



McDonald's Europe Flagship Farms Dairy Beef – Leitner Farm, Germany

Introduction

The focus of this case study is to show how a family farming enterprise has positively embraced technology to assist in the management of their dairy unit. Investment in new animal housing, dairy facilities and diversification opportunities have helped to ensure the sustainability of this business.

The key initiatives undertaken by Leitner can be summarised as follows:

- Automated milking allows the cows to be milked when they want, and frees the family from the time-consuming task of the daily milking routine, a valuable saving for a small family-run farm.
- Technology developed by DeLaval measures the somatic cell counts (SCC) of every cow's milk at each milking, allowing any udder health issues to be quickly identified and resolved.
- Leitner uses a dual purpose dairy breed (Simmental). The cows average a milk yield of 7,800 litres and run at four lactations (with the aim of extending to eight). Excellent prices are paid for the cull cows and bull calves, which is due to the Simmentals' good growth rates and high carcass meat yields.
- A water capture system for collecting rainwater has been installed on farm building roofs. Over the last 6 months this system has collected 300m³ of rainwater, which is used on the farm, and the system has already saved the farm €300.
- Hourly slurry removal when cows are housed, non-slip flooring, comfortable lying areas and regular foot trimming all mean that cows' feet are healthy, with levels of lameness currently zero.
- All cows are fitted with a neck transponder which measures their movement/activity level. As cows dramatically increase their activity levels during oestrus the system provides an 80-90% accurate heat detection rate (which indicates readiness for mating).
- The farm has purchased a small hand-held device to record treatments and daily management activities; this is then connected to the main computer which logs all the data recorded during the day. This system saves time and ensures all treatments/daily activities are captured and recorded.

"The introduction of the automatic milking system has enabled us to implement a more flexible approach to our working day. An approach that not only suits us but the cows as well. Both this, and additional systems we have introduced, work well together and ensure that the cows are both relaxed and stress free. It is a pleasure to be selected as a Flagship Farmer."

Kajetan Leitner,
Leitner Farm, Germany



Summary of actions

Action	Benefits
Certification/ Assurance	QS assurance EN Assures farm production methods, which in turn improves consumer confidence in beef produced by the farm EC Allows the farm to improve marketability of beef
Animal Health & Welfare	Automated milking EN Releases half a labour unit for every 70 cows being milked ET Cows choose when to be milked which increases their time budget and reduces stress Housing and lying areas well designed for cow comfort EC Healthy cows are more productive and increased cow longevity improves the farm's economics ET Cows need to lie down for between 10 and 14 hours per day. Providing a comfortable area allows the cows to fulfil this important need Cow brushes available to all stock ET Cows perform grooming as part of their natural behaviour. Research has identified that cows will dramatically increase their time scratching (by 508%) when provided with a mechanical brush Automatically controlled natural ventilation in livestock housing EN Ideal environmental conditions are maintained for the cows, maintaining their health and welfare EC Good ventilation avoids heat stress which can cause a decrease in milk production of 5-15%
Product Quality	Milk conductivity and SCC measured at every milking EC Early detection of intramammary infection reduces severity, improves control and limits milk quality penalties ET Early identification of mastitis allows timely treatment, eliminating or reducing the painful outcome of this condition
Diversification	Holiday apartments for tourists EC Four apartments provide a total of 20 beds for local tourists visiting the Alpine region and generate an additional income for the farm business
Environment	Main cow housing constructed from wood grown on the farm EN Reduces the farm's carbon footprint by reducing building material transport and using wood as the main supporting structures is cheaper than steel EC Using the farm's raw materials offers economic benefits over buying in materials from external suppliers
Water	Rainwater capture from building roof EN Uses a free natural resource that would otherwise be wasted EC During a 6 month period this has collected 300 m ³ of water, resulting in a €300 saving
Biodiversity	Approx. 150 hectares of high conservation land EN The farm has designated areas under special protection to protect natural habitats, flora and fauna
Renewable Energy	Heat transfer system EN Fresh milk directly from the cow is passed through a plate cooler, this transfers EC the heat contained within the milk to the water, which is then used to pre-warm the cows' drinking water
Management	Grass/forage based ration EC More milk produced from forage/grass, which is the cheapest feed material ET Cows have access to pasture during grazing period Dual purpose breed EC The Simmental cow has the potential to produce good milk yields (average milk yield of 7,800 litres at the Leitner farm), whilst cull cows provide a good meat yield at slaughter and bull calves have a high economic value Pedometers fitted to the cows EC All cows are fitted with a neck transponder which measures their movement/activity level. This system provides an 80-90% accurate heat detection rate ET Noticing a decrease in a cow's normal activity level can help in early diagnoses of injury/illness Hand-held recording device ET Ensures all daily treatments/activities are easily recorded at the time and are then transferred to the main computer. This has saved on administration time and ensures all necessary records are kept

Background

The Leitner farm is located in the Miesbacher alpine region of Upper Bavaria near the border to Tyrol (Austria) at 795 m NN. The extensive grassland farm consists of 37 hectares of pasture, 63 hectares of alpine pasture and 110 hectares of forest.

In February 2011, the family moved their dairy herd of 36 Simmental dairy cows and followers (i.e. young stock) into a new purpose-built free-stall building, which is equipped with the latest DeLaval automated milking machine. During the summer followers are moved to the alpine grazing pastures and milking cows have access to pastures around the farm.

Facts: Bavarian Farming

The state of Bavaria is one of the most important agricultural areas in Germany. It is the largest producer of food and is home to most of the country's dairy farming. Bavaria has approximately 42,800 farms and 1.2 million dairy cows, producing over 25% of Germany's milk. The predominant breed is the Fleckvieh (Simmental), making up around 80% of the total dairy herd.

Certification/Assurance

QS Quality Assurance programme

QS stands for Quality Assurance, and participation in the scheme is voluntary for farmers. The scheme's guidelines take into account all important legal requirements, and regular updates ensure that any new legal regulations or new scientific knowledge is captured within the standards.

The QS scheme is independently audited and certified, ensuring all farmer members meet the criteria for passing the scheme. All areas are inspected during an audit – from animal welfare through to environmental requirements.

The Leitner farm passed its first QS inspection in December 2011 and achieved the status of 'higher level', meaning it attained the best result during the inspection.

Animal Health & Welfare

Automatic Milking Systems (AMS)

With AMS, cows are able to set their own milking schedule, which should replicate a more natural milking pattern. The potential to increase frequency of milking can reduce stress on the udder, which is especially important in early lactation, when cows are producing the highest yields. Reducing pressure on the udder and stress on ligaments is more comfortable for the cows, especially when lying.

In well-managed automated systems, farmers have noticed reduced stress amongst the cows. More frequent milking may also help reduce the amount of time which allows for the growth of mastitis organisms, however, increased milking frequency may cause more stress on teats.

Facts: AMS

The number of farms using automatic milking systems (AMS) has grown from the first installation in the Netherlands in 1992 to more than 8,000 AMS units on over 2,400 farms today. The vast majority of these farms are in north-western Europe, with the Netherlands having the largest installed base and Scandinavia showing the fastest growth rate in the past few years.

(Lind, 2007)

The farm invested in automated milking to help free Mr Leitner from the task of the daily milking routine. This has allowed him to spend more time managing the cows. Estimates suggest that for every machine milking 70 cows, half a labour unit is saved. Two robots milking 140 cows would save three-quarters of a labour unit, and three machines milking 200 plus cows would save one full labour unit.



Automated milking is less stressful for the cows

The cows benefit from AMS as they need to accomplish certain behavioural activities every day. In general a cow requires 20 to 21 hours per day to satisfy her 'basic' behavioural needs. This is split between 5 to 5 ½ h/d for eating, 12 to 14 h/d for lying and resting (including 6 hours per day of rumination), 4 h/d for rumination (while standing) and ½ h/d for drinking. If another 30 minutes per day are included (for other activities such as grooming and other interactions), the total time required in the budget is 20.5 to 21.5 h/d (Grant, 1999). Given this time budget, it is easy to see how AMS can have a positive effect on the cow's normal time budget. Excessive time in holding pens waiting to be milked is a common way of disrupting a cow's time budget and reducing herd productivity.

Cow comfort/housing

To maintain good health and welfare, and high levels of productivity, it is essential that dairy cows have enough time to lie down and rest. Research has shown that cows lie down between 10 and 14 hours per day. It is important that lying surfaces provide thermal comfort and softness, yet be durable, promote hygiene and have sufficient friction to allow rising and lying down without slipping (Chaplin et al, 2000). Evidence suggests that badly designed free access stalls can lead cows to spending more time standing on concrete and in slurry which can result in an increased risk of lameness.

The free access stalls at the Leitner farm are fitted with rubber matting which is then covered in straw. This provides a thermally comfortable and conformable lying area. Between the straw bedding and the rubber matting a non-slip surface is provided which ensures that cows are confident to stand or lay whenever necessary, which is of crucial importance for the cows to fulfil their behavioural needs.

Auto-scraped passageways every hour

When cows are housed, regular slurry removal is crucial to ensure hygienic conditions and to help reduce the risk of cows slipping. The difficulty of removing slurry is that the cows have to be moved from the area when slurry removal is taking place.

The Leitner farm has invested in an automatic scraping system; with this system cows are able to step over the scraper blade so they can remain in the area. This allows hourly scraping, subsequently reducing the amount of time cows have to stand in slurry.

Fact:

Time out of the pen milking was a significant factor for increased lameness prevalence in a recent survey of free stall herds.

(Espejo and Endres, 2007)

Fact:

Digital dermatitis thrives in damp dirty conditions, so keeping passageways clean and minimising cow contact with slurry reduces the risk of infection.

Negligible lameness levels

Lameness is a major reason for premature culling of dairy cows, typically accounting for about 10% of culls (Farm Animal Welfare Council, Opinion On The Welfare Of The Dairy Cow, October 2009). The condition is usually caused by infection, physical factors, management practices or housing design (which may also be linked to other health problems).

Common elements of lameness are:

- Digital dermatitis
- Foreign object in foot
- Sole ulcers
- White line disease
- Overgrown claw



Fact:

Lameness is second only to mastitis in terms of its detrimental effect on herd productivity (Esslemont and Kossaibati, 1996).

The estimated cost of lameness for a 100 cow herd is €4,850 (£4,000) per year. One case of sole ulcer has a direct cost (treatment) of €87 (£72), with indirect costs (reduced fertility and milk yield, higher culling risk) amounting to an average €300 (£246) (Kossaibati, Esslemont et al. 1999).

The cows on the Leitner farm are provided with conditions which prevent the onset of lameness, while routine twice-yearly foot-trimming ensures any foot problems are dealt with. The lameness level of the herd is zero and to date there have been no cows culled from the herd due to lameness.

Fact:

There is reasonable evidence to suggest that cows housed in free-stall facilities on concrete floors require a minimum of 12 h/d of rest in a comfortable stall. When their time budget is challenged, the primary outcome is increased lameness.

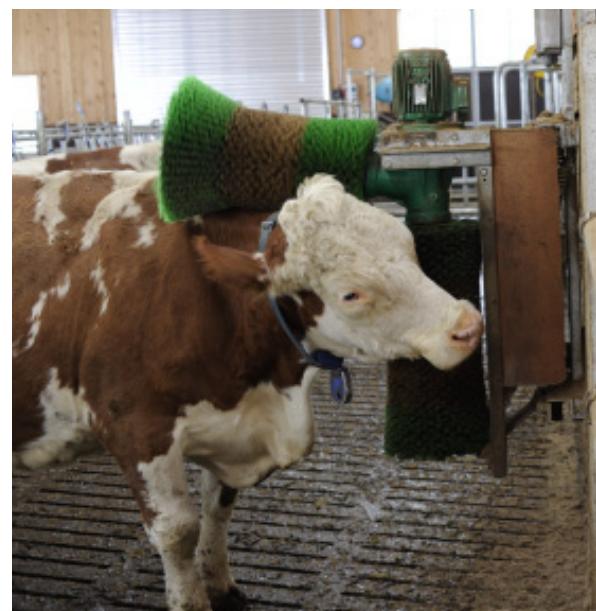
(see: Automated Milking)

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Cow brushes

Cows perform grooming as part of their natural behaviour. The animals remove mud, faeces, urine, insects and parasites, thus reducing the potential risk of disease.

An experiment was conducted to compare a group of cows provided with a mechanical brush and a group with no brush. It was found that cows dramatically increased their time scratching when provided with a mechanical brush. Total time spent scratching increased by 508%. When cows were provided with the mechanical brush they decreased the frequency of scratching their heads (repetitive behaviour which might be a sign of boredom) and increased the frequency of scratching their necks, backs and tails.



Providing a mechanical brush for the cows makes it easier for them to groom, particularly in places that are otherwise difficult to reach.

Other benefits include:

- The brush fulfils some of the cow's natural behaviours
 - They help keep the cow clean
 - May assist in the reduction of frustration/stress due to boredom when housed
- (DeVries et al. 2007, Journal of Dairy Science)

The farm has fitted brushes in all areas where animals are housed; the frequency with which the cows use the brushes shows they provide a valuable benefit in reducing stress within the herd.



Mechanical brushes are beneficial to the cows

Automatically Controlled Natural Ventilation (ACNV)

A 650kg Holstein cow giving 30 litres of milk per day generates heat equivalent to about 15 one-hundred watt lightbulbs. Cows can easily dissipate this heat on cool days, but may find it increasingly difficult on warm and/or humid days, at which point they may start to suffer from heat stress.

When a cow is stressed, it releases the hormone cortisol; this has the effect of reducing metabolic processes, which can lead to hormonal changes, and reduced fertility and milk yield.

It has been estimated that high humidity and temperature levels in poorly ventilated buildings can be responsible for a 5-15% decrease in milk production.

Automatically Controlled Natural Ventilation (ACNV), which is used on the Leitner farm, uses temperature sensors to mechanically open and close blinds. When the blinds open, air flow passages allow clean air to enter the building, displacing stagnant or dirty air. The difference in building pressure and atmospheric pressure caused by wind passing over the building and by thermal buoyancy creates the movement of air (the stack effect).

The ACNV system allows the building to maintain a more constant environment which ensures temperatures are within the cows thermal comfort zone. Good air quality within housing is also a very important factor in maintaining the cows health.



ACNV prevents stress from overheating

Facts: good ventilation

To ensure livestock housing has good ventilation, Dairy Co¹ believes it is important that the building is designed to:

- Remove excess heat
- Remove excess water vapour
- Remove microorganisms, dust & gases
- Provide a uniform distribution of air
- Provide correct air speed for stock

1. DairyCo is a levy-funded, not-for-profit organisation working on behalf of Britain's dairy farmers.

Product Quality

Milk quality measured at every milking

Automated Milking Systems (AMS) have almost eliminated the interaction time between personnel and cows at milking which makes the discovery and diagnosis of intramammary infections a challenge. The introduction of appropriate technology, namely the conductivity test and in-line Somatic Cell Count (SCC) testing, has been an important step forward in the detection and control of intramammary infections.

Mastitis is an infection of the mammary gland causing persistent inflammation of the udder tissue. Mastitic milk has a higher electrical conductivity than normal milk due to tissue damage and a subsequent increase in sodium and chloride ions. The change in electrical conductivity is one of the earliest manifestations associated with new infections making the early detection and recording of possible mastitis cases routine. SCC is the most widely used indicator of udder health in cows, it is quantified as the number of cells per ml of milk and is also an indicator of milk quality.

As the Leitner farm's AMS incorporates both milk conductivity and SCC testing, early diagnosis of mastitis is easily maintained. Every cow's SCC levels are monitored and recorded daily, and swift treatment plans are implemented where necessary. The SCC records give an ongoing long-term perspective of SCC levels – this helps identify cows which are chronic persistent offenders that need to be culled from the herd.

Fact:

In developed countries, mastitis is one of the most common and costly diseases for the dairy industry.



Diversification

Diversification – four apartments with a total of 20 beds for tourists visiting the area
Tourists visiting the local area now have the opportunity to stay over on the Leitner farm at the apartments which were converted to provide accommodation for up to 20 people. This has provided a valuable additional income for the farm and is also beneficial to the economy in the wider local community.

Environment

Farm buildings constructed from wood grown on site

The growing concentration of atmospheric carbon dioxide contributing to global climate change is a long term and large scale problem. Forests and forest products can play an important role both to reduce emissions and to increase carbon sinks. At Leitner farm, wood has been used as a building material in place of more greenhouse gas intensive materials. Not only is this cheaper, as wood is energy efficient (primarily because it is a good insulator) and is highly versatile; it also has other environmental benefits: it is completely biodegradable, uses less energy to process than steel, concrete, aluminium, or plastic, and is 100% renewable.

Water

Rainwater capture

‘Water is essential in dairy production, livestock drinking accounts for 50-70% of water use, with plate cooling, the washing of yards, parlours, bulk tanks and plant also contributing to water use.’ (Dairy Co, 2009).



RWH saves the
Leitner Farm €600
per year

that falls onto the livestock housing. The water is diverted to an underground tank where it is pumped from when needed. The system was simple to install, and in the first 6 months of operation, collected 300m³ of water, saving €300. These savings are on-going and should continue for the life of the system (25 years plus).

To reduce the reliance on purchased water, Rainwater Harvesting (RWH) is becoming increasingly popular. RWH is the collection and use of rainwater falling onto buildings which would otherwise have gone down the drains, been lost through evaporation, or soaked into the ground.

The Leitner farm has invested €8,500 in a RWH system which collects rainwater

Benefits of RWH:

There are both economic and environmental benefits to RWH, including:

- Reduced expenditure on mains water supply
- Reduced quantity of water entering the slurry store – reducing quantity to spread and storage capacity required
- Rainwater does not contain additives
- Reduce the risk of localised flooding, where water from large roof areas is not managed properly.

Environment Agency (2009)

Biodiversity

Biodiversity is crucial to a healthy and thriving ecosystem, which in turn is a vital element for a healthy agricultural system. Agriculture's reliance on biodiversity comes from pollination and the creation of genetically diverse plant and crop varieties which are capable of developing disease, and insect resistance.

For terrestrial ecosystems globally, habitat loss is largely accounted for by conversion of wild lands to agriculture, which now accounts for some 30% of land.

The Leitner Farm has 150 hectares of high conservation land which provides a valuable natural habitat for the area's flora and fauna. These areas are carefully managed, which allows livestock to be grazed on the land during the summer. Carefully managed livestock grazing has been proven to have a beneficial effect on levels of biodiversity.

Renewable Energy

Heat transfer system from plate cooler

Milk from the cow has a temperature of around 37°C, to ensure it can be stored safely without spoiling the milk quality the temperature needs to be reduced to 4°C. A bulk tank refrigeration system does most of the work to cool the milk and requires a significant amount of energy. To reduce the load on the bulk tank, a plate heat exchanger can be used. This is a device which allows water and milk to pass either side of heat conducting plates enabling the water to partially cool the milk. This method of cooling can remove large amounts of heat from milk in a very short time. To be effective the plate area needs to be maximised and the ratio of water to milk flow

needs to be as high as possible. The electrical costs of the farm can be significantly reduced by using a plate cooler due to the reduction in energy needed to cool the milk in the bulk tank.

The farm not only saves money by using a plate cooler to pre-cool the milk prior to it entering the bulk tank, it also uses the warm water as drinking water for the cows; this can be beneficial for cow health, especially during winter when ambient temperatures are low.

Fact:

Plate heat exchangers can reduce milk cooling costs by as much as 50%.

(Milk Development Centre,
Gelli Aur College, 2011)

Management

Milk from forage/grass

Feed is one of the largest costs within dairy farming; concentrates (cereals, soya) can generally make up 20 - 25 percent of the costs of milk production. Grass is the cheapest form of feed for dairy cows, followed by silage, with concentrates representing the highest cost feed material. Furthermore, increasing milk production from forage invariably increases margins and profitability.

The financial effects of changing the feeding regime is usually seen within a relatively short timeframe, whereas changing other key management practices tend to have a longer term impact.

Fact:

Fibre is one of the more important nutrients in a dairy cow diet because of its role in maintaining rumen function and cow health.

EC

Grass is the cheapest form of feed for dairy cows

which are fed lower-quality forage. Increasing the levels of good quality forages fed to the dairy cow has a positive impact on the cows production level, feed efficiency and health.

The cows and followers at the Leitner farm have access to pastures during the summer grazing period, which is helping to reduce summer feed costs. The farm aims to make high quality grass silage and hay over summer which is then utilised over the winter period when outdoor conditions preclude cows being able to graze outside. The high quality grass silage and hay grown on the farm has helped reduced feed costs and has improved financial margins.

Benefits of forage/grass:

- Savings in silage – research has shown that two to three hours access to grazed grass can reduce silage requirements by 25 percent
- Reduced concentrate costs – grazing good quality autumn grass is worth almost 2 KG concentrates per cow per day
- Increased protein – the inclusion of autumn grass in the diet has been shown to improve milk protein content
- A shorter housing period means less stress on cows, improved herd health and reduces slurry production all of which creates further cost savings.

(Source: DARDI, Grass Utilisation)





Dual purpose breed, Simmental

The Simmental is a breed of cattle whose history dates back to the Middle Ages. Early records indicate that they were the result of a cross between large German cattle and a smaller breed indigenous to Switzerland. The name Simmental is derived from the name of the area where the cattle were first bred – the Simme Valley which is situated in the Berner Oberland in Switzerland.

The farm is using the Simmental as it is a 'dual purpose' cattle breed. The herd is currently averaging annual milk yields of 7,800 litres, whilst achieving four lactations, although the aim is to increase this to eight. As the Simmental is also a good beef animal, high prices are paid for the cull cows and bull calves, this is due to the breed's good growth rates and high carcass meat yields.

Simmental breed statistics:

- High, long term fertility
- Longevity
- Calving ease
- Excellent mothering ability
- Good grazing ability
- Early maturity
- Good growth rates
- Easy to handle
- Good feed conversion and efficiency

Pedometers to measure cow activity

Heat detection rate is a key factor in determining reproductive success in a dairy herd. The failure to accurately detect oestrus is a large economic cost to the dairy industry. Accurate heat detection requires observation of the herd by a trained individual three to four times per day, seven days per week. The biggest challenge to systematic heat detection is to be able to carry out observations consistently when required every day.

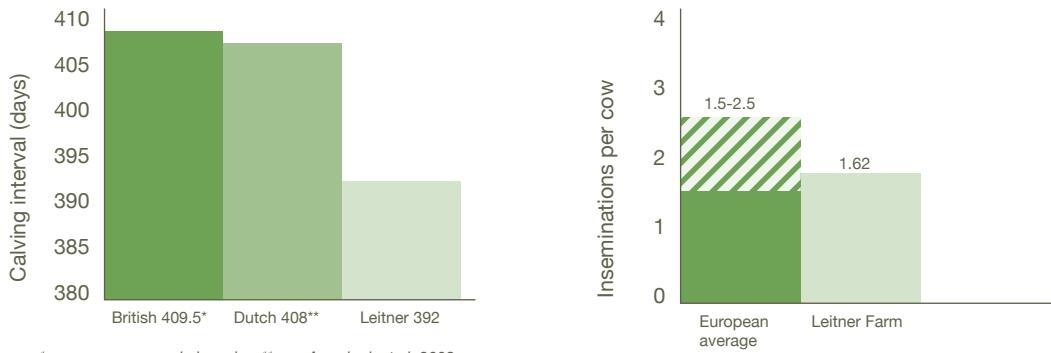
Fact:

In high-producing cows, the period of mounting activity lasts an average of 5.8 hours, and some cows only stand to be mounted one to two times per heat cycle.



Pedometers have multiple benefits

A pedometer is a motion detecting recording device that provides an opportunity to save labour, improve individual cow care and management through the use of technology. Heat detection efficiency in dairy herds is less than 50%, whereas pedometers provide 80 to 90% accurate heat detection rates. The Leitner farm has fitted pedometers to all the cows, allowing for accurate monitoring of animal activity and improved oestrus detection. The peak in cow activity is easily identified by the system and the cow can then be selected for service.



An additional benefit of this technology is that all cows are individually identified by a microchip in the pedometers. This allows Mr Leitner to easily identify cows which may need to be inspected, as they pass through the AMM. This prevents having to select cows from within the whole herd, limiting stress and disruption.

Auto system for recording treatments

A true representation of cow health and the incidence of infection, disease and cure rates are dependent on the accuracy of treatment records. There are legal implications as well as farm assurance stipulations for recording veterinary medicine treatments. However, sometimes records are not detailed enough to be used for analytical purposes. It is therefore important that robust and routine recording procedures are in place to ensure accurate treatment records are maintained.

'It is important that all outside people (for example veterinarians, etc) and any others involved with handling dairy cattle on the farm know what treatments have been given to cows'. (FAO)

The farm is well aware of the importance of correctly maintained and accurate records, so it was with this in mind that they purchased an electronic handheld recording device. This has enabled them to immediately record all herd treatments without having to remember them or write them down. At the end of the day, the recording device is connected to the farm's desk top computer where all

the daily treatments are downloaded into the herd records. This has reduced administration time and made record keeping of the daily herd treatments easier. All data are recorded in a consistent manner and also provide the reassurance that all treatments are accurately recorded.



Auto system greatly reduces administration

Appendix

The following matrix has been developed by McDonald's to help assess the sustainability of the agricultural production within the supply chain. Flagship farms have been identified that demonstrate best practice in one or more of the 17 key areas in the matrix, whilst also operating to general high agricultural standards in all other areas.

A ✓ in the matrix below indicates good practices demonstrated in this case study.

Ethical (Acceptable Practices)

Human health & welfare	Animal health & welfare	Business ethics & supplier relationships
i Employee health & welfare ii Food safety	i Nutrition ii Medication & growth promoters iii Genetic selection iv Animal cloning v Husbandry ✓ vi Transport vii Slaughter	Rural landscape preservation

Environment (protecting the planet)

Climate change ✓ i Greenhouse gas emissions ii Energy efficiency & renewables ✓	Natural resources – water ✓ i Water pollution ii Water usage efficiency ✓	Ecosystem protection ✓ i High Conservation Value Land (HCVL) ✓ ii Habitat & species preservation
Natural resources – soil i Soil fertility & health ii Soil erosion, desertification & salinisation iii Soil contamination	Natural resources – air i Air emissions	Waste i Production waste ii Hazardous waste iii Waste to landfill

Economics (long-term economic viability)

Sufficient high quality production ✓ i Producer income security & access to market ii Agricultural input costs ✓ iii Crop & livestock disease	Community investment i Local employment & sourcing ii Support for community programmes
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