THE WINSTON CHURCHILL MEMORIAL TRUST OF AUSTRALIA

Report by Anthea Young (nee Lisle) – 2003 Churchill Fellow

The Jack Green Churchill Fellowship to study a variety of feeding regimes within the international dairy industry, particularly processes employed to minimise the environmental (and other) effects of highly intensive dairying systems.

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Introduction

As a dairy advisory officer with the NSW Department of Primary Industries, I have seen the Australian dairy industry become increasingly efficient in milk production since deregulation of the industry in most states in July 2000. Although our industry has always been set apart from most other major dairy produce exporters in that we produce milk in pasture-based systems, it is important to recognise strengths or learning opportunities in other industries. Industries in many other countries have intensified production to a greater degree than Australia, either because of lower land availability or because of decreasing subsidies paid for agricultural production and the need to maintain profit levels. As the Australian agricultural community becomes increasingly concerned about sustainable production (environmentally, financially and socially), it is appropriate to investigate practices employed in other countries.

Acknowledgements

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- The group responsible for raising sponsorship funds in memory of the late Mr Jack Green, in particular Mr Neville Miles and Mr Arthur Stubbs. This group obviously realise the great benefits of a Churchill Fellowship to those involved in the dairy industry, and their generosity and effort is appreciated.
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- The scores of individual milk producers who opened their farm records to me, for their openness and honesty in discussions.
- The staff of research institutes and private organisations visited for their time and effort in preparing material and information for my use.
- My family and friends, and particularly my husband Tom, for firstly pushing me to apply for a Churchill Fellowship, and then for being so ecstatically excited for me! And of course for their continuous support before and during my travels, and since my return. You are the best.

Executive Summary

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Project: To study a variety of feeding regimes within the international dairy industry, particularly processes employed to minimise the environmental (and other) effects of highly intensive dairying systems.

Fellowship highlights:

1. *Farm visits* (The Netherlands) hosted by Mr Wim Kleverkamp (ABCTA, feed company) demonstrated importance of quality feed conservation in high production herds..
2. *De Marke Research and Information Centre* – (Hengelo, Eastern Holland) Farm Manager Zwier van der Vegte explained the outcomes to date of the full-farm research project aimed at meeting or exceeding predicted environmental targets for the year 2015 whilst maintaining profitability. Discussed farmer reactions and extension methodology.
3. *Semenzoo* –Ms Marina Manfredotti and Mr Claudio Mariani, Export Mangers for Semenzoo, arranged 5 days touring a variety of dairy farms in the Poe Valley irrigation area of Italy. Discussions with farmers demonstrated the prohibitively high value of agricultural land and milk quota, and the financial benefits to farmers involved in small cooperatives producing Parmigiano-Reggiano cheese. Use of new hay-drying technology used to significantly improve hay digestibility was demonstrated.
4. *ANAFI*– (Cremona, Italy) Staff outlined the cohesive organisational structure incorporating animal registration (national identification and traceability), animal registration (stud), milk recording, animal classification, genetic evaluation of bulls, and artificial breeding
5. *Reading University* – (Reading, England) A range of researchers involved in dairy research in the UK and Europe outlined research priorities for the near future, with particular emphasis on genetically modified feedstuffs, alternatives to "non-natural" production and health enhancers/rumen modifiers/feed additives, and altering the composition of milk for human health benefits through altering the cow's diet. In order to gain any government support (including salaries for staff), all research project proposals must demonstrate benefits to (a) environment; (b) animal welfare; and/or (c) human lifestyle improvement. For Australian products entering UK or EU markets in the future, these emphases are likely to become increasingly important.

Dissemination of major findings: •Technologies employed to increase feed digestibility and therefore efficiency of milk production have been shown to producers (milk and hay) in radio interviews (aired nationally), newsletter format and an address to the Tamworth Produce Marketing Cooperative (26th August 2004). •Effluent management regulations (incorporating mineral balancing on-farm) in place in the Netherlands are supported by the farmers and seen as aiding farm profitability and sustainability. The use of mineral balancing in nutrient budgeting has been aired on local ABC radio, and will be circulated to NSW DPI Dairy Officers around NSW for newsletter distribution to milk producers. •The importance of selecting cows suitable for high forage systems will be discussed with artificial breeding companies through NSW DPI's Herd technical area team, with a view to including a "foragability" breeding value in the future. •Farmers will be made aware (through newsletters across NSW) of new research being conducted on effectiveness of "natural" production or health enhancers, and the possible implications for the dairy industry (on market access) of continuing to use "non-natural" products in milk production systems. •European and Australian markets, both future and current, will be compared for farmers through the current Dairy Australia "Dairy Moving Forward" project, in which industry analysts and representatives are invited to fully explain industry issues and movements to local farmers – one speaker in late 2004 will be asked to address the projected movements in European, US and Asian export markets, and Australia's position in each of them. •Emphasis in the EU and the UK is being placed on improving human lifestyle and addressing consumer concerns, through reducing environmental impacts of agricultural production, increasing human health through diet, and improving animal comfort. Discussion of this point in research focus groups may bring an increased awareness of the importance of relating future dairy research topics to a wider range of issues. •The production of very high quality forage is seen as essential to milk producers in the countries visited. An article outlining the benefits of this philosophy for NSW dairy producers will be distributed (newsletters).

Programme

Overussel, Gelderland, Noord Brabant – the Netherlands
25th April – 7th May
Hosted by Holland Genetics/CR Delta (Mr Sander Selten) and ABCTA (Feed Company) (Mr Wim Kleverkamp)

- Visits to over 25 commercial dairy farms
- Visit to CR Delta's regional office (Zuid-West Region), Rijen (Mr Bart Jan Wulfse)

Research Institute for Animal Husbandry – the Netherlands
10th-13th May

- Wageningen Univeristy, Lelystad – discussions with researchers
    - Andre van der Kamp (High-tech farm)
    - Michel de Haan (Low-cost farm)
    - Leon Sebek (De Marke – dairying and the environment)
- Waiboerhoeve – visit to High-tech and Low-cost farms (Andre van der Kamp and Michel de Haan)
- De Marke Research and Information Centre - Hengelo, Overussel (eastern area); (Farm Manager Zwier van der Vegte)

Po Valley, Italy
19th-25th May

- Visits to
    - Commercial dairy farms producing milk for domestic milk market, general cheese production, and Parmigiano-Reggiano cheese production
    - A commercial Parmigiano-Reggiano cheese factory
    - ANAFI (international Holstein-Friesian society)

Hosted by Semenzoo – Ms Marina Manfredotti and Mr Claudio Mariani (Export Managers)

Berkshire, England
26th May

- Dairy farm competition – visits to participating farms (Mr Richard Plank)

Gloucestershire, England
27th – 31st May

- High production, high volume herd (Mr John Round, Elmore Back Farm, Elmore Back)

Reading University, England
1st-4th June

- Research projects
    - Professor Ian Givens – Research foci in current political environment
    - Dr Richard Phipps – Genetically modified feedstuffs in cattle production, and beneficial impacts on the environment
    - Dr Mike Proven – high forage diets for high genetic merit cows
    - Dr Fergus Mould – investigating properties of 50 different plants for use as "natural" production or health enhancers
    - Dr Eddie Deaville – fate of genetically modified dietary constituents in dairy cattle
- Visit to CEDAR (Centre for Dairy Research)

Dumfriesshire, Scotland
7th – 8th June

- Visit to commercial dairy farms (Mr Colin Mair, Townhead, Mouswald; Mr Mark Calendar, Castle Douglas; Mr John Forrest, Mouswald) – effluent management and housing for large herds.

Scottish Agricultural College (Royal Crichton Farm), Dumfries, Scotland
9th – 11th June

- Dairy extension in Scotland – Farmer concerns and support requirements (Mr Jimmy Goldie, Dairy Advisor, SAC)
- Comparison of high and low genetic merit cows on high and low concentrate diets (Ms Jenni Bell, SAC)
- Methane emissions from dairy cattle (Ms Allison Todd, PhD student)

Lanarkshire, Scotland
14th – 18th June

- Visits to commercial dairy farms (Mr John Warnock, Eastfield Farm, Biggar; Mr Meikle Jackson, Wolfclyde Farm, Biggar) – silage production from perennial ryegrass

Edinburgh, Scotland
24th – 26th June

- Royal Highland Show

Travels of a Churchill Fellow

The Netherlands

The Dutch dairy industry has traditionally been strong, with emphasis on high production from cows and genetic traits that are attractive to dairy producers world-wide. In 2004, there are around 22,000 dairy farms in the Netherlands, with an average of 59 cows and 500,000 litres of quota per herd. The "normal" commercial herd in the Netherlands, milking 90 cows, could be expected to have the following attributes:

- 8,500L/cow/yr, @ 4.4% butterfat and 3.5% milk protein
- ~45ha production area – 81% grassland, 19% maize silage
- No employees, 100% family labour
- Free stall barn
- Calve 12 months of the year
- Calving interval 395 days

A regulated quota system is in place, with strict pricing regimes – farmers are paid ~€0.30/L, but are penalised by more than this price for producing over their allowed quota. Milk price is set based on kilograms of milk fat and protein production, with a negative incentive for yield. This payment system is the reason for the perhaps surprisingly low average production per cow (8,500L/cow/yr with high genetic merit and being fed a total mixed ration for most of the year), with high fat and protein being the main production aim.

There is currently debate in the community regarding the grazing of cows on pasture during the summer season – from a purely nutritional point of view, the most efficient feed conversion occurs in the housed system, as the ration can be accurately balanced and fed, and there is little daily fluctuation in feed quality. Feed utilisation is also much higher when fodder is cut and conserved, rather than cows grazing pastures, trampling and fouling much good quality feed. However, there is some expectation from the community that cows be grazed, and can be seen by the public – this is seen as very much a part of the Dutch countryside.

Farm visits, hosted by Holland Genetics

A number of farms were visited, showing the variety of management systems used in the Netherlands dairy industry.

1. Fodder production: Due to the climate in the Netherlands, growth of pastures and crops over the winter period is very slow, if there is any growth at all. Thus, all cattle are housed over the winter period, and fodder is conserved through spring and summer and stored for feedout during the next winter. My visit coincided with a good start to the spring/summer silage production, with warm weather early in April leading to high yields for first-cut silage. The staple ingredients of rations on all farms visited were maize silage and pasture silage; if cows grazed during summer, maize silage and pasture silage were still fed strategically overnight to supplement and balance the ration. All fodder was grown on farm, with by-products and grains bought in. Most farmers owned machinery to harvest and ensile pasture silage, and contractors were used to make maize silage. Contractors are readily available and reliable – this has been long-standing, and farms are ion close proximity to each other. Most fodder is ensiled in bulk, and all pits are compacted and sealed in accordance with Top Fodder guidelines.
2. Feed out: Free stall barns are used on most farms, with a central lane for feedout from a mixer wagon. Those using a total mixed ration (TMR) feed at one rate across the herd, regardless of stage of lactation. Others feed a partial mixed ration (PMR) of fodder and/or by-products, and grain is fed individually through electronic feeders. Two farms visited used a semi-automated system to feed out silage, involving a moving platform

on the ground, in front of which blocks of silage are placed. Cows reach these blocks through headstalls, and each day (or as needed) the platform is moved forward (using electronic motor) towards the cows, allowing more access. This system eliminates the need for farmers to have expensive mixing and feed-out machinery, and saves time in feeding, as up to 5 days worth of silage can be placed out at once. Another similar system moved two parallel rows of head stalls towards each other, with the silage in the middle. This allowed more cows to eat at once, and also greatly reduced waste, as cows were able to eat loose silage that had spilled off the blocks.

CR Delta – (Rijen, The Netherlands) Bart Jan Wulfse (Regional Manager – South) outlined the cohesive organisational structure incorporating animal registration (national identification and traceability), animal registration (stud) milk recording, animal classification and artificial breeding.

Waiboerhoeve

The high tech and low cost dairy farms were both set up in response to rising costs and decreasing payments for milk. Farmers were questioning the best management system to invest in.

The "high tech" farm at the Waiboerhoeve (near Lelystad) maintains a 305-day milk production of 10,000L/cow, in a fully housed system. The barn in which the cows are housed has been designed to allow optimal light and ventilation, while cow comfort in ensured with diagonal cubicles. Slatted floors are fitted with automatic scrapers, and cows are milked and fed automatically using voluntary milking systems (robotic milkers) and electronic feed dispensers. To this end, the high tech farm has installed the world's first automatic forage dispenser, allowing cows to be fed a completely individualised total mixed ration. The lack of handling by humans is seen as important in reducing stress levels in the herd. Calves are kept in quarantine for 6 months to reduce risk of disease. Contractors are used to harvest and ensile forage, and one labour unit works a maximum of 50 hours per week managing the 75-cow herd. So far, the high tech farm has not yet been able to return an acceptable level of profit.

The low cost farm contains 50 milking cows, with an aim of 16kg concentrate fed per 100L of milk. It is also managed with one labour unit of 50 hours/week, and cows graze all day and night in the summer months. Grain is fed in the bails only, and minimal equipment is kept for feeding out. Fertiliser costs are minimised by mixing legumes with pastures. Construction costs of the farm are around 30% lower than that of traditional farms, but are still acceptable for animal welfare. There has been much interest in this low cost sytem, but there is concern that the genetic merit of Dutch Holstein Friesian cows would not allow them to cope with the low cost, low concentrate system.

Mineral balancing on dairy farms

The Dutch government regulates the amount of synthetic fertiliser that farmers can apply to their land, under a system known as MINAS. MINAS is based on nutrients imported (grain, cows and bought-in fodder) and exported (milk, milk components, fodder, effluent), and the area of land used to produce fodder.

If the amount of dairy effluent produced from a farm operation is deemed to contain less nutrient than can be taken up by the plants grown on the farm, then the farmer can spread all of that effluent on the farm, and may be allowed to spread supplementary fertilisers, up to allowable limits of N and P for the farm. If, however, the nutrients produced as effluent are too great to be utilised by the crops grown, the farmer must access the rights spread the effluent on another property that can utilise the nutrient.

Dutch dairy farmers are in general very supportive of the MINAS system, as they feel that it is tailored to their own production system, and is protecting their agricultural system from pollution.

Presently, levies are being charged for use of non-effluent N and P (around €2.50/kgN and €15.00/kgP), encouraging farmers to grow crops with efficient use of nutrients, and to move towards a "closed" system of nutrient use and production.

A Dutch farmer aiming for optimal production with strategic nutrient use

De Marke Research and Information Centre

The De Marke Research and Information Centre, out of Hengelo in Eastern Holland, is home to a research project to manage nutrients and the environment, on sandy soils with high rainfall. De Marke have taken the MINAS system to heart, and have predicted MINAS requirements out to the year 2015, with the very real expectation that regulations will become tighter and tighter each year. Researchers at De Marke aimed to achieve these targets for 2015, whilst still making a profit. Their targets are:

Lowered N leaching, measurable in groundwater levels (<50mgN/L groundwater)
Loss of N as ammonia minimised (ammonia emissions <30kgN/ha)
No more than 125 kgN/ha and 1kgP/ha applied as artificial fertiliser

The farm has been fine-tuning this system since 1992, and is able to meet or exceed targets in most years, as well as achieving acceptable profits and maintaining healthy cattle. They estimate that achieving their targets costs them an extra €0,02-3 per litre of milk, but they are still able to produce a profit.

Measures used to achieve these targets include:

- Milk from individual cows analysed every two weeks for milk urea nitrogen and protein content, and individual rations varied accordingly;
- Source as little feed from off farm as is possible, thus limiting imported nutrients;
- Reduced grazing time to <5 hours per day in summer months, as more than this results in too much nitrogen being lost as ammonia through urine;Effluent being trapped under a solid floor, rather than the slatted floors that are most common, in order to reduce nitrification/ammonia emissions;
- Effluent being bio-fermented, to further reduce ammonia emissions and render the nitrogen more available to the plant once spread.

This project was an excellent example of a research project being based on a hypothetical future situation (but one that is a very real prospect), to show the farming community what is possible. Even though some methodology may not be practical for the general farmer today (eg bio-fermentation of effluent), it is seen as a demonstration of possibilities and not as an off-target or irrelevant project.

Poe Valley, Italy

Hosted by Sememzoo, Cremona.

Full housing of cattle in a warm temperate climate

Temperatures in the Po Valley irrigation area between Milan and Verona range from -10°C in winter to >40°C with high humidity for prolonged periods in the summer. Irrigation water is readily available, and growth of pastures is achieved for most of the year. Despite this environment seeming ideal for producing milk in a grazing system, all cows and replacement stock are housed and fed a total or partial mixed ration all year. It transpired that this management is due to prohibitively high land prices – ranging from €60000/ha ($AU100,000/ha) to €150000/ha ($AU250,000/ha). Agricultural land is zoned such that it cannot be developed, but there is also no more land becoming available for agricultural production. As such, it is essential for farmers to produce and utilise as much digestible dry matter from their land as is possible.

Housing

Cow housing is generally open-sided or at least open-ended, unlike other European housing where the barn is closed and the climate can be controlled. Italian barns have high ceilings and are well ventilated, open and airy, and are situated to give maximal airflow in summer. Feed-out areas are generally on one long side of the cow area, a smooth concrete surface that can be swept easily.

Feeding

Due to high levels of grain feeding per cow and high production, a good source of effective fibre is essential. For this reason, conservation of pastures and legumes is usually into hay rather than silage, with maize being the general parent crop for silage. Good growth conditions, fertile soils and a long period of warm weather through spring and summer ensure production of high quality hay. Round bails of hay are generally fed out using a side-winder, rolling out the bail down the feeding lane, or are chopped into a feeding wagon which delivers a mixed ration via a side delivery. Cows are generally fed a concentrate mix (including fats, proteins, and any other necessary additives) on an individual basis using electronic identification.

Use of hay in high production herds

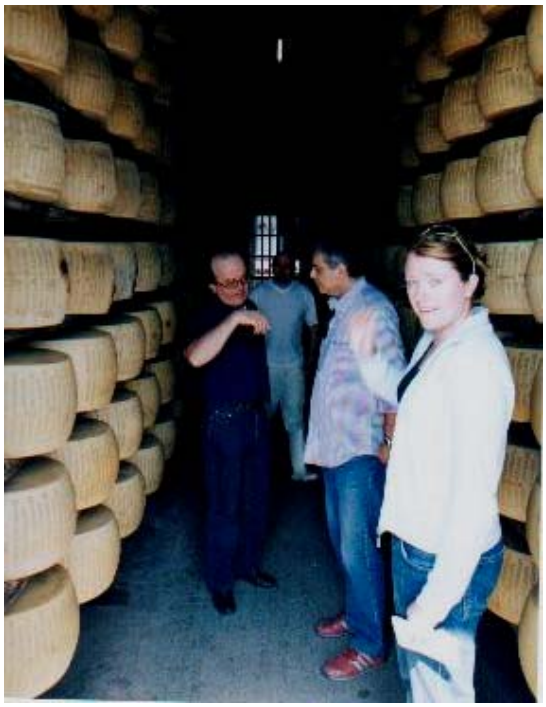
The Po Valley is home to Parmigiano-Reggiano cheese production. This cheese is produced by around 500 cooperative-owned factories, in a regional area bordered to the north by the Po River and containing an area of around 12000km^2. With afternoon and morning milk being combined to make a cheese by ten o'clock the next morning, milk taints cannot be tolerated. As such, silage use is not acceptable on any farm supplying milk for Parmigiano-Reggiano cheese production.

Two farms visited were achieving per production levels of >11000L/cow. When one farmer was asked what his main challenges were in maintaining production to a level that is profitable, he responded that first, he had to maintain cow dry matter intake through the hot, humid summer months, and second he had to make top quality hay.

The high production on these two farms was achieved using a ration of 13kg grain/concentrate, 9kg of lucerne hay and 3 kg of pasture hay. At neutral detergent fibre levels in Australian hays, a cow's appetite limit would not allow her to eat this much hay and grain in a day, thereby severely limiting the prospective milk production - however, the use of innovative hay drying technology allows the dairy farmer to make hay of exceptional quality, energy, protein and digestibility.

The hay dryer is a simple piece of equipment – hot, dry air produced by a generator is pushed through flexible hoses to the top and bottom of a round bale of hay sitting on its flat end. The hay, which has been baled within 24 hours of cutting, is dried to around 85% (from its baling dry matter of ~35%) within 5 hours. This allows the farmer to have hay stored in the shed within 36 hours of cutting, posing a number of advantages – reduced lead shatter and loss of quality, ability to take advantage of short windows of good weather, faster regrowth, and an overall increase in hay quality. Cost to the farmer for 8 modules (allowing drying of 16 bales) was around $AUD120,000.

Quality hay production……



for Parmigiano-Reggioano cheese production

Genetic evaluation

A day was spent at the head office of ANAFI (the Italian Holstein-Friesian Association) discussing the unique policies of the organisation. ANAFI provides not only the national herd book register, but also the central milk recording agency and national identification database. All dairy cattle in Italy must be identified by a national identification number, and all movements registered. If a dairy producer chooses to register his cattle in the Holstein-Friesian Association register, he is also required to classify all first lactation heifers, conduct milk recording on a regular basis, and use a proportion of progeny test bulls in his breeding program. All in or all out! Bearing this in mind, approximately 90% of the Holstein-Friesian cow in Italy are registered and have been classified, at least in their first lactation, and have their milk production performance recorded across their lifetime. As the majority of semen used for artificial insemination is from Italian bulls, this also provides a high level of confidence in genetic evaluation of bulls in a vast range of herds, due to the vast amount of information available on daughters of bulls in over 15000 herds.

United Kingdom

Berkshire district – Farm competition
Hosted by Richard Plank, of Hall, Plank and Robinson Stock and Feed Merchants.
This invaluable opportunity to visit 8 farms in the fertile cropping area of Berkshire, west of London, showed a good picture of the diversity of farms in the region. All farms had a strong emphasis on genetic selection, although all were selecting for slightly different traits – one for type, one for strength due to an intensive grazing routine, one for consistency of production and milking speeds. Strategic use of effluent in the nutrient budget and increasing dry matter production decreased costs of production, although the impending changes to subsidies paid to farmers (resulting in an overall reduction in payments) were causing concern. Winter wheats grown in the area, with a growing season of ~11 months, were of consistently high quality and accessible to the farmer at a relatively low price per tonne. However, margins over costs were, on average, around 1-2p/L, due to high overhead costs.

Keeping condition on cows is a major objective in the United Kingdom

High production herd - Gloucestershire
Mr John Round, Elmore Back Farm, Elmore Back.
Mr Round milks 250 cows in Gloucestershire, with an average production of 11,300L/cow in 305 days; heifers average 10,000 litres in their first lactation. Average butterfat content is 3.4%, average protein content is 3.4%**.** While this farmer is not involved in showing cows, the genetic merit of the herd is incredibly high, with calves frequently ranking in the British Holstein-Friesian Association's top 10 for breeding value. Bulls are selected for stature and longevity. The higher producing half of the herd are housed all through the lactation, while the others graze during the day through the summer.

Mr Round, after employing a consulting nutritionist for some years, now relies on his own experiences and cow performance to formulate rations. Ration ingredients are relatively constant across the year – soya meal and rapeseed meal are used for energy and protein, as well as large amounts of wheat germ. Bypass fat (palm kernel oil) is used to maintain butterfat and boost body fat deposition.

Maize is grown as a break crop, on a rotation with pastures. Very little P fertiliser is used on the maize, and nitrogen is only added at sowing, not during growth – the high rates of effluent application during cultivation are adequate to maintain soil fertility and health. An inoculant is used for pasture silage production, even though sugar levels are high – this seems to be as a

precautionary measure rather than for any particular problem at the time of harvest, as there ere so many variables affecting the quality and ensilability of the parent pasture crop.

Reading University
Professor Ian Givens:
The research foci for the agricultural sector are now, by necessity, environmental protection, animal welfare, and improvement of human lifestyle. Without addressing these issues, research institutes struggle to access funding. The following projects that are discussed address these issues.

Dr Richard Phipps (Head of the Centre for Dairy Research (CEDAR)):
Genetically modified feedstuffs are expected to have a very large and beneficial impact on production costs and environmental impacts in the United Kingdom and in Europe. Since the commercialisation of genetically modified crops (approximately 12 years), especially GM soya, global use of pesticides and herbicides has decreased by 23 million tonnes (from discussion with Dr R Phipps).

Dr Mike Proven: "High genetic merit cows on high forage diets".
Management recommendations made based on this research (through ADAS Bridgets Dairy Research Centre, UK) include the following:

- "High dry matter intakes of high quality forage are essential to making high indexing cows on high forage systems work" (Bull, 2000)
- First lactation heifers of high genetic merit will not adapt and perform well on a high forage diet unless they have first reached 90% of their mature body weight
- Feed levels of concentrate appropriate for level of production
- Supplementing low levels of grain to high producing cows (>30L/day) affects the effective NDF content of the ration, resulting in poor rumen function and milk quality, as well as weight loss. Supplementation with maize silage may be better management for these cows
- Supplementation during times of pasture shortage is essential, to maintain dry matter intake
- Very high indexing cows may not be best suited to very low input, low yield systems
- Can be a profitable system (margins over total feed costs were within the top 10% pf UK herds)
- High genetic merit cows need to be more carefully managed for body condition score than do those of lower genetic merit, high genetic merit cows on a hogh forage system recover more slowly from body condition loss

Dr Mike Proven: Manipulating composition of milk through dietary changes

- Human health benefits of including certain conjugated linoleic acids (CLA's) in the diet have been proven for some time
- Research into the increased synthesis of these CLA's in the milk is currently being undertaken
- It may not be economically feasible, nor good animal husbandry, to increase the concentrations of these CLA's through the cow's diet

Dr Fergus Mould: *Rumen Up* project
A European Union project – new plants and plant extracts to decrease methane and nitrogenous emissions from ruminants and to alleviate nutritional stress. This project is responding to consumer concerns about "non-natural" products used to alter production and rumen function.
So far, Reading University's part of the project has lead to the patenting of the bloat-reducing or acidosis-preventing properties of 23 plants, ranging from lettuce to nettles.

Dr Eddie Deaville: the fate of genetically modified feedstuffs fed to ruminants.

Progress on this research so far indicate that modified genetic material may remain intact in the dairy cow, but none has been found in animal products (meat, milk or hide).

Farm visits – Dumfrieshire
Mr Colin Mair, Townhead, Mouswald; Mr Mark Calendar, Castle Douglas; Mr John Forrest, Mouswald: Mr Mair milks up to 110 cows, while Mr Calendar and Mr Forrest both milk upto 500 cows with rotary dairies. However, their concerns are common – effluent disposal and meeting environmental standards; accessing and keeping good employees; and maintaining high quality feed. With costs of production increasing and returns for milk decreasing, utilisation of best possible quality forage is essential for these farmers.

Scottish Agricultural College – Royal Chrichton Farm, Dumfries
Mr Jimmy Goldie: Dairy Adviser, SAC
The average milk production on Scotland's 1500 dairy herds is 7000L/cow, from 130 cows. The advisory component of the SAC (equivalent of advisory branch of state government agricultural departments in Australia) is available on a fee-for-service basis, and advisors felt that the services accessed by farmers are more specific and more valued because of the cost involved. The SAC has moved towards a financial focus due to demands by farmers for financial advice, and financial analysis packages linked to nutritional decision support tools are very popular. A recent addition to a nutritional decision support tool has been a grid of beef market specifications, allowing farmers to assess the benefits of targeting particular liveweight gains for their dairy/beef cross animals, as well as cull cows. Farmers are mainly concerned with financial implications of business decisions, and the sustainability of their management systems with ever-decreasing milk prices and subsidy payments.

Ms Jenni Bell: Research project coordination, SAC, Dumfries
In a comparison of high and average genetic merit cows on high and low forage diets, the expectations placed on high genetic merit cows in a high forage system were met (producing 7500L /cow/lactation), but the production targets for high genetic merit cows on a low forage diet (13000L/cow) were far from being met – these cows were producing 9200L/cow. The high forage system fed a mixture of pasture silage, wheat alkalage and less than 1 tonne of concentrate per cow per year, and cows were grazed in the summer months. The low forage ration consisted of up to 3.6 tonnes of concentrate per cow per year, with no grazing. Research using these herds will be ongoing, with vets currently assessing fertility measures, longevity and other factors across the herds.

Ms Allison Todd: PhD student – "Applications of a novel tracer technique for quantification of methane emissions from grazing cattle" (Glasgow University - part of and EU funded research project)
Initial comparisons of methane emissions from dry dairy cows grazing well-fertilised, highly digestible pastures compared to emissions from those cows grazing rougher, under-fertilised pastures suggest that cows grazing the highly digestible pastures will emit less methane. As this is an environmentally focussed research project, this may present an interesting quandary if further work supports these initial findings, as environmental studies have suggested that high rates of fertiliser application may have detrimental effects on the environment if not managed correctly.

Farm visits – Lanarkshire
Mr John Warnock, Eastfield Farm, Biggar; Mr Meikle Jackson, Wolfclyde Farm, Biggar.
These farms represent average size and production herds for "lowland" Scotland, at between 100 and 180 cows, milked utilising 100-145 hectares. Per cow production is 6500-7200L/cow. The climate in this area does not allow for growth of maize for silage, so rations are based on

pasture silage, whole-crop silage (wheats or barleys), grain, by-products and grazing in summer. Again, production of high quality silage is essential to achieving profitable use of the feed, as costs of housing and feeding cows for up to 8 months per year, as well as growing crops and pastures over much longer periods than is necessary in most of Australia, are very high. Quality of silage can be greatly decreased if wilting is not possible due to weather conditions, and inoculants are added as an extra insurance, even when conditions appear to be favourable. Conservation of whole crops as "alkalage" (adding sodium hydroxide to preserve the fodder) gives the farmer another insurance against adverse weather, as the window for harvest of the parent crop is quite long – the effectiveness of the preservation process does not depend on the quality or dry matter of the harvested crop, although this will of course impact on the quality of the end product.

Royal Highland Show

This annual event was a chance to speak to numbers of farmers about their vision for the future of Scottish agriculture. Overall, feelings were uncertain, as government policies changing the structure of subsidies paid to farmers are being phased in over a number of years. Farmers feel that markets closed to the UK due to the latest outbreak of foot and mouth disease will not be reopened easily, and that the reluctance of the UK government to fully integrate with the European Union will perhaps limit markets of beef and other animal products even more.

The quality of animals on show was astounding, and a credit to the exhibitors. The large number of dairy animals being shown also demonstrated a confidence in the industry, as opposed to dairy classes in shows in Australia, where numbers have drastically decreased since deregulation of the industry. Producers showing at the Royal Highland Show felt that the cost and effort involved in preparing and exhibiting animals was still financially justifiable, whereas many Australian producers do not feel this way.

Conclusions and recommendations

1. Feed quality and utilisation are of utmost importance to the profitability and sustainability of European and United Kingdom dairying systems, with short growing seasons and the necessity to spend money on housing cattle during part or all of the year. *Recommendation: continue to emphasise and demonstrate the importance of pasture utilisation and optimisation of feed quality to Australian dairy farmers.*

2. Innovative feeding technologies may be adaptable for Australian dairy farmers who are considering feeding a partial or total mixed ration to the milking herd for any part of the year – for example, the semi-automated silage feeding systems observed in the Netherlands. *Recommendation: Make a package of photographs available as part of any feed pad or mixed ration information packages. Make available to other NSW DPI dairy officers for their use.*

3. Farmers in the Netherlands are supportive of the regulation of nutrient use on farm, as they see that it increases profitability and sustainability of their dairying operations. *Recommendations: Continue to emphasise to NSW dairy farmers the benefits of using a nutrient budgeting system that allows for net import or export of nutrient on to and off the farm. Use the Netherlands(particularly De Marke Research Institute, as a demonstration of what is possible.*

4. Adoption of innovative technology in the field of hay making can significantly increase the digestibility, energy and protein of hay produced in Australia, as well as greatly reducing risk of weather damage and increasing the number of cuts that could be achieved from a crop. *Recommendations: The agricultural community have been made aware of the potential of this technology through national media (ABC radio, Small Farms Magazine and newspapers). One hay producers group has been addressed regarding the potential of this technology for Australian hay producers. Further distribute this information to agronomists through networks and media.*

5. High production from cows in hot climates is possible if cows are bred appropriately and managed to maintain dry matter intake. *Recommendations: Investigate research opportunities into management strategies for milk production in hot weather in NSW.*

6. Consumer concern has lead to a reduction in rumen or other nutritional modifiers available for use in Europe or the United Kingdom. This has begun to occur in Australia, with the recent reclassification of virginiamycin (an antibiotic used to protect against ruminal acidosis) as an S4 drug. There is a strong possibility that this may also extend further in Australia. *Recommendations: Australian dairy industry should remain in touch with latest developments on international research into alternative products.*

7. Farmers in more intensive production systems such as those in Holland, Italy and the UK, are focussed strongly on maintaining cow condition. They recognise the importance of good body condition in maintaining the overall production potential of the cow. *Recommendations: Continue to disseminate the results of projects such as InCalf (Dairy Australia)to Australian dairy farmers, emphasising the correlations between body condition score, fertility and production.*

8. Specific management considerations have been identified both in the UK and in Australia for feeding high genetic merit cows on high forage diets. *Recommendations: Continue to reassess the factors for which we breed dairy cattle, and continue to question the make up of the "ideal cow" for Australian production systems – or the "ideal production system" for Australian cows. Farmlet studies at Mudtapilly (QLD) and other centres are involved in assessing systems for the Australian dairy industry.*

9. European milk producers are concerned about increased efficiency of production from countries in Eastern Europe, in a market where subsidies are decreasing and demand is relatively stagnant. The advantage to the Australian dairy industry of having an expanding Asian export market so close

(geographically and politically) should not be underestimated for the future profitability of the industry. *Recommendations: Arrange a forum at which industry analysts and representatives are invited to fully explain industry issues and movements to local farmers – including the projected movements in European, US and Asian export markets, and Australia's position in each of them. Possibility of using the current Dairy Australia "Dairy Moving Forward" project to achieve this aim.*

Reference

Bull, R. 2000. *A blueprint for high genetic merit cows in high forage diets – Final report.* Submitted to Milk Development Council, Cirencester, UK. ADAS, Bridgets.