# Agenda

| | **Speaker** | **Time** | **Location** | **Page Number** |
|---|---|---|---|---|
| Lunch for visitors | | 1.00 | Manor Restaurant | |
| Welcome | Dr Stephanie Woods | 2.00 | GRC Lecture Theatre | |
| **Chairperson** | **Richard Moore** | | | |
| Review of previous minutes | Paul Anderson (secretary) | 2.05 | | 2 |
| ***Finance and Promotion Team*** | | 2.10 | | |
| Targets within the project | Jeff Townsend | | | 8 |
| Rolling herd performance | Lynn Colhoun | | | 9 |
| Recent PR and herd successes | | | | 12 |
| ***Feeding Team*** | | 2.25 | | |
| Current diet evaluation | Michael Calvert | | | 14 |
| Current cow condition scores | | | | 16 |
| Future plans | David Brownlee | | | 18 |
| ***Milking and Health Team*** | | 2.40 | | |
| Health/veterinary analysis | Andrew Dunn | | | 20 |
| Lactation curves | | | | 22 |
| Johnes status of the herd | Robert Whittaker | | | 24 |
| ***Breeding Team*** | | 2.55 | | |
| Bull selection criteria | Fiona Clarke | | | 27 |
| Selected bulls | | | | |
| Current herd PTAs | | | | 30 |
| Fertility results 04/05 | Ian Boyce | | | 32 |
| ***Questions/Discussion time*** | ***Board Members and attending staff.*** | ***3.10*** | | |
| Depart for C.R.E.A.M. unit | | 3.45 | | |
| Presentation of recent classification results/Viewing of C.R.E.A.M. unit and stock | Neal Symminton | 4.00 | C.R.E.A.M. unit | |
| Board buses to Manor Restaurant | | 4.25 | | |
| **High tea** | | **4.35** | **Manor Restaurant** | |

# C.R.E.A.M. Advisory Board Meeting Minutes - 20th April 2005

In attendance: C.R.E.A.M. students, David Mawhinney, Stephanie Woods, Dr. David Patterson, Dr. Sam Kennedy, Ian McCluggage, Michael Graham, Charlie Kilpatrick, Dr. Michael Mullan, Dr. Vicky Morrison, John Fay, Brian Hunter, Ashley Fleming, William Crawford.
Apologies: Robin Irvine, David Workman, John Thompson, Brian McAuley, Morrell McCollum and Dr. Alistair Carson.

**Welcome and Introduction**
The meeting got under way with David Mawhinney welcoming everyone. David outlined the changes made to C.R.E.A.M. in the past year as highlighted in the Review of all Student Learning Projects by David Patterson at Greenmount Campus. These include:

1) Data collection and recording has been streamlined by C.R.E.A.M. project staff to allow better comparisons between Greenmount dairy herds and benchmarking against other high yielding dairy farms.
2) Technology investigation work incorporated into the project includes feeding to improve milk composition, transition feeding, embryo transfer and mixer efficiency of feeder wagons.
3) External industry specialists were regularly involved. In the 2004/05 academic year presentations/workshops have been held with nutritionists, veterinary specialists, embryo transfer specialists, dairy computer software specialists, a breeding adviser and a feeder wagon manufacturer.
4) Farm visits – David thanked Morrell McCollum for opening up his farm to the students and giving an insight into how he managed his herd.
5) Publicity – Positive messages regarding C.R.E.A.M. have been put out to the industry throughout the year via press releases and the ruralni website (www.ruralni.gov.uk).
6) A 10 year celebration event was held in October 2004 with the theme of past, present and future. All past C.R.E.A.M. students and staff were invited to hear short presentations from present students and the dairy cattle young breeders clubs were also invited as a drive for recruitment for the C.R.E.A.M. project and other courses at Greenmount. In total, approximately 120 people attended the event.

Daryl Givan chaired the first session of student presentations and started with an introduction outlining student team management responsibilities and data recording carried out since September 2004.

**Milking and Health team**

The first talk was from the milking and health team, by Caryn Smith, who gave a presentation on current herd performance and physical performance indicators. She highlighted that milk yield is down slightly on last year to 10,758 litres which is just above target (10,500litres). Butterfat and protein % have both increased in the last year and are currently 3.62% and 3.06% respectively. TBC was high in February 2005 due to a number of factors which are now under control. Sam Kennedy queried whether it was efficient to feed over 4 tonnes of meal per cow. It was pointed out that the milking herd was managed as one group this year and fed 10kg blend via the TMR plus top up in the parlour. This was to ease feeding management of the herd and also it was impractical to split the cows into 2 groups because there were only a very small number of cows at any one time which did not justify the 10kg meal in the TMR and these cows needed to increase body condition.

Stewart Gallick was next to speak, his presentation was on health and veterinary analysis. He pointed out that the C.R.E.A.M. herd had 43 cow cases of mastitis per 100 cows in the past year. The DAISY UK report shows that the average cow cases per 100 cows is 42, proving that C.R.E.A.M. herd is average. Mastitis control has been improved with the use of “Biosuper” disinfectant and dessicant being spread on the cubicles, and the cows are pre-dipped prior to milking. Also bulls with resistance to high SCC are being used this year. Breeding treatments were also discussed with problem cows highlighted. Over the past year there have been 5 problem cows, 3 of these cows are now in calf while 2 are still being treated. Action taken this year to improve breeding problems include regular monitoring of the diet energy balance and keeping the herd young.

Brian Hunter asked if it was our policy to maintain the very high replacement rate of 46%. William Crawford enquired as to how we managed cows with high SCC. David Calderwood answered by saying cows were culled in severe cases but stated that there was a possibility of treating cows in 4 quarters for 3 days in succession which elevates the figures. William also queried E-coli and asked if we found patterns with cases of E-coli and stress on the cow, and pointed out that in a herd of such high genetic merit, culling should be a last resort.

**Feeding Team**

Andrew Lamberton presented on the topics of diet evaluation and transition feeding. After pointing out that our first cut silage and wholecrop wheat was of excellent quality, he went on to point out that we were feeding maintenance plus 32 litres for the cows and maintenance plus 28 litres for the heifers through the TMR. Any changes in the diet are based on monthly condition scores and evaluation of the daily intake information now being kept by students. The crude protein level in October - December was 16-17% and was increased to 18% in January to increase milk yield.

The intakes of 2 heifers were measured for 7 days after calving in February. It was highlighted that the Dry Matter Intakes were increasing over the week but were not high enough on day 7 after calving to support the milk yield, resulting in bodyweight loss of 0.6kg/day and 1.4kg/day. More work needs to be done to measure intakes of more cows and relate this to bodyweight and milk yield. Research at ARINI shows that a cow should to be eating 3% of her weight in dry matter after calving.

William Crawford congratulated the students on how we are managing this. He talked about the importance of feeding fibre in the dry period as the rumen cannot enlarge quickly enough after calving, therefore increase rumen development as quickly as possible.

Claire Hunter talked about feeding to improve milk composition. C.R.E.A.M. has increased both butterfat % and protein % in the last year. The fact that we are now feeding protected fat high in C16 fatty acids was highlighted and although our butterfat % has improved, the economics of feeding it have been negative. Ashley Fleming asked if the butterfat had increased due to the feeding or the genetic merit of the cows. It was suggested that it was a combination of both. Sam Kennedy stressed that we needed to find out the science behind feeding C16 fatty acids as there is only so much that can be done to increase the butterfat of cows producing over 10000 litres. This fact was backed up by Michel Mullan who added that we needed to have more control over the products which we were feeding. Ian McCluggage pointed out that a research project is currently under way at ARINI into feeding C16 products however this study is still commercial in confidence and no literature is available on it. Ian also expressed that bull selection is now vital to improve the compositional quality of the milk. Brian Hunter said we could improve our herd average milk composition if we looked at each individual cow on milk records as there can be a difference of 4-5ppl between cows with high quality milk and the cows with poorer quality milk.

David Calderwood took over the position of chairperson at this time.

**Finance and Promotion team**

Richard Moore gave a presentation on the Phosphorus balance of the C.R.E.A.M. herd. At a slurry event held at Greenmount in April 2004 by DARD and UFU it was indicated that there was a 9000t surplus of phosphorus in N.I.

The calculation showed the current P balance of the C.R.E.A.M. herd as a stand alone enterprise was 26.9kg/ha. Richard explained how this needs to be reduced to 10kg/ha by 2010 and 6kg/ha by 2012 to comply with EU legislation. He then showed how the C.R.E.A.M. herd could reduce this to 13.2kg/ha by reducing concentrate intake to 3 tonnes/cow/year and reducing P level in the concentrate from 0.6% to 0.5%. To reach the compulsory 10kg/ha and then 6kg/ha Richard showed that concentrate intake would need to be 2.7tonnes/cow/year and 2.2

tonnes/cow/year while maintaining current milk output. This would not be possible.

Ian McCluggage commended Richard on the work put into calculating the P balance while Sam Kennedy stressed that the C.R.E.A.M. unit was not a ring fenced unit and the total Greenmount farm did not have a serious Phosphorus surplus problem. Brian Hunter proposed we make use of the 'experts' at Greenmount to tell us how to reduce this in the future. Michel Mullan asked whether there was any way we could use a breeding system to lower the amount of concentrate fed but which would still improve composition while lowering the phosphorus balance. No answer was attempted! Sam Kennedy also stressed that the C.R.E.A.M. unit and students in control of it will have to adapt to change, while Ian McCluagge emphasised that decisions within the herd taken now will affect the herd for a number of years and also the students which will be running the herd in years to come. David Patterson made the point that students for the board meeting next year need to work with staff to draw up an Action Plan on how to deal with the problems currently arising from mid term review within the unit. Charlie Kilpatrick pointed out that the whole Farm Development Centre at Greenmount had a phosphorus balance currently of 13kg/ha surplus. However if the pigs were taken out of this equation, it would drop to 7kg/ha surplus phosphorus. Sam Kennedy also stated that with the strategic use of meal and fertiliser we can drop the P balance and we need to look closely at the targets.

Ian Boyce presented the C.R.E.A.M. gross margin figures to the board. Gross margin per cow is £454. There is a high replacement rate this year (46%) due to the high number of heifers which entered the herd. If we calculate using a normalised (target) replacement rate of 25% the gross margin increases this year to £743/cow. Meal feeding is also up on last year along with the price per tonne of meal and our sundry receipts were up mainly due to purchased embryos and veterinary costs.

Ian also showed the board our promotion articles including the rolling average figures on the rural portal website and articles which went to press, including the 10 year celebration event.

Sam Kennedy praised the students on the promotion work as it has improved greatly on any promotion work carried out in previous years.

**Breeding Team**

Peter Cagney gave a presentation on fertility performance and looked at calving index, submission rates and conception rates. The calving index has increased by 6 days since last year and now stands at 435 days. The target is 420 days. The calving index however does not take into account the cows that are culled or the high proportion of heifers in the herd. Submission rate is a measurement of heat detection efficiency and due to the small herd size the figures can be distorted dramatically in any one period due to one or two cows. With the

calculation assuming the breeding season starts on 1 October 2004, the actual submission rate is 73% while the target is 75%. Therefore we are on target.

It was again pointed out that criteria for bull selection is:

| | |
|---|---|
| Type: | >1.8 |
| Milk | >350kg |
| Protein | >0.00% |
| Butterfat | >0.02% |
| Reliability | >70% |
| CVM | negative |

The three bulls being used this year which meet this criteria are Sandy Valley Onyx (for heifers and cows), Picston Shaker and Comestar Export for cows.

Sammy Watson presented the next topic on embryo transfer. Embryo transfer is being used as milk composition targets set for the C.R.E.A.M. herd are not achievable in the next 5 years with the current genetics in the herd. 6 embryos have been purchased from Cogent and we have 6 of our own embryos for Supreme Annemarie (sired by Silky Gibson). Currently we have 12 recipients on a programme and the embryos will be implanted week commencing 25 April 2005. From these embryos we hope to have 2 heifer calves. The heifers produced from the purchased embryos will have the potential to produce 10,125kg milk and will introduce a new cow family with higher milk composition while maintaining high milk yield and strong linear profile traits.

The main advantages of embryo transfer are that it eliminates bio-security risks from buying in heifers and it is an excellent student learning exercise.

**Discussion time**

Ashley Fleming highlighted that when C.R.E.A.M. was set up the main focus was on achieving high yields/cow. After a few years concentrations went to the type of cow and now our focus is on compositional quality. This will take time to rectify. He proposed we purchase a heifer from a herd with high compositional quality rather than spending money on embryos which doesn't guarantee we will end up with a heifer calf and it takes longer for any influence on the herd. This will not happen as the Greenmount herds must remain closed for biosecurity reasons and we are trying to get the herd accredited as being Johnes disease free.

Vicky Morrision made the relevant point that the students should forward project our butterfat and protein % after the embryos come in to see what improvement will be made to herd figures.

William Crawford again commended the students on the detail presented to the Advisory Board and agreed it is the route to go down and he believes that we should introduce a new cow family to the herd each year. Embryos give us the potential to select from a wide range of genetics more so than if we were going out to purchase heifers and embryos will pay for themselves with the sale of a

heifer or bull. William also asked if we give cows a BVD vaccination as it has been proven that BVD vaccination improves fertility in the cows and also builds up immunity. Michael Graham stated that all dairy stock are vaccinated for BVD.

David Calderwood enquired to the Advisory Board if money could be put aside each year to buy embryos. No negative answers were forthcoming but finances would have to be looked at each year. It was also again highlighted that working with embryos would be of great advantage to student learning.

On the feeding regime, it was stated that there is not much more that can be done to improve quality of the milk as we are already feeding whole crop wheat. An alternative may be maize silage, however due to environmental constraints this is not possible at moment but will not be ruled in the future. There is currently research undergoing at ARINI into looking at alternatives for using Atrazine when growing forage maize.

It was also noted that each year brings different challenges and different products for the higher yielding herds.
With the student classroom presentations completed and hailed very successful, Sam Kennedy highlighted some staff and Advisory Board changes being put in place. Sam Kennedy will be replaced by Michael Mullan. He has been employed at Loughry Campus until now and will have a lot to contribute to the C.R.E.A.M. project through his background in dairy science. Charlie Kilpatrick is a new addition to the board in the form of new farm director and replaces Martin McKendry.
Another change was highlighted emanating from the SLP Review. Industry Advisory Board members will be given the opportunity to resign this year. Their invaluable contributions over the years was acknowledged. Individual Advisory Board members will be notified about this over the summer months by Michael Mullan.

**Visit to C.R.E.A.M. Unit**
Steven Graham led the discussion at the C.R.E.A.M. unit in the farmyard. He highlighted dietary intakes pointing out that the cows total average dry matter intake was 20.1kg with a crude protein of 18%. The TMR is formulated to provide cows with maintenance plus 32 litres while heifers maintenance plus 28 litres. For every litre above this supplementation of 0.45kg is fed through the parlour. William Crawford proposed that this was slightly on the high side and that 0.35kg should be adequate. He also suggested that an out of parlour feeder would possibly be a good investment for the future.
Steven presented the cows and heifers that achieved high classifications when the herd was re-classified by Holstein UK in February 2005.
David Mawhinney closed the meeting and thanked all the Advisory Board members for attending and giving the students sound guidance and encouragement.

## C.R.E.A.M. HERD TARGETS FOR 2005/2006

At Greenmount students are taught when setting objectives and targets that they must be specific, measurable, achievable, realistic and time specific. With this in mind it was felt that some of the targets/objectives of the past were no longer suitable for the herd. As such the targets of 2004/2005 have been revised for the current academic year.

**Table 1**. Targets for the herd for 2004/2005 and 2005/2006

| Target | 2004/05 | 2005/06 |
|---|---|---|
| | | |
| Number of cows | 30 | 30 |
| Milk yield | >12,000 l/cow (305 d) | - |
| | 10,500 l/cow/year | >10,500l/cow/year |
| Protein (%) | 3.25 | 3.10 |
| Butterfat (%) | 3.8 | 3.70 |
| TBC/SCC | to attract hygienic quality premium each month | |
| Concentrate usage | 3 T/cow | 3.5 T/cow |
| Calving index | 420 | 420 |
| Average days to first service | 70 | 70 |
| Conception rate to first service | 50% | 40% |
| Conception rate to all services | | 40% |
| Submission rate | | >70% |
| Replacement rate | 25% | 25% |
| Gross margin | | Within the top 15% of current bench marked farms above 8000 litres |

## C.R.E.A.M. HERD PERFORMANCE

The performance of the C.R.E.A.M. herd is summarized in the Table below.

Milk yield/cow is characteristically low at this time of the year as most of the cows tend to be in the later stages of lactation. This ultimately effects the rolling herd performance. This years figures follow a similar trend with the current annual milk yield per cow at 9,722 litres. This is below our target of 10,500 litres, however it is expected that as more cows calve down and reach peak yield that this figure will rise. Rolling herd milk production per cow is down 247 litres from the same time last year, however this can be attributed to the fact that out of a total of 41 calvings since October 2004 16 were heifers. Another result of the increased proportion of heifers in the herd is that the calving percentage has increased by 20 % indicating a tighter calving pattern. Rolling herd butterfat concentration has increased by 0.15% (0.5% above target) and protein has remained relatively unchanged with a difference of –0.01% compared to last years figures. Somatic cell count has increased to 126 and TBC has decreased to 7, leaving both figures well below our desired targets.

**Table 2**. Physical performance of the herd September 2004-September 2005

| | Sept 2004 | Feb 2005 | Sept 2005 | **Target** |
|---|---|---|---|---|
| Cows in herd | 28 | 29 | 31 | ***30*** |
| Calvings (%) | 88 | 97 | 117 | **-** |
| Milk yield/cow (litres) | 9,969 | 10,758 | 9,722 | ***10,500*** |
| Concentrate/cow (kg) | 3,880 | 4,418 | 4,099 | ***3,500*** |
| Milk price (ppl) | 17.4 | 17.29 | 17.27 | **-** |
| Butterfat (%) | 3.60 | 3.62 | 3.75 | ***3.7*** |
| Protein (%) | 3.04 | 3.06 | 3.05 | ***3.1*** |
| SCC (‘000) | 105 | 114 | 126 | ***<150*** |
| TBC (‘000) | 12 | 13 | 7 | ***<10*** |

From United milk recording data, rolling 305 day herd average has decreased by 1237 litres to11296 litres in September 2005.

**Table 3**. Rolling herd 305 day milk yields September 2004 and September 2005

| | Sept 2004 | Feb 2005 | Sept 2005 | Target |
|---|---|---|---|---|
| Rolling 305 day herd average (litres) | 12,533 | 11,960 | 11,296 | - |

C.R.E.A.M. herd

| Rolling 12 Months Averages | 2005 SEPT | OCT | NOV | DEC | JAN | FEB | MARCH | APRIL | MAY | JUNE | JULY | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cows in herd | 28 | 28 | 28 | 28 | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 31 |
| Calvings % herd | 88 | 96 | 100 | 111 | 107 | 97 | 99 | 106 | 105 | 107 | 106 | 105 | 117 |
| Milk yield/cow | 9969 | 10047 | 10113 | 10330 | 10666 | 10758 | 10695 | 10611 | 10527 | 10275 | 1000 | 9790 | 9722 |
| Milk from forage (litres/cow) | 1347 | 1127 | 1387 | 1080 | 1014 | 940 | 1203 | 1200 | 739 | 1254 | 1092 | 846 | 613 |
| Concs/cow (kg) | 3880 | 4014 | 3927 | 4162 | 4343 | 4418 | 4271 | 4235 | 4405 | 4059 | 4009 | 4025 | 4099 |
| Concs/litre (kg/l) | 0.39 | 0.4 | 0.39 | 0.4 | 0.41 | 0.41 | 0.40 | 0.40 | 0.42 | 0.4 | 0.4 | 0.41 | 0.42 |
| M.O.C./cow (£) | 1100 | 1089 | 1107 | 1100 | 1130 | 1131 | 1140 | 1114 | 1114 | 1141 | 1109 | 1081 | 1053 |
| M.O.C./litre (p) | 11.03 | 1084 | 10.94 | 10.65 | 10.6 | 10.52 | 10.65 | 10.58 | 10.58 | 11.11 | 11.09 | 11.04 | 10.83 |
| Price/litre (p) | 17.4 | 17.41 | 17.38 | 17.33 | 17.35 | 17.29 | 17.19 | 17.16 | 17.2 | 17.27 | 17.29 | 17.3 | 17.27 |
| Cost/tonne concs (£) | 164 | 165 | 166 | 166 | 166 | 165 | 164 | 161 | 158 | 156 | 155 | 152 | 153 |
| Weighted average butterfat (%) | 3.6 | 3.61 | 3.61 | 3.61 | 3.62 | 3.62 | 3.62 | 3.62 | 3.64 | 3.68 | 3.71 | 3.74 | 3.75 |
| Weighted average protein (%) | 3.04 | 3.04 | 3.05 | 3.05 | 3.06 | 3.06 | 3.05 | 3.06 | 3.06 | 3.06 | 3.06 | 3.05 | 3.05 |
| Weighted average SCC (' 000) | 105 | 106 | 104 | 109 | 112 | 114 | 118 | 123 | 128 | 125 | 132 | 128 | 126 |
| Weighted average TBC (' 000) | 12 | 12 | 12 | 12 | 13 | 13 | 14 | 13 | 13 | 7 | 7 | 7 | 7 |

**Table 4**. Rolling herd performance September 2004 to September 2005

## C.R.E.A.M. PROMOTIONAL MATERIAL SEMMESTER 1 2005/2006

In the current academic year, 2 press articles have been published in local press. All herd performance and herd management data are updated on a monthly basis on the rural portal by the Finance and Promotion team.

***Article 1 (in brief)***

**"Classy C.R.E.A.M."** (printed in Farming Life)

By Samuel Watson, finance and promotion team.

Pictured below is "Creamer Gibson Annemarie", daughter of Supreme Annemarie, a thirteen-year-old cow that is currently in her ninth lactation and has given in excess of 118,000 litres to date. Supreme Annemarie has been classified five times Excellent and is a very notable cow within the herd, as she is the only original foundation cow remaining. Creamer Gibson Annemarie looks set to follow in her mother's footsteps, by being classified as Good Plus 84 as a first lactation heifer.

Another four first lactation heifers were classified into the Good Plus category and a forth lactation cow was awarded Excellent 90.

*Article 2 (in brief)*

**"From the hills of Donegal to the land down under"** (submitted to United Dairy Farmers for publication in the November edition)
By Paul Anderson.

Coming from a beef suckler farm in Co Donegal, my only experience with milking cows was during my first year in the C.R.E.A.M. project at Greenmount Campus, CAFRE. The experience I gained from C.R.E.A.M. enterprise management proved to be invaluable to me and made me fully aware of the important issues regarding milking, feeding, breeding, and the daily management of dairy cows……..

*Notable achievements in 2005/2006*

***C.R.E.A.M. wins the challenge cup***

In October 2005, the C.R.E.A.M. herd was awarded the John Thompson and Sons perpetual cup in the Holstein NI herd production competition for the three times a day milking, medium sized herd section.

This is the fifth time that the C.R.E.A.M. project has won this award since 1999 which is an excellent achievement by all involved with the herd over the past few years.

## C.R.E.A.M. FEEDING REGIME

At present there are two groups of milking cows in the C.R.E.A.M. herd. In order to try to optimize concentrate feeding a stale group has been formed, comprising of late lactation cows producing below the maintenance plus levels provided by the TMR. Ideally in a larger herd situation it would be feasible to increase the number of groups in a high yielding herd such as C.R.E.A.M. However, due to the small number of cows in the C.R.E.A.M. it is not practical to create more than two groups.

**Table 5.** Analysis of the silage, whole crop wheat and concentrates offered for the winter of 2005.

| | Dry Matter (%) | ME (MJ/kg DM) | Crude Protein (%DM) |
|---|---|---|---|
| Silage (*) | 29.7 | 11.4 | 14.4 |
| Whole Crop (*) | 50 | 10.4 | 8.5 |
| Blend | 87 | 13.5 | 20.6 (18%fresh) |
| Nut | 87 | 13.7 | 22.9 (20% fresh) |

(* - Source HFIS)

Following a visit by Morgan Sheehy (on 19 November) the TMR offered to the herd has been altered. The current TMR (fresh weight fed/cow/day) offered is detailed below:

| | |
|---|---|
| 1st cut silage | 35kg |
| Wholecrop wheat | 10kg |
| Blend | 11kg |
| Molasses | 0.5kg |
| Straw | 0.75kg |

The TMR for the C.R.E.A.M herd for the winter of 2005 / 2006 is comprised of first cut grass silage, fermented wholecrop wheat, straw, concentrate blend and molasses. This is formulated to produce M+28 litres for heifers and M+31 litres for cows. In the milking parlour, the cows receive concentrate at a rate of 0.45 kg per litre above this level, up to a maximum level of 8kg for cows, 6kg for heifers and 6kg for stale cows.

This means a cow yielding 31 litres will be receiving a ration with an overall diet protein concentration of 15.9%. A cow yielding 42 litres (currently the average production level in the herd) will be receiving 4.95kgs of nut in the parlour with a total diet protein percentage of 17.1%. The late lactation group receives the TMR refusal from the main group (weighed), topped up with silage when required. It is calculated that this should be providing the stale cows with enough energy for maintenance plus 12 litres of milk.

The alteration to the ration included an increase to the portion of concentrates offered through the TMR in an effort to avoid digestive upsets. The current ration also has a lower protein concentration compared to diets offered previously. This is intentional as upon examination of the most recent herd condition scores it was decided that, in general, the herd would need to put on some condition. In theory

the lower protein in the ration will mean that the cows are not milking as heavily at the expense of body condition (refer to following page for further details).

Through continued use of the ration spread sheet set up last year, dry matter intakes (DMI) are monitored each day by recording the weight of feed in the feeder wagon and weighing the amount of feed not eaten the next day. The current average total daily DMI since the beginning of term is approximately 23.8 kg. The dry matter of the forages is determined on a fortnightly basis in the college lab to allow accurate calculation of DMI.

Any changes to the ration are based on the information contained in this and the monthly Body Condition Scores for the herd.

It has been arranged that the herd nutritionist will visit the herd on a monthly basis to assess the situation and review the feeding programme if necessary.

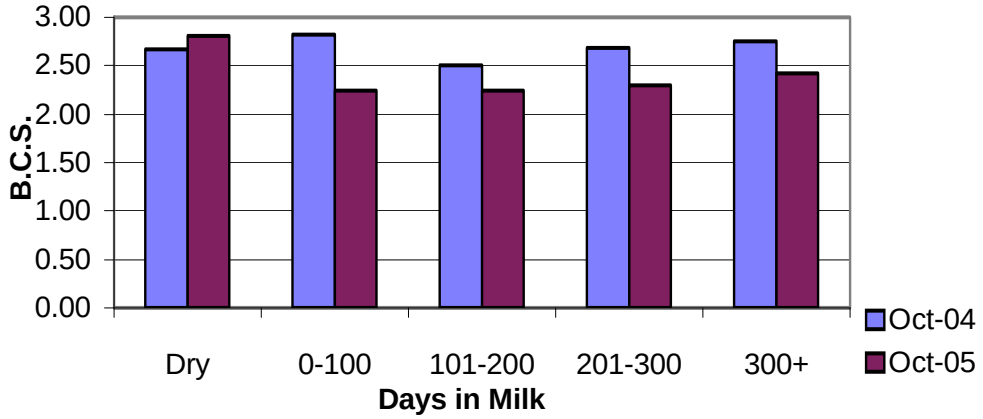
## C.R.E.A.M. herd current body condition scores

The herd is condition scored in order to keep a record of the physical condition of the herd through the different stages of lactation. Adequate body reserves are necessary to maintain health, production and reproductive efficiency in dairy cattle. Under conditioned cows are prone to reduced milk production, poor persistency of lactation and poor reproductive performance. Over conditioned cows are likely to suffer dystocia, fatty liver syndrome and metabolic disorders. The Dairy herd fertility challenge recommended body condition scores are as follows:

| Stage of lactation | Condition score |
|---|---|
| Calving | 3.0 |
| Service | >2.5 |
| Drying off | 3.0 |

The body condition scores of the C.R.E.A.M. herd for October 2004 and October 2005 are presented in the graph below. The overall condition score of the herd at present would appear to be lower than the equivalent time period last year. Upon examination of the graph it would also appear that the herd are failing to reach the target condition scores set out by the fertility challenge. The Dairy Herd Fertility Challenge recommends that if more that 15% of cows in each stage of lactation are outside the 2.5 to 3.5 condition score range, changes need to be made to the ration of that group of cows to bring condition score back on target. Currently within the milking cow herd 34% of the cows are outside the range of 2.5-3.5. The change in the current feeding regime should help to rectify this deficit.

**Graph 1.** Average body condition score of the C.R.E.A.M. herd October 2004 and 2005.



## FUTURE PLANS

*(1) Out of parlour feeders*

Many of the cows in the C.R.E.A.M. herd require substantial quantities of concentrate, a lot of which they are expected to eat in 3 feeds in the parlour. When feeding these large amounts of concentrates in the milking parlour it often means that the cows don't get all of the concentrates consumed during milking time. Also at the later stages of lactation, many of the cows in the C.R.E.A.M. herd are consuming, through the TMR, over and above what they require for production. This understandably leads to the concentrates not being fed as efficiently as they could be. The installation of out of parlour feeders will mean each animal will be identified by the computer upon entering the feeder and the appropriate quantities of concentrates will be fed to the cow according to her yield. At present the C.R.E.A.M cows are eating on average 4200kg/year of concentrates each. This has a huge impact on the gross margin of the herd. The installation of the out of parlour feeders should result in the concentrates being fed in the most efficient way possible.

The out of parlour feeders should help to promote better health as the cows will be able to obtain a small amount of concentrate which can be given a number of times (up to 12) throughout the day. The feeders should help reduce the occurrence of digestive upsets, which may be caused by the cows eating large amounts of concentrate in the parlour during each milking. The large quantities of concentrates being fed in the parlour put the rumen under pressure and so the cow's digestive system is upset, causing acidosis. As a result the cow may go off her feed, drop in milk yield and also lose condition.

Work carried out at The Agricultural Research Institute Northern Ireland (ARINI) has demonstrated an increase in both fat and protein percentages with feeding cows to yield through out of parlour feeders, compared to flat rate through the parlour.

*(2) Proposal of the introduction of Maize silage to the diet*

The introduction of Maize silage as alternative forage to the C.R.E.A.M herd is currently under review and is something that the students wish to discuss with the board to obtain their views. The two options for consideration are to either for Greenmount Campus to grow the crop itself or to purchase it from a contract grower.

**Table 6.** Analysis of a typical Maize silage.

| | |
|---|---|
| Dry matter % | >30% |
| Crude protein % | 9% |
| ME (MJ/kg DM) | 11.5 |
| Starch % | 22-30% |
| NDF% | 55% |

Studies at Hillsborough have demonstrated that maize silage will increase dry matter intake and due to the high percentage of starch contained within, has the potential to increase both yield and protein concentration in the milk.

Other research carried out at Hillsborough has established that offering maize for two hours after milking (twice a day milking system) had the equivalent effect to feeding 3.1kg of standard dairy concentrate. This illustrates that the addition of maize to the C.R.E.A.M. diet should allow the level of concentrates currently offered to the herd to be reduced. This will have both positive economical and environmental impacts.

A full cost benefit economic appraisal for both the out of parlour feeders and contract growing vs. campus grown maize will be presented at the next board day in April.

We would appreciate the boards opinion on both of these future ventures.

# VETERINARY HEALTH ANALYSIS

The C.R.E.A.M. project records all veterinary and health treatments within the herd, as a result problem areas and problem animals can be identified within the herd. It also allows the herd to be benchmarked against published UK health data.

Upon analysis of the veterinary health data collected it can be observed that the three health issues with highest incidence in the C.R.E.A.M. herd are mastitis, feet problems (lameness) and stomach problems.

**Table 7**. Comparison of the incidence of mastitis, feet problems and stomach problems between the C.R.E.A.M. herd and the premium herd (from 1st January 2005).

| Disorder | C.R.E.A.M. (per 100 cows) | Premium Milk Herd (per 100 cows) |
|---|---|---|
| Mastitis | 68 | 46 |
| Lameness | 40 | 12 |
| Digestive upsets | 12 | 3 |

This data suggests that the incidence of mastitis is relatively high. A small number of problem cows have increased this figure due to being repeatedly treated, a number of which have since been culled. To combat mastitis we plan to bacteria screen each cow in the herd to determine which bacteria is causing the problem. This should enable problem cows in the herd to be treated with antibiotics with a high specificity for the infecting bacteria.

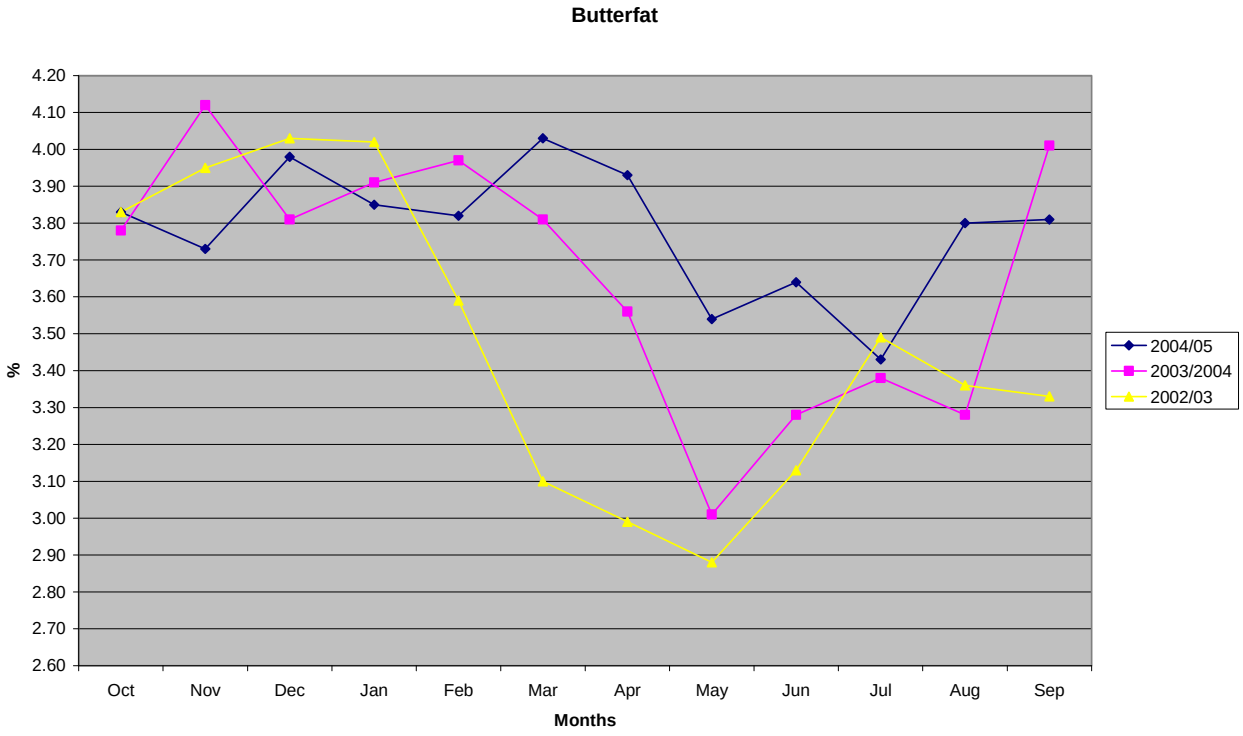
An increased incidence of feet problems are to be expected with a high input herd like the C.R.E.A.M. as they are housed most of the year. Measures which are taken to minimise problems include feet bathing once a week with blue stone and Lincospectrum (antibiotic based) on an alternative basis, automatic scraping of all passageways every 2 hours and foot paring is carried out on each cow at

drying off and any other time it is needed. Also, within our bull selection this year a strong emphasis was placed upon choosing bulls have good feet and legs scores.

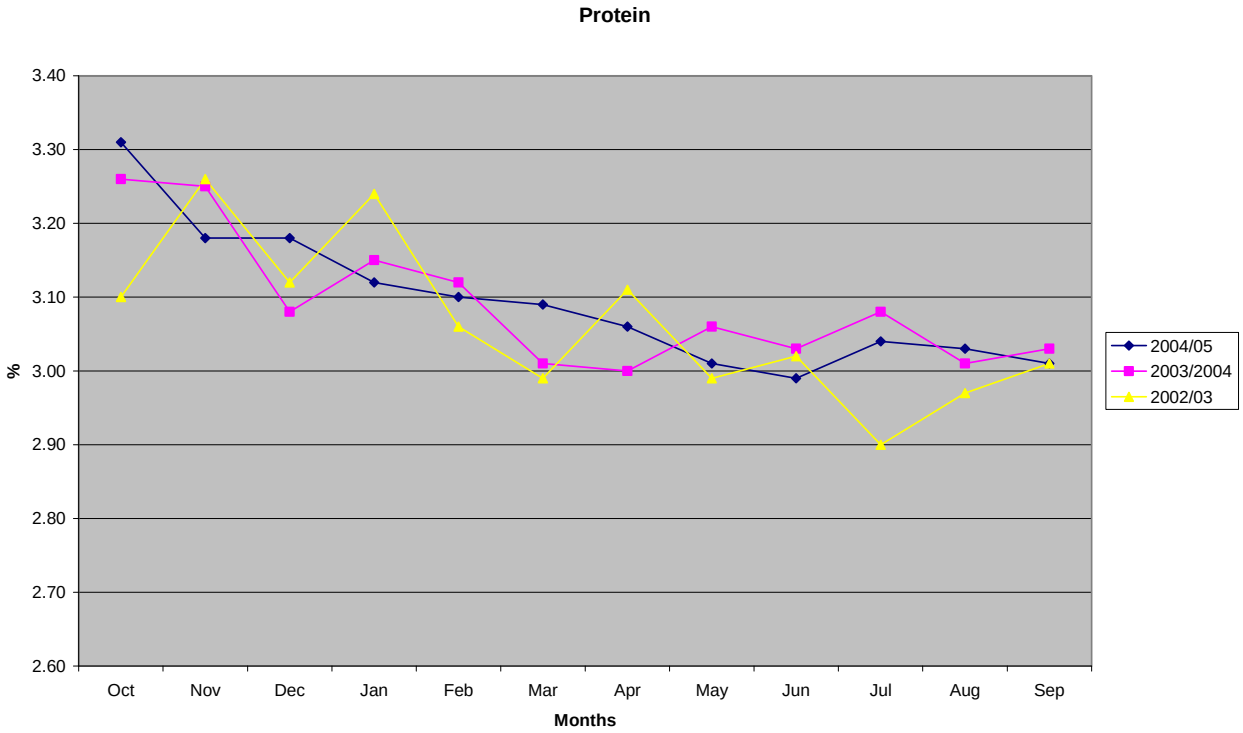
Stomach problems are also a problem area within C.R.E.A.M. due to the high quantity of meal being offered. A high yielding cow may receive up to 19kg of concentrate per day during peak yield. It is hoped that the introduction of the out of parlour feeders will help to minimise any digestive problems in the future.

# LACTATION AND MILK COMPOSITION GRAPHS

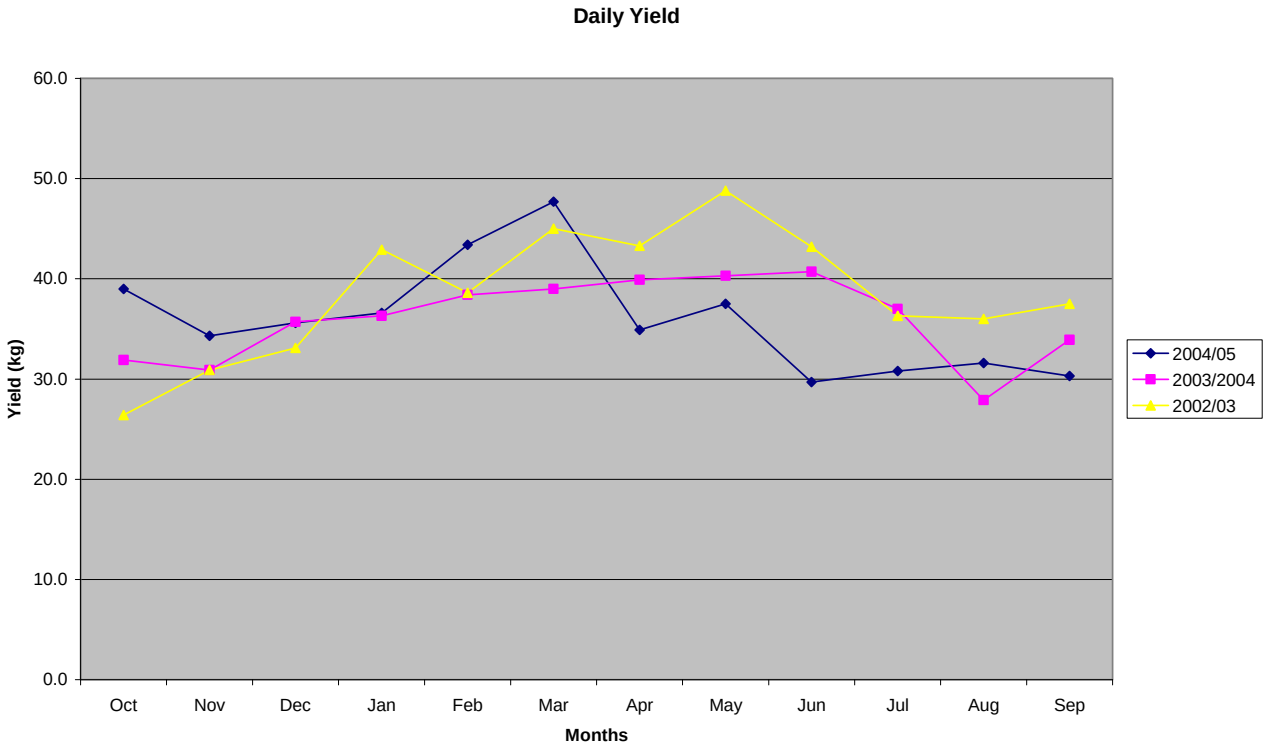
**Graph 2.** Milk butter fat concentration October 2002 – September 2005.




**Graph 3**. Milk protein concentration October 2002 – September 2005



**Graph 4.** Daily milk yield per cow (kg)




Graphs 1 and 2 allow comparison of milk butterfat and protein percentages of the herd over the previous three years. The butterfat percentage appears to be higher this year than the previous two years. As previously discussed by the finance and promotion team, the rolling herd average for September 2005 is lower than September 2004 and this point is also illustrated in Graph 3, with average daily yield between April – December 2005 consistently lower than the previous two years. This decrease in milk yield can be attributed to the fact that a total of 16 out of 41 calvings since October 2004 were heifers. As heifers have both a characteristically lower milk yield and flatter lactation curve this has ultimately resulted in a lower milk yield. The high proportion of heifers in the herd at present would also explain the increased milk butter fat percentage as there would be less dilution effect and (as displayed on page 24) previous bull selection has lead to an improvement in average component PTA figures for heifers in the herd.

# JOHNE'S DISEASE STATUS

Johne's Disease is becoming one of the most topical diseases in the dairy industry. It can have serious financial impacts on the herd through loss of output in the milk yield, premature culling of infected cattle and their cohorts and the costs involved in sourcing and rearing replacements for these animals. It has also been cited that the organism causing Johnes in cattle (*Mycrobacterium avium paratuberculosis)* may be linked to Crohn's Disease in humans. Therefore, a long term plan for the control and prevention of Johnes Disease in herds will be beneficial in a number of ways:

1. To reduce or prevent production losses from reduced milk yield and income.

2. To increase the value of breeding stock upon certification of a disease free herd.

3. To reduce the level of *MAP* in milk and the environment

In the ruminant Johne's disease is a chronic, progressive, wasting condition and is caused by an organism which is closely related to the organism which causes TB. It is a chronic gastro-intestinal infection of adult animals that damages the intestines. The disease causes profuse and persistent diarrhoea, severe weight and condition loss, reduced milk yield, infertility and results in early culling of infected cows. The disease is known world wide and the instances in the UK are becoming more common as herds are becoming larger and stocking densities increase.

The cost of the disease is difficult to assess but one case is estimated to cost an average of £26/cow across the UK dairy herd. Financial losses are estimated to be a 10% reduction in milk yield in lactation before critical signs of the disease are seen and a 20% reduction in yield when the disease is detected. The disease

also increases susceptibility to other diseases, such as mastitis, leading to further financial losses.

Principles of Johne's disease control include:

- reducing exposure and infection of replacement cattle on farm
- identifying and removing the most highly infected cattle
- preventing introduction of infection by screening sources of off-farm replacements

Johne's disease control programs require a long-term commitment to prevention and must be adapted to individual herds. This approach, however, has not yet been widely adopted by veterinarians and producers in the UK.

The policy taken on Johne’s disease within Greenmount is that any animal tested positive for the disease will be culled immediately. Any cohorts of the infected cows will also be culled. Other measures introduced in order to try and eradicate the disease are management alterations for fresh calved animals and their calves. Calves will be separated from the dam as soon as possible after birth to avoid contact with potentially contaminated faeces, and faeces in the colostrum and milk. All potential herd replacements will only be fed the colostrum from its dam. There has also been implementation of an annual round of testing of all

cattle aged 2 years and over. Additional testing of any suspect clinical cases and all culled stock is also carried out.

There were two cattle that died on Greenmount Farm Development Centre with the condition prior to 2002, one of these being a C.R.E.A.M. cow (purchased from the Netherlands) and another from the main herd. In February 2002 a request for a complete herd screening was carried out and a test has been carried out annually since then. The table below shows the number of cows identified as being tested positive for Johnes Disease and being culled and their Identification number for each year's test.

**Table 8.** Cows tested positive with Johnes in C.R.E.A.M. from 2002.

| Year | No. of Cows Infected & Culled | Cow I.D. Numbers |
|---|---|---|
| 2002 | 3 | C51, C49,C53 |
| 2003 | 1 | C30 |
| 2004 | 0 | CLEAR TEST |
| 2005 | 1 | C101 |

# SIRE SELECTION 2005/2006

Sire selection in the C.R.E.A.M. herd has concentrated on maintaining milk yield, improving milk compositional quality and fertility as well as improving type (legs/feet, udder, strength and stature). In addition, all bulls selected are CVM free to avoid any potential problems with this recessive genetic mutation.

## Changes in Bull Selection Criteria

**Table 9.** Selection criteria for 2004/2005 (PTA 2000 and PTA 2005) and the new selection criteria for 2005/2006 (PTA 2005)

| | 2004/05 PTA**2000** | 2004/05 PTA**2005** | **2005/06 PTA 2005** | Changes |
|---|---|---|---|---|
| Milk kg | >350 | >65 | **50** | -15 |
| Butterfat % | >0.02 | >0.1 | **>0.1** | 0 |
| Protein % | >0.00 | >0.02 | **>0.02** | 0 |
| Type | >1.8 | >1.2 | **>1.2** | 0 |
| Reliability % | >70 | >70 | **>80** | +10% |
| CVM | NEGITIVE | NEGITIVE | **NEGITIVE** | NEGITIVE |

The PTA for milk was decreased slightly this year (by 15kgs) to give us a wider range of strong component bulls to chose from. We also increased the level of reliability by 10%. The following bulls were short listed for use on the herd with the final choice listed below.

**Table 10**. Bull selection short list

| Bull | Milk (kg) | Protein (%) | Butterfat (%) | Legs & Feet | SCC | Type | Reliability (%) | Fertility Index |
|---|---|---|---|---|---|---|---|---|
| Ford | 268 | 0.01 | 0.07 | 0.18 | -1.2 | 2.16 | 99 | -3 |
| C. Lee | 69 | 0.05 | 0.17 | 1.94 | -8 | 2.32 | 99 | -3 |
| Hanno | 128 | 0.07 | 0.14 | 1.26 | 0 | 1.69 | 80 | -4.5 |
| Eaton | 283 | 0.11 | 0.1 | 0.41 | -14 | 0.66 | 83 | -4.9 |
| Brad | 346 | 0.03 | 0.1 | 1.27 | 1 | 1.97 | 82 | N/A |
| Jucor | 442 | 0.04 | 0.07 | 2.33 | 9 | 1.63 | 78 | N/A |
| Shaker | 35 | 0.08 | 0.15 | 0.9 | -14 | 1.3 | 98 | 0.7 |
| Mascol | 428 | 0.09 | 0.06 | 2.3 | -22 | 1.62 | 80 | -3.9 |

From the range of bulls listed above we have selected the following four:

- Shaker (sexed)
- Mascol
- Comestar Lee
- Hanno

This year a new fertility index has been released for many of the bulls available. Although we tried to minimize the bulls selected with negative fertility scores it was not possible to avoid negative scorers altogether as there were very few bulls that were positive for both milk yield and fertility. The Fertility Index is expressed as a '£' value reflecting the management costs of fertility. The range between the top and bottom bulls is expected to be around +£8 to -£10 respectively, which reflects the additional fertility saving/cost per lactation from the average daughter of an individual bull.

*Final decisions on bullchoice*

After a comprehensive discussion we have decided to serve all maiden heifers with Shaker (sexed) for the first service, any repeats will be reserved with Comestar Lee (non sexed) as they are easy calving bulls. Mascol and Hanno will be used to serve the cows according to their PTA's.

Reasons for choice:

- Mascol; High milk, with good solids with reasonable type merit and good feet and legs.
- Hanno; Good solids with reasonable type with a good pedigree with good reports within the industry.
- Comestar Lee; Highly reliable bull with good solids, good type and a reasonable fertility index and ease of calving.

- Picston Shaker; Good solids with a good pedigree and high reliability and is the most suitable bull of those that are available to us as sexed semen.

*Bull that were considered and rejected*

Ford, Eaton, Brad and Jucor.

Reasons;

- Ford; poor feet and legs even though he had high reliability and we had good experience of him in the past.
- V Eaten; Low butterfat % and type merit.
- Brad; Low solids compared with the other bulls with no fertility index available and low reliability.
- Jucor ; Low reliability and no fertility index with a poor score for cell count.

*Reasons for the use of sexed semen on heifers*

- Increase the number of heifer calves born allowing a wider choice for replacements.
- Heifer calves are usually born smaller and are easier on the heifer at calving.
- Bull calves are currently worthless therefore we can try to increase our margins by calving more heifers.

Recent research has demonstrated that using sexed semen for the first service and conventional semen for all subsequent services, results in the ratio of heifers to bulls changing from 50:50 to 62-66% heifers (Weigel, 2004).

Also this year after 4 services using AI, cows are going to be served with a beef stock bull to reduce the costs of semen on repeating cows and try to increase conception rates etc unless the are an exceptional cow in the herd.

*Current PTAs of the herd*.

**Table 11.** Herd PTAs using PTA 2000

| PTA2000 lactation number | Number of Animals | milk | Fat kg | fat% | Pt kg | Pt % | PIN £ | PLI £ | Rel |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 140 | 7.22 | 0.25 | 2.62 | -0.02 | 10 | 14 | 39 |
| 2 | 9 | 188 | 1.86 | -0.06 | 3.63 | -0.03 | 5 | 8 | 40 |
| 3 | 2 | 139 | 9.35 | 0.06 | 5.1 | 0.01 | 20 | 19 | 41 |
| 4 | 5 | 341 | 0.18 | -0.15 | 6.88 | -0.05 | 6 | 10 | 63 |
| 5 | 1 | 690 | -5.1 | -0.35 | 9.5 | -0.14 | -6 | 1 | 66 |
| 6 | 1 | -61 | -3.4 | -0.01 | -1.1 | 0.01 | -4 | -1 | 43 |
| 7 | 2 | 69 | 5.2 | 0.04 | 1.35 | -0.01 | 7 | 14 | 62 |
| 9 | 1 | -427 | -26.8 | -0.14 | -18 | -0.06 | -65 | -61 | 51 |
| **HERD AVERAGE** | 34 | **171.62** | **3.10** | **0.05** | **3.07** | **-0.03** | **5.41** | **8.91** | **45.65** |

**Table 12.** Herd PTAs using PTA2005

| PTA2005 lactation number | Number of Animals | milk | Fat kg | fat% | Pt kg | Pt % | PIN £ |
|---|---|---|---|---|---|---|---|
| 1 | 13 | -145 | 1.32 | 0.33 | -5.28 | 0.00 | -8 |
| 2 | 9 | -97 | -4.04 | 0.02 | -4.27 | -0.01 | -13 |
| 3 | 2 | -146 | 3.45 | 0.14 | -2.80 | 0.03 | 2 |
| 4 | 5 | 56 | -5.72 | -0.07 | -1.02 | -0.03 | -12 |
| 5 | 1 | 405 | -11.00 | -0.27 | 1.60 | -0.12 | -24 |
| 6 | 1 | -346 | -9.30 | 0.07 | -9.00 | 0.03 | -22 |
| 7 | 2 | -216 | -0.70 | 0.12 | -6.55 | 0.01 | -11 |
| 9 | 1 | -712 | -32.70 | -0.06 | -25.90 | -0.04 | -83 |
| **HERD AVERAGE** | **34** | **-113.38** | **-3** | **0.13** | **-4.83** | **-0.01** | |

The PTA of the herd is currently negative for milk when compared to the 2005 genetic base. However as we examine the trend of PTA's between the older cows and first and second lactation heifers we can see that PTA for components within the herd is gradually improving. This is the main reason that mascol will be mainly used on the herd with his reasonably high PTA for milk along with his good solids.

*Progress within the embryo transfer program from April 2004.*

Following advice received at previous board meetings 12 embryos were implanted in April 2005 with an overall success rate of 50%.

The embryos that are successfully implanted are;

2 x Silky Gibson x Supreme Annemarie
(PTAs [2005]of –87 Milk, +0.88 butterfat and –0.04 protein)

4 x Braedale Goldwyn x Cogent Tugolo looking 2
(PTAs [2005] of 215 milk, +0.19 butterfat, +0.09 protein)

These are due to calve in early January and we look forward to see and work with the progeny of these embryos.

Depending on the amount of available capital we hope to purchase more embryos this year concentrating on the same selection procedure as last year (based on improving overall milk solids).

# C.R.E.A.M. FERTILITY PERFORMANCE 2004/2005.

Calving index is a widely recognised measure of fertility and is the average interval between successive calvings for a herd of cows. As you can see below the calving index is 410 days for the month August 2005 compared to 439days in September 2004. With a decrease of 19 days we are currently more than meeting our target.

*Calving Index*

**Table 13.** Calving index for September 2004 and September 2005

| | Sept 2004 | Febuary 2005 | Sept 2005 | **Target** |
|---|---|---|---|---|
| Calving Index (days) | 439 days | 435 days | 410 days | ***420days*** |

(UDF milk recording statements)

While widely used, calving index isn't the most accurate measure of a herds fertility as it doesn't count cull cows. However, key elements to fertility are serving cows when they become eligible (submission rate) and ensuring that they become pregnant when they are served (conception rate). These two methods of assessing fertility can be used to compare year on year fertility performance and enable comparisons between herds. These fertility indicators are used in the *Dairy Herd Fertility Challenge* programme for NI diary farmers, and in the fertility benchmarking initiative due to be launched early next year. This initiative will also look at other fertility indicators (heat detection rates and accuracy of heat detections). At the previous board day (April 2005) partial updates of the 2004/2005 fertility results were presented. The following data is for the full 2004/2005 breeding year.

*Submission rates*

Submission rate is a measure of heat detection within the herd. For C.R.E.A.M we have taken our breeding season start date as 16th November 2004 and a voluntary waiting period of 60 days.

**Table 14.** Submission rates based on first service date of breeding season - 16th November 2004.

| Period | Calved on/before | End of period | No. eligible for service | No. cows served | SR% |
|---|---|---|---|---|---|
| 1 | 17-Sep | 06-Dec | 3 | 3 | **100%** |
| 2 | 08-Oct | 27-Dec | 2 | 2 | **100%** |
| 3 | 29-Oct | 17-Jan | 2 | 2 | **100%** |
| 4 | 19-Nov | 07-Feb | 1 | 1 | **100%** |
| 5 | 10-Dec | 28-Feb | 2 | 1 | **50%** |
| 6 | 31-Dec | 21-Mar | 2 | 2 | **100%** |
| 7 | 21-Jan | 11-Apr | 3 | 3 | **100%** |
| 8 | 11-Feb | 02-May | 2 | 0 | **0%** |
| 9 | 04-Mar | 23-May | 1 | 1 | **100%** |
| 10 | 25-Mar | 13-Jun | 0 | 0 | |
| 11 | 15-Apr | 04-Jul | 0 | 0 | |
| 12 | 06-May | 25-Jul | 1 | 1 | **100%** |
| 13 | 27-May | 15-Aug | 1 | 1 | **100%** |
| 14 | 17-Jun | 05-Sep | 0 | 0 | |
| 15 | 08-Jul | 26-Sep | 2 | 1 | **50%** |
| 16 | 29-Jul | 17-Oct | 3 | 1 | **33%** |
| **Total** | | | **25** | **19** | **76%** |

As you can see from the table the overall submission rate for the year was 76%. This is 1% above the target for all year round calving of 75% target submission rate.

*Conception rates*

Conception rate is the number of cows that conceive as a proportion of the total number of cows served. It has been calculated throughout the breeding season based on a non return rate (cows not served within 60 days of the last service and therefore assumed pregnant). Conception rate to 1st service up to 17th September 2005 was 38%. The overall conception rate was 29%. We are

almost reaching our first conception rate target of 40%, however conception rate to all services would need to improve in order to obtain our target of 40%.

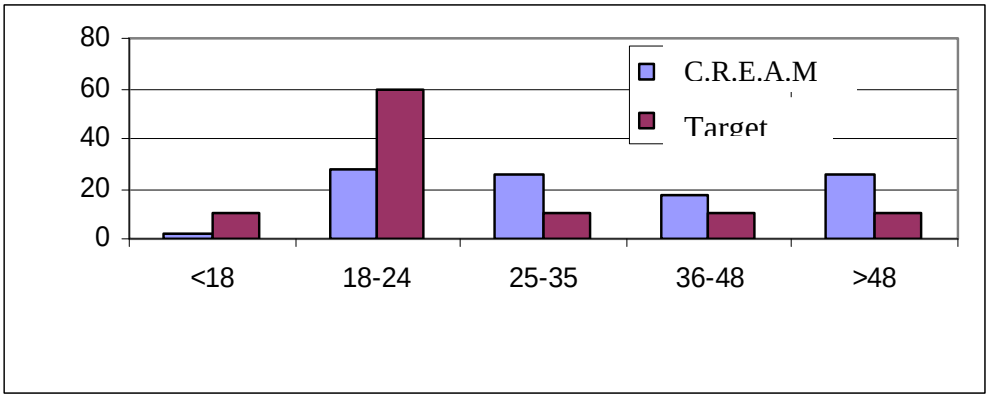
*Heat detection rate*

Heat detection rate is closely linked to submission rate and will also be part of the Fertility Benchmarking initiative that will be available via the Rural Portal web site from early 2006. Heat detection rate has been calculated using inter-service intervals via the same method as Hillsborough in their fertility study of 19 herds (2002). In that study the average heat detection rate for these herds was 71% but varied from 55-88% between herds. The current heat detection rate for C.R.E.A.M is 56%. This may be due to a number of heats being missed or cows not cycling correctly. As this is a new measure that has been introduced to C.R.E.A.M we aim to improve this figure as we start the new breeding season.

*Heat detection accuracy (HDA)*

Heat detection accuracy is also featured in the Fertility Benchmarking initiative and has been introduced to C.R.E.A.M for the first time this year. It takes account of the interval between successive services.

**Graph 5.** Percentage repeats compared to Fertility Benchmarking targets



*Days to first service*

Ideally cows should return 18-24 days after service as intervals outside this period indicate irregular heats or poor heat detection rates. The target HAD is to have approximately 60% of repeats falling within the 18-24 day period but currently C.R.E.A.M has only 28 % of cows repeating 18-24 days after service. For the next three group periods (25-35; 36-48; >48) C.R.E.A.M. is above target. This means that heats are not being picked up quickly enough or cows are not cycling within the normal ranges. The combination of lower heat detection rate than submission rate, and higher percentage of repeat intervals over 24 days would suggest that the cows may be experiencing embryonic/early foetal loss.

This is the number of days from calving until first service. For the last breeding season it was 78 days with our target being 70 days. The target number of days to first service was calculated by adding the voluntary waiting period of 60 days to half the number of days in a heat cycle.

$$60 + ( 0.5 \times 21 ) = 70.5 \text{ days}$$

Since the average interval to first service was 78 days, one week over target, this indicates that one third of cows were missed in the periods that they became eligible for service. This may be due to silent heats or due to the cows exhibiting periods of prolonged anoestrus.