



Peter Llewellyn



First Milk Nutrient Efficiency Project summary report

29th January 2021



ADAS GENERAL NOTES

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Date:	<u>29th January 2021</u>	Date:	<u>3rd February 2021</u>

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK ADAS Ltd.

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1 INTRODUCTION

The First Milk cooperative dairy farms that supply the cheese processing plant in Haverfordwest have formed a sustainability working group. This group was originally established to deliver the commitment to focus on the sustainability of soil, water and nutrients, as set in the sustainability agenda. The nutrient efficiency programme is the mechanism to deliver this commitment.

This report summarises the outcome of the nutrient efficiency programme undertaken by 33 First Milk cooperative farms, participating voluntarily in this project, over the period 1st December 2019 to 30th November 2020.

The impact of the diffuse pollution abatement actions undertaken on the farms, is assessed using the diffuse pollution modelling tool called Farmscoper V3 ([Farmscoper](#)).

The waste water treatment works for the dairy manufacturing site is regulated by Natural Resources Wales (NRW) in accordance with the Environment Permitting Regulation (EPR) permit. One of the permit conditions, stated in this permit, is the requirement to “offset” the nutrient and sediment load discharged as final effluent by the dairy manufacturing site, in equal, or greater than, quantities. This is achieved by matching the final effluent load with the reduction in nutrient and sediment losses at the farms, within the milk field, that supply the processing plant. The three parameters considered in this study are nitrate-N, phosphate and sediment as required in the EPR permit.

2 OBJECTIVES

2.1 Specific objectives

The objective of this study is to identify the total reduction in nutrient (Nitrate-N and Phosphorus) and sediment losses, for the 33 farms participating voluntarily, in this efficiency programme for the period 1st December 2019 to 30th November 2020.

An overview of the tasks are:

- For each farm, check that the mitigation measures, that have been agreed to be implemented, have remained in place
- Identify the total reduction in losses of nutrient (nitrate-N, phosphorus) and sediment as a consequence of deploying agreed interventions, using the Farmscoper diffuse pollution tool
- Present a nutrient efficiency report for each farm
- Present a nutrient efficiency summary report for the group of 33 farms

2.2 Objectives overview

First Milk Ltd dairy processing plant, based in Haverfordwest, is regulated under The Environment Permitting (England and Wales) Regulations 2010 permit number EPR/XP3830UR. The EPR condition, that is relevant for this report, is the pre operational condition (POC 2) as shown in fig 1.

The format of this report is specifically designed for enforcement compliance purposes and hence it follows the order of requirements as stated in POC 2 (Fig1).

POC 2	Effluent treatment plant	The operator shall submit a report, for agreement with Natural Resources Wales, detailing the mitigation measures to be adopted by the farms linked to the proposed scheme. The report will consist of, but not be limited to, the following requirements:
	1	Scheme scope and methodology
	2	Organogram detailing roles and responsibilities
	3	Details of participating farms
	4	Details of measures to be employed at the farms
	5	Methodology of how a baseline will be set to enable comparison
	6	Timeframe of implementation
	7	How reductions will be measured/monitored at each farm
	8	Frequency of review to confirm the status/summary of the measures implemented on each farm (to demonstrate continued compliance)
	9	List of guidance to be utilised to calculate or measure off-set
	10	Contingency measures. For example if a farm leaves the scheme
	11	Collation and reporting of information
		The scheme must ensure that pollution reductions at the farms within the scheme will equal, or be greater than, the amounts of nutrients discharges by the effluent plant to the Cleddau Catchment

Figure 1 Pre operational condition (POC) 2

3 PERMIT CONDITIONS

The aim of the project is to monitor reductions in nutrient loading as a result of diffuse pollution mitigation methods deployed on 33 First Milk farms. The nutrient savings are offset against the nutrient and sediment loads as discharged through the First Milk waste water treatment plant.

The current permit (EPR/XP3830UR) condition 3.1.2 states the emission standards, including the relevant emission standards for Ammonia, Total Phosphates and Total suspended solids.

The standards as stated in Schedule 3 of the permit are:

Total Suspended Solids limit is 60 mg/l Absolute maximum and 30mg/l (95th percentile)

Ammonia limit is 10 mg/l Absolute maximum 3.5 mg/l (95th percentile)

Total phosphates is 5mg/l Absolute maximum and 3mg/l (95th percentile)

Offset calculation

First Milk Ltd provide monitoring data for the final effluent discharge from the treatment plant. The data provided is daily flow in m³, ammonia (mg/l), total phosphorus (mg/l) and suspended solid (mg/l).

The total annual load in kilograms (kg) is the sum of actual discharge load over a 12 month period. This is calculated using the following formula for the period 1st December 2019 to 30th November 2020:

$$\text{Actual Daily flow in m}^3/\text{day} \times \text{actual load value mg/l} \times 0.001$$

This provides the target offset values for Ammonium N, Total Phosphate and Suspended Solids for the 12 month period

The EPR permit stipulates BS EN 11732 as the analysis method and this analysis suite measures ammonium nitrogen (NH₄-N). The analysis of the effluent and subsequent reporting, undertaken by Severn Trent, from the treatment work is ammonium-N as per BS EN 11732.

The Farmscoper tool measures phosphorus, sediments and nitrates as Nitrate-N.

There are 100 ppm of ammonium-N per 100ppm of nitrate-N. There is no requirement for a conversion factor as there is a direct correlation between the nitrogen values.

3.1 POC 2.1 Scheme scope and methodology

First Milk has requested ADAS continues to monitor the reduction in nutrient (nitrate and phosphorus) and suspended solid loadings to river catchments in South West Wales, from a voluntary group of First Milk supplier farms. The reduction in nutrient and suspended solid loads is achieved by the deployment of mitigation measures on the farms. The information gathered for each farm is entered into the diffuse pollution model called Farmscoper. The Farmscoper tool models the potential impact on the losses of nutrients and sediments to watercourses.

The Farmscoper tool assesses the impact of undertaking specified diffuse pollution interventions on a farm. For this study the farms have agreed during the initial phase of the project which diffuse pollution measures would be adopted voluntarily and contribute these savings as part of the offset scheme.

There were no new entrants to the group this year. Each participating farmer received a visit or call in Spring 2020 to check that the agreed interventions were in place, that the farm packs were appropriate and up to date and that evidence of diffuse pollution works were made available as proof that abatement measures were installed. In Autumn 2020 the farmers received a follow up audit to ensure all agreed measures had been implemented and that the required evidence of activity is maintained in the farm file. Due to the restrictions of the Covid-19 pandemic, some of the audits were completed remotely.

The Farmscoper data was verified and each farm received a summary report to show the performance of the farm and the performance of the farm within the group

This report summarises the outcomes of the Audits which for some would be Audit 9 & 10 and for some Audit 5 & 6 for the 2020 year. An example of the records maintained on farms is shown overleaf.

Efficient Use of On Farm Nutrients Working Group

Your Name:	
Your Address:	
Postcode:	
E-mail Address:	
Phone Number:	
Membership No:	
Photographs of capital works	Yes or no
Is there a NMP In place	Yes or no and date of NMP

Ac or Ha

Total area assigned to Mitigation Methods

Total Farm Area

Mitigation Method Number	Mitigation Method Summary	Your Individual Action Plan (✓)	Area assigned to Mitigation Method (Ac / Ha)	Crop Mitigation Method Actioned on
15	Loosen compacted soil			
69	No slurry spread at high risk times			
32	No P fertiliser to high P-index soils			
23	Integrate fertiliser and manure nutrient supply			
9	Cultivate and drill across the slope			
22	Use a fertiliser recommendation system			

Mitigation Method Number	Mitigation Method Summary	Your Individual Action Plan (✓)	Area assigned to Mitigation Method (Ac / Ha)	Crop Mitigation Method Actioned on
4	Use autumn cover crops			
24	Reduce fertiliser application rates			
32	No P fertiliser to high P-index soils			
5	Harvest early and establish crops in Autumn			
11	Manage over-winter tramlines			
7	Reduced cultivation systems			
8	Cultivate compacted tillage soils			
32	No P fertiliser to high P-index soils			
26	No fertiliser at high risk times			
14	Establish riparian buffer strips			
25	No fertiliser to high risk areas			
68	No manure to high risk areas			
21	Fertiliser spreader calibration			
31	Use clover in place of N fertiliser			
6	Cultivate land in Spring rather than Autumn			
10	Leave Autumn seedbeds rough			
13	Establish in field buffer strips			
19	Make use of improved genetic resources			
20	Use plants with improved N efficiency			
33	Reduced dietary N/P intake			
34	Phase feeding of livestock			
37	Reduce stocking rate in wet soils			
38	Frequently move feeders			
39	Construct water troughs with a firm but permeable base			
41	Reduce overall stocking rate			
43	Additional straw bedding in cattle housing			
45	Outwinter on woodchip pad			

Mitigation Method Number	Mitigation Method Summary	Your Individual Action Plan (✓)	Area assigned to Mitigation Method (Ac / Ha)	Crop Mitigation Method Actioned on
52	Increase capacity of slurry stores			
57	Minimise slurry/dirty water produced			
60	Site muck heaps away from watercourses/drains			
61	Construct muck heaps on an impermeable base and collect leachate			
63	Separate liquid and solid manure			
65	Change from slurry to solid manure system			
67	Manure spreader calibration			
72	No FYM spread at high risk times			
76	Fence off rivers and streams from livestock			
77	Construct bridges for livestock over streams and rivers			
78	Re-site gateways away from high-risk areas			
79	Farm track management			
80	Establish new hedges			
81	Establish artificial wetlands			

Please complete by copying your record of mitigation methods chosen to implement for this project, and assign an area (acres or hectares) to each method

Farm Pack Content Outline

Title	Detail	Action by you
Nutrient Losses report		
Field List		
Field Record sheet		
Farm Map		
Farm Details		
Nutrient Management Plan		
Action Plans		
ADAS Reference Workbook		
Mitigation Method Baseline calculations		
ADAS Mitigation Method Guide		
Manure Management Plans		
Application of fertilisers, soil conditioners, manures & slurry		
Technical Updates		
Advice & Guidance		

Efficient-Use-of-On-Farm-Nutrients-Working-Group



Farm-Profile-Form

Name:
 Address:
 Postcode:
 Telephone:
 E-mail:
 Membership-number:

Stock-Numbers

201X Stock (at November 201X)	Number	Winter-housing
		Cubicle-Numbers Loose-Numbers
Dairy Cows		
Youngstock (dairy & beef)		
<1-yr		
1-2-yr		
Dairy heifers-in calf		
Bulls		
Beef-Suckler cows		
Sheep-/Goats		
Pigs		
Poultry (layers)		
Poultry (broilers)		
Others.....		
What is the average yield of your cows? (litres per cow)		
How much concentrate feed do you use? (tonnes per cow per year)		

Land

Farmed-Area

Field-boundary-to-watercourse: % Field-Boundary: % Farm-drained:

*Enter either Hectares or Acres.

Select-and-use-consistent-units-throughout-form (delete non-applicable)

Crops-Grown--hectare/acre (please specify)

	Growing-Season-201X	Growing-Season-201X
Grassland--leys (5 years or less)		
Permanent-pasture		
Rotational-grassland		
Rough-grazing		
Maize		
Cereals State-spring-or-winter		
Other (please state).....		
Area-of-land-left-bare-over-winter (identify units)		Hectare/acre
Is bare-land-cultivated-to-reduce-run-off?	Yes/No	(delete as applicable)
Do you have water-courses run-through-farm?	Yes/No	(delete as applicable)
Do you use any decompaction methods on your land?	Yes/No	(delete as applicable)

What proportion of clover do you have in your swards? (circle)

<20% 20-30% 40% 50-60%

Soil

Soil-Sampling-Frequency

Fields soil sampled within the last 12 months

Fields soil sampled within the last 2 to 5 years

Fields not soil sampled within the last 5 years

Total number of fields on your farm

What is your average annual rainfall? (circle which applies)

<25 inches (635 mm) 25-35 inches (625-875 mm) 35-42.5 inches (875-1060 mm) >42.5 inches (1060 mm)

What is your main soil type? (circle which applies)

Clay (heavy) Loam (medium) Peats Sand & Gravel Chalk

Fertilisers

Do you currently have a written manure/fertiliser plan?

Tonnes of fertiliser purchased to use in 201X?

% of land on which bagged fertiliser is applied?

Do you use GPS for fertiliser applications?

Do you calibrate your fertiliser spreader annually?

Yes/No (delete as applicable)

Typical fertiliser applications in a year Specify units (circle): kg/ha or units/acre

	Area (ha)	N	P	K
Grazing				
Silage 1 st cut				
Silage 2 nd cut				
Silage 3 rd cut				
Silage 4 th cut				
Maize				
Wheat				
Barley				
Other cereals				
Other..... Grazing				

Farm-Manures--FYM

FYM--Where & when do you apply FYM?

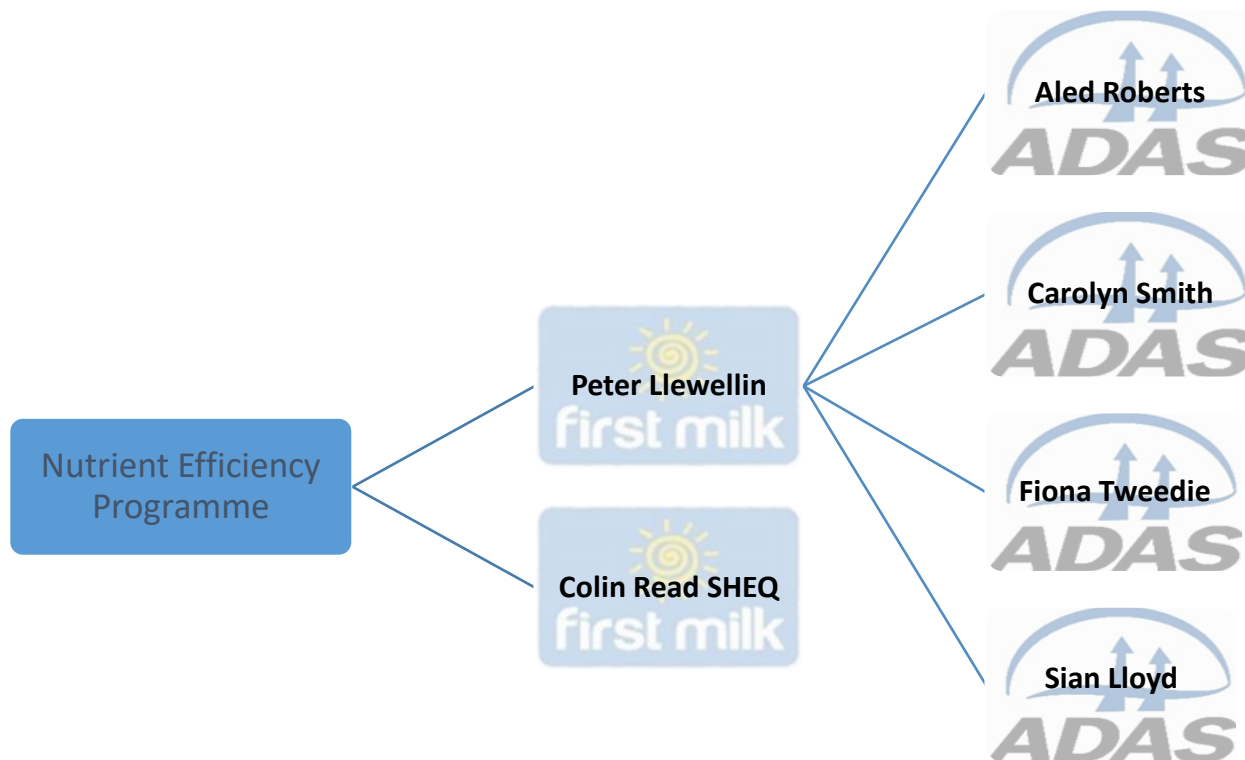
% of FYM is spread on-land

Which months do you apply FYM? (circle)

	%	J	F	M	A	M	J	J	A	S	O	N	D
Grazing													
Silage 1 st cut													
Silage 2 nd cut													
Silage 3 rd cut													
Silage 4 th cut													
Maize													
Wheat													
Barley													
Other cereals													
Other.....													

FIELD RECORD SHEET																		
 ADAS Soil analysis date	FARM NAME							FARM MEMBER No										
Feed limit for applications of organic manures in a rolling 12 month period = 250 kg Nitrogen per hectare * No application of phosphate fertiliser to soils at P index 4																		
Crop eg grass/wheat	Field Name or number	Field size - acre or hectares	Soil Analysis/Index				Fertiliser application eg(250kg/ha 20:10:10 1 March) or (cwts/acre eg 2 cwts 34.5%N 1 Apr)							Organic manures applied(eg 3000galls/ac 30 Jan) or(6t/ac FYM 1 Apr)				Comments Box - eg undertaken subsoil, moved livestock due to wet weather etc for mitigating action and date
			P	K	Mg	pH	1st application	2nd application	3rd application	4th application	5th application	6th application	7th application	1st application	2nd application	3rd application	4th application	
Gross grazing	top field	12.5	2	2-	3	5.7	1.5cwt/ac 34.5%N 5 march	1cwt/ac 34.5N 25 apr	1cwt/ac 34.5%N 25 Jun	1cwt/ac 25:5:5 4 Sept					2000galls/ac slurry 10 jan	2t/ac FYM nov		no cattle graze due to wet weather 2-5 aug , aerate soil 30 sep, applied lime 1.3 t/ac june

3.2 POC 2.2 Organogram of roles and responsibility



First Milk

Peter Llewellyn – Regional Manager Farm Enterprise Team - *role* Nutrient efficiency project lead

Colin Read – SHE & permit compliance

ADAS

Aled Roberts - Agricultural advisor - *role* nutrient efficiency advisor

Carolyn Smith -Agricultural advisor - *role* nutrient efficiency advisor

Fiona Tweedie – Agriculture consultant – *role* Contract manager

Sian Lloyd - Administrator

3.3 POC 2.3 List of participating farms

The list of 33 participating farms as of December 2020 is listed separately in Appendix 1 and it is requested that this information is deemed confidential.

3.4 POC 2.4 Details of mitigation measures

There are over 100 measures listed in Farmscoper Tool as listed in Fig 2. When the farm data is entered into the tool, a list of potential intervention measures, applicable for the farming system, is provided by the tool. The Farmscoper tool can be used for a range of farming systems but will only generate potential mitigation measures appropriate to the farming systems. For example, mitigation measures relating to pig production will only be proposed if pigs are reared on the farm and the information is entered into the tool. The specifics of the farming system and management is located in the Create files of Farmscoper.

 ID	Method Name
4	Establish cover crops in the autumn
5	Early harvesting and establishment of crops in the autumn
6	Cultivate land for crops in spring rather than autumn
7	Adopt reduced cultivation systems
8	Cultivate compacted tillage soils
9	Cultivate and drill across the slope
10	Leave autumn seedbeds rough
11	Manage over-winter tramlines
13	Establish in-field grass buffer strips
14	Establish riparian buffer strips
15	Loosen compacted soil layers in grassland fields
16	Allow grassland field drainage systems to deteriorate
180	Ditch management on arable land
181	Ditch management on grassland
19	Make use of improved genetic resources in livestock
20	Use plants with improved nitrogen use efficiency
21	Fertiliser spreader calibration
22	Use a fertiliser recommendation system
23	Integrate fertiliser and manure nutrient supply
25	Do not apply manufactured fertiliser to high-risk areas
26	Avoid spreading manufactured fertiliser to fields at high-risk times
27	Use manufactured fertiliser placement technologies
28	Use nitrification inhibitors
290	Replace urea fertiliser to grassland with another form
291	Replace urea fertiliser to arable land with another form
300	Incorporate a urease inhibitor into urea fertilisers for grassland
301	Incorporate a urease inhibitor into urea fertilisers for arable land
31	Use clover in place of fertiliser nitrogen
32	Do not apply P fertilisers to high P index soils
331	Reduce dietary N and P intakes: Dairy
332	Reduce dietary N and P intakes: Pigs



ID	Method Name
333	Reduce dietary N and P intakes: Poultry
34	Adopt phase feeding of livestock
35	Reduce the length of the grazing day/grazing season
36	Extend the grazing season for cattle
37	Reduce field stocking rates when soils are wet
38	Move feeders at regular intervals
39	Construct troughs with concrete base
42	Increase scraping frequency in dairy cow cubicle housing
43	Additional targeted bedding for straw-bedded cattle housing
44	Washing down of dairy cow collecting yards
46	Frequent removal of slurry from beneath-slat storage in pig housing
48	Install air-scrubbers or biotrickling filters in mechanically ventilated pig housing
50	More frequent manure removal from laying hen housing with manure belt systems
51	In-house poultry manure drying
52	Increase the capacity of farm slurry stores to improve timing of slurry applications
53	Adopt batch storage of slurry
54	Install covers to slurry stores
55	Allow cattle slurry stores to develop a natural crust
56	Anaerobic digestion of livestock manures
570	Minimise the volume of dirty water produced (sent to dirty water store)
571	Minimise the volume of dirty water produced (sent to slurry store)
59	Compost solid manure
60	Site solid manure heaps away from watercourses/field drains
61	Store solid manure heaps on an impermeable base and collect effluent
62	Cover solid manure stores with sheeting
63	Use liquid/solid manure separation techniques
64	Use poultry litter additives
67	Manure Spreader Calibration
68	Do not apply manure to high-risk areas
69	Do not spread slurry or poultry manure at high-risk times
70	Use slurry band spreading application techniques
71	Use slurry injection application techniques
72	Do not spread FYM to fields at high-risk times
73	Incorporate manure into the soil
76	Fence off rivers and streams from livestock
77	Construct bridges for livestock crossing rivers/streams
78	Re-site gateways away from high-risk areas
79	Farm track management
80	Establish new hedges
81	Establish and maintain artificial wetlands - steading runoff
82	Irrigate crops to achieve maximum yield
83	Establish tree shelter belts around livestock housing
90	Calibration of sprayer
91	Fill/Mix/Clean sprayer in field
92	Avoid PPP application at high risk timings
94	Drift reduction methods

 ID	Method Name
95	PPP substitution
96	Construct bunded impermeable PPP filling/mixing/cleaning area
97	Treatment of PPP washings through disposal, activated carbon or biobeds
101	Protection of in-field trees
102	Management of woodland edges
103	Management of in-field ponds
105	Management of arable field corners
106	Plant areas of farm with wild bird seed / nectar flower mixtures
107	Beetle banks
108	Uncropped cultivated margins
109	Skylark plots
110	Uncropped cultivated areas
111	Unfertilised cereal headlands
112	Unharvested cereal headlands
113	Undersown spring cereals
114	Management of grassland field corners
115	Leave over winter stubbles
116	Leave residual levels of non-aggressive weeds in crops
117	Use correctly-inflated low ground pressure tyres on machinery
118	Locate out-wintered stock away from watercourses
119	Use dry-cleaning techniques to remove solid waste from yards prior to cleaning
120	Capture of dirty water in a dirty water store
121	Irrigation/water supply equipment is maintained and leaks repaired
122	Avoid irrigating at high risk times
123	Use efficient irrigation techniques (boom trickle, self closing nozzles)
124	Use high sugar grasses
125	Monitor and amend soil pH status for grassland
126	Increased use of maize silage

Figure 2 Farmscoper mitigation measures

For individual farms the relevant mitigation measures are highlighted in the Audit reports.

An example the 2020 audit report (Fig 3) includes an overview of relevant information and support programmes, nutrient efficiency updates and an overview of the activities undertaken at the farm.



21 February 2020

Name
Farm Name
Address

ADAS Aberystwyth
Unit 10D
Cefn Llan Science Park
Aberystwyth
Ceredigion
SY23 3AH

Tel: 01974 847000

Dear

First Milk Sustainability Project: Production year 2020 Efficient use of farm nutrients

Ref

Thank you for your continued support of this nutrient efficiency programme. It is important that the work, that has been agreed to be done, is maintained as this contributes to the nutrient offset as required for the permit of the First Milk dairy processing plant in Haverfordwest.

This is the report for the 2020 year First Milk Nutrient Efficiency Programme audit. We have entered our 5th year of working on this nutrient efficiency compliance programme, which is so crucial for the continued operation of the waste water treatment plant. I wanted to take this opportunity to highlight the value and importance of your time and work, and how your continued participation has rippled out to the wider agricultural community in Pembrokeshire and throughout Wales.

I have enclosed your latest report (2020 year) which shows the Nitrate, Phosphorus and sediment losses from your farm to the watercourses and how the actions that you have undertaken have reduced these losses. It is important that you maintain the First Milk Sustainability File by keeping field records, relevant certificates of fertiliser/manure use and photographs where necessary. It is likely that the sustainability files for a few farms will be audited by Natural Resources Wales as part of the permit compliance activity.

As you can see, we are keen to ensure that this nutrient efficiency programme meets the commitments of the First Milk processing plant permit but also evolves with time, so that it becomes; less onerous for you and the First Milk cooperative, leads as an example for nutrient control, and has potential for better environment protection in Wales, for the present and the future.

Can I remind you that we have started the 2021 year. Please keep the same records which you have maintained for the previous years' data up to date by recording your fertiliser, organic manures applications and the mitigating measures you have said that you will undertake on the standard spreadsheet. Your mitigating measures commitment can be found on the following page

Nutrient efficiency programme 2020

Please keep this report and place this copy in your First Milk Sustainability File.

A summary of the findings of my visit is listed below.

Option	Description	Status	Action
22	Use a fertiliser recommendation system	Compliant	
23	Integrate fertiliser and manure nutrient supply	Compliant	
32	Do not apply P fertilisers to high P index soils	Compliant	No P index 4 soils. Uses GPS on fertiliser spreader
37	Reduce field stocking rates when soils are wet	Compliant	New housing constructed winter 2017, reducing the need to graze in wet conditions
52	Increase the capacity of farm slurry stores to improve timing of slurry applications	Compliant	Photo taken of new 1.2 m gallon lagoon. Please ensure that a copy of the photo is kept on file
571	Minimise the volume of dirty water produced (sent to slurry store)	Compliant	All the dairy herd now housed under cover reducing the volume of dirty water further
61	Store solid manure heaps on an impermeable base and collect effluent	Compliant	
68	Do not apply manure to high-risk areas	Compliant	Ensure a copy of the manure spreading risk map is placed on file
69	Do not spread slurry or poultry manure at high-risk times	Compliant	New Slurry lagoon ensures that slurry can be stored all winter

For the following options a certificate is required. Please keep a copy of this report on your Nutrient Efficiency file.

Option	Description

Please do not hesitate to contact me if you wish to discuss further. I can be contacted on 01267 220127 or by email Carolyn.smith@adas.co.uk.

Yours sincerely

Carolyn Smith

Consultant

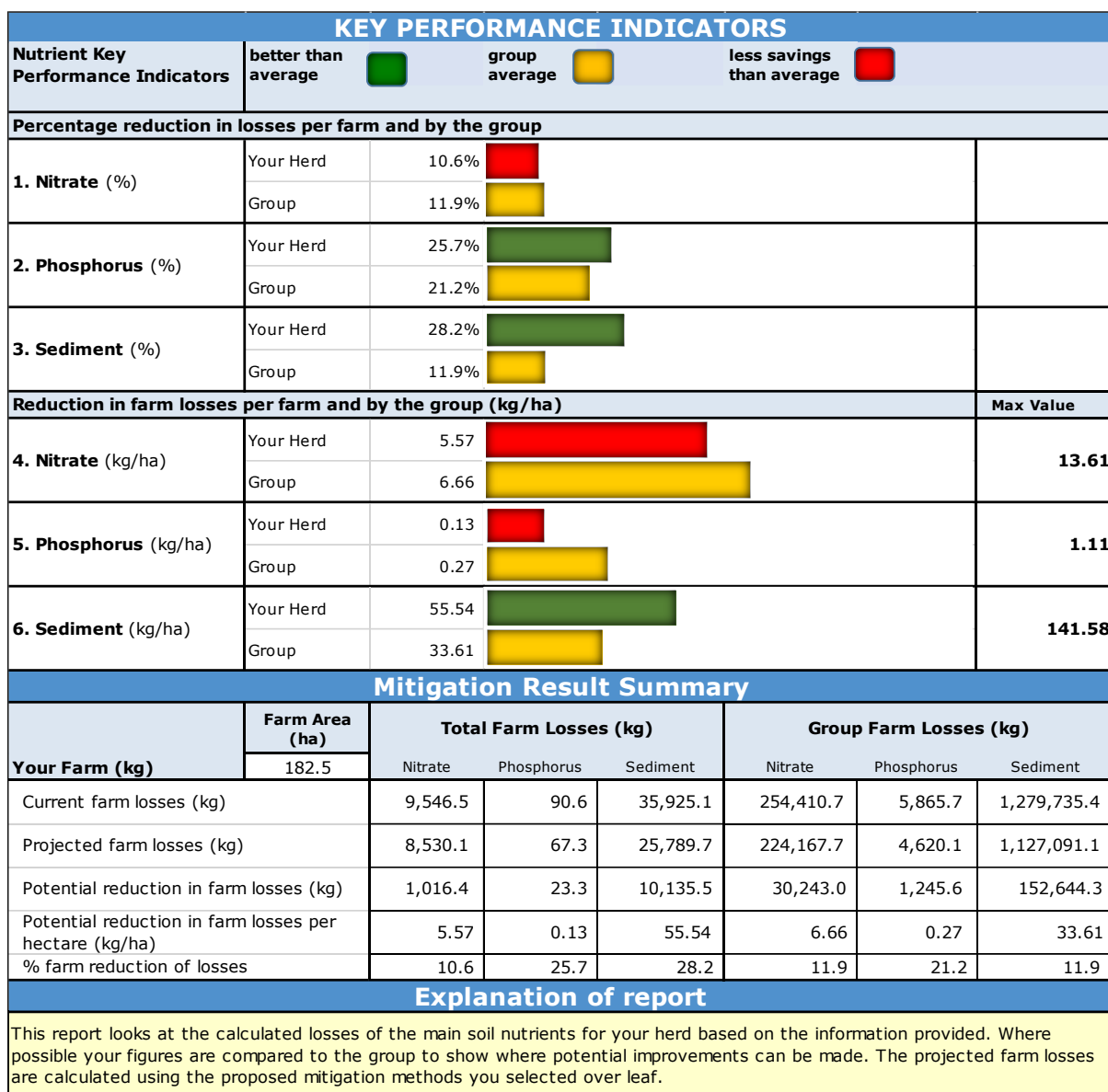


Figure 3 Nutrient Efficiency Programme Autumn 2020 report

3.5 POC 2.5 Methodology for base line

2014-2015

The farm benchmark was established in the first year of this programme i.e. in 2014-15 (Fig 4).

Benchmark report - each farm, which has volunteered to participate in the nutrient efficiency programme, underwent a half day farm survey by an ADAS nutrient advisor to establish the farm management practices, for benchmark purposes. Data assessed included the farm management, stock numbers, slurry and dirty water management, rainfall, soil type, location typography and the potential mitigation measure relevant for the sector. The ADAS advisor entered the data into Farmscoper tool to calculate the baseline losses and the potential savings for Nitrate –N, Phosphorus and Sediments for each mitigation method proposed. A farm mitigation measures action plan was drafted. This report is set as the benchmark report.

First Audit (Audit 1). A *follow up* site visit was undertaken on each farm, within 3 months of the initial site visit. The mitigation measures action plan was discussed and agreed with individual farmers. The farm management profile was validated and any problems were addressed.

Second Audit (Audit 2). After an interval of 6 months, each participating farmer was contacted by phone or visited, depending on preference, by an ADAS advisor. During the discussions the farm management profile was validated. All data collected was passed through Farmscoper and the action plan updated, to offer the farmer an indication of the savings made to date. Any potential new mitigation methods appropriate for the farm sector were offered. Each farm was provided with an Audit 2 report which highlighted the progress of the mitigation measures, any outstanding actions that needed to be done and also an insight into how that farm was performing against the sustainability working groups. This is seen as a key performance indicator (KPI) for the farm.

A component of the project is to ensure that the farm records and the requirement to produce evidence that an action has been undertaken as a direct result of entering the scheme. This information is held within a farm file, held on the farm.

The overall savings for the nutrient efficiency group is calculated for the 12 month period.

The overall discharge load from the waste water treatment plant is provided by First Milk at 6 monthly intervals so that any changes in load can be identified.

Nutrient efficiency summary reports were provided to NRW after Audit 1 and after Audit 2.

2016-17 Year 2

Third and Fourth Audit (Audit 3 & 4). Similar activity to Audit 1 and 2 took place, with Audit 3 taking place in November 2016 and Audit 4 taking place in March 2017.

Nutrient efficiency summary reports were provided after Audit 3 in January 2017.

14 new farmers were recruited to the Nutrient Efficiency group in 2017.

2017-18 Year 3

Fifth Audit (Audit 5). This audit was completed in March 2018.

Sixth Audit (Audit 6). This audit was completed, for the existing farms in August 2018.

First and Second Audit (Audit 1 and 2 new group). The new farms recruited in 2017 were brought into the scheme and went through their first and second audits using the methodology above. These audits took place in June 2018 and October 2018.

Audits 5 & 6 and 1 & 2 for the new group were reported in February 2019.

2018-19 Year 4

Seventh and Eighth Audit (Audit 7 & 8). These audits were completed in July 2019 and October/November 2019, respectively.

Third and Fourth Audit (Audit 3 and 4 new group). These audits were completed in a similar timeframe to Audit 7 & 8 above.

2019-2020 Year 5

These audits are referred to as the 2020 audit in the letter sent to the farmer. Given that the two farmer groups are now well into the process, the audits are referred to differently compared to previous years – Spring 2020 audit and Autumn 2020 audit. All farmers within the Nutrient Efficiency Group are included in the auditing process.

This report summarises the Audits conducted in Year 5 and against plant emissions data for the period 1st December 2019 to 30th November 2020.

POC 2.6 timeframe

Activity	Delivery date
Initial farm visit to establish farming system, gather data and ensure that the farmer is “on board” with overall scheme and required commitments.	November 2014 to February 2015
3 month audits (audit 1)	March to April 2015
6 month audits (audit 2)	August – October 2015
Project Summary report	December 2015
Audit 3	November 2016
Audit 4	March 2017
Annual summary report	January 2017
Audit 5	Feb 2018
Recruitment of 14 new farmers	2017
Annual summary report	March 2018
Audit 1 (new farms)	June 2018
Audit 6	August 2018
Audit 2 (new farms)	October 2018
Annual summary report	January 2019
Audit 7	June 2019
Audit 8	October 2019
Audit 3	July 2019
Audit 4	November 2019
Annual Summary report	February 2020
Spring 2020 audit	June 2020
Autumn 2020 audit	November 2020
Annual Summary report	January 2021

Figure 4 Nutrient Efficiency Programme timetable

3.6 POC 2.7 Monitoring and measuring reductions

The monitoring of mitigation measures, agreed to be undertaken at participating voluntary farms, is done through a combination of on-farm site visits (subject to Covid-19 pandemic restrictions) and communication by phone.

The ADAS advisors represent an independent third party contractor. ADAS has been employed to set the baseline and monitor the deployment of specific diffuse pollution interventions. Each farm is allocated an ADAS advisor and this relationship has remained consistent for three years. As a result, there is often an ongoing dialogue, between the farmer and the advisor, throughout the year. This open communication is important as it helps to respond to any technical queries, forecast any potential changes and proactively implement contingency measures as required.

The impact of the diffuse pollution activity, or intervention, is assessed using the Farmscoper tool.

The First Milk treatment plant daily discharge monitoring for the period 1st December 2019 to the 30th of November 2020 is monitored by Dafydd Lewis of Severn Trent Business Water Services and provided to ADAS by Peter Llewellyn of First Milk. The discharge of ammonium-N, phosphate and sediment were greatly reduced in 2019 in comparison to previous years, despite a similar overall discharge volume. This is due to the introduction of an upgraded processing plant which is greatly more efficient than that previously used.

A summary for the First Milk treatment plant load is provided in Fig 5

Discharge volume for period 1 st December 2019 to 30 th November 2020 (m ³)	Ammonium-N Discharge period 1 st December 2019 to 30 th November 2020 (kg)	Phosphate Discharge for period 1 st December 2019 to 30 th November 2020 (kg)	Total Suspended Solids Discharge for period 1 st December 2019 to 30 th November 2020 (kg)
486,566	48	343	1299

Figure 5 Effluent treatment plant discharge volume (m³) and load (kg) for period 1st December to 30th November

The quantity of the nutrients and sediments discharged from the effluent treatment plant must be balanced with the nutrient and sediment savings achieved within the farm group.

The savings achieved by the 33 farms participating in the nutrient efficiency programme as of November 2019 -1st Dec 2020 is provided in fig 6.

Farmscoper output for Farm group (33 farms)	Nitrate-N	Phosphorus	Sediment
Potential farm reduction (kg)	30,241	1245	152644
Potential farm losses (kg/ha)	6.66	0.27	33.61
% farm reduction	11.89%	21.24	11.93%

Figure 6 Outcome of diffuse pollution interventions as assessed by Farmscoper tool

The savings achieved for nitrates, phosphates and sediment in Fig 6 are greater than the plant discharge volumes as provided in Fig 5.

3.7 POC 2.8 Frequency of review to confirm the status/summary of the measures implemented on each farm (to demonstrate continued compliance)

Current review periods are listed below (Fig 7)

Years	Task and review activity	Timeline
YEAR 1	Benchmark	0 month
	Audit 1	3 month
	Audit 2	6 month
YEAR 2	Audit 3 and any subsequent audit	12 month
	Audit 4	18 month
YEAR 3	Audit 5	24 month
	Audit 6	30 month
YEAR 4	Audit 7	36 month
	Audit 8	42 month
YEAR 5	Spring Audit 2020	48 month
	Autumn Audit 2020	54 month

Figure 7 Nutrient efficiency programme review periods

3.8 POC 2.9 List of guidance

The guidance on the use of Farmscoper V3 is available for free on the ADAS Website ([Farmscoper](#))

Each farm participating in the project is provided with a report (Fig 3) for each audit. The report shows the performance of the farm against actual losses and the savings made, for nitrates-N, phosphorus and sediments, by taking up the mitigation measures. The report also provides an indication of the farms performance against the project groups as a form of key performance indicator.

3.9 POC 2.10 Contingency

Increases in production by the First Milk factory is likely to increase end of pipe losses. This requires contingency measures to be prepared for deployment. The contingency measures are:

- Increase the number of farmers within the scheme

- Increase the uptake of interventions on each farm

Numbers of farmers participating in the programme has decreased from 36 in the 2017-18 year, to 33 in the 2018-19 year. The current cohort is 33 farms. However, the loss savings on farm provide a good buffer to the pipe losses.

3.10 POC 2.11 collation and reporting

First Milk provide each participating voluntary farm with a Nutrient Efficiency Programme report. The report shows (Fig 3) how each farm is performing and how it is performing against the sustainability working group.

The Farmscoper data and summary reports are held electronically by First Milk and can be accessed by NRW upon request.

A Nutrient Efficiency Programme farm pack file is kept and maintained by the participating farmer.

4 SUMMARY OF 2020 RESULTS

The First Milk Nutrient Efficiency group, comprising of 33 farms, has undertaken a total of 453 mitigation measures and a summary of the measures is shown in Fig 8.

The most frequently taken up measures relate to the management and application of fertilisers, including animal manures.

Detailed quantities of the baseline, current and projected losses for each farm are shown in Table 1.

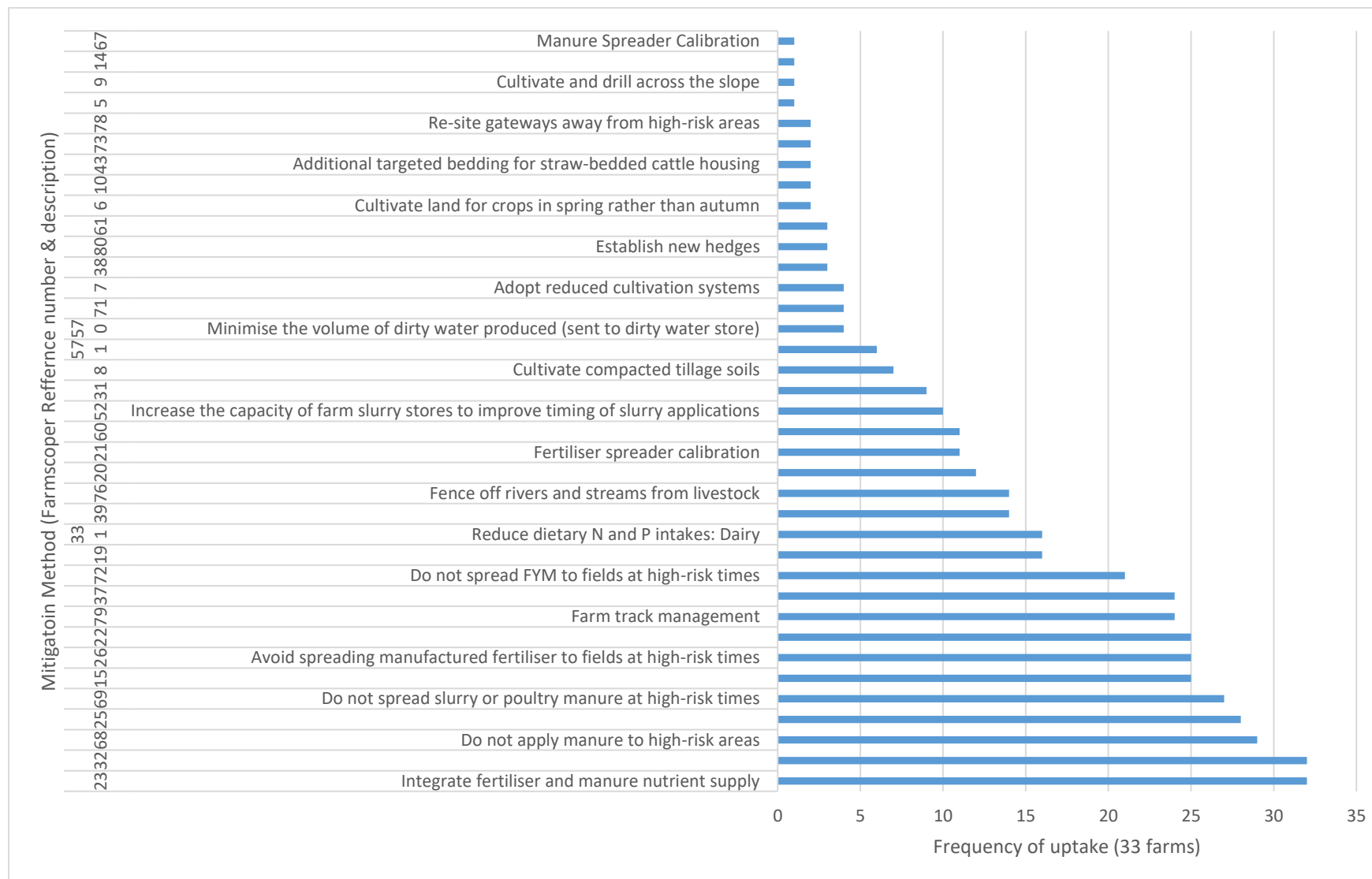


Figure 8 Frequency of uptake of mitigation measures

Table 1 A summary of the Farmscoper evaluation for the 33 farms in the Nutrient efficiency group

Farm ref number	Item	Scenario	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)
2501096	Baseline	Baseline	6023	27.4	7164
	current losses	WithPriors	5874	24.3	6422
	Projected losses	Set	5486	17.2	4896
2501129	Baseline	Baseline	5745	26.8	6177
	current losses	WithPriors	5413	22.4	5173
	Projected losses	Set	4866	16.7	4170
2501136	Baseline	Baseline	8500	459.3	67273
	current losses	WithPriors	8500	459.3	67273
	Projected losses	Set	6719	378.7	66384
2501137	Baseline	Baseline	6857	394.2	76595
	current losses	WithPriors	5994	336.5	76427
	Projected losses	Set	5102	272.3	75923
2501181	Baseline	Baseline	2299	16.7	3075
	current losses	WithPriors	2299	16.7	3075
	Projected losses	Set	2208	10.6	1941
2501190	Baseline	Baseline	8652	395.6	91054
	current losses	WithPriors	8652	395.6	91054
	Projected losses	Set	7199	380.6	87713
2501256	Baseline	Baseline	6209	36.2	7322
	current losses	WithPriors	6073	32.5	6772
	Projected losses	Set	5742	25.1	5122
2501301	Baseline	Baseline	5321	78.7	33768
	current losses	WithPriors	5321	78.7	33768
	Projected losses	Set	4781	58.9	27848
2501368	Baseline	Baseline	18010	122.9	19990
	current losses	WithPriors	18010	122.9	19990
	Projected losses	Set	16199	81.0	13634
2501452	Baseline	Baseline	11183	72.1	22996
	current losses	WithPriors	11183	72.1	22996
	Projected losses	Set	9859	46.2	16554
2501463	Baseline	Baseline	6760	467.2	102848
	current losses	WithPriors	6760	467.2	102848
	Projected losses	Set	5588	381.5	97929
2501467	Baseline	Baseline	9546	90.6	35925
	current losses	WithPriors	9546	90.6	35925
	Projected losses	Set	8530	67.3	25790

Farm ref number	Item	Scenario	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)
2501490	Baseline	Baseline	7580	48.7	11224
	current losses	WithPriors	6943	38.0	8415
	Projected losses	Set	6489	28.0	6263
2501549	Baseline	Baseline	11769	59.0	12125
	current losses	WithPriors	11235	47.4	10155
	Projected losses	Set	10664	35.9	8185
2501549	Baseline	Baseline	3678	138.7	70796
	current losses	WithPriors	3431	132.9	70384
	Projected losses	Set	2977	116.6	65630
2501549	Baseline	Baseline	7175	36.9	7896
	current losses	WithPriors	6841	29.7	6612
	Projected losses	Set	6482	22.6	5329
2501549	Baseline	Baseline	8011	40.6	8600
	current losses	WithPriors	7642	32.7	7203
	Projected losses	Set	7246	24.9	5805
2501549	Baseline	Baseline	8158	43.2	9094
	current losses	WithPriors	7776	35.1	7616
	Projected losses	Set	7366	27.0	6138
2501551	Baseline	Baseline	5201	335.0	69985
	current losses	WithPriors	5201	335.0	69985
	Projected losses	Set	4326	299.3	66562
2501581	Baseline	Baseline	4649	328.5	30419
	current losses	WithPriors	3782	253.7	29822
	Projected losses	Set	3185	208.1	29103
2501591	Baseline	Baseline	10969	517.9	178154
	current losses	WithPriors	10969	517.9	178154
	Projected losses	Set	8262	384.4	140847
2501603	Baseline	Baseline	14303	72.5	29539
	current losses	WithPriors	14303	72.5	29539
	Projected losses	Set	12798	51.9	21400
2501604	Baseline	Baseline	8139	52.3	14240
	current losses	WithPriors	8139	52.3	14240
	Projected losses	Set	7155	42.3	8651
2501614	Baseline	Baseline	11259	47.3	12548
	current losses	WithPriors	10979	43.3	11529
	Projected losses	Set	10098	29.3	7623

Farm ref number	Item	Scenario	Nitrate (kg)	Phosphorus (kg)	Sediment (kg)
2501616	Baseline	Baseline	7750	502.2	62497
	current losses	WithPriors	7350	469.0	61911
	Projected losses	Set	5281	311.0	59667
2501618	Baseline	Baseline	7924	28.4	7761
	current losses	WithPriors	7734	23.0	6915
	Projected losses	Set	7253	16.8	6070
2502340	Baseline	Baseline	12474	141.4	25920
	current losses	WithPriors	12474	141.4	25920
	Projected losses	Set	11530	90.7	17664
2503184	Baseline	Baseline	4965	462.2	76826
	current losses	WithPriors	4965	462.2	76826
	Projected losses	Set	4015	392.9	75563
2503383	Baseline	Baseline	3427	320.7	50092
	current losses	WithPriors	3427	320.7	50092
	Projected losses	Set	2711	264.4	50092
2503428	Baseline	Baseline	4256	350.9	36585
	current losses	WithPriors	4256	350.9	36585
	Projected losses	Set	3653	276.6	35347
2503688	Baseline	Baseline	4404	38.2	8933
	current losses	WithPriors	4404	38.2	8933
	Projected losses	Set	4203	29.3	8933
2503755	Baseline	Baseline	16429	180.8	78300
	current losses	WithPriors	16429	180.8	78300
	Projected losses	Set	14293	104.0	56227
2910957	Baseline	Baseline	2507	170.1	18877
	current losses	WithPriors	2507	170.1	18877
	Projected losses	Set	1904	127.8	18090

Appendix 1 List of Participating Farmers

Contact Address 1	Contact Address 2	Contact Address 3	Contact Address 4	Contact Address 5
Broomhill	Martletwy	Narberth	Pembrokeshire	SA67 8BJ
Castell Y Gwcw	Llandeloy	Haverfordwest	Pembrokeshire	SA62 6LH
Churchland Farm	Clarbeston	Clarbeston Road	Haverfordwest	SA63 4QY
Clun Gwyn	Cynwyl Elfed	Caerfyrddin	Carmarthenshire	SA33 6ST
Clyngwyn	Efailwen	Clynderwen	Pembrokeshire	SA66 7XH
Cotland Farm	Llawhaden	Narberth	Pembrokeshire	SA67 8DT
Cox Lake Farm	Narberth		Pembrokeshire	SA67 8EJ
Denant Farm	Walton Grange	Clarbeston Road	Haverfordwest	SA63 4SY
Dollaston	Crundale	Haverfordwest	Pembrokeshire	SA62 4EL
Fagwr Fran East	Puncheston	Haverfordwest	Pembrokeshire	SA62 5RW
Felindre Uchaf	Cwmanne	Lampeter	Ceredigion	SA48 8HT
Cuckoo Grove	Haven Road	Haverfordwest	Pembrokeshire	SA61 2UY
Llwyngwair Home Farm	Newport		Pembrokeshire	SA42 0LX
Maenhir	Login	Whitland	Carmarthenshire	SA34 0XE
Marlsbrough	Portfield Gate	Haverfordwest	Pembrokeshire	SA62 3NP
Moor Farm	Walwyns Castle	Haverfordwest	Pembrokeshire	SA62 5EE
Nantyrhebog	Llysonnen Road	Carmarthen	Carmarthenshire	SA33 5DY
New Scollock	Ambleston	Haverfordwest	Pembrokeshire	SA62 5RD
North Farm	Walton East	Clarbeston Road	Pembrokeshire	SA63 4SU
Orton Farm	Clarbeston Road		Pembrokeshire	SA63 4UY
Pantycabal	Tufton	Haverfordwest	Pembrokeshire	SA63 4TR
Parc-Y-Morfa Farm	Fishguard		Pembrokeshire	SA65 9SS
Pelcomb Farm	Pelcomb Bridge	Haverfordwest	Pembrokeshire	SA62 6EA
Pentrefelin	Talsarn	Lampeter	Ceredigion	SA48 8QE
Penymynydd Mawr	Puncheston	Haverfordwest	Pembrokeshire	SA62 5RS
Shipping Farm	Llawhaden	Narberth	Pembrokeshire	SA67 8DN
Spittal Cross	Spittal	Haverfordwest	Pembrokeshire	SA62 5DB
Sychpant	Rhoshill	Cardigan	Pembrokeshire	SA43 3DJ
Trevaughan Farm	Whitland	Carmarthenshire		SA34 0QL
Velindre	Llys-Y-Fran	Clarbeston Road	Pembrokeshire	SA63 4RN
Walton Grange	Clarbeston Road	Haverfordwest	Pembrokeshire	SA63 4SY
West farm	Walton East	Clarbeston Road	Pembrokeshire	SA63 4SX
Westhill Farm	Lamphey	Pembroke	Pembrokeshire	SA71 5NL