

## Research needs for an efficient livestock industry

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This paper addresses the research requirements of the dairy, pig, beef and sheep industries and reflects the collective views of the three relevant sectors (DairyCo, EBLEX and BPEX) of the Agriculture and Horticulture Development Board (AHDB) that are charged with providing technical support in the form of funding for research and knowledge transfer.

Research priorities are summarised under the headings of: breeding, feeding and health with the objective of enabling higher levels of production to be achieved per unit of greenhouse gas emitted. This high level objective is likely to be a major driver for research and knowledge transfer in the UK industry into the foreseeable future.

Along with other components of the food chain, the UK livestock sector is charged with reducing emissions of greenhouse gases (GHG) ( $\text{CH}_4$ ,  $\text{N}_2\text{O}$  and  $\text{CO}_2$ ) in line with the targets set by the 2008 Climate Change Act and the subsequent Low Carbon Transition White Paper published in July 2009. In the period to 2020, an 18% reduction in emissions ( $\text{CO}_2$  equivalents) over 2008 levels is required and, for England alone, this has been equated to 3 million tonnes of  $\text{CO}_2$  (equivalent) per annum.

It has been calculated that UK agriculture is responsible for 7% of the total UK GHG emissions made up as follows:  $\text{N}_2\text{O}$  (3.5%),  $\text{CH}_4$  (2.8%) and  $\text{CO}_2$  (0.7%). Reducing emissions of  $\text{CH}_4$  from ruminant enteric fermentation and manure heaps as well as  $\text{N}_2\text{O}$  from use of slurry and nitrogen fertilisers on grassland have become a major focus for future attention. At the same time however, there is increased demand for food production in general, and animal products in particular, as the UK population grows towards a projected 70 million by 2050. Achieving emissions targets by simply scaling down livestock and milk production is not an option given that this would simply pass the problem elsewhere in the world and result in an increase in imports at a time when recent government policy encourages greater reliance on home-based production.

The livestock and dairy industries are committed to increased efficiency which can best be measured in terms of increased units of production (Kg of meat or milk solids) per Kg  $\text{CO}_2$  equivalents. It follows that there is a need for well-targeted genetic improvement of the national herds of cattle, sheep and pigs coupled with improved health and nutrition alongside increased grassland productivity and better manure management. For the most part, increases in efficiency, defined in these terms, is entirely compatible with improved profitability and return on investment.

### Breeding

Genetic selection for conversion efficiency in the case of pigs and production volume in the case of dairy has had substantial impact on the efficiency of pig meat and milk production. However, genetic interactions with health and quality related traits continue to require elucidation. In the case of beef cattle and sheep, there is still much progress in terms of genetic improvement for feed conversion that could be made with significant benefit in all species. The exploitation of genomic tools provides the promise of greatly increased selection efficiency. Research to elucidate further the genetics of key traits underlying growth rate, conversion efficiency, disease resistance, fecundity, fertility and meat quality together with provision of closely associated markers is of continuing high priority. At the same time, in cattle and sheep, there is an urgent need to exploit the genetic basis for observed differences in methane emissions and to understand better the genotype x nutrition interaction in this regard such that selection of reduced  $\text{CH}_4$  emissions is conducted under the appropriate nutritional regime. In this context, selection for gut length, gut enzymes and transport functions and control over rumen microflora are all areas requiring further research.

### Nutrition

Diet formulation for pigs and dairy cattle are well advanced but there is scope to investigate alternative ingredients and particularly greater use of "co-products" from within the food chain that might otherwise have been classified as waste. There is likely to be pressure to reduce the quantity of cereals fed to pigs and cattle (in competition with biofuel production) and, in this context, alternative protein sources for pigs and increased productivity of grassland production, including more efficient use of slurries and fertilisers (to reduce  $\text{N}_2\text{O}$  losses due to de-nitrification) will assume increasing priority. Interactions between nutrition and the animal's immune system and the way in which this impacts on animal health is an area requiring increased research effort.

### Health

Production animals can divert around 6% of available net energy supplied towards immune functions and a challenged animal expresses greater requirements for amino acids in the daily diet. It is axiomatic therefore that a healthy animal will utilise its in-feed nutrients in a far more efficient way and there will be associated benefits in terms of environmental impacts. For beef and sheep endemic disease control and reduction continues to be a high priority with further development work required on bio-security measures between farms as well as specific diagnosis and control. Recent developments in the genetic control of innate immunity offer new opportunities to reduce disease in herds exposed to pathogens.