

Aberystwyth University

SUREROOT: A novel approach to root design

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Research into practice



Contents

Introduction	3
Health and welfare	4
Genetics	11
Heifer rearing	16
Nutrition	19
Forage	25
Soils	28
Business management	32
Collaboration	35
Getting R&D onto farm	38





Introduction

Levy-funded research and development can contribute to a more sustainable future by improving technical efficiency, reducing costs of production and retaining positive public perceptions of dairy farming.

Dear Levy Payer,

Based on predicted global demand, the long-term prospects for dairy are good. However, the economic challenges brought by greater exposure to market volatility are here to stay. Levy-funded research and development (R&D) has little direct influence over market dynamics. However, R&D can play an important role in helping to achieve a more sustainable future by improving technical efficiency, reducing costs of production, and retaining positive consumer perceptions of dairy farming, eg in relation to animal health and welfare, or the contribution dairy makes to sustainable production and consumption.

This booklet summarises some of the R&D that we have been carrying out recently, using levy funds. In particular, it draws from two five-year research partnerships we established with leading universities and research institutes to deliver research on health, welfare and nutrition (led by University of Nottingham – UON) and on soils, forage and grassland (led by Scotland's Rural College – SRUC).

In this report, we present a cross-section of projects, their relevance to industry and how we intend to exploit the results. Some projects focus on producing new insight into traditional subjects, such as lameness, mastitis or maintaining soil fertility. Others explore more novel topics that also have a direct economic impact, such as the application of Lean Management techniques, developed in other industries, to dairy farming. Beyond the farm gate, collaborative work with The Dairy Council means that levy funds have been used to produce strong evidence on the nutritional, environmental and cost per nutrient benefits of including dairy in the national diet.

We strive to get the maximum return on levy spend by leveraging from other funding sources, such as the UK Research Councils or, increasingly, through cofunding with other AHDB Sectors. The research we commission is guided by our Research and Development Advisory Forum (RADAF), made up predominately of GB dairy farmers. Recognising there is

much to be gained by sharing information internationally, we have forged formal relationships with other like-minded organisations, such as Teagasc, Dairy Australia and DairyNZ. AHDB Dairy currently coordinates the European Cattle Innovation Partnership and, from 2016, will lead a new EU-funded network ('EuroDairy') to share innovation and best practice across 14 European countries.

I hope you find this booklet useful and interesting. The aim is to provide an overview of the work, so **please follow the links for more detailed information.**

The R&D team at AHDB would be very pleased to provide you with any further information required.

Ray Keatinge

AHDB Head of Animal Science



“Independent, well-targeted R&D is essential to maintaining our competitiveness. This is the underlying driver for RADAF. But the potential benefits will only be realised when good research is put into commercial practice.”

Jim Baird, Nether Affleck Farm, Lanark and Chairman of RADAF

Health and welfare

Profitable, consumer friendly dairy farming is underpinned by good health and welfare. AHDB funds research into specific diseases, such as lameness, mastitis and Johne's Disease, as well as improved strategies for vaccination and biosecurity. New findings will feed directly into programmes such as

AHDB Dairy Mastitis Control Plan and AHDB Dairy Healthy Feet Programme, while others will support industry initiatives such as Action Johne's Initiative and BVDFree. For further information on AHDB Dairy-funded research in the area of health and welfare, contact: jenny.gibbons@ahdb.org.uk

Mastitis research

In 2004, a levy-funded pilot trial tested a new approach to mastitis control in 52 herds experiencing greater than 35 quarter-cases of clinical mastitis per 100 cows per year. The outcome a year later was a 20% reduction in cases of clinical mastitis and reduced Somatic Cell Counts (SCC). Where herds fully complied with recommendations in their plans, reductions in clinical mastitis cases were closer to 30%.

The AHDB Dairy Mastitis Control Plan (DMCP) was launched nationally in 2009. Since then, over 1,000 herds have had full plans completed. Where herds adhere to recommendations derived from their plan, similar reductions are seen to those found in the pilot study, confirming the effectiveness of this approach.

AHDB Dairy continues to fund innovative research into mastitis, which can then be incorporated into the DMCP.

One of the key challenges to the DMCP is deciding which interventions are most likely to be cost-effective. Using DMCP data, a decision support tool is in development to assist farmers and DMCP deliverers by identifying the management interventions that, for specific farms, are most likely to provide the greatest health and financial benefits.

Other levy-funded research has focused on understanding the behaviour of mastitis pathogens using novel technologies.

Traditionally, *Strep. uberis* was considered to be spread environmentally. According to our latest research, only nine strains of

Strep. uberis were responsible for 40% of the clinical mastitis cases across 52 farms, indicating that some strains of *Strep. uberis* are contagiously transmitted between cows. In some herds, these strains are extremely important. The key question is whether these strains can be detected earlier to allow prompt changes to be implemented more quickly on farm, increasing the effectiveness of control measures. Rapid advances in technology mean that novel detection methods will be available to farmers in the future, increasing the speed and accuracy of diagnosis.

dairy.ahdb.org.uk/mastitis

AHDB
Mastitis
Control Plan





CASE STUDY

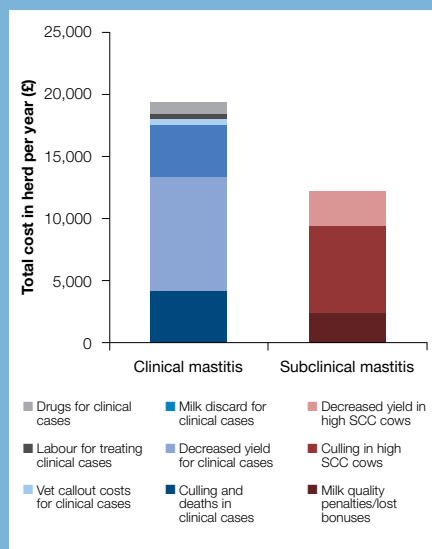
Chronic mastitis halved with DMCP

John Whitby decided to invest in a mastitis control plan for his farm to improve cow welfare and reduce costs.

The DMCP plan deliverer visited John's farm to review mastitis data, current management and existing mastitis controls, to identify key areas for improvement. The main source of new mastitis cases was identified as environmental infections during the dry period.

After changes to the management and the environment of cows in the dry period, there was a steep fall in the level of new cases of mastitis in cows after calving. Dry period cure rates also improved. The number of cows with a SCC over 200,000 reduced from 33% to 17%, while the number of chronically infected cows almost halved, reducing from 21% to 11%.

John and the farm team are pleased with the initial outcome and continue to monitor clinical and subclinical mastitis with their plan deliverer to identify further opportunities to reduce mastitis.



Here's what a typical 120-cow 8,500L herd could save each year by implementing the DMCP.

Before DMCP

- Cost of clinical mastitis: £19,200
- Cost of subclinical mastitis: £12,300
- Total cost of mastitis: £31,500 (~3ppl).

After DMCP

- Cost of clinical mastitis: £15,700
- Cost of subclinical mastitis: £7,200
- Total cost of mastitis: £22,900
- Total saving after one year: £8,600 (~1ppl).

Figures based on a 120-cow herd giving 8,500L/cow with a clinical mastitis incidence rate of 75 cases/100 cows/year and a milk price of 28ppl. Actual data from a DMCP case study farm.



Understanding claw horn lesions

Back in 2011, AHDB funded a review to explore the current gaps in knowledge on lameness treatment and control on farm. Out of 30 published papers available on this topic, only three related to sole ulcers and none to white line disease. This review has been fundamental in shaping the direction of levy-funded research on control and treatment of claw horn lesions in the UK.

Every year thousands of cows are treated for claw horn lesions, such as sole ulcers and white line disease, but hard evidence on the most effective treatment is limited. A five-year study led by University of Nottingham highlighted the importance of early detection and treatment of claw horn lesions. Recent research has shown that a three-day course of non-steroidal anti-inflammatories, in addition to trimming and a hoof block, produced the highest cure rates.

In a separate study, researchers investigated how changes to the anatomy of the foot, particularly the pedal bone and digital cushion that lie within the hoof, play a critical role in the development of claw horn lesions.

The digital cushion is a pad of fat that acts as a shock absorber, protecting the hoof from impact during walking (see figure 1). If this cushioning fails, irreversible damage occurs to the bone in the foot and the cow becomes more susceptible to repeated bouts of lameness for the rest of her life (see figures 2a and 2b).

It has been found that loss of body condition up to peak yield leads to fat loss from the digital cushion, compromising its function. Therefore, minimising body condition loss in early lactation could help reduce lameness.

Research is continuing to further our understanding on the role of the digital cushion in the development of lameness.

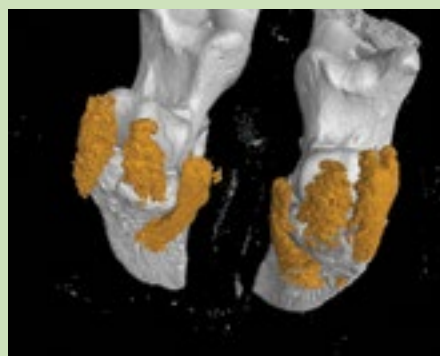


Figure 1: Digital cushion (three pads of fat within the hoof)



Figure 2a: Normal bone

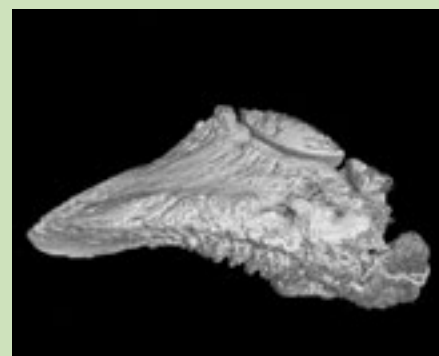


Figure 2b: Damaged bone (new bone has formed at base)

Healthy Feet Programme

In 2006, the Healthy Feet Project, led by University of Bristol, pioneered a new approach to helping farmers make changes to reduce lameness. This was based on increasing understanding of the foot conditions occurring in their herd, an assessment of the farm-specific risk factors and the development of a lameness control plan. The approach has been taken on and further developed as part of the AHDB Dairy Healthy Feet Programme, which now includes the training of 'mobility mentors' to support

farmers in tackling lameness on their farms. As new research emerges, it is added to the pool of knowledge available to farmers, vets and mobility mentors participating in the Healthy Feet Programme.

To demonstrate the effectiveness of the plan, a recent study on 44 dairy farms participating in the DHFP showed lameness was reduced by a fifth after one year.

More information on the programme can be found on the website:

dairy.ahdb.org.uk/healthyfeet



Unravelling how digital dermatitis is transmitted

Digital dermatitis (DD) is responsible for 25% of all dairy lameness in GB, yet relatively little is known about how the bacteria causing DD survive and are transmitted between cows.

One finding from current AHDB-funded work at the University of Liverpool has highlighted the importance of disinfecting hoof trimming knives between cows and between farms, as the knives can potentially spread DD between cows.

This research continues to investigate other ways in which the bacteria are transmitted and survive in the farm environment.

"A logical precaution to limit the spread is to disinfect hoof trimming equipment between animals and between farms."

Dr Nick Evans,
University of Liverpool

The Healthy Feet Project recommended that an industry lameness review group be convened. AHDB Dairy provide the secretariat to the Dairy Cattle Mobility Steering Group, which is independently chaired and comprises veterinarians, hoof trimmers, lameness researchers and industry representatives. The group aims to engage with all parts of the dairy industry, promoting achievable, affordable and effective measures to minimise lameness and maximise mobility in the GB dairy herd.

Research to reduce Johne's Disease losses

Research funded by AHDB Dairy aims to help farmers reduce losses due to Johne's by identifying more effective ways to prevent calves from becoming infected with *Mycobacterium avium* SSP *paratuberculosis* (MAP). The infection usually occurs early in life and infected animals become chronic carriers. There is no effective treatment.

It has been calculated that Johne's Disease costs can rise to over 2ppl with higher disease levels and these costs persist for a number of years until the disease is brought under control.

In the study, heifer calves are being followed from birth to calving to evaluate the impact

of calf management and whether they then develop antibodies to MAP. Videos of calving and the early post-calving period are being analysed to assess which risk factors, such as cross suckling, and timing and method of colostrum administration, best predict which cows will become Johne's test positive.

The project has also analysed Johne's blood tests and milk recording data from a large number of herds:

- To check for associations between Johne's and impacts on production
- To identify any patterns in the timing of development of antibodies to MAP.

Further research is planned that will continue to follow animals through successive lactations to determine if and when they might become positive for Johne's Disease.

As this work progresses, the results will be fed into the Action Johne's Initiative.

Individual animals can develop clinical Johne's Disease, usually after more than two years. The key signs are scouring and wasting, following irreversible damage to the gut. Johne's can be confused with other diseases and can remain undetected for many years in an untested herd. Carrier animals can also suffer production losses.

Action Johne's Initiative

In April 2015, the dairy industry launched the Action Johne's Initiative, which aims to reduce the risk of further spread of Johne's Disease. The initiative hopes to engage 80% of dairy farmers in Great Britain in robust Johne's management activities by October 2016.

The National Johne's Management Plan was developed by the Action Group on Johne's, an open forum for industry stakeholders.

In the first phase of the initiative, farmers will assess their level of Johne's risk and status. This will help them to work out, in consultation with their vet, which of the six control strategies developed by the Action Group would be most effective on their farm. The initiative is part-funded by AHDB Dairy, together with milk processors.

If the risk to the next generation of dairy cows can be reduced, then the level of Johne's Disease can be cut on dairy farms in the long term.

More information is available from the Action Johne's Delivery Team:
actionjohnesuk.org



National disease status

Poor animal health can have a significant economic impact on dairy farms. In order to help guide disease control at a national level and improve production efficiency, accurate and up-to-date information on cattle health at a national level is needed.

Researchers from the Royal Veterinary College (RVC) visited 225 dairy farms across GB to gather information on the incidence and prevalence of health conditions in British dairy cows. On all farms, bulk tank milk samples were collected and tested for Bovine Viral Diarrhoea (BVD), IBR, Johne's Disease, liver fluke, gut worms (*Ostertagia ostertagi*), Salmonella, Leptospirosis, Neospora, Q fever and Chlamydia-like organisms. The data from this study will provide a baseline, which can be used to track future changes in disease status, guide priorities and monitor improvements in the health of the national herd.

One disease that poses a constant threat is BVD. From the above study, 4–8% of farms (both vaccinated and not vaccinated against BVD) tested positive for BVD virus in quarterly testing. However, many more farms are at a constant risk of introducing the virus, due to unknowingly moving infected animals, nose to nose contact with animals from neighbouring farms or contact with infected animals at market or at shows.

The impact of BVD on the English dairy and beef sectors is estimated at £11m a year – with the impact doubling to £22m in a 'worst case scenario' – according to estimates by the RVC. Scottish Government economists have estimated that getting rid of BVD would be worth up to £80 million to the Scottish cattle industry over 10 years.

The cost estimates for dairy and beef herds included reproductive disorders, veterinary and production costs, diagnostic cost and palliative treatment cost of clinically affected animals.

The full report by the RVC is available from AHDB. For further information, please contact: derek.armstrong@ahdb.org.uk



Industry BVD schemes to cover GB

Scotland

Since 2011, the Scottish Government has been supporting an ambitious industry-led scheme to eradicate BVD from Scotland.

England

In December 2014, the industry endorsed a national, co-ordinated, strategy for the elimination of BVD virus from all cattle herds in England. This includes a four-point Charter, which producers are asked to stand behind.

- To actively engage in BVD control in order to eliminate the disease from their herd
- To report all BVD testing results from their herd to the national database
- To allow herd status and/or individual animal status to be openly accessible through the BVDFree database
- Not to move Persistently Infected (PI) animals, other than directly to slaughter (or through a dedicated red slaughter market).

Wales

The BVD sub-group of the Animal Health and Welfare Strategy Steering Group has strongly recommended that Wales should eradicate BVD from the country.

Estimated costs of BVD – England

Estimates by RVC	BVD impact (£/year)		
	Best (1%)	Average (1.5%)	Worst (2%)
Prevalence of BVD in affected herd – (% PI)			
Impact at cow level			
Dairy	21	31	43
Beef	27	40	54

Impact at farm level			
Dairy	3,133	4,625	6,266
Beef	1,151	1,127	2,302

Impact at national level			
Dairy	6,173,977	9,114,362	12,346,442
Beef	5,038,107	7,557,160	10,076,213
Total	11,212,084	16,671,522	22,422,655

Control of Worms Sustainably

Anthelmintic (wormer) resistance has become a major problem in many sheep rearing areas of the Southern Hemisphere. While in the UK, and in cattle, the development of anthelmintic resistance has been slower, it is still a developing problem of major concern.

Gastrointestinal roundworms have a major impact on growth of replacement youngstock, particularly through subclinical infections. Control is heavily dependent on the regular use of anthelmintics combined, where practical, with pasture management. Lungworm and liver fluke are also controlled with the help of anthelmintics.

There are currently only five main families of anthelmintics, two of which are solely licensed for use in sheep. Resistance to the three main families, benzimidazoles, levamisoles and avermectins is widespread.

There have been significant advances in the understanding of managing anthelmintic resistance in recent years. The general principles of resistance management are: firstly identification and mitigation of high-risk practices, secondly using effective anthelmintics, and thirdly maintaining a population of unselected parasites.

The Control of Worms Sustainably (COWS) industry stakeholder group, including AHDB, promotes best practice in the control of cattle parasites and encourages farmers to adopt practices to slow the rate of development and spread of anthelmintic resistance.

More detailed information is available on the COWS website: cattleparasites.org.uk



High level of liver fluke in dairy herds

Liver fluke is a common parasite in cattle with a recent study revealing 75% of dairy herds in England and Wales had evidence of fluke infection.

Control options for liver fluke are limited in lactating cows, with a narrow range of anthelmintics for treatment and a narrow treatment window for some products, if long milk withdrawal times are to be avoided.

AHDB is supporting a Biotechnology and Biological Sciences Research Council (BBSRC) funded project led by the University of Liverpool that aims to produce new, sustainable control programmes for beef and dairy farms, to reduce the losses associated with liver fluke infections. The project is using data collected from 250 farms to identify the

most important factors affecting whether a farm has fluke and assessing the cost-benefit of changing practices.

For further information please contact: derek.armstrong@ahdb.org.uk

Managing for optimal lying comfort

Lying times of 12 to 14 hours a day are associated with reduced stress, improved foot health and increased milk yields. To provide an insight into lying behaviour on British farms, the daily lying times of 741 cows in 23 dairy herds were recorded in a BBSRC and AHDB Dairy-funded project by the RVC and Evidence Based Veterinary Consultancy Ltd.

Although the average daily lying time was 10 hours, some cows spent as little as three hours and some as much as 17 hours lying down per day. Lying times even varied between cows from the same herds, sometimes by up to 12 hours per day.

This research also identified that lying times were increased by deep bedding material in cubicles, compared with mats or mattresses.

“This project data provides a point of reference for producers and advisors who record lying behaviour to benchmark and make informed decisions about the management of cow comfort.”

Dr Nick Bell, Royal Veterinary College

More information and a short film can be viewed on the AHDB Dairy website: dairy.ahdb.org.uk/lyingcomfort



Bedding options for dairy cattle

Increased costs and reduced availability of common bedding materials has prompted many farmers to search for alternatives, such as recycled manure solids (RMS). RMS is the solid fraction of slurry using specialised slurry separation technology that produces dry matter levels above 34%. There has been growing interest in manure solids for bedding, and information is lacking in relation to its use on GB farms.

This is why AHDB Dairy commissioned research through the Welsh Dairy Supply Chain Efficiency Project. The starting point was a review of data worldwide on the use of RMS as bedding for dairy cattle. This was followed by a survey of over 120 farms bedding on RMS, sand or sawdust, together with replicated experiments at Newton Rigg College. The specific aim was to provide greater technical understanding

on the safe use of RMS as bedding, and to investigate management options to safely mitigate any potential risks to animal or human health. The results were intended to inform the regulatory position of the devolved administrations, as well as update current guidance to farmers available on the AHDB Dairy website.

In light of these projects, government regulators in England, Scotland and Wales currently permit the use of RMS as bedding provided that farmers comply with certain conditions, and follow best practice management criteria. If at any point, unacceptable risks emerge that cannot be sufficiently mitigated through changes in practices or management, the regulators may no longer permit the use of RMS as bedding.

This fail safe is essential to ensure that the good reputation of the dairy industry and consumer confidence in its production methods are maintained.

Further information on the requirements and recommendations surrounding the use of RMS as bedding and the research project summaries can be found at: dairy.ahdb.org.uk/rmsbedding



Biosecurity and vaccination

Research into disease prevention and biosecurity practices on British dairy farms indicates the positive appetite in both vets and farmers to pursue a more collaborative approach towards endemic disease control. Further work will now focus on how to

translate the key findings into practical guidelines to optimise cattle vaccination and biosecurity in the UK.

A best practice guide to vaccination film was created with contribution from vets, dairy farmers, animal scientists and industry

stakeholders and is an ideal aide-memoire for farmers and a learning tool for new entrants into dairying. It is available online at: dairy.ahdb.org.uk/vaccination

Data exchange hub to boost access to livestock information

There is a considerable amount of individual animal data available for cattle in Great Britain. However, currently it is spread across many sources, including Government, industry bodies and farmers' own records, so farmers are missing out on the opportunity of sharing that data to increase efficiency, save costs, and create new infrastructure to support national disease control programmes.

AHDB Dairy and AHDB Beef & Lamb are collaborating to manage an innovative new project to develop a system for the exchange of cattle information along the supply chain.

While the initial focus is on animal disease, providing a facility for risk-based trading for economically important diseases such

as BVD and Johne's Disease, it is hoped that the framework developed can be expanded to other areas of data collection, which will further benefit the industry as a whole. The objective is to develop a data exchange hub, to an industry-agreed specification, accessible at key transaction points in the food supply chain, for example at auction markets. Creating industry-agreed data exchange protocols will standardise the transfer of information, making it easier for all parties involved.

If successful, the system developed could be taken forward to full implementation by industry collaborators participating in the project.

AHDB is working with more than 20 industry collaborators on the project, supported by

a steering group that includes the NFU, Livestock Auctioneers' Association, British Meat Processors' Association, Association of Independent Meat Suppliers, British Cattle Veterinary Association, and Cattle Health and Welfare Group.

The 15-month feasibility study, which is due to be completed in November 2016, is being funded through the UK Agri-Tech Catalyst programme, which brings the additional benefit of leveraging the £60,000 AHDB cash investment by a further £222,000.

For further information visit the AHDB website: ahdb.org.uk/projects/datahubproject

Genetics

Genetic evaluations are produced and disseminated three times a year for all the major dairy breeds and crosses in the UK. These form an integral part of the dairy industry, with many organisations feeding into the process and subsequently benefiting from it.

Every year, the economic value of the genetic gain achieved by the breeders accumulates. The aggregate benefits of genetic improvement in the UK dairy industry are estimated to have

been between £2.2 billion and £2.4 billion in the period 1980–2010¹. In addition, the reduced impact on greenhouse gases is estimated to have been 0.8% per year as a consequence of genetic improvement². For more information on genetic research and development undertaken by AHDB Dairy please contact marco.winters@ahdb.org.uk

1. Amer et al. INTERBULL BULLETIN NO. 43. Stavanger, Norway, August 26th – August 29th 2011.
2. Defra (AC0204) conducted by Genesis Faraday and Cranfield University, 2008.

Genomics offer good reliability

Genomic indexes are calculated from an animal's DNA rather than its progeny's performance and can help predict the performance traits of young sires and females before they are mated. Since April 2012, genomic evaluations have been available in the UK for the Holstein breed.

Development of this index started by relating DNA information on thousands of Holstein sires with the actual breeding performance of these bulls. AHDB Dairy-funded research helped identify which parts of the DNA are associated with which performance traits. The results can be used to predict the performance

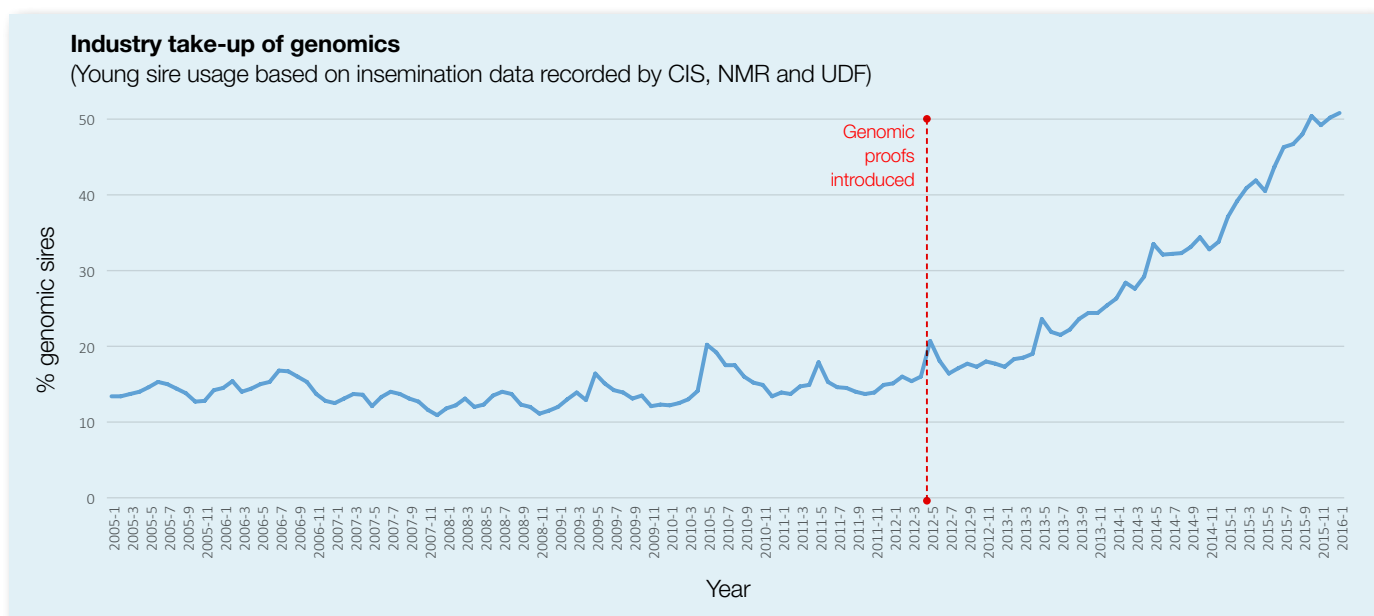
potential of a young animal (male or female) from the moment it is born.

These predictions or genomic indexes now have a reliability of close to 70%, which is considerably more than predictions based on parent-average performance, but is still slightly less than those from a daughter-proven sire.

DNA samples are simple to collect, typically from a sample of hair or ear notch. This is sent to the laboratory for DNA analysis and the genotype profile is used to estimate the genomic prediction, using the previously calibrated DNA estimates.

Genomic evaluations are allowing the breeding industry to accelerate the quality of genomic young sires through earlier and more accurate matings. Genomic young sires were used for just over half of all Holstein inseminations by the end of 2015. This has resulted in much faster genetic gain for all genetic traits of importance.

Application of the technology is also gaining acceptance for female testing to allow farmers to pre-screen youngstock for rearing, and make better breeding decisions to improve the quality of their herds.

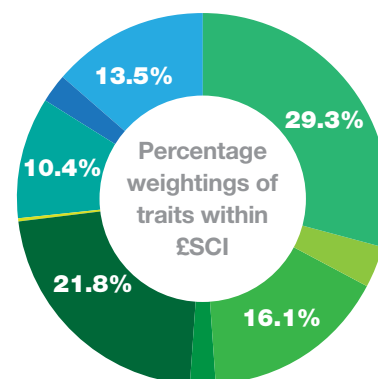
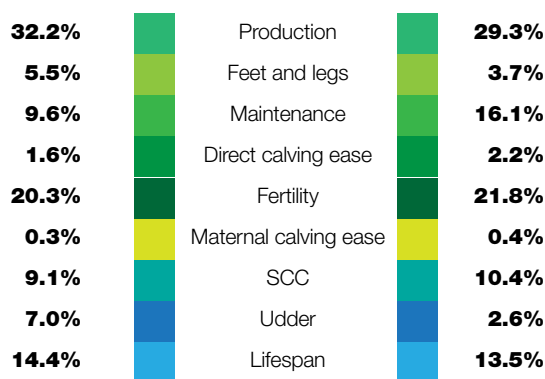
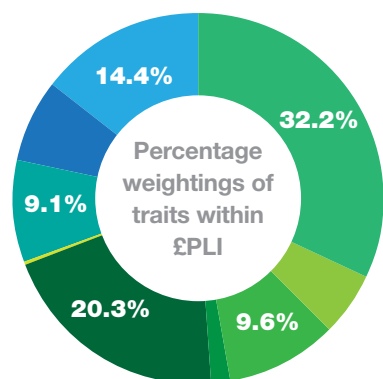


Breeding decisions

Cow health, welfare and longevity have been a focus of the national breeding strategy for more than 10 years and the current national breeding goal, Profitable Lifetime Index (£PLI), weights the 'fitness' traits over production traits in a ratio of roughly two-thirds:one-third. The national £PLI is published by AHDB Dairy Breeding, as part of its genetic evaluation service. The £PLI is a within-breed genetic ranking index developed for UK dairying conditions, in consultation with industry partners and is expressed as a financial value.

£PLI:

- Promotes yield while protecting milk quality
- Increases emphasis on fertility
- Improves functional type – feet, legs and udders
- Increases emphasis on longevity
- Reduces costs associated with maintenance
- Improves udder health
- Improves calving performance.



The Spring Calving Index (£SCI) is an across-breed genetic ranking index developed in consultation with industry partners specifically for spring block-calving herds and expressed as a financial value.

£SCI:

- Promotes milk quality rather than volume
- Places strong emphasis on fertility
- Selects for reduced maintenance cost
- Improves udder health
- Places strong emphasis on longevity
- Promotes easier calving
- Protects functional type – feet, legs and udders.

“Having an understanding of the genomic profile of our heifers will feed into our breeding decisions going forward, to ensure we have a herd fit for purpose in the future.”

Andrew Leggott, *White House Farm, host farmer for Yorkshire Calf to Calving meetings*

Genomic testing of heifers – on-farm comparisons

The Calf to Calving (C2C) on-farm meeting series will track 10 heifer calves on each host farm through their rearing period and time in the milk herd, to demonstrate the validity of their genomic evaluations.

Each calf has been genomically tested, either by hair or ear tissue sample. When the genomic results were compared against traditional Predicted Transmitting Abilities (PTAs), the results showed significant differences between predicted production traits, often with even greater variation in health traits.

Increasing the reliability of genetic information will allow farms to retain replacement heifers most suited to their system.



Cross-bred evaluations boost accuracy

Since January 2010, genetic evaluations have been using data from both pure and cross-bred daughters of bulls to produce PTAs for production traits, SCC, fertility index and lifespan.

Historically, data from cross-bred animals was discounted from genetic evaluations; however, following changes to the evaluation model, valuable information on cross-bred animals has been included.

This not only gives greater accuracy to the existing bull proofs but has allowed for the development of female proofs for cross-bred animals and has assisted in

generating genetic evaluations for both the Brown Swiss and Montbeliarde breeds.

This data has also been highly valuable for the less heritable 'fitness' traits, where larger numbers of progeny are needed to gain reliability.

Fitness Traits

Lifespan

Fertility

SCC

Conformation, eg legs and feet

Calving ease

Importantly, including cross-bred daughter information in evaluations has allowed the comparison of genetic merit between breeds, offering the potential for broader, more sustainable breeding goals for all breeds under selection. This objective is reflected in the national breeding goal, £PLI, which now has a 68% weight on 'fitness' traits.

The information has also been fundamental in developing the £SCI, national economic ranking published on an across-breed base, making direct comparisons between bulls of different breeds possible.



Increasing beef value

The dairy industry is estimated to be the source of 50% of the UK's beef, through the supply of cull cows and dairy-bred calves reared for beef, as well as through the maternal lines in suckler cow systems.

Historically, dairy farmers had no way to select dairy bulls whose progeny would have the optimal conformation and fat class and maximum carcass weight to return the greatest price at the abattoir or for sale of live animals.

In 2013, a feasibility project investigated whether abattoir and British Cattle Movement Service (BCMS) data could be used to produce genetic evaluations

for carcass traits. This project was jointly funded by AHDB Dairy, AHDB Beef & Lamb and Hybu Cig Cymru (HCC).

The study found that net carcass weight, conformation and fat class were all heritable traits, with sufficient genetic variation to improve carcass quality through genetic selection.

Trait	Heritability
Carcass weight	0.31
Conformation	0.24
Fat class	0.14

This research is continuing in the Carcass Trait Evaluations Phase II project, which will produce genetic evaluations for the main dairy and beef breeds for net carcass weight, conformation and fat class. Following the completion of the phase II project in 2016, the genetic evaluations will be made available to the industry.

These evaluations will immediately allow dairy farmers, who either raise or sell surplus heifer and bull calves for beef, to select bulls that will give improved conformation and fat class in animals reared for slaughter.

Genetic index for feed efficiency on the horizon

The expense and difficulty of recording feed efficiency has prevented it being included in UK genetic evaluations, but an international project could see that change in 2016.

In 2011, a group of 10 organisations (including AHDB Dairy) from nine countries agreed to contribute dry matter intake measurements and genotype data of dairy cattle to an international database to develop breeding values for feed intake. This was known as the global Dry Matter Initiative (gDMI).

By May 2012, a database was created containing the pedigree of 6,953 dairy cows in lactation 1–5 and 1,784 dairy heifers. Of these 8,737 animals, genotypes were available for 5,429.

Using this pooled data, the group ran genetic evaluations for dry matter intake (DMI) generating an average reliability of 24%. This was considerably higher than individual countries were able to achieve by using only their own data, which averaged just 3%. By sharing data on feed intake between countries, a trait that

was previously impossible to evaluate was generated with reasonable reliability.

Further work in 2015 has seen the development of genomic breeding values for feed efficiency.

The genetics team within AHDB Dairy will assess these genomic breeding values for application in the UK during 2016. They hope this will result in the emergence of a new genetic selection tool to improve feed efficiency.



New genetic index for bovine TB (bTB)

TB Advantage is a genetic index published by AHDB Dairy to help dairy farmers breed cows with improved resistance to bTB.

The index follows extensive research into the genetics of bTB, undertaken jointly by the University of Edinburgh, Roslin Institute and SRUC, with financial support from Defra and the Welsh Government.

The research showed genetic variation between animals and formed the basis of TB Advantage: the first genetic index of its kind in the world. It used data from more than 650,000 Holstein cows who have contracted bTB, according to Animal and Plant Health Agency (APHA) records. The breeding lines were established and more resistant bloodlines identified.

The index indicates the degree of resistance to bTB that a bull is predicted to pass on to his offspring. It is expressed on a scale that typically runs from -4 to +4 and as for most other traits, positive values are desired. For every +1 point

in the index, 1% fewer daughters are expected to become infected during a TB breakdown.

Due to the nature of dairy cattle breeding, the benefits of using this index in any herd will take some years to have an impact, which will increase as heifers replace the existing herd. Therefore, the index must be seen as an addition to current eradication policies already in place. However, the decision to breed for improved resistance in a herd is a permanent benefit, which accumulates with each new generation.

Initially, TB Advantage is only available for the Holstein breed, but work is under way to establish if the index can be extended to other dairy and beef breeds.

The TB Advantage index will be included in the national genetic and genomic evaluations provided by AHDB Dairy in April, August and December each year.

dairy.ahdb.org.uk/breeding

TB hub website

A joint industry online bTB hub was launched in autumn 2015. The website aims to be a one-stop-shop for beef and dairy farmers to find practical advice on bTB, from wildlife and cattle biosecurity to trading rules and guidance on managing a TB breakdown. It has been developed and will be maintained by AHDB, APHA, BCVA, Defra, Landex and the NFU on behalf of the broader cattle industry. Chris Lloyd, AHDB Head of Knowledge Transfer Programme Development, who co-ordinated the development of the hub, said the aim is to provide a comprehensive resource on bTB that is easily navigable for the user to find the information of relevance to them: "It will be responsive to the needs of users and feedback on how its value can be further developed after launch will be welcome."

tbhub.co.uk



TBhub
The home of UK TB information

Assessing your herd's genetic potential

Lactation Group	Number of animals	DFU	Inbreeding %	Fat %	Milk (kg)	Fat (kg)	Prot (kg)	Fat (%)	Prot (%)	Lifespan	SCC	Fertility Index
0-12 months	87	213	4.1	36	269	10.7	7.8	0.00	-0.01	0.19	-4.8	4.1
13-18 months	42	102	3.9	36	267	7.3	6.8	-0.04	-0.02	0.20	-6.2	3.2
19-24 months	32	78	4.5	36	269	8.0	6.7	-0.00	-0.02	0.19	-6.8	1.9
25+ months	30	138	3.8	40	232	8.5	4.9	0.01	-0.02	0.16	-0.9	1.8
1st Lactation	96	198	3.8	37	182	6.8	3.9	0.01	-0.02	0.12	-1.5	1.9
2nd Lactation	79	79	3.0	45	89	0.2	1.5	-0.04	-0.01	0.13	-1.2	2.8
3rd Lactation	66	66	3.4	37	74	1.5	1.6	-0.02	-0.01	0.08	-1.3	2.6
4th Lactation	36	36	3.8	48	81	1.3	0.8	-0.01	-0.01	0.07	2.8	2.8
5th Lactation	27	-1	2.8	68	106	1.2	2.2	-0.06	-0.03	0.01	2.8	-0.2
6th Lactation	5	-40	3.0	79	-6	-2.8	-1.4	-0.00	-0.01	-0.80	8.8	0.7
Average	600	100	3.8	50	179	6.5	4.8	-0.02	-0.02	0.13	-2.8	2.4

Herd Genetic Reports (HGRs) have been available for a number of years through AHDB Dairy, to all UK dairy farmers who milk record. HGRs allow farmers to see the genetic potential of their herd by providing the following information for the cows registered on their farm:

- Milk (kg)
- Fat and protein (kg and %)
- £PLI
- Inbreeding level
- Management traits – SCC, lifespan and fertility.

Recently HGRs have been expanded to also provide genetic evaluations for youngstock, helping farmers select the best replacement heifers to breed from.

dairy.ahdb.org.uk/breeding

Heifer rearing

After feed and forage, raising heifer calves is the second largest annual cost to a dairy business, with no income until the first lactation and no prospect of profit until into second. Heifers are the future of the dairy herd and deserve to have the best management that incorporates all the

latest research and management advice. In return, they will repay the investment through higher milk production and a longer productive life.

For more information on heifer rearing, contact: jenny.gibbons@ahdb.org.uk

Study reveals heifer rearing costs

Recent estimates of the cost of rearing have ranged from £1,000 to £1,500 and tend to average around £1,200. But to create a more accurate estimate and address an absence of definitive GB data on current heifer rearing practices and costs of rearing, AHDB Dairy funded a survey of 102 dairy farms in England, Scotland and Wales.

The cost of rearing, including fixed and variable costs, interest on capital and other opportunity costs ranged from £1,073 to £3,070, with an average cost of £1,819 – considerably more than previous estimates.

The daily cost of rearing per heifer ranged from £1.47 to £3.35 with an average of £2.31. Heifers paid back their cost of rearing, on average by, 1.5 lactations.

Feed was the largest contributor to costs. Excluding interest and opportunity cost, purchased feed and home grown forage contributed 43.7% to the total cost of rearing. Labour and bedding were the next two largest contributors, accounting for 22.3% and 8.7% of the total rearing costs respectively.

The factor identified as having the most significant effect on cost of rearing was age at first calving. The cost of rearing increased by £2.87 for each day increase in age at first calving.

“Heifers represent an important investment in your dairy farm’s future. As with all investments, however, looking at costs as well as returns could pay dividends for your bottom line.”

Professor Claire Wathes,
Royal Veterinary Centre



The importance of a good start to life

In 2013, AHDB Dairy brought together key individuals and organisations involved in calf health and management to discuss areas for improving calf survival. This coincided with a review of the scientific evidence on best practice calf nutrition and management, funded by AHDB Dairy.

Working in partnership, the Royal Veterinary College (RVC) and AHDB Dairy produced films and factsheets that incorporate the latest research and management advice to ensure farmers keep up to date on best practice in calf rearing.

These reviews highlight that getting the milk feeding management of your calves right is crucial for optimising growth and lactation performance when they enter the milking herd. Colostrum and early nutrition during the first 60 days of a replacement heifer's life strongly influences her future health and performance.

Feeding plenty of clean, antibody rich colostrum, with low bacterial contamination, as soon as possible after birth gives a calf the chance to absorb antibodies directly into her blood, before she develops her own antibodies.

Making a particular effort to produce, harvest and correctly handle top quality colostrum will be repaid in healthier, more productive animals.

It can also pay to offer more than the traditional two litres of milk twice per day, particularly when the calf has to cope with reduced ambient temperature. Research and experience from dairy farmers show feeding 15% of body weight in milk or milk replacer has a positive impact on growth, health and feed efficiency.

The film and factsheet topics are:

- The three Qs of colostrum management (Quality, Quantity and Quickly)
- Colostrum hygiene
- Testing colostrum using a colostrometer and refractometer
- Tube feeding colostrum
- Ensuring thermal comfort and sufficient feed intakes
- Hygiene in the calf house
- Calf jackets
- Monitoring growth rates (weight and height)
- Milk feeding
- Calf milk replacer
- Starter and water
- Weaning.

They are available at:

dairy.ahdb.org.uk/calves



Calf to Calving – bringing the latest research to farmers

AHDB Dairy's C2C initiative brings up to date best practice to the dairy industry on calf and heifer rearing to improve calf survival and growth.

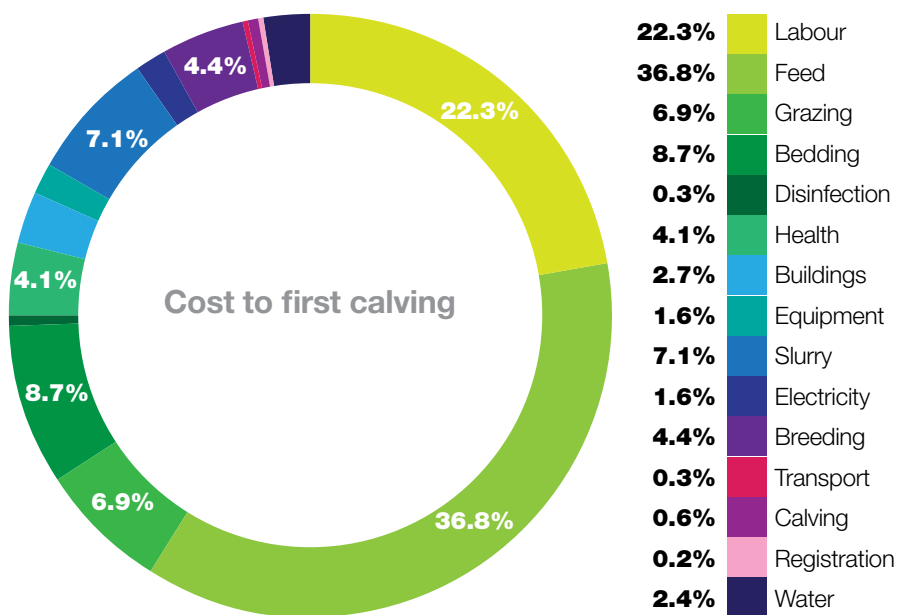
It is recognised that youngstock are the future of the dairy herd and, as such, deserve greater attention to ensure they get the best possible start in life in terms of nutrition, health and welfare. Based on the available evidence, which includes figures on calf mortality and incidence of disease, there is a need to increase awareness of best practice management on farm.

Approximately 8% of all calves are either stillborn or die within the first 24 hours. In 2012, 2.5% of heifer calves born alive and tagged died on farm before one month of age, the period when milk feeding is providing the principal source of nutrition. Furthermore, another 12% of these heifers do not calve down for the first time. A large number of these losses can be attributed to inadequate early nutrition and poor growth and development from birth to first calving.

Working with a number of host farms around the country, a series of meetings will look at the wide range of topics associated with rearing heifers. To bring the information to life, 10 calves on each farm will be followed from birth into lactation, with data gathered throughout.

Topics include:

- Colostrum feeding
- Economics of rearing
- Post-weaning nutrition
- Nutrition at grass
- Genomics
- Fertility of youngstock
- Outwintering.



“Today’s calves are tomorrow’s herd – we need to take the time to look at our rearing practices to ensure we get all of the stages right.”

Roger Hildreth, *Curlew Farm*,
host farmer for Yorkshire Calf to
Calving meetings



Nutrition

Protein nutrition of dairy animals: how much is enough?

The UK is heavily reliant on imported protein sources to feed its livestock. In 2013, this totalled 1.6 million tonnes of soy bean, of which 19% entered the dairy feed sector. This exposes the sector to large fluctuations in the market and can impact negatively on the environment.

Levy-funded research has focused on three routes to reducing the challenge of protein supply:

- Reducing the overall concentration of protein in the diet
- Replacing imports with domestic sources
- Producing high protein forages.

For more information on the research undertaken on nutrition, contact: stephen.whelan@ahdb.org.uk

Protein nutrition in early lactation

There is a reluctance to reduce crude protein (CP) in cow diets in early lactation for fear of reducing milk yields. However, a study by Harper Adams University (HAU) and University of Nottingham found that with careful diet formulation, the CP content of the diet could be reduced from 18% to 15% without impacting on performance.

The study involved 45 cows at each site, yielding an average of 40.0 and 44.1 litres/day respectively. Cows were offered a maize silage-based diet to allow the CP of the diet to be reduced to 15%, and measurements taken to assess the impact of CP level on health and performance.

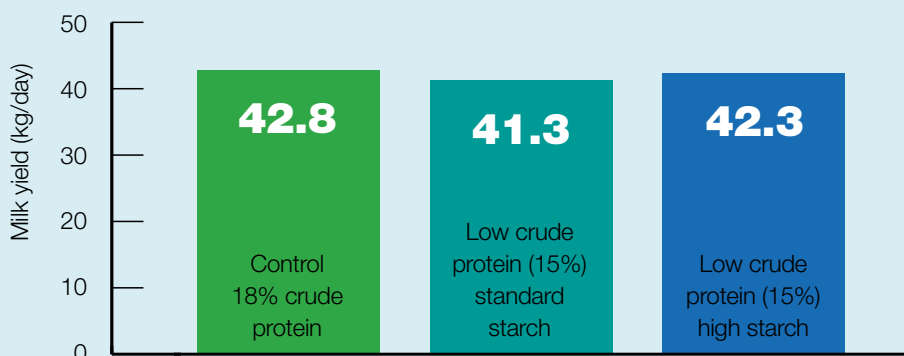
By lowering the CP, the researchers were able to reduce purchased soy bean by 2kg/cow a day, while maintaining milk production of 42kg/day. The results of this study demonstrate that CP can be reduced in the dairy cow's diet, although the ration must be carefully formulated to balance for energy.



“Reducing crude protein from 18% to 15% helped reduce feed costs and improved protein efficiency in the herd, without affecting cow performance.”

Professor Kevin Sinclair, University of Nottingham

Milk production



The longer term effects of reduced protein rations

Most research projects focus on closely defined time points or specific elements, within the production cycle. For farmers, the longer term effects of nutrition on the health and production of their dairy animals are equally important.

In a Defra and AHDB Dairy-funded study, researchers at the University of Reading are coordinating large experiments that examine lifetime performance on lower protein diets from the time a heifer calf is weaned to the end of its third lactation.

The studies are being conducted across three sites – Reading University, Aberystwyth University and SRUC at Dumfries – and are examining the potential for lower CP diets using various forages and in herds of differing production potentials.

Although the trial is still ongoing, early indications are that the first lactation effects of CP level on milk production are less than expected. This highlights the often weak relationship between milk production and the CP concentration in the diet.

“The project is unique, as it is examining the longer term economic, productive and environmental implications when dairy cows are offered lower protein diets.”

Professor Chris Reynolds, *University of Reading*

Alternative protein sources for dairy cow diets

While reducing the overall CP concentration in the diet will reduce the amount of protein feeds used on British farms, there are options to replace imported protein with domestic sources.

Wheat dried distillers grains with solubles (WDDGS), a high protein, high dry matter feed from the bioethanol industry, is one potential domestic protein source that has been investigated by researchers at the University of Nottingham.

This Defra LINK-funded project, with partners including AHDB Dairy, found that WDDGS can be used effectively in the diet of dairy cows producing up to 50kg/day.

The project aimed to improve the overall understanding of the WDDGS production process, allowing for a more nutritionally consistent feed to be produced. As a result, up to 6kg/day of WDDGS could be used in a well-balanced diet, without impacting on the performance of the cow.

While this allowed for a reduction in the amount of soy bean meal, rapeseed meal and wheat used in these cows' diets, the decision to include WDDGS in the ration should be based on the nutritional quality of the feed available and its price relative to other protein sources.

“As with all feeds, it is important that the nutritional quality of the specific WDDGS feed is known, to allow more precise dietary formulation.”

Professor Phil Garnsworthy, *University of Nottingham*





Diet and a well-functioning digestive tract

For dairy cattle, rapid changes in diet can be quite detrimental to the digestive system so diets require careful management.

Of course, the ultimate aim of feeding the animal is to optimise performance, which requires knowledge of the physical and chemical aspects of the diet. In order to further our understanding of how diets function in the digestive system of the cow, AHDB Dairy has funded a number of projects that are examining dietary change including sub-acute rumen acidosis (SARA) and functional fibre.

Understanding dietary change

When we change the diet of the cow we must do so gradually to avoid digestive upsets and reduced performance. However, being able to detect subtle effects of diet change, before performance is affected, has been difficult to date. Researchers at UON are currently examining markers such as the stress hormone cortisol in cows' faeces.

If successful, this could then be developed into an on-farm tool to identify and quantify the impact of feed management on stress levels and more importantly how to avoid these stresses.

SARA

The condition SARA is defined as when acid production in the rumen is greater than absorption, causing the pH to drop to below 5.8 for longer than two hours at a time.

A project co-funded by the BBSRC and AHDB Dairy aims to further our understanding of the condition.

What effect is SARA having in the large intestine, for example, or how might we reduce the potential effects of SARA on the dairy cow? These questions are currently being addressed in a trial at the University of Glasgow, which will finish later in 2016.

Functional fibre

One method of reducing the risk of low rumen pH is to offer the animal a form of functional fibre to encourage saliva production and slow the rate of acid production: but what is functional fibre and how can we quantify it?

A Penn State Particle Separator may be used. However, this was developed for higher dry matter diets than those in the UK, which typically contain more grass silage.

With this in mind, researchers at Reading University and HAU are currently investigating what functional fibre really means for the dairy cow and what physical and chemical aspects of the diet contribute to its functionality. Ultimately, this work will offer a more rounded approach to diet formulation, which goes beyond its nutrient content.

Growing and feeding lucerne

With increasing volatility in the price of purchased protein, home-grown protein crops have an important role to play in reducing dietary feed costs in the future. In recent years, there has been growing interest in lucerne (alfalfa) as a high protein (20% crude protein) crop that, at an estimated 50p/kg protein grown, can be a viable alternative to purchased feeds.

Recently, researchers have been investigating the impact of including lucerne silage in the diet, with grass silage or maize silage, on animal performance. Lucerne was included in a total mixed ratio (TMR) in two separate studies with maize silage, at HAU or with grass silage, at SRUC.

In both scenarios, including lucerne in the diet did not impact on milk production, fat or protein content, with average milk yields of 40.9 and 32.7kg/cow/day at HAU and SRUC, respectively (table 1).

In both studies, including lucerne in the diet reduced the requirement for bought-in protein. When lucerne was incorporated with maize (60% lucerne, 40% maize), it reduced protein requirements by the equivalent of 0.6kg/cow/day of soya bean meal and 0.12kg/cow/day of urea, resulting in 23.6p/cow/day saving.

However, when lucerne was incorporated in a TMR with grass silage (75% lucerne:25% grass), the savings made in bought-in protein were outweighed by an increase in the requirement for purchased energy, increasing feed costs by £0.74/cow/day compared to a grass silage based TMR.

Farmers looking to incorporate lucerne silage in their diet should base their decision on the ability of the farm to grow the crop and likely fertiliser savings, rather than improvements in milk yield or milk quality.

Growing lucerne

Although lucerne is the most common forage crop in the world, its use in Great Britain remains restricted by agronomic challenges, with many growers struggling to obtain good establishment. Recent research has aimed to shed more light on this area. In trials at SRUC, HAU and the University of Reading, researchers have found:

- Spring sowing of lucerne is more reliable than autumn sowing due to the warmer soil temperatures required by the plant
- Sowing lucerne with a cereal cover crop reduces weed burden at first harvest; however, there is no long term impact on lucerne plant numbers.

More information on lucerne agronomy can be found in the AHDB 'Growing and feeding lucerne' guide, available on the website.

dairy.ahdb.org.uk/lucerne

% forage as lucerne	Maize based TMR			Grass based TMR		
	0	40	60	0	50	75
Dry matter intake, kg/day	24.5	24.5	23.4	19.8	23.4	24.6
Milk yield, kg/day	42.2	40.2	40.5	32.0	32.7	33.2
Milk fat, g/kg	41.1	40.4	41.8	39.5	39.5	39.5
Milk protein, g/kg	30.9	31.0	30.8	30.1	30.2	30.0

Table 1. Dry matter intake, milk production and milk composition from cows' feed rations with increasing levels of lucerne in the forage portion





Requirements, supply and balance in mineral nutrition

Mineral nutrition has an important role in the normal functioning of our animals. However, the effectiveness of mineral nutrition depends on the type of forage being fed and the interactions between different minerals in the diet.

As part of the AHDB-funded Research Partnership work, researchers at HAU conducted a survey of 50 dairy farms to assess what levels of minerals were being offered to dairy cows.

This highlighted that while some farms were underfeeding minerals, there were many more overfeeding, both having the potential to limit animal performance, according to Professor Liam Sinclair, who led the research.

“Mineral nutrition requires a joined up approach, knowing what levels are in the forage, water and other feeds and then what supplementation is required to meet the animal’s requirements,” he explains.

The team were particularly interested in assessing the copper levels in dairy cow diets, as copper forms complex bonds with antagonists such as molybdenum and sulphur in the rumen, greatly reducing its availability. This is further complicated by the type of forage fed, explains Professor Sinclair.

“We found little difference in copper status of animals, regardless of whether they were on a grass or maize silage-based diet when molybdenum concentrations are normal. However, in grass silage-fed animals, a lower copper status was found where molybdenum concentration was high.”

When considering the type of copper supplement fed, the team found little difference, in animal performance, between organic and inorganic copper, regardless of antagonist level.

These studies clearly show how important it is to analyse forages for mineral content and supplement animals accordingly, to avoid problems arising.

“Assessing mineral requirements on farm should start with forage analysis.”

Professor Liam Sinclair,
Harper Adams University



Outwintering replacement heifers

Outwintering replacement heifers can lower rearing costs by £150/head during the winter period; however, careful management is vital to ensure optimal performance.

With heifer rearing the second largest cost on dairy farms after feed and forage, identifying cost-effective strategies for managing replacement youngstock is essential.

In 2012, 70 farms took part in a survey to assess current outwintering practices on GB dairy farms. This showed:

- Most farmers opt to outwinter to reduce the cost of heifer rearing; however, labour and access to buildings were also important decision factors
- Deferred grazing (55% of farms), kale (36%) and fodder beet (32%) are the most common types of outwintering forages
- Selecting free-draining soils with a gentle slope is key to protecting soil structure and minimising any potential runoff
- Farmers remove animals not performing to targets.

Around 70% of outwintering takes place on spring block calving farms. However, outwintering replacement heifers may also be a cost-effective option for farmers managing a higher input system.

To investigate this, HAU followed 48 heifers, split into three management

groups, through the winter period and into their first 100 days in milk. Two groups were outwintered, on either deferred grazing and grass silage or fodder beet and grass silage. The other group was housed and fed grass silage and concentrate through the winter months.

The results show early lactation milk performance and fertility were not affected by either forage type or outwintering, indicating that with careful management heifers destined for high-input systems can be successfully outwintered.

Throughout the winter months, animal live weight gains averaged 1.1kg/head/day and similar gains were observed for animals outwintered on fodder beet compared to those housed (figure 1). The heifers outwintered on deferred grazing had lower live weight gains (0.95kg/head/day) and had a small reduction in body condition score over the outwintering period. Results from the trial suggest animals outwintered on deferred grazing require additional supplementation during January and February, when grass quality is lower or in particularly wet periods.

Through survey work, commercial farm monitoring and trials, researchers at HAU and SRUC have been investigating current outwintering practices in GB and comparing the performance of outwintered animals with housed youngstock.

For more information on outwintering research, contact: debbie.mccconnell@ahdb.org.uk

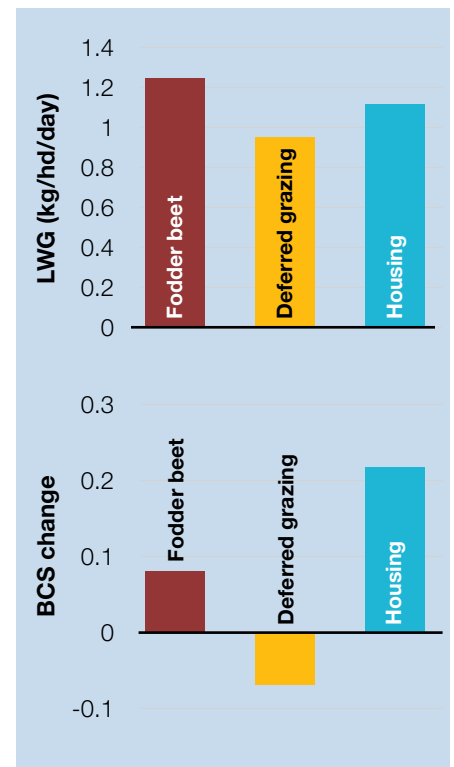


Figure 1. The effect of outwintering on the live weight gain (LWG) and body condition score (BCS) change of in-calf replacement heifers during the winter months



It is the farms that are regularly measuring and monitoring individual growth rates that achieve good animal performance and this will help them achieve maximum cost-benefit from the system."

More information on outwintering, can be found in our videos and resources at:

dairy.ahdb.org.uk/outwintering

Economics of outwintering

Financial analysis of outwintering systems highlights that feed costs for outwintering on fodder beet or deferred grazing were approximately 70–80% of housed animals but varies dependent on crop yield.

However, the largest financial benefit from outwintering 1–2 year old heifers is the potential savings in capital costs. In total, the study highlighted the potential to reduce rearing costs during the winter period by outwintering by approximately 50% or £150/heifer.

Professor Liam Sinclair, who led the research team, comments: "Outwintering can certainly be a cost effective method of managing replacement heifers in a range of systems, however, cost savings can only be realised if good animal performance is achieved.

"Our on-farm work has shown that there can be a wide range in animal performance over the outwintering period, regardless of the type of forage used.

Forage



Grass and clover under low nitrogen (N)

Varieties listed on the Recommended Grass and Clover Lists (RGCL) can be confidently used under low N conditions, according to recent AHDB-funded research by the National Institute of Agricultural Botany (NIAB).

With rising fertiliser costs and a greater focus on reducing losses to the environment, improving nutrient use efficiency is increasingly important in livestock systems. Currently, varieties tested under the RGCL are managed under high N inputs (400kg N/ha) to evaluate their genetic potential.

However, little was known about how the same varieties would perform under lower nutrient conditions, so AHDB funded research to investigate the effect of different input levels.

Plots were sown with six different varieties at three sites across England and managed under three levels of N: 100kg, 200kg and 400kg N/ha. The six varieties were managed under both simulated grazing and silage regimes.

Under silage management there was an average 23kg DM grass response to each 1kg of nitrogen applied, but there was no significant change in the ranking of varieties at each level of N application. As a result, the highest performing grasses under a 400kg N fertiliser regime, performed the best under the 100kg and 200kg N regimes.

For more information on this work, contact:

debbie.mcconnell@ahdb.org.uk

Nutrient efficient grass and clover varieties

Grass breeders have been working towards developing nutrient-efficient grass and clover varieties, reducing the requirement for purchased fertilisers.

Over the years, some varieties of grass and clover have adapted to low nutrient status soil. However, these varieties have typically displayed poorer agronomic performance than those on the RGCL.

Recently, researchers at Aberystwyth have been able to identify the genetic markers for improved nutrient use efficiency and are crossing plants that express these traits with the top performing varieties used today. It is hoped that these varieties, by using nutrients more efficiently, will be able to maintain grass growth rates and

quality, while requiring lower inputs of N and phosphorus.

From these trials, a number of new varieties have now been entered into national list testing programmes.

This project was funded under the Defra-LINK programme, in which AHDB participated as an industrial partner.

Recommended grass and clover lists

Selecting varieties from the RGCL will ensure farmers are using the best genetics for grass growth and yield, quality and disease resistance.

Grass and clover varieties are required to be on a national list in a European country to be retailed in the UK. However, this means some varieties available to buy in the UK have not been independently tested in the UK climate or on its soils.

The RGCL for England and Wales tests grass varieties on four sites, plus two additional disease testing sites, across

England and Wales. This provides independent information on grass growth, agronomy and disease characteristics for individual varieties under UK conditions.

A panel of experts, including breeders, scientists and farmers, assess this data, with the best performing varieties gaining a place on the RGCL. This process removes any varieties that are not suited to UK conditions. Only one in 20 of the varieties tested make it to full recommendation.

Since 2012, AHDB, through its Beef & Lamb and Dairy sectors, along with HCC

have been supporting the promotion of the RGCL for England and Wales. A separate recommended list scheme operates in Scotland, with the lists published by SRUC.

A copy of the current RGCL handbook and an interactive list can be found at:

dairy.ahdb.org.uk/rgcl



Giving clover silage its true value

Current Near Infrared Spectrometry (NIRS) analysis methods under-predict CP of grass-clover silage content by almost 2% on average, compared with alternative methods of lab analysis.

NIRS is a quick and inexpensive technique that is widely used for the analysis of forages in the UK. Using NIRS, a wide range of nutritional characteristics can be measured; however, a robust calibration equation is required before material can be analysed accurately.

Currently, no calibration equation exists for grass and clover mixture silages in the UK. Instead, these silages undergo

analysis using the equations developed for pure grass silage, which could give inaccurate results.

AHDB Dairy has been funding research at the University of Reading to investigate the suitability of the existing calibrations for grass-clover silages. The research team, working in partnership with the Forage Analytical Assurance (FAA) group, collected 90 grass-clover silage samples, both big bale and clamp, from farms across Great Britain, covering a range of clover contents for the study.

The preliminary results, from the first 75 of the samples analysed for major

components, metabolisable energy and rumen degradability by both NIRS and traditional wet chemistry techniques, suggest that:

- As clover content rises, CP, acid detergent fibre (ADF) and ash content tend to increase
- Current NIRS analysis under-predicts CP content by 1.9% on average, ADF was under-predicted by 3.6%, and ash content by 0.6%
- As the amount of clover in the silage increases, the difference between the NIRS and wet chemistry analysis increases
- The analysis of other characteristics such as dry matter, are unaffected by clover content.

The findings from this research will contribute to improving the equations used in UK laboratories to predict CP concentration in grass-clover silages and, ultimately, to more accurate ration formulation.

For more information on this project, contact: debbie.mcconnell@ahdb.org.uk

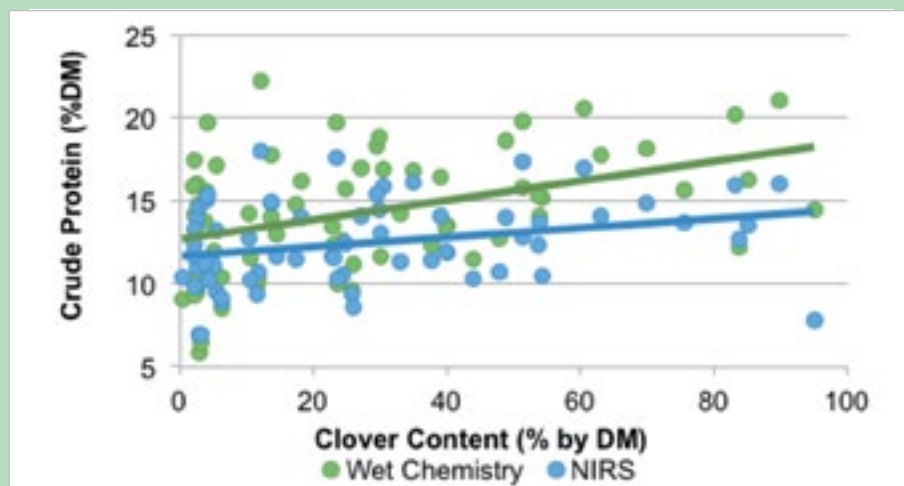


Figure 1. Effect of clover content and analysis method on CP content of grass-clover silages

“With an estimated 80% of British dairy farmers including clover in their grass swards, accurate measurement of the nutritional content of grass-clover silages is vital to help reduce feeding costs and improve ration formulation on farms.”

Professor Chris Reynolds, University of Reading

The role for pasture in high-output dairy systems

Increasing the proportion of fresh grass in the diet of higher-yielding cows via cut-and-carry systems can be a viable option to reduce feed costs and leave a greater financial return, suggests new AHDB Dairy-funded research.

As volatility in the price of purchased feedstuffs increases, fresh grass has an important role to play in reducing feed costs. Although grazed grass remains our lowest cost feeding option for dairy cows, with high-yielding animals it can often be difficult to strike a balance between maximising grass utilisation and maintaining animal performance.

Recently, there has been growing interest in cut-and-carry (zero grazing) systems as a method of introducing fresh grass into cows' diets; however, little is known about animal

performance and the economics of these systems. A recent trial at SRUC investigated how increasing the amount of fresh grass fed to higher-yielding cows (38 litres/cow/day) via a cut-and-carry system can impact on animal performance and economics. These cows were fed one of three diets:

100%	TMR diet
75%	25% fresh grass on a dry matter TMR (DM) basis
50%	50% fresh grass on a DM basis TMR

The low DM content of the grass meant that cow DM intake was on average 2kg/cow/day lower with the 50% TMR: 50% fresh grass diet.

This resulted in a reduction in milk yield of 4.3 litres/cow/day compared with the 100% TMR diet, which averaged

35.7 litres/cow/day over the course of the trial.

Despite this, however, the lower feed costs offered by the 50% grass diet resulted in a greater economic margin per cow (£/cow/day) over the course of the trial (figure 2). On average, net margin was 47p/cow/day higher with 50% grass diet compared to the 100% TMR diet, when factoring in a milk price of 20ppl. These cost calculations included the total cost of feed and labour associated with the systems, with the TMR costing 84p/kg and pasture feeding at 15p/kg. It was only once milk prices reached 33ppl or above that the TMR-fed cows delivered a higher economic margin.

For more information on this work, please contact: stephen.whelan@ahdb.org.uk

Getting the most from cut-and-carry:

- If including fresh grass in the TMR, grass should be added last to the diet feeder and mixed for only a few minutes to avoid damage of the plant
- Grass requires pushing up at the feedface 3–4 times per day to ensure good intakes
- Spoilage will be greater than ensiled forages. Fresh grass needs to be cut and offered at least once per day
- Grass destined for cut-and-carry should be managed similarly to a grazing sward, to ensure maximum output per hectare.

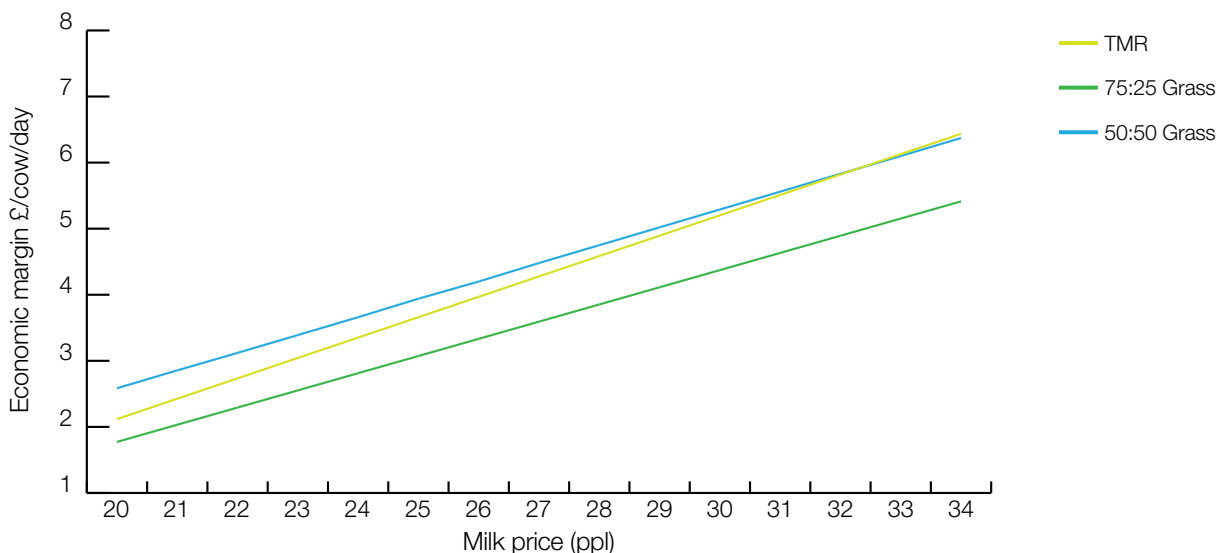


Figure 2. Effect of diet on economic margin (£/cow/day)

Soils

Realising the true costs of compaction

Soil compaction on grassland has been shown to cause grass yield losses of 1–2t DM/ha, restrict soil drainage and cause damage to soil structure, in recent AHDB Dairy-funded research.

A survey completed in 2012 indicated that 70% of grassland soils in England and Wales exhibited signs of soil compaction, but little was known about the true impact of compaction on grass growth and soil function.

In a three-year study examining compaction from both machinery and cattle, researchers at SRUC and HAU outlined the impacts of compaction on grass growth and soil function.

Throughout the experiment, compaction from both machinery and animals was found to increase soil bulk density, reducing vital pore spaces for air and water transfer, and increased water retention by 20% in the soil throughout the season.

The study also found compaction from machinery and cattle reduced first cut yields by 24% and 16%, respectively.

The findings from this experiment have been used to develop an industry standard assessment of soil structure – Healthy Grassland Soils.



For practical guidance on soil structure and aeration, visit:

healthygrasslandsoils.co.uk



No compaction



Cattle compaction



Tractor compaction

Soil aeration strategies



In addition to soil compaction studies, SRUC and HAU researchers compared potential aeration strategies for improving soil structure.

Sward lifter and slit aeration both proved to be effective methods of alleviating compaction, reducing soil bulk density by 10% and increasing the proportion of air in the soil. Aeration also decreased water retention, increasing trafficability at the shoulders of the season.

The results also suggested autumn aeration is more favourable than spring. Springtime aeration, particularly sward lifting, was found have a short-term negative effect on grass growth, reducing first cut yield by as much as 25%.

For more information on soil research, contact: **debbie.mcconnell@ahdb.org.uk**

Controlled traffic farming shows promise

With an estimated 85% of the area of a field covered every year by tractor tyres, the potential impact of compaction from machinery can be significant. However, using Controlled Traffic Farming (CTF) principles has benefits for soil structure and sward performance in grass silage operations.

CTF has been developed by the arable sector to minimise the risk of crop and soil damage from machinery traffic. CTF uses Real Time Kinematic (RTK) and Global Positioning Satellite (GPS) technology to set tramlines within the crop, confining traffic movements to small areas of the field.

With recent AHDB Dairy research highlighting potential yield losses of 24% in grassland from compaction by machinery, researchers at SRUC have been investigating the feasibility of implementing CTF practices in grassland harvested for silage.

The study used a newly established perennial ryegrass ley, with areas managed either under a random traffic silage operation or a controlled traffic regime. Within the controlled traffic regime, mowing, tedding, raking and lifting operations were all completed on a 9m working width. In addition, tractors with trailers were restricted to travelling on an adjacent tramline 9m away.

The controlled traffic regime reduced the area covered by tractor tyres by 50%. Initial sward results from the trial have also shown that grass yields were

0.9t DM/ha lower from the random traffic area than the controlled traffic (figure 1). Fuel usage and work rate will also be assessed.

To find out how demonstration farmer Joe Dugdale is implementing CTF on his grassland farms, visit the AHDB Dairy YouTube channel: [youtube.com/user/DairyCoAHDB](https://www.youtube.com/user/DairyCoAHDB)

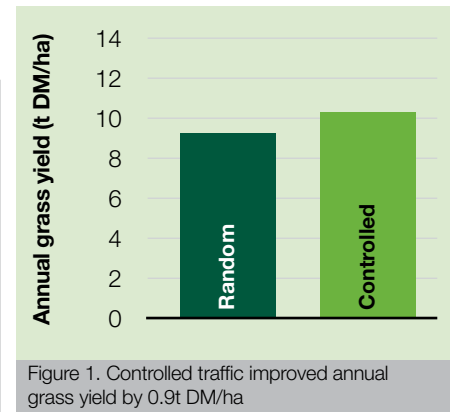


Figure 2. Controlled traffic

Making the most of manure

With current high fertiliser prices, making the most of nutrients in manures is key to keeping costs down on farm. A 40m³/ha application of cattle slurry would typically supply 40kg of available nitrogen, 50kg of phosphate, 130kg of potash and 10kg of available sulphate per hectare. That has a nutrient value of £125 per hectare and can help reduce fertiliser costs significantly.

Recent research has also shown a good relationship between dry matter content

and nutrient content. Slurry hydrometers can be used on farm to obtain a quick measurement of dry matter content. From this we can then better estimate slurry nitrogen, phosphate and potash content and more accurately plan both manure applications and supplementary fertiliser applications to meet crop requirements. AHDB Dairy is co-funding work with other AHDB sectors on crop sulphur requirements, including the role of organic manures.

Computer software, MANNER-NPK, is also available to help calculate the nutrient value of slurry application.



Healthy Grassland Soils

With grassland compaction causing yield losses up to 24%, reducing water infiltration and impacting negatively on nutrient use, understanding soil structure is fundamental to profitable grassland farming.

The Healthy Grassland Soils project, co-funded by AHDB Dairy and AHDB Beef & Lamb, has produced a quick and effective, four-step method for farmers to carry out in-field assessments of soil structure.

Healthy Grassland Soils – Four quick steps to assess soil structure

Step one: Surface assessment
Look at sward quality to identify potentially damaged areas which require further assessment.

Good
• Sward intact
• No poaching
• Few wheelings

Moderate
• Surface poached
• Wheelings in places
• Poaching
• Poor sward quality

Poor
• Surface compacted
• Soil exposed
• Poaching
• Poor sward quality

Step two: Soil extraction
Dig out one spadeful block of soil (depth approx. 30cm). Cut down on three sides and then level the block out leaving one side undisturbed. Lay soil block on a plastic sheet or tray.

Step three: Soil assessment
Gently open the soil block like a book to break it up. If the structure is uniform – assess the block as a whole. If there are two or more horizontal layers of differing structure identify the layer with the poorest structure. Carry out the rest of the assessment on this limiting layer.

Step four: Soil scoring
Break up the soil with your hands into smaller structural units or aggregates (see chart). Assign a score by matching what you see to the descriptions and photos provided. A score of 1 or 2 is Good; a score of 3 is Moderate; and 4 or 5 is Poor and requires management action. Record depth of limiting layer to assess management options.

Step one

Surface assessment

Look at sward quality to identify potentially damaged areas that require further assessment.

Step two

Soil extraction

Extract a spade-sized block of soil of about 30cm. Cut down on three sides and level the block out, leaving one side undisturbed.

Step three

Soil assessment

Gently open the soil block like a book to break it up. If the structure is uniform, assess the block as a whole. If there are two or more horizontal layers of differing structure, identify the layer with the poorest structure and carry out the rest of the assessment on this limiting layer.

Step four

Soil scoring

Break up the soil with your fingers into smaller structural units, known as aggregates.

Assign a score by matching what is seen to the descriptions and photos.

Score 1 or 2	Good
Score 3	Moderate
Score 4 or 5	Poor

If the score is poor, action is required. Record the depth of the limiting layer before deciding what to do.

For more information on improving soil structure, download our soil assessment guide and pocketbook from: healthygrasslandsoils.co.uk

Structure quality	Identification of structural problem eg limiting layer	Soil structure features	Description
Score 1 Closely	Aggregates readily crumble with fingers	Small (<6mm), round	• Good soil structure • High porosity • Many well-developed roots • Small earthy small • Small, rounded aggregates
Management Options	Re-assess after equipment crosses the ground or grazing in wet conditions or entry two years.		
Score 2 Loose	Aggregates easily break apart	Rounded (1-2mm)	• Good soil structure • Earthy soil • Pores • Some indication of larger aggregates • Good root distribution
Management Options	Re-assess after equipment crosses the ground or grazing in wet conditions or entry two years.		
Score 3 Firm	Most aggregates break down	Round (10mm) but some are angular	• Adequate soil structure • Larger aggregates, some angular • Moderate root distribution • No strong smell • Less visible pores
Management Options	Consider infrastructure changes (eg bank-facing, to minimise traffic in marginal weather conditions, multiple field entrance or track).		
Score 4 Compact	Effort needed to break down aggregates	Larger (3-5cm) angular	• Large angular aggregates (3-5cm) with low pore numbers • Some red/orange mottling may be present (sign of poor drainage) • Some clumps in larger areas • Worm channels and cracks between aggregates • May have sulphur smell in soil
Management Options	Consider use of sward tiller or cultivator (if poor soil structure <10cm) or tillage or mixed tiller (if poor soil structure deeper than 10cm). Assess sward then plough and reseed if required.		
Score 5 Very compact	Aggregates compact, difficult to pull apart and platy	Large (10cm) angular	• Very large angular aggregates (>10cm) with very few pores • Any roots seen mostly at the surface or clustered down large furrows or cracks • May have grey colour with red/orange mottling (sign of poor drainage) • May have strong sulphur smell in soil
Management Options	Use sward tiller or cultivator (if poor soil structure <10cm) or tillage or mixed tiller (if		





“Festulolium’s large well developed root systems combat flooding, reduce soil erosion and compaction and offer opportunities for significant carbon capture and storage at depth in soils.”

Professor Mike Humphreys, Aberystwyth University

SURERROOT: A novel approach to root design

Drought-tolerant grasses that also enable grassland soils to capture more rainfall and reduce the risk of flooding downstream are being developed in the SURERROOT project.

SURERROOT is a five-year £2.5 million LINK project, funded by BBSRC, with match-funding from a range of industrial partners. AHDB is providing funding and in-kind support. The project is being conducted at Aberystwyth University's Institute of Biological, Environmental and Rural Sciences (IBERS) and Rothamsted Research.

This project builds on research published in 2013, which showed that a festulolium (ryegrass/fescue species) hybrid with modified root architecture had potential for flood control.

The festulolium root-soil interactions instigated a change in soil structure, leading to a 51% reduction in surface runoff compared with other grasses. Improved rooting structures also allow for better drought tolerance during dry periods.

This new project is building on that preliminary data and exploiting the vast genetic variation available within forage species to modify root dynamics to mitigate the effects of excess or deficient rainwater supply.

The project is:

- Identifying genomic markers for root structure traits, incorporating these into new varieties to maintain agronomic performance and improve drought and flood tolerance
- Investigating the effect of root growth and turnover on carbon deposition over a three-year period. Genome regions for root growth and turnover are being located and bred into high-quality grass varieties
- Examining the role of novel festuloliums in the field. Grasses are being grown at Rothamsted Research's North Wyke facility, measuring water and nutrient runoff levels. These are to be grazed and cut to understand the interactions between management and rooting structure, and soil structure and carbon content.

CASE STUDY

SURERROOT on farm

Andrew Farrant, a third generation dairy farmer from Oxford, is one of the commercial development farmers for the SURERROOT project. Andrew manages a 650-cow, spring/autumn block calving herd with the aim of producing as much milk from grass as possible. The farming partnership also finishes 400 beef cattle surplus to the dairy each year at their farm in Worcestershire.

As a commercial development farm, Andrew is evaluating the performance of deeper rooting festuloliums on one of his fields. The impact of festulolium on soil structure and health is also being monitored. For more information on the SURERROOT project, contact: debbie.mcconnell@ahdb.org.uk



Business management

Lean Management

Using Lean Management principles on dairy farms to reduce costs and increase margins can offer a route to profitability, with most farms in a pilot study seeing an improvement in net margin. In the AHDB Dairy study, farmers were supported by consultants to embed Lean Management into their business practices.

The farms were either brought from a negative position to a positive net margin with improvements up to 7.5ppl, or maintained/increased net margin by an average 1.56ppl. This is set against a national fall of 2.1ppl, according to Milkbench+ figures, over the same period.

Lean Management is a management principle originally developed in the Japanese car manufacturing process by Toyota. It uses various tools to manage any and all processes in the business.

Doing this minimises all possible sources of waste and maximises the value of inputs used in the process. On a dairy farm, waste could be defined in terms of time inputs, concentrate usage, sub-optimal heifer rearing, losses to disease, etc.

The Lean Management process involves development of process maps for activities on the farm, and measuring and monitoring performance and economic data at a very detailed level. The data is reviewed at regular intervals to help inform decisions, with the goal of continuous improvement.

Collaborating with Stream Line Farm Management and Reaseheath College, the project also developed an ILM (Institute of Leadership and Management) Level 5 course and qualification, initially for dairy farm consultants, to support farms that want to implement Lean Management.

AHDB Dairy regularly holds events on the basic principles of Dairy Lean Management, which give an insight into the tools of Lean and how to use them to best effect in a dairy business. The details of nine AHDB Dairy ILM accredited Dairy Lean Consultants can be found on the AHDB Dairy website.

For further information on business management contact:

rachael.chamberlayne@ahdb.org.uk

“I have incorporated Dairy Lean Management into all of my consultancy work, which has brought considerable direct financial benefit to the businesses that I work with. The key to helping businesses with Dairy Lean Management is to have a clear focus on what needs to be achieved, but to recognise that each business is different and the speed at which Lean can be implemented will need to be prioritised and tailored to the individual dairy business.”

Ian Powell, The Dairy Group

Benefits of Lean Management on farm:

- Increased efficiencies, increased net margin
- Higher levels of operational performance
- Ability to better predict problems before they occur
- Deeper understanding of linkages within the different processes and their relative impacts
- Improved business management and professional development for the farmer and team
- Clearer prioritisation and management of business goals and targets
- Increased management time available.

What makes a profitable business leader?

Dairy farmers with staff or family teams, who have a people oriented personal style, combined with a decisive command role, are more likely to run more profitable farms, according to an AHDB Dairy study.

When looking at the differences in financial performance between the most and least profitable dairy farms, it seems that the results are more a function of management than size or output. In AHDB's 2014–15 annual benchmarking evidence report, the top 25%, on average, earned at least £1.20 for every £1 of cost. In contrast, the bottom 25% lost £0.20 for every £1 of cost. Despite significant changes in milk and input prices, the gap between the top and bottom 25% has remained reasonably steady for the last eight years.

To help understand this and support dairy farmers to become better business leaders, assessments were carried out on 65 dairy farmers based in England and Wales. A qualified executive leadership coach also interviewed 23 of these producers. From the responses obtained, their approach to people and to self-management was compared with their business financial performance.

An approach based on conscientiousness, developing others, leadership and persistence was significantly higher in the top 20 most profitable farmers. These farmers tended to be more aware of the impact their emotions, strengths and limitations had on how they led their teams.

High performers also attached importance to two-way feedback with staff and partners. They explicitly made the link between involvement, good communication and high performance.

These traits had often come through their upbringing and professional and social experiences. However, several studies in other business sectors show it is possible for individuals to improve their leadership and management skills. The first step is recognition of the beneficial impact, a desire to change and develop new habits.

DairyLeader

How would you define a DairyLeader?

Those in the industry who are progressive in their business outlook, wish to challenge both themselves and their businesses, and recognise the value of learning from others (inside the sector and in the wider business world), fall under the DairyLeader banner.

AHDB Dairy has been working with this group to identify areas and refine an offering that fits their particular needs. One particular area has been helping with the team and people management aspects often critical to these businesses.

To date, two DairyLeaders forums have been held to bring together this group of like-minded producers. Titled Leadership, Growth and Resilience, these forums challenged not just the business but also the person behind the business.

One such DairyLeader is Joe Delves of Burnt House Farm in Sussex. Having been brought up on the family farm, Joe

took the decision to build a career outside dairying before a change of direction back into the sector. Joe and his partner now run the family autumn calving herd as well as a joint venture on a unit around 50 miles away from the home farm.

To find out more about Joe and other dairy leaders' visions for their businesses and team development, please visit the DairyLeader pages on the website.

'I manage people, not cows, within my business.'

Joe Delves, Burnt House Farm



Dairy products in the human diet

There is an increasing body of information to support the health benefits of including dairy products in the human diet, countering criticism from some nutritionists who claim their saturated fat content makes them an unhealthy choice.

Milk and meat products are also often criticised for having a disproportionate impact on the environment. However, milk is acknowledged as being a nutrient-dense food, containing high levels of nutrients, such as protein, calcium, phosphorous, iodine and vitamin B12, per unit of energy.

In collaboration with The Dairy Council, AHDB Dairy funded a study to quantify the nutritional, environmental and cost benefits of including dairy in the human diet. The project was delivered by an independent team of experts from the University of Reading, ADAS and RAND Europe.

The first stage of the project was to objectively review existing and emerging information from around the world on the nutritional and health implications of consuming dairy products. This found that milk and certain dairy products are associated with reductions in blood pressure, no increase in body weight in diets of similar energy content and they may be less detrimental for cardiovascular health than had previously been assumed.

In stage two, a predictive model was developed to analyse the impact of varying levels of milk and dairy products in the diet on nutritional adequacy, environmental impact and cost per nutrient.

Information on UK dietary patterns for 1,655 males and females (aged 19 to 64 years old) was obtained from the National Diet and Nutrition Survey. This data was separated into four quartiles, ranging from high (267–1,429g dairy/day) to low (0–99g dairy/day) patterns for daily dairy consumption. The main conclusions were:

- People with a high dairy pattern met most, but not all, nutrient recommendations
- Females with a high dairy pattern had significantly lower female Body Mass Index
- Overall, the analysis showed that excluding dairy foods, particularly milk, from the diet had important negative nutritional consequences
- Dairy products, and milk in particular, can be part of a dietary pattern that does not increase greenhouse gas emissions beyond the current UK average male and female diets

- Dietary patterns that include dairy products provide lower financial cost per nutrient compared with those that are free or low in dairy.

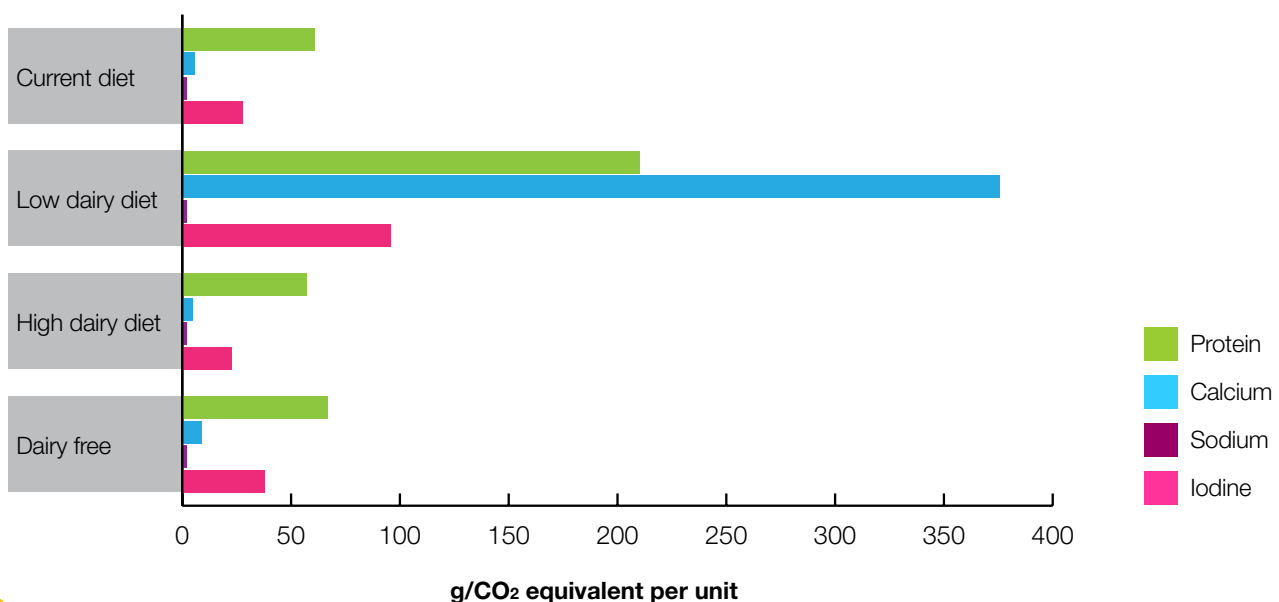
The results of this work are being published as peer reviewed papers in scientifically respected journals, in order to enforce the credibility of the work. The results will be promoted to health professionals, nutritionists, policymakers and Non-Governmental Organisations (NGOs), while AHDB and The Dairy Council will carry the message to consumers through their websites, factsheets and promotional materials.

For further information, contact:

ray.keatinge@ahdb.org.uk



Carbon cost per unit of nutrient



Collaboration

Levy body collaboration in Europe

Currently coordinated by AHDB Dairy, the European Cattle Innovation Partnership (ECIP) is a collaboration of farmer-funded levy bodies, which aims to work more closely in the co-ordination of applied research, development and knowledge exchange.

ECIP was formed in June 2012 by partners in Sweden, Denmark, the Netherlands, France, Great Britain, Northern Ireland, the Republic of Ireland, Italy and Israel. The objective is to ensure better value for money for levy-funded research and development, by sharing knowledge, avoiding duplication and

ensuring better translation of research results into practice.

So far, ECIP has:

- Compiled information on 200 projects by its partners
- Agreed eight strategic themes under which to collaborate
- Shared technical information on topics such as the use of recycled manure solids for bedding
- Scoped particular technical challenges, such as phosphorous management.

It is also working at national and EU levels to influence evolving agendas under the new EU Framework Programmes, such as Horizon 2020 (H2020). The aim is to optimise the benefits to dairy farmers by ensuring their involvement in translating research and innovation into practice.

ECIP partners are key players in the H2020 Thematic Network – EuroDairy.

For further information, contact:

ray.keatinge@ahdb.org.uk



Centre of Innovation Excellence in Livestock (CIEL)

The UK Agri-Tech Strategy has established a number of centres of excellence to develop the UK's capacity to deliver cutting-edge science to the agricultural sector, nationally and internationally.

The overall objective is to support, promote and deliver innovative, industry-led research for sustainable intensification, with the aim of generating wealth and business competitiveness through growth in profitability.

CIEL will bring together the UK's leading research and knowledge exchange providers in the beef, dairy, pigs, poultry and sheep sectors. There will be more than £50 million of investment over five years in state-of-the-art research facilities.

CIEL will cover the whole food chain at all levels from cell to farming system, from production to food quality and food safety, with its headquarters at the National AgriFood Innovation Campus at York.

For dairy, the most significant investment will be at Nottingham University, where a new facility will focus on optimising the housed environment for dairy cattle. Additional investment will be made at Agri-Food and Biosciences Institute (AFBI) in Northern Ireland and at the Future Farm Dairy facility at Duchy College.

AHDB has been instrumental in developing the proposal for the establishment of CIEL and will continue to be closely involved with the centre, to develop and fund research programmes that meet the needs of levy payers.

For further information, contact:

kim.matthews@ahdb.org.uk



EuroDairy – a pan-european network for dairy knowledge exchange

A new three-year project to help solve problems on dairy farms using the best technical innovations available across Europe is being funded by the EU Horizon 2020 programme and led by AHDB Dairy.

EuroDairy aims to increase the economic, environmental and social sustainability of dairy farming by sharing information, best practice and technical innovation across member states. From Ireland to Poland and from Sweden to Italy, 20 industry partners span 14 countries, representing 40% of dairy farmers, 45% of cows and 60% of European milk output.

The approach is to draw on the input from farmers, vets, researchers and commercial companies, so that knowledge is exchanged, rather than being driven top down or from a research-led perspective.

Much can be learned from connecting the knowledge, experience, research results and knowledge exchange programmes across a diversity of dairy farming scales and production systems.

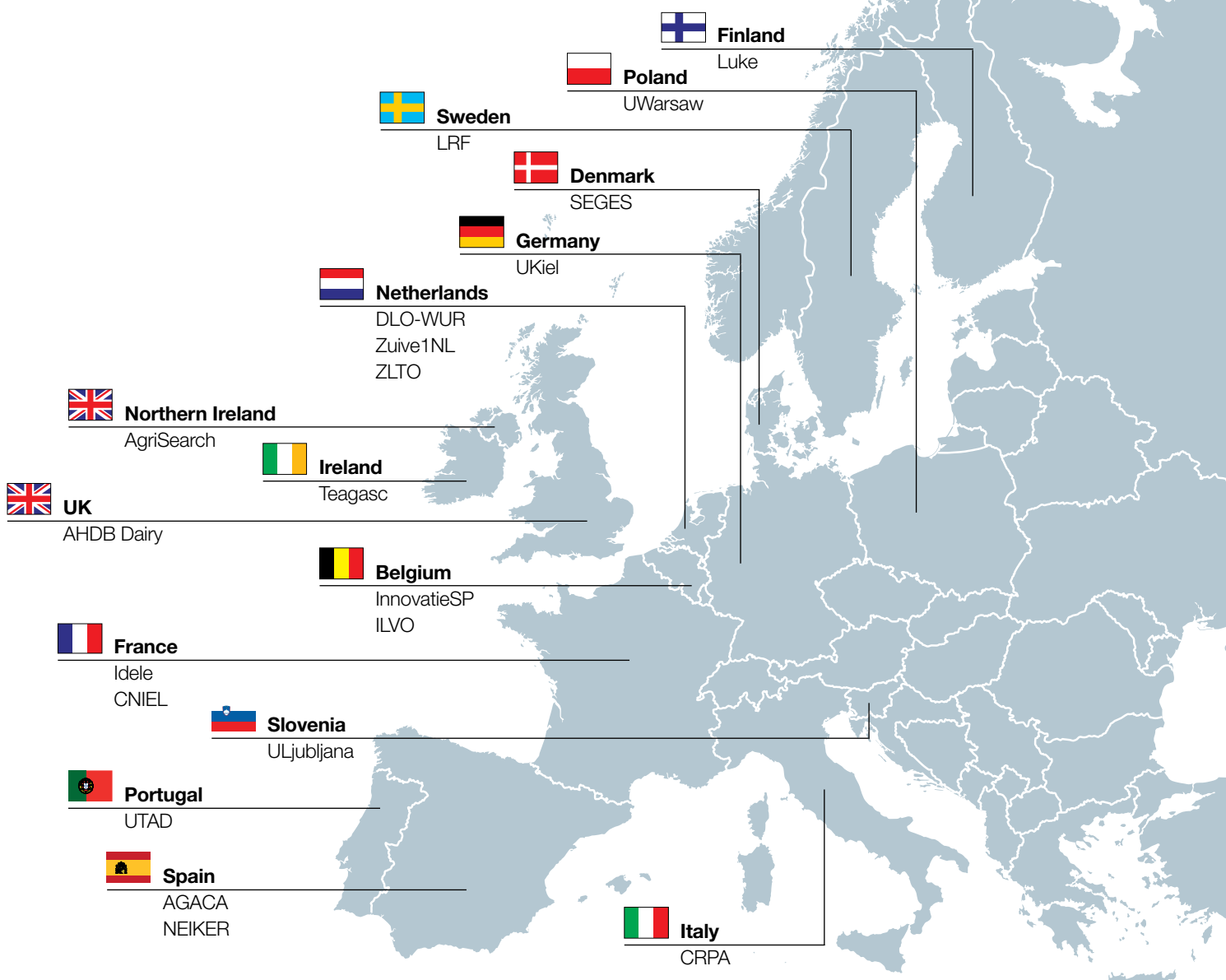
The project will focus on key issues for the post-quota era:

- Improving resource efficiency – precision feeding, soil fertility and nutrient management, water and energy efficiency
- Animal care – reducing antimicrobial use, improving welfare and optimising the housed environment for dairy cattle
- Socioeconomic resilience – farm profitability, resilience to volatility, labour use, succession and quality of life
- Biodiversity – integrating profitable dairy farming with care for the environment.

Information will be generated through international workshops, farmer exchange visits, case studies and over 40 regional ‘Operational Groups’ focused on specific issues. The project will also identify, develop and demonstrate best practice on 120 innovating pilot farms, located right across Europe.

New knowledge and innovation will be made accessible through technical literature, video clips, webinars, by other digital channels, including social media, and through the complementary activities of project partners such as AHDB.

For further information, contact:
ray.keatinge@ahdb.org.uk



Investing today to answer tomorrow's questions

One major spinoff of AHDB Dairy's investment in R&D is the development of high-calibre PhD graduates who will be able to rise to the future challenges of the dairy industry.

Over the five year duration of the research partnerships, 35 PhD students have been either partly or wholly funded by AHDB Dairy.

Student projects address specific issues relevant to the dairy industry, from healthy soils to the finer details of a well-trimmed hoof.

The PhD programme develops a skill set that will serve them well in their future careers as researchers, consultants and industry experts. PhD students are actively

encouraged to take part in AHDB Dairy activities, including research days and on-farm knowledge transfer activities.

Q and A with Anna Thomson – AHDB Dairy-funded PhD student at the University of Reading



Can you explain briefly what your PhD is about?

I'm investigating the accuracy of the nutritional analysis of grass-clover silages and seeing if this can be improved.

How will this work help the British dairy farmer?

Improving analysis of grass-clover silages will enable more precise ration formulation and improve feed efficiency in livestock.

What is the most challenging part of the research?

Getting the answers takes a lot of time. We visited 50 farms over several seasons to get the samples required.

What have you found to be the most rewarding aspect so far?

Meeting farmers and seeing how my research will have a beneficial impact on their business.

Doing a PhD can be a bit all-consuming at times, what interests do you have outside of research?

I go horse riding, it is fun and refreshing after a long day at work.

Details of the project Anna has been involved with can be found in the Forage section.

New PhDs in the pipeline

In 2016, we will be funding a further three PhD projects: investigating bovine ischaemic teat necrosis, a new emerging disease causing concern within the industry (Liverpool University), precision approaches to heifer rearing (AFBI Hillsborough) and reducing respiratory disease in calves (SRUC).



Getting R&D onto farm

Our ultimate goal is to get the latest R&D results onto farm and into practice as quickly and as effectively as possible. The end point for each project occurs when the outputs are communicated to levy payers. AHDB Dairy has a strong programme of discussion groups and open meetings, both of which have benefited from access to the researchers involved with levy-funded work.

Incorporating results into different types of publication and AHDB Dairy-led initiatives such as the DMCP and DHFP, means that producers and often those working closely with their businesses, are aware of the latest findings.

Demonstration is a very powerful way of bringing the research to life, so that farmers can visualise and discuss with researchers and other farmers the pros and cons of practical implementation. While traditional print is still very important, increasingly, farmers are using a wider range of media to communicate and to quickly access information relevant to their business.

Short films

Using technical experts and researchers AHDB Dairy has produced a number of short films on topics such as the differing welfare assessment scoring schemes, vaccination protocols, calf management and feed waste. Films are being developed on the topics of successful outwintering and foot blocking techniques. As a complement to these films, short quizzes can be incorporated, which allows the viewer to recap on what has been learnt, with guidance towards sources of further information. These quizzes are hosted on the AHDB Dairy website, while current films can be accessed on both the website and the AHDB Dairy YouTube channel:

[youtube.com/user/DairyCoAHDB](https://www.youtube.com/user/DairyCoAHDB)

Webinars

Webinars are an effective and efficient way to access nationally and internationally renowned speakers regardless of where they are located. Presentations are given live over the internet, usually in the evening, followed by an interactive question and answer session. These are also recorded so they can be viewed at any time for months or, if relevant, even years ahead, on the YouTube channel.



Research days

Delivering research information in a farm setting can help with applying the information to real situations, as was the case at Research Days hosted in Cornwall, Cheshire, Carmarthenshire and Norfolk. Run as a series of demonstration stations around the farm, researchers and AHDB Dairy technical staff shared information on chosen topics highly relevant to the host farm.

Aeron Owens, host of the Carmarthenshire Research Day, said: "The Research Day is a great chance to see what research is being funded with our levy and how it translates into a practical farm setting. Research is important to my business; we have started to use genomics, which is an exciting new technology that has come out of many years of research."

"AHDB Dairy Research and Development is important to me and my business, as without great ideas being researched and developed into practical tips, we'd still be rubbing sticks together to make fire."

Alistair Cliff, host of the Cheshire Research Day



Newsletters

Forage for Knowledge is AHDB Dairy's monthly electronic newsletter bringing readers the latest research and advice on grass, forage and soil management.

The electronic newsletter includes:

- Up-to-date technical information on grass and forage management
- Latest grass growth rates and quality analysis from farms across GB

- The latest forage research from across the globe
- Farmer case studies
- Ask the expert – put your question to a range of grass, soil and nutrient management experts from across the industry
- Monthly reminders
- Relevant events.

Grass monitor farms

Throughout the growing season, weekly grass growth rates and fortnightly grass quality results will be published for 12 farms across Great Britain.

Forage for Knowledge will follow these farms as they aim to maximise the supply of high quality grazed and ensiled forages. The selected farmers are all excellent examples of good grassland managers.

R&D Demonstration farms

Demonstration farms have been helping communicate the latest outcomes from AHDB Dairy's Grass Forage and Soils Research Partnership. Working together with the British Grassland Society, a series of six commercial farms across GB have been applying the latest AHDB

Dairy-funded research findings on topics such as controlled traffic farming, lucerne, soil compaction and manure management. A series of on-farm events has brought farmers and researchers closer together as they discuss how to improve soil and forage management.

This has also allowed farmers to feed back their questions and experiences to those scientists conducting the research trials, helping mould the research projects as they progressed.



“We have received much expert input to our soils and grassland management, from both scientists employed by AHDB Dairy and external scientists. The demonstration plot enabled solid monitoring of compaction and grass growth/analysis.”

Joe Dugdale, Craythorne Farm

To sign up for any of our newsletters, view our range of publications or find out about forthcoming events, please visit the website dairy.ahdb.org.uk or speak to a Knowledge Exchange Officer.

AHDB Dairy is a part of the Agriculture and Horticulture Development Board (AHDB)

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