INTEGRITY AG
& Environment

Monitoring and Evaluation Report – WS7 Holbrook Landcare Network

Prepared for: Holbrook Landcare Network

Integrity Ag and Environment
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projects@integrityag.net.au

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Disclaimer

1.1 Background

There has been increasing interest and pressure within the agricultural industry to quantify and reduce emissions to meet industry goals, consumer and community expectations, ensure market access in the future and utilise technologies that deliver economic, environmental and social benefits. The red meat industry is highly proactive in establishing goals to reduce GHG emissions. This starts with understanding your carbon position and establishing options to reduce impacts over time.

This project involved working with producers to develop skills and an understanding of farm GHGs by completing a farm carbon account. An understanding of farm carbon accounting and reduction options are essential steps in working towards industry targets.

1.2 Project Objectives

The project included carbon accounting workshops throughout the national Landcare network to;

1. develop producer skills and knowledge regarding the carbon footprint of their operation,
2. to identify options to reduce emissions and sequester carbon, and
3. identify carbon gaps and opportunities for Landcare groups.

1.3 Methods

Objectives 1 and 2 involved conducting 1 on 1 meetings with each manager to gain an understanding of their operation and assist in completing an accurate and representative carbon account. After the generation of each property's carbon account and vegetation carbon assessment, a group carbon accounting workshop was held (objective 3). This workshop covered topics such as: GHGs in agriculture and sequestration sources; emissions from livestock and farm inputs; key aspects influencing emissions; comparison of results against benchmarks; tree and soil carbon storage, opportunities to reduce emissions and store carbon, and a Strengths, Weaknesses, Opportunities, and Threats (SWOT) session. An action plan was developed from the findings of the interactive SWOT session.

The carbon account was generated using the SB-GAFv1.3 tool, which provides a high-level estimate of the carbon footprint of sheep and beef production for the representative data entered for an operation, based on the SB-GAF V1.3. The estimate is 'cradle to farm gate': it includes GHG emissions sources on-farm (Scope 1, e.g. livestock emissions) and indirect (Scope 2, grid-supplied electricity) and some emissions from pre-farm sources (Scope 3, e.g. from purchased products). Net farm emissions and emissions intensity values generated by this calculator are generally accurate to within +/- 25%.

The results presented in the property report were developed using the FLINTpro software and provided participants with a rapid assessment of carbon stocks in relation to forests on their property using readily available data. We have reported the carbon sequestration in forests by taking the most recent year (2017/2018) of the analysis. Noting the results are generated without on-ground verification, the findings were discussed with each producer and where results could not be supported by on-ground knowledge, they were not reported (n.r) in this report (see Table 2).

1.4 Limitations

The results presented here were developed using data supplied by the client and have not been independently verified. The accuracy of modelled results will be limited to the quality of the data

supplied and should be considered as a ‘first order’ estimate. These are not suitable for developing a carbon market project or a carbon neutral product without further analysis and data verification. Emissions intensities in particular can have large errors in herds and flocks that are not in "steady state" conditions. The unit of measurement for emissions intensity is kilograms of greenhouse gases (converted to CO_2-equivalent amounts) per kilogram of liveweight or greasy wool sold. The reported carbon footprint included assessment of carbon storage in vegetation and soils where data were provided, but these assessments did not include validation and can be highly variable. Additionally, specific carbon market and carbon neutral requirements were not followed in these assessments. These must be viewed as indicative only and are not suitable for achieving any particular carbon market or verified carbon neutral outcome. The results from the satellite vegetation carbon assessment are not suitable for the purpose of valuing or creating carbon credits under any scheme, rather the results provide an indication of the potential forest carbon stock changes based on Australian Government and global data. An audit of the data used to generate this report has not been undertaken and results can’t be guaranteed.

1.5 Summary of Workshop Participation

Integrity Ag & Environment conducted one-on-one meetings with eleven participants. The purpose of the one-on-one meetings was to go through each producer’s data request spreadsheet to, a) ensure the data had been accurately recorded in the relevant section, b) to develop a better understanding of each operation, and c) in order to develop an accurate carbon account. These meetings allowed the participants to gain a better understanding of the carbon accounting tool and ask questions.

Table 1 – Producer engagement

Producer	Pre workshop 1:1 completed	Property boundary supplied & vegetation report generated	Workshop attended	Carbon Account Report Generated	Contacted Post Workshop 1:1
Gill Sanbrook	12/05/2021	Y	Y	Y	Y
Richard Bull	12/05/2020	Y	Y	Y	Y
Felicity Anderson	12/05/2021	N	Y	Y	Y
Karen and Geoff Daniel	12/05/2021	N	Y	Y	Y
Cindy – Scott's Angus	11/05/2021	N	Y	Y	Y
Jill Coghlan	11/05/2021	Y	Y	Y	Y
Marcus Richardson	12/05/2021	Y	Y	Y	Y
Mary and Peter Hoodless	12/05/2021	Y	Y	Y	Y
Bruce Allworth	7/05/2021	N	Y	Y	Y
Stuart Hulme	11/05/2021	Y	Y	Y	Y
Dick Turnbull	12/05/2021	Y	Y	Y	Y

Following the one-on-one meetings, a webinar was conducted with twelve participants (all producers and their facilitators) on Thursday the 13th May. This meeting allowed operations to be benchmarked against each other and industry averages, and also included a good session on potential actions and strengths/weaknesses for the group.

1.6 Workshop results

The following tables provide the total emissions, estimated carbon sequestration and enterprise specific emissions for each enterprise.

Table 2 - Estimated emissions and indicative potential carbon sequestration

Farm	Livestock emissions (t CO_2-e)[1]	Carbon stock change - forests (t CO_2-e)*	Carbon stock change - plantings (t CO_2-e)*	Net Emissions (t CO_2-e)[2]	Vegetation emissions offset (%)
1	2928	-200	-931	1797	39%
2	2411	-275	-176	1960	19%
3	2641	n.r	-2	2639	0%
4	1867	n.r	0	1867	0%
5	3966	n.r	-792	3174	20%
6	424	-5	0	419	1%
7	2225	-175	-316	1734	22%
8	891	4000	-421	4470	0%
9	4805	n.r	-351	4454	7%
10	989	-50	-217	722	27%
11	2578	-1275	0	1303	49%

* Carbon stock change estimates are indicative only. Positive values are emissions. Negative values are carbon storage (i.e. removal of CO_2 from the atmosphere). The estimates are based on non-replicated data supplied by each producer and cannot be used for carbon market or carbon neutral certification without sampling and re-analysis.

[1] Livestock emissions estimate is 'cradle to farm gate': it includes GHG emissions sources on-farm (Scope 1, e.g. livestock emissions) and indirect (Scope 2, grid-supplied electricity) as well as emissions from pre-farm sources (Scope 3, e.g. from purchased products). In some cases, very large scope 3 emissions can arise from purchased cattle, which represents emissions that occur on the farms where these cattle are bred.

[2] Calculation of net farm emissions did not include soil carbon sequestration.

Table 3 – Beef Benchmarking Results

Farm	Total Emissions	Emissions Intensity	Corrected Emissions Intensity
	Tonnes CO_2-e (excl. vegetation and soil)	kg CO_2-e / kg LW (excl. veg and soil)	kg CO_2-e / kg LW (excl. veg and soil)* (+/- 25%)
1	2928	12.0	12.0
3	2641	14.8	11.8
4	921	16.0	16.0
5	3966	10.0	10.1
6	424	14.9	18.5
7	2225	26.4	16.4
9	981	12.5	11.1
10	1579	11.7	11.7
12	2041	13.7	13.1
av.	1967	14.7	13.4
min.	424	10.0	10.1
max.	3966	26.4	18.5
st dev	1056	4.5	2.7
CoV	54%	31%	20%

* Corrected emission intensity corrected for seasonal variation in livestock sales to improve alignment between herd emissions and herd output.

The average results for the corrected emission intensity were similar to the national average for beef (13.8 kg CO_2-e / kg LW, corrected with AR5 GWP_{100} values) but were slightly higher than beef production from NSW (12 kg CO_2-e / kg LW, corrected with AR5 GWP_{100} values) reported by Wiedemann et al. (2015a)[3].

[3]Wiedemann S, McGahan E, Murphy C, Yan M (2015b) Resource use and environmental impacts from beef production in eastern Australia investigated using life cycle assessment. Anim Prod Sci 56:882–894. doi: 10.1071/AN14687

Table 4 – Sheep Benchmarking Results

Farm	Total Emissions	Emissions Intensity meat	Emissions Intensity wool	Corrected Emissions Intensity meat	Corrected Emissions Intensity wool
	Tonnes CO_2-e (excl. vegetation and soil)	kg CO_2-e / kg LW (excl. veg and soil) (+/- 25%)	kg CO_2-e / kg greasy (excl. veg and soil) (+/- 25%)	kg CO_2-e / kg LW (excl. veg and soil)*	kg CO_2-e / kg greasy (excl. veg and soil)*
2	2411	8.8	27.2	6.6	20.3
4	947	10.2	40.5	7.5	29.9
10	3225	7.9	30.9	7.6	29.8
11	989	6	21.8	7.6	27.8
12	537	6.7	26	8.4	32.6
av.	1622	7.9	29.3	7.6	28.1
min.	537	6.0	21.8	6.6	20.3
max.	3225	10.2	40.5	8.4	32.6
st dev	1022	1.5	6.3	0.6	4.2
CoV	63%	19%	22%	8%	15%

* Corrected emission intensity corrected for seasonal variation in livestock sales to improve alignment between herd emissions and herd output.

The results for wool were higher than Merino wool from high rainfall regions reported by Wiedemann et al. (2016b) when corrected with AR5 GWP_{100} values[4] . Lamb results were similar to the average merino systems reported in the same study and results reported for cross-bred lamb production in NSW reported in a separate study by Wiedemann et al. (2016c) when corrected with AR5 GWP_{100} values[5].

1.7 SWOT Analysis

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was completed during the workshop with all producers to determine both opportunities for individual operations, and opportunities for the group. The findings are below, and the key opportunities are summarised in the following section.

[4] Wiedemann S, Yan M-J, Henry BK, Murphy CM (2016) Resource Use and Greenhouse Gas Emissions from Three Wool Production Regions in Australia. J Clean Prod 122:121–132l

[5] Wiedemann, S. G., Yan, M.-J., & Murphy, C. M. (2016). Resource Use and Environmental Impacts from Australian Export Lamb Production: A Life Cycle Assessment. Animal Production Science, 56(7), 1070–1080.

Table 5 – Strengths, weaknesses, opportunities, and threats analysis

	Farm	1	2	3	4	5	6	7	8	9	10
	Please enter your property size (ha)	264	190	900	667	1500	950	1365	600	2000	980
Vegetation Management	**Young tree plantations**	N/A	S	N	N	S	S	N	S	S	N
	What percentage (%) of your property have you currently planted with trees?	0%	7.50%	4%	10%	4%	19%	5%	1%	6.5%	10%
	What percentage (%) of your property could you plant with trees in addition to current plantings without affecting productivity?	0%	25%	4%	5%	5%	10%	0%	5%	0%	15%
	Native vegetation regeneration	S	S	N	W	N	S	N	W	S	S
	What percentage (%) of your property have you fenced off and allowed to revegetate?	10 %	5%	1%	<1%	1%	21%	1%	0%	6.5%	23%
	What percentage (%) of your property could you fence off and allow to revegetate in addition to current areas without affecting productivity?	0%	5%	3%	2%	1%	50%	1%	1%	0%	15%
Livestock	**Livestock accounting systems**	N	S	N	N	S	S	S	S	S	S
	Joining age	N	S	S	N	S	N/A	N	S	S	S
	Genetic improvement	S	S	N	N	S	N/A	S	N	S	S
	Weaning/marking rate	W	S	N	S	S	N/A	S	S	S	N
	Growth rates	N	S	S	N	S	N	S	S	S	N
	Supplementary feeding	S	W	N	N	S	W	N	W	N	S
	Fodder cropping	W	S	S	S	S	W	N	W	S	S
	Grain finishing	N	N/A	S	S	S	N	N	N	S	N/A
Soil and pasture management	**Soil fertility**	S	S	S	S	S	N/A	S	S	S	S
	Soil organic carbon (SOC) stock		S	N	N	S	S	N	N	N	N
	Soil chemical management (acidity, salinity, sodicity etc.)	S	S	N	S	S	S	N	N	S	S
	Improved pasture (high productivity grasses, legumes)	S	N	S	S	S	N/A	S	S	S	S
	Pasture utilisation rate	S	S	N	N	S	S	N	N	S	N
	Grazing rotations	W	S	N	N	S	S	N	N	N	N
	Ground cover %	N	S	N	N	S	S	S	S	N	S
	Cultivation history (degraded or improved?)	S	S	S	N	S	N/A	S	S	S	S
	Compost application	W	W	W	W	W	N	W	W	W	N
	Soil disturbance/tillage practices	S	S	S	S	S	N/A	S	S	S	S
	Stubble retention from crops	N/A	N/A	N	N	N	N/A	N/A	N/A	S	S
	Irrigation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Introduction of legumes	S	S	S	S	S	N/A	S	S	S	S

1.8 Summary of Strengths, Weaknesses and Opportunities

1.8.1 Strengths and Opportunities:

1. Land available for additional tree plantings has been identified on almost all properties. Tree plantings present an opportunity to offset a portion of livestock GHG emissions, while providing additional benefits to biodiversity, soil erosion and salinity, and livestock shelter. This may provide a future opportunity to produce low carbon beef, lamb and wool, though at present the areas are too small to participate in carbon markets.
2. Several farms have young tree plantations on their property which presents an opportunity for additional carbon sequestration to offset livestock emissions for another 20-30 years before these trees reach maturity.
3. Group members have a collective interest in pasture management for the purpose of increasing soil carbon and overall productivity. These best management practices (for example, rotational grazing, improved pasture, maximising ground cover) may present the opportunity to be 'market ready' with respect to carbon. This could take the form of:
    a. Increased soil carbon sampling to determine an accurate baseline and inform future investment and actions.
    b. Potentially in the future, being able to deliver 'low carbon' production compared to average and seeking markets that will reward this.
    c. Potentially in the future, being able to deliver 'carbon neutral' production and seeking markets that will reward this.
4. Each operation utilises good data management systems which may present the opportunity to be 'market ready' with respect to carbon. This could take the form of:
    a. Being able to quantify the carbon footprint of production to help beef, lamb and wool buyers understand the true footprint of their supply chain.
    b. Potentially in the future, being able to deliver 'low carbon' production compared to average and seeking markets that will reward this.
    c. Potentially in the future, being able to deliver 'carbon neutral' production and seeking markets that will reward this.

1.8.2 Weaknesses and Opportunities:

1. Most farms have implemented rotational grazing and maximising ground cover. This suggests fewer opportunities to increase soil carbon will come from these strategies going forward.
2. Costs to comply with carbon markets are a barrier to entry for smaller producers. This may be overcome by exploring aggregation opportunities or developing a collective approach to producing low impact wool/lamb/beef or entering carbon markets. Harnessing this opportunity could take the form of seeking funding to explore aggregation opportunities or to establish a group of producers with better carbon/environmental credentials. Most farms have implemented rotational grazing and maximising ground cover. This suggests fewer opportunities to increase soil carbon will come from these strategies going forward.