



# Lean Dairy Operations - Improving sustainability through innovative approaches

Leprino Foods/The Dairy Roadmap



## About Leprino Foods & The Dairy Roadmap

Leprino Foods produces mozzarella for the food service and food manufacturing sector. In the UK and EU, they contract and source milk directly from 380 dairy farms. Leprino Foods are actively engaged with these suppliers in on farm solutions to mitigate the GHG impact of pre-farmgate emissions which represent 94% of all GHG emissions in the Leprino supply chain.

The Dairy Roadmap is a DSF Aggregating Member, collating annual sustainability data on behalf of dairy organisations in the UK, including Leprino Foods. The Dairy Roadmap is a cross-industry collaborative initiative founded in 2008 that aims to improve the environmental sustainability of the UK dairy sector whilst ensuring the continued prosperity of the industry, and the provision of safe, affordable, nutritious and sustainable produce for years to come.

## The issue:

Leprino Foods recognised that simply telling farmers **efficiency was a solution to reducing GHG emissions and support resilient business** was patronising. No farmer aims to be inefficient in running their dairy operation and so it was felt what was needed was to provide a framework that showed how to be more efficient.

## Approaching the issue:

Leprino Foods ran a number of farmer workshops, tasking the farmers to identify their own needs and the support that would help them in becoming more efficient. The farmers identified a knowledge gap in that they didn't know, what they didn't know i.e., when running the farm, they did what they knew best and really needed to step back and apply a framework to make changes that lead to added value.

A framework was subsequently developed based on lean management principles that had been tested in the UK horticulture

## How they did it:

The project delivered 'lean training' to 10 UK farms from February 2023 to November 2023. The training consisted of four face-to-face sessions, in which farmers left the farm and undertook focused training as a group on the principles of lean dairy operations. The lean educators consisted

and pork sectors, summarised here: [International lean review | AHDB](#)

A research review highlighted how farmers best like to learn ([An analysis of the learning styles preferences of UK farmers, growers and industry stakeholders | AHDB](#)) and a capacity building programme was established directly to address the farmers' needs, using a framework proven to have relevance to agricultural production, adopting a process that farmers stated they prefer to learn by.

of a dairy vet and two lean management consultants.

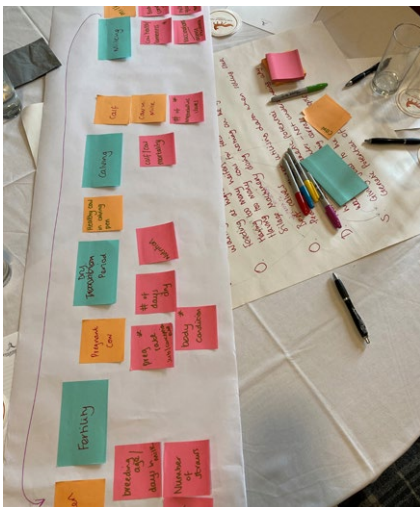
In between each session, each farm business was supported with dedicated farm consultancy to implement their learnings within their own businesses.



## The lean sessions followed the lean principles:

### Session 1 – Intro to lean and value stream mapping (VSM) -Establish value, map value

Farmers were introduced to the principle of value creation and the realisation it is not people or machinery but the cow that creates the value. The value chain and the measures of success relevant to the cow were mapped, using a 'lego' simulation to deliver fun and practical, visual exercises to highlight the impact of inefficiency and the value of optimising the system. Farmers created a VSM for their business using key performance indicators (KPIs) commonly reported e.g., milk yield (including constituents), replacement rate, pregnancy and conception rates and average age at first calving. The programme also looked at some more unique KPIs such as Youngstock to Breeding cow ratio which has been shown to have a moderate correlation with the farms carbon footprint and Overall Herd Effectiveness (OHE) (a measure of the effectiveness of a cow's productive cycle). OHE is a dairy appropriate 'translation' of manufacturing's OEE or Overall Equipment Effectiveness.



### Session 2 – Waste walks and waste identification (Create flow)

Farmers visited two different farms and engaged in 'waste walks' following the TIM WOODS framework (The 8 wastes). A waste walk is a technique where you physically observe and analyse work areas, workflows, and practices with the objective of uncovering non-value-added activities and processes that contribute to inefficiency, delays, defects, and unnecessary costs. The first farm walk was led by the lean educators and the second walk was a chance to put the learnings of this into practice, with the group coming together

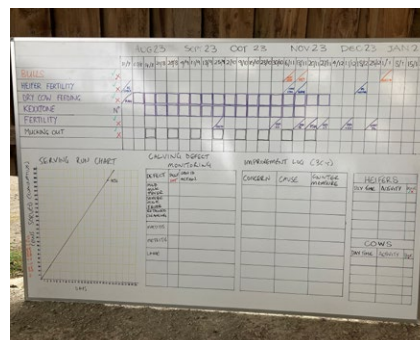
and discussing the potential wastes they identified, the consequences of those on production and some potential mitigations. The host farms were not part of the lean cohort but were supported financially to implement the most impactful mitigation options suggested by the visiting farmers and the outcomes were in turn reported back to the lean study group.

### Session 3 – Overall Herd effectiveness (Create pull)

Analysing the link between % of animals calving under 24 months at the right specification, the % of animals completing a target lifetime yield, and the % of animals retained in the herd. Farmers brought their own KPI data under each of these headings. The farmers conducted an analysis, supported by the lean educators, to identify their current efficiency and any lost opportunity cost to their business. Each farmer, with the support of the vet, suggested strategies that could be employed to improve efficiency. These options were then translated into an individual farm level action plan that could include a focus on heifer rearing to replacement rates.

### Session 4 – Embedding change, visual management and the role of innovation (Pursue perfection).

An innovation event was then organized supported by businesses and researchers providing practical solutions to help minimise waste and/or optimise processes previously identified as challenges in the farm waste walks and OHE exercises. This was supported by practical and taught sessions from the lean educators on visual management systems and the Plan, Do, Check, Adjust (PDCA) cycle (same as employed by the DSF). With support, each farmer designed their visual management systems to allow the wider farm team to support on-going change. These varied from simple checklists to more complex run charts, and problem solving solutions.



### The desired outcome KPIs, agreed by the farmer in their first one to one on farm session, were:

- A measurable reduction in the cost of production for each business (absolute measure in GB Pounds (£) saved per business).
- A measurable reduction in the cost of production as measured by the reduction in operating costs described in costs of production pence per litre (ppl).
- An estimated reduction in carbon emissions through either a reduction in inputs or inventory with a maintained output or, an optimisation of existing inputs with an increased output. Measured against an average farm baseline figure across the supply group of 1.21 kgCO2e/litre FPCM
- A qualitative assessment of farmer engagement was also made – based on total number of recommended actions completed by each farmer.

### Data sources used were:

- Purchased milk yield and quality data (supplied by Leprino Foods from the payment database)
- Herd performance data including individual animal lactations and lactation yield from milk recording or herd management systems.
- Breeding records and fertility data (actual data) from farm records, milk recording data or herd management systems. Where possible, data existing in multiple systems was cross referenced to provide an estimate of data confidence.

### The programme produced two products used for data analysis and interpretation:

1. A digital Value Stream Map (VSM) that allowed farmers to model the impact of changes on farm as well as evaluate the effectiveness of the programme. A VSM shifts a traditional profit and loss statement into a visual representation of how 'value' e.g., money, milk or quantifiable benefits move through each process. They account for the value created and the value lost through 'waste'.
2. A 'Cowculator' that allowed farmers to model the impact of changing strategies to benefit OHE. The output was a detailed breeding and health plan that informed the farmer's herd breeding decisions for a specific planned output.

## Results

Ten farms completed the programme by December 2023 and across all ten farms just under £1 million GB Pounds of 'lost' opportunity costs were identified and programmes were designed and implemented to return that value to the business. The values used to estimate return to farm businesses were deliberately conservative, with a farm gate milk price of 30ppl used for calculating the benefits of improved yield (the farm gate milk price never fell below 34ppl), a value of £1400 per heifer was applied for estimating the cost of excess inventory (AHDB figures value heifers at more than £2000), the Leprino payment matrix was used to identify the potential value of improved milk quality (constituents) and a figure of £5 GB Pounds / cow for every 1% improvement in a 6 week 'in calf' rate was used to estimate the impacts of improved fertility. This is

based on the value of milk gained over a full lactation from a reduced calving interval.

A unique set of actions were devised with each farm with 100% of actions completed across those farms. This was the greatest surprise to the lean educators as traditionally the rate of actions implemented as a result of attending a free course, is extremely low.

### Some key highlights:

- **Reviews of farms through year-on-year carbon audits suggest a 4 – 6% fall in carbon footprint year on year (YOY)**
- **In pence per litre (ppl) terms, farms saved 3 – 6ppl on their cost of production across the 10 farms (average milk yields ranged from 6000 to 11,000 litres/cow).**
- **£430,000 worth of excess heifers were removed from the production system, reducing the replacement rate from an average of 31% to just over 25%, supporting the carbon audits figure of a 4 – 6% reduction in carbon footprint. Farms have embedded breeding plans with controls to significantly limit the future production of heifers, minimising pollution leakage to other farms through the trading of excess animals i.e., farms cannot keep producing excess heifers and then simply sell them to someone else and avoid claiming the emissions.**
- **Farms have reported yield increases where strategies were designed to provide them of between 1.5 and 2.5 litres per cow/day, higher overall lactation averages due to a (flatter lactation curve) reduced drop in literage approaching the dry cow period.**

## The challenges to be overcome:

Farmer engagement was a major challenge and a co-design approach was used to ensure that the programme met farmer needs. For the co-design element we sat 50 farmers together and ran through a structured problem-solving exercise, using behavioural levers (Regulation, Economics, Social Pressures, Education, Tools/ Technology) to assess which levers would support them in engaging with a complex challenge. We started with an everyday challenge, how to stop people exceeding speed limits when driving. We then applied the same process to two more challenges: Reducing antibiotic usage and increasing efficiency. In the efficiency element, it was education that was the main lever, farmers stated would help them engage with change. We then surveyed 403 farmers and industry to assess how farmers learn ([An analysis of the learning styles preferences of UK farmers, growers and industry stakeholders | AHDB](#)). This showed that it follows a cycle, one which closely matches the Plan, Do, Check, Analyse cycle of lean.

Data availability and ease of access was also a major challenge. The data to undertake the programme is available in farm systems and mandatory data portals such as national cattle movement systems, but it is often uninformative in isolation and challenging to link with other, useful information.

Leprino Foods have partnered with a supplier and produced a data visualisation platform that combines key farm level data into one portal and provides benchmarked insights to support farm decisions. This is free and fully anonymised for all Leprino Farmers to utilise.

On starting the program and to overcome any initial challenges, Leprino Foods recruited specific farmers that were one or a combination of the following:

1. Considered progressive by their peers,
2. Were not necessarily supporters of Leprino and their programmes so far,
3. Representative of a range of production systems i.e., spring and autumn calving, housed and grazed, large and small.

Whilst this initial recruitment required significant time and investment, it was viewed to be worthwhile as this allowed the outputs to be of relevance and interest to a range of farmers. A sort of 'if they can do it, so can I' approach, thus helping to enable future recruitment to be easier.

Leprino also recognised that once the training with this initial cohort of farmers was completed, there would be a group of skilled and engaged farmers that would like to continue their journey. This led to the development of a mentoring/business development programme into which each successive cohort of farmers could enrol, creating a network of driven and engaged farmers.



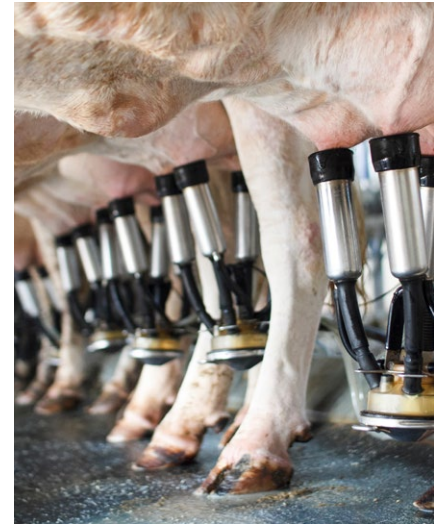


## What happened next?

The programme was considered so successful that Leprino Foods have doubled the funding envelope for the following year with cohorts enrolled across Wales and Northern Ireland and a target 25 farms. A small element of this new cohort is supported by a global feed supplier as part of their support for their farming customers. Knowledge Exchange bodies within Wales have also been invited to join for the next cohort, with their team members applying for the opportunity to upskill in lean alongside Leprino farmers. These farm extension staff, will participate

in the programme along with a cohort of Leprino farmers to help grow and develop the lean educator resource to allow an even larger roll out across our own supply chain of circa 400 farms and wider industry in the coming years.

Leprino Foods has also invited a supply chain customer to join and participate as part of the programme which has resulted in increased engagement with their farmer suppliers progressing to directly fund further research into interventions that directly support carbon reduction and on farm productivity.



## Points to note

- **Choose your lean educators very carefully**, they must have the ability to apply themselves in an agricultural setting otherwise it can be difficult and counterproductive trying to deploy their lean mindset to farmers i.e., they talk the talk, but farmers can't see them walking the walk.
- **Provide appropriate time to complete the programme**, it's not one to rush, start early in the year, provide realistic gaps in delivery to allow silage, crop harvests and other farm tasks.
- **Think carefully about the farmers you invite**, encourage farmers who are a challenge to you to attend. This aids in communicating the success and trust in the success to other farmers i.e., if a challenging farmer trusts in this programme than others are likely to as well.
- **Do not assume you can deploy a set of lean tools without following the lean process**. The lean process itself is rooted in deep learning theory with proven results. Whilst some lean tools in isolation can be of quick and lasting benefit, effects on ad hoc usage can be patchy and fleeting leading course participants to assume lean does not work, or won't work for them.
- **Get the data**, there will be substantial challenge to what is seen on farm in terms of the value of 'fixing' or optimising it. Having the data linked to the potential recoverable lost opportunity costs is vital, money talks!

## Key Learnings

- › **There are aspects of this programme that are key to progressing as a sector, especially around optimising cows and their OHE. Until we as an (UK) industry, balance cows coming in at the right age and spec i.e., we don't push too many into the milking herd whilst at the same time ensuring they can be productive enough to stay for at least five lactations, the value we will see from genetic gain will continue to be extremely limited.**
- › **Many of the findings of the waste walks and the strategies to return value into the system seem frighteningly obvious after the fact. What is more frustrating is, these processes are viewed by multiple other advisors, sales representatives and consultants and they have not been identified. This suggests that there is substantial need to change our approach across the agricultural sector and its support industries to drive rapid and sustained change i.e., we all need to be leaner, not just our farmers.**

**Click here** to view two short films about the changes a couple of Leprino Foods supplying farms have made to improve their efficiency and sustainability and the results achieved.



On-farm Interview with Sion Thomas at Drysgolgoch Shorthorns



On-farm Interview with Rheinalt Harries at Llwynmendy Uchaf