Breeding Programme
British Limousin Cattle Society Ltd

Updated 8th April 2021

The purpose of this document is to lay out the detail upon which the British Limousin Cattle Society and its members manage the breeding of British Limousin Cattle within the UK. This is in accordance with the requirements of the Regulation (EU) 2016/1012 of the European Parliament and of the Council of 8 June 2016 on zootechnical and genealogical conditions for the breeding, trade in and entry into the Union of purebred breeding animals, hybrid breeding pigs and the germinal products thereof and amending Regulation (EU) No 652/2014, Council Directives 89/608/EEC and 90/425/EEC and repealing certain acts in the area of animal breeding ('Animal Breeding Regulation').

Contents

1. Properties and definition of the breed and objectives of the breeding programme

Aims of the breeding programme

To encourage, promote and improve the breeding of Limousin cattle in the United Kingdom of Great Britain and Northern Ireland and, with a view so far as may be thought fit, to purchase, import, breed, hire or otherwise acquire and hold, recall, let out on hire or otherwise deal in Limousin cattle whether of British of foreign origin.

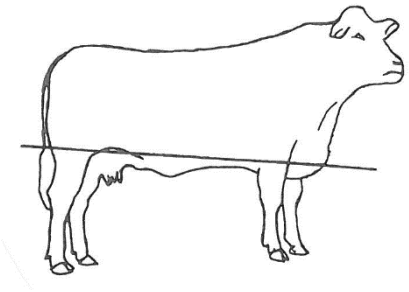
2. Breed characteristics

Breed Characteristics

Colour This should be solid and vivid red in colour, or black. Some variation is acceptable, but it should not be too dark or light, and should be lighter under the stomach, inside the thighs, around the eyes and muzzle, and around the anus and end of the tail.

At the discretion of the Society, any male or female which has a solid patch of hair of an inconsistent colour with the main coat colour and which is larger than 1.25cm in diameter except below a straight line extending from where the flank meets the anterior aspect of the hind leg to the point of the sternum (breast bone) and not including the legs must not be used for pedigree breeding. (Please see **Diagram A** below).

Diagram A:



Horn status: Animals may be heterozygous or homozygous polled or horned

Size - the Limousin should have a large, but fine, strong boned frame. Mature Limousin females should average 650 kilos and mature males 1000 kilos.

Head - the head should be short with a wide forehead and broad muzzle. If horns are present, they should be fine and curved forward with slightly raised extremities of lighter colour than the rest of the horn.

Body - The body should have well-fleshed forequarters; a deep, rounded chest with well sprung ribs; a broad, straight, and well-muscled back; a large and well-rounded rump, with pin bones not too protruding; and deep and well-rounded thighs. The belly should be wide but straight, and not too prominent on the bottom line. The hide should be fine and supple.

Legs - the legs should be fine-boned but strong and straight with a square even stance, and sound feet.

Disposition - Animals should have a quiet and manageable disposition.

3. Geographic area and size of the breeding population

The geographical area of the breeding programme extends throughout the United Kingdom. Limousin genetics from the UK are present in many countries around the world, from the main beef-producing countries within Europe to Australasia, Africa, the United States and Canada.

The breeding population of pedigree Limousin animals is estimated to be approximately 56000 head. In the region of 16-17000 calves are registered annually.

The Society has approximately 2520 full members.

4. Identifying breeding animals

4.1 New entries to the herd book

A new entry to the herd book is accepted by the Society following successful completion of a registration application by breeders. **Age limits and rules apply for registration applications and full details are within the Society byelaws (https://limousin.co.uk/the-society/byelaws/).** Animals can be registered up to 180 days of age and, at the Society's discretion, between 181 and 365 days of age.

The registration application contains all essential information about that animal for herd book entry and its accuracy is the sole responsibility of the breeder.

The following information must be included:

- The identification number of the animal in accordance with current legislation
- Herd prefix and animal name
- Sex
- Declaration of sire and dam
- Date of birth
- Service type (artificial/natural)
- Ease of calving score
- Birthweight (estimated or actual)
- Birth type (twin/single)
- Insemination type (embryo transfer, artificial insemination (AI))
- Service date for all animals arising from AI and, where known, for animals arising from natural service.

For breeding animals that have arisen from Embryo Transplant (ET), the following additional records are required:

- The statutory identity of the recipient dam
- The date of birth of the recipient dam
- The breed or breed type of the recipient dam
- The date of implantation of the embryo
- Receipt of relevant ET forms

Animals arising from embryo transfer will in principle not be entered in to the herd book until the result of sire and dam verification through DNA analysis has been made available.

Imported animals and imported germinal products can also be added to the herd book if they have been registered in other countries by a recognised Limousin herd book affiliated to either the International Limousin Congress or Eurolim Association. The rules around eligibility and importation that apply are stated within the Society byelaws (https://limousin.co.uk/the-society/byelaws/).

If a registration application is not received within 28 days from the birth of an animal, or if a calf born to a pedigree Limousin dam is a crossbred calf, it must be birth notified to the Society within those 28 days. The information required for birth notification is the same as that required for registration, excluding a declaration of sire. Birth notified calves are placed in suspension within the herd book until an application for registration is presented by the member and accepted by the Society.

4.2 Parentage identification

To verify parentage, DNA analysis is conducted through contracted laboratories using a combination of microsatellite and SNP (Single Nucleotide Polymorphisms) analysis techniques. The laboratories are, as a minimum, approved for parentage analysis and data interpretation by the International Society for Animal Genetics (ISAG).

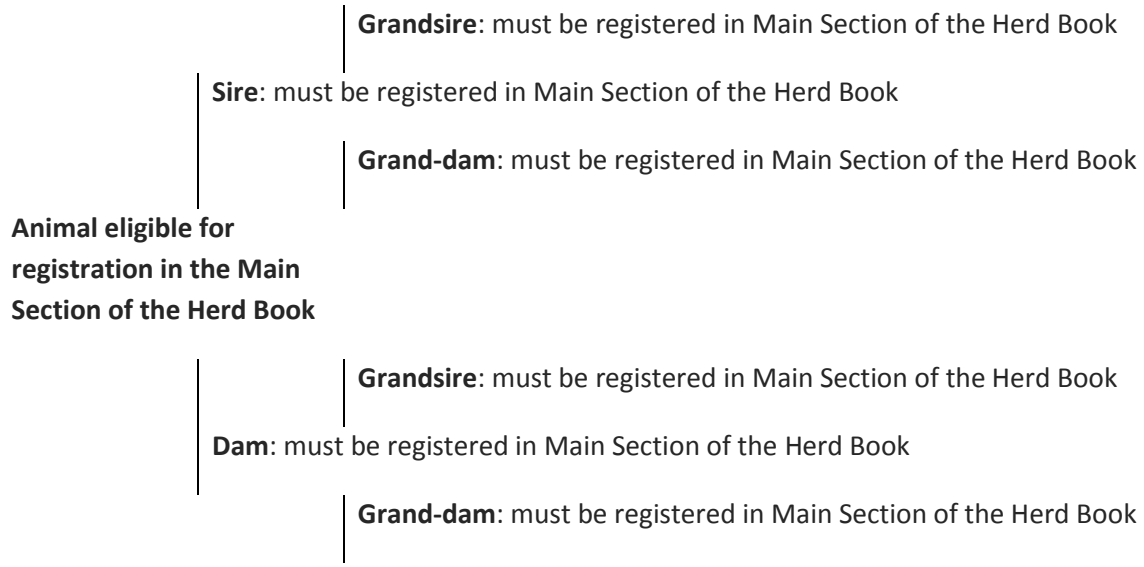
5. System for Recording Pedigrees

The Society herd book is divided in to two sections; a Main Section where the details of all pedigree Limousin cattle are held and a Supplementary Section, where details are held of cattle that are part of a programme to 'grade up' progeny from animals that are not within the Main Section of the herd book to Main Section status.

5.1 Entry in the Main Section

To be eligible for entry into the main Herd Book animals must also comply with the 'three generation rule' prescribed by the EU Zootech Regulation (2016). This states that the parents and both sets of grandparents must be registered in the main section of a recognised Limousin Pedigree Herd Book.

For clarity:



5.2 Entry in the Supplementary Section

Females only may be entered in the Supplementary Section of the herd book

- A female that is at least 50% Limousin (being the progeny of one cross from a Limousin bull entered in the main section of a recognised Limousin Pedigree herd book, on a cow suitable for the establishment of a grading-up programme, conforming to a Limousin breed type) can be entered in the Supplementary Section of the herd book as a 'base cow'
- Base cows will be entered in to the Supplementary section of the Herd Book at a grade of 50%
- Breeding details of base cows will be held within the Supplementary section of the Herd Book
- A base cow may be registered at any time, for the basic fee determined from time to time by the Council of Management and published in its byelaws
- Members may enter base cows in the Supplementary section of the Herd Book subject to approval by the Society through an appointed inspector (or inspectors) and payment of the normal inspection fee.
- Percentage grades shall be published at the Society's discretion for animals registered in the Supplementary section of the Herd Book.
- For the purposes of the calculation and publication of grade percentages, all percentages will be whole numbers. Therefore, 0.49 and below will be rounded down and 0.5 and above will be rounded up. For example, a grade percentage of 87.5% would be rounded up to 88%.

For clarity, only females bred out of animals in the Supplementary Section may be entered into the Main Section of the Herd Book where they meet the following conditions:

- The mother and maternal grandmother are entered in a supplementary section of a recognised Limousin Pedigree Herdbook
- The father and two grandfathers are entered in the main section of a recognised Limousin Pedigree Herd Book

This can be illustrated as follows:

Female eligible for registration in the Main Section of the Herd Book

- **Sire**: must be registered in Main Section of the Herd Book
  - **Grandsire**: must be registered in Main Section of the Herd Book
  - **Grand-dam**: must be registered in Main Section of the Herd Book
- **Dam**: registered in Supp. Section of the Herd Book
  - **Grandsire**: must be registered in Main Section of the Herd Book
  - **Grand-dam**: registered in Supp. Section of the Herd Book. May be a 'base cow'

Males bred from graded-up animals may only be registered in the Main Section of the Herd Book if their sire and dam are also registered within the Main Section of a recognised Limousin Pedigree Herd Book. This can be illustrated as follows:

Main section regd males bred by graded females

- **Sire:** must be registered in main Section of the Herd Book
  - **GSire**: must be registered in Main Section of the Herd Book
    - **GGrandsire**: must be registered in Main Section of the Herd Book
    - **GGrand-dam**: must be registered in Main Section of the Herd Book
  - **GDam**: registered in Supp. Section of the Herd Book
    - **GGrandsire**: must be registered in Main Section of the Herd Book
    - **GGrand-dam**: registered in Supp. Section of the Herd Book. May be a 'base cow'.
- **Dam:** must be registered in main Section of the Herd Book
  - **GSire**: must be registered in Main Section of the Herd Book
    - **GGrandsire**: must be registered in Main Section of the Herd Book
    - **GGrand-dam**: must be registered in Main Section of the Herd Book
  - **GDam**: registered in Supp. Section of the Herd Book
    - **GGrandsire**: must be registered in Main Section of the Herd Book
    - **GGrand-dam**: registered in Supp. Section of the Herd Book. May be a 'base cow'.

Males may not be registered within the Supplementary section of the herd book.

5.3. Issue of zootechnical certificates for purebred breeding animals

The issue of zootechnical certificates for purebred breeding animals is in accordance with the requirements of Regulation (EU) 2016/1012 of the European Parliament and of the Council of 8 June 2016. An example is contained within Appendix F of the Society's Byelaws (https://limousin.co.uk/the-society/byelaws/).

In the case of germinal products, the Society issues only Part A of the certificate required under the legislation above. The required Parts B, C & D (for semen, oocytes & embryos respectively) are issued by the approved collection/distribution authority within the definition of the legislation.

5.4 Management of the herd book

The management of the herd book takes place according to the rules laid down in the Articles of Association and Bye Laws of the Society. These are available online through the following link and printed copies can also be provided on request to the Society office:
https://limousin.co.uk/the-society/byelaws/

6. Breeding Objectives

The Society has implemented a Breeding Improvement Plan and a copy is attached in Appendix 1.
The breeding objectives within this are as follows:

Rank	Economically Important Characteristics	Breeding Goal
1	Development of the performance recorded base within the breed	**Breeding Goal 1** To grow the performance recorded population to 75% of registrations by the end of this Strategy period.
2	Easy calving cows and calves	**Breeding Goal 2** To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero. (To expect positive genetic gain to be made across the population in the time of this strategy is arguably unrealistic).
3	High resistance to disease	**Breeding Goal 3** To establish and implement breeding solutions to address disease issues as they become available
4	High feed conversion efficiency	**Breeding Goal 4** To establish and implement breeding solutions to identify and improve feed efficiency
5	High carcase conformation at target market weights	**Breeding Goal 5** To improve the rate of gain in growth and carcase traits, without compromise to correlated traits
6	High growth rate	
7	High Meat Quality	**Breeding Goal 6** To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.
8	Good docility	**Breeding Goal 7** To maintain current levels of genetic progress in Docility
9	Good cow fertility	**Breeding Goal 8** To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow fertility.
10	Good longevity	**Breeding Goal 9** To maintain current levels of genetic progress in Longevity.
11	Good muscling/muscle depth	To improve the rate of gain in growth and carcase traits, without compromise to correlated traits. This is a repeat of the Breeding Goal 4 above and is merged with it.
12	Good cow milking ability	**Breeding Goal 10** To generate positive genetic change and improve 200 Day Milk Weight within the breed.

7. Performance Testing

7.1. Performance Recording

A Performance Recording scheme is managed through the Society's Taurus website. A genetic evaluation of this data is carried out at least three times annually and this is conducted by Scotland's Rural College on the Society's (SRUC) behalf. SRUC is internationally recognised as a provider of genetic evaluation services across a number of species and is ICAR accredited for this purpose.

Performance records are collated for genetic evaluation from a number of sources:

- Farm records and genotypes collected and submitted by members
- Farm records and genotypes collected and submitted by Society-appointed herd inspectors
- Farm records and genotypes collected and submitted by Society-appointed data collectors
- Slaughter records collected from national abattoir data sets
- Breeding records collected from national data sets
- Records and genotypes gathered through completed research initiatives

7.2 Genetic Evaluation Results

The genetic evaluation is undertaken using a BLUP (Best Linear Unbiased Prediction) analysis.
11 Estimated Breeding Values (EBVs), 12 Genomic Estimated Breeding Values (GEBVs) and 2 Economic Indexes are produced for the following traits. Accuracy values are published along with each breeding value.

GEBVs	EBVs	Economic Indexes
Age at first calf (days)	Gestation Length (days)	Beef Value (EBV)
Calving interval (days)	Birth Weight (kg)	Retail Value(GEBV)
Longevity	Calving Ease (%)	
Calf Survival	Mat.Calv. Ease (%)	
Age to slaughter (days)	200 Day Growth (kg)	
Carcase weight (kg)	400 Day Growth (kg)	
Fillet (kg)	Muscle Depth (mm)	
Striploin (kg)	Fat Depth (mm)	
Rump (kg)	200 Day Milk (kg)	
Topside (kg)	Scrotal Circ (cm)	
Silverside (kg)	Docility (%)	
Knuckle (kg)		

7.3 Implementation of the Genetic Evaluation

All results produced from the genetic evaluation are published on the Society's Taurus database (www.taurusdata.co.uk), subject to the Council of Management's rules of publication which are stated in the Society byelaws (https://limousin.co.uk/the-society/byelaws/)

Results from the genetic evaluation are also published in wider literature of the Society, for example, in sale catalogues. This is also subject to the Council of Management's rules of publication, referred to above.

Public search functions are in place on the Taurus database to enable interrogation of the population by the following, in both isolation and in combination:

- Individual animal
- Breeder
- Sex
- Date of birth - range
- EBVs & GEBVs
- Single gene information – Myostatin, colour and polled genotypes
- Progeny list

7.4 Use of the Genetic Evaluation Results

The evaluation results are used by the pedigree and commercial sectors to identity the animals with superior genetics for their traits of interest. Use of these animals in their breeding programmes can generate greater returns through higher product value and increased savings from production efficiencies.

8. Wider Genetic Analyses

8.1 Myostatin

The Society has rules in place regarding genotyping for the presence of the Myostatin variants in two defined groups of animals:

- All breeding bulls used for the first time since 1st March 2018 must be genotyped for the presence of the Myostatin variants before calves can be registered to each sire. This information is published for each individual animal on the Taurus database and in wider literature at the Council of Management's discretion.

- All animals sold at Premier Collective sales held by the Society must be genotyped for the presence of the Myostatin variants prior to the sale. This information is published for each individual animal on the Taurus database and in wider literature (eg the sale catalogue) at the Council of Management's discretion.

The Myostatin variants analysed are: F94L, NT821, Q204X, NT419, E291X

The Myostatin results of animal genotyped for that purpose prior to 1st March 2018 are published at members' discretion.

8.2 Colour, Polled & Protoporphyria

Members can elect to genotype their animals for colour, polled and protoporphyria to establish the variants present for these genes. In the case of polled and colour test results, where animals have been genotyped for this purpose since 1st March 2018, the results are published for each individual animal on the Taurus database and in wider literature (eg sales catalogues) at the Council of Management's discretion. The results of animal genotyped for that purpose prior to 1st March 2018 are published at members' discretion.

9. Verification of All Herd Book Records

Herd book records are verified in three main ways (but are not limited to these):

- At point of submission – where parameters and rules are applied that identify inconsistency and error
- At the point of data evaluation – part of the analysis procedures involve the cleansing of data and reporting of inconsistency and error
- Through herd inspection. The Society has a policy of herd inspections to verify data submitted by owners in the form of:

  - Routine inspection of every 200th calf registered or birth notified
  - Random calf inspections, as directed by the appointed Herd Inspection Committee
  - Full herd inspections, as directed by the appointed Herd Inspection Committee

  The rules and conditions relating to herd inspections are included within the Society byelaws (https://limousin.co.uk/the-society/byelaws/)

10. Outsourcing to Third Parties

Members are offered the genetic evaluation service evaluation through a contractual arrangement with Scotland's Rural College (SRUC), Peter Wilson Building, The King's Buildings, West Mains Road, Edinburgh, EH9 3JG https://www.sruc.ac.uk/info/120275/egenes. Contact person is Professor Mike Coffey.

Database support and hosting services are also provided to the Society on a contracted basis by SRUC.

Laboratory services and DNA analysis are provided to members by Weatherby's Scientific, Unit F1, M7 Business Park, Newhall, Naas, Co. Kildare, Ireland W91 VX86 http://weatherbysscientific.com**.** Contact person is Mags Treacy.

Wider website, database, office computing and telecoms resources are supported by appropriate independent organisations. Design and print activity are contracted to appropriate design/print companies.

11. Herd Investigations and Disciplinary Processes

Compliance with herd book rules and complaints procedures are overseen by two processes; referral to a Herd Inspection Committee and referral to a Disciplinary Committee. Both committees are appointed by the Council of Management. The Disciplinary Committee acts completely independently of the Council of Management. The processes available to both committees are laid out in the Society's byelaws (https://limousin.co.uk/the-society/byelaws/) along with members rights of appeal and those appeal processes.

12. Approval date

This document was approved by the BLCS Council of Management at its meeting on 8th April 2021.

LIMOUSIN

The British Limousin Cattle Society Ltd

Breed Improvement Plan 2014 – 2024



27th February 2014

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The British Limousin Cattle Society Ltd

Breed Improvement Plan 2014 – 2024

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The British Limousin Cattle Society Ltd

Breed Improvement Plan 2014 – 2024

BLCS Statement of Objectives (from Constitution)

To encourage, promote and improve the breeding of Limousin cattle in the UK.

In achieving this, the main aims of BLCS's work are:

- The maintenance of an accurate herdbook and the provision of herdbook services to members
- The management of technical and breed improvement programmes
- The funding of educational programmes through agricultural colleges
- National genetic evaluation of the breed and the provision of performance recording to all its members
- The promotion of Limousin cattle, beef, semen and embryos to all potential markets

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1. Introduction

This plan lays out the strategic direction for the genetic improvement of Limousin cattle in the UK from 2014 to 2024. It consists of ten key strategies and their related objectives that can be applied from individual herd level to guiding BLCS Ltd towards achievement of its objectives.

The benefits of having a plan

All breeds have to genetically develop to help retain their market position, to increase the value of breed, to improve the profitability of their keepers and thereby ensure their long term survival. Breeding is a long term outcome of successive short term objectives. However, the objective and outcome are often 5-10 years apart and in most cases span the changing membership of BLCS Council. Thus a plan avoids short term changes to breeding goals that more often reflect market fluctuations rather than long term changes to markets. It also helps incoming Council members understand the deliberations of their predecessors in arriving at the current goal they have inherited. Finally, a plan offers the opportunity to measure progress.

2. Building the Plan

BLCS have undertaken some key areas of work & consultation to help identify future breeding priorities:

2011

- A bull buyers' survey in 2011. 600 bull purchasers were surveyed and responded about their experience of buying and using Limousin bulls.
- A roadmapping exercise with support from Biosciences KTN was undertaken. This examined the strengths and weaknesses of the breed within the industry and identified resulting priorities for future research and development.

2012/13

- A survey across the full BLCS membership was completed in 2012 to identify common breeding aims & objectives
- Consultation was carried out with geneticists from within Egenes and Biosciences KTN
- Opinion taken from processors and retailers

November 2013

- Council review of Draft Strategic Plan

March 2014

- Council adoption of Strategic Plan

April 2014

- Publication of Strategic Plan

3. Situation Statement

The roadmapping exercise identified a number of strengths, weaknesses, opportunities and threats for BLCS members in relation to development of a breeding strategy. All are current at the time the strategy was developed. In no particular order, they are as follows:

3.1 Markets

Strengths
Numbers of members/cattle
Popularity of the breed
Limousin breed qualities
Promotion & Visibility
Market share of UK cattle
Annual industry of £500million
Large customer base
Across industry recognition
Diverse activity base
Recognition within dairy herd
Web site
Adaptable to extensive and intensive systems
Good carcase conformation
Moderate sized
Fine grained meat
Low fat
Fine boned
Longevity
Breeding stock typically more uniform than other breeds (phenotypically)
Breed easily managed, easy calving etc
Premium quality product

Weaknesses
Sales & shows
Small numbers of cattle in UK
Not an indigenous cattle breed in the UK
No name awareness to consumer
Docility/perception around docility
Perception around Johne's disease
Small average herd size
Lack of commercial data & costings
Segmentation of producer base
Low enterprise profitability/low reinvestment
Gaps exists between breeder and buyer needs/demands as well as those of wider food sectors (communication and knowledge)
Maintaining breeding market share left to chance?
Uniqueness of breed giving way to composite breeds
Inability to maintain a premium for Limousin beef
Danger of complacency due to strong market position (need to remain very aware of market)

Opportunities
Technical efficiency improvements
Connections to retailers
First to market for most things
Eastern Europe and other emerging markets
Cattle health
Beef marketing/branding
Association with processors/retailers
Retailer producer groups
Functional food, healthy beef
'Green' beef production
Sales of animals with more information
Change in Singe Farm Payment
Global and domestic demand for beef increasing
Market for beef and beef products is wide
Longer term, change in consumer demands away from processed/convenience foods
High production/welfare standards in UK
Food security – demand for efficient cattle
Breeder/producer groups

Threats
Breeding companies (Genus/Cogent)
More feed efficient breeds/crosses
A contracting UK beef industry
Marketing advantages for native breeds
Perception around Johne's disease
No name awareness to consumer
Retailer/processor producer groups
Losing UK market share
Agro pharmaceuticals steal all the ground and become provider of choice
Costs of production (labour, grain price) in comparison to other protein sources
Human health issues linked to beef consumption
Ongoing decline in beef/dairy cow numbers

3.2 Environment

Strengths
Untapped genetic resource within Limousin
Unique properties of F94L

Weaknesses
Perceived inferior environmentally

Opportunities
Science and research to further carbon footprint efficiencies

Threats
Environmental grants favouring native breeds
Effect of EU/domestic policy on UK producers' competitiveness (land use, public health, greenhouse gas emissions etc)

3.3 Genetics

Strengths
Large genetic pool compared to other breeds
Many go-ahead breeders
Genetic content within UK cattle
Terminal and maternal breed
Basco database and IT
Unique properties of F94L
International base
Untapped genetic resource within the breed
Performance recording base
R&D linkage
Rates of genetic gain compared to other breeds
'Proximity' to provider of genetic evaluation/wider gene technologies
Increasing overseas market for UK genetics

Weaknesses
Low performance recording
Breeders' understanding of performance recoding
Horns/low numbers of polled animals
Poor adaption of existing technologies
Reluctance by some breeders to take on new concepts of genetic progress, and or to opt out of data transfer processes
Poor awareness (and willingness) amongst some breeders of the need to change and also their scope to change (also raises issues of measuring/benchmarking)
Rates of genetic gain not maximised (large second tier of breeders whose breeding decisions not governed by end-product factors)
Industry partners hold back society ambition for EBV/genomic development

Opportunities
Genomic selection and gene technology
F94L gene
Genomics and new breed improvement tools & technologies
IT – collection, use and dissemination of data
Speed of genetic improvement
Polling
Increasing global demand for high performance Limousin genetics
Science and research to further feed efficiency
Science and research to further breeding efficiency
Science and research to further meat quality, tenderness and flavour
Science and research to further temperament
Science and research to further cholesterol and heart-healthy beef
Potential to drive genomic services market
Potential to share data across countries
Potential untapped genetic resource relating to disease control and management

Threats
French more advanced in gene technology
Development of new composites back by major retailers and quicker genetic progress and more relevance to general population of composites
Genomics & product improvement tools and technologies
Perception around docility
Genetics replacing pedigrees and so weakening the breed society
Cost of new breeding technologies relative to gain
Need to stamp out all negative perceptions about keeping UK evaluation approach and demonstrate why it is an effective long terms arrangement
Losing sight of fundamental traits that established the breeds present day standing
Polling – EU legislation

3.4 Other

Strengths
Progressive and financially strong breed society
Society structure and management
Willingness to try new things and lead
Consistent management of the society
Regional structure for communications
Innovative thinking within society
Clear drive evident within business
Willingness to work with a broad spectrum of allied industry bodies

Weaknesses
Low technical infrastructure
Target from other breeds
Small company
Limited staff resource
Industry perception of breed societies
Industry connectivity
Lack of knowledge transfer (though improving)
Breeder/society aims differing from those of service providers
Many breeder to keep happy as ultimately society serves membership
Many breeders with little foresight or willingness to co-operate

Opportunities
Web and PDA opportunities for data capture
International opportunities, including R&D
To become informatics based
Strong track records in developing services such as Basco, Semenstore

Threats
Overseas herd books
Role of classic pedigree society less relevant
Government R&D priority
CAP reform

4. Method

In formulating a breed improvement strategy either at individual herd level or across a whole breed, there are several steps that apply:

Step 1: Identify the herd/breed's current performance
Step 2: Identify the traits of economic importance
Step 3: Identify the herd/breed's Breeding Goals
Step 4: Measures required to achieve the Breeding Goals
Step 5: Action!
Step 6: Review Progress & Adapt the Strategy

Within this framework and within the context of current and future funding streams, this strategy will fully consider the outcomes of the bull buyers' and roadmapping exercises to identify specific goals and initiatives required to achieve them.

STEP 1 Identify the Herd/Breed's Current Performance

Figures from the British Cattle Movement Service (BCMS) have confirmed that the Limousin breed is the foremost breed in the UK in terms of market share and that this has remained so for the last 17 years. In 2012 the proportions between the main breeds were as follows:

Breed	GB Total	England	Scotland	Wales
Limousin	**536,197 (30%)**	**304,546 (29%)**	**139,897 (30%)**	**91,754 (38%)**
A-Angus	266,180 (15%)	167,486 (16%)	85,563 (18%)	13,131 (5%)
Charolais	242,433 (14%)	96,107 (9%)	98,674 (21%)	47,652 (20%)
B Blue	186,282 (11%)	139,742 (13%)	17,178 (4%)	29,362 (12%)
Simmental	173,573 (10%)	87,658 (8%)	74,935 (16%)	10,980 (5%)
Other Beef	360,985 (20%)	259,063 (25%)	54,794 (12%)	47,128 (20%)
Total	1,765,650	1,054,602	471,041	240,007

Beef-sired calves in Great Britain in 2012. Source BCMS

However, what these figures don't reveal is the annual reduction in total number slaughtered. Over two years from 2010, for example, the national suckler cow herd declined by approximately 5%. In this same period, Limousin registrations with BCMS have reduced from 568 376 animals to 536 197. This is a reduction of 5.66%, mirroring perfectly the suckler downturn. The national suckler herd is predicted to fall a further 15% over the next 10 year period; it is logical to assume this will also be reflected in the rate of decline of Limousin births each year in the absence of any change in market share.

Servicing this suckler cow & finishing sector are 2717 pedigree breeders with an average herd size of approximately 7 cows. 19082 calves were registered in 2012; very little annual change being observed since 2009 when 19055 calves were registered. This arguably identifies a 'time-lag' effect between reduction in suckler cow numbers and resulting reduction in pedigree numbers.

With regard to genetic change over the years, the genetic trend graphs are attached in Appendix 1. It should be noted these breed trends by their nature will be typical of the trends that can be observed in many individual herds. Genetic trend reports at herd level are produced for performance recording members annually.

Progress for the production traits (growth and carcase traits) has been steady and, whilst it could be considerably greater, it is consistent with that made by other UK beef populations and Limousin populations overseas. Gains in maternal traits are again steady, but again could be considerably higher. The gains made have arguably been a result of correlation with the production traits as opposed to direct selection. Comparison with other populations is difficult owing to lack of overseas data. Of concern are Calving Ease, which has seen decline since 1980 and most significantly in recent years and 200 Day Milk which has seen no significant genetic change over the same period.

Currently, 230 herds performance record, this representing 8% of the BLCS membership but approximately 50% of the calves registered annually. Within the evaluation, performance records relating to 500469 animals are currently analysed.

STEP 2: Identify the Traits of Economic Importance

The roadmapping exercise involved 15 sector representatives (made up from Society staff members, Limousin breeders, scientists, a Signet representative and an independent consultant). A series of exercises examining current and future Business Drivers (affecting breed society members) and current and future Market Drivers (affecting commercial buyers) produced a list of performance characteristics ranked according to their relative importance. Fundamental to change and development in all of these characteristics is a wide, sustainable performance recorded population within the breed, and for this reason it has been added, ranking first on the list:

Rank	Characteristic
1	Development of the performance recorded base in the breed
2	Easy calving cows and calves
3	High resistance to disease*
4	High feed conversion efficiency
5	High carcase conformation at target market weights
6	High growth rate
7	High meat quality (leanness, tenderness , flavour & juiciness)
8	Good docility
9	Good cow fertility
10	Good longevity
11	Good muscling/muscle depth
12	Good cow milking ability

* identified as Johne's, Respiratory Diseases, Scours, BVD, TB, Worm Resistance and Fluke

The results from the bull buyers' and members' surveys would seem to broadly support these findings, giving assurance they correctly identify the characteristics in an appropriate and relevant order. When asked to identify the characteristics of the breed that attracted them to it, buyers listed the following in order:

- Easy Calving and Good conformation
- Carcase quality & killing out percentage
- Quality of progeny

STEP 3: Identify the Herd/Breed's Breeding Goals

By considering the current performance levels of the breed identified in Step 1 with the characteristics industry consider to be economically significant in Step 2, the Breeding Goals are identified and are automatically ranked in order of priority:

Step 2 Rank	**Step 2 Economically Important Characteristics**	**Step 1 Genetic Trend Information Relating to the Characteristic**	**Breeding Goal**
1	Development of the performance recorded base within the breed	n/a	**Breeding Goal 1** To grow the performance recorded population to 75% of registrations by the end of this Strategy period.
2	Easy calving cows and calves	Calving Ease in decline, birth weight and gestation length increasing	**Breeding Goal 2** To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero. (To expect positive genetic gain to be made across the population in the time of this strategy is arguably unrealistic).
3	High resistance to disease	None available	**Breeding Goal 3** To establish and implement breeding solutions to address disease issues as they become available
4	High feed conversion efficiency	None available	**Breeding Goal 4** To establish and implement breeding solutions to identify and improve feed efficiency

5	High carcase conformation at target market weights	Growth & Muscle Depth showing steady progress, though could be higher Changes in Fat Depth relatively small & satisfactory	**Breeding Goal 5** To improve the rate of gain in growth and carcase traits, without compromise to correlated traits
6	High growth rate	Growth showing steady progress, though could be higher	
7	High Meat Quality	None available	**Breeding Goal 6** To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.
8	Good docility	Docility showing steady and satisfactory progress	**Breeding Goal 7** To maintain current levels of genetic progress in Docility
9	Good cow fertility	Age at First Calving and Calving Interval making slow but steady progress. These are the only indicators currently of cow fertility.	**Breeding Goal 8** To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow fertility.
10	Good longevity	Longevity making slow but steady progress	**Breeding Goal 9** To maintain current levels of genetic progress in Longevity.
11	Good muscling/muscle depth	Muscle Depth showing steady progress, though could be higher	To improve the rate of gain in growth and carcase traits, without compromise to correlated traits. This is a repeat of the Breeding Goal 4 above and is merged with it.
12	Good cow milking ability	No significant genetic change since 1999.	**Breeding Goal 10** To generate positive genetic change and improve 200 Day Milk Weight within the breed.

STEP 4: Measures Required to Achieve the Breeding Goals

Through a number of processes, the roadmapping exercise produced a list of technologies, ranked in terms of relative impact, which would assist the breed in meeting its breeding objectives:

Rank	Relevant Technology
1	Genomics – within breed, across breed and species**
2	Abattoir data (VIA, meat quality, meat yield, ovary counts, pelvic dimensions etc)**
3	Remote sensing technology for on-farm recording
4	Docility – flight recorders, blood samples for stress recording*
5	Live animal measurements pre-slaughter (VIA, ultrasounds, calf dimensions)
6	On farm scanning (FD/MD/Muscling & scrotal circumference)*
7	On farm recording (calving ease, birthweight, gestation length)*
8	Linking in to national databases
9	On farm weight recording (100, 200, 300, 400 day growth)*
10	Feed conversion recording (feedlot/individuals)

* Technologies already in existence

** Some tools will become available as part of the TSB Carcase Traits Project

Cross referencing this list to the Breeding Goals established in Step 3 identifies the technological pathway for the Breeding Goal to be realised, maintaining the Breeding Goal order of priority, shown below:

Breeding Goals from Step 3		**Relevant Technology/Technologies**
Breeding Goal 1	To grow the performance recorded population to 75% of registrations by the end of this Strategy period.	Breeding Goals 2 to 10 embrace aspects of herd improvement common to all Limousin producers. Development in these areas along with strong knowledge transfer support and 'demand-pull' from the commercial sector will grow the recording base.
Breeding Goal 2	To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero.	Genomics Abattoir data Live animal measurements pre-slaughter On farm recording Linking to national databases
Breeding Goal 3	To establish and implement breeding solutions to address disease issues as they become available	Genomics Remote sensing technology On farm recording
Breeding Goal 4	To establish and implement breeding solutions to identify and improve feed efficiency	Genomics Abattoir data Live animal measurements pre-slaughter On farm scanning On farm weight recording Linking to national databases Feed conversion recording
Breeding Goal 5	To improve the rate of gain in growth and carcase traits, without compromise to correlated traits	Genomics Abattoir data Live animal measurements pre-slaughter On farm scanning On farm weight recording Linking to national databases
Breeding Goal 6	To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.	Genomics Abattoir data Live animal measurements pre-slaughter On farm data collection Link to national databases
Breeding Goal 7	To maintain current levels of genetic progress in Docility	Docility measures On farm recording Remote sensing
Breeding Goal 8	To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow fertility.	Genomics Abattoir data Remote sensing On farm recording Linking to national databases
Breeding Goal 9	To maintain current levels of genetic progress in Longevity.	On farm recording Linking to national databases
Breeding Goal 10	To generate positive genetic change and improve 200 Day Milk Weight within the breed.	Genomics On farm weight recording

Step 5: Action!

Now that the Breeding Goals and the technologies surrounding them have been established, the specific actions required to achieve the Goals can be identified. Again, these appear in Breeding Goal order and their implementation will be approached as such, subject to changes in market drivers and available funding streams.

It is important to note that the anticipated start times for each area of work are subject to the constraints and opportunities of budget and funding.

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 1 To grow the performance recorded population to 75% of registrations by the end of this Strategy period.		Breeding Goals 2 to 10 embrace aspects of herd improvement common to all Limousin producers. Development in these areas along with strong knowledge transfer support and 'demand-pull' from the commercial sector will grow the recording base.	2014-2019	£7000 See Appendix 1 Note 1	A natural outcome of Breeding Goals 2-10 that accelerates potential for genetic gain by herd & individual

Breeding Goals from Step 3	Relevant Technology/ Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 2 To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero.	Genomics	The Carcase Traits project will establish the first UK Limousin SNP key. As this project draws towards conclusion in 2014/2015 opportunities to introduce data relevant to Calving Ease will be explored & the value of doing so considered against the cost. This may include use of existing records and/or new.	2016-19	Stage 1 £50000 Stage 2 £20000 See Appendix 1 Note 2	Total cost estimate by Year 7 (2021) is £163000. Total annual benefit by Year 15 ((2029) to allow for
	Abattoir data	Examples of new data potentially impacting on Calving Ease are pelvic measurements & ovary counts, amongst others. This source of new data will be considered in conjunction with the above.	2015-6	Stage 1 £10000 Stage 2 £25000 See Appendix 1 Note 3	
	Live animal measurements pre-slaughter	In conjunction with the investigation above in to recording of data for genomic purposes, opportunities to explore the value of collecting	2015-16		

		wider animal measurements than at present will be taken. Calf dimensions, for example.			20% replacem't rate) is £3.6 million pa. An important benefit will also accrue to breeders securing and improving market share of Limousin in the breeding sector. See Appendix 1.
	On farm recording	All reasonable steps will be taken to increase the proportion of the breed that are performance recording and that submit actual birth weights (not estimates) at the point of registration. Additionally, a programme of myostatin genotyping will be introduced with a view to reaching a point by 2018 where the genotypes of all sires of registered calves are known and published. Genotyping of dams will remain voluntary and publication via Basco optional. Longer term, the aim will be to incorporate this genotype information in to the BLUP analysis through marker assisted selection, as appropriate.	2015-19 2015-18 2020-21	Stage 1 £3000 Stage 2 £15000 See Appendix 1 Note 4. £10000. See Appendix 1, Note 5. £10000. See Appendix 1 Note 6.	
	Linking to national databases	The Carcase Traits project has established a link with the BCMS database & has allowed incorporation of animal data through the use of a new 'super-pedigree' model. Opportunities to widen this technique and draw in additional animal data relevant to calving ease will be identified and the value of doing so considered against the cost.	2016	£20000. See Appendix 1 Note 7.	

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 3 To establish and implement breeding solutions to address disease issues as they become available	Genomics	Investigate genomic solutions applied to disease control overseas. Availability of UK Health Scheme data should be considered.	2015	£3000. See Appendix 1 Note 8.	Not definable until completion of review. See Appendix 1 Breeding
	Remote sensing technology	Consider measures adopted by other species to enhance recording of disease on and off-farm.			
	On farm recording				

					Goal 3 for detail.

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 4 To establish and implement breeding solutions to identify and improve feed efficiency	Genomics Abattoir data Live animal measurements pre-slaughter On farm scanning On farm weight recording Linking to national databases Feed conversion recording	Investigate appropriate models that will secure the long term capture of performance data and provide an appropriate means of genetic evaluation. Practices and models adopted by groups and individuals overseas will be relevant. Securing large scale industry partners for research phases and beyond is likely to be beneficial.	2015 - 2021	£750000 See Appendix 1 Note 9.	£18 million per annum. See Appendix 1 Breeding Goal 4 for detail.

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 5 To improve the rate of gain in growth and carcase traits, without compromise to correlated traits	Genomics Abattoir data Live animal measurements pre-slaughter On farm scanning On farm weight recording Linking to national databases	This breeding goal will largely be met by the current work in progress under the Carcase Traits Project. Its aim is to identify the contribution that genetics make to carcase attributes using VIA and DNA technologies. Using VIA data its main outcome will be genomic breeding values for up to nine main muscle groups. This will be the first introduction of genomics to the beef sector and wide knowledge transfer support will be provided.	2011 - 2015	£300,000 See Appendix 1 Note 10.	£25 Million annually. See Appendix 1 Breeding Goal 5 for detail.

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 6 To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.	Genomics	Investigate through appropriate means the influence genetics have on meat quality. Based on the outcome of this, establish relevant means of data capture and evaluation, setting appropriate and achievable breeding targets. Creation of market demand for an improved product will be crucial.	Long term – date not definable	Not currently definable See Appendix 1 Note 11.	Not currently definable See Appendix 1 Breeding Goal 6 for detail.
	Abattoir data				
	Live animal measurements pre-slaughter				
	On farm data collection				
	Link to national databases				

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 7 To maintain current levels of genetic progress in Docility	Docility measures	Continue to encourage the scoring of docility amongst recorded population. Consider new methods of measurement and data capture that will enhance accuracy of predictions.	2017 (when yearlings available under Feed Efficiency Project) to 2022.	£21000 See Appendix 1 Note 12.	£1.25 million pa (realisable after the term of this plan). See Appendix 1 Breeding Goal 7 for detail.
	On farm recording				
	Remote sensing				

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 8 To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow production efficiency.	Genomics	Investigate availability currently of cow weight information on Basco and consider appropriate ways this could be used to provide an indicator of production efficiency. Also investigate enhanced data collection requirements that would support this. Knowledge transfer in appropriate use of breeding values would be essential and industry partners in this respect are important.	2015-2016	£30000 + annual data collection /analysis fees (not yet definable).	£10.5m pa beyond Year 10
	Abattoir data				
	Remote sensing				
	On farm recording				
	Linking to national databases		2014	Review £3000. (Wider costs not yet definable). See Appendix 1 Note 13.	Not yet definable See Appendix 1 Breeding Goal 8 for details.

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 9 To maintain current levels of genetic progress in Longevity.	On farm recording	Evaluate current methods of data analysis and how these could be enhanced through higher levels of data capture. For example, use of BCMS data etc.	2014-2017	£13000 See Appendix 1 Note 14.	Not currently definable See Appendix 1
	Linking to national databases				

					Breeding Goal 9

Breeding Goals from Step 3	Relevant Technology/Technologies	Action	Start When	Estimated Cost	Estimated Benefit
Breeding Goal 10 To generate positive genetic change and improve 200 Day Milk Weight within the breed.	Genomics On farm weight recording	Evaluate current methods of data analysis and how these could be enhanced through higher levels and/or alternative means of data capture.	2014-2015	£3000 for initial investigation. See Appendix 1 Note 15.	Not definable until investigation completed. See Appendix 1 Breeding Goal 10.

Step 6: Review Progress and Adapt the Strategy

For each Breeding Goal, there will be key performance indicators and these are identified below. Regular – and at least annual – evaluation of these will be carried out and the plan adapted accordingly. Flexibility in the plan is required so it can adapt to the changing needs of BLCS members and their customers, as well as changes in market environments and available funding streams.

Breeding Goal		Key Performance Indicators
Breeding Goal 1	**Breeding Goal 1** To grow the performance recorded population to 75% of registrations by the end of this Strategy period.	• Annual increase in the proportion of registered calves that are performance recorded
Breeding Goal 2	To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero.	• The annual genetic trend for the trait (and those closely associated with it)
Breeding Goal 3	To establish and implement breeding solutions to address disease issues as they become available	• Quantity and quality of knowledge transfer materials & vehicles • Reduction in incidence/prevalence of disease in pedigree and commercial herds • The annual genetic trend for the trait(s), as appropriate.
Breeding Goal 4	To establish and implement breeding solutions to identify and improve feed efficiency	• The annual volume and quality of feed efficiency measures • Quantity and quality of knowledge transfer materials & vehicles • Laterally, annual genetic trend for the trait
Breeding Goal 5	To improve the rate of gain in growth and carcase traits, without compromise to correlated traits	• The annual volume and quality of on-farm and abattoir-sourced data • Quantity and quality of knowledge transfer materials & vehicles • The annual genetic trends for the growth and carcase traits
Breeding Goal 6	To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.	• The volume and quality of data captured • The number of new markets • The increase in market share • Laterally, the annual genetic trend for the trait(s)
Breeding Goal 7	To maintain current levels of genetic progress in Docility	• Annual increase in submissions of docility data • The annual genetic trend for the trait

Continued over/

Breeding Goal 8	To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow fertility.	• The annual volume and quality of cow size/efficiency measures • Quantity and quality of knowledge transfer materials & vehicles • Laterally, annual genetic trend for each trait.
Breeding Goal 9	To maintain current levels of genetic progress in Longevity.	• The annual genetic trend for the trait
Breeding Goal 10	To generate positive genetic change and improve 200 Day Milk Weight within the breed.	• The annual genetic trend for the trait

In order to achieve the strategy, all parts of the beef industry will need to continue to invest adequately, and Government will need to continue to play its part. That investment will only be made by the various parties if there is a firm expectation of a healthier and more sustainable sector. This reinforces the need for the strategy to gain widespread support in order to secure adequate funding for its implementation.

Appendix 1

Assessment of Anticipated Costs and Benefits

Breeding Goal 1: To grow the performance recorded population to 75% of registrations by the end of this Strategy period.

Action: Breeding Goals 2 to 10 embrace aspects of herd improvement common to all Limousin producers. Development in these areas along with strong knowledge transfer support and 'demand-pull' from the commercial sector will grow the recording base.

Estimate of Benefit

It is accepted that performance recording across as wide a population as possible increases the rate of gain achievable by any individual within it, and thereby enhances the breed's ability to change.
Current levels of performance recording account for just under 50% of calves registered annually. Increasing this to 75% will offer potential to increase gains, this through a combination of widening breeding opportunities and the potential to identify animals considered to be outliers and is a natural outcome of the implementation of Breeding Goals 2 to 10.

Notes Relating to Cost Estimate

Note 1

The cost of establishing this outcome is largely borne by development of the other Breeding Goals. However, its successful establishment, particularly in the early stages of the plan term could be enhanced and cemented by low-level investment in regular knowledge transfer to BLCS members. Estimated cost £7000 over 5 years.

Breeding Goal 2: To improve Calving Ease to a point at the end of this Strategy period (2024) where its annual rate of genetic change is zero.

Estimate of Benefit
The current breed average EBV for Calving Ease is -2.4%
This interprets as 2.4 more animals/100 require assistance than the average in 1990.
The estimated cost of assisted calvings is £300/cow (source: Eblex).
Improving Calving Ease to 0% represents a saving to industry of £720/100 cows pa, equivalent to £7.20/cow pa.
There are an estimated 500,000 Limousin-bred animals in the UK. A saving of £7.20/cow is equivalent to an annual £3.6 million saving industry-wide, achievable by the end of the fifth year following the term of this plan (ie allowing for a replacement rate of 20%).

Notes relating to Cost Estimates

Note 2
Action: "The Carcase Traits project will establish the first UK Limousin SNP key. As this project draws towards conclusion in 2014/2015 opportunities to introduce data relevant to Calving Ease will be explored & the value of doing so considered against the cost. This may include use of existing records and/or new"

In tandem with the action point immediately below, opportunities to incorporate genotypes in to the evaluation of VIA calving ease data will be pursued. A two stage approach will be required:

Stage 1: Collection of genotypes, including exploitation of DNA already collected through the Carcase Traits project. Estimated cost £50000.
Stage 2: Development of genomic breeding values, along with associated programming and knowledge transfer. Estimated cost £20000.

Note 3
Action: "Examples of new data potentially impacting on Calving Ease are pelvic measurements & ovary counts, amongst others. This source of new data will be considered in conjunction with the above"

Two stages will be required:

Stage 1: investigate the value of data that can be mined from VIA and establish the pathway for its transmission. Estimated cost £10000.
Stage 2: Development of a new breeding value(s), along with associated programming and knowledge transfer. Estimated cost £25000.

Note 4
Action: "All reasonable steps will be taken to increase the proportion of the breed that are performance recording and that submit actual birth weights (not estimates) at the point of registration".

A two-stage approach will be taken to investigate the use of hoof and girth tapes to achieve better quality and higher-volume birth weight data.

Stage 1: A trial amongst target herds to collect birth weights measured by weigh scales and hoof and girth tapes. Data from at least 1500 registered calves would be required over three years. Estimated

cost: Programming to store data and analysis of data £3000. It is anticipated that data would be collected and provided voluntary.

Step 2: Depending on the outcome of stage 1, programming & refinement of the birth weight EBV (and possible development of a new EBV, independent of the current birthweight EBV), along with appropriate knowledge transfer and review procedures would be required. Estimated cost (based on recent costs associated with development of new EBVs) £15000.

Note 5

Action: "Additionally, a programme of myostatin genotyping will be introduced with a view to reaching a point by 2020 where the genotypes of all sires of registered calves are known and published. Genotyping of dams will remain voluntary and publication via Basco optional".

Programming costs to store and publish results will be required. Estimated cost £5000. Automated transmission of test results from Wetherbys to Basco has already been accommodated within the Carcase Traits Project.

Online guidance and a mating predictor facility will be required to assist breeders in predicting the outcome of specified matings. This will work in conjunction with a programme of knowledge transfer activity, including case studies, breeder meetings etc. Estimated cost £5000.

Note 6

Action: "Longer term, the aim will be to incorporate this genotype information in to the BLUP analysis through marker assisted selection, as appropriate".
Estimated cost £10000.

Note 7

Action: "The Carcase Traits project has established a link with the BCMS database & has allowed incorporation of animal data through the use of a new 'super-pedigree' model. Opportunities to widen this technique and draw in additional animal data relevant to calving ease will be identified and the value of doing so considered against the cost".

Costs associated with investigation in to availability of appropriate data and programming estimated to be £20000.

Breeding Goal 3: To establish and implement breeding solutions to address disease issues as they become available

Action: "Investigate genomic solutions applied to disease control overseas. Availability of UK Health Scheme data should be considered. Consider measures adopted by other species to enhance recording of disease on and off-farm".

Estimated Benefit
Not possible to define until completion of review (below).

Notes Relating to Cost Estimate

Note 8
An independent review will be carried out in to breeding solutions to Johne's, Respiratory Diseases, Scours, BVD, TB, Worm Resistance and Fluke in particular. This will include full consideration of the use of other databases and sources of data (e.g. abattoir) as well as investigation of new tools to identify and manage disease. Estimated cost (using student/PhD resource) £3000.

Breeding Goal 4: To establish and implement breeding solutions to identify and improve feed efficiency

Action: "Investigate appropriate models that will secure the long term capture of performance data and provide an appropriate means of genetic evaluation. Practices and models adopted by groups and individuals overseas will be relevant. Securing large scale industry partners for research phases and beyond is likely to be beneficial".

Estimated Benefit

Work conducted on the TSB application in 2011 identified benefits to the UK beef sector of £18 million pa, these realised through selection of Limousin breeding stock that cost less to feed, increase output (growth and carcase yield) and reduce greenhouse gas emissions.

Notes Relating to Cost Estimate

Note 9

The anticipated model for data collection and analysis is as follows:

- Partner dairy herds are established that use specified Limousin semen. Calving results, amongst other relevant measures are recorded.
- Calves are finished on contract through existing breeder/finisher infrastructures. Equipment to measure feed efficiency is installed in the finishing units. Opportunities to record wider measures (eg temperament) are also exploited.
- Animals are slaughtered through partner abattoirs where VIA data is captured.
- Outputs will be breeding values and genomic breeding values for measures associated with feed efficiency
- Steps will be taken to protect the longevity of this structure after the life of the project to ensure data continues to be captured and evaluated.

In 2014, Defra's funding position will become clear. It has expressed interest in this subject area as a result of the potential to reduce GHG emissions. Discussions will be held with potential partners in the breeding, finishing and processing sectors with a view to being in a position to submit an application for funding towards the end of the year, or as opportunity arises.

Until partners and the final model are established, the total cost to BLCS is difficult to estimate. A similar model was proposed under the 2011 TSB2 application, where direct costs to BLCS were estimated to be £750 000 over 5 years.

Breeding Goal 5: To improve the rate of gain in growth and carcase traits, without compromise to correlated traits

Action: "This breeding goal will largely be met by the current work in progress under the Carcase Traits Project. Its aim is to identify the contribution that genetics make to carcase attributes using VIA and DNA technologies. Using VIA data its main outcome will be genomic breeding values for up to nine main muscle groups. This will be the first introduction of genomics to the beef sector and wide knowledge transfer support will be provided".

Estimated Benefits

The following is an extract from the Project Plan that was approved for funding by TSB:

"The overall market place for this type of data, knowledge and information may eventually be worth as much as £34 million per year; however this assumes that all target sectors purchase fully for every animal. This will certainly NOT be the case, so a more conservative approach has been taken, with overall market share by value expected to be about 6%, yielding sales of about £2.2 million. With gross profits of about 45%, this should yield about £1 million per annum.

In addition to this data value it should not be ignored that if this type of approach, combined with incentivising payments for more valuable animals (e.g. those with a higher % meat yield in the valuable cuts) is fully utilised it will provide a major increase to the value of Limousin bred carcasses / meat. An initial estimate (based on the strip loin) has demonstrated that this value could be as much as £50/animal. If this was exploited across the UK it would lead to an ultimate benefit of £100 million for the beef sector".

The benefits across the wider industry are significant. For the purposes of this plan, those relating directly to Limousin-bred animals are assumed. £50/animal pa across a population of 500 000 is equivalent to £25 million annually if successful uptake by the sector is achieved.

Notes Relating to Cost Estimate

Note 10

The total cost of the Carcase Traits project is £1.5 million, of which BLCS are to contribute £300 000 over 4 years 2011 – 2015.

Breeding Goal 6: To establish the role genetics has to play in control of meat quality, identify suitable means of evaluation & set appropriate breeding targets.

Action: "Investigate through appropriate means the influence genetics have on meat quality. Based on the outcome of this, establish relevant means of data capture and evaluation, setting appropriate and achievable breeding targets. Creation of market demand for an improved product will be crucial".

Estimated Benefits

The breeding effects (ie influence of genetics) on meat quality are typically low. Much published work identifies that environmental effects relating to feeding and pre-slaughter stress have a more direct effect on meat quality. Financial benefits following breed improvement measures are therefore likely to yield low return and, under current payment structures, would only manifest themselves through positive change in market share. Other, more direct non-breeding measures can be taken to address market share that are quicker to implement and will yield equal or better return.

However, it would be a natural progression from the Carcase Traits project to use the data flow pathway established with processors to capture appropriate meat quality information that may present itself in the future, if it were deemed appropriate. Although it isn't possible to define the financial benefit of this at this point in time, it is right that reference to it is made.

Notes Relating to Cost Estimate

Note 11

Until data collection and analysis procedures are known, it is not possible to estimate costs relating to this future area of work.

Breeding Goal 7: To maintain current levels of genetic progress in Docility

Action: "Continue to encourage the scoring of docility amongst recorded population. Consider new methods of measurement and data capture that will enhance accuracy of predictions".

Estimated Benefits

Cattle that are difficult to handle cost the industry and estimated £4.6 million per annum in terms of additional labour and handling requirements. This is equivalent to approximately £2.50 per animal. On the basis of 500 000 Limousin-bred animals in the UK, the annual benefit from eliminating this cost through breeding more docile animals could therefore be assumed to be in the region of £1.25 million pa, realisable by the end of this 10-year plan.

There would also be benefit to Limousin breeders by increasing their pedigree market share. A significant proportion of producers currently have perceived or actual experiences of Limousin behaviour that encourage them to use other breeds. As ease of handling improves, this barrier is removed and it would be reasonable to expect market share to improve. The financial benefit of this is difficult to define at this point, however, and probably not fully realisable within the term of this plan.

Notes Relating to Cost Estimate

Note 12

Good rates of progress are currently being made in the pure-bred population to improve Docility. It is closely correlated with growth and muscling and is moderately heritable, so genetic improvement is inevitable as a result of indirect selection on the carcase traits (most common) and direct selection on the trait itself (less common). Low cost inputs only are required to maintain breeder understanding of this trait and increase submission of docility measures. Estimated cost £1000 over 5 years.

Less is understood about the behaviour of Limousin in the cross-bred population. This is where temperament issues manifest themselves more noticeably and is the area of greatest concern to Limousin customers. The proposals for a breeding scheme to underpin the collection of Feed Efficiency data present an ideal opportunity to collect data within that cross bred population for eventual analysis. Investigation should also be carried out on published work relating to cross-bred Limousin temperament elsewhere in the world. Initial costs will be concerned with data capture and analysis and are estimated to be in the region of £20000 over 5 years, starting on commencement of a Feed Efficiency project in 2017 (ie first yearlings not available until 2017).

Breeding Goal 8: To improve current levels of progress being made for Age at 1st Calving and Calving Interval and Gestation length. To investigate wider measures of cow production effiency.

Action: "Investigate availability currently of cow weight information on Basco and consider appropriate ways this could be used to provide an indicator of production efficiency. Also investigate enhanced data collection requirements that would support this. Knowledge transfer in appropriate use of breeding values would be essential and industry partners in this respect are important".

Estimated Benefits

Age at 1st Calving and Calving Interval are two of the main trait EBVs within the Maternal Value. Investigation carried out by SAC in 2011 established the additional value of selecting replacement females with Maternal Values in the Top 10% of the breed compared to average at £42pa. Genetic improvement that moves the Limousin population towards this, could start yield to similar benefits across all Limousin-bred animals by the end of this plan. Assume by Year 10 that 50% of this gain has been achieved; the potential benefits are in the region of £10.5 million per annum.

The benefits resulting from improved cow efficiency are more difficult to quantify until the exact measures and outcomes are known (see below).

Notes Relating to Cost Estimate

Note 13

The EBVs for Age at 1st Calving, Calving Interval and Gestation Length are well-established within the evaluation. Opportunities to draw data through the pathway established with BCMS will be investigated to increase the volume of records from a wider range of herds. Costs relating to programming and data cleaning are estimated to be in the region of £30000. Annual BCMS and evaluation fees will need to be investigated at time of development.

With regard to cow efficiency it is proposed that a review of the UK data held to date is carried out as well as a literature review conducted in relation to Limousin work published elsewhere in the world. This is with a view to establishing the most appropriate measures in the UK, likely parameters in the eventual evaluation and ongoing methods of data collection. Until this has been conducted, the costs and benefits cannot be defined. Estimated cost of review £3000.

Breeding Goal 9: To maintain current levels of genetic progress in Longevity

Action: "Evaluate current methods of data analysis and how these could be enhanced through higher levels of data capture. For example, use of BCMS data etc".

Estimated Benefits

Longevity is often cited in producer surveys, for example, as an important factor in their breed choice. However, the perceived problem lies more with breeding bulls than with cows, the answer to which is more a management issue than something that can be addressed through a breeding route. However, this must not allow breeders to take their eye off the ball and allow cow longevity to decline. Steady annual genetic progress is being made and is comparable with other breeds. The financial benefit of maintaining this is difficult to define, since it largely surrounds issues relating to protection of pedigree market share.

Notes Relating to Cost Estimate

Note 14

Three elements will help maintain the current rate of genetic gain for this trait...

The first is regular knowledge transfer to breeders about the importance of the trait to Limousin buyers – and therefore the emphasis that should be placed on it during selection of breeding animals. This can be relatively low cost and largely achieved through electronic means. Estimated cost £1000.

The second is better fate coding within Basco. Currently, recording disposal and death reasons is not required. More accurate data capture will indicate where potential problem areas lie and potentially create a better data set for analysis in the future. Cost £5000.

The third is to investigate the value of adding wider industry data via the BCMS pathway already established by the Carcase Traits project. Early investigation costs would be estimated in the region of £2000, with further data capture, programming & analysis costs estimated in the region of £5000. It is possible an annual fee would be charged by BCMS for ongoing supply of data as well as an additional analysis fee. This would need to be established at time of development.

Breeding Goal 10: To generate positive genetic change and improve 200 Day Milk Weight within the breed.

Action: "Evaluate current methods of data analysis and how these could be enhanced through higher levels and/or alternative means of data capture".

Estimated Benefits

As the breed selects more heavily on growth and carcase traits, the downward pressure on 200 Day Milk increases. Improving gains within the breed has a real and perceived effect, both of which will protect and, depending on the degree of gain, enhance the breed's market share. However, the real economic benefit of doing so isn't known and much evidence of it is anecdotal. Until wider investigation is carried out, the precise benefit from focus of resource in this area is difficult to quantify.

Notes Relating to Cost Estimate

Note 15

It is proposed that a study be conducted to evaluate the current method of analysis, its real impact on industry and to fully examine new methods of evaluation (including genomic solutions and potential for overlap with data collected for the Carcase Traits project). The initial cost of this is estimated to be in the region of £3000. Wider costs relating to new data collection and analysis cannot be defined until the study has been completed.