Herd-i Case Study
Return on Investment Analysis

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Document Quality Assurance

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1.0 Executive Summary

AgFirst has completed an independent analysis of the return on investment for a farm using Herd-i for lameness scoring. The analysis is based on a case study approach using Darnley Dairy Ltd farm in Culverden, North Canterbury, which has been using the lameness-scoring technology since installation in August 2022.

Herd-i technology has the potential to identify lameness in dairy cows earlier, allowing proactive and preventative treatments. There is additional Body Condition Score (BCS) camera technology available which offers farmers daily information, facilitating more timely decisions in managing BCS targets. The impact of the BCS Herd-i technology has not been included in this analysis.

Lameness can vary significantly between seasons so the analysis has used data from the 3 seasons prior and 3 seasons post Herd-i installation in order to reduce the impact of seasonal variation on the results. There were no other significant changes in farm system, infrastructure or management during this period.

The return on investment for Darnley Dairy Ltd has been calculated using farm information and MINDA records since the 2019/2020 season. The MINDA data shows the numbers of cows that have been treated for a range of lameness ailments including white line disease, footrot, overgrown hooves, abscesses, stone bruises, and hoof penetrations.

Herd-i has enabled Darnley Dairies to identify cows showing signs of lameness earlier, allowing proactive intervention and treatment that has led to 38% lower rates of herd lameness and a 41% reduction in antibiotic use for lameness. Although there was no change in overall herd reproductive performance the data showed that cows treated for lameness had approximately double the Not-In-Calf rate as those untreated. This apparent benefit in reproduction has not been included in the financial analysis.

The study shows a reduction in the cost of lameness in this herd and an overall return on investment (ROI) of 13%.

Herd-i Cost: Benefit Breakdown

Capital Cost - Herd-i Installation		**$8,000**
Annual benefit (reduction in lameness costs)	$17,270	
Annual Cost	$16,250	
Net Annual Economic Benefit		**$1020**
Return on Investment	**13%**	
Reduction in lameness incidence	38%	
Reduction in antibiotic treatments for lameness	41%	

2.0 Introduction

Herd-i is an automated computer vision system that uses artificial intelligence (AI) to both assess the herd for signs of lameness and assign an individual animal body condition score (BCS) as the cows exit the dairy shed. There are a range of potential benefits for using Herd-i and the value of this technology to the individual farmer will vary according to their circumstances, e.g. farm contour, walking distances and their existing infrastructure.

Lameness is a well-recognised animal health issue that affects animal welfare and poses a significant financial impact both in terms of effect on milk production and treatment costs.

The purpose of this case study is to evaluate the financial ROI for farmers that have invested in the technology to manage lameness. The use of Herd-i for BCS scoring has not been included in this case study analysis.

The report takes an independent view of the costs and potential benefits that might be derived from using Herd-i to ultimately establish a potential return on investment.

3.0 Methodology

The approach used to quantify the potential benefits of the Herd-i system was as follows:

- Interview with Hayden Fletcher, equity partner and operations manager for Darnley Dairy Ltd
- Quantify the initial capital outlay and ongoing costs for Herd-i since installation in August 2022.
- Assess and review the measurable farm system impact using farm data and herd records to quantify the direct and indirect benefits. Three dairy seasons both pre and post technology installation have been included to reduce any seasonal effects.
- Calculate the annual net benefit and ROI.

4.0 Assumptions

Herd-i technology involves the use of in-shed cameras positioned to capture video footage of individual cows as they exit the cowshed. The Herd-i lameness system identifies each animal as it passes the drafting gate via EID tags and the video images of each cow are stored on a cloud-based server where the animal's gait and BCS is analysed.

Each animal is scored using the DairyNZ lameness Scoring system with scores ranging from 0 (healthy) to 3 (very lame). BCS is assessed against DairyNZ BCS industry standards. Farmers access their data and images via a web-based dashboard where they can adjust customised threshold settings, set notifications, and monitor changes for individual cows and the entire herd.

To enable the use of this technology some cowsheds may require modification but these are likely to be minor and vary widely between farms. There were no alterations required on the case study farm.

Assumptions for Infrastructure requirements on-farm:

- EID readers and drafting technology is already installed and any costs for this technology are not included in this study.
- The cowshed exit race design is suitable for camera positioning to capture the cows' gait as they exit the shed.

Assumptions:

Milk price	$9.00 per kg MS
Milk loss per lame cow (kg MS)	25
Treatment cost per cow[#] (antibiotic and anti-inflammatory)	$110
Labour cost per cow treated	$35
Vet cost per cow treated (50% of cows)	$50

[#]The treatment cost figures presented are based on market rates for a range of commonly used antibiotic and anti-inflammatory treatments and are not actual direct costs for Darnley Dairy.

These figures are estimated current market costs. Lost production is calculated as 8 days @ 2.4kgMS/c/d (3 d treatment and 5 d milk withholding), and 25% drop in milk production for the following 10 days. Darnley Dairy historically peaks at approximately 2.4 to 2.5 kgMS/c/d and this case study assumes that most lameness occurs during the first half of the season.

Lameness incidence varies significantly within and between seasons and is influenced by a wide variety of factors including weather, track condition, herd stockmanship and the skill set of the farm team identifying and treating lameness. The lack of reliable industry data on lameness incidence means weather effects between seasons are difficult to assess. In order to provide a robust baseline, the analysis included three dairy seasons prior to Herd-i introduction, and three seasons following.

5.0 Herd-i Capital and Annual Costs

The capital investment includes the purchase and installation of the Herd-i technology, plus any modifications required to the cowshed exit race so the lameness camera has a clear view of cows. These costs can vary significantly between farms depending on infrastructure configuration. This case study farm did not require any alterations.

Capital costs Darnley Dairy	
Herd-i technology – lameness only	$8,000
Infrastructure alteration costs	-
Total Capital Cost	**$8,000**

Annual costs are primarily made up of the monthly subscription fee. Depreciation has been estimated at 25%.

Cost of capital has not been included as this will differ for each situation depending on source of funds. Excluding cost of capital also allows comparison with other investments, including debt reduction.

Annual costs		
Subscription costs (950 cows)	$1.25/cow for 12 months	$14,250
Depreciation	25%	$2,000
Total Annual Cost		**$16,250**

6.0 Key Farm Statistics

Darnley Dairy Ltd is a 255ha effective dairy farm in North Canterbury, New Zealand and is part of the Craigmore Group which manages 22 dairy farms in the South Island.

The 950 cow Holstein Friesian F12 herd winters off farm before returning home for calving in late July. The property is 100% irrigated using spray irrigation. Herd-i was installed on-farm in August 2022.

Table 1. Key farm statistics

Total Area (ha)	280
Effective Area (ha)	255
Cows Wintered	950
Peak Milk Cow Numbers	920
Stocking Rate Cows/ha	3.6
Herd Average Liveweight kg/cow	515
Cowshed	70 Bale Rotary
Irrigation	100%
In-shed feeding	Yes

Table 2 shows farm performance for the six-year period analysed.

Table 2 Key Performance Indicators 2019 - 2025

	3 Seasons Post Herd-i Installation			3 Seasons Pre Herd-i Installation		
	24/25	23/24	#22/23	21/22	20/21	19/20
Peak Cows^	920	920	920	920	920	920
Stocking Rate Cows/eff ha	3.6	3.6	3.6	3.6	3.6	3.6
Total Milk Production (kg MS)	555,787	565,520	546,392	539,925	543,453	492,578
KgMS / cow	604	615	594	586	590	535
Average kgMS/cow 3-Seasons	#	604			570	
KgMS / ha	2,180	2,218	2,143	2,117	2,131	1,931
Average KgMS/ha 3-Seasons		2,180			2,059	

^Peak milk cows ranges between 915 and 920 over the 6 seasons studied. 920 cows was used for all season for consistency.

Installation August 2022

7.0 Darnley Dairy Ltd Investment Analysis

Herd-i quotes the potential to identify cows showing signs of lameness earlier, therefore allowing earlier intervention and treatment. Proactive treatment would involve drafting lame cows from the herd as they are identified and following up with hoof care and treatment.

Darnley Dairy Ltd lameness incidence and antibiotic use pre and post Herd-i has been analysed. Table 3 shows the percentage of the herd identified and treated for all types of lameness, and the percentage of the herd treated with antibiotics, during the six-year analysis period.

Table 3. Lameness Treatments over six years

% Herd	24/25	23/24	#22/23	21/22	20/21	19/20
Herd treated for lameness	13%	13%	18%	18%	13%	40%
Average 3-Seasons	14.6%			23.6%		
Lameness antibiotic treatments	5%	5%	9%	8%	6%	18%
Average 3-seasons	6.3%			10.6%		

Installation August 2022

Comparing the averages over three seasons prior and three seasons post installation, Darnley Dairy has seen a 38% reduction in the number of cows requiring individual hoof treatment for lameness and a 41% reduction in lame cows requiring antibiotics post treatment. This equates to 82 fewer cows treated and 40 fewer antibiotic treatments each season.

The economic impact from reduced lameness manifests in several ways. The immediate benefit is cost savings in antibiotics, reduced milk losses and labour savings. Subsequent benefits can include improved reproductive performance and reduced culling or cow losses due to lameness.

Economic benefit from reduced labour and antibiotic costs.

Lameness impact for farms includes treatment and labour costs and lost milk production. This study uses the figures listed in Section 4.0 to estimate the reduction in lameness costs for the case study farm.

Darnley Dairy carries out their own hoof trimming and prevention work for cows that are not presented for vet care and treatment. It is assumed that 50% of cows given antibiotic treatment are attended by vets. Fewer cows treated therefore saves labour and vet costs, lowers antibiotic and anti-inflammatory costs, and reduces milk losses. The savings on the Case study farm are shown in Table 5.

Table 5: Estimated reduction in lameness costs.

82 cows x $35 labour cost	$2,870
40 cows less treatment cost x $110/cow	$4,400
40 cows on antibiotics lost production ($9 x 25kgMS/cow)	$9,000
Saved Vet time treating fewer cows (50% of 40 cows @ $50/c)	$1,000
Economic benefit from reduced costs	**$17,270**

Other benefits

Reproduction

- Industry data would suggest that a reduction in lameness during spring would positively impact reproductive performance. The case study farm did not show an improvement in 6-week in-calf rate or not in-calf rate (NIC) over the six-year period. There could be multiple reasons for this and the positive effect of reduced lameness may have been masked by other factors. The inability to isolate these factors means reproductive effect has not been included.
- Despite the lack of improvement in overall herd reproduction, the data did show that cows treated for lameness were more likely to be recorded as NIC than cows that were not treated.

  Table 6 compares the NIC rates for cows treated for lameness against the rest of the herd from 2022-2024.

  Table 6.

	NIC rate for cows treated for lameness	NIC rate for cows not treated for lameness
2024	26%	12%
2023	44%	24%
2022	35%	17%

Reduced culling

- It is reasonable to assume there would be fewer culls due to lameness when incidence of severe lameness has dropped. This was not evident on the case study farm so has not been included.

Improved animal welfare

- Lameness is not a pleasant experience for animals or staff. The reduction in the proportion of cows experiencing lameness will have a positive effect on wellbeing overall. This has not been quantified.

8.0 ROI Analysis Summary

Annual return	
Annual Benefit	
Reduced treatment and production losses	$17,270
Total Benefits	**$17,270**
Annual Costs	
Subscription costs	$14,250
Depreciation	$2,000
Total Costs	**$16,250**
Annual Net Benefit	**$1020**

Return on Investment	
Capital Cost	$8,000
Annual net benefit	$1020
ROI	**13%**

9.0 Appendix Individual lameness treatments

Individual hoof treatments for 2019 – 2025 recorded in MINDA. Cow numbers treated will differ slightly as some cows had multiple hoof treatments.

By Category individual hoof treatments	24/25	23/24	#22/23	21/22	20/21	19/20
Between Claw/Footrot treatments	61	41	59	55	43	135
White Line treatments	94	89	148	160	52	320
Other treatments	4	25	6	7	7	34
Total individual hoof treatments	159	155	213	222	102	489
Average individual hoof treatments 3-Seasons	175			271		

Installation August 2022

Lameness treatment assumptions

Milk discarded during lameness treatment	Average 2.4 kg MS/cow/ day 8 days withheld and 10d of 25% reduced production	25 kg MS cow treated
Cow treatment course range	3 days	
Milk withholding time range	5 days	
Treatment cost assumptions staff and vet per cow	Actual costs used for 5 days anti-inflammatory and 3 days penicillin	$35 per cow staff cost $50 per cow vet cost

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