climate X change

Scotland's centre of expertise connecting climate change research and policy

Impacts of the Scotland Rural Development Programme on Greenhouse Gas Mitigation

Kairsty Topp and Bob Rees, SRUC
May 2013
Enquirer: Antje Branding

1. Key Points

- Most SRDP measures provide benefits across a range of indicators of greenhouse gas (GHG) savings and reduced nutrient losses.
- There is significant geographical variation in the applicability of different measures, which can therefore limit their potential for greenhouse gas mitigation at the national scale.
- Carbon sequestration and reduced nitrous oxide emissions are the most common benefits arising from SRDP measures.
- The quantity of GHG savings associated with implementing existing SRDP measures remains uncertain. A more detailed study would be required to quantify their magnitude.
- With the exception of reduced fertiliser applications and livestock numbers, the GHG savings would not be captured in the national GHG inventory.
- Reducing livestock numbers on the area to which measures apply may simply mean an increase in livestock elsewhere on the farm, or further afield.
- This report covers environmental benefits (mostly related to GHG mitigation). However, the wider environmental, social and economic impacts of measures also need to be taken into consideration.

2. Introduction

At the request of the Scottish Government, ClimateXChange has reviewed the impact of the Agri-Environment options of the Scottish Rural Development Programme (SRDP), in relation to greenhouse gas emissions.

The objectives of this report are to:

1) assess the existing SRDP options in relation to their impact on GHG emissions or carbon sequestration;
2) evaluate potential additional benefits from the SRDP options with regards to their GHG impacts; and
3) produce a summary report and an easy to use matrix of the potential SRDP options.

3. Background

The SRDP is the main fund supporting rural development in Scotland. It supports economic, environmental and social measures to encourage sustainable development within rural Scotland. The programme provides funding for projects covering farming, forestry, rural enterprise and business development, diversification and rural tourism. The aim is to provide the greatest social benefit through the adoption of local solutions. The current SRDP is due to end in 2013, with a new programme to begin in 2014.

Work is underway to develop the next SRDP and part of this involves assessing what on-the-ground options

should be included. This research report explores the potential for GHG mitigation from agri-environment options undertaken by land managers.

4. Research Requirement

The primary focus of SRDP projects has been preserving biodiversity within Scotland, but the impacts in relation to GHG emissions or carbon sequestration have largely been overlooked. ClimateXChange has undertaken various pieces of work for the Scottish Government on the cost effectiveness of measures for on-farm GHG mitigation, and this report builds on these.

It is the intention of the Scottish Government that this review will support the drafting of the next SRDP, which will be presented to the European Commission.

Key Questions:

- Is there a robust evidence base for available and new options?
- Are there gaps in the current options for agri-environment in the SRDP?
- If so, what are they?
- What options have the greatest potential to deliver multiple benefits for the wider environment, including climate change mitigation and adaptation, biodiversity and recreation?
- What design guidance is available and what is required?

Key Objectives

1. Review measures collated as part of the 49 possible options in agri-environment currently in the SRDP, SEPA's BMP Handbook, Defra's User Manual, England's HLS and ELS Schemes, the Welsh Glastir, equivalent schemes in Europe (OSCAR), the GHG Inventory, reports and relevant literature; including the marginal abatement cost curves of agricultural measures conducted by SRUC. SRDP options which are positive or negative in terms of GHG outcomes based on current data (appropriate models) are identified and gaps in the current data available are highlighted. Where possible, outcomes have been quantified (similar to the CDM methodology that compares the baseline scenario to the 'with project' scenario to estimate impact). The factors that determine the positive or negative balance of GHG emissions are described.
2. A definitive list of potential options is provided and ranked with an indication of their evidence base. Rankings are based on effectiveness; commentary on suitability for Scottish conditions; potential for multiple benefits; and pollution swapping. Ranking also considers differences in the impact across various habitats in Scotland.
3. The ranked list has been cross-checked against other likely impacts in Scotland. Options have been grouped in the final list to provide an easy to use matrix of the SRDP options for land managers.

5. Overview of Mitigation potential

The following table provides an overview of the scoring of each individual measure applied across the four farm types occurring in Scotland. A detailed description of each measure is provided in the sections that follow. Likely has been used to indicate that is highly probably that there would be some effect on GHG emissions and that there is some indication of the effect, whereas possible has been used to indicate less certainty about the effect of the measure. This is partly due to the difficulty in determining the exact management changes that will occur in light of the measure being adopted, which will be determined by the individual land manager.

ID	SRDP Measure	Soil C*					N2O*					Leaching*					CH4*				
		Arable	Dairy	Mixed	Beef and sheep	LFA Beef and sheep	Arable	Dairy	Mixed	Beef and sheep	LFA Beef and sheep	Arable	Dairy	Mixed	Beef and sheep	LFA Beef and sheep	Arable	Dairy	Mixed	Beef and sheep	LFA Beef and sheep
1	*Conversion and maintenace of organic farming*	1	0	1	0	0	1	1	1	1	0	1	0	0	0	0	0	1	1	1	0
2	*Wild bird seed mix / unharvested crop*	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
3	*Mown grassland for wildlife*	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
4	*Mown grassland for Corn Buntings*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	*Mown grassland for Corncrakes or Choughs*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	*Grazed grassland for Corncrakes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7	*Creation and management of cover for Corncrakes*	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	1	1
8	*Management of Cover for Corncrakes*	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	1	1
9	*Open Grazed or Wet Grassland for Wildlife*	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	1	1
10	*Mammal and bird control*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	*Supplementary food provision for raptors*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	*Wardening for Golden Eagles (opion closed from 2010)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	*Control of invasive non-native species*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	*management of species rich grassland*	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
15	*bracken Management Programme for Habitat Enhancement*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	*Creation and management of species rich grassland*	2	0	0	0	0	2	1	1	1	0	1	0	0	0	0	-1	1	1	1	1
17	*Management of habitat mosaics*	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
18	*management of wetlands*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	*Create, restore and manage wetland*	2	1	1	1	0	2	1	1	1	0	1	0	0	0	0	-1	1	1	1	1
20	*Management and restoration of lowland raised bogs*	0	0	0	1	2	0	0	0	1	2	0	0	0	1	2	0	0	0	1	1
21	*Water margins and enhanced riparian buffer areas*	2	0	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0
22	*Management of flood plains*	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
23	*Buffer areas for fens and lowland raised bogs*	0	0	0	1	2	0	0	0	1	2	0	0	0	1	2	0	0	0	1	1
24	*Coastal, serpentine and special interest heath*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	*Lowland heath*	0	0	0	1	2	0	0	0	1	2	0	0	0	1	2	0	0	0	1	1
26	*Wildfire management on upland and peatland sites*	0	0	0	1	2	0	0	0	1	1	0	0	0	1	1	0	0	0	1	1
27	*Management of moorland grazing*	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
28	*Moorland grazings on uplands and peatlands*	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
29	*Moorland- stock disposal*	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
30	*Away-wintering of sheep*	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
31	*off-wintering of sheep*	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
32	*Muirburn and heath swiping*	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
33	*Management of hedgerows (options temporaility suspended)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	*Extended hedges*	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0
35	*Grass margins and beetlebanks*	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
36	*Biodiverisity cropping in in-bye*	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0
37	*Cropped machair*	1	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0
38	*management of Ancient wood pasture*	2	2	2	1	1	2	2	1	1	1	2	2	2	1	1	0	1	1	1	0
39	*Scrub and tall herb communities*	1	1	1	2	2	1	1	2	2	2	1	1	2	2	2	0	1	1	1	1
40	*Arable reversion to grassland*	2	2	2	2	2	1	1	1	1	1	0	0	0	0	0	0	-1	-1	-1	-1
41	*Habitat grazing management*	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	*Livestock tracks, gates and river crossings*	0	0	0	0	0	0	1	1	1	0	0	2	2	2	0	0	0	0	0	0
43	*Conservation managament for small units*	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
44	*Creation and management of grassland for hen harriers*	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
45	*Grazed grassland for Chough*	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
46	*Grazing Management of cattle*	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
47	*Woodland creation*	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	0	0	0	0	0
48	*Sustainable management of forests*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
49	*Woodland improvement grant*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

* Positive impacts on Soil C, N2O, leacing and CH4 emissions indicate lower losses

2	Strong positive impact
1	Positive impact
0	Little or no impact
1	Negative impact
2	Strong negative impact

General Observations

This review has identified a wide range of GHG savings from the implementation of SRDP measures. Most measures are associated with positive benefits in terms of GHG mitigation. The largest emission savings are associated with those measures that are applicable to multiple habitats and address more than one GHG.

The magnitude of the scores associated with each measure provides an indication of its relevance in terms of greenhouse gas mitigation and ability to reduce leaching losses. The measures with more green cells

confer more benefits, and these measures tend to impact on multiple farm types, Fig 1. There are measures with both green and red cells indicating that there will be trade-offs; however, the overall balance is difficult to quantify. At the national level, the overall balance will be dependent on the area of land to which the measure is applied.

In some circumstances there is a clear and well established link between greenhouse gas mitigation and the implementation of measures (e.g. when there is a reduction in application of fertiliser nitrogen). Such changes would be directly reflected in national inventory reports. In other cases the linkage is much less clear and more uncertain. For example the installation of buffer strips would be likely to reduce diffuse pollutant loss to water courses and could therefore be expected to reduce indirect losses of nitrogen as nitrous oxide from aquatic sources. Such changes would be difficult to capture in national inventory reports. A reduction in livestock on a particular area arising from the introduction of a measure may simply be results the livestock being moved to another area of the farm, and thus no effect at the farm or national level on emissions.

Options available under Axis 2

1. Conversion and Maintenance of Organic Farming
2. Wild Bird Seed Mix/Unharvested Crop
3. Mown Grassland For Wildlife
4. Mown Grassland For Corn Buntings
5. Mown Grassland For Corncrake or Choughs
6. Grazed Grassland For Corncrakes
7. Creation And Management of Cover For Corncrakes
8. Management Of Cover For Corncrakes
9. Open Grazed Or Wet Grassland For Wildlife
10. Mammal and Bird Control
11. Supplementary Food Provision For Raptors
12. Wardening For Golden Eagles**(option closed from 2010)**
13. Control of Invasive Non-Native Species
14. Management of Species Rich Grassland
15. Bracken Management Programme for Habitat Enhancement
16. Creation and Management of Species Rich Grassland
17. Management of Habitat Mosaics
18. Management of Wetland
19. Create, Restore and Manage Wetland
20. Management/Restoration of Lowland Raised Bogs
21. Water Margins and Enhanced Riparian Buffer Areas
22. Management of Flood Plains
23. Buffer Areas for Fens and Lowland Raised Bogs
24. Coastal, Serpentine and Special Interest Heath
25. Lowland Heath
26. Wildlife Management on Upland and Peatland Sites
27. Management of Moorland Grazing
28. Moorland Grazings on Uplands and Peatlands
29. Moorland - Stock Disposal
30. Away-Wintering of Sheep
31. Off-Wintering of Sheep
32. Muirburn and Heather Swiping
33. Management of Hedgerows **(option temporarily suspended)**
34. Extended Hedges
35. Grass Margins and Beetlebanks
36. Biodiversity Cropping on In-Bye
37. Cropped Machair
38. Management of Ancient Wood Pasture
39. Scrub and Tall Herb Communities
40. Arable Reversion to Grassland
41. Habitat Grazing Management (available as an Actual Cost Capital Item from June 2011)
42. Livestock Tracks, Gates and River Crossings
43. Conservation Management for Small Units
44. Creation and Management of Grassland for Hen Harriers
45. Grazed Grassland for Chough
46. Grazing Management of Cattle
47. Woodland Creation
48. Sustainable Management of Forests
49. Woodland Improvement Grant

6. Commentary on individual measures

1. Conversion and Maintenance of Organic Farming

The conversion of land to organic is likely to enhance carbon sequestration on arable systems as there is likely to be an increased use of cover crops, and retention of crop residues and organic amendments within the system, which will lead to an increase in soil organic matter (Fitton et al., 2011; Kong et al., 2007). There is not likely to be any effect of conversion to organic for long-term grasslands. The effects of organic farming on nitrous oxide emissions (on an area basis) are more uncertain. Inputs of nitrogen by biological fixation make an important contribution to the nitrogen budgets of organic farming systems, and are generally associated with lower emissions of nitrous oxide (Rochette and Janzen, 2005). However, the use of organic manures and slurries which is also a feature of organic farming systems can be associated with significant emissions (Jones et al., 2007). Due to the reduction in intensity associated with organic systems compared to conventional systems, there will also be a reduction in the greenhouse gas emissions per hectare; however, the difference not likely to be significant when it is expressed on a per unit of production (Mondelaers et al., 2009). The impact of maintenance of organic systems will not lead to further reduction in greenhouse gas emissions.

2. Wild Bird Seed Mix/Unharvested Crop

This measure will result in the retention of a crop over the winter which is then ploughed in at a later date in the spring will results in a greater amount of crop residue being returned to the soil which will potentially lead to an increase in soil organic matter (Fitton et al., 2011). The maintenance of cover crops overwinter would also be likely to contribute to reduced leaching losses and therefore improved water quality

3. Mown Grassland For Wildlife

As no fertiliser or manure can be applied between the 1 March and 15 May, there is likely to be a reduction in the total N applied to the field, and thus a reduction in N_2O emissions (Luo et al., 2010). With regards to soil carbon, the effects of grazing and removal of grazing are inconsistent (Fitton et al., 2011).

4. Mown Grassland For Corn Buntings
5. Mown Grassland For Corncrake or Choughs

These measures will have an impact on the cutting and grazing dates. However, it is not anticipated that these measures would have any significant impact on carbon sequestration, nitrous oxide emissions, nitrate leaching, or methane emissions.

6. Grazed Grassland For Corncrakes

This measures aims promote the growth and structure of species composition of vegetation of the land that is suitable for corncrakes. As the grazing is restricted to achieve, there is likely to be a small reduction in enteric methane production.

7. Creation And Management of Cover For Corncrakes

This measure aims to support the management of habitats for corncrakes. This involves the establishment of iris beds and other tall vegetation in damp areas. Due to the grazing period being restricted and the stocking density being limited to 0.3 livestock units per ha there is the potential for a reduction in enteric methane production and returns of excreta. It is likely that there will be a reduction in fertiliser and hence a reduction in emissions of nitrous oxide (Rees et al., 2013). The impact on soil carbon will be partially dependent on the change in productivity associated with this measure.

8. Management Of Cover For Corncrakes

This measure aims to support the management of cover for corncrakes. This involves allowing improved grassland or unimproved grassland on in-bye to revert back to vegetation with clumps of tall plants such as iris, nettles or cow parsley or reedbed. Due to the stocking density being restricted to 0.3 livestock units per ha there is the potential for a reduction in enteric methane production and returns of excreta. In the case of improved grass reverting back, it is likely that there will be a reduction in fertiliser and hence a reduction in emissions of nitrous oxide (Rees et al., 2013). The impact on soil carbon will be partially dependent on the change in productivity associated with this measure.

9. Open Grazed Or Wet Grassland For Wildlife

This measure reduces the grazing intensity and hence is likely to have a small impact on the enteric methane production from that area of the farm. In addition, it places restrictions on when fertiliser and manures can be applied and hence there is likely to be a small reduction in nitrous oxide emissions.

10. Mammal and Bird Control
11. Supplementary Food Provision For Raptors
12. Wardening For Golden Eagles **(option closed from 2010)**
13. Control of Invasive Non-Native Species

It is not anticipated that these measures would have any significant impact on carbon sequestration, nitrous oxide emissions, nitrate leaching, or methane emissions.

14. Management of Species Rich Grassland

This option encourages the growth of flowering plants and other species in unimproved grassland to act as a food supply for insects and a seed source for birds. To maintain the required sward height, stocking density will be low, and hence there is the potential for a reduction in enteric methane production and returns of excreta. Such vegetation has the potential to encourage an increase in the soil organic matter pool. As no fertiliser of slurry can be applied, there may also be a reduction in emissions of nitrous oxide (Rees et al., 2013).

15. Bracken Management Programme for Habitat Enhancement

This measure is aimed at preventing the loss to bracken of existing habitats of conservation values, and to encourage the regeneration of characteristic native plants. It is not anticipated that this measure will have any significant impact on carbon sequestration, nitrous oxide emissions, nitrate leaching, or methane emissions.

16. Creation and Management of Species Rich Grassland

This measure requires the creation of species rich grasslands. For arable land, this has the potential to increase soil carbon (Falloon et al., 2004; Freibauer et al., 2004; Smith et al., 2010). However, for improved grassland, the measure requires that the grassland is destroyed and it states that the cultivation depth must not exceed 150 mm. Hence, there is a risk that any soil carbon stocks that have been built-up in the grass phase will be lost when the soil is cultivated (Bell et al., 2011). Nevertheless, during the grass phase of the soil carbon stocks will increase. The effects of grazing management on soil carbon are inconsistent (Fitton et al., 2011) and are affected by plant species as well as soil type and climate. As the stocking density will be decreased on previously grazed land, the enteric methane emissions will be reduced. However, on land than was previously under arable cultivation any introduction of grazing will increase emissions.

As applications of fertiliser and slurry are banned under the measure, there will be reduction in the nitrous oxide emissions from site (Rees et al., 2013). In arable soils as there is a reduction of fertiliser applications and there will be crop coverage through the year, there is the potential for nitrate leaching to be reduced.

17. Management of Habitat Mosaics

This measure is aimed at providing a habitat for birds, small mammals and invertebrates. The impact of this measure on greenhouse gas emissions will be the result on the ban on fertiliser and slurry applications (Rees et al., 2013). The impact on soil carbon will be partially dependent on the change in productivity associated with this measure.

18. Management of Wetland

It is not anticipated that this measures would have any significant impact on carbon sequestration, nitrous oxide emissions, nitrate leaching, or methane emissions.

19. Create, Restore and Manage Wetland

This measure requires the creation or restoration of managed wetlands. For arable land, which will no longer be ploughed this, has the potential to increase soil carbon (Falloon et al., 2004; Freibauer et al., 2004; Smith et al., 2010). Such ecosystems accumulate carbon as a consequence of lower rates of decomposition of plant material added to the system by growing vegetation (Billett et al., 2010; Ramchunder et al., 2012). These low rates of decomposition are promoted by the wetness of the soil. As the stocking density will be decreased on previously grazed land, the enteric methane emissions will be reduced. However, on land than was previously under arable cultivation any introduction of grazing will increase emissions.

As applications of fertiliser and slurry are banned under the measure, there will be reduction in the nitrous oxide emissions from site (Rees et al., 2013). In arable soils as there is a reduction of fertiliser applications and there will be crop coverage through the year, there is the potential for nitrate leaching to be reduced.

20. Management/Restoration of Lowland Raised Bogs

The management and restoration of lowland raised bogs is likely to encourage carbon sequestration. Such ecosystems accumulate carbon as a consequence of lower rates of decomposition of plant material added to the system by growing vegetation (Billett et al., 2010; Ramchunder et al., 2012). These low rates of decomposition are promoted by the wetness acidity of the soil environment. Lowland raised bog vegetation has a limited geographical extent, and the measure would not be applicable in many arable farming environment more intensive livestock rearing farms in the South and East Scotland. The measure would be most applicable to areas where there are existing raised bog vegetation, and where existing management regimes can be modified to accommodate the requirements scheme.

The main greenhouse gas benefits would arise from increased carbon sequestration, and low rates of nitrous oxide emission (Dinsmore et al., 2009; Drewer et al., 2010). It is possible that this measure would slightly increase methane emissions as a consequence of by wetter soils. The reduced drainage and nutrient loadings associated with this measure would be anticipated to reduce nitrate losses to the aquatic environment.

The benefits would depend upon pre-existing baseline from which the measure was being introduced the purposes of this review it is assumed that the pre-existing land use be classified as a type of degraded heathland vegetation, and that the new measure would promote management to restore the heathland vegetation and reduce stocking densities particularly during the winter period.

21. Water Margins and Enhanced Riparian Buffer Areas

The aim of this measure is to protect water margins from soil erosion and diffuse pollution by encouraging waterside vegetation. In arable soils, this will result in an increase in soil carbon (Falloon et al., 2004; Freibauer et al., 2004; Smith et al., 2010). In the case of the grasslands, the impact on soil carbon will be partially dependent on the change in productivity associated with this measure. On the buffer area, no fertiliser or manure will be applied and thus there will be a decrease in nitrous oxide emissions (Rees et al., 2013), and hence leaching losses.

22. Management of Flood Plains

This measure allows will create and maintain a mosaic of wash lands and dry lands by allowing the watercourse to overflow onto its natural flood plain. The applicability of this measure will be limited and is most likely to be relevant in lowland grass areas. In the flood plain area, there are restrictions on fertiliser applications, and therefore there is likely to be a reduction in nitrous oxide emissions (Rees et al., 2013).

23. Buffer Areas for Fens and Lowland Raised Bogs

The management and restoration of buffer areas for fens lowland raised bogs is likely to encourage carbon sequestration. Such ecosystems accumulate carbon as a consequence of lower rates of decomposition of plant material added to the system by growing vegetation (Billett et al., 2010; Ramchunder et al., 2012). These low rates of decomposition are promoted by the wetness acidity of the soil environment. Fens and lowland raised bog vegetation has a limited geographical extent, and the measure would not be applicable in many arable farming environment more intensive livestock rearing farms in the South and East Scotland. The measure would be most applicable to areas where there are existing raised bog vegetation, and where existing management regimes can be modified to accommodate the requirements scheme.

The main greenhouse gas benefits would arise from increased carbon sequestration, and low rates of nitrous oxide emission (Dinsmore et al., 2009; Drewer et al., 2010). It is possible that this measure would slightly increase methane emissions as a consequence of by wetter soils. The reduced drainage and nutrient loadings associated with this measure would be anticipated to reduce nitrate losses to the aquatic environment.

The benefits would depend upon pre-existing baseline from which the measure was being introduced the purposes of this review it is assumed that the pre-existing land use be classified as a type of degraded heathland vegetation, and that the new measure would promote management to restore the heathland vegetation and reduce stocking densities particularly during the winter period.

24. Coastal, Serpentine and Special Interest Heath

The purpose of this measure is to encourage native heathland plants and small grassland forbs on costal heaths. This measure will have restricted geographical coverage. With the exception of possibly reducing grazing and therefore enteric methane emissions, it is not anticipated that this measure will affect soil carbon on nitrous oxide emissions.

25. Lowland Heath

The preservation of lowland heath vegetation is likely to encourage carbon sequestration. Such ecosystems accumulate carbon as a consequence of lower rates of decomposition of plant material added to the system by growing vegetation (Billett et al., 2010; Ramchunder et al., 2012). These low rates of decomposition are

promoted by the wetness acidity of the soil environment. Lowland heath vegetation has a limited geographical extent, and the measure would not be applicable in many arable farming environment more intensive livestock rearing farms in the South and East Scotland. In many of these areas existing soil drainage schemes make it difficult to establish Lowland Heath vegetation. The measure would be most applicable to areas where there are existing heathland vegetation, and where existing management regimes can be modified to accommodate the requirements scheme.

The main greenhouse gas benefits would arise from increased carbon sequestration, and low rates of nitrous oxide emission (Dinsmore et al., 2009; Drewer et al., 2010). It is possible that this measure would slightly increase methane emissions as a consequence of by wetter soils. The reduced drainage and nutrient loadings associated with this measure would be anticipated to reduce nitrate losses to the aquatic environment.

The benefits would depend upon pre-existing baseline from which the measure was being introduced the purposes of this review it is assumed that the pre-existing land use be classified as a type of degraded heathland vegetation, and that the new measure would promote management to restore the heathland vegetation and reduce stocking densities particularly during the winter period.

26. Wildlife Management on Upland and Peatland Sites

Upland peats form important carbon store the Scottish landscape (Smith, 2007). This measure that improves the condition of Upland peats and therefore enhances their capacity to sequester carbon. The measure is only applicable to existing heathland soils and in some cases it is not expected that it would not involve extensive changes in management. Where drain blocking is included with the anticipated that this would have a significant impact on increasing rates of carbon sequestration (Alfarraj et al., 1984; Armstrong et al., 2010; Wallage et al., 2006a; Wallage et al., 2006b). Other important impacts could arise from reducing erosion losses. This would have the effect of reducing particulate and dissolved carbon loss, as well as losses of nitrate and phosphate to the aquatic environment. It is not envisaged that the measures would result in large changes in stocking density, and therefore methane emissions would probably increase slightly as a consequence of additional soils derived emissions (Drewer et al., 2010).

27. Management of Moorland Grazing

Moorland grazing management plans would be introduced in areas of existing high carbon soils mostly in upland areas. Again such soils provide significant storage capacity for carbon (Smith, 2007), and it is anticipated further improvements grazing management will help to enhance ecological quality of the habitat, and increase rates of carbon sequestration. This could be anticipated as a consequence of maintaining appropriate stocking densities as required by the moorland grazing plan, which would help to avoid overgrazing vegetation and the consequent problems of soil erosion and degradation.

The greenhouse gas benefits would occur primarily as a consequence of increased carbon sequestration rates, with relatively small changes anticipated in emissions of methane and nitrous oxide.

28. Moorland Grazings on Uplands and Peatlands

The focus of this measure is to protect the biodiversity and soil the environment associated with upland and peatland soils. These soils form an important part of Scotland's carbon stocks (Smith, 2007), and the measures outlined in this proposal would be anticipated to improve the carbon sequestration potential of these areas. The measure would improve soil quality and help to reduce excessive losses by upland erosion (Dawson and Smith, 2007; Evans et al., 2006). This would in turn reduce losses of carbon by enhancing carbon uptake by the system, and reducing losses by erosion of particulate and dissolved organic carbon substrates.

29. Moorland - Stock Disposal

This measure aims to reduce stocking densities of livestock in moorland areas and in vegetation types of conservation interest in order to promote regeneration and improvement of the habitat. This measure is applicable to high carbon and peatland soil types. The improvements in habitat quality that would occur as consequence of this measure, would be anticipated to promote carbon sequestration and reduce losses (Ostle et al., 2009). Because of the reduction stocking density is demanded by this measure, there would be and associated reduction of enteric methane emissions associated with livestock management (Murray et al., 2001). It is not anticipated that there will be any significant changes in nitrous oxide emissions, although a small improvement in water quality may be anticipated as consequence of reduced erosion losses.

30. Away-Wintering of Sheep
31 Off-Wintering of Sheep

Measures 31 and 32 apply to Upland sheep farms in the areas associated with high carbon soils and peats. High stocking densities of sheep can cause damage to vegetation soils encouraging erosional losses and degrading the quality of peatland soils. Damage is most likely to occur during the winter period, and therefore the removal of all sheep during this period is expected to enhance the quality of soil environment thereby promoting carbon sequestration. As a result of reduced overwinter nutrient losses it would be anticipated that small improvements in water quality would be associated with reduced inching losses associated with this measure. The measure does not lead to overall reductions livestock numbers and therefore would not be associated with reductions in methane emissions.

32. Muirburn and Heather Swiping

The burning of heather is used as a management tool to improve the quality and diversity of heather patches on open moorlands. These sites are associated with carbon rich soils and provide an important carbon stock within the Scottish landscape. Although this management improves the productivity of the overall system in promoting and regenerating plant growth, it also has the potential to contribute to losses of soil carbon and other nutrients at the time of burning. A limited number of studies have examined the impact of muirburn on carbon storage, and show that it has a slight negative impact (Farage et al., 2009; Garnett et al., 2000a; Garnett et al., 2000b).

33. Management of Hedgerows (option temporarily suspended)

It is not anticipated that this measure would have any significant impact on carbon sequestration, nitrous oxide emissions, nitrate leaching, or methane emissions.

34. Extended Hedges

This measure promotes the creation of hedges that are wider than normal with adjacent undisturbed grass margins. Where such hedges are created within existing arable and grassland farming areas, there is an effective land use change associated with the creation. Woody species provide a strong sink for atmospheric carbon, which is a consequence of the high rates of carbon uptake by trees alongside reduce soil disturbance, which minimises carbon loss. The overall impact therefore is that tree species will contribute to increase using carbon sequestration. The grass buffer surrounds the hedge will also contribute to carbon sequestration. Because both the hedge and buffer strip exclude the use of nitrogen fertilisers and grazing livestock, there will also be a reduction in nitrous oxide emissions (Rees et al., 2013) and in circumstances where there is excluded livestock grazing, there will also be a reduction in methane emissions (Murray et al., 2001). The hedges themselves will promote and removal nutrients from the soil intercepting lateral flow of

solutes such as nitrate and phosphate, thereby reducing losses nutrients to water.

35. Grass Margins and Beetlebanks

The creation of grass strips along the margins of arable fields will contribute to carbon sequestration within these areas. This is a consequence of the increased uptake of carbon by the grassland vegetation alongside reduced losses associated with the avoidance of cultivation (McGechan et al., 2005). The areas would also be excluded from receiving nitrogen fertilisers and so would be associated with lower losses of nitrous oxide (Rees et al., 2013).

36. Biodiversity Cropping on In-Bye

This measure is aimed at increasing conservation value and supporting low input management systems in order to increase the numbers and other wildlife. The measure supports increased diversity of crop species and also limits period within which fertilisers can be applied. It is likely that the main impact of this measure would be to reduce nitrous oxide emissions as a consequence of lower fertiliser application rates. Spring cropping is associated with lower inputs of fertiliser nitrogen and this would contribute directly to lower emissions of nitrous oxide (Rees et al., 2013). Lower inputs of fertiliser nitrogen and the maintenance of cover crops overwinter would also be likely to contribute to reduced leaching losses and therefore improved water quality. It is unlikely that the measure would contribute to significant changes in soil carbon for methane emissions.

37. Cropped Machair

This measure supports the traditional cropping previously cultivated machair land. This is achieved by creating a rotation in which there is a reversion to natural grassland will between 2 to 3 years. Observations of this grassland for subsequent arable phases of the rotation require that the cultivation debt does not exceed 150 mm. Is likely that this measure will provide a wide range of benefits in terms of carbon sequestration associated with the grassland phase of the rotation and reduced nitrous oxide emissions associated with lower nitrogen fertiliser inputs (Rees et al., 2013). Nitrous oxide emissions will however be increased somewhat by the use of manures. Machair soils are very different to those in many other parts of Scotland and the cover very limited geographical area. Partly for this reason, studies of greenhouse gas emissions are very limited in these areas, and there is therefore a high uncertainty associated with extrapolating the results of research studies carried out elsewhere in Scotland.

38. Management of Ancient Wood Pasture

The aim of this measure is to enhance and extend areas of ancient woodland pasture to support and protect habitats for wildlife. The measure supports the reduction or removal of grazing animals and prohibits the use of lime and nitrogen fertilisers or manures. In some circumstances this can be considered as a land use change from grassland to woodland. It is anticipated that this measure would promote an increasing carbon sequestration as a consequence of the protection of woodland. It would also be associated with reduced nitrous oxide losses as a consequence of lower much input (Rees et al., 2013), reduced methane emissions as a consequence of lower livestock density and reduced inching losses as a consequence of the removal nutrients whether woodland and grassland vegetation.

39. Scrub and Tall Herb Communities

This measure aims to enhance extended areas of native scrub vegetation and tall Herb communities in order to provide conservation benefits. Although all land managers are eligible to apply for this measure it would seem most likely to be relevant to areas with some existing conservation value, and extensive or low input land uses. The measure prohibits the use of fertilisers (except with special permission), and ploughing is not

allowed. It is therefore anticipated that this measure, carbon sequestration by increasing inputs of carbon and reducing their losses. This would also reduce emissions of nitrous oxide is a consequence of lower fertiliser nitrogen additions (Rees et al., 2013). Lower nutrient input would also contribute to reduce losses nutrients by aquatic pathways. Methane emissions from livestock would be slightly reduced this would be dependent on the level of reduction in stocking rates.

40. Arable Reversion to Grassland

This measure is used to improve soil and water quality in areas where arable farming is contributing to degradation of the environment by nutrient loss by drainage and soil erosion. The measure involves converting areas of arable farmland to permanent grassland and prohibiting the use of fertilisers and cultivation. Such a land-use change would be very likely to promote significant amounts of carbon sequestration. The areas concerned will have high background soil fertility, promoting rapid growth pasture which could be sustained by biological nitrogen inputs by clover. The absence of grazing by livestock would avoid losses associated with livestock grazing returns. There is however a danger of some continued nutrient losses from surrounding agricultural land, although the extent of this would depend on the area covered by the buffer strip. In addition to increased carbon sequestration the measure would therefore contribute to significantly lower emissions nitrous oxide associated with the avoidance of fertiliser nitrogen use (Rees et al., 2013), and somewhat lower levels of nitrates and phosphates leaching.

41. Habitat Grazing Management (available as an Actual Cost Capital Item from June 2011)

This measure is used to provide extra support for shepherding in upland habitats. It addresses the issue of under all overgrazing and helps to contribute to improved management soils and vegetation. It is anticipated that this measure would have minor benefits in terms of greenhouse gas emissions through increased carbon sequestration and reduced losses. Impacts on nitrous oxide and leaching would be considered to be minimal. Where the measure supports reduction in stocking levels would be anticipated that the reduced levels of methane emissions from livestock.

42. Livestock Tracks, Gates and River Crossings

This measure is used to improve tracks and gateways on farms in order to reduce the impact livestock on water quality. Reducing losses of nutrients from livestock wastes is a clear benefit in terms of improvement in water quality and would be associated with reduced nutrient loading is in streams and rivers. There is also benefit to the farm in terms of improved recycling nutrients within farm environment and the potential for lower levels of fertiliser use as a consequence. For this reason it is possible that there could be small benefits in terms of reduced nitrous oxide emissions from direct losses (i.e. losses associated with the application of nitrogen fertilisers to fields). The reduction in leaching losses, would also contribute to lower indirect losses of nitrous oxide (Reay et al., 2009). Indirect losses of those that occur within the aquatic system, at some distance from the point of input. It is not anticipated that this measure would have any impacts on carbon sequestration or methane emissions.

43. Conservation Management for Small Units

This option is designed to help maintain and enhance the landscape and wildlife crofting community. It encourages the conservation of species rich grasslands, and through doing so would promote lower nutrient use and better nutrient recycling in mixed farming systems. There is also support tree planting and covering storage areas (middens). As a consequence it is likely that this measure will contribute to small improvements in carbon sequestration, small reductions in nitrous oxide emissions and lower leaching of nutrients. Because the precise changes in management associated with this scheme are fairly loosely defined, the environmental benefits are associated with significant amounts of uncertainty.

44. Creation and Management of Grassland for Hen Harriers

This option supports the protection of breeding areas for hen harriers and is primarily intended for Orkney, which restricts its geographical relevance. The measure would include creation and maintenance of rough grassland. Such grassland would encourage sequestration carbon and they would also require the avoidance of fertiliser nitrogen use thereby reducing emissions nitrous oxide (Rees et al., 2013), in wetlands had previously been used for arable production. It is not anticipated this measure would have any significant impact on methane emissions although small reductions in leaching losses are possible.

45. Grazed Grassland for Chough

This measure aims to support the management of habitats for choughs. This involves the maintenance of grazed pastures foraging throughout the year. Staggered cutting dates between mid-June in the end of July are encouraged. The measure does not prevent use of nitrogen fertilisers or grazing of livestock the winter period. The impacts on greenhouse gas emissions are therefore likely to be limited. The maintenance of grassland would encourage small amount of carbon sequestration, methane emissions nitrous oxide emissions and leaching losses would be unlikely to be significantly affected.

46. Grazing Management of Cattle

This measure is designed to support the maintenance or traditional native breeds of cattle in small land units. The measure encourages adoption of measures that avoid overgrazing and promotes good nutrient management. Impacts on greenhouse gas emissions are likely to be relatively small. The maintenance permanent grassland encourage carbon sequestration and reduced overgrazing and good nutrient management could provide beneficial impacts in terms of reduced nitrous oxide emission and leaching. No impact on methane emissions is anticipated.

47. Woodland Creation

The woodland creation scheme is designed to encourage the creation of new woodlands in existing rural areas. The planting of conifers and broadleaves are encouraged within the scheme. Woodland habitats tend to have lower greenhouse gas emissions than those associated with agricultural areas. This occurs as a consequence of increased carbon sequestration within the soil, reduced nitrous oxide emissions as a consequence of the avoidance of nitrogen fertiliser usage (Rees et al., 2013), and reduced emissions methane as a consequence of the absence of livestock. Forests are also highly effective at removing nutrients from the soil environment and thereby reduce levels of leaching and contamination surrounding the bodies. Changes associated with use of forestry are likely to be most significant where the previous land-use was intensive grassland or arable farming.

48. Sustainable Management of Forests

The sustainable management of forests is intended to improve forest management of existing forests with high environmental value. Forest land supports high levels of carbon sequestration this scheme applies to areas which are already and forestry and therefore doesn't contribute to additional carbon sequestration benefits. Options are available the reduction of livestock within sustainable management forestry areas. This would be likely to contribute to reductions in methane emissions in these circumstances.

49. Woodland Improvement Grant

Woodland improvement grants provide support for operations that will improve existing woodland habitats and biodiversity benefits that are associated with them. Because these grants applied to existing woodlands,

no additional benefits in terms of greenhouse gas mitigation or nutrient loss to water would be anticipated.

7. References

1. **Alfarraj MM, Giller KE, Wheeler BD. 1984.** Phytometric estimation of fertility of waterlogged rich fen peats using *epilobium-hirsutum* L. *Plant and Soil* **81**: 283-289.
2. **Armstrong A, Holden J, Kay P, Francis B, Foulger M, Gledhill S, McDonald AT, Walker A. 2010.** The impact of peatland drain-blocking on dissolved organic carbon loss and discolouration of water; results from a national survey. *Journal of Hydrology* **381**: 112-120.
3. **Bell M, Worrall F, Smith P, Bhogal A, Black H, Lilly A, Barraclough D, Merrington G. 2011.** UK land-use change and its impact on SOC: 1925-2007. *Global Biogeochemical Cycles* **25**.
4. **Billett MF, Charman DJ, Clark JM, Evans CD, Evans MG, Ostle NJ, Worrall F, Burden A, Dinsmore KJ, Jones T, McNamara NP, Parry L, Rowson JG, Rose R. 2010.** Carbon balance of UK peatlands: current state of knowledge and future research challenges. *Climate Research* **45**: 13-29.
5. **Dawson JJC, Smith P. 2007.** Carbon losses from soil and its consequences for land-use management. *Science of the Total Environment* **382**: 165-190.
6. **Dinsmore KJ, Skiba UM, Billett MF, Rees RM, Drewer J. 2009.** Spatial and temporal variability in CH4 and N2O fluxes from a Scottish ombrotrophic peatland: implications for modelling and up-scaling. *Soil Biology & Biochemistry* **41**: 1315-1323.
7. **Drewer J, Lohila A, Aurela M, Laurila T, Minkkinen K, Penttila T, Dinsmore KJ, Mckenzie RM, Helfter C, Flechard C, Sutton MA, Skiba UM. 2010.** Comparison of greenhouse gas fluxes and nitrogen budgets from an ombotrophic bog in Scotland and a minerotrophic sedge fen in Finland. *European Journal of Soil Science* **61**: 640-650.
8. **Evans M, Warburton J, Yang J. 2006.** Eroding blanket peat catchments: Global and local implications of upland organic sediment budgets. *Geomorphology* **79**: 45-57.
9. **Falloon P, Powlson D, Smith P. 2004.** Managing field margins for biodiversity and carbon sequestration: a Great Britain case study. *Soil Use and Management* **20**: 240-247.
10. **Farage P, Ball A, McGenity TJ, Whitby C, Pretty J. 2009.** Burning management and carbon sequestration of upland heather moorland in the UK. 351-361.
11. **Fitton N, Ejerenwa CP, Bhogal A, Edgington P, Black H, Lilly A, Barraclough D, Worrall F, Hillier J, Smith P. 2011.** Greenhouse gas mitigation potential of agricultural land in Great Britain. *Soil Use and Management* **27**: 491-501.
12. **Freibauer A, Rounsevell MDA, Smith P, Verhagen J. 2004.** Carbon sequestration in the agricultural soils of Europe. *Geoderma* **122**: 1-23.
13. **Garnett MH, Ineson P, Stevenson AC. 2000a.** Effects of burning and grazing on carbon sequestration in a Pennine blanket bog, UK. *The Holocene* **10**: 729-736.
14. **Garnett MH, Ineson P, Stevenson AC. 2000b.** Effects of burning and grazing on carbon sequestration in a Pennine blanket bog, UK. 729-736.
15. **Jones SK, Rees RM, Skiba UM, Ball BC. 2007.** Influence of organic and mineral N fertiliser on N2O fluxes from a temperate grassland. *Agriculture Ecosystems & Environment* **121**: 74-83.
16. **Kong A, Fonte S, Kessel C, Six J. 2007.** Soil aggregates control N cycling efficiency in long-term conventional and alternative cropping systems. *Nutr Cycl Agroecosyst* **79**: 45-58.
17. **Luo J, de Klein CAM, Ledgard SF, Saggar S. 2010.** Management options to reduce nitrous oxide emissions from intensively grazed pastures: A review. *Agriculture, Ecosystems & Environment* **136**: 282-291.
18. **McGechan MB, Henshall JK, Vinten AJA. 2005.** Cultivation and soil organic matter management in low input cereal production following the ploughing out of grass leys. *Biosystems Engineering* **90**: 85-101.
19. **Mondelaers K, Aertsens J, Van Huylenbroeck G. 2009.** A meta-analysis of the differences in environmental impacts between organic and conventional farming. *British Food Journal* **111**: 1098-1119.
20. **Murray PJ, Gill E, Balsdon SL, Jarvis SC. 2001.** A comparison of methane emissions from sheep grazing pastures with differing management intensities. *Nutrient Cycling in Agroecosystems* **60**: 93-97.
21. **Ostle NJ, Levy PE, Evans CD, Smith P. 2009.** UK land use and soil carbon sequestration. *Land Use Policy* **26, Supplement 1**: S274-S283.
22. **Ramchunder SJ, Brown LE, Holden J. 2012.** Catchment-scale peatland restoration benefits stream ecosystem biodiversity. *Journal of Applied Ecology* **49**: 182-191.

23. **Reay DS, Edwards AC, Smith KA. 2009.** Importance of indirect nitrous oxide emissions at the field, farm and catchment scale. *Agriculture Ecosystems & Environment* **133**: 163-169.
24. **Rees RM, Baddeley JA, Bhogal A, Ball BC, Chadwick DR, MacLeod M, Lilly A, Pappa VA, Thorman RE, Watson CA. 2013.** Nitrous oxide mitigation in UK agriculture. *Soil Science and Plant Nutrition* **59**: 3-15.
25. **Rochette P, Janzen H. 2005.** Towards a Revised Coefficient for Estimating N2O Emissions from Legumes. *Nutrient Cycling in Agroecosystems* **73**: 171-179.
26. **Smith P. 2007.** Ecosse - estimating carbon in organic soils; sequestration and emissions. Edinburgh: Scottish Executive.
27. **Smith P, Bhogal A, Edgington P, Black H, Lilly A, Barraclough D, Worrall F, Hillier J, Merrington G. 2010.** Consequences of feasible future agricultural land-use change on soil organic carbon stocks and greenhouse gas emissions in Great Britain. *Soil Use and Management* **26**: 381-398.
28. **Wallage ZE, Holden J, McDonald AT. 2006a.** Drain blocking: An effective treatment for reducing dissolved organic carbon loss and water discolouration in a drained peatland. *Science of the Total Environment* **367**: 811-821.
29. **Wallage ZE, Holden J, McDonald AT. 2006b.** Drain blocking: An effective treatment for reducing dissolved organic carbon loss and water discolouration in a drained peatland. *Science of the Total Environment* **367**: 811-821.

Appendix 1 Detailed description of SRDP measures included under Axis 2

1. Conversion and Maintenance of Organic Farming
2. Wild Bird Seed Mix/Unharvested Crop
3. Mown Grassland For Wildlife
4. Mown Grassland For Corn Buntings
5. Mown Grassland For Corncrake or Choughs
6. Grazed Grassland For Corncrakes
7. Creation And Management of Cover For Corncrakes
8. Management Of Cover For Corncrakes
9. Open Grazed Or Wet Grassland For Wildlife
10. Mammal and Bird Control
11. Supplementary Food Provision For Raptors
12. Wardening For Golden Eagles**(option closed from 2010)**
13. Control of Invasive Non-Native Species
14. Management of Species Rich Grassland
15. Bracken Management Programme for Habitat Enhancement
16. Creation and Management of Species Rich Grassland
17. Management of Habitat Mosaics
18. Management of Wetland
19. Create, Restore and Manage Wetland
20. Management/Restoration of Lowland Raised Bogs
21. Water Margins and Enhanced Riparian Buffer Areas
22. Management of Flood Plains
23. Buffer Areas for Fens and Lowland Raised Bogs
24. Coastal, Serpentine and Special Interest Heath
25. Lowland Heath
26. Wildlife Management on Upland and Peatland Sites
27. Management of Moorland Grazing
28. Moorland Grazings on Uplands and Peatlands
29. Moorland - Stock Disposal
30. Away-Wintering of Sheep
31. Off-Wintering of Sheep
32. Muirburn and Heather Swiping
33. Management of Hedgerows**(option temporarily suspended)**
34. Extended Hedges
35. Grass Margins and Beetlebanks
36. Biodiversity Cropping on In-Bye
37. Cropped Machair
38. Management of Ancient Wood Pasture
39. Scrub and Tall Herb Communities

40. Arable Reversion to Grassland
41. Habitat Grazing Management (available as an Actual Cost Capital Item from June 2011)
42. Livestock Tracks, Gates and River Crossings
43. Conservation Management for Small Units
44. Creation and Management of Grassland for Hen Harriers
45. Grazed Grassland for Chough
46. Grazing Management of Cattle
47. Woodland Creation **: Changes to Option from 1st October 2012.** You can read the full details in the FCS Briefing Note 6 – SRDP Forestry Grants
48. Sustainable Management of Forests **: Changes to Option from 1st October 2012.** You can read the full details in the FCS Briefing Note 6 – SRDP Forestry Grants
49. Woodland Improvement Grant **: Changes to Option from 1st October 2012.** You can read the full details in the FCS Briefing Note 6 – SRDP Forestry Grants