



EIPWALES

Cydweithio er ffyniant gwledig  
Collaborating for rural success

# EIP Wales

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## European Innovation Partnership (EIP) Wales Collaborating for rural success



Owain Rowlands  
EIP Wales Manager

Welcome to the second booklet, in a series of three, sharing the main results and stories from 46 on farm projects EIP Wales has funded since 2017.

We hope there was something of interest to you in the first booklet. In this edition you will be reading about another sixteen EIP Wales projects on a variety of different topics.

One of the featured projects looked at improving the quality of sheep milk for cheese production. The demand for sheep milk to produce cheese, yoghurts, ice-creams, and butter is increasing, not only in Wales, but throughout the UK. There is an opportunity for Wales to be at the forefront of this developing market, and ensuring products are of the highest quality is key.

Another project led to three dairy farmers significantly reducing their use of wormers within their youngstock. The reduction of anthelmintic usage is growing in importance across all livestock systems to try and slow down the development of resistant worms. Monitoring the condition of animals, alongside the use of faecal testing will increase farmer confidence to only treat the animals required.

We hope you enjoy reading this edition, and that something will be of relevance to your business.

Further information and resources on all the projects within this booklet and other EIP Wales projects can be found using these QR codes.

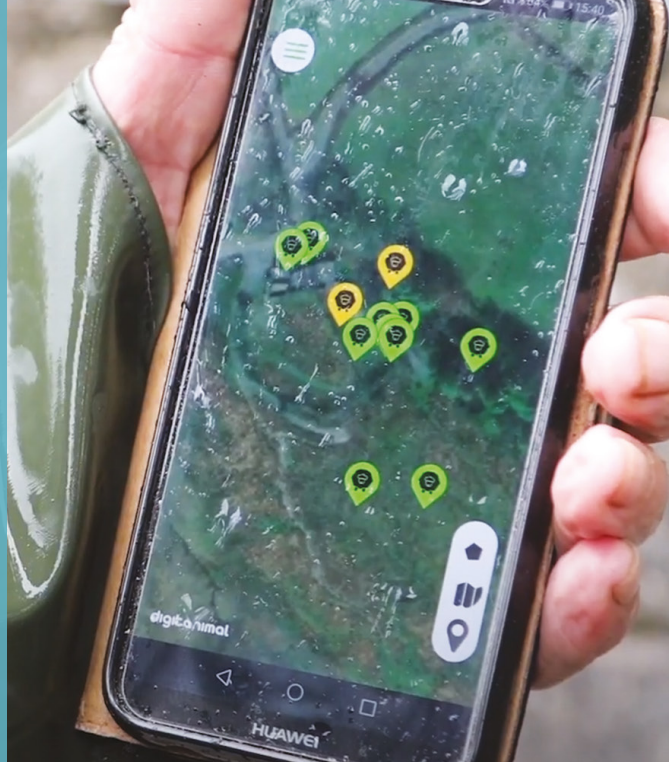
Project information  
and resources.



If you missed the first  
EIP Wales booklet it  
is available here.



## Where have ewe moo-ved to? Trialling the use of tracking technology in extensive grazing systems



The Digitalanimal app showing the location of the collared animals.

When farmer Hilary Kehoe's cow and calf went missing on grazing land it took four people two days to locate them, eventually found under a tree lost in the fence edge and reed grasses.

Now, thanks to new technology, she can check an app on her phone to locate exactly where they are and go straight to the right place.

The use of the cutting edge technology was funded by EIP Wales for six farmers to investigate how using tracking technology on grazing livestock can help prevent difficulties in gathering, grazing management and theft, as well as boosting diversity.

Four of the farmers are sheep producers on the Brecon Beacons, one farmer grazes the Kenfig coastal reserve near Margam, Port Talbot, with Hilary Kehoe undertaking conservation grazing on land in North Wales.

She trialled the collars on the cattle to see how the technology can help farmers grazing this type of land. *"I get an alert if a cow is inactive for more than four or five hours, and I know that I have to come and check it, because my phone pings and tells me so!"* she said.

The livestock tracking technology, one of the first of its kind in Wales, was supplied by Digitalanimal in the form of a collar which is placed around the animal's neck. The collars 'talk' to a gateway/antenna located in an area which has internet access – sending information to the farmers' smart phones or devices.

The farmers can access the following information via an app on their smartphones:

- GPS Location
- Activity Flags – alerting the farmer to a level of movement by the animal (including possible theft)
- Social Interactions – contact with other animals, which may be useful when considering parent to off-spring interactions and assessing mothering abilities of the collared female

The technology could give farmers the confidence to graze stock on more remote areas, including habitat ground, which will match grazing with conservation objectives.

### Outcomes

- Farmers will now be able to know where their animals are in 'real-time', what they are doing, and where their animals graze over a period of time.
- This can reduce gathering time and costs, minimise the risk of theft, help identify ill animals, and gain a better understanding of grazing habits
- Further reviews into the product will look to increase the connectivity, overall aesthetics and level of information which can be provided to a farmer.

### Barriers include:

- The cost of the equipment remains the biggest barrier to adoption. At the time of this project, the tracking collars from

Digitanimal were £120 each, and the associated gateway was over £500. Many sheep farmers would be unable to justify the purchase because the current price of the product does not equal the value of a breeding ewe. However, should the price be lowered or some external support provided, this may be enough to encourage adoption.

- Both the supplier of the technology and the project participants felt more training was needed to understand how the technology works and how to set it up to get the most use out of it. Despite this, Digitanimal and the farmer group worked very well together and communicated regularly, to address any issues in a timely manner.



A Digitanimal collar on an ewe within a hefted flock on the Black Mountains.

Watch this video of two of the farmers talking about the technology.



Learn more about this project.





## Managing dairy ewes for cheese production

Brefu bach (Little bleat) sheep milk cheese, made by Dr Carrie Rimes, Cosyn Cymru.

The sheep milking sector is attracting more interest from farmers seeking to future proof their family businesses, and those further along in the food supply chain looking to capitalise on the growing demand for sheep milk products.

Nutritionally, ewes' milk contains healthier fats, higher calcium, protein, energy, iron, and vitamins than cows' milk. Sheep milk is predominantly A2, which means it contains far less of the A1 beta-casein protein that is known to cause digestive discomfort.

A group of farm businesses who initially got together through Farming Connect's Agrisgôp in 2017, teamed up with award-

winning and internationally respected artisan cheesemaker Dr Carrie Rimes, of Cosyn Cymru from Bethesda, north Wales, to secure EIP Wales funding in 2019.

Alan Jones, who farms in Chwillog, near Pwllheli is one of Carrie's sheep milk suppliers and played a key role in the EIP Wales project.

*"I felt there were large gaps in my understanding and the information available for me or any other farmer in my position, on what affects the quality of ewes' milk when it comes to making unpasteurised cheese. Much research on dairy ewe milk production has been confined to European regions other than the UK."*

With guidance from Dr Yoav Alony-Gilboa of Friars Moor Vets in Dorset, the project

aimed to investigate whether the breed of sheep, stage of lactation, and selenium diet supplementation, can improve the bacteriological profile of the milk.

The project demonstrated the many types of bacteria present in milk, a few of them are pathogenic while most of them not. By monitoring Somatic Cell Counts (SCC) and looking at bacterial plate counts Alan has been able to bring down the flock's SCC score to improve flock performance and milk quality.

*"This included extreme actions such as removing ewes with high-scoring SCC from the milking flock, and more operational adaptations such as better methods for teat wiping and improving knowledge of how to monitor and maintain good udder health. I am in regular contact with most dairy sheep farmers in Wales, and we are regularly comparing our husbandry with bovine dairy,"* explained Alan.

*"The results also show there is scope for the Lleyn breed of sheep to be an effective dual-purpose breed on an extensive system – meaning a farmer could get decent lambs from the ewe for the red meat market and milk with particularly high solids,"* says Geraint Hughes, the EIP Innovation Broker who facilitated the project.

During the running of the project, Alan has tripled his flock to 135 Lleyn ewes, moved to once a day milking and developed a phased approach to lambing, with groups of ewes lambing from February to May, to extend the period of milk availability.

By increasing the understanding of this sector, it is hoped more farmers will be encouraged to enter the dairy sheep industry, leading to a larger supply base of ewes' milk.

This can ultimately create an industry of niche food producers using Welsh ewe milk as a core ingredient in their products.



A Lleyn ewe being milked.

Here's a guide to producing high quality sheep milk.



Learn more about this project.





## Sustainable intensification in upland grazing production systems

The project trial plots at Llwyn y Brain.

After visiting Finland and seeing how timothy is the main grass species used in the challenging climatic conditions, the Yeomans family have been trialling its use on wet, deep-peat soil on their beef and sheep farm at Llwyn y Brain in Adfa, near Newtown, in a project funded by EIP Wales.

Timothy is the main grass species grown in Finland where it is normal to have ice and snow in April, just weeks ahead of first cut in June. It can grow when the soil temperature is at 0°C and the air temperature is +5°C.

At the highest point of 430 metres, the Yeomans' farm can be a challenging environment for growing grass on the shoulders of the season, but by incorporating timothy into seed mixes leys are yielding an average of 10tDM/ha.

The results have convinced Mr Yeomans that timothy will have a place in his system going forward.

Leys established through the project in 2019 averaged more than 12tDM/ha in 2021, providing valuable feed for 58 ewes

and lambs per hectare for nearly three months and extending late season growth considerably.

*"It lifted productivity massively from May to late June,"* Mr Yeomans reports.

In 2022 the percentage of timothy in one of the plots increased to 25% – up from around 10% in 2020.

Independent grassland specialist Chris Duller, who has been providing technical input into the project together with Dr Iwan Owen, of IBERS, and Finnish grassland specialists Anu Ellä and Jarkko Storberg, said:

*"There was no difference in the protein and energy values of timothy and ryegrass, despite an expectation that the quality of ryegrass would be higher."*





The open day in June 2022 where the project results were shared.

*“But the trial had suggested that the highest percentage of timothy that could be achieved in any of the plots was 25%, whatever the sowing rate of the seed.”*

Seed mixture composition did not seem to play a huge role in this outcome – even with huge numbers of timothy seed going into mixtures, swards were still likely to be dominated by more aggressive grasses (e.g. ryegrass and *Festulolium*).

As timothy seed is far smaller than ryegrass, shallow sowing is crucial, said Mr Storberg – he recommends broadcast sowing, or planting no deeper than 1cm, as any deeper and establishment is likely to be reduced and there is a high risk that weed grasses will fill the gaps.

With a lack of any real cold spells during the project lifespan there was no genuine test of the winter hardiness of timothy compared to ryegrass. The timothy plots produced very similar dry matter yields to the ryegrass control, however analysis did show that

timothy had lower energy levels compared to ryegrass.

There is a strong argument that a higher component of timothy in the seed mix will be needed to produce consistent effects on forage quality – and on animal performance.

The project has highlighted the benefits of reseeding to increase productivity and extend the grazing season, having seen increased productivity above the older swards by over 300%.

Learn more  
about this  
project.





## Introducing fat-tailed sheep to Wales to satisfy UK market demand

A pure bred Damara lamb.

**In the early 1990s, farmer Peter Williams left Wales to work on a sheep farm in Saudi Arabia, encountering Romney ewes which were crossed with the native fat tailed rams.**

Fast forward 32 years and, looking for diversification on his Anglesey farm and seeking extra income streams, Peter considered whether fat tailed (Damara) sheep, which originated in North Africa and are more accustomed to warmer climates, could be successfully bred in Wales.

A chat with fellow farmer Bedwyr Jones followed, leading to support from EIP Wales that has led to the first purebred Damara rams and ewes, as well as crosses to be born in the UK.

To establish the trial, embryos and semen were imported from Australia, with Peter and Bedwyr working with veterinary specialist Ian McDougall of Farmgene to implant the embryos and artificially inseminate the recipient ewes.

In 2020, six healthy pure-bred lambs were born as well as 75 cross-bred lambs, having artificially inseminated Texel, Lleyn, and Romney cross ewes – all of which were closely monitored by vet Tricia Sutton.

*“The lambs were monitored carefully, and results show that they thrived and coped well with the Welsh climate. They appear to be unfazed by the rain and seem happy here out in the fields. They are however more feral than other breeds,”* said Peter Williams.

In 2021 a further 9 pure-bred lambs were born, as well as 74 cross-bred lambs, all with non-assisted births.

The pure and cross Damara lambs did however, grow more slowly to 130 days of age compared to Texel cross lambs and the shearlings had a lower prolificacy (136%) than what would be expected from standard crossbred ewes.

This will need to be taken into consideration when considering the price of meat per kg.

An important part of the project was tapping into a niche market with unique meat and fat. Meat from Damara sheep is renowned for its flavour and tenderness and is popular in traditional Arabic cooking. The group undertook market research, realising a gap in the market for selling speciality lamb to ethnic minorities in the UK.

After the successful breeding programme, Peter and Bedwyr sought feedback from several prominent Welsh chefs who praised the quality and flavour of the meat, one of which was Gareth Ward of double Michelin star restaurant Ynyshir, Powys.

This led to the launch of the Damara Môn brand, which has gone from strength to strength, selling its first meat box in September 2022 online.

*“At a time when the sheep industry faces multiple once in a generation changes and disruption, innovating has never been so valuable,”* said Geraint Hughes, the project’s EIP Innovation Broker.

*“There are well over 1,000 sheep breeds on the planet, and with far less than 10% in the UK, meaning there must be further opportunities to broaden the genetic base in Wales to develop new markets.”*

Watch the first Damara lambs to be born in the UK.



Learn more about this project.





## Improving the diagnosis and treatment of gastrointestinal round worms in cattle

Chris Mossman who farms at Nantybach, Llangrannog.

A three-year EIP Wales project on dairy farms in Ceredigion resulted in all three farms managing their R2 yearling heifers at grass without the need to treat them for gut round worms.

Chris Mossman, one of the farmers involved in the project, runs 100 R1 and 100 R2 heifers. Previously, he had followed the standard practice of routinely worming heifers three weeks after turnout and every five weeks thereafter during the grazing season.

But when Faecal Egg Counting (FEC) testing showed consistently low egg counts the Mossmans had the confidence to not treat their R1 and R2 heifers at all.

The other two farms; Pentrefelin, Talsarn and Henbant, Talgarreg which had a higher worm burden, wormed their R1s less often. They also switched to using white (1BZ) drenches and yellow (2LV) drenches after

efficacy testing showed a reduced efficacy of the clear (3ML) wormers.

The data collected during the EIP project showed that there were similar growth patterns to previous years when clear wormers were used and heifers were dosed routinely, therefore, the changes in worming treatments had no obvious negative effects on performance.

One of the experts involved in the study, Professor Diana Williams, from the University of Liverpool's Veterinary Parasitology Research Group, said the study demonstrates that the advice around worming needs to change.



Irfon Jenkins, who farms with his brother Eurig at Pentrefelin, Talsarn.

*“Traditionally the advice to farmers was to dose first season grazing calves in the early part of the season to prevent disease mid-season but because of lots of factors such as climate change and wormer resistance that advice needs to change.”*

*“This project has demonstrated that we can reliably use FEC alongside growth rate data and calf condition, as a means of monitoring infection during the grazing season and only treat when the animals actually need it rather than dosing by calendar date.”*

One of the issues thrown up by the project is the threat of lungworm when wormer used to control gut worms is reduced.

*“If you are starting to think about FEC to control gastrointestinal worms, you can’t forget about lungworm,”* warned Professor Williams. *“Seek veterinary advice if there is any reduction in growth rates or animals are coughing.”*

Quarantine treating all incoming stock will reduce the risk of bringing lungworm onto the farm and R1 heifers can be vaccinated before turnout to protect against lungworm.

### Wormer resistance

The project found a significant lack of efficacy of the 3ML group of anthelmintics on two of the farms where several Faecal Egg Count Reduction Tests (FECRTs) using Techion UK’s FECPAKG2 system were carried out.

This was found in wormers where both ivermectin, and the longer acting moxidectin, were the active ingredient.

On one of the farms, treatment with a pour-on clear wormer showed that on one occasion it had an efficacy rate of just 8% and it was never higher than 81%.

In contrast, benzimidazole and levamisole – white and yellow wormers – were fully effective, giving a 100% reduction.

The results from a FECRT give a picture of possible resistance, said Eurion Thomas, of Techion UK, who was also involved in the project.

He recommends a FECRT every two to three years to ensure that the wormers that are being used are working.

Mr Thomas said the research highlighted why farms shouldn’t rely on one class of wormer and that farmers fully understand which active ingredients are in the product they are using.



Professor Diana Williams examining faecal sample slides.

Learn more  
about this  
project





## Targeted approach for selective **dry cow management** decision making

Three farmers in north east Wales have investigated whether a new piece of technology could help them reduce antibiotic usage in their cattle, without compromising herd welfare.

The group, who milk a total of 1,700 Holstein Friesian cows in all year-round calving systems, participated in the EIP Wales funded project after coming up with the idea following a demonstration of Q Scout Farm Lab technology.

They were all keen to see whether there is a more targeted approach to dry cow management which involves abruptly ending milk secretion.

Generally, the system is reliant on monthly recording of cow's individual Somatic Cell Count (SCC), mastitis records, and using the California Mastitis Test (CMT) on the day of drying off.

CMT testing is subject to interpretation and not always carried out to specifications, and the milk recording SCC is an average of the four quarters, potentially being a month out of date by the time it comes to analyse the data.

The project focused on the use of new technology involving milk leukocyte differential (MLD) testing using Q Scout Farm Lab, which is a new and scientifically proven diagnostic machine that scans milk samples microscopically.

## What is MLD testing?

The system allows for the sampling and testing of each milking quarter prior to drying off, determining whether individual quarters require antibiotic therapy to combat an intra-mammary infection, or whether they could be dried off using an internal teat sealant in isolation.

Utilising the programme, test results are available within a couple of hours, meaning dairy managers could have access to up-to-date udder health data, allowing them to be confident in decision making for every cow and individual milking quarter.

Tom Bletcher of Argoed Hall Farm, Flintshire was one of the participating farms. The Bletcher family run a 450 cow all year-round calving herd, rearing their own herd replacements. 5-7 cows are dried off each week depending on yield and calving date. Once dried off the cows go to a dry paddock in the grazing season or onto sand based dry cow cubicles away from the milking herd, then on to a transition straw yard 2-3 weeks before calving.

- During the project 711 cows in total were dried off at Argoed Hall, 406 with antibiotics and sealant, 305 with sealant alone.
- 29 from the 406 cows had only one quarter treated with dry cow antibiotic (the other three sealant only). None of these cows calved down with mastitis and only one with a higher SCC than at dry off.

When comparing the SCC when drying off to the score after calving:

- 72.5% of the cows which were dried off with antibiotic + sealant had a SCC lower or the same after calving.

- 88.1% of the cows that were dried off with sealant alone had a SCC either lower or the same after calving.
- No mastitis issues with sealant only cows at dry off or at calving.

Some of the cows tested would not have been treated with antibiotics if farmers were relying on milk record cell count data alone, meaning that they would have calved down with mastitis.

The new test could give farmers who are nervous about selective dry cow therapy the confidence to start using teat sealant alone, as well as having definitive information on which quarters may require antibiotics.

As a result of reducing antibiotic usage, the three farms were able to save a total of £7,133.80 during the lifetime of the project based on an average antibiotic tube cost of £2.49.

However, it must be noted record keeping is paramount for selection, as while selective dry cow technology is not risk free, correct training for clean administration, record keeping, and using new technology, is required to ensure these risks can be reduced.

Learn more  
about this  
project.



# Developing a novel way of rapidly measuring agronomic treatment effects on grass growth



Using a rising plate meter to measure grass yield can be a laborious task.

**Drone and satellite technology can provide important information on how grass responds to inputs in greater detail and more rapidly than if farmers manually measured with a rising plate meter.**

Tramline trials were established on three Welsh grassland farms for the three-year EIP Wales project to investigate whether data acquired by drones and satellite imagery is robust enough to be used to prevent the laborious task of farmers having to manually measure grass heights with a rising plate meter or weigh silage trailers.

Analysis of the information from the drone and satellite technology showed it could detect significant differences in agronomic treatments applied on the farms as well as data that could not be picked up by plate meters.

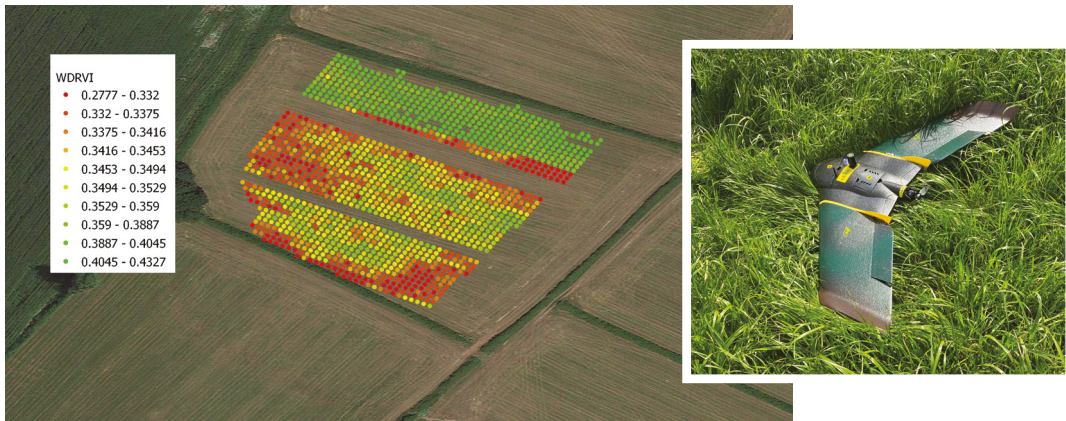
The project also showed that the drone was able to detect the smallest treatment

differences at a level two or three times smaller than the satellite used.

*“The results of the trial demonstrate that grassland farmers can be confident in using either technology to test the effect of agronomic treatments on grass dry matter on their farms to help fine-tune grassland management and improve farm performance,”* says Cate Barrow, ADAS consultant who managed the project.

David Jones, one of the participating farmers has a multi-cut silaging system to make forage for his 200-cow Holstein Friesian herd. He relies on data gathered from weighing silage trailers to understand how fields at Hardwick





Left: Drone image and data captured at Hardwick Farm showing ryegrass plot (top), white clover plot (middle) and ryegrass/red clover plot (bottom). This showed that the ryegrass had around 1100 kg/ha more dry matter compared to the white clover and ryegrass/red clover plots. Right: The drone used to capture Wide Dynamic Range Vegetation Index (WDRVI) data, giving over one million measurements per hectare.

Farm, near Abergavenny, are performing.

*“Having this information, which I would never have captured from weighing silage trailers, will help inform my reseeding decisions,”* says Mr Jones.

Although the cost associated with capturing the data is not insignificant, Mr Jones says with soaring input costs he is confident that the financial outlay could be quickly recouped.

*“Also, if we are using different rates of fertiliser we can see what’s working and providing us with value for money. Which is more important than ever with rising inflation.”*

However, both methods may have some disadvantages. Drone data had the advantages of high precision and could be used in cloudy conditions, but is limited by its requirement for a high level of technical expertise by the farmer or the hire of a specialised contractor to analyse data.

### How the costs stack up (ex VAT) at the time of the project in 2022

Using a drone to collect the data worked out

as the most expensive option in this project – it cost around £850 for a typical size field.

In comparison, the satellite data was free but to access it required in the region of £200 worth of consultant’s time for each field.


The process of analysing the data to statistically test the effects of agronomic treatments increased the budget further – for the drone it was around £400 a field and for the satellite £250.

Ms Barrow says these costs are reliant on the farmer being able to provide GPS coordinates and for there being no requirement for additional consultant visits.

*“The trials proved treatment effects of between 150 and 1100 kg dry matter per ha, so the value will soon stack up when applied over several fields,”* she says.

Learn more about this project.





## Improving knowledge and experience of **integrated pest control** of soft fruit in Wales to reduce pesticide application and wastage

Above: Tabletop strawberry production at Springfield Farm, Pembrokeshire.

For strawberry growers Nick and Pat Bean, an innovative EIP Wales funded project to increase awareness of integrated pest management of soft fruit has proved extremely timely and very successful.



Nick Bean, Springfield Farm, inspecting the strawberry plant leaves for pest damage.

The couple, who have been growing strawberries since the mid-1980s, said the decision to change from unprotected crops in the field to table-top tunnel growing presented new problems and was a continual learning process.

*“This EIP Wales project came along in a very timely way to help us improve our understanding of pests and disease control without using a lot of conventional pesticides,”* said Nick Bean of Springfields Farm, near Tenby.

The project’s main aim is to show to growers in Wales that biological controls can achieve equal, if not greater, pest control compared with a conventional approach in strawberry crops.

With more people moving into growing horticultural crops in Wales, they are increasingly vulnerable to damage from aphids, mites, thrips, and other pests.



Polytunnels and net covered tunnels at Springfield Farm.



Biological control sachet can hook on to your crop in pest hotspots.

Effective biological control can enable growers to reduce pesticide applications, and future proof against further reductions in pesticide availability.

The two-year project, involving Springfields Farm and Scurlage Farm in Gower, trialled the establishment of different biological pest control strategies. Separate tunnels were used to compare the growers' standard programme with biological control.

Working closely with experts to develop a programme to suit their growing systems, the exact methods used were identified on the basis of what pests are present on each grower's site, however a minimum of four pests were targeted.

The growers received training on pest identification, monitoring methods, and biological control options.

### General key points for using biological controls effectively:

- Don't blindly follow a calendar and apply at the same time each year. Biological controls rely on certain conditions to use them effectively. If you do not meet those then the application will be less effective. Understanding the conditions at application is critical.
- Follow the manufacturer's advice for application carefully.
- Rates will vary heavily depending on crop, crop size, condition, and pest pressure, with the best practice to consult an

advisor on the right approach to take depending on the individual crop.

- The most effective use of most biological controls is preventative. Most will struggle to cure heavy infestations of pests without high rates of control. It is therefore more cost effective to use them preventatively, especially on pests you know are regular problems.
- Once delivered, most biologicals need putting out into the crop as soon as possible as long-term storage is rarely an option. Where storage is necessary, be very careful to follow manufacturer instructions to ensure proper storage for best results.
- Make sure staff selected for the introduction of biological controls are trained and competent, as easy mistakes can lead to costly reintroductions.
- Regular crop monitoring is important to allow time for biological orders to be made.

Watch this video of Nick Bean discussing the project.



Learn more about this project.



# Is there something in the water? Identifying and addressing Cryptosporidium in sheep

A project focused on the *Cryptosporidium* parasite in sheep has increased understanding of the issue – arming farmers with greater knowledge and confidence to reduce the risks.

Mike Lewis and Liz Lewis-Reddy were among seven farmers in Powys who embarked on the EIP Wales project to understand the pathways of cryptosporidium infection in sheep and identify measures to control and prevent the disease in their flocks.

Although the couple did not believe they had an issue with infection in their sheep, by participating in the project they were able to trace the origins of cryptosporidium to control it in calves and to prevent it passing to their lambs.

They run a herd of rare breed Ancient Cattle of Wales together with a sheep flock on an organic, forage-based system on their family's 150-acre hill farm, Brynhoveth Farm, near Llandrindod Wells.

Calves had been developing a persistent, severe scour and the cause was identified as cryptosporidium.

*"This project allowed the farmers to work closely with Welsh Water, Moredun Research Institute in Scotland, Wales Veterinary Science Centre, and sheep specialist Kate Hovers to focus on the management and reduction of*

*crypto levels on their farms,"* Helen Ovens of ADAS, who led the project, explains.

*"Eradication of crypto is costly and difficult to achieve, however the more information and knowledge farmers have, the better able they'll be to reduce the spread."*

Mike and Liz discovered that the micro-organism was being introduced to calves through river water; the field where cows calve in the spring sits alongside a river that is prone to flooding in the winter resulting in cryptosporidium in the water contaminating the pasture.

*"Without realising it we were infecting our calves with cryptosporidium,"* says Liz.

*"We can't control what happens in the river, but we can limit the risk to our calves,"* says Liz.

Calves are given an oral preventative solution from 24 hours of age.

The product reduces the viability of the cryptosporidia in the gut and cuts the shedding of oocyst numbers, limiting the spread of the disease.



Installing water troughs can help reduce the risk of Cryptosporidium spreading further down the water catchment.

Cryptosporidium was found in most waterbodies entering and leaving all seven farms, it was found in water from two of the three boreholes tested too.

Cryptosporidium was detected in lambs on all but one farm. Lambs become less susceptible to disease the older they are but animals with previous exposure are not protected from re-infection.

Even animals not showing clinical disease can shed a large number of oocysts.

Biosecurity measures at Liz's farm are already very high but management options recommended to all the farmers to limit the risk of cryptosporidium include:

- Steam cleaning buildings to kill oocysts
- Frequent cleaning and disinfection of livestock sheds; research has found that 3% hydrogen peroxide and hydrogen peroxide-based disinfectants are the

most effective at reducing the viability of cryptosporidium oocysts. Disinfectants are less effective on oocysts which are in faeces, therefore thorough cleaning of sheds is advised before disinfection.

- Frequent bedding down with straw
- Quarantining of scouring animals
- Ensuring lambs and calves quickly receive adequate quantities of good quality colostrum

Learn more  
about this  
project.





## Reducing ammonia emissions from broiler chicken production

The importance of reducing ammonia emissions in the broiler chicken sector has been highlighted in a project funded by EIP Wales.

Between 2020 and 2021, two broiler farmers in Wales took part in the project to investigate whether the use of products currently used mainly to improve gut health and flock performance may also have an impact on ammonia emissions.

Ammonia production is an inevitable consequence of poultry farming, being released by the breakdown of nitrogen-containing compounds such as manures.

Aerial emissions of ammonia can damage sensitive habitats and react with other atmospheric acids to impact adversely on human health.

In 2019, the poultry sector was responsible for 14% of all UK ammonia emissions and under international agreements, the UK government has agreed to reduce emissions by 16% by 2030.

The project involved three different commercially available ammonia reducing additives being tested on each farm.

Working with a specialist poultry ventilation company, a vet, and an environmental modeller, they established farm-based trials in two similar broiler houses on each site. One house was used for the trial and the

other as a control. They used three different products, each for one complete broiler flock cycle on each farm:

The following variables were monitored and recorded for each treatment:

- Ammonia levels within the houses
- In house temperature
- Foot pad condition, hock and gait scoring
- Feather condition
- Litter condition
- Mean bird liveweight
- Flock mortality
- Feed intake

Whilst the project did not provide evidence that the products had an overall impact upon ammonia emissions or bird liveweight, the additives did show potential to increase the dry matter of the litter.

With both farmers now having ammonia monitoring systems in place, there is the opportunity to assess ammonia levels and fluctuations daily, allowing for the consideration of appropriate management responses as necessary.

One of the farmers said: *“Whilst the use of additives is not a substitute for good practice, they may be able to offer a marginal gain for farmers and be seen as a means of fine-tuning, whether in terms of ammonia reduction or other aspects of performance.”*



Poorly ventilated sheds will result in wet litter, which allows more ammonia to be released into the air. The use of effective ventilation to optimise the in-house environment, and preventing condensation can increase litter dry matter content and so reduce ammonia emissions. This can also increase its value per tonne as a fertiliser and reduce haulage costs and odour risks.



Ventilation inlets and exhausts mounted on the roof of a broiler shed.

With manure being an important source of ammonia emissions, the benefits of containing manures in covered stores on impermeable surfaces is key. If field heaps are used, the surface area should be as small as possible to reduce emissions.

Learn more  
about this  
project.





## Improving knowledge and experience of micronutrient management in cucurbit production in Wales

Above: Andy Matthews, one of the farmers who took part in the project, who runs a pick your own (PYO) pumpkin business at his farm Aberbran Fawr, near Brecon.

**A project aimed at stopping the rot in pumpkins could go some way towards increasing product quality and sales on Welsh farms, as well as reducing crop wastage and fungicide applications.**

As part of the cucurbit family, pumpkins are an increasingly popular crop, not only in terms of prominent eating varieties, but also the potentially high value returns from 'pick your own' local markets around Halloween.

The EIP Wales funded project focused on a common problem of pumpkin growing – the development of rots such as blossom

end rot (BER), which can render the fruit unmarketable.

BER can lead to significant crop losses and it is one of the main sources of wastage in the sector.

Whilst a limited number of fungal plant protection products are available, these are generic fungicides and their use in an open field setting may be unsuitable.

With increasing evidence suggesting that the development of BER is likely to be linked with crop nutritional status, management of the crop's calcium and boron nutritional status could provide a method of control.





One of the PYO pumpkin patches at Aberbran Fawr.



An example of blossom end rot in pumpkin.

The most effective method of applying calcium and boron to the plant is foliar feeding directly to the leaf and fruit of the plant as a fine mist, which is then absorbed by the plant.

The two-year project involved farmers from horticultural units based in Brecon, who are members of the Tyfu Cymru network, working together to gain more knowledge on whether foliar feeding calcium and boron can reduce BER in their pumpkin crops.

The project involved trialling five different commercially available calcium and boron foliar feed products at field scale, over two growing seasons, at two sites.

Foliar spray products were applied every 10 to 14 days from the onset of flowering – around four to six weeks from planting – and continued until the onset of leaf senescence, with an untreated plot also grown to act as a control.

The variable onset of BER symptoms, and difficulties achieving effective inoculation in the lab, impacted the ability of this project to draw clear conclusions.

The results suggest that the use of calcium foliar feeds can be beneficial in reducing the incidence of rots in the field, and the progression of rots once they become established.

Growers should not assume that all foliar calcium products are equivalent to each other, and they should base their choice of feed product on all available information rather than on pure calcium content alone.

Foliar nutrient sprays are effective at directly addressing specific deficiencies with the crop but remain secondary in effect to soil nutrient management.

Listen to Andy Matthews talking about how to establish a PYO pumpkin business.



Marketing considerations for PYO businesses.



# Maximising udder health for improved herd performance through **dynamic testing**

One of the main factors of poor udder health in dairy cows is overmilking, as highlighted in an innovative project funded by EIP Wales.



The project, involving four farms in Carmarthenshire, with an average herd size of 260 cows, showed more than 60 per cent of cows were overmilked.

After being identified, changes were able to be made on the farms to rectify this, and overmilking reduced on average across all four farms by 21 per cent.

The project came amidst the requirement for dairy farmers in Wales, and the UK more widely, to improve the quality of milk sold - adding pressure on dairies to reduce antibiotic use and improve health.

It set out to 'dynamic test' the milking plants in a form of time and motion study. All elements of the milking process - from the milking plant to the milking routine and any effect on the cow's teats - were considered to see if dynamic testing can improve udder health.

The difference between dynamic testing and normal maintenance undertaken by manufacturers/farmers is that it tests the parlour when it is under stress of being used, whereas the others do not.

Dynamic testing can also incorporate both mechanical issues and husbandry issues which all contribute to improving udder health.

Left: Huw Morgan (back) who farms with his parents at Twyn Farm, Nantgaredig, and Dr Sotirios Karvountzis of Mendip Vets.

Examples of what is monitored through dynamic testing include:

- Udder preparation for good milk flow
- Biphasic milk flow
- Overmilking
- Flow away from the cow
- Liner fit
- Liner slip
- Milk plant pulsation

Overmilking takes place when the cow has the milking units (and therefore a vacuum) on her udder for longer than is required. During overmilking, the machine is milking at full vacuum power with low or no milk flow.

Some primary causes for this are when the automatic cluster removal (ACR) is set to remove the milk units at too low a milk flow (such as 200ml per minute), or the delay in pulling the milk units off the udder and cutting the vacuum off the milk liners is set too high (for example, over 10 seconds).

Overmilking is one of the primary mechanisms of damage to the teat end, which in turn is one of the many defence barriers of the udder to mammary infection.

The dynamic testing was carried out by vet Dr Sotirios Karvountzis every two

months on each farm for one year, alongside additional milk samples and teat scoring. The results from the testing were analysed, with a variety of interventions being implemented on the farms to correct issues depending on what was found.

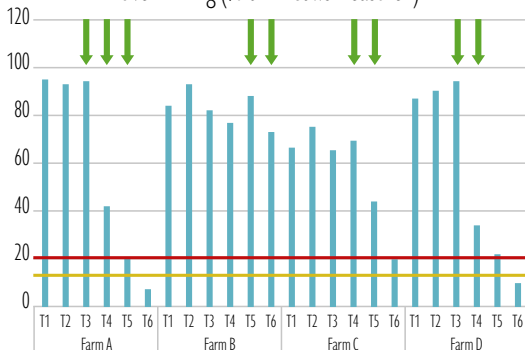
Huw Morgan, who farms with his parents at Twyn Farm, Nantgaredig near Carmarthen, said: *“We wanted to take part in the project because we are a low input, low output system, so maximising profits from our cows is important.”*

*“We saw the project as a chance to ‘fine tune’ the system and a good chance to get healthier cows, meaning less antibiotic usage, which is important to everyone. Healthier udders, healthier milk, healthier cow, healthier bank balance.”*

Learn more about this project.



Overmilking (% of All Cows Measured)



This graph shows that on all four farms over 60% of the cows were being overmilked (T1). The amber line at 15% represents the industry standard of a satisfactory level of overmilking and the red line at 20% shows where action to improve overmilking is needed. The green arrows show when recommendations from the dynamic testing were acted upon.

# Using **photo selective films** to enhance the profitability of leafy salad production in Wales

An innovative project examining whether polytunnel plastics which control light quality can improve yields in some salad leaves has great potential, according to one of the growers who took part.

Early polytunnel plastics were designed to get as much light as possible to the crop, but innovations in plastic technologies have produced new materials with novel properties to enable new ways of controlling plant growth and reduce diseases.

These offer growers a range of benefits of extending the grower season, improved environmental management, enhanced resource use, and improved efficacy of

biological control compared with open field production, without having the high costs of other light modifying technologies such as LED systems.

Different varieties of light-modifying plastics were tested under normal growing conditions at two market gardens in Wales during a three year EIP Wales-funded project to test which approach could add weight and colour to the crop.

Plastic	Properties	Proposed Benefits
Clear	Conventional clear plastic	Microclimate modification, high light transmission
Diffuse	High light scattering	Increased light penetration into closed canopy, improved older leaf condition
Blue	Absorbs red and green portion of the spectrum, transmitting blue light	Compact habit and enhanced colour development in pigmented leaves
UV Blocking	High transmission light transmission but UV blocking	Enhanced pest and disease control
Untreated	Bare ground	N/A

The different types of photosensitive plastics used in the trial. A clear plastic and a bare ground treatment was included for comparison as a control.

Grower mentoring was provided during the trial to support those taking part in adapting to protected cultivation.

One clear trend was the benefits of protected cultivation compared with bare ground cultivation. This was particularly evident in the spring trial at the start of 2022 where practically no yields were achieved from bare ground cultivation at either site compared to plastic treatments.

Philip Handley, who runs Mostyn Kitchen Garden in Holywell and was one of two growers who took part in the project, said: *“For us, the use of plastic covers has extended the season straight away.”*

*“As a small grower, the results stemming from the project could make a huge difference to the business and could have great potential with a wider examination of the impacts.”*

The project demonstrated that different photosensitive plastics can impact both yield and produce quality although growers will need to carefully decide which type will be of greatest benefit to their cultivars and the crop characteristics of greatest relevance to customers.

Growers would also need to factor in additional costs, with specialist plastics costing 15% more than standard clear plastic.

Plastic choice may also impact crops which require pollinator activity (e.g., strawberry, tomato), particularly the blue and UV-blocking which can impact insect flight.

There are also potential concerns about the additional use of plastics impacting the environmental sustainability of growing systems, although the long lifecycle of these plastics (eight or more years) coupled

with the use of industry recycling schemes means the materials can be used in a more sustainable way going forward.



Mini polytunnels with different plastic covers trialled at Mostyn Kitchen Garden.

Here's Philip Handley discussing the project.



Learn more about this project.





## Comparing on-site preservation techniques for fresh **Welsh birch sap** for use in artisan products by local businesses

One of the rarest and most highly-prized gourmet food products in the world is being produced for the first time in Wales, thanks to an ambitious project.

The two-year project, funded by EIP Wales, has become the first in Wales to focus on the production of birch sap – with some of those involved benefitting and receiving income from sap sales.

Forestry Statistics for 2019 indicate birch is the third most common broadleaf tree species in Wales, covering an estimated 2,000 hectares of the Welsh Government Forest Estate (NRW) and 11,000 hectares on private land.

As many birch trees found on farms are not intended for timber, they are potentially available as a source of other non-wooden products such as birch sap.

Birch syrup is mostly produced in North America and can sell at up to five times the price of maple syrup.

Birch syrup is half glucose half fructose and contains more acid and salts so has quite a different composition and flavour to maple syrup.

A key barrier for commercial birch sap harvesting has been its short shelf life, which lasts for just 24 hours at 5°C. The freshly collected sap needs to be immediately preserved and stored on farm before being transported to a commercial kitchen for finishing into syrup.

Taking place across four sites in Wales, the project focused on three different preservation methods, analysing which is most effective at turning birch sap into a concentrate at different scales of production. 70 birch trees were tapped over two seasons, producing a total of 2000 litres of sap.



Left: A birch tree must be 20cm in diameter to be suitable to be tapped. A sterile 8mm drill bit is used to make a 40mm deep inclined hole before inserting a sterile spile. Right: A collection bottle is connected to the spile to collect the sap. On average a tree will produce up to 2 litres of sap per day, however can be up to 12-15 litres.

The preservation methods:

- **Outdoor wood stove** – The sap is boiled down in evaporation pans over a home-made stove constructed from breeze blocks and flue pipe.
- **Reverse osmosis** – The sap is pushed through vacuum pumps and micro-porous osmosis filters which brings the sap down to around 6 Brix sugar concentration.
- **Urn** – An electric thermostatically controlled urn can be used to boil or simmer the sap.

These methods were compared on:

- Capital set-up costs
- Preservation time to produce concentrate from sap
- Logistics
- Operating costs – in particular fuel costs

All three systems work, each with its own costs and benefits. The optimal system was to pass fresh sap through reverse osmosis and then evaporate in either wood stove or urn to no more than 38 Brix sugar

concentration. The concentrate should then be transferred to a commercial kitchen for finishing and bottling.

Alongside trials of sap preservation, the project also investigated appropriate tapping procedures to ensure that harvesting of birch sap is sustainable. Wound healing following tapping was good, with external wound closure after 18 months. Unsurprisingly, larger, healthy, fast growing trees gave the best yield and quickest healing of the tap wound.

Sap has been included as a named product in the draft UK Woodland Assurance Standard (UKWAS 5), supported by good practice guidance such as the reports prepared by the EIP Wales and Dewis Gwyllt projects. Once approved UKWAS 5 will form the basis for Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) for responsibly harvested birch sap from UK woodlands.

Watch this video to learn how to tap a birch tree for sap.



Learn more about this project.



# Early adoption of on-farm ‘Internet of Things’ (IoT) sensor networks to alert and notify farmers to improve farm security



The sensors can be programmed to send alerts to a phone in different situations, such as: if gates open/are left open; if farm machinery exit the farm boundary, or move during the night.

The bringing together of farmers from a range of backgrounds with cutting edge surveillance technology could help shape the way rural crime is solved in the future in Wales.

In an innovative project funded by EIP Wales, five farms took part in a trial to evaluate the capabilities of a range of LoRaWAN (long range area wide network) sensors to alert and notify farmers with the aim of improving farm security.

The 2020 NFU Report on Crime shows theft from farms cost Welsh farmers £2.6m in 2019 – an increase of 11% from the previous year.

With many thefts occurring at night and therefore making it less likely for criminals to be seen, some crimes were not being noticed until the farmer carried out their daily duties, creating a large time gap for police to investigate.

At the start of the project the operational group engaged with PC Dewi Evans, who has many years of operational experience within North Wales Police’s Rural Crime Team.

Based upon his detailed knowledge of rural crime incidents, he identified the areas where LoRaWAN technology could assist in preventing and solving crime and this was incorporated into the project design.

During the project, a range of LoRaWAN sensors were used to monitor the location of valuable farm assets that are a common target for thieves. In the future, 5G technology could replace LoRaWAN.



## How can LoRaWAN sensors help?

The technology enables devices to communicate with one another by sending small, yet frequent amounts of data over distances of up to 15km depending on line of sight. Sensors can be programmed to deliver an alert to a farmer notifying them an asset has moved – addressing issues such as reducing vehicle, fuel, and livestock theft.

The real-time information gathered by the sensors were able to alert farmers to an incident involving key assets, allowing them to inform the police sooner with higher quality information.

Monitoring systems provided logged evidence to show when the sensor was triggered, which is intended to help police focus their resources to a specific time period and help trace stolen assets quickly.

The areas of priority identified by project partners North Wales Police were:

- Quadbike theft
- Monitoring the open/close status of various on-farm infrastructure
- Tracking valuable farm equipment

Relevant expertise was also commissioned to merge the sensor data into an easy-to-use alerting system for farmers to use on their tablet or smart phone.

The project encouraged further cooperation between the farming community, North Wales Police, and technology experts to come up with solutions to common problems and bring about smarter ways of working.

The knowledge gathered during this project will help develop a farming industry in Wales that is fit for purpose for the future world.

This could also potentially increase the number of jobs available within agricultural technology sectors and encourage those with an entrepreneurial flair to venture into this market to create further solutions for current agricultural challenges.



GPS trackers can be fitted to valuable farm machinery.



Open/close sensors can be fitted on gates, shed doors etc.

Here's a video showing the technology at work in Glynllifon.



Learn more about this project.



# Improving suckler herd management through nutrition and hygiene around calving time to enhance productivity and **reduce antibiotic use**

Welsh beef farmers, all keen to improve the nutrition and management of their suckler herds around calving, have been at the heart of a two-year project aimed to improve animal health and reduce the use of antibiotics.



The farming industry is facing pressure to reduce antibiotic use to slow down the development of Antimicrobial Resistance (AMR) and prolong the life of treatments for agricultural use.

In addition, issues around the health of cattle cost the UK beef industry an estimated £133m in lost productivity and mortality, with scouring in calves alone accounting for £11 million of these losses.

Farmers from Ceredigion and Carmarthenshire were involved, with all having herds of between 30 and 45 suckler cows.

The project involved:

- Ration formulation based on metabolic profiles as well as feed and forage analysis
- The implementation of strategies to increase colostrum quality and absorption
- Creating strategies for the preventative management of diseases, including cleaning and hygiene protocols, which were based on the results of bedding analysis, faecal sampling, and post-mortem reports
- Designing a framework for decision making on antibiotic treatments

The project highlighted how critical the first few hours immediately after calving are to the health and survival of both the cow and calf, with management strategies at calving focused upon reducing the impacts of dystocia, ensuring adequate colostrum consumption, and managing housing and environmental conditions.

Regular observation of the cow and calf in the first week of life is equally as important to ensure the cow has recovered from parturition and exhibits good maternal

behaviour, as well as ensuring the calf is receiving enough milk, is vigorous, and is not vulnerable to poor weather conditions.

Additionally, regular monitoring also enables subtle clinical symptoms of disease to be detected early, with a close working relationship with the farm's vet also crucial to ensure the best prevention and treatment measures can be put in place.

### **We spoke with Debby Brown of Dugdale Nutrition, who worked closely with the farmers during the project**

#### **What information was collected during the project?**

*"Data was collated from the herds involved from the year before the project and then throughout the project to show fertility, cow, and calf losses.*

*"The herds had forages, soil, and blood samples taken to review nutrients available and the transfer of these through to the animals."*

#### **What was the benefit of reviewing the nutrients as part of the project?**

*"The benefits of higher nutrient quality in forages were seen in better colostrum transfer, ensuring better calf health and less losses.*

*"The soil analyses were reviewed to show where improvements could be made to forage, grass production, and quality."*

#### **Were there any major hurdles faced during the project?**

*"The project had its challenges with collation of data and contact with the farmers due to Covid-19 and busy schedules, but the farmers were attentive, passionate, and had improved management on the farms throughout,*

*becoming more proactive to issues which meant performance was improved compared to before the study."*

#### **What are some key takeaways from the project?**

*"Moving forward, the project should highlight to suckler farmers the need to optimise their land and improve soil quality, which will then improve grass and forage quality, allowing for the better health and production of livestock.*

*"Monitoring throughout the project, especially around calving time, showed where changes needed to be made quickly to avoid issues arising."*



**Learn more  
about this  
project.**

