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## Focus Site Project Review

G & A Jones

Llindir

Eglwys Bach

Conwy

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**Contents**

- 1.0 Summary ..... 1**
  - 1.1 *Farm details* ..... 1
  - 1.2 *Project key objectives*..... 1
  - 1.3 *Project achievements* ..... 1
  - 1.4 *KPI changes*..... 2
  
- 2 Business Review ..... 3**
  - 2.1 *Overall Project Findings* ..... **Error! Bookmark not defined.**3
  - 2.2 *Potential impact of the project on business*..... 4
  
- 3 Project Review ..... 4**
  - 3.1 *Milk Powder Project*..... 4
  - 3.2 *Benefits for other Welsh dairy / beef businesses* ..... 6
  - 3.3 *Alignment with livestock sectors strategic goals* ..... 7
  
- 4 Impact on the industry ..... 8**
  - 4.1 *Impact on individual business*..... 8
  - 4.2 *Impact on wider industry*..... 8
  - 4.3 *Impact on Welsh Government’s cross cutting and priority themes* ..... 111



## 1.0 Summary

### 1.1 Farm details

The main business enterprise run by brothers Arfon and Geraint Jones at Llindir is intensive indoor calf rearing for the beef trade, with an annual throughput of 1,400 calves. The calves come on to the unit @ 3 -6 weeks of age and reared until ~180kg's before they are move on to a finishing unit.

Calves are sourced from numerous units all over the UK, and are tested for BVD using the tag and test method. Despite high welfare standards at the unit, due to the nature of the enterprise, pneumonia incidence is higher than desired.

Excellent stockman-ship coupled with close analysis of milk intake of each individual calf means that affected animals are identified very quickly and treated accordingly resulting in a very efficient enterprise.

Despite this high level of performance, the Jones brothers were looking for further improvements in DLWG and reducing their vet and med costs, particularly the use of antibiotics.

One of the specialists involved in this project was Vet Dai Grove White and a group of final year students from Liverpool University and he has been monitoring the health of calves by using a BRD Scoring tool developed by the University of Wisconsin. This has identified a number of mildly affected calves which would not have otherwise been detected, as there are no clear visual signs. Despite this mild infection, Dai believes the performance of such calves will be compromised, with a substantial reduction in DLWG thus reducing efficiency within the business.

#### **Business Objectives:**

- Improve calf DLWG to ensure calves reach 180 kg by 5 months of age
- Reduce the incidence of pneumonia
- Develop early pneumonia detection system
- Improve ventilation
- Reduce Vet costs
- Reduce the use of antibiotics

### 1.2 Project key objectives

The key project objectives are to determine the true extent of pneumonia cases in young calves through the process of individual examination to determine the pneumonia score of each animal. Evaluate the use of a probiotic added to milk as a method of reducing dependence on Antibiotics through preventative measures rather than treatment.

### 1.3 Project achievements

The project raised a number of interesting points especially highlighting the strong relationship between pneumonia and reduced growth rates. The meeting held at the farm

also revisited a number of important principals equally as relevant in any dairy calf rearing system as they are in intensive calf rearing systems.

The work carried out by Vet Sara Pederson who specialises in building design identified areas to look at to further improve the housing.

“The importance of stocking density and building design in reducing BRD instances in young calves cannot be over stated. Dairyland Initiative research suggests that a target of at least 2.8m<sup>2</sup> bedded area per calf and at least 18m<sup>3</sup> of air space should be provided. This coupled with consistent ventilation and a good drainage system will drastically reduce the BRD challenge experienced by young calves.”

Unfortunately due to external factors the installation of a bespoke positive-pressure tube ventilation system (PPTV) that had been designed specifically for the sheds at Llindir did not go ahead. This would have provided interesting information because the poor ventilation of the buildings was highlighted as a business weakness.

#### 1.4 KPI changes

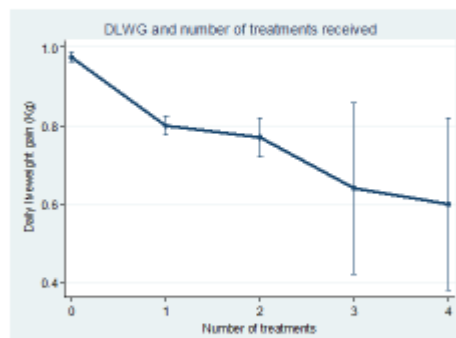
The main KPI was to monitor the Daily Liveweight gain DLWG in Kg / day for calves during their time at the farm.

Other KPI included the incidence of pneumonia and calf mortality rates.

## Pneumonia

- Dec 2015 – September 2016 – 400calves

Number of treatments	Number of calves	Percent
1	82	20.50
2	19	4.75
3	1	0.25
4	1	0.25



20% less DLWG after one treatment!

The data presented showed a clear correlation between the incidence of treatment for pneumonia and a reduction in calf growth rates, falling from 1.0 kg DLWG to 0.8 Kg DLWG.

At the farm meeting run by Dai-Grove White the total cost to the business as a direct result of pneumonia was quantified further to be £13,020 a year based on 20% of calves being infected.

## 2 Business Review

### 2.1 Project Findings

There are several key factors that should be considered when it comes to reducing pneumonia but the critical ones identified at Llindir were:

- Ventilation,
- Stocking density
- Drainage.

**Ventilation:** The project emphasised that calves require a constant supply of fresh air as this reduces the number of airborne bacteria around them, reducing the risk of disease. However, almost all calf buildings do not naturally ventilate sufficiently well due to inadequate positioning in relation to prevailing winds and insufficient inlets and outlets. The calf is unable to produce sufficient heat to create the 'stack effect' such that in most cases the warm expired air which is laden with bacteria does not rise but resettles around the calves.

Ventilation is one of the risk factors for pneumonia at Llindir with insufficient air changes being achieved in the shed per hour (minimum target 6-8 changes/hour all year round) due to proximity to adjacent buildings and the direction of the prevailing wind. While the large, high roofed sheds create a nice environment, they are prone to accumulating stale air due to the lack of cross winds through the sheds and the inability for the calves to create heat to force moist, bacteria-laden air through the ridges.

The proposed solution was to introduce a constant blanket of fresh air just above calf height throughout the shed, aiming for a minimum of 6-8 complete air changes per hour throughout the year, thus reducing the build-up of bacteria in the air. This was to be achieved through the installation of a bespoke positive-pressure tube ventilation system (PPTV) that had been designed specifically for the sheds at Llindir ensuring that the calves constantly receive a supply of fresh air without draught. Unfortunately the project did not go ahead but would be one to consider again in the future.

**Stocking density:** Research has shown that targeting at least 2.8m<sup>2</sup> bedded area per calf and at least 18m<sup>3</sup> of air space aids in the reduction of respiratory disease by reducing the number of bacteria in the air. When airspace allowances fall below 18m<sup>3</sup> it becomes difficult to ventilate sufficiently even with PPTV. At Llindir the calf pens were found to be slightly overstocked thus increasing pneumonia risk and recommendations were made to reduce numbers of calves per pen to fall in line with targets.

**Drainage:** The importance of adequate drainage was identified. Bacteria and viruses are only able to move around in moisture. Therefore maintaining a clean, dry environment reduces the risk of pneumonia.

Plenty of deep bedding was always provided at Llindir and the sheds were kept very dry and clean, however, the areas around the automatic feeders were prone to becoming poached. To tackle this the aim was to look alternative drainage systems, including the use of slatted pig flooring, to help drain away spilled milk and urine and reduce the build-up of ammonia in

the environment. This is a very relevant point to the wider industry as automatic calf rearing machines increase in popularity.

Ventilation, stocking density and drainage were the key risk factors identified at Llindir. These are areas which can often be improved without significant capital expenditure. The project looked at monitoring the incidence of pneumonia on an ongoing basis using the Dairyland Initiative Calf Health Scorer and medicine records.

KPIs.

The initial targets at the outset were to reduce the level of pneumonia cases on the holding by 50%

## 2.2 Potential impact of the project on business

If successful, in reducing pneumonia incidence levels will:

1. Reduce Vet costs and significant benefit in growth rates by 0.2 kg DLWG
2. Improve animal welfare by having a healthier calves
3. Increase staff morale by having to treat less animals as well as free up staff time
4. Reduce antibiotic usage as a result of less animals needing treatment for pneumonia
5. Reduce the levels of calf mortality
6. Increase overall business profitability as a result of reduced health costs resulting in the business being more competitive

### 3 Project Review

#### 3.1 Milk Powder Project

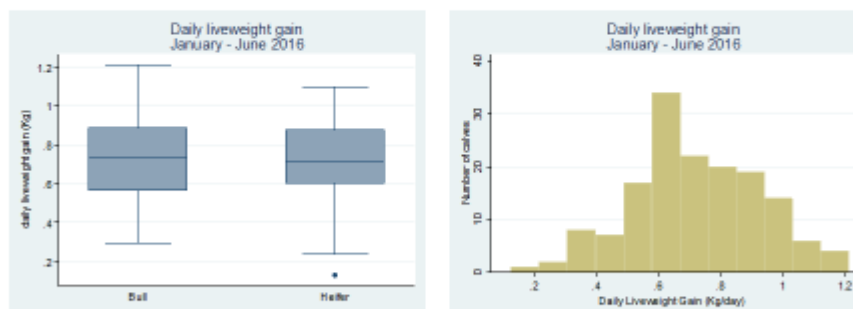
Following the initial visit from Dai Grove-White the recommendation was made to increase the quantity of milk powder fed to calves to a maximum of 6 litres for a 10 day period. The improvements in DLWG suggested that increased total milk fed resulted in an increase in DLWG.

#### Calf Management

- Calves purchased at 14-21 days
- “All in-all out” system
- Kept in pens of 25 calves on automatic feeder
  - Fed 6L for 10d @ 15% = 0.9 Kg daily MR
  - Then 4L for 8 days
  - Then dropped down at 0.2 l per day & weaned
- Sold at ~170 Kg (spend 16 weeks on farm)

Final weights taken in January - May 2016

Growth rates DLWG = 0.72  
(range 0.126 – 1.21 Kg/day)

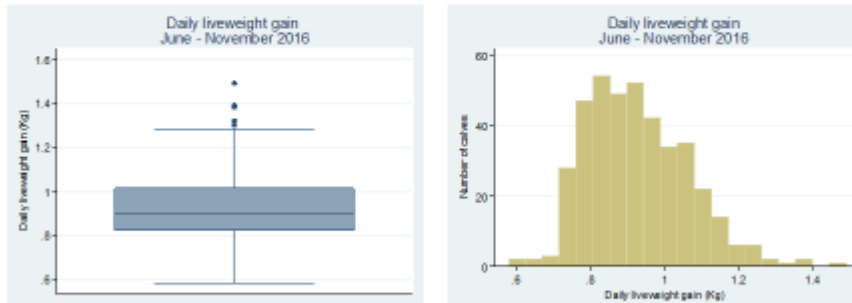


The average daily liveweight gain in the period from January to May 2016 was 0.72 DLWG. This increased to 0.93 kg DLWG in the following period to November 2016, which could have been attributed to some of the minor building improvements made and increasing the quantity of milk powder fed.

However more detailed information on the changes made in terms of, the type of milk powder used, mixing concentration and volumes fed would have given the results obtained more credibility.

## Final weights taken in June – November 2016

Growth rates (DLWG)= 0.93  
(range 0.58 – 1.49)



Improved – impact of extra milk feeding??

### 3.2 Benefits for other Welsh cattle businesses (Dairy, Calf Rearers & Suckler Herds)

The main success of the implementation of the projects was to understanding the limitations of the buildings and identify areas for minor improvements which are key messages for all livestock producers.

One area identified by Dai-Grove White at the meeting was the risk from Mycoplasma.

The risk of Mycoplasma contamination is reduced in a calf rearing situation by running an all-in and all out system to reduce carry over of infection.

Control in a dairy herd or suckler herd would be considerably different, and is an area of concern. Mycoplasma bovis has spread at a significant pace in New Zealand with the Government trying to control the disease by introducing a herd culling program for infected herds. The level of infection in the UK is not well understood.

It is vital that moisture in the shed is kept to a minimum as Mycoplasma can survive well in damp conditions. Keeping the feed equipment clean and disinfected between groups of calves is also important. In the case of Llindir and the general increase in the popularity of automated calf feeding machines with all calves suckling from the same teat this might become more of a challenge in the future.

In order to monitor Mycoplasma levels, future calf projects could involve Mycoplasma screening to see what the exposure levels are in different herds and groups of calves. This could raise awareness of the disease amongst farmers, vets and the wider industry.



### 3.3 Alignment with dairy / Beef sectors strategic goals

This work contributes to the Welsh Dairy / Beef Sector's strategic objectives; specifically in relation to ***Strategic aim 3 - To improve the business performance of producers and processors in response to changing market conditions, environmental requirements Climate Change and consumer demands.***

The success of the project has resulted in the business being more profitable due to improved growth rates, reducing the carbon footprint as well as meeting consumer demands in improving animal welfare whilst also reducing overall antibiotic usage.

## 4 Impact on the industry

### 4.1 Impact on individual business

The pneumonia message and the need to improve ventilation has come over strongly from the work at Llindir with a clear message to take home for individual businesses. Development of a BRD Scoring to identify mildly affected calves which would not have otherwise been detected is an interesting concept but probably too early for practical use.

A simple message that needs further communication with individual businesses is the importance of monitoring calf temperatures on a daily basis to pick up the mildly affected calves.

The key messages are not so clear from the project that looked at increasing the level of milk powder feeding which resulted in a positive increase in DLWG. More information could have been collected on the quantity, concentration and type of milk powder used.

The milk replacer market is a competitive one and understanding the implications of ingredient choices and inclusion rates is important. Things like Vitamin A and Vitamin D3 tend to be included at a fairly standard rate across the board, but other areas can be more of a minefield.

The level of protein and sources of protein are an important consideration. Protein from dairy-based (skimmed milk or whey-based) offer the highest levels of digestibility for calves. There is a need to be wary of powders containing a high level of soya-based protein as these tend to be economical, but not so great nutrition wise.

Commercial milk replacers are often compared based on the percentage of fat on the label, but it is the components of this fat that will impact the subsequent digestion, absorption and growth with the size of the fat globules having an effect on digestibility. Coconut oil is equally as useful for calves as it is for humans thanks to its antimicrobial and antiviral properties, but needs using in conjunction with other oils to prevent scours.

Lower oil/fat milk powder formulations may include higher levels of lactose which, while a good energy source, can impact the osmolality of the product and therefore should be less than 45% of the entire formulation.

Possibly any future projects on calf rearing could focus more on the area of milk powders to give a greater understanding of the types of powder on the market and their suitability in different situations.

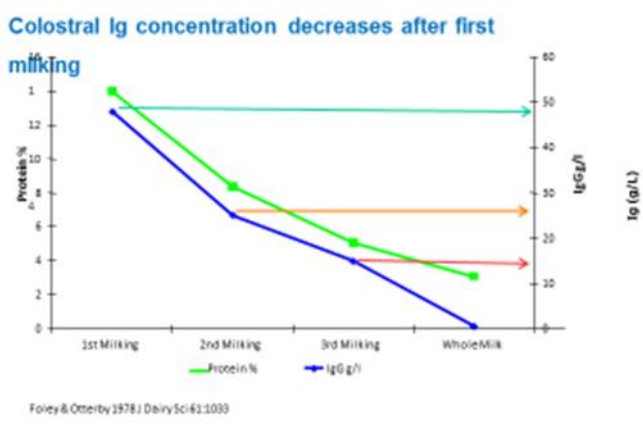
### 4.2 Impact on wider industry

In order to engage with a wider audience the projects could also have had a greater emphasis on the importance of colostrum. Although this was out of Llindir's control, by monitoring the

Serum total protein (STP) to estimate of IgG in the blood in young calves it could be used to assist the choice of where calves are purchased from. Such thinking will help develop more of an integrated supply chain.

Numerous research studies have shown that total protein of 5.2 to 5.5 g/dl indicates that calves have achieved “successful passive transfer” of immunity – that is, a serum IgG concentration  $\geq 10$  g/L. Other simple messages could focus on the importance of ensuring that calves receive 4 litres of colostrum in the first 6 hours of life and how the quality of colostrum decreases after the first milking.

## Colostrum – quality decreases after first milking

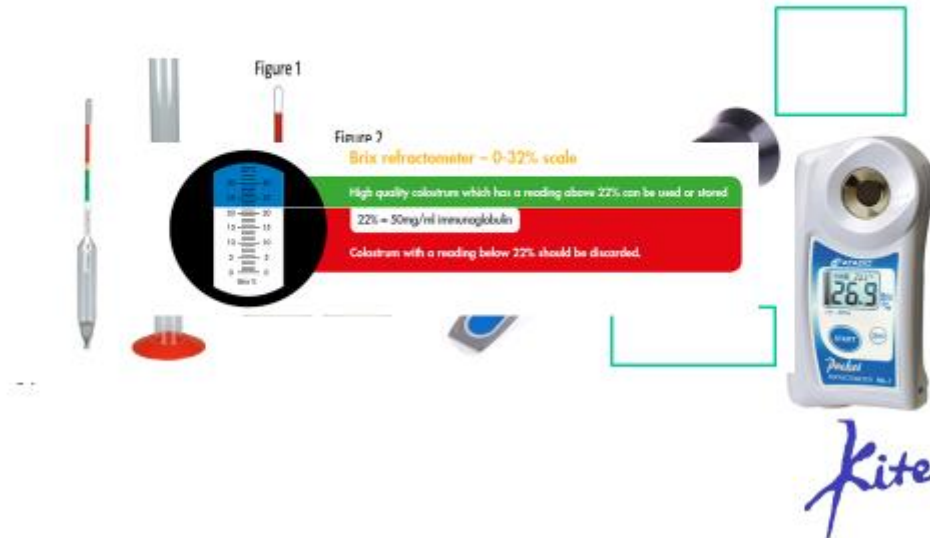


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For the wider Welsh Dairy industry which is the source for most calves in to calf rearing units the developments in testing colostrum quality are further areas that could be considered in future projects.

# Testing colostrum quality

## Colostrometer or Brix refractometer



Other impacts on the wider industry for dairy and beef herds include reaching the target of calving heifers at 2 years of age. Even for the dairy industry 2 year calving is not being achieved with the average age at calving for NMR herds at 28 months. More often than not the main limitation is the calf rearing phase. Calving heifers older than 2 years has further implications on future performance.

## Age at calving – target vs actual

Source	Average Age (months)	Average Age (Days)	Reduction required (days) to achieve 24 month
Target (achieving weights)	24	720	
NMR	28.8	864	144

*Kite*

The impact of age of calving on future performance is shown below and clearly shows the positive effect of calving as near as possible to 2 years of age.

## Effect of age at calving and future performance

Calving Age (months)	22-23	24-25	26-28	32-36
Pre-calving weight (kg)	591	621	625	769
Calving Assistance	17%	17%	27%	67%
Cows still alive 5yrs	86%	62%	41%	33%
Total 5yr milk yield (kg)	25,031	20,395	16,671	8,029
Time in milk during first 5	48%	42%	38%	18%



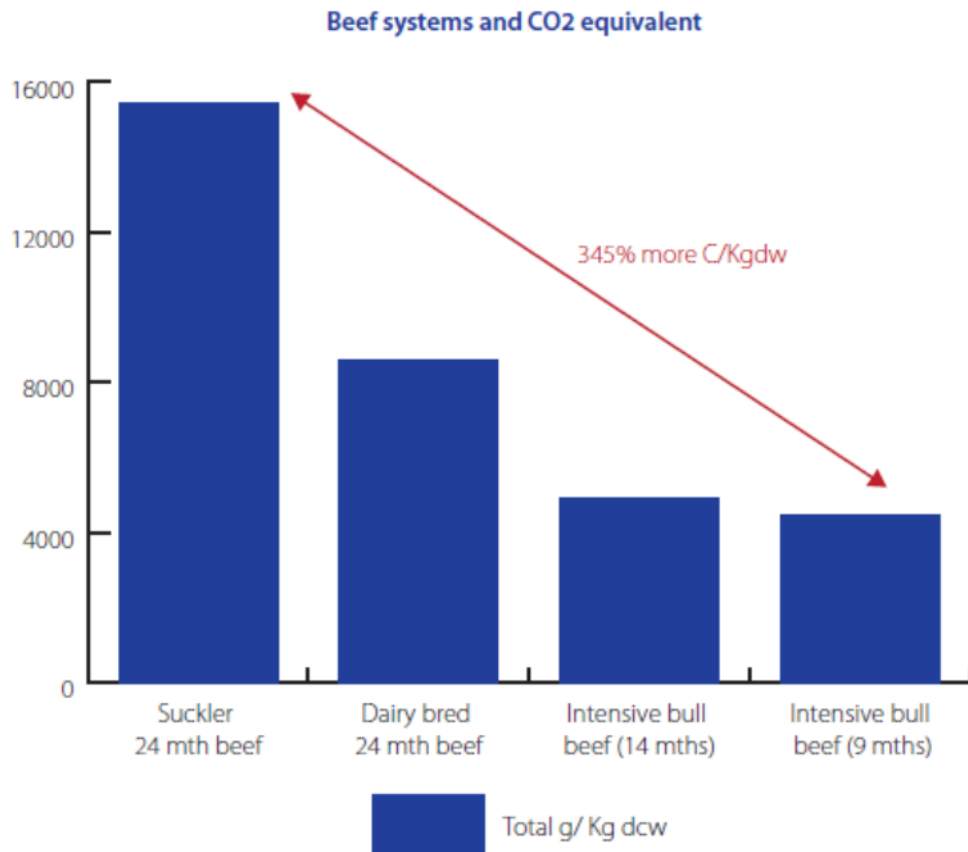
### 4.3 Impact on Welsh Government's cross cutting and priority themes

#### Climate change

The UK government is legally required to reduce greenhouse gas emissions across agriculture by 80% of the 1990 levels, by 2050 (there is also an interim reduction target of 11% by 2020). Agriculture has to play a key role in achieving these reductions. Through better animal health, increased meat DLWG and reduced mortality rates, had the potential to reduce its carbon footprint.

Analysis of various beef production systems indicate that the quicker beef animals are finished, the lower their carbon footprint as a result of increased Feed Conversion Efficiency (FCE). Maximizing calf health and growth rates will therefore lower the carbon footprint per kilo of liveweight gain.

The CO<sub>2</sub> equivalent is based on modelling the methane, nitrous oxide and direct CO<sub>2</sub> emissions from the different systems on a Life Cycle Analysis (LCA) methodology. The results are summarised on the graph below:



### Animal Health and Welfare (AHW)

Through a reduction in the use of antibiotics (through less infection) as well as improved calf health and overall levels of calf welfare were improved which has resulted in improved growth rates and reduced mortality. Benefit to the industry and consumers through highlighting ways farms are utilising research in building design and disease identification to benefit calf welfare and reduce antibiotic usage. The benefits are just as applicable to the dairy and beef sector and thus any future projects on calf health have the potential to reach a wide audience.

### Future Generations

By being able to reduce levels of calf pneumonia, the resulting financial benefit increases overall farm profit levels. This not only reduces cost of production but retains more money within the business to allow businesses to cope with milk price volatility. This in turn ensures that the business is more viable in the long-term.

### The Natural Environment

The reduction in usage of antibiotics per farm not only reduces the level of meat withdrawal, but also reduces risk of antibiotic failures as well as any antibiotic residues.

### Tackling Poverty

By developing profitable technical efficient livestock production systems, typically the additional monies are then reinvested back into the business. This results in more money being spent in the locality with suppliers to the business, resulting in continuation of job retention in local communities.

### **Health & Safety**

Improving overall herd health begins with rearing healthy disease free calves, resulting in the reduced need for antibiotic treatments, risk to staff of being hurt or kicked by cattle reduces due to there being a reduced number of calf/ cow interactions.

