



# UK Genetics for Livestock & Equines (UKGLE) Committee Mission Statement

This Mission Statement was prepared by the UK Genetics for Livestock & Equines (UKGLE) Committee, an independent expert advisory Committee to Defra and the Devolved Administrations (DAs), providing advice and support on the conservation and use of our farm *animal genetic resources* (AnGR).

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## Role of the Committee and Key Objectives

The global landscape we live in is constantly changing and evolving which impacts on how we produce our food sustainably, protect our environment and address the challenges posed by climate change. To help meet these challenges, Defra has reviewed and widened the remit of the Farm Animal Genetic Resources (FAnGR) Committee to provide the necessary expert advice and support on the conservation and use of our AnGR moving forward.

The Committee, now named the UK Genetics for Livestock and Equines (UKGLE) Committee, will continue to advise Defra and the DAs of Scotland, Wales and Northern Ireland on all issues relating to managing and conserving AnGR. They will continue to identify opportunities to capture value from taking account of the genetic variation in livestock species more effectively, with a focus on applications to enhance production efficiency and minimise environmental footprint, whilst maintaining high levels of animal health and welfare. The Committee will also continue to advise on breed conservation and their sustainable use, and on compliance with retained UK zootechnical legislation.

The Committee's role includes assisting Defra and the DAs to:

- highlight the importance of considering AnGR as part of wider policy-making
- raise awareness of AnGR and the importance of genetic variation in ensuring resilient, robust, sustainable production and high health standards
- review and advise on advances of relevance to genetics
- help evaluate proposals on zootechnical controls
- improve the collection of data for livestock and equines in the UK
- investigate the use of genome enhanced precision breeding and production
- advise on building and sustaining the market for UK genetics on an international level

## **Key areas of work that UKGLE will be leading on in 2022:**

### **1. Building UK Capability through our Genetic Resource**

Working with both industry and UK Government, promoting our GR and advising on new technologies that will support livestock production and benefit the UK market both domestically and internationally. Full details, including key targets, can be found at [Annex A](#).

### **2. Resource Monitoring**

Monitoring of all the UK's livestock GR, using this data to inform government and industry on the resources available to help support agriculture and food production for both domestic and international markets. Full details, including key targets, can be found at [Annex B](#).

### **3. Harnessing the Potential of the Data Revolution and Genomic Passports**

#### Developing a common vision and roadmaps for effective data use

Current advances in the capturing, access and use of genetic data, are offering new ways for industry to make effective and timely decisions in livestock production that will generate wider benefits. Working with both government and industry the Committee will develop a long-term vision to make best use of these new technologies.

#### Genomic Passports

Linked to above, recent developments in genomic tools will provide further benefits, not only in breeding and sustainable management of GR, but also through feeding and disease management systems tailored to each circumstance. Combining this with easy access to knowledge of the animals own genetic make-up offers potential to apply precision management in all areas of livestock production.

Full details, including key targets, can be found at [Annex C](#).

## **Livestock Production**

In the UK, livestock production has been carried out for centuries across a wide range of geographical areas and production systems. We also have a long history of developing and applying advanced genetic improvement approaches to help breed animals that can thrive in specific environments or to meet the requirements of target markets. As a result, we host a wealth of genetic variation in livestock, as demonstrated by the wide range of distinctive breeds in many species, often referred to as genetic resources (GR). We are also home to some of the most well-known and advanced animal breeding companies in the world.

The UK's accumulated AnGR are a critical natural capital providing ecosystem services that cannot be replicated by other means and can play an important role in meeting societal challenges, such as sustainable, robust and resilient food production, mitigating and adapting to climate change, and

supporting the rural economy. The UK also has obligations to conserve these assets, as set out under international agreements and is also an active member of the European Regional Focal Point for Animal Genetic Resources.

To-date the economic benefits of AnGR have been characterised in broad commercial terms. There is now the potential for them to be more clearly aligned to genomic capability, intellectual property and traceability, and understanding the economic benefits that they provide to "public goods", for example, by calculating the social, cultural and environmental benefits that would occur from genetic capital and future investment.

Historically, the exact genetic/genomic cause of variation within and between breeds was largely unknown. Through dramatic improvements in production efficiency and distinct geographical distributions of breeds and crosses, there is evidence that tailoring the genetics to best fit each specific production system can potentially generate real and significant benefits. It is likely that we have only scratched the surface in terms of the benefits that could be captured from a better understanding and harnessing of the genetic variation that already exists within our livestock populations.

As a result of recent rapid advances in genetics, genomic tools, data collection technologies and methods, it is now increasingly possible to better understand and characterise specific genomic variations in livestock. This growth in knowledge includes developing a better understanding of the impact genetic variations can have directly or in combination with specific feeding, management or disease treatment and prevention options on a number of characteristics of interest, such as production efficiency, efficiency of feed use, green-house gas emissions, disease resilience/resistance and welfare. These advances, when combined appropriately with our wealth of GR, offers a strong platform for innovation to meet the challenges ahead, sustainably manage and conserve these important resources for generations to come, and to support economic growth across the UK.

We will endeavour to continue our horizon-scanning of relevant technological developments and to assess the potential impacts and opportunities for the UK while also taking account of markets, economics and Government policy, to support the conservation and use of our AnGR.

## Building UK Capability through our Genetic Resource

The production of livestock products, such as meat, milk and eggs are a key part of the UK economy, with a combined (across species) annual market value of over £16 billion<sup>1</sup> in 2021. As well as playing a key role of maintaining a resilient, robust and secure supply of nutritious food for UK citizens, it also contributes a significant revenue stream for the UK economy through exports. For example, in 2021 the value of UK exports in meat alone exceeded £2.2 billion.

As production occurs across a wide range of geographical areas across the UK, the revenue generated helps support and maintain rural communities and rural landscapes, particularly in hill and upland areas where growing crops (other than grass) is extremely difficult.

Much of this success is underpinned by a wide diversity of livestock breeds and breed crosses that are well adapted to different production environments, which are the result of many decades of selective breeding. The diversity in genetics, ability to utilise different feed types and to thrive in different environments, particularly amongst our native breeds, allows us to make highly efficient use of the land and resources available, adapt to emerging environmental and disease challenges, and to remain highly competitive in a large global market. It also offers a means to generate distinctive, premium products both for domestic consumption and export, with an emphasis on sensory quality, tradition, history and culture; efficient use of grass and water; naturalness, environment and purity, and importantly healthier nutrition.

Ensuring that our livestock populations retain these important qualities whilst continuing to build-upon our strong heritage through the adoption and appropriate use of new technologies will be vital in meeting the wider Government priorities.

When the rate of technology development is rapid, as is currently the case with genomic and digital technologies, capturing value in a cost-effective manner can be very challenging, particularly for sectors that are highly fragmented (e.g., beef and sheep). However, if done successfully, it could support not only more efficient livestock production, but also the generation of additional benefits through growth in the export of elite genetics and the development of new products and services.

We will work together with industry to engage effectively with relevant new technologies. Where industry has proactively adopted these in the past, there is sound evidence to show that it can have a dramatic and positive effect on performance and profitability. For example, in pigs, early theoretical calculations suggested an increase in genetic progress of some 20% to 30% through the integration of genomics into improvement programmes. This has now been validated in commercial production<sup>2</sup>.

The UKGLE Committee will focus on galvanising collaboration between Defra, the DAs, industry and academia, obtaining stakeholder feedback and sharing information/knowledge exchange along the supply chain. We will regularly engage with industry partners on common issues to enable collaboration and achieve livestock genetic improvement that is informed by market requirements thereby substantially increasing the efficiency of production in the UK.

We will support Defra in the delivery of the Animal Health and Welfare Pathway, by helping to ensure that farmers have what they need to maintain the very highest levels of health and welfare for their animals, whilst meeting market demand. We will also support the DAs with their development of similar payment schemes.

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<sup>1</sup> [Total Income from Farming of the United Kingdom 2021, provisional estimate](#) – Published 12 May 2022

<sup>2</sup> Knol, Nielsen and Knap, 2016

Ostensen and Vestergaard, 2020

[Genomic selection in commercial pig breeding | Animal Frontiers | Oxford Academic \(oup.com\)](#)

We will work closely with Defra, APHA, the DAs and industry to help minimise the spread and impact of disease outbreaks by advising on the role genetic improvement in resistance to diseases could play. For example, how genetic improvement can reduce the use of antimicrobials as set out in the UK Anti-Microbial Resistance 5-year National Action Plan which aims to deliver a better understanding of antibiotic use.

#### Key targets

- Work with industry to promote engagement with relevant new technologies,
- Increase collaboration between Defra, the DAs, industry and academia,
- Support Defra in the delivery of the Animal Health and Welfare Pathway,
- Work closely with Defra, APHA, the DAs and industry to help minimise the spread and impact of disease outbreaks.

## Resource Monitoring

UKGLE will monitor all the UK's farm animal genetic resources, both mainstream and niche, to ensure that government and industry have up to date information on the resources to help support animal agriculture and food production for both domestic and international markets.

As the variety of data capture increases for health and welfare, such as genomic screening, UKGLE will also monitor this, providing advice to support development of modern breeding strategies that will provide further improvements in health and welfare. Using this data to also highlight potential concerns and proposed mitigations.

The UK is home to some of the world's most innovative breeders, breeding companies, researchers and research institutions all of whom are involved in developing the farm animals of the future. UKGLE will continue to develop monitoring systems to ensure that all these resources are recognised to provide accurate information to support policy development and can continue to improve its animal agriculture for the benefit of the environment and consumers both at home and abroad. This will enable the UK to maintain its status as one of the leading suppliers of improved genetics for the development of sustainable animal agriculture around the world and to exploit the opportunities created by our new status as a single trading nation.

The UK is also home to an extraordinary rich pallet of native livestock, poultry and equine breeds. These native breeds are an important resource for the future development of sustainable animal agriculture, and they are also an integral part of our national biodiversity protected by international treaties. UKGLE will continue to build on the success of the National Breed Inventory to monitor these populations both on farm and in genebanks. This information will be used to ensure that the UK continues to meet its obligations under the Convention on Biodiversity and the Sustainable Development Goals set by the United Nations. The inventory will help to inform policies across all the UK governments for the conservation of these native breeds in the face of threats such as of exotic and newly emerging diseases. UKGLE will also ensure that UK governments have accurate information on which to base future support schemes for native breeds as they develop their own post EU policies for agriculture.

### Key targets

- Act as hub to collate information relating to UK capability in livestock breeding and genetics which can be used both at home and abroad to promote our breeds and our breeding companies,
- UKGLE will help to promote the benefits that UK livestock breeding and genetics can bring to the challenges of climate change and the needs of developing countries to feed their growing populations,
- Encourage breeders and breeding companies to submit case studies and success stories which demonstrate the ability of our genetic resources to contribute to sustainable animal agriculture
- Continue to build on the success of the National Inventory as a tool for livestock policy makers, including working with both the ovine and equine sectors to improve data collection,
- Work with European Regional Focal Point for Animal Genetic Resources to integrate ex-situ and in-situ conservation programmes into biodiversity indicators.

## Harnessing the Potential of the Data Revolution and Genomic Passports

### Developing a common vision and roadmaps for effective data use

The collection and analysis of good quality data on specific characteristics of interest (often referred to as phenotypes or traits) is a key component of successful genetic improvement programs. In recent years, society as a whole has been experiencing the beginning of a revolution in the way data is captured and used. These advances offer real opportunities for improving breeding programs for livestock, particularly through offering the potential to measure a wider range of characteristics as possible targets for selection than has been possible in the past. The effective capture, use and rapid access to data also offers a means to support effective and timely decision making to generate benefits more widely across livestock production and the Agri-tech sector.

Many of the major future advances in farming will be achieved by optimising systems through working across traditional disciplines such as breeding, nutrition and health. The ability to combine data from different sources, such as genomic profile, feed and disease treatment options, with access to results in real time on farms, has the potential to enable a step-change in the efficiency of livestock production.

In relation to data use, the UK agriculture sector is currently highly fragmented and a resolution to address this is needed to achieve the level of potential benefits on offer. Coordinated efforts in this area, to capitalise on the emerging innovation through knowledge and data sharing could generate additional benefits across production and resource efficiency, breeding and conservation.

The UKGLE committee believe it is vital that this growing challenge is addressed, and they will work with Defra, DAs and industry to promote and support:

- Development of a clear and common long-term vision for data use across UK livestock sectors,
- A review of current activity in each sector to find ways to enable the vision's goals,
- Identification of opportunities for sharing ideas and lessons across sectors,
- Where appropriate, work with each sector to build on existing activity and address gaps in, for example data sharing, and help find ways to build collaboration to reduce fragmentation and maximise access to information, data and knowledge sharing,
- Develop ways to address those gaps with industry wide input.

### Genomic Passports

Over the last 20 years, dramatic advances have been made in developing genomic tools which has resulted in a continual increase in the level of detail that can be generated, with a reduction in cost. This technological innovation has supported rapid and on-going growth in our understanding of how the content of genomes impact characteristics of interest in different species. The use of genomics is already generating significant benefits in terms of increasing the rate of genetic improvement in many livestock species (particularly for dairy cattle). It is also supporting genetic improvement in traits that would have been considered too difficult or expensive to measure at any real scale in the past (e.g. meat quality, feed efficiency and disease resistance traits), and is likely to be a key enabling tool for improvement in new traits of growing interest, such as reducing greenhouse gas emissions from ruminants.

As genomic technologies and our knowledge continue to advance, this offers the potential to generate further benefits, not only through applications in breeding, more advanced sustainable management of genetic resources and traceability, but also through tailoring of feeding, management and disease management systems to suit the genetic profile of individuals or cohorts

of animals. The use of genomics to characterise disease organisms both in laboratories and on farms is also growing rapidly, as is the ability to characterise the specific microbial populations that animals carry in their stomachs or rumens, which is now known to have a direct effect on feed efficiency and the level of emissions generated<sup>3</sup>. When used in combination with knowledge of the animals own genetic make-up, this offers real potential to apply precision management, feeding and use of medicine in livestock production.

In view of recent developments, one of the major barriers is enabling real-time access to detailed knowledge of an animal's genomic profile at an affordable cost. Currently, in order to save cost, only a relatively small number of genomic locations are typically characterised, which can limit its application, and the process of generating results tends to be slow, taking from several days to weeks to get results back on farms. Recent developments in genomic tools, including low-pass-sequencing and imputation, combined with recent developments in data management systems may provide a solution, particularly when combined with a coordinated industry wide approach and an effective individual animal traceability system - which already exist for cattle in the UK.

The development of a UK-wide whole genome sequence database for cattle, linked to traceability and other effective data collection and collation systems, could establish a strong and effective innovation platform that is built around existing UK strengths and genetic resources, that could benefit livestock production not only in the UK but also globally for decades. It could offer a means to benefit from the economies of scale and to distribute the core sequencing and genome analysis cost across multiple, as opposed to single uses.

As a result, this could make the potential benefits from using genomic information much more accessible to a wide range of farmers and other stakeholders across the UK cattle sector. By linking to the existing traceability system, it also offers a means for cattle owners to influence who can access the information and help build trust across the sector, which would be a vital component for increasing use and success. Once established, it could also serve as a valuable exemplar for establishing similar systems for other livestock species.

UKGLE believe that such an initiative could play a key role in supporting the livestock production and service sector to thrive and meet the challenges ahead. With that in mind the Committee will bring together industry, Defra and wider stakeholders to explore ways to maximise the opportunities offered by the application of whole genome sequencing.

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<sup>3</sup> Jones, H. E. *et al.* (2008) The effect of genetic improvement on emission from livestock systems, in *Proceedings of the European Association of Animal Production* (Vilnius), 24–27  
[Research in animal genomics and breeding to reduce nitrogen and methane emissions](#)