Meatlinc
The Ram For Quality Lamb

SRUC

Thinking about breeding differently

By *George Fell*

Lutz Bunger

History of Meatlinc

A 5 breed cross started by Henry Fell in the 1960's

Using Suffolk, Poll Dorset, Ille de France, Berrichon de Cher and Charollais

Aim:

- To create a commercial ram for commercial lamb producers that is fit for purpose
- Grass based system

After 50 years of breeding, what's next to maintain genetic progress??

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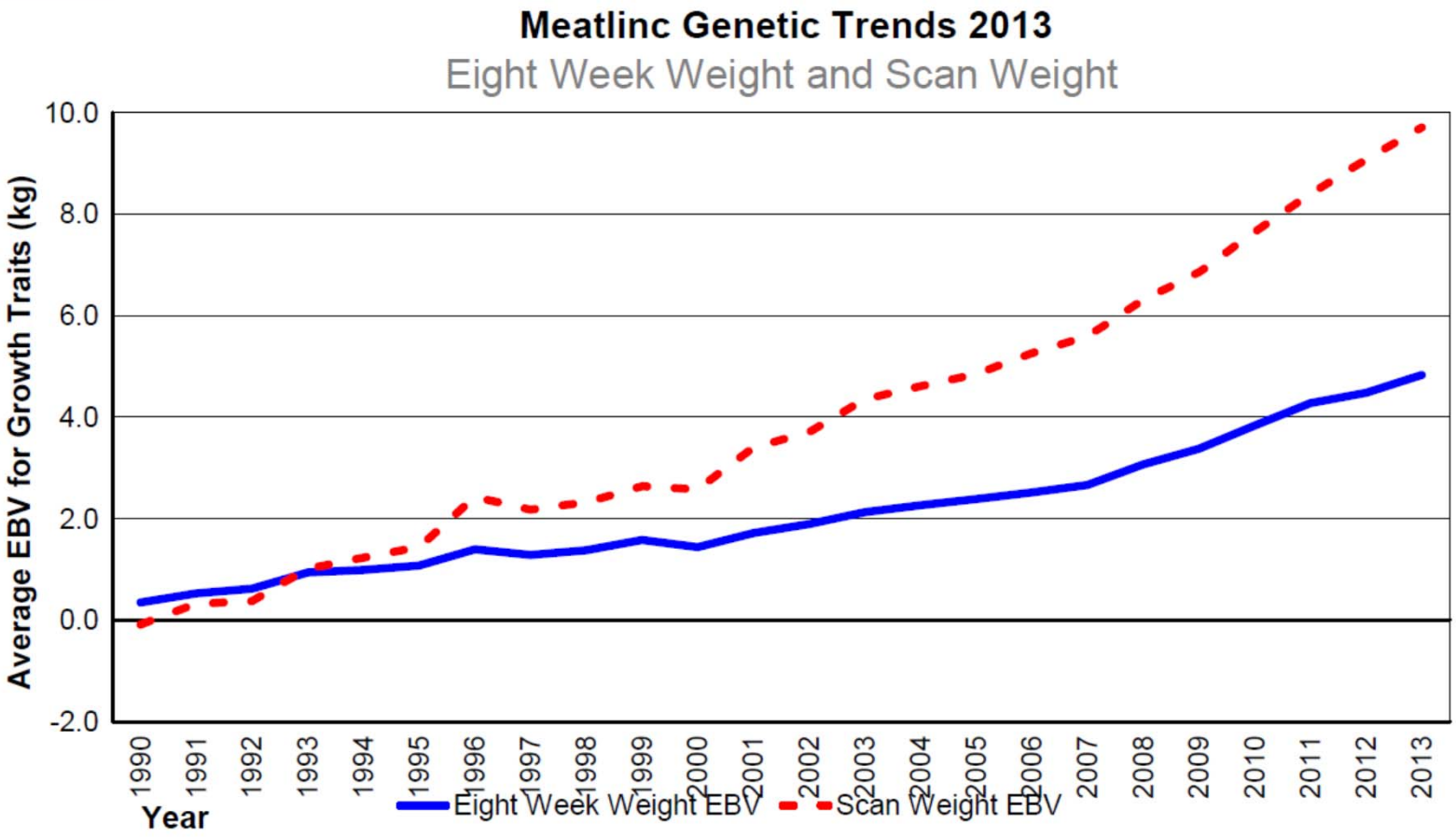
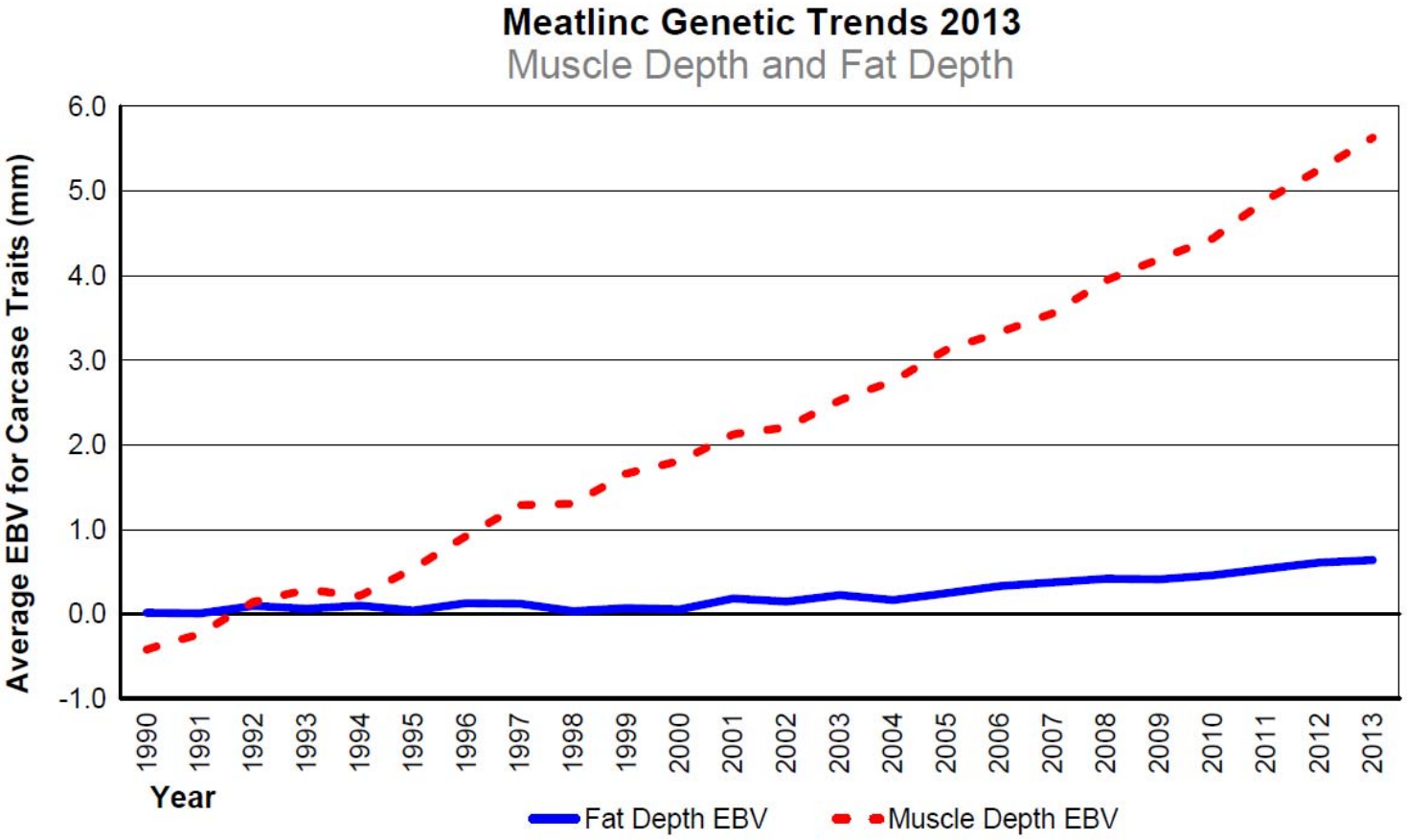
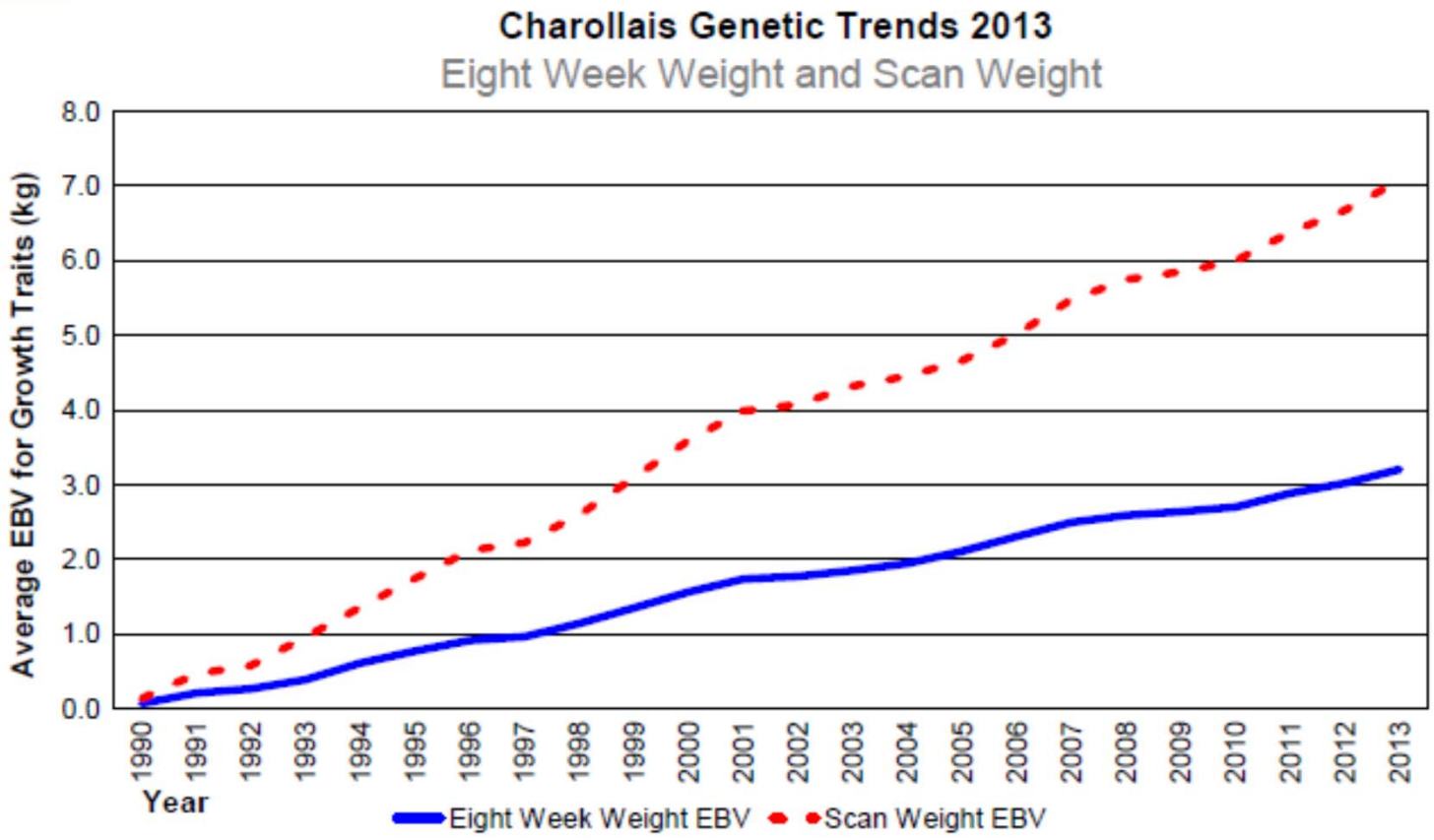
Genetic gain in the Meatlin



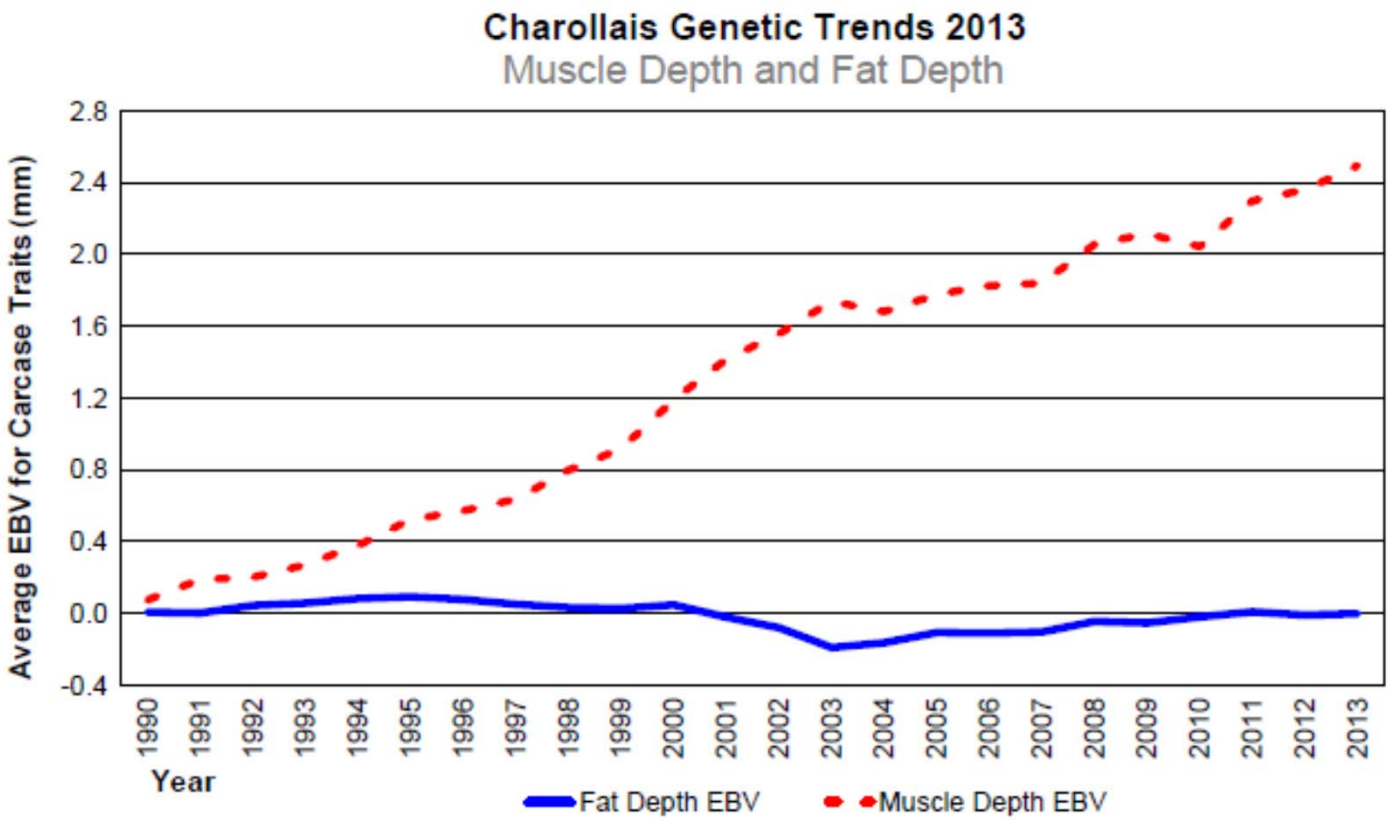
Genetic gain in the Meatlin



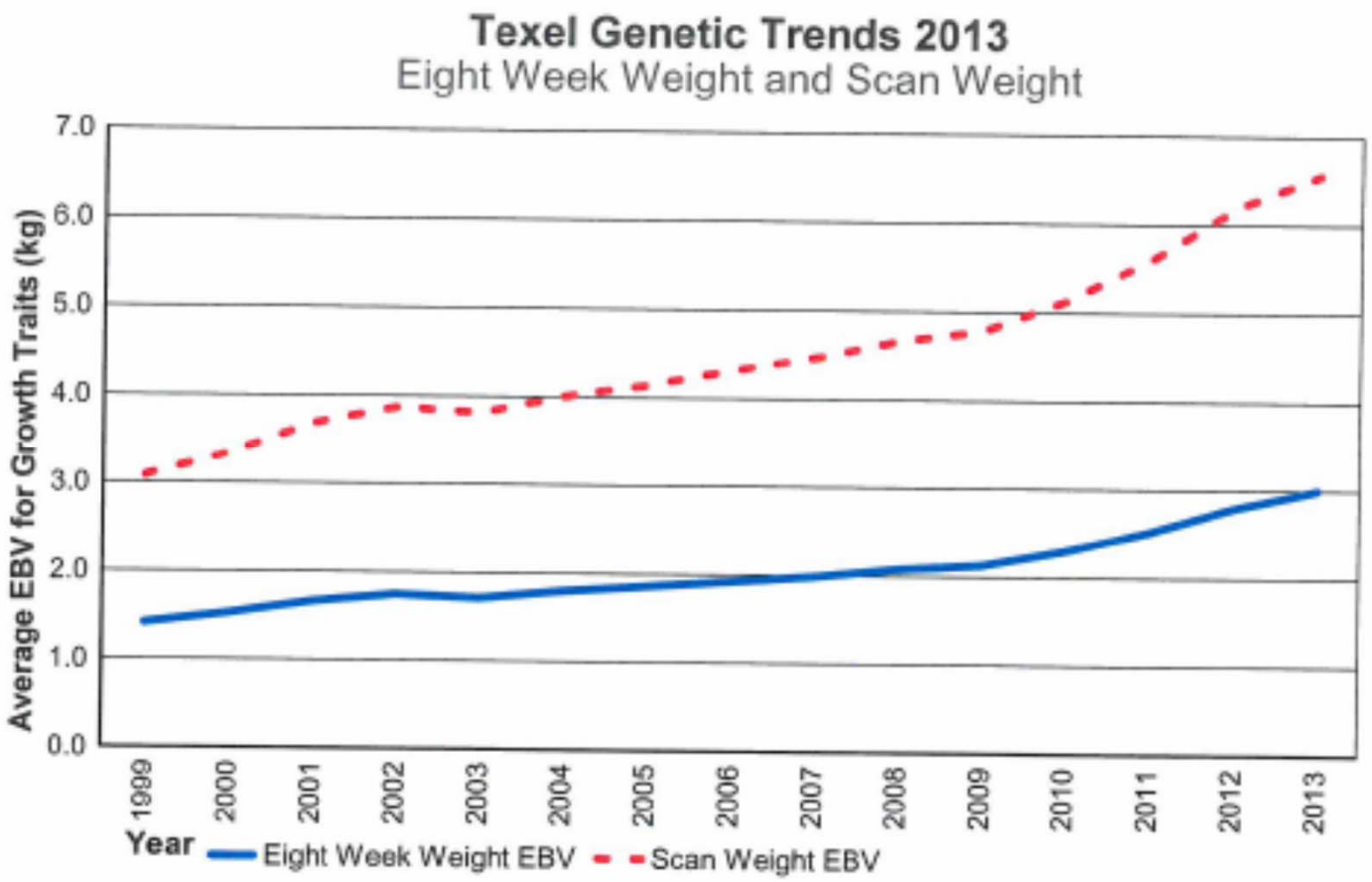
Genetic gain in the Charol



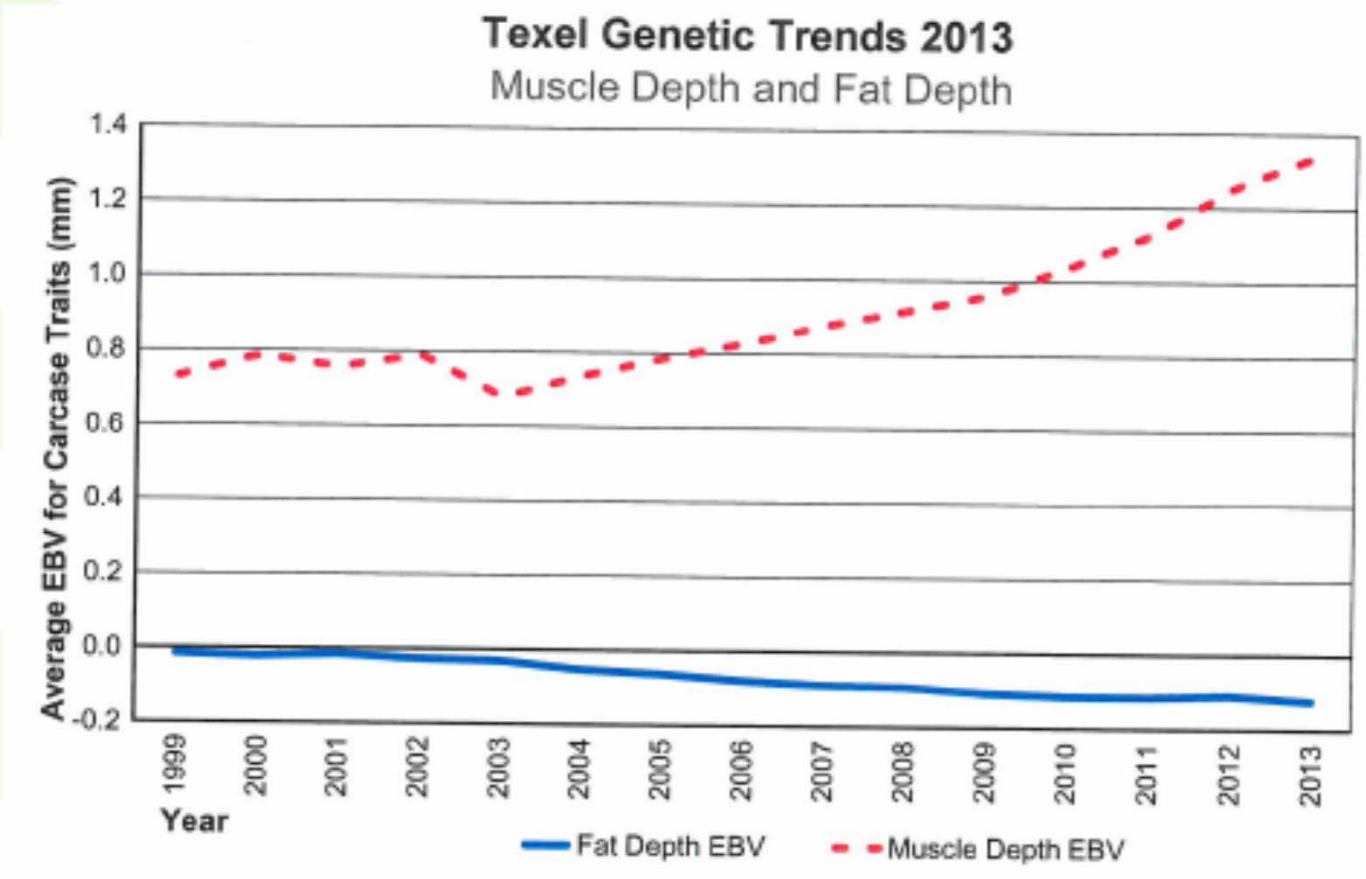
Genetic gain in the Charol



Genetic gain in the Texel



Genetic gain in the Texel



What would be the new breeding goal?

- The aim is still the same- commercial rams for commercial lamb producers- growth rate/muscling/EMA/muscle shape, lower external fat, length, vertebra number

  ease of lambing/from forage

- Can we take some of the best genetics from other breeds?
- Can we incorporate them into the existing Meatlinc breeding? program.
- Can we select for the traits we want ?
- Can we create a genetically superior ram for the benefit of our customers ?

What was required- funding and genetic evaluation and analysis

Technology Strategy Board TSB

- Funding announced for 'Sustainable Protein Production'
- Genetic improvement in livestock was within scope
- Funding of up to 50% available
- A collaboration agreement had to be produced between industry (Meatlinc) and academic (SRUC)
- In Autumn 2011, Meatlinc and SRUC were awarded 50% grant funding over a 5 year project

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Gene pool fishing by out-crossing and back-crossing cycles in one Terminal Sire Sheep Breed- Blueprint for Terminal Sire Breeding in the UK and beyond

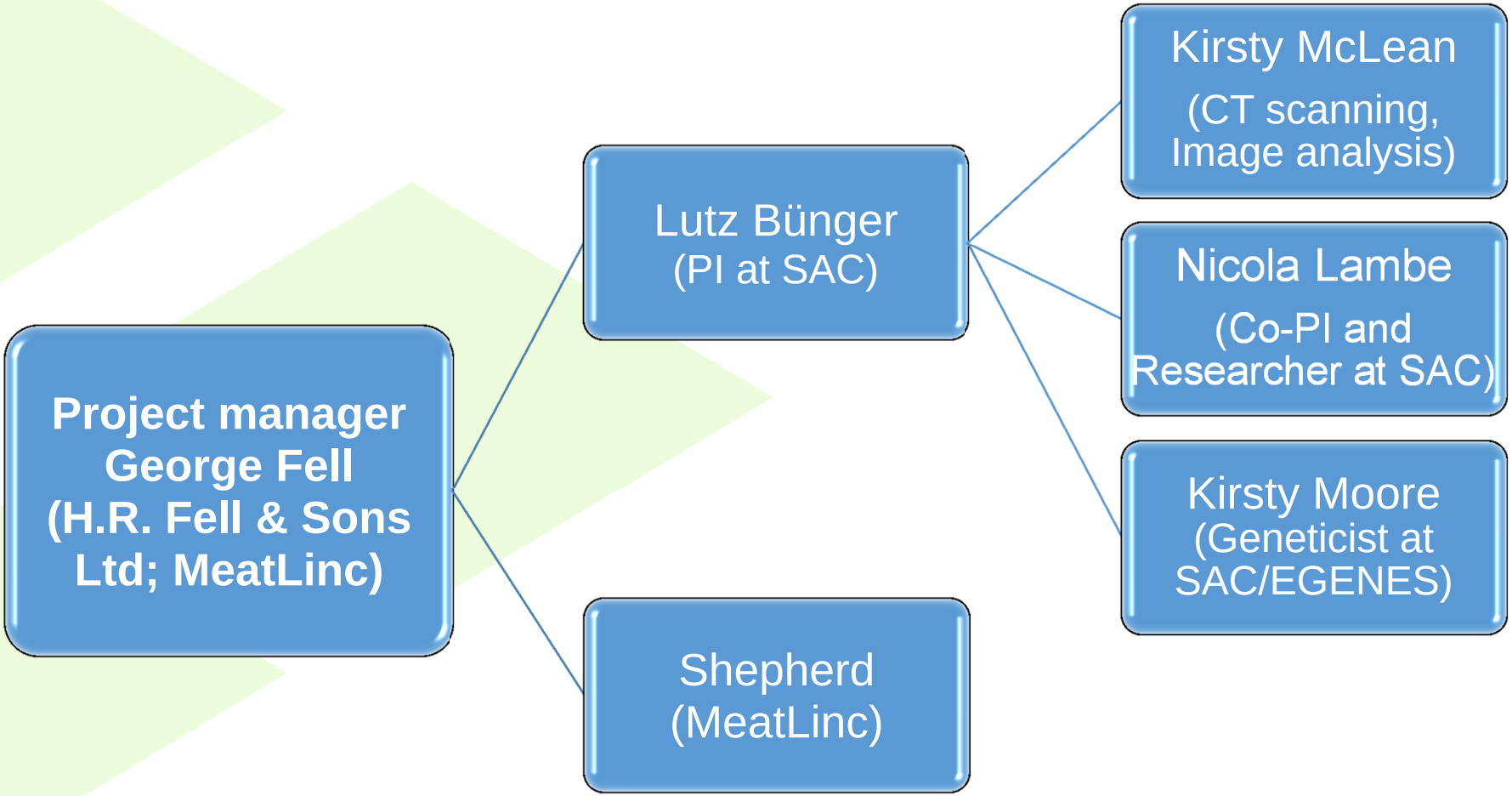
Project leader: G. Fell[1]

In the team: L. Bünger[2], N.R. Lambe[2], K. McLean[2];K. Moore[2]; M. Coffey[2];

[1]MeatLinc, H.R. Fell & Sons Ltd

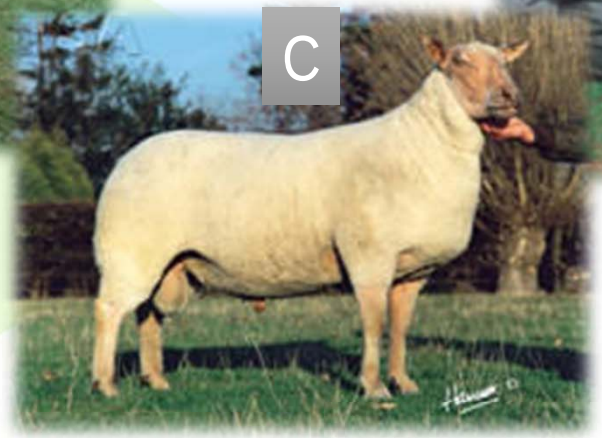
[2] AVS, Scotland's Rural College

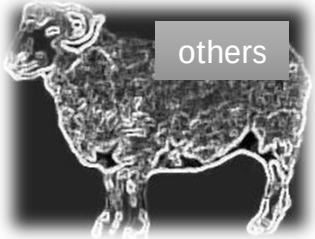
Project management



CT work at SRUC aims mainly at the Terminal Sire breeds

410 000 rams used annually





Introduction

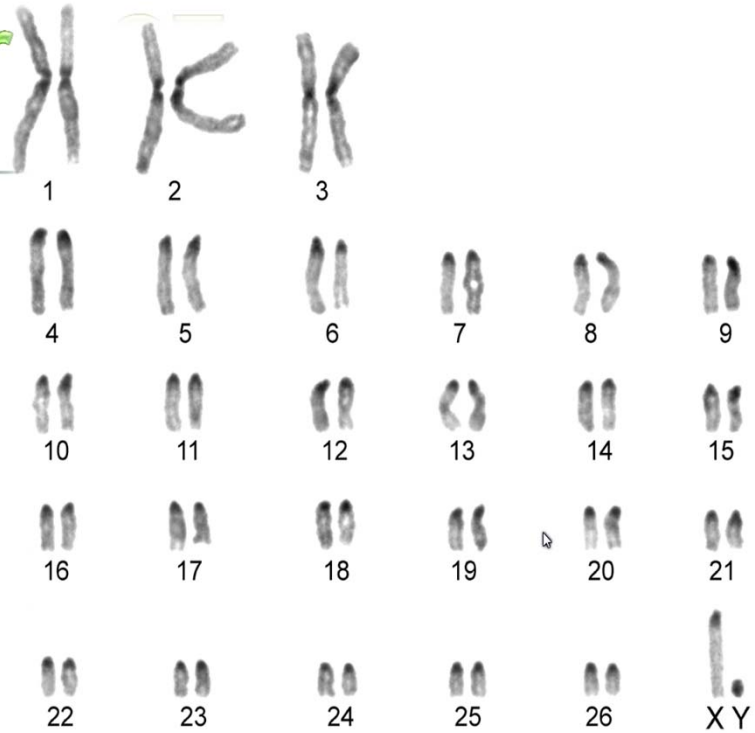
- ~90 recognised breeds of sheep in the UK (Pollott & Stone 200
an
- Larg
resource.
- The UK's (or World's) many sheep breeds and the variation between them should be cherished
- **C**
m
(probably not all but many!) need to preserved

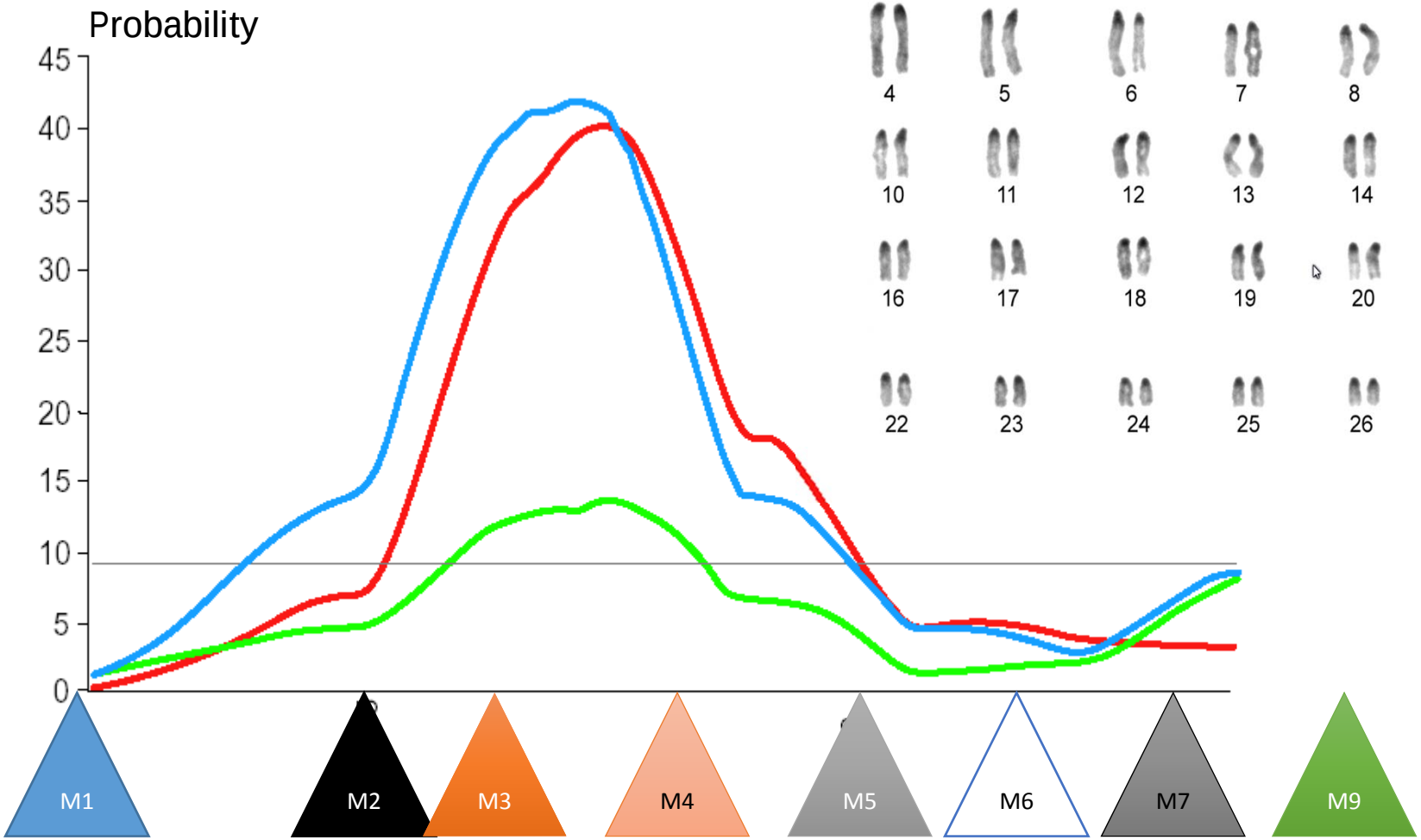
The Million Dollar Question:
How to use it

The Ten Minutes to answer it!

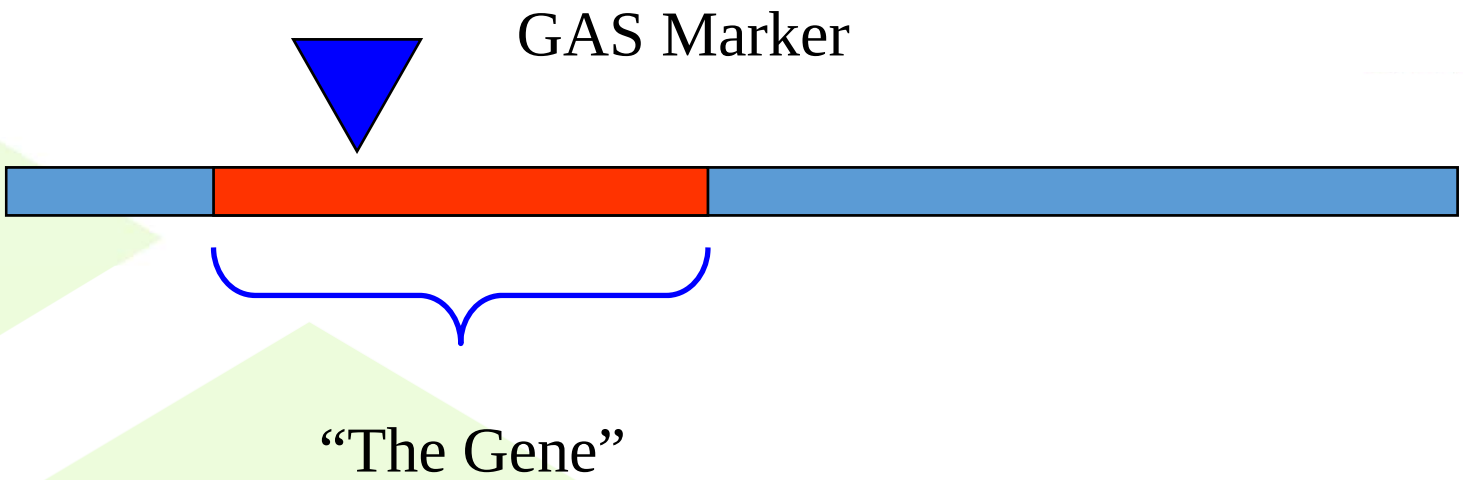
Pollott,G.E. and Stone,D.G.(2006). *The breeding structure of the British sheep industry 2003*.Defra,

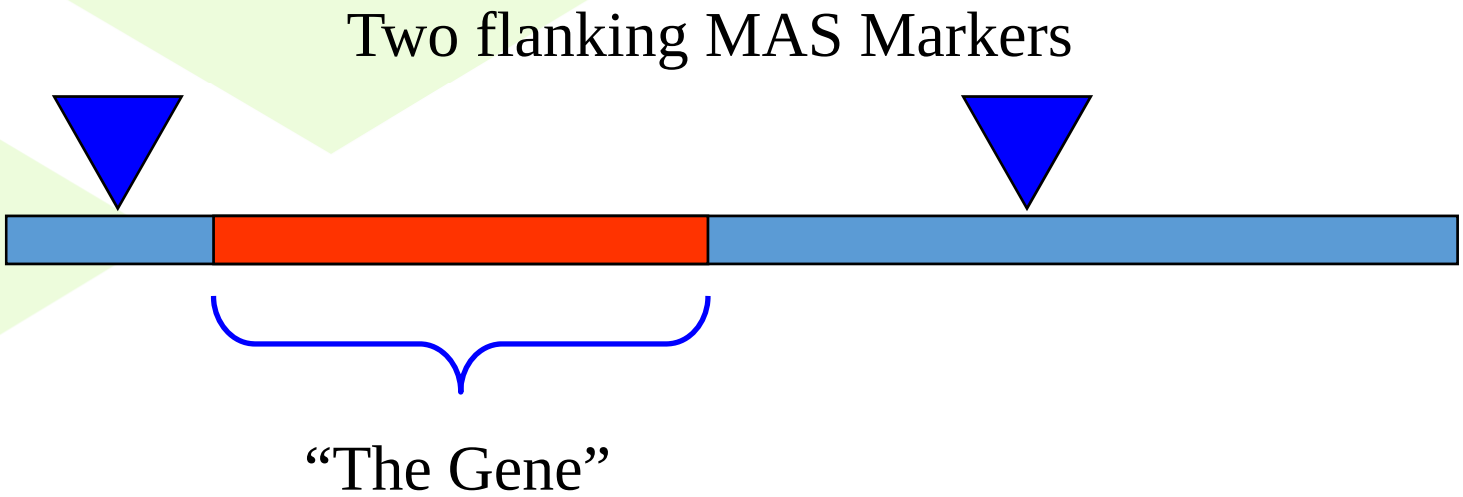
"QTL studies" find QTL for in a chromosomal region





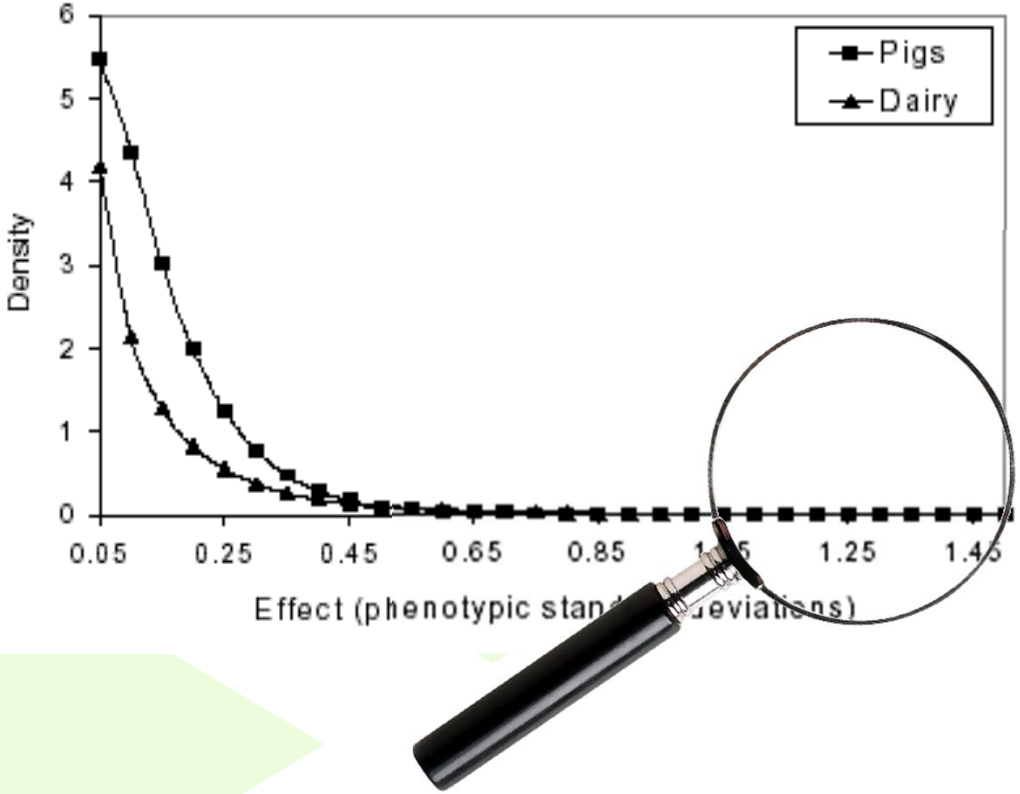
If only 1 gene or a few - no problem MAI can do it!



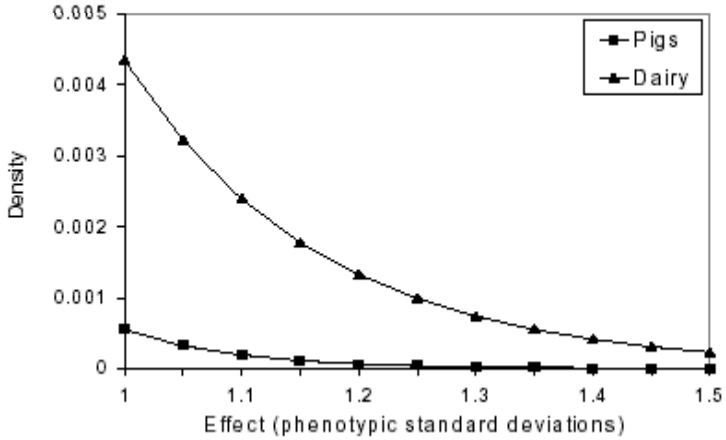


Distribution of QTL effects

Figure 2. Distributions of QTL effect from pig and dairy experiments magnification of distribution from effect = 1 to 1.5σ_p (B).

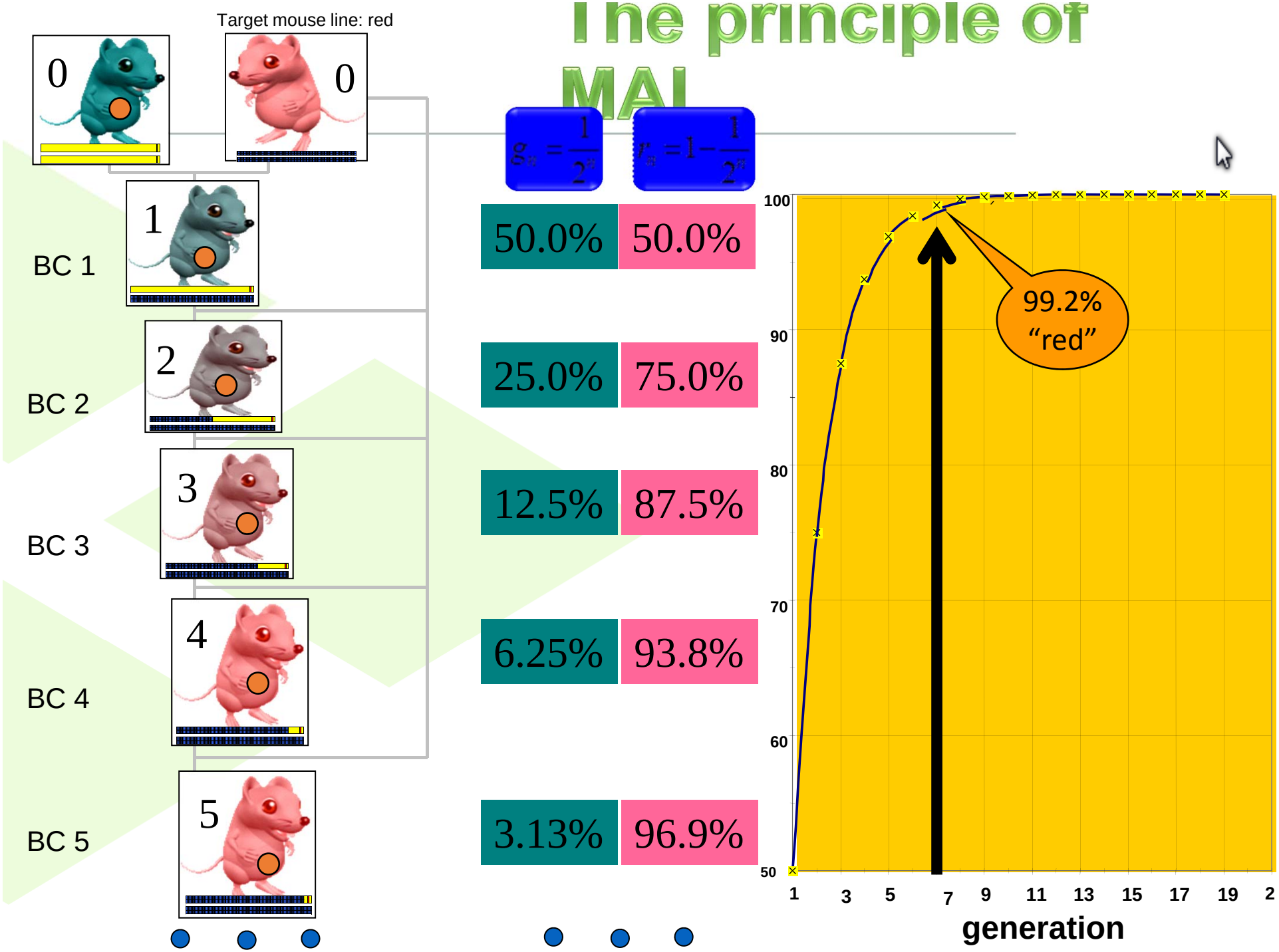


A



Hayes,B. & Goddard,M.E. (2001). The distribution of the effects of genes affecting quantitative traits in livestock. *Genet. Sel Evol.* **33**, 209-229.

The principle of MAI



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The problem:

- Too few QTL, GWAS studies → only a few genes/QTL known
- Too many genes affecting traits of interest (infinitesimal model)
- Too expensive, too much labour

Project Idea

- Impressive rates of genetic gain have been achieved in UK terminal sire breeding programmes through selection on the Lean Index
- High performance in the different TS Breeds at least partially determined by different alleles and different allele frequencies
- Whereas other species and countries (e.g. NZ moved to 'across breed' or 'multibreed' genetic evaluations) the rigid breed standards and hanging on to the 'breed concept' in the UK hinders or slows down such approach

- ***Hypothesis:*** (Repeated?) Fishing) in the gene pool of other developed high performance breeds by crossing and backcrossing provides higher genetic gains than purebred selection

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Fishing in the large gene pool of UK sheep

Background

- Crossbreeding is often done
  (i) to use heterosis/hybrid vigour
  (ii) with the intent to ultimately creating a new breed

i. Heterosis. This cross needs to be produced continuously to use the produced heterosis and requires the parental breeds/line to be maintained. Such systems are adopted in the pig breeding

ii. An alternative approach is out-crossing to other high performance breeds followed by inter-se matings and repeated backcrossing under high selection pressure, which allows to maintain a breed with its typical characteristics whilst making larger breeding progress compared to purebred selection

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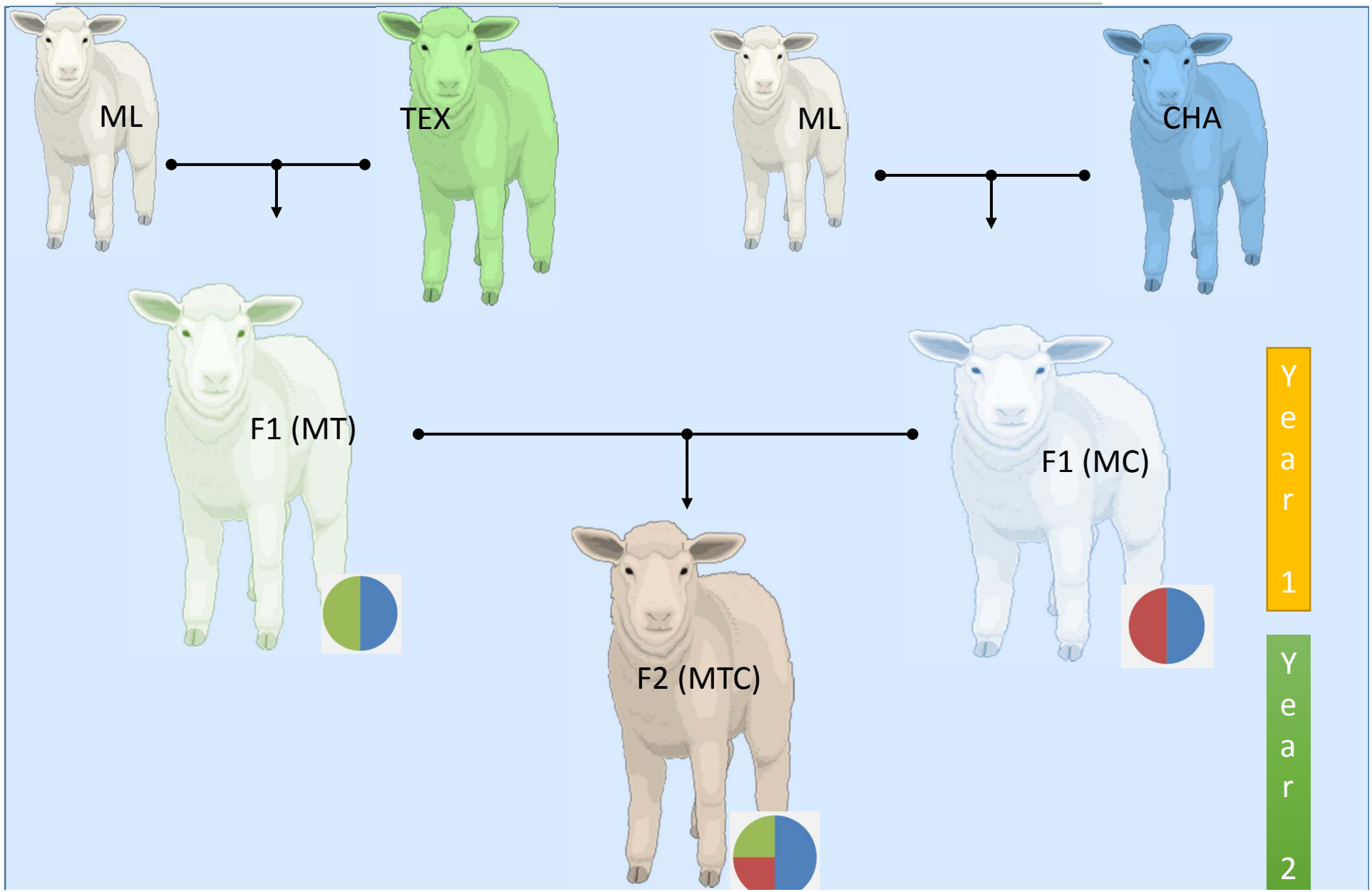
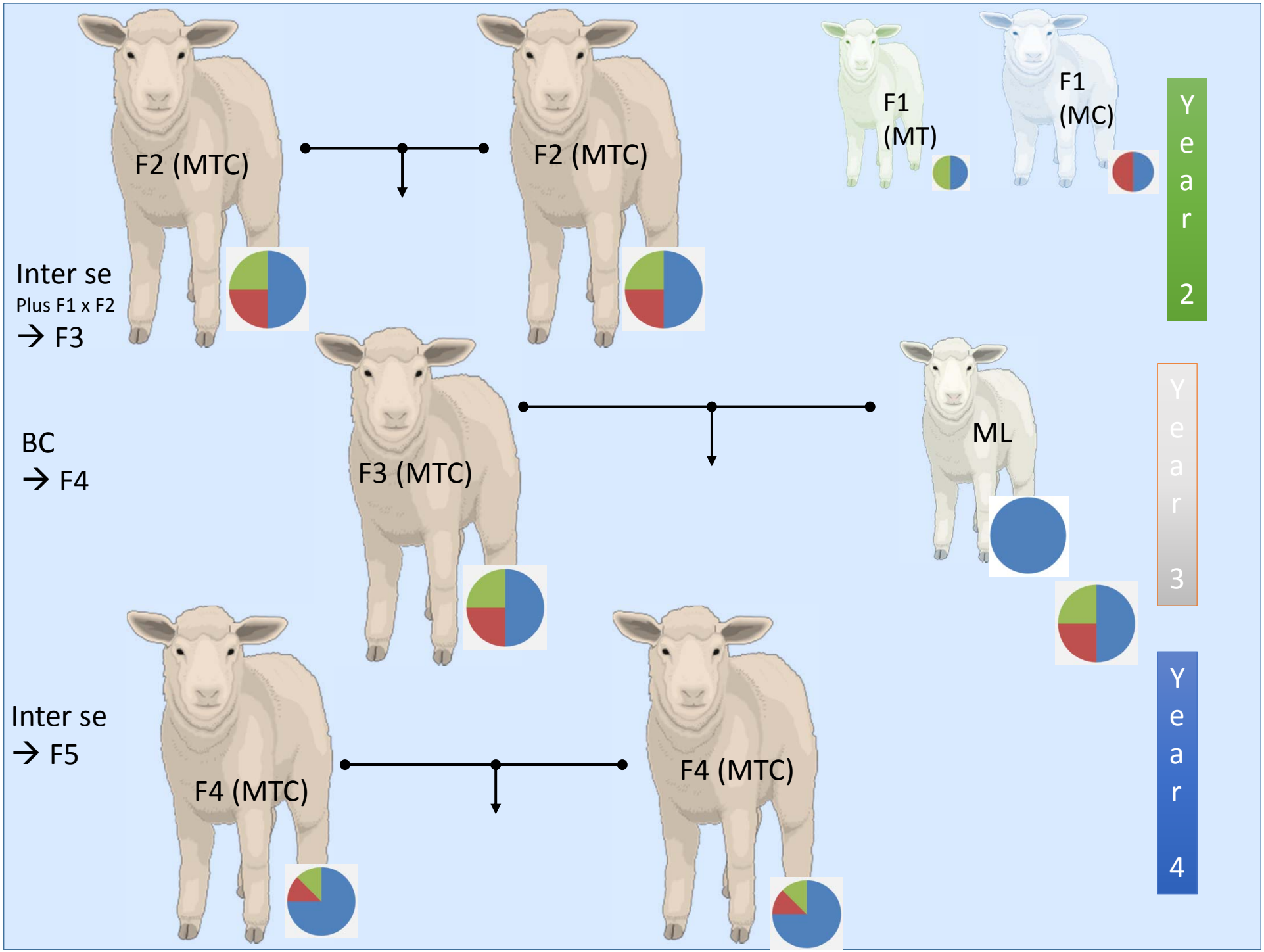
Summary

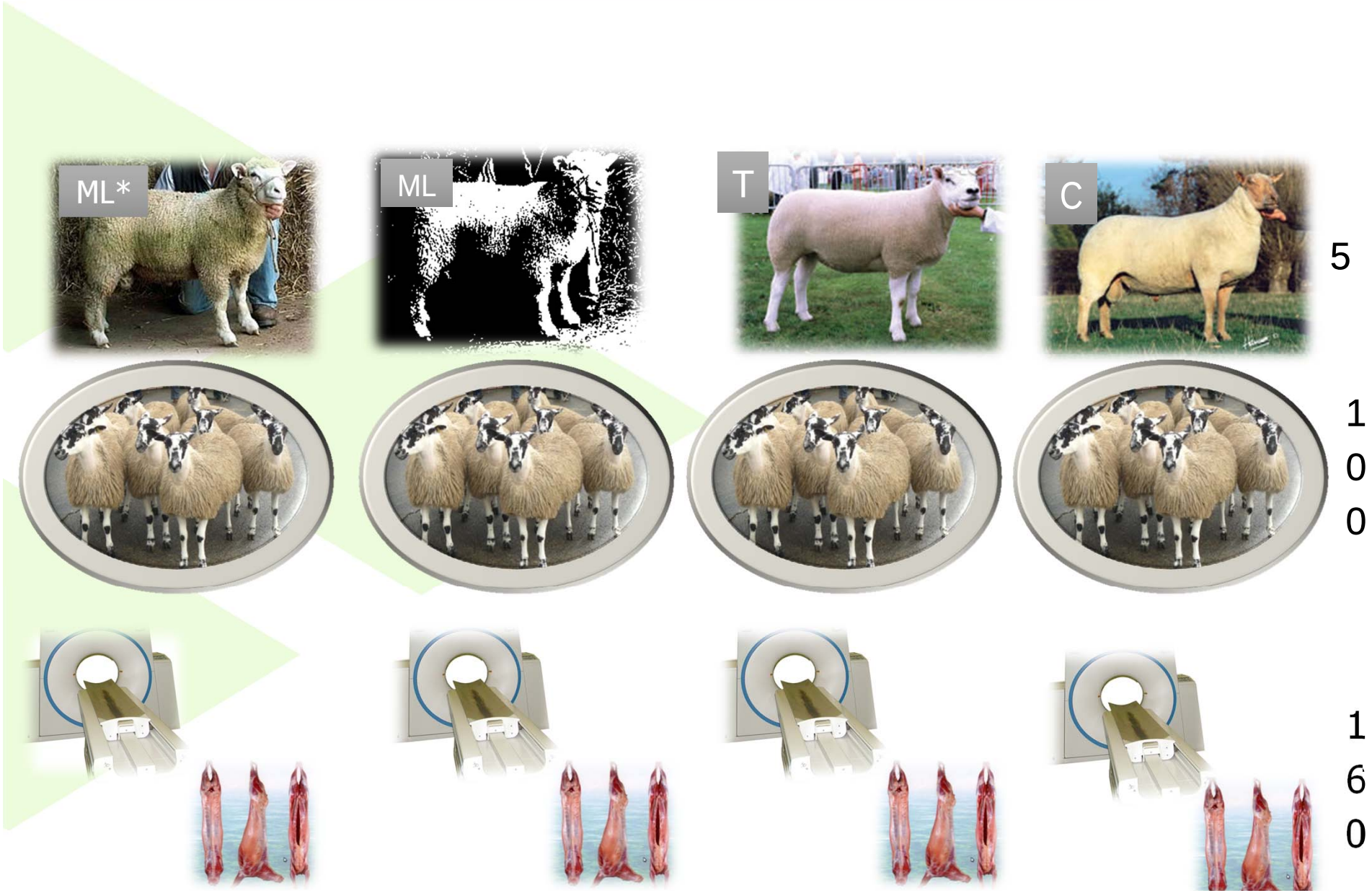
SRUC

- **Deliverables:**
  - genetically improved terminal sire sheep breed
  - demonstration on how to achieve substantial extra selection gains
  - blueprint for other breeds about "exploiting genetic variance in other breeds"
- **How:**
  - Outcrossing followed by inter-se matings and repeated backcrossing
  - "Gene Fishing with a dense net" of phenotyping based on non-invasive, high accuracy (computed tomography [CT])
- **Aim:**
  - **Identify** carriers of valuable genetic variants relating to production efficiency in other breeds
  - **Increase their frequencies** in the target terminal sire breed,
  - **Enrich** the gene pool of the target terminal sire breed
  - **Demonstrate** their superiority


ML
TEX
ML
CHA
F1 (MT)
F1 (MC)
F2 (MTC)
Year 1
Year 2


F2 (MTC)
F2 (MTC)
F1 (MT)
F1 (MC)
Year 2
Inter se
Plus F1 x F2
→ F3
BC
→ F4
F3 (MTC)
ML
Year 3
Inter se
→ F5
F4 (MTC)
F4 (MTC)
Year 4

Validation trial at the end



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