IntegrityAg

August 2026

Halter Beef LCA Report

Halter Pty Ltd

Executive Summary

Halter is a virtual fencing grazing system for managing cattle grazing that uses a GPS enabled collar on each animal to control grazing in selected, "virtual" paddocks. The technology enables livestock producers to manage grazing pressure at a finer level of resolution than is usually possible with traditional fencing.

The product is promoted for its ability to increase the area of land available for grazing where this was previously limited by fencing, to improve pasture utilisation through controlled grazing pressure, and to enable targeted grazing management for some classes of livestock which could improve feed availability and quality; for example, by creep feeding calves or providing higher quality feed to high demand livestock classes such as early-lactation cows.

Where the product is able to improve feed availability or quality for target livestock classes, it has the potential to lift herd performance via higher growth rates or weaning rates in breeding herds. Where these herd benefits are achieved, this could have the potential to reduce the product carbon footprint (PCF, a measure of emission intensity) in the beef from farms using Halter.

The technology has been adopted by beef producers in New Zealand, Australia and the USA. While proven farm productivity results are positive, no study has been commissioned to examine the PCF outcomes of early adopting farms. Further, the Halter product, which includes a collar, radio frequency or GPS system, and a technology platform, creates an environmental impact during manufacture and implementation that has not been examined previously.

To quantify the early positive results, Halter commissioned a life cycle assessment (LCA) of the Halter product, and of the carbon footprint of beef from five farms that have implemented Halter in New Zealand and Australia.

The study used an attributional LCA approach following ISO 14040/44 and 14067, and reported on the product carbon footprint (PCF) of both the Halter product and beef.

All aspects of the Halter product were assessed, including the collar, radio transmission system and the product support system. Results were reported "per halter collar" and "per product day" to handle the multi-use nature of the product.

For the beef farms, results were reported per kilogram of beef produced (LW).

The farms were assessed using a trend analysis approach, where primary data were obtained over 2 or 3 years of pre-adoption and two years post-adoption. The study focused on all aspects of production directly related to the Halter change. Some variables not related to the implementation of Halter were normalised across the trend period to remove confounding effects and these are described in the methods section. Greenhouse Gas (GHG) emissions were assessed using National GHG Inventory methods and standard LCA practices published in the peer-reviewed literature by Integrity Ag.

The study confirmed that the impact of manufacturing and implementing the Halter product was modest and did not materially impact the carbon footprint of farms using the product. The Halter product carbon footprint (PCF) was 23.3 kg CO_2-e per Halter product, and 0.01 kg CO_2-e per product day over its service life. The inclusion of the Halter product contributed only a 0.1% increase to the overall farm gate beef PCF.

The trend results for early-adopting beef farms are shown in Figure 1. The carbon footprint ranged from 14.7 to 11.9 in the baseline and from 14.2 to 11.5 in the second year after Halter adoption (2026).

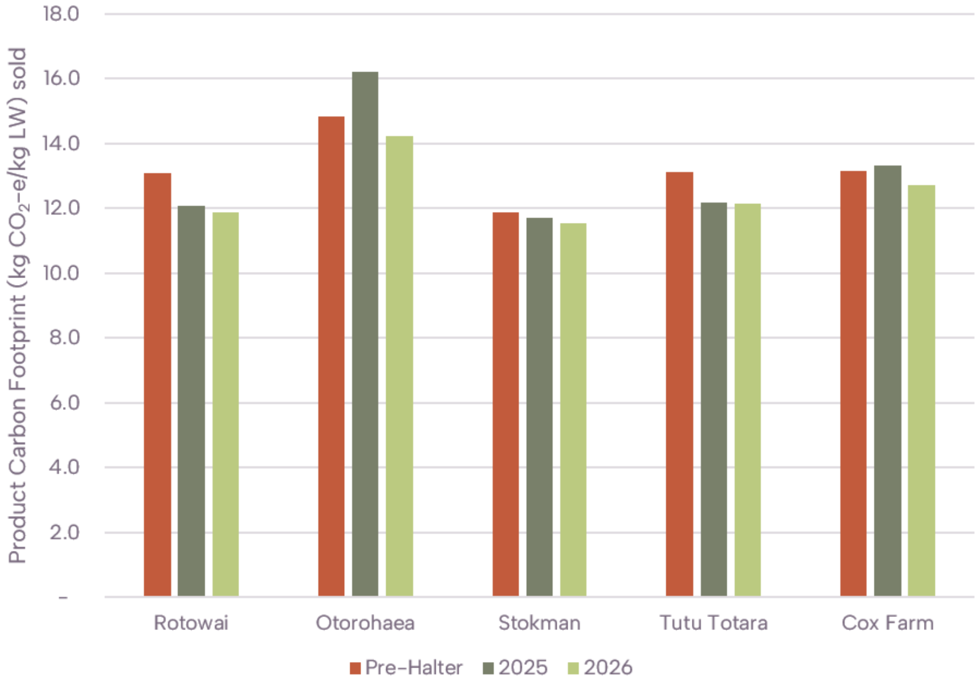

Figure 1. Product carbon footprint results showing baseline (pre-halter) and two years of results following introduction of Halter

Average carbon footprint reductions of 3% for the five aggregated farm results under normalised business-as-usual conditions across 2 years post-adoption were reported. A range of -3.0% to -9.6% was shown in the second year post Halter adoption (2026) (Figure 2). All farms showed greater carbon footprint reductions in the second year. First-year results were more varied, principally due to multiple changes in livestock and pasture management, facilitating accelerated productivity and resulting in higher inputs. These activities are attributed to the lifecycle of the livestock sold (2025), which still retain pre-Halter conception and birth year impacts0

The Stokman Angus enterprise (a large, steady-state breeding system) was the clearest example of steady improvement after adoption, showing 2% reduction in the first year, and 3% reduction in the second year post-Halter adoption, respectively.

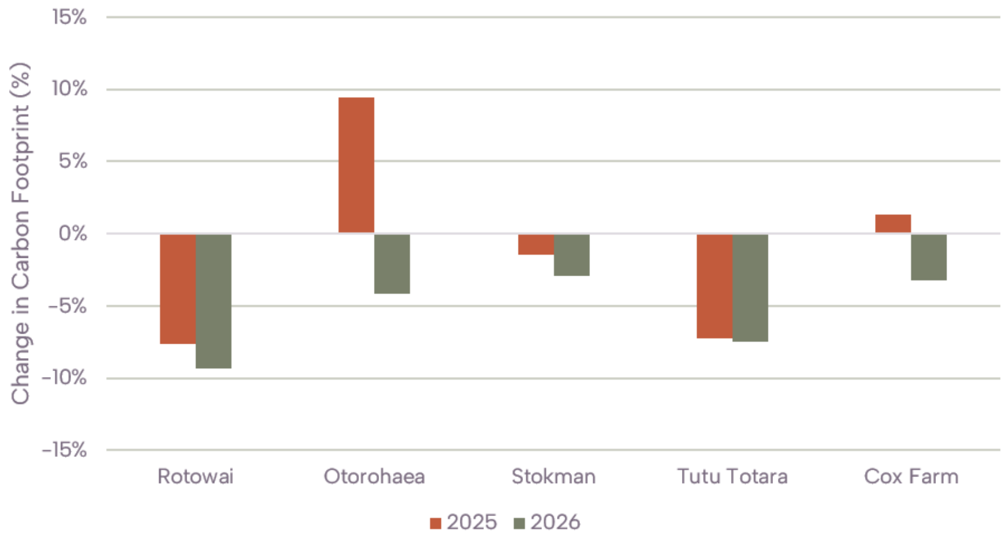

Figure 2.Change in PCF using Halter enabled beef grazing systems. Post Halter years compared to the aggregated pre-Halter BAU years

Variability in rainfall showed no consistent trend across farms between pre and post-Halter adoption years. However, further research and longer-trend periods will be needed to confidently separate any climatic influence in the results.

Overall, the results of this initial trend analysis of early-adopting farms reveal small reductions in the carbon footprint of beef as a result of adopting Halter in the first 2 years, with the result being most consistent in the second year when grazing management changes had a greater impact on productivity factors such as weaning rate and growth rate. It was noted that 2025 had slightly lower rainfall across some farms, and 2026 was a slightly better rainfall year for three farms compared to the baseline period.

Halter is proven to be an enabling technology and, from the perspective of reducing carbon footprint, the key benefits are likely to be in providing higher quality feed to targeted high-requirement animal groups such as lactating cows, calves and cattle during finishing. Halter could also facilitate a range of other emissions reduction activities on-farm.

The study observed that farmers often make multiple changes to management when they introduce Halter, which can take two years or more to stabilise. Other objectives that are valued by landholders, such as increasing pasture utilisation and stocking rate, will not necessarily reduce carbon footprint and may have a short-term impact (through lower existing feed quality and increased inputs) resulting in higher carbon footprint until the feed base adjusts to the changed grazing management.

Further research would be valuable to examine scenarios that optimise animal productivity through using Halter. Opportunities are also likely to exist to improve other aspects of land management such as managing grazing in riparian zones and reducing grazing pressure where regeneration is targeted. Future research is needed to fully understand the scope of these new opportunities.

The promising findings from early adopting farms and the additional opportunities afforded by Halter warrant ongoing research and analysis to optimise on-farm performance.

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1. Introduction

1.1 Background

Livestock production systems are a significant contributor to greenhouse gas (GHG) emissions, with emissions primarily arising from enteric methane, manure management, and upstream production inputs. Improving emissions efficiency in these systems requires interventions that enhance productivity and resource use efficiency while maintaining or increasing product outputs.

Halter is a virtual fencing and livestock management platform comprising smart collars, on-farm communication infrastructure, and a real-time pasture management application. The system enables automated livestock movement and provides data-driven management capability across grazing enterprises.

The technology is being deployed across Australia and New Zealand, where it has contributed to improvements in operational efficiency, labour requirements, and grazing management outcomes. These management changes are expected to influence livestock productivity, pasture utilisation, and ultimately emissions intensity within beef production systems.

This project was commissioned to quantify the environmental impacts associated with the Halter system using a life cycle assessment (LCA) framework. The study is designed to support beef producers and their supply chains in validating emission reductions to enable supply-chain insetting, alignment with Science Based Targets initiative (SBTi) reporting requirements, and broader sustainability reporting. It evaluates both the carbon footprint of the Halter product itself, and the impact of Halter-enabled management on beef production systems.

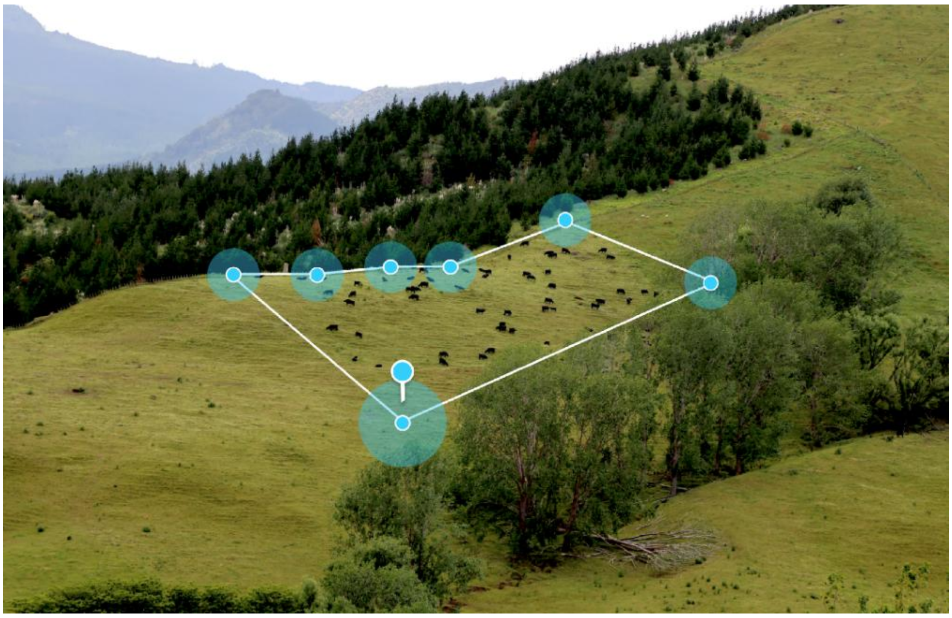

Figure 3. Halter virtual fencing and pasture management in a beef grazing system. Source: Halter

1.2 Objectives

The objectives of this study were to use LCA to quantify emission-reduction and environmental benefits from Halter adoption across Australian and New Zealand beef farms by:

- Quantifying the embodied emissions associated with the manufacture, distribution, and operation of the Halter product across Australasia.
- Quantifying the carbon footprint of beef production systems before and after adoption of Halter technology.
- Integrating the Halter product carbon footprint into whole-of-system LCA results.
- Assessing changes in emission intensity arising from Halter-enabled management practices.
- Providing an evidence base for verifiable supply-chain reporting of Halter-enabled emissions reductions in beef production.

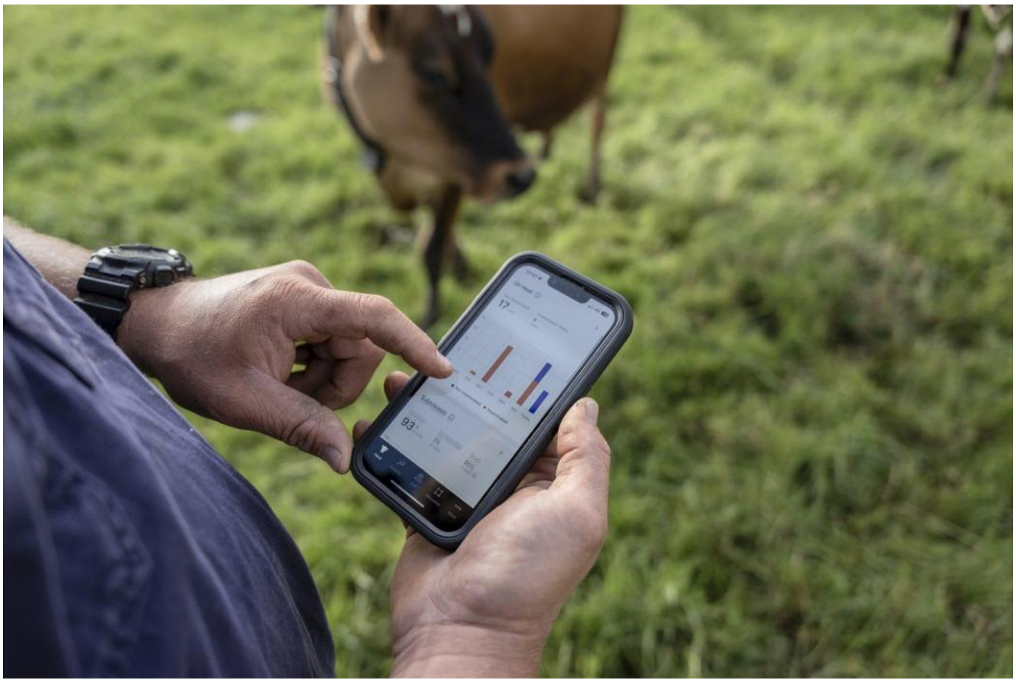

Figure 4. Real-time animal and pasture management through the Halter app. Source: Halter

2. Methods

2.1 Goal and Scope

This assessment was conducted as an attributional life cycle assessment (LCA) in accordance with the principles and framework of ISO 14040 (ISO, 2006a) and the requirements and guidelines of ISO 14044 (ISO, 2006b) and was aligned with ISO 14067 (ISO 2018) for the quantification of the product carbon footprint (PCF). Livestock specific methods were aligned with the large-ruminant supply-chain guidance of the FAO Livestock Environmental Assessment and Performance Partnership (LEAP, 2016). The methods are consistent with those applied to previous studies by Integrity Ag (Wiedemann et al., 2015, 2016, 2017, 2023) and with the industry benchmarks published for the Australian Beef Sustainability Framework (Wiedemann et al., 2025).

The study evaluated two distinct product systems, each with its own goal:

1. **Halter product carbon footprint:** to quantify the embodied (cradle-to-distribution) emissions of the Halter virtual-fencing system (collars, towers and associated business services), expressed per product and per product-day of service life.
2. **Beef product carbon footprint:** to quantify the cradle-to-farm-gate carbon footprint of beef produced on participating enterprises before and after Halter adoption, and to isolate the change in emissions intensity attributable to Halter-enabled management.

The intended application of the results is to support beef producers and their supply chains in validating emission reductions to enable supply-chain emission reduction.

2.2 Functional units and reference flows

Results were expressed relative to the functional output of each product system:

- **Halter product:** per Halter product (one fully operational collar, inclusive of its share of tower infrastructure and supporting business services) and per “product-day” of service life for each Halter collar (service life of 2,190 days).
- **Beef:** per kilogram of liveweight (kg LW) leaving the farm gate.

For the beef system pre-Halter baseline, results represent an average of two or three years of production data where available, consistent with Integrity Ag's standard beef reporting practice (Wiedemann et al., 2016, 2025). Averaging over multiple years reflects the influence of prior-year production on sales in any given year and improves the stability of the result by reducing seasonal fluctuation in sales. Where required, sales corrections were applied to align liveweight gain (production) with liveweight sold.

2.3 System boundary

A cradle-to-farm-gate system boundary was applied to the beef system, including pre-farm (upstream) inputs, enteric methane, manure management, on-farm energy and services, transport and purchased inputs, and the embodied emissions of Halter equipment and business services. Downstream post-farm processing, transport and distribution were excluded. Beef enterprises in New Zealand, and Tasmania were assessed. Pre-Halter results were aggregated by farm and compared to each post-adoption year to reflect the emissions impact of Halter collar use.

The Halter product system boundary spanned raw-material extraction, component manufacture and assembly, distribution (including sea and air freight from the country of manufacture to local distribution centres), in-use maintenance and end-of-life, together with Halter's business-services operations.

2.3.1 Land use, land-use change and biogenic carbon

Land use and land-use change (LULUC) emissions and removals, and biogenic carbon, were treated as net-zero on the basis that the participating farms are managed according to sound agricultural practice such that biogenic emissions and removals are balanced. Consistent with the IPCC Tier 1 approach, carbon pools were treated as being at steady state in the absence of land-use or management change; accordingly, annual carbon stock change was set to zero for above- and below-ground biomass and dead organic matter in both forestland-remaining-forestland and grassland-remaining-grassland (IPCC, 2006b, 2006a). Land degradation was not observed on the farms assessed, and soil carbon was therefore considered to be at steady state (zero carbon-stock change).

2.4 Life cycle impact assessment

The impact category assessed was climate change, reported as the product carbon footprint. Greenhouse gas emissions were converted to carbon dioxide equivalents (CO_2-e) using IPCC Sixth Assessment Report (AR6) 100-year global warming potentials (GWP_{100}) of 27 for methane (CH_4) and 273 for nitrous oxide (N_2O) (Forster et al., 2021). Life cycle inventory modelling was performed in SimaPro v10.1 (PRé Sustainability, 2023).

2.5 Greenhouse gas accounting standards and national inventory methods

Country-specific national inventory methods were applied so that results are comparable to regional and national benchmarks. The key methodological sources used for each country are summarised below.

2.5.1 Australia

- Australian National Greenhouse Gas Inventory, referenced here as the National Inventory Report (NIR) (Commonwealth of Australia, 2025a), for methods to determine agricultural emission sources.
- Australian National Greenhouse Accounts Factors (Commonwealth of Australia, 2025b) for energy related emissions.

2.5.2 New Zealand

- New Zealand's Greenhouse Gas Inventory (Ministry for the Environment, 2025), including the Ministry for Primary Industries agricultural inventory methodologies, for agricultural emission-estimation methods and livestock-specific emission factors.
- Measuring Emissions: A Guide for Organisations — 2024 Detailed Guide and associated Emission Factors Summary (Ministry for the Environment, 2024).

2.6 Life cycle inventory

Inventory data and modelling methods for each stage of the two product systems are described below, beginning with the Halter product and followed by the beef production system. Supporting inventory data are provided in Appendix A (Table A-1 to Table A-5).

2.6.1 Halter product manufacture and distribution

A bill of materials (per collar and per tower) were provided by Halter, together with deployed collar and tower counts and product-maintenance data. Key inventory data for Halter product deployment are summarised in Table A-1. Greenhouse gas emissions associated with input materials were modelled using spend-based US Environmentally-Extended Input-Output (US EEIO v2.0) factors (US EPA, 2022), inflation-adjusted, with ecoinvent v3.1 database processes (Ecoinvent, 2014) used for freight, including air and sea transport from the country of manufacture to local distribution centres.

2.6.2 Halter business services

Inventory data covering a 12-month period were supplied by Halter, drawn from Halter's Toitū carbon reporting, and included electricity and fuel inputs, staff travel and other services associated with operating the business. Business-services emissions were modelled using country-specific and spend-based emission factors.

2.6.3 Livestock production and herd modelling

Five beef enterprises across New Zealand and Tasmania were included in the aggregated assessment. These enterprises spanned breeding, trading/backgrounding, and mixed grazing at different stages of Halter adoption in 2024 and 2025. The temporal boundary covered financial years FY2022 to FY2026, providing a baseline of at least two years prior to Halter adoption for each property. FY2026 was reported from known inventories up to March 2026, with partial results projected to year-end to enable a full-year estimate.

Halter engaged Integrity Ag to undertake farm-level data collection from the participating farms. Primary production and input data were supplied to, and verified by, Integrity Ag through its data-collection portal. Herd structure and performance, including herd composition, liveweight sold, daily weight gain, weaning rate, mortality, and fuel, fertiliser and supplementary feed use, were collated for each farm and year. Livestock emissions were modelled using Integrity Ag's iVCF model, applying the methods of Wiedemann et al. (2016, 2017). Where herds were expanding or contracting, liveweight sold was corrected to remove the influence of herd fluctuations.

2.6.4 Allocation and treatment of co-products

Where enterprises produced co-products, shared farm services and inputs associated with multiple enterprises were handled by system separation (sub-division), consistent with the preferred hierarchy of ISO 14044 (ISO, 2006b) and (LEAP, 2016). Inputs associated with non-beef activities (for example, potato and fodder production at Cox Farm, and sheep production at Otorohaea) were excluded from the beef enterprise assessment.

2.6.5 Normalisation to isolate the direct Halter effect

To better isolate the direct effect of Halter from concurrent, unrelated business change, results were normalised by removing uncontrolled and unrelated variables. One-off lime applications were distributed across all reporting years. Differences in traded animal type, including changing from dairy-bred to beef-bred cattle, were also standardised to a beef-cattle purchase so that all traded livestock before and after Halter adoption were modelled. In addition, changes in transport distance arising from market changes unrelated to Halter were removed.

The specific anomalies addressed at each property are noted in the farm descriptions (section 2.6.6). These normalisation steps allow the before-and-after comparison to more accurately reflect the effect of Halter adoption under business-as-usual conditions.

2.6.6 Farm descriptions

Rotowai Farms (Waikato, New Zealand)

Rotowai Farms is a breeding enterprise with around 200 cows with a small number of traded females. Four years of verified data were supplied, comprising three pre-Halter years (2022–2024) and one post-Halter year (2025), with 2026 projected to year-end based on known inventories. Trade cattle purchased across the years were normalised to beef weaners to remove the variable of feeder type (dairy content cattle), from the assessment.

Otorohaea (Waikato New Zealand)

Otorohaea is a hill-country enterprise grazing sheep and cattle and is focused on trading and backgrounding cattle. Four years of verified data were supplied, comprising three pre-Halter years and one post-Halter year (2025) with 2026 projected to year-end.

Figure 5. Cattle managed within a virtual fence boundary. Source: Halter

Stokman Angus (Bay of Plenty, New Zealand)

Stokman Angus is an Angus seedstock breeding enterprise of 470 head that sells bulls and breeding stock. Four years of verified data were supplied, comprising three pre-Halter years, and one post-Halter year (2025), with 2026 projected to year-end using known inventories.

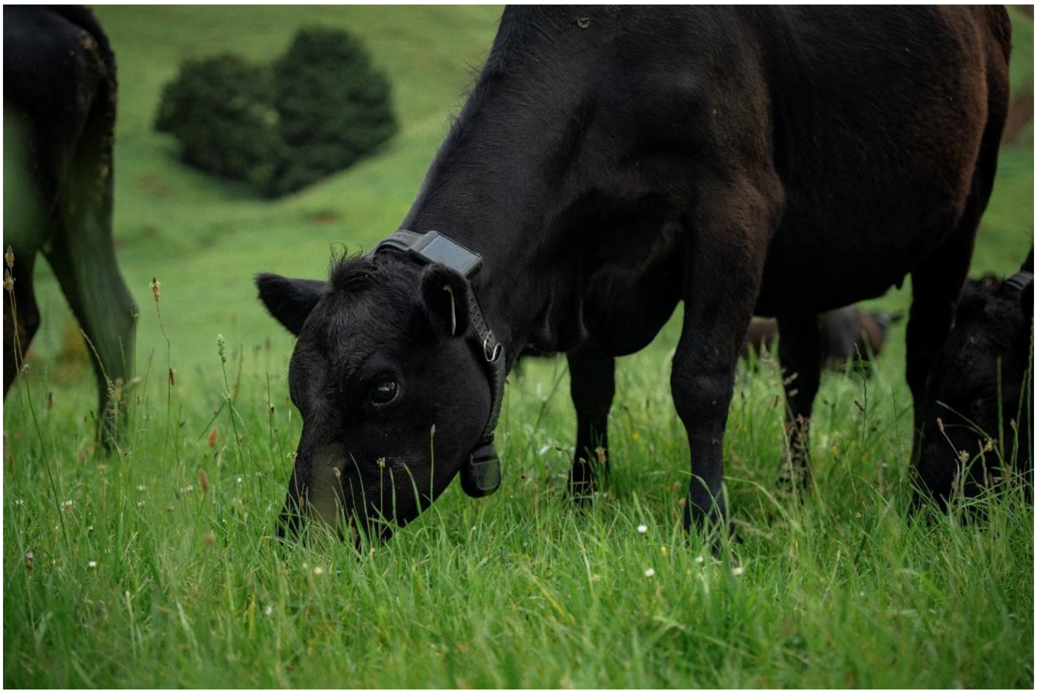

Figure 6. Stokman Angus cows grazing using Halter collars. Source: Halter

Tutu Totara – The Ridges (New Zealand)

Tutu Totara – The Ridges is a trading and backgrounding enterprise operating under highly intensified pasture-based production systems. Data were supplied for two pre-Halter years ending 31st May (2023–2024) and two post-Halter years ending 31st May (2025, with 2026 projected).

Cox Farm (Tasmania, Australia)

Cox Farm is a mixed farming operation with a breeding herd that sells weaners directly off the cow, alongside potato and fodder production. Data were supplied for two pre-Halter years (2023–2024) and two post-Halter years (2025–2026).

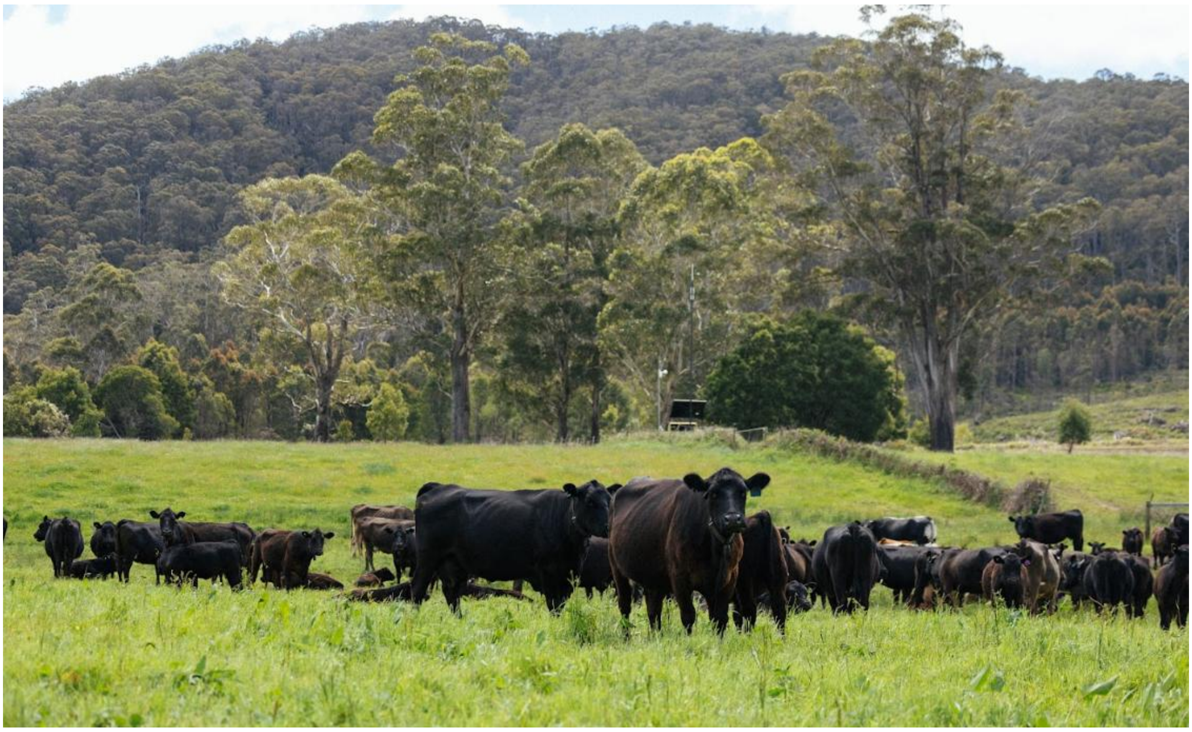

Figure 7. Grazing cattle at Cox Farm Tasmania. Source: Halter

Farm 6 (Queensland, Australia)

A sixth farm was baselined as part of the study for future inclusion. At the time of publishing, there were insufficient data available to complete the post-Halter assessment. This may be revisited in subsequent years.

3. Results

3.1 Halter product carbon footprint

The Halter product carbon footprint was 23.3 kg CO_2-e per Halter product, equivalent to approximately 0.01 kg CO_2-e per product.day over a six-year service life. Collars accounted for around 99% of the product footprint, while towers accounted for most of the remaining 1%, with business services such as corporate travel, product transportation negligible at a per collar level.

3.2 Farm-level product carbon footprint (beef)

Figure 8 shows the PCF of beef (kg CO_2-e/kg LW) produced on each farm for each year of analysis.

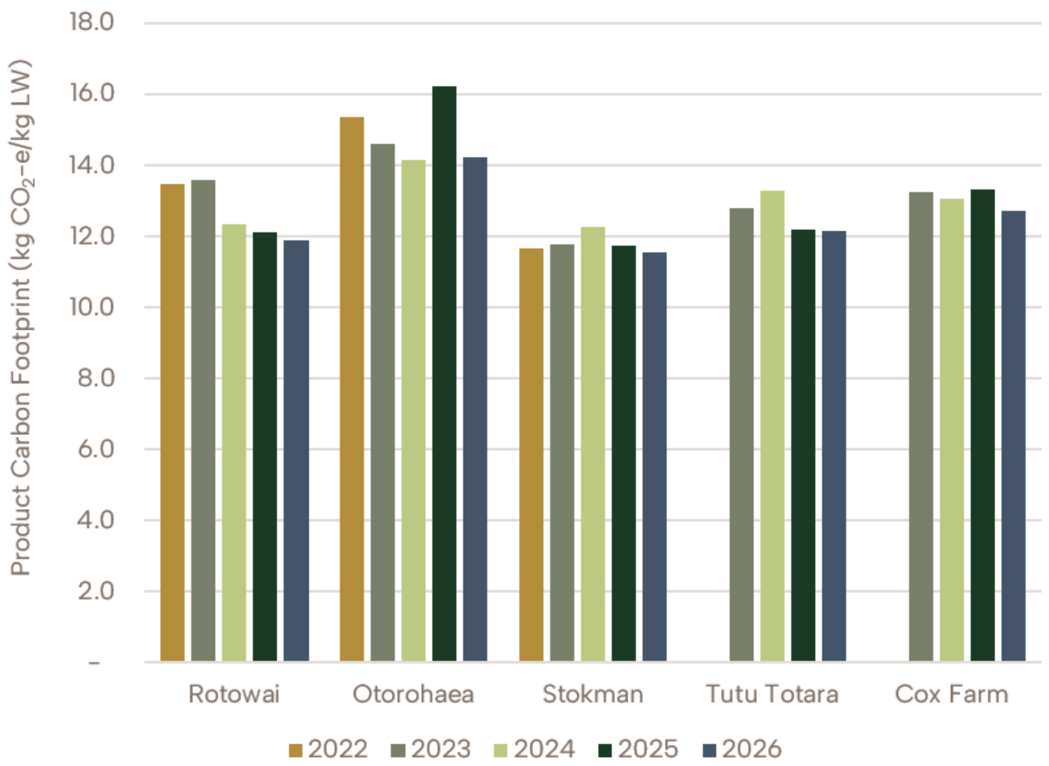

Figure 8. Product carbon footprint results for all farms and all assessment years

3.2.1 Before and after comparison

Figure 9 shows the weighted average PCF for each farm across the aggregated pre-Halter production years, compared to the post-adoption PCFs. The carbon footprint ranged from 14.7 to 11.9 in the baseline and from 14.2 to 11.5 in 2026.

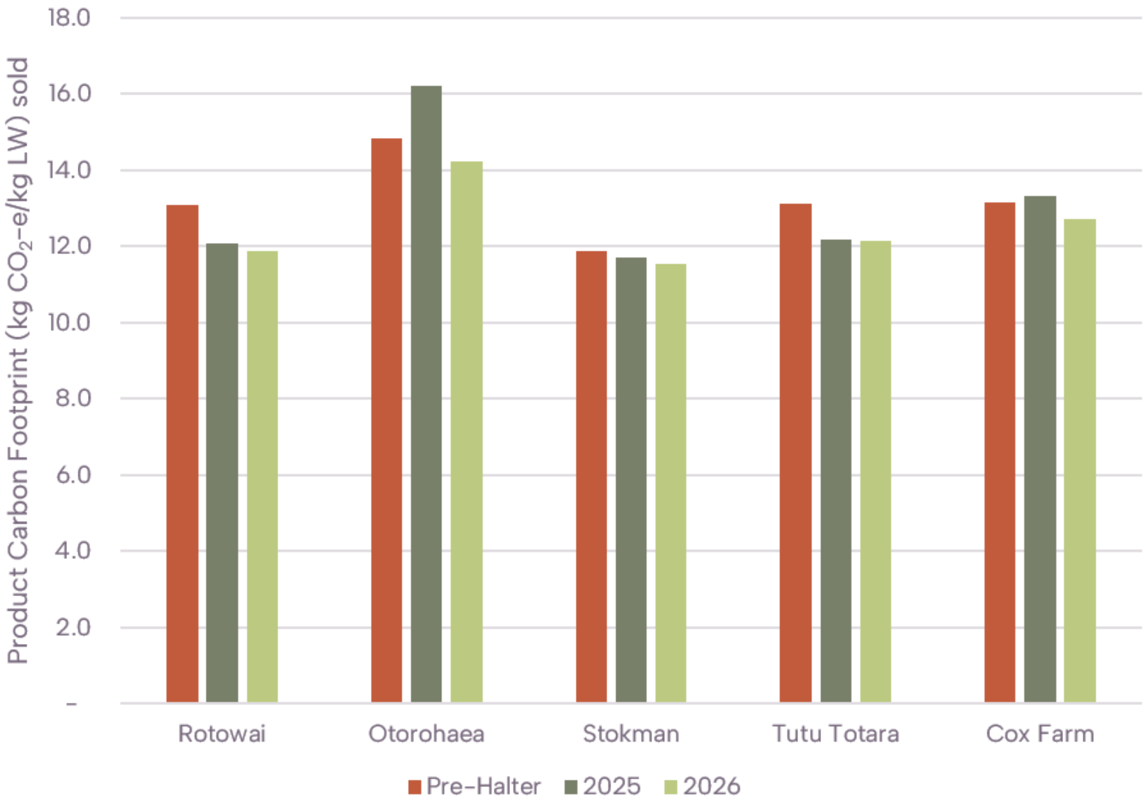

Figure 9. Product carbon footprint results showing baseline (pre-Halter) and two years of results following introduction of Halter

4. Interpretation

Enteric methane dominated the beef carbon footprint, therefore, emission intensity was governed chiefly by livestock performance, specifically lifetime average daily gain (ADG) and reproductive performance.

4.1 Farm results

Rotowai

A 9.6% reduction in CF was achieved between the baseline and 2026 result. This result was driven by the average sale weight of owner-bred cattle increasing by around 10%. This resulted in a 15% increase in average lifetime ADG of sale animals, lowering the livestock emissions intensity.

Otorohaea

A 3.4% reduction in CF was achieved between the baseline and 2026 result. The results showed a 9% increase in PCF in the first post-Halter year (2025), reflecting increased intensification of beef grazing practices in previously inaccessible areas with low nutritional value in pastures, which resulted in higher stocking rates but lower individual animal performance and a corresponding increase in PCF. This was then reversed to a 3.4% reduction relative to the pre-Halter footprint in 2026, as pasture growth and quality improved from increased time-managed grazing, which resulted in higher daily gains.

The carbon footprint reduction was driven by a 10% increase in ADG for traded cattle. Before Halter, animals were kept on farm for an average of 510 days, and achieved an ADG of 0.48 kg. Following Halter adoption, time to turn off was reduced by 9 months, while ADG increased to 0.53 kg.

Stokman Angus

A 3.4% reduction in CF was achieved between the baseline and 2026 result. Stokman Angus recorded carbon footprint reductions of 1.7% in the first year post-adoption. In 2026, the reduction in carbon footprint was driven by an average 15 kg increase in weaning weight and an 8% increase in turnoff weight of animals sold at the same age using the Halter Beef grazing system.

Aggregate weaning rates also increased by 4% between the pre- and post-Halter periods.

Additional benefits reported by the farm manager included an estimated three-hour reduction in labour requirements per day and reduced handling of livestock, contributing to improved wellbeing of farm staff.

Tutu Totara – The Ridges

A 6.9% reduction in CF was achieved between the baseline and 2026 result. Specific trading outcomes were difficult to determine from the data provided, meaning the PCF results could not be verified for this farm. Nevertheless, improvements in whole farm productivity were evidenced by the increased lifetime average daily gain of cattle sold, shown in Table 1. Self-reported improvement in farm pasture production and feed conversion rates were also supported by the increased number of trade cattle sales post-Halter.

Table 1. Tutu Totara turnoff and ADG results

Reporting year	Total cattle sold	Mean lifetime ADG (kg/day)
FY2023 up to 31st May	133	0.62
FY2024 up to 31st May	256	0.63
FY2025 up to 31st May	493	0.76
FY2026 up to 31st May	512	0.76

Cox Farm

A 3.8% reduction in CF was achieved between the baseline and 2026 result. Pasture establishment occurred in the first year post-Halter, due to the conversion from potato cropping to permanent pasture grazing. Additional land areas became accessible for beef production which were previously unmanageable due to the inability to retain and maintain physical fences across river crossings.

Figure 10. Riverside grazing management is enhanced by Halter virtual fencing. Source: Halter

4.2 Group Results

When results from the contributing farms were aggregated, the net effect of Halter adoption was associated with a small reduction in beef emission intensity under business-as-usual conditions in the second year after adoption, averaging 3% and ranging from 0%–9%. Where herd structures and grazing remained reasonably stable (notably Stokman Angus), reductions of 2% and 3% were evident, which supports the group average result of 3%.

Otorohaea and Cox farms showed an increase in carbon footprint the first year after adoption, which reflected the specific implementation and management practice change on these farms. Both farms increased grazing utilisation and stocking rate, but involved greater inputs for pasture development in the initial adoption year, which came at the expense of individual animal emission intensity. Poorer pasture quality on offer in the areas that were previously under grazed resulted in no animal productivity gains in this initial year. In the second year, livestock performance improved, which was likely to be a response to an overall improvement in pasture quality after expansion of grazing area and greater control of timing and intensity of grazing events.

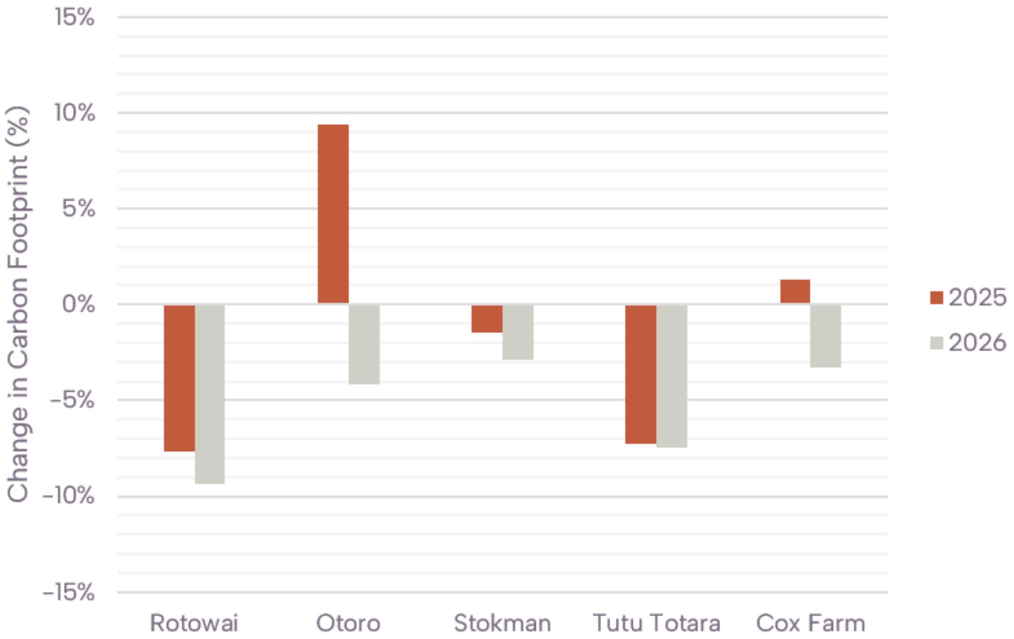

Figure 11. Halter impacts on PCF compared to the aggregated pre-Halter BAU

4.2.1 Relative contribution of Halter to the PCF of Beef

The embodied footprint of the Halter product itself (section 3.1) contributed 0.1% additional emissions to the farm gate beef PCF, which was considered negligible within a beef production system. The impacts of materials, manufacturing, transportation and Halter business services were insignificant compared to the livestock emissions and potential productivity efficiencies achievable for each kilogram of liveweight gain on farm.

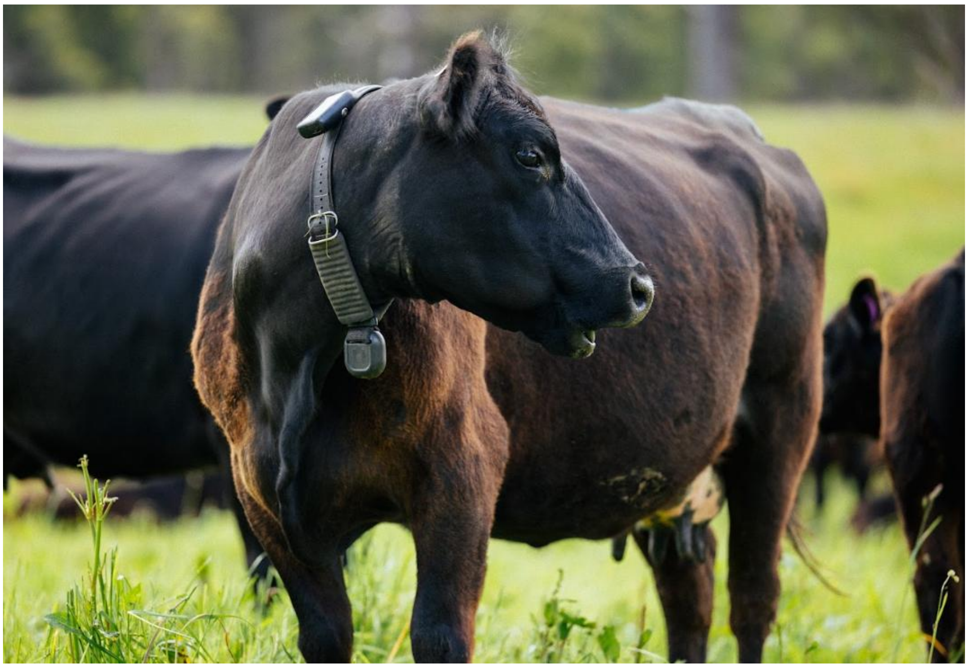

Figure 12. Beef cattle on pasture under Halter management. Source: Halter

4.3 Mechanisms of impact

Adoption of the Halter product resulted in improved grazing management efficiency by enabling precise, remote control of where and when animals grazed. Farms reported higher pasture utilisation, more effective stocking, and the ability to access previously under-utilised areas, resulting in higher daily gain and, in consistent breeding systems, improved weaning rates (see Table A-5).

Compared with other widely discussed GHG emission mitigation strategies/technologies, the abatement potential was broadly similar to that of grazing feed additives, such as Agolin (PCF impacts equated from Batley et al (2024) based on achieving 17% enteric methane abatement feeding over 10% of the animal's lifetime), but without an ongoing per-animal input cost and with a productivity benefit.

4.4 Limitations

Table 2 shows the annual variation in rainfall totals in the reporting years compared to the long-term regional mean annual rainfall. Variability in rainfall showed no consistent trend across all farms between pre and post-Halter adoption years, but it was noted that 2025 was a slightly lower rainfall across farms and 2026 was a slightly better rainfall year for Rotowai, Otorohaea and Stokman farms compared to their baseline period. However, further research and longer-trend periods will be needed to confidently separate any climatic influence in the results.

Table 2. NZ and AUS Regional rainfall variation compared to long-term average (Commonwealth of Australia, 2026; NIWA, 2026a, 2026b)

Region / Station	FY2022	FY2023	FY2024	FY2025	FY2026
Waikato Waipa River Otewa (Rotowai Farms and Otorohaea, NZ)	Above average +28%	Well above average +61%	Near average +7%	Above average +12%	Well above average +74%
Bay of Plenty Okaro (Stokman NZ)	Above average +13%	Well above average +77%	Below average -18%	Near average +2%	Well above average +36%
Horizons Whanganui (Tutu Toara, NZ)	Above average +26%	Above average +15%	Below average -24%	Below average -26%	Near average +1%
Devonport Airport, TAS (091126) 759.5 mm long term average	Above average +8% (818.7 mm)	Below average -7% (705.2 mm)	Well below average - 31% (524.6 mm)	Near normal (748.4 mm)	Below average -7% (709 mm)

In addition to climate, the changes in herd management that were implemented following Halter increased the variation in results. While these changes were controlled to the greatest extent possible, further investigation using longer term trends and controls would be warranted to both understand and optimise carbon footprint outcomes through the use of Halter.

It should be noted that the assessment did not include any amortisation of the impacts of existing physical fencing infrastructure on farms. While these impacts may be avoided under future Halter-supported management systems when replacement of physical fencing infrastructure becomes redundant, it was not possible to quantify these changes in business inputs or consistently attribute them to the product outputs across farms.

5. Conclusions and recommendations

An attributional LCA was conducted to quantify both the embodied emissions of the Halter product and the beef product carbon footprint outcomes of Halter-enabled beef production across five early adopting Australian and New Zealand farms.

This assessment provides an early, evidence-based view of the product carbon footprint of Halter-enabled beef production.

Overall, the results of this initial trend analysis of early-adopting farms reveal small reductions in the carbon footprint of beef as a result of adopting Halter in the first 2 years. It was noted that 2025 was a slightly lower rainfall across some farms and 2026 was a slightly better rainfall year for two regions compared to the baseline period, suggesting that climate may have had a small influence on three farms in 2026, which could have contributed to part of the positive trend in the 2026. The study confirmed that the impact of manufacturing and implementing the Halter product was modest and did not materially impact the carbon footprint of farms using the product.

Halter is best considered an enabling technology and from the perspective of reducing carbon footprint, the key benefits are likely to be in providing higher quality feed to targeted high-requirement animal groups such as lactating cows, calves and cattle during finishing.

The study observed that farmers often make multiple changes to management when they introduce Halter, which can take more than two years to stabilise. Other objectives that are valued by landholders, such as increasing pasture utilisation and stocking rate, will not necessarily reduce carbon footprint and may have a short-term impact (through lower feed quality and increased inputs), resulting in a higher carbon footprint until the feed base adjusts to the changed grazing management.

Further research would be valuable to examine scenarios that optimise animal productivity through using Halter. Opportunities are also likely to exist to improve other aspects of land management such as managing grazing in riparian zones and reducing grazing pressure where regeneration is targeted. Future research is needed to fully understand the scope of these new opportunities, including how positive impacts on other natural capital assets might be enhanced by Halter beef systems, or how Halter management systems could support the adoption and data collection needs of other emissions abatement and removal options enabling verified carbon insetting. This enablement could include quantifying and verifying low-emissions grazing activities and feed additive supplementation, as well as land-based removals measurement through an accurate forage production and consumption data system.

The promising findings from early adopting farms indicate an improvement in performance into the second year, and further analysis into the third and fourth years would be warranted to fully consider the impact of structural changes enabled by the Halter product.

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Appendix A Inventory Tables

Halter product activities and on-farm production performance inventories are supplied in the following Appendix to support the analysis outcomes reported.

Table A-1. Halter product assumptions

Component	Proportion of impact	Lifespan (years)	Lifespan (days)
Collars	99.1%	6	2,192
Towers	0.9%	5	1,826
Total / weighted average	100%	5.99	2,188

Table A-2. Production liveweight turned off by farm per assessment year (kg)

Farm	FY2022	FY2023	FY2024	FY2025	FY2026 (proj.)
Rotowai Farms (NZ)	63,039	59,837	69,984	79,634	89,332
Otorohaea (NZ)	176,237	60,984	115,215	80,299	132,003
Stokman Angus (NZ)	207,504	212,617	197,272	202,247	218,366
Tutu Totara – The Ridges (NZ)	–	71,717	137,684	212,123	218,576
Cox Farm (TAS)	–	23,381	23,647	22,046	23,044

Table A-3. Reported head collared and calculated collar head-days, FY2025 and FY2026

Farm	FY2025 head	FY2025 head-days	FY2026 head	FY2026 head-days
Rotowai Farms (NZ)	211	77,015	210	76,650
Otorohaea (NZ)	210	75,390	332	101,260
Stokman Angus (NZ)	522	190,530	556	202,940
Tutu Totara – The Ridges (NZ)	493	101,558	512	179,712
Cox Farm (TAS)	73	26,645	78	28,470

Table A-4. Deployed collars, towers and collar-to-tower ratio by region

Region	Collars	Towers	Collar-to-tower ratio
Tasmania	5,595	37	151.2
Waikato	9,898	124	79.8
Wellington	10,068	85	118.4
Total / average	**31,190**	**298**	**104.7**

Table A-5. Stokman Angus key herd variables driving PCF, pre- and post-Halter adoption

Stokman Angus NZ	Cow Weight (kg LW)	Weaning Rate (%)	Lifetime Average Daily Gain of sale animals
2022	620	92%	1.1
2023	620	88%	1.2
2024	620	84%	1.1
Pre-Halter average	**620**	**88%**	**1.13**
2025	620	90%	1.1
2026	620	94%	1.2
Post-Halter	**620**	**92%**	**1.15**

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