Potential for 'carbon farming' on Scottish farms

Factchecking potential income from carbon credit creation

What is carbon farming?

Carbon farming is a relatively new term to describe farming according to agricultural practices that will increase (soil) carbon capture within the agricultural land involved. Increased soil carbon may be the main aim of these practices, or a by-product of other agricultural goals. While often use interchangeably with 'regenerative agriculture', the latter implies the potential for broader environmental or biodiversity benefits.

Carbon farming has recently become a buzzword as increasing soil carbon has been excitedly identified by some as a potential new resource and income stream for landowners to capitalise on, as well as a means to add value to currently less productive land, and meet sector and supply chain targets & compliance. Part of this enthusiasm is linked to current uncertainty about the level of future farm support in the UK post-Brexit, and prices at farmgate putting pressure or margins with rising costs.

However, the science indicates that the actual potential for carbon as a long term and sustainable income stream, as well as its contribution to offsetting agriculture's carbon footprint, is relatively small; at best it may be just a supplementary or bonus income for farmers, or at worst agricultural practices may result in soil carbon loss. There is ongoing scientific research into improving methods of measuring and quantifying soil carbon, as well as better understanding soil carbon saturation point, but the low opportunity level for soil carbon as an income stream for farmers is relatively clear.

Furthermore, recent stakeholder analysis has begun to identify some of the potential wider impacts and unintended consequences of carbon markets if not fully integrated and consulted with the wider landscape and rural community. There are also concerns about the sustainability of income in volatile and fast-changing carbon markets, as well as the danger of selling carbon credits outside of agriculture, with it selling off the tools for the sector to meet pressing climate targets in the future.

As part of this project, a survey was put out to members of the farming community to gauge the level of understanding around carbon markets and agriculture. While generally there was a good understanding of the practicalities of managing soil carbon and risks of engaging in the current carbon credit marketplace, 71% of respondents (incorrectly) believed that based on typical Scottish stocking density, grassland could sequester enough carbon to offset the emissions from livestock grazing on it. Confusion was also common around whether being paid by an external funder for carbon actions on farm meant that the carbon benefit as offsets could be counted against the farming business footprint or not. The survey is useful to being identifying areas of upskilling and training needed across the farming sector.

What real opportunity is there for farmers?

Delving a bit deeper into assessing the real opportunity of soil carbon credits for farmers, it is worth looking at a worked example to get a sense of indicative income figures, as a quick 'factcheck' of the actual potential income from carbon mitigation and sequestration on a typical farm based on the current carbon price in voluntary markets.

Taking the total agricultural emissions in Scotland of 7.5Mt CO2e annually and the 51,356 registered agricultural holdings to give an average holding size of 110ha, this suggests an average farm holding emits around 146t CO2e per farm per year.

The following table gives an indication of the scale of carbon income from mitigation actions from farming (as a reference point – not currently being paid for via carbon credits and unlikely to be in the future), soil carbon sequestration (based on an estimate using average figures from Agrecalc and Chapman et al., 2023[1] (forthcoming), and for comparison an area of woodland planting. This does not include consideration for any financial support through public funding, or address the issues of permanence, additionality or cost of implementation linked with these options.

N.B. These are just average and indicative figure for illustrative purposes.

CARBON PRICE: £30/T	**CARBON OVER TIMESCALE**	**CARBON PER YEAR**	**REVENUE (WHOLE FARM) PER YEAR**	**REVENUE PER HA PER YEAR**
10% REDUCTION IN FARM EMISSIONS	14.6t over 5 years	2.9 t/yr	£87 /yr	£0.79 /yr
30% REDUCTION IN FARM EMISSIONS	43.8t over 10 years	4.4 t/yr	£132 /yr	£1.2 /yr
SOIL CARBON SEQUESTRATION	500t over 20 yrs	25t/yr	£750 /yr	£6.82 /yr
10% FARM AREA PLANTED (14.6HA)	*2.97 t CO2e/ha/yr*	*43.4t/yr*	*£1,302 /yr*	*£11.84 /yr*

The costs indicate that the potential income from either carbon reduction (hypothetically, if it was paid in some direct or indirect way, via private or public finance), or soil carbon sequestration are low. It is important to note that these costs just outline potential carbon income and not costs of implementation. More detailed costings would be recommended to

[1] Chapman, P.J., Andrews, L and Ziv, G. (2023). Feasibility of a UK Farm Soil Carbon Code: Interim report on the evidence base for soil carbon benefits associated with changes in agricultural practices. Yorkshire Integrated Catchment Solutions Programme (iCASP) Report.

assess the gross margins of measures including other subsidies, income and indirect benefits to the farm, and fully compare economic viability.

Importantly, in relation specifically to carbon markets, the table does not include costs of implementation, professional and brokerage fees etc.. If and when these are factored in, it is very likely that carbon credits will not provide significant income for an average sized, agriculturally productive holding, and at best may over some small bonus income; indeed, some experts suggest that the cost of MRV alone would absorb the entire carbon income. Therefore, implementing, verifying and monitoring carbon projects involves high transaction costs, which naturally favours projects of scale. This level of assurance is required to build trust and value in markets, but it does disincentivise smaller projects with no current, formal, and standardised scheme or process to facilitate them. While standardising and streamlining these processes is ongoing work, it is inherently complicated and costs unlikely to be reduced significantly when required across a large number of relatively small carbon creation projects (i.e. compared to large scale woodland creation, for example).

This reflects the fact that many case studies of carbon credit creation projects featured in the press or at farming events are on much larger areas of land than the average farm (e.g. large estates), where scale of implementation can reduce relative overall costs. There are various reasons for the land-based carbon market in the UK currently being led by large estates, including:

- Land is seen and treated as an investment option;
- Professional resources available to invest in exploring new markets;
- Up-front capital investment required to explore and establish a new venture;
- Tax incentives for particular land uses;
- Food production or other agricultural output is not necessarily needed from all or most of land for income;
- Many are already well-established with experience in woodland and peatland investment;
- Farmers are primarily focused and interested in food production, rather than speculative land use investment.

As such, the lottery of land, land type and environment available to land managers will naturally benefit some more than others, and some will be much more limited by this for carbon sequestration/offsetting options, and will be at a financial disadvantage. This, alongside economies of scale and concerns about the distribution of carbon between landowners and land managers, risks exacerbating existing inequalities in income potential from land access. This is supported by recent stakeholder research by Mark Reed at SRUC[2].

[2] https://www.hutton.ac.uk/sites/default/files/files/research/srp2016-21/RESAS-D5-3-Stakeholder-Analysis-(final).pdf

What is the next step for carbon farming? How might it develop as an opportunity?

Income from carbon creation projects on farm may be possible, although a high level of due diligence is very much recommended. Under this project, we have developed a checklist for farmers and land managers to use when considering exploring carbon markets. It is hoped this is a useful guide through what is a complex and fast evolving space. This can be found on the project webpage.

Ways in which the market is and might be able to develop for farmers is as follows:

- Developments on the horizon:
    - **Carbon codes & standards** – new levels of checks on scientific methodologies of carbon codes which provide MRV to projects will be implemented by an arms-length body in the near future. This will create much more trust and assurance in the marketplace, and is likely to increase the value of carbon credits.
    - **Impact analysis of land use change & farming** – forthcoming research for RESAS by SRUC will explore implications and unintended consequences, as well as multiple factors influencing changing trends in land use management.
- Next steps needed:
    - **Better understanding of the economics** – current studies suggest soil carbon credits are only viable if transaction costs are reduced, measures stacked, and other indirect benefits to farm business factored in, as well as a higher price of carbon influencing viability. More detailed economic studies area needed to assess the impact of these factors on viability and profitability of carbon options on farm;
    - **More resources & training of land managers & rural professionals** to help them navigate this emerging market securely, and be better informed on when/if to act;
    - **Innovation around scalability & reducing transaction costs,** especially around agri-tech, data collection and verification;
    - **Greater clarity around future policy**, e.g. – how does public finance interact with private, what precludes another, what are the interactions between financing of other public goods (e.g. biodiversity), methodologies, reporting, timescales etc.;
    - **Clarity on tax implications** for income arising from carbon credits, versus other forms of investment e.g., woodland.

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