External Capital and the Drivers of Entrepreneurial Success in Large scale Dairying

Experiences from the United States and their potential application to the UK

David Alvis

A 2008 Oxford Farming Conference / Nuffield Farming Scholarship Trust award

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Introduction

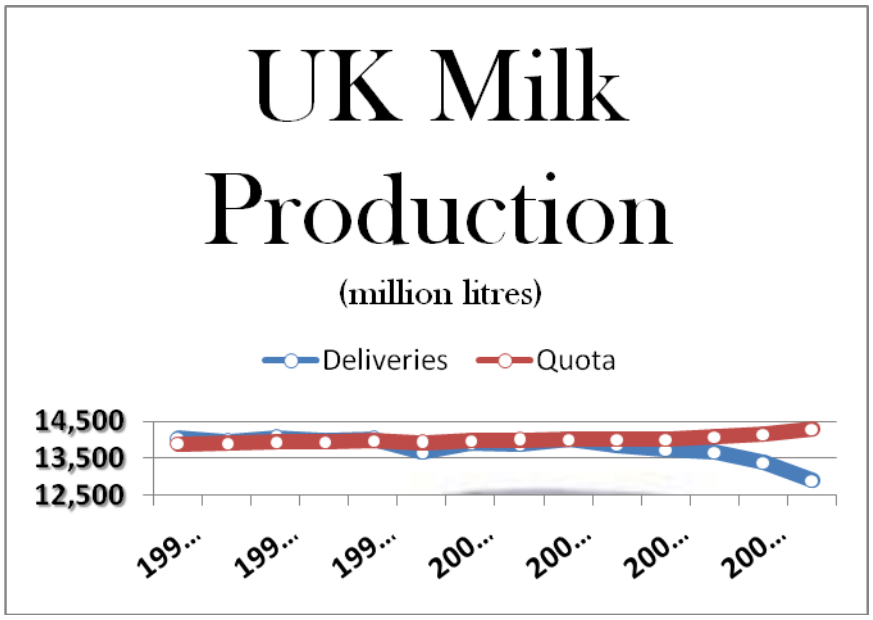
My name is David Alvis and I want to be a Dairy farmer.

I live in Buckden, Cambridgeshire with my wife Katie and two young sons Dickie & Harry, from where I run my own consultancy business, which I started since my Nuffield study. I am currently contracted to the Technology Strategy Board, (www.innovateuk.org) as lead specialist in their Sustainable Agriculture and Food Innovation Platform,

I grew up on a mixed dairy and arable farm in North Somerset, and studied Agriculture at Wye College, University of London. After graduating in 1990, I worked for three years as assistant farm manager on a large potato growing and packing business based in Essex, followed by 8 years with Anglian Produce, a grower owned potato marketing co-operative based in Norfolk and subsequently as a regional general manager for Greenvale AP, the product of the merger between Anglian Produce and Greenvale Produce to form one of the largest integrated potato growing and pre-packing businesses in the UK.

In 2001 I took a year out to study for an MBA at Cranfield School of Management, after which I worked as commercial director for Timac UK, part of the Roullier Group. It was during this time that my interest in dairy farming was re-ignited.

It was becoming apparent to me at this time that with the long term decline in UK milk production; a potential opportunity was opening up within the sector. Following ten years of low milk prices and underinvestment in the industry, the decline in national output has made milk quota, previously a major barrier to entry to the industry, effectively worthless, fundamentally changing the economics of milk production.

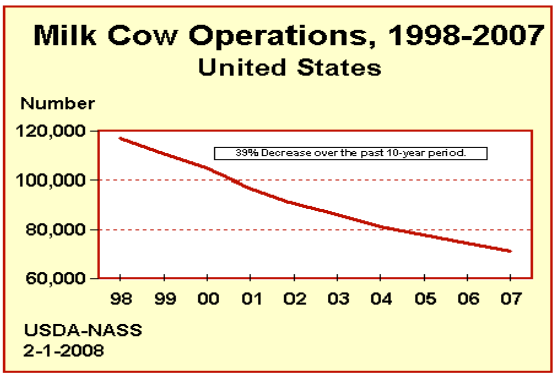


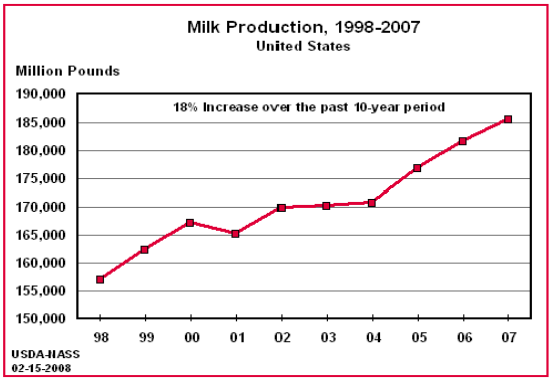
source DairyCo

Given that, per capita, Total UK milk consumption is stable and projected to rise in line with population growth, there appeared to be a potential gap opening up in the market for a new business model that might help reverse the decline in UK milk production.

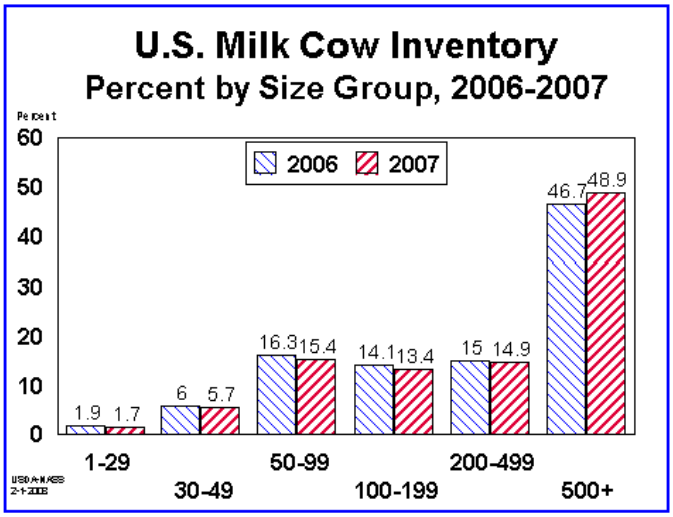
By comparison, the US dairy industry has for the last fifteen years seen a similar rate of decline in producer numbers to the UK, with numbers declining by 40% between 1997 and 2007. The net effect on production however has been very different.

Over the same period (97-07) total milk output in the US grew by 18% compared to a 10% fall in the UK. This has been achieved in part by a rapid concentration of production into the hands of a few, very large producers.





By 2008 the USDA estimated that 50% of US milk was being produced by little more than 3% of the nation's dairies, on units of over 500 cows. In reality that figure is probably even more extreme as many of these 'super dairies' were part of multi site businesses, which were expanding rapidly.



The rise of these super producers intrigued me. Who were they? Who was financing them? How were these businesses structured and managed and most importantly how much of their experience could be successfully transferred to the UK?

When I applied to The Nuffield Farming Scholarship Trust I had started working on a plan in partnership with a syndicate of arable farmers in south Cambridgeshire to build a large scale dairy unit, of over 1,500 cows, that would integrate with their existing arable businesses. The inspiration for the idea came from the United States, and I felt that the drivers behind the rapid growth of large scale dairying in the US would make the basis of an interesting study with potentially valuable lessons for the UK dairy industry

Agriculture in Europe is rapidly changing, with reducing levels of support forcing a wave of rationalisation particularly in the arable sector that is continually driving up the minimum economic size for commercial farms. It was clear to me that in the future, successful new entrants to agriculture would need to be able to manage not only the technical and economic aspects of food production but also become more adept at sourcing and managing external sources of capital to fund their establishment and growth.

The combination of this potential paradigm shift for agriculture and how it might be applied to the UK dairy sector has shaped my study and subsequently my life.

Study itinerary

During 2008 I visited the United States three times, Firstly for 10 days in March to California, visiting a number of large scale producers in the spiritual home of the large scale dairying, including a fascinating tour and conference organised by Alta Genetics for 200 of their largest global farmer customers. The second was to New York state and Ontario in April with a small group of UK dairy farmers and fellow 2008 Nuffield scholar Graham Lochhead, on a tour organised by Rob Heap of Bauer UK .

The third and most significant block of travelling was a solo five week trip of the mid West in September and October, visiting a number of large dairy businesses, in Wisconsin, Indiana, Ohio & Michigan as well as spending a week at the World dairy Expo at Madison where I stayed with Dave Wieckert, a long time friend of Nuffield an professor emeritus of dairy science at the University of Wisconsin, Madison.

That trip also included time in Chicago, where I visited the HQ of the Global Dairy Platform and dairy commodity brokers Downes O'Neill, who gave me a fascinating tour of the trading floor of the Chicago Mercantile Exchange. I also travelled to Missouri to meet Professor Mike Cook and his team at the school of agricultural economics at the University of Missouri, Columbia and to Dairy Farmers of America HQ in Kansas City.

These trips were interspersed with shorter visits to Germany and the Netherlands courtesy of Michael Heinrich of GEA Westfalia Surge and Alex van Bakel of Vreba Hoff.

California, March 2008

The central valley of California is the spiritual home of the super dairy, a state with nearly 2 million dairy cows and some of the largest producers in America. It seemed the logical place to begin and when I had the opportunity to join an Alta Genetics trip to visit some of their larger partner dairies in the state I jumped at the chance, despite only having just returned from the Nuffield international conference in Australia.

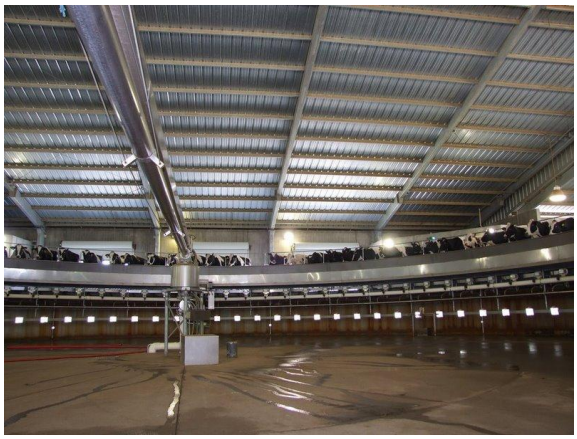
The standard of dairy farming I witnessed was excellent and the Shehadey family's new 6,500 cow dairy at Kerman near Fresno was among the most memorable visits of my study. Seeing two 80 point rotary milking parlours side by side, milking a combined total of 900 cows an hour was not something I will quickly forget! The £50million unit was built in 2006 and is part of Producers Dairy Inc, an integrated dairy farming, milk processing and distribution business and bears the name of its founder Larry A Shehadey, who sadly passed away in 2009 at the age of 100 years old.

Larry A Shehadey Dairy, Kerman California

Designed and built in 2006 by Vance Dairy Construction of Homedale, Idaho, the Larry A Shehadey dairy was a truly impressive facility, sitting on a 400 acre site; it houses 6,500 milking cows in four 1,800 ft long sand bedded free-stall barns. The business was in transition from sand bedding to using dried composted manure solids that was being

processed in windrows in the open air for a period of weeks to ensure effective pathogen kill. This area of the central valley of California receives as little as 12 inches of rain a year and as such the climate enabled outdoor composting of manure

The cows were milked twice a day through two 80 point De Laval rotary parlours that were situated on either side of a six- bay tanker dock that was filling a 25,000 litre 'semi trailer' tanker every two and a half hours destined for the company's processing facility in Kerman 6 miles away.



All calves and young stock were reared on the site with pre-weaning calves kept in individual raised crates in a specialist calf nursery for 8 weeks before being moved into groups of a dozen weaned calves in a covered calf barn with external loafing areas. Older heifers were reared in outdoor dry-lots until they joined the milking herd at approximately 2 years of age

The cows were fed a TMR diet based on Maize & wholecrop cereal silage and alfalfa hay supplemented with whole cottonseed, soybean meal, Almond hulls, and dry corn. California's climate allows two crops of forage to be grown each year, typically this would comprise a winter crop of wholecrop cereal silage (barley or rye) planted in October and harvested in April yielding up to 16 tonnes to the acre, followed by corn (maize) planted in late April / early may and within 100 days can yield a staggering 35 tonnes to the acre of high starch silage. Californian maize crops typically stand 12 – 14 feet tall at maturity and by all accounts harvesting them is a truly tedious business, as all you see in front of you all day long is a wall of corn!

Everything about the Shehadey dairy was extremely impressive, as was much of what I saw in California but as I toured the central valley talking to dairymen, it became apparent that it was likely that this would be one of the last big dairies to be built in the valley for some time.

California was awash with milk, so much so that processors were imposing mandatory quotas on suppliers due to their inability to cope with the volume being produced. At the same time competition for land and particularly for water was driving up the cost of

production across the state. When you added to that the prospect of an anticipated drop in milk prices in the medium term, Californian dairy farmers were bracing themselves for a rough ride.

Longer term the sustainability of dairying in the state at its current level has to be questioned. The industry is essentially mining fresh water resources at an unsustainable rate and saline water contamination of aquifer was becoming a problem in some coastal areas. Air pollution is another major problem that the Californian dairy industry has to address, which all adds up to a challenging time ahead

Consequently a lot of the smart money was moving or indeed had moved out of the state. Many of the original Southern Californian dairymen had sold land for residential development to feed the ever growing urban sprawl of greater Los Angeles and some were using this money to fund dairy developments elsewhere in the US with Idaho and Texas particularly seeing significant growth in production in recent years.

Whilst California will remain a major milk producer for many years yet, it is an industry past its peak.

New York State & Ontario, April 2008

In April 2008 I travelled to New York State with fellow Nuffield Scholar Graham Lochhead and a small group of UK dairy farmers o a trip organised by Rob Heap, then UK general Manager for Bauer & Fan separator, to look primarily at the concept of using dried manure solids as a bedding medium for dairy cows and also at the development of on farm anaerobic digestion (AD) of cattle manure.

During the trip we visited a number of medium to large scale producers who were experimenting with AD as a means of mitigating their environmental impact, saving on energy costs and potentially generating revenue from the sale of electricity and Carbon credits.

Twin Birch Dairy at Skeneatles, New York was a good example of a family dairy farm that was steadily expanding, and taking advantage of new technology to improve both economic and environmental performance of the business. Dirk Young the owner had installed a plug flow digester that powered a series of micro-turbine generators to produce electricity from the biogas it produced. He was a net seller of electricity and was beginning to benefit from the nascent carbon credit market in the US .

Digested manure was then separated and used as bedding for the dairy cows. He was convinced that cow comfort compared favourably to sand and despite the high summer temperatures and humidity he experienced in this part of Northern New York State, cell counts and mastitis had not suffered in the transition from sand.

The decision to switch to bedding on manure solids was taken when they installed the Anaerobic digester, as sand laden manure is a no-no for AD and he wasn't prepared to invest the significant sums of money and management time required to install and run a sand separation and recovery plant.

The cows appeared to be very clean and happy with the arrangements and were performing well, producing a high daily average of 83lbs or 37 litres of milk per cow.

Across the border in Ilderton Ontario, we visited Stanton Bros, a recently completed stae of the art 2,000 cow capacity dairy and home to the renowned Stanton's herd of pedigree Holsteins. http://www.holsteinworld.com/stanton

Dairies of this size are unusual for Canada, as strict quota controls and high milk prices make the cost of dairy expansion extremely expensive

Laurie Stanton sold his original farm 6 miles away on the outskirts of London Ontario for development and decided to reinvest in a dairy that would allow him to compete in a more open market, as he felt that the Canadian quota system would not remain indefinitely and when it went he wanted to be ready.

Currently the dairy is home to a milking herd of 700 pedigree Holsteins which included Crockett-Acres Mtot Elly, formerly the number 1 genetic merit Holstein cow in the world. Nine years old at the time of our visit, the now deceased, Elly had been purchased as a mature cow two years earlier from the US and now lived in her own loosebox at Stantons where she was being kept dry and regularly flushed for embryos to sell.

Elly has a number of high ranking sons in AI in Canada and the US and her daughter Crockett Acres Elita and granddaughter Wabash-Way Emily Ann, sired by the British bull Picston Shottle , have both subsequently held the distinction of No.1 Genetic merit animal in the breed. Emily Ann has since been acquired by the Stantons to replace her grand-dam as the star addition to their herd.

Whilst there were only 700 milking cows, the remaining 1,300 spaces on the unit were full with pedigree young stock and commercial heifers used as embryo recipients for the elite animals, which are on regular flush programmes.

Selling pedigree stock and embryos is a key part of the Stanton's business and the unit was designed to be able to show cows and heifers at their best in a light, airy & pleasant environment that hopefully would encourage prospective buyers to dig that little bit deeper!

The dairy features an novel design of anaerobic digester called an IBR or induced blanket reactor, developed by Andigen (www.andigen.com) a US based business which used a series of modular upright vessels and claimed to offer faster cycle times and increased gas yields than the more traditional plug flow designs seen on many US dairies. Laurie Stanton was very optimistic about the prospects for the digester and was working closely with Andigen and researchers from the University of Guelph, to develop the concept. They were looking to incorporate municipal food waste as a co-feedstock to increase Biogas yield from manure and also had a plan to develop an algal biodiesel production facility on the farm using digestate from the AD plant to feed oil producing algae in large out-door tanks.

Unusually for the normally conservative world of pedigree cattle breeding, Laurie Stanton and his sons were clearly focused on the future and determined to ensure that every aspect of their business was ready to embrace the challenges of life after quotas. They were investing heavily in both state of the art technology and elite genetics to ensure that they remained competitive...and they had a beautiful herd of cows.

The Mid West, September & October 2008

California and New York had given me a an insight into which direction the US dairy industry was moving, and while I had seen some excellent dairy businesses I was still looking for the 'killer business model' that would work in the UK.

The Nuffield network proved a useful source of contacts to supplement my own research. I was conscious that Nuffield dairy scholars have beaten a well trodden path around the world and wanted to strike out and claim some new territory, but equally there's nothing like a bit of local knowledge to help you on your way.

For that I am particularly grateful to Paul Fox for putting me in touch with Professor Dave Wieckert at the University of Wisconsin and with Jay Waldvogel, a director of Dairy Farmers of America, both of whom proved invaluable sources of information and contacts and in the case of Dave and Joan Wieckert, extremely generous hosts during the week of the World Dairy Expo when every hotel in the city was fully booked.

Thanks also to Kevin Bellamy at the Global Dairy Platform in Chicago, my first point of contact in the US who provided me with some excellent leads, not least the contact with Tom Gaughan at Downes O'Neill, who gave me a great insight into the world of dairy commodity risk management and organised an unforgettable tour of the trading floor of the Chicago Mercantile Exchange.

World Dairy Expo

The World Dairy Expo (WDE) is the world's largest dairy event held every year at the Alliant centre in Madison, Wisconsin, with every major company in the global industry represented and some of the finest cattle from all over North America on display. There was a particular buzz among the pedigree breeders in 2008 as the Canadians were back after a long period of BSE enforced exile and promised to raise the standard in the cattle lines.

During the week of expo I stayed with Dave and Joan Wieckert, who were charming and generous hosts. They are long time friends of Nuffield and were happy to invite yet another in a long line of scholars into their home.

It was a particularly proud week for Dave as his protégés, the Crave Bros, were being honoured by WDE as Dairymen of the Year. Two of the four brothers, Tom & Charles, had studied under Dave at UWis in the 1970's and had subsequently started out in dairy farming in 1978 with Dave acting as their mentor, business partner and financial backer. I was flattered to be invited as a guest of Dave and Joan to the awards dinner that week where I enjoyed a great evening in the company of many leading figures of the US and international dairy industry.

Crave Brothers, Waterloo, Wisconsin

Dave had taken me to see the Crave's farm at Waterloo Wisconsin, earlier in the week. The four brothers have built up an impressive business milking 1,200 of the highest yielding cows in the state, averaging 90lbs (41Kg) of milk per day without BST. In 2001 they built a cheese dairy and were manufacturing a successful range of award winning artisan cheeses (www.cravecheese.com). The dairy capacity was significantly increased in 2008 to meet growing demand for their product

The farm is recognised as one of the best performing dairies in Wisconsin and the brothers are quick to acknowledge Dave Wieckert's invaluable support in the early years of their business. Dave pointed out that the farm was a great example of a successful dairy business that had utilised external capital funding, *i.e his!* to get started.

Contented cows at Crave Bros, Waterloo Wisconsin,

The standard of husbandry at Craves was exceptional and the herd certainly confounded the argument that high yields means unhappy, unhealthy cows. This herd was as comfortable and relaxed as any I have seen and was happily averaging over 13,000 litres of milk a year.

The Crave Bros model was working well. Each of the four bros had specific and complimentary areas of responsibility and as a result the whole was greater than the sum of the parts. Charles the eldest was responsible for business management, George ran the cheese dairy, Thomas the field and cropping operations and the youngest brother Mark was responsible for the cows.

They were continually improving the buildings on the farm with a view to expanding cow numbers and had recently built an anaerobic digester to process manure and generate electricity. Crave bros was a great example of a successful family dairy business that has, by adding value to their product, created a solid platform for future growth.

Spring Grove Dairy, Brodhead Wisconsin.

Prior to Expo I had visited Dan Monson at Spring Grove Dairy in Brodhead Wisconsin. Dan was a local farmer's son who had gone into business in 1999 with two brothers George and Cornell Kasbergen, who each milk over 3,000 cows in Illinois & California respectively. The Kasbergens were looking to expand and diversify their dairy business outside of California and entered into a joint venture with Dan and his wife Mary to build an 1800 cow dairy on an 80 acres site on hours drive south of Madison.

The Kasbergens provided $2million of the $6million required to finance the business in 1999 *(roughly half of what it would cost today)* and borrowed the remainder, with the debt secured against their Californian diary and other real estate assets.

Dan and Mary provided 5% of the equity in the business which increased to 20% on a profit share basis over 4 years. They project managed the build of the dairy and are responsible for its day to day management.

The herd was managed very much on an intensive Californian style system. All cows were treated with Posilac *(rBST)* from 60 days in milk, which according to Dan was worth 7-8 lbs of milk per cow per day. No visual heat detection was practiced at Spring Grove, with all cows on an 'Ovsynch' synchronised oestrus programme. Scheduled breeding was done once a week on a Wednesday morning by an Alta breeding technician.

Whilst one might question the consumer acceptability of such a system, you could not argue with the results. Spring Grove Dairy was maintaining a rolling herd average yield of over 30,000lbs *(13,500 litres)* per cow per year milk sold with a calving interval of 400days. Herd annual replacement rate was running at 35%, with 50% of the cows holding to first service and a pregnancy rate of 23%.

However at this level of production the cows were vulnerable to metabolic heat stress and related lameness issues, especially in the summer months, necessitating a regular two day a week visit from the foot trimmer.

Until 2008 all forage crop production was outsourced to local farmers, but the business had recently purchased 2,000 acres of irrigated cropland. Dan had engaged a neighbouring farmer to act as principal contractor for all cropping operations effectively bringing forage production in house and was working closely with Pioneer, the plant breeding division of Dupont to improve the yield and quality of Maize and Alfalfa (lucerne).

The land acquisition had cost $10million made up of a $3million down payment & $7million mortgage. US tax laws allow them to defer tax liability on the dairy profits by offsetting them against future interest payments, thus reducing the effective cost of the land and the subsequent cost of producing forage.

Dan and Mary Monson run a tight ship. They have earned a significant equity share in a profitable and expanding business from a relatively small upfront stake. Their expertise and hard work has created value for them and their investors and I felt that this model could be readily adapted to work in the UK.

Holsum Dairies, Chilton, Wisconsin

"We want our dairy to be an example of agriculture contributing positively to the community. We have developed strong links in our community, economically, environmentally and socially." - Kenn Buelow, Holsum Dairies, LLC

At first site, Kenn Buelow is an unremarkable character; modest, softly spoken and self effacing, his outward demeanour belies a great vision, intellect and sharp commercial mind that has made him one of the most respected dairy farmers in the state of Wisconsin if not the entire United States.

A native of Calumet county, Kenn studied veterinary medicine at the University of Wisconsin, Madison before working for 15 years in large animal practice in the Mid West and in New Mexico, where he formed a 10 dairy management group specialising in herd health, nutrition and fertility management.

One of his clients in New Mexico was a family trust with a diversified portfolio of investments from dairy farms to property & broadcast media. When the trust divested itself of a majority stake in a local TV station for $60million in the late 1990s, Kenn seized the opportunity to realise his long held ambition of starting a dairy business back in his home state of Wisconsin

Kenn had for some time been concerned about the future profitability of dairying in the South Western states, due to rising cost of feed relative to the value of milk and longer term concerns over the availability of water, so he put a proposal to the trust to invest some of the proceeds of the sale of the TV station in a state of the art dairy in the Mid West, where there was a stronger market for milk, feed costs were lower and water abundant.

The business model was a simple one; to sustainably produce quality milk at the lowest possible financial and environmental cost per litre. This would be achieved by focusing management activity on the core value drivers for the business, outsourcing of non-core activities, exploiting the potential value of waste streams and effectively managing risk.

The trust would act as sole financier to the business, providing both debt and equity at commercial rates, avoiding the need for bank finance in the capital structure of the business

and all the issues that that would entail. The investors had confidence in Kenn's ability to manage a large dairy business and thus the counterparty risk to them was considerably reduced.

The proposed model separated infrastructure and operations with the business divided into two separate corporate entities; a property company that would own the site and the dairy infrastructure and an operating company that would own the cows and be responsible for all dairying operations.

Kenn's initial equity stake would be 3% of the operating company which he would manage in return for a salary and a bonus of 5% of all operating profits over $1million per year, with the option to convert that bonus into equity in the operating company, up to a maximum of 20%.

Holsum Irish Dairy, was built on Irish Road, Hilbert, Wisconsin in 2001 for 3,500 Holstein cows housed for 365 days a year in free-stalls (cubicles) and milked though a single 72-point rotary milking parlour, operating 24 hours a day on a 3-shift system.

Milk is sold locally to a cheese manufacturer supplying cheese to the pizza market. Supplying a commodity market enables the business to accurately hedge the value of its milk sales as the contracted milk price is linked by a transparent mechanism to the value of cheese and cheese derivatives traded on the Chicago Mercantile Exchange (CME).

The only land that the business owns is the 75 acres that the dairy buildings, feed pads & digestate lagoons stand on. All non-core operations i.e. forage production, harvesting, calf & heifer rearing, milk haulage and manure spreading, are outsourced to local farmers and contractors.

This approach significantly reduced the amount of capital required to establish the business as it avoided the substantial outlay required to purchase land for forage production. The rationale behind this was that, provided input price risks were adequately managed, the core dairying activity offered a significantly higher return on investment than holding land did. The trust had a sufficiently diversified investment portfolio to carry the managed risk associated with outsourcing of feed production.

The success of this strategy was contingent on the establishment and maintenance of strong relationships with local farmers and contractors with clear pricing mechanisms for

contracted crops that allow all parties to hedge their positions, as required, in a fair and transparent way.

Consequently Kenn developed a pricing mechanism that links the price paid for Corn (Maize) silage and Alfalfa (Lucerne) haylage to the market value of Dry corn and Soybeans respectively, which the contracted growers would otherwise grow.

Additionally the contracts are conditional on growers taking, pro-rata to their contracted area, and all the manure from the dairy in the form of separated digestate with 50% of the value of nutrients (N, P&K) in the digestate available in the first year offset against the price Holsum pays for forage.

Holsum organise all harvesting operations through local contractors to better manage harvest logistics and the quality of work done and to further reduce costs for all parties.

The forage contracts are structured in such a way that a typical grower earns 10% more in net profit terms supplying Holsum Dairies than he otherwise would grow Corn & Soybeans for the general market.

This arrangement works extremely well in practice, with 40 growers contracted in 2008 and demand for the digestate so high that Kenn was in negotiation with suppliers to increase the value of the offset to 75% of available nutrient value for 2009, to reflect its increasing value as a fertiliser

Where there's muck….

All manure is processed through an anaerobic digester to produce Biogas which in turn is burned in an onsite Combined Heat and Power (CHP) plant to generate electricity and hot water.

All electricity generated is sold to the local grid, in order to obtain maximum carbon credits, and any requirement for the dairy is purchased back at commercial rates. The recovered heat is used to maintain digester vessel temperature, provide hot water for the dairy and heat the floors of the free-stall buildings in winter via an underground heat matrix. This

prevents slurry freezing to the concrete in the very cold winter temperatures common in this part of North East Wisconsin.

The digested slurry or 'digestate' is separated and the solid fraction retained as free-stall bedding, effecting a saving of more than $150,000 a year over the cost of buying and recycling sand. Having passed through both the cows and the anaerobic digester, the solids are by this stage being pretty much inert and therefore provide a comfortable and hygienic bedding medium.

Using digested manure solids (DMS) as free-stall bedding requires careful management, but does avoid many of the costs and logistical challenges of using sand, particularly when anaerobic digestion is an integral part of the manure handling process, without compromising cow comfort. Work at Cornell University has shown that somatic cell counts and mastitis incidence in well managed systems using DMS are statistically no different to sand based systems and in some cases improvements in environmental hygiene were reported

This would be supported by the experience at Holsum dairies, but Kenn pointed out that regular stall grooming and topping up with fresh material every other day was essential to maintain a healthy environment. This is not a problem given the volume of solids generated; in fact for Kenn, it also provides a significant source of revenue for the business, as he is able to sell 30 truckloads of separated solids a week, at $15 a tonne, to other dairy farmers to use as bedding. This income stream effectively covers the salary cost of the two unit managers employed to look after the day to day running of the business.

The separated liquid fraction is stored in a sequence of settling lagoons, and used as fertiliser for forage crops. The combination of solid separation and post separation settling, essentially removes the majority of the phosphorous bearing particles from the manure stream.

This is a major benefit as Phosphorous rather than Nitrogen is the determining factor that limits the quantity of manure that can be applied to land in many states in the US. Low P

levels in the resulting liquid fraction allows larger quantities of N&K to be applied to crops as digestate, reducing fertiliser costs for the growers and minimising the amount of land required to dispose of the dairies liquid waste stream.

Exporting manure solids, regular dredging of the settlement lagoons and the subsequent spreading of high-P solids to land with a requirement for Phosphorous allows Holsum dairies to better exploit the nutrient value of their manure without compromising environmental legislation.

Kenn sets a very high standard in all areas of his business and environmental management is a key performance area for him, given the level of scrutiny large dairies are under in this respect. Holsum Dairies have set new standards for environmental compliance within the dairy industry. In 2006 they were the first dairy farming business in Wisconsin to achieve ISO 14001 standard for environmental management and are active participants in the Green Tier Environmental stewardship programme run by the Wisconsin Department of Natural Resources.

Operational efficiency

The business operates as close to maximum operational efficiency as any dairy in the world. The milking parlour works at pretty much maximum capacity milking 3,350 cows, 3x daily, processing approximately one cow every 7½ seconds, allowing for an hour between shifts for washing and maintenance.

Most scheduled maintenance tasks are carried out either during the break between milking shifts or during parlour operation. The parlour is designed accommodate a 50% failure rate of key components such as the drive motors and the roller bushes supporting the Parlour deck, without interrupting milking.

Both of these components can be replaced while the parlour is working. Other key system components such as the vacuum systems and refrigeration plant are modular and have built in surplus capacity to allow maintenance to be carried out without interruption to milking operations.

As is increasingly common on large US dairies there is no bulk milk tank on the unit. Milk flows from the parlour through a filter and over a plate cooler where it is chilled down to 38 degrees farenheit (3 degrees C) and directly into a 'semi-trailer' tanker parked in one of 4 docking points adjacent to the dairy.

Tankers are filled at a rate of one every 6 hours, so hauliers drop empty tankers on arrival, hook up to a full one and go minimising turnaround time. Tanker load status is visible to the milking team who can monitor and switch between trailers remotely from the parlour as necessary.

Milk production and milking time is recorded in the parlour on an individual animal and group level to track performance on a shift by shift and group basis. Each group of 350 cows is moved from their pen to the parlour holding yard as the previous group is being milked allowing a seamless flow of all 3,350 milking animals throughout each shift.

Target 'turn time', measured as the time between the first cow in a group leaving the free-stall pen and the last one returning to the pen after milking, is 45 minutes. This means that despite being milked 3 times a day, the maximum amount of time that any one cow is away from its food water and lying area is limited to 2½ hrs in any 24 hour period.

Cow management & cow comfort

Heifers are kept separate from mature cows for their first lactation to avoid bullying, thus allowing them to reach mature size without compromising milk yield. Stocking rate was slightly over 100% in terms of cows per free-stall (with the exception of fresh cows' pens which was never more than 80%) but always below 100% in terms of cows to available feed spaces, ensuring all cows were able to feed at the same time. Dry matter intake along with cow comfort was a key driver of performance and anything that compromised that was designed out of the system

All free-stall pens are fitted with self locking yokes on the feed fence which were set to catch the cows as they return from milking and hold them for up to one hour. This allowed each group to be inspected, and routine procedures such as AI & Pregnancy diagnosis to be carried out while the cows were eating in a familiar environment. It also allows sufficient time for the cow's teat canals to close fully before the lying down in their fee-stalls, significantly reducing the rate of pathogen ingress and consequently mastitis incidence.

Typically cows would be locked up for an hour following the morning milking to allow time for routine inspection and no more than half an hour for the other two, for teat canal closure, optimising the amount of time spent away from the lying area. Research has shown that the more time the cows spends lying down, the greater the rate of blood flow to the udder increasing milk production and the lower the incidence of lameness.

Standing and 'high-traffic' areas within the pens, transfer alleys and collecting yard have rubber mats on the floors to improve comfort and traction for the cows and to minimise the amount of time spent standing on concrete, a key cause of lameness in housed dairy cows.

Kenn advocated the use of second hand moving walkways, recycled from airport terminals *(left)*, for this purpose. They have grooved rubber backing for flexibility, which when turned upside down and bolted to a concrete floor, provided a comfortable and hard wearing surface for the cows to stand and walk on, that was considerably cheaper than custom made rubber flooring.

Another interesting observation was that the width of the rubber walkways in the return lanes was restricted to little more than that of a single cow. This improved cow flow around the unit considerably, as cows tended to push the cow in front along rather than walk around her on a concrete surface.

Diet & Feeding

The cows are fed a Total Mixed Ration (TMR) ration based on Corn (maize) silage, Alfalfa (Lucerne) haylage and by-product feeds (Brewers & Distillers grains, Corn bran, Cotton seed, Whey protein permeate, & Blood meal); the majority of which are sourced locally resulting in a very low cost ration requiring no prime grains (Corn or Soya).

Due to this availability of abundant good quality by-product feeds, Kenn is able to keep his feed cost per cwt of milk as low as anyone in the state if not the entire US. Each ration is costed down to the last cent allowing him to establish a feed efficiency curve for individual groups of cows according to age and lactation stage.

All animals are fed by one man using a single 45cubic metre, tractor drawn mixer wagon, working approximately 10-11 hours a day, every day of the year. Loading instructions are sent direct from the office computer to a display on the mixer wagon in real time, telling the operator exactly how much of each ration component is required for each mix. The system monitors exactly what is fed and how long each load takes to load, mix and feed enabling feeding efficiency and feed inventory to be tracked extremely accurately.

When I visited Holsum in October 2008, the tractor that drove the feeder wagon had recently had an engine overhaul, having clocked 21,500 engine hours in a little over 5 years!

Blood meal & Posilac (rBST)

Kenn was quite relaxed about using blood meal as a protein source for the cows, something not permitted in the EU since the BSE crisis of the 1990s. As a veterinarian he was satisfied with the regularly audited risk management processes in place and felt the economic and environmental benefits far outweighed any perceived risk to health, either animal or human. There have been no reported cases of BSE associated with the practice of feeding blood meal in the US and he did not feel that there was any ethical or physiological issue either.

The amino acid profile in blood meal was such that he is able to maintain a herd average yield of 11,500 litres of milk sold per cow per year, feeding a ration with a significantly lower crude protein content than he could use soya or other vegetable protein sources. This in turn reduces the amount of nitrogen excreted by the animal, in turn reducing the overall environmental load created by his dairying operation. And given that blood meal worked

out at 60% of the cost of soya on % protein adjusted basis, then is his view it was a 'no brainer'.

Similarly, he routinely uses Posilac (rBST) to maintain milk yields in mid to late lactation cows. With no evidence of any risk to human health but a quantifiable improvement in Feed conversion efficiency, the benefits in terms of reduced feed cost and consequently carbon footprint per litre of milk produced, (something he felt would probably have a commercial value in itself in the future), and using rBST was both an economically and environmentally simple choice.

Financial performance and business growth.

In 2006 Kenn built a second unit, Holsum Elm Dairy (below), three miles away from the original site. This unit was designed for 4,200 cows milked through an 80 point rotary and whilst it incorporated a number of minor design improvements were essentially a larger version of the original design. Milking began in November 2006 and by June 2007 the unit was operating at full capacity.

Holsum Elm Dairy – October 2008

Meticulous attention to detail at every level has allowed Kenn to achieve and maintain remarkably low operating costs through a period of rapid business expansion. In the 12 months to October 2008 his average cost of production across both units was $12.40 per cwt, the equivalent of approximately 16.5 ppl at the prevailing exchange rate. Over the same period his average receipts were $21 per cwt.

To put that in perspective, in the 21 months between commencement of milking at the second dairy and my visit in early October 2008, the two dairies had, between them, generated sufficient net profit to pay off the $15 million build cost of the Elm dairy. For a

new dairy to achieve that level of performance from a standing start is a remarkable feat and a testament to Kenn Buelow's excellent management.

Refining the model

At the time of my visit he was in the process of building a state of the art calf nursery and heifer rearing barn to accommodate all replacement heifer calves for the two existing dairies and a third planned for construction in 2009/10, from birth to 9 months of age. He felt that he could do a better job of managing this critical stage of the animal's life in house and continue to contract out the job rearing of older heifers to his existing contract rearers. Having consulted with them, they were happy to rear more heifers for fewer months as this would simplify their operations and reduce their costs.

The Future

By May 2009, the dairy market had weakened significantly. The market price of milk had crashed from $19/cwt in October to around $11 but a combination of effective hedging of his milk price and increasing gas/electricity output from the AD/CHP plant through the introduction of food and abattoir waste, for which he was charging a gate fee, meant that while the third dairy had been put on hold, Kenn was continuing to operate at what he described as 'above breakeven' while the majority of dairies across the US were losing over $5 a cwt

Kenn is constantly looking to the future. When it is built, he will have a significantly larger equity stake in both the property and operational businesses of the proposed third dairy, but is actively planning his own obsolescence, training two young managers to whom he is increasingly delegating more of the day to day management responsibility for the business as he looks for new challenges both at home and abroad, citing China as 'offering some interesting opportunities'

He has achieved the difficult task of building a world class large-scale dairy business in a traditional dairying area where such businesses are often viewed with antipathy if not outright contempt. He has done so by forging genuine partnerships with local businesses and created mutually reinforcing relationships that have won him a great deal of support from the local community.

MilkSource Group, Kaukauna, Wisconsin

"We are committed to being stewards of the land, our employees, our cows, our community, our neighbours and the future of dairy farming in America's Dairy State," - Jim Ostrom, CEO Milksource Group.

Twenty miles to the North of Holsum dairies close to the town of Kaukauna, is Tidy View dairy, headquarters of the Milksource group. *(www.milksource.com)*

In 1994 ago Jim Ostrom (left), along with John Vosters and Todd Willer bought a stake in the Vosters' family dairy farm, a traditional 150 cow Wisconsin dairy and embarked on a period of aggressive growth, leveraging their assets as hard as they were able, to increase cow numbers, expanding to 600 cows in the first year.

Mr Vosters senior was bought out in 1996 and the business continued its aggressive growth strategy, borrowing money to buy land, which they considered a one way long-term bet; and using their steadily appreciating asset value to securitise the finance needed to increase cow numbers, the cash generating engine of the business.

Much of Milksource's original borrowing was secured via the US Farm Credit System (www.farmcreditnetwork.com) a nationwide network of financial cooperatives, owned and operated by the farmers, ranchers and rural customers it serves.

Approximately 90 local Farm Credit associations and 5 System banks each have their own boards of directors and are owned cooperatively by those who borrow from them. Each bank and association manages and controls its own business activities, operations and financial performance.

This system provides access to finance for US farmers and growers enabling access to capital that might not otherwise be available, particularly due to the in-built risk management infrastructure within the FCS organisation. However the conservative nature and requisite levels of securitisation against assets required by the FCS meant that it alone would not be sufficient to fund Milksource's ambitious growth model

External Investment & Diversification

Consequently external investors were brought into the business to provide growth capital, industry knowledge to help diversify their business interests. Two parallel ventures were started with mixed success. The first, a milk bottling business, was in Jims words 'a BIG failure' and incurred substantial losses.

When it was clear that this business had no future the 3 original investors and their new partners faced disagreement over how the company should be wound up. The external investors were looking to cut their losses and seek bankruptcy protection, leaving a number of local suppliers facing heavy losses with little likelihood of recovering any of them.

The original partners however were concerned over the potential damage this would do to their reputation and local standing and therefore decided to cut their ties with the external investors and seek to wind up the business at their cost paying back all the supplier debt in the process.

The winding up of that business was a salutary lesson in business ethics and taught the team a lot about where their expertise lay and where they should focus their efforts in future. It also illustrated the risks of engaging external investors whose objectives were not fully aligned with their own; something they would not repeat again.

The second diversification, Calfsource, a contract calf rearing enterprise was a more successful venture. Building on their collective stockmanship and understanding of the needs of local farmers, they grew Calfsource into a 7,000 head rearing facility that was generating a valuable income stream. Calfsource was sold in 2003 to Smithfield Foods, releasing a significant amount of capital that allowed the business to further expand its core dairying business.

Focusing on core strengths

The business model was now a simple one; to grow their asset base focusing on their core strengths which were expertise in milk production, and in structuring finance for continued land acquisition.

In Jim's view land ownership is a critical component of the business's success. The long term appreciation in asset value has provided an equity cushion that has allowed them to continue to grow without recourse to external (non-bank) sources of finance. It is very much a business model that is contingent on maintaining a track record of consistent performance

and minimising downside risk, but avoids the exposure to the 'local feed mafia' that Jim felt was a fundamental weakness of the Holsum Dairies model.

Kenn Buelow had in Jims view set a floor value for locally contract grown forage that was driving prices in the area. By keeping production in house, Milksource avoided direct competition for cropping expertise, which they have subsequently developed internally and instead concentrate on acquiring the right land at the most economic cost.

Managing Risk

On an operational level Jim's key area of focus within the business is to manage the business's financial risk which he has achieved by locking in a margin over cost of production that generates sufficient cash to service their debt level and to drive further expansion through acquisition.

This in turn relies on the business maintaining the requisite level of technical performance which is down to John's (livestock) & Todd's (operational) expertise.

They three partners would appear to have highly complementary skill sets as the business model appears to be working well. In October 2008 Milk Source were milking just under 10,000 cows on two dairies, selling over 100 million litres of milk per year. They owned 4,000 acres of land, contract farmed a further 10,000 acres to support the existing dairy herd and had recently acquired another 3,000 acres as part of a new dairy development at Rosendale in Fond Du Lac County.

All input costs will be for crop production, feed purchase, operational and energy costs are fixed over an 18month horizon. Likewise the company's milk price had been secured with their buyer over a similar period, at a modest discount to the historically high but relatively illiquid and thus volatile milk futures market, to secure a net margin over total cost of production of $3.5 dollar per cwt of milk sold.

After debt service that left a significant seven figure net free cash-flow* available for investment, against which further debt could be securitised to drive their continued expansion.

Financing Expansion

When I visited they had just completed the construction of phase one of a new $70million dairy facility in Rosendale, Fond du Lac county (www.rosendaledairy.com) and were about to start stocking this unit with the first of 4,000 cows. The facility was designed to house up to 8,000 cows at full capacity, in state of the art air-conditioned free-stall barns employing cross ventilation & evaporative cooling technology and milked through two 80 point rotary milking parlours. Unlike their earlier units the Rosendale facility will incorporate AD & CHP technology to process manure as part of an integrated environmental risk management process and to generate additional revenue for the business.

Rosendale Dairy milk loading dock

As of autumn 2009, stage two had subsequently been built and was in the process of being stocked. This is doubly remarkable given that the second phase of expansion has occurred during a period of marked downturn in US milk prices, yet MilkSource's disciplined approach to risk management had enabled them to maintain their planned growth despite the ravages of the commodity cycle and the credit crunch.

As they have developed their business and established a consistent track record of operational and financial performance, so their sources of finance have evolved.

Operational assets continue to be funded via the Farm credit system, typically geared at 50%. In Jim's words, *'The FCS understands the industry and as such is easier to deal with than the generic banking system when it comes to financing operational assets and working capital, particularly when your track record is as consistently sound as ours is'.*

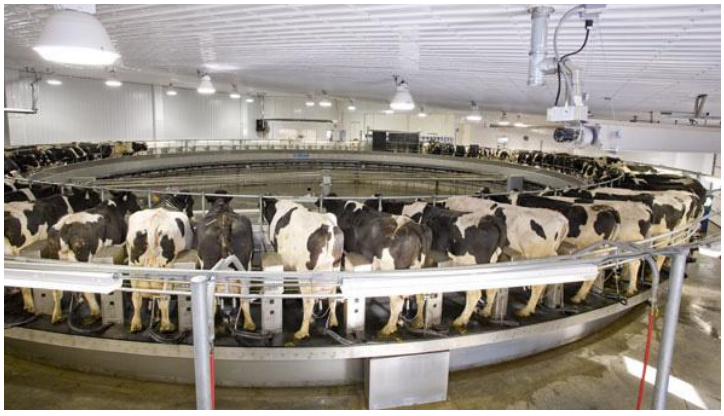
The Real estate portion of their portfolio tends to financed at 30-35% equity (65-70% gearing) using generic commercial banking channels, where the more competitive nature of the market has allowed them to borrow at cheaper rates. Jim budgets on a long term weighted cost of capital of between 6½ to 7%; in 2008, prior to the credit crunch, he was able to secure borrowing at 4%.

Sustaining Growth

The operational structure of the business is also constantly evolving to support their continued growth. The business has employed an in house lawyer and a professional project manager from the construction industry to manage the legal and operational aspects of their planned expansion, which is set to grow by an ambitious 3,500 cows per year for the next ten years and achieve a target of 50,000 cows within a 2hr flight of their home base.

Managing the key risk areas of the business is fundamental to achieving this target. Continually improving operational performance underpins the financial risk management strategy and this is down to attracting, motivating and retaining the right people and ensuring that the business stays at least one jump ahead of ever tightening environmental legislation.

MilkSource's objective is to become a model of best practise for the industry and a magnet for talent to sustain their success. This is doubly important when, in a traditional dairying states such as Wisconsin, they face a perceived *'social stigma associated with large scale dairying'* with constantly accusations from many local farmers and often the wider community of trying to '*buy up the industry*'.



80 point Rotary parlour, Rosendale Dairy, Wisconsin

'We are conscious that we what we are doing creates a degree resentment in some quarters and consequently we are under a great deal of local scrutiny. That only underlines the importance of staying the right side of the environmental regulations. Historically you were allowed to make the occasional mistake....not any more. It's a case of one strike and you're out'

However the rewards for success are clear and Jim is comfortable that his approach is sustainable. '*A pollution Tsar would insist on dairying being done this way as we have to demonstrate a far greater degree of environmental compliance than the smaller guys'*

He sees the trend towards larger scale as inevitable stating *'what we offer is a viable exit route for smaller producers either through contract farming arrangements or sale of land based on a purchase price that is many times greater than its written down value'.*

Jim cites examples of other successful dairy entrepreneurs across the US such as Louis Bettencourt *(70,000 cows in Idaho)* Gary Fehr *(40,000 in Minnesota)* and the McCloskey / den Dulk partnership based at Fair Oaks, Indiana, all of whom are rapidly expanding their operations based on leveraging their core competences in commercially and environmentally sustainable dairying.

As has happened in the pig and poultry industry, Jim foresees an exit opportunity in the longer term for dairy entrepreneurs via a '*rolling up of the better large dairy operations'* by corporate investors in what he predicts will be the next wave of industry rationalisation. These opportunities however will only be available to well invested businesses operating at optimum commercial scale with established risk management systems in place.

Jim Ostrom has a clear view of the future and is building a business that is able to adapt to meet the challenges and opportunities of an ever evolving industry. By creating a clear corporate structure, brand identity, and robust operating model, Milksource group will be well placed to exploit those opportunities as they arise.

Fair Oaks Farms & Bos Dairies, Fair Oaks, Indiana

The art of dairy is what we do. We are so passionate about our extraordinary dairy, we invite you to visit us any day and every day. - Fair Oaks Farms

Straddling interstate I65, midway between Chicago and Indianapolis in the heart of the Indiana corn-belt, is one of the largest dairy farms in the United States, home to 30,000 milking cows and some of the most innovative approaches to large scale milk production anywhere in the world.

Fair Oaks Farms (www.fofarms.com) is the brainchild of Mike McCloskey *(left)*, a visionary agricultural entrepreneur who started out as a dairy vet in Southern California in the early 1980's.

Expansion opportunities for dairy farmers in southern California at that time were limited so McCloskey & a small group of milk producers sold up and relocated to New Mexico, which at the time was experiencing a mini dairy boom.

The dry climate in the region and allowed them to build large low cost 'dry-lot' dairies fed by abundant borehole water for less than $1,000 per cow. The milk was sold through co-ops in Eastern Texas to the growing market in the south east and for a number of years they enjoyed a period of high rapid growth and high returns, accumulating considerable net worth in the process.

Low cost infrastructure and competitive freight rates enabled many of the dairies to pay for themselves in under 3 years, but by the end of the 80's, with the reorganisation of the East Texas co-ops and others to form Dairy Farmers of America and subsequent changes in the freight rules applied to West Texas & New Mexico producers, profitability started to fall dramatically.

So McCloskey went looking for a new market for his milk and soon identified a regional grocery chain that was looking to source its milk more effectively. Their requirement at the time was for the equivalent of 30,000 cows, so McCloskey subsequently set up Select Milk Producers in 1994, a co-op made up initially of 16 large-scale producers who were able focus on the consistent supply of quality liquid milk for the retail market. Today Select Milk is the 5th largest milk co-op n the United States supplying over 3.3 billion lbs of milk per year, from less than 50 members.

In the mid to late 1990s McCloskey started looking domestically and abroad for new opportunities to expand his successful dairy model and identified the Mid West as offering the best combination of productive land, water, good transport infrastructure and a strong and secure local market for milk.

At the same time the Prudential insurance company were looking to offload a sizeable block of land that they had acquired, about an hour's drive south of Chicago as a speculative site for a new airport to service the city. When it became apparent that the project would never materialise, the insurance

they started looking for someone to take the 15,000 acre block of irrigated land off their hands in a hurry.

Additionally the Indiana state government was, at the time, keen to attract agricultural investment into the state to relieve its flagging rural economy and was prepared to offer fairly keen tax incentives to anyone prepared to relocate to Indiana, as well as looking favourably on the granting of development permits for large scale livestock operations that would provide a local market for the states key crops of corn and soybeans.

These three factors made for a once in a lifetime investment opportunity and McCloskey and his partner Tim den Dulk were quick to capitalise on it, mobilising a syndicate of South West Dairy producers backed by a Californian real estate fund that acquired the land at Fair Oaks for a 'fire sale' price of $2,200 an acre and set about building what is now one of the most successful dairy operations in the United states.

Aerial photograph of Bos Dairies No.1&2, Fair Oaks, Indiana .

The land base now extends to 25,000 acres and is home 30,000 cows on 9 dairies; 4 on the west side of the interstate run by McCloskey & den Dulk as Fair Oaks Farms and 5 on the East side operated by the Bos family, who relocated from Texas, as Bos Dairies.

Financing & Operations

Gary Corbett *(left)*, a former senior executive at Dean Foods joined Fair Oaks Farms as CEO in 2002, specifically to develop the business and the visitor centre (see below). In what was a very frank interview he talked me through the operational structure and strategy of the business.

"Essentially the business was funded by the principle partners own equity with external capital from a Southern Californian real estate fund. Partners' equity was provided by the sale or lease of their former dairy operations in the South West & Texas. US Banks have traditionally kept away from 'Big Dairy' due to the volatility of the milk market, perceived environmental risk and public perception issues."

The Fair Oaks business is divided into a number of separate profit centres for legal and operational reasons. These were broadly defined as Real Estate, Operations, Energy generation, Education, on farm processing & Retail.

Whilst Fair Oaks Farms (FOF) and Bos Dairies are essentially separate businesses they operate as one outward facing entity, with regards to cropping, input purchasing, environmental management and essentially milk marketing.

“We produce around 2.1 million lbs (950,000 litres) of milk a day here - Our economies of scale mean that we are able to take advantage of a market where the long- term price is determined by the cost base of smaller family dairies”

“Based on current feed prices, we can produce a workable return at a milk price of $15 per cwt while most of the US dairy industry works on a break-even price of $18”, but he was quick to point out that “there was no room for complacency as 50% of US milk is now produced by the largest 2% of producers so that price dynamic was changing.

“Falling prices in real terms over the longer term horizon will continue to drive high cost producers out of the industry. We need to constantly improve our performance in all areas of our operations to maintain our competitive advantage and stay ahead of the game. Effective management of both business risk and customer relationships are key components of that process”

Milk Marketing

All of the milk produced by the two companies is sold through Continental Milk Producers, the Midwest sister co-operative of Select Milk Producers. Continental like Select is a relatively small group of approximately 30 large (2,000 cow+) producers who are able to offer the kind of logistical economies of scale and consistency of supply that allows them to deal direct with major retailers and processors.

Milk from the two co-ops (Select & Continental) is brokered by a single company, Quality Milk Supplies, set up and managed by McCloskey & den Dulk. Despite having less than 100 farmer suppliers in total, QMS is now reportedly the 3rd largest supplier of milk in the US after Dairy Farmers of America and Land O’Lakes.

Principal customers include the Kroger supermarket chain, Dean Foods and Wal Mart. While the Co-ops have a processing agreement with Dairy Farmers of America, price negotiation with the end customer is essentially done by QMS.

This lean and responsive supply chain model is able, by keeping tight control on overhead and logistics costs, to maximise the share of the milk value returned to the producer while offering an attractive value proposition to the customer. Traceability and Quality control are the other key components of the offer that strengthens the competitive position of these large dairies.

It is an evolution of the co-operative concept that I believe UK producers can learn from. Tightly focused groups of similarly sized and progressively minded producers, that are better able to meet a specific customers needs than the more unwieldy traditional, 'one size fits all' co-operative model, where any perceived value created by absolute volume is often eroded by higher admin & logistics costs, organisational politics and a general inertia with regard to the implementation of new technologies and practices

By better matching supply to the specific needs of individual high value retail customer accounts, QMS and its suppliers were able to reduce the volatility of their milk price and at the same time command a premium over the market for higher service levels, significantly mitigating one of the major risk factors associated with large scale milk production.

Corbett appeared quite comfortable with how the business was positioned to deal with the impending weakening of the US milk market. "Our average milk price for the 12 months to October 2008 was over $20 per cwt, with many commodity inputs fixed at pre 'price spike' levels, so we're quietly confident about our competitive position, despite an expected drop in milk prices in 2009"

Operational excellence

In 2008 Fair Oaks Farms & Bos Dairies were, between them, milking 30,000 cows and were permitted to expand to 40,000. They were carrying sufficient heifer stock within the business to replace culls and populate this expansion, but were waiting to see how the market developed before committing to build 3 new dairies. Build cost was estimated at $5,600 per cow space in 2008 compared to $3,300 when they built the original 4 units in 1999.

The business typically carries 2 years supply of forage in stock which Gary considered a "cheap insurance policy against weather and market movements". In 2008 corn silage had yielded an impressive 30 tonnes to the acre, well above the five year average of 18t. This would prove particularly beneficial in the following 12 months as milk prices dropped below cost of production allowing Fair Oaks Farms to eat into their existing stock of forage whilst harvesting and selling a significant proportion the 2009 season corn silage crop as dry corn to ease their cash flow position.

Herd rolling average production was running at 26,000lbs (11,800 litres) of milk sold per cow per year , from 3x daily milking, without using rBST, as its use was not permitted for the liquid market that FOF supplied. Herd replacement rate varied between 25-30% with a high level of voluntary culling possible due to the large number of heifers currently in the system.

Class leading levels of Herd health, Cow comfort and Nutrition management are the key to maintaining this high level of performance. “It's not rocket science, we just concentrate on getting the basics right and are continually looking to improve. A lot of it is down to having the right people.”

Fair Oaks Farms & Bos Dairies employ a total 450 people across all their business operations. All dairy staff below management level is Hispanic, an increasingly common practice on large US dairies. Contrary to the popular myth, good Hispanic workers are not cheap to employ but are as a general rule, reliable, hard working and conscientious and tend to work well together in teams often made up of members of the same extended family.

Fair Oaks typically pay their dairy staff c.$35k per annum + benefits and provide a house with utilities paid, which equates to a total cost of $50-60k per employee. This is above the industry average, but in Corbett’s view was a worthwhile investment as staff turnover was comparatively low and they had very few labour issues on any of the farms. “We have a lot of money invested in this business and we need quality people to make it work”

Milking area at Bos dairies, 15mins after milking 2,850 cows

At 35-40 staff per dairy, this equates to 1 labour unit per 80-90 cows. Corbett’s view was that this was close to the optimum level. “There are plenty of dairies operating at a higher cows-per-labour-unit figure, but our view is that overall business performance can slip very quickly if labour is overstretched. We need to be adequately resourced to maintain optimum performance”

The technical standard of all operations at Fair Oaks Farms & Bos Dairies was extremely high and much of the technology employed, cutting edge. Craig Martins, US Sales Manager for Westfalia Surge, who supplied the parlours and milking equipment for the 5 Bos dairies summed it up succinctly as we toured one of their cross-ventilated dairy units... “There is no shortage of innovators and early adopters in US dairying, but these guys are right on the ‘sword point’ of the industry. What you’re seeing here will be common practise throughout the industry in 5-10 years”

The cross ventilation system uses banks of evaporative cooling pads, hollow paper filaments filled with water, located along one side of the buildings and high volume fans on the other side to draw ambient air through the pads. The evaporative effect of the ambient air flowing over the permeable pads cooled it by up to 20 degrees F as it entered the barn. Warm air was drawn out the far side by the banks of extractor fans creating a cool breeze through the building.

Cross ventilated free-stall barn, Bos Dairies Indiana

The resultant effect was an extremely cool and pleasant environment for the cows and they appeared to respond well, especially in the summer months where heat stress can have a marked effect on both milk yield and fertility. Both had been maintained at target levels through the summer since the installation of the system.

The downside to this system is that, for it to work effectively, the buildings need to be closed denying the animals natural light. On balance the net welfare benefits in this climate, where summer heat stress is a major issue, would appear to favour the cross ventilation approach but it is, understandably, a difficult sell to consumers, which is why the Bos dairies do not feature in what is the most innovative and effective Agricultural PR exercise I have ever seen..

The Fair Oaks Dairy Adventure

Large, intensive, zero grazed dairy farms are not typically keen to open their doors to the general public. This type of dairying, however well run, tends to jar with many consumers' view of how milk is or should be produced. And the industry has and continues to receive more than its fair share of criticism, some justified, much not, on both environmental, food safety and animal welfare grounds.

As was discussed earlier this is both a major PR issue for the industry and has profound consequences for dairy entrepreneurs wishing to raise capital for such ventures, with many mainstream banks steering clear of 'Big Dairy' on PR grounds as much as for any inherent financial risks associated with the business.

Fair Oaks farms have however approached this issue in a very innovative way and have turned what for many would be seen as a major liability into a PR triumph and a significant revenue stream in its own right.

The Fair Oaks Dairy Adventure is an extremely well thought out and executed concept that has captured the imagination of hundreds of thousands of American consumers and is now the largest Agri-tourism destination in the Mid West if not the entire US.

Based around a very professionally designed and operated education & visitor centre, it presents large scale dairying in a sympathetic and professional light and explains in great detail the philosophy behind Fair Oaks Farms business, how milk and other dairy products are produced, their importance as part of a balanced diet and farming's role in sustainably managing the environment.

They make no attempt to hide any aspect of what they do and how they do it, but rather explain clearly and without patronizing the audience, the reason behind why this system of dairying works best for the cows and the environment. It is an engaging and interactive experience and manages to get the message that well run large dairies are both environmentally sound and have the cows' welfare at the heart of their business model.

As well as the excellent visitor centre, visitors get to take a guided bus trip around one of the 4 dairies, where the bus actually drives down the central feed passage of a 1,500 cow free-stall barn allowing the visitors to see the cows in their working clothes. They then get to observe milking from a gallery overlooking one of the rotary parlors before being returned to the visitor centre for the 'piece de resistance', watching a live birth in the recently constructed birthing barn.

This particular PR masterstroke consists of auditorium style seating allowing the audience to watch cows give birth in pristine straw pens, attended to by a trained dairy 'midwife', through a one way glass wall that avoids unsettling the cows. The whole process has a live commentary with CCTV cameras mounted on the pen walls to afford a 360 degree live view of the action.

With an average of 90+ calvings a day across the business, there is never a shortage of cows to watch giving birth. Close-up cows are monitored and moved in pairs from the dairy to the birthing barn, as required, at the first sign of labour.

They have had to perform live caesarians on occasion, which only adds to the theatre and as is inevitable have to deal with the issue of still births, which is done in an honest but sympathetic way.

Since the birthing barn was opened visitor numbers have jumped 30% and in the 15 months prior to my visit the Dairy Adventure had hosted 450,000 visitors from all over the US and beyond.

The experience ends with a trip to the restaurant and gift shop, where visitors can sample a range of Fair Oaks dairy products such as ice cream and a range of 'award winning' cheeses that are manufactured on site. The cheese dairy, which utilises less than 1% of the milk produced on the farm, is co-located with the restaurant and visitors can observe the cheese-making process through large plate glass windows as they enjoy their meal and reflect on their visit.

The whole process is extremely well thought out and professionally run. It is a growing part of the business generating a significant revenue stream as well as an almost incalculable PR value for the business and the wider industry.

View of Cheese production from Fair Oaks Dairy Visitor centre

They were aware of the risks of opening up their business to public scrutiny from the animal rights and environmental lobbies but felt that this proactive approach was far more constructive in the longer term than adopting the siege mentality that too many in the industry have done, to its ultimate detriment.

As visitor numbers have shown, there is genuine and growing public interest in the venture and while it has inevitably attracted the attention of the animal rights lobby, they have invariably gone away with their tails between their legs, unable to gain any traction with the visiting public, when faced with such a compelling and well presented message.

The funding of the visitor centre is equally ingenious. All US dairy farms are legally obligated to pay 15c per cwt of milk sold towards milk marketing activities. 5 cents of that goes into a centrally administered fund, whilst the individual producer can choose what they do with the remaining 10cents, subject to it being channelled through a USDA approved scheme.

Co-operatives qualify as appropriate marketing vehicles and as all of Fair Oaks milk is marketed through Continental Milk Producers, the co-op set up and administered by Michael McCloskey and Timothy den Dulk, then their 10c is retained by the co-op and used to fund the dairy visitor centre at Fair Oaks.

The USDA rules state that such ventures must be run on a not-for-profit basis, so in the case of the Fair Oaks Dairy Adventure, despite appearing to be a single seamless enterprise, the visitor centre itself is funded by the co-op (using the 10c/cwt levy) whilst the dairy tours,

cheese dairy, restaurant and gift shop are separate privately owned entities, with all profits retained by the business.

Gary Corbett would not be drawn on exactly how much money the Dairy Adventure franchise was generating, but it certainly wasn't being subsidised by the farming business. By my rough estimations it was generating a revenue stream considerably in excess of $6million dollars per annum. The PR value is harder to quantify but could be considered invaluable given the

Looking to the future, Fair Oaks Farms has 600 acres around the visitor centre earmarked to develop into an agricultural theme park...a kind of 'Agro-Disney', with the bus tours even replaced with a mono-rail system if visitor numbers top the 1 million a year mark! However Gary was keen to point out that in doing so the core message should not be trivialised. 'We are first and foremost a commercial farm and intend to stay that way'

Environmental Management, Manure handling & Energy Generation.

All the dairies process their manure through anaerobic digesters and most generate electricity on site using integrated Combined Heat & Power (CHP) plant. The Bos dairies each has its own AD plant as does one of the Fair Oaks units, with the remaining three Fair Oaks dairies sharing a new central manure processing and AD facility.

Mark Stoermann is the environmental manager for Fair Oaks Farms. I had previously met Mark at an Anaerobic Digestion seminar at the World Dairy Expo three weeks earlier where he had offered to show me around Fair Oaks' new $12million Manure management and anaerobic digestion facility

Mark is a microbiologist by training, who had worked in the food industry prior to coming to Fair Oaks to develop the cheese dairy and visitor centre, had been instrumental in designing and building the facility. It had only just recently been commissioned a matter of weeks prior to my visit and was, even by Fair Oaks standards, an impressive piece of engineering.

To supply the plant, 400,000 gallons of sand laden manure a day is scraped from the freestall barns of 3 of the dairies by tractor drawn vacuum tankers equipped with giant squeegees mounted under their draw bars and transported to the central facility where it is discharged into a reception pit.

From there the manure is passed through 4 McClanahan screw separators that remove most of the coarse sand particles. The manure then passes along a settlement race where most of the finer sand particles fall out of suspension before the manure is passed into the 7½ Million gallon capacity Anaerobic Digester to begin the disgestion process.

The system is designed to recover over 95% of all sand from the manure stream, which amounts to approximately 250 tonnes of sand a day from 10,000 cows.

This is then spread out across a large concrete pad *(left),* exposing it to the sunlight to destroy the majority of bacteria and other photosensitive pathogens present, before being recycled as bedding.

In order to process the huge volume of relatively dilute manure generated efficiently, the digester operates on a fast cycle time of just 14 days. Post initial digestion the manure solids are separated and returned to the digester vessel. This enables solids to be retained in the system, in higher concentration than in raw manure, for a longer period, to ensure that the maximum amounts of organic solids are digested, and the maximum amount of biogas recovered.

The liquid fraction then passes through a series of polymer flocculation tanks which remove most of the suspended phosphorous and small solid particles. The remaining liquid, virtually odourless but relatively rich in Nitrogen & Potash is stored in two 36 million gallon lagoons before being returned via umbilical injectors or centre pivot irrigators as fertiliser for crops of maize and alfalfa grown on the farms 25,000 acres of cropped land.

Polymer Flocculation tanks

Phosphorous rich solids are stored and spread as required according to soil indices with the surplus sold off the farm as fertiliser.

The system was still being ramped up to full capacity when I visited, with initial gas production used to heat the main digester vessel. Once fully operational it is intended that the gas generated will be cleaned and either sold back to the local gas grid or used to power the company's fleet of trucks that delivered bulk milk to customers as far afield as Georgia.

Effective manure management is a critical part of FOF's risk management strategy and the whole system is not only hugely impressive but was delivering in all key areas. By anaerobically digesting the manure and separating out the solids, nutrient management is significantly enhanced, and odour and pathogen loads minimised and environmental risk mitigated

Odour & Fly Management

When I arrived at Fair Oaks on a warm day in October, with an ambient temperature in excess of 20 degrees C, the one thing that was immediately apparent was the smell...or lack of it. Considering I was standing in the middle of a 30,000 cow dairy farm, barely a kilometre from 70 million gallons of separated, digested cow slurry, that was in the process of being stirred and spread, there was no smell... and no flies.

Gary Corbett later revealed that the business spends as much as $2 million dollars a year on fly suppression and control measures, a significant amount of which is on R&D with Purdue University's Entomology department, which would ultimately benefit the whole US dairy industry.

Odour and fly control contribute greatly to the Fair Oaks' good neighbour policy that in itself is a critical component of any future growth strategy, however the $12million Dollars that the business has recently invested in manure handling and Anaerobic Digestion is far more than an expensive PR exercise

Better management of nutrients and the resultant improved crop productivity has reduced the business's exposure to volatile feed and fertiliser markets and mitigated the risks of environmental pollution.

Lower methane emissions from manure and a marked reduction in the requirement for purchased fertiliser & energy provides not only a cost benefit to the business but also a quantifiable reduction in its Carbon Footprint, which whilst a good PR story now may well prove to be an invaluable marketing tool in the future

And, whilst Anaerobic Digestion was introduced as part of an environmental and nutrient management policy, Fair Oaks Farms is now a significant net seller of energy and as such is well positioned to benefit from future rises in energy prices

Leveraging success

Fair Oaks Farms' business model is extremely effective. Mike McCloskey & Tim den Dulk have built themselves a very powerful position within the milk supply chain, managing the interface with the customer, through the establishment of a lean and effective co-operative structure of focused large scale producers. They are able to offer a genuine value proposition to retailers and processors, which in turn add significant value to their own milk production business.

The dairy operations are amongst the most innovative and well managed in the US and their approach to all aspects of the business is clear and focused. It is difficult to select a single area that really makes this business stand out, however the visitor centre is to my mind perhaps the most inspired innovation in a business where they appear at every turn.

I would be very surprised if there is a better example of a large-scale intensive livestock business, anywhere in the world, that has managed to do a more effective job of turning what conventional wisdom would consider being one of its biggest liabilities into such a strategic and commercial asset.

One final factor in the Fair Oaks success story is how the partners have, and continue to; leverage their success by investing in new talent, often nurtured from within the organisation.

In 2006 Dr Gordie Jones, a vet and the consultant nutritionist at Fair Oaks started up his own dairy business, milking 3,250 cows on a greenfield site at Central Sands, Wisconsin in partnership with a large scale arable and vegetable grower, Jim Wysocki and backed by Den Dulk and McCloskey.

In 2008 the Business entered into an agreement with R D Offutt Co, the largest potato grower in the world, to manage two out of three 7,000 cow dairies on Three mile Canyon Farms *(left)*, a 45,000 acre irrigated farm on the south bank of the Columbia River near Boardman, Oregon. Three mile Canyon Farms www.threemilecanyonfarms.com , is one of if not the largest integrated dairy & arable business in the US and is itself an excellent model for future sustainable agriculture.

Tim den Dulk, who runs his own dairy business in Grand Rapids, Michigan is also a major investor in Bridgewater dairy, a 4,500 cow operation in northern Ohio, run by Leon Weaver, another vet turned dairy farmer, who worked with Den Dulk & McCloskey back in the south West in the 1980s.

The constant drive to identify strategic opportunities and threats ahead of the rest of the market and the ability to develop innovative value creating solutions to the challenges that undermine the profitability of all dairy farms is a distinguishing characteristic of this most successful and dynamic business.

Fair Oaks Farms is without doubt the most impressive farming business I have ever seen. Breathtaking in terms of its vision, strategy and sheer scale and clinical yet reassuringly sensitive in all aspects of its operational, animal welfare and environmental management. For me and I am sure for the majority of consumers, this is the acceptable face of industrial livestock farming.

Vreba Hoff Dairy Development LLP, Wauseon, Ohio & Vreba Dairy, Vredepeel, Netherlands

Milk Quotas, ever tightening environmental regulations and high land values are major obstacles to dairy expansion in Europe and nowhere is this more acute than the Netherlands, where the cost of expanding production in 1999 was estimated at as high as 30,000 Euros per cow *(including land & quota purchase)*

This might be a problem for many progressively minded dairy farmers but not for Willy van Bakel, a maverick dairy entrepreneur in every sense. Van Bakel along with his brothers, Alex & Rene is the largest dairy farmer in the Netherlands, milking 1,200 cows on a single unit at Vredepeel, in south east, Holland. The family also ran a successful agricultural real estate and quota brokerage business, trading farms and dairying assets within the Netherlands and Northern Europe.

Willy van Bakel .

In the 1960's Van Bakels cousins, the Vander Hoff family emigrated from Holland to Michigan to start a new life dairy farming in the US. They progressively grew their dairy business to 1,800 cows. In 1998, they doubled the size of their herd and built a state of the art 3,500 cow dairy in Hudson Michigan in partnership with Willy van Bakel. Three years later they built a second.

Vreba Hoff Dairy 2, Hudson Michigan

Today they milk 7,500cows, own 4,500 acres of land and contract farm a further 3,000 acres. This is an impressive feat in its own right, but it is how they leveraged that success that is more extraordinary.

Asset Arbitrage

Steven Vander Hoff and Willy van Bakel saw an opportunity to capitalise on their collective expertise and in 1998 set up Vreba Hoff Dairy Development LLC to provide a one stop shop service for Dutch and German dairy farmers wishing to relocate to the US.

Dutch farmland in the late 1990s was selling for typically 5- 10 times what land could be acquired for in parts of the Mid-West and with quota worth as much as the land itself, emigrating Dutch farmers could, after allowing for the coast of building a state of the art dairy facility, increase the size of their operation by 5 to 10 times virtually overnight with the added opportunity of being able to grow further without the restriction of quotas and punitive environmental laws.

Maize silage being clamped Vreba-Hoff Dairy, Oct 2008

Van Bakel handled the sale of farms, cows and quota in the Netherlands, whilst Vander Hoff, one of 6 siblings involved in the US farming operation, looked after business stateside locating suitable sites, negotiating land purchases, permits and cropping contracts with neighbouring farmers, organising the design and build of the dairy facilities, sourcing of cattle and potential customers for the milk.

The business also provided a support network to ease the transition process for the families, identifying suitable schools and other necessary services that would otherwise prove time consuming and potentially problematic for the expats who had to quickly come to terms with farming on an altogether larger scale and a very different climate to what they were used to.

In 10 years, Vreba Hoff has relocated over 50 Dutch, German and Canadian dairy farmers to new dairies in Michigan, Ohio & Indiana. The standard unit size is typically 699 cows; just

below the 700 cow threshold at which point stringent CAFO environmental regulations are applied.

Once established the units can be expanded and the company provides a full business and technical consultancy service to help their clients establish, manage and grow their businesses as required. This size is not prescriptive however and Vreba Hoff has built client dairies for up to 5,000 cows, an example being the Van Deurzen Dairy in Ohio that commenced operations in 2007.

Van Deurzen dairy

Wouter van Deurzen *(right)*, a young Dutchman in his early 30's had no prior experience of dairying before relocating to the US. His family farmed broiler poultry and Mink for fur in Holland and grew 400 acres of cereals. In 2008 he was milking 4,500 cows three times a day through a 100 point rotary parlour; the largest in the US at the time of installation.

Wouter owns only the 100 acre site his dairy sits on and sub contracts out all forage production to neighbouring farmers. Employing a mix of Hispanic and Dutch labour and under the guidance of Jan Janssen, Vreba-Hoff's technical-director, he was, after a challenging start beginning to make considerable progress towards what Jan described as an 'acceptable level of performance'.

100 cow De-Laval rotary milking parlour at Van Deurzen Dairy

'We would not generally advise clients to build a dairy this big as a first step' but added that Wouters lack of dairying experience has probably worked in his favour as he had no preconceptions about how a dairy farm of this size ought to be managed.'

Loading Maize silage, Van Deurzen Dairy

Jan felt that the biggest challenge for many of the Dutch immigrants was making the jump from managing cows on small family operations in the Netherlands, where they were often the only labour, to managing people on much larger operations in the US.

'We can provide all the technical advice they require, but they have to be able to adapt their mindset'

Adapting the business model

The Vreba Hoff model has been a very lucrative one but as land values in the US rose on the back of improving farm profitability and quota values in Holland fell, the opportunities for would be émigrés began to look less attractive and by 2007 the stream of prospective clients began to dry up.

Consequently Vreba Hoff switched direction and started developing a new business model based around a capital fund raised largely from private investors in Holland. The fund would be leveraged against and used to buy land and build a number of 2-3,000 cow dairies which Vreba Hoff would lease and operate themselves. They planned to put a young manager into each one and give them the opportunity to earn a profit related equity stake in the business in a similar way that Kenn Buelow had at Holsum dairies in Wisconsin.

This would allow Vreba Hoff to continue to grow their dairy business and to maintain an income stream from their construction assets and the expertise that they had developed building dairies over the previous ten years.

To support this growth, the company purchased a former beef feedlot in Oklahoma which it now runs as a heifer rearing facility. With capacity for 15,000 head and potential to expand to over 30,000, the facility is able to service all the Vreba Hoff dairies and supply stock to third party clients.

When I visited, they had just sold a consignment of 2,500 heifers to stock a new dairy in Russia, as the price of heifers in Europe was significantly higher than in the US and being outside the EU, Russia was able to source live animals from the USA.

Challenging times

Vreba Hoff had enjoyed ten years of virtually unbroken success, on the back of the post millennium dairy boom in the US. The model had allowed them to capitalise on the huge disparity between asset values on either side of the Atlantic and their expertise and entrepreneurial spirit meant that they were able to extract a margin out of step in the process. However risk management and environmental compliance did not seem as high up the agenda as they had been on other businesses I visited.

They were at the time of my visit, themselves facing severe fines for a number of breaches of Michigan state environmental laws, with regard to manure spills and water course contamination. A number of their client dairies were in a similar position in Ohio and Indiana; something Vreba Hoff were keen to distance themselves from, not wishing to add to their existing problems.

Subsequently, a combination of falling milk prices and the wider credit crunch meant that they have been unable to raise sufficient finance to complete the construction of the proposed new dairies. To add to their mounting woes, a number of client dairies are in dispute with them over alleged mismanagement of their assets during the relocation process.

The American dream appeared to be turning into a nightmare for Vreba Hoff and some of their clients. A small number of Vreba Hoff expats have returned to Europe having lost all their equity in the extremely volatile US milk & feed markets of the last 2 years. Whilst this is unfortunate for the individuals concerned, there was always a significant risk associated with relocation and it was inevitable that out of 50 farmers that chose to relocate, there would be some that didn't make it.

Vreba Hoff itself is under increasing pressure at the present time with rumours circulating in recent months that the business is on the verge of collapse due to mounting legal costs arising from disputes with suppliers, clients and despite considerable recent investment in manure storage *(left),* the state environmental regulators, but as yet they appear to be surviving.

Aerated Slurry storage lagoon at Vreba-Hoff dairy

Willy van Bakel is reported to have severed ties with the Van Bakel's dairy farming interests in the Netherlands to protect the family's assets from the potential consequences of any future failure in their US business

Vreba-Hoff recognised and took advantage of an opportunity offered by the historically huge disparity in asset values on either side of the Atlantic. The asset arbitrage model was an ingenious one that allowed the van Bakel & Vander Hoff families to leverage the value of their collective experience and knowledge of the dairy industry to their considerable benefit

It would be a disappointing end for an ingenious and enterprising business if it were to fold, but equally it underlines the fact that the US milk market is as unforgiving in a downturn as it is lucrative in a boom and however entrepreneurial the venture, adequate risk management is an essential element of any large dairy business, especially when the business model relies so heavily on leveraged finance.

Personal reflections on my study

An interesting aspect of my travels in the Midwest in the autumn of 2008, was watching the world's financial markets unravelling in real time. 24hr news is often criticised for desensitising the viewer to significant events but in this case it served to focus my mind on what was happening in the wider economy and how that related to agriculture.

It also provided the opportunity to get a greater insight into the financial strategies and risk management processes employed by the businesses I visited. I was warned by a previous Nuffield scholar that Americans, as a generalisation, are happy to discuss their businesses with you until you start asking specific questions about financial numbers. However given the rollercoaster ride that the US dairy industry had experienced in the previous 10 years and the financial storm that was beginning to blow through the whole economy, finance and particularly risk management were subjects that many of my hosts were surprisingly willing to discuss.

Financial structures varied widely from business to business and there was little clear evidence of a uniquely superior business model. The range of different financial structures reflected the evolutionary process of the individual business, but one characteristic, common to all successful large scale dairy businesses and the Achilles-heel of those that were struggling was their ability or lack of it to manage risk.

Risk Management

Effective risk management is without doubt the single most significant differentiating factor between successful large scale dairy businesses and the rest. Technical efficiency is assumed for dairies of this scale and whilst essential is no guarantee of business success.

All the farms I visited were, from a technical performance standpoint, streets ahead of the average dairy farm in the UK. This is perhaps an unfair comparison as they were certainly not average US producers as one is naturally inclined to seek out examples of best practice for a Nuffield study, but one thing that became clear to me very quickly is that price volatility makes the US milk market a brutal environment where sub optimal performance is rapidly and harshly exposed and even the best operators have little room for manoeuvre at the bottom of the cycle.

And I mean risk management in its broadest sense. It goes far beyond mastering the use of financial instruments to hedge your position against market movement and lock in margins, although this was key for many of the businesses I visited, not least Jim Ostrom, who as a

result of an extremely disciplined approach to margin hedging was able to secure significant debt finance to grow his business through the worst of the financial crisis.

Building and maintaining relationships with partners and suppliers, both upstream and downstream is fundamental to mitigating commercial and market risk.

Kenn Buelow has developed a highly successful, mutually reinforcing network of supplier relationships with local farmers and other businesses that reduce both market and environmental risks to his business.
His forage pricing matrix captures the value of the manure stream and secures an outlet for that manure, provides a stable & lucrative market for his suppliers and secures a supply of quality forage without having to invest in land, machinery and working capital to finance the growing costs.

Mike McCloskey and Tim den Dulk at Fair Oaks have, by building and managing a lean, efficient co-operative marketing infrastructure for their milk, been able to manage the interface with the customer, driving out supply chain costs and improving responsiveness, two factors that generate a premium value for their milk and reduce market price volatility.

Their major investment in manure handling and Anaerobic digestion infrastructure as part of an environmental management policy has helped to mitigate many of the environmental and reputational risks that threaten large scale dairy farming whilst at the same time reducing their exposure to increasingly volatile fertiliser and energy markets; and as net sellers of energy derived from waste, they are set to profit from future rises in energy costs.

And by developing the truly remarkable visitor centre and associated activities, they have turned a potentially huge corporate reputation risk into a source of positive PR and wealth generation

External Capital

When I set out on my Nuffield study I made an assumption that was quickly proved wrong; that the growth in large scale dairying in the US over the last 20 years had to be driven by large scale external capital investment.

The reality is that external investors are active in this market, exemplified by the private investment fund behind Kenn Buelow at Holsum dairies and the real estate fund investor in Fair Oaks Farms; but these are often relatively small players in financial market terms and their origins are often rooted in agriculture. In the case of Fair Oaks, the source of much of

the fund's capital was from the sale, for development, of farmland in California; a not uncommon source of funding for many large US dairy businesses.

The Vreba Hoff model created value by exploiting the differential in asset values between Europe and the USA, allowing relatively small Dutch dairy farmers to quickly achieve the critical mass necessary to survive in the harsh commercial environment of US dairying. How they adapted to the cultural and operational challenges that came with such a transition was a separate issue and one that in some cases destroyed much of the value that had been created.

Vreba Hoff's transition to a true external capital funding model, whilst a logical progression, appears to have been, temporarily at least, undermined by the sharp fall in dairy prices in late 2008 & 2009 and the businesses (in)ability to manage risk in its existing activities

The age of the large institutional investor in dairying would still appear to be some way off. Jim Ostrom alluded to the fact that a number of funds were watching the industry with interest and will almost certainly drive the next major wave of rationalisation in the dairy sector, in a similar way to how the pig and poultry industry has evolved.

Dairy farming has always been viewed as a more complex and thus more fundamentally risky business than monogastric production, where management is generally simpler, less land constrained and thus easier to scale up than dairy. Therefore it has taken longer for the dairy industry to develop the requisite and often technology driven management solutions to the challenges of scale.

That said the recent $100million+ investment by Kohlberg Kravis & Roberts, a largeUS based venture capital house, in Mengniu Modern Dairy a large scale, vertically integrated dairy farming and milk processing business in China, has perhaps signalled the dawn of true corporate investment in dairy farming.

Likewise there have been a number of significant institution backed dairy ventures in South America and in parts of United States often led by New Zealand based consortia, lured by the relatively benign climate and abundance of cheap land. Such an environment suits the low cost New Zealand grazing based model but their relative geographical isolation and seasonal production profile, means that such systems are often constrained to supplying increasingly volatile world dairy commodity markets.

As major producers such as the US and EU with large internal markets that effectively act as a buffer against world market volatility, increase production, those producers more exposed to the global market are likely to see even more volatility in the future and as such their

business models will become increasingly dependent on appreciation of the underlying land value.

Just last month (February 2010) New Zealand Farming Systems, Uruguay a New Zealand backed dairy venture was forced to sell off 2,500 hectares of land to service its mounting debts. This follows previous substantial land disposals in June and October 2009. Whilst the disposals realised a significant profit over purchase cost it somewhat calls into question the long term sustainability and thus attractiveness to investors of such a model and whether such a venture is principally a dairy farming business or merely a property speculator, using dairy farming as a rather risky means of maintaining the productive capacity of its asset base.

Application to the UK market.

With domestic 'per capita' consumption stable and the UK population set to increase by 10 million over the next 20 years, the prospects for the UK dairy market provides a relatively stable long-term investment environment.

This is further reinforced by the recent resilience of the UK milk market during what was a blood-bath for many producers globally, not least in the US. While prices here fell from their 2008 highs, they didn't fall nearly so far and so fast as elsewhere in Europe and beyond which suggests to me that our market with its large and growing domestic consumer base is actually a lot less volatile and offers more long term sustainable growth opportunities with lower risk than many other countries.

The key for new entrants will be developing an appropriate business model for the market sector they seek to supply and ensuring that adequate risk management procedures are in place.

Jim Ostrom provided a great example of how to manage sustained growth in such an environment, combining scale, technical performance and a disciplined approach to managing risk and market volatility.

The importance of the liquid market in the UK and the cost to the industry of balancing seasonal milk supply against essentially flat year, round demand would seem to favour the establishment of large scale production units, supplying on a level profile close to centres of population. Arla' s announcement in 2009 that it plans to build the largest liquid milk processing plant in the world on the outskirts of London would tend to support this and is a further vote of confidence in the future of the UK milk market.

Developing the supply chains necessary to feed such a facility efficiently presents both a challenge and an opportunity for the industry, but one that my Nuffield experience and particularly the lessons learned from Fair Oaks has shown to be eminently achievable and sustainable.

Another positive development in the UK in the past 12 months is the introduction of government guaranteed 'Feed-in-tariffs' for small and medium scale renewable energy projects (up to 5MW capacity). This effectively underwrites the price producers receive for up to a 20 year period, essentially the life of the asset and provides a stable and potentially securitisable income stream.

The potential introduction of feed in tariffs for renewable heat in 2011 will further add to the revenue generating potential of on farm AD, provided that a suitable use for the recovered heat can be found.

This may require a degree of imagination and lateral thought, but there are many potential applications for heat recovered from AD/CHP which have the potential to significant improve the long term sustainability of integrated Dairy / AD models both commercially and from an environmental and consumer acceptability viewpoint.

Consumer acceptance of large scale dairying will be one of the more challenging issues to address. The recent media furore surrounding a proposed 8,000 cow unit at Nocton in Lincolnshire, shows how the media and single issue pressure groups will attempt to undermine in the eyes of the consuming public what is essentially a robust and sustainable business model, through often blatant misinformation and the use of inappropriately emotive language and imagery.

Effective stakeholder management is the key to ensuring success in this potentially hostile environment. Fair Oaks Farms and Holsum dairies provide excellent examples of how large scale dairy businesses, can exist in harmony with their environment, and contribute significantly to the local economy.

The Educational and PR value of the Fair Oaks Farms visitor centre is fundamental to their gaining and maintaining consumer acceptance, operating in an industry sector that is under increasing public scrutiny on animal welfare and environmental grounds. By actively engaging the public and presenting a clear, positive and professionally managed message, they have been able to win back a lot of ground ceded by the industry in previous years to the better managed PR machine of the animal welfare and environmental lobbies.

Kenn Buelow at Holsum dairies also provides an excellent model of best practise. By engaging fully with neighbouring farmers, he has created a mutually reinforcing business model that generates value and mitigates risk for all parties involved. His approach is one of co-operation allowing his business to focus on its core strengths whilst exploiting, to their mutual benefit, the potential of relationships with neighbouring crop growers and other local businesses.

Combined with excellent levels of technical performance, environmental management and disciplined financial control, Kenn has built a truly sustainable model of large scale dairying and of all the businesses I visited is the one that I feel could be replicated most successfully in the UK.

There is potentially no shortage of private and institutional capital to fund such a venture and the combination of a more stable milk market and government underwritten energy tariffs should in theory increase the attractiveness to investors and the potential debt capacity of a large UK dairy business relative to a comparable American one. In the short to medium term however the higher perceived level of risk due to the lack of a proven UK business model will drive risk premiums up and acceptable levels of gearing down.

The UK banking system offers potentially more opportunities for this kind of venture than is the case in the US. Although large scale dairying is not uncommon, many US banks are relatively small regional businesses that do not have the balance sheet strength to support lending on the scale required to finance large dairy ventures.

The UK banking industry by contrast is dominated by large corporates with the resources, if not yet the will , to support such projects and expertise in structured finance that would potentially allow individual businesses to better match their financial structure to their specific business model.

Establishing a robust risk management framework for structured finance projects is a critical element of a success, however the nature of this business is such that, once a suitable model is identified it can be replicated relatively easily

Agricultural banking in the UK is however an extremely conservative business, with requisite levels of security often far higher than would be sustainable in other industry sectors. Optimal financing of large scale dairy businesses will require more innovative solutions from both borrowers and lenders than has traditionally been the case in UK Agriculture.

Ultimately however, the funding decision will often boil down to the perceived strength of the individual entrepreneur and how they articulate their vision and business case. Whether the funding is sought from banks, private investors or institutions, the same rule applies....Investors invest in people.

Final thoughts

My Nuffield experience was in many ways one of the most enjoyable two years of my life. I have had the privilege to visit some wonderful countries, gained experience of some outstanding businesses and to meet some equally outstanding people many of whom are now lifelong friends.

What I have seen and experienced has broadened my mind and extended my horizons with regard to what is possible. Whilst my report has been rather longer in the writing than many

might have hoped for, the delay has allowed me to frame the experience of my travels within context of some significant global events and fundamental changes to the industry.

It is an experience for which I shall remain forever grateful

David Alvis March 31st 2010.