



EIPWALES

Cydwethio er ffyniant gwledig
Collaborating for rural success

EIP Wales

Collaborating for rural success

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European Innovation Partnership (EIP) Wales

Collaborating for rural success



Welcome to our latest EIP Wales booklet that features the final results from some of our projects.

The purpose of EIP Wales was to fund agricultural projects across Wales that encouraged the collaboration between farmers and others that work within the sector. Bringing people from both practical and scientific backgrounds creates a great opportunity to draw from different experiences, benefit from the latest knowledge and introduce new ideas whilst tackling problems.

Since 2017, EIP Wales has funded 46 projects across Wales, working with over 200 farmers, and a multitude of individuals, businesses and academics working across the agricultural sector. As the programme draws to a close in June 2023, we will share the results and stories from each project with you in a series of three booklets, of which this is the first.



Owain Rowlands
EIP Wales Manager



It has been great to see the initial ideas develop into projects and deployed on multiple farms, generating results which have brought valuable insights not only to the farms involved, but also to the wider industry. EIP Wales has demonstrated the importance of farmers being directly involved in putting research into practice and working with other farmers with both similar and contrasting approaches and systems. There is always a different way of doing something, and there is much to learn from trialling innovative ideas and new technologies.

A huge variety of topics will be covered in each booklet which really shows how diverse and innovative the farming sector is in Wales. We hope you find something that will be of interest to you and your business.

The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) was launched by the European Commission in 2012. It aims to foster a competitive and sustainable agriculture and forestry sector that “achieves more from less.”

Menter a Busnes delivers the EIP Wales scheme on behalf of the Welsh Government, and has received funding through the Welsh Government Rural Communities – Rural Development Programme 2014-2020, which is funded by the European Agricultural Fund for Rural Development and the Welsh Government.

Further information and resources on all the projects within this booklet and other EIP Wales projects are available on the Farming Connect website.

Project information and resources





Improving the sustainability of goat meat production in Wales by investigating the efficacy of recommended **wormer dose rates for meat goats**

Four goat farmers came together for a project focused on picking up worm burden early before it can spiral out of control.



The project group benefited from meat goat-specific BCS training from Dr Yoav Alony-Gilboa of Friars Moor Vets, Dorset.

The project looked at gaining more clarity around effective parasite dosing regimes to improve daily live weight gains and reduce time to slaughter – helping to enable the sustainable development of goat meat production in Wales.

Sheep and goats are both hosts to the same gastrointestinal (GI) parasites. However, there is currently limited published dose rates for the anthelmintic treatment of goats; instead, it is assumed to be higher than the recommended sheep dose.

As goats metabolise toxins quicker than sheep, there is concern that inaccurate treatment could be accelerating anthelmintic resistance within meat goat breeds.

Worms and their accompanying resistances are a key area of concern across ruminants for welfare and production burdens. In goats,

these pose an even greater concern due to lower resistances and resilience observed in adult animals in many goat breeds compared to most cattle and sheep. This means adult animals can pass a large number of worm eggs onto the pasture, posing a risk to other susceptible grazing animals.

If these concerns aren't addressed, they may hinder the sector's growth potential, which otherwise could have high value in Wales, due to goats' strong performances on marginal lands and potential for positive associated environmental impacts.

The EIP project established baseline data using body condition scoring (BCS), regular weighing, composite worm egg counts (WECs) and faecal egg counts (FEC) to examine if there are existing resistance issues within the herds.

The four participating farmers run herds in mid and south Wales, farming 270 Boer meat goats between them. They primarily focused on goat nutrition to ensure that the animals were more robust to cope with the worm challenge they face.

From this, grazing plans were established and thereafter FEC testing. FEC testing is critical to reducing the reliance on anthelmintic treatments. Also, when such treatments are used, basing management decisions on research means that the treatments can be far more targeted.

Body condition scoring BCS has been identified as a highly effective tool by all

farms who adopted the practice. BCS is particularly effective as an early warning system to instigate FEC testing. It is an indicator of which animals may be suffering from higher worm burdens when all other factors e.g., age, gestation stage, feed etc. remain equal.

Grazing management has been proven to be incredibly important. The combination of overgrazing and unmonitored worm burdens on pasture can lead to serious problems and reduced productivity.

Varying sward lengths were seen to dramatically impact the worm burden seen within the group/herd. The study found that goats benefiting from longer pastures saw lower worm burden.

Participating goat farmers Damian and Meg McNamara who farm in Pembrokeshire, said:

"This project has allowed us to maintain a high standard of welfare among our herd of meat goats. It has enabled us to undertake regular worm egg counting in our herd, both for regular monitoring and when there has been a symptomatic goat needing diagnosis."

"We've benefited from the access to specialist veterinary advice before and after the worm egg counting and analysis of results which has resulted in a more efficient use of wormer for our herd, both in terms of welfare and saving us money by using the correct wormer."

Common myths
and misconceptions
about worm
control in goats



Learn more
about this
project





Rob Lewis (Left) with son Rhys and wife Audrey

Developing the Cambrian Mountains Beef group to manage and expand their **short supply chain**

Five farming families from Powys have developed closer connections with their customers by establishing a short supply chain for their beef products.

Managing a short supply chain requires multiple skills including marketing, product processing, and product development; skills the Cambrian Mountains Beef Group – from the Llanidloes and Rhayader areas – have been able to develop through support.

A short supply chain represents an alternative to more conventional, longer food chains where small farmers often have little bargaining power and the consumer cannot trace the food to a known producer or local area.

The group was supported by the EIP Wales project to develop a range of marketing and business development skills to help them to promote their products. This was provided via technical specialists and methods and resources to develop the group as a self-sufficient entity.

This included:

- Developing a marketing strategy for their beef brand that involved understanding and adopting social media as well as more traditional communication methods
- Having younger members of the group take on roles such as social media account management as well as developing butchery skills to help ensure long-term security of the business
- Developing an understanding of the consumer was essential to securing long-term contracts
- Developing their knowledge of legislation and regulations to ensure business compliance

Rightly proud of their quality product, the group are managing and expanding their markets to inspire more farmers and the next generation to work together to develop their own paths to market, increasing the value of what they produce.

As a result of working with the project, the group has been able to utilise a number of resources developed, including producer forecasts, carcase meat yield calculations, and pricing schedules as well as access to packaging and logistics options.

A clear legacy for the project has also been set out, with the group working to develop a box scheme offering and proceed with registration as a food business thanks to the

skills and resources now being available to them to take this venture forward.

Emma Jones, of ADAS, who worked with the group, said: *“The Cambrian Mountains Beef group have been enabled by the EIP project to develop their own resources and build their confidence. This has helped them to manage their own supply chains, whether individually or as a collaboration.”*

The skills developed by one of the farmers has helped him and his family to launch a restaurant business which is going from strength to strength.

Rob Lewis of Glanelan Farm, Rhayader, runs The Triangle Inn in Cwmdauddwr in Powys. The restaurant uses ingredients sourced from local farms.

“The EIP funding was of paramount importance to help us develop the skills we required to promote our products. Younger members of our group are using the social media skills they learned to promote our products and we are continuing to make the most of the butchery skills we developed.”

“It is important that people know where their food comes from, and we are proud to source our ingredients from local farms. We can promote this on our website and via social media including Facebook.”

The focus is now on a sustainability strategy for the work to continue after EIP funding ended.

Learn more
about this
project





Potato blight control using components of indigenous non-food waste plants

Potato blight treatment plots, Henfaes Bangor.

Ty'n yr Helyg near Llanrhystyd and Henfaes farm at Bangor University took part in the project to test two new blight control options over two growing seasons (2017 and 2018) – Hederin, which is made from ivy leaves and OptiYield Diamond (OptD), a biostimulant that can help plants grow.

Led by representatives from Sarvari Research Trust and Emerald Crop Science and Naturiol, the efficacy of the treatments were assessed by measuring the progression of the blight epidemic in each of the trial plots, as well as the yield and health of tubers in each plot post-harvest.

The project results could contribute to the development of a brand-new market opportunity to grow common ivy commercially for the production of Hederin to help organic growers reduce blight infestation.



Dark patches on potato plant leaves due to blight.

Two Welsh farms were at the centre of an ambitious trial to control late potato blight using components of indigenous non-food waste plants to create a new, environmentally sensitive biopesticide.

Key findings showed:

- The Hederin treatment slowed the progression of blight, however it did not prevent blight infection reaching 100% of the crop and overall was less effective than the standard fungicide
- OptD was successful both in terms of slowing progression of the disease and reducing the overall level of blight by the end of the season
- When Hederin was combined with OptD the impact was more effective and this showed potential as a blight control
- This combination may be useful in an integrated pest management control programme particularly for organic growers
- Hederin may have a role to play in integrated disease management programmes, especially for organic growers

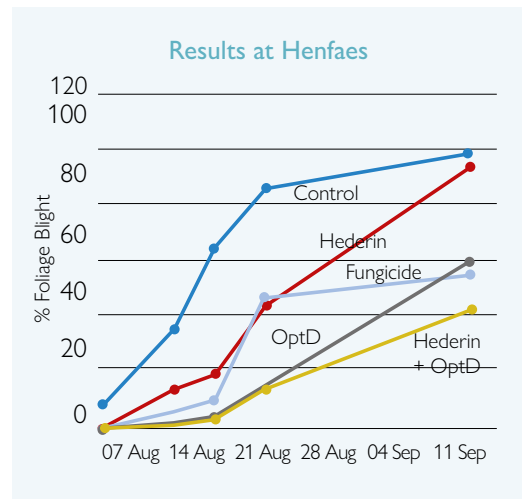
While the new biopesticide should not be seen as a direct replacement for synthetic fungicides, it can be an effective element of an integrated disease management strategy in combination with, for example, blight resistant varieties. This will reduce crop wastage through decimation of crops through potato blight, and, as a direct result, allow increased potato sales, improved turnover, and improved profitability.

Tony Little, who managed the project on behalf of RSK ADAS said: *"This project was a great example of how research and*

development organisations and farmers can come together to explore sustainable, agroecological solutions to major challenges. Routine preventative applications of fungicides to manage blight has a huge environmental cost, and this could offer an effective alternative to that approach."

David Shaw, who managed the trials at Henfaes and is a director of Sarpo Potatoes Ltd, which develops and multiplies blight resistant potatoes varieties said: *"Our results were very encouraging and suggest that the Hederin spray could be improved by adjusting how the spray is prepared."*

"Trials are now in progress to grow ivy commercially to provide large amounts of Hederin."



Average scores of late blight for each treatment at Henfaes in 2017.



Learn more
about this
project



Reducing antibiotic use on sheep farms at lambing time through best practice management by improving nutrition and hygiene



Sheep farmers on Anglesey have cut antibiotic use during lambing by almost 60 per cent over a two-year period.



By improving nutrition, hygiene, colostrum quality, and management, a group of seven farmers reduced the number of animals treated with antibiotics without impacting on production or welfare.

Jack Foulkes of Marchynys, Penmynydd was one of the farmers who took part in the project, in the lambing periods between 2017-2019.

“We’ve stopped using oral antibiotics on all lambs and things are going well,” he said.

“We make sure that lambs get plenty of colostrum within the first six hours from birth.”

We clean and disinfect each pen between each ewe and monitor cases of watery mouth and scour we get on the farm.”

The EIP project funded nutritionist Kate Phillips and vet Kate Hovers to oversee the project, as well as lab costs of the blood tests and the silage sampling.

“This has been a tremendous help in the progression of the project,” added Mr Foulkes.

One of the simplest but most effective measures he put in place was to allow sufficient feeding space for ewes – 15cm per animal for ad-lib forage and 45cm for restricted concentrates.

He disinfects the sheds twice when ewes are housed for lambing in January, with a two-week gap between groups to reduce E. coli levels – singles are grouped separately from twins and triplets. After lambing, the ewes and lambs are moved from big pens into small, individual pens.

Sheep vet Kate Hovers says the project demonstrated what can be achieved with


good hygiene and nutrition and simple management changes.

Protocols at lambing on the project farms included:

- Pre-lambing pens cleaned out, disinfected, and limed between batches
- Water troughs cleaned out regularly
- Lam e ewes treated promptly and managed separately, to avoid spread of infection
- Castration and tailing of lambs in the first week of life is avoided to minimise stress and wounds where joint ill bacteria could enter
- Everyone involved in lambing wearing rubber gloves, including when they handle sick lambs
- Stomach tubes washed in warm soapy water and disinfected in baby bottle solution
- Lambing pens set up in a separate area away from the main lambing pens for sick ewes or lambs and for ewes that have aborted
- Where cow colostrum is used, the quality is assessed using a refractometer and only colostrum at 22 IgG (Immunoglobulin G) or higher is fed to lambs

Learn more
about this
project





Environmental benefits of low impact machinery in small scale farm woodlands

An area of woodland which has been thinned.

The untapped potential of small Welsh forests to provide extra revenue for farmers and landowners was the focus of a project which also looked at their important role in woodland ecology.

Small woodlands, scattered over the countryside, are a feature of the Welsh agricultural landscape. However, many are under-managed due to their size as the high cost of larger forest machinery makes it uneconomical to manage or harvest.

Areas choked by brambles restrict natural regeneration of trees and structural diversity.

Environmental damage can also be caused by larger forest machinery, with timber harvesting particularly, which can leave deep ruts in the ground. This leads to poor regeneration due to soil compaction and sedimentation in waterways because of soil surface runoff.

The EIP Wales project focused on how reinstating woodland management could bring benefits including wildlife and providing

a valuable source of extra revenue. Although not all the woodland products would be suitable for the timber market, collectively small woodlands present an opportunity for increased timber production in Wales, which is desirable due to an increase in timber demand.

Farmers are now being encouraged to bring their native and ancient farm woods into formal and sustainable management.

Michael Lewis and Andrew Thomas are both farmers near Cowbridge, Vale of Glamorgan, who were facing problems accessing their farm woodlands. They were keen to discover what was the most appropriate low impact machinery methods to reinstate their woodland whilst minimising environmental disturbance.



A plantation of oak that needs thinning.

An area of the two woodlands were chosen for their uniformity in surface and subsurface site conditions (such as soil type, slope, stand density and rainfall) and were then divided into four treatment areas:

- A control area where no activity took place
- Clearing using conventional machinery – County tractor
- Clearing using an Alpine tractor
- Clearing using a tracked Bobcat vehicle

The volumes of water runoff during the above operations were then monitored as well as the loss of nutrients and sediments and hence the impact on soil structure.

Although results did not show distinctive differences between treatments it did demonstrate that all the machinery types used successfully gained access to the small woodlands. The Alpine tractor and Bobcat were just as successful as the County

Tractor at clearing a woodland ride and none of the treatments caused compaction.

Tracked machinery such as the Bobcat should be employed where the ground has a low load bearing capacity e.g. on peaty gleys in drier areas; soft mineral soils in wetter areas; peaty gleys in wetter areas and on deep peats.

The project highlighted the issues of measuring soil water run off as there is huge variation depending on topography, vegetation cover and severe weather events.

Learn more
about this
project





Feasibility study on **Squill** production in north Wales



Squill (*Drimia martima*) uprooted.

A plant native to the Mediterranean and used in many ‘over the counter’ cough mixtures can be successfully grown in Wales – providing an opportunity for diversification for farmers.

A research project showed that not only can squill be grown at locations across Wales, it also contains higher levels of the main bioactive ingredients used by pharmaceutical

industries than in squill grown in native countries.

Squill is a wild perennial plant that grows from a large bulb just below the soil surface. It predominantly grows wild in rocky coastal areas in the Mediterranean Basin. In recent years, the plant has been subject to uncontrolled collection in these areas because of the increasing demand for the key ingredient to produce health related products.

Following preliminary research at Bangor University, a larger scale project was commissioned by EIP Wales to investigate the ability to grow squill at a variety of locations with varying differences such as rainfall, altitude and distance from the north Wales coast.

More importantly, the project aimed to discover if the plant could produce suitable levels of the sought-after active ingredients within its bulb. Five trial sites were established across north Wales and squill bulbs were planted for the first time in the UK.

Squill bulbs were planted at the five sites in spring 2018 weighing 14-15kg. At harvest in early summer 2019, the bulbs weighed an average of 34.2kg, representing a growth of 237.81%.

Soil analysis before planting and post-harvest also showed no significant changes to soil macro-nutrient balance, however a multi-year trial is needed to examine the long-term impact on soil nutrient levels.

Kevin Stephens of Agroceutical Products worked closely with the group throughout the project. He is confident that squill could be planted, harvested, and processed with relatively inexpensive equipment on farms before being sold on for further processing.

“I was interested to discover that squill contains a number of other compounds that have potential anti-bacterial and anti-cancer properties and may also be of interest in treating diabetes and arthritis,” he said.

Findings included:

- Squill can grow at several locations across north Wales
- It does contain a number of high value compounds
- There is existing technology that can be adapted to plant and process squill at commercial scale
- There are potential high value/low volume products in both animal and human health, but further work would be required to develop these

- There is interest in squill as a ruminant feed additive and this would be a quick route to a lower value/high volume market

The project demonstrated the availability of seed bulbs will be an issue for any commercial exploitation, with additional information required on the biology of the squill plant to be able to design an optimal growing/production methodology in Wales.

The project also concluded that further work is needed to replicate the trials and to experiment with different growing conditions to further increase our knowledge on this peculiar plant.

More research is also needed on how farmers wishing to start growing squill could access the market as there are regulatory constraints when supplying ingredients for health related products. The result of this project has however been very encouraging and has hopefully sparked the beginning of an exciting new diversification option for farmers in Wales.



The location and altitude of the trial sites.

Learn more
about this
project



Assessing the potential of genomic testing dairy heifers to increase genetic gains and financial returns



Father and son dairy farmers Roger and Tom Bletcher are now using genetics to decide which animals to keep in the herd and which to let go after taking part in an innovative project funded by EIP Wales.



Tom Bletcher, Argoed Hall Farm.

The farmers, who run Argoed Hall Farm near Mold, are utilising genomics to improve their cows' traits by selection. Genomics uses an animal's DNA to estimate their genetic potential and gives dairy farmers confidence to make informed breeding decisions with their young stock.

Genomic testing is now 60-70% reliable for predicting future performance compared to just 35% for parent averages.

But as genomic testing adds an extra £25-£30 (prices at time of project) to rearing costs, the group wanted to see if this extra cost is worth the improvement in the reliability of the information generated.

Argoed Hall Farm is one of nine dairy farmers that were involved in the three-year project involving more than 400 Holstein Friesian heifers.

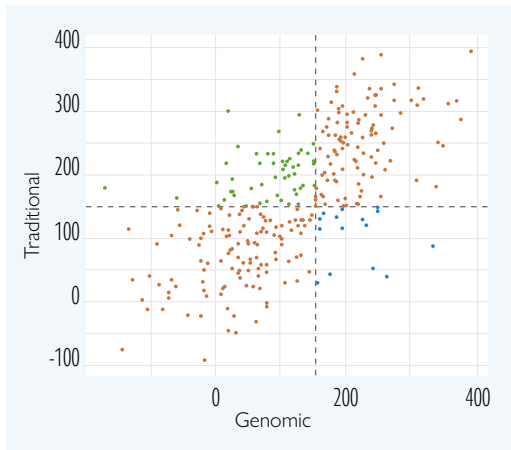
Culling decisions at Argoed Hall Farm had been based on fertility, lameness, and mastitis, but the business now intends to use genomics to factor production into the decision-making on which animals to keep in the herd and which to let go.

As Tom Bletcher's experience will highlight, the change in £PLI (profitable lifetime index) didn't just shift values, it also re-ranked animals too.

To demonstrate this, a theoretical selection point of £150 PLI was used to decide whether heifers would be bred to a beef or dairy sire and what the differences would be if genomic or traditional £PLI was used.

This exercise aims to demonstrate the number of animals that would have been incorrectly selected if only traditional £PLI values were known.

The project found potential breeding mistakes that can be made when solely using traditional PTA (Predicted Transmitting Ability) values as 23% of heifers were mis-identified as being either above or below £150 PLI.



Scatter plot showing the theoretical cut off point at £150 PLI for making breeding decisions using either genomic or traditional PTA's.

“We were surprised in the difference in spread of the herd,” said Tom: *“Those with a lower PLI ranked a lot higher than we were expecting.”*

Tom also stressed the importance of making the most of the data. *“You can test all your animals and have the data, but you have to do something with it and make your breeding decisions based on that data.”* He also believes that farms with more settled herd numbers could get the most value from genomic testing.



Victoria Hicks, Kite Consulting.

Vicky Hicks, of Kite Consulting who worked with the farmers said: *“One of the most interesting things for me was the re-ranking of animals.”*

“One heifer at Argoed Hall Farm went from a PLI of 54 to 239. She went from the bottom to the top of the re-ranking and that was the biggest eye-opener for me being involved in the project.”

The project outcomes:

- A hypothetical breeding scenario illustrated how 23% of the heifers would have been incorrectly bred if information was based on the traditional £PLI figures. This equated to lost £PLI potential of £6,914 to the next generation
- The benefit of genomic testing lies in the increased progression of genetic gain
- The total economic benefit generated from genomic testing totalled £46.89, and once removing the cost of genomic testing at £27.50, creates a cost benefit of £19.39 per heifer. However, this does not account for the additive and compound interest that investing in herd genetics creates

Watch the video of Tom and Vicky discussing the project results



Learn more about this project





One of the trial fields following establishment.

Alternative forage systems for marginal land

The EIP Wales project looked at how seed mixtures containing a range of grass, legume and herb species performed compared to conventional ryegrass/clover mixtures in upland conditions with high rainfall, thin soils and relatively low inputs.

The farmers were keen to explore if the multispecies leys would offer any yield, quality and persistence benefits above traditional leys.

With the help of grassland specialist Chris Duller and Will John from ADAS the group have monitored the performance of the different leys between 2018 and 2020.

The three farms differed slightly in their management (based on individual stock

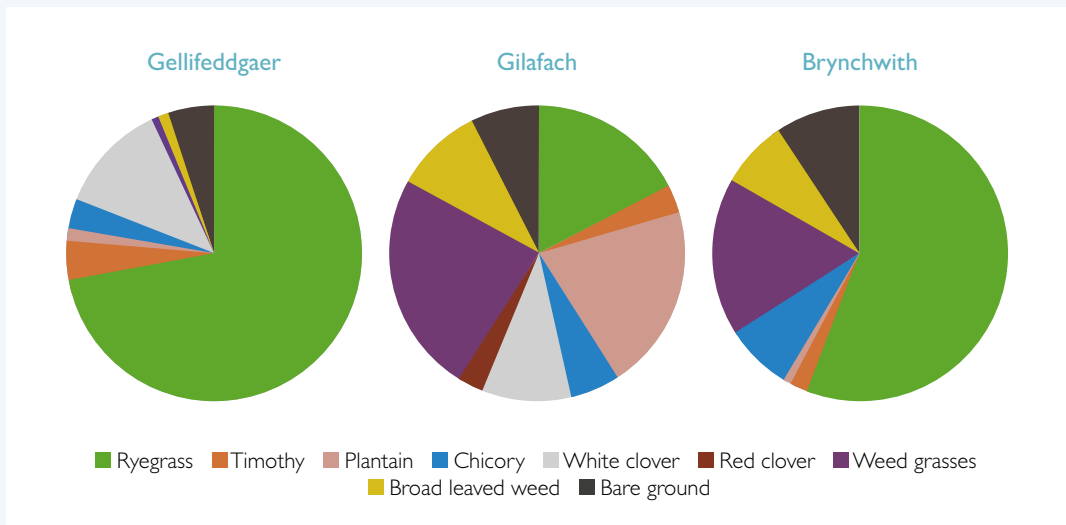
Three farmers from Bridgend, South Wales were part of this project which looked at the suitability of multispecies leys for sheep and beef producers in marginal areas.

requirements) – with one farm taking a silage cut from the leys, and cattle grazing included on two of the farms.

One farm used minimal amounts of nitrogen (30kgN/ha/yr) whilst the farm that was cutting for silage applied 120kgN/ha/yr. All farms tried to graze the fields on a graze and rest policy rather than continual grazing and all farms rested the swards over the winter.

Two of the farmers in the project thought the multispecies leys a success, with the other suggesting if he were to sow another multispecies mixture he would choose a drier field.

By the end of the project, the three farms had developed three quite different swards in terms of species composition considering all started with the same seed mix.



“There seems to be a good deal of flexibility in terms of grazing management and nutrient inputs – but ultimately the leys will develop differently under different regimes. Probably the best way to find out how they suit your farm is to have a go!” says Chris Duller.

Project outcomes and farmer feedback:

- Multispecies (MS) leys have performed as well as traditional ryegrass leys on a range of fields with challenging conditions
- The greatest benefits of MS leys are in the early life of the ley – as often the herb content declines quickly
- MS leys have provided yield benefits in early and late season production
- Wet soils and poorly drained land are probably not best suited for MS leys
- Seed mixture selection is difficult due to the huge choice on the market
- Establishment early in the year is beneficial

- Rotational grazing is preferred to continuous to prevent plants from being grazed out
- Late autumn grazing and under-grazing in spring may have contributed to the decline in diversity
- Winter rest period is important to allow the legumes and herbs to persist
- A single silage cut (mid-season) seems to have no detrimental effect on the ley
- Moderate N applications (<150kgN/ha) have not adversely affected the mixtures
- Forage quality and mineral status haven't been significantly altered by using MS leys
- Benefits for animal performance and animal health from grazing MS leys have not been evident from this project

Learn more about this project





Night milk – Assessing the reliability and economic benefit

A dairy farmer has been given the opportunity to explore the possibility of producing milk that helps to aid sleep – thanks to financial support from EIP Wales.

Rhys Lougher, Ty Tanglwyst.

Rhys Lougher, of Ty Tanglwyst in Bridgend, South Wales, had long been interested in the link between melatonin in cow's milk and the potential beneficial impacts this could have for consumers in aiding sleep.

The innovative project enabled him to test whether cows' milk produced at night, contained higher levels of melatonin – a hormone that regulates the sleep-wake cycle – than milk produced during the day.

Ty Tanglwyst was one of two farms, in Bridgend, South Wales, to take part in the project. Both farms milk their cows three times a day at eight-hour intervals, with one of these milking sessions occurring at night.

This made it simple to sample the milk produced during the night to see whether 'night milk' contains sufficiently high levels



of melatonin to brand the milk for its sleep promoting properties – potentially providing the dairies with a ‘unique selling point’ in erratic and volatile markets.

The milk from the three milkings is normally pooled together. In this project from September 2018 to April 2019 the milk collected during the night and day were sampled separately.

Both milk samples were then analysed for melatonin levels and other related compounds using liquid chromatography mass spectrometry.

According to the EU Register of Nutrition and Health (EURH) guidelines, the level of melatonin needs to be 1mg per 250ml portion or higher to market the milk for its sleep promoting properties.

From the 77-night milk samples analysed, no single sample showed any presence of melatonin above 0.00125 mg/250ml. Whilst this does not meet the required 1 mg threshold dictated by the EURH, it does exceed naturally occurring levels in humans (of 10-60 pg/ml).

There was also no significant difference in melatonin levels between the milk collected during the night and during the day, and no trend linked to seasonality, location, or nutrition.

On a more encouraging note, melatonin levels were not affected by the process of pasteurisation, with levels not differing significantly between raw and pasteurised samples. If a way of manipulating levels of melatonin in cow’s milk could be found, then this would not be affected by the processing of the milk.

The project demonstrated that in a commercial farm setting, the production of melatonin-rich milk may be more complicated than previously suggested in other studies. However, it demonstrates a clear niche in the market for melatonin-based products, which may offer a more ‘natural’ aid to sleep than other over the counter medications on the market.

Despite the disappointing results, Rhys said: *“It was something that I’d been interested in for many years, and it was wonderful to be able to test the theory. I will always be grateful for the opportunity to be involved.”*

Learn more
about this
project



Electrophysical dock control



Rootwave pro hand held electric weeder.



A unique method of controlling dock weeds using electricity as its secret ingredient is gaining interest from across Europe.

The EIP Wales project, a first for the UK, saw farmers from Monmouthshire working with partner Rootwave to destroy weeds by sending a high voltage current through the plant via an electrical weeder.

The innovative project has captured the interest of a team at the Agricultural University of Athens which is currently leading Oper8, a collaborative project on alternative weed management.

ADAS consultant Will John, who had a key role in the project, attended the launch meeting of Oper8 in Athens.

Will, who is an environment, food and farming consultant at ADAS, said that

increasing focus on sustainability issues and evidence of herbicide resistance was driving decision making to look at a range of alternatives to pesticides and a more integrated pesticide management approach.

Three dairy farmers, whose farms were all experiencing dock infestation, took part in the project.

Docks are less palatable than grass and can also reduce silage quality as docks have only 65% of the feed value of grass. The use of herbicide sprays to control docks in pasture can have a negative effect on clover and implications for the wider catchment ecosystem if used incorrectly.

The project involved two grazing fields being split into trial plots of 2m x 6m to compare the effectiveness of electrical treatment against normal herbicide application.

The electrical weeder is designed to send a high voltage current through the plant where the natural resistance of the weed transforms the electrical energy into heat which boils it inside out from the root upwards.

For the small trial plots in the project a hand-held lance with a 20m cable powered by a petrol generator was used. Each dock plant in a plot is touched with the charged lance for approximately 5-10 seconds before moving on to the next plant.

Overall results concluded that electrically treating dock plants on three treatment timings was very effective and can be equivalent to a herbicide application alone.

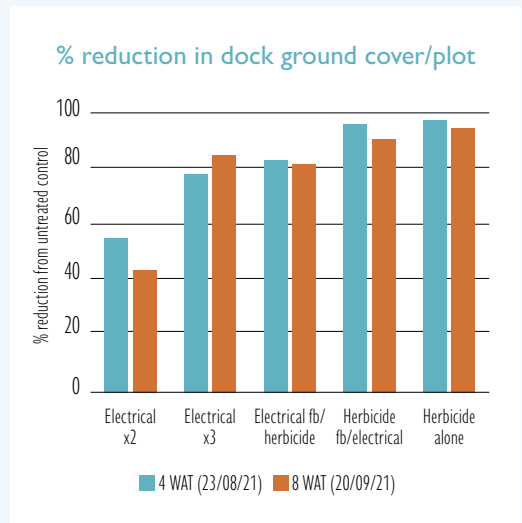
Electrical control is extremely promising as an additional tool for dock management in grassland, that would benefit organic farmers or those requiring lower herbicide inputs. It would also retain clover in the sward if targeted treatments were applied.

The tractor-mounted system is urgently required for uptake of this technology into the grassland market for it to be a commercially viable option.

“This unique method of dock control has great potential for both organic and conventional farmers,” said Will John.

“The technology is scalable, and larger tractor based electrical weeders could be used in a variety of different farm situations.

“It is still early days for this technology, and as with anything new, developments will lead to greater effectiveness and a reduction in price. Electrical weeding could provide an alternative option for future weed control in conventional, as well as organic, farming.”



The mean percentage reduction from the untreated control for % dock ground cover per plot at farm 1 for the final two assessment timings in 2021, at four and eight weeks after treatments (WAT). (fb= followed by).

Learn more
about this
project





Growing small scale **asparagus** organically



The asparagus trial field at Square Farm.

A natural curiosity and a desire to learn new skills has resulted in organic farmer Rob Whittal producing bumper crops of asparagus which have proved a hit with customers at his popular farm shop.

The produce – picked at night and on the shelves of Square Farm shop first thing the next morning – is the result of a successful EIP-funded project to examine the practical and financial potential for growing small scale asparagus on two farms in Monmouthshire.

Rob, of 190-acre Square Farm and Ruth Tudor of neighbouring Trealy Farm were keen to examine whether asparagus can

be grown organically successfully on the holdings as asparagus has good potential in Wales as it is high value and is a good draw for farm gate sales.

With lack of knowledge about the crop a deterrent, the project gave both Rob and Ruth the mentoring and support necessary to produce the crop, via organic specialist Chris Creed.

And it has shown that organic asparagus can be successfully grown and marketed on a small scale in Wales, although it highlighted that location, crop management and factors such as climate can impact on productivity.

The crop falls into the 'hungry gap' period from the end of April to the 21 June when few other crops are available

One hectare (ha) of asparagus was established on each farm at an approximate cost of £7,900/ha excluding VAT – a higher than anticipated cost due to a lack of availability of contractors in the area experienced in planting asparagus on a small scale.

Some 22,000 crowns of asparagus were planted on each farm. For Square Farm, return from the organic crop was £21,600/ha in 2020 in the first year of production, but down to £10,700/ha in 2021, largely as a result of poor spring conditions.

At Trealy, yields were lower in comparison – in 2020, only 118kg was marketed, excluding some also sold for wholesale, and the 2021 harvest yielded an average of just 5kg/day.

However, a top-end sale price of up to £18/kg was achieved through local direct sales and, with other sales considered, approximately 300kg was marketed at an average of £10/kg – sales of £3,000 with minimal costs.

The three-year project also highlighted the importance of marketing to ensure maximum returns can be achieved on harvest. Key marketing messages of local production, low food miles, organic methods and high-quality produce are crucial.



Rob Whittal, Square Farm.

Rob, who is a second-generation farmer with a 190-acres of mixed farming, said: *"I had been afraid to grow asparagus, though it does sell well in the shop. I've now been able to see what works and what doesn't, and I feel like we are making good progress."*

Outcomes of the project:

- Asparagus can be grown successfully under organic management
- Asparagus is marketed easily and can command a good premium if sold direct and locally
- Having sufficient skilled labour can be an issue at peak times and should be considered a major cost to the enterprise
- Apart from labour, other costs were negligible post planting and it is the low input costs which have resulted in the apparent good margins for the farms

In the future the emphasis will be on appropriate nutrition and weed/pest control to ensure the crop can further establish itself prior to harvesting.

Watch this video for some tips from Rob on growing asparagus



Learn more about this project





Organic ancient cereal supply chain

Gerald Miles of Caerhys Farm, and Tony Little, the EIP Wales Innovation Broker who facilitated the project.

The increasing popularity of artisan bakeries and a renewed interest in long lost wheat varieties as a good alternative to modern wheat led to a series of growing and baking trials in Pembrokeshire.

Bread from ancient cereals is widely thought to have better, richer flavours compared to many modern varieties.

Their extensive root systems, compared to modern varieties, allow them to access nutrients more efficiently, and from deeper within the soil profile. This allows them to be grown on less fertile soil and with fewer inputs, potentially increase levels of certain nutrients in the grain and compete against weeds.

The project set out to investigate the agronomy of ancient and heritage wheat and to identify the most appropriate methods for their production. By embedding the research in commercial farming operations, a 'real-world' perspective could be gained.

Only 9% of farmland in Wales is currently used for arable production and most of this is used for growing modern grains.

But farro grains, including Emmer, Einkorn, and other varieties falling under the label of ancient and heritage grains have now been trialled in organic and minimum tillage farming systems with funding from EIP Wales.

These varieties have been pushed to the margins of agriculture for hundreds of years by higher yielding, more gluten-rich wheats.

Trials were set up in spring 2019 across four farms, and certain management factors were included, such as varying seed rates and under-sowing.

After this preliminary study, trials were set up in autumn 2020 across three sites, looking at ancient and heritage winter wheats. In spring 2021, trials across three farms looked at ancient, heritage and modern wheat, as well as intercropping with field beans.

Overall, the project revealed heritage wheats can yield equivalent to modern varieties under organic conditions, as evidenced by the spring heritage wheat April Bearded, compared to the modern variety Mulika, over two growing seasons.

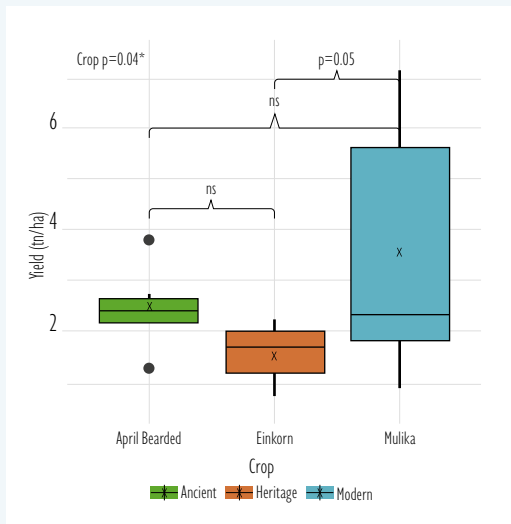
In 2019, Mulika yielded more than the ancient wheat Einkorn, but yielded equivalent to April Bearded and in 2021, there was no significant difference in the yields of the modern variety compared to April Bearded and another heritage wheat Atle, and the ancient wheat Emmer.

One of the participating farmers was Gerald Miles of Caerhys Farm, who has a suckler herd and grows cereals and organic vegetables. *“I have a big belief in ancient varieties and really wanted to test them and compare them with modern varieties,” he said. “My vision is to market them to local bakers and to prove the health aspects of these grains.”*

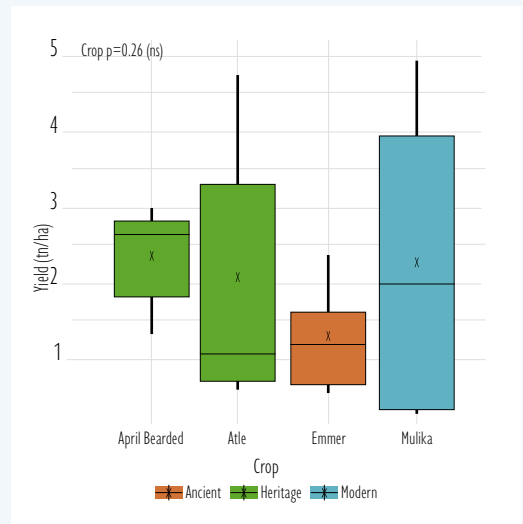
“I believe strongly in these grains compared to modern grains which have been changed over the years to justify harvesting easily instead of concentrating on the actual benefits of the health of the grains.”

He now hopes the trials will result in more of these crops being grown across Wales.

“Artisan bread is now really popular, I would like to see every consumer in Wales having the opportunity to eat this bread,” added Gerald.



2019 Spring Wheat Yield.



2021 Spring Wheat Yield.

Learn more about this project

Foliar feed for grassland



Robin Nicolson (left) of Pisgah Farm, who was one of the participating farmers. Nigel Howells, grassland consultant.

A project carried out on Welsh grassland farms has shown that foliar fertiliser can increase nitrogen (N) use efficiency by up to four times compared to conventional N fertiliser.

Foliar feeding is a technique of feeding plants by applying liquid fertiliser directly to the leaves, compared with the more traditional method of applying it in solid or prill form with a spreader.

Four dairy farms in mid and south west Wales took part in the EIP Wales funded project to assess the extent to which using a foliar feed that is based on urea and humic acid can reduce the application of conventional N fertiliser to grass.

On each of the four farms, one field (approximately 6 Ha) was split into three sections of equal size and the following treatments were compared:

- Plot 1: Conventional prilled nitrogen (N) application every 21 days
- Plot 2: Foliar feed (a mixture of urea and humic acid) was applied at intervals of 21 days during the grazing season
- Plot 3: A control of no nitrogen

The performance of each plot was measured in terms of:

- Dry matter yield
- N content of fresh grass tissue
- Costs of N application per tonne of dry matter
- Clover content to assess the impact on species composition of the sward

Soil and grassland consultant Nigel Howells, the advisor to the project, said the results of the project were very positive with many benefits including environmental factors and cost savings.

“The difference varied from site to site, but in most cases, nitrogen use efficiency (NUE) continued to be significantly higher in the foliar-fed plots, achieving similar DM yields to conventional plots by applying only 40-50% of N,” he said.

When the EIP project was run, the total cost of applying foliar fertiliser and humic acid to the grazing land was £26/ha; for conventional fertiliser, it was £43/ha.

	Conv			Foliar Feed			Foliar Feed NUE compared to conventional (%)
	Total N applied (Kg/Ha)	Additional Yield (Kg/Ha)	NUE (additional Kg DM/Kg N)	Total N applied (Kg/Ha)	Additional Yield (Kg/Ha)	NUE (additional Kg DM/Kg N)	
Site 1	275	5700	20.7	110	3200	29.1	140
Site 2	245	2900	11.8	92	2800	30.4	257
Site 3	275	2300	8.4	110	2900	26.4	315
Site 4 (Gzd)	270	4300	15.9	92	4100	44.6	280
Site 4 (Sil)	425	9000	21.2	224	9200	41.1	194

Nitrogen Use Efficiency (NUE) of both application methods in 2021.

“At today’s fertiliser prices, and including both the product and spreading costs, it would be £56/ha for foliar feed and £93 for conventional fertiliser,” Mr Howells calculates.

“Those figures incorporate contractor costs of £18/ha to spray the foliar feed and £10/ha to apply dry fertiliser. However the increased NUE more than compensates for this additional spreading cost.”

Key findings were:

- It is possible to achieve comparable yields to the conventional plots using foliar feed systems
- At lower rates of N application, yields were lower in the foliar fed systems. However, the Nutrient Use Efficiency (NUE) was between 2 and 3 times higher in foliar fed systems
- On average the cost of N per litre of milk produced was 39% lower using foliar feed compared to conventional fertiliser
- Foliar fed systems achieved higher yields in adverse conditions, for example cool and/or dry conditions. This could be because absorption through the leaves was less affected by adverse soil conditions compared to uptake through the roots

- The levels of sugar in the grass plant were also consistently higher in the foliar feed plots over the 2 years
- The data was unable to show any relationship between the method of N application and nitrate levels in leaf tissue. Peaks were observed in the plots with no fertiliser, which are likely to be linked to the higher clover levels in these plots
- Grass quality was only measured on one site over two years, so the results need to be treated with appropriate caution. Digestibility (D) values and metabolizable energy (ME) was similar between foliar feed and conventional fertiliser regimes
- Crude protein appeared to be higher in conventional plots which is likely to be related to the high total amounts of N applied

Top tips for maximising the performance of foliar feeding on grassland



Learn more about this project





Implementing advanced nutritional management in the Welsh sheep industry

After taking part in this project, Llŷr Jones of Derwydd, Llanfihangel Glyn Myfyr learned a copper deficiency was one of the contributing factors to the condition of his ewes which had led to very low scanning results.

“We were almost 20% down on the year before and this project has highlighted the underlying problem that we were unaware of,” said Llŷr. *“I’m really pleased to have taken part and I hope the results will aid our business.”*

The EIP funded project, involving taking liver biopsies from breeding ewes across 12 flocks, helped establish the mineral status of their flocks and fine-tune rations. Testing tissue samples from the livers of live ewes can be costly and is not commonly used in UK flocks. The technique is, however, widely used in New Zealand to monitor trace element status.

Vet Joseph Angell, who was involved in the study, says

“Liver tissue sampling provides a much longer-term historical estimation of the status of some trace elements, particularly copper. This

information, coupled with an understanding of the expected nutritional demands of the sheep, and an understanding of the potential available supply, can help to make decisions about nutritional adjustment.”

Cost v benefit

The monitoring costs (vet and lab fees, analysis, individual farm advice) came to a total of £1,299.67 (ex VAT) per flock.

Dr Angell says the cost of sampling needs to be weighed against improved performance and cost savings on trace element supplementation and over-feeding concentrates.

“I would, on balance, suggest liver tissue samples are likely to be useful, particularly during an initial investigation and monitoring phase, as was the situation for the flocks in this project.

“A bolus could cost in the region of £1 per ewe which, if necessary, is likely to deliver a return, yet if not, is an unnecessary cost. Similarly, over-supplying ewes with concentrates pre lambing can result in a large feed bill and health problems associated with overfeeding”

“Conversely, under-supplying concentrate feed pre-lambing is likely to result in reduced milk quality and quantity, with disease consequences for both ewes and lambs,” he added.

Key outcomes from the project:

- There are big improvements to be made in managing nutrition on sheep farms and a key intervention would be for farmers to adopt regular body condition scoring, adjusting grazing to enable sheep to meet pre-established targets at key times of the year

- Trace elements are an important component in proactive and optimal nutritional planning but are far less important when compared to the overall availability of forage and the body condition of the ewes

When tissue sampling is the most beneficial:

- When optimal production is the goal rather than the investigation of a clinical disease or syndrome
- If sheep change pastures regularly
- When pastures have different mineral concentrations
- When borderline cases are identified, the extra data allows decisions to be better informed



Blood and liver tissue samples were taken from eight ewes from each farm pre tupping.

Flock trace mineral
planning for
optimal health



Learn more
about this
project



Pasture for pollinators



A group of six organic dairy farmers – all keen to farm sensitively with nature – have played an important part in helping to reverse a decline in pollinators like bumblebees.



A project meeting following the establishment of the multi species leys.

The Pasture for Pollinators project, led by the farmers who are all members of the Calon Wen Milk Co-operative, has successfully shown that simple changes to grassland management, without sacrificing farm productivity and profitability, can go hand in hand with pollinator conservation.

The three-year project focused on the inclusion of a multi-species ley that included bird's foot trefoil, clovers (red, white, sweet and alsike) and yarrow as well as ryegrass.

Attracting national attention including a feature on BBC Radio 4's Farming Today programme, resources are now available on the Farming Connect website to help other farmers emulate the success in increasing the numbers of bumblebees and other pollinators across rural areas of Wales.

So, how was it achieved?

Silage Harvesting – leaving a 2-4 metre strip of forage uncut along the sides of fields provides flowers for bumblebees and other pollinators to forage in.

With each cut – Harvest the previously uncut margin but leave another uncut strip on the other side of the field.

Result – Leaving uncut areas that contain mature flowers provides valuable nectar and pollen for a wide range of insects including bees. Beneficial insects will predate pests such as aphids, pollinate crops such as clover or the apples in the orchard and provide a food source for birds and small mammals.

Who was involved?

With funding from EIP Wales, farmers from six organic farms in Flintshire, Wrexham, Ceredigion, and Pembrokeshire, worked with representatives from the Bumblebee Conservation Trust and the RSPB.

One of the farmers, David Edge of Cop House Farm in Saltney Ferry, Flintshire, is encouraged by the success of the project.

“We’ve run this project as farmers which we hope will show others how bumblebee conservation can be practical and beneficial to the farm.”

“I believe that more often than not, wildlife conservation can go hand in hand with productive farming and does not have to take over from the farming itself.”

Findings

Higher numbers of bumblebees and other pollinators, and greater numbers of pollinator species were recorded in uncut/ungrazed agricultural ley margins compared to cut/grazed ley margins when surveyed within two weeks of silage being cut/grazing.

The results indicate that leaving uncut/ungrazed margins in agricultural ley fields could help support bumblebee and other pollinator populations, especially in terms of ‘bridging gaps’ in forage (nectar and pollen) during the season when a continuous supply of forage is required by these species from around March through to October.

Additionally, the results indicate that greater numbers of species and abundance of individual pollinators may be supported by the more species-rich herbal fertility building ley (or fields which have been seeded with an agricultural ley but retain a variety of wildflower species as well), compared to less species-rich agricultural leys.



Common carder bee. Inset: Burnet moth on bird's-foot trefoil.

A guide to
Pollinator friendly
grassland farming



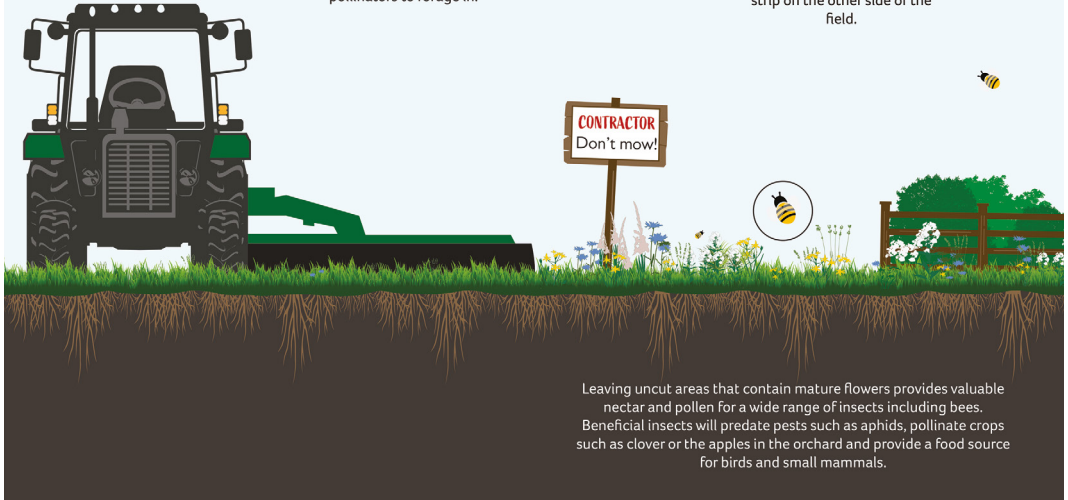
Learn more
about this
project



Bee friendly silage harvesting

Silage harvesting:
Leaving a 2-4 metre strip of forage uncut along the sides of fields provides flowers for bumblebees and other pollinators to forage in.

With each cut:
Harvest the previously uncut margin but leave another uncut strip on the other side of the field.



Leaving uncut areas that contain mature flowers provides valuable nectar and pollen for a wide range of insects including bees. Beneficial insects will predate pests such as aphids, pollinate crops such as clover or the apples in the orchard and provide a food source for birds and small mammals.

Benefits of multi species leys

Tannins in herbs can help to control parasitic worms naturally which will reduce the farmer's dependency on anthelmintic medicines.

Deep rooting plants draw up more nutrients providing important vitamins and minerals to the animals.



Deep rooting herbs can help reduce soil compaction, increase oxygen levels in the soil and improve drainage

Legume plants fix valuable nitrogen into the soil which can reduce the need for fertilisers