other potential threats (antimicrobial resistance, large herds, climate change, cattle movements and EU Animal Health Law), and potential positive influences (herd health planning, climate change, potential for improved control of salmonellosis, BVD eradication and surveillance).

The Report closes with fourteen conclusions that cover areas CHAWG considers to be of key importance. Data quality is one issue which arose throughout the Report and CHAWG concludes that "there are large gaps in availability and consistency of current data" and that data consistency could be improved through the use of standard templates and by private companies pooling pre-competitive data. Additionally, CHAWG considers that many sources of useful information remain under-utilised, such as the data collected via the Cattle Tracing Scheme (CTS), the British Cattle Movement Service (BCMS), the National Fallen Stock Company and abattoir data.

On the whole, the Report provides a very good overview of a number of important issues affecting the dairy and beef industries and if, as intended, the Report is the first in a series of annual reports, then these should provide useful benchmarks for monitoring progress and identifying where more research and effort may be required. However, although the report is intended to cover both health and welfare, and it is generally successful in relating the effects of various disorders on health, it is not always clear about effects on welfare. It would perhaps be helpful if future editions began with a description of what the authors consider welfare to be, and if each section clearly explained impacts on welfare.

Annual Report 2012: First Annual Report (September 2012). A4, 45 pages. GB Cattle Health and Welfare Group. Available for download from the Cattle Health and Welfare Group website: www.chawg.org.uk.

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Welfare implications of commercial livestock breeding and breeding technologies

Over the past 20 years there have been various reviews of the positive and negative effects that breeding techniques and technologies may have on the welfare of farmed animals. The latest publication on this topic is the 'Opinion on the welfare implications of breeding and breeding technologies in commercial livestock agriculture', of the Farm Animal Welfare Committee (FAWC). FAWC regularly publishes short reports to inform UK Governments (the Department for Environment, Food and Rural Affairs in England, the Scottish Government, and the Welsh Government, and other Government Departments and Agencies) on issues relevant to farm animal welfare and FAWC last considered the welfare implications of animal breeding in 2004. The new Report aims to provide updated, independent advice on the impact of conventional and novel breeding technologies on farm animal welfare.

The livestock sectors considered in this project include: dairy cattle, beef cattle, sheep, pigs, meat chickens, laying hens, turkeys and salmon. FAWC notes that, although other sectors are not covered in detail, the issues discussed may be applicable to them. FAWC states that within the UK, over one billion farm animals are reared every year (excluding fish). The effect of breeding on welfare is therefore an important subject.

The Opinion begins by outlining relevant background issues. There is a section on welfare concerns, contentious issues and opportunities to improve welfare, followed by a brief consideration of the numbers of animals involved, and the duration and extent of poor welfare or suffering.

In the past, FAWC was concerned about the focus on breeding for productivity, because of negative effects on health (eg through skeletal and metabolic disease, lameness and mastitis). However, FAWC notes that, more recently, selective breeding has increasingly incorporated other traits, including health, fitness and welfare. Encouragingly, FAWC is now of the view that, although there are still some concerns with regards to livestock breeding, many breeding goals now address animal welfare to some degree (eg through selecting for disease resistance), which is a positive step forward.

FAWC mentions various initiatives which are now in place, including, the Farm Animal Breeding and Reproduction European Technology Platform (FABRE TP) which, in 2006, produced a vision for livestock breeding in 2025. New breeding technologies, used in some livestock sectors, are described in the Report, including whole genome single nucleotide polymorphism (SNP) technology and genome-wide selection (GWS). Advanced genomic tools allow a much greater rate of genetic progress and one concern voiced by FAWC is that "'easy to measure' (largely production) traits are being implemented in advance of those for functional fitness, due largely to lack of good data on health and fitness traits. If a breeding programme does not include both types of trait the non-production traits will fall behind in selection and lead to poorer animal welfare".

FAWC also comments that the genetic modification (GM) of commercially farmed animals is currently not permitted within the UK. This may be hindering progress for animal welfare, for example, towards finding solutions to disbudding and de-horning — two mutilations that are widely believed to cause pain and distress that are regularly carried out on large numbers of calves. If the DNA coding for polledness could be inserted into horned populations there would be no need to disbud or de-horn.

The legislation that covers animal breeding is also touched upon, as are international considerations. Within Europe, the European Forum of Farm Animal Breeders (EFFAB) has developed a 'Code of Good Practice for Farm Animal Breeding and Reproduction Organisations' (CODE-EFABAR), which is widely endorsed by animal breeders. CODE-EFABAR seeks to address issues of food safety and public health, product quality, genetic diversity, efficiency, environmental impact, animal health, animal welfare, and breeding and reproduction technologies. The Code is intended to be complementary to legal or national obligations and is updated every two years.

https://doi.org/10.1017/S0962728600005133 Published online by Cambridge University Press

Following a section that discusses previous advice by FAWC and the European Food Safety Authority (EFSA), the Opinion considers scientific and commercial aspects of selective breeding and the ways it may enhance or impair health, welfare and productivity. Examples covered include: sector-level breeding programmes; breeding and anti-social behaviour; double-muscling and resulting dystocia; molecular technologies; and other breeding practices, such as trans-cervical insemination (AI), embryo transfer, laparascopic AI, and cloning. This section ends by providing further detail on breeding practices in salmon, laying hen, broiler chicken, pig, sheep, beef and dairy cattle industries.

Among the critical issues and questions, FAWC states that "Despite welcome initiatives to broaden breeding goals, it is still the case that selection for heavier, more muscular carcasses in all livestock species can lead to associated leg problems and dystocia: an animal's mass must be supported appropriately throughout its life". And, "selection for high growth rates in broilers has resulted, in some strains, in animals that spend much of their time lying down when they are not feeding. If the housing conditions for these broilers are poor, this can exacerbate problems, eg causing increases in hockburn or pododermatitis".

An interesting section on ethical analysis examines a variety of breeding issues, such as the mismatch which may occur when elite breeding animals are reared in different conditions. Whether the full genetic potential of an animal is expressed depends on the quality of the environment, and animals of high genetic production potential may not thrive when reared in some commercial farming conditions.

FAWC asks "How far should the breeding process be permitted to go before *telos* is inappropriately compromised?" It considers that both established and new breeding technologies should only be used "in such a way that the essence of each farm animal species is not compromised".

The Opinion draws to a close with six conclusions and ten recommendations. FAWC congratulates farm animal breeding companies for the progress that they have made on breeding goals which aim to improve robustness and health and welfare traits but is concerned that "a renewed drive for production efficiency in an effort to reduce the impact of livestock production on the environment through higher producing, biologically efficient livestock could detract from inclusion of broader breeding goals into breeding programmes, and lead to a deterioration in animal welfare".

FAWC directs several recommendations to breeding companies including a need for them to "incorporate a broad range of breeding goals into their breeding programmes, including fitness and functionality in tandem with productivity". Additionally, FAWC recommends that they "include 'commercial' farm data into genetic evaluations from descendants of nucleus breeding stock, and thereby match the genotype to the rearing environments". Other recommendations are directed to the Government, industry and farmers.

FAWC Opinion on the Welfare Implications of Breeding and Breeding Technologies in Commercial Livestock Agriculture (November 2012). A4, 29 pages. Farm Animal Welfare Council. Available for download from the FAWC website: http://www.defra.gov.uk/fawc/advice-2/opinions/ or by contacting the FAWC at the following address: Area 8B, 9 Millbank, c/o Nobel House, 17 Smith Square, London SW1P 3JR, UK

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https://doi.org/10.1017/S0962728600005133 Published online by Cambridge University Press