

**An evaluation of the importance of cow comfort for the health of cows on large scale dairy enterprises.**

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Report for the Farmers Club Charitable Trust Agricultural Educator Awards 2018

## Acknowledgments

This study tour would not have been possible without the generous financial support from the Agricultural Educator Award provided by the Farmers Club Charitable Trust. I would like to thank Meryl Ward, Des Lambert and Charles Abel for their advice and support during the process.

I would like to thank all the dairy farmers who hosted me, especially to Dr Donald Niles and his wife, Ann, for making me feel so welcome. Thank you for sharing your time, knowledge and experiences with me during my study tour. I would also like to thank my employers and colleagues at Harper Adams University for allowing me the time to undertake the study. And finally, a huge thank you to Mr Gustavo Barboza for accompanying me on the study tour.

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## **Summary**

In recent years, the UK dairy industry has faced many challenges, including the volatility of milk prices. This has seen a decline in the number of dairy producers in the UK which currently stands at 8,859 (AHDB dairy, 2019). In the past six months alone, there has been a decrease of 4.6% (AHDB dairy, 2019). The UK dairy industry is observing a shift from small family run dairy farms to large scale dairy enterprises also known as 'mega or super dairies'. There has been a significant amount of negative attention within the media regarding these mega/super dairies. The main issue surrounding large scale dairy farms is concerns about cow health and welfare.

This report set out to investigate whether large scale dairy enterprises have an impact on cow comfort, health and welfare by using CowSignals assessments. 8 mega dairy units in the state of Wisconsin, USA were visited. These ranged from 780 to 8,400 cows and one 2,200 dairy unit was visited in the UK. Positive aspects of the farms were highlighted; some of the main points being excellent production levels, high levels of milk quality and excellent maternity care was provided to the cows. Some critical CowSignals observations were mainly focused in the housing environment and these included; perching on beds, issues with water troughs, and shiny metal. Recommendations such as increasing the volume of green bedding to cubicle beds, increasing the water temperature of the troughs and installation of back scratchers were suggested to farmers in order to improve the cows' environment.

It was clear from my study tour that these large scale dairy enterprises are focused on continually improving cow comfort, health and welfare in order to achieve maximum productivity from their cows.

## **Introduction**

In recent years, the UK dairy industry has faced many challenges, including the volatility of milk prices. This has seen a decline in the number of dairy producers in England and Wales which currently stands at 8,633 (AHDB dairy<sup>a</sup>, 2019). In the past six months alone, there has been a decrease of 4.6% (AHDB dairy<sup>a</sup>, 2019). Despite the decreasing number of dairy producers, there has been a 5.7% increase in cow numbers in the past five years (AHDB dairy<sup>b</sup>, 2019).

The surviving dairy farms are increasing their herd sizes and are implementing more intensive practices that support higher milk yields to enable them to become a more successful and profitable business. Milk production per cow has been steadily increasing. AHDB dairy<sup>c</sup> (2019) reports that the average yield per cow in 2018 was approximately 7,959 litres. This is due to many factors including; enhanced breeding and genetics, better management strategies and the introduction of new technology.

The UK dairy industry is observing a shift from small family run dairy farms to large scale dairy enterprises also known as 'mega or super dairies'. In 2017, it was documented that there were 21 mega dairies in the UK (Wasley and Davies, 2017).

In 2009, a planning application was submitted to North Kesteven District Council for an 8,100 dairy cow unit at Nocton Heath, Lincolnshire. This caused phenomenal controversy amongst the general public due to concerns surrounding cow welfare and this led to a media frenzy who were reporting it as a 'battery farm for cows' (Davies, 2010). It even led to an Early Day Motion signed by 172 MP's in the House of Commons (Davies, 2010). After concerns raised by the Environmental Agency, the plans were revised and re-submitted in November 2010 for a 3,770 dairy cow unit. Organisations such as Compassion in World Farming (CIWF), Vegetarians International Voice for Animals (VIVA) and the World Society for the Protection of Animals (WSPA) instigated opposing this planning application, claiming that 'the welfare of the animals will suffer from being permanently housed indoors and subjected to a high-yielding regime' (Levitt, 2010). In February 2011, the planning application was withdrawn but North Kesteven District Council had intentions of rejecting the planning application due to a number of environmental issues (CIWF, 2019).

Despite the fact that the planning application for this 'mega dairy' was rejected, there are a number of 'mega/super dairies' operating in the UK. Therefore, I intend to investigate using my CowSignals training whether cow comfort, health and welfare are compromised on large scale dairy enterprises. I would like to identify management strategies and techniques that are currently being used to improve cow comfort, health and welfare and to consult with dairy farmers in the UK on how this can be applied to their farms. My other intentions would be to educate students on intensive dairy systems and educate the general public about these systems to reduce the negative perceptions the UK dairy industry often encounters.

I visited the state of Wisconsin, USA for my main study tour as there are a large number of large scale dairy enterprises operating there. I was able to evaluate the cow comfort, health and welfare of 8 dairy farms ranging in herd size (from 780 to

8,400 cows). I was also able to visit a 2,200 dairy cow unit in the UK. I have decided to keep the names of the farms anonymous to protect them.

The following report will describe my findings and evaluate cow comfort, health and welfare on large scale dairy enterprises.

## **1. Large Scale Dairy Enterprises**

### **1.1 Intensive dairy production systems**

In the UK, there is no specific definition of the term 'mega/super dairy', however it is used to describe livestock facilities that are much larger than the UK average (Parliament UK, 2012). The US defines a mega/super dairy as a Concentrated Animal Feeding Operation (CAFO) (Davies and Walsey, 2017). This is defined as 'agricultural operations where animals are kept and raised in confined situations. Animal Feeding Operations congregate animals, feed, manure and urine, dead animals and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures, fields or rangeland' (Overcash, 2011). Dairy Cow Production systems in the USA are categorised into three size thresholds; Small CAFO's (less than 200 cows), Medium CAFO's (200-699) and Large CAFO's (700 + cows) (Overcash, 2011).

Intensification can be measured in multiple ways, including; the increase in farm output, herd size, feed concentrate use per unit of land or per head, produce per head and produce per unit of land (Gonzalez-Mejia *et al.*, 2018). Improving the genetic merit of the breeds can also be considered (Alvarez *et al.*, 2008). The intensification of livestock production systems is considered to be detrimental to the environment (Bava *et al.*, 2014). In order to operate an intensive production system, a permit issued by the relevant environment agency is required (Environment Agency, 2010).

### **1.2 Advantages of large scale dairy enterprises**

There are many advantages to large CAFO's. These include; lower cost of production which means larger farms have higher levels of profitability. This is supported by a study carried out by MacDonald *et al.*, (2007) where profits and costs were analysed when looking at the changing structure of the dairy industry in USA.

Large CAFO's have leverage in terms of economics of scale in capital and labour, spreading costs and labour over more cows and litres of milk. To increase farm efficiency and lower production costs, these farms often have newer equipment and up to date technology. Larger farms have relatively more equity and liquidity which allows them to leverage during good and bad financial situations. They also have the ability to use market-based risk tools more effectively.

### **1.3 Disadvantages of large scale dairy enterprises**

As previously mentioned, there are many factors that large CAFO's have to overcome. These include; public concerns around the health and welfare of dairy cows. In the UK, all farmers are expected to abide by the Farm Animal Welfare Council's, 5 Freedoms. As with the Nocton dairy unit application, there are concerns about the environmental risks and impacts these large scale dairy farms have on the environment, particularly relating to urine, manure and bedding material. Recent advances in dairy production systems have seen the industry develop methods to reduce these impacts including Anaerobic Digesters and recycled manure solids (RMS) (also known as green bedding) (Leach *et al.*, 2015). The Dutch dairy technology firm, Hanskamp has developed a 'cow toilet' which stimulates urination and collects the urine of dairy cows (Martin, 2019). The concept is to reduce ammonia emissions on farm and use the concentrated urine in precision fertilisation (Martin, 2019). Another major concern regarding large scale dairy enterprises is the use of anti-biotic medication and the impacts this has on antibiotic resistance. Both the USA and the EU have taken steps to regulate the use of antibiotics in agriculture. The main issue surrounding large scale dairy farms is concerns about cow health and welfare. So how can we reassure the public that these systems do not infringe on cow comfort, health and welfare? The answer is by carrying out an assessment of the cows using CowSignals.

## **2. What are CowSignals?**

The CowSignals training company was founded by two veterinarians from the Netherlands (Joep Driessen and Ian Hulsen) in 1997. Their goal is to improve animal health, welfare and management on dairy farms across the world to improve cow productivity by up to two additional lactations (CowSignals, 2019). Studies have shown that by going from 2.5 lactations to 5 lactations with an age of first calving at 23 months, this can reduce methane production by 30% (Van Duifhuizen, 2015).

CowSignals is observing the cows in their environment and understanding the body-language of the cow and herd. Visual assessments are carried out at the feed barrier, amongst the cows in their environment and assessing individual cows. In order to assess the cow's health and welfare, the assessor must follow the CowSignals Diamond (Figure 1). They will assess all aspects of dairy cow management with regards to feed, water, light, air, rest and space. Upon assessing the cows and the environment they live in, an evaluation can be made. Feedback can be provided to the farmers on areas of what is going well on farm, what critical CowSignals were observed and suggestions on where improvements could be made to reduce these critical cowsignals.





**Figure 1. Diagram of the CowSignals diamond to assess the health of a dairy cow**

(Source; CowSignals<sup>a</sup>, 2019)

### **3. Farm Evaluations based on CowSignals assessments.**

#### **3.1 Farm A Information**

**Table 1. Relevant Farm Information for Farm A**

No. of Milking Cows	Approx. 5400
No. Of Dry Cows	450
No of heifers	450
No of acres	8800 – Crop production: grow own corn silage and haylage
Housing type, stocking capacity	Free stall barns with green bedding system. Most barns over overstocked by 20%
Calf Housing	Nursery barns with individual pens ( 2miles from main site)
Milk Yield	Approx. 85 Lbs/day (39 litres per day)
Contract & milk price	UNABLE TO ANSWER THIS
Economic cost of production	Approx. 14.15 dollars per 100lbs of milk to break even
Fat %	4.2%
Protein	3.37%
Somatic Cell Count	120 000 cells
No of mastitis cases per week	Approx. 20 per week.
No of lactations	Approx. 4
Lactation length	160-170 days
Dry Cow length	45-50 days

#### **FERTILITY INFORMATION:**

Calving Pattern	AYR
Calving interval	13 months
Pregnancy rates	50%

Calving pens	Nursery barns
Age at first serving	13 months
Age at first calving	22 months
Fertility monitoring methods	Double off sync programme (Tail Paint/Heat Detection)
AI/Natural Serving	AI. Sexed semen used.

## **NUTRITION:**

Grazing Management Strategy	None – Cows are all housed.
Feed Ration	TMR
No of push ups per day	Every 90 minutes
Total feed costs	6.47 dollars per cow.

Farm A are milking three times per day on a 72 point rotary parlour. They are milking 550 cows per hour. The farm is TB free but does have a problem with Johnes Disease. They are currently testing and cull any positive cows.

### **3.1.1 Positive Aspects of Farm A**

Farm A are producing high volumes of milk (approx. 39 litres/day/cow) and the quality of the milk is also very good with 4.2% fat and 3.37% protein levels with a low somatic cell count of 120,000 cells/ml. Farm A take pride in their excellent maternity and nursery care. They have a high pregnancy rate at 50%.

### **3.1.2 Critical CowSignals Observed**

The main CowSignals that were observed included perching on the beds. This could be an indication that there were not enough beds to accommodate for the number of cows present in the barn. Another suggestion could be that the cows had a preference as to where they would lie down in the barn.

When walking through the cubicle housing, it became apparent that a number of the cows had some abrasions to their carpal joints and brisket. These injuries may have come from the type of bedding that is used in the cubicle housing. Currently the cows are bedded down on green bedding. This is a very fine material which kept being blown away due to the well ventilated fan system. The shape and material of the brisket board could have also contributed to these injuries.

### **3.1.3 Suggested Improvements**

Based on the CowSignals assessments, the main areas for improvement for Farm A are to add green bedding to the stalls. This will encourage the cows to lie down for longer periods of time and hopefully, reduce the number of cows with abrasions to their briskets, carpal and hock joints. Cows should always have access to their ration, this will help to improve rumen scores.

## **3.2 Farm B**

### **3.2.1 Farm B Information**

**Table 2. Relevant Farm Information for Farm B**

No. of Milking Cows	Approx. 604
No. Of Dry Cows	75
No of heifers	On site – 150, of site at heifer rearing facility - 430
No of acres	440 mainly growing alfalfa and corn silage. Some wheat production
Housing type, stocking capacity	Free stall Cross Vent Barn System. Overcrowded – 150% - increased production when went above 535 cows. However, no overcrowding in dry cow yard or Fresh calved cows. Deep sand beds, sand added every Weds afternoon.
Calf Housing	Outdoor individual hutches then moved to group hutches at day approx. 75-80days
Milk Yield	47.6 litres per day, milk tanker comes 8 times per week.
Contract & milk price	July milk price – 15.62 dollars per 100lbs of milk
Economic cost of production	Approx 15.50 dollars per 100lbs of milk
Fat %	3.65%
Protein	2.95%
Somatic Cell Count	127 000 cells
No of mastitis cases per week	Approx. 4. Have issues with water sprinkler system, runs off cows back and increases mastitis.
No of lactations	Approx 4 as sell dairy cows but one cow is in 10 <sup>th</sup> lactation!
Dry Cow length	2 yr olds – 60 days Older cows- 50 days Only dry off 1 day per week. Using antibiotics on all dry cow therapy and teat sealant.

**FERTILITY INFORMATION:**

Calving Pattern	AYR
Calving interval	12.4 months, 377days
Calving pens	Individual outside
Age at first serving	13 months
Age at first calving	22 months
Fertility monitoring methods	Pre sync/off sync. Tail painting
AI/Natural Serving	AI. Sexed semen used on heifers (1 dose only). Wants to start using on rest of cows

Bull Calf management	Picked up 3 times per week. Receives 225 dollars for beef, only 60 dollars for Holsteins
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**NUTRITION:**

Grazing Management Strategy	All cows housed in same barn. Dry Cows have access to grazing (although very muddy on observation). Return heifers have access to 10 acres of grazing
No of push ups per day	21
Total feed costs	Lactating dairy cows (high yields) – 6.25 dollars per cow

Farm B is milking three times per day in a double 16 parallel system. The fresh cows are milked six times per day. The farm is TB and Johne’s Disease free.

**3.2.2 Positive Aspects of Farm B**

Farm B are producing very high volumes of milk (approx. 47.6 litres/day/cow) and with a low somatic cell count of 127,000 cells/ml. Farm B have excellent conception rates at 52%. The cross vent barn system allows for excellent ventilation. Despite the fact that the barn was overstocked by 150%, there was very little evidence of waiting or perching cows (Figure 2).



**Figure 2. Cows lying uniform in a cross vent barn system that is overstocked by 150%**

(Authors Own, 2018)

### 3.2.3 Critical CowSignals Observed

The main CowSignals that were observed in this system was the presence of lots of shiny metal (Figure 3 & Figure 4) and the barn was rather noisy from the cows scratching at the feed barrier. This is an indication that there were no back scratchers present.



**Figure 3. Shiny metal present at feed barrier. This was where the cows were scratching**

(Authors Own, 2018)



**Figure 4. Shiny metal on neck rail**

(Authors Own, 2018)

The other main CowSignals observation was that the cows were splashing when drinking from the water trough. This was recorded on video. The water troughs were full and very clean so this CowSignal would suggest that the water temperature was too cold for the cows.

### 3.2.4 Suggested Improvements

Based on the CowSignals assessments, the main areas for improvement for Farm B are to add back scratchers to this cross vent barn system but without reducing cow flow. This will reduce the amount of shiny metal present and also reduce the noise from the feed barrier. The other improvement to be made would be to increase the temperature of the water in the troughs to reduce the splashing behaviour and increase the volume of water the cows consume.

## 3.3 Farm C

### 3.3.1 Farm C Information

#### FARM INFORMATION:

**Table 3. Relevant Farm Information for Farm C**

No. of Milking Cows	Approx. 2964
No. Of Dry Cows	300
No of heifers	TLO; 3752
No of acres	0 – buy all feed in.
Housing type, stocking capacity	Free stall barns, using green bedding 336 cows in pen with 274 self-locking yolks = approx. 15% over
Calf Housing	Calf Nursey with individual pens and outdoor hutches for bull calves.
Milk Yield	Approx. 86 Lbs/day (39 litres per day) milk tanker comes 4 times per day.
Contract & milk price	July milk price – 16.25 dollars per 100lbs of milk
Economic cost of production	Approx. 16.70 dollars per 100lbs of milk
Fat %	3.87%
Protein	3.14%
Somatic Cell Count	165 000 cells
No of mastitis cases per week	Approx. 35. Stay in hospital pen for 5 days
No of lactations	Approx. 2.8-3 but some cows are in 8 <sup>th</sup> lactation!

#### FERTILITY INFORMATION:

Calving Pattern	AYR
Conception rates	36%
Calving pens	Inside nursery hutches
Age at first serving	12 months
Age at first calving	22 months

Fertility monitoring methods	Heat detection/Tail painting
AI/Natural Serving	AI. Sexed semen used
Bull Calf management	Sold at 3 days old (achieve approx.. 40 dollars per bull calf)

## NUTRITION:

Grazing Management Strategy	N/A
Feed Ration	TMR – each cow (DMI = 56lbs per cow).
No of push ups per day	24 (1 per hour)

Farm C are milking three times per day in a double 24 parallel system. The herd is TB free but Johnes Disease is present. The farm are continually testing for this.

### 3.3.2 Positive Aspects of Farm C

Farm C are producing high volumes of milk (approx. 39 litres/day/cow) with low somatic cell counts of 165,000 cells/ml. Farm C prides itself on excellent maternity care.

### 3.3.3 Critical CowSignals Observed

The main critical CowSignals observed were carpal abrasions. On Farm C, the green bedding was very deep and appeared to be comfortable for the cows to lie on. However, there was very little coverage over the brisket board and due to this being made of concrete, some abrasions were observed. Many cows also preferred to have their front legs over this board instead of tucking their legs under. This could impact on their lying time and also cause lameness issues. There was some evidence of perching in the cubicle stalls. This is very similar to that seen in Farm A. Both Farm A and C are very similar systems.

Another major critical CowSignals observed on Farm C was tongue rolling. This was recorded on video. Tongue rolling is considered to be a stereotypic behaviour (Relic *et al.*, 2012). This is carried out when the cow is struggling to cope with her environment.

### 3.3.4 Suggested Improvements

Based on the CowSignals assessments, the main areas for improvement for Farm C are to add more bedding to the stalls and try to cover the brisket board. The shape of the brisket board may also need to be taken into consideration with the possibility of rounding the concrete off to obtain a smoother finish. Farm C also needs to provide the cows with more enrichment opportunities to reduce the stereotypic behaviours that have been observed.

## 3.4 Farm D

### 3.4.1 Farm D Information



**FARM INFORMATION:****Table 4. Relevant Farm Information for Farm D**

No. of Milking Cows	Approx. 2100
No. Of Dry Cows	260
No of heifers	Owens 6—acres, rents – 600-900 acres. Grows Haylage, Alfalfa, corn silage.
No of acres	0 – buy all feed in.
Housing type, stocking capacity	Free stall barns, tunnel ventilated. 110-112% overstocked.
Calf Housing	Individual hutches and then into group housing at 11 weeks of age.
Milk Yield	Approx. 96 Lbs/day (44 litres per day) milk tanker comes 4 times per day.
Contract & milk price	July milk price – 14.10 dollars per 100lbs of milk
Economic cost of production	Approx. 18.00 dollars per 100lbs of milk
Fat %	4.0%
Protein	3.2%
Somatic Cell Count	135 000 cells
No of mastitis cases per week	Approx. 4-5 per week.
No of lactations	Approx. 2.5, farm are very successful with heifers.
Lactation length	
Dry Cow length	45 days . Give antibiotics to all cows. No teat sealant given.

**FERTILITY INFORMATION:**

Calving Pattern	AYR
Calving interval	13 months
Conception rates	45%
Calving pens	Outdoor individual hutches
Age at first serving	390 days
Age at first calving	22-23 months
Fertility monitoring methods	Tail painting
AI/Natural Serving	AI. Sexed semen used
Bull Calf management	Sold every day and getting approx. 50-60 dollars for bull calves

**NUTRITION:**

Grazing Management Strategy	N/A – some exercise lots for heifers
Feed Ration	TMR – corn silage, haylage, gluten seed, cotton seed and protein blend.
No of push ups per day	Fed twice per day (5-7am & 12-1pm), push ups are done hourly.



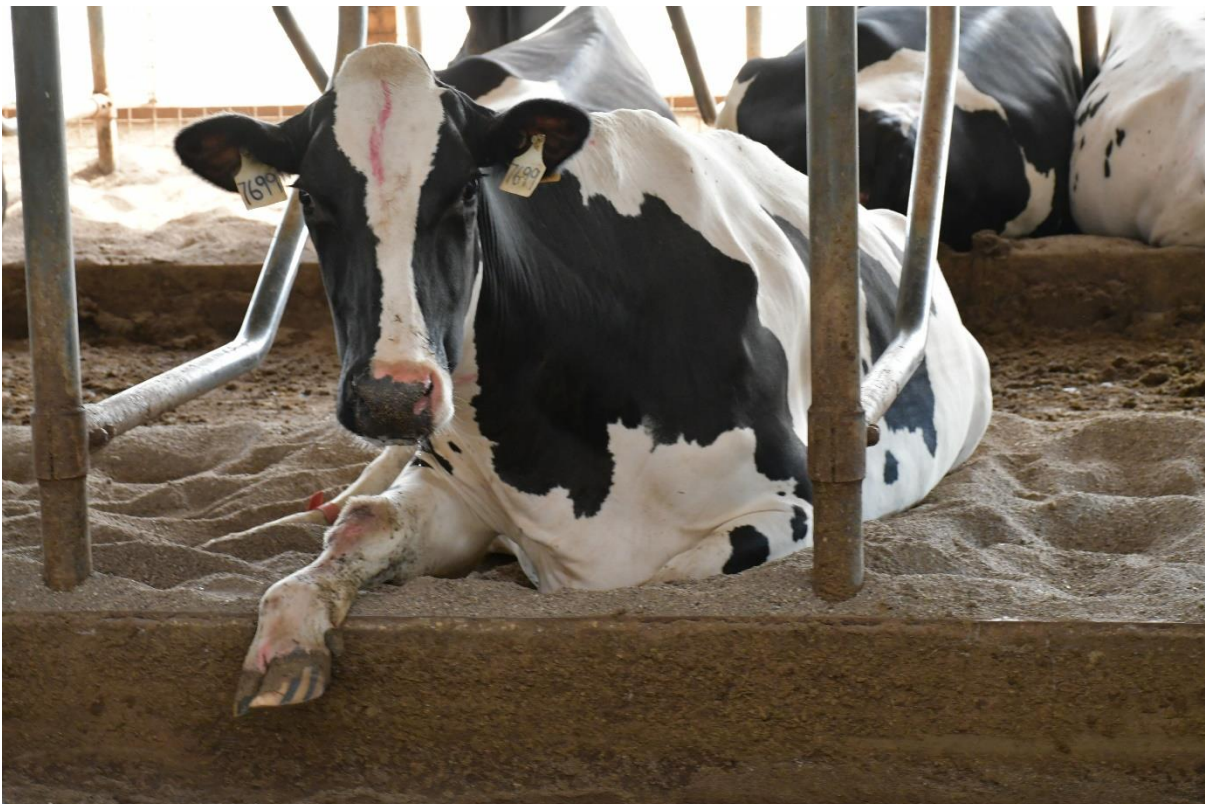
### 3.4.2 Positive Aspects of Farm D

Farm D are producing high volumes of milk (approx. 44 litres/day/cow) with very low somatic cell counts of 135,000 cells/ml. Farm D have a high fat percentage of 4%. There was very little difference between the cows and heifers. The heifer rearing barn was excellent, the calves looked in very good condition and were used to the cubicle housing.

### 3.4.3 Critical CowSignals Observed

Please note: It was difficult to fully assess the cow comfort, health and welfare of Farm D due to being escorted around the unit. Therefore, CowSignals observations could only be made at the feed barrier and so it was difficult to take photographic evidence of some observations.

The main critical CowSignals observed were carpal abrasions. On Farm C, the green bedding was very deep and appeared to be comfortable for the cows to lie on. However, there was very little coverage over the brisket board and due to this being made of concrete, some abrasions were observed. Many cows also preferred to have their front legs over this board instead of tucking their legs under (Figure 5). This could impact on their lying time and also cause lameness issues. There was also a huge problem with flies on Farm D. This could cause distress to the cows and be a risk of disease transmission i.e. summer mastitis.



**Figure 5. Cow with outstretched leg with evidence of carpal joint abrasions.**

(Source: Authors Own, 2018)

### 3.4.4 Suggested Improvements

Based on the limited CowSignals assessments, the main areas for improvement for Farm D are to add more bedding to the stalls and try to cover the brisket board to reduce the carpal abrasions. The farm also needs to look at fly eradication schemes.

## 3.5 Farm E & F

### 3.5.1 Farm E & F Information

Please note that Farms E & F are run by the same company but are based on two different sites.

#### FARM INFORMATION:

**Table 5. Relevant Farm Information for Farms E & F**

	<b>FARM E</b>	<b>FARM F</b>
No. of Milking Cows	Approx. 3300	Approx. 4400
No. Of Dry Cows	500	650
No of heifers	0 – at farm F	Non Lactating - 2000
No of acres	Between both farms – 11 000 acres	
Housing type, stocking capacity	Free stall barns with green bedding system. Some overstocking.	Free stall barns with green bedding system. Overstocking at 110-120%
Calf Housing		Indoor group housing in barns
Milk Yield	Approx. 77 Lbs/day (35 litres per day) – this is due to some heat depression. It normally averages 80lbs/day	Approx. 80lbs/day (36 litres/day)
Contract & milk price	July/August milk price – 17.20 dollars per 100lbs of milk	July/August milk price – 17.20 dollars per 100lbs of milk
Economic cost of production	Approx. 15.64 dollars per 100lbs of milk – Grande Cheese	Approx. 14.60 dollars – milking 400 more cows here
Fat %	3.9%	3.7%
Protein	2.9%	2.9%
Somatic Cell Count	130 000 cells	130 000 cells
No of mastitis cases per week	Approx. 2% of milking herd.	Approx. 1.5% of milking herd.
No of lactations	Approx. 2.1. Has a high cull rate due to 38% replacements.	Approx. 2.1. Has a high cull rate due to 38% replacements.
Dry Cow length	Approx. 55-60 days or can be as low as 45 days. Given selective Dry Cow Therapy	Approx. 55-60 days or can be as low as 45 days. Given selective Dry Cow Therapy

## FERTILITY INFORMATION:

	FARM E	FARM F
Calving Pattern	AYR	AYR
Calving interval	Approx. 390 days	Approx. 390 days
Conception rates	42% - pregnancy rates = 27%	48%
Calving pens		Group housing on slatted system in indoor barns
Age at first serving	13 months	13 months
Age at first calving	23 months	23 months
Fertility monitoring methods	Tai paint. Time insemination programme used.	Tai paint. Time insemination programme used.
AI/Natural Serving	AI. Sexed semen used	AI. Sexed semen used
Bull Calf management	Sold within first week for approx. 28 dollars	Sold within first week for approx. 28 dollars

## NUTRITION: BOTH FARMS HAVE THE SAME NUTRITION INFORMATION

Grazing Management Strategy	None
Feed Ration	TMR
No of push ups per day	12

### 3.5.2 Positive Aspects of Farm E and F

Farm E and F have very good conception rates at 42-48%. They have an efficient milking routine with good protocols for staff to follow. This is supported with low somatic cell count results at 130,000 cells/ml. The company has excellent processes in place to make the farm as sustainable as possible. This includes the Green Bedding processing facility.

### 3.5.3 Critical CowSignals Observed

The main critical CowSignals observed were lameness issues. There was evidence of the cows slipping due to problems with the sprinkler system and the passageways being water logged. This also impacted on the hygiene of some the cows and caused the hygiene scores to be high. On farm F, the farmer had issues with overcrowding in one shed. The cows would only go so far down the shed and not utilise the rest of the space. This was not a problem during winter months (when windbreaks are put up on the outside of the sheds). Upon further investigating, the shed in question was too close a wooded area and the cows demonstrated hesitation behaviour.

### 3.5.4 Suggested Improvements

The main areas for improvement for Farms E and F are to improve the sprinkler cooling system to avoid the passageways from being flooded with water. The angle of the sprinkler could also be altered so the moisture runs down the shoulders of the

cows rather than on the hook bones and avoid the risk of water potentially running down onto udders.

### 3.6 Farm G

#### 3.6.1 Farm G Information

#### FARM INFORMATION:

**Table 6. Relevant Farm Information for Farm G**

No. of Milking Cows	Approx. 3240
No. Of Dry Cows	350
No of heifers	200
No of acres	10 000 – Crop production, Corn, Soya, Alfalfa and wheat.
Housing type, stocking capacity	Free stall barns with green bedding system. Depends on which pen as to whether there is over stocking or not.
Calf Housing	Nursery barns with individual pens
Milk Yield	Approx. 92.5 Lbs/day (42 litres per day)
Contract & milk price	July/August milk price – 17.20 dollars per 100lbs of milk
Economic cost of production	Approx. 15.86 dollars per 100lbs of milk
Fat %	3.9%
Protein	3.2%
Somatic Cell Count	117 000 cells
No of mastitis cases per week	Approx. 21 per week. Poor udder health due to green bedding.
No of lactations	Approx. 2.2. Has a high cull rate due to 42% replacements.
Lactation length	158 days
Dry Cow length	45 days. Given selective Dry Cow Therapy

#### FERTILITY INFORMATION:

Calving Pattern	AYR
Calving interval	13 months
Pregnancy rates	31-32%
Calving pens	Nursery barns
Age at first serving	390 days
Age at first calving	22.5 months
Fertility monitoring methods	Heat detectors
AI/Natural Serving	AI. Sexed semen used on first 3 serves
Bull Calf management	Raise them all. Has a finishing yard in Kansas. Contract with Wendy's

## NUTRITION:

Grazing Management Strategy	None
Feed Ration	TMR – 65% forage ration
No of push ups per day	12-14 times per day

Farm G are milking three times per day in a double 45 parallel rapid release system. The herd is TB free but they have problems with calf pneumonia.

### 3.6.2 Positive Aspects of Farm G

Farm G have excellent production yields (approximately 42 litres per day) with low somatic cell counts of 117, 000 cells/ml. The farm are very proud of the high welfare standards, good land management and sustainability. They provide a lot of training for their staff. This farm prides itself on being the best, it is in the top 10% of the mid-west and 25% of production in the USA. It is evident that this farm tracks every aspect of the cow's key performance indicators. They are very good at tracking health events and having good protocols in place for employees to follow.

### 3.6.3 Critical CowSignals Observed

Please note: It was difficult to fully assess the cow comfort, health and welfare of Farm G due to being escorted around the unit. Therefore, CowSignals observations could only be made at the feed barrier and so it was difficult to take photographic evidence of some observations.

The main critical CowSignals observed were perching on cubicle beds. There was also evidence of some shiny metal in some sheds and some tongue rolling. This has already been identified as a stereotypic behaviour. Farm G also had issues with cows congregated up one end of the barn causing overcrowding.

### 3.6.4 Suggested Improvements

Based on the limited CowSignals assessments, the main areas for improvement for Farm G are to add more bedding to the stalls and more observations need to be done on one of the barns where cows congregate at one end.

## 3.7 Farm H

### 3.7.1 Farm H Information

This was a 2,200 cow unit based in the UK. However, this unit is based upon a similar design to Farm A in Wisconsin.

**FARM INFORMATION:****Table 7. Relevant Farm Information for Farm H**

No. of Milking Cows	Approx. 1820
No. Of Dry Cows	Approx. 280
No of heifers	1200 on a different site
No of acres	2400 – Crop production; Wheat, Barley, Oil Seed Rape
Housing type, stocking capacity	Free stall barns with sand bedding.
Calf Housing	Nursery barns with individual pens until suckling well then moved into group pens (this is carried out a different site)
Milk Yield	Approx. 12, 300 litres per year.
Contract & milk price	Tescos Muller Contract
Economic cost of production	Approx. 25.6p/litre
Fat %	3.9%
Protein	3.4%
Somatic Cell Count	180 000 cells
Bactoscan	18 000
No of mastitis cases per week	Approx. 16% per year
No of lactations	
Lactation length	
Dry Cow length	Given selective Dry Cow Therapy

**FERTILITY INFORMATION:**

Calving Pattern	AYR
Calving interval	374 days
Pregnancy rates	28%
Calving pens	Nursery barns – Individual until suckling well then moved into group pens
Age at first serving	
Age at first calving	22.6 months
Fertility monitoring methods	Moo Monitor Collars and Chalking
AI/Natural Serving	AI (In house). Sexed semen used. 70% of herd put onto beef breeds (mainly Aberdeen Angus – recently moved away from Belgium Blue)
Bull Calf management	Raise them until 3-4months of age then selling them.

**NUTRITION:**

Grazing Management Strategy	None
Feed Ration	TMR
No of push ups per day	8 times per day
Total feed costs	7.6 p/litre

Farm H are milking three times per day on a 60 point rotary parlour. Farm struggles with Johnes Disease. They test for JD quarterly using milk sampling.

Despite having badger proof fencing, the farm has had TB in the past. They have been TB free since August 2018.

### **3.7.2 Positive Aspects of Farm H**

Farm H have excellent production yields (approximately 12 300 litres per year) with bactoscan results of 18000 cells/ml. The farm are very proud of their high welfare standards. The cows were particularly friendly and there was no evidence of any injuries to the cows.

### **3.7.3 Critical CowSignals Observed**

The main critical CowSignals observed were perching on cubicle beds. There was also evidence of some cows licking the water troughs. There was also evidence of shiny metal in some sheds, this is due to no back scratchers present for the cows.

### **3.7.4 Suggested Improvements**

The main areas for improvement for Farm H are to clean the water troughs thoroughly and look at improving the re-fill time of these water troughs. Back scratchers need to be introduced to the sheds without disturbing cow flow.

## **4. Discussion of overall findings**

After visiting and evaluating the cow comfort, health and welfare of all 8 dairy units, it was clear that every farm had a number of positive aspects. These farms are not only focused on high production levels but are committed to improving the health and welfare of their cows. The positive aspects to all farms were their high production levels, good quality milk, efficient parlour routines and hygiene protocols. The maternity care was excellent and the ventilation systems were incredible at keeping the cows cool. On some days, outdoor temperatures were 42 degrees Celsius and yet the indoor shed temperatures were approximately 15-17 degrees Celsius. It was fascinating to see how these large scale dairy enterprises are using anaerobic digesters and making their own green bedding in order to be as sustainable as possible.

The main critical CowSignals observed included perching behaviour, overstretched legs and carpal joint abrasions. This could be an indication that the cubicle beds are not long enough for the size of the cow or there are problems with the depth of the bedding substance. It could also be an indication that there is something wrong with the brisket board design. Another consideration would be the position of the neck rail, however there was no evidence of any swan necks in the cows. Two out of the 8 farms had evidence of shiny metal. This is an indication that there are no back scratchers present and the cows are scratching up against the cubicle dividers and the feed barrier. This could be easily resolved but installing back scratches into the shed systems without reducing cow flow. Two out of the 8 farms also had cows demonstrating the tongue rolling behaviour. As previously stated this is a stereotypic behaviour and this needs to be addressed by providing the cows with different forms of enrichment.

## **5. Conclusion**

To conclude the findings of this project it is clear that large scale dairy enterprises both in the USA and UK are focused on high production levels and maximising the full potential of their cows. It was re-assuring to see that all farms were also focused on cow comfort, health and welfare. All farms had strict protocols to follow and it was great to see that the staff have training on how to look after the cows correctly. The main critical CowSignals observed were to do with the housing environment such as perching on beds, issues with water troughs, excess water in passageways and shiny metal. I did see evidence of tongue rolling behaviour which is considered to be a stereotypic behaviour. Recommendations such as increasing the volume of green bedding to cubicle beds, increasing the water temperature of the troughs and installation of back scratchers were suggested to farmers in order to improve the cows' environment and reduce the number of critical Cowsignals observed which will help improve cow comfort, health and welfare on these large scale dairy enterprises.



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