



Title: Pembrokeshire Coastal Forum: WP2 Catchment Sensitive Farming Deepford Brook case study

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Executive Summary

This case study reviews the Catchment Sensitive Farming (CSF) project evaluation study (2008), undertaken by Welsh Government on Deepford Brook in Pembrokeshire and the Twrch and Llafar tributaries, Bala Lake, with a view to tease out the salient points that are relevant for a future Payment for Ecosystem Services (PES) scheme. The overall aim of the CSF pilot project was to raise awareness of catchment sensitive farming issues, to trial innovative pollution abatement techniques and to evaluate the impact of these measures on water quality. The water quality issues on Deepford Brook are poor oxygen levels and elevated nitrate concentrations and the high phosphorous concentration in the Twrch and the Llafar.

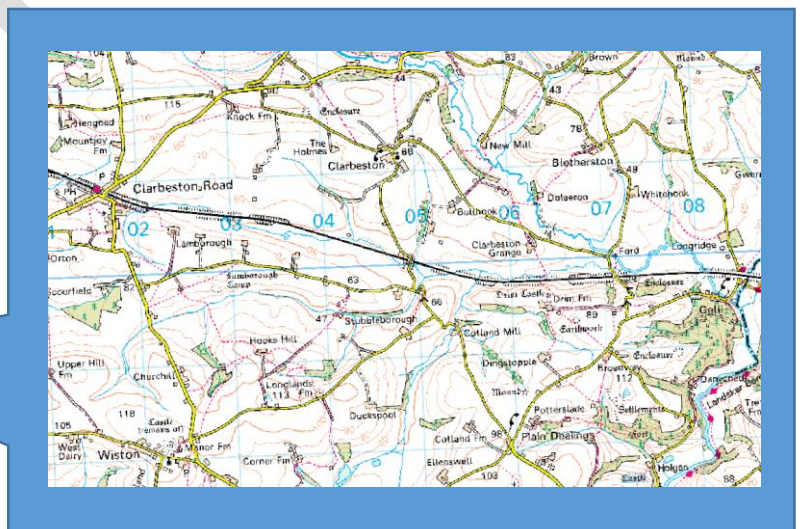
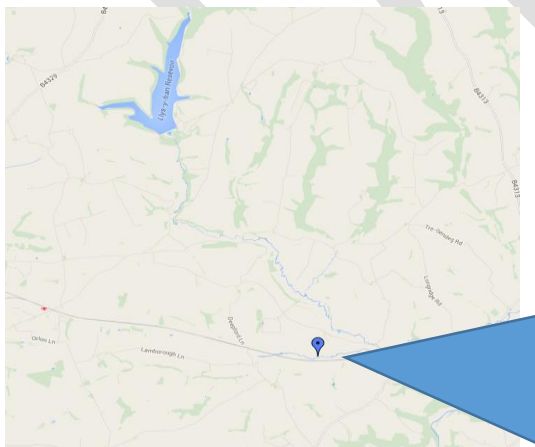
The percentage of land entered into the Deepford Brook catchment was 67 ha which equates to about 0.005 % of the catchment area. The impact of the pollution prevention work is unknown as water quality monitoring data is not available. However, the total cost of putting the measures in place was on average £19,000 per farm of which 60% was grant aided.

Evaluating environmental improvements and providing this information back to the CSF group was limited but was highlighted as an important issue to encourage participation. The water quality issues differed for the three rivers and this was reflected in the uptake of the appropriate mitigation methods. The dairy farms of Deepford Brook favoured farmyard infrastructure improvements whereas the Bala catchment favoured field nutrient management techniques to improve the water quality.

Investment for project initiation, monitoring and data management, along with capital investment should be costed within a PES scheme. Improved communication such as applications, remote sensing and continuous monitoring techniques can be accessed by all participants on personal mobile phones and personal computers. This will enhance inclusivity into a PES programme for the community and the wider interested public.

1 Introduction

In 2005 the Welsh Government set up the Catchment Sensitive Farming (CSF) pilot project on three catchments in Wales; the Llafar and Twrch tributaries which discharge to Bala Lake and Deepford Brook, tributary of the Eastern Cleddau in Pembrokeshire. Deepford Brook catchment is shown below.



The CSF project, (October 2005 to December 2007) was open to farmers with at least 10 ha within the Deepford CSF catchment, which has an area of about 183 km².

The aim of this case study is to highlight the points raised in the CSF pilot study that may help to shape a future Payment for Ecosystems Services (PES) scheme.

2 Objectives

Overall aim

The purpose of the CSF project was to

- ❖ Raise the awareness of CSF issues
- ❖ To trial various practical measures to reduce diffuse pollution
- ❖ Evaluate the effectiveness of the trials upon water quality

The Wales Catchment-Sensitive Farming Demonstration Project Evaluation Project (November 2008) Report, as reviewed for this case study, evaluates the effectiveness of the CSF demonstration project in changing farmer attitudes, how the project influences farming practices and the how those changes in farming practices are reflected in improving water quality. The CSF evaluation makes recommendations for future employment of pollution prevention mitigation measures within the farming sector in Wales.

Under the CSF scheme 60% capital grant funding was available to tackle diffuse pollution through a range of measures such as improved fertiliser use (organic and non-organic), prevention of sediment loss, stock feeding and watering areas, fencing and farmyard infrastructure works. The capital grant provision covered a range of works such as the purchase and installation of troughs and piping, hard standing areas, culverts and piping, stream bridges and bankside works. For farmyard areas, capital investment was available for new/repair concreted areas, roofing, manure stores and dirty water drainage. The costs for the capital works ranged from under £100 to over £130,000 for new silage stores. However there are financial constraints in the total amount of grant aid provision under the CSF scheme of £10,000 or £20,000 for exceptional cases.

Along with capital funding, free nutrient planning advice was provided, which would include free soil sampling and analysis, free nutrient consultation and provision of a nutrient management plan. Additional payments were also offered for those farmers willing to participate in any consultations or willing to adopt any additional activities such as maintaining diaries, records for stock etc. As an example of payment, a participant was paid £25 as a disruption recompense for undertaking a survey interview.

Each of the three catchments had an assigned Catchment Officer who acted as a single point of contact for the participating farms. Water quality monitoring was undertaken for two years as part of the CSF pilot project but the results were not concluded at the time that the evaluation report was drafted.

Survey responses

The CSF evaluation report is considered in this case study to capture salient points and lessons learned that may support the development of a Payment for Ecosystems Services (PES) scheme.

1. Collaborative working - there is a potential difficulty in neighbouring farmers working towards a common goal over a long period, as there is a concern about “taking on other people’s problems” – and the potential “falling out” with neighbours. Any PES scheme which required inter-farm cooperation would need to be sensitive to inter-farm relationships and the willingness to support one another.
2. Value for money - All CSF participants were keen to see the “fruits of their work” – and requested to see the scientific evidence that shows the impact of the diffuse pollution prevent work that they

had undertaken at the farm and how their efforts had changed water quality. The provision of the water quality data to the participants would have had a benefit for the perception of “value for money” and cost benefit. On this basis many farmers could not see the benefit of the CSF scheme as water quality data was not available at the time and the data to show the economic benefit to the rural economy was also not available. The monitoring and evaluation of environmental and socioeconomic benefits is valuable throughout the term of a PES scheme. In order to capture the impact of any works under PES it is suggested that any monitoring includes baseline, current and post-project periods, and that the data is accessible to the project participants as a “performance indicator”.

Due to Objective 1¹ funding constraints 95% of the grant had to be spent on capital works and land agreements could not be made. This restricted that measures that could be deployed at the field level.

3. Evidence for water quality status - farming practices causing water nutrient enrichment through the input of nitrogen and suppression of Dissolved Oxygen (DO) are highlighted as the main diffuse pollution issues in Deepford Brook and these are mainly attributed to dairy farming practices.

The CSR evaluation report states that there was a requirement to show evidence before an acceptance and acknowledgement by the farming community that there was a water quality problem within the catchment. However, for the three catchments there was a lack of baseline water quality data and insufficient post project data to show any improvements. The impact of mitigation measures upon water quality can take several years to show and the two-year post project sampling regime is unlikely to reveal any changes in water quality. It is highlighted that the impact of the investments made in the CSF programme was particularly important in maintaining the momentum of the programme of works. Chemical monitoring is not the only method of environment monitoring as there are other mechanisms to show changes in the changes in the quality of the environment such as remote sensing, habitat and biological monitoring, and these should be considered for inclusion in a PES scheme.

The understanding of the goals to be achieved in PES is crucial. For Deepford Brook, suppression of dissolved oxygen (DO) in the headwaters was the primary goal but it is not clear that this was made apparent to the participants of Deepford Brook CSF project. The DO data could have been made available as an indicator of ongoing or continuous monitoring. Under this example, a PES monitoring scheme should target DO as one of many parameters. In contrast, phosphorous was the main concern for the Bala tributaries and therefore phosphorus should be the main monitoring and reporting determinand. Appropriate monitoring and associated costs for data collation, interpretation and dissemination, should be incorporated within PES.

4. Farm engagement process and timescale – The pilot project was started in 2006 and completed with a stakeholder engagement survey in 2008 as seen in Table 1. The engagement process, data collection and activities undertaken are seen in Fig 2. There are a few gaps in the time table as it is not clear how quickly the diffuse pollution measures were implemented at a farm level and a progress sheet may help to clarify this.

¹ Objective 1 is a component of EU structural funding to promote the development and structural adjustment of regions whose development is lagging behind (per capita GDP is lower than 75 % of the Community average).

Table 1: CSF pilot project Schedule

Process of Engagement	
Date	Activity
2006	Letter sent inviting all farms in catchment as an invitation to attend workshop to explain CSF
	"kick off" Meetings
	Registration of farm
	1 st farm survey on 3 catchments plus a control catchment
2006-2007	3 surveys on control catchments
2007	21 farms joined CSF scheme and pollution audit completed
Summer 2008	21 stakeholder interviews

The project does not detail the timeframe between the letters being issued and the first, second and subsequent farm visits and therefore it is assumed that the all farms were issued with invitation letters at the same time. The project ran for 2 years or 104 weeks. Table 2 highlights the length of time required to identify and implement pollution prevention measures and some of the hindrances can be outside the scope of the project such as seeking planning permission. The method of farm registration is also not covered and the report does not provide several key pieces of information such as how many farms are in the catchment and how many farms are owned by the same business.

Table 2: Timeline of Farm Engagement between 2006 and 2008

Overall timeline	Progress	Task	Action	Activity
104 weeks	?	invitation	letter of invite to join CSF scheme	invitation issued to all farms in catchment to attend event to explain CSF
	?	Workshop	attend workshop	event to explain CSF
	?		farm registration	?
	week 1	1st farm visit	data capture	walk farm
				identify opportunities for improvement
				record general farm details
				existing nutrient management
	week 2-3	2nd farm visit	data capture	data capture
				cropping
				stocking
				fertiliser management plan drafted
	?	3rd farm visit	farm visit	potential capital expenditure
				discussion on restrictions such as planning
	?	no visit required	Discussion with WG	delivery of nutrient management plan
?	no visit required	Formal offer made	agreement on capital works	
?	4th farm visit	farm visit	capital expenditure	
			signed contract	
			review fertiliser use	
			assess progress of works	

5. CSF scheme joining process -By July 2007, 57% of the farmers in the CSF catchment had joined the scheme (27% had not joined and 16% undecided/not responded). In Deepford Brook the land area entered into CSF was 67 ha compared to 46 ha that chose not to enter the scheme. The land area within the CSF scheme is lower in Deepford Brook when compared to the other two catchments.

It is not known how many farms are in the Deepford catchment but the catchment area is 183 km² i.e. 1,183,000 ha. The total area covered by the CSF Deepford Brook scheme within the Deepford Brook represents only 0.0056% of the total catchment area. This raises a question of whether a land area target would have been a useful CSF indicator of success, particularly when the water quality data is not available. The required level of land area participating in a PES scheme may be a useful performance indicator when other data is lacking.

The CSF evaluation report covers other polling inputs such as private and public sewage treatment works and other consented discharges. These additional nutrient inputs should be accommodated in a PES scheme.

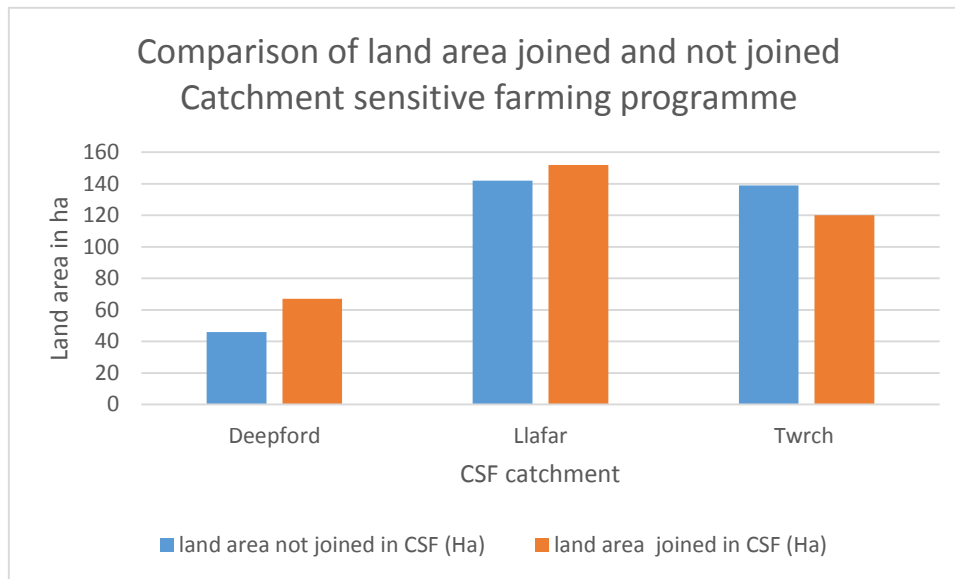


Figure 1 Catchment land area within and outside CSF project

A common reason for not entering the CSF Deepford Brook scheme was that there was insufficient financial support to make it worthwhile. The main reasons why a farmer did not take up the CSF scheme in general are:

- ❖ Concerns about how the farm was complying with existing regulation
- ❖ The commitment to comply with future regulation
- ❖ The required contribution by the farmer and the poor return on the investment

However as part of the follow up survey many farmers that joined the CSF scheme reported that they were glad that they entered the scheme and would do so again for similar initiatives.

6. Uptake of measures – 47 farms undertook capital investments across all three catchments. Of these, 22 were in Deepford Brook.
7. Catchment selection - Some participants commented that they had not been informed about the selection process of the individual catchments and there was very little understanding about the overall reasons why the area had been targeted for diffuse pollution work. A survey of stakeholders also highlighted that a wider communication strategy would have been helpful. A clear message to clarify the purpose and goals of a PES scheme is important and reflection back to the key drivers would help to keep the focus of the PES group.
8. Ambassadors - In all three catchments, the biggest CSF uptake was by farmers already within an agri-environment scheme and in Deepford Brook the engagement with key leading

“ambassadors” was important in adding momentum to the project initiation. These leading figures included the chair of the Agri-Food partnership and senior members of the Farming Unions.

9. Capital works costs and quotes - the European Union (EU) requirement for three quotes for capital works delayed and hampered work progress. A requirement for three quotes under PES may also hamper the progress of capital schemes and should be accommodated in a PES timetable for capital delivery, spend and proof/evidence of financial expenditure. Evidence that could be gathered could range from invoices to photographs and certificates, notices of completion and professional sign off by properly qualified advisors (PQAs).

Capital grant aid was limited to £10,000 per farm with a further maximum grant aid fund of £10,000 for permitted under special provision. There are exceptions to the grant aid categories but the basic categories were:

- ❖ The construction, acquisition or improvement of immovable property
- ❖ The purchase or lease purchase of new machinery or equipment

The pollution audits highlighted the recommended measures to reduce pollution in the three tributaries and Table 3 provides the capital costs for undertaking all the measures recommended in the farm audits. The actual costs incurred average £19,624 per farm of which each farm contributes an average of £8,689. The cost of implementing all the work as stipulated in the pollution audit is higher in Deepford Brook compared to the Bala farms on the Twrch and Llafar rivers.

Table 3: Estimated costs for implementing mitigation measures

Total cost in £'s	Activity
2 530 000	total cost of implementing all recommended measures as per audit for 21 farms
120 653	average cost of implementing all recommended measures as per audit for 21 farms
76 920	north farms average cost of implementing all recommended measures as per audit for 21 farms
208 120	south farms average cost of implementing all recommended measures as per audit for 21 farms
19 624	average costs of implementing CSF measures at each farm
8 689	average contribution cost per farm
55.70%	average contributory costs for CSF scheme
454 000 000	CSF applied to all farms >5 ha
380 000 000	CSF applied to all farms >10 ha
300 000 000	CSF applied to all farms >20 ha

Deepford Brook has the largest cost of just over £400,000 with a farmer contribution of about £166,000 based on 22 farms (see Figure 2). This financial contribution by the Deepford Brook farms is 40% and this matches the 60% financial restraint for grant provision under the EU criteria.

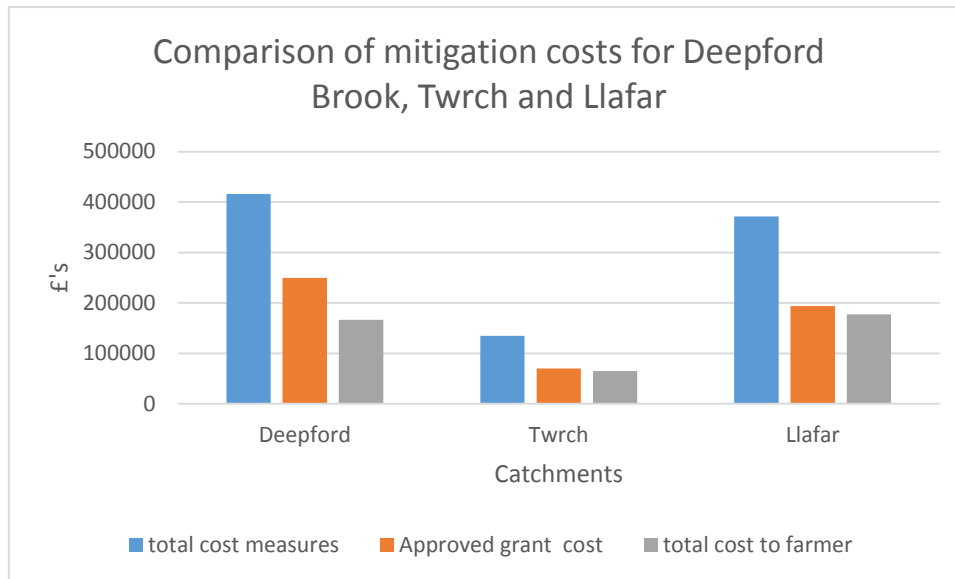


Figure 2 Comparison of grant aid and farmer contributions for Deepford Brook, Twrch and Llafar

10. The influence of externalities – at the time of the CSF project there was an increase in the price of fertiliser and this was beneficial in supporting the appropriate measures where efficient use of organic and inorganic fertilisers was offered within the CSF scheme. However the influence of fertiliser pricing could have had an adverse impact if the price of fertiliser had dropped. Assessing and continuous monitoring of influencing externalities such as weather conditions and farmgate or market products prices and changes in market demand, will help to inform a PES Scheme.
11. Adoption of mitigation measures - the type and number of mitigation options adopted by the participating farms varied within each catchment. For Deepford Brook, many measures were associated with farmyard improvements whereas in Bala the soil sampling activities were popular. A menu of mitigation measures were presented to the farmer and the potential choice of measures was discussed with the Catchment Officers. The adoption of an intervention method was often determined by the farmer and not by the environmental priority. For Deepford Brook there was a prevalence for improving farm manure storage (termed waste storage in the evaluation report) and the uptake of the storage provisions is at a rate higher than recommended in the CSF audits. Improving and increasing storage is often perceived as pollution prevention solution rather than to reduce the ingress of water, and PES should must accommodate and look to overcome such misconceptions.

As reported by the Stakeholder Group, a follow-up inspection found that where capital monies were spent, the actions undertaken appeared to not resolve the environmental problems. The pollution prevention mitigation methods as proposed under any future PES should be both appropriate for the farm and of maximum beneficial use for the environment. This would include the implementation of the appropriate measures placed at the best location and at the best time.

The spatial and temporal location of pollution prevention mitigation measures is very important if the aims of the PES are to be achieved. So for instance it is important that a buffer strip is placed at a strategic location, and of a certain width dependent on land topography, to prevent runoff to the watercourse and not as a general field boundary at the top of a slope where it will have no effect. The precision of placing PES funded measures is very important.

For Deepford Brook 45 % of the farms undertook rainwater mitigation measures, followed by special projects followed by 31% farms undertaking roofing improvements. It is reported that a key driver to encourage an investment in pollution prevention methods is to show the cost benefit to the business

efficiency on the farms and to improve regulatory compliance. A requirement for PES would be to show the cost “Balance” to the farm business and these savings should encompass all cost benefits and cost negatives for the farm. So for instance, nutrient management planning may save on fertiliser use but may also impact on yield and productivity while rain water management will reduce storage requirements, labour, fuel, electricity for pumps, cleaning and reduce the risk of causing pollution etc.

12. Cross Compliance, Agri–Environment Schemes and Regulatory compliance – in the study there was no grant aid for capital schemes required to meet cross compliance or statutory standards. This point was ambiguous in this pilot project and any PES should make the eligible PES funding criteria clear and explicit for each participant. This would avoid the duplication of payments and reduce the risk of a PES measure contravening any statutory and “best practice” regulations and codes. A thorough understanding of current agri-environment, cross compliance criteria and all regulations associated with farming practices must be understood before a PES mitigation method can be implemented so that the concept of PES “additionality” is satisfied. Future changes in the regulatory baseline represent a potential risk to PES schemes.

13. Willingness to Pay – the estimated costs for CSF in Wales were estimated through a willingness to pay (WTP) study at £67 per household, applied to farms of greater than 20 ha. If visitors are included in the WTP scheme then the contribution will decrease.

3 The Offset offer

Ecobanking and PES associated with nutrient reduction on farms is the basis for “upstream thinking” programmes used by water companies such as Wessex Water and South West Water. The CSF programme is very similar to the “Upstream Thinking” programme, the Llys Y Fran Reservoir Catchment project and the Nutrient Efficiency programme for First Milk, as all are looking to reduce the input of nutrients into the watercourses. However for Deepford Brook the main parameter of concern is dissolved oxygen while nitrate and phosphorous are the main concern for the Twrch and Llafar in Bala. These are all measurable parameters but their respective chemistry and pathways in the environment can be complicated. Therefore chronic and historic pollution must be accommodated in any PES scheme.

PES is often associated with the voluntary participation of the farming community and the CSF pilot project is a voluntary scheme. The mitigation measures that are undertaken at each farm have to be “above and beyond” that required by Cross Compliance, statutory regulations and any agri-environment activities which are funded. These criteria are common to many PES schemes but the adherence to the criteria may be deemed inconsistent. The criteria of PES will also vary with area and regions depending on the relevant legislation for the area, new legislative drivers and change in policy, guidance and best practice.

Some PES schemes allow an overachievement of the PES targets so that the surplus reductions or credits can be sold to other sources. This could be deemed as a Farmer to Farmer trading scheme but as raised in the CSF evaluation report, inter-farming working may be regarded as unfavourable as the interactions between neighbouring farms is reported as complex and requires respected consideration.

4 Participants

The CSF project invests a considerable amount of time, expense and effort in recruiting participating farms and this was achieved through letters, phone calls, workshops, numerous one to one visits as well as direct financial incentives for capital works and participating in feedback sessions.

5 Barriers and Challenges

Challenges

The CSF evaluation report highlights a general reticence about neighbouring farms working in collaboration and this is justified by the reluctance to adopt or “take on” additional problems that are beyond the direct control of the farm.

Many PES schemes cite that the time and resource required to recruit landowners is often understated and underestimated and incentives should be in place to reduce the level of disengagement. The time taken to initiate a PES scheme and the time taken to see the changes in the environment can be considerable and this can be perceived as failure of the PES schemes. The success of PES and potential feedback can be linked to accurate and contemporary monitoring that is relevant for each PES area and relevant for the PES supporters and participants.

The target for Deepford Brook is to increase the dissolved oxygen content of the river and for the Twrch and Llafar it is to reduce phosphorous load to the river. For many PES schemes there is a ratio of offsetting and the different ratios depend on the amount of pollutant that is naturally removed between the source and the receptor and the ability to remove the pollutant. As an example, a reduction in loss of phosphorous from a farm is more onerous than a reduction in loss of nitrate and therefore a PES scheme should weight accordingly.

The implementation of measures is ultimately governed by the landowner and not necessarily by the environmental need. For the CSF scheme, the capital budget per farm was limited to £10,000 and this restricted the type of measure put in place. As found with other PES schemes, the cheapest solution is not always the most cost effective for improving the environment over the long term. A risk assessment of the catchment and the application of precise abatement techniques will reduce the risk of poor investment decisions. Nutrient accounting across several sources and pathways is difficult but there are several models available that can work towards a targeted approach.

The grant aid support as offered by the CSF pilot project was set at a maximum of 60% contribution with a maximum limit of £10,000 (or £20,000 in exceptional cases). The grant aid contribution may be insignificant when compared to the overall expenditure and in common with other PES schemes, this financial contribution is regarded as a “bonus” rather than actual investment in the infrastructure.

Compliance with regulatory standards and best practice are deemed to be a baseline with which farms must comply before entering the CSF scheme. However, in practice it is questionable if this criteria is met. Compliance-based PES schemes prove to be an incentive for participation and this is reported in the CSF project. However, this does negate the potential for additionality.

The CSF project evaluation report has not covered the socioeconomic benefits such as construction labour, equipment and material supplies. This is an important consideration but requires the relevant information to be collated and interpreted and reported at regular intervals as part of the PES feedback.

The influence of National and International economic trends has been overcome in the United States by a program, the Actual Cost Method (ACM) that sets the payment rates on actual costs of providing the nutrient load reduction credit. These costs can be revisited on a regular basis. However there can be local demands and trends that should be considered such as change in land value, change in legislation such as implementation of Nitrate Pollution Prevention Regulations, often referred to as the Nitrate Vulnerable Zone Regulations (NVZ Regulations) and changes in local product demands or land use. An example is the recent use of maize as a feedstock for Anaerobic Digestion (AD) plants, where there is anecdotal evidence of displacement of other crops such as potatoes, which then move to less favourable land. The impact of these changes can occur in the PES catchment itself or be as a result of a change in a neighbouring

catchment. The implementation of the NVZ regulations may encourage landowners that are at risk of breaching the regulations, to export organic manures to areas outside the NVZ area.

The CSF evaluation report explores the potential of “willingness to pay” by the community. The report estimates that the household contribution at £67 (2008) but some local authorities object to raising funds to pay farmers for reduction of pollutants on the basis of the polluter pays principle² as well as wider priorities for funding such a social care and education.

The aim of the CSF project was to improve water quality in three river catchments but the proof, by which to measure success of the project, has not been incorporated into the project.

Possible Resolutions.

1. Catchment Collaboration _____ The concept of all participants working together to achieve an attainable common goal is crucial for the success of a PES scheme but is often cited as a reason for project failure. There is an implication in the CSF review that the stakeholders are remote from the participants but ironically, all parties have an invested interest in improving the environment. Consideration could be given to bringing all the groups together so that the common goal is shared.
2. Measures of success _____ Performance monitoring is an important impetus for continued participation and enhances the sustainability of the project. The CSF Evaluation report suggests that there is a reliance on a chemical change in water quality as a measure of success. However, the water quality assessments will not provide adequate information at an appropriate time or interval of time which can be returned back to the CSF group. In addition to chemical monitoring, there are several mechanisms to monitor changes in the quality of the environment.

The measures of success and failure need to be determined at the project outset. The success criteria need to be relevant and applicable for both the PES scheme and to the interests of the participants or sellers.

The units of measurements will vary in accordance with the aim of the PES scheme and a combination of modelling, substantiated with environmental monitoring and evidence collation can support the savings achieved. Interpretation of data, data storage and record maintenance should be accommodated and costed with the PES. Continuous monitoring throughout the project duration allows key performance indicators to be targeted and performance modified where there is a risk of under achievement.

3. Additionality _____ The PES baseline and standards to be achieved must be set as clear criteria and objectives at the project onset. Confusion and misunderstanding about the eligibility criteria for entering the CSF scheme resulted in the loss of participants and this could be avoided for PES delivery if this was clarified at an early stage. If the baseline criteria are communicated then the rewards of providing environment benefit and additionality are justified.

A comprehensive current knowledge of Cross Compliance, statutory environment legislation and farming “best practice “ will define those actions that are eligible for PES credits and this expertise should be costed within the ecosystem service.

4. Financial Contribution _____ Under the CSF project there is a 40% contribution paid by the landowner. The willingness and ability of the land owner to contribute to PES may be influenced by the cost-benefit of undertaking the work to the farm business. If a PES scheme follows a similar match

² This principle dictates that the party responsible for producing pollution is responsible for paying for the damage done to the environment.

finding profile, then the uptake of the scheme will rely on the economic status of the farm and the cost-benefit of the investment.

5. Timetable slippage The time taken to start and deliver a PES scheme can exceed many expectations and there are several reasons for this, one of which is the time taken to obtain relevant permissions or permits. Planning permissions and statutory consultations should be incorporated within PES including associated costs. A generic guidance document or a PES “update” document to highlight these issues may be useful.

6 Credit valuation and economic assessment

The main opportunities for securing credit for environmental offsets in a catchment programme are:

- The prevention of sediment loss
- The prevention of nutrient loss
- The prevention of pesticide loss
- Improved water quality through other parameters such colour

Mitigation measures can range from taking land out of higher risk use e.g. reversion of arable land to grassland, to more sympathetic management e.g. use of appropriate buffer strips, reduced nutrient use by farmers etc. As these actions have an economic cost to farmers, there is a need for an incentive payment to encourage behaviour change (above and beyond that needed to meet the regulatory baseline). Compliance with legislation offers a useful ‘stick’ to engage farmers but is outside the scope for PES or offset payments.

The value of payments should reflect the economic response curve for nutrients across a range of contexts and be cost-effective for the offset buyer who will also need to make a financial case for action. While we can use benefits transfer to ‘value’ the environmental benefits secured by mitigation, it is more practical to quantify additional costs / income forgone as a result of mitigation as a basis for estimating the funding need. Payments need to account for transaction costs as well as trading costs and have some element of ‘return’ to incentivise change. Buyers will need to allow for the operational costs of the scheme (including monitoring and evaluation) and private buyers will also require an element of ‘return’ to support their business case.

The key limitation of the CSF approach is the budgetary limit of £10k which requires land managers to finance additional costs above this threshold and the case study has demonstrated valuable leverage of farmer investment. This depends on measures which are reasonably cost-effective to farmers and may limit the scope as well as the scale of mitigation delivered. There is significant heterogeneity in costs of implementing measures at individual farm level so that different farms will be incentivised to take up different measures. As long as the right measures are delivered in the right place and deliver the desired outcome in aggregate, there is a basis for a market-based scheme. Mapping costs and threshold uptake to support a PES or offset scheme are key elements of the necessary scoping work required.

From a buyer’s perspective, CSF is a simple scheme to communicate and administer but monitoring is limited to the presence/absence of mitigation measure uptake spatially and relies on modelling to estimate impact. Capital investment items represent tangible measures and are well suited to this model.

7 Opportunities

There are opportunities for reducing nitrate loss, capturing nitrates within the soils and monitoring the losses is increasing as the knowledge of the behaviour of nitrogen in the environment improves. The use of cover crops, tramlines and release of soil compaction are not new methods but how these activities impact on nitrate loss is better understood. With continued research and development, the weighting of PES payments to abate nitrate loss can be adjusted to encourage a change in farming practice.

Environmental monitoring is becoming more sophisticated and “remote sensing” to monitor the activities under PES is one method which could be explored. Since 2008 the availability of data has improved and on-line updates can be received on mobile phones and at home. In-situ monitoring and data downloads can be made available to encourage inclusivity into a PES programme.

The CSF pilot project involved the local farming community and the stakeholders and there is an opportunity to share the project aims and objectives to a wider audience such as schools, colleges and other CSF work in the UK.

8 Conclusions

The CSF evaluation report has raised some interesting points that are relevant for any future PES scheme. The inertia associated with project start can be costly, environmental monitoring, data validation and corroboration are important to maintain project momentum and collaboration between neighbours needs to be considered carefully.

The aims of each PES scheme vary from catchment to catchment and the constraints within each catchment may alter as the project progresses. This can be determined by legislative changes, policy changes, market changes, environmental changes or climatic changes such as adverse weather. With this in mind the PES scheme must have a certain amount of flexibility to manage these changes but be robust enough to be consistent, verifiable, auditable and measurable.

Proportional payments in accordance with the needs to the environment are a difficult concept to overcome and a cost-benefit study for nitrates must include the impact on the efficiency of the farm as a whole.

9 Non-technical summary Poster for Website one side of A4 must be circulated to company before release to PCF for approval. To be uploaded onto website