

West Wales Water Quality Improvement Project 2019

10th November 2019

A joint project between:



Working with Welsh Farmers with the support from:



Afonydd Cymru

Authors

Kate Speke-Adams

Stephen Marsh-Smith

Jodie McGregor

Forward

We were delighted when Dwr Cymru agreed to fund this project. Afonydd Cymru, its member Trusts and Dwr Cymru share a common need for significant reductions of agricultural pollution in all its forms. The project linked 1:1 farm advice with delivery of grants and infrastructure upgrades. Importantly, we found we were able to calculate the actual benefits so derived. The outcome was a calculable reduction in farm diffuse pollution. The work took place in two selected catchments in West Wales, the Ceri Brook (Ceredigion) and the North Western Cleddau (Pembrokeshire), but we hope the project will be a catalyst and a methodology for future activity to bring about improvement on a much wider scale.

If every farm took up the grant offered to them, we have the potential to save over 59,586m³ of dirty water entering the two waterways at Western Cleddau and Ceri Brook. That amounts to approximately 60 tonnes of Phosphates saved from entering our rivers, along with Nitrates and other pollutants.

This report describes the detail of farm visits, what was investigated and what was done to improve water quality. Details of cost and outcomes enable assessment of the value of the project to the future of the reduction of Wales' farm pollution problem. We think it offers a template of how diffuse pollution can be substantially reduced across Wales at a very low cost to each farm.

*Dr Stephen Marsh - Smith OBE
CEO Afonydd Cymru*

QUICK FACTS about the ACDC project

65,365	GBP of total grant at 50% offered to farmers across the catchments
46,560	GBP of total improvement work spent on farms
45,837	M ³ less dirty water entering the catchment via point source and diffuse pollution
23,280	GBP of grant at 50% spent on farm improvement works to assist with water quality improvements
11,236	Acres of farmland engaged within the two catchments
8,223	M's of fencing recommended to keep stock out of waterways and improve water quality
2,320	M's of fencing erected to keep stock out of waterways and improve water quality
2,052	M's guttering installed to keep clean and dirty water separated
4,585	Kg of phosphates removed annually from two watercourses (4.6 Tonnes)
217	Individual recommendations suggested to improve farmers businesses
157	Farmers positively engaged with across the catchments
61	Suitable farmers offered grants and advice to make improvements
20	Farmers accepted grant and made improvements
8	Partner organisations involved
5	Drinking bays blocked
2/3	Catchment Advisors
1	Rivers Trust

Contents

1. Introduction & Aims of the Project	3
2. Delivery Approach	5
3. Establishing an Advisory Approach	6
4. On Farm Advice	8
4.1 Farmyard Infrastructure	9
4.2 Clean and dirty water separation	10
4.3 Manure and Nutrient Management	11
4.4 Limiting Stock Access to watercourses	12
4.5 Improving Soil Management	13
5. Farm Opportunities and Success of Grant Uptake	14
6. Additional Benefits of Farm Visits	16
7. Monitoring	18
8. Project Finance	19
9. Discussion and Recommendations	21
Appendix (i)	
<i>Project Leaflet</i>	28
Appendix (ii)	
<i>Common Grazing Strategies</i>	29
Appendix (iii)	
<i>Farm Questionnaire/ Evaluation form</i>	31

1. Introduction & Aims of the Project

The objective of the **West Wales Water Quality Improvement Project** was to establish a working methodology to tackle diffuse pollution from agriculture. This is a partnership project primarily between Afonydd Cymru (AC), Dwr Cymru (DC). In addition, start up and delivery has been co-ordinated by the Wye & Usk Foundation (WUF), West Wales Rivers Trust (WWRT) have provided local knowledge and additional funding has been provided by Natural Resources Wales (NRW) to support capital works. Strategic support from Farming Connect (FC), Farming Union Wales (FUW) and NFU Wales (NFU Cymru) through the project steering group has also proved invaluable.

During the AMP6 (2015-2020) investment period, Dwr Cymru Welsh Water (DCWW) undertook a significant number of river water quality (WFD) investigations. These were to establish both the impact of their waste water assets in those rivers, and also to understand what other sources of pollution e.g. from diffuse sources, were evident, and so make a contribution to focusing both their future investment plans (AMP7 – 2020-2025) and NRW's activities to control and improve water quality. The project sought to address the reasons for failure by engaging with agricultural holdings within the target waterbodies of the North Western Cleddau, Pembrokeshire and the Ceri Brook, Ceredigion.

Three central aims were:

- 1) Establish an advisory function within Wales to engage land managers
- 2) Reduce losses of slurry, manure and sediment which are currently impacting on water body status
- 3) Reduce the impact of diffuse pollution and costs in DCWW assets including a reduction in faecal coliforms and suspended solids.

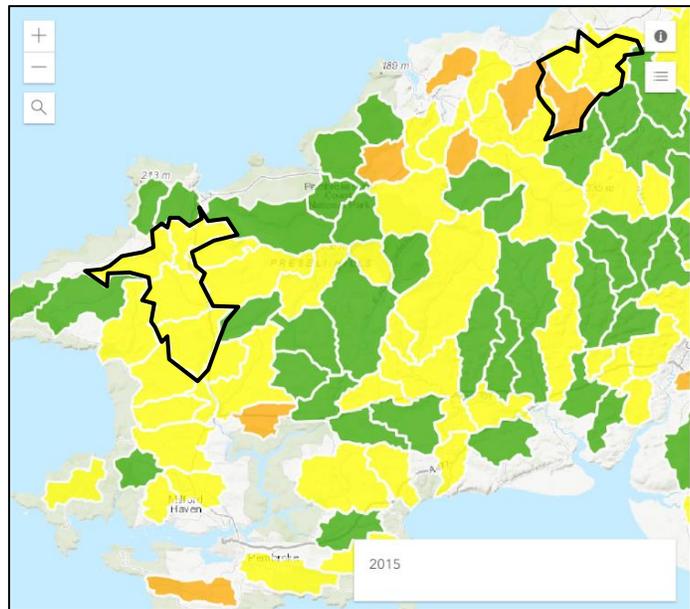


Fig 1: Status of Water Framework Directive water bodies, 2015. Good status (green) Moderate status (yellow) and Poor status (orange). The two catchments: North Western Cleddau (left) and Ceri Brook (right) are outlined.

We proposed to adopt a similar approach to that of WUF, targeting waterbodies impacted by agricultural pollution, offering farm advice 1:1, leaving Government bodies such as the Environment Agency (EA) and Natural Resources Wales (NRW) deliver their respective regulatory function. We hoped that the project would become a template for the delivery of measures to reduce diffuse pollution across Wales.

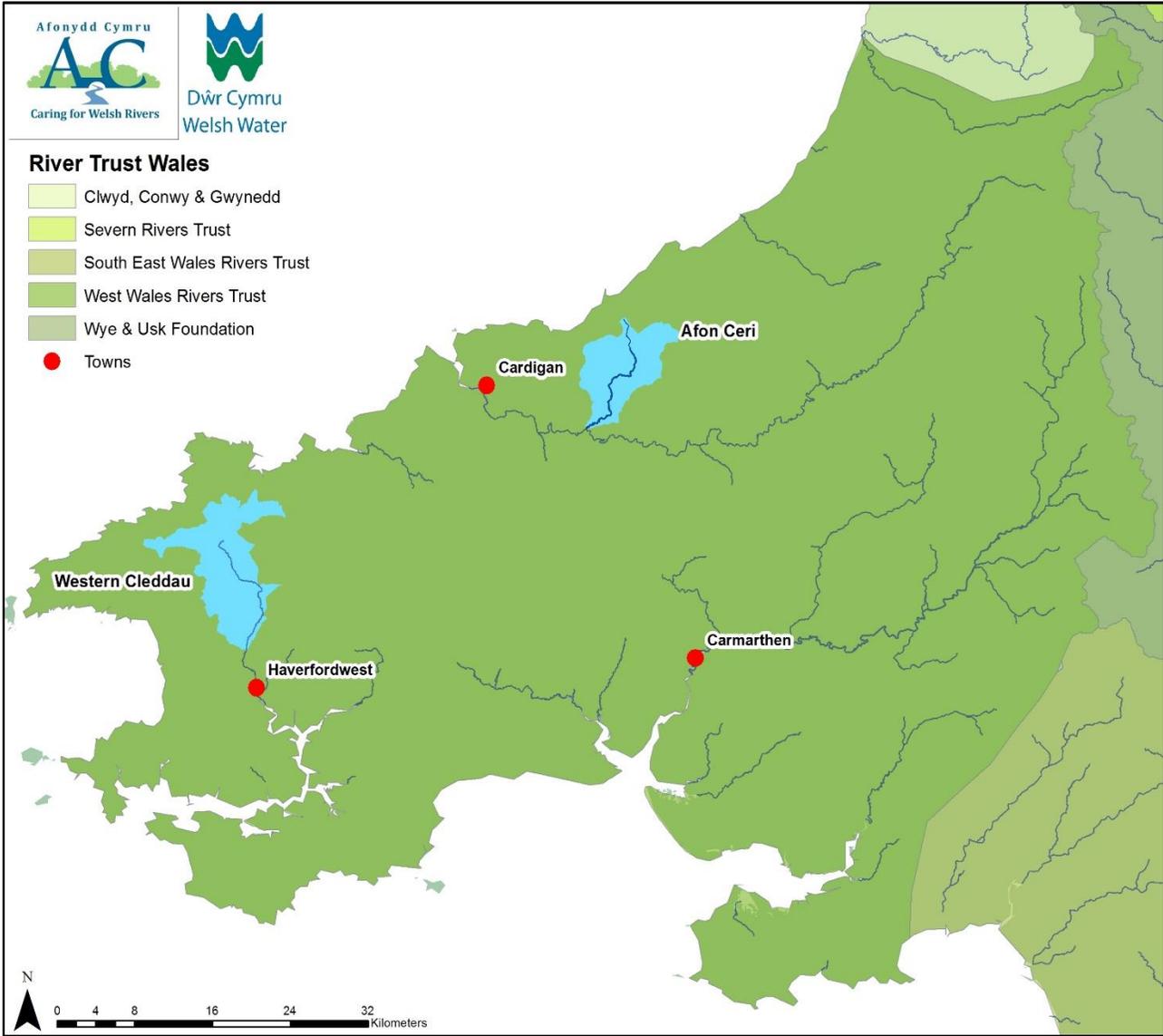


Fig 2: Map showing location of selected catchments in West Wales

2. Delivery Approach

Two catchment advisors were appointed in August 2017 and undertook extensive training within the established WUF advisory team between September 2017 and February 2018. A third catchment advisor was appointed to cover maternity leave (June 2018 – April 2019). The project passed to AC management on 1st March 2019

Training undertaken:

- Cold calling techniques
- River monitoring and invertebrate identification
- Regulatory requirements and standards for slurry, manure and silage storage (SSAFO)
- Soil health assessments including testing for nutrient levels, structure & biology
- Grass utilisation and grazing techniques
- Farm yard infrastructure assessments
- Writing farm reports
- BASIS Soil and Water

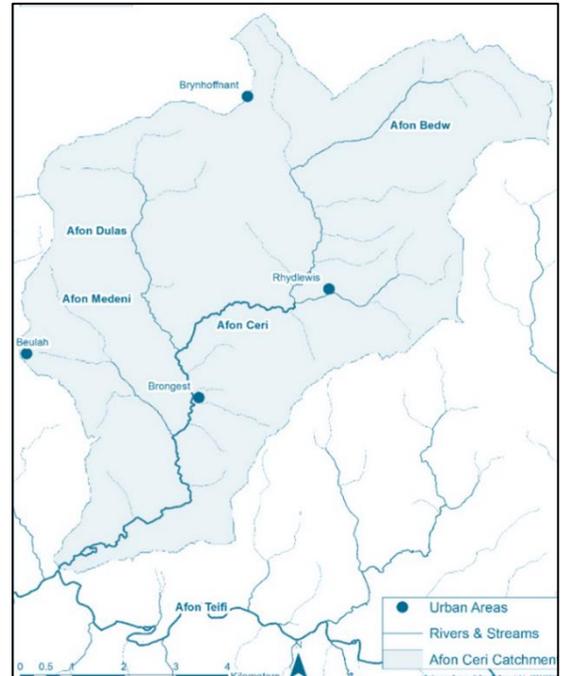


Fig 3: The Ceri Brook Catchment

Summary of delivery approach:

1. Work with the project steering group to agree Modus Operandi.
2. Existing DCWW data on each of the target water bodies to be analysed.
3. The project had been publicised within the target areas and through partners within the steering group (Please see Appendix i) for bilingual leaflet).
4. Catchment advisors undertook cold calling within each of the target areas in order to generate farm visits and subsequent plans.
5. At each farm visit, priority areas were identified and recommendations subsequently drawn up. Advice was supported by analysis of soil nutrient/organic matter

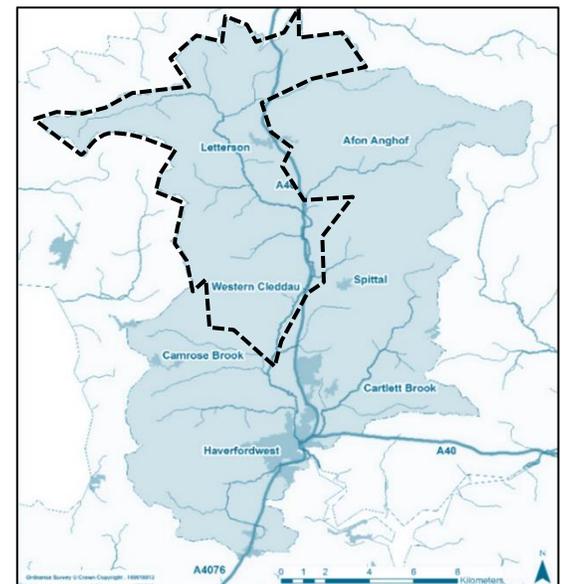


Fig 4: North Western Cleddau Catchment
(--) within the wider Western Cleddau Catchment

and structure where appropriate.

6. Where appropriate, grant support was offered to remedy issues having a direct impact on water quality. Additional investment was signposted to WG Small Grant Scheme and WG Sustainable Production Grant.
7. Grant aided works were delivered by the landowner and /or contractors.
8. Ongoing support was provided to all those engaged to help address any developing issues and establish long term trusting relationships between the Catchment Advisor and participating landowners.

3. Establishing an Advisory Approach

The Rivers Trusts are an established delivery mechanism for farm support in Herefordshire (1100+ farms). To date this approach has not been replicated much beyond east Wales. The aim for each Advisor was to try and engage with at least 100 farmers, with the target of at least 80 full farm visit reports written.

There was some doubt from stakeholders as to what type of response a Catchment Advisor would receive from farmers in West Wales. The success of the West Wales project has been as high as the WUF project it was emulating with over 70% of contacts made offering a positive response.

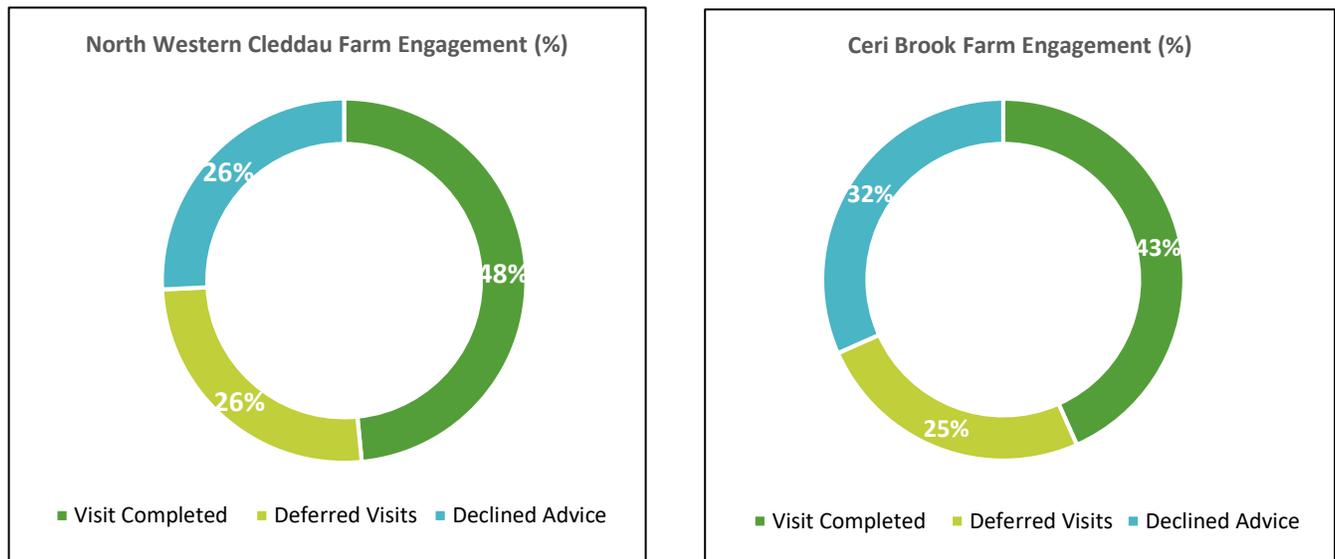


Fig 5: Success rate of contacts made during the project, based at North Western Cleddau (97 farms) and the Ceri Brook (60 farms).

Factors Affecting Uptake of Advice

Initially, farmers were particularly weary of the advisors. However, once the project and grant offer had been explained and landowners understood that advisors were also from a farming background, this immediately changed. In both catchments nearly half of the farmers approached requested a full farm plan. Where reports were written, grants and advice were offered. Approximately 25% of those cold called showed interest in a return visit, requesting Advisors to call back later.

After making the initial call, our Catchment Advisors noted several recurring factors that impacted on the delay/decline for a further visit being followed up, or grants offered not being accepted at all. These included:

- **Status of farm ownership:** Tenants were less likely to accept a farm visit first time round.
- **Cautious farmers:** Some farmers were initially worried about being reported to NRW.
- **TB testing:** Financial stress and anxiety of some farmers in West Wales led to grant not being taken up.
- **Retirement age:** Farmers did not want to pursue a visit as didn't feel the need to invest if about to retire.

Linking with other partnerships and exchanging best practice

Building on the expertise of the Afonydd Cymru/ Dwr Cymru (ACDC) steering group and in addition engaging with businesses 1:1, the Advisors attended local events and shows, marts and agricultural hubs to improve their visibility within the area. Catchment Advisors also made good links with other agricultural officers working within alternative projects and areas, aimed at reducing diffuse agricultural pollution. (ACDC's Catchment Advisors maintain strict confidentiality of all farms during any discussions between agri-officers).

Outside of the key ACDC steering group, additional working relationships were made during the course of the project. Key benefits of the wider working partnership included; farm referrals and new enquiries directed to our Catchments Advisors and up-to-date information that we could pass onto our contacts. Such projects and partnerships included:

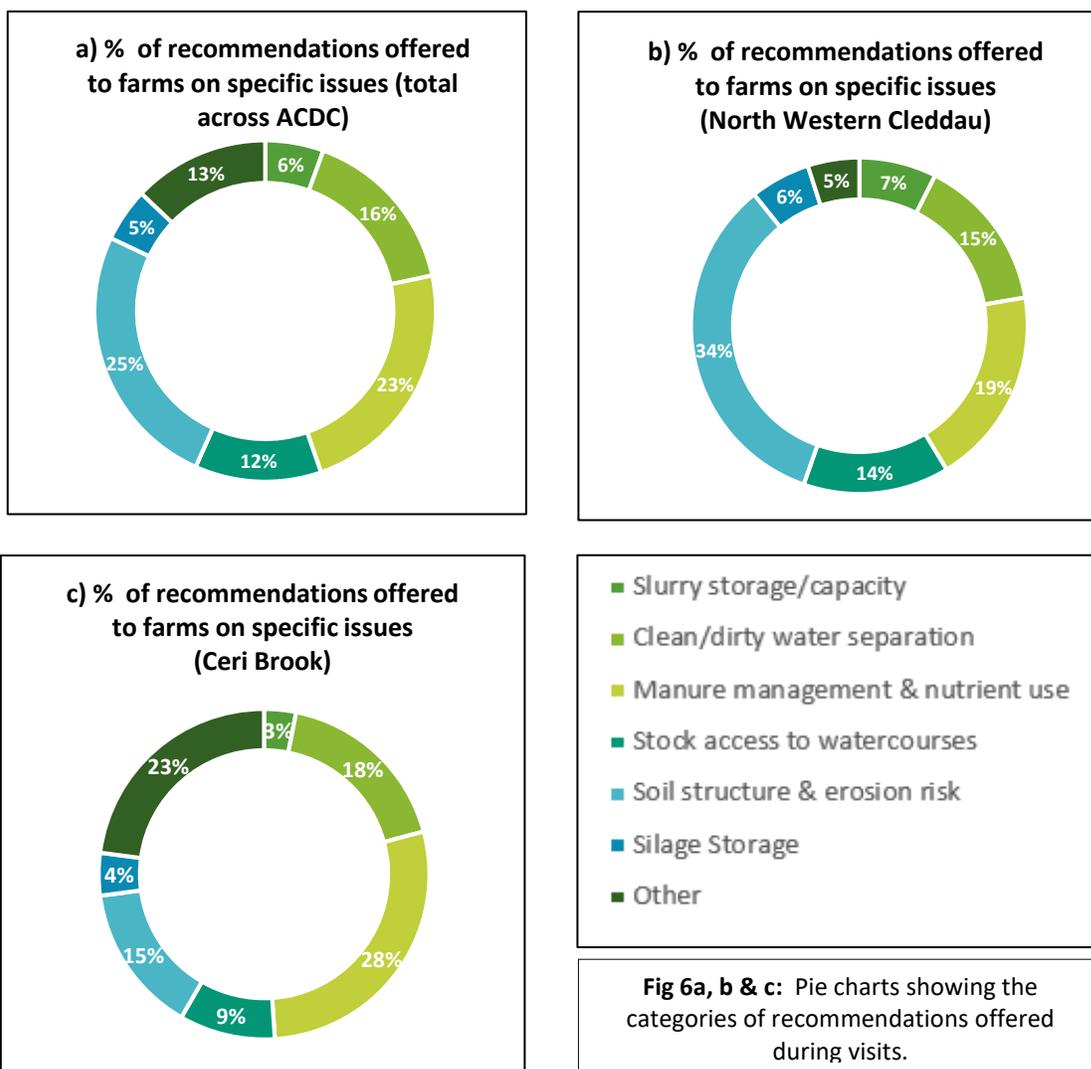
- Building Resilience In Catchments (BRIC) Project Officer
- DCWW Community Engagement Officer
- Estate Agents / Land Agents
- Farming Connect Area Officers
- NRW Dairy Project Officers
- Surveying the Waterway Environment for Pollution Threats (SWEPT) Project Officers
- The Slyri Project, Gelli Aur

4. On Farm Advice

Farm visits included beef, sheep, dairy and mixed holdings. The main element of the ACDC project sought to engage landowners on a confidential basis to assess and provide advice on the following elements:

- Farm yard infrastructure – slurry and manure storage capacity
- Clean and dirty water separation
- Manure management & nutrient use in field (SCIMAP)
- Stock access to watercourses
- Soil structure & erosion risk
- Silage storage

In total, 217 individual recommendations were offered, to a total of 61 farms, visited across both catchments. The figures below (Fig. 6a, b & c) show the breakdown of recommendations offered across both catchment.



The following sections summarise the issues identified, observations on why these issues occur and the best way for them to be addressed.

4.1 Farm yard infrastructure – slurry and manure storage capacity

Catchment advisors identified capacity issues with existing slurry storage and opportunities to reduce quantities of slurry produced.

The standard of slurry storage varied from farm to farm, with many farms failing SSAFO compliance. Some holdings had invested in purpose built stores so the structure was up to standard, but unfortunately not having adequate capacity (due to quantity of rainwater entering the system or subsequent increases in cattle numbers). In some instances the collection and storage of slurry is non-existent, either allowing it to escape across open yards or drain in to adjacent watercourses.



Fig 7: Pond used as a slurry store: not SSAFO compliant.

From calculations carried out by DEFRA, it is estimated that for every 1m³ of dirty water produced on a farm yard, 0.1kg of phosphate (P) is discharged to a watercourse or storage. Its value as a fertiliser is estimated at 0.60p. Advising Farmers on the P content value of their dirty water / slurry enabled some farms to make savings on future fertiliser needs. Some farms visited had entirely straw based systems or out-wintered stock to avoid the production of slurry. However, there were subsequent issues around poaching and compaction and the safe storage of solid manure tumped in fields, which had the potential to drain into a watercourse. These issues could be addressed through the introduction of the new slurry and manure regulations which will help to clarify how and where solid manure can be stored.

Recommendations to improve slurry and manure storage capacity:

1. Compliance with a regulatory baseline is required to bring up the standard of slurry storage on the majority of farms. The new regulations proposed for introduction from 2020 could resolve these issues if NRW are provided with adequate resource to enforce the requirements.
2. Increased awareness of what slurry is, how it should be stored and the consequences of allowing it to enter a watercourse will require wide-scale campaigns best delivered by partners like Farming Connect.
3. 1:1 advice is required on all farms producing slurry to assist with identifying compliance issues and providing recommendations for improvements where issues are identified.
4. Significant investment will be required on farms. The WG Sustainable Production Grant currently seeks to support these improvements however is vastly under resourced & infrequently available - resulting in very few holdings receiving support via this mechanism to date. A far larger scheme, accessible to all, is required in order to facilitate compliance with slurry storage regulations.
5. Increase opportunities on farm to reduce quantity of slurry produced, (see section 4.2), alternative bedding materials to counter lack of straw, slurry separation technology, etc.

4.2 Clean and Dirty Water Separation

The project identified opportunities to improve clean and dirty water separation to increase capacity in slurry stores and/or ensure nutrients are not allowed to enter clean water.

Over half the farms engaged had issues with clean and dirty water separation. On slurry based systems, improvements to basic infrastructure (such as gutter repairs) can eliminate significant quantities of clean water from what is already limited capacity within slurry stores. These simple interventions are often neglected but are absolutely essential in such a high rainfall area.



Fig 8: Example of clean water entering dirty yard area from broken downpipes, entering the slurry store and thus reducing storage capacity.

To encourage actions, where issues were identified as likely to be contributing to WFD failure, NRW's contribution facilitated a delegated grant. 35 of the 61 farms were offered grant for clean and dirty water separation, 17 farmers took up the offer and improved their infrastructure. This could have been significantly higher however had impending regulatory pressure arrived earlier. In addition to this initial work, some sites are looking to make larger scale improvements beyond the scope of the project grant and will subsequently make applications to Welsh Government Sustainable Production Grant. The majority of funded works provide improvements to clean and dirty water separation through installation or repairs to guttering, underground drainage, cross drains and concrete yards.

Recommendations to improve clean & dirty water separation:

6. There is a lack of understanding of what is classed as dirty water, with slurry and effluents often being categorised as such by farmers. A clear communication strategy will be required as part of the proposed new regulations to provide clarity on this issue.
7. 1:1 advice is required on all livestock farms to assist with identifying infrastructure issues and providing recommendations for improvements where issues are identified.
8. Improvements to correct all basic yard infrastructure like clean water separation should be a precursor to accessing any larger grant scheme to provide additional slurry storage. This should be inspected and approved by NRW prior to any subsequent fund being approved.
9. Significant improvements can be made with small levels of effort and investment, support via various mechanisms will improve uptake of advice. The grant support through this project was able to be administered in a quick & paperwork light fashion, which aids in uptake without compromising its ability to deliver improvements to water quality.

4.3 Manure & Nutrient Management

Utilise SCIMAP to increase awareness of risk in relation to slurry/manure spreading and where possible reduce overland flow which carries nutrients and sediment in to watercourses.

Due to the issues detailed in sections 4.1 and 4.2, subsequent spreading of slurry and manure can be a disposal operation rather than a well-planned application of nutrients to benefit the crop (see Fig 9).

Once sites have adequate capacity to store the quantities of manure and slurry produced, tools like the SCIMAP provide a guide for runoff risk based on topography. Afonydd Cymru has the capacity to produce SCIMAPs anywhere in Wales.

As well as managing risk from spreading, SCIMAPs can help identify fields which are a lower risk for:

- out-wintering stock,
- growing high risk crops like stubble turnips maize or swedes,
- storing FYM in field heaps,
- locating feeders ,
- livestock and machinery tracks
- Feedback from our farmers who have used the SCIMAP confirm they have been able to identify areas vulnerable if used for spreading



Fig 9: Poor slurry spreading techniques.

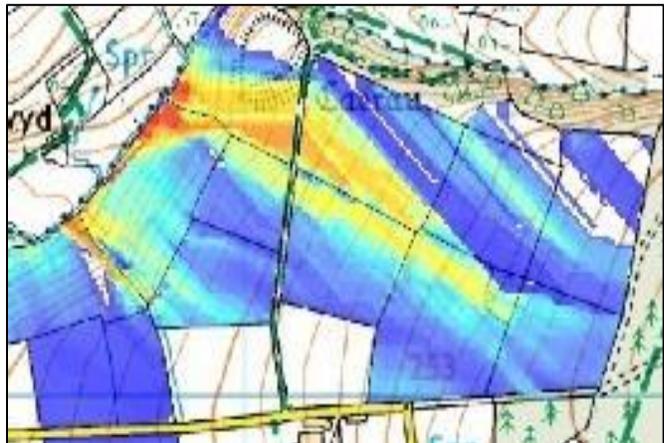


Fig 10: SCIMAP showing areas at risk of runoff.

Recommendations to reduce the risk of manure and nutrient runoff:

- 10.** Little assessment is carried out for considering risk during field operations. Use of a simple visual tool like SCIMAP can aid in this process and should be utilised when considering risk from the wide range of activities listed above. Areas identified as high risk should be considered as no spread zones during the winter period when runoff is far more likely to occur.
- 11.** This tool should be used to support WG schemes to avoid high risk crops, which are encouraged for inclusion in Glastir agreements, from being located in high risk fields.
- 12.** As can be seen in the example above (Fig.10), a buffer strip 5m wide, along the length of a watercourse, may not be as useful as a buffer strip 15m wide, at the highest risk point in the field. Agri-environment scheme options like buffer strips should be tailored to reflect this.

4.4 Limiting stock access to watercourses; avoiding direct losses of manure and bankside degradation.

The impact of livestock access to watercourses often splits opinion however, a New Zealand study found that cattle were 50 times more likely to defecate in water than on adjacent land. This study also concluded that 246 cattle deposited 37kg of faeces during two stream crossings.

Even without the direct input of faeces and urine entering the watercourse, the damage done to banks due to footfall by stock when accessing to drink can also be significant. The degradation of bankside vegetation through unrestricted grazing has an impact on shading and therefore water temperature, as well as bankside stability and increases its risk of sediment loss.



Fig 11: Drinking bay on the North Western Cleddau.

Of the farms visited during this project, over a third of farmers received advice about excluding livestock from watercourses and 8,223m's worth of fencing was offered as grant. In most instances these issues were not the highest priority for action on the holding due to other more significant issues like those identified in Section 4.1 & 4.2.

The cost of fencing, installation of water troughs and ongoing water bills were primarily the reasons given for not excluding stock from streams and rivers. Water is considered to be a "free" resource. Advice therefore focussed on raising awareness of the additional costs that can arise from stock entering watercourses including:

- exposure to waterborne diseases
- increasing conditions that favour liver-fluke
- lameness issues from slips and falls and
- additional stock handling time

Recommendations to reduce bankside degradation:

- 13.** The provision of alternative drinking water in fields adjacent to watercourses helps to reduce stock pressure and should be provided as a minimum.
- 14.** Where stock numbers are high or where grazing is for long periods of time, then fencing should also be installed to protect the bankside vegetation.
- 15.** Funding support from those who benefit, for example tourism and recreation, should be established to better monetise good management of river corridors.

4.5 Improving soil management to increase ability to hold water and improve grazing capacity.

All farm engagements included an optional FREE soil assessment to identify compaction and nutrient issues in three fields. Where compaction is present it not only increases risk of runoff, it also reduces productivity of both arable crops and grassland... in turn impacting on the profitability of the business.



Compaction was identified as a result of a number of practices:

- In arable fields, due to cultivation during poor conditions.
- In arable fields where organic matter levels had been depleted: soil no longer able to support subsequent vehicle traffic.
- In grassland due to overgrazing which had restricted root growth.
- In grassland due to grazing in wet conditions.
- In both arable and grassland due to slurry spreading activity during wet soil conditions.
- Poor grazing techniques.

Fig 12: Example of different soil assessments and biological activity observations made in farm reports.

Of the farms visited during the project, over a quarter of the recommendations given would address issues like those listed above. These issues again tended not to be the priority issue on the farm in terms of impact on water quality however, they do negatively impact on the farming business as a whole due to decreased yields and therefore need to be addressed in order to improve the sustainability of the system.

Recommendations to improve soil management:

16. Aeration allows oxygen and nutrients to reach the grass roots and encourages more vigorous growth.
17. By building in increasing organic matter levels, soils improve water retention capacity. It also increases trafficability and number of grazing days.
18. Consider alternative management of winter sheep grazing patterns for optimum grass feed and reduced soil compaction. Advised to use ADHB extract on rotational/paddock grazing options. See Appendix (ii) for example.
19. Consider strip grazing your fields to get the best results and prolonged grazing time.
20. Farmers were encouraged to come out with Catchment Advisors to soil pit test, with many accepting the invitation. We explained that worms are an important natural aerator. Worm casts contain on average, far more available nutrients than ordinary soil: 5x more N, 7x more P, 11x more K. Increased worm numbers can be maintained by limiting the frequency and magnitude of cultivation (this can kill up to 80% of worms) and limiting over application of slurry as worms can drown.

5. Farm Opportunities and Success of Grant Uptake

The grant pot of £18,500 was supplied by NRW. Afonydd Cymru were able to add a further £4800. This brought the 50% grant pot up to the total of £23,800. The uptake of the grant offered by Catchment Advisors was subject to the farmer being able to match the other 50% into the project. As part of the farm visit process, the amount of grant offered depended on the level of work required and related to the area of the farm. The size of farm buildings and acreage of farms varied within the two catchments. Farms visited in the North Western Cleddau tended to be larger holdings (up to 500 acres) thus requiring a larger grant offers, in comparison with the Ceri Brook, where farm sizes ranged from 13 -400 acres.

Figure 13a shows charts of how much of the 50% grant was originally offered across the North Western Cleddau Catchment (£39,046.54) and 10b the Ceri Brook (£26,318.66).

It took some time before the first grant was signed up in both catchments, as farmers were cautious of the ACDC offer and many had never accessed grants before. However, once word spread and farmers grew to know Advisors, momentum of the visits and grant sign off exponentially increased.

Across both catchments 61 farmers were offered a total of £65,365.20 grant towards

improvement. It could be as little as six weeks from the first farm visit to potential sign up and payment. Catchment Advisors had to use their judgment as to which farm had priority. At the time of grant sign off, the total amount offered and signed off may not always have been the total amount actually spent when work was

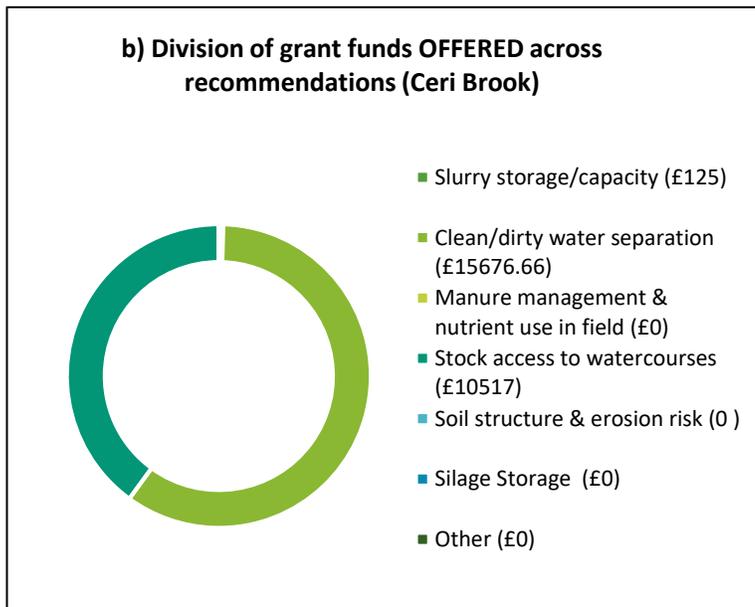
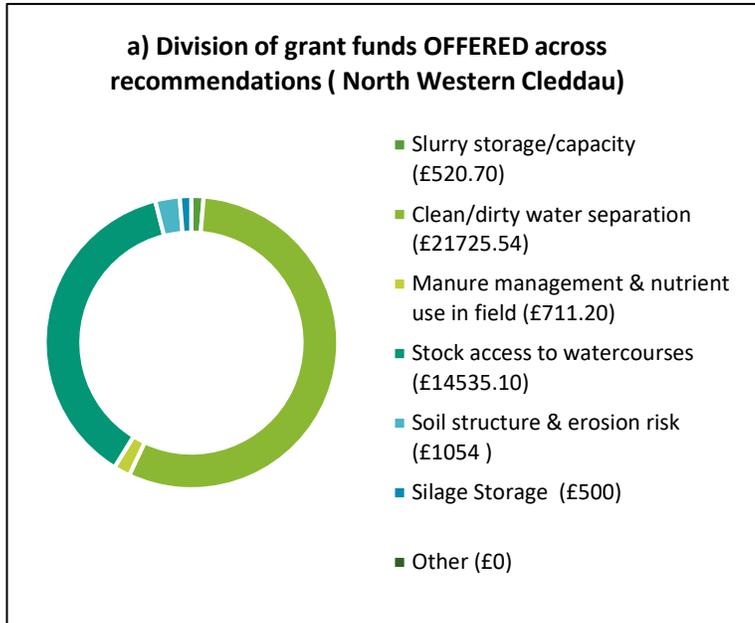


Fig 13: Graphs to show where the division of grant was offered in a) North Western Cleddau and b) Ceri Brook.

complete. The 50% ACDC grant offer never changed once signed for, but farmers had the choice to spend over the 50% match funding if they so wished. Very few did. However, if they found the contractor's bill came to a lower amount, they received 50% of that lower amount.

We also found some farmers actually spent under their anticipated contribution. There were several reasons for this: farmers 50% contribution had become unavailable, family bereavements hindered work being completed, time constraints, ill health, lack of extra labour, weather conditions making fields inaccessible and TB testing and results changing priorities and cash flow.

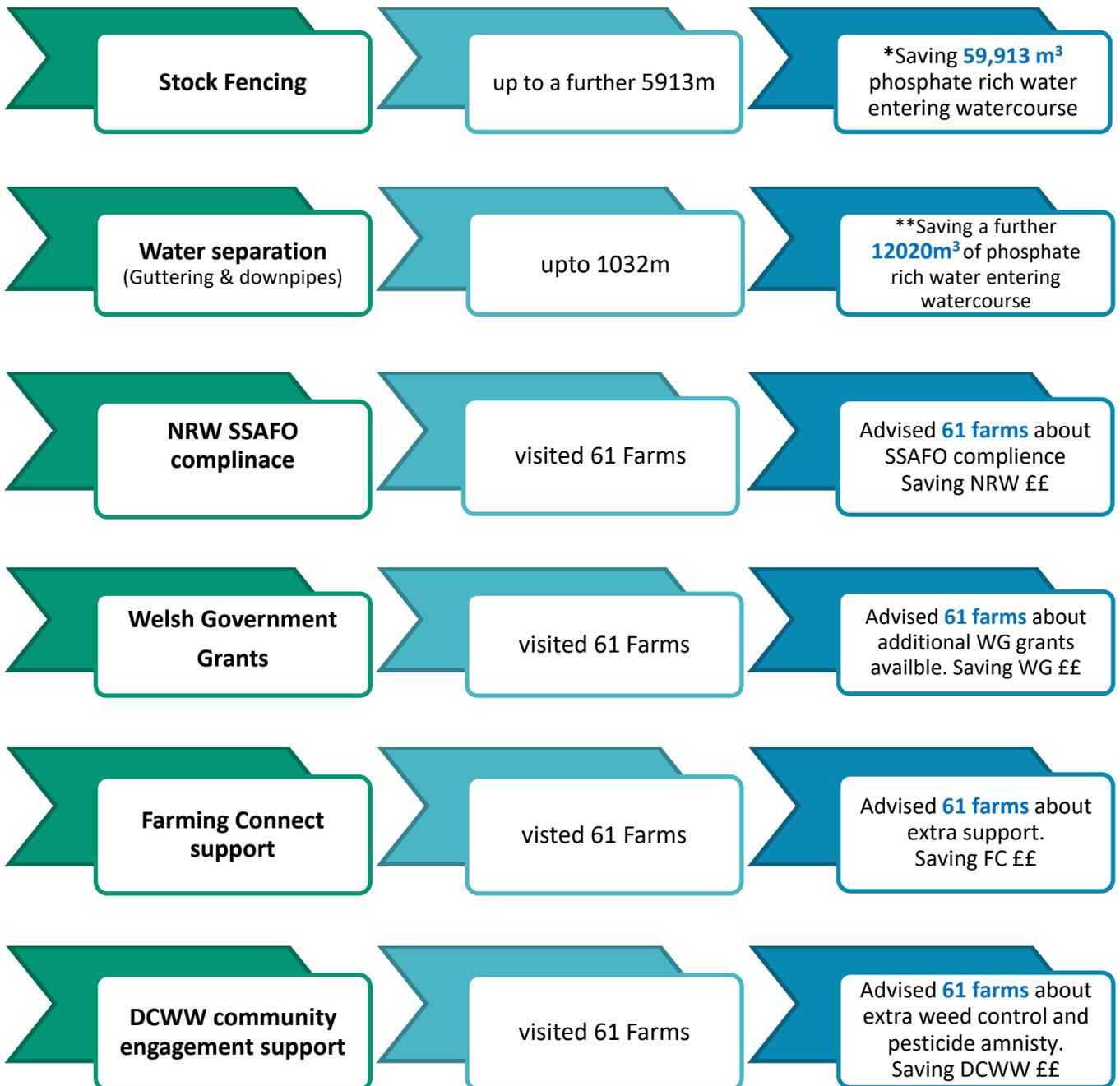
In this next section are several images which show before and after photos of the work completed with the assistance of the 50% grant. The ability of this grant to be flexible and offer practical solutions has been able to solve environmental issues, whilst still saving the farmers thousands of pounds. Many improvements we found to have paid for themselves within the first year.



Fig 14: Photos showing before and after capital work improvements where 50% grant funding was spent by farmers. This includes new guttering infrastructure and stopping stock accessing the waterways and poaching the banks.

6. Additional Benefits of farm visits

On top of the advice and grants offered by the two Catchment Advisors and received by landowners, the wider potential of the project is included below in **Figure 15**, which shows benefits not taken up by holdings as entire grant had already been disbursed:



*Typical 10 year rainfall variation from average is +/- 10% giving savings of 53921M³ min - 65904.3M³ max (top right)

**Typical 10 year rainfall variation gives savings of 11898M³ min – 13222M³ max

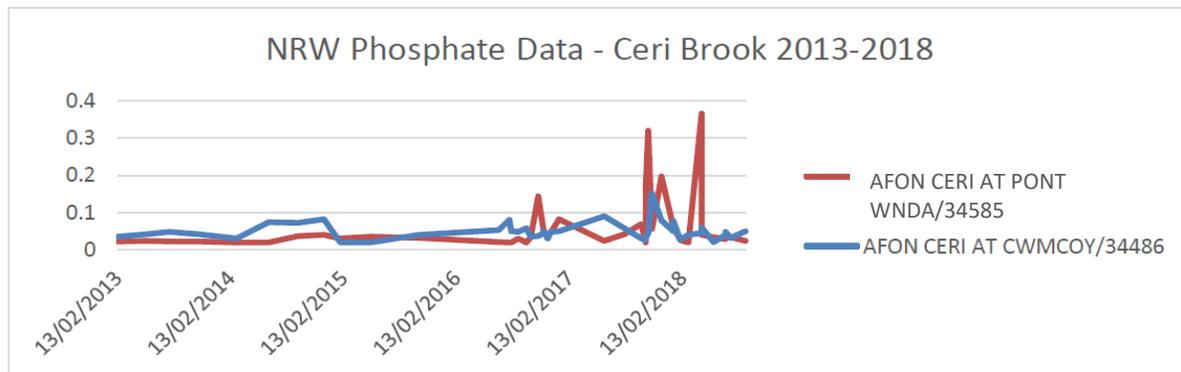
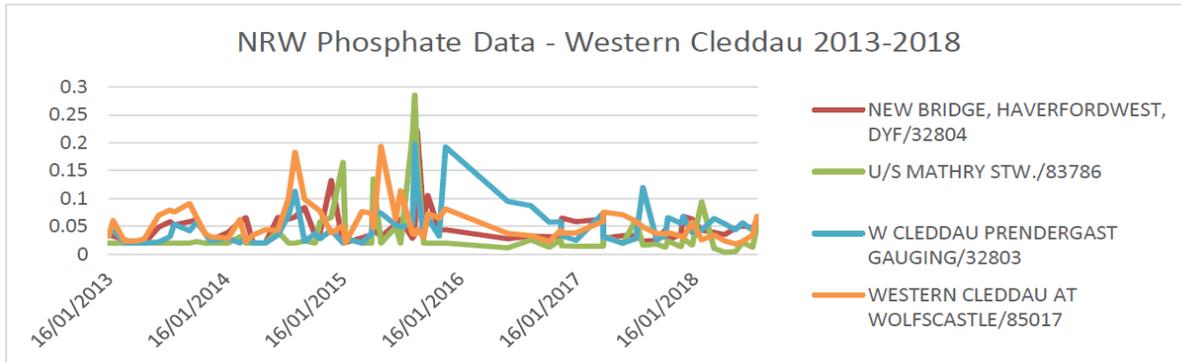
Farmers Feedback and Support

As part of the independence of farm visits, our Catchment Advisors were able to have frank and open conversations with the farmers. They were asked if they had any further ideas of where support would be needed for their business to develop and what it would consist of. These comment were then filtered back to Welsh Government grant consultation during the project. Comments focused on:

- Covered yards
- New sheds
- Farm advisor / farm Liaison Officer
- Bigger slurry store
- Grants for building works and environmental schemes
- Larger grants
- 100% grants for yard coverage
- Bigger lagoon
- More shed space
- Covered slurry pit
- New roof for muck heap



7. Monitoring



Formal sampling data collection has been undertaken by both Dwr Cymru and NRW in the Ceri Brook and Western Cleddau. Data has been collated for both of water bodies, see Fig 16. We believe the physical impact of infrastructure work which Advisors have funded and signed off may only be able to be assessed until a minimum of a year of installation. Updated data from NRW and DCWW will be required.

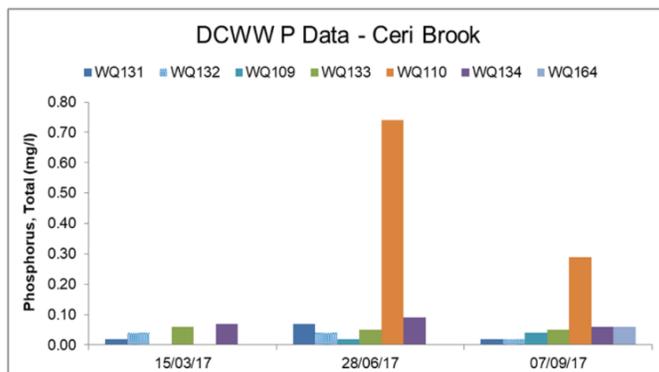
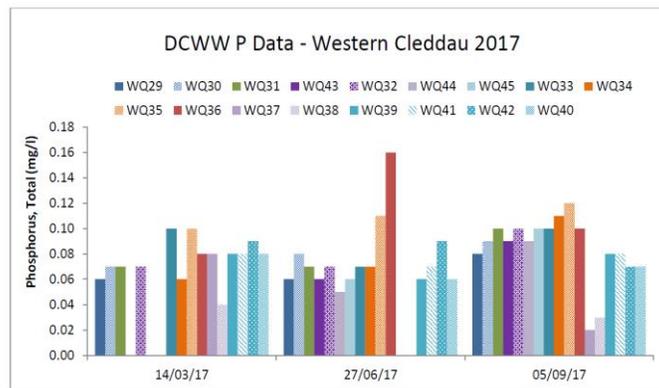
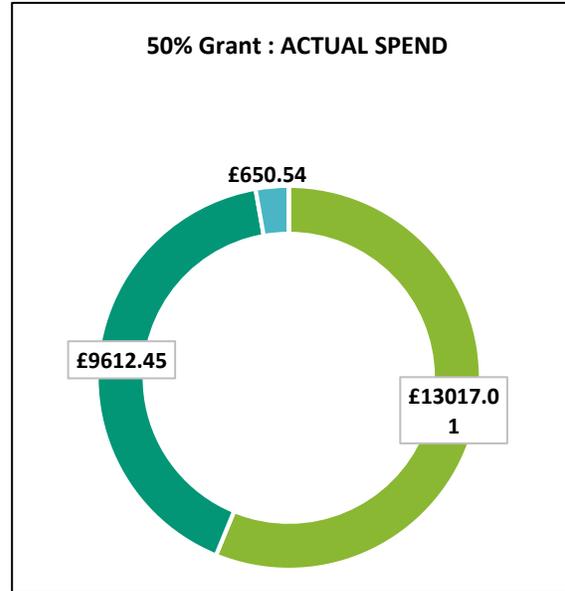
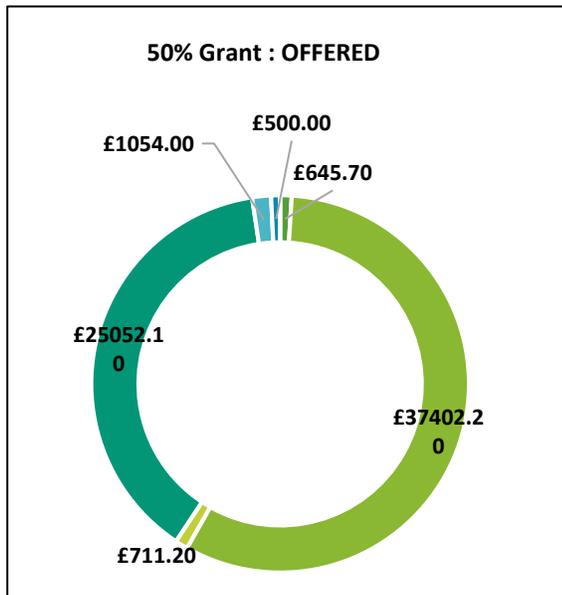


Fig 16: Monitoring data of Phosphate by NRW and DCWW of the Ceri Brook and the Western Cleddau.

8. Project Finance

During this project, before the 50% grant offer is taken into account, a total of £130,730.40 worth of improvements were identified on 61 holdings. Averaging £2,143.12 per farm. Of those 61 offered, 20 farmers took up the grant. From the 1st March 2019 the project reverted solely to the management of Afonydd Cymru which brought significant cost reductions and the project life was extended.



KEY

- Slurry storage/capacity
- Clean/dirty water separation
- Manure management & nutrient use
- Stock access to watercourses
- Soil structure & erosion risk
- Silage Storage
- Other

Fig 17: Pie chart showing where the proposed 50% grant offer was directed across the ACDC project (totaling £65,365.20).

Fig 18: Pie chart showing where the actual 50% grant monies were spent across the ACDC project (totaling £23,280).

The two graphs below give a breakdown of the costing's associated with the ACDC project.

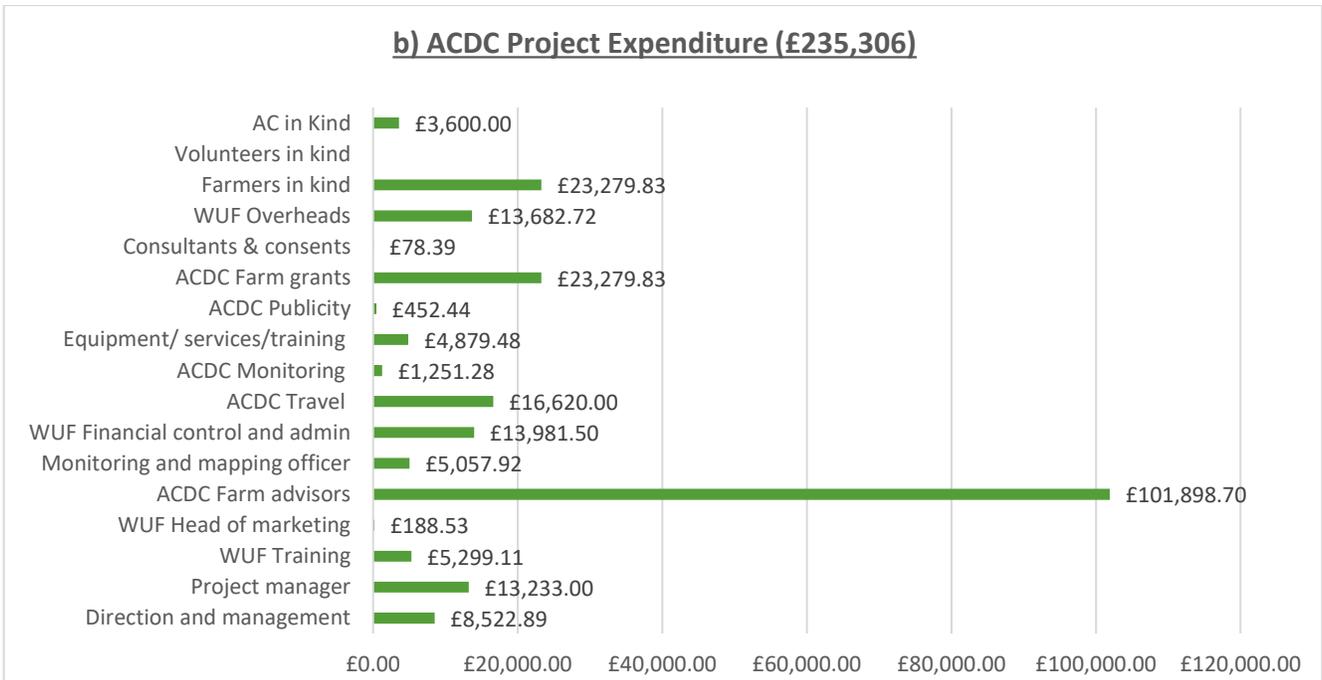
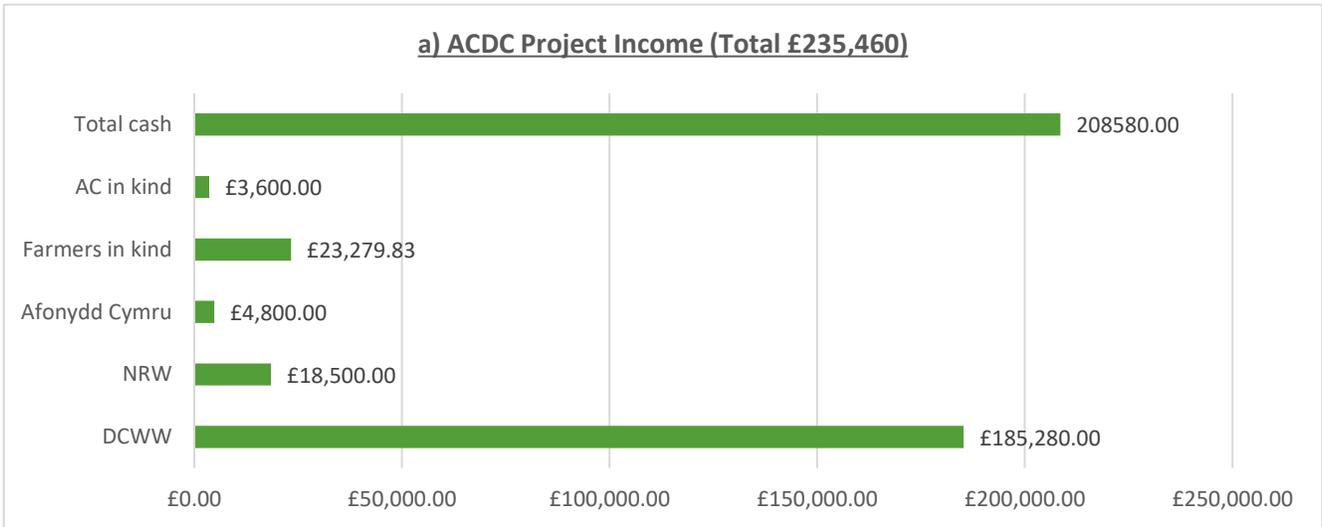


Fig 19: Bar charts showing a) income and b) expenditure of the ACDC project.

9. Discussion and Recommendations

The ACDC project was the first example of a River Trust 1:1 advisory project in West Wales. Without knowing the type of support this project would gain from landowners and partners, it has been a steep, yet positive learning curve. The original proposed farm visit targets may not have been met, however the grant pot was heavily oversubscribed and more benefits beyond 'target' numbers have been achieved. We have sought additional funding to increase the benefit of our farm advice.

By far the most crucial aspect of the project is in relation to the *actual* removal of diffuse pollution from our rivers and streams. On the basis that every M³ of farmyard dirty water contains 0.1Kg of Phosphate and that we can calculate not only the amount of water safely diverted from dirty yardscoupled with the other remedial actions highlighted in the project. We know the cost of achieving this per farm holding. The project will have removed 4.6 tonnes of Phosphate* annually. The cost for the grant for this was £23,280 with the farmers themselves contributing an equal amount.

We discovered that while some farmers, including tenants were worried about the costs of investment in large scale storage and other infrastructure, both owners and tenants saw the benefits to both their farm and to water quality in making these small but important infrastructure changes.

It became apparent that the return on this investment was often only about 12 months and for some it heralded further thoughts about more wide scale changes, but this benefit came from the 1:1 relationship with the farm advisor.

We found progress was not in any way halted by a refusal as often the next farm was receptive and once the knowledge that new regulations were in discussion, by the end of the project we did not have enough grant to satisfy requests.

Finally, we suggest that if regulations are in place to ensure poor slurry spreading (which we regard as a point source pollution) is proscribed, then there is a chance that very significant improvements in our water quality could be achieved.

***In addition to phosphate removal, a corresponding amount of Ammonia / Nitrates will also be removed along with pesticides and unwanted pathogens.**

Other positive outcomes and comments

- Improvements linked to water quality can be traced back to some inexpensive actions made on the farm and farm buildings. It was paramount to provide a business case for farmers before they took any offer seriously.
- A close working relationship between DCWW, AC, NRW and WG is essential for ensuring best use of resources, consistent messaging and that a regulatory baseline is quickly in place.
- Not all grant offers to improve poor infrastructure are taken up by farmers, this can be due to a combination of factors; lack of regulatory pressure was key here as there is no perceived consequence for bad practice. This changed during the project. Financial limitations within the business were also a concern in order to match fund grant offers.
- The level of cost needed to bring change as typified in this project was no less attractive to tenant farmers whereas larger cost schemes are very often rules out.
- It is low cost actions on many farms (of large schemes on few) that is most likely to reduce diffuse pollution.
- Utilisation of Welsh Government grant schemes has been limited as they are often not fit for this purpose and are always over-subscribed, with inadequate targeting. Farmers can be intimidated by the lack of personal support.
- Catchment Advisors, with a knowledge of the farming sector and practices, were key to the success of securing a farm visit. Once farmers knew Advisors were not there to report or inspect they were much more accommodating.
- Many of the farms visited were not SSAFO compliant in some way (slurry store, silage clamp or fuel tank not double bunded). It was part of the Catchment Advisors role to inform in the farm report and offer advice on SSAFO, directing farmers to the NRW website or leaflet.
- Future projects will need to deliver a broader range of advice, better use agri-support schemes and develop new markets in order to achieve a greater variety of ecosystem services and reflect the direction of travel of a new post Brexit Farm Scheme.
- More emphasis should be made on the link between diffuse pollution and the quality of drinking water. Many farmers, who are customers of DCWW did not make the connection that the diffuse pollution from their farm could increase their cost as a customer.

- In addition, those farms we have successfully engaged will need ongoing support. Similar advice will be required in other catchments where diffuse pollution remains the limiting factor in achieving good ecological status.
- The ACDC project enables a reasonably accurate estimate of the quantity of phosphate removed from a watercourse and the cost for so doing ($M^3 = 0.1kg P$).
- Projects longer than two years should be considered. It took a lot of time to gain the farmers trusts. At the end of the ACDC project when momentum picked up, a further £12,000 worth of grants could have been offered. More improvements could have been completed, had the funding pot been larger.

We show again a breakdown of the figures that have evolved across the ACDC project below:

65,365	GBP of total grant at 50% offered to farmers across the catchments
46,560	GBP of total improvement work spent on farms
45,837	M^3 less dirty water entering the catchment via point source and diffuse pollution
23,280	GBP of grant at 50% spent on farm improvement works to assist with water quality improvements
11,236	Acres of farmland engaged within the two catchments
8,223	M's of fencing recommended to keep stock out of waterways and improve water quality
2,320	M's of fencing erected to keep stock out of waterways and improve water quality
2,052	M's guttering installed to keep clean and dirty water separated
4583	Kg of phosphates removed annually from two watercourses (4.6 Tonnes)
217	Individual recommendations suggested to improve farmers businesses
157	Farmers positively engaged with across the catchments
61	Suitable farmers offered grants and advice to make improvements
20	Farmers accepted grant and made improvements
8	Partner organisations involved
5	Drinking bays blocked
2/3	Catchment Advisors
1	Rivers Trust

Listening to farmer's feedback.....

Based on feedback from a short evaluation form included at the end of the visit, farmers were very happy with the knowledge and practical ability of Catchment Advisors. All farmers found the information included in the reports very useful. See Appendix iii) for example evaluation form. Some parting comments from landowners include:

-
- “Farm advisors with practical knowledge which can balance environmental knowledge is key”
 - “Continue with farm visits with farming understanding officers”
 - “Personal cold calling method and farm visit was the reason for taking up grant. A phone call would not have worked”
 - “As tenant farmers, early contact with the landlord (Pembrokeshire County Council) would have been useful.”
 - “100% grants in future please”
 - “Longer in catchment permanent / 5 years in catchment”
 - “Continued presence in Catchment”
 - “The advice we were given was wide ranging and we were pleased with it.”
 - “Run the project in the catchment area again, it takes a long time for word of mouth to get around.”
 - “The funding has been easy for us to access because of our Catchment Advisors willingness to sit at our kitchen table and fill out all the paperwork!”
 - “The Roof area m² figures were very useful in checking how many down pipes were needed on larger roof areas”

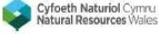
Future Recommendations:

For future projects, our suggestions include:

- Promotion of the cost effectiveness of Phosphate removal by ensuring clean and dirty water separation across a larger catchment
- Build capacity to increase number of independent Advisors
- Work alongside local Farming Connect officers in catchment and speak at local events
- Promote the project wider by attending more farming events
- Include a better coverage of holdings to include beef, sheep and potentially horse and poultry
- Work at building closer relationships with landlords, e.g. County Council
- Provide reports which include:
 - Potential phosphate cost saving table
 - Slurry capacity calculation (aligning with SSAFO regulations)

Appendix (i)

Bilingual leaflet used to promote the project and Grants

<h2 style="color: green;">Gorllewin Cymru</h2> <h3 style="color: blue;">Prosiect rheoli maetholion a phridd</h3> <p style="text-align: right;">  Afonydd Cymru Caring for Welsh Rivers </p> <p>Yn eich dalgylch gall ein hymweliadau fferm gynnwys:</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  <p>FFENSIO A CHYFLENWAD ARALL O DDŴR I STOC Medrwn eich <u>helpu</u> i wella rheolaeth stoc a lleihau'r risg o'r stoc yn dod i gysylltiad â chlefydau sy'n cael eu cario mewn dŵr drwy wella cadernid glannau'r afon a safon y dŵr.</p> </div> <div style="width: 50%; background-color: #c8e6c9; padding: 5px;"> <p>Ymweliadau fferm cyfrinachol ac am ddim, sy'n cynnwys cyngor a photensial am arian grant</p> </div> <div style="width: 50%;">  <p>RHEOLI DŴR GWASTRAFF O'R CLOS FFERM Medrwn rhoi <u>cyngor</u> ynglyn â sut i osgoi llygredd o ddŵr gwastraff o'r clos drwy wella rheolaeth o ddom, slyri a defnydd o bla laddwyr.</p> </div> <div style="width: 50%; background-color: #ff9800; padding: 5px;"> <p>Cynnwys 3 prawf pridd am ddim ynghyd â phrawf deunydd organig</p> </div> <div style="width: 50%;">  <p>ASESIADAU SRWYTHUR PRIDD Medrwn <u>asesu</u> deunydd organig, strwythur pridd a lefelau maetholion gan eich helpu i gynnal iechyd haenen ucha'r pridd a lleihau dyfr lenwi'r tir.</p> </div> <div style="width: 50%; background-color: #0070c0; color: white; padding: 5px;"> <p>EICH DALGYLCH: Gorllewin Cleddau, am ragor o wybodaeth cysylltwch a'ch Ymgynghorydd dalgylch: Jodie McGregor ar 07881 092 882</p> </div> <div style="width: 50%;">  <p>MAPIO LLIF DŴR GWASTRAFF Medrwn <u>gynhyrchu</u> mapiau risg syml ar eich cyfer sy'n cynnwys, llethr, mathau o gnydau a glawiad er mwyn eich helpu i gadw'r uwchbridd ar eich caeau.</p> </div> <div style="width: 50%;">  <p>GRANTIAU A CHYNLLUNIAU AMGYLCHEDDOL Er mwyn gwella CYNNYRCHEDD ac ELW ar eich fferm, medrwn rhoi help ac arweiniad ynglyn â grantiau cyfredol a chynlluniau Glastir.</p> </div> </div> <p style="font-size: small;">Gweithio mewn partneriaeth â:</p> <div style="display: flex; justify-content: space-around; font-size: x-small;">     </div>	<h2 style="color: green;">WEST WALES</h2> <h3 style="color: blue;">Nutrient and Soil Management Project</h3> <p style="text-align: right;">  Afonydd Cymru Caring for Welsh Rivers </p> <p>What our farm visits cover in your catchment:</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  <p>FENCING & ALTERNATIVE WATER FOR STOCK We can <u>help</u> improve stock management & reduce the risk of stock exposure to waterborne disease by improving the bank stability & water quality.</p> </div> <div style="width: 50%; background-color: #c8e6c9; padding: 5px;"> <p>Free and confidential farm visits, including advice and grant funding</p> </div> <div style="width: 50%;">  <p>MANAGE RUN OFF FROM YARDS We can <u>advise</u> how to reduce the risk of yard run off via drainage improvements including manure, slurry and pesticide management.</p> </div> <div style="width: 50%; background-color: #ff9800; padding: 5px;"> <p>Includes 3 FREE soil tests, plus organic matter testing</p> </div> <div style="width: 50%;">  <p>SOIL STRUCTURE ASSESSMENTS We can <u>assess</u> organic matter, soil structure and nutrient levels helping you to maintain good sward health & reduce waterlogging.</p> </div> <div style="width: 50%; background-color: #0070c0; color: white; padding: 5px;"> <p>YOUR CATCHMENT Western Cleddau, for more information contact your Catchment Adviser: Jodie McGregor 07881 092 882</p> </div> <div style="width: 50%;">  <p>RUN OFF RISK MAPS We can <u>produce</u> simple risk maps for you taking into account slope, crop type & rain-fall, helping you keep your topsoil in your field.</p> </div> <div style="width: 50%;">  <p>GRANTS & ENVIRONMENTAL SCHEMES To help improve PROFITABILITY and PRODUCTIVITY on your farm, we can also give assistance and guidance with current grants and Glastir schemes.</p> </div> </div> <p style="font-size: small;">Working in Partnership with:</p> <div style="display: flex; justify-content: space-around; font-size: x-small;">     </div>
---	--

Appendix (ii)

Common grazing strategies taken from the AHDB Manual 8, [Planning grazing strategies for Better Returns booklet](#)

8

Common grazing strategies

There are many ways to achieve sward height or pasture cover targets. One strategy does not fit every farm and there is always a need for flexibility depending on the year. It may be that continuous grazing is practised early in the year with cows and calves, then growing cattle are grazed using a paddock system.

Optimising production from grassland is a balance between utilisation, yield and management input.

Is the hassle of moving fences and updating infrastructure worth it?

Generally with a strategy that gives the grass a rest, eg by moving stock to another field, the yield will go up by around 20%. If the grazing pressure is then tightened by putting in temporary fences, utilisation will be increased.

More information on fencing options can be found online in [BRP+ Electric Fencing for Livestock](#).

The example in Table 5 suggests moving from set stocking to paddock grazing can almost double grass yield. If the cost of buying in an extra 3.9t DM/ha of feed is compared to buying some fencing and troughs that will last five years or more – the answer is yes.

Table 5: Effect of moving from a set stocking to paddock grazing

Strategy	Annual yield (t DM/ha)	Utilisation (%)	Useable yield (t DM/ha)	Percentage increase
Set stocking	6.0	50	4.3	
Continuous (variable)	8.5	60	5.1	20%
Rotational	10.2	65	6.6	56%
Paddock	10.2	80	8.2	92%

Research carried out in Ireland has shown that every hour spent on grassland management, be it moving fences or troughs or measuring grass, is worth €100 (£85).

Worm control and grazing management

Grazing management can be used to reduce the dependence on wormers and flukicides, but requires significant planning. The elements that reduce parasite burdens are grazing with other classes of stock, eg grazing with sheep one year and cattle the next, using the fields for conservation for some or all of the year, or grazing new reseeds after a forage or arable crop.

Sheep

High risk fields are any that had any sheep (including ewes and lambs, store lambs or replacements) or goats grazing the previous year or earlier in this season. The risk reduces to medium if only adult non-lactating sheep were grazing the year before, or if a cut of hay

or silage was taken from that field the previous year. Grazing with cattle the previous year or earlier in the season also reduces the risk to medium.

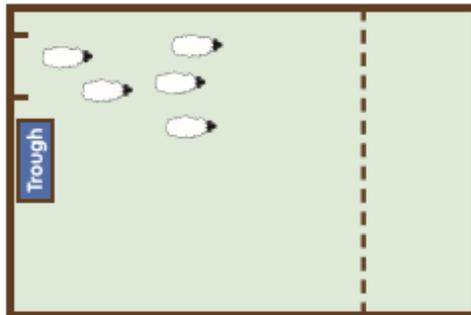
Cattle

For cattle systems apply the same principle, with land that has seen cattle the year before generally high risk, while having sheep in the system reduces the risk. The objective is to dilute the number of worms that affect cattle with sheep worms and vice versa.

See Sustainable Worm Control Strategies for Sheep at www.scops.org.uk and Control of Worms Sustainably (COWS) at www.cattleparasites.org.uk for more details.

Continuous (variable) grazing

Stock can graze a particular area throughout the season and no fields are generally left ungrazed for more than a few days. However, areas can be closed up to control sward quality if sward height or cover exceeds targets.



Pros

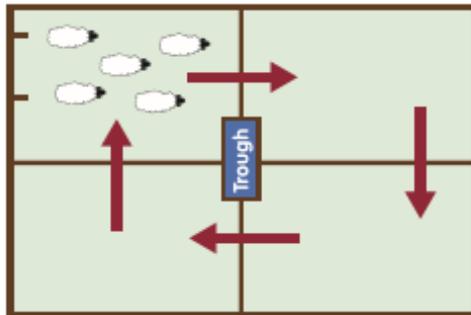
- Low management input
- Low capital costs
- Can work well if sward height targets maintained

Cons

- Lower forage yield
- Can be difficult to maintain grass quality and even sward height
- Uneven manure distribution
- Lower utilisation due to trampling
- Weeds can build up

Rotational grazing

Stock is moved around a small number of fields based on sward height or pasture cover targets, or after a certain number of days.



Pros

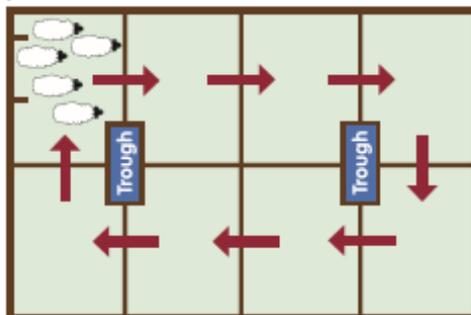
- Higher productivity than continuous grazing
- Allows the pasture to rest and re-grow
- Can extend the grazing season
- More even manure distribution

Cons

- More fencing required and water provision increases cost
- Forage production and pasture utilisation is not optimal

Paddock grazing

Stock is moved frequently through a series of paddocks based on measured grazing heights or pasture covers.



Pros

- Highest forage production and use per ha
- Provides very high quality feed – 11-12MJ of ME
- Higher stocking rates can be sustained
- More even manure distribution
- Weeds can be controlled through grazing
- Reduced need for conserved forage by extending the grazing season

Cons

- Requires careful monitoring of forage supply
- Initial costs of fencing and water provision may be high
- More management intensive

