Sheep Industry Consultation Meeting

Tullamore Court Hotel
9th October 2013

Meeting Agenda

- **Sheep Ireland Update – Sean/Eamon**

- **Sheep Breeding Research Teagasc**

- **Sheep Index proposals – Noirin McHugh and Thierry Pabiou**

- **Genomics in sheep – Donagh Berry**
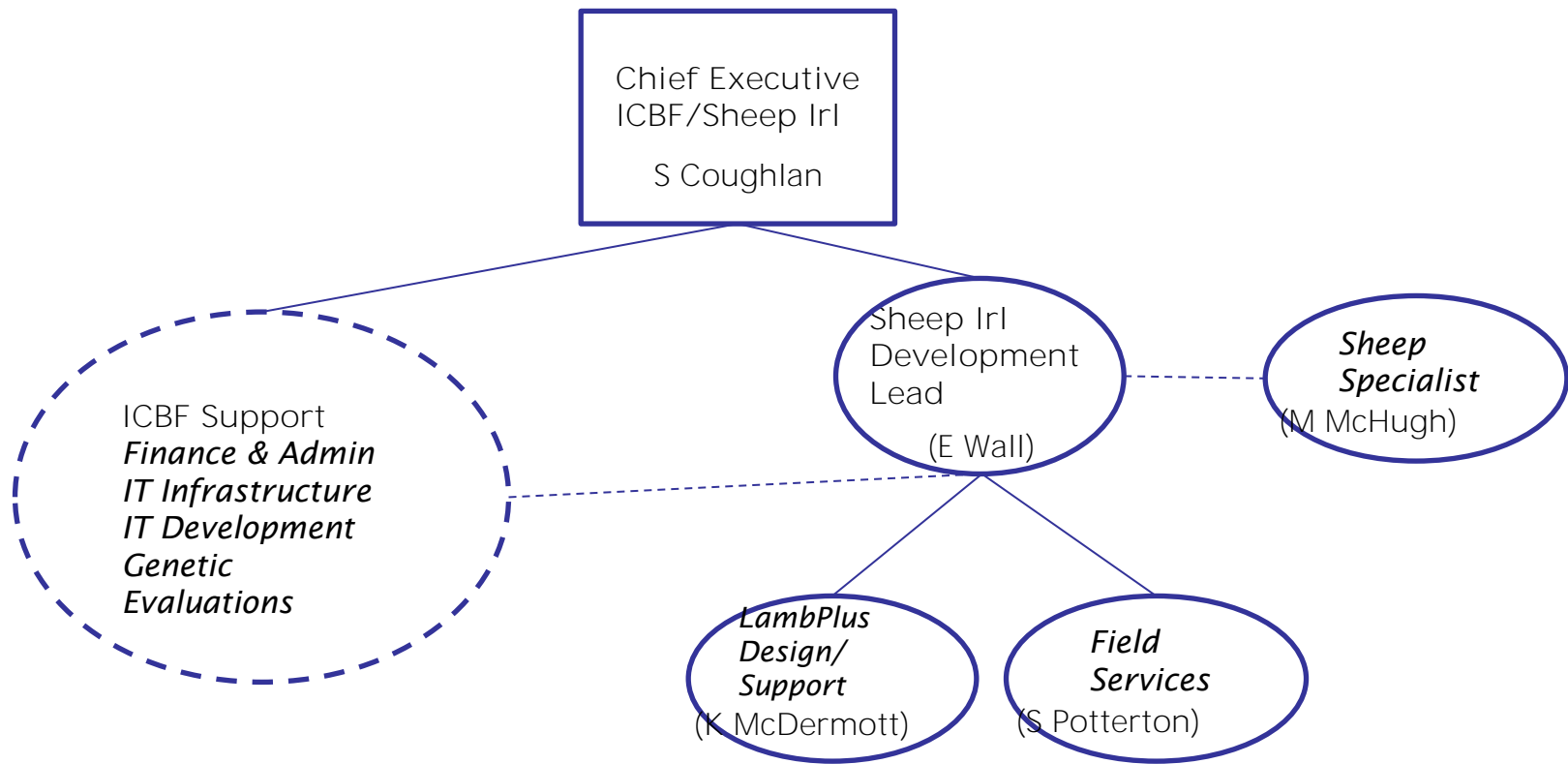
- **Discussion**

Sheep Ireland Update

Sean Coughlan/Eamon Wall

Sheep Ireland
www.sheep.ie

NDP
National Development Plan
Transforming Ireland

Sheep Ireland
www.sheep.ie

Board Structure of Sheep Ireland

- Chairman – James Murphy (IFA)
- Company Sec – John Carty (DAFM)
- Kevin Kinsella – (IFA)
- James Brosnan – (IFA)
- Dermot Ryan – DAFM
- Cormac Healy – MII
- Liam Coen – Flockbooks
- Anne Murphy – Lambplus
- Micheal O'Neill – MALP/CPT
- Sean Fair – Lamb Producer Groups

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NDP
National Development Plan
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Sheep Ireland
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Executive Structure of Sheep Ireland

Chief Executive
ICBF/Sheep Irl

S Coughlan

Sheep Irl
Development
Lead

(E Wall)

*Sheep
Specialist*
(M McHugh)

ICBF Support
*Finance & Admin
IT Infrastructure
IT Development
Genetic
Evaluations*

*LambPlus
Design/
Support*
(K McDermott)

*Field
Services*
(S Potterton)

Financing

- DAFM have been hugely supportive of Sheep Ireland
  - ~100% of funding 2008 – 2011
  - ~90+% of funding 2012
  - 80% of funding 2013
  - Farmer slaughter contribution in 2012 has been a very significant element in securing the on-going viability of Sheep Ireland

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NDP
National Development Plan
Transforming Ireland

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Two Other Key Infrastructure Components

Central Progeny Test (CPT)

- Provide linkage to enable evaluations across the industry through the use of AI on large numbers of ewes

Maternal Lamb Performance (MALP)

- Commercial flocks providing data

- Demonstrating how the indexes are working in commercial situations

CPT

- Central Progeny Test (CPT)
    - Andrew Moloney
    - John Large
    - James Napper
    - UCD

- Focus now changing away from 'linkage' to higher index maternal rams
- Have been key in getting Sheep Ireland off the ground in terms of Indexes

MALP

- MALP Flocks
  - Now 12 flocks
  - Have been very supportive
  - Big learning curves
    - Using Micro-satellite for parentage testing did not go well
    - Move to Single Sire Mating in 2013 and new on-farm software – significant data difficulties that we are still finalising
    - Returning of data on indexes has been too slow as a result
  - Focus now staying with SSM
  - Some moving towards whole flock SSM
  - Will be key in demonstrating outcomes of todays discussions on indexes

LambPlus

LambPlus

- 300 Pedigree rams breeders performance recorded in 2013

- 12 Malp flocks (Commercial)

- 4 CPT flocks (Commercial)

- 15 other commercial flocks submitting useable single sire mating data to SI

Sheep Ireland Map

Flockbooks

Breed Flock books

- Texel flockbook – all 220/230 members engaging with Sheep Ireland
- Belclare flockbook – all 25 members involved in LambPlus
- Galway – Approx 30 breeders recording parentage only

- Engaging with all other societies to provide €uro-Star information for sales catalogues etc.

Where is Sheep Ireland today?

STAP – Sheep Technology Adoption Programme

- Has put Sheep Ireland on the map

- Over 4500 involved and engaging with Sheep Ireland for completion of Task 1

- Greatly increased demand for recorded rams

- Greatly increased awareness across farmers

- Greatly increased interest from Pedigree breeders

Plans for 2014

Further engagement with Flockbooks on key areas for the Programme:

- Ancestry data – missing link for many breeds
- Animal Identity issues – Tattoos & NSIS
- Minimum requirements set for animal evaluations
- Inbreeding checker
- Website - www.sheep.ie – Complete overhaul of recording screens for 2014 season
- Data quality Index (2014 – 2015)
- Promotion of high Index rams/semen to recording breeders
- Improvements to Online Ram search - +25K individual ram searchs to date

Teagasc Sheep Programme

Michael G. Diskin
Sheep Enterprise Leader
Teagasc
Animal & Grassland Research and Innovation Programme
Mellows Campus, Athenry, Co. Galway.
Michael.diskin@teagasc.ie

Stakeholders Meeting, Athenry, 9th October 2013

CONTEXT

- **32,500 Sheep producers Nationally**

- **2.5 million ewes**

- **Average flock size < 100 ewes**

- **Low weaning rate 1.3 lambs /ewes**

- **81% of lamb meat exported**

- **Efficient lamb production give very good incomes**

- **Increased lamb prices for 2010 to 2012**

- **Significant scope for increasing output at farm level & nationally**

- ***Food Harvest 2020***

- **Greater use of grazed grass**

- **Anthelmentic Resistance**

- **STAP**

Overall & Specific Objectives of the Sheep Programme

Increase the <u>productivity</u>, <u>sustainability</u> and <u>competitiveness</u> of Irish sheep production systems

- **Increase production efficiency –Grazed grass**
- **Increase the rate of genetic gain**
- **Adopt best practices in relation to animal health**
- **Improve product quality**
- **Enhance knowledge transfer to drive farm efficiencies**
- **Provide Leadership to the Sheep Industry**

Research Programme Staff

Programme	Research Staff	Collaborators
Research-Demonstration Farm & Variety Evaluation	P. Creighton, N. McHugh & M. O'Donovan (MP) + WF	T. Boland (UCD), & D. Grogan (DAFM)
Lamb Meat Quality	M. Diskin, A. Moloney, P.Allen (Ashtown), N. Claffey	F. Monaghan, N Brunton (UCD) L. Farmer
Ewe Lamb Rearing & Grazing	T. Keady, C Lynch, B Good & O Keane,	
Flock Health	B. Good & O. Keane (GR)	G. Mulcahy, T. De Waal T. Sweeney (UCD) & QUB S. Galloway & G. Davis (NZ)
Genetics	N. McHugh. D. Berry. M. Diskin	A Fahey (UCD) , Sheep Ireland J. McEwan (NZ)
Bio-Economic Modelling	N. McHugh, L. Shalloo, C. O'Donoghue, P.Creighton, M. Diskin,	Sheep Ireland NUI Galway
BETTER Farm	M. Diskin, C. Lynch	Frank Hynes & Michael Gottstein. Advisors/Veterinarians

Teagasc Resources

- **Flocks**
  - Pedigree 340 ewes (Suffolk, Texel, Belclare and Cambridge
  - Non Pedigree 1050 Crossbred
  - 325 ewe lamb replacement
  - 13 BETTER farms (n~ 4000+ ewes) (10 Lowland + 3 Hill)

- **Laboratories** (Athenry & Grange)

- **Land**
  - 160 ha
  - Staff

Recent Developments on Sheep Research Programme-1

- External Funding for Lamb Meat Quality Study
  - Project Collaborators (Teagasc Athenry, Grange and Ashtown, UCD & AFBI)
  - Walsh Fellow recruited
- Research Demonstration Flock – Walsh Fellow recruited.
- Grass - Clover Evaluation for Sheep - Start May 2013
- Ewe Lamb Breeding Studies – Commenced
- Sheep BETTER farm programme extended

Recent Developments on Sheep Research Programme-2

- Anthelmintic resistance survey …ML resistance now apparent in Irish flock

- Monitoring infection in lambs on BETTER farms over the grazing season

- Evaluation of New Zealand CarLA test for use a diagnostic of GI infection in Irish sheep and selection of more resistant animals (Purebred Suffolk and Texel flock)

- Evaluate the effect of part treatment of lambs post-weaning on production and parasitological parameters

Sheep Breeding Research Teagasc

Objective

To augment and enhance the national sheep genetic evaluations

Tasks

1. **To (re)-evaluate genetic parameters for Ireland**

2. **Derive new economic values for Sheep Value Index**

3. **Benchmarking of Sheep Value Index**

4. **Research new traits for potential inclusion in the index**

1. Evaluation of genetic parameters

- **Knowledge of genetic component of each trait essential for genetic evaluations**

- **Original genetic parameters estimated in 2008**

- **Large amounts of data available**

- **Will improve genetic evaluations and accuracy**

- **Implemented late 2014**

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2. Economic values

- **A bio-economic model is needs to accurately determine economic values for breeding (EBI)**
- **Breeding values are now available for sheep**
- **Optimal weights for these traits and consistency across production systems needs further investigation**

3. Benchmarking Sheep Value Index

- New proposal for the establishment of elite genetics flock

- Compare NZ versus Irish **genetic elite animals** under common environment

- Establish the **rate of achievable genetic gain** in Ireland

- Show the **variation within breed** across traits

- Establish a **nucleus flock** → superior genetics available to the industry

- Generates **genetic linkage** between NZ and Ireland

4. New traits

- A number of important traits **not included** in index to date

- **Feed Intake**

- **Health and disease**

- **Ewe longevity/ survival**

- **Data and research** required before considering inclusion of traits in the index

Conclusions

- **Genetic evaluations are available for sheep**

- **Large progress made but lots more to do**

- **A large amount of research is continually required for genetic evaluations**

- **All research will be undertaken in consultation with Sheep Ireland**

Proposition for new SheepIreland indexes

T. Pabiou[1], T. Byrne[2], E Wall[3], M. McHugh[3], K. McDermot[3], & N. McHugh[4]

[1] ICBF & SheepIreland – [2] AbacusBio – [3] SheepIreland – [4] Teagasc

09 Oct. 2013

General goal of animal breeding

- Obtain future generations of animals that will produce more efficiently under future production circumstances
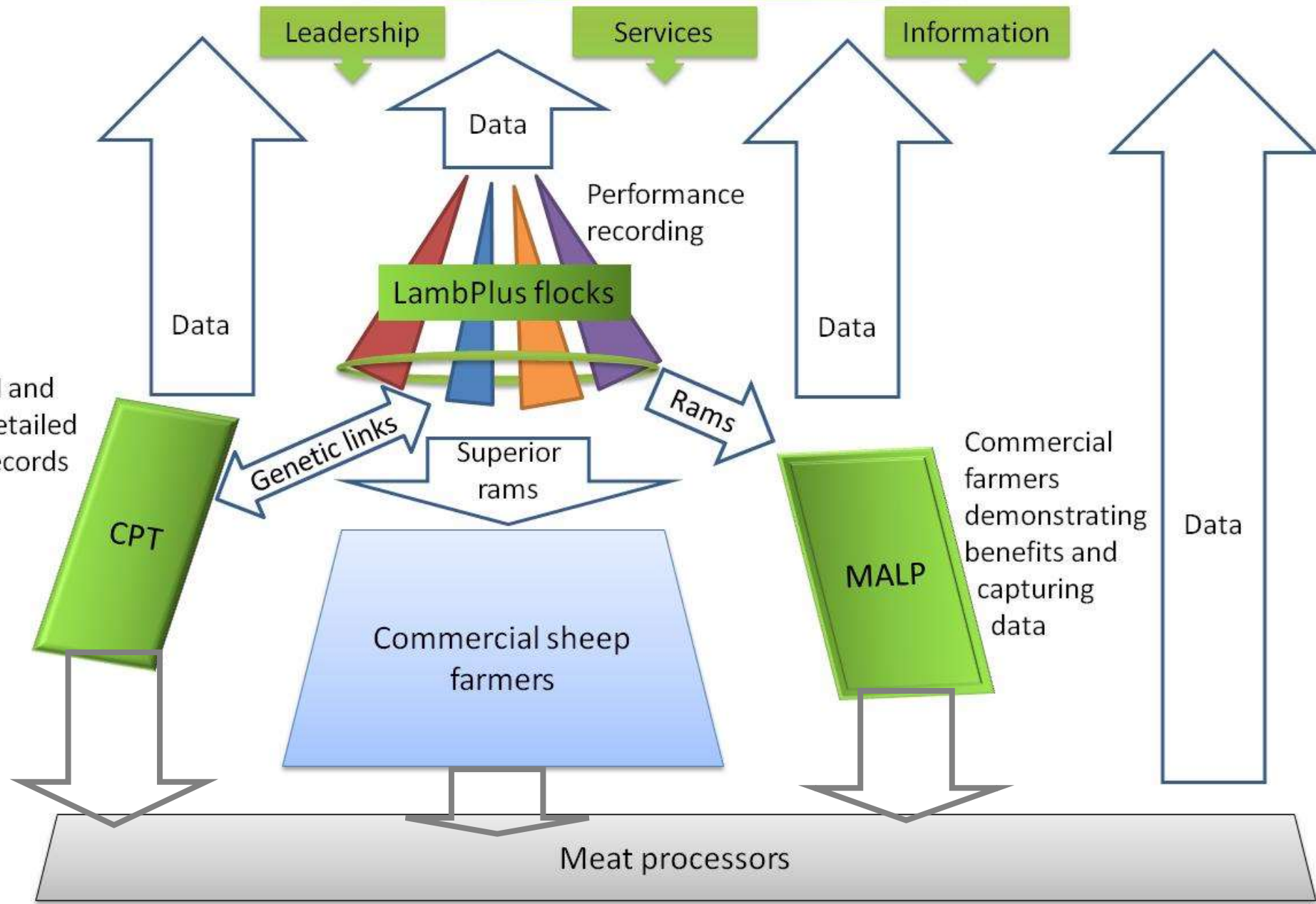
Why Indexes?

- GOAL: Increase profitability
  - Many traits contribute to profitability
  - Develop indexes to allow selection on multiple traits
  - Index = group of traits weighted by **€** economic importance (economic weight)

- Indexes = tools to select more profitable animals

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Genetic Evaluation

Good
quality
data

+

Good
quality
model

=

Good
quality
EBVs

From Records to Indexes

Predictor traits

Goal traits

Indexes

Predictor traits	Goal traits	Indexes
40 day weight Weaning weight Scan live weight Ultrasonic muscle depth Ultrasonic fat depth	Days to slaughter Carcase conf. score Carcase fat score	Production index
Lamb survival Lambing ease	Lamb survival Lambing ease	Lambing index
Lamb weights Ewe weights Litter size Lamb survival Lambing ease	Ewe effect on 　Days to slaughter 　Lamb survival / l. ease Ewe mature weight Litter size	Maternal index
	Faecal egg count Footrot	Health index

Overall Sheep Value

Sheep Ireland
www.sheep.ie

Current Indexes Perception

Lot: 148	Owner: John Murphy: Ballyvan, Hillcrest, Co. Waterford				

Animal Details		**Ancestry Details**		**€ uro-Star Indexes - 02/08/11**				

Animal Details		Ancestry Details			% Rank	Star Rating	Indexes	€ Value	Acc%
Official Id	IE041111701081E	Sire's Sire	TXC08029						
Tattoo	ZEI11019				Top 5%	★★★★★	Overall Sheep Value	€ 0.784	23%
Name		Sire's Dam	EWI08011						
					Top 5%	★★★★★	Lambing	€ 0.5	15%
Birth date	15-Jan-2011	Sire	EWI10021		Top 40%	★★★★	Production	€ 0.186	37%
Breed	Texel								
		Dam	ZEI08034		Top 40%	★★★★	Maternal	€ 0.098	26%
Sex	Female								
Birth type	Twin				**Other Key Traits**				
Dam rec	2	Dam's Sire	SJI06027		Top 20%	★★★★	Days to Slaughter	-2.273 days	42%
Musc & fat	08-Jun-2011								
scan date		Dam's Dam	ZEI06032		Top 5%	★★★★★	Lamb Survival	1.446%	22%
Comment:					Copyright, Sheep Ireland				

- Production index : adopted

- Maternal index : confusing. What ewes am I gonna end up with?

- Lambing index : how do I use it?

- Overall Sheep Value : Production or OSV?

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New Indexes

- Farmers needs to breed
  - For factory lambs

  and

  - For replacement stock

- 2 overall indexes
  - 1 terminal
  - 1 replacement

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Terminal & Replac. Indexes

Ram with 100 progenies

100 prog. express lambing ease & lamb mortality traits

50 males

50 females

50 males + 10 females progeny express slaughter traits

40 female progeny express ewe traits: maternal lambing, milk, fertility

135 grand-progenies (~4.5 lambs / ewe career)

180 g. prog. express lambing ease & lamb mortality traits

100 g. prog. express slaughter traits

80 g. prog. express ewe traits: maternal lambing, milk, fertility

TERMINAL INDEX	
REPLACEMENT INDEX	
Ewe Production	Ewe Maternal

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Terminal & Replac. Indexes

Breeding Decision to produce a replacement female is made at conception of the female ; not at point of breeding the female herself

50 females

DGEs account for multiple (lifetime) expression in replacement females and later generations

TERM

REPLACEMENT INDEX

Ewe Production	Ewe Maternal

40 fe...
ewe...
lan...

(~

...0 g. ...
lamb morta...

100 g. prog. express slaughter traits

80 g. prog. express ewe traits: maternal lambing, milk, fertility

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From Records to Indexes

Predictor traits

Goal traits

Indexes

40 day weight
Weaning weight
Scan live weight
Ultrasonic muscle depth
Ultrasonic fat depth

Days to slaughter
Carcase conf. score
Carcase fat score

Terminal index

Lamb survival
Lambing ease

Lamb survival
Lambing ease

Lamb weights
Ewe weights
Litter size
Lamb survival
Lambing ease

Ewe effect on
    Days to slaughter
    Lamb survival / l.
ease
Ewe mature weight
Litter size

Replacement index

Faecal egg count
Footrot

Health index

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Relative Emphasis

Trait	Current	Terminal	Replacement
Days to slaughter	18.14%	40.30%	13.89%
Carcase conformation	3.51%	7.80%	2.69%
Carcase fat	6.75%	14.98%	5.17%
Mat. days to slaughter	9.12%	-	10.28%
Mat. carcase conformation	2.01%	-	2.26%
Mat. carcase fat	4.07%	-	4.60%
Ewe mature weight	14.86%	-	18.25%
Mat. Lamb survival	11.09%	-	13.24%
Mat. Single Lamb diff	0.39%	-	0.46%
Mat. Multiple Lamb diff	0.21%	-	0.25%
NLB	11.85%	-	14.33%
Single Lambing difficulty	0.55%	1.12%	0.44%
Multiple Lambing difficulty	0.27%	0.60%	0.24%
Lamb survival	17.18%	35.20%	13.90%

How to use the new indexes?

● € factory lambs

● Ewe lambs

Terminal index

= selection on growth and lambing
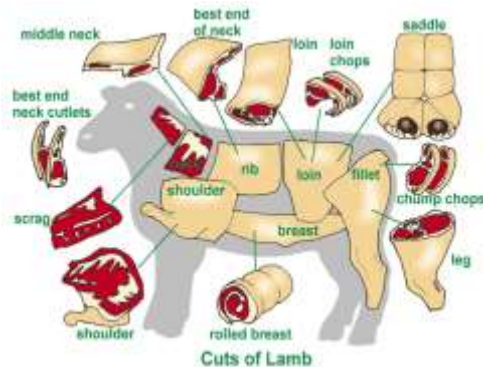
Replacement index

= selection on maternal AND production

= Use Ewe maternal & Ewe production to pinpoint strength and weaknesses of ewe lambs

Current Prod. and Terminal

CORRELATION CURRENT & NEW INDEXES — 2013 LAMBS

NEW INDEX= Ter_index | N= 55043 | Mean= 0.049 | STD= 0.208 | Min= −1.223 | Max= 1.562

CUR INDEX= Prodn_subindex | N= 55043 | Mean= 0.063 | STD= 0.253 | Min= −1.622 | Max= 1.98

CORRELATION (Ter_index,Prodn_subindex) = 0.92
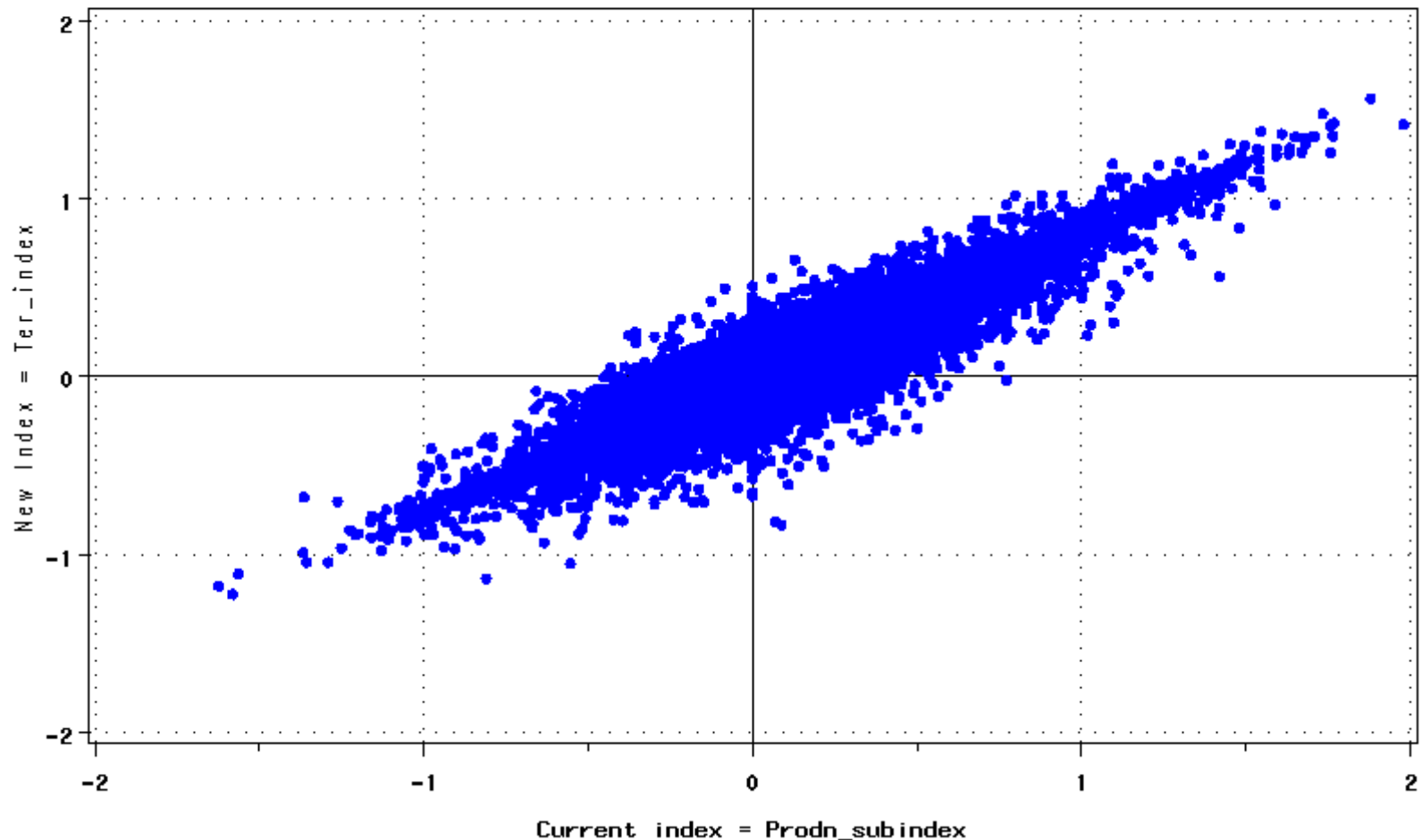
Ex: ranking VN

	Ranking of 2013 VN ram lambs	
	Current Production sub-index	New Terminal index
IE043656126634B	1	1
IE044267015163C	2	2
CMK13042	9	3
IE044267015199J	7	4
JGS13057	4	5

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Response to Selection – Days to Slaughter

45
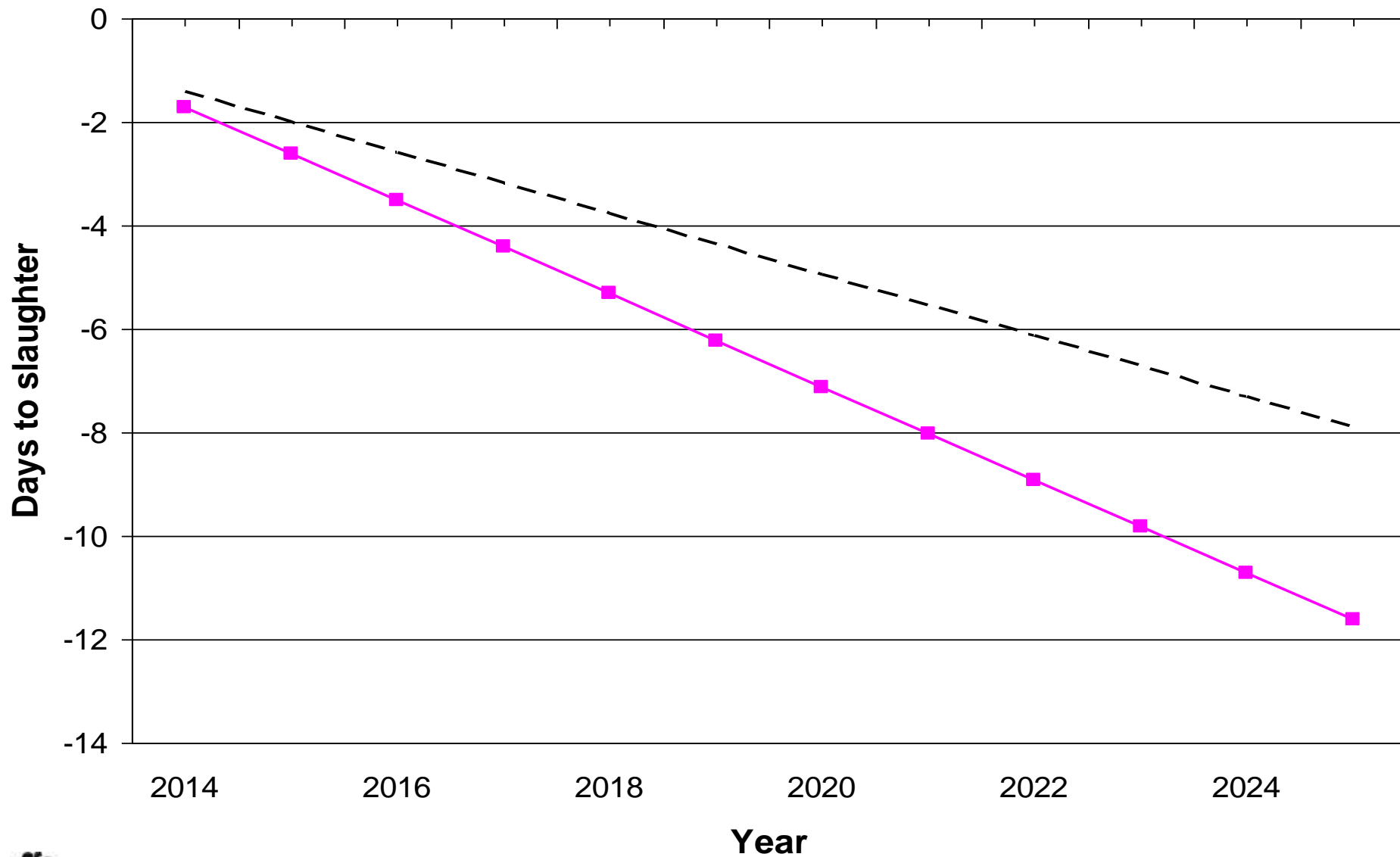
Current Mat. and Replacement
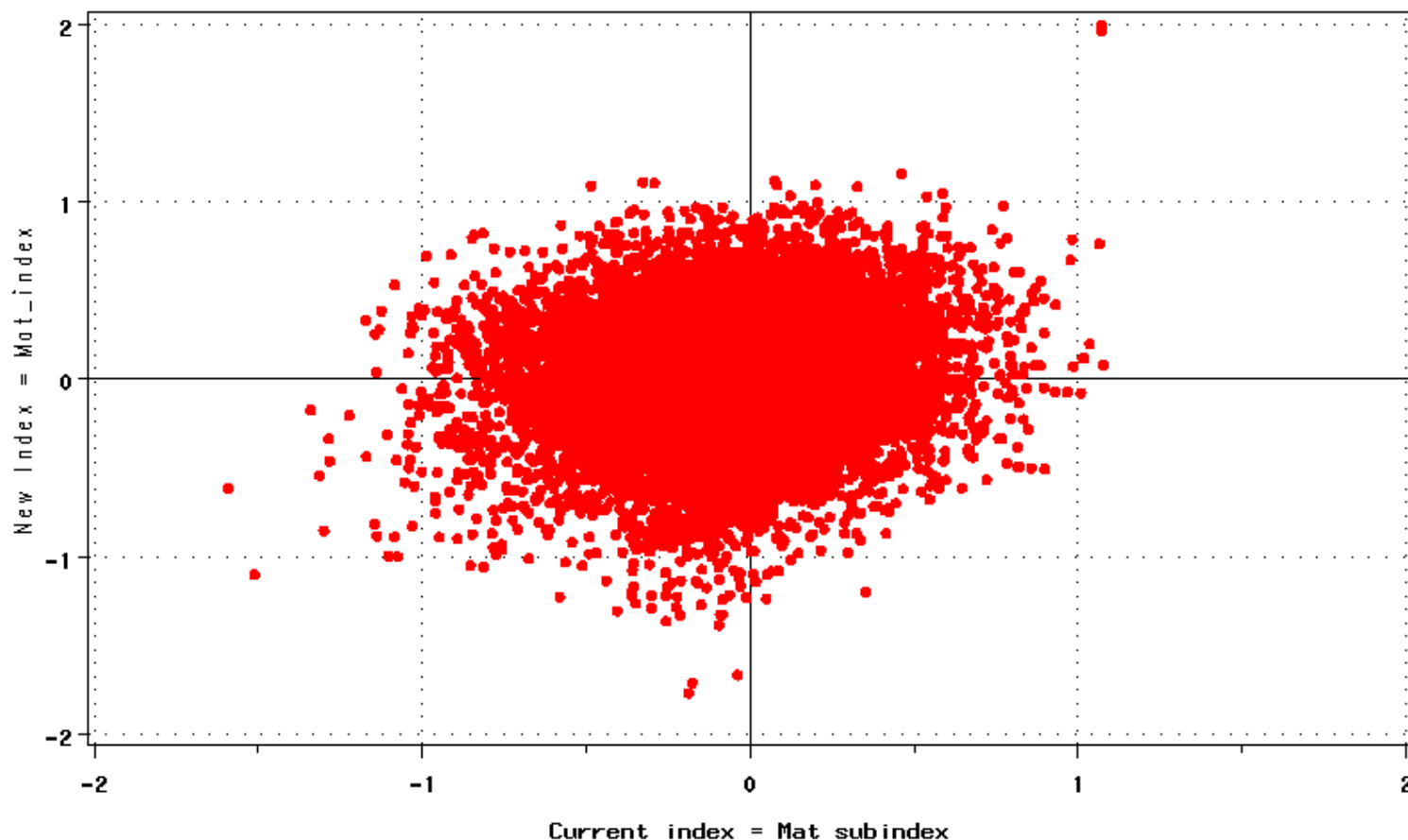
Current Mat. and Ewe Prod.

CORRELATION CURRENT & NEW INDEXES – 2013 LAMBS

NEW INDEX= mat_Prodn_subindex | N= 55043 | Mean= 0.075 | STD= 0.302 | Min= −1.94 | Max= 2.368

CUR INDEX= Mat_subindex | N= 55043 | Mean= −0.025 | STD= 0.182 | Min= −1.591 | Max= 1.077

CORRELATION (mat_Prodn_subindex, Mat_subindex) = −0.7
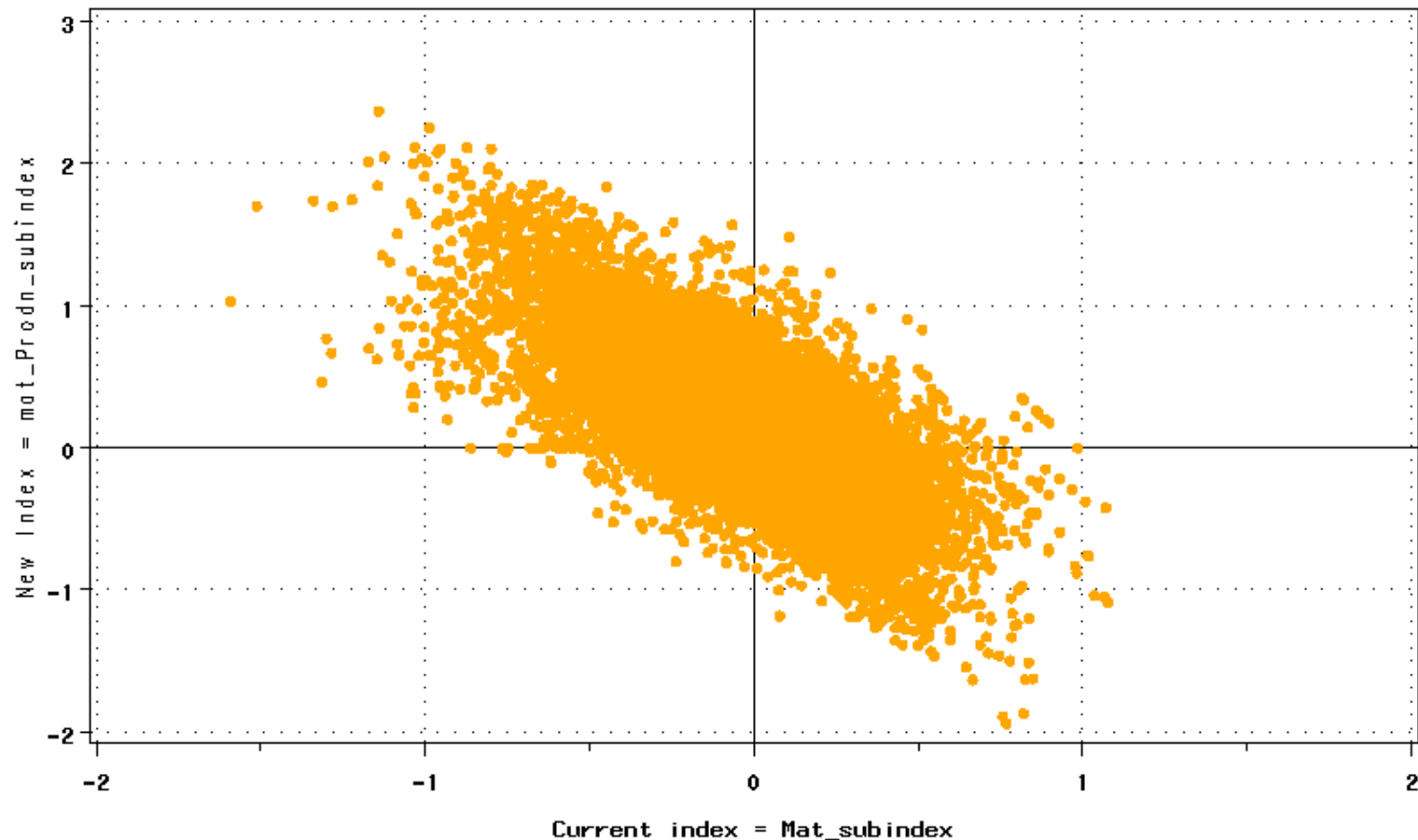
Current Mat. and Ewe Maternal

CORRELATION CURRENT & NEW INDEXES — 2013 LAMBS

NEW INDEX= mat_Mat_subindex | N= 55043 | Mean= −0.068 | STD= 0.281 | Min= −2.167 | Max= 1.596

CUR INDEX= Mat_subindex | N= 55043 | Mean= −0.025 | STD= 0.182 | Min= −1.591 | Max= 1.077

CORRELATION (mat_Mat_subindex,Mat_subindex) = 0.79

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Ex : ranking BR
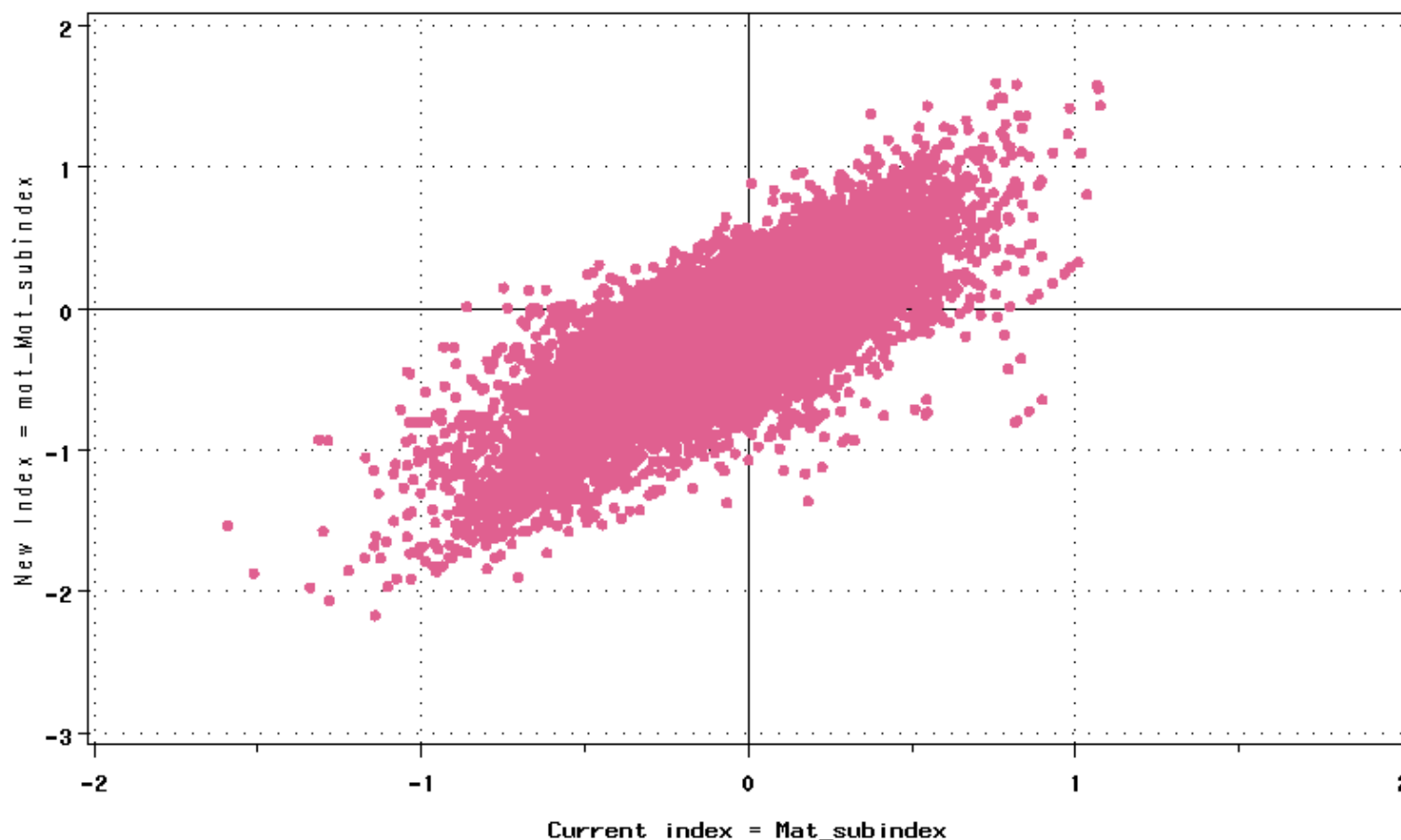
	Current Maternal sub-index	New Replacement index	Ewe Maternal	Ewe production
		Ranking of 2013 BR ram lambs		
IE044267014806G	1	74	1	1291
IE043792613640B	2	660	6	1292
IE043656126913D	3	8	3	1248
IE043792613544H	4	41	4	1242
IE041064001515J	5	797	5	1289
IE044582401482E	1262	88	1292	1

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Response to Selection - NLB

Federation Soc. Ltd 2008

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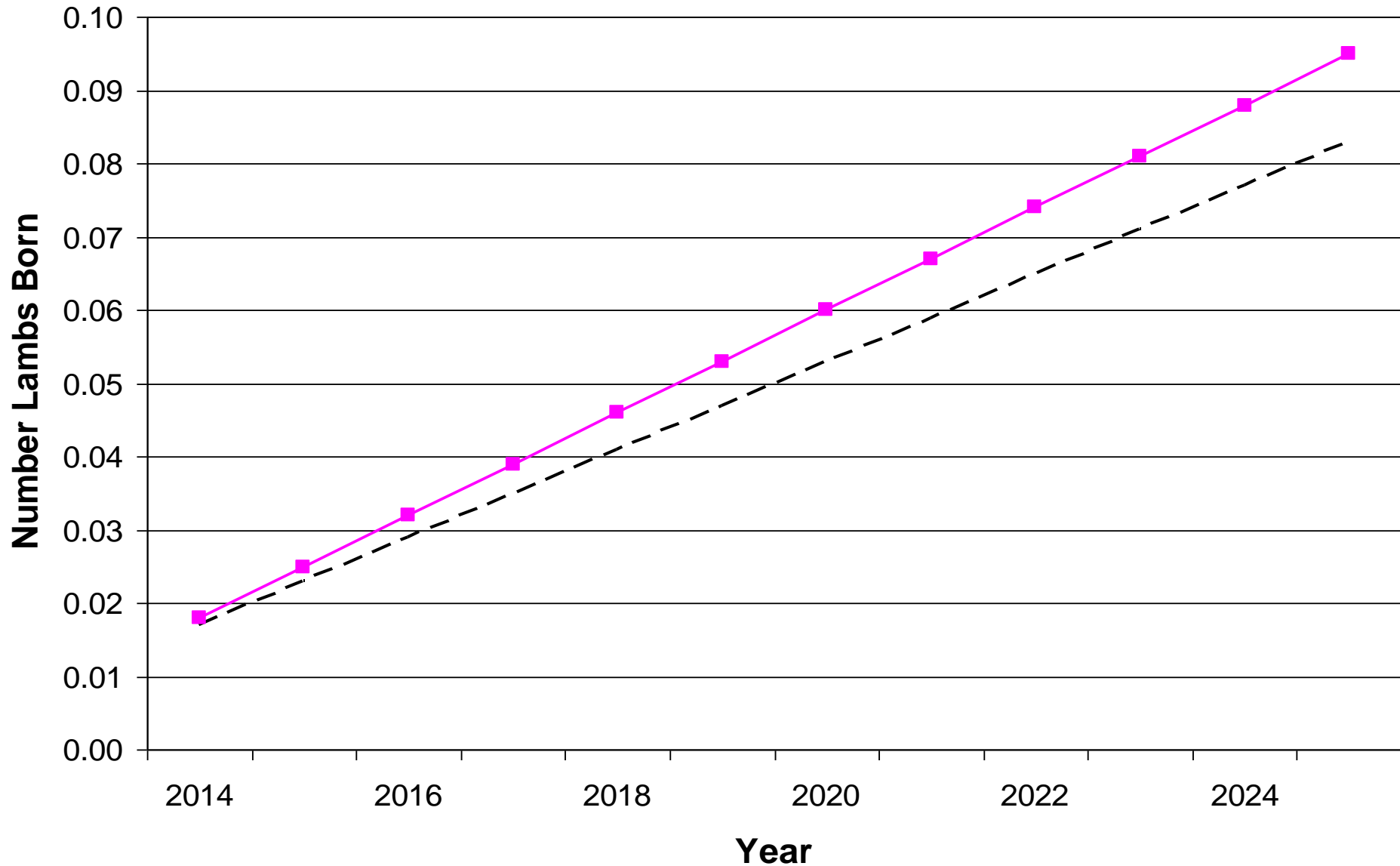
Response to Selection – Lambing Difficulty
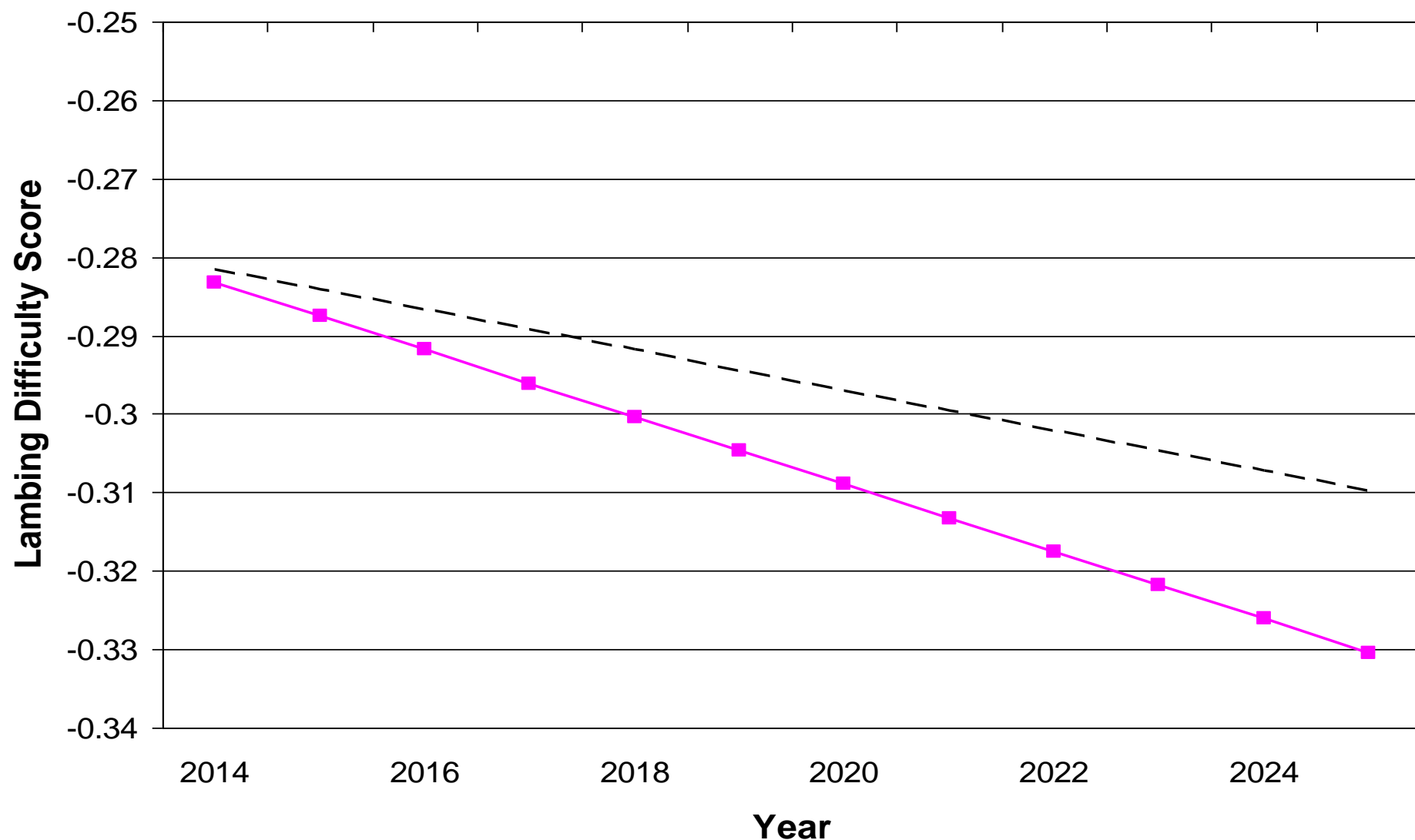
In a nutshell

- 1 Overall Index => 2 Overall Indexes

- Breeding for factory lambs and breeding for replacement = 2 ram selection strategies

- Little re-ranking in terminal index compared to production sub-index

- Replacement index :
  - **Ewe maternal index (milk, fertility, longevity...)**
  - Ewe production index (production traits of ewes)

- Better genetic efficiency for SheepIreland breeding program

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Full index correlation matrix

- Rams +25% acc OSV

	OSV	Prod.	Mat.	Lamb.	Term.	Replac.	Ewe prod.	Ewe mat.
OSV								
Production	0.46							
Maternal	0.30	-0.63						
Lambing	0.42	-0.08	0.04					
Terminal	0.60	0.93	-0.59	0.30				
Replacement	0.59	0.08	0.16	0.73	0.35			
Ewe prod.	0.46	1.00	-0.63	-0.08	0.93	0.08		
Ewe maternal	-0.26	-0.90	0.70	0.11	-0.83	0.24	-0.90	

Genomics in sheep

Donagh Berry[1], Noirin McHugh[1], Philip Creighton[2], Michael Mullen[2], Eamon Wall[3] & Thierry Pabiou[3]

[1]Teagasc, Moorepark, [2]Teagasc, Athenry, [3]ICBF

Donagh.berry@teagasc.ie

Sheep Ireland Industry Meeting, Tullamore, Oct 2013

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Genomics (DNA) is the future!!

Applicability

- **Major gene effects**
  - **Scrapie, Inverdale ….**
  - **More to come but don't be fooled by the hype**
- **Parentage**
  - **Undergoing shift in technology**
- **Genomic selection**
  - **Lets get the basics correct first!**
- **Others…**

Accuracy of genetic evaluations

33 kg

29 kg

34 kg

37 kg
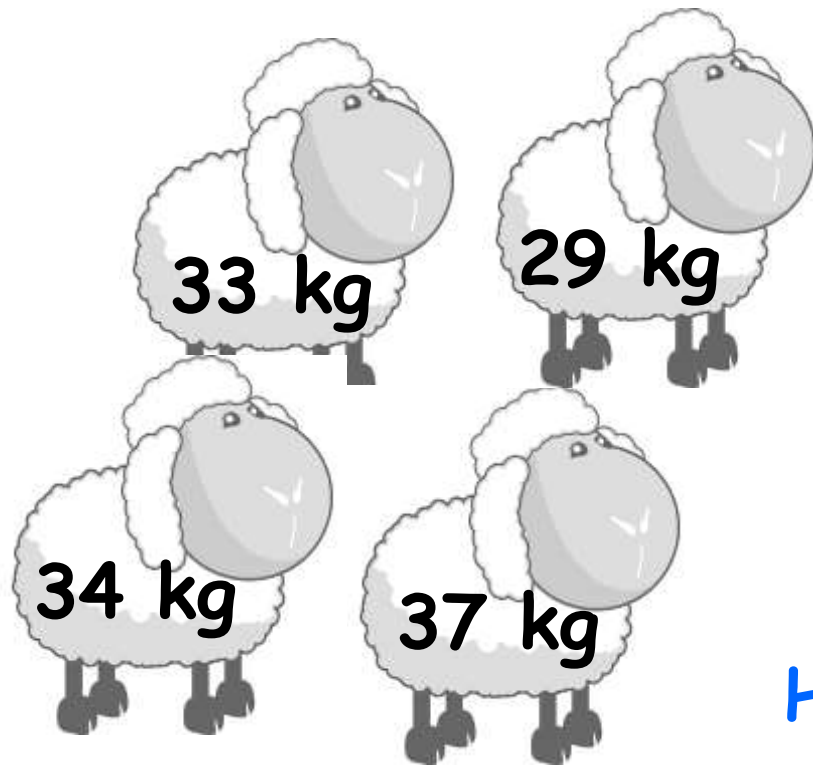
Which is genetically the best?

How accurate is our prediction?

How confident are we our prediction is correct

How much could the prediction move with time?

Impact of parentage and data
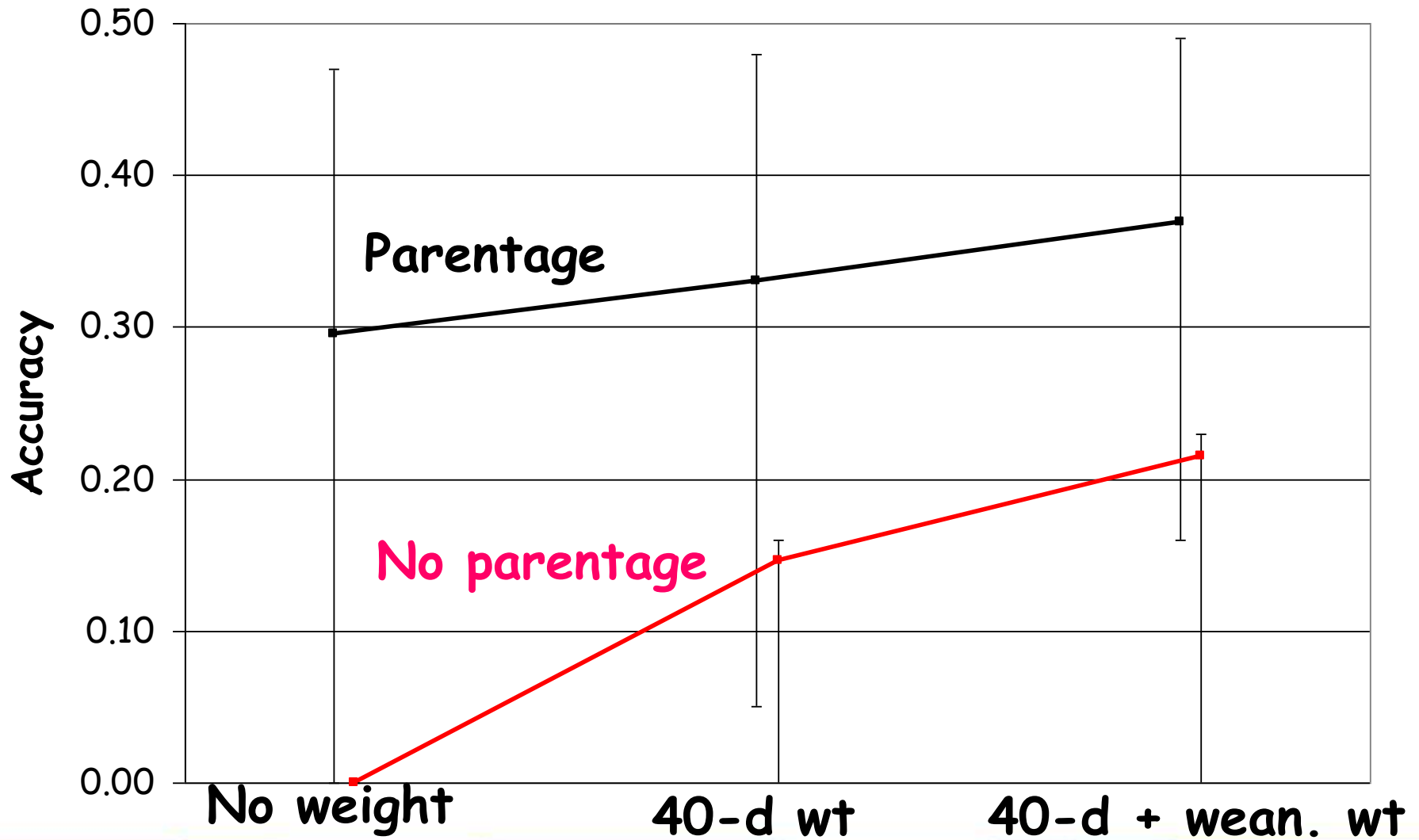
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Impact of parentage and data

Microsatellite markers

132/142 ♂   ♀ **134/136**

132/ 134 **132/ 136** **142/ 134** **142/ 136** ♂   ♂ **132/ 134** **132/ 136** **142/ 134** **142/ 136**

25% probability of each   **25% probability of each**

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Microsatellite markers

132/142

134/136
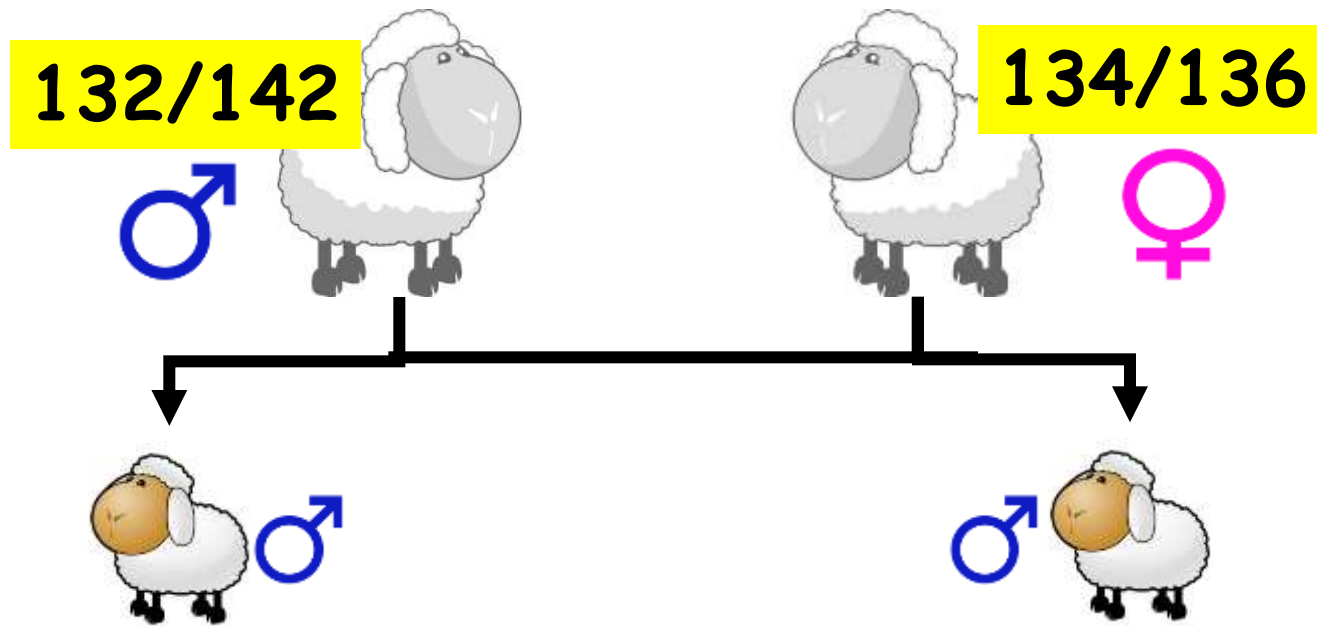
...but 14 different markers

Microsatellite markers

132/142 ♂   134/136 ♀

132/ 132/
134 136

132/ 132/
134 136

132/ xxx

Who's your daddy?

Microsatellite markers

132/142 ♂

134/136 ♀

142/ 142/
134 136

Can be errors

132/ 132/
134 136

132/ XXX

Who's **not** your daddy?
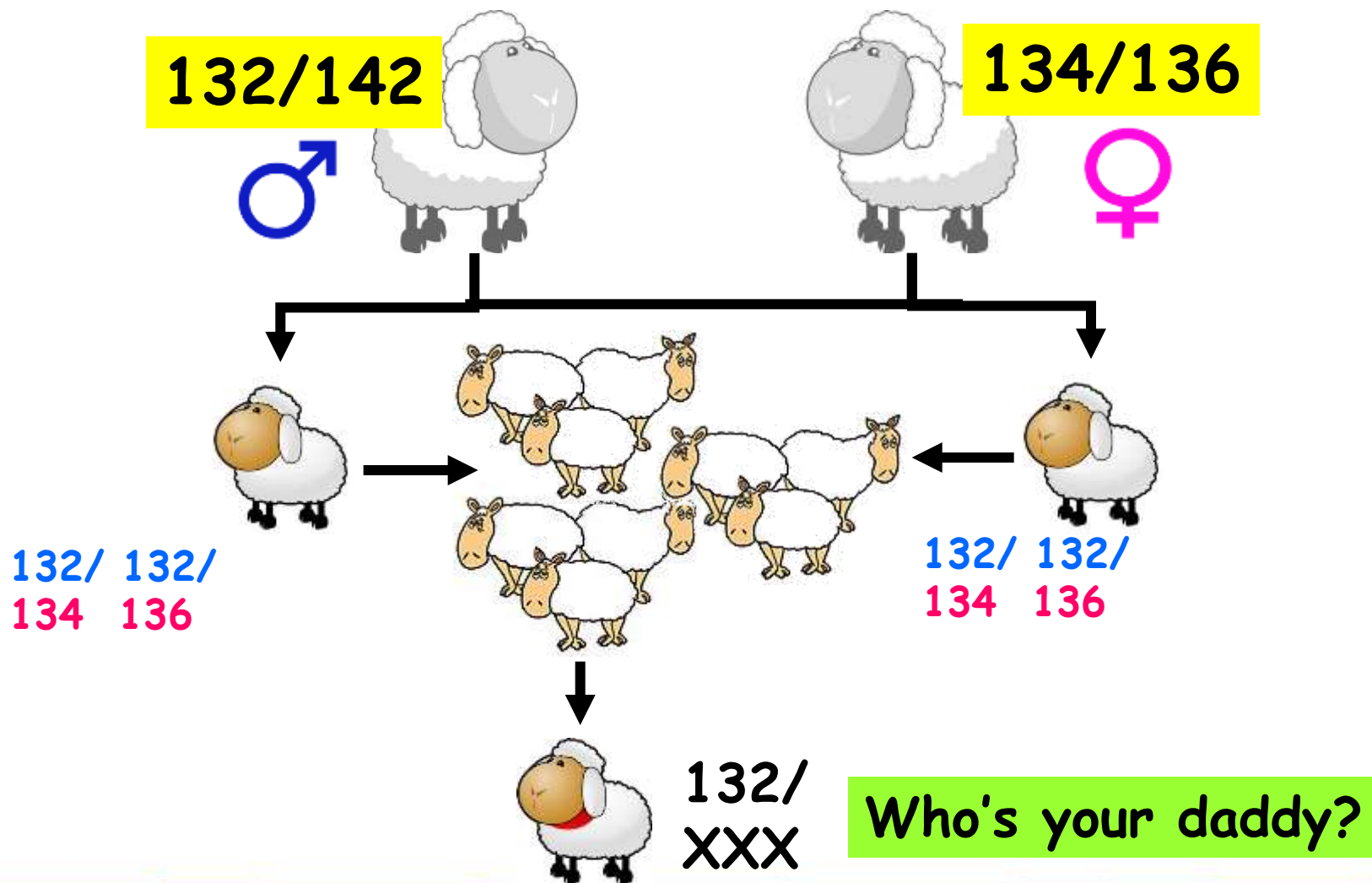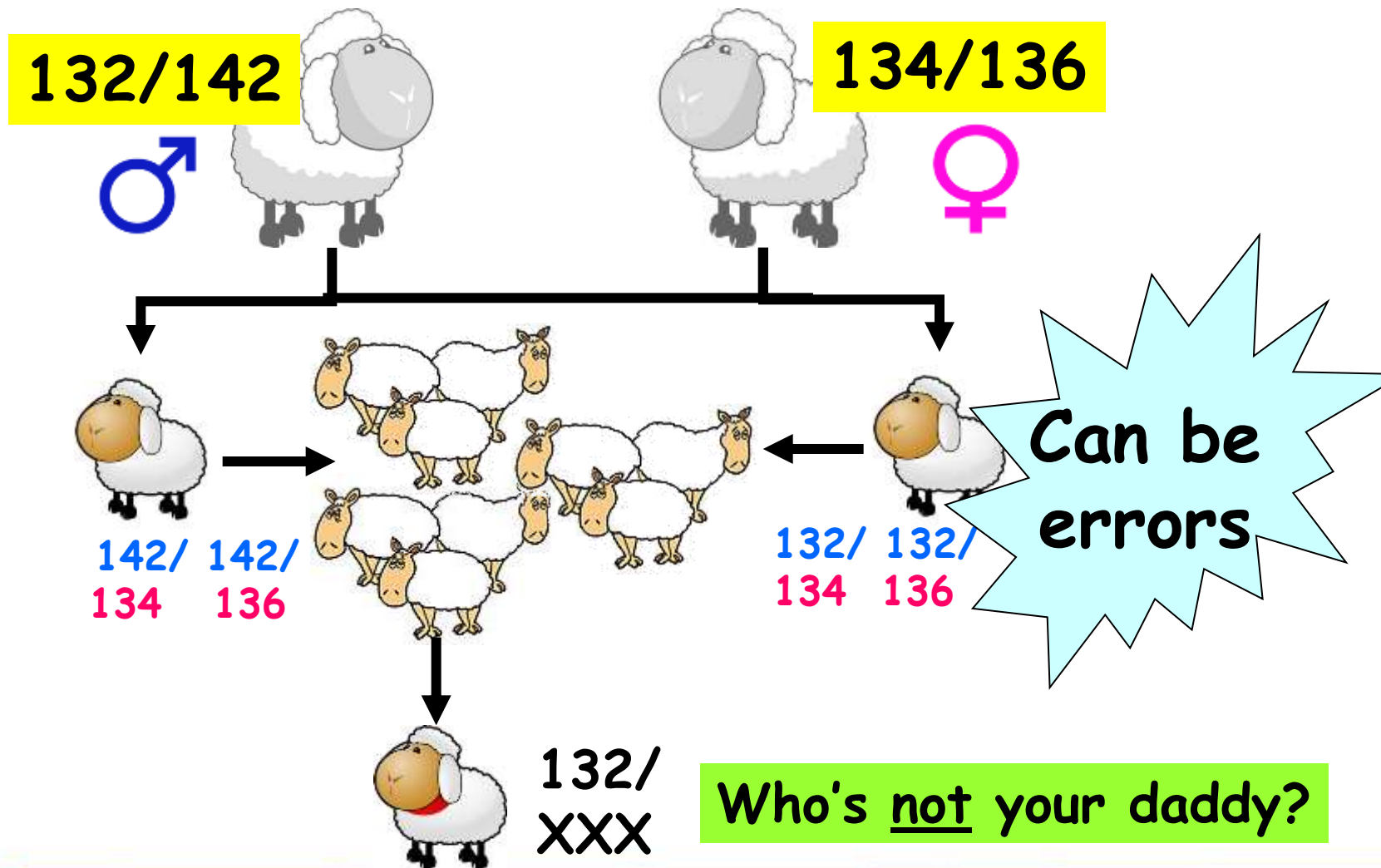
SNP technology

- Philip Creighton's 694 lamb flock
  - 10 rams (no assignment to lambs)
  - 400 ewes (assigned at birth)
  - 336 lambs
- SNP chip with >5000 SNP markers
  - Cost €37
- All lambs 100% assigned to rams with confidence
- All lambs assigned to ewes with almost 100% accuracy
  - 2 lambs mis-matched were born on the same day – likely management error

Priorities

- **Need a huge amount more data to generate accurate proofs**
  - **+ other research**
- **Need highly accurate + low cost DNA technology**
  - **SNP technology**
  - **Cattle in the process of moving**
- **Maximise the information potential per unit cost**

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Proposal

- **Custom SNP chips**
    - **High density – highly influential animals**
    - **Low density – breeding animals**
    - **Ultra low density – commerical lambs**

1. **Major genes (e.g., Scrapie)**
2. **Parentage SNPs**
3. **SNPs for genomic selection (later)**
4. **Breed assignment??**

What the cattle can do sheep can do better!

Next steps

- **Storage of biological material from all influential animals**

- Develop accurate, ultra-low, low cost SNP chip (~300 SNPs) for parentage using research data

  - **Validate on independent commercial animals**

Conclusions

- DNA is a powerful tool which is here to stay

- Extremely useful to assign parentage
  - Larger population for genetic evaluation
  - Increased accuracy of selection
  - Increased genetic gain