KTIF SG Final Report

Contents:

1. PROJECT TITLE/APPLICANT

1.1 Carbon Trotterprints (KTIF/004/2021)

1.2 Wholesome Pigs (Scotland) Ltd

Wholesome Pigs Scotland Ltd was formed in 2003 as a not-for-profit body to deliver an abattoir surveillance system for significant production diseases of pigs. Dr David Strachan from SAC designed the programme and funding was from a mixture of membership fees and contracts from various funders. All significant commercial pig producers in Scotland are members of WPS, enabling it to take a non-competitive approach to improving the health & welfare of the national pig herd.

Wholesome Pigs Scotland is co-located Scottish Pig Producers, the largest pig marketing cooperative in Scotland. Since its formation in 1979, SPP has grown steadily and has over 93 active members in Scotland and Northern Ireland, marketing around 11,000 pigs every week with an annual turnover of around £75m.

2. EXECUTIVE SUMMARY

The project aim was to enable annual carbon audits to be undertaken on all Scottish pig farms and encourage subsequent actions to reduce emissions through benchmarking. This was achieved by:

- Developing a central database to hold the raw data required to complete the various commonly used carbon calculators
- Understanding what data can be provided by third parties such as feed companies or supply chain cooperatives and establishing data sharing protocols for them
- Designing a benchmarking system for the key carbon metrics
- Better understanding the obstacles to routine carbon auditing in the pig sector and reporting by the three main Greenhouse Gases

The data required to complete all common calculators has been identified and the database was designed. It was not actually built due to illness affecting a key contractor but for the purposes of the pilot, MS Excel was effectively used instead.

Data from supply chain cooperatives is accessible and may be more accurate than farm-derived data. Using data from feed companies is more problematic due to a lack of precision in traceability systems and variability over the raw materials depending on source and production system. The feed sector recognises this and have a project underway to develop a global reference database for ingredients.

A benchmarking system has been developed and used in the feedback to individual farmers, although this will be refined further once the database is built. In principle, the results can be reported according to the three main GHG's but in practice, that will require changes to the software of Agrecalc and the other common carbon footprint calculators.

Circumstances in the sector are the worst that they have been for a generation so the project team did well to deliver the objectives in spite of the headwinds. In conclusion, this project successfully laid the groundwork for routine carbon auditing to take place in the Scottish pig sector and this will be rolled out in 2023.

3. PROJECT DESCRIPTION

The aim is to enable annual carbon audits to be undertaken on all Scottish pig farms and encourage subsequent actions to reduce emissions through benchmarking.

Successful delivery of four objectives will deliver this aim:

1) Developing a central database to hold the raw data required to complete the various commonly used carbon calculators
2) Understanding what data can be provided by third parties such as feed companies or supply chain cooperatives and establishing data sharing protocols for them
3) Designing a benchmarking system for the key carbon metrics
4) Better understanding the obstacles to routine carbon auditing in the pig sector and reporting by the three main Greenhouse Gases

4. FINANCE

4.1 Sum awarded: £35,100
4.2 Total spend: £26,348.42
4.3 Reasons for underspends:

- No database build (saving £10,500)
- No formal input from Professor Mark Reed (saving £2,250)
- No requirement for T&S for external facilitators, the costs of that were just absorbed in the Project Development daily rates (saving £900)
- REDUCTION IN TOTAL PROJECT BUDGET: £13,650 (28.98% less than original budget)

The reasons for the underspends were detailed in the Request for Change Form Variation of Grant Conditions that was approved on 26/10/22.

5. PROJECT AIMS/OBJECTIVES

Aim

To enable annual carbon audits to be undertaken on all Scottish pig farms and encourage subsequent action to reduce emissions through benchmarking

Objectives

1. Develop a central database holding the data required to complete the common carbon calculators
2. Establish data sharing protocols from feed companies and supply chain
3. Design a benchmarking system for carbon metrics
4. Better understand obstacles to routine carbon auditing and reporting by the three main GHG's in the pig sector

6. PROJECT OUTCOMES

Methodology

A small sample of farms (15) were contacted and asked to supply information required to produce a carbon audit. The information was entered into the Agrecalc carbon auditing tool and a carbon footprint was generated for each business.

Independently, information gained from abattoir slaughter statistics, which is routinely collected by Scottish Pig Producers Ltd, was used to replace data on pigs slaughtered that was collected on farm.

The two sets of results were then compared to see if there was a material difference between the two datasets.

The data required to be collected would then be passed to a data specialist to be used as test information to explore the feasibility of capturing information which can then be used remotely to complete other carbon auditing tools.

Interviews were held with representatives from the feed compounding sector to discuss and understand where the feed industry was in addressing the need to more accurately record the greenhouse gas emissions associated with feed and in particular pig feed especially with regard to the source and carbon emissions associated with protein.

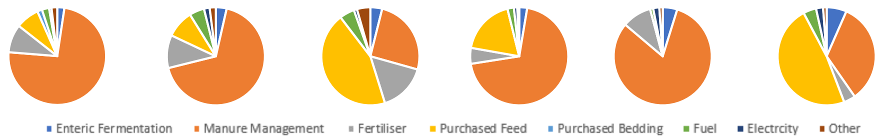
Results

Of the 12 farms where carbon footprints were prepared, 6 were indoor breeder finisher units, two were outdoor breeder units, 3 were indoor finisher units. All of these units have been categorised as intensive simply to differentiate them from the last unit which is a small-scale unit producing pork to sell via farmers markets and other local channels. This business uses traditional breeds on a free-range system meaning all pigs are bred and finished outdoors as opposed to the outdoor rearer / finishers which sees weaned pigs finished indoors.

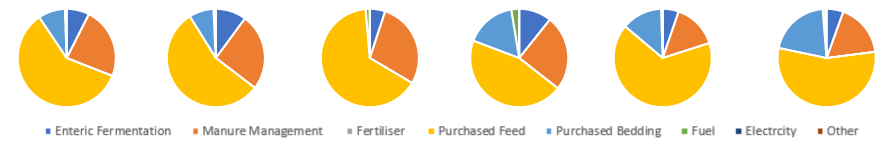
The results of the 12 carbon footprints prepared are shown below with the first table relating to the indoor breeder finisher units and the second table to outdoor breeder units, one small free-range unit and 2 indoor finisher units. Coincidentally, the farms in the first table all grow a proportion of their required feed on farm whilst those in the second table all buy in all of their feed.

Carbon Footprints of Each Participant Measured in KgCO$_2$e/KgDwt

	B/F - A	B/F - B	B/F - C	B/F - D	B/F - E*	B/F - F
Enterprise Type	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor
	Intensive	Intensive	Intensive	Intensive	Intensive	Intensive
	Breeder Finisher	Breeder Finisher	Breeder Finisher	Breeder Finisher	Breeder Finisher	Breeder Finisher
Feed Source	Mainly Home Grown	Mainly Home Grown	Mainly Home Grown	Mainly Home Grown	Mainly Home Grown	Mainly Home Grown
Enteric Fermentation	0.15	0.21	0.15	0.21	0.52	0.17
Manure Management	4.67	3.98	0.98	5.6	8.82	0.87
Fertiliser	0.59	0.64	0.61	0.42	1.05	0.1
Purchased Feed	0.49	0.54	1.71	1.47	0	1.24
Purchased Bedding	0.1	0	0	0	0	0
Fuel	0.15	0.29	0.19	0.17	0.11	0.11
Electricity	0.05	0.11	0.04	0.09	0.22	0.06
Other	0.12	0.12	0.17	0.05	0.12	0.03
Total Emissions	6.31	5.89	3.86	8.01	10.84	2.48
Fertilsier & Purchased Feed	1.08	1.18	2.32	1.89	1.05	1.34



	B - G	B - H	B/F - I	F -J	F-K	F-L
Enterprise Type	Outdoor	Outdoor	Outdoor	Indoor	Indoor	Indoor
	Intensive	Intensive	Free Range	Intensive	Intensive	Intensive
	Breeder	Breeder	Breeder Finisher	Finisher	Finisher	Finisher
Feed Source	Mainly Purchased	Mainly Purchased	Mainly Purchased	Mainly Purchased	Mainly Purchased	Mainly Purchased
Enteric Fermentation	0.53	0.82	0.75	0.29	0.11	0.13
Manure Management	1.66	2.04	4.2	0.67	0.31	0.41
Fertiliser	0	0	0	0	0	0
Purchased Feed	4.22	4.51	9.64	1.22	1.38	1.3
Purchased Bedding	0.63	0.66	0	0.45	0.28	0.48
Fuel	0.02	0.02	0.2	0.07	0.01	0.02
Electricity	0	0	0	0	0	0
Other	0.02	0.04	0	0	0	0.01
Total Emissions	7.08	8.09	14.79	2.7	2.09	2.35
Fertilsier & Purchased Feed	4.22	4.51	9.64	1.22	1.38	1.3



* Feed information incomplete

Milestones

M1: Database design complete – January 22
M2: Data input from 15 farms plus feed companies and supply chain complete – August 22
M3: Carbon footprints completed using "back end" system – August 22 (partially; database not built as explained in Project Change Request Form)
M4: Benchmarking and individual farm reports circulated – October 22
M5: Final report completed – November 22

Outcomes Achieved

1. Central database for collating farm data once each year with additional data feeds from feed companies and pigmeat supply chain

PARTIALLY ACHIEVED: Whilst a serious illness prevented the building of the database, the planning and exploratory work was completed giving a clear understanding of which metrics can be accessed and from where. The database structure required is technical simple and discussions are already underway to explore how that work can be progressed.

2. Understanding of limitations of data relating to the source and production system of feed raw materials

ACHIEVED: Discussions with the feed suppliers highlighted two major shortcomings in the data that is currently available.

Firstly, traceability for most raw materials is not precise enough to enable the geographical origin of inputs for a batch of feed delivered to a single farm to be determined. That has a very significant impact upon the carbon footprint for a farm because soya is all assumed to be Brazilian and therefore carrying a penalty for deforestation, whereas at least 40% of the soya imported to the UK is from other countries (Argentina, North America, southern Europe).

Secondly, there is a significant variation in the carbon footprint of individual feed ingredients depending on the location and production system that they came from but all the farm carbon footprinting tools apply a single standard factor for each ingredient. The feed industry has a global project underway to develop a database providing the carbon footprint for all common ingredients by country, with UK input coordinated by the Agricultural Industries Confederation. Once that is complete, this can be used as a reference point for the farm carbon footprint tools.

3. Understanding the potential to report farm emissions by nitrous oxide, carbon dioxide and methane rather than conversion to a single carbon equivalent.

ACHIEVED: The project team developed a deep understanding of which on-farm factors relate to which greenhouse gas and this has been discussed with the individual farm participants. Routine reporting by the three greenhouse gases would require changes to the software in AgreCalc but it is technical possible.

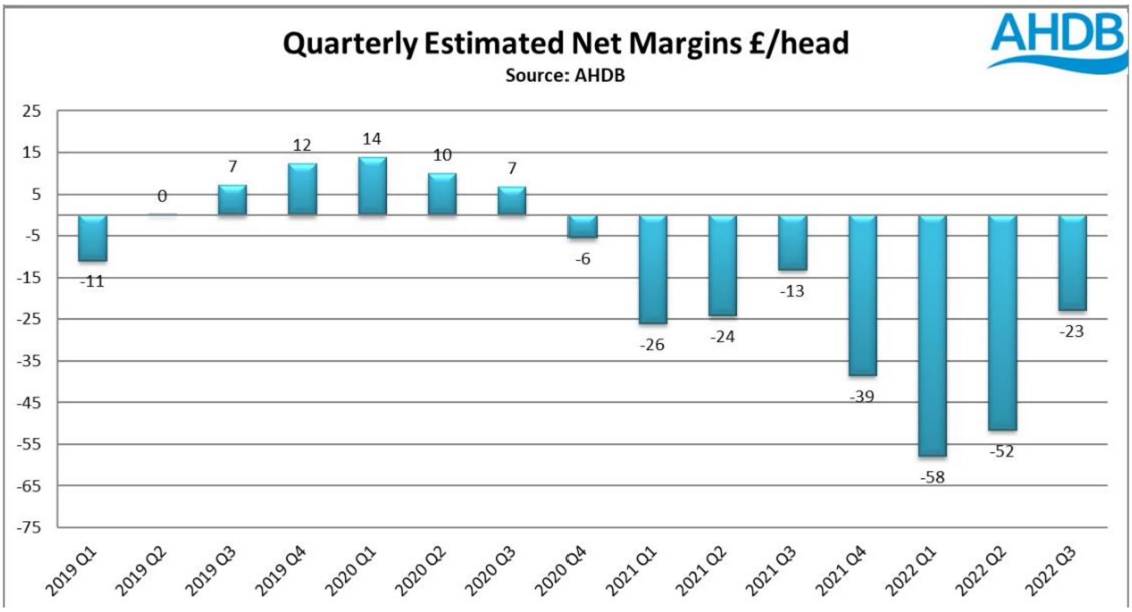
7. LESSONS LEARNED

7.1 Issues/Challenges

Over the course of the project, the pig sector has been subject to three enormous shocks:

- The labour shortage following Brexit
- The Covid 19 pandemic applying pressure to global supply chains and exacerbating the already fragile labour situation
- The war in Ukraine increasing global commodity prices

The labour shortage was most acute in abattoirs and processing plants meaning UK slaughter capacity was severely reduced leading to on farm slaughter of stock and a backlog of pigs on farm. All of which added cost to the point where all pig businesses were loss making. The sector appeared to be dealing with / recovering from the first two shocks when the war in Ukraine started which gave a third shock which is still ongoing. The graph of estimated quarterly pig margins collected by the AHDB below shows that pig businesses have been loss making for 9 of the last 15 quarters. Data collection has therefore been difficult as pig farmers have been extremely focussed on saving their businesses as opposed to looking at longer term issues. This is the main reason for the difficulty in recruiting farms onto the study and farmers being slower than normal in dealing with information requests.



8. COMMUNICATION & ENGAGEMENT

8.1 Detail throughout the project's lifetime

Press activity included inclusion of a quotation in the Scottish Government press release announcing the funding; specific interviews in February that were published in the Press & Journal, Dundee Courier and Farm North East; with further periodic references in the Scottish Farmer.

The project was presented in more detail at the Aberdeen Pig Discussion Group in March 22 and the Scottish Government Agricultural Reform Implementation Oversight Board in December 21. Repeated updates have been provided to the Boards of Scottish Pig Producers, Scotlean, Quality Meat Scotland and SAOS, along with the Pigs Working Group of National Farmers Union Scotland.

8.2 FAS Engagement – not applicable (although numerous discussions took place throughout the project with parts of SRUC, who operate the current FAS contract and also own AgreCalc)

8.3 EIP-AGRI Engagement – not applicable

9. KEY FINDINGS & RECOMMENDATIONS

Results from Indoor Rearer / Finisher Units (6)

Emissions from the 6 indoor rearer/finisher enterprises varied between 2.48 and 10.84 KgCO_2e/KgDwt pig meat produced and averaged 6.23 KgCO_2e/KgDwt.

Manure management emissions averaged 4.15 KgCO_2e/KgDwt and varied between 0.87 and 8.82 KgCO_2e/KgDwt. The variation in these figures is explained by a number of factors. Firstly, the units with higher slaughter weights have bigger pigs, presumably converting less efficiently producing more dung or slurry. This difference was more than a 40% difference between two of the units. Where farms are producing FYM and are able to spread it quickly, manure management emissions are much lower than in other scenarios (20% lower). Finally, some units buy in gilts and some breed them at home giving rise to a higher emissions for those breeding their own gilts since Agrecalc does not recognise the emissions cost of bought in gilts. The conclusion is that much of the emissions related to manure management are structural within the system.

The carbon cost of feeding the pigs is captured either as purchased feed, or a combination of purchased feed, fertiliser, fuel and electricity utilised by the growing crops and other, where crop residues and lime from the arable enterprise are captured. Adding fertiliser and purchased feed (totalled below the total emission row) gives a reasonable proxy for feed use efficiency. Please note, we know unit B/F- E had additional purchased feed which we were unable to capture. The remaining variation is however higher than one would necessarily expect but will be related to differences in slaughter weight, replacement policy and production efficiency.

As the pie charts show, the emissions associated with managing pig manure far exceed the other emissions being 61.4% of the average emissions by all participants. Purchased feed is the next most significant at 13.4% followed by other at 9.4% and fertiliser at 8.2%. All remaining emissions sum to less than 8%. The two units where purchased feed dominated emissions are the units where manure management was particularly low, not necessarily because purchased feed emissions were high.

Results from Outdoor Breeder Units (2) - Free-Range Breeder Finisher (1) - Indoor finishing Units (3)

Most of the units in this group have a different profile of emissions where the purchased feed used is the dominant source of emissions, some 58.5% of all emissions compared to management of manure which has dropped in importance to just 24.4% of all emissions.

Enteric fermentation (6.9%) purchased bedding (6.6%) and fuel (3.4%) are the remaining material emitting categories. With fertiliser, electricity and other emissions counting for just 0.2% collectively and therefore being immaterial. These variations are explained below: -

- Outdoor sows use more food than indoor sows, their output is weaned piglets and therefore the incurred feed cost is applied across less kilos. Emissions from outdoor sow's manure management are relatively lower.
- For finishing pigs, the feed is the more dominant emission because the maintenance cost of the sow's emissions are not being carried and feed of the finishing pig is a larger proportion of emissions than it is for the breeding herd.
- The free-range herd has much higher emissions than any other system as it carries the maintenance emissions of the sow, plus the higher feed cost associated with outdoor living as well as the inefficiency associated with an outdoor finishing herd that is slaughtered to suit market needs. This is the cost of a small scale, very high welfare system.

Data Collection from Abattoirs

In addition to the data collected direct from the farms, slaughter statistics were obtained from Scottish Pig Producers Ltd which in turn obtained direct from abattoirs for 5 of the participants. This data was then substituted for the data collected on farms to see if there was a difference in the calculated carbon footprints.

Of the five participants, the comparisons between the two data collection methods were within 1% of each other, 1 was 3%, 1 was 6% and the final one was a difference of almost 25%.

Looking back at the data, three issues were identified. Firstly, that the farmers submission of killing out percentage differed from what was recorded at the slaughterhouse.

Secondly, on the farm where the large difference was identified, it appeared as though 111 pigs slaughtered were omitted from the sales recorded on farm. There was also a difference of 30kg between the assumed weight of sows and the actual weight of sows when killed.

Thirdly, we believe carcase weights were likely to be more accurately recorded from abattoir data.

Data Collection from Feed Compounders

There are several issues at play here: -

- Whether feed compounders can accurately record what has been utilised on farm.
- The accuracy of the assumptions within Agrecalc regarding the carbon cost of purchased pig feed.
- The variation across different feeds supplied to farmers.
- The variation between the same or equivalent feed as formulations change and the ingredients used are sourced from different locations, and growing systems, each with inherently different carbon footprints.

Early in the project, initial discussions were held with one particular feed compounder who explained that the sector was looking at this issue internally and was attempting to standardise how the carbon cost of agricultural feeds is being calculated and reported to farmers.

Initially the aim was simply to understand if the volume of pig feed utilised by a particular farm could be captured more effectively than utilising the farmers recording systems. Given the experience found with the accuracy of pig numbers, there is a case to be made that utilising volumes of feed delivered to farm would be more accurate. However, it became clear that whilst the volume of the feed is important, the composition of that feed particularly regarding the source of the protein element of the feed is likely to have a much larger impact on the accuracy of a carbon footprint. Given this is an issue that the feed compounding sector is grappling with, it makes sense to see how this develops before looking again to as whether this aspect of data capture can be automated. At the same time, the carbon auditing tools should be reviewed to see if they can take account of more accurate information regarding the carbon cost of animal feeds. It should be noted that Agrecalc does not differentiate between the carbon cost of different feed sources, it uses an average.

Central Database for Collating Farm Data Once Each Year

One of the aims of the project was to identify the data required for the main carbon auditing tools and look to see if this data could be gathered at the same time and held in a central database. The database preparation aspect of the project did not go forward. However, the differences in data required for different auditing tools is discussed in the following section.

The theory of this exercise is good especially if accurate information regarding feed volumes and carbon cost of ingredients can be generated. Such a system, if implemented would reduce recording errors at farm level which in itself would make the benefits from benchmarking more meaningful.

Use of Alternative Carbon Calculators and Impact on Data Collection

All the data provided for the project was put through the AgreCalc carbon auditing tool which was chosen as it is the only model developed specifically for Scottish agriculture and also handles livestock farming in a robust way.

Alternative carbon calculators are available for the agricultural industry including the Farm Carbon Toolkit, which is being developed in collaboration with AHDB, and the Cool Farm Tool. Both AgreCalc and the Farm Carbon Toolkit look at emissions on a whole farm level while the Cool Farm Tool looks at each individual enterprise separately. AgreCalc also allows for enterprise individual results to be looked at and is therefore unique in that it gives both a total farm position and enterprise specific breakdown.

Initially it was anticipated that the data gathered over the course of the project would be used to produce carbon footprints using the Cool Farm Tool and Farm Carbon Toolkit. However, this proved difficult to achieve for the following reasons: -

The Farm Carbon Toolkit and the Cool Farm Tool are geared less towards pig enterprises meaning that livestock category and feed choices are often limited. In the case of the Cool Farm Tool, this is due to the calculator being designed for global use and not covering the feed profile of British producers. The Cool Farm Tool requires all feeds to be input in terms of each ration's constituent ingredients. Each ration is then broken down for each development stage: juvenile, non-productive adult and productive adult. The absence of some feed ingredients from the menu options makes this problematic. That the feed needs to be added per stage, requires additional information to be gathered from the producer in terms of number of pigs at each stage alongside use of each ration in that stage. No benefit is gained from this additional information as the Cool Farm Tool only gives a total pig carbon audit, not a staged one which might justify the additional information gathered. Key ingredients such as fishmeal, protected fats, minerals and other specialist feeds are not available, creating the issue that these then have to be entered as the next best feed type available in The Cool Farm Tool which is likely to reduce accuracy.

The Cool Farm Tool kit calculates the amount of feed used at each stage by asking for the ration make up as a percentage of each ingredient and then multiplying by dry matter intake for each stage of production. This compares to Agrecalc which asks for the actual feed quantities used. These should be the same, but may not be, due to the error associated with calculating feed use from first principles when an actual is easily available and by definition more accurate. From the perspective of completing the audit, it is clear, that much more information is required by The Cool farm Tool which is not necessary required to get a meaningful and accurate result.

AgreCalc and The Cool Farm Tool ask for the crude protein and digestibility of a ration which makes the calculation of emissions from enteric fermentation more accurate. The Farm Carbon Toolkit does not ask for these criteria and the assumption is that the model may not be as accurate as the other two.

The data required and data inputting process differs between the calculators. A master list of information required for each auditing tool can be seen in Appendix 1

After putting the data through AgreCalc and then attempting to do the same with the Farm Carbon Toolkit and the Cool Farm Tool the following additional issues were identified:

- Farm Carbon Toolkit asks for the kgs of active ingredients applied per crop for its' herbicide application section. This information is harder to obtain from the farmer than the number of spray passes completed with herbicides, insecticides and fungicides.
- The split of the pig classes within the Farm Carbon Toolkit and The Cool Farm Tool are less clear than within AgreCalc. It is harder to make sense of where suckling piglets and gilts should sit within the calculators.
- The Farm Carbon Toolkit does allow the farm to include any fencing or building materials used on farm which are not factored into either the Cool Farm Tool or AgreCalc. It could be argued that these are not an annual cost to a business as these are items which are used over multiple years of life and are unlikely to be material.

AgreCalc is the only one of the calculators that enables comparison of emissions to either a benchmark or on an output per kg dwt basis. Without the latter benchmarking is much more difficult and would have to be completed manually. Possibly why benchmarking is not a part of either the Cool Farm Tool or Farm Carbon Toolkit.

We attempted to put the information gathered for one participant through the Farm Carbon Toolkit and Cool Farm Tool. We were able to get a result from the Farm Carbon Toolkit but are concerned about accuracy due to the difficulty experienced entering the feedstuffs. For the Cool Farm Tool, we were unable to get a result because we did not collect intakes for each stage of production or ration composition. Rather total actual quantities of feedstuff were requested.

The results for the Farm Carbon Toolkit are 3,758.51tCO_2e emitted annually. This compares to an AgreCalc figure of 2385.59tCO_2e emitted annually. The Farm Carbon Toolkit result is 1,372.92tCO_2e (57%) higher than the AgreCalc result despite missing some data including kg of active ingredients used for spraying and some feedstuffs; megalac, fishmeal and piglet creep. This does not necessarily mean one calculator is more accurate than the other. This will depend on the detailed methodology used on which we do not have the experience to comment. It should be remembered that the value of the auditing exercise is to provide consistent results across several years so that reductions in emissions can be tracked.

Overall, it is thought that AgreCalc is the most suitable carbon calculator for calculating the carbon footprints of pig farms due to the ability to easily transfer home grown crops into the pig enterprise, easily identify and categorise the different stages of pigs in the production cycle and include a full range of feed ingredients utilised by the business. Where the other calculators are required, Additional information will have to be gathered. The vision of having an information store which can be used to populate any carbon audit tool is therefore possible, but the data collection has to cover all of the requirements of each tool. Each tool has quirks with each quirk requiring a slightly different metric to be gathered (the information on fencing required by the Farm carbon Toolkit is an example). More importantly the information required to calculate emissions associated with feed to enable the use of all 3 models means that the data has to gathered twice to account for the differing methodologies i.e., actual feed use versus calculated feed use from ration make up.

In addition to the publicly available, agriculture based, carbon auditing models, supermarkets have contracted with specialist consultancies to produce sector specific calculators, such as the AlltechECO_2 used by Tesco for the dairy sector. Where these calculators are insisted upon there may be additional data collection requirements as each will inevitably have similar individual quirks to those noted above.

Making Recommendations to Farmers

The writing of the recommendations to farmer participants proved to be harder than first thought. We were able to identify differences in emissions between participants in a manner which we were satisfied was robust but when it came to making recommendations as to how to reduce each units' emissions, this proved much more difficult without resorting to generic points such as improving health and welfare, fuel monitoring and improving feed efficiency. On considering the reasons why this was the case we made the following observations: -

The linkage between changing one variable and its impact on emissions is not easy to predict. For example, changing a source of protein will impact on feed conversion efficiency and not necessarily in a positive way.

Enteric emissions are broadly related to the number, size and the time that livestock spend on farm, but again diet also has a major influence.

Manure management emissions are affected by system choice, housing type, slurry storage, management and spreading practice across the whole unit. With some farms probably having between 10 and 20 different systems or practices in place all operating in tandem with one another. This can be split between different sow management phases, growth phases along with different shed management systems such as the slurry storage method.

The complex system and inter-relating factors mean making anything other than generic recommendations almost impossible. The conclusion is that a much deeper understanding of the way in which a particular farm operates is required before meaningful recommendations can be given.

There are two potential ways forward, one would be to follow up the carbon audits with a benchmarking group meeting where the individual farmers can review the carbon audit results and tease out where their key issues lie based on comparing with others, some facilitation around practices which are associated with reduced emissions and their deep knowledge of their own units.

The second way would be an in-person visit after the audit has been prepared to discuss how potential changes could impact future emissions possibly using scenario's in Agrecalc to model changes in practice. This approach would also give a degree of error checking as the farmers would begin to appreciate the key factors affecting carbon emissions from seeing scenarios tested and might identify where errors lie with the information gathered at the start of the process.

Recommendations for Future Work

The ability of compounders to produce a carbon specification for all feed and rations supplied to a farmer is a key future development in being able to monitor, measure and reduce Scottish pig farming's carbon performance and one which offers the potential for a competitive advantage over other sources of pig meat. As such the progress of the feed compounders project needs to be followed closely.

The carbon footprinting and benchmarking undertaken should be introduced into existing and / or new producer groups in a facilitated manner so that farmers can understand exactly how they perform and where their businesses differ with others so they can give more weight to their carbon performance when they make decisions going forward.

Longer term a way of differentiating the growing sources of soy protein should be included within carbon calculators. This also feeds into the long-term goal of the industry to move towards home grown protein sources in order to reduce the carbon cost of feed within the carbon footprint. This will require support and trials to be undertaken by the feed sector.

10. CONCLUSIONS

The principal aim of the project was to understand whether data captured remotely, off farm, can give accurate reporting of carbon emissions. Our conclusion was that information on pigs produced can be as accurately gathered remotely (from abattoirs) as on farm. This is because, errors associated with end of year movements are removed and, reporting of killing out percentage and reporting of carcase weights are more accurate. This is unless on farm recording systems are very good and the time is taken to analyse the records properly.

Where farms produce weaners for a proportion of their output, or slaughter for niche markets then the information will have to be gathered from the farmer. This does not mean that gathering data direct from abattoirs should not be used, it means that where it can be gathered in this way the error in the reporting is reduced and the carbon footprints produced are more accurate. There is therefore a clear benefit from utilising centrally held information in addition to streamlining the data collection.

In the same way, it can be seen, that the error in recording the carbon cost associated with feed use can be reduced by utilising data direct from feed compounders where available and appropriate. However, there is a much bigger goal. The project, currently underway by the feed compounders offers the potential to differentiate between the carbon footprint at ingredient level. This offers much more scope in facilitating reduced emissions especially around protein.

The potential offered by promoting benchmarking groups on carbon performance is huge. Most calculators do compare performance with similar farms, but our experience shows that most farms are good in one area, poor in others and the majority of farms tend to average out with a small number of farms being either very good or have poor performance. The results from this report bear this out. The value comes when a facilitated group of farmers can see how they compare with others and the reasons for their good or poor performance. They can then take home these points to factor in to their short- and longer-term decision making. It is this longer-term decision making which is particularly important around manure management as the performance of this measure is largely built in with the housing system. Missing the point in the investment cycle where it could be addressed because carbon emissions are poorly understood is a wasted opportunity.

The remote capture of slaughter and feed information when entered into a central database clearly reduces the burden of information gathering and increases the accuracy of carbon footprints. It also means that farmers are much more likely to diligently supply the reduced amount of information requested which should again increase accuracy. Holding the data centrally will also enable different models to be used should it be required by the farmer or co-operative as a whole, for example, when tendering for business for a particular supermarket who specify the use of a certain calculator.

Recommendations for the individual reports were too generic mainly due to the complexity of the pig production system. Getting more value from the carbon audit requires more analysis on farm post preparation of the carbon audit or review of several audits in a group benchmarking setting.

It must be respected that when reviewing these results, that the financial performance may be driving the business towards less carbon efficient production systems. Also, these businesses may not have been operating at peak efficiency due to disruption caused by labour shortages in the supply chain due to Brexit and Covid 19.

One issue which featured during the study was the impact of pigs being held on farm for longer due to both Brexit and Covid 19. The results show that there is a significantly higher carbon footprint where pigs were noted to be heavier and that there was a large variation between units. The conclusion is that some units were better able to deal with these issues than others. What is clear is that an earlier intervention by UK Government in solving the supply chain issues could have seen both the carbon and financial costs of Brexit/Covid 19 mitigated to a much greater degree.

11. ANNEXES

1. Master List of Data Required for Pig Carbon Footprinting Tools