A report on adapting the PG tool to incorporate management of landscape elements for woodfuel

Catherine Gerrard, Mary Crossland, Sally Westaway and Jo Smith
The Organic Research Centre

TWECOM
Growing local energy

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THE ORGANIC RESEARCH CENTRE
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Executive summary

One of the aims of the TWECOM project is to assess, monitor and evaluate the impacts of the energetic use of landscape elements. To contribute to achieving this, it was decided to adapt an existing sustainability assessment tool (the Organic Research Centre's PG tool) to better cover landscape elements and the use of woodfuel for energy.

The PG tool was developed in 2010/11 as part of a project funded by Defra through Natural England. It assesses a farm on a number of areas (spurs) which may be impacted by agricultural management practices and may be related to public goods such as water quality and air quality. These spurs are: soil management, agri-environmental management, landscape and heritage, water management, fertiliser management and nutrients, energy and carbon, food security, agricultural systems diversity, social capital, farm business resilience, and animal health and welfare management. Each spur is assessed by asking questions based on a number of key "activities". Each activity has at least one corresponding question and these allow the advisor carrying out the assessment to evaluate the detailed ways in which the farm contributes to sustainability. The original project culminated in a pilot of the tool on forty organic farms. Following on from that, the tool was modified to remove the focus on organic farms and to enable it to carry out assessments on conventional farms and the updated version of the tool was tested in a pilot on thirty two conventional farms.

As part of the TWECOM project the tool was adapted to include additional questions on landscape elements and woodfuel. In addition, it was also used to create a standalone landscape-element sustainability assessment tool for situations where a full sustainability assessment would be too time-consuming. The adaptations to the tool that were required were identified by a review of the tool by TWECOM project partners. The new questions were mainly in the areas of agri-environmental management and energy and carbon. The landscape and heritage, water management, soil management, and animal health and welfare spurs also required a smaller number of adaptations. A new landscape elements module was added to the tool to summarise the results of new and existing questions that were specific to landscape elements and woodfuel. This module also formed the basis of the shorter standalone tool.

Once the adaptations had been made, the PG tool was tested on two farms in the South West of the UK that make use of woodfuel and landscape elements: one in Devon, and one in Dorset. The pilots highlighted some small issues and questions that needed to be clarified or slightly updated. The main issue that they revealed was that export of energy off farm (rather than use of renewable energy on-farm) was not being picked up sufficiently well and as a result farms were not being rewarded for producing energy that could be exported e.g. as electricity to the national grid or as woodfuel sold to neighbours. An additional question was added to cover this gap.

The adapted version of the PG tool allows a farmer to see, not only the overall sustainability assessment for their farm, but also how the landscape elements contribute to the overall sustainability.

Introduction

One of the aims of the TWECOM project is to assess, monitor and evaluate the impacts of the energetic use of landscape elements. To contribute to achieving this, it was decided to adapt an existing sustainability assessment tool (the Organic Research Centre's PG tool) to better cover landscape elements and the use of woodfuel for energy.

The PG tool

The PG tool was developed in 2010/11 as part of a project funded by Defra through Natural England. Further information about the tool and its development can be found in that project report (Gerrard *et al.*, 2011).

As part of development process, a stakeholder workshop identified a variety of agriculture-related public goods against which the tool would assess each individual farm. These "spurs" were: soil management, agri-environmental management, landscape and heritage, water management, fertiliser management and nutrients, energy and carbon, food security, agricultural systems diversity, social capital, farm business resilience, and animal health and welfare management.

The tool has been designed to be used on farm with an advisor gathering data through an interview with the farmer. It has been constructed as a Microsoft Excel workbook with a worksheet for each spur. In addition there is an initial data sheet collecting general farm information used in multiple spurs and a final results sheet which provides graphical representations of the farm's assessment as soon as the interview is completed.

Each spur is assessed by asking questions based on a number of key "activities". Each activity has at least one corresponding question and these allow the advisor to evaluate the detailed ways in which the farm contributes to sustainability. The activities were identified as a result of a literature review and discussion at a stakeholder workshop attended by researchers, agricultural advisors and representatives from Natural England. The choice of activities was influenced by a desire for the data collected to be of a type that a farmer would have in their farm records already, i.e. not requiring any further surveys to be carried out. Care was also taken to balance quantitative and qualitative activities. It was also necessary to maintain a balance between obtaining sufficiently detailed information to assess the spurs while keeping the assessment to a reasonable length of time. The PG Tool assessment takes two to four hours to complete depending on the size and complexity of the farm. The individual spurs are discussed in more detail below in Table 1.

Each question is marked with score between 1 and 5 where 1 is the lowest mark, indicating that no benefit is being provided and 5 is the highest score. Some questions have a not applicable (N/A) option. This is the case where a situation may arise such that the farmer cannot possibly provide that benefit, for instance, a farmer who does not have cattle or dairy goats will not include mastitis prevention on their livestock health plan but should not be scored lower for failing to do so and therefore can choose N/A as the answer for this question.

Some activities are assessed using several questions while others require only one. Where multiple questions are asked their scores are averaged and rounded to the nearest whole number to give the score for that activity. Thus an activity requiring several questions is not weighted more heavily than one requiring only a few or one question.

The scores for each spur are obtained by averaging the scores for all its activities. These are then shown on a radar diagram (Figure 1) allowing farmers to see in which areas they perform well and which areas could be improved. A bar chart showing the activities on each spur gives more detailed information so that if the farmer sees from the radar diagram that they scored less well on a particular area they can then identify the specific activities to work on to improve the score in the future.

The original project culminated in a pilot of the tool on forty organic farms. Following on from that the tool was modified to remove the focus on organic farms and to enable it to carry out assessments on conventional farms and the updated version of the tool was tested in a pilot on thirty two conventional farms (Gerrard *et al.*, 2014).

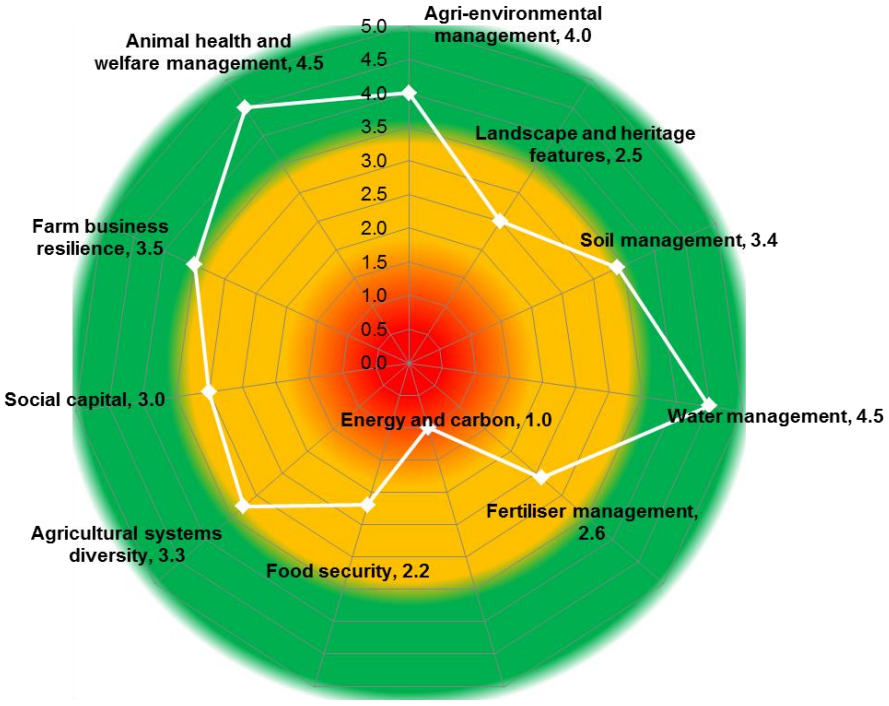

Figure 1: Example of PG tool reporting format.

Table 1: The PG tool spurs

Spur	Description
Soil Management	The soil management spur assesses a farm's performance in terms of monitoring of soil organic matter and nutrient levels, in addition to assessing the amount of damage done to the soil from erosion, e.g. from leaving land bare over the winter or out-wintering cattle.
Agri-environmental management	The agri-environmental management spur assesses how well the farm is managed with regards to environmental stewardship and encouraging native wildlife. The activities assessed are agri-environmental participation, conservation plan, awards, provision of habitats, and use of crop protection products.
Landscape and Heritage	The landscape and heritage spur assesses how well a farm contributes towards preserving the countryside and its heritage. The activities which are used to assess this are: historic features, landscape features, and management of boundaries.
Water Management	The water management of the farm is assessed through the measures being taken to reduce pollution, the sources of water used and the efficiency of irrigation systems that are put in place.
Fertiliser Management and Nutrients	The fertiliser management and nutrients spur is spread over two worksheets: the first worksheet is an NPK (nitrogen, phosphorus, potassium) budget which takes information from the initial data collection sheet and calculates a 'farm gate' balance based on standard yield and NPK figures and the amounts of crops and livestock moving on and off the farm; the second worksheet for this spur contains more qualitative questions about the management of nutrients, manure and wastes on farm.
Energy and Carbon	The energy and carbon spur is spread over three separate worksheets: the first worksheet focuses on the farm's own fuel and electricity use, recording both the total amount used and the amount attributed to the various farm enterprises: arable, beef and sheep, dairy, horticulture, pigs and poultry; the second worksheet for this spur uses energy and carbon benchmarks (CALU and ADAS, 2007) to compare the farm's performance in terms of MJ of energy per head of livestock, or per hectare; the final worksheet for this spur asks more qualitative questions regarding the farm's energy use.
Food Security	The food security spur assesses the contribution of the farm towards food quality and availability of food in the local area. The activities assessed are total productivity, local food, off-farm feed, food quality awards, food quality certification and production of fresh produce.
Agricultural Systems Diversity	The agricultural systems diversity spur determines the extent to which the farm is incorporating a range of crop varieties and animal species and breeds in its production.

Social Capital	The social capital spur assesses the farm's community engagement and the benefits it provides to its staff. It is assessed through the following activities: employment, skills and knowledge, community engagement, corporate social responsibility initiatives and accreditations, public access, human health issues.
Farm Business Resilience	The farm business resilience spur assesses the financial resilience of the farm as a business and whether it is a long-term prospect. It uses two activities to assess this – financial viability and farm resilience.
Animal Health and Welfare Management	The animal health and welfare management spur assesses how the farmer manages their livestock so as to ensure their health and welfare. The activities under which this is assessed are staff resources, health plan, animal health, ability to perform natural behaviours, housing and biosecurity.

Method

A presentation on the PG tool was given to project partners at the TWECOM meeting held at Elm Farm in April 2014. This presentation gave some background on the topic of sustainability assessments and introduced partners to the PG tool.

After the meeting a copy of the PG tool was circulated to partners in the TWECOM project who had expressed an interest in further pursuing the sustainability assessment aspect of the project and feedback was requested with regards to questions that were already felt to cover landscape elements and energy from woodfuel, and additional questions that could be added. They were also asked to use their copy of the tool to highlight questions that should be kept (to be highlighted in green), those about which they were unsure (yellow) and those that they thought should be removed (red). Feedback was received from PUM (Philipps-Universität Marburg), RLLK (Regionaal Landschap Lage Kempen vzw) and ZLTO (Zuidelijke Land- en Tuinbouworganisatie) as well as from ORC staff who had not previously been involved in the development of the PG tool.

A working group discussion was carried out by Skype on 19th May 2014 involving partners from PUM, RLLK, ZLTO and ORC to further discuss the adaptation of the PG tool for use in TWECOM. The main feedback from the discussion was that for many partners a PG tool assessment would take too long and so it was suggested that a standalone tool that only consisted of the landscape elements and woodfuel related questions would be a good compromise. However, others felt that having the questions as a standalone spur might make the landscape element impact more clear but might lose the whole farm context and may be of less interest to a farmer who sees landscape elements as only a small part of his farm.

As a result of the workshop discussion and subsequent internal discussion at ORC it was decided that the PG tool (after some adaptation) would have an additional landscape element module added which could also be separated out and used as a standalone tool. This landscape element module within the PG tool would pull in the questions from the other spurs and their scores (where the whole tool has been completed) under sub-headings that match the existing PG tool spurs. The results sheet would then show all the information that it currently does with an additional radar diagram showing the landscape element scores for biodiversity, soil management etc. If the landscape element module is used as a standalone then a separate spreadsheet would be used but with the same questions and scoring as within the whole PG tool assessment, and the same landscape element radar diagram.

A list of adaptations to the tool was put together based on the feedback from the project partners and ORC staff involved in TWECOM. Some questions were slightly altered to better include landscape elements and new questions were added as well as new energy and carbon calculations to include woodfuel and renewable energy use. The landscape element module was added based on existing and new questions.

Once the first draft of the TWECOM version of the PG tool was complete it was agreed that it would be trialed on two farms in the South West of the UK that were involved in the use of landscape elements for woodfuel. The two tools (the full TWECOM PG tool and the landscape element standalone tool) were also sent to two of the TWECOM partners (PUM and ZLTO). They did not formally test or pilot the tool but provided feedback which is summarised in the results section below.

The initial pilot took place in Devon and highlighted that it was important to not just consider the use of renewable energy on farm but also consider whether the farm exported energy (e.g. in

this case solar panels provided electricity which was exported to the National Grid as it wasn't needed on farm where most energy was provided by woodfuel). The second pilot was in Dorset and proved to be a very good test of the tool as the farmer was both exporting energy in the form of woodfuel which he sold off farm and also "exporting" grazing which he made available to neighbours as a means of using conservation grazing on his land. It was decided that the focus for TWECOM should be on making sure that the tool could cope better with exported energy as this had been highlighted by both of the pilot assessments. As a result a separate question was added to cover export of energy off farm as well as use of renewable energy on farm.

Results

Adapted tool

Adaptations that were made to the tool included adding extra questions to more thoroughly cover landscape elements and woodfuel, clarifying existing questions to more explicitly contain landscape elements and adding standard data on woodfuel yields from woodland and hedges.

The following are the main adaptations that were made to the tool (smaller changes were also made but mainly consisted of debugging and minor changes to options or scoring):

Initial data collection

Woodland categories were split between trees managed for woodfuel, trees managed for timber and other woodland (which was further subdivided into newly planted, established and ancient). The total length of the hedges was added and the length managed for woodfuel was also recorded. Figures for yields and energy associated with these were provided based on data from hedge trial plots at Elm Farm and in the South West of England (yields) and the Biomass Energy Centre[1] (energy) respectively.

Soil Management

The questions on erosion were combined and consolidated to reduce the number of different erosion types that were included and hedge and tree planting were included as options to prevent erosion.

Agri-environmental management

The agri-environment options were originally split between arable and livestock options; these were combined and consolidated to make a more user-friendly list. Questions on Biodiversity Action Plans and Sites of Importance for Nature Conservation were removed as these are not wholly within the control of the farmer. The rare species question was supplemented by an additional question about the presence of the 12 Hedgelink[2] UK flagship species (Purple ramping fumitory *Fumaria purpurea;* Orange-fruited elm-lichen *Caloplaca luteoalba;* Large (Moss) Carder bee *Bombus muscorum;* Brown hairstreak butterfly *Thecla betulae;* Goat moth *Cossus cossus;* Common lizard *Zootoca vivipara;* Bullfinch *Pyrrhula pyrrhula;* Tree sparrow *Passer montanus;* Yellowhammer *Emberiza citronella;* Soprano pipistrelle *Pipistrellus pygmaeus;* Hedgehog *Erinaceus europaeus;* Dormouse *Muscardinus avellanarius)*. The habitat questions were extended to include a number of additional questions on hedges:

- What proportion of the field boundaries are hedgerows?
- What proportion of the hedges are coppiced or layed?
- Has a hedgerow survey been completed?
- Number of woody species present in the hedgerows? Note: climbers and brambles do not count.
- Condition of hedges?
- How do you manage your hedges?

[1] http://www.biomassenergycentre.org.uk/portal/page?_pageid=73,1&_dad=portal&_schema=PORTAL
[2] http://www.hedgelink.org.uk/

Landscape and heritage

Hedges were added more explicitly into some of the questions on boundaries.

Water management

The options for minimising water pollution and maximising water efficiency were combined and consolidated to make a more user-friendly list. Tree riparian buffers and contour hedging were added to the list of options.

Fertiliser management

No changes were made.

Energy and carbon

Two new enterprises were added: “woodfuel/hedges” and “domestic/other”. Two new fuel options were added “woodfuel” and “electricity (renewable)”. A ratio of renewable energy use to total farm direct energy use was calculated and scored (60%+ renewable energy use scoring 5), a question was added on export of energy off farm (e.g. solar energy that is exported to the grid, woodfuel that is sold to neighbours), two new questions were added under land use change on whether any hedges had been removed and whether any new hedges had been planted. The climate change options were combined and consolidated to make a more user-friendly list.

Food security

No changes were made.

Agricultural systems diversity

No changes were made.

Social capital

No changes were made.

Farm Business Resilience

No changes were made.

Animal health and welfare

In the section on ability to perform natural behaviours two new questions were added, one on provision of shelter (including trees and hedges) and one on availability of grazing and browse.

Results

An additional tab was also added to the spreadsheet: this was used to bring together all of the landscape element related questions and scores in one location so that the farmer could see the results from the landscape element/woodfuel enterprises on his farm separately from the overall farm scores. An example is shown in Appendix A. This tab was also used to create a much shorter, standalone landscape element sustainability tool for farmers who might not have time to complete a full PG tool assessment. This tool asks only the questions that are directly related to the landscape elements on the farm.

Pilot assessments

Devon

An assessment was carried out on a 30ha beef and sheep farm in Devon. The farm has 0.3ha of woodland for timber, 0.7ha of established woodland and 5070m of hedges of which 2500m are managed for fuel. The farm scored 3 or above for each spur on the landscape elements results sheet and scored 5 for animal welfare. The energy and carbon spur scored lower than might have been expected for a farm that produces woodfuel. This seemed to be a result of two factors. Firstly, the very low benchmark energy use from the CALU figures for sheep farms (which appear to have been based on very extensive hill farms). Secondly, the fact that although the farm produced solar energy it did not receive full credit for this as the electricity is exported to the national grid rather than used on farm (as little electricity is used on the farm and most energy needs are fulfilled using woodfuel) so the use of renewable energy was not picked up in the initial set of questions.

The feedback from the pilot suggested a number of changes to PG tool (see Appendix B). There were a small number of bugs detected (e.g. summing over incorrect cells, error messages occurring when a N/A option was used) which were corrected. It was also clear that farms that export energy need to be better rewarded for doing so and an additional question was added to identify and score these. Detail was also added on the Freedom Foods standards so that the farmer could more readily state whether their livestock housing meets those standards.

A number of areas were also mentioned which may require further consideration in future development of the tool. These included possible improvements/updates to the energy benchmarks (particularly for beef and sheep farms and for domestic use).

Areas that received positive feedback:

- Sending out the Initial data collection sheet and fuel use data sheet in advance meant that the time spent doing the assessment was reduced to just under an hour and meant the farmer could search out those data in his own time.
- The radar diagram approach to showing the results was appreciated and felt to demonstrate the result clearly.

Dorset

The second pilot of the tool was carried out on a 146ha mixed farm in Dorset. There are 2.4ha of woodland managed for fuel and 19.3km of hedgerows of which 16.1km are managed for woodfuel. As well as managing his own hedges for woodfuel, the farmer also manages hedges for neighbouring farms and sells the woodfuel. The farm scored 4 or above for each spur on the landscape elements results sheet with soil management, landscape and heritage and animal welfare scoring 5.

The feedback from the pilot suggested a number of changes to PG tool (see Appendix B). It was again highlighted that farms that export energy need to be better rewarded for doing so. Future development of the tool may also need to consider whether it is possible to make conversion between acres and hectares and feet and metres easier, and some means of adding “export of grazing” such that the N,P,K balance is more accurate for farms that “export” their grazing to others.

Project Partner Feedback/testing

Feedback from PUM

The feedback from PUM focused on the standalone tool and is provided verbatim below.

"We think the landscape and energy version is a good summary concerning the important issues regarding to landscape elements. Especially the sheets on Landscape elements is very good and easy to use. The part on fuel use input data is very detailed: The advantage is that you can do very detailed calculation. Depending on the context in which you want to use the tool this is likely to be too demanding for farmers. For an academic evaluation this is great, but if you want to do a short assessment with farmers it could be necessary to summarise the questions.
E.g.:
Heat consumption (KWh):
- Gas
- Heating Oil
- Biomass
- Other
Electricity consumption (KWh): xx / share of RE
Mobility fuel consumption (litre): / share of RE
- Diesel
- Petrol
- Other
This would give an overview of total energy that is consumed and the energy carriers that are used. One could also ask questions about renewable energy production on farm (PV, solar thermal, wind, ...) but this not focussing on landscape elements.
We would suggest to combine the most important questions from "Fuel input data" with "Energy and carbon balance".”

It was decided that for the present purposes of the tool the “fuel use input” and “energy and carbon balance” would be left in their current form but that it would be possible to reduce them to the items suggested by PUM in the future if required. It is easier to remove items and simplify the tool in the future rather than to add back in complexity and the current more complex version does, as PUM identified, allow a very detailed calculation to be made which can be useful to farmers who are particularly interested in how their use of landscape elements is impacting on their energy use.

Feedback from ZLTO

ZLTO provided feedback on the full version of the PG tool, which is reproduced verbatim below.

“We are setting up 2 practical small pilots in local heat supply chains in Agribusiness based on Biomass. Our potential biomass is collected and processed by local Agricultural Nature Organisations who manage and maintain landscape elements, smaller forests and nature elements on barnyards. Many of this work is done by volunteers with the help of farmers. By setting up a structure and co-operation in harvesting and processing the pruning and wood to chips, which can be sold, you will get an economic support for landscape maintenance. The Nature Organisations aren’t calculating the potential biomass per hedge, this is too time-consuming. It depends on many factors to harvest the possible calculated amount of Biomass. And because they work with volunteers it’s hard to make an prediction. Perhaps later, when the organisations are more professionalised and there is a business case your tool can be applied in practice.

Now it's too early for us to test it in a real setting, also because it is very detailed and asks for parameters based on experiences over the last 12 months. These numbers we don't have yet. And 'our' farmers don't have them either.

But I can give you feedback of our impression. First of all I would like to compliment you with this software tool. It looks great and has a simple and pleasant way for using it.

I assume you want to fill this in together with an farmer or landowner instead of sending it on and let them fill it in themselves. This because it is very detailed and contains many smaller questions, like the percentage distribution in 'Fuel use input data'. This can deter a user and has the risk of providing wrong answers.

The outcome of the tool is a 'spiderweb' of the balance between contribution of landscape elements to several actors. But I miss a sort of conclusion or advice. Like if one or 2 of the elements are 'in the red' you should look up the questions that belong to that element and make an action plan on how you can provide higher scoring answers on that questions. For example, What should you have to do to increase the number of woody species?

Correct me if I'm wrong but I understand this tool helps an local advisor who visits farmers and landowners who maintain hedges. The tool helps to compare the different owners and helps to give an advise. Therefore it's a good tool, and if you work with it for some time, I think it's also pretty easy and fast in use. If you ask a farmer to fill it in themselves it's too complicated and it misses a actual outcome.

About the data and parameters that are used in the tool, these look normal and right to me."

As ZLTO noted, the tool is designed for use with an advisor who would use the tool as a starting point for a discussion with the farmer about the farm management, focused in this case on the landscape elements. Rather than have the tool provide generic advice which may not be appropriate for the individual farm being assessed, the advisor will work through the tool with the farmer and then they can discuss together management changes which may impact the scores and therefore come up with solutions that are tailored to the farm.

Conclusion

As the energetic use of landscape elements increases so will the need to assess, monitor and evaluate the impacts on farm sustainability. The adapted version of the PG tool allows a farmer to see, not only the overall sustainability assessment for their farm, but also how the landscape elements contribute to the overall sustainability. The standalone landscape-element tool allows for assessment in situations where a full sustainability assessment would be too time-consuming. The tool is available for free once a user-agreement has been signed (stating that the user will not pass the tool on to others, will acknowledge the tool in any publications resulting from its use, will not use it for commercial purposes and will provide data back to the authors of the tool). Although issues raised during piloting have been addressed, there is potential for further tool development. Through future use by farmers and advisors, collected data can be used to improve bench mark values, correct bugs and refine questions.

References

CALU and ADAS (2007) Managing Energy and Carbon: The farmer's guide to energy audits, available from http://www.calu.bangor.ac.uk/Technical%20leaflets/Energyauditmanual.pdf

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Gerrard, C.L., Smith, L.G., Padel, S., Pearce, B., Hitchings, R., Measures, M., Cooper, N., (2011), OCIS Public Goods Tool Development, Report to DEFRA, available from http://orgprints.org/18518/

To obtain a copy of the tool

Contact catherine.g@organicresearchcentre.com

Appendix A: The landscape elements tab of the TWECOM PG tool

Landscape elements			Score
Initial data collection			
Farm name	Enter name		
Dates covered (note that this should be a year)	e.g 1.1.2010-1.1.2011		
Own farm or tenant farmer? (if both, give one which is predominant)	FBT>5years		
Dominant soil type	Heavy soil		
Annual rainfall	0.00	mm	
Average field size	0	ha	
energy crops			
Miscanthus	0	ha	
Short Rotation Coppice (eg: Willow harvested for biomass)	0	ha	
Woodland			
Trees managed for woodfuel	0	ha	
Trees managed for timber	0	ha	
Other woodland (newly planted)	0	ha	
Other woodland (established)	0	ha	
Other woodland (ancient)	0	ha	
Total hedges	0	km	
Within which, total length of hedgerow managed for fuel	0	km	
Soil Management			
On what percentage of your cultivated land are you implementing cultivation that reduces risk of erosion? eg minimum tillage and contour ploughing, hedge and tree planting- use N/A option if you land is not subject to erosion	N/A		N/A
Are you implementing measures to reduce the risk of erosion and run off? - use the N/A option if your land is not subject to erosion	Medium intensity measures: eg planting grass strips and shelterbelts		4
			4
Agri-environmental management			
How many of the arable options listed below (row 388 onwards) do you have on your farm?	N/A		N/A
How many of the livestock options listed below (row 388 onwards) do you have on your farm?	2 to 3		3
Do you have a written voluntary conservation plan?	conservation plan written		3
How many hectares do you have of native woodland?	0.00		#DIV/0!
To what extent do you manage farm woodland?	very active woodland management		5
Do you exclude livestock from woodland?	Yes		5
Do you protect in-field trees?	Yes		5
Are you restoring and/or establishing wildlife habitats on your land? What percentage of the area is covered by this?	0-5%		1
Do you monitor habitats and maintain them as necessary to ensure that they are in good condition, if so how regularly?	monitored rarely (5+years)		2
Do you survey/monitor flora and fauna species on your farm?	No		1
How many of the rare/red list species (some of which are listed below the documentation section on this worksheet) do you have evidence of on your farm? (please identify in notes column)	6 to 7		3
In the UK there are 12 key species associated with hedges (see list from row 424 onwards), how many do you have on your farm?	5 species		4
What proportion of the field boundaries are hedgerows?	>75%		5
What proportion of the hedges are coppiced or layed?	1-5%		3
Has a hedgerow survey been completed?	yes		5
Number of woody species present in the hedgerows? – note climbers and brambles do not count.	5 or more		5
Condition of hedges?	In-between those two states		3
How do you manage your hedges?	Trim/flail annually or as necessary		1
			N/A

Landscape and heritage			
How closely does the farm's landscape reflect the the landscape character of the area? Not at all, little, partially, mostly, fully	mostly		4
Do you have the following boundaries on your farm - stone walls, stone-faced banks, earth banks, hedges, hedgebanks, lines of trees, ditches, relics of boundaries of historic importance	Greater than 10% of all boundaries		5
What proportion of those boundaries are hedgerows	Greater than 10% of all boundaries	%	
How many hedgerow trees per 100m do you have on the farm?	3 to 4		3
Are you taking action to restore appropriate boundary features (e.g hedges, hedge banks, earth banks, stone faced banks, stone walls, ditches)?	No		1
			3
Water Management			
Which of the options below do you have on your farm (see list on lines 149 onwards)?	1 to 3		2
			2
Energy and Carbon			
Energy benchmarks			n/a
Energy efficiency score			n/a
Percentage renewable energy score			N/A
Do you monitor/record on-farm energy use?	No		1
Have you completed an energy audit to explore efficiency options and are you acting on it?	No		1
How many of the options below (see list at Row 102 below) do you have on your farm?	4 to 6		3
Have you converted woodland or grassland to arable in the last 20 years? If so what % of your total woodland/grassland was converted?	None		5
Have you converted arable land to permanent grassland or woodland in the last 20 years? If so what % of your total arable area was converted?	None		1
Have you removed any hedges in the last 20 years?	no		5
Have you planted any new native hedges in the last 20 years?	yes		5
			3
Animal Health and Welfare			
Is there provision of shelter for the animals e.g. trees, hedges, man-made shelters?	some shelter available some of the time		3
Availability of grazing/browse?	grazing avaiable most of the time		3
			3

Landscape elements	Score
Soil Management	4
Agri-environmental management	N/A
Landscape and heritage	3
Water Management	2
Energy and Carbon	3
Animal Health and Welfare	3

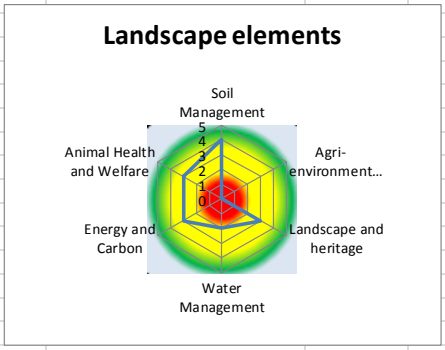

Figure shows contribution of landscape elements to the areas of soil management, agri-environmental management, animal health and welfare etc.

Appendix B: Feedback from the pilots

Devon

An assessment was carried out on a 30ha beef and sheep farm in Devon. The farm has 0.3ha of woodland for timber, 0.7ha of established woodland and 5070m of hedges of which 2500m are managed for fuel. The farm scored 3 or above for each spur on the landscape elements results sheet and scored 5 for animal welfare. The energy and carbon spur scored lower than might have been expected for a farm that produces wood fuel. This seemed to be a result of two factors. Firstly, the very low benchmark energy use from the CALU figures for sheep farms (which appear to have been based on very extensive hill farms). Secondly, the fact that although the farm produced solar energy it did not receive full credit for this as the electricity is exported to the national grid rather than used on farm (as little electricity is used on the farm and most energy needs are fulfilled using fuel) so the use of renewable energy was not picked up in the current set of questions.

The following outlines the implications of the pilot for further changes to the PG tool:

Areas that definitely needed to be changed (*all of the corrections below were made*) :

- Initial data collection sheet cell B116 (total woodland): should only sum from B100 to B104 (not include B106 and B107) to ensure that we don't add hectares of woodland to km of hedges.
- Energy and carbon: Need to better reward farms that export electricity.
- Landscape elements: Where a spur (e.g. soil management) has N/A answers for all questions need to change the formula so the overall score shows N/A instead of the #div/0! Error.
- Animal health and welfare: Need to add a brief description of the Freedom Food standards for the questions where they are used as a comparative benchmark.
- Social capital: reconsider scoring to better reflect normal numbers of farm visitors.
- Landscape and heritage: line 14, add a note to say that lines of trees are counted as hedgerow trees
- Nutrient management: Line 10, no option for soil sampling so add it to the software option (scoring 3).

Areas that need further consideration:

- The energy benchmarks for beef and sheep farms and for domestic energy use seem very harsh and difficult to achieve a score of more than 1.
    - *The benchmarks were investigated but it was decided not to change them as some farms from the previous testing of the PG tool had succeeded in meeting the benchmark so it is attainable and using the same source for all of the farm type benchmarks guarantees consistency.*
- Questions in agri-environment management, social capital, etc. that ask about awards/certification may need further consideration – they do provide 3rd party assurance about the farm's performance in these areas but a lot of farms don't choose to enter for awards so can't win them.
    - *It was decided to keep these as many of the other questions allow a farmer to self-assess their farm but this question asks about independent third party assessments.*
- Agri-environment management – the farmer was surprised that his score was low as he can't think what else he could be doing on this for his farm. Have another look at the questions and see if there's anything obvious missing.
    - *As a result of this the options that were asked about in agri-environmental management, water management and energy and carbon were combined and consolidated to make them more user-friendly. The agri-environmental options were also split into those applicable on arable land and those applicable on livestock farms and these were scored separately so that livestock farms are not disadvantaged by not applying measures that would not be applicable to their farm type.*

Areas that received positive feedback:

- Sending out the Initial data collection sheet and fuel use data sheet meant that the time doing the assessment reduced to just under an hour and meant the farmer could search out those data in his own time.

- The radar diagram approach to showing the results was appreciated and felt to demonstrate the result clearly.

Dorset

The second pilot of the tool was carried out on a 146ha mixed farm in Dorset. There are 2.4ha of woodland managed for fuel and 19.3km of hedgerows of which 16.1km are managed for wood fuel. As well as managing his own hedges for wood fuel, the farmer also manages hedges for neighbouring farms and sells the wood fuel. The farm scored 4 or above for each spur on the landscape elements results sheet with soil management, landscape and heritage and animal welfare scoring 5.

The following outlines the implications of the pilot for further changes to the PG tool:

Areas that definitely need to be changed (*this was addressed by the addition of a question on energy export.)*:

- Energy and carbon: Need to better reward farms that export electricity.

Areas that need further consideration:

- How to deal with farmers that work in acres and miles rather than hectares and kilometres.
    - *The tool already provided conversion figures and it was decided that it is not possible to do anything more than that in its current format e.g. using Excel. The conversions will need to be applied by hand where necessary for the time being.*
- How to cope with "export of grazing". It's difficult to include the animals as they effectively net off as they import onto and export off the farm, but ignoring them causes issues with the N,P,K balance because they're removing grass from the pasture.
    - *It was decided that this would need to be dealt with on an ad hoc basis – the "exported grazing" could be accounted for by calculating an equivalent amount of "hay" to export off the farm and the livestock import/export figures may need to be adapted to take account of the fact that livestock may be imported onto the farm at a young age and leave at a more developed stage.*
- Water management: the questions are well suited to farms in the east but in the west of the UK where irrigation and water-saving aren't an issue at present, are less well suited.
    - *The tool includes some questions on flood management which maybe more appropriate to farms in the west. The questions on irrigation have n/a options which can be used if needed. Also, as climate change is unpredictable it may be that farms in the west should consider water management options that may be required in the future.*

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