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GLASTIR MONITORING & EVALUATION PROGRAMME

FINAL REPORT – Annex 2

Wales Farm Practices Survey

Design and Delivery of Survey

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Abstract

*The Glastir Monitoring and Evaluation Programme (GMEP) led by the Centre for Ecology and Hydrology (CEH) is an integrated programme of whole ecosystem monitoring and modelling for robust analysis of the outcomes of the Welsh Government's Glastir agri-environment scheme (**Emmett** **et al.**, **2014**). This first interim report documents the design of a stratified survey of changing farm inputs and management at whole-farm level that can be attributed to the scheme, and farmer perceptions of how the scheme has contributed to climate change adaptation and the enhancement of farm business profitability. The survey is intended to compare practices and perceptions between groups of farms that are stratified by system type (dairy, lowland beef and sheep) and level of scheme participation. It is compatible with a survey of the preceding Tir Cynnal and Tir Gofal agri-environment schemes (**Anthony** **et al.**, **2012**), and designed to assess the level of additionality achieved by Glastir and the persistence of any changes in management delivered by Tir Cynnal and Tir Gofal. We report on the intended and achieved survey stratification and compare the farm attributes for survey respondents with those of the general farm population, and conclude that the survey is representative. Analyses of the survey responses will follow in separate reports.*

1. Introduction

A survey of changing farm practices attributable to participation in the Glastir and preceding Tir Cynnal and Tir Gofal agri-environment schemes was commissioned by Welsh Government as part of the Glastir Monitoring and Evaluation Programme (GMEP) led by the Centre for Ecology and Hydrology (CEH; **Emmett *et al*., 2014**). This interim report is focussed on the design of the survey and the achieved stratification.

1.1 Agri-Environment Schemes in Wales

Agricultural and rural development in the European Union (EU) is funded under the Common Agriculture Policy (CAP). Pillar one of the CAP is transitioning to the Basic Payments Scheme that will make area based payments to farmers who keep their land in Good Agricultural and Environmental Condition (GAEC), with additional payments for compliance with certain Greening measures based on maintenance of permanent grassland, crop diversification and ecological focus areas. Pillar two of the CAP is known as the Rural Development Pillar (RDP) and provides financial support to farmers to deliver environmental goods and support rural economies and communities. Agri-environment schemes in Wales are funded under Axis 2 of the RDP (Improving the Environment and the Countryside), and provide funding for farmers to manage their land in a way that benefits biodiversity and landscape features, and improves the quality of water and soil.

The Glastir agri-environment scheme was introduced in 2009 following a review of the RDP (**Welsh Government, 2008**) and became the single operational agri-environment scheme in Wales from 2013. The scheme objectives reflect the government's environmental objectives and a reframing of support to farmers as payments for ecosystem goods and services (**Wynn-Jones, 2013**):

- *Conserve and enhance wildlife and biodiversity;*
- *Management and protect landscapes and the historic environment;*

- *Create new opportunities to improve access and understanding of the countryside;*

- *Manage soils to help conserve carbon stocks and reduce soil erosion;*
- *Improve water quality and reduce surface run-off; and*
- *Manage water to help reduce flood risks.*

The operation of the Glastir scheme retains the basic model of the preceding Tir Gofal scheme (**Auditor General for Wales, 2014**) and operates as system of points and payments for adoption of management options. Glastir is composed of an Entry (GE) level element that is accessible to all farmers in Wales, an upper level Advanced (GA) element which spatially targets issues of concern in pre-defined priority areas (addressing soil carbon management, water quality, water quantity, biodiversity, the historic environment, and improved access), a Commons element (GC), the Efficiency (GF) capital grant element, an Organic farming (GO) element, and a stand-alone Woodland (Creation and Management) (GW) element (**Rose, 2011**). Farms participating in Glastir are required to adhere to a Whole Farm Code that concerns record keeping and habitat protection, and prohibits some practices such as application of livestock manures when soils are waterlogged. When introduced, participants were required to join the Entry level scheme before progressing to the Advanced scheme. This is no longer necessary and participants can join the Advanced scheme directly. There are currently 4,600 participants in the Entry level scheme, including 1,400 in the Advanced level, managing 35% of the total utilised agricultural area in Wales (**Table 1**).

Prior to Glastir, between 1999 and 2009, support for agri-environmental action under Axis 2 was provided by four schemes: Tir Cynnal (TC), Tir Gofal (TG), Tir Mynydd (TM) and the Organic Farming and Maintenance Schemes (OFS). The TC scheme was an entry-level scheme that ran between 2005 and 2013 with first payments made in 2006. Participants were required to prevent erosion of biodiversity through protecting wildlife habitats (and have a minimum 5% of the farm area in a wildlife habitat), and expected to complete a Farm Resource Management Plan specifying the actions that need to be taken to remove the risks to the environment from their current farm practices, including the use of potential pollutants such as fertiliser, manures and chemicals. The TG scheme was launched in the year 2000 and the last agreements concluded in 2015. It had stricter requirements than the TC scheme and imposed an obligatory suite of measures going beyond mandatory requirements (GAEC) for good environmental practice, and obligatory conservation and sustainable management of priority habitats. It provided for optional payments for capital works and management for the restoration and preservation of habitats and landscape features. The OFS was introduced in 1999 and provided area payments for organically certified fields to farmers to help them convert from conventional to organic farm management, and to sustain the change. The TM scheme supported livestock production in the less productive farming areas by a direct forage area payment. At their peak, there were 7,600 participants in Tir Cynnal and Tir Gofal, managing 52% of the total utilised agricultural area in Wales (**Table 1**).

Table 1. Number of scheme agreements and the area of land managed under Glastir and the preceding Tir Cynnal and Tir Gofal agri-environment schemes in Wales (2001 to 2015; Defra statistics annual publication *Agriculture in the United Kingdom*).

Number of Agreements	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Organic Farming Scheme	400	500	500	600	700	800	800	900	1000	1000	1000	1000	600	1000	…	
Tir Gofal	1700	1800	2400	3000	3200	3300	3200	2900	3200	3100	3000	3000	2800	100	…	
Tir Cynnal	…	…	…	…	3400	3400	4200	4400	4400	4200	3900	3800	3700	…	…	
Glastir Entry (Includes Glastir Advanced)	…	…	…	…	…	…	…	…	…	…	…	1700	1900	4200	4600	4600
Glastir Advanced	…	…	…	…	…	…	…	…	…	…	…	…	300	1000	1400	1400
Glastir Commons (Includes Glastir Advanced) (Commons))	…	…	…	…	…	…	…	…	…	…	…	100	100	200	200	200
Glastir Organic	…	…	…	…	…	…	…	…	…	…	…	…	…	…	500	500
																500
Area of Agreements (1000 ha)	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Organic Farming Scheme	37	48	55	55	68	81	76	121	126	132	130	132	51	97	…	
Tir Gofal	99	116	120	115	332	354	439	329	377	381	378	372	358	12	…	
Tir Cynnal	…	…	…	…	223	223	273	293	281	279	245	253	297	…	…	
Glastir Entry (Includes Glastir Advanced)	…	…	…	…	…	…	…	…	…	…	…	155	203	508	546	546
Glastir Advanced	…	…	…	…	…	…	…	…	…	…	…	…	29	184	251	251
Glastir Commons (Includes Glastir Advanced) (Commons))	…	…	…	…	…	…	…	…	…	…	…	…	34	111	117	119
Glastir Organic	…	…	…	…	…	…	…	…	…	…	…	…	…	…	64	65
Decoupled Advanced																34

*Glastir Entry values include Glastir Advanced

Table 2. Overall rate of fertiliser applied to arable crops and improved grassland in England and Wales (British Survey of Fertiliser Practice, 2000 to 2015).

	Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Arable Crops	**Phosphate (kg/ha)**	44	40	41	37	38	37	32	32	28	19	27	27	25	25	26	26
	Nitrogen (kg/ha)	154	144	153	152	150	149	145	148	141	140	149	150	147	138	149	149
	Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Grassland	**Phosphate (kg/ha)**	18	16	18	16	15	15	14	12	9	7	9	8	8	8	8	8
	Nitrogen (kg/ha)	95	90	85	79	73	72	69	64	52	54	62	57	54	57	58	53

Table 3. Numbers of breeding livestock and total arable crop and grassland areas in Wales (1000 head and 1000 hectares; June Agricultural Survey; Welsh Government, 2000 to 2015).

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dairy Breeding Herd	268	269	267	268	271	264	280	265	259	251	251	250	253	253	265	279
Beef Breeding Herd	224	207	195	212	216	220	223	206	200	192	196	197	193	183	177	176
Breeding Ewes	5,644	5,086	5,154	5,016	4,957	4,732	4,700	4,529	4,195	3,995	4,109	4,117	4,169	4,275	4,765	4,742
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Rotational Grassland	133	118	128	117	107	115	99	95	86	88	103	116	138	143	152	157
Permanent Grassland	933	974	925	1,002	1,009	982	1,037	1,001	1,016	1,026	1,020	1,044	1,049	997	1,047	1,068
Sole Rights Rough Grazing	261	227	272	210	201	220	228	209	199	213	229	224	222	263	257	257
Arable Crops	65	63	64	65	68	64	62	65	74	82	85	88	84	79	85	87

1.2 Survey Objectives

The Glastir scheme land management options and Advanced level spatial prioritisation and selection process will evolve with changing policy priorities and emerging evidence on the effectiveness of options. Computer modelling of scheme outcomes for diffuse water pollution and climate change at catchment and regional scale will be a key decision making tool in this process, to complement the field scale ecological monitoring that is being carried out under GMEP (**Emmett *et al*., 2014**). Computer modelling was used in a quantitative assessment of the impacts of the preceding agri-environment schemes that was able to link modelled agricultural emissions with the measured chemical and ecological status of freshwaters in Wales (**Anthony *et al*., 2012; Jones *et al*., 2016**). This computer modelling requires quantitative evidence of changes in farm practices that can be attributable to a scheme.

Except in a limited number of cases, such as support for adoption of slurry injection, the impact of the Glastir scheme management options on practices that might affect diffuse pollution pressures and the whole-farm effects of a portfolio of management options on overall stocking rates and nutrient inputs, are neither explicit or collated centrally as part of the record keeping framework. This was addressed in studies of the preceding schemes by the commissioning of surveys of Welsh farms to collect information on baseline practices and changes attributable to the scheme, with a focus on the level of adoption of lists of diffuse pollution mitigation measures relevant to good soils, manures, fertiliser and livestock management (**Anthony *et al*., 2012; AgraCEAS, 2003; ADAS, 2010**). Surveys of changes in practice under the preceding Tir Cynnal and Tir Gofal schemes established that significant reductions in expenditure on fertiliser (**AgraCEAS, 2003; ADAS, 2010**) and absolute quantities of fertiliser used (**Anthony *et al*., 2012**) had occurred. Reductions in livestock numbers (**ADAS, 2010; Anthony *et al*., 2012**) were also identified, although a large proportion of farmers reported that changes would possibly or definitely have occurred regardless of scheme entry (**ADAS, 2010**). Differences in the level of adoption of farm management plans and specific mitigation options, such as the testing of soil nutrient status and fencing off farms from livestock, were also established (**Anthony *et al*., 2012**).

The first objective of this survey was therefore to similarly establish farm level changes in management that are claimed by farmers as a direct response the Glastir management options, and to establish the background level of change on non-scheme farms in response to other drivers for change, including farm economics. These would be placed in the context of national long-term trends in nutrient inputs and livestock numbers (**Table 2 and 3**). Robust information on raised levels of uptake of diffuse pollution mitigation options would later be fed into computer models to estimate the catchment and regional impact of participation in the Glastir scheme.

In September 2014 the Auditor General for Wales published a report on Glastir. The report contained a series of observations and related recommendations including a number associated with the setting of scheme targets and monitoring actual scheme impact against scheme targets which has had an impact on the reporting requirements of the GMEP project (**Auditor General for Wales, 2014**). The auditor identified six strategic objectives, amongst which there was a need:

- *To increase the level of investment into measures for climate change adaptation with the aim of building greater resilience into both farm and forest businesses and the wider Welsh economy and environment to ongoing climate change; and*

- *To use agri-environment investment in way that encourages positive environmental outcomes but also contributes towards farm and forest business profitability and the wider sustainability of the rural economy.*

To respond to these recommendations, the GMEP project management worked with the Welsh Government and the GMEP Advisory Group to develop a small number of impact indicators for each strategic objective. It was decided that a farm practice survey for collection of information on changes in management was also an opportunity to collect information on the level of farm interest in on-farm energy and renewables production, especially relating to woodland creation and management, and farmer perceptions of how participation in the Glastir scheme had contributed to climate change adaptation and the enhancement of farm business profitability.

The second objective of this survey was therefore to provide evidence of evidence for investment by farms into measures for climate change adaptation and the enhancement of business profitability and the wider sustainability of the rural economy.

2. Survey Design

The survey was designed by ADAS in consultation with the GMEP (Bridgett Emmett and Bronwen Williams) and Welsh Government (James Skates) project managers and stakeholder (Bill MacDonald) and the Agriculture and Rural Affairs statistician (Stuart Neil). Official approval of the questionnaire and final sample design was obtained from the Statistical Directorate through the completion of an official 'Approval of Statistical Surveys' form (Approval No. 4/2016).

The survey questionnaire was designed to be a scripted telephone interview of 600 farms, taking up to 20 minutes to complete. The survey was translated into Welsh for those farmers requesting this. The structure and flow of the survey were checked via a web implementation of the survey prior to the field work.

2.1 Thematic Structure

The survey questionnaire (and introductory letter) are presented in **Appendix A**. Following the design of the first Wales Farm Practices Survey (**Anthony *et al*., 2012**), this second survey was first structured by areas of farm management (fertiliser, soil, manure and livestock), supported by introductory segments to collect background information on current scheme participation (to validate the targeting of the survey), and on land use and soils (to better interpret the management information) (**Table 4**).

Table 4. Thematic structure of questions in this second Wales Farm Practices Survey.

- *Targeting (Section 1)*
- *Scheme Participation (Section 2)*
- *Land Use, Soils and Drainage (Section 3)*

- *Employment (Section 4)*
- *Livestock Management (Section 5)*
- *Manure Management (Section 6)*
- *Fertiliser Management (Section 7)*
- *Soil Management (Section 8)*
- *Woodland and Renewables (Section 9)*
- *Resilience (Section 10)*
- *Comment (Section 11)*

Each area of management is represented by questions on the completion of relevant farm management plans (such as Nutrient Management Plan or a Soil Protection Review), questions quantifying the change in inputs or the numbers of livestock carried by a farm, and questions identifying specific diffuse pollution mitigation practices that had been carried out by a farm in the past three years (Sections 5 to 8). The latter are selected from pre-prepared lists that are consistent with the first survey.

This survey does not include questions on management of crop protection chemicals or usage of veterinary medicines as the preceding survey established that change was largely driven by system type (especially conventional versus organic management) and other stewardship programmes (such as the Voluntary Initiative and farm assurance schemes) rather than the agri-environment programme (**Anthony *et al*., 2012**).

To capture information on the potential for expansion of woodland and renewables production, questions were added on existing capacity and the level of interest in expansion and perceived barriers (Section 9).

To capture information on scheme impact on farm businesses, questions were added on the change in the number of employees (Section 3) and whether the Glastir scheme specifically had supported the farm business in taking up practices for adaptation to climate change or improving the efficiency of the business (Section 10). Information is collected on whether the scheme brought forward planned action by providing information, capital support, or facilitated collaboration with other farmers.

The survey also concludes with a set of opinion questions that gather farmer perceptions on whether scheme participation resulted in changes in management and improved the resilience of the farm business (Sections 10 and 11).

All change questions are asked differently depending on scheme participation. For farms that were in the Tir Cynnal or Tir Gofal scheme, but have not applied to the Glastir scheme, we ask whether change has occurred as a result of ending a previous scheme agreement. For farms that are in the Glastir scheme, we ask whether change occurred as a result of the new agreement. Whilst for farms that have never been in scheme, we ask whether any change has occurred in the past three years. The responses to these questions are intended to establish the background level of change in response to non-scheme drivers for change, the level of change attributable to the portfolio of management options taken up under the Glastir scheme, and the potential reversion to a previous management intensity on departure from the preceding schemes.

Where change has occurred, the respondent is asked what other factors may have influenced change in addition to the agri-environment schemes.

2.2 Stratification

All farms surveyed were active businesses and were claiming under the Single Payment Scheme. Stratification for analysis was by Robust Farm Type (**MAFF, 1993**) and level of participation in the Glastir, Tir Cynnal and Tir Gofal agri-environment schemes. Stratification for selection also considered farm size and agricultural region. Only grazing livestock farms were surveyed, accounting for 86% of the total farmed area and 94% of the total number of cattle and sheep in Wales (**Table 5**).

Survey by Robust Farm Type provided a means of extrapolating results across the whole of Wales, and linking to other government surveys. Farm type definition is based on the dominant source of revenue (Dairy versus Cattle and Sheep) and location (Less Favoured Area status). We use the acronym CS-SDA for grazing livestock farms with cattle and sheep that are located within the Severely Disadvantaged Area of the Less Favoured Area, and CS-DA are located within the Disadvantaged Area. The CS-LOW are grazing livestock farms with cattle and sheep located outside of the Less Favoured Area (**Figure 1**).

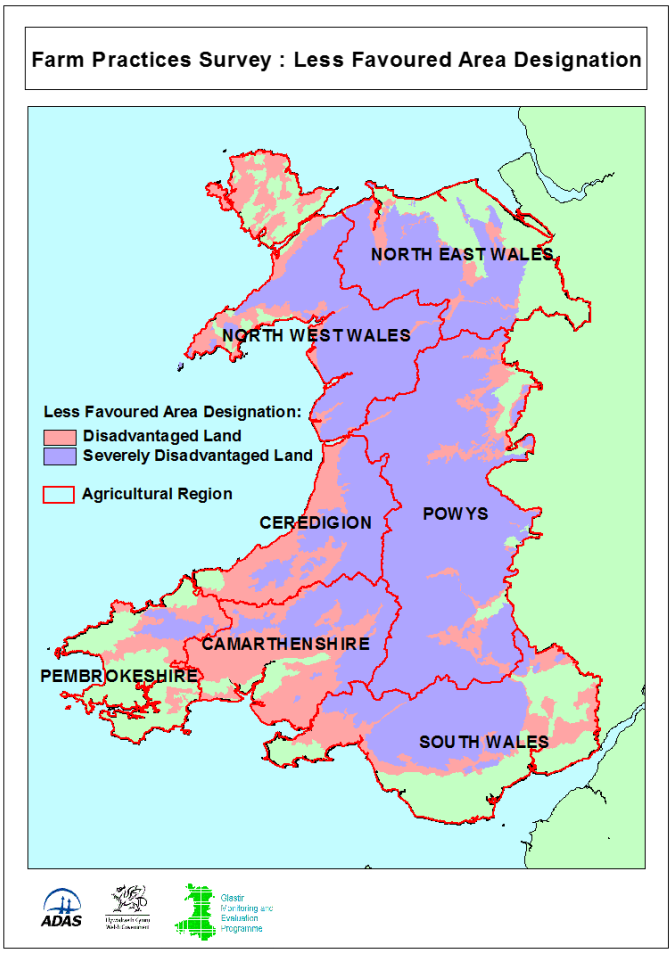


Figure 1 Spatial extent of the Severely Disadvantaged and Disadvantaged Areas within the designated Less Favoured Area of Wales, and superimposed the agricultural regions of Wales.

Table 5. Percent (%) of all farms, the total farmed land area and livestock in Wales managed by the grazing livestock farm types (Welsh Government, 2015).

Farm Type	Total Farms	Total Farmed Area	Total Beef Cattle	Total Dairy Cattle	Total Sheep
DAIRY	7	14	13	94	3
CS-LFA	49	65	64	3	86
CS-LOW	10	8	16	1	7

The survey was designed where possible to achieve a balanced number of responses between farms in any scheme and out of scheme, and between the representative farm types. The sampling of the Glastir and preceding schemes was split between the lower and higher levels. The survey was designed to compare and contrast select management groups, and not to deliver proportional sampling of all Welsh farms. The planned comparisons were of:

- Farms in Glastir (Entry, Advanced) *versus* not in Glastir
    - Nested Previous Scheme (None, Tir Cynnal, Tir Gofal)
    - Nested Farm Type (Dairy, CS-SDA, CS-DA + CS-LOW)
- Farms in Tir Cynnal or Tir Gofal *versus* not in Tir Cynnal or Tir Gofal
    - Nested Current Scheme (None, Glastir Entry, Glastir Advanced)
    - Nested Farm Type (Dairy, CS-SDA, CS-DA + CS-LOW)

The first comparison was to establish the effect of the current Glastir scheme, and the second to assess any legacy of the preceding Tir Cynnal and Tir Gofal schemes. **Table 6** summarises the survey stratification and planned number of respondents. Note that in contrast to the earlier survey we split the CS-DA from the CS-LFA and combined them with the CS-LOW to create a CS-DA+CS-LOW survey category that it was believed better represented the gradation of stocking rates between lowland and upland areas, and also increased the available number of survey respondents for the lowland farms. The archived survey results from the earlier survey have been re-classified for compatibility (**Anthony *et al*., 2012**).

Table 6. Planned sample stratification by level of scheme participation and farm type.

	Sample Pool				Planned Sample Number				Survey Pool		
Stratification	**Dairy**	**CS-SDA**	**CS-DA+CS-LOW**		**Dairy**	**CS-SDA**	**CS-DA+CS-LOW**		**Dairy**	**CS-SDA**	**CS-DA+CS-LOW**
None / None	864	1585	1407		50	50	50		336	335	332
TC / None	244	470	330		25	25	25		161	167	163
TG / None	170	420	313		25	25	25		170	161	163
None / Entry	97	424	142		15	35	25		79	256	118
TC / Entry	101	364	157		10	10	15		83	131	135
TG / Entry	64	486	133		10	10	15		60	91	90
None / Advanced	21	138	60		15	35	25		21	83	60
TC /Advanced	31	103	40		10	15	15		31	35	40
TG / Advanced	24	434	103		10	15	15		24	77	66

2.2.1 Sample Selection

Creation of a potential sample pool was the first stage in delivering the survey. The sample pool selection was based on analysis of Welsh Government records of farms participating in the agri-environment schemes that could be linked to databases of contact details and the annual June Agricultural Survey. Farm holdings are uniquely identified in the government databases by either a County-Parish-Holding number (CPH); a Customer-Record-Number (CRN); or a Scheme-Record-Number (SRN).

Customer Contacts

Welsh Government provided a database of *c*. 50,000 contact names and addresses for farms registered with any scheme, including the Basic Farm Payment. The contacts database was correct as of October 2013. This was filtered to exclude dormant or closed records or those where the details were changing, and only those with a valid post code and telephone number.

The list was filtered to include only those that could be assigned a main farm County-Parish-Holding number using a Welsh Government provided CRN to CPH look-up table that links government records of scheme payments to the results of the June Agricultural Survey, and whose main farm office was located in Wales, leaving an overall *c*. 16,500 valid records.

Farm Type and Size

The list was further filtered to include only those with a record in the holding level June Agricultural Survey that permitted the assignment of a Robust Farm Type from the Main Farm Type, and only those that are DAIRY, CS-LFA or CS-LOW grazing livestock farms which are the dominant farm types in Wales (**Table 5**):

- *Dairy (RFT 5)*
- *Less Favoured Area Grazing Livestock (CS-LFA; RFT 6)*
- *Lowland Grazing Livestock (CS-LOW; RFT 7)*

The farm records were re-assigned to a survey farm type, splitting the CS-LFA category, based on the Main Farm Type:

- *Dairy (18% records)*
- *CS-SDA (51% records)*
- *CS-DA+CS-LOW (31% records)*

The list was finally filtered to exclude farms with a Standard Labour Requirement less than 0.5 for consistency with the previous survey, *i.e*. we excluded spare time farms (a SLR of 1 is equivalent to one full-time person who works a 39 hour week or 1900 hours per year). This was consistent with the previous farm practices survey for Wales. By this process, the sample pool was reduced to 18% of the original list of contact names and addresses.

Note that this size threshold excluded a large number of scheme agreements from the sample selection. Using government provided records of scheme participation, it was estimated that between 20 and 25% of all current Glastir agreements and all past Tir Cynnal

or Tir Gofal agreements were with farms with a Standard Labour Requirement less than 0.5. However, these farms accounted only 5 to 10% of the total managed agricultural area on farms participating in the schemes. This survey was therefore focussed on the farms that managed the majority of the land area of all farms with scheme agreements.

Preceding Scheme Participation

Participation lists for each of the preceding Tir Cynnal, Tir Gofal and the Organic Farming Scheme were provided by Welsh Government. Records were excluded from the sample pool if it were not possible to assign a previous scheme status to a farm. For the purpose of stratifying this second survey, any farm that had participated in both the Tir Cynnal and Tir Gofal was recorded as participating in Tir Gofal only**. Table 7** summarises the total number of scheme agreements in the sample pool by survey farm type, and for all farm types across the whole of Wales. The farms in the survey pool accounted for between 50 and 62% of all previous scheme agreements.

Table 7. Total number of previous scheme agreements in the sample pool of farms by survey farm type, and for all farm types across the whole of Wales.

Survey Farm Type	TC	TG	OFS
DAIRY	377	258	87
CS-SDA	944	1344	357
CS-DA+CS-LOW	530	551	151
All Wales – All Farm Types	3749	3454	990

Current Scheme Participation

Participation lists for each of current Glastir Entry, Advanced, Commons, Organic, Efficiency Grant, Woodland Creation and Woodland Maintenance schemes were provided by Welsh Government. The records were correct as of October 2015. Records were excluded if it were not possible to assign a scheme status. For the purpose of stratifying this second survey, any farm that was participating in both the Entry and Advanced scheme was recorded as participating in Advanced only. **Table 8** summarises the total number of scheme agreements in the sample pool by survey farm type, and for all farm types across the whole of Wales. The sample pool included 64% of all Glastir Entry and 61% of all Glastir Advanced agreements, 78% of all Glastir Organic agreements, and 82% of all Glastir Efficiency agreement holders. Principally as a result of the minimum farm size criteria, the sample pool included less than 20% of all Glastir Woodland grant holders (**Table 8**).

Table 8. Total number of current Glastir scheme agreements in the sample pool of farms by survey farm type, and for all farm types across the whole of Wales.

Survey Farm Type	*GE	GA	GC	GO	GF	GW(C)	GW(M)
DAIRY	338	76	0	4	97	15	4
CS-SDA	1949	675	0	83	107	73	15
CS-DA+CS-LOW	635	203	0	14	42	35	6
All Wales – All Farm Types	4560	1569	42	129	301	532	186

*Glastir Entry values include Glastir Advanced

2.2.2 Survey Selection

The sample pool was reduced to a survey pool to minimise the survey notification effort whilst maintaining a large enough pool to ease farm contact and secure the required number of responses. Sufficient was defined as a ratio of 6 to1 between the survey pool and required number of respondents for each strata, based on experience and expert advice. The reduction of the sample pool from circa 8,700 records to 3,500 records was done by randomised sampling within the survey strata.

Each sample pool strata was further divided by farm size (5 classes) and agricultural region (7 classes) and the randomised sampling carried out within these finer resolution strata in order to maintain the overall characteristics of the sample pool. For the survey pool, we also removed a small number (24) of records for holdings that shared the same main holding CPH as another and provided names and addresses indicated that the farms were managed by the same family, although at different locations and having different CRN.

Table 6 summarises the final total number of potential respondents in the survey pool. It was not possible to achieve a survey ratio greater than 3 for the farms now in the Glastir Advanced scheme, and there remained a significant risk that some of these target groups would not be adequately surveyed because of the difficulty in making contact with farm managers drawn from a small survey pool. The risk would be exacerbated by inevitable inaccuracies in the farm contacts details. This was kept under daily review during the survey.

2.3 Prospective Power Analysis

The design of the survey was a practical compromise between statistical power and resource limitations. The cost of each survey return was approximately £25, including an estimate for the respondent's time, giving a total survey value of £15,000. Prospective statistical power was evaluated using the G* Power software (*version* 3.1**; Faul *et al*., 2007; Faul *et al*., 2009**).

A majority of the survey questions would return binary information on the prevalence of an activity. One tailed tests were evaluated as participation in the schemes was expected to result in an increase in prevalence. Independent sample groups compared would generally each have between 75 and 150 respondents.

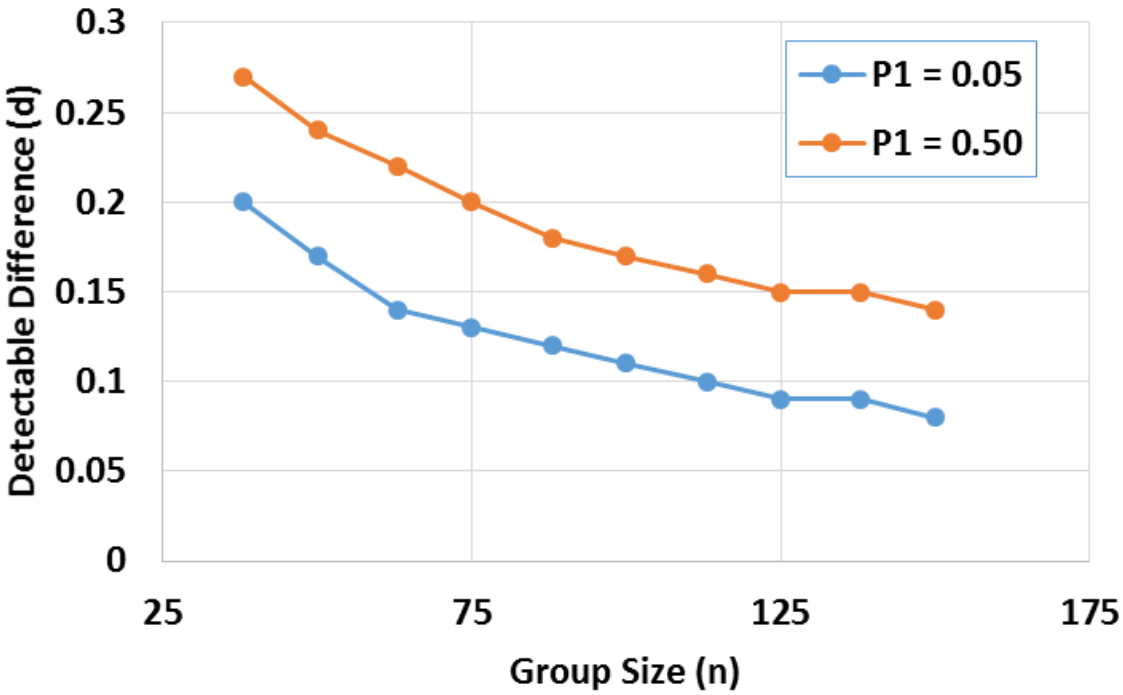


Figure 2. Calculated sample group number required for a fixed alpha probability (false positive) of 0.05 and beta probability (false negative) of 0.80 for detecting the difference between two independent prevalence proportions, where the first proportion (P_1) has values of 0.05 and 0.50.

Figure 2 graphs and **Table 9** summarises the calculated sample group number required for a fixed alpha probability (false positive) of 0.05 and beta probability (false negative) of 0.80 for detecting the difference between two independent prevalence proportions (P_1 and P_2) with varying effect size, using a standard z-test. A 'medium effect size' as measured by a Cohen's *h* value of 0.50 (**Cohen, 1988**), is equivalent to absolute differences in prevalence proportions of between 0.17 and 0.24, is detectable for a sample group size of 50. The required group sizes were also calculated to detect an effect by multiple logistic regression, using a standard Wald test, where the different in prevalence proportions is described by an odds ratio. The calculated group sizes were similar for the case of a balanced design and a single explanatory variable (**Table 10**). If there are additional explanatory variables then the required group sizes are scaled by 1 / (1-*R*) where *R* is the proportion of the total variance in the first explanatory variable that is explained by other explanatory variables. This can be established by regression analysis (**Faul *et al*., 2009**).

Overall, the design of the survey was expected to be generally sufficient to detect absolute differences in prevalence proportions between survey groups that are greater than 0.15.

Table 9. Calculated sample group size required to detect absolute differences in prevalence proportions from two independent groups, for a fixed alpha of 0.05 and beta of 0.80, using a standard z-test for a range of absolute differences described by Cohen's *h*.

Total Sample Size	Group Size	Cohen's h	P_1	P_2	Difference
75	38	0.60	0.05	0.25	0.20
100	50	0.52	0.05	0.22	0.17
125	63	0.46	0.05	0.19	0.14
150	75	0.42	0.05	0.18	0.13
175	88	0.39	0.05	0.17	0.12
200	100	0.36	0.05	0.16	0.11
225	113	0.34	0.05	0.15	0.10
250	125	0.32	0.05	0.14	0.09
275	138	0.31	0.05	0.14	0.09
300	150	0.29	0.05	0.13	0.08
Total Sample Size	**Group Size**	**Cohen's h**	**P_1**	**P_2**	**Difference**
75	38	0.58	0.50	0.77	0.27
100	50	0.50	0.50	0.74	0.24
125	63	0.45	0.50	0.72	0.22
150	75	0.41	0.50	0.70	0.20
175	88	0.38	0.50	0.68	0.18
200	100	0.35	0.50	0.67	0.17
225	113	0.33	0.50	0.66	0.16
250	125	0.31	0.50	0.65	0.15
275	138	0.30	0.50	0.65	0.15
300	150	0.29	0.50	0.64	0.14

Table 10. Calculated sample group size required to detect differences in the odds ratio of prevalence proportions from two independent groups, for a fixed alpha of 0.05 and beta of 0.80, using a standard Wald test for a range of absolute differences described by Cohen's *h*, as appropriate for logistic regression analysis.

Total Sample Size	Group Size	Cohen's h	P_1	P_2	Difference
84	42	0.60	0.05	0.25	0.20
105	53	0.52	0.05	0.22	0.17
139	70	0.46	0.05	0.19	0.14
154	77	0.42	0.05	0.18	0.13
173	87	0.39	0.05	0.17	0.12
197	99	0.36	0.05	0.16	0.11
228	114	0.34	0.05	0.15	0.10
268	134	0.32	0.05	0.14	0.09
295	148	0.31	0.05	0.14	0.09
322	161	0.29	0.05	0.13	0.08
Total Sample Size	**Group Size**	**Cohen's h**	**P_1**	**P_2**	**Difference**
80	40	0.58	0.50	0.77	0.27
102	51	0.50	0.50	0.74	0.24
122	61	0.45	0.50	0.72	0.22
149	75	0.41	0.50	0.70	0.20
186	93	0.38	0.50	0.68	0.18
209	105	0.35	0.50	0.67	0.17
236	118	0.33	0.50	0.66	0.16
269	135	0.31	0.50	0.65	0.15
290	145	0.30	0.50	0.65	0.15
310	155	0.29	0.50	0.64	0.14

2.4 Survey Method

The survey was conducted via telephone interview using CATI (computer assisted telephone interviewing), and administered by experienced telephone interviewers from TeamSearch with support from ADAS. TeamSearch is a dedicated market research telephone interviewing agency with experience of agricultural surveys. Each interview lasted up to 20 minutes.

Prior to the fieldwork period, covering letters were sent by ADAS in English and Welsh to all those within the sample database to inform them of telephone survey, and also encourage their participation. A contact number was provided for the Welsh Government project manager should the recipients have had any queries.

The main fieldwork was conducted between15th August and 15th September 2016. The sample stratification was reviewed daily and a snapshot of the survey responses was reviewed after the first 4 days to further ensure the questionnaire was working effectively. Candidate farms were selected from the survey pool until each of the survey farm type and scheme type quotas were satisfied. A single survey was completed in Welsh.

2.4.1 Interviewing standards

All interviews were conducted in line with the Market Research Society (MRS) code of conduct. Standards applied under the code included:

- Designing a questionnaire that is fit for purpose
- Clearly communicating reassurances about the MRS code of conduct, the subject and purpose of the interview and the likely length of the interview to the respondent
- Allowing the respondent to opt out of the survey if they did not wish to take part either before or during the interview
- Interviews were not conducted before 9 am weekdays or Saturdays or 10 am on a Sunday, or after 9 pm on any day unless by appointment.
- Respecting respondent anonymity – individual respondents are not identified by this report, only aggregated data are used
- Respondents were not re-contacted unless they had provided permission, and unless for quality control purposes.

3. Achieved Survey Response

A total of 601 farm questionnaires were completed. The stratification of the completed interviews is given by **Table 11** following any necessary recoding of responses. **Figure 3** maps the distribution of the respondents, separated according to agricultural region, farm type and scheme participation. **Table 12** summarises the distribution by region and farm size based on the total standard labour requirement of crops and livestock.

3.1 Recoding

A small number (13) of surveyed farms had no grazing livestock, and a number (28) of farms that were anticipated to have a dairy herd on the basis of past June Agricultural Survey returns were found not to have any dairy cattle but did have beef cattle or sheep. The latter were re-coded for analysis as CS-DA+CS-LOW or CS-DA farm types according to their location within the Less Favoured Area.

Regarding scheme participation, the answers given by the survey respondents were used in place of Welsh Government records of participation in the preceding and current schemes. This allowed for inaccuracies and latencies in the government records. Overall, 4% of the surveyed farms were not in the expected Glastir Entry or Advanced participation strata, and 17% of farms were not in the expected Tir Cynnal or Gofal participation strata. The records were re-coded for analysis as appropriate.

3.2 Scheme Participation

Figure 4 compares the planned and surveyed number of respondents by level of preceding and current scheme participation. Overall, the planned number of respondents who have never been in scheme (*n* 150), or were in the previous Tir Cynnal and Tir Gofal schemes but not the current Glastir scheme (*n* 148), were achieved satisfactorily. The overall planned number of respondents in the Advanced level of Glastir (*n* 155) was also achieved, with a small excess of previous scheme participants. The number of respondents in the Entry level of Glastir (*n* 125) was less than the planned, with the balance (*n* 23) made up by farms in other elements of Glastir including Commons, Organic and Woodland agreements. A small number (*n* 24) of farms were in both the preceding Tir Cynnal and Tir Gofal schemes, and are identified as being in Tir Gofal in **Table 11** for comparison with the planned stratification. Analysis would take account of the separate effects of each scheme.

A total of 42 farms were organic or in the process of being certified as organic, of which 29 were in the Glastir Organic scheme. A total of 27 respondents had a Glastir Commons agreement; 11 respondents has a Glastir Efficiency Grant; and 11 had a Glastir Woodland management agreements.

3.3 Spatial Distribution

Figure 5 summarises the distribution of total number of surveyed farms of each type by agricultural region. The distribution is compared to that of all farms surveyed by the June Agricultural Survey (2015). The regional distribution of the number of farms of each farm type is well represented. When the data are re-expressed as a percent of the total managed agricultural land area in comparison to the regular agricultural survey, there is possibly a small degree of under-sampling of the DAIRY farms in the Pembrokeshire region, and an

over-sampling of the CS-SDA farms in the Powys region (**Figure 6**). The latter potentially reflects the inclusion of farms with a greater area of sole rights grazing in the sample pool.

Table 11. Planned and actual survey respondents, stratified by level of scheme participation in the previous Tir Cynnal (TC) and Tir Gofal (TG) schemes, and the current Glastir Entry (Entry) and Glastir Advanced (Advanced) schemes, and by farm type.

	Surveyed Sample Number				**Planned Sample Number**			
Stratification	**Dairy**	**CS-SDA**	**CS-DA+CS-LOW**		**Dairy**	**CS-SDA**	**CS-DA+CS-LOW**	
None / None	41	48	61		50	50	50	
TC / None	19	26	30		25	25	25	
TG / None	19	24	30		25	25	25	
None / Entry	15	30	17		15	35	25	
TC / Entry	5	18	14		10	10	15	
TG / Entry	6	9	11		10	10	15	
None / Advanced	7	28	23		15	35	25	
TC /Advanced	8	19	19		10	15	15	
TG / Advanced	10	22	19		10	15	15	
None / Other	4	2	2		n/a	n/a	n/a	
TC / Other	2	0	1		n/a	n/a	n/a	
TG / Other	5	4	3		n/a	n/a	n/a	

Table 12. Percent distribution of survey respondent farm count by agricultural region and farm size, for each survey farm type. See **Table 13** for an explanation of farm size.

a) CS-SDA

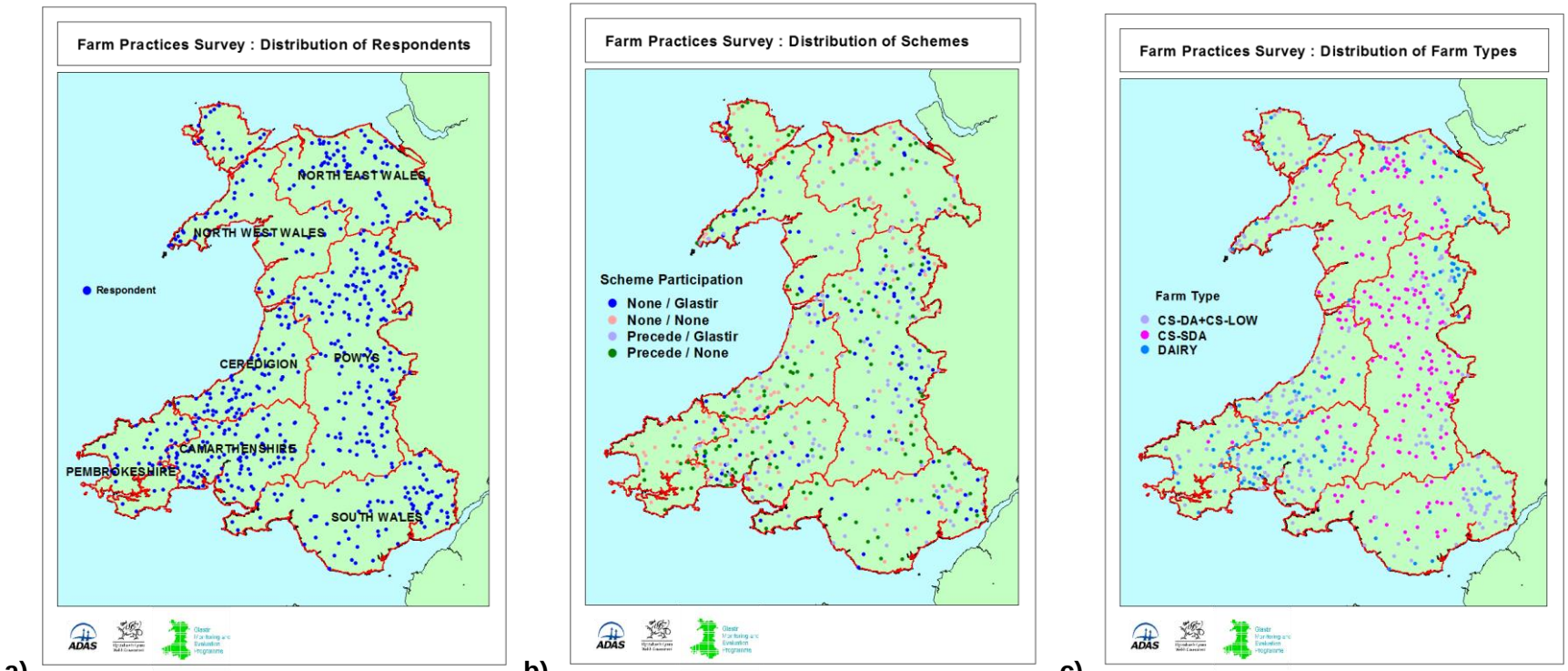
	Farm Size					
Region	**SLR1b**	**SLR2**	**SLR3**	**SLR4**	**SLR5**	**Total**
CAMARTHENSHIRE	1.7	1.3	0.4	2.2	0.0	5.7
CEREDIGION	0.9	0.9	1.7	0.9	0.4	4.8
NORTH EAST WALES	2.6	3.9	3.5	3.5	1.3	14.8
NORTH WEST WALES	2.6	3.0	3.0	2.2	0.4	11.3
PEMBROKESHIRE	0.0	0.4	0.4	0.0	0.0	0.9
POWYS	7.4	9.6	12.6	14.8	7.0	51.3
SOUTH WALES	5.2	3.9	0.9	1.3	0.0	11.3
Total	20.4	23.0	22.6	24.8	9.1	100.0

b) CS-DA+CS-LOW

	Farm Size					
Region	**SLR1b**	**SLR2**	**SLR3**	**SLR4**	**SLR5**	**Total**
CAMARTHENSHIRE	9.1	6.5	1.7	0.9	0.4	18.7
CEREDIGION	6.5	5.7	2.2	1.3	0.4	16.1
NORTH EAST WALES	2.2	1.3	1.3	1.7	0.4	7.0
NORTH WEST WALES	4.4	5.7	2.2	1.7	1.3	15.2
PEMBROKESHIRE	5.7	1.3	0.9	0.9	0.4	9.1
POWYS	3.9	3.9	2.6	1.7	0.9	13.0
SOUTH WALES	7.4	7.0	4.4	1.7	0.4	20.9
Total	39.1	31.3	15.2	10.0	4.4	100.0

c) DAIRY

	Farm Size					
Region	**SLR1b**	**SLR2**	**SLR3**	**SLR4**	**SLR5**	**Total**
CAMARTHENSHIRE	0.7	4.3	7.8	8.5	7.1	28.4
CEREDIGION	0.7	4.3	2.8	2.8	2.1	12.8
NORTH EAST WALES	0.0	1.4	5.0	8.5	5.7	20.6
NORTH WEST WALES	0.0	0.7	2.8	1.4	1.4	6.4
PEMBROKESHIRE	0.0	1.4	5.0	2.1	3.6	12.1
POWYS	0.0	2.8	2.8	3.6	4.3	13.5
SOUTH WALES	0.0	1.4	0.7	1.4	2.8	6.4
Total	1.4	16.3	27.0	28.4	27.0	100.0



a) b) c)

Figure 3. Distribution of respondents to the second Wales farm practice survey, a) relative to the agricultural regions of Wales; b) by participation in the agri-environment schemes; and c) by farm type.

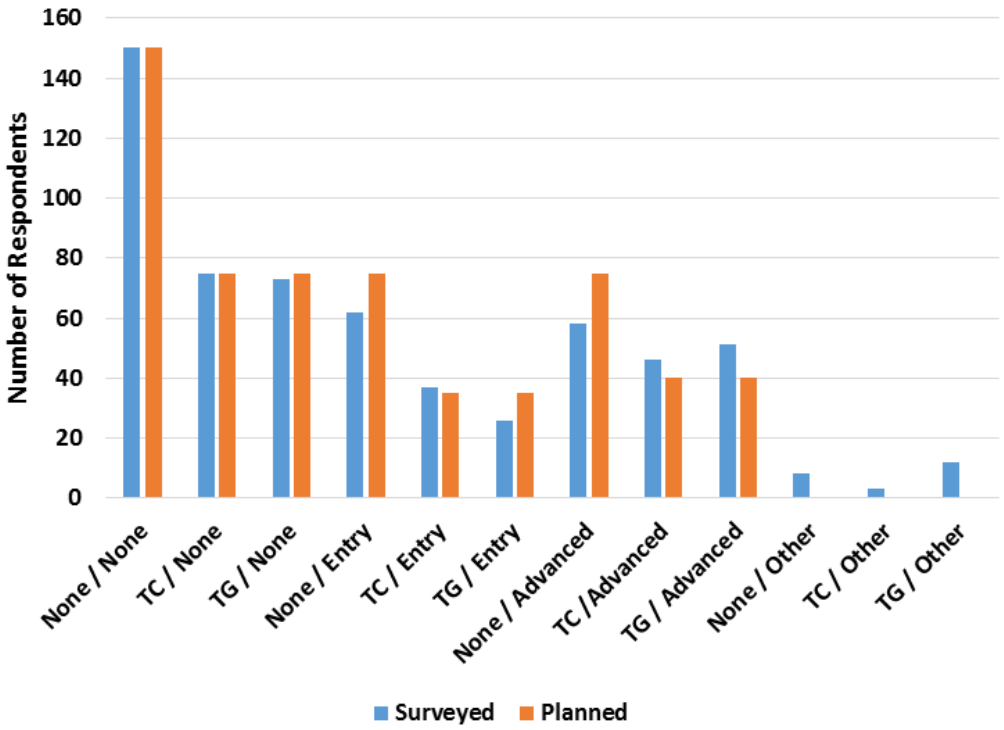
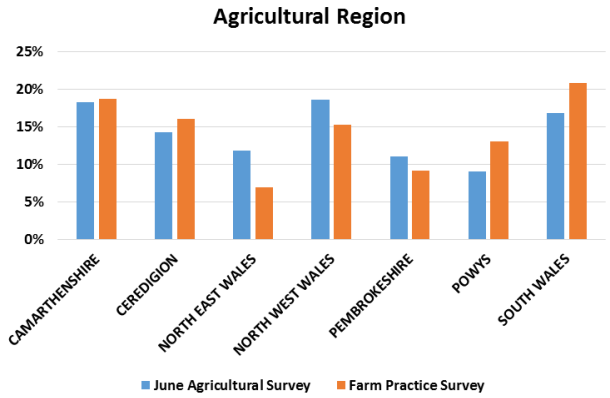
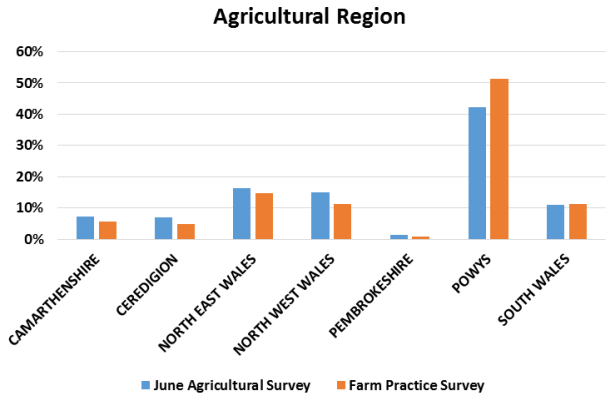


Figure 4. Number of planned and actual survey respondents, stratified by participation in the previous Tir Cynnal (TC) and Tir Gofal (TG) schemes, and the current Glastir Entry (Entry) and Glastir Advanced (Advanced) schemes. 'Other' refers to other elements of Glastir including commons, organic and woodland management agreements.

a) CS-DA+CS-LOW



b) CS-SDA



c) DAIRY

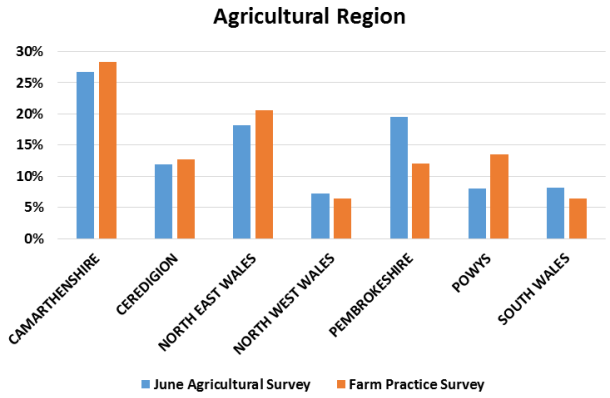
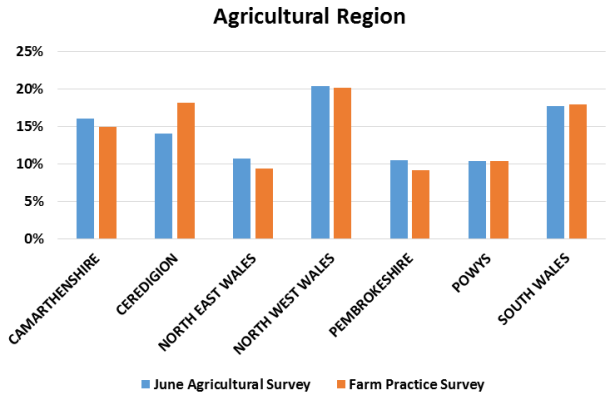
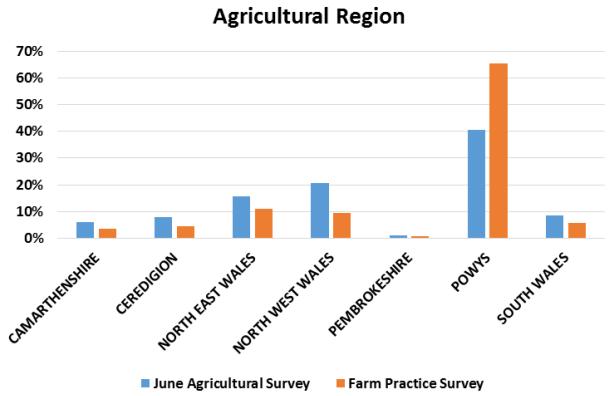


Figure 5. Percent of total number of all farms of a) CS-DA+CS-LOW; b) CS-SDA; and c) DAIRY farm types, by agricultural region, for all farms recorded by the June Agricultural Survey (2015) for Wales, and all respondents to this Wales Farm Practices Survey.

a) CS-DA+CS-LOW



b) CS-SDA



c) DAIRY

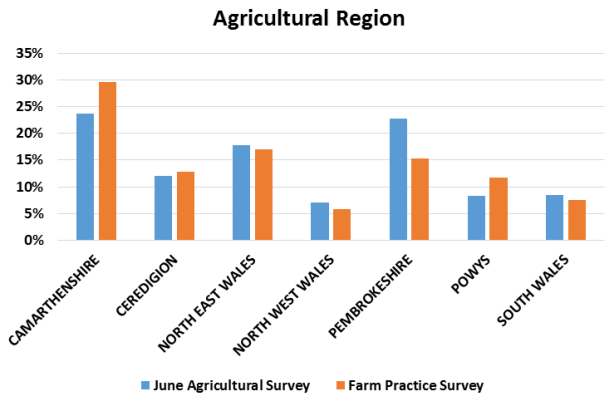


Figure 6. Percent of total managed land area on a) CS-DA+CS-LOW; b) CS-SDA; and c) DAIRY farm types, by agricultural region, for all farms recorded by the June Agricultural Survey (2015) for Wales, and all respondents to this Wales Farm Practices Survey.

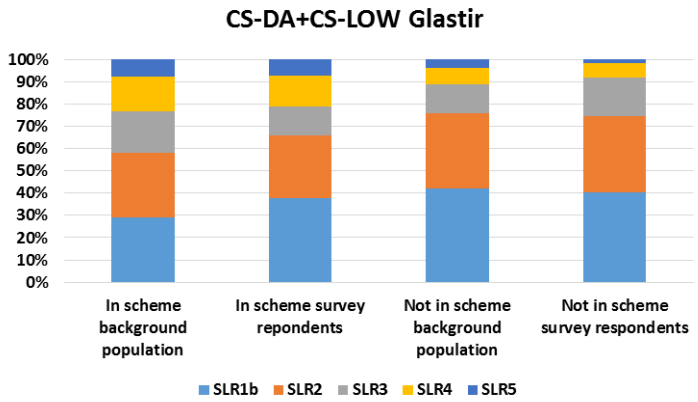
3.4 Farm Size

Farm size was based on the classification of the expected labour requirement for all crop and livestock related activities (**Table 13**). **Figures 7 and 8** compare the cumulative distribution of farm sizes for the survey respondents and the general population of farms in Wales drawn from the June Agricultural Survey. The distributions are compared by farm type for the strata in the current Glastir scheme, and for the strata that had participated in the preceding Tir Cynnal or Tir Gofal schemes. Ordinal regression analysis was used to establish that there were no significant differences ($P<0.05$) between the population of survey respondents and the general population of farms in Wales, but also that the population of farms in the current Glastir or previous schemes had significantly ($P<0.05$) fewer small or very small farms than were in the non-scheme general population.

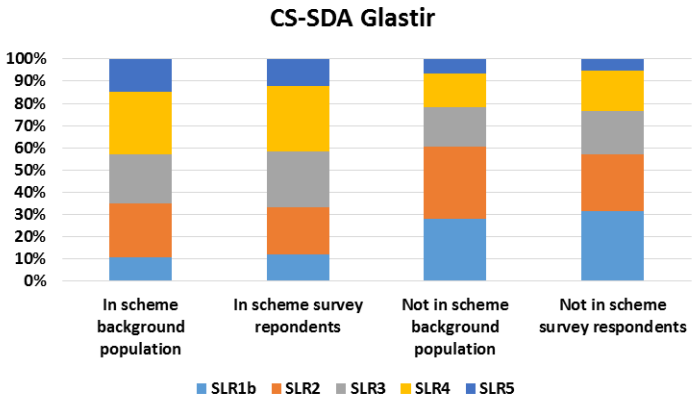
Table 13. Standard Labour Requirement farm size classification.

SLR Class	Description		
SLR1a	Very Small	Spare Time	< 0.5 FTE
SLR1b	Very Small	Part Time	< 1.0 FTE
SLR2	Small	Full Time	< 2.0 FTE
SLR3	Medium	Full Time	< 3.0 FTE
SLR4	Large	Full Time	< 5.0 FTE
SLR5	Very Large	Full Time	>= 5FTE

a) CS-DA+CS-LOW



b) CS-SDA



c) DAIRY

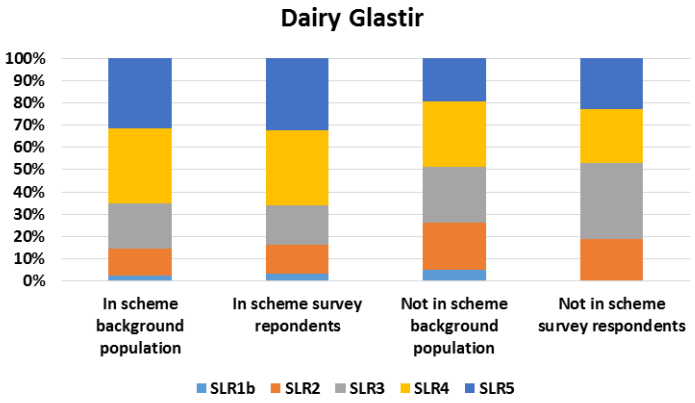
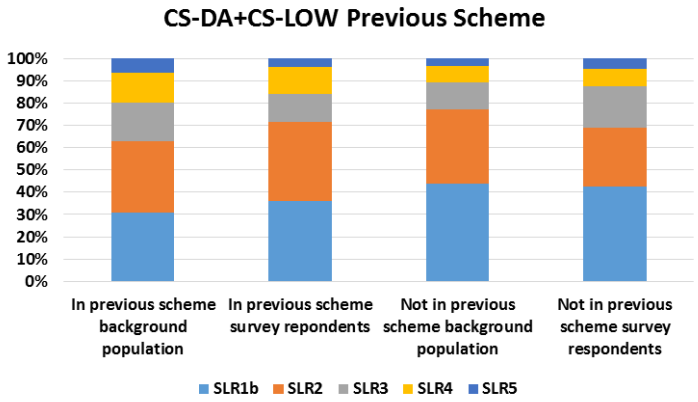
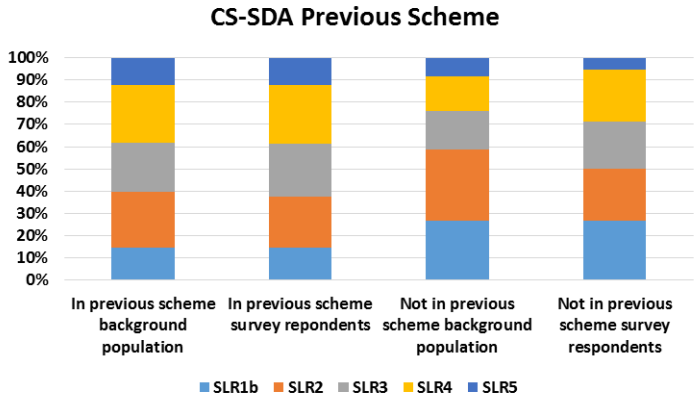


Figure 7. Cumulative percent distribution of farm sizes for a) CA-DA+CS-LOW; b) CS-SDA; and c) DAIRY farm types, stratified by participation in the current Glastir scheme, and by inclusion as a respondent in this Welsh Farm Practices Survey or as a respondent to the general June Agricultural Survey.

a) CS-DA+CS-LOW



b) CS-SDA



c) DAIRY

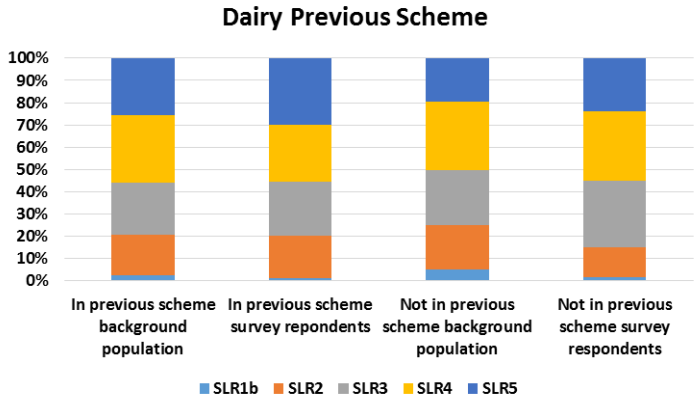


Figure 8. Cumulative percent distribution of farm sizes for a) CA-DA+CS-LOW; b) CS-SDA; and c) DAIRY farm types, stratified by participation in the preceding Tir Cynnal or Tir Gofal schemes, and by inclusion as a respondent in this Welsh Farm Practices Survey or as a respondent to the general June Agricultural Survey.

3.5 Summary Farm Statistics

Tables 14 to 19 summarise the total crop area and livestock numbers on the respondents' farms, and the proportions having each type of stock. Statistically significant ($P<0.05$) differences in sole rights rough grazing and woodland areas, and of breeding ewe numbers existed between the farms with different scheme participation histories. Farms that were currently in the Glastir scheme tended to have larger areas or counts. The arable and improved grassland areas, and all other livestock numbers, were similar for all farm types across all scheme participation histories.

The surveyed farms managed a total area of 68,600 ha, of which 55% was improved grassland and 6% was arable land. Sole rights rough grazing accounted for 34% of the total land area. Comparison with June Agricultural Survey returns leads us to believe that the respondents reported the total area of rough grazing that was utilised rather than just the sole rights area. More than 1 ha of woodland was found on 56% of respondent's farms.

Table 14. Average crop areas (ha) and livestock numbers on the surveyed DAIRY farm types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing*	Woodland*	Breeding Ewes**	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	17 (6-30)	80 (62-99)	17 (4-32)	2 (1-3)	144 (60-254)	139 (112-168)	2 (0-4)	9 (0-20)
None / None	11 (5-19)	69 (51-90)	16 (7-26)	2 (1-3)	70 (28-128)	164 (130-205)	2 (0-5)	11 (2-24)
Previous / Glastir	10 (5-16)	101 (76-128)	33 (8-78)	6 (4-9)	161 (62-276)	192 (146-244)	1 (0-3)	0 (0-0)
Previous / None	5 (3-7)	67 (52-83)	20 (9-32)	11 (3-26)	46 (17-79)	139 (109-171)	2 (0-3)	1 (0-3)

Table 15. Percent (%) of surveyed DAIRY farm types with different crop and livestock types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing	Woodland	Breeding Ewes	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	50 (30.8-69.2)	96.2 (88.5-100)	34.6 (15.4-50)	76.9 (61.5-92.3)	46.2 (26.9-65.4)	100 (100-100)	11.5 (0-26.9)	11.5 (0-26.9)
None / None	35.9 (20.5-51.3)	87.2 (76.9-97.4)	51.3 (35.9-66.7)	76.9 (64.1-89.7)	36.6 (22-51.3)	100 (100-100)	7.3 (0-17.1)	12.2 (2.4-22)
Previous / Glastir	47.2 (30.6-63.9)	97.2 (91.7-100)	50 (33.3-66.7)	86.1 (75-97.2)	55.6 (38.9-72.2)	100 (100-100)	5.6 (0-13.9)	0 (0-0)
Previous / None	44.1 (26.5-61.8)	91.2 (79.4-100)	52.9 35.3-67.7)	73.5 (58.8-88.2)	26.3 (13.2-42.1)	100 (100-100)	21.1 (10.5-34.3)	7.9 (0-18.4)

Table 16. Average crop areas (ha) and livestock numbers on the surveyed CS-DA+CS-LOW farm types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing	Woodland*	Breeding Ewes*	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	8 (3-15)	69 (49-92)	34 (16-56)	5 (2-10)	334 (222-467)	0 (0-0)	38 (27-52)	12 (3-24)
None / None	4 (2-7)	44 (36-52)	12 (7-18)	2 (1-3)	161 (115-204)	0 (0-0)	24 (17-31)	21 (9-36)
Previous / Glastir	8 (2-16)	47 (36-60)	25 (11-45)	4 (3-6)	320 (233-411)	0 (0-0)	25 (18-33)	8 (1-17)
Previous / None	4 (1-7)	41 (32-51)	14 (9-21)	2 (1-3)	186 (131-243)	0 (0-0)	28 (20-37)	21 (7-38)

Table 17. Percent (%) of surveyed CS-DA+CS-LOW farm types with different crop and livestock types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing	Woodland	Breeding Ewes	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	38.1 (23.8-52.4)	85.7 (73.8-95.2)	54.8 (38.1-71.4)	66.7 (52.4-81)	75.6 (61-87.8)	0 (0-0)	70.7 (56.1-85.4)	14.6 (4.9-26.8)
None / None	35.6 (23.7-47.5)	91.5 (84.7-98.3)	55.9 (42.4-69.5)	64.4 (52.5-76.3)	70.5 (59-82)	0 (0-0)	65.6 (54.1-77)	26.2 (16.4-37.7)
Previous / Glastir	31.8 (19.7-42.4)	83.3 (74.2-90.9)	57.6 (45.5-69.7)	83.3 (74.2-90.9)	86.6 (76.1-94)	0 (0-0)	61.2 (49.3-73.1)	10.4 (4.5-17.9)
Previous / None	22 (11.9-32.2)	79.7 (69.5-89.8)	55.9 (42.4-69.5)	61 (49.2-72.9)	75 (63.3-85)	0 (0-0)	68.3 (56.7-80)	21.7 (11.7-31.7)

Table 18. Average crop areas (ha) and livestock numbers on the surveyed CS-SDA farm types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing*	Woodland*	Breeding Ewes**	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	8 (1-18)	67 (52-85)	51 (32-76)	7 (4-13)	512 (428-600)	0 (0-0)	21 (14-28)	1 (0-1)
None / None	5 (2-9)	58 (39-84)	40 (12-81)	3 (2-4)	410 (261-611)	0 (0-0)	23 (11-40)	3 (0-7)
Previous / Glastir	8 (3-14)	81 (65-99)	122 (46-365)	10 (6-17)	742 (608-920)	0 (0-0)	27 (18-38)	7 (3-13)
Previous / None	2 (0-5)	61 (38-92)	40 (19-71)	5 (3-9)	350 (269-450)	0 (0-0)	17 (11-24)	8 (2-16)

Table 19. Percent (%) of surveyed CS-SDA farm types with different crop and livestock types, stratified by history of scheme participation in the Tir Cynnal, Tir Gofal and Glastir schemes. Values in brackets are the ninety-five percent confidence interval.

Scheme History	Arable	Improved Grassland	Sole Rights Rough Grazing	Woodland	Breeding Ewes	Dairy Cattle	Beef Sucklers	Beef Finishers
None / Glastir	28.8 (18.6-40.7)	81.4 (71.1-91.5)	62.7 (49.2-74.6)	78 (66.1-88.1)	98.3 (95-100)	0 (0-0)	58.3 (45-70)	5 (0-11.7)
None / None	20.8 (10.4-31.3)	70.8 (58.3-83.3)	60.4 (45.8-75)	62.5 (47.9-77.1)	89.6 (81.3-97.9)	0 (0-0)	60.4 (47.9-72.9)	10.4 (2.1-18.8)
Previous / Glastir	34.3 (22.9-45.7)	84.3 (74.3-91.5)	75.7 (64.3-85.7)	77.1 (67.1-87.1)	94.4 (88.9-98.6)	0 (0-0)	58.3 (47.2-69.4)	11.1 (4.2-19.4)
Previous / None	14 (6-26)	80 (68-90)	68 (54-80)	74 (62-86)	85.7 (73.5-93.9)	0 (0-0)	53.1 (38.8-67.3)	14.3 (6.1-24.5)

3.6 Agricultural Land Classification

The majority (63%) of survey respondents' farms were located on land of Agricultural Land Class 4, with limitations on productivity caused by soil wetness and the risk of soil poaching (**MAFF, 1988**). The remainder of the CS-SDA farm type were generally located on Agricultural Land Class 5, with severe limitations due to adverse soil, climate or relief that is generally under permanent pasture or rough grazing, and the remainder of the CS-DA+CS-LOW and DAIRY farm types were located on Agricultural Land Class 3 with moderate limitations where rainfall, exposure and occasionally gradient restrict choice of crops or demand careful management (**Table 20**). Grass is the principal crop, with arable forage crops. Very little land in Wales is in Agricultural Land Classes 1 and 2, suitable for a range of arable and horticultural crops.

Table 20. Percent of survey respondent's farms located on land of Agricultural Land Class (1 to 5), stratified by farm type.

Agricultural Land Class	CS-SDA	CS-DA+CS-LOW	DAIRY
1 and 2	0	2	2
3	4	24	26
4	57	65	68
5	39	8	3

3.7 Soil Classification and Field Drainage

The majority (41%) of the land area on survey respondents' farms was located on medium textured soils (**Table 21**). When weighted by the national area of each soil type, the respondents reported that 31% of the total arable and improved grassland area had field drains, of which 40% was in need of repair or replacement.

This area of drained land is greater than previously reported for Wales. Anthony *et al*., (2012) used responses from the first Welsh Farm Practices Survey to estimate that 15% of the total arable and grassland area, excluding rough grazing, was under-drained. A separate study by Anthony *et al*. (2012) used records of grant aided field drain installation and investment on estates from the late nineteenth century to the present day to estimate that 12% of the improved grass and arable land area in Wales was drained

The difference between the drained area estimates is partly explained by changes in question format. The first Welsh Farm Practices Survey asked about the extent of tile drains rather than field drains, and required that respondents estimate the percent of the land area drained rather than directly report the area of drained land. It is suspected that respondents included areas of rough grazing serviced by open field drains in their estimates, resulting in an increase in the drained area.

The Defra (2009) Farm Practices Survey of upland land management in England reported that 55% of upland farms on the Welsh Borders had areas of rough grazing (n 22) with drains, presumably open field drains. Of this survey respondents with sole rights rough grazing only (n 49), a reported 13% of the total rough grazing area was drained. On this

basis, with an appropriate adjustment for the national distribution of soil types, the percentage of the arable and improved grassland area in Wales that is drained is estimated to be 23%.

The majority of drains installed in Wales are older than a typical 30 to 50 year life span of tile or pipe drains, and it has been estimated that 40% predate modern design standards (Anthony *et al*., 2012). This is consistent with the survey estimates of the drained area requiring repair or replacement. The Defra Farm Practices Survey (England, 2012) reported that up to 12% of the drained area on grazing livestock farms was not functioning satisfactorily and affected by seasonal water logging and risk of soil damage, and up to 14% by yield reduction due to sustained water logging. Poor drainage of grassland can result in enhanced nitrous oxide emissions, hinder grass growth, and risk soil damage by animal treading and machinery compaction. This is an area that Welsh Government may consider for further investigation.

3.8 Fertiliser Practice

This survey respondents reported that 73% of the total arable and improved grassland area was located on farms that used manufactured nitrogen fertiliser somewhere on the farm, and 65% of the area was on farms that used phosphate fertiliser. These values are similar to values derived from the British Survey of Fertiliser Practice, and indicate that the intensity of fertiliser use on the survey farms is comparable to the general population. Analyses of individual farm records from the British Survey of Fertiliser Practice (2010) found that 84% of farms in Wales used manufactured nitrogen fertiliser somewhere on the farm, and 78% used phosphate.

3.9 Self-Selection Bias

Farmers contacted to take part in the survey were given the opportunity to opt out. The overall refusal rate by farmers that were contacted was just 19%. This varied from a low of 12% for farms current participating in the Glastir scheme, to 24% for farms that have previously participated in the Tir Cynnal or Tir Gofal scheme but had not progressed to Glastir. The refusal rate for farms that had not participated in any scheme was 23%. The refusal rate was significantly higher ($P<0.05$) for the farms not currently in Glastir.

The refusal rate for Glastir and non-Glastir farms was consistent across the range of farm sizes, ranging from 16 to 28% for the five size classes for farms not in Glastir and from 6 to 17% for farms in Glastir. There was no statistical evidence that the farms refusing to participate in the survey differed in output from the participating farms.

It is not possible to say anything about the large number of farms that we were not able to make contact with, sometimes because phone numbers were incorrect or inactive, but also because there was no answer or only a telephone answering machine.

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Appendix A - Farm Practices Survey Questionnaire and Letter of Introduction

Serial number . |__|__|__|__|__|

COMPANY. Company name from sample

SCHEME. Scheme from sample

FARM. Farm from sample

REGION. Region from sample

ADASID. ADAS ID from sample

|__|__|__|__|__||

SCHEMECODE. Scheme type from sample

None / None	01
Tir Cynnal / None	02
Tir Gofal / None	03
None / Glastir Advanced	04
Tir Cynnal / Glastir Advanced	05
Tir Gofal / Glastir Advanced	06

FARMCODE. Farm Type from sample

Dairy	01
CS SDA	02
CS DA+LOW	03

TELNUM. Phone Number

INTRO. Good [VTODS] my name is [INSERT NAME].and I am calling on

behalf of ADAS. We are conducting a telephone survey about change in farming practice on behalf of the Welsh Government, and we are keen to obtain your views. The survey is to aid the Government in assessing the effects of the current Glastir and previous Tir Cynnal and Tir Gofal agri-environment schemes. We intend to interview farmers both in and out of scheme.

INTERVIEWER: The farmer is advised to contact Welsh Government directly if they have any queries regarding the 'Glastir' scheme - This project queries to Bethan Webber at Welsh Government (0300 062 2287)

INTRO2. Our interview should not take up more than 15 minutes of your time.

All interviews are being conducted in line with the Market Research Society code of conduct and all the answers you give will be treated in the strictest confidence. The answers that you provide will be combined with those from other farmers in the area and used to assess the overall changes in practice that have occurred as a result of the schemes.

START. The answers provided by an individual will remain anonymous and it will not be possible for them to be used in any compliance assessment - Are you willing to participate?		
INTERVIEWER: Press F12 and "continue later" to make an appointment		
Yes	01	
Yes - but wants a Welsh Speaker	02	
No	03	<ineligible>

ASK: Wants a Welsh Speaker [02]		
QWELSH. When would be a good date and time for a Welsh speaker to call you back to conduct the interview ?		
INTERVIEWER: Note Date and Time ----------		

ASK: OK to Start		
Q.1.1 First of all can I confirm that you are the person responsible for managing the farm?		
INTERVIEWER: If NO - F12 to make appointment to speak to appropriate person.		
Yes	01	
No	02	<ineligible>

SECTION 2 – SCHEME PARTICIPATION

Q.2TEXT. The survey is organised into sections relating to your current manure, fertiliser and soil management practices and woodland or renewables activities, followed by a number of opinion questions.

We do not expect or want you to refer to farm records. But first we would like to confirm which schemes you are involved with and some basic farm details.

Q.2.1 Which of the following schemes have you previously participated in?

INTERVIEWER: READ OUT - Code all that apply

Tir Gofal - (pronounced Teer Goval)	01
Tir Cynnal - (pronounced Teer Cunnal)	02
None of these	03

Q.2.2. Which of the following schemes are you presently in?

INTERVIEWER: READ OUT - Code all that apply

Glastir Advanced	01
Glastir Entry	02
Glastir Commons	03
Glastir Efficiency Grants	04
Glastir Organic	05
Glastir Woodland	06
None of these	07

ASK: Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.2.3 What are your main reasons for not having participated in any of the Tir Cynnal, Tir Gofal or Glastir schemes?

INTERVIEWER: READ OUT - Code all that apply

I applied but was not accepted	01
It would not fit with my farming system	02
I did not want to be tied to a scheme for 5 years	03
The scheme was too complicated	04
The payment rate was insufficient	05
I was not interested	06
Other	99

ASK: Other [99]

Q.2.3 OTH. Other - please specify

ASK: Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.2.4 What are the main reasons that have prevented or delayed you from entering the Glastir scheme?

INTERVIEWER: READ OUT - Code all that apply

I applied but was not accepted	01
It would not fit with my farming system	02
I did not want to be tied to a scheme for 5 years	03
The scheme was too complicated	04
The payment rate was insufficient	05
I was not interested	06
Other	99

ASK: Other [99]

Q.2.4 OTH. Other - please specify

SECTION 3 – BASIC FARM DETAILS

Q.3.1 What is the total area of arable crops on your farm?

INTERVIEWER: Prompt for best estimate - Acres or Hectares

|__|__|__|__|__|__||

Q.3.2 What is the total area of improved grassland on your farm?

INTERVIEWER: Prompt for best estimate - Acres or Hectares

|__|__|__|__|__|__||

Q.3.3 What is the total area of sole rights rough grazing on your farm?

INTERVIEWER: This excludes the area of commons grazing - Prompt for best estimate - Acres or Hectares

|__|__|__|__|__|__||

Q.3.4 What is the total area of woodland on your farm?

INTERVIEWER: Prompt for best estimate - Acres or Hectares

|__|__|__|__|__|__||

Q.3.5 Were those responses in acres or hectares?

Acres	01
Hectares	02

Q.3.6 Which of the following best describes the main soil type on your land?

INTERVIEWER: READ OUT Hint: These are standard Defra soil types

used in advisory works.

Light sandy soils - including sandy soils over sandstone rock	01
Deep clayey or deep silty soils	02
Medium soils	03
Shallow soils over rock	04
Organic or peat soils	05

Q.3.7 What area of your land has field drains?

INTERVIEWER: Please record 'Don't Know' with 'DK'

|__|__|__|__|__|__||

ASK: Q.3.7 [Greater than 0]

Q.3.8 In your opinion what area of your drained land would benefit from repair or replacement of the field drains?

|__|__|__|__|__|__||

Q.3.9 Were those responses in acres or hectares?

Acres	01
Hectares	02

Q.3.10 Do you have any land or livestock certified as organic or that is in the process of being certified as organic?

Certified	01
In Process	02
No	03

SECTION 4 – EMPLOYEE CHANGE

Q.4.1 How many persons, including family, are normally employed to work on your farm in a full or part-time capacity?

|_|_|_|_|_|_|_|

ASK: Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.4.2 Has the number of persons employed changed in the past three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.4.3 Has the number of persons employed changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.2.2 [01 to 06] – Presently in Glastir

Q.4.4 Has the number of persons employed changed as a result of your present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.4.2 [01 or 02] or Q.4.3 [01 or 02] or Q.4.4 [01 or 02] – Any Change

Q.4.5 By how many did the number of employees change?

|_|_|_|_|_|_|_|

ASK: Q.4.2 [01 or 02] or Q.4.3 [01 or 02] or Q.4.4 [01 or 02] – Any Change

INTERVIEWER: READ OUT - Code all that apply

Q.4.6 What factors influenced the change?

Cost Savings	01
Farm Enlargement	02
Farm Diversification	03
Use of Contractors	04
Grant Payment	05
Retirement	06
Other	99

ASK: Other [99]

Q.4.6 OTH. Other - please specify

SECTION 5 – LIVESTOCK CHANGE

Q.5.1 Do you have a sheep flock on your farm?

Yes	01
No	02

ASK: Q.5.1 [01] – YES

Q.5.2 What is the current number of breeding ewes?

|_|_|_|_|_|_|_||

ASK: Q.5.1 [01] – YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.5.3 Has the number of breeding ewes changed in the past three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.1 [01] - YES and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.5.4 Has the number of breeding ewes changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.1 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir

Q.5.5 Has the number of breeding ewes changed as a result of your

present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.1 [01] - YES and
Q.5.3 [01 or 02] or Q.5.4 [01 or 02] or Q.5.5 [01 or 02] - Any Change

Q.5.6 By how many did the number of breeding ewes change?

|_|_|_|_|_|_|_||

Q.5.7 Do you have a dairy herd on your farm?

Yes	01
No	02

ASK: Q.5.7 [01] - YES

Q.5.8 What is the current number of dairy cows in the main herd?

|_|_|_|_|_|_|_||

ASK: Q.5.7 [01] - YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.5.9 Has the number of dairy cows changed in the past three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.7 [01] - YES and Q.2.1 [01 or 02] and Q.2.2 [07] -

Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.5.10 Has the number of dairy cows changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.7 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir

Q.5.11 Has the number of dairy cows changed as a result of your present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.7 [01] - YES and
Q.5.9 [01 or 02] or Q.5.10 [01 or 02] or Q.5.11 [01 or 02] – Any Change

Q.5.12 By how many did the number of dairy cows change?

|_|_|_|_|_|_|_||

Q.5.13 Do you have a beef suckler herd on your farm?

Yes	01
No	02

ASK: Q.5.13 [01] – YES

Q.5.14 What is the current number of suckler cows in the main herd?

|_|_|_|_|_|_|_||

ASK: Q.5.13 [01] – YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.5.15 Has the number of suckler cows changed in the past three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.13 [01] - YES and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.5.16 Has the number of suckler cows changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.13 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir

Q.5.17 Has the number of suckler cows changed as a result of your present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.13 [01] - YES and Q.5.15 [01 or 02] or Q.5.16 [01 or 02] or Q.5.17 [01 or 02] – Any Change

Q.5.18 By how many did the number of suckler cows change?

|_|_|_|_|_|_|_||

_____

Q.5.19 Do you buy in and finish beef cattle on your farm?

Yes	01
No	02

ASK: Q.5.19 [01] – YES

Q.5.20 What is the current number of beef finishers on your farm?

|_|_|_|_|_|_|_|

ASK: Q.5.19 [01] – YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.5.21 Has the number of beef finishers changed in the past three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.19 [01] - YES and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.5.22 Has the number of beef finishers changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.19 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir

Q.5.23 Has the number of beef finishers changed as a result of your present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.5.19 [01] – YES and
Q.5.21 [01 or 02] or Q.5.22 [01 or 02] or Q.5.23 [01 or 02] – Any Change

Q.5.24 By how many did the number of beef finishers change?

|_|_|_|_|_|_|_|

ASK: Q.5.3 [01 or 02] or Q.5.4 [01 or 02] or Q.5.5 [01 or 02] OR
Q.5.9 [01 or 02] or Q.5.10 [01 or 02] or Q.5.11 [01 or 02] OR
Q.5.15 [01 or 02] or Q.5.16 [01 or 02] or Q.5.17 [01 or 02] OR
Q.5.21 [01 or 02] or Q.5.22 [01 or 02] or Q.5.23 [01 or 02] – Any Change

Q.5.25 What factors influenced the change in livestock number?

INTERVIEWER: READ OUT - Code all that apply

Sale of Land	01
Availability of land to rent	02
Change in Market Prices	03
Stock Health	04
Farm Enlargement	05
Farm Diversification	06
Retirement	07
Grant Payment	08
Other	99

ASK: Other [99]

Q.5.25 OTH. Other - please specify

SECTION 6 – MANURE MANAGEMENT

ASK SECTION 6: Only if Q5.1 [01] - YES or Q.5.7 [01] - YES or Q.5.13 [01] - YES or Q.5.19 [01] - YES - Has some livestock of any type

Q6 TEXT: I am now going to ask about the management of animal manure on your fields and yards.

Q.6.1 Have you completed a manure management plan?

Yes	01
No	02

ASK: Q.6.1 [01] – YES

Q.6.2 Did you complete it yourself?

Yes	01
No	02

Q.6.3 What percentage of your animal manure is managed as slurry?

|_|_|_|_|_|_|_||

_____

Q.6.4 Which of the following do you use to assess the nutrient value of spread manures?

INTERVIEWER: READ OUT - Code all that apply

Own knowledge or experience	01
Standard values such as RB209	02
Professional advice or manure testing	03
Do not assess nutrient value	04
NONE (Do not read out)	98
Other	99

ASK: Other [99]

Q.6.4 OTH. Other - please specify

Q.6.5 Which of the following manure management actions have you taken in the last three years?

INTERVIEWER: READ OUT - Code all that apply

Increased the size of your slurry store	01
Bought or rented more land to spread manure	02
Exported excess manure to another holding	03
Roofed yard areas	04
Separated 'dirty' yard water from runoff from clean concrete and roofs	05
Reduced water usage for watering or cleaning livestock and buildings	06
Covered manure heaps	07
Moved manure heaps away from watercourse	08
Calibrated manure spreader	09
Increased proportion of manures spread during spring or growing season	10
NONE of the above (Do not read out)	11

SECTION 7 – FERTILISER MANAGEMENT

Q7 TEXT: I am now going to ask about the use of fertiliser on your farm.

Q.7.1 Do you presently use manufactured phosphate fertiliser anywhere on your farm?

INTERVIEWER: Hint: Manufactured means NOT animal manure or slurry

Yes	01
No	02

Q.7.2 Do you use presently manufactured nitrogen fertiliser anywhere on your farm?

INTERVIEWER: Hint: Manufactured means NOT animal manure or slurry

Yes	01
No	02

ASK: Q.7.1 [01] or Q.7.2 [01] – YES

Q.7.3 Have you completed a soil nutrient management plan?

Yes	01
No	02

ASK: Q.7.3 [01] – YES

Q.7.4 Did you complete it yourself?

Yes	01
No	02

ASK: Q.7.1 [01] – YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.7.5 Has your overall farm use of manufactured phosphate fertiliser

changed in the last three years? |

|

Increased | 01 |

Decreased | 02 |

No Change | 03 |

ASK: Q.7.1 [01] – YES and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir |

|

Q.7.6 Has your overall farm use of manufactured phosphate fertiliser changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement? |

|

Increased | 01 |

Decreased | 02 |

No Change | 03 |

ASK: Q.7.1 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir |

|

Q.7.7 Has your overall farm use of manufactured phosphate fertiliser changed as a result of your present Glastir agreement? |

|

Increased | 01 |

Decreased | 02 |

No Change | 03 |

ASK: Q.7.1 [02] - NO and Q.3.2 [Greater than 0] – Has Improved grassland |

|

Q.7.18 Have you previously used manufactured phosphate fertiliser on your improved grassland fields in the last three years? |

|

Yes | 01 |

No | 02 |

ASK: Q.7.1 [02] - NO and Q.3.1 [Greater than 0] – Has Arable |

|

Q.7.19 Have you previously used manufactured phosphate fertiliser |
on your arable fields in the last three years? |

|

Yes | 01 |

No | 02 |

ASK: (Q.7.18 [01] – YES or Q.7.19 [1] – YES)and Q.2.1 [01 or 02] |
and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not |
in Glastir |

|

Q.7.20 Was the reduction in phosphate use as a result of ending your |
previous Tir Cynnal or Tir Gofal agreement? |

|

Yes | 01 |

No | 02 |

ASK: (Q.7.18 [01] – YES or Q.7.19 [1] – YES) and Q.2.2 [01 to 06] |
– Presently in Glastir |

|

Q.7.21 Was the reduction in phosphate use as a result of your |
present Glastir agreement? |

|

Yes | 01 |

No | 02 |

ASK: Q.7.5 [01 or 02] or Q.7.6 [01 or 02] or Q.7.7 [01 or 02] – Any |
Change and Q.3.2 [Greater than 0] – Has Improved grassland |

|

Q.7.8 By what percentage has your use of manufactured phosphate |
fertiliser changed on typical improved grassland fields? |

|

INTERVIEWER: Please record ‘Don’t Know’ as ‘DK’ |

|_|_|_|_|_|_|_||

_____

ASK: Q.7.5 [01 or 02] or Q.7.6 [01 or 02] or Q.7.7 [01 or 02] – Any |
Change and Q.3.1 [Greater than 0] – Has Arable |

|

Q.7.9 By what percentage has your use of manufactured phosphate fertiliser changed on typical arable fields?

INTERVIEWER: Please record 'Don't Know' as 'DK'

|_|_|_|_|_|_|_||

ASK: Q.7.2 [01] – YES and Q.2.1 [03] and Q.2.2 [07] - Not in any scheme now and were never in a scheme

Q.7.10 Has your overall farm use of manufactured nitrogen fertiliser changed in the last three years?

Increased	01
Decreased	02
No Change	03

ASK: Q.7.2 [01] – YES and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.7.11 Has your overall farm use of manufactured nitrogen fertiliser changed as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.7.2 [01] - YES and Q.2.2 [01 to 06] – Presently in Glastir

Q.7.12 Has your overall farm use of manufactured nitrogen fertiliser changed as a result of your present Glastir agreement?

Increased	01
Decreased	02
No Change	03

ASK: Q.7.2 [02] - NO and Q.3.2 [Greater than 0] – Has Improved grassland

Q.7.22 Have you previously used manufactured nitrogen fertiliser on your improved grassland fields in the last three years?

Yes	01
No	02

ASK: Q.7.2 [02] - NO and Q.3.1 [Greater than 0] – Has Arable

Q.7.23 Have you previously used manufactured nitrogen fertiliser on your arable fields in the last three years?

Yes	01
No	02

ASK: (Q.7.22 [01] – YES or Q.7.23 [1] – YES)and Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.7.24 Was the reduction in nitrogen use as a result of ending your previous Tir Cynnal or Tir Gofal agreement?

Yes	01
No	02

ASK: (Q.7.22 [01] – YES or Q.7.23 [1] – YES) and Q.2.2 [01 to 06] – Presently in Glastir

Q.7.25 Was the reduction in nitrogen use as a result of your present Glastir agreement?

Yes	01
No	02

ASK: Q.7.10 [01 or 02] or Q.7.11 [01 or 02] or Q.7.12 [01 or 02] – Any Change and Q.3.2 [Greater than 0] – Has Improved grassland

Q.7.13 By what percentage has your use of manufactured nitrogen fertiliser changed on typical improved grassland fields?

INTERVIEWER: Please record 'Don't Know' as 'DK'

ASK: Q.7.10 [01 or 02] or Q.7.11 [01 or 02] or Q.7.12 [01 or 02] – Any Change and Q.3.1 [Greater than 0] – Has Arable

Q.7.14 By what percentage has your use of manufactured nitrogen fertiliser changed on typical arable fields?

INTERVIEWER: Please record 'Don't Know' as 'DK'

ASK: Q.7.5 [01 or 02] or Q.7.6 [01 or 02] or Q.7.7 [01 or 02] OR Q.7.10 [01 or 02] or Q.7.11 [01 or 02] or Q.7.12 [01 or 02] or Q.7.18 [01] or Q.7.19 [01] or Q.7.22 [01] or Q.7.23 [01] Any Change

Q.7.15 What factors influenced the change in fertiliser use?

INTERVIEWER: READ OUT - Code all that apply

Change in fertiliser cost	01
Change in forage type	02
Advised by agronomist	03
Change in stock numbers	04
Grant Payment	05
Other	99

ASK: Other [99]

Q.7.15 OTH. Other - please specify

ASK: Q.7.1 [01] – YES and/or Q.7.2 [01] – YES

Q.7.16 Which of the following do you use to calculate the nutrient requirement of your crops and grassland?

INTERVIEWER: READ OUT - Code all that apply

Own knowledge or experience	01
RB209 or PLANET or similar software	02
Professional advice	03
NONE (Do not read out)	98
Other	99

ASK: Other [99]

Q.7.16 OTH. Other - please specify

ASK: Q.7.1 [01] – YES or Q.7.2 [01] – YES

Q.7.17. Which of the following fertiliser management actions have you taken in the last 3 years?

INTERVIEWER: READ OUT - Code all that apply

Calibration of the fertiliser spreader	01
Testing of soil nutrient status	02
Use a fertiliser recommendation system	03
Increased use of straight rather than compound fertiliser	04
Delayed application to avoid spreading to wet or frozen ground	05
NONE (Do not read out)	98

SECTION 8 – SOIL MANAGEMENT

Q8 TEXT: I am now going to ask about soil management on your farm. |

Q.8.1 Have you completed a soil assessment or protection plan?

Yes	01
No	02

ASK: Q.8.1 [01] – YES

Q.8.2 Did you complete it yourself?

Yes	01
No	02

Q.8.3 How often do you test your fields for soil nutrient status?

Annually	01
Every two years	02
Every three years of more	03
Never	04

Q.8.4 How often do you test your fields for pH and liming?

Annually	01
Every two years	02
Every three years of more	03
Never	04

ASK: Q.3.1 [Greater than 0] - Has Arable

Q.8.5 Which of the following soil management actions have you on arable fields in the last three years?

INTERVIEWER: READ OUT - Code all that apply

Established winter cover by early drilling	01
Leave stubble in field	02
Established winter cover by sowing cover crop	03
Delayed field operations to avoid working on wet soil	04
Used minimal cultivation techniques	05
Rough ploughing to remove harvest compaction	06

Loosened or disrupted compacted tramlines	07
Delayed tramline establishment	08
Delayed cultivation for spring sown crops until the spring	09
Left autumn seed beds rough	10
Cultivating across slope	11
Established vegetated and uncultivated buffer strip	12
Convert field corners to grass or bird cover	13
NONE (Do not read out)	98

ASK: Q.3.2 [Greater than 0] - Has Improved grassland

Q.8.6 Which of the following soil management actions have you on grassland fields in the last three years?

INTERVIEWER: READ OUT - Code all that apply

Delayed putting stock out to grass	01
Reduced stocking rate on fields subject to poaching	02
Reduced length of grazing season or day	03
Improved drainage on poached fields	04
Remove compaction by re-seeding or soil loosening	05
Fenced off streams from livestock	06
Provided in-field watering points	07
Re-sited or regularly rotated feeding sites	08
No longer out-winter cattle	09
NONE (Do not read out)	98

SECTION 9 – WOODLAND AND RENEWABLES

Q9 TEXT: We are now going to ask about the management of woodland and investment in other renewable resources on your farm.

ASK: Q.3.4 [Greater than 0] - Has Woodland

Q.9.1 Have you received any of the following grants to help manage your woodland?

Woodland Grant Scheme	01
Better Woodlands for Wales	02
Glastir Woodland Management	03
Glastir Woodland Creation	04
Glastir Woodland Restoration	05
NONE (Do not read out)	98

ASK: Q.9.1 [98] – None

Q.9.5 What are the main reasons that have prevented or delayed you from applying for grants for woodland planting or management?

INTERVIEWER: READ OUT - Code all that apply

I applied but was not accepted	01
Availability of land for planting	02
Insufficient time to diversify	03
Insufficient knowledge or equipment	04
Tenancy agreement	05
Market prices for timber are low	06
Deterred by regulations, such as felling licences	07
The payment rate was insufficient	08
The scheme was too complicated	09
I am not interested in woodland management	10
Other	99

ASK: Other [99]

Q.9.5 OTH. Other - please specify

ASK: Q.3.4 [Greater than 0] - Has Woodland

Q.9.2 Do you actively manage your woodland for any of the following?

INTERVIEWER: READ OUT - Code all that apply

Provision of fuel or firewood	01
Provision of timber for other uses	02
Sports and recreation	03
Shelter for livestock	04
Public access and education	05
Wildlife habitat	06
Protection of watercourses from runoff	07
Biosecurity, to reduce contact with livestock	08
Carbon sequestration	09
None of the Above – (Do not read out)	98

ASK: Q.3.4 [Greater than 0] - Has Woodland

Q.9.3 Have you restored or planted any new woodland in the past three years?

Yes	01
No	02

ASK: Q.9.3 [01] – YES and Q.9.1 [01 to 05] – Grant

Q.9.4 Would you have proceeded with the restoration or planting without grant support?

Yes	01
No	02

Q.9.6 Do you generate renewable energy from any of the following on your farm?

INTERVIEWER: READ OUT - Code all that apply

Wind energy	01
Solar Thermal	02
Solar Photovoltaic	03
Hydropower	04
Anaerobic digestion	05
Biomass burning	06
Heat exchanger	07
NONE (Do not read out)	98

ASK: Q.9.6 [01-07] – Renewable energy on farm

Q.9.7 Do you know how much energy is generated on your farm each year?

Yes	01
No	02

ASK: Q.9.7 [01] – YES

Q.9.8 How much energy is generated?

|_|_|_|_|_|_|_| kWh

ASK: Q.9.7 [01] – YES

Q.9.8a Was that answer in Kilowatt or Megawatt hours?

Kilowatt	01
Megawatt	02

ASK: Q.9.7 [02] – NO

Q.9.9 Do you know what the installed capacity is?

Yes	01
No	02

ASK: Q.9.9 [01] – YES

Q.9.10 What is the installed capacity?

|_|_|_|_|_|_|_| kWh

ASK: Q.9.9 [01] – YES

Q.9.10a Was that answer in Kilowatt or Megawatt hours?

Kilowatt	01
Megawatt	02

ASK: Q.9.6 [98] – NONE

Q.9.11 Would you consider installing a renewable energy production system on your farm?

Yes	01
No	02

ASK: Q.9.6 [01 to 07] – Renewable energy on farm

Q.9.12 Would you consider installing any additional renewable energy on your farm?

Yes	01
No	02

ASK: Q.9.11 [01] – YES or Q.9.12 [01] - YES

Q.9.13 What type of renewable energy production system would you consider installing?

INTERVIEWER: READ OUT - Code all that apply

Wind energy	01
Solar Thermal	02
Solar Photovoltaic	03
Hydropower	04
Anaerobic digestion	05
Biomass burning	06
Heat exchanger	07

ASK: Q.9.11 [02] – NO or Q.9.12 [02] – NO

Q.9.14 What are the main reasons that would prevent you from installing renewable energy on your farm?

INTERVIEWER: READ OUT - Code all that apply

Restrictions on the availability of land	01
Lack of knowledge about renewable energy	02
Additional paperwork	03
Large capital costs	04
Concerned about reliability of supply	05
Visual impact	06
Other	99

ASK: Other [99]

Q.9.14 OTH. Other - please specify

SECTION 10 – RESILIANCE

Q10 TEXT: We are now going to conclude with a few general questions about activities to improve the health of the farm business and resilience to the effects of climate change

---

Q.10.1 Have you taken a specific action in the past 3 years to help adapt to any of the following climate change threats:

INTERVIEWER: READ OUT - Code all that apply

Increased frequency of flooding	01
Increased frequency of drought	02
Increased rates of soil erosion	03
Loss of Biodiversity	04
Increased threats of pest and disease	05
Heat Stress on Livestock	06

ASK: Q.10.1 [01 to 06] – Action and Q.2.2 [01 to 06] – Presently in Glastir

Q.10.2 Where you have taken action, has membership of the Glastir scheme supported you in any of the following ways:

INTERVIEWER: READ OUT - Code all that apply

Encouraged you to bring forward an action already planned	01
Provided you with information	02
Provided a grant for capital investment	03
Encouraged collaboration with other farms	04
Other	99
No Support Provided – (DO NOT READ OUT)	98

ASK: Other [99]

Q.10.2 OTH. Other - please specify

Q.10.3 Have you taken a specific action in the past 3 years to help improve any of the following aspects of the farm business:

INTERVIEWER: READ OUT - Code all that apply

Fuel and energy Efficiency	01
Nutrient Efficiency	02
Animal Health	03
Business Diversification	04
Water Use Efficiency	05

ASK: Q.10.3 [01 to 05] – Action and Q.2.2 [01 to 06] – Presently in Glastir

Q.10.4 Where you have taken action has membership of the Glastir scheme supported you in any of the following ways:

INTERVIEWER: READ OUT - Code all that apply

Encouraged you to bring forward an action already planned	01
Provided you with information	02
Provided a grant for capital investment	03
Encouraged collaboration with other farms	04
Other	99
No Support Provided – (DO NOT READ OUT)	98

ASK: Other [99]

Q.10.4 OTH. Other - please specify

ASK: Q.2.2 [01 to 06] – Presently in Glastir

Q.10.5 On a scale of 1 to 5 where 1 = Strongly disagree and 5 = Strongly agree – How much do you agree or disagree with each of the following statements about the impact of Glastir on your farm?

Q.10.5.1 How much do you agree with – It has changed my management of the farm?

INTERVIEWER: READ OUT

1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

Q.10.5.2 How much do you agree with – It has expanded my interest in the public benefits of farming?

INTERVIEWER: READ OUT

1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

Q.10.5.3 How much do you agree with - It has improved the health of my farm business

INTERVIEWER: READ OUT

1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

Q.10.5.4 How much do you agree with - It has helped me to plan for the future of my farm?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 - Disagree	02
	3 - Neither	03
	4 - Agree	04
	5 - Strongly agree	05

Q.10.5.5 How much do you agree with - It has reduced my farms contribution to the pollution of rivers and lakes?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 - Disagree	02
	3 - Neither	03
	4 - Agree	04
	5 - Strongly agree	05

Q.10.5.6 How much do you agree with - It has reduced my farms contribution to climate change?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 - Disagree	02
	3 - Neither	03
	4 - Agree	04
	5 - Strongly agree	05

Q.10.5.7 How much do you agree with - It has enhanced the plants and wildlife on my farm?

INTERVIEWER: READ OUT	
1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

Q.10.5.8 How much do you agree with - It has improved the appearance of my farm?

INTERVIEWER: READ OUT

1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

ASK: Q.2.1 [01 or 02] and Q.2.2 [07] – Previously in Tir Cynnal or Tir Gofal but not in Glastir

Q.10.6 On a scale of 1 to 5 where 1 = Strongly disagree and 5 = Strongly agree – How much do you agree or disagree with each of the following statements about the lasting effect of Tir Cynnal or Tir Gofal on your farm?

Q.10.6.1 How much do you agree with – It changed my management of the farm?

INTERVIEWER: READ OUT

1 - Strongly disagree	01
2 – Disagree	02
3 – Neither	03
4 – Agree	04
5 - Strongly agree	05

Q.10.6.2 How much do you agree with – It expanded my interests in the public benefits of farming?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.3 How much do you agree with - It improved the health of my farm business		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.4 How much do you agree with - It helped me to plan for the future of my farm?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.5 How much do you agree with - It reduced my farms contribution to the pollution of rivers and lakes?		

INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.6 How much do you agree with - It reduced my farms contribution to climate change?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.7 How much do you agree with - It enhanced the plants and wildlife on my farm?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04
	5 - Strongly agree	05

Q.10.6.8 How much do you agree with - It improved the appearance of my farm?		
INTERVIEWER: READ OUT		
	1 - Strongly disagree	01
	2 – Disagree	02
	3 – Neither	03
	4 – Agree	04

5 - Strongly agree	05

SECTION 11 – CONCLUDING

Q11 TEXT: Do you have any final comments you would like to make on:

ASK: Q.2.2 [01 to 06] – Presently in Glastir

Q.11.1 How has participating in Glastir improved your farm?

ASK: Q.2.2 [01 to 06] – Presently in Glastir

Q.11.2 How has Glastir hindered your farm management?

Q.11.3 What if anything would be your priority for improving the Glastir scheme?

INTERVIEWER: If None put "N"

QNAME. Finally can I confirm your name is [NAME] [SURNAME]?

INTERVIEWER: If correct put “Y” otherwise write in full

Q.11.4. Thank you for your help with this - Would you be happy to have someone contact you again in the event of any queries?

Yes	01
No	02

```
ENDTEXT. Thank you for your help with that - My name is [INSERT        |
         NAME] from ADAS calling on behalf of the Welsh Government     |
         I can assure you again that all your responses are treated    |
         with complete confidentiality.                                |
_______________________________________________________________________
```

Welsh Assembly Government:
Glastir Monitoring and Evaluation Programme
Farm Practices Survey

Dear Sir/Madam

As part of the CEH-led Glastir Monitoring and Evaluation Programme the Welsh Government has commissioned a telephone survey to record the changes in practices resulting from farm participation in Glastir and the legacy of the previous Tir Cynnal and Tir Gofal agri-environment schemes in Wales.

The survey is being carried out on our behalf by ADAS and Teamsearch Market Communications.

We would like to advise you that a member of these organisations may therefore contact you and ask you to take part in a short telephone survey of farm practices.

The answers that you provide will be combined with those from other farmers in the area and used to assess the overall change in practice at whole-farm level, such as stocking rates and use of nutrient management plans that have occurred as a result of the schemes. The answers provided by an individual will remain anonymous and it will not be possible for them to be used in any compliance assessment.

We hope this will be of interest to you, both for now and in the longer term to see how you and the schemes are contributing to a changing environment.

If contacted, we hope that you will take every opportunity to take part, as this is an opportunity to support Glastir and influence its development. If you are contacted but have not yet participated in any scheme - you are just as important as your information will help us to establish a baseline for comparison.

We anticipate that ADAS and Teamsearch will contact farmers during August. Please note that all information provided will be treated in complete confidence.

Yours sincerely,

James Skates – Welsh Government Technical Project Manager
Bronwen Williams – CEH Project Manager

If you have any specific queries regarding this project please contact:
Bethan Webber at 0300 062 2287

Llywodraeth Cynulliad Cymru:
Arolwg o Arferion Ffermydd ar gyfer y Rhaglen Monitro a Gwerthuso Glastir

Annwyl Syr/Fadam

Fel rhan o Raglen Monitro a Gwerthuso Glastir dan arweiniad y Ganolfan Ecoleg a Hydroleg (CEH) mae Llywodraeth Cymru wedi comisiynu arolwg dros y ffôn er mwyn cofnodi'r newidiadau mewn arferion yn sgil cyfraniad ffermydd at gynllun Glastir a gwaddol y cynlluniau amaeth-amgylcheddol Tir Cynnal a Thir Gofal blaenorol yng Nghymru.

Caiff yr arolwg ei gynnal ar ein rhan gan ADAS a thîm cyfathrebu'r farchnad Teamsearch.

Hoffem roi gwybod i chi felly ei bod yn bosib y bydd aelod o'r sefydliadau hyn yn cysylltu â chi yn gofyn i chi gymryd rhan mewn arolwg byr dros y ffôn i drafod arferion ffermydd.

Bydd yr atebion a rowch yn cael eu cyfuno ag atebion ffermwyr eraill yn yr ardal a'u defnyddio i asesu newid cyffredinol mewn arferion ar lefel fferm gyfan, megis i gyfraddau stoc a'r defnydd o gynlluniau rheoli maetholion o ganlyniad i'r cynlluniau. Bydd atebion unigolion yn aros yn ddienw ac ni fydd yn bosib eu defnyddio mewn unrhyw asesiad cydymffurfio.

Gobeithio y bydd hyn o ddiddordeb i chi, nawr ac yn y tymor hwy, er mwyn gweld sut rydych chi a'r cynlluniau yn cyfrannu at amgylchedd sy'n newid.

Os bydd rhywun yn cysylltu â chi, rydym yn mawr obeithio y gwnewch fanteisio ar y cyfle i gymryd rhan, gan fod hwn yn gyfle i gefnogi Glastir a dylanwadu ar ei ddatblygiad. Os bydd rhywun yn cysylltu â chi ond nad ydych wedi cymryd rhan mewn unrhyw gynllun eto, rydych chi yr un mor bwysig gan y bydd eich gwybodaeth yn ein helpu ni i sefydlu llinell sylfaen ar gyfer cymharu.

Rydym yn disgwyl y bydd ADAS a Teamresearch yn cysylltu â ffermwyr yn ystod mis Awst. Nodwch y bydd yr holl wybodaeth y byddwch yn ei darparu'n cael ei thrin yn gwbl gyfrinachol.

Yn gywir,

James Skates – Rheolwr Prosiectau Technegol Llywodraeth Cynulliad Cymru
Bronwen Williams – Rheolwr Prosiectau, CEH

Os oes gennych gwestiynau penodol am y prosiect hwn, cysylltwch â:
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