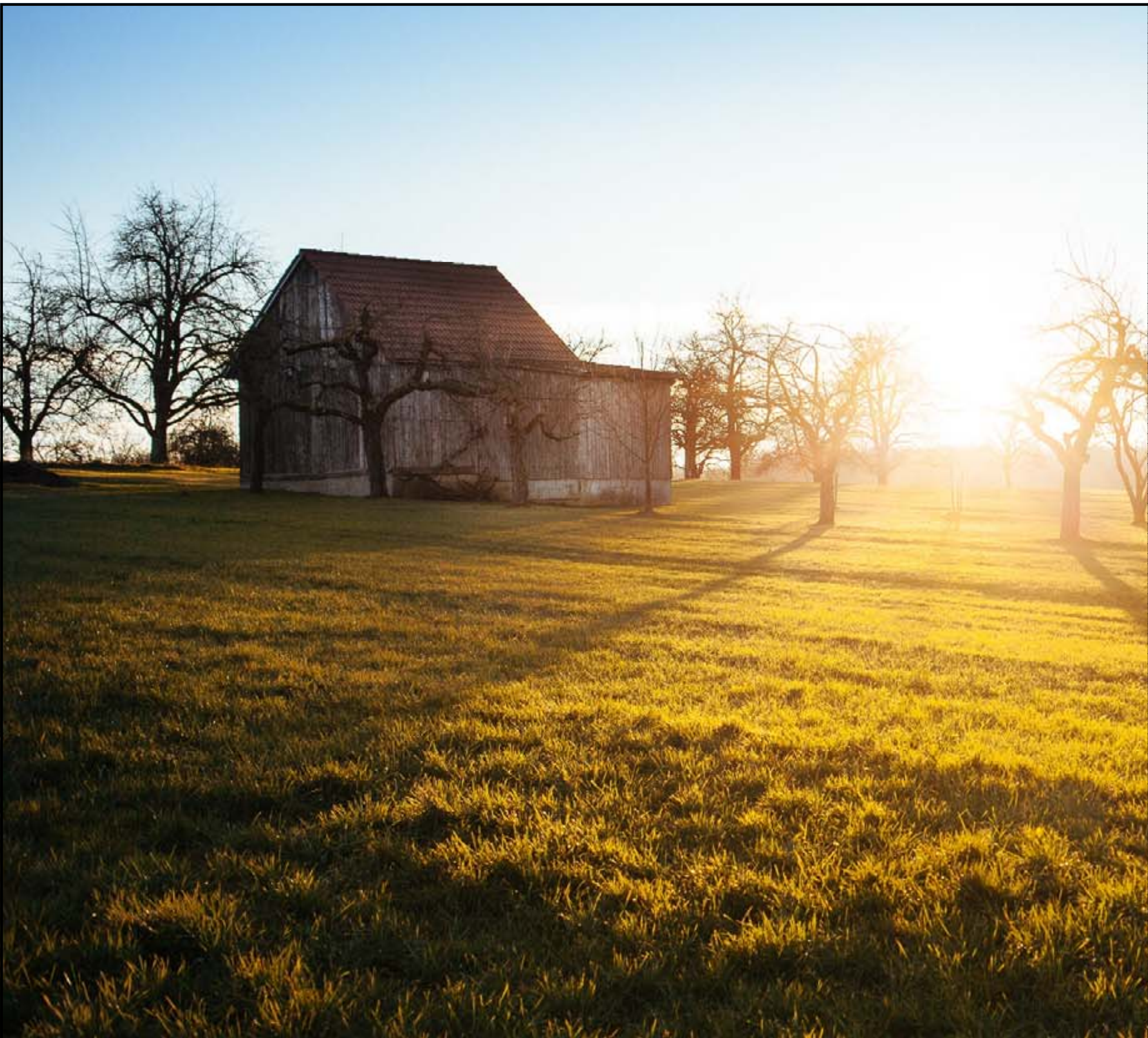
Using Data from Multiple Sources – the Reality of Genetic Evaluations

João Dürr, CDCB CEO

ICAR 2016 – Challenges and Opportunities

Puerto Varas, Chile, October 26, 2016

COUNCIL ON DAIRY CATTLE BREEDING



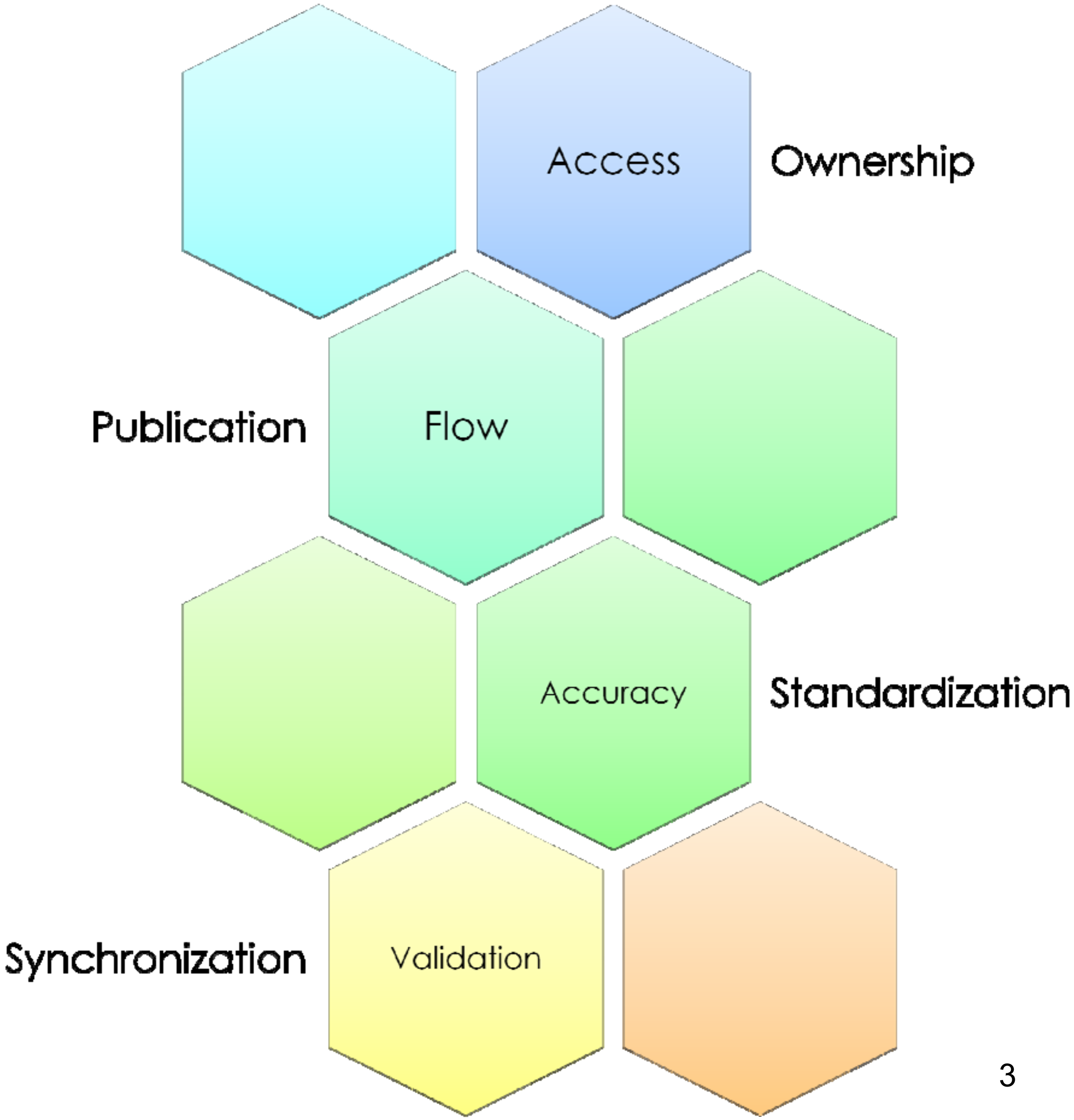
Data management

Case 1: Interbull Centre (2008-2014)

Case 2: CDCB (2014-Present)

Take home messages

Data Policies



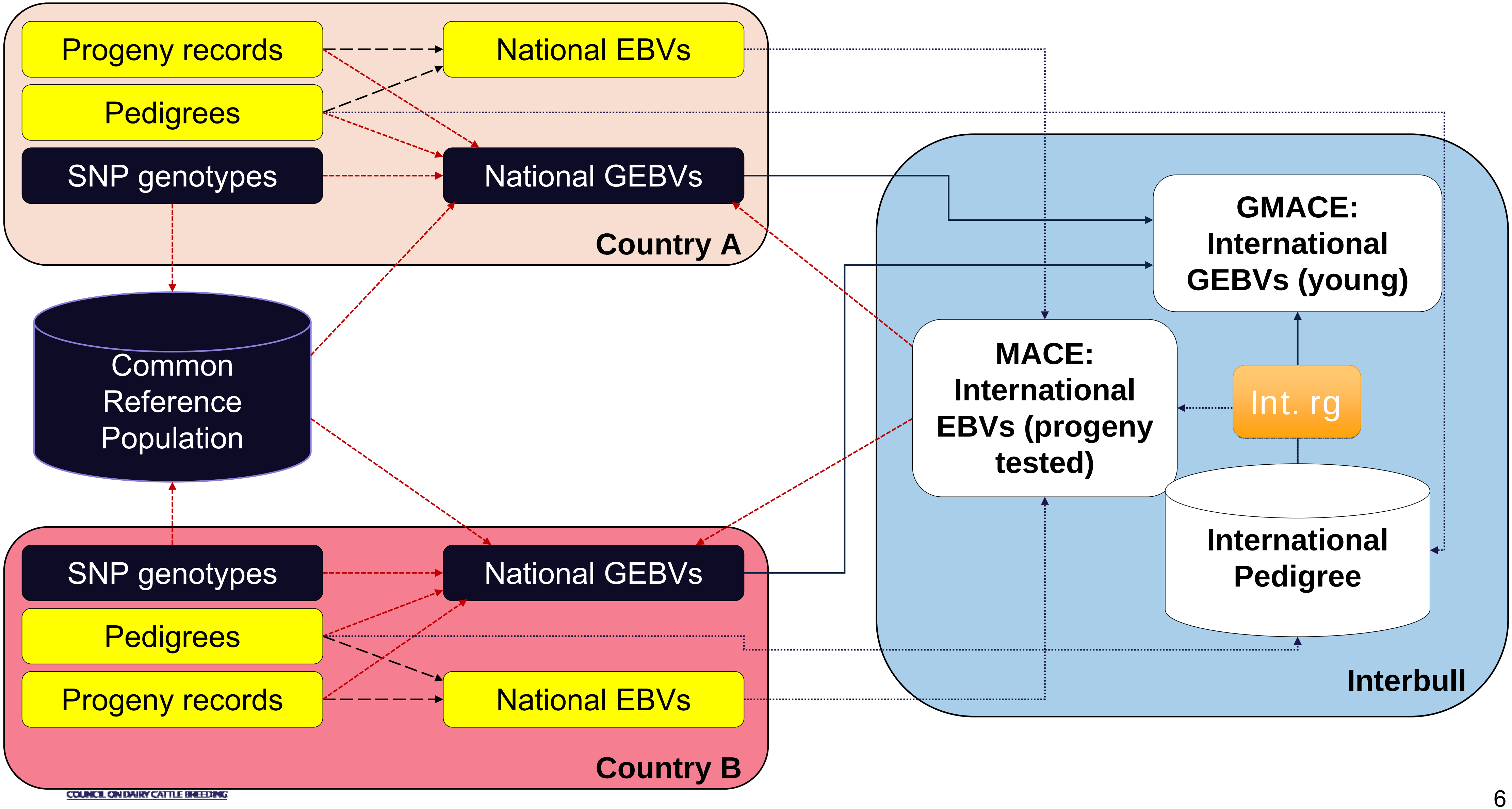
Wikipedia: Data validation

(https://en.wikipedia.org/wiki/Data_validation)

Data validation is the process of ensuring that a program operates on clean, correct and useful data. It uses routines, often called "validation rules" "validation constraints" or "check routines", that check for correctness, meaningfulness, and security of data that are input to the system.

2008-2014

CASE 1: INTERBULL CENTRE


Progeny records
National EBVs
Pedigrees
SNP genotypes
National GEBVs
Country A
Common Reference Population
GMACE: International GEBVs (young)
MACE: International EBVs (progeny tested)
Int. rg
International Pedigree
Interbull
SNP genotypes
National GEBVs
Pedigrees
Progeny records
National EBVs
Country B
COUNCIL ON DAIRY CATTLE BREEDING

Features of the Interbull Data Pipeline

- Data suppliers (April 2016)
  - 391 dairy cattle populations, from 34 countries
- Evaluations calendar
  - 3 Annual official evaluations
  - 2 Test runs
  - 5 different national evaluation validation methods

- Data types
  - National genetic merit data (EBV, PTA)
  - 1825 country-breed-trait combinations
  - Pedigrees
  - Population parameters
  - National evaluation validation tests
  - Genotypes (Intergenomics - BSW)

Interbull Centre - 2008 Opportunities

- No database, only flat files
- Each trait group developed separately
  - Independent file formats
    - Duplication - inconsistencies
  - Separate procedures
    - Different edits/checks
    - Separate processing, different levels of automation
  - Analyst-dependent
- Pedigree re-built from scratch every evaluation
- Limited documentation
- Validation of national evaluations not synchronized with users

The joy of developing a database…

Test if you are ready to start developing a DB by answering these very simple questions:

- Why do you need a database?
- ***Which are the business rules?***
- Are those effectively using the DB involved in validating the business rules?
- ***Would a person that knows nothing about your business (the DB developer, for instance) be able to follow the business rules?***
- Have you identified a driver for the project?
- ***Do you have a DB administrator since the beginning of the process?***
- Is your DB Admin happy with the choice of tools?
- ***Is your budget for the project realistic?***

IF YOUR ANSWER FOR ANY OF THE ABOVE IS “NOT SURE”, “NOT YET” OR “ALMOST THERE”

<u>YOU ARE NOT READY TO START</u>!!!

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Standardizing data ingestion

- Interbull Centre solution: IDEA
  - Data type and range validation performed locally prior to upload
  - Cross-reference validation performed at the Interbull servers during upload
  - Interactive interface with users to intermediate data acceptance
  - **Golden rule: only data suppliers can modify input data**
- IDEA for pedigrees
  - Principle of “Authoritative Organization”
  - Data flow independent from evaluation deadlines
- IDEA for genetic merit
  - Same file format for all traits
  - “Verify” checks summarized by well established indicators

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Interbull Validation of National Evaluation Estimates

- Opportunities
  - Tests applied with subtle differences in implementation yielded different results for users when compared to the Interbull Centre results
  - Much time spent on communication to find out why results were not identical
- Interbull Centre solution
  - Software supplied by the Interbull Centre is run locally
  - Test results and implementation details are recorded
  - Users and the Interbull Centre have access to the same figures

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Interbull Centre ISO 9000 Certification

- Write what you do, do what you write
- Good documentation makes your life better
- Comprehensive business rules define your system's credibility
- Version control is much easier when there is only one shared version of the document (Wiki)
- Quality is not an achievement, it is a life style

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COUNCIL ON DAIRY CATTLE BREEDING

Lessons from the Case 1

- Databases: be sure you have a plan
- Standardizing data ingestion improves consistency through the use of efficient validation tools
- Keep comprehensive business rules and consistent documentation to stay in business
- Make sure your data suppliers see the same data quality indicators that you see
- Define clear roles and responsibilities between you and your data suppliers

COUNCIL ON DAIRY CATTLE BREEDING

2014 – Present (Discovery phase)

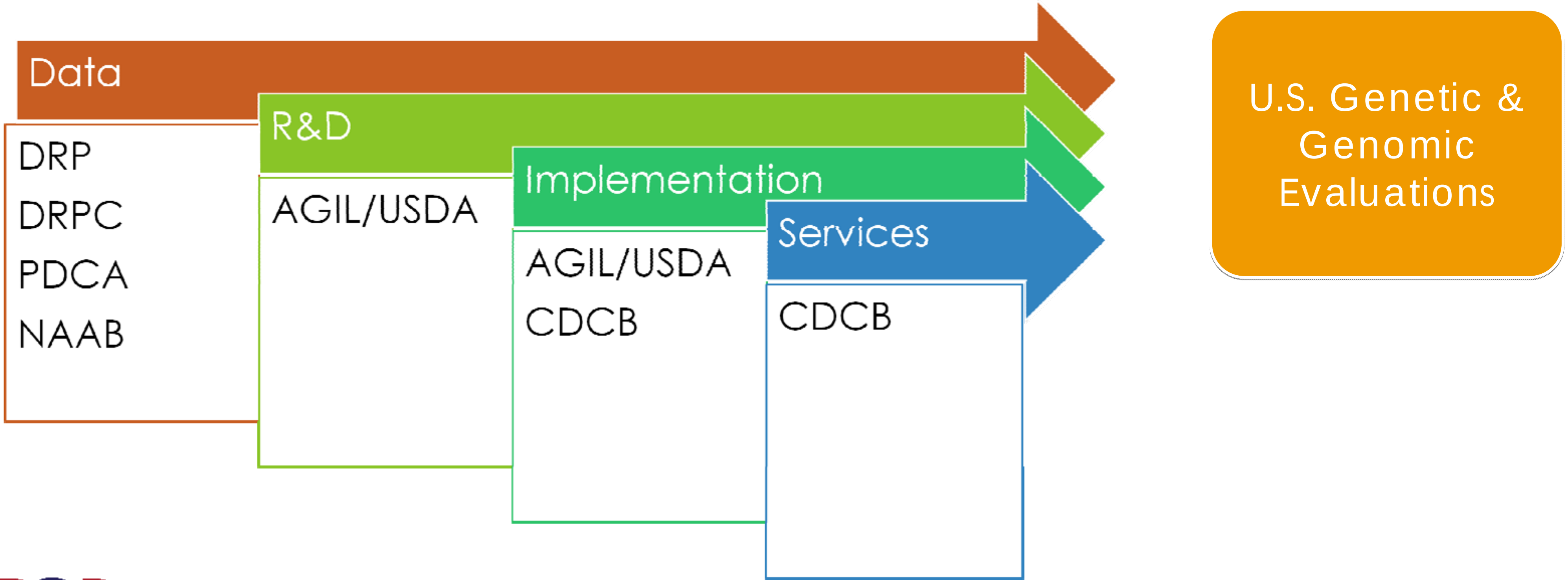
CASE 2: CDCB

Organization

- 12 voting members (3 from each sector)
- 2 nonvoting industry members

COUNCIL ON DAIRY CATTLE BREEDING

US Genetic Evaluation Process



Dairy Records Providers (25)

- AgSource Cooperative Services
- Arizona DHIA
- Dairy Lab Services
- Dairy One Cooperative Inc.
- DHI Cooperative Inc.
- DHIA West
- Gallenberger Dairy Records
- Heart of America DHIA
- Idaho DHIA
- Indiana State Dairy Association
- Integrated Dairy Herd Improvement
- Jim Sousa Testing
- Lancaster DHIA
- Mid-South Dairy Records
- Minnesota DHIA
- Northstar Cooperative DHI Services
- Puerto Rico DHIA
- Rocky Mountain DHIA
- San Joaquin DHIA
- Southern DHIA Affiliates
- Tennessee DHIA
- Texas DHIA
- Tulare DHIA
- United Federation of DHIA's
- Washington State DHIA

Genomic Nominators (16)

- ABS Global. Inc.
- Alta Genetics USA
- American Jersey Cattle Association
- Brown Swiss Cattle Breeders' Association
- Genetic Visions-ST LLC
- Genex Cooperative. Inc.
- Holstein Association USA. Inc.
- Holstein Canada
- National Association of Animal Breeders, Inc.
- Neogen Corporation dba GeneSeek
- New Generation Genetics. Inc.
- Select Sires Inc.
- Semex Alliance
- Tri-State Breeders Cooperative dba Accelerated Genetics
- VHL Genetics
- Zoetis Genetics

Purebred Dairy Cattle Association (7)

- American Guernsey Association
- American Jersey Cattle Association
- American Milking Shorthorn Society
- Brown Swiss Cattle Breeders' Association
- Holstein Association USA. Inc.
- Red and White Dairy Cattle Association
- U.S. Arshire Breeders' Association

Internationa l Partners (7+)

- Agriculture and Horticulture Development Board
- ANAFI
- CDN
- Interbull Centre (34)
- Intergenomics (8)
- Qualitas
- Vit

Dairy Records Processing Centers (4)

- AgriTech Analytics
- AgSource Cooperative Services
- Dairy Records Management Systems
- DH I-Provo

Genomic Laboratories (6)

- Bio-Genesys Ltd.
- Genetic Visions-ST LLC
- Neogen Corporation dba GeneSeek
- VHL Genetics
- Weatherbys Ireland DNA Laboratory
- Zoetis Genetics

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Quality Certification Services Inc.

Mission Statement

Providing a reliable source of information to people interested in the US dairy records industry.

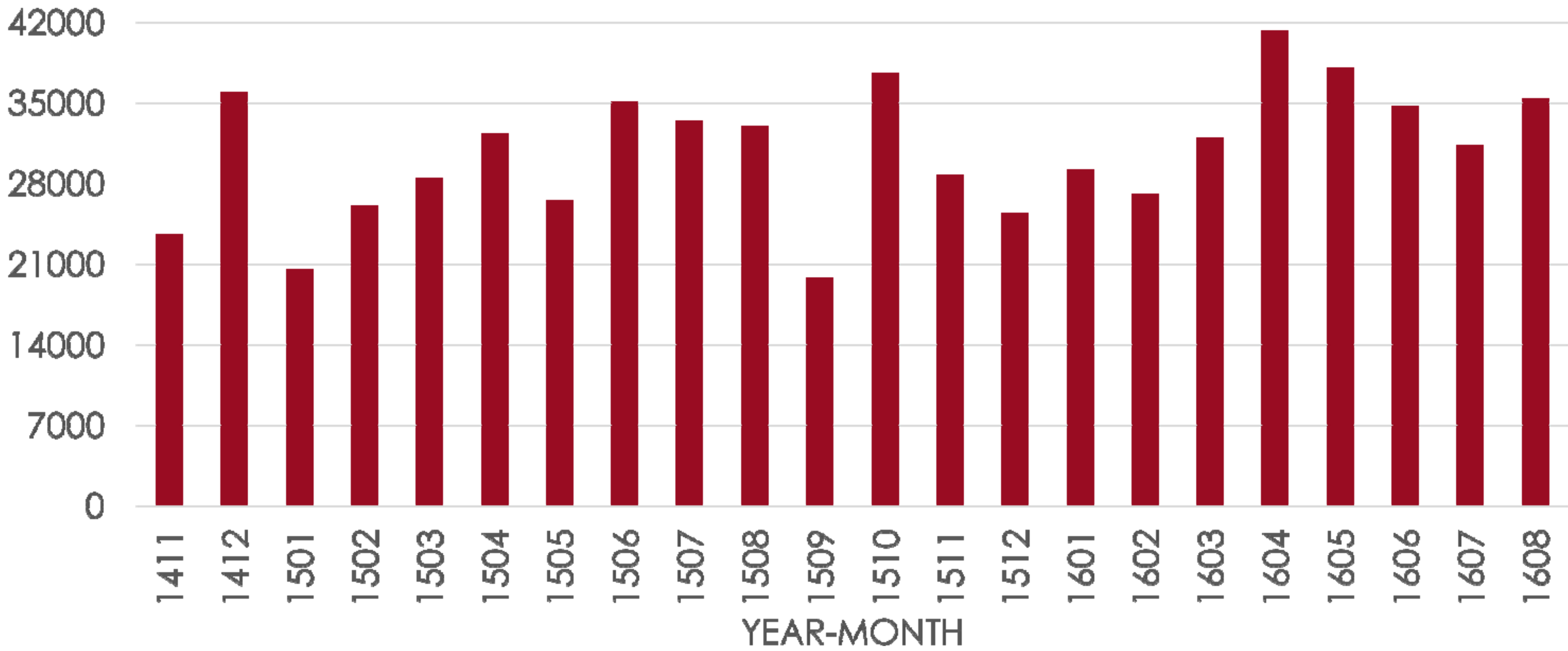
COUNCIL ON DAIRY CATTLE BREEDING

official evaluation runs since December 2015

Record type	New records added between December 2015 and April 2016	New records added between April 2016 and August 2016
First lactation test day records	3,012,084	3,061,753
Later lactation test day records	4,578,898	4,752,008
Heifer breeding records	963,249	918,528
Cow breeding records	5,164,212	4,833,899
Calving ease records	401,247	458,785
Stillbirth records	332,704	381,462

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Number of genotypes received by CDCB



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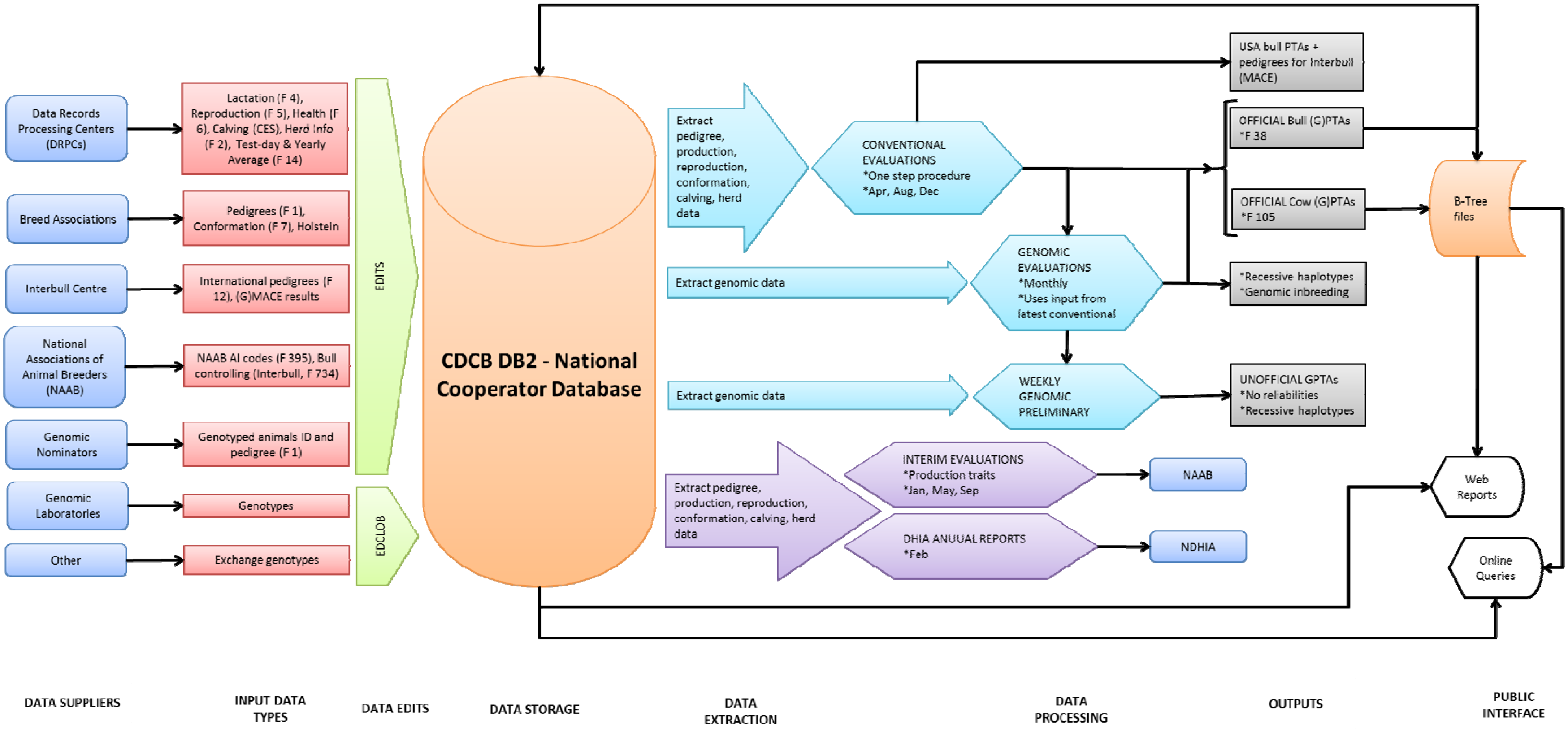
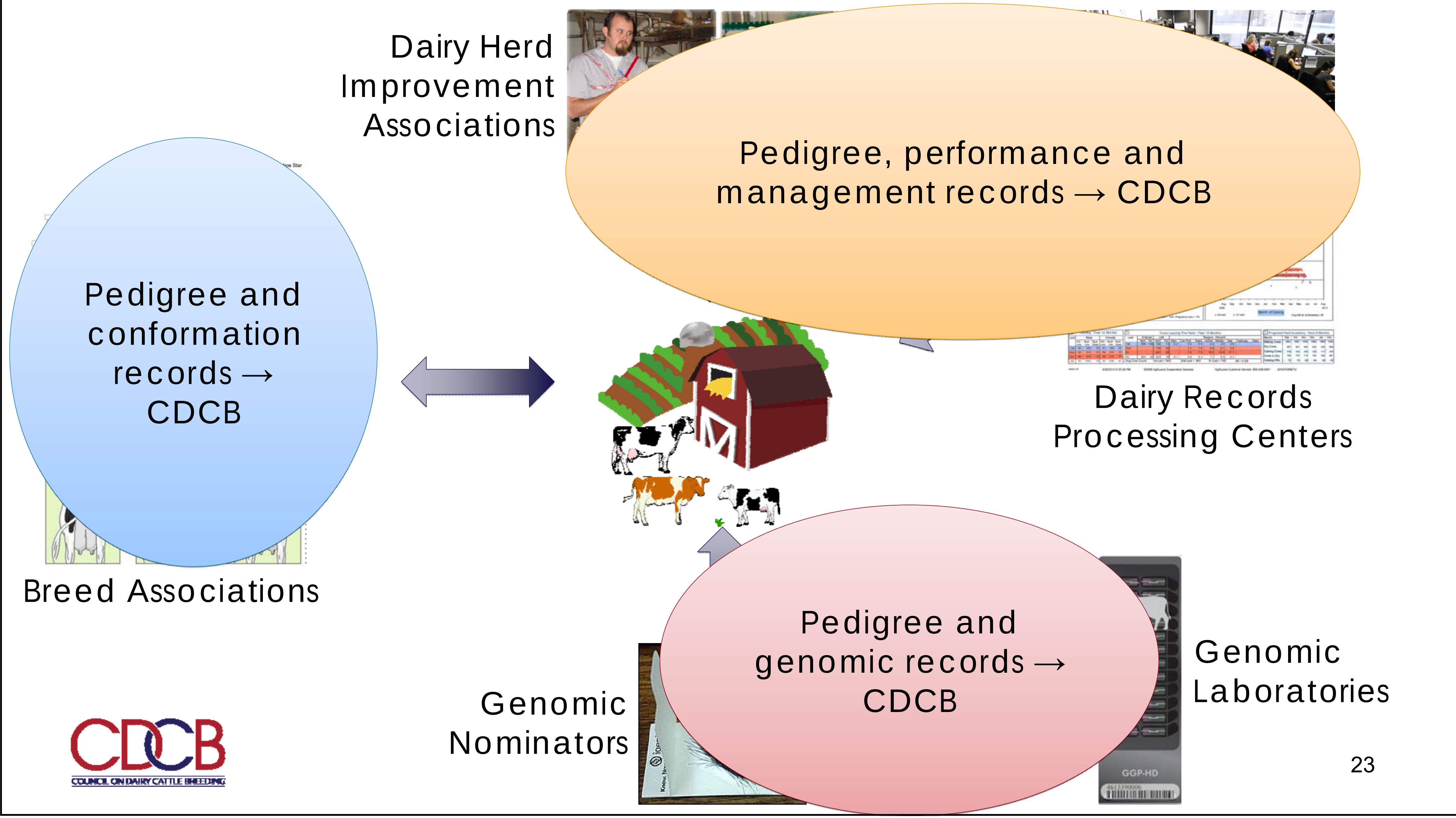
Number of genotypes stored in the CDCB database by continent of origin, sex and availability of phenotypic information (September 2016)

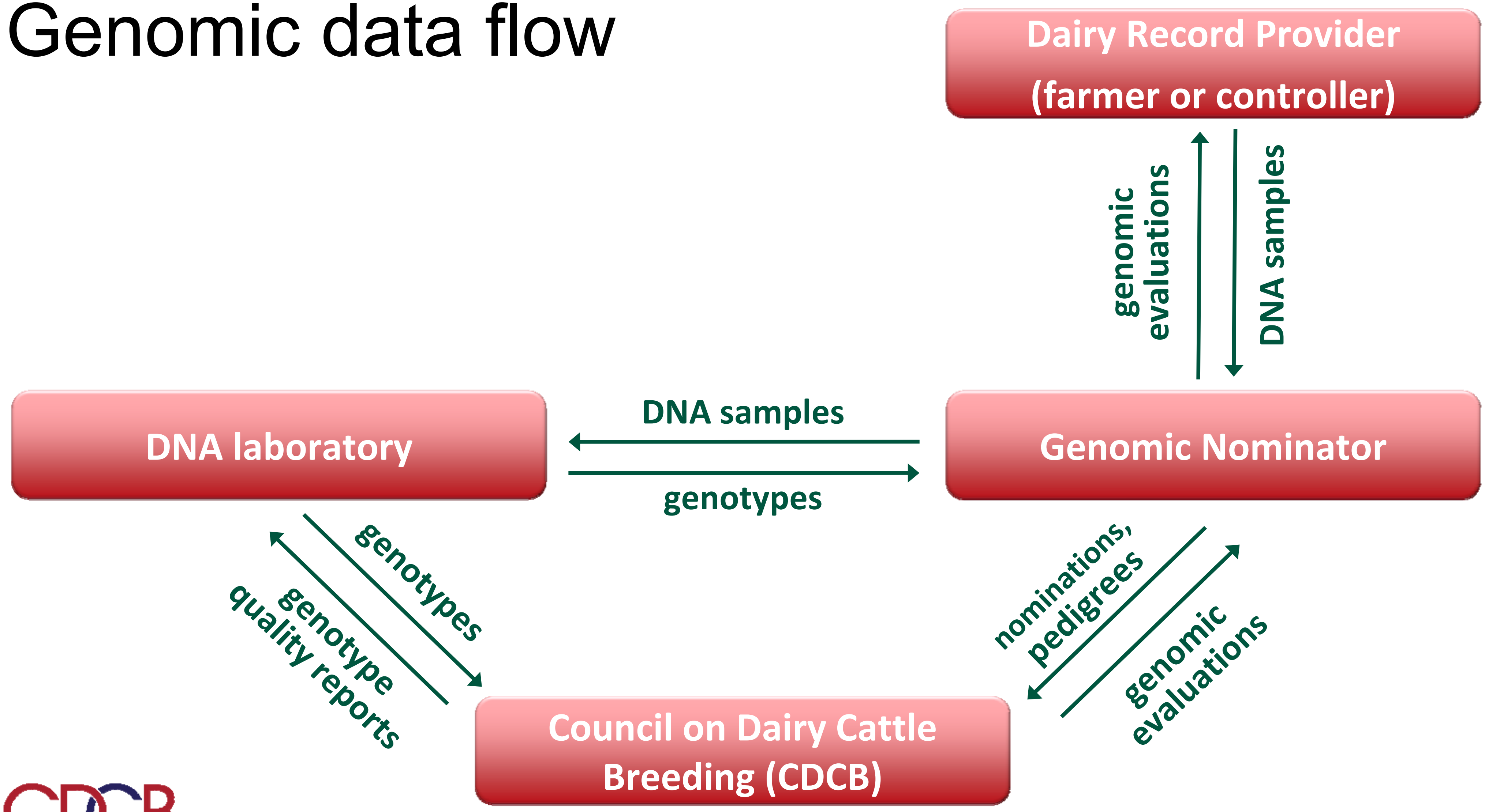
Continent	Predictor		Predicted		Total
	Females	Males	Females	Males	
Africa	6	-	374	48	428
Asia	15	1,826	2,101	883	4,825
Eastern Europe	24	425	2,120	591	3,160
West and Central Europe	226	15,250	57,113	45,886	118,475
Latin America	343	2	11,983	752	13,080
North America	324,437	29,240	772,096	133,902	1,259,675
Oceania	[illegible]	439	[illegible]	[illegible]	8,785



CDCB COUNCIL ON DAIRY CATTLE BREEDING


Dairy Herd Improvement Associations
Pedigree, performance and management records → CDCB
Pedigree and conformation records → CDCB
Breed Associations
Dairy Records Processing Centers
Pedigree and genomic records → CDCB
Genomic Laboratories
Genomic Nominators
GGP-HD
CDCB
COUNCIL ON DAIRY CATTLE BREEDING

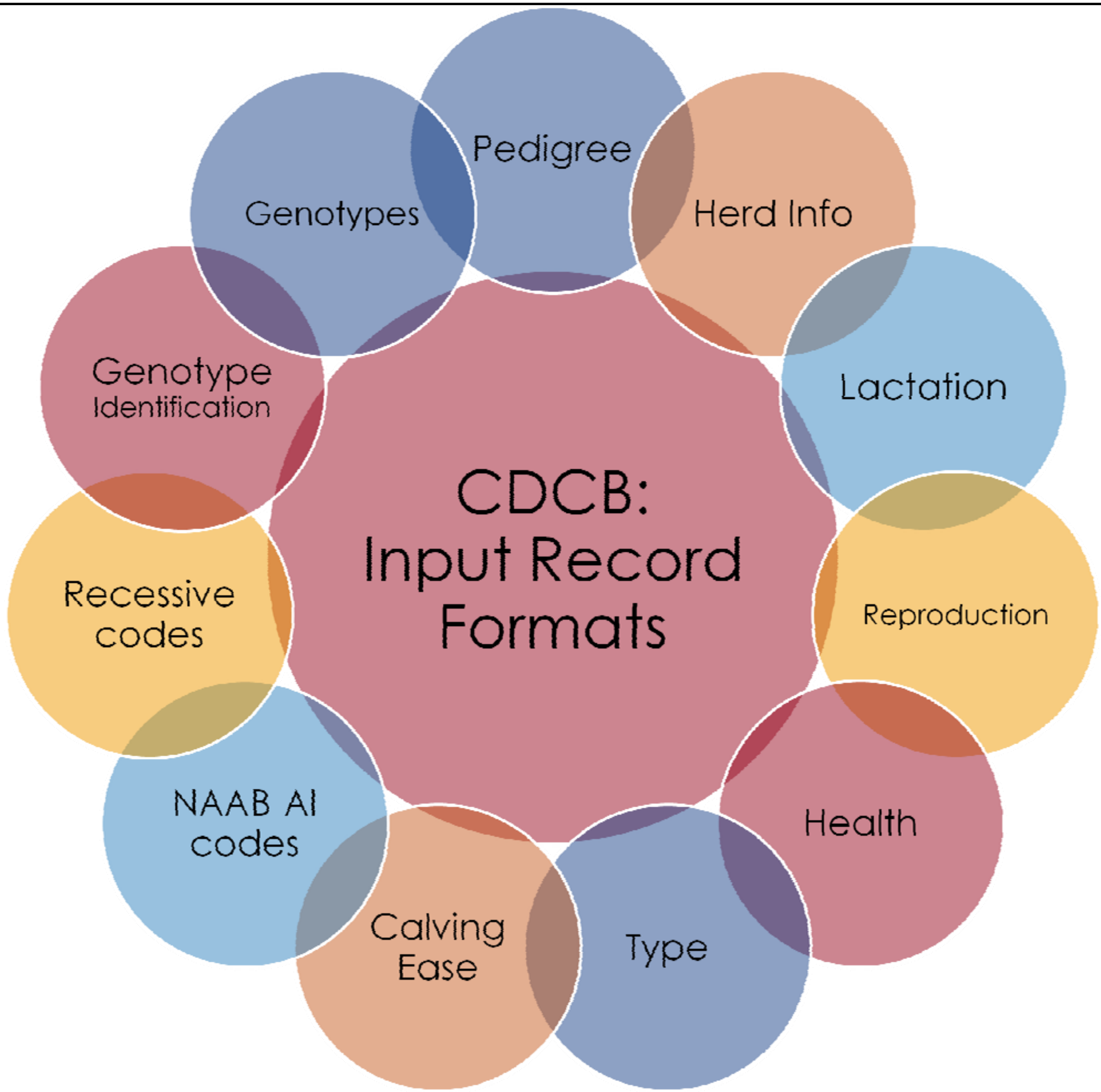
Genomic data flow



CDCB Fee Schedule (Updated March 2, 2015)

<table>
<tr><th>Rate Code</th><th>Participation type</th><th>Female fee ($)</th><th colspan="2">Initial male fee ($)</th><th>AI service fee for males ($)</th></tr>
<tr><td>1</td><td>Total program</td><td>0.00</td><td colspan="2">15.00</td><td>575.00</td></tr>
<tr><td>2</td><td>Member</td><td>1.00</td><td colspan="2">22.00</td><td>575.00</td></tr>
<tr><td>3</td><td>Non-member</td><td>3.00</td><td colspan="2">150.00</td><td>575.00</td></tr>
<tr><td></td><td></td><td></td><td><15 mo</td><td>> 15 mo</td><td></td></tr>
<tr><td>4</td><td>Canada</td><td>6.00</td><td>150.00</td><td>575.00</td><td>575.00</td></tr>
<tr><td>5</td><td>Approved partners</td><td>7.00</td><td>15.00</td><td>575.00</td><td>575.00</td></tr>
<tr><td>6</td><td>All others</td><td>7.00</td><td>150.00</td><td>1200.00</td><td>1200.00</td></tr>
</table>

CDCB
COUNCIL ON DAIRY CATTLE BREEDING


CDCB:
Input Record
Formats
Pedigree
Herd Info
Lactation
Reproduction
Health
Type
Calving
Ease
NAAB AI
codes
Recessive
codes
Genotype
Identification
Genotypes

Bovine SNP chips processed by the CDCB

COUNCIL ON DAIRY CATTLE BREEDING

Error-Codes for CDCB Data Checks (832)

Error Codes

Complete Error Lists

- **CSV/Excel**
- **Tab Separated**

0 General Record
1 Animal Identification
2 Sire Identification
3 Dam Identification
4 Cross-Reference Identification
5 Birth Date
6 Nontest-Day Production
7 Test Day
8 Reproductive Event
9 Health Event

Genomic Error Documentation

Example: **Gender Change Errors**

Code	Description	Action	Returned Data	Updated
↑↓	↑↓	↑↓	↑↓	↑↓
0Pa	Format 4 can not change gender of animal.	Reject		09/26/2000
0Pb	Animal not found under opposite gender. Record type code is changed to 'P'.	Change		11/03/2000
0Pc	Change of gender for animal with different master file pedigree.	Reject		09/26/2000
0Pd	Change of gender for animal with master file lactations.	Reject		09/26/2000
0Pe	Change of gender for animal with master file progeny.	Reject		09/26/2000
0Pf	Change of gender for animal with multiple identifications.	Notify	Cross-reference identification and pedigree source	09/26/2000
0Pg	Change of gender for animal with homozygous row.	Reject		04/08/2009
0Ph	Change of gender for animal with confirmed genotype.	Reject		09/09/2010

CDCB COUNCIL ON DAIRY CATTLE BREEDING

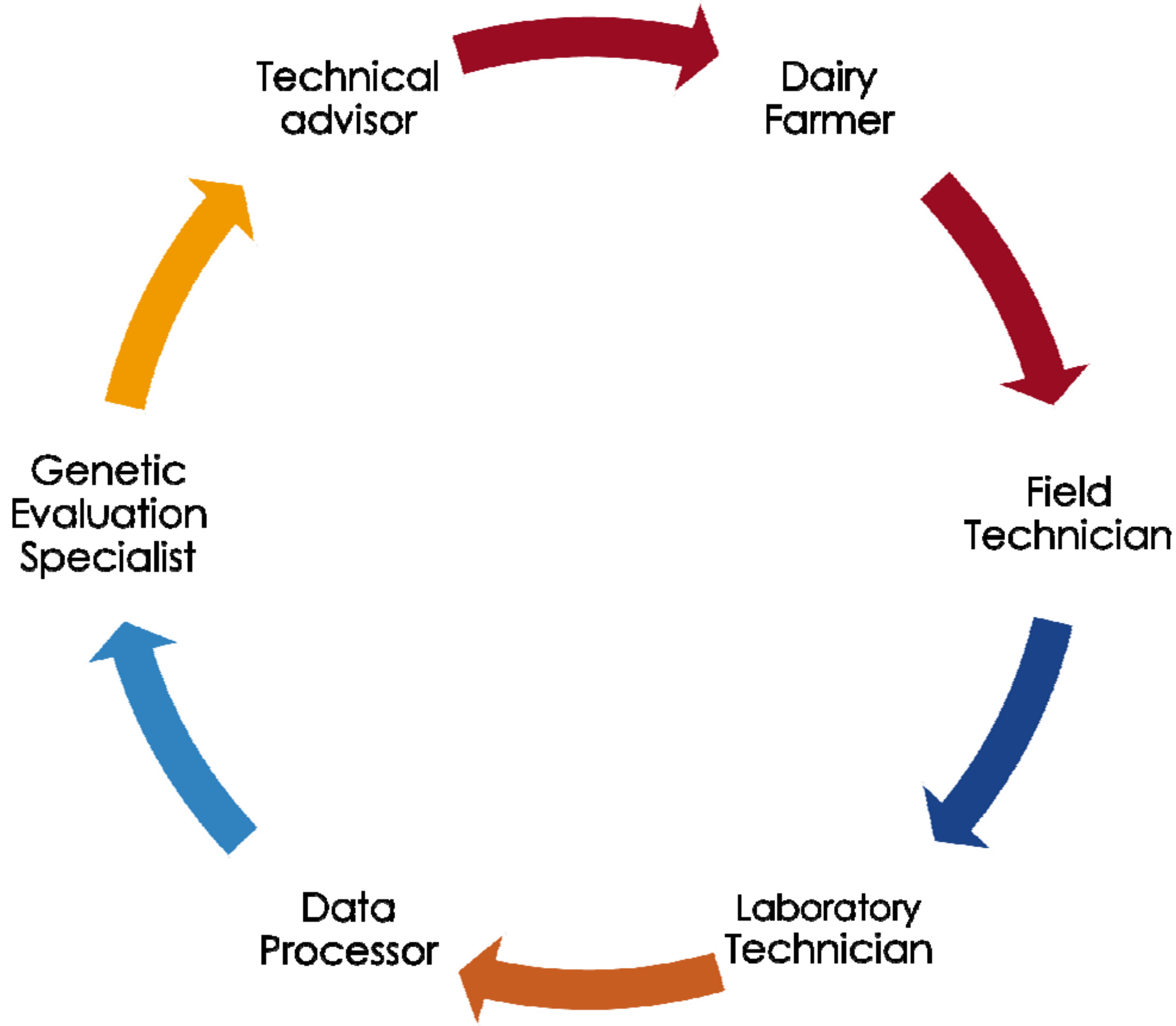
CDCB Evaluation Calendar

- 3 Annual Official Evaluations
  - Conventional
  - Genomic
  - Interbull files
- Monthly Genomic Evaluations
- Weekly Genomic Predictions
- 3 Annual Interim Evaluations

CDCB - Opportunities

- Transition from USDA to CDCB
  - Recruiting
  - Transfer DB, web applications, directory/files structures, programs
  - Knowledge transfer
  - Roles & responsibilities between AGIL and CDCB
  - Communication
- Multiple file formats
- Web applications developed in several platforms
- Heavy use of SAS in data processing
- Documentation
  - Not consolidated into a unique platform
  - More oriented to operations
  - Limited on business rules

Agents involved in the data pipeline



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Standardization of New Data Types

Example: MAST = 132 unique 4-letter acronyms used!

CLIN PSEU TXIC MCAD SCMA MLZ MLR MALL MILD MCA3 MRF MRFQ MT MASI

MRRQ SA+ STAF MAS2 MCUL MIVT MSLF QM

MFOR MRR MTRT STAG MST1 BETA MLP

KLEB MCAI MLF CEFA MAST MAS4 STPH 4 CEF

MYCO QUAR MCA1 MPP RFRR MCPD SEVE LF M.F. MCA2 MPZ TOX CLLR MASR MST3 MSRR STAP MLRQ QTMS

MLFQ MST2 LRRR MCPI TOXI QUTR RF CLAK LR MSTA RR MAS 4QRT M4QT TOXM MAPP STRP MSRF

STAU NEWM SA ALL4 MSLR STAR

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CDCB – First steps

- No changes to the legacy before transition was complete
- Keeping the “old pals” around
- Documenting the legacy
- Strengthening AGIL
- Establishing a policy to compensate phenotypic data suppliers
- Reviewing data access policy
- Developing a new web portal
- Standardizing file formats
- Refining genomic data flow

Lessons from Case 2

- Dairy data awareness has changed the business
  - Control, roles and responsibilities need to be redefined
  - Business rules need to adapt
  - Data access needs to be adjusted
  - Data flow needs to be renegotiated
- Data quality
  - Every link in the chain has to participate
  - Acquiring and validating new data types requires a new mentality

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Take Home Message

- Dairy data recording services need to remain relevant for dairy farmers in this fast changing industry.
- Data for genetic evaluations are a by product, not the main goal.
- Making data ingestion more efficient is an effort that involves all agents in the dairy chain.
- Access to dairy data will define the future of dairy genetics.
- Increasing awareness about data quality is the best protection against opportunistic new products in the market.

CDCB
COUNCIL ON DAIRY CATTLE BREEDING

Acknowledgements:

- Interbull Centre
- AGIL
- CDCB staff
- Data Providers

Thank You!

www.cdcb.us

COUNCIL ON DAIRY CATTLE BREEDING

Phenotyping and selecting for genetic resistance to gastro-intestinal parasites in sheep: the case of the Manech French dairy sheep breed

JM. Astruc * , **F. Fidelle, C. Grisez, F. Prévot, S. Aguerre, C. Moréno, P. Jacquiet**

* *French Livestock Institute - Toulouse, France*

Session TS7 *Improving Production in Small Ruminants*
Puerto Varas, Chile, October, 28th, 2016

INSTITUT DE L'ELEVAGE

The Blond-Faced Manech dairy sheep breed

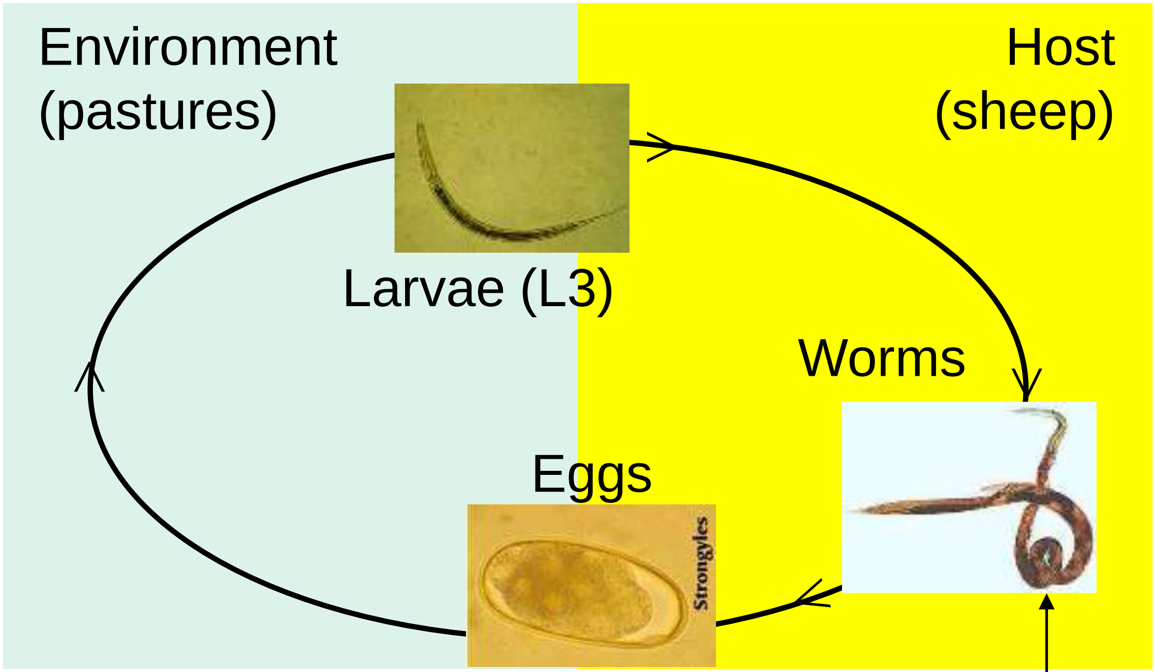
Basque country (south-west of France) : rainy and mountainous area, favorable to gastrointestinal nematodes

280,000 Blond-Faced Manech.
Efficient breeding program conducted by CDEO

- -28% ewes in selection program
- -150 AI progeny-tested rams / year

The gastrointestinal nematodes (NGI) parasites in sheep

Life cycle



Abomasum	Haemonchus contortus Teladorsagia circumcincta
Small intestine	Trichostrongylus colubriformis

Why selecting for resistance to NGI parasites ?

- **Economic** concern
  - ✓ Economic losses due to decrease of production and culling
  - ✓ Cost of the anthelminthic treatment

- Increasing **resistance to anthelmintic** molecules
  - ✓ No more effects of molecules in numerous flocks (especially in the Blond-Faced Manech flocks)

- **Environment** concern
  - ✓ Ecotoxicity => pollution of soil, entomofauna sensitive to chemical residues

Genetic selection = sustainable and efficient alternative to treatments ?

How to measure resistance to NGI parasites ?

Host **resistance** => decrease establishment, development, fecundity and fitness of the worms

FEC | Faecal Egg Count (eggs per gram)
from coproscopy = reference method

Also : **resilience** => maintain performance while subjected to parasite challenge.
Measure of packed cell volume (PCV)

How to measure resistance to NGI parasites ?

- Natural infestation on pasture
  - ✓ In many countries (Oceania, UK)
  - ✓ But : depends on meteorological conditions ; no control of species and larvae ingested

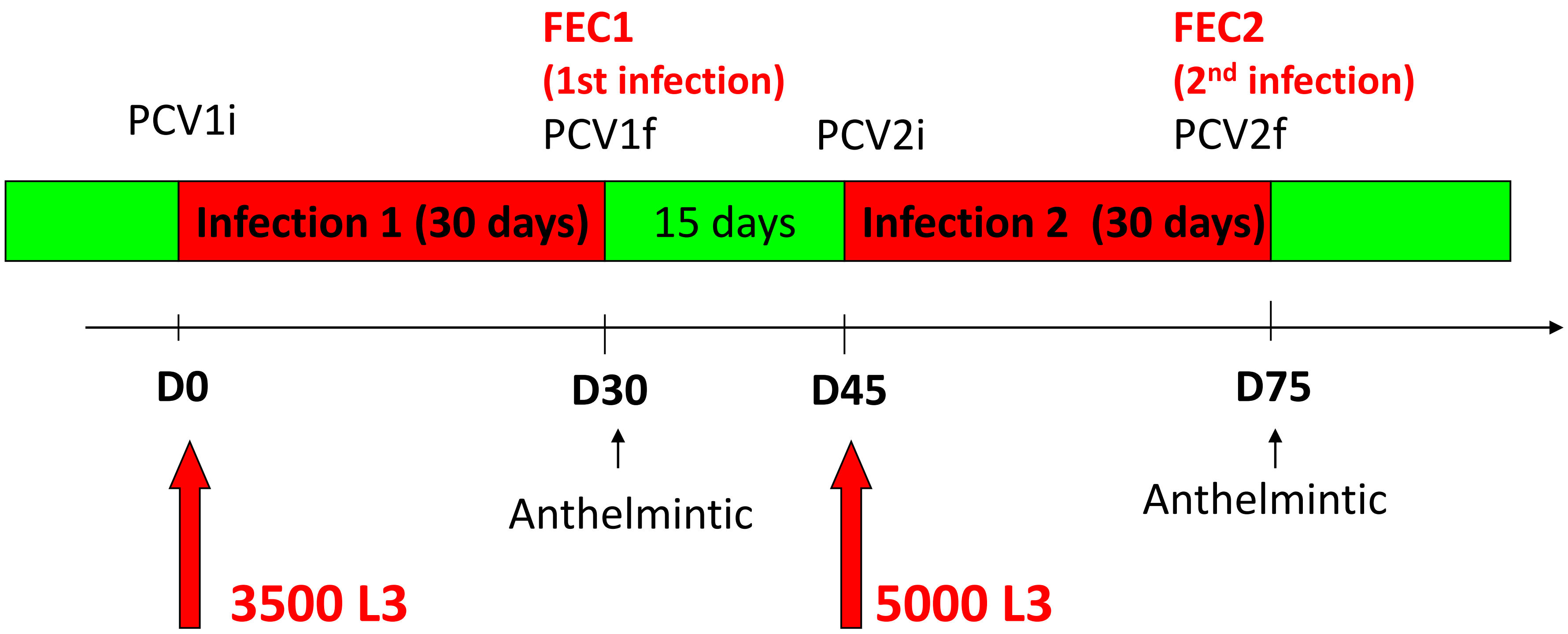
- **Experimental infestation**
  - ✓ Original design set up in France (Jacquiet at al, 2015)
  - ✓ Applied to young rams gathered in breeding centers
  - ✓ Future sires
  - ✓ Enabled by collective breeding programs
  - ✓ Rams must be naïve regarding gastrointestinal parasites

Protocol of experimental infections (*Haemonchus contortus*)

Source Jacquiet

Two periods of infection (duration = 1 month)

FEC in eggs / gram
PCV in %



What is the relevance of an experimental infection ?

- High correlation between resistance in **experimental infestation vs natural infestation** (~ 0.8 to 0.9)
- High correlation between resistance to **Haemonchus contortus *vs* other species** of nematodes (~ 1 | Gruner *et al.* 2004)
- Correlation between resistance of **young rams in breeding center and offspring on pastures** is being assessed (on-going on-farm experiments using divergent lines of rams)
- Resilience (packed cell volume) => allows to check that rams have no pathologic effects

Experimental infections in Manech Blond-Faced

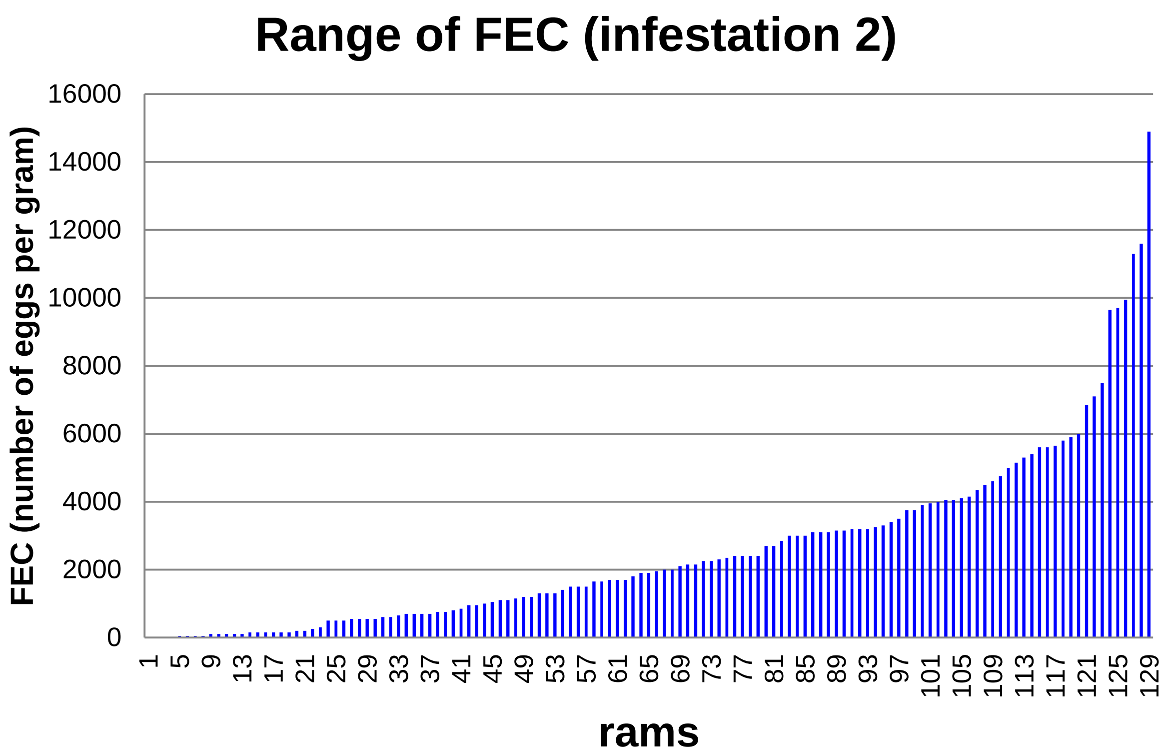
5 experimental infestations design carried out from 2008 to 2015

451 rams, mainly aged 2 or 3

	FEC1	FEC2	PCV1f-PCV1i	PCV2f-PCV2i
Mean	2141	1641	3.4	1.0
Std	2491	1787	3.75	3.15

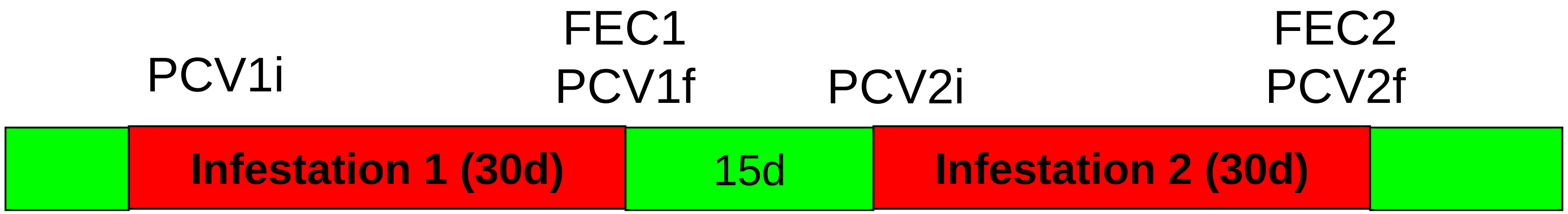
Phenotypic variability of rams

Infection 2014 : 132 rams in breeding center of Manech blond face (CDEO | Ordiarp)



=> Important variability between rams

Genetic parameters : traits and model



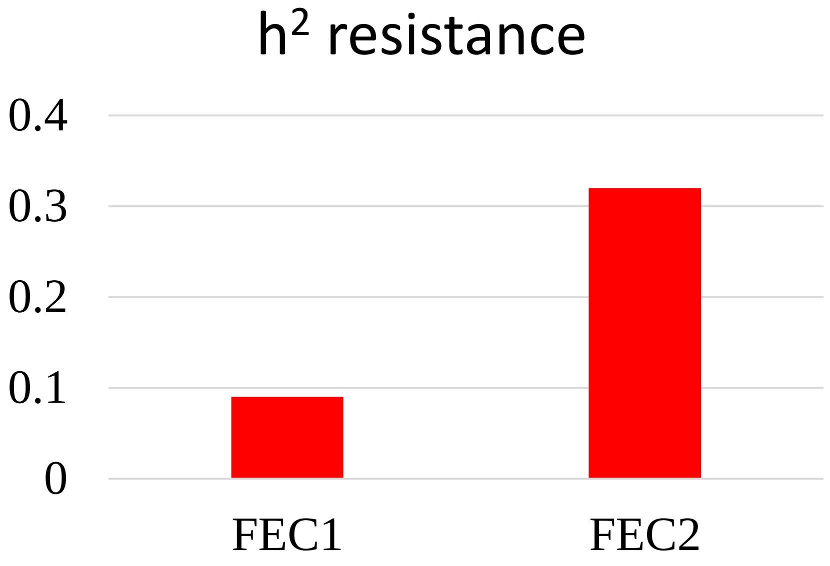
$$diffPCV1 = PCV1i - PCV1f \qquad diffPCV2 = PCV2i - PCV2f$$

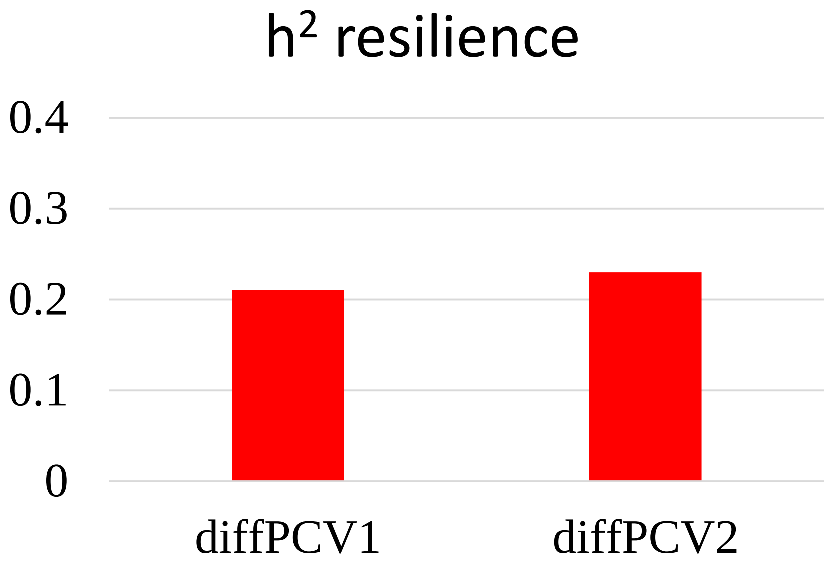
Model :

$$\left.\begin{array}{l} \sqrt{\mathrm{FEC1}} \\ \sqrt{\mathrm{FEC2}} \\ \mathrm{diffPCV1} \\ \mathrm{diffPCV2} \end{array}\right. = \mu + \mathbf{YEAR} + \mathbf{AGE} + \mathbf{RAM} + e$$

REML – VCE software
All rams from known sire
Average : 4.5 rams per sire

Genetic parameters resistance / resilience to nematodes at both infestations





$\rho_g = 0.92$

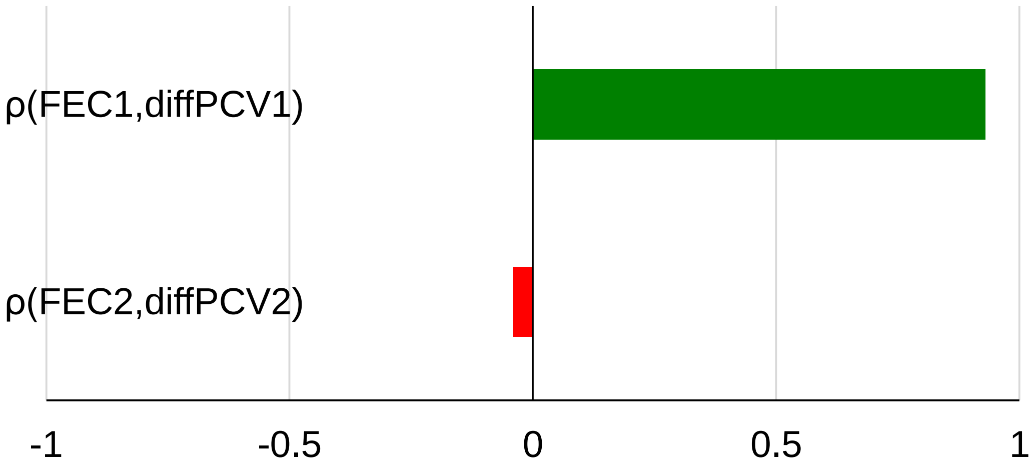
$\rho_g = -0.49$

Heritabilities moderate

h^2 FEC2> h^2 FEC1.

Surprisingly negative correlation

Genetic correlations between resistance and resilience traits at both infestations



1st infection : resistance and resilience highly correlated

2nd infection : correlation between resistance and resilience near to zero

Genetic correlation between resistance to nematodes and milk yield (MY)

- Method of estimation :

  ✓ Genetic evaluation performed on resistance to NGI parasites traits => EBV_{FEC} & REL_{FEC}

  ✓ $\rho_g = corr(EBV_{FEC2}, EBV_{MY}) / \sqrt{REL_{FEC2}\, x REL_{MY}}$

  ✓ $\rho_{g\ FEC2,MY} = \mathbf{0,184}$ **(unfavorable)**

- Slight unfavorable correlation between resistance at 2nd infestation and milk yield

Conclusion, perspectives

- **Genetic variability** of resistance to nematodes exhibited in an experimental and controlled challenge
=> **selection possible**

- **Unfavorable correlation** between **resistance & milk yield**
=> to be considered in the selection objective

- **Phenotyping** resistance to nematodes **laborious and expensive**. 2 ways to reduce costs | work

  -FEC measure : quantitative real-time **PCR** from worm DNA | currently investigated

  -Decrease number of individual FEC : measure of **FEC2 only** (moderate h2, high correlation with FEC1)

Conclusion, perspectives

- **2 strategies of selection** :
  - Short-term : resistant rams (AI) in flocks with resistance to anthelmintic
  - Long-term : classical selection with selection pressure on rams in breeding center

- Genetic evaluation have been performed for 2 years. **EBVs provided** to Blond-Faced Manech breed society

ICAR issues

- Resistance to nematodes in sheep = novel trait
- **Guidelines** could be proposed for recording resistance to nematodes
  - -under natural conditions
  - -under experimental conditions

THANK YOU FOR YOUR ATTENTION

Acknowledgements

Financial support provided by Aquitaine region (PSDR-INGEDICO program) and FGE (FENOPAR program)

Thanks to CDEO (breeding organization of Manech Blond-Faced) and ENVT (Veterinary School of Toulouse) which performed the phenotyping

A special thank to Philippe Jacquiet and his team from ENVT

Connecting on-farm systems to improve herd management and genetic level of the herd

Frido Hamoen, manager global product management information products

CRV

- Cooperative of dairy and beef farmers
- 176 million euro turnover – 1300+ fte

CRV Activities

in the Netherlands and Flanders, financial year 14/15

- Herdbook (different dairy and beef breeds)
  - 25,000+ herds, 3,000,000+ alive cows in herdbook
- Milkrecording
  - 16,500+ herds, 1,500,000+ cows in milk recording, 12,727,000+ milksamples
- Type classification
  - 7,500+ herds, 200,000+ cows
- Information products
  - VeeManager used by 10,000+ herds
- Insemination services
  - 1,300,000+ inseminations, also ET/IVF
- Genetics
  - Different breeding programs for dairy and beef breeds
- International activities in many countries, like Brazil, New Zealand, USA, various European countries and others)

CRV

Why did we develop this solution?

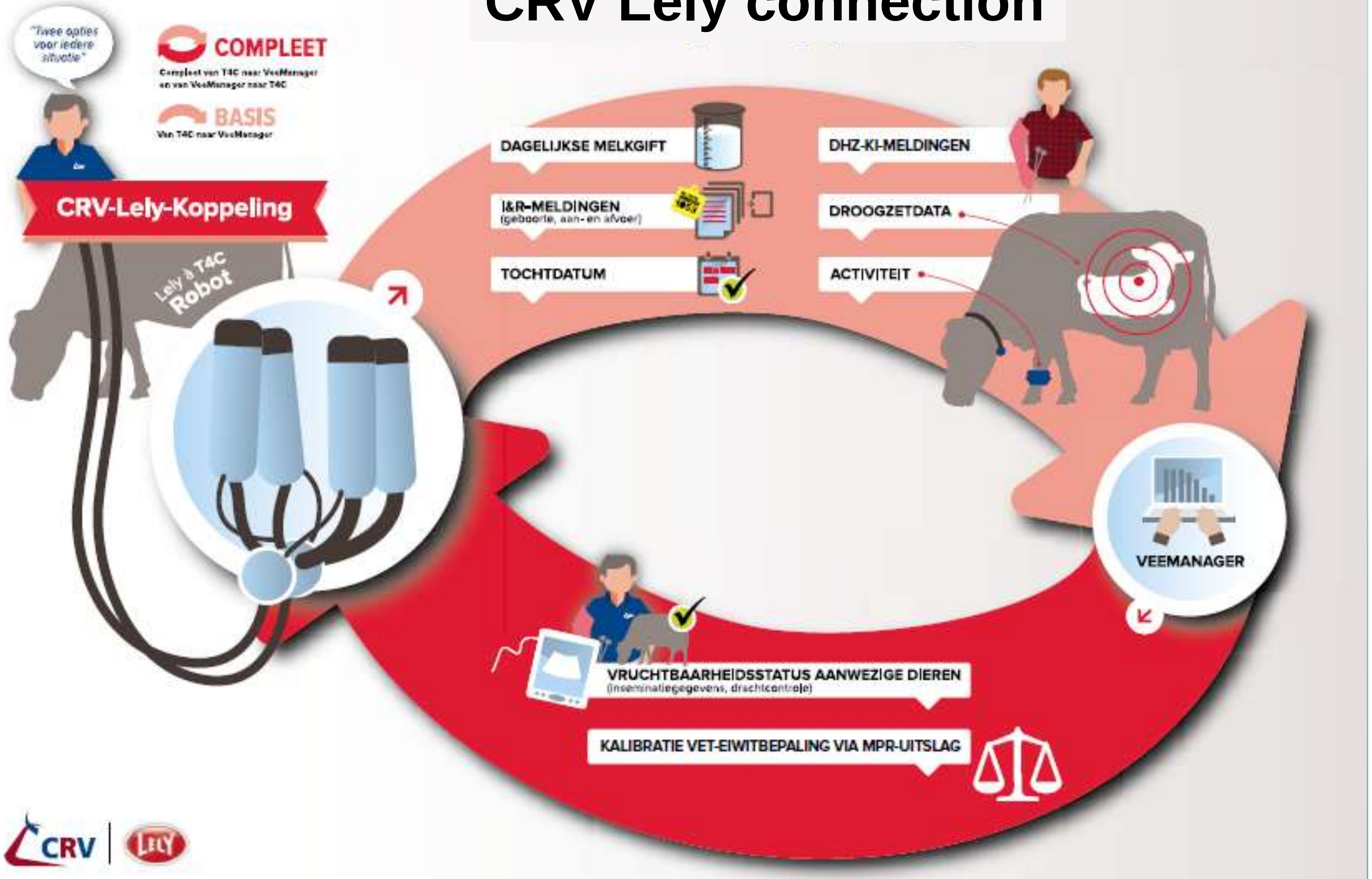
Trends
- Big Data
- Internet of things
- Smart Farming / Precision Livestock Farming

- Further automatic exchange of cow data to
  1) support the farmer with relevant management information
  2) enhance genetic improvement of the herd of the farmer

- For the farmer: less administration, saves time, less mistakes, more efficient production, higher income

CRV

CRV Lely connection

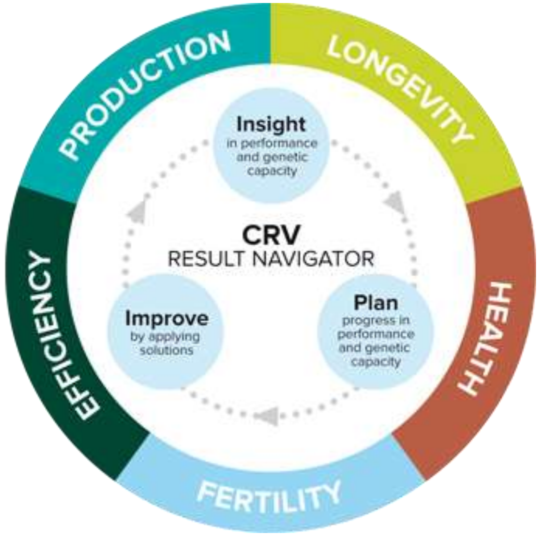


What data do we exchange?

- National animal registration system
  - Birth/calving, arrival, departure, dead.
- Change farm animal number, name of cow
- Fertility
  - Observed heat
  - Insemination data (AI and DIY)
  - Pregnancy check (palp, ultra, MR)
- Dry off date
- Daily milk yield
- Activity/Heat attentions
- Milk recording data (fat%, protein%, scc)

What does CRV do with the data?

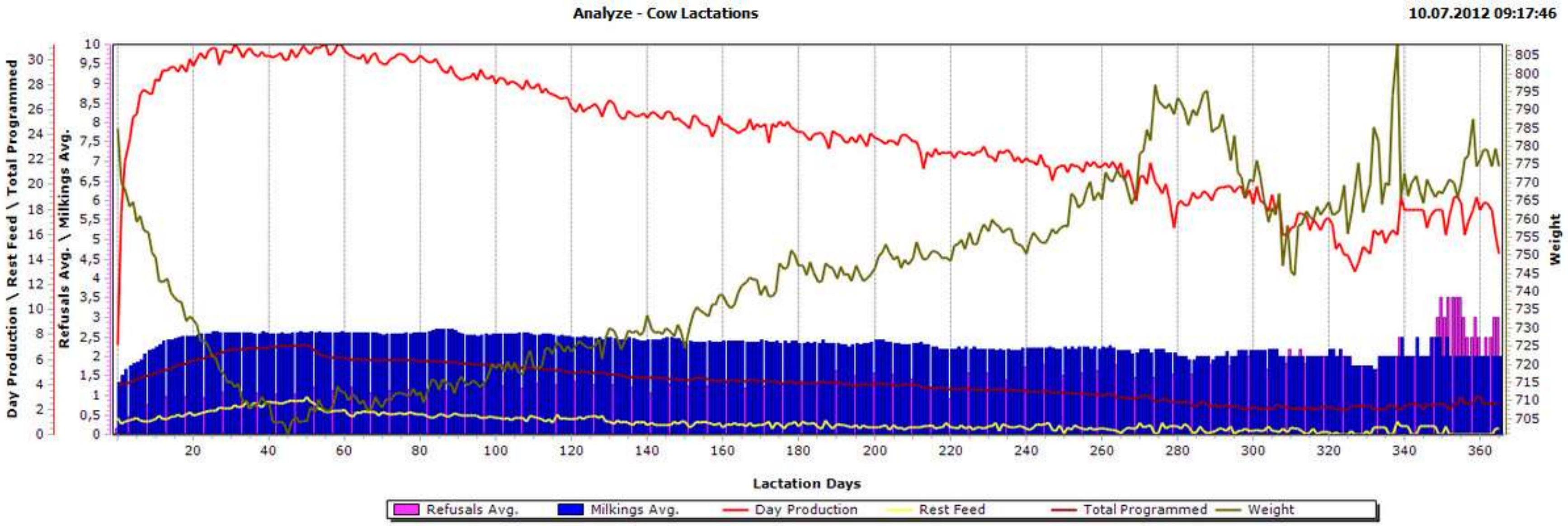
- First: Calculate daily milk yield for milk recording (cost saving).
- Second: use all available data to provide farmer with relevant information (example fertility analysis).
- Third: use all available data to genetically improve the herd of the farmer (example milk robot suitability).



CRV

What does the milking system do with the data?

- Automatic upload of all cow data at start up of new milking system
- Automatic updates on all cow arrivals/departures and fertility status
  - New cows are automatically added in the milking system
  - Expected dry off date can be calculated and feeding and milk interval adjusted weeks before dry off.
- Calibration of sensors with fat% and protein% measurements on individual cows from milk laboratory



CRV

Which systems do connect with?

	Daily milk yield	Basic	Complete	Activity
DeLaval	✓	↻	↻	✓
GEA	✓	n.a.	✓	✓
Lely	✓	✓	✓	↻
Fullwood	✓	✓	✓	✓
Boumatic	-	-	-	✓
SAC	✓	-	✓	✓
NEDAP	-	-	-	✓
SCR	-	-	-	✓
Dairymaster	-	-	-	↻
….				
✓ Introduced ↻ testing – not started				

What did we experience? Problem? Challenges?

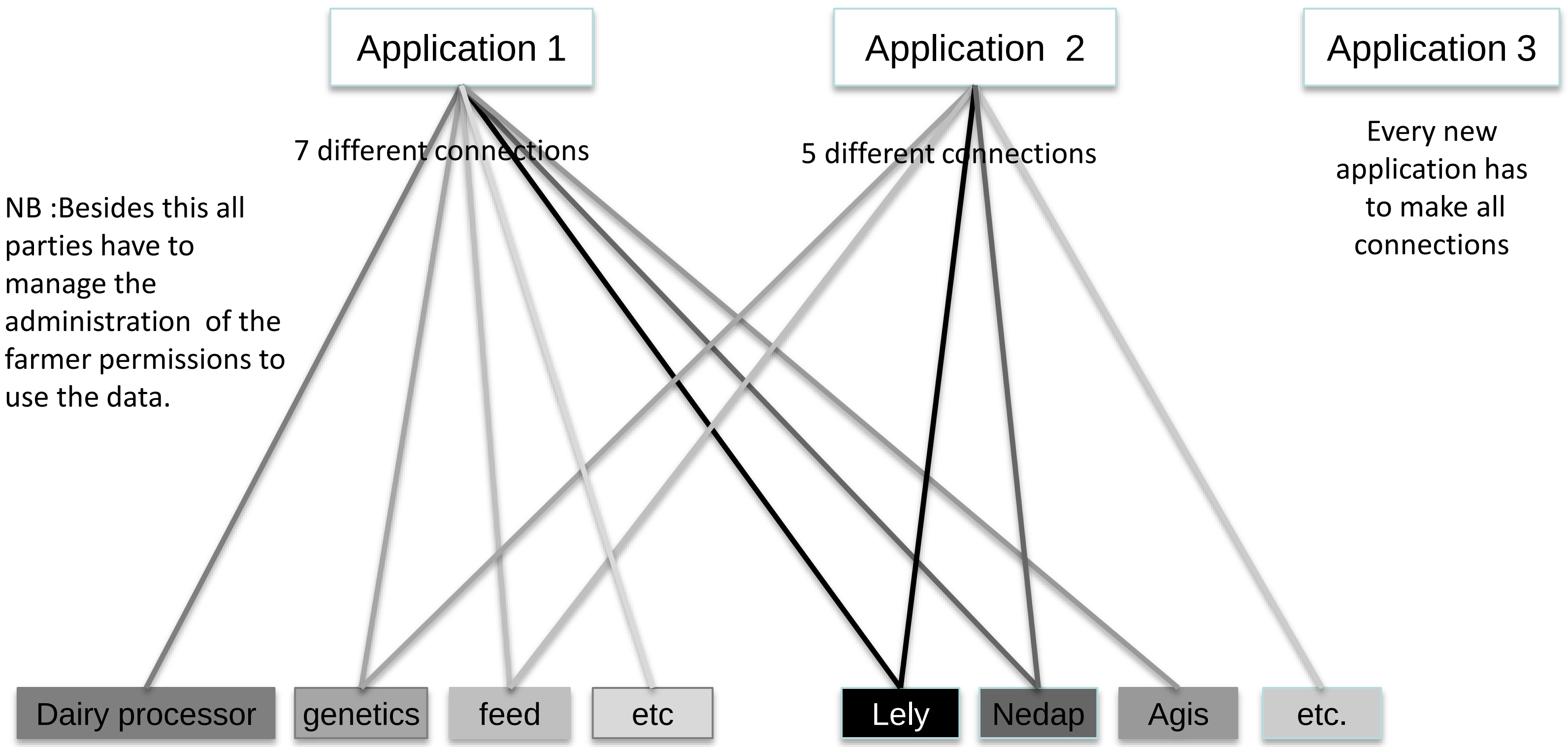
- Quality of the internet connection and the local network at the farm
- Many different standards (API, ISO, Taurus and some very outdated) to work with, or no standards at all
- Many different versions of milking system software in the field
- Updates at the milking system software
- Connection is in many cases not real-time, but once a day, or every several hours
- Complex instructions to the farmer what to input in which system and in what order
- Quality of the data (both sensor and farmer data)
- We want to add more data fields
- A lot of work to manage this all

How can we make our live easier?

- Stimulate standardization: Agroconnect and ICAR ADE workgroup

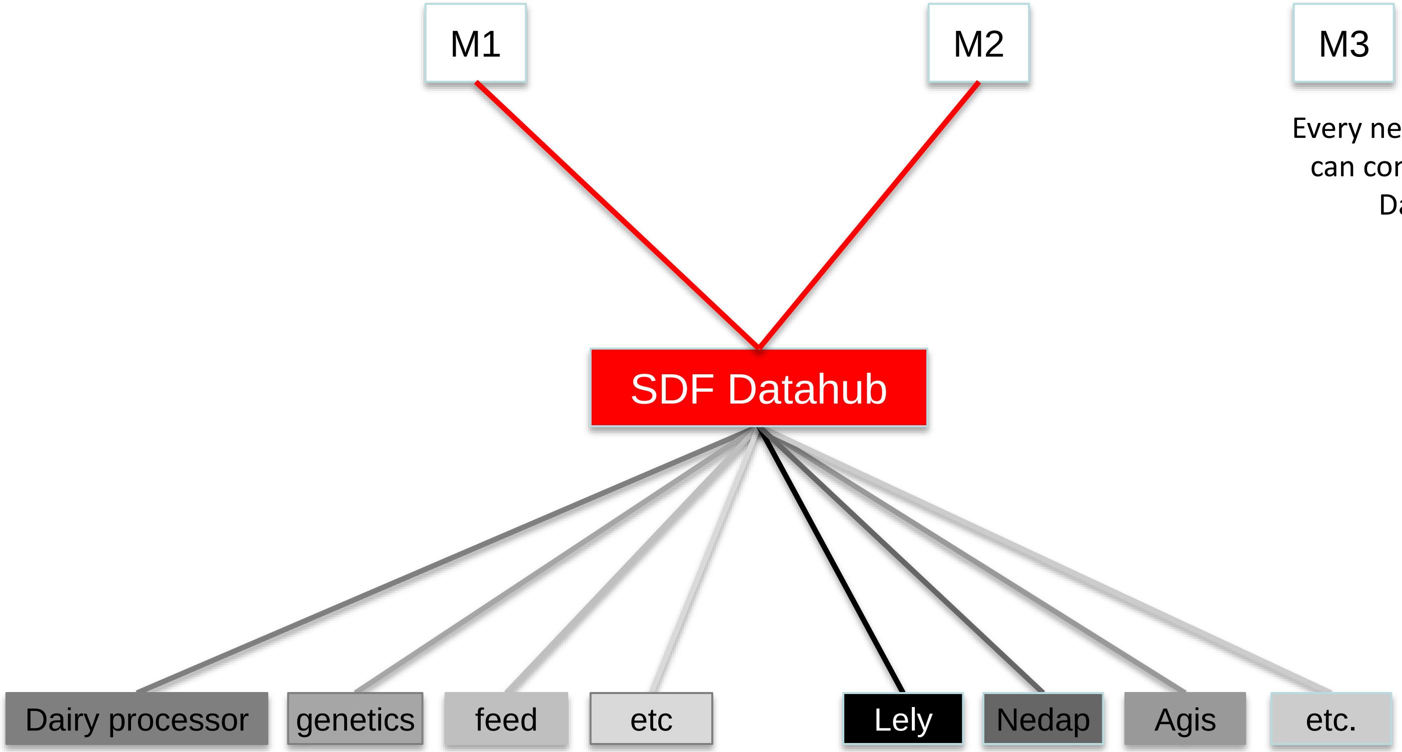
- Initiate SDF Datahub
  - Together with FrieslandCampina and Agrifirm, CRV has taken the initiative to set up the SDF Datahub.
  - This SDF datahub will solve some of the issues

Current road (simple example)



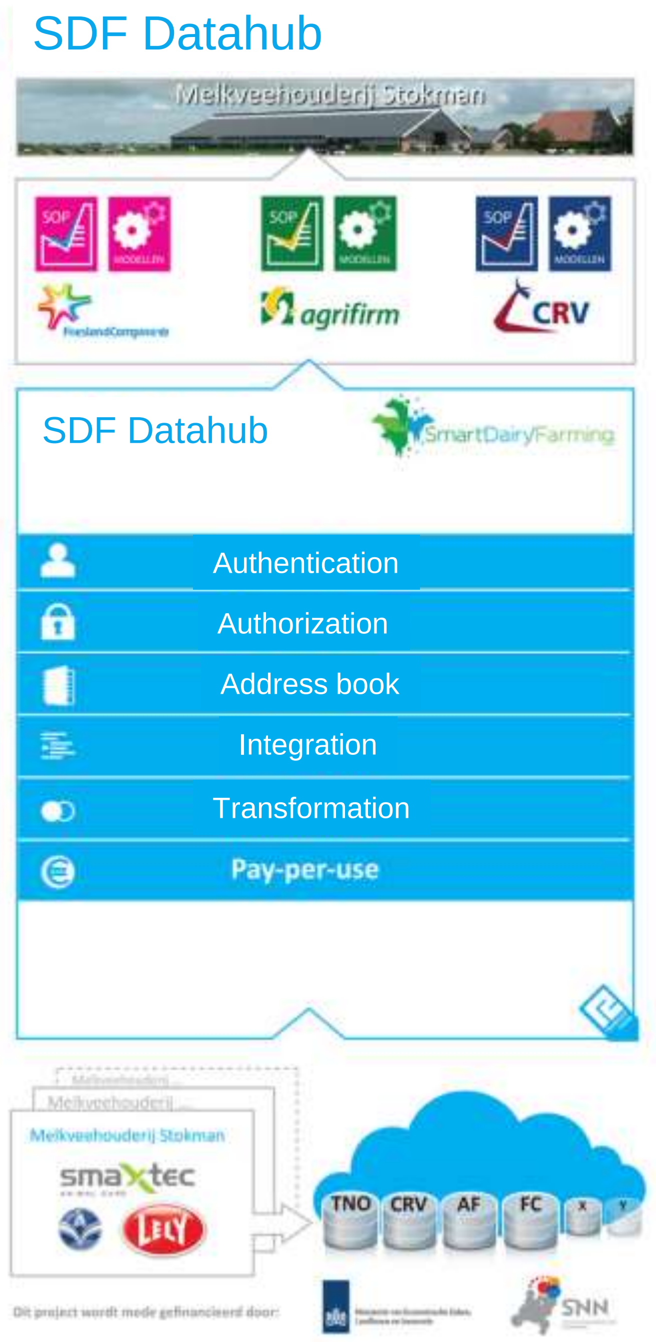
NB :Besides this all parties have to manage the administration of the farmer permissions to use the data.

Use SDF Datahub (example)



Every new application can connect to SDF Datahub

Every source has it's own standardized interface



- SDF Datahub
  - Like telephone exchange
  - No database, no storage
  - Open for all parties
  - Governed by a non profit foundation

- Using the SDF Datahub all parties can focus on their own strength
  - Develop sensors
  - Send and receive data
  - Analyze data
  - Develop algorithms
  - Milk cows
  - Feed cows
  - Processing of milk
  - …

Thank you for your attention