Factors affecting milk supply
January 2009
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Foreword

During the autumn of 2008 the UK dairy industry saw the lowest level of milk supply for a number of years. This may have helped, in the short-term, to maintain relatively higher milk prices by partially isolating the domestic market as processors competed for dwindling milk supplies. However, a continued structural decline in milk supply is likely, in the longer term, to lead to a weakening in the position of our dairy farmers.

If milk supply continues to fall, we may see processors reluctant to invest in what they feel is a contracting industry. This lack of investment from our domestic processors, or an unwillingness by the major global players to invest in the UK, with all of their advantages of scale and established R&D and innovation programmes, would inevitably disadvantage our farmers in the longer term. A lack of the economies of scale or innovation necessary to compete in the increasingly globalised market would make the UK more vulnerable to imports even in the markets that are currently somewhat isolated, such as liquid milk and added value cheddars.

With these longer term challenges in mind, DairyCo felt it was timely to put together this report that aims to outline the most important factors currently affecting milk supply in the UK. Many of the aspects highlighted are very difficult to quantify as there is a considerable degree of cross linkage between the individual elements. However, DairyCo hopes the report will help the whole supply chain understand the main factors that have led to the current low levels of supply and the factors that may stabilise milk production in the coming years, if farmers have the confidence to invest in their businesses.

Declining milk supply is likely to continue for the immediate future. However, there is an opportunity for this trend to be slowed, stabilised or potentially reversed due to an increased number of replacement heifers predicted to be available from 2011.

As outlined in this report a number of factors may combine in three to four years time, such as increased heifer numbers, that will give those farmers with available cow spaces, or those willing to invest, the opportunity to expand and in turn increase supply. However, the resulting stabilisation of milk supply will only occur if financial returns and confidence are sufficient for farmers to move their businesses forward.

There are currently less than 3900 farmers in Great Britain producing over 1 million litres per annum and they account for 57% of the milk produced. Although all producers make a valuable contribution toward national supply, proportionally the confidence of these larger farmers is essential, as they will continue to provide the majority of British milk in the years to come. Farmers are skilled business mangers who need to plan investment and manage cashflow in order to expand.

This again emphasises the need to identify ways of managing volatility within the supply chain, which will only be achieved through the continued development of fairer contracts and better partnerships between farmers, processors and retailers. If the supply chain moves forward by sharing the imminent price volatility and by providing farmers with reassurance regarding the long term future of the dairy industry, it is likely that crucial, forward-thinking farmers will have enough confidence to initiate a positive supply response. This will help farmers and processors achieve the efficiency necessary to thrive in an increasingly globalised market.
Introduction

For the last twenty years milk supply in the UK has fluctuated between 13 billion and 14 billion litres. However, since the 2003/4 milk year UK milk supply has been on a discernable declining trend. In the latest milk year ending March 2008 only 13.2 billion litres of milk were supplied in the UK, 310 million litres (2.3%) lower than the previous year and the lowest level since 1974. Moreover, despite being only part way through the current milk year, it is already apparent that milk supply will be lower again, with DairyCo estimates suggesting annual supply levels may be below 13 billion litres.

Figure 1: UK annual milk supply

![Figure 1: UK annual milk supply](image)

Source: RPA/DairyCo/MMB figures. Note: Quotas were introduced at the beginning of the 1984/85 milk year.

Figure 2: UK annual milk production - recent years

![Figure 2: UK annual milk production - recent years](image)

Source: RPA

It is important to define the difference between milk supply and milk production that is assumed in this report:

**Milk supply** is the sum of milk delivered to dairies plus the volume of milk used for on-farm processing. Therefore any milk thrown away for any reason or milk used on farm is excluded from the calculation of milk supply but is included in the calculation of milk production.
In its simplest form, annual milk supply is a function of two elements; the number of milking cows and the average annual milk yield per cow.

\[
\text{MILK SUPPLY} = \text{COW NUMBERS} \times \text{AVERAGE MILK YIELD}
\]

This document attempts to identify the main factors which have influenced both cow numbers and yield, how and why they have impacted on milk supply, along with their predicted future effect. When predictions of future supplies are given it is important to remember they are based on hypothetical situations to give an idea of the significance of the factor in question.

Arguably the biggest factor influencing both cow numbers and milk yield is dairy farmer confidence. Due to its significance, confidence is discussed separately in Section 3 of this report.
Section 1 - Number of milking cows

Since 2005 the number of milking cows in the UK aged two years or more has declined by 4.5% to 1.909 million – a fall of 89,000 head. The year on year decline has increased from slightly under 1% between 2005 and 2006 to over 2% between 2007 and 2008.

Figure 4: UK cow numbers

Using the data available for dairy females under two years old from the Defra survey of agriculture and horticulture suggests the number of replacements available to go into the milking herd in 2009 will show a slight increase on the number in 2008 – up by 2,250 to 481,000 (0.5% increase on 2008). By 2010 this will have increased by a further 12,000 (3.1% increase on 2008). This increase in the number of dairy replacements available is backed up by NMR data suggesting services to dairy breeds have increased from 71.9% of all services in 2006 to 75.3% of all services in 2008, primarily due to increased cost of replacements as farmgate milk prices rose. This should lead to an increase in cow numbers in 2011 to 2012.

Analysis of past data suggests the national replacement rate is between 25% and 30% per annum. As a result, a figure of 27.5% has been used to calculate the number of replacements required to maintain the national herd size at the previous year’s level.

Table 1: Number of replacements reported in 2008

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy females aged between 1 and 2&lt;sup&gt;1&lt;/sup&gt;</td>
<td>481,000</td>
</tr>
<tr>
<td>Dairy females aged less than 1&lt;sup&gt;2,3&lt;/sup&gt;</td>
<td>493,000</td>
</tr>
</tbody>
</table>

Source: Defra survey of agriculture and horticulture, DairyCo extrapolations

<sup>1</sup> Assumed to be joining the national herd in 2009
<sup>2</sup> Assumed to be joining the national herd in 2010
<sup>3</sup> Data only available from England and Wales, total UK figures extrapolated using historic data.
Although continuing to increase between 2008 and 2010 the number of available dairy replacements is not expected to be sufficient to completely stem the decline in the number of milking cows.

This suggests the number of milking cows will continue to decline until at least 2010, with 1.85 million cows predicted to be in the national herd. However, the rate of decline may begin to slow between 2009 and 2010 due to an increased number of replacements. If milk yields (and all other factors) remained constant this would result in UK milk supply of around 12.8 billion litres in 2010/2011.

The effect of the increased number of replacements could be reduced if the replacement rate increased. This could occur if disease rates increased or if it was no longer viable for farmers to keep on older cows to produce extra milk.

There is also evidence to suggest there is an upward trend in dairy cow longevity. If this trend continues, and all other factors including yield remain constant, then replacement rates may begin to fall and fewer replacement animals will be required to maintain the national population of milking cows. As a result, the population could increase, which would have a positive influence on milk supply.

Figure 5: Replacements available vs. replacement required to maintain national herd size

![Graph showing replacements available vs. replacement required to maintain national herd size.]

Source: DairyCo estimates based on Defra agricultural and horticultural survey

Figure 6: Average number of lactations

![Graph showing average number of lactations from 1991 to 2005.]

Source: DairyCo breeding+
It is more difficult to predict the number of milking cows beyond 2010 as the new replacement heifers that will join the milking herd in 2011 onwards have not yet been born. However, there is evidence to suggest that the use of sexed semen has increased over recent months with NMR data showing services to dairy breeds have increased from 71.9% of all services in 2006 to 75.3% of all services in 2008. If this increase is significant enough to stem the decline in milking cow numbers then we could see milk supply begin to stabilise. However, it is important to remember that if the number of first calved heifers in the national herd increases significantly compared to older milking cattle, milk supply may continue to decline in the short term due to lower milk yields associated with animals in their first lactation.

Factors influencing the number of milking cows
The factors discussed below influence the number of milking cows in the national herd. More cows leaving the national herd means a greater number of replacements are required to keep stable the number of cows in the milking herd. If these replacements are not available then the number of cows in the milking herd falls and, unless a sufficient yield response can be achieved, milk supply will also fall.

- **Slaughtering due to bovine TB** – Despite a small decrease in 2006/2007, the trend in the number of dairy cows slaughtered as a result of reacting to TB tests has been increasing in Great Britain since 2001.

In the 2007/2008 milk year it is estimated that 16,192 dairy cattle were slaughtered as a result of TB testing – equivalent to 0.8% of the total population. Losing this number of cows, for even one lactation, would result in a loss of supply of 114 million litres. However, the compound effect of TB slaughtering increases this loss because cows may be culled early in their productive life missing a number of lactations, plus there are fewer breeding cows available leading to fewer replacements being born and consequently a declining national milking population.

**Figure 7: TB slaughterings in GB dairy herd**

![Graph showing TB slaughterings in GB dairy herd](image)

*Note: Estimated using Defra data*

The average rate of increase in the total number of cattle slaughtered each year due to testing positive for Bovine TB has been 9.2% over the past 10 years. If this trend continues, and it is assumed that the rate of increase is the same in dairy cows as the total cattle population, by the
2010/11 milk year 21,000 dairy cattle could be slaughtered due to TB – this is estimated to be around 1.1% of the national milking herd. However, it needs to be remembered that culling a cow early, for any reason including TB as mentioned above, has a compound effect on milk supply for a number of years after the initial cull. In addition, TB culling affects planned replacements and calving patterns. Furthermore, the movement restrictions as a result of TB can lead to farms becoming overstocked leading to pressure on facilities, forage and finances which can all have a negative effect on milk supply.

Although only reducing the number of cows in the national herd by around 0.8% directly in the year of the cull, over a five year period the compound effect of TB slaughtering, its resulting effect on the number of replacements available and an increase in the incidence rate of the disease, would lead to 5.5% more cows leaving the national herd than if the disease did not exist.

The existence of TB is also a major factor influencing farmer confidence.

- **Cull cow prices** – The opportunity cost of milking a cow is the difference between the amount the cow contributes to the milk cheque (taking into account marginal costs) and the amount that could be earned by doing something else with that cow. In this scenario let’s consider that the choice is between keeping a cow in the milking herd or selling the cow as a cull cow (rather than as a replacement).

Cull cow prices increased rapidly at the beginning of 2008 due to supply falling short of demand. Based on an average liveweight of 550kg, weekly average prices have ranged from £312/head to £548/head during 2008 compared to a range of £230/head- £372/head in 2007.

**Figure 8: Prices achieved for dairy sired cull cows**

![Figure 8: Prices achieved for dairy sired cull cows](image)

Source: Defra/DairyCo Based on an average liveweight of 550kg/head

Although the reasons for culling cows are often complex, the increase in the price achieved for dairy sired cull cows may have acted as an incentive for farmers to cull some lower yielding cows. This is because the amount they would return from being culled would be greater than the contribution they make to the milk cheque after marginal costs have been taken into account. In 2008, 59,500 dairy sired cull cows were sold compared to 43,600 and 33,900 in 2007 and 2006 respectively.
Although the ban on cattle over thirty months of age entering the food chain has been relaxed, cows that were born before August 1996 are still prevented from entering the food chain. Since the end of the Over Thirty Months Scheme (OTMS) the Older Cattle Disposal Scheme (OCDS) has been in operation which pays out a per head value for the disposal of cattle born before August 1996. This scheme ended on 31 December 2008 and figures for the first 50 weeks of the year show slaughterings under this scheme at similar levels to last year. This suggests that the ending of this scheme is unlikely to have a detrimental effect on cow numbers.

- **Farmer numbers** – The number of farmers leaving the industry has an indirect effect on the number of cows in the national herd. It is estimated that for every farmer leaving the industry only 80% of the cows remain in milk supply, with the rest being culled as a result of being un-saleable or too old.

**Figure 9: Number of dairy farmers in UK**

![Graph showing the number of dairy farmers in the UK from 1995 to 2008.](https://example.com/graph)

*Source: Defra Survey of Agriculture and Horticulture: United Kingdom, 2008 based on DairyCo estimates for Scotland and Northern Ireland*

Between June 2006 and June 2007, 1,096 dairy farmers left the UK dairy industry. Assuming the national average herd size of 110 this would result in just over 24,000 cows being culled as a result of dairy farmers leaving the industry. However, between June 2007 and June 2008 it is estimated that 794 dairy farmers left the UK industry. Based on the same assumptions this would result in 17,500 cows being culled as a result of being un-saleable.

There is anecdotal evidence that those leaving the industry are mainly larger than average herds. This would result in a larger impact on national cow numbers and consequently milk supply. If this were an increasing trend, i.e. if the average size of herds leaving the industry were increasing over time, this may counteract any benefit of fewer farmers leaving the industry.

Despite the percentage change in dairy farmers leaving the industry remaining broadly stable since the year 2000 - except in 2008 where it is estimated to have dropped to below 4.5% for the first time in 10 years - the number of dairy farmers this represents has been declining for the past five years as the remaining dairy farmer population decreases.
Although farmer numbers have historically been on a declining trend it is only likely to be in more recent years that the number of farmers leaving the industry has impacted on the number of cows in the national herd and consequently on milk supply. This is because in the past, the number of farmers expanding their herds has been sufficient to counteract the effect of those leaving the industry. However, in recent years the rate of expansion has slowed as shown in Figure 10 overleaf meaning that it no longer fully counteracts the effect of farmers leaving the industry and hence impacts on milk supply. With expansion intrinsically linked to dairy farmer confidence, if confidence were to increase we would expect to see the rate of expansion in the industry also increase.

**Figure 10: Average UK herd size**

[Graph showing average UK herd size from 1998 to 2008]

*Source: DairyCo extrapolations based on Defra data*

- **Cattle imports and exports**— Other than the number of domestically bred replacements available, the number of cows in the national milking herd is also affected by the number of cattle imported to and exported from the country.

Figure 11 shows the number of dairy cattle imported into the GB from outside the UK since 2005. Although numbers imported are broadly similar in 2005 and 2006 at around 6,500 – equivalent to around 0.33% of the total number of milking cows in the UK - they fall dramatically in 2007. This fall to just over 2,300 imported animals in 2007 may be a result of increased concerns surrounding infectious diseases such as blue tongue and in some cases restrictions on the movement of animals to safeguard against the spread of disease.

**Figure 11: Imports of dairy cattle into GB**

[Graph showing number of dairy cattle imported into GB from 2005 to 2008]

*Source: British Cattle Movement Service*
The number of cattle imported into GB from outside the UK is also likely to be price sensitive. In 2007 farmgate prices in the rest of Europe were much quicker to react to the rallying world commodity markets than in GB. This rise in milk prices in the countries where imports to GB are commonly sourced is likely to have increased demand for milking cows in their country of origin and hence put upward pressure on prices. This may be another factor contributing to low levels of imports in 2007.

In the first eight months of 2008, the number of cows imported into GB from outside the UK is already higher than during the whole of 2007. Some disease risks remain, specifically surrounding blue tongue infection, however, movement restrictions have been eased. It is likely the increasing GB milk price has also played a part in increasing the number of dairy cattle imported into the country.

Exports of dairy cattle should also be mentioned here. Although only limited data is available, the number of dairy females being exported from GB is not significant. In 2007, only 274 female dairy breed cows were exported and although in the first nine months of 2008 the figure has increased to 773, this represents less than 0.05% of the total number of milking cows in the UK.

**Fertility** – Although predominantly impacting on yields, poor fertility also impacts on cow numbers, predominantly by reducing the number of replacements produced. Ideally a cow should calve every 365 days. However, the latest data available from NMR suggests that the average calving index now stands at 419 days. This means that over a four year period the cow with an ideal calving interval would breed four calves while the average cow would only breed three.

If we consider there is only a 50% chance that the calf will be a heifer and, if crossbreeding with a beef breed is involved, an even lower proportion will be dairy replacements, it is evident how poor fertility impacts negatively on the number of replacements available and consequently on national milk supply.

A further effect of poor fertility on cow numbers is that if a cow proves consistently difficult to get in calf she may be culled earlier than otherwise would have been the case.

**In context – Section 1: number of milking cows**

The current main influences on the number of milking cows are previous breeding decisions, TB slaughtering, fertility and cull cow prices whereas farmers leaving the industry and imports and exports currently have a lesser impact.

The majority of the factors explored above have been acting to reduce the number of milking cows in the UK over recent years and it is predicted they will continue to reduce cow numbers in the short term. However, the relative influence each factor has is likely to adjust and, with an increased number of replacements predicted from 2009 onwards, the rate of decline in the total milking population may stabilise and begin to slow. In particular, if the rate of farmers leaving the industry continues to slow, and this is not counteracted by an increase in the size of herds leaving, this may have a positive effect on the milking population, providing sufficient cows are available to allow for continued herd expansion and that expansion is economically viable.
Section 2 - Yield per cow

Historically, the volume of milk the average cow in the UK produced has been increasing. In the fifteen years from 1990 to 2005 the annual average yield per cow increased by over 1,800 litres – equivalent to a 36% increase. This increase undoubtedly helped counteract some of the effect of falling cow numbers on national milk supply.

Most recently, year on year growth in the national average milk yield has slowed and between 2006 and 2007 has actually shown a slight decline. If the average milk yield had stayed at the 2006 level this would have contributed an estimated additional 146.6 million litres to national milk supply in 2007.

It is important to clarify here how the national average yields used in this report are calculated. It is simply the amount of milk supplied for processing in a particular period divided by the number of cows in the national herd. Therefore it does not include any milk which is thrown away for whatever reason or fed to calves, and as such is likely to be lower than the average annual production per cow.

Although growth in yields have slowed in recent years, constituent quality has increased as shown in Figure 13. This means although milk supply is lower, milk buyers are seeing an increase in milk solids. Both breeding decisions and lower milk supply are likely to have contributed to an increase in available milk solids.

Figure 12: National average yield

![Figure 12: National average yield](image)

Source: Defra

Figure 13: Combined butterfat and protein percentage and milk supply

![Figure 13: Combined butterfat and protein percentage and milk supply](image)
Factors influencing the average yield

The factors explored below are the main influences on the national average yield, however, the list is not exhaustive. Historically, the year on year increase in average yields has counteracted some of the impact of declining cow numbers on milk supply. However, if national average yields are now declining year on year this will exert further downward pressure on milk supply.

- **Breeding** – Latest data available from NMR suggests the percentage of Holstein or Friesian breed type cows has been declining slightly over the past eight years.

**Figure 14: Percentage of Holstein and Friesian cows**

![Percentage of Holstein and Friesian cows](image)

If we assume the NMR results are representative of the entire UK milking population, and that the average milk yield of a Holstein or Friesian type animal is 7500 litres/annum and for all other types of dairy animal is 6000 litres/annum, a 0.1% fall in the percentage of Holstein and Friesian breed type cows in the national population would result in around a three million litre fall in national milk supply (assuming all other factors remain constant).

If the trend seen over the past eight years continues, and all other factors remain constant, then by 2010 the proportion of Holstein and Friesian cows in the national herd could fall by a further 1% to 91.72% - which would result in milk supply reducing by 0.18% compared to if the proportion of Holstein and Friesian cows remained at current levels. If the proportion of Holstein and Friesian cows in the national herd fell, it is likely that the amount of milk solids would increase.

Anecdotally, it has been suggested that dairy farmers are increasingly favouring milking and/or crossbreeding with types of dairy cow other than Holstein and Friesian – although recent increases in both the price of dairy replacements and farmgate price levels may have reduced this effect. Reasons given for this are to improve longevity, increase the health of the herd, produce easier calving cows, improve fertility and to produce cows better suited to the system in operation on the farm or to better meet requirements of milk contracts.

This suggests a dual effect of crossbreeding. Although initially yields may be reduced if dairy farmers select and breed for traits other than milk production, if longevity and/or fertility of the milking population can be increased this may reduce the number of cows being culled each year which could act to boost the number of cows in the milking population.
It should also be remembered that breeding decisions are, in their nature, long term. Therefore a significant change in breeding decisions today would not impact on the national average yield for at least two years. The evidence so far is that changes are not yet significant and the influence of crossbreeding on milk supply is, for the short term at least, relatively small. However, this may change in the future.

- Genetics – Much of the increase in milk yields which has been seen over the past fifteen years has been a result of genetics with dairy farmers inseminating cows to bulls with high milk Predicted Transmitting Ability (PTA). The milk PTA of sires has risen dramatically over the past 30 years, however, most recently it appears to have reached a plateau as farmers are increasingly switching to sires with high fat or protein PTA’s. Moreover, it has been predicted that cows born in 2009 will no longer make significant genetic progress for milk yield.

![Figure 15: Milk PTAs of recorded dairy population, their sires and dams (projected from 2006.)](image)

Source: DairyCo breeding+

It has been suggested that as milk production per cow increases so does the tendency for the cow to suffer health problems. Therefore, conversely, farmers not selecting sires for their yield potential may, ultimately, act to increase yields if cow health improves which leads to increased fertility.

- Fertility – Poor fertility leads to reduced annual average yields. The ideal calving interval is 365 days, however, latest NMR data suggests that the average is nearer 419 days. This is almost an additional two months above the ideal. This has increased from 400 days in 2000 and by 2010 could reach 429 days if the average increase seen over the past seven years continues.

![Figure 16: Average calving index](image)
Due to the skewed nature of the lactation curve, with the majority of milk being produced during the months immediately after calving, during the additional 54 days the average cow is in milk compared to the ideal, she will only be yielding a relatively low level of milk. Over a period of eight years, the average cow will only have seven lactations compared to the ‘ideal’ cows’ eight.

If we assume that during 305 days in milk a cow produces 7,000 litres of milk and each extra day the cow is in milk after this only adds an additional 10 litres a day on average then, over a four year period, the ideal cow would produce 28,000 litres of milk whereas the average cow only produces 26,300 litres of milk and has an annual yield of 6,568 litres/annum - around 6% less. If the decline in fertility continues, and calving index reaches an average of 429 days by 2010, using the four year example given above this would result in the average cow only producing 6,500 litres per annum – 7.1% less than the ideal. Using this example it is clear to see that poor fertility also has a significant economic cost.

Why is fertility declining in the UK milking herd? As stated above fertility is reported to have declined as a correlated response for selection for higher yields, in addition poorly managed herd expansion could also be a contributing factor.

• **Forage quality** – The level of Metabolisable Energy (ME) in silage is one of the main influences on a cow’s level of production. Research by the Agri-food and biosciences institute in Northern Ireland (AFBI) - as shown in Figure 17 - shows that, all other factors remaining constant, that an increase in ME of 1Mj/kg dry matter evokes a production response of around 1.5 litres per day.

![Figure 17: Effect of ME on milk yield](image)

Most experts agree that the most productive silages are those which have ME values of over 11 Mj/kg Dry matter. However, since 2006 average ME values of silages produced in GB have been below this level largely due to adverse weather conditions. This in turn is likely to have reduced silage intake and as a result will have negatively impacted on yields. In addition, poor weather conditions have meant that the material cut was more mature, more fibrous and was fermented more fully which would act to reduce intakes per cow – further reducing the overall energy supply.
Comparing the average ME value of silage in 2008 to those in 2004 and 2005 and using the results from AFBINI suggests the difference in quality would result in around a litre a day difference in milk yield - equivalent to a 3.5% decline in milk supply. Therefore, if it is assumed that cows are fed silage for 200 days a year, and if silage quality in 2008 was at 2004 levels of ME milk supplies, this would result in an additional 380 million litres of milk supply. However, in reality, some of the effect of poor quality silage will have been compensated for by increased feeding of concentrates.

- **Weather** – Weather impacts on yields and therefore on milk supply in two main ways; by impacting on intakes of grazed forage and by influencing forage quality.

In the past four years we have experienced extremes of both very hot dry summers and much wetter summers. These have led to decreased intakes of grazed forage, poor grass growth and heat stress which may have impacted badly on fertility and reduced body condition which also has a negative impact on fertility.

Latest predictions of the impacts of climate change suggest average winter temperatures are expected to rise by 1°C and average summer temperatures are expected to increase by 1.5°C by 2020. Predictions for the longer term are more varied with the most extreme scenario estimating a 5°C increase in summer temperature and a 3.5°C increase in winter temperature by the end of the century. How increases in temperature of this magnitude will impact on milk supply is unclear.

When considering rainfall, latest predictions of the impact of climate change suggest by 2020 the UK’s summer rainfall could decrease by 10% whereas winter rainfall could increase by 10%.

The second way that the weather affects yields is through the quality of forage which is harvested and conserved (usually as silage) for use during the winter.

Examination of annual silage quality shows that historically the best quality silages (in terms of ME content) are produced with rainfall of between 510mm and 630mm over the seven month period from March to September. As the five year average for rainfall over this period is 620mm, the predicted impact on rainfall from climate change is likely to reduce the amount of rain the UK has over this period but this shouldn’t be detrimental to silage quality.
Looking to the future, there are mixed messages for how predicted climate change will impact on yields and ultimately milk supply and while the trend may be towards warmer and wetter winters together with warmer and dryer summers there is likely to continue to be considerable volatility. Dairy farmers will need to continue to plan and adapt to be able to take advantage of any opportunities future climate change may offer such as allowing maize crops to be successfully grown further north in the country.

**Mastitis** – The incidence rate of mastitis has historically proved difficult to quantify, however, studies have suggested an average incidence rate of between 35 and 50 cases per 100 cows per annum. In 2002/03 a study by Edinburgh University estimated the average incidence rate of mastitis in the UK dairy herd to be 47 cases per 100 cows per year. A recent study by DairyCo, however, suggested the (mean) average incidence rate was 71 cases per 100 cows per year.

Assuming the average daily lactation is 23 litres/day and that for eight days after the discovery of a case of mastitis milk must be thrown away due to the cow receiving antibiotic treatment, along with antibiotics still being present in the milk, this equals 184 litres of lost milk per case of mastitis. Therefore, on average, assuming that the incidence of mastitis is 71 cases per 100 cows per year, national annual average yields are reduced by an average of 130 litres per cow per annum. If the incidence of mastitis were at its reported 2002 level the reduction would be equal to 86 litres per cow per annum.

When scaled up to the national herd an incidence rate of 71 cases/100 cows per year reduces the UK milk supply by around 250 million litres assuming all other factors remain constant.

The example above could be seen as a best case scenario with, in reality, cows taking longer than eight days to fully recover from infection – thus having a further negative impact on yield. In addition, the example above only considers clinical cases of mastitis. National Somatic Cell Count (SCC) levels are on a rising trend – with an average of 198,000/ml recorded for the first 11 months of 2008 compared to 196,000/ml in the same period in 2007 and 188,000/ml five years ago – this suggests that the amount of subclinical infection in the national herd is also increasing, which will have a further negative impact on milk yields.

**In context – Section 2: yield per cow**

In recent years declining levels of fertility, falling silage quality and increased levels of mastitis have been among the main factors causing the rate of increase in the national average yield per cow to plateau and begin to decline. With increasing yields year on year having historically been a factor counteracting the impact of declining cow numbers on milk supply it is not surprising that now both factors are declining together we are seeing sharper falls in milk supply.

In the future, despite anecdotal evidence to suggest that producers are no longer placing as high a priority on yield when making breeding decisions as in the past, yield per cow may actually increase particularly if breeding decisions result in increased fertility. However, these changes are likely to be gradual. What happens to yield in the more immediate future will depend on the control of mastitis infection and other diseases, forage quality as well as dairy farmers’ response to the opportunities and challenges brought by climate change.
Section 3 - Dairy farmer confidence

Although impacting on both cow numbers and yield the significance of farmer confidence on milk supply means it is discussed separately in this section. Farmer confidence or attitude is less easy to quantify than either cow numbers or yield per cow but it remains an important factor in defining available milk supply. If a farmer doesn’t feel confident regarding his or her future in the dairy industry they will be less likely to invest in improvements to increase efficiency or to increase output and may be less likely to engage in proactive forward planning to make the best use of any opportunities that arise.

Factors influencing dairy farmer confidence

Although it is recognised that dairy farmers have many different motives for choosing to and continuing to remain in the industry, it is likely that regardless of the motive, profitability is likely to play an important part in determining a farmer’s confidence regarding his/her future in the industry.

DairyCo’s 2008 farmer intentions survey was conducted at a time when dairy farmers were receiving payment for their January milk. According to Defra data, the average price paid for January milk was 25.8ppl and was perceived by farmers to be on a rising trend.

The survey showed more optimism than compared with previous years with 37% of British dairy farmers intending to increase supply and only 7% intending to leave the industry. This would result in a 0.6% fall in milk supply in GB from 2007/08 levels by the 2009/10 milk year to 11.13 billion litres.

Asking the same question with hypothetical price scenarios of a 2ppl fall and a 4ppl fall (reducing prices to 23.8ppl and 21.8ppl respectively) revealed how fragile this increase in confidence was with a 2ppl reduction in farmgate milk price leading to a predicted fall in British milk production of 28% to 8.13 billion litres by the 2009/10 milk year. The reaction to a hypothetical 4ppl fall in milk price was a predicted contraction of British milk supply by two thirds to around five billion litres.

To further illustrate the fragility of the situation a 4ppl reduction in the average price paid for January milk from 2008’s levels would reduce the price to 21.8ppl, which besides 2008, would be the highest January price received since 1997. Rather than take these figures as absolute predictions of what would happen to milk production if milk prices fell they should be seen as indications of how such changes in milk price would impact on farmer confidence and attitude.
Farmgate milk prices – Figure 22 shows the evolution of annual milk prices in the UK since 1995. For the majority of the thirteen years depicted milk price has been below 20 pence per litre. The variation in farmgate milk price over the period is almost eight pence per litre. This illustrates that returns from producing milk have been very variable in the recent past, which challenges an individual dairy farmer’s ability to make a profit and, moreover, make decisions and investments regarding his/her future in dairy farming. Sustained periods of uncertainty and volatile returns understandably have a negative effect on farmer confidence.

Although milk prices increased significantly in 2007, we are yet to see an increase in milk supply. The reason for this are the impacts of the numerous factors identified in this document, which are exerting a downward pressure on milk supply.

Figure 20: GB dairy farmer intentions scenario 1: 2ppl decrease

Source: DairyCo

Figure 21: GB dairy farmer intentions scenario 2: 4ppl decrease

Source: DairyCo
UK farmgate prices are closely linked to returns from dairy commodity markets, as are prices in much of the rest of Europe. Comparing the UK average farmgate price with the average for the EU fifteen shows the price received in the UK is regularly over 3ppl lower than the EU average price.

An individual dairy farmer has the opportunity to exercise some degree of control over the price received for their milk by using their milk contract to maximise price. However, this is not always easy as the majority of contracts or milk purchasing agreements in existence are complex - in some cases milk buyers are able to change payment rates, giving minimal or no notice to producers, whereas producers may be required to give a year’s notice to change milk buyer and may receive a reduced price while on notice. This lack of stability relating to the income a farmer receives from milking cows is likely to be a key factor undermining confidence in the industry.

Moreover, despite farmers already suffering many years of milk price volatility, unless significant progress is made with milk contracts, supply chain relationships and industry product mix, this exposure to price volatility looks set to continue in the future. This is a result of predicted greater volatility in world market prices, coupled with the European Union continuing to withdraw market support mechanisms which have in the past acted as a shelter from fluctuating world prices.
• **Input costs** – Purchased feed costs are widely regarded as the single largest cost in producing a litre of milk. In the ‘Economics of Milk Production Survey 2002/03’ conducted by the University of Manchester it was estimated that 19.75% of the total cost of production was accounted for by the cost of concentrates. Figure 24 shows the University of Manchester assumption for margin over feed for the 2002/03 year and Kingshay figures for margin over feed for subsequent years.

**Figure 24: Margin over feed**

<table>
<thead>
<tr>
<th>Year</th>
<th>Margin over Feed (pence per litre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002/03</td>
<td>13.29</td>
</tr>
<tr>
<td>2003/04</td>
<td>14.21</td>
</tr>
<tr>
<td>2004/05</td>
<td>15.12</td>
</tr>
<tr>
<td>2005/06</td>
<td>16.04</td>
</tr>
<tr>
<td>2006/07</td>
<td>17.05</td>
</tr>
<tr>
<td>2007/08</td>
<td>18.07</td>
</tr>
</tbody>
</table>

Source: Economics of Milk Production Survey 2002/03 and Kingshay MOPF

The value of the margin over purchased feed represents how much there is left per litre to cover all other costs after feed has been accounted for. In 2002/2003 there is only a margin of 13.29ppl available, however, the Economics of Milk Production Survey reported that costs of production less the cost of concentrate equalled 14.71ppl and hence the average dairy farmer was making a 1.42ppl loss.

This analysis shows that, if all other costs remained at 2002/03 levels, dairy farmers would have made an economic profit in only one of the six years examined. In reality, we know that other input costs have increased which will have had a further impact on profitability and hence on farmer confidence.

• **Investment** – From the crude analysis above it is evident to see that over recent years the difference between the average farmgate price and the average cost of production has not been sufficient to allow for any profit. This in turn has led to low levels of investment.

Figure 25 depicts that historically UK dairy farmers have tended to invest less than the European average in buildings. UK dairy farmers invested around 0.7ppl in 2003. This is less than half of the EU average. Some commentators suggest that materials in continental Europe are less expensive than in the UK. However, it should be remembered when comparing UK dairy farms with the EU as a whole that UK farms tend to be larger in terms of the number of litres produced per year and as such total investment levels per farm are likely to be more closely aligned than the pence per litre comparisons suggest. In addition, larger farms may be better able to benefit from economies of scale.

More recently, DairyCo’s 2008 Farmer Intention Survey revealed that only half of dairy farmers intended to invest over £25,000 in the dairy unit over the next five years and 40% were investing just to maintain their units at current levels.
Labour – The availability of labour may also be an issue affecting the confidence of dairy farmers in the UK with almost 60% of those questioned in the 2008 Farmer Intentions Survey saying they had difficulty in recruiting good quality staff.

Failing to recruit and retain good quality, reliable staff will further increase the work load of dairy farmers and their family. It is easy to see how this situation would reduce a farmer’s confidence and subsequently reduce the likelihood of expansion or significant investment to improve yields.

Price and availability of replacements – Although not affecting national cow numbers, the price and availability of replacement milking animals can affect farmer confidence and behaviour.

Both Figures 27 and 28 below suggest that despite some monthly fluctuations prices for both freshly calved heifers and cows, prices have been on an upward trend since the beginning of 2007. In addition, the supply and demand balance has become tighter since the beginning of 2007 with prices ‘spiking’ when availability is low. Availability of replacements is likely to be lower than in the past due to fewer farmers leaving the industry as well as a consequence of past breeding decisions.
Increased milk prices, and the associated bonuses some milk buyers are offering for increased supply levels, may be a reason for prices increasing. Some market commentators also suggest some of the demand for and resulting high prices of replacement cows and heifers are a result of TB compensation money.

For some dairy farmers the increased price of replacements may be a barrier to expansion and may even lead to a contraction in herd size and milk output. For others who may have been considering leaving the industry anyway, high replacement prices may act as an incentive to leave sooner rather than later. High demand for replacement cattle which is driven by those wishing to expand their herds can also be seen as a sign of confidence in the industry.

Source: Defra
• **Regulation** – Compliance with regulations in the vast majority of cases involves a financial cost. At times when profitability of milk production is low any additional costs may be difficult to accommodate.

Currently the largest regulatory cost facing dairy farmers in England is compliance with NVZ regulations which has been estimated by a Promar study for Dairy UK as an additional 0.77ppl on average over ten years. However, the affected farmer will have to pay a proportion of these costs up front. The study estimates the upfront proportion of the costs could amount to around £40,000. With Promar figures also suggesting dairy farms are already servicing debts of around £360,000 this additional £40,000 could prove too much for some farmers. In the current turbulent economic climate borrowing this money could be difficult for some (especially tenant farmers with no collateral), although farming is often seen by bankers as a lower risk option. Overall, even if the money can be sourced, it will lead to increased costs which may prohibit further expansion or investment in the future.

**In context – farmer confidence**

While not being the only motivating factor in the decision to pursue or continue a career in dairy farming, profitability is likely to be a key factor influencing farmer confidence.

The analysis above supports other evidence to suggest that the profitability of dairy farming has been consistently low for a number of years which has impacted on investment levels. Intrinsically linked to dairy farmers’ profitability are milk supply contracts. Although there are examples of contracts that have made progress towards increasing transparency within the supply chain there is still significant room for improvement for the majority of raw milk contracts and supply chain relationships. In addition to low levels of profitability, increased regulatory burden, problems sourcing labour, younger generations being less willing to take on the business and increased replacement prices are all factors that impact on dairy farmer confidence.

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4 Based on 70% of land area in England and 57.5% of quota effected.
Conclusion

The table below assigns a relative value to each factor discussed in this document in relation to its impact on milk supply in recent years. The relative influences would be expected to alter in the future and what are negative influences today may, following correct management of the issue, become positive influences in the future.

Table 2: Relative influence of factors affecting milk supply

<table>
<thead>
<tr>
<th>Factor</th>
<th>Relative influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient number of replacements available</td>
<td>- - - -</td>
</tr>
<tr>
<td>Increasing average lactations per cow</td>
<td>+</td>
</tr>
<tr>
<td>Increasing trend in slaughterings due to TB</td>
<td>- -</td>
</tr>
<tr>
<td>Cull cow prices increasing</td>
<td>-</td>
</tr>
<tr>
<td>Slowing in the rate of farmers leaving the industry</td>
<td>+</td>
</tr>
<tr>
<td>Cattle imports increasing</td>
<td>+</td>
</tr>
<tr>
<td>Declining fertility/increasing calving interval</td>
<td>- -</td>
</tr>
<tr>
<td>Declining proportion of Holstein/Frisian breeds as a percentage of national herd</td>
<td>-</td>
</tr>
<tr>
<td>Prediction that from 2009 there will no longer be significant genetic progress for milk yield</td>
<td>-</td>
</tr>
<tr>
<td>Trend in declining forage quality over recent years</td>
<td>- -</td>
</tr>
<tr>
<td>Extreme weather conditions seen over recent years</td>
<td>- -</td>
</tr>
<tr>
<td>Increasing incidence of mastitis</td>
<td>- -</td>
</tr>
<tr>
<td>Increasing farmgate milk price</td>
<td>+ +</td>
</tr>
<tr>
<td>Increasing input costs</td>
<td>- -</td>
</tr>
<tr>
<td>Historically low levels of investment</td>
<td>- -</td>
</tr>
<tr>
<td>Difficulties in recruiting and retaining adequately skilled labour</td>
<td>- -</td>
</tr>
<tr>
<td>New/ Increased regulation – particularly as a result of costs of compliance</td>
<td>- -</td>
</tr>
</tbody>
</table>

This document highlights that a number of factors have combined over recent years to exert negative pressure on milk supply in the UK.

The main reason for this decline is that there are an insufficient number of replacements available to compensate for those leaving the national milking herd. This is a result of past breeding decisions, poor levels of fertility and increased numbers of animals leaving the national milking herd as a result of TB.

A further challenge to milk supply has been provided by the extreme summer weather conditions experienced over recent years. Moreover, years of low and fluctuating milk prices combined with rising input costs have created uncertainty and a lack of confidence among dairy farmers leading to both inability and unwillingness to invest in their businesses and plan for the longer term.

5 Does not take into account associated disease risk
6 Although if this leads to better fertility this would have a positive impact on milk supply
7 Although if this leads to better fertility this would have a positive impact on milk supply
8 There is evidence that increased farmgate prices has lead to increased confidence however some of this has been eroded by increasing input costs. Sustainable margins are the most important factor
Declining milk supply is likely to continue for the immediate future. However, there is an opportunity for this trend to be slowed, stabilised or potentially reversed due to an increased number of replacement heifers predicted to be available from 2011.

The extent to which this increase in available replacements will impact on milk supply will depend heavily on farmer confidence. Dairy farmer confidence increased in 2008, as a result of rising milk prices. However, DairyCo analysis suggested this increase in confidence was extremely fragile and with falls in farmgate price already announced for 2009, with the likelihood of more to come, this increased confidence will very quickly disappear.

Over recent years we have seen significant structural changes to the British dairy farming industry. In the 2007/08 milk year 26% of British dairy farmers, who produced over 1 million litres of milk in the 2007/08 milk year, accounted for 57% of the total milk supply. This is a 5% increase from the 2004/05 milk year when 21% of farmers produced over 1 million litres of milk and accounted for just 48% of British milk supply. These larger, technically more efficient farmers are likely to be key to the maintenance of national milk supply. However, much will depend on the level of confidence.

Anecdotal evidence suggests the majority of dairy farmers planning to stay in the industry for the long term are already operating their farms at full capacity, in order to reap the maximum rewards from the relatively high milk prices seen during 2008. To expand their businesses further, and help increase national milk supply, many in this group will need to incur significant amounts of capital expenditure which not all have the long term confidence to undertake at the present time.

To provide sufficient confidence to dairy farmers to expand and plan effectively for the future, communication in the industry needs to be improved. Dairy farmers need to have clear messages from milk buyers about how much milk is required, of what type (in terms of constituent quality) and when.

Dairy farmers and milk buyers will need to work together to improve milk price contracts to communicate the needs of the milk buyer and, crucially, to share volatility with farmers as far as possible. This will allow cashflows to be managed and plans to be made to further improve efficiency on farm. Retrospective milk price changes that we have seen by some buyers over recent months do not allow for this and quickly erode farmer confidence.

Building dairy farmer confidence is key to the future of the UK dairy industry. Providing dairy farmers with the confidence they need to expand will have a positive impact on building a sustainable milk supply for the future. However, if confidence is knocked and margins become tighter it is likely to be the larger, more progressive, more business-minded dairy farmers that will leave the industry – potentially having a substantial impact on national milk supply.