Efficiently Achieving 1000kg

Maximising milk solids for sustainable dairy production

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Foreword from Ben Bartlett, Sales & Marketing Director, NMR

Over recent years the industry has seen a shift in focus in the market from milk volume as a key commercial driver to total solids (fat and protein). This is no surprise given the significance of fat and protein as finished product ingredients for many processors. Focussing on total solids offers benefits, not just in terms of meeting the market need, but in contributing to improving the carbon footprint of dairy.

It is clear that some dairy farmers have embraced this market need and are seeing the dividends. NMR is therefore pleased to be supporting this study which looks into the management practices on a selection of farms that have orientated their decision making with this goal in mind.

The report is not intended to provide a blueprint for all GB dairy farmers as there are plenty of other herd management strategies that are equally valid. However, there are some common themes that have emerged from the study that are relevant for all. Examples of these include:

- The importance of having a clear strategy for the herd and being proactive in pursuing this strategy.
- Following a carefully considered breeding plan – as herd improvement all starts with the right breeding.
- Data secured from genomic testing allow better decision making and give a head start in the pursuit of the breeding plan.

In summary, while the GB dairy industry will doubtless continue to face challenges in terms of price volatility, input costs and environmental pressures, evidence provided by the farms in this study demonstrates that positive outcomes can be achieved through careful planning that is focussed on market needs, backed up by decision making based on robust cow data. This report demonstrates what can be done when clear planning is combined with the use of the right herd improvement tools.

Maximising the weight of fat and protein produced per cow is one way of increasing the sustainability of a dairy business and reducing its environmental impact.

While the average milk solids production per cow in the UK is 675kg, there are a small number of dairy farmers producing near to, or over, 1000kg of fat and protein per cow a year. Kite Consulting has looked at 7 of these herds to understand what sets them apart from the average.

> *"The average herd in the UK is yielding 675kg total milk solids over 305 days with the top 25% producing 748kg"*

Why high milk solids drive higher returns and reduce environmental impact

Global dairy consumption currently favours increased yields of fat and protein within a lower volume of milk. As land, cow places and labour become more limiting it is imperative that farms find the most profitable and sustainable way to maximise income from milk solids.

A more efficient cow that can produce milk solids with fewer inputs is a more sustainable cow. It means fewer cows are required for the same amount of fat and protein production, leading to decreased emissions per kg of milk. It also reduces the number of replacement heifers required, again, reducing the environmental impact of dairy production. In addition, transportation of milk with higher levels of solids has less carbon impact than shipping larger volumes of liquid milk.

Protecting the economic viability of dairy farms while at the same time lowering the carbon footprint of milk is extremely important for UK dairy farmers; sustainability and profitability are positively correlated.

The study includes an overview of the following key areas:

- Genetics
- Management
- Nutrition
- Environment
- Health & Welfare

The herds

All herds involved in the project were all-year-round (AYR) calving and predominantly housed. Far off dry groups on three of the units visited were grazed in the summer. Average total milk solids in the project ranged from 890 to 1060kg per cow per year. Herds were of varying sizes, but all were family businesses subject to the same labour constraints as the rest of the UK. On all farms, the owners were working closely day to day with the herd and integrally involved with management detail.

> *"We are looking for 3.2kg solids/cow/day – currently at 1022kg rolling average total solids"* *Study Farmer*

Farm ID	Feeding system	Cow numbers	Average total milk solids/cow/year (kg)	Range in 305d total solids production (kg)
1	1 TMR	212	990	680-1390
2	1 TMR	180	900	510-1320
3	1 PMR+ fed in robots	246	1030	695-1350
4	1 TMR	405	1060	690-1490
5	1 PMR + fed in parlour	424	890	580-1270
6A*	1 TMR	421	1020	650-1380
6B	1 TMR	458	1000	690-1230
7	1 TMR	435	960	550-1210

*Farm 6 had two units hence two sets of data in this table

Genetics

- All herds ranked high for £PLI (top 15% and above) demonstrating the importance of genetics for laying the foundations for excellent performance.
- All farms are using 100% sexed semen for Holstein inseminations.
- 6 out of the 7 farms were basing their breeding decisions on genomic data i.e. using it to decide which animals have sexed semen and which are served to beef semen.
- All 7 farms were far exceeding their genetic predictions for total solids production.
- 5 of the 7 farms included fat and/or protein as important selection criteria.
- All farms were milk recording; accurate farm level phenotype data is essential to feed back into the national genetic evaluation provided through AHDB (Agriculture and Horticulture Development Board).
- All farms were achieving a good rate of gain for £PLI as well as production PTAs for each successive generation.
- The average herd £PLI ranged from £237 to £337; the £PLI for 0-12 month heifers ranged from £409 to £473.
- Herd average fat kg PTAs ranged from 14.6 to 20.9 and protein kg PTAs ranged from 9.9 to 16.2.
- For the 0-12 month category, fat kg PTAs ranged from 24.7 to 28.3 (UK youngstock average is 12.4) and protein kg PTAs ranged from 16.5-20.8 (UK youngstock average is 9) showing a good rate of genetic gain for total solid PTAs.

Both fat and protein traits are highly heritable, compared to fertility for example, and so it is relatively easy and quick to improve the genetic base for these traits.

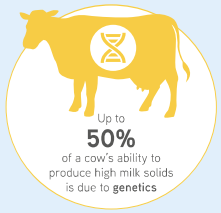
One interesting finding was that, although fat and protein kg PTAs were high, 4 of the 7 units had average or below average fat and protein % PTAs, meaning that these farms have the potential to increase their selection pressure for total solids output even further.

Although the breeding strategy differed between farms; the one thing they all had in common was a very clear and focused breeding strategy, which they reviewed and changed over time.

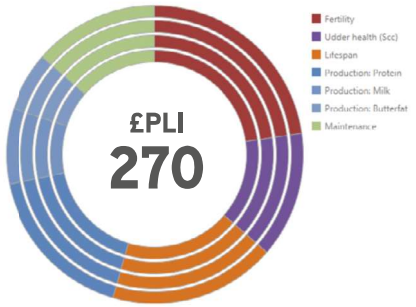
All but one farm was genomically testing their youngstock and using the information to make breeding decisions. Genomic selection alongside strategic sexed/beef semen use is a fantastic way to increase the rate of genetic gain at an individual farm level.

What does the data show?

Our linear regression analysis of the herd's genetic data has shown that up to 50% of the cow's fat and protein yield performance is down to their genetics. While other factors are important when it comes to maximising kgs of milk solids, without a strong genetic baseline, herds will not achieve above average performance.



Herd Status showing this farm is in the top 25% for all of the traits included in £PLI (from NMR Herd Companion)



The pie chart shows how the cows in the herd match up to the national averages. It shows the components of the PLI and how the cows in the herd's scores correspond to the national results. If a PTA, for example, fertility shows all four segments with colour; that signifies that the PTA for the cows in the herd are in the top 25% of the country.

Genetic Progress for fat and protein kg PTAs (from NMR Herd Companion)

Milking and Environment

- All farms milked ≥3 times per day; the robotic herd milked cows on average 3.2 times per day.
- Sand bedding was used on 5 of the 8 units and 3 units used sawdust and mattresses.
- A common observation among all of the herds was that cows were clean and had very few hock sores.
- Most of the farm buildings were well ventilated, especially for the milking cow groups. 4 of the 8 units had fans although only 2 had them placed throughout the sheds. All cows on all units had access to brushes.

Whatever the system, cow comfort and lying times are being prioritised, promoting rumination and foot health. Providing the best possible, well ventilated, most comfortable environment enables cows to express their full genetic potential for total milk solids.

"We've been into breeding for many years...we knew our cows were genetically high performers but until the robots went in, they didn't have the environment to express that. Now they are expressing their full genetic potential which is fantastic!

The cows have given us everything, so we owe it to them to put them in the best environment." *Study Farmer*

Grouping and Cubicle Layout

- Cow grouping varied between the units; only one farm had a "true fresh" group with heifers kept in this group for 2 weeks post calving and cows kept in for 4 weeks.
- 7 of the 8 units were on a two-row cubicle design.

The farm with a true fresh group was at the top end for daily total solids/cow at 1020kg for herd A and 1000kg for herd B. Having a separate fresh group is likely to be one of the factors that help them to achieve this.

A two-row cubicle system typically provides more feed space as the stocking density at the feed face is lower, helping achieve the target of more than 60cm per cow. Often on three-row systems, feed space and therefore dry matter intake (DMI) is compromised, negatively impacting potential milk yield.

Herd Health

- 6 of the 7 herds were vaccinating for BVD and IBR (and the non-vaccinating herd was certified free of BVD and IBR through SRUC's Premium Cattle Health Scheme).
- All herds were successfully controlling Johne's disease; Johne's ATVs were all below the 2023 national average quoted by NMR (7.28%).
- Mastitis incidence was particularly good ranging from 6 to 16 cases/100 cows/year compared to a UK mean incidence of 29.7.
- Lameness incidence was more variable with a range of 2 to 32 cases/100 cows/year, which reflects the challenges of consistent and accurate recording of lameness on UK dairy farms.
- All farms in the study were carrying out regular foot bathing and foot trimming and 4 of the 7 were carrying out a routine foot trim at 100 days in milk, which is considered best practice.
- All farms were using activity meters for heat detection (6 neck-collar systems and 1 ear-tag system); the 3-month rolling 21-day pregnancy rate (as defined by TotalVet's Fertility Efficiency rate) ranged from 15.4 to 30.0%.

Endemic disease such as mastitis and lameness reduce production as well as having a negative impact on cow welfare. To maximise production efficiency, fertility also needs to be optimum.

There were no clear similarities between health and fertility and total solids output when comparing the farms; but they were all achieving better than average health performance overall. Cows are only able to achieve these high levels of production if their health indices are excellent.

> *"Surrounding yourself with a good team is pretty important...we surround ourselves with a nucleus of very good people including our nutritionist and the vet"* *Study Farmer*

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Nutrition and Feed Efficiency

- 6 out of the 8 herds had a forage inclusion of over 50% DM of the total diet.
- Milk from forage varied between the herds (range 921-5,011kg of milk).
- All farm diets included a rumen buffer, 7 out of 8 units included a live yeast product.
- All cows within the study were achieving ≥1.4kg energy corrected milk (ECM) per kg DMI.
- 5 out of the 8 units were achieving ≥1.6kg ECM/kg DMI indicating that they are very feed efficient.
- 6 out of the 8 herds feed a single TMR to all cows.
- All herds fed C16 fat in lactating cow diets.
- 7 out of the 8 herds feed choline in transition diets.
- 6 out of the 8 herds feed protected methionine in transition diets while two out of the 8 herds also fed protected methionine during lactation.
- 7 of the 8 herds ran a Dietary Cation Anion Balance (DCAB) diet for close up cows.

Feed efficiency is key to efficient milk production. It is affected by many things including genetics, days in milk, age, health, metabolic disorders, forage quality and fibre level. Forage is the most cost-effective feed on farm and a driver of increased acetic acid production in the rumen, which favours butterfat. Buffers and live yeasts are proven to help promote increases in milk fat percentage and reduce milk fat depression.

There is a geographical difference between the herds and so levels of inclusion of maize silage varied. Grass silage quality also, inevitably, varied between herds although all herds focused on making the best possible forage they could and were all operating multi-cut grass silage systems.

Most milk protein is mammary derived and consists of casein and whey protein. Milk protein percentage and yield is influenced by the amount of energy consumed, energy density and source of energy in the diet. Supplementing rumen protected amino acids increases milk protein

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Calving and Calf Rearing

- Age at first calving (AFC) ranged from 685 to 757 days, well below the UK average of 799 days.
- 6 of the 7 farms calved cows on straw and had dedicated individual pens for calving.
- A common theme amongst all farms was good management of colostrum; 5 of the 7 farms were testing colostrum quality and using the results to make management decisions.
- All calves were receiving at least 3l (majority 4l) as soon as possible after birth; 4 out of the 7 farms were giving a second colostrum feed and 2 farms were feeding colostrum for extending periods (3-4 days) after calving.
- All farms were feeding appropriate milk volumes: range 6-9l at a 15% inclusion rate ensuring that all calves received ≥900g of CMR per day; one farm was feeding pasteurised whole milk.
- Age at weaning was 9-10 weeks for all the farms.

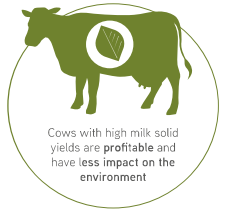
A common practice between all the study farms was to feed higher milk volumes than may have been recommended historically. Excellent preweaning calf management and nutrition is necessary to achieve a target AFC of 730 days; half the farms were hitting this target which suggests that the calf feeding protocols were working well.

The first 50 days of life are particularly important for influencing the future performance of a heifer. Environmental and nutritional conditions both prepartum and in the early neonatal period, can modify expression of certain genes (Epigenetics).

Carbon Footprint

The average kg CO2e/litre ECM is 1.2 for dairy farms in Great Britain while the range reported for the herds in the study was 0.8 to 1.1 kg CO2e/litre ECM*.

*It should be noted that not all the carbon footprints were calculated using the same carbon tool and so it is difficult to critically compare the results.



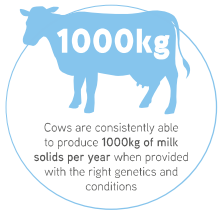
Conclusion

Kite Consulting suggests that a target of 1000kg/cow/year combined fat and protein production is both achievable and desirable for UK dairy farmers on AYR calving, predominantly housed systems. All seven farms included in this report are far exceeding their genetic prediction for total solids production (range 890-1060 average total solids/cow/year (kg)) highlighting that control of the cow's environment and nutritional factors were very good.

The farms in this study had more similarities than differences and it was possible to identify several key management and genetic factors that could be adopted by other dairy farmers.

These farms were not operating to unobtainable standards due to high levels of investment or business structure. Instead, these were all efficient, well-run units where the right kind of investment had been made regarding the long-term sustainability of the herd. But each of the herds also had areas they had identified where improvements could be made that would lead to further increases in milk solids.

Genetics was found to be responsible for up to 50% of the cow's milk solids performance. This is a significant percentage, particularly when considering the relatively low investment required to improve herd genetics, compared to other contributing factors discussed in this report. Both fat and protein traits are highly heritable, and so it is relatively easy and quick to improve the genetic base for these.



Farms producing milk for a solids contract need a suitable benchmarking KPI to measure their performance against their peers. Total milk solids sold per cow per year is the metric proposed by Kite Consulting that should feature in these dairy farmer's performance reviews.

For access to the full report and for further information contact Rose Jackson on r**ose.jackson@kiteconsulting.com** or call the Kite Office on **01902 851007.**