DairyCo

The structure of the GB dairy farming industry – what drives change?

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ANDERSONS
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Executive summary

1. Restructuring in the GB dairy industry has been considerable – on average there has been a loss of over 1,100 farmers per year across GB since 1995. However, over this period total milk output has been relatively stable with both average herd size and average yield per cow increasing to compensate for declining producer numbers.
2. The trends in farm numbers is broadly in line with the restructuring that has taken place in other developed milk production nations – the changes seen in this country are by no means unique.
3. Milk production in Great Britain has moved west over the past few years. This is partly due to the more favourable conditions for growing grass in the west and partly due to the wider range of options available to dairy farmers in the Midlands and East (both farming and non-farming).
4. Milk production has increased in Northern Ireland despite a decrease in dairy farmer numbers comparable to England and increased volatility in milk prices as a result of exposure to the world market. Both Wales and Scotland have increased milk output while having a comparable milk price to England.
5. There was no evidence that differences in the allocation of support payments is a major contributory factor in differences in structural change between regions.
6. While it is often believed that dairy farming is an aging industry, the data does not support this.
7. This report examines data from; the Farm Business Survey (FBS) and DairyCo (Milkbench+ costings, Farmer Intentions Survey (FIS) and segmentation study), in order to assess the factors affecting producers' decisions to expand, continue unchanged or exit the industry. Although useful analysis was possible, it is recommended that better integration between various surveys would aid future analysis of the sector.
8. As might be expected, the level of profit made by dairy businesses does influence their decision to expand/remain/exit the industry. However, the linkage is quite weak and profits are not a key driver for those leaving the dairy sector.
9. The level of milk prices clearly influences the average level of profits in the industry. Indeed, all types of farmers (see point 19 below) cite it as the number-one factor likely to affect their decision making. However, those with a higher milk price are no more likely to expand than other producers.
10. However, milk prices only set the 'profitability environment'. The level of profit actually achieved by businesses compared to their peers is determined by management and cost of production.
11. Larger herds do not currently achieve a higher milk price than smaller units.
12. There are profitable and non-profitable businesses at all herd sizes, although larger businesses obviously have the *potential* to make higher total profits.
13. Targeting increased yield does not automatically result in higher profits, although smaller farms may benefit from higher yield to spread their fixed costs.

14. Larger dairy businesses are *slightly* more likely to be looking to expand but current size was not a *significant* determinant of future intentions.
15. Many producers who are not necessarily in a high 'economic performance' category are still intending to expand and grow their business; ultimately aiming for better economic performance in the future.
16. Farms with a high proportion of family labour tend to be more expansion-minded. This suggests that these businesses are growing to support multiple generations.
17. The age of business proprietors is not a large factor influencing future intentions. However, there is an age-related effect on farm profitability, with older farmers tending to make less profit on average.
18. Farms with a successor in place are far more likely to be intending to increase production. Thus, the absence of a successor to the business is one of the key drivers for those exiting the dairying industry. Owner-occupier businesses are more likely to have a successor than tenant farms.
19. Different businesses will react to external and internal pressures in unique ways. It is therefore useful to 'segment' the dairy industry into different types of farms based on their behavioural traits to produce a more 'fine-grained' analysis. This can be cross-referenced to quantitative factors such as herd size or age of proprietors to understand whether specific behaviours or mindsets are more prevalent among certain groups.
20. Younger farmers tend to be more positive about the future. They also tend to be more business-focused, looking to maximise returns. In a similar way, those with larger herds were again more optimistic for the future and more profit-orientated.
21. EU Milk Quotas are due to end on 31 March 2015. This may see production in Europe increase and prices fall unless new export markets are found. Any price cuts may lead to greater exits, although the analysis indicates the effect may not be great in the short-run as prices have only a weak immediate affect on business exits.
22. There are undoubtedly opportunities for the GB dairy industry to become more involved in world markets. If this was to be in commodity milk products then the price of GB raw milk would have to be internationally competitive. There may be more opportunities in markets with some value-added component but this would require industry investment in developing export markets.

Contents

1. INTRODUCTION

1.1. BACKGROUND

'The trend towards fewer but larger-scale dairy farms has led to speculation that the rise in larger-scale milk production is the reason behind the reduction in the number of smaller 'family' dairy farms. The trend is clear but the reasons have not been defined.'

This study will attempt to establish which factors (both economic and socio-economic) are significant influences in whether producers leave the dairy industry or remain and/or expand. It aims to analyse the changes in farm size and farmer behaviour in relation to farm competitiveness both in the UK and abroad in order to identify the drivers of increased scale of production. The project will also determine how the different factors identified affect different sizes and systems of dairy farms within Great Britain. Additionally the project will assess the likely impact of dairy industry developments (eg abolition of quota, expansion in processing capacity, etc.) on the different categories of dairy farms.

The overall purpose of the project is to help clarify the question of 'cause and effect' around the development of larger dairy farms and the reduction in numbers of smaller dairy farmers in the industry, while identifying what dairy farmers have to do in the future in order to remain in business.

1.2. THIS REPORT

This report comprises a summary of the findings of the project. It has been produced in line with the tender submitted by The Andersons Centre and University of Nottingham on 11 May 2012, in response to an Invitation to Tender published by DairyCo on the 23 April 2012.

The project has been undertaken primarily as a desk-based research exercise. It has gathered quantitative data about the British dairy sector from a number of sources and analysed these to arrive at conclusions on what factors influence the survival of dairy businesses.

1.3. STRUCTURE OF THIS REPORT

The following chapter provides background details on how the structure of the dairy sector in Great Britain has evolved over the last 10 to 20 years. This includes any market effects that might have occurred due to changing business size.

Chapter 3 looks in more detail at the factors that lie behind the structural changes identified in the previous chapters. These fall into two main areas – economic and social. Firstly, the economic factors involved with farm profitability; output prices, input costs and management will be explored to determine their influence on decisions to exit the industry. Following this, the impact of the more 'social' factors (age, education, etc.) on this decision will analysed.

A farmer segmentation exercise is analysed in Chapter 4. This groups dairy producers by some of the characteristics identified in Chapter 3 – size, age grouping and proprietors personal circumstances and attitudes.

In Chapter 4, the segmented farmer groups are analysed to see which factors are the prime drivers of farm survival, based on the specific characteristics they each present.

Some scenario modelling is undertaken in Chapter 5, to look at likely future developments in the dairy industry (in a global and EU context) and what this might mean for GB dairy farmers. This is assessed in relation to the drivers of farm survival outlined in Chapter 4 to see which dairy farm types might be best placed to prosper in the likely future shape of the industry.

Finally, in Chapter 6, a summary and conclusion brings the various strands of the report together.

2. EVOLUTION OF THE GB DAIRY SECTOR

2.1. GENERAL

All data is presented for Great Britain where possible. Firstly, this corresponds with the area that DairyCo's remit covers. More importantly, Great Britain can be thought of as a single dairy production region. Although Northern Ireland is politically part of the UK (and is part of the UK milk industry in terms of legislation, quotas, CAP administration, etc.), the province is not closely integrated with the rest of the UK in terms of the milk market. The lack of a land border and the difficulty of transporting raw milk mean that Northern Ireland is more closely aligned with the Republic of Ireland in terms of its dairy sector. Where appropriate, data is presented for Northern Ireland to allow comparisons to be drawn with both Great Britain as a whole, and the various regions within it.

2.2. BASIC STATISTICS

Figure 1 sets out recent trends in GB milk production, dairy farm numbers, cow numbers, average herd size and average milk yield. Data going back to 1970 is shown for historical context but on a UK basis.

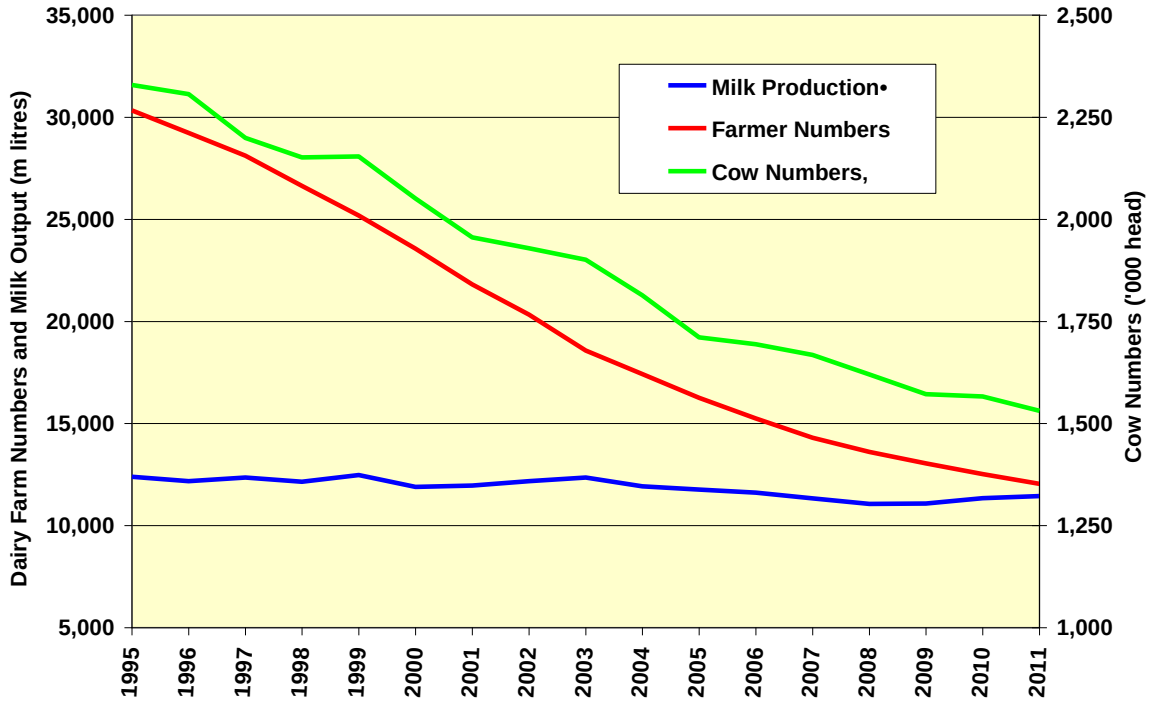
Figure 1: Trends in the GB dairy sector: 1970 to 2011

Year	Milk production①		Farmer numbers		Cow numbers②		Ave. herd size	Ave. yield
	UK	GB	UK	GB	UK	GB		
1970	≈12,000		100,741		3,244		32	3,700
1980	15,340		56,247		3,224		57	4,750
1990	15,429		41,267		2,846		69	5,420
1995	14,554	12,389	36,583	30,332	2,601	2,329	77	5,320
2000		11,898		23,567		2,051	87	5,800
2001		11,958		21,815		1,956	90	6,110
2002		12,172		20,334		1,929	95	6,310
2003		12,353		18,567		1,901	102	6,570
2004		11,924		17,415		1,814	104	6,570
2005		11,767		16,255		1,711	105	6,880
2006		11,614		15,250		1,694	111	6,860
2007		11,336		14,298		1,668	117	6,800
2008		11,063		13,603		1,620	119	6,830
2009		11,083		13,041		1,572	121	7,050
2010		11,341		12,519		1,566	125	7,240
2011		11,442		12,040		1,531	127	7,480
Change: 2000 to 2011		***-4%***		***-49%***		***-25%***	***+46%***	***+29%***

Source: DairyCo, Defra, RPA ① calendar year basis, million litres. UK figures show total available for human consumption, GB data based on deliveries to dairies/processed. ② Thousand head

Total milk output, cow numbers and producer numbers are shown graphically for the period 1995 to 2011 in Figure 2.

Figure 2: Trends in the GB dairy sector: 1995 to 2011



Source: DairyCo, Defra, RPA

Due to the scale of the axes, the slight overall fall in total GB milk output during the period is almost unnoticeable. This is in sharp contrast to the number of dairy farmers which has obviously declined dramatically. On average, there has been a loss of over 1,100 dairy farmers across Great Britain each year since 1995. This illustrates the huge structural change the sector has already undergone. However, this trend in decreasing producer numbers is slowing and evidence for this and a possible prediction if this trend continues in the future is shown in Appendix V.

The number of dairy cows has fallen during this period but by less than producer numbers. The result is a steadily increasing average herd size, which is another well-recognised trend from the last few decades.

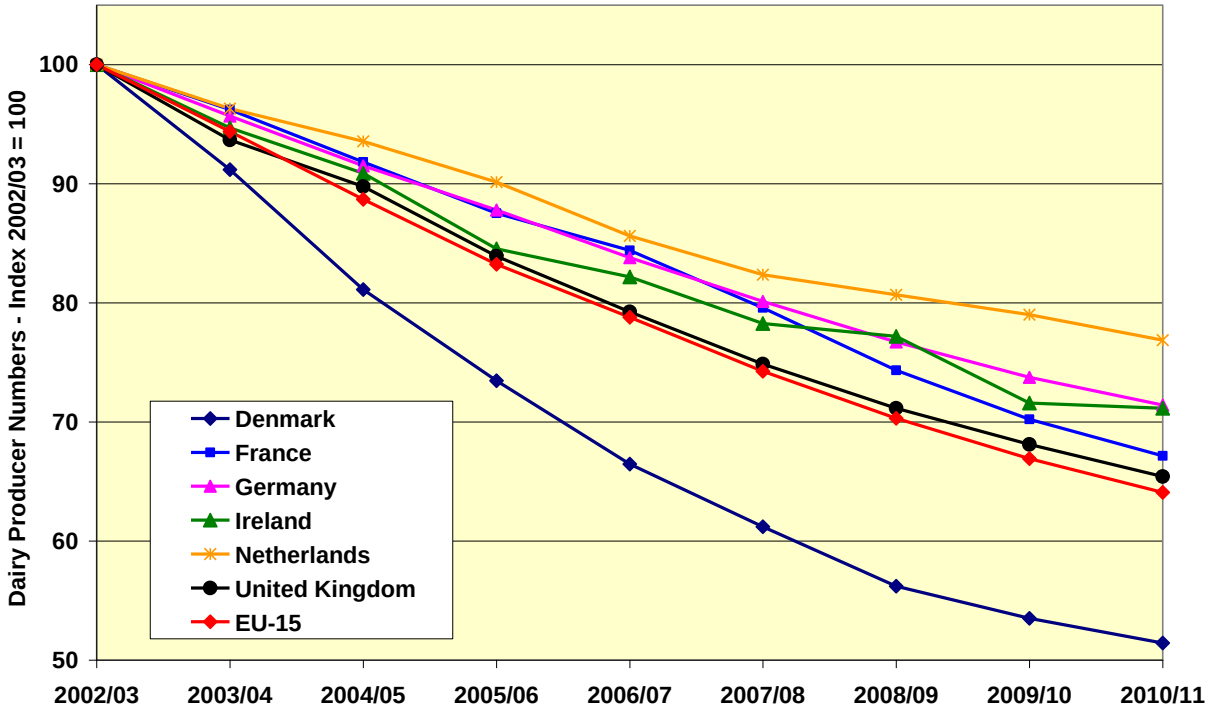
2.3. GLOBAL COMPARISON

The decline in dairy producer numbers is not a phenomenon unique to the UK. The following section shows trends for a selected number of countries, which have been selected as, climatically, economically and socially, good comparisons with the UK.

2.3.1. EU trends

Figure 3 plots an index of dairy farmer numbers, based on the 2002/03 year as 100. It shows the trends for a selected number of EU countries – the largest, close neighbours and those with similar climate and dairy sector to the UK. The data for the whole of the EU-15 is also shown.

Figure 3: EU producer numbers: 2002 to 2011



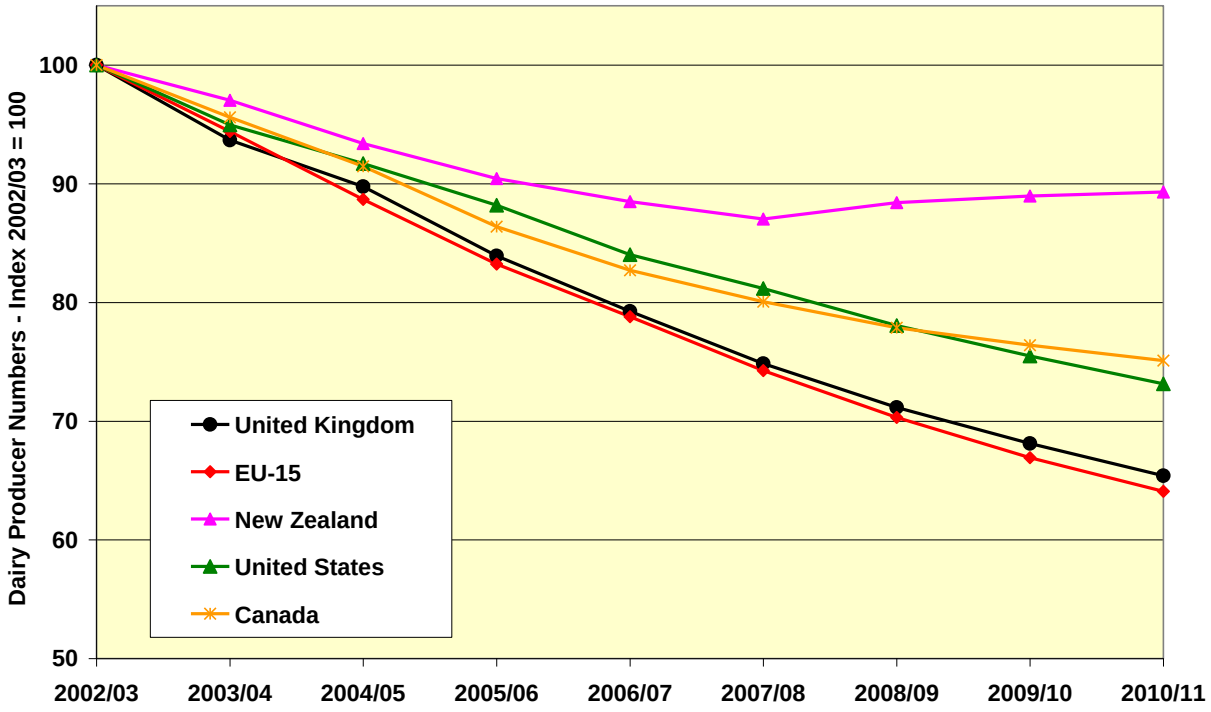
Source: Eurostat

It can be clearly seen that the trend in producer numbers in all countries mirrors the situation in the UK (and GB). In fact, the UK is almost on the average for the 'old' European Union 15. The main outliers are Denmark, showing a very high number of producer exits and the Netherlands with a less pronounced decrease. However, closer examination reveals that both Denmark (47) and the Netherlands (43) had very similar herd sizes in 1996 but by 2010 Denmark had increased to 140, while the Netherlands had only grown to 75. With broadly similar average yields per cow between both countries the overall effect on total milk production has been negligible. Possible reasons for the differential in restructuring could include significantly higher cost of both land and quota in the Netherlands, restricting expansion.

2.3.2. Other countries

Looking more globally, Figure 4 undertakes the same analysis for countries outside the EU (but with the EU-15 and UK included for comparison). Those shown are some of the major dairy export nations – the competitors to the GB sector.

Figure 4: Producer numbers, selected countries: 2002 to 2011



Source: Eurostat/USDA/NZDA/CDA

The New Zealand, US and Canadian dairy sectors have all seen a decline in producer numbers. This indicates that restructuring of the producer base is not a factor confined to the UK or even EU. However, the fall in dairy farms has been less pronounced in these nations. Indeed, after falling initially, the number of dairy farms in New Zealand has stabilised and even grown slightly in recent years. The majority of New Zealand production is exported and NZ dairy producer's production costs are amongst the lowest of the major dairy producing nations (IFCN); as a result, the NZ dairy industry was well placed to benefit from the boom in global dairy commodity values in 2007. This, combined with falling returns from other agricultural sectors, has led to a large area of dairy 'conversions' to exploit their comparative advantage. An increasing production area (ie more land devoted to dairying from previously beef/sheep/arable holdings) combined with a general 'aura' of success and profitability surrounding the NZ dairy industry, evident in media publications which frequently cite 'the booming dairy industry', for example, along with coherent dairy industry recruitment initiatives (such as the DairyNZ 'Get Fresh' campaign) has led to an increase in people entering the

industry as well as expansion of those existing producers. The psychological effect of being part of what is perceived to be a growing and vibrant industry should not be underestimated.

The vast majority (>90%) of NZ dairy producers are supplier members of the co-operative processor Fonterra. This closeness to the marketplace, especially in relation to global trade (due to the reliance on exports) combined with the seasonal production systems practiced by the majority of producers, means they are very 'production responsive'. The majority of farms do not have the 'stickiness' of costs that many do in the UK for example. NZ producers do not have as much capital invested in machinery, concrete and buildings, for instance and thus, when world demand and therefore prices of dairy products are low they are able to reduce inputs such as supplementary purchased feed and reduce their total costs to a higher degree than those more capitalised systems elsewhere. This of course has a knock-on effect on production, which should then help to re-establish the supply-demand equilibrium. In this way NZ farmers are able to 'ride-out' periods of low returns and maximise profitability during the 'peaks'.

Both Canada and the United States have seen a fairly consistent decline, albeit lower than that in the EU/UK. Dairy production in Canada is significantly controlled by supply management with very high milk prices (in comparison to world prices), maintained by a strict quota system, which also acts as both a barrier to entry and expansion due to the very high cost. The US 'Farm Bill' provides some support for dairy farmers in the form of the 'Dairy Production Margin Protection Program' which offers them a basic level of coverage against low margins along with a 'Market Stabilisation Program' that addresses the imbalance between supply and demand when farm-level margins are poor. A supplementary insurance plan is also available, jointly funded by the government and participating farms. Nevertheless, while the US was partially able to benefit from the recent increases in global dairy prices, they were also impacted by the significant increase in feed prices due to their high reliance on non-forage feeds. There is also considerable competition for both the various grains produced and the land available to grow them on, due to the demand for bioethanol production and competition with agriculture alternative sectors, for example, soya for pigs and poultry feed, etc.

2.4. GEOGRAPHICAL DISTRIBUTION

As well as shifts in the national figures, there have been substantial structural changes behind the aggregate data. One pattern of the last few years is a steady shift westwards of milk production in GB (and UK). This can be tracked by where milk quota is held[1]. This is illustrated in Figure 5.

In total, England has accounted for around 65% of total UK milk production over recent years. Northern Ireland contributed 14%, Wales 11% and Scotland 10%. However, the overall figure for England shows a decrease in production, mostly as a result of considerable reductions in

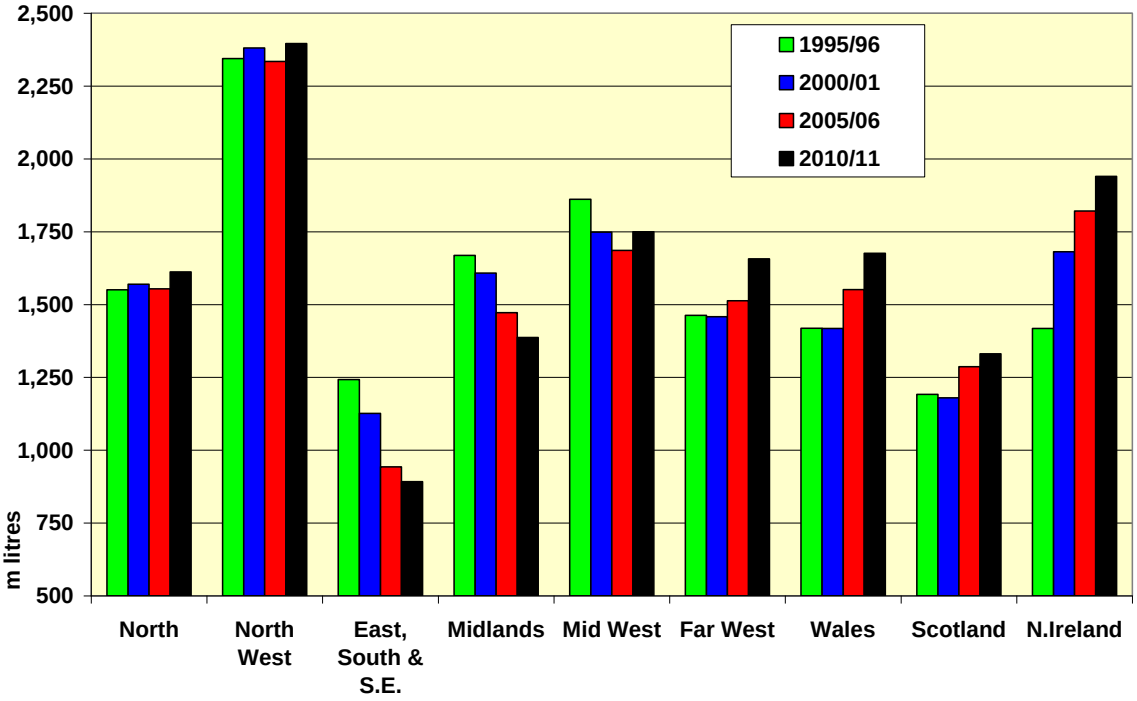
[1] *It is recognised that, especially in recent years, this is an imprecise measure of where milk production is being carried out. As the UK has fallen consistently below milk quota, expanding producers have no longer seen it as crucial to match milk output with quota held. Therefore, the location of quota probably understates the movement of actual production.*

the East, South East and Midlands. Northern regions have seen only a very marginal increase, with the 'far West' the only region to have seen a significant rise.

To illustrate the trends in production from the various parts of the UK in more detail, Figure 6 shows the % change in milk production since 1995.

While England represents the most significant proportion of total milk production in the UK, production has been falling in this part of the UK. This is in contrast to Wales, Northern Ireland and Scotland, which have all actually increased milk production.

Figure 5: Distribution of UK milk quota: 1995 to 2011



Source: DairyCo, Defra, RPA – Note: 'Far West' is Devon and Cornwall, 'Mid West' is Avon, Dorset, Somerset and Wiltshire. 'East, South and South East' comprises the area east of a line roughly from the Humber to the Solent. The total volume of UK is greater in latter years due to extra allocations under various reforms of the CAP.

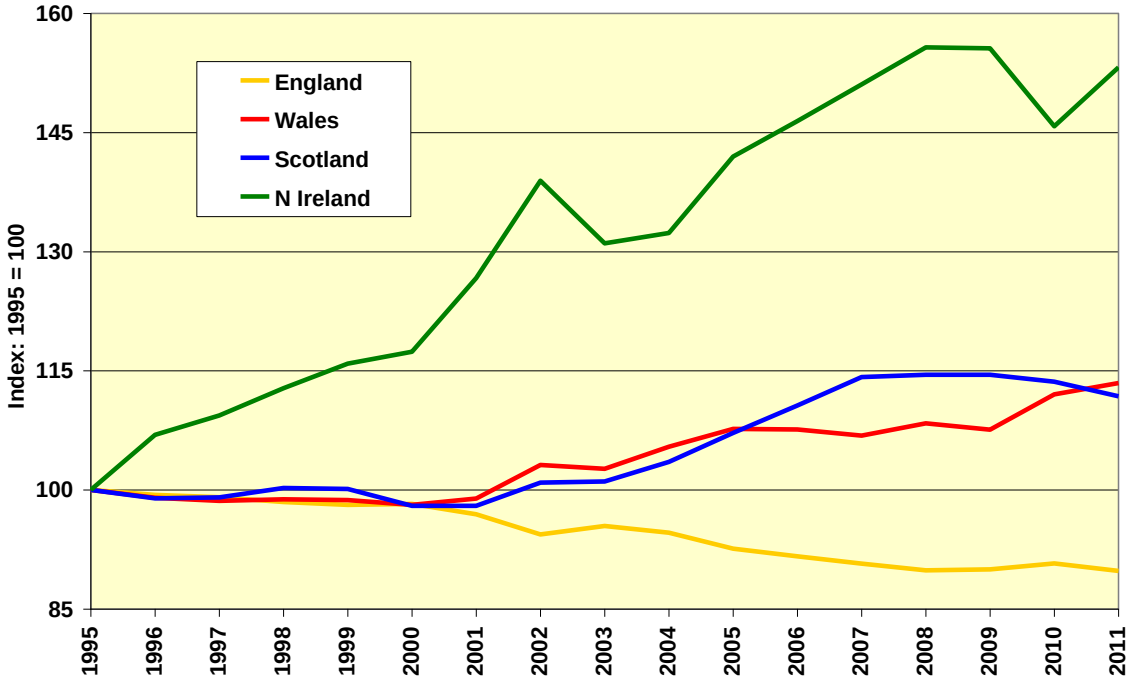
There are likely to be two main factors driving these relative changes. Firstly, due to rainfall patterns, the west of the British Isles is favoured for grass growth. Secondly, those farmers in the east and midlands generally have a greater number of options when it comes to their business, being closer to large centres of population, brings greater 'diversification' opportunities, while land quality and climate makes other farming enterprises, especially arable, a viable alternative to dairying. As a result, dairy farmers further west exhibit an element of comparative advantage where they are able to produce milk at a lower cost by utilising a higher proportion of forage. Agricultural land prices may also influence this shift, with development pressures from urban areas, 'lifestyle buyers' as well as alternative agricultural sectors increasing relative values in the south east and midlands especially.

Further evidence for this westward shift is the fact that within both Scotland and Wales there is evidence of increasing milk production in western areas such as Dumfries & Galloway, Pembrokeshire and Carmarthenshire, for example.

It is also possible that other factors specific to the devolved regions are playing a role, with regard to subsidy payments, legislative issues, markets supplied and relative importance of the industry to the 'region/economy'.

Lastly, many of the major milk buyers/processors are located along the major transport networks on the western side of the country. There are considerations of cause and effect, with milk processors for manufactured products particularly wishing to be in located within extensive 'milk fields' to minimise transport costs. Once the plants are in place, however, they are a fixture and may, in turn, encourage greater milk production nearby.

Figure 6: Change in UK milk production: 1995 to 2011



Source: RPA

2.5. FARM SIZE

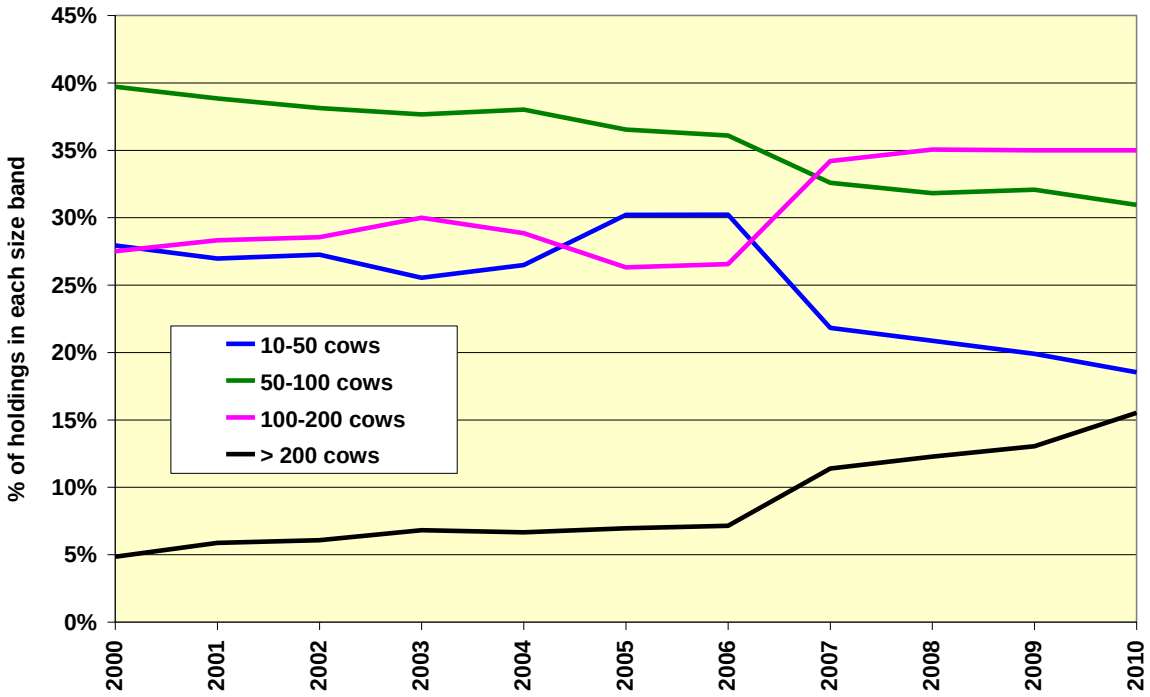
While producer numbers in GB have been falling, milk output has been relatively static over the past fifteen years. This is due to both an increase in average yield and an increase in average herd size. In 1995 the average yield in the GB herd was 5,320 litres per cow with an average herd size of 77 cows. By 2011 the average herd size had increased by 65% to 127 cows with yields increasing by 40% to 7,480 litres per cow. There has been considerable debate in the industry of the reasons behind the move to larger farms and as to whether there is a direct impact between increased prevalence of large farms and decrease in the number of small farms; this issue is considered in this report.

Note that the 'size' of a dairy business can be measured in a number of ways – cow numbers, hectares farmed, milk output, etc. In this report we have used the milk output measure where possible, as it is likely to equate most closely to business turnover. Where it has not been possible to use this measure an explanation is given.

As with geographical dispersal, looking at average dairy farm numbers and sizes does not show the trends that lie behind the figures in terms of farm size. Figure 7 charts the relative numbers of producers in certain size categories over the last few years. Herds below 10 cows have been excluded from the analysis as 'non-commercial'. The figures are expressed as a percentage of the total number of dairy holdings, so the overall decline in dairy businesses seen in Figure 2 is adjusted for. Therefore, Figure 7 is showing the relative change in different herd sizes.

This data is limited just to England as size bands are not consistent with those used for Wales and Scotland. Therefore, it has not been possible to produce results for Great Britain. However, looking at the data for Wales and Scotland, the overall trends seen in England are consistent for other parts of Great Britain.

Figure 7: Distribution holdings by herd size: 2000 to 2010



Source: Defra – Note: the basis of recording changed between 2006 and 2007 meaning that the figures are not strictly comparable. The size categorisation changed for the 2010 year and the data has been adjusted to correspond with previous years.

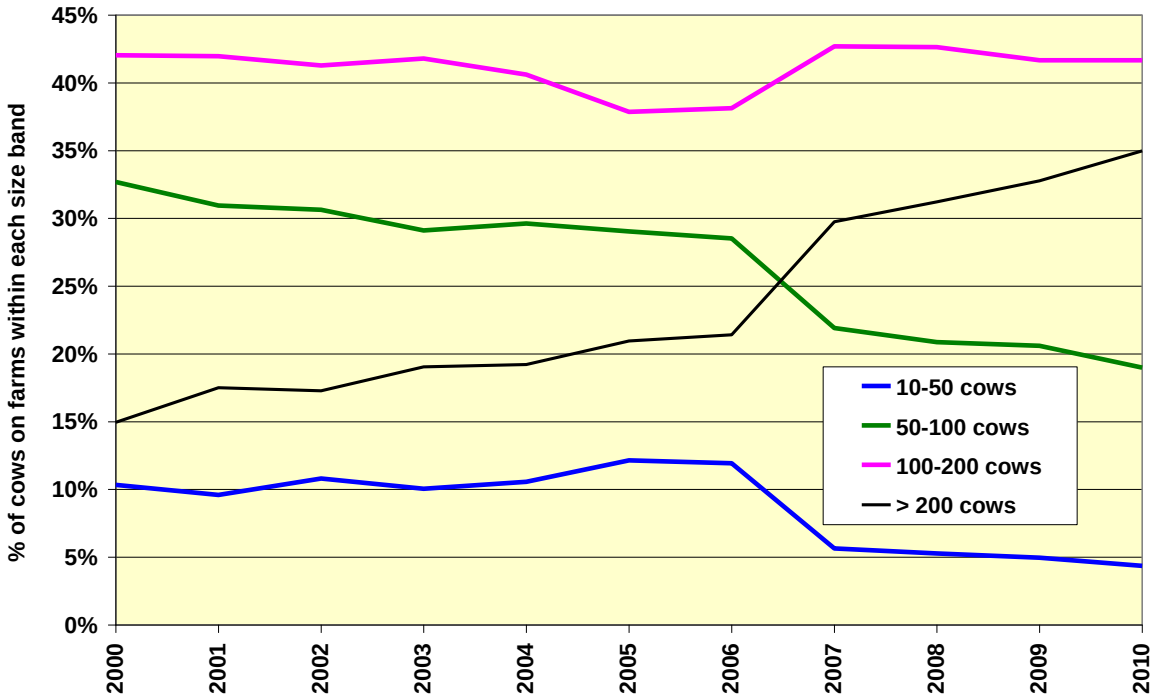
The trend towards larger herd sizes in England is clear. A decade ago herds with 200 or more cows comprised less than 5% of the total number of dairy units. In 2010 this had trebled to over 15%. There has been a decline in the proportion of very small herds of less than 50 cows over the period, with an especially sharp fall in more recent years. The percentage of slightly larger herds of 50-100 cows has also dropped but by a lesser amount. The proportion of herds

falling into the 100-200 cows category has increased and this size of operation is now the most prevalent in English dairying.

It is worthwhile re-working this analysis to look at cow numbers. While there are relatively few very large herds, because of their size, they comprise a far greater percentage of the overall dairy industry. Data on the total number of cows in the different size categories is presented in Figure 8 and can equally represent a good approximation, milk output from the different herd sizes.

The very smallest farms only contribute 5% of the national herd. Unsurprisingly, the dominant herd size of 100 to 200 cows is also the most important in terms of cow numbers. The growth of the percentage of dairy cows managed on large holdings comprising over 200 cows can clearly be seen.

Figure 8: Distribution cows by herd size: 2000 to 2010



Source: Defra – See notes on previous Figure.

While not directly equivalent to the herd size categories above, Figure 9 shows how the distribution of quota between sizes of quota holders[2] has changed over the last 16 years.

It is immediately obvious that there has been a significant increase in the number of farms holding more than 2 million litres of quota, whereas the smallest category of producers has declined almost to the point of extinction. In total, over 85% of quota is now held by holdings with greater than 500,000 litres and two-thirds on holdings with more than 1 million litres.

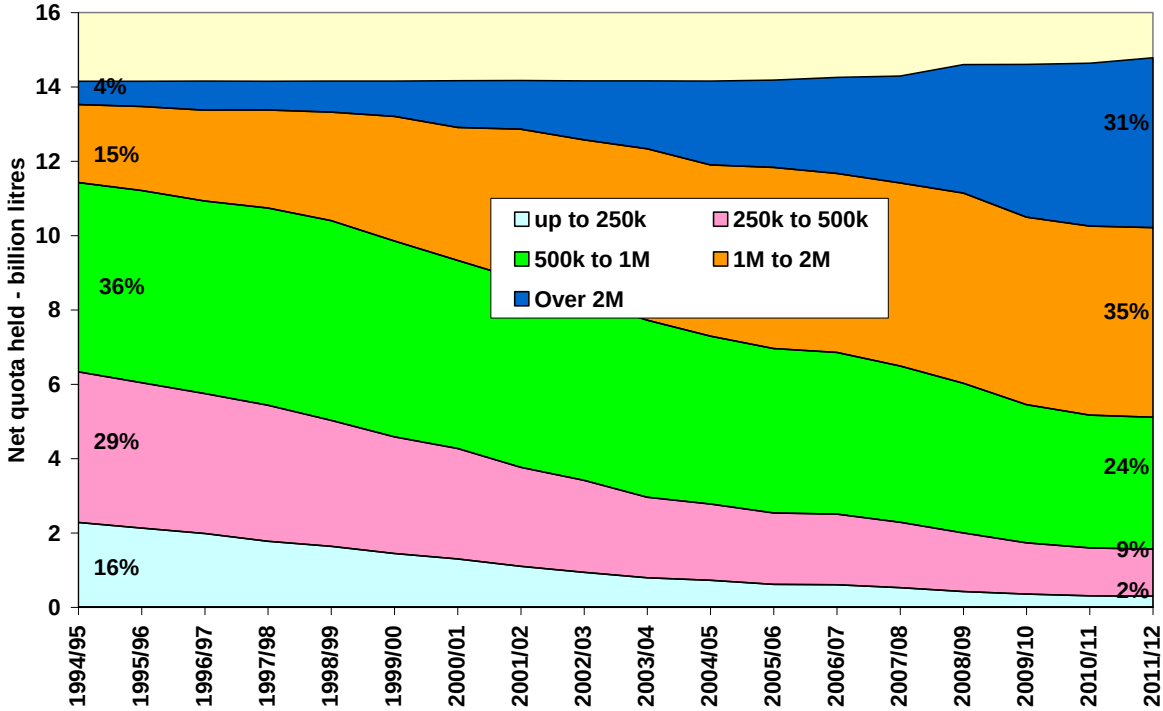
[2] *It is recognised that, especially in recent years, quota is an imprecise measure of actual milk production. As the UK has fallen consistently below milk quota expanding producers have no longer seen it as crucial to match milk output with quota held. This may well mean the statistics underestimate the trends in business growth.*

Assuming an average yield of 7,500 per cow in 2011/12, the largest category equates to average herd sizes of over 260 cows. The smallest band would be below 35 cows. Back in 1994/95 a lower average yield of 5,300 litres per cow means the average herd sizes for the largest and smallest categories would be over 375 and below 50 cows respectively.

There has been a consistent fall in the quota held by the smallest dairy farms – it has dropped every year since 1994/95. The rate of decline has varied though, from -21% in some years to just -2% in others. Overall, it averaged -11% per year during the 17-year period. The quota held by those in the 250-500K litre band has declined on average by -7% per year. For the 500K-1M category the average yearly drop was -2%. Interestingly, at the start of the period this size category was growing but by the end it was in decline – indicating what might once have been considered a large dairy enterprise might no longer considered to be one.

The 1M-2M band saw average growth of 5% and the largest category 13% average annual growth.

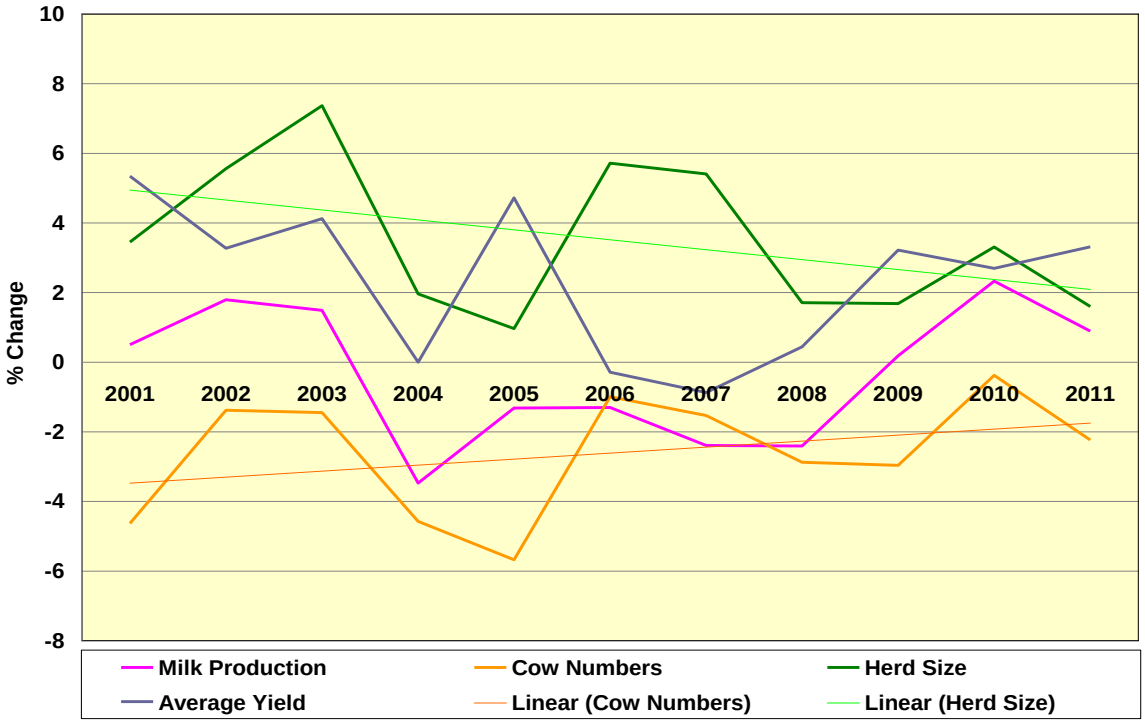
Figure 9: Distribution of UK quota by holding size: 1994/95 to 2011/12



Source: RPA – Note: figures for GB only are unavailable. It is believed unlikely that there would be significant differences between trends in the UK and GB.

In order to more closely examine these recent trends, with respect to possible future development, the rate of structural change is important. This is illustrated on Figure 10.

Figure 10: Annual change in GB milk production, cow numbers, herd size and yield



Source: RPA

It is interesting to note that the actual rate of increase in average herd size from year to year appears to be slowing and similarly, the average decrease in total cow numbers is slowing. The trends in annual total milk production and average yield show less consistency and are no doubt signicantly effected by the vagaries of the weather as well as a wide number of micro- and macro-industry influences from year to year.

2.6. FARMER AGE

It has been suggested that the average age of dairy farmers is increasing and is representative of a lack of new entrants in the dairy sector. According to the 2010/11 Farm Business Survey (FBS), the average age of dairy farmers in England was 52.4 years[3]. This is slightly younger than the average for all farm types in England of 55.5 years. Although the FBS is only covers a sample of English producers, it is believed that this figure should be broadly applicable to the whole of the GB dairy sector. Figure 11 shows the average age of dairy farmers at 2 yearly intervals. It can be seen that while the average age has been increasing in the last few years, this follows a period when it fell. It does not appear that the profile of the industry is becoming any 'older'.

[3] *The age figure from the Farm Business Survey (FBS) is not significantly different from that found in DairyCo surveys. The FBS data has been used, as it provides a longer time series*

Figure 11: Average ages of dairy farmers: 1996 to 2011

Year	1996/97	1998/99	2000/01	2002/03	2004/05	2006/07	2008/09	2010/11
Average age	55.3	51.1	50.8	50.7	50.9	51.8	51.6	52.4

Source: Farm Business Survey

While the age profile may not be changing significantly, having an average age of just over 50 (even if this is not increasing) would not seem to indicate a dynamic youthful industry. Leaving aside the question of whether dynamism is the preserve of the young, some care needs to be taken over the interpretation of the age statistics. The 'farmer' is taken to be the person who is responding to the Farm Business Survey. On many farms, particularly family farms, the senior generation may well undertake a greater proportion of 'lighter' office duties such as responding to surveys. Although the older generation may style themselves as the 'farmer' the management of the dairy operation may be undertaken in part, or wholly, by a younger generation. This would not be picked up by the survey data. In addition, any joint venture arrangements such as share or contract farming would tend to record the land provider rather than the (often younger) farmer/manager. Finally, it is also worth noting that whilst the age profile of the industry may have stayed fairly consistent in terms of averages; a 52 year old 20 years ago is not necessarily the equivalent of a 52 year old currently. Relative to 20 years ago, people are in general living longer and indeed working longer, thus, in 'real' terms it could be argued that a 52 year old now is perhaps 'younger' than a 52 year old two decades ago.

2.7. THE PROCESSING SECTOR

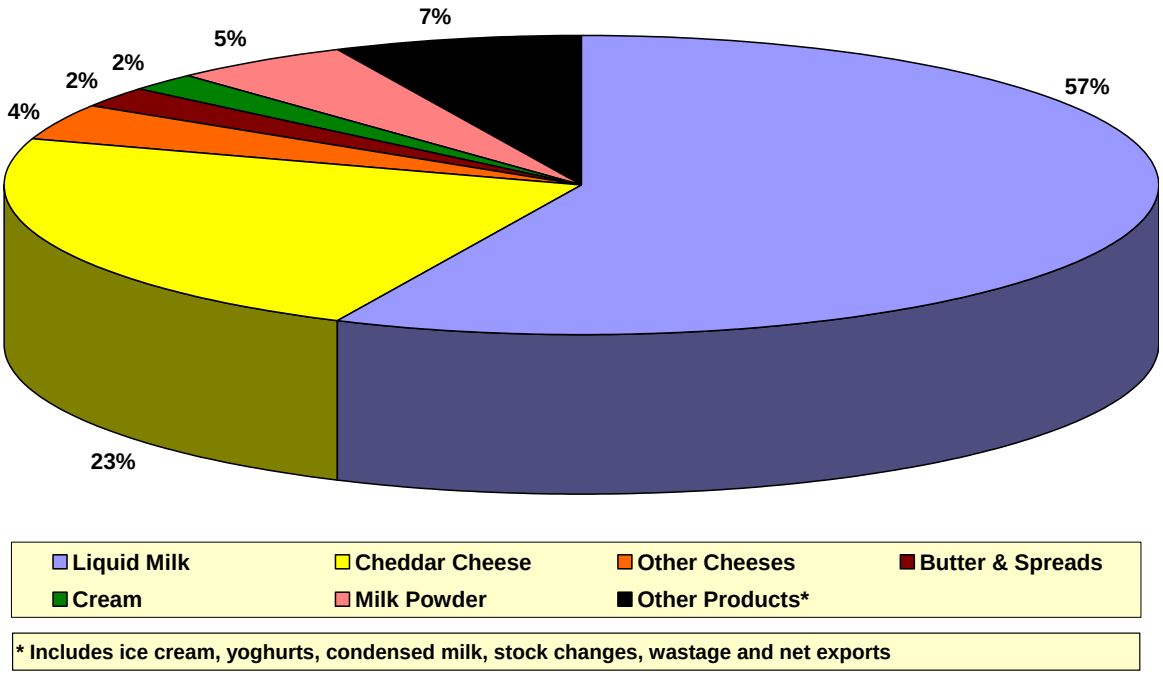
In economics, agriculture at the farming level is often cited as an example of 'perfect competition', whereby the product (at the farm-gate at least) is homogenous and there are large numbers of sellers. As a result, and much to their chagrin, dairy farmers are the classic 'price takers', ie there are lots of sellers (dairy farmers) all producing an undifferentiated product (raw milk), with no one supplier able to influence the market or dictate a price, milk buyers can easily find alternative supplies.

In fact, the milk market is not an example of true perfect competition, as the product is not totally homogenous. Farmgate milk is not priced completely uniformly – this is usually characterised as being a result of its final end use. But this embodies many other differences in the 'product' such as constituent values, adherence to production standards and production profile throughout the year. Much of this variation can be manipulated by the payment structure of the contract, ie constituents-based contracts paying more for butterfat and protein or seasonality payments attempting to flatten out the production profile dependant on the market. Geographical location may also influence the eventual market, with producers in closer proximity to large consumption regions more suited to supplying the 'local' liquid market. For the purposes of this analysis, however, it is useful to categorise milk by its end-use in order to segment the marketplace.

Figure 12 shows the end use of milk produced in Great Britain in the 2010 calendar year. It can be seen that 'liquid milk' for retail sale, doorstep delivery and use in foodservice outlets comprises by far the biggest category. The remainder of the market is usually referred to as 'manufacturing milk', as the raw milk is processed into a variety of products.

It should be noted, however, that there is no clear demarcation between the liquid and manufacturing markets. Raw milk can be easily switched from one to the other as it is still fundamentally the same product (albeit perhaps with a different constituent makeup). In addition, there are flows between the markets – for example, excess cream from the liquid milk market goes into the manufacturing sector. These linkages are important because it means that the two markets are intertwined, with considerable price influences operating from one to another.

Figure 12: Utilisation of milk in Great Britain: 2010



Source: Defra, DARDNI

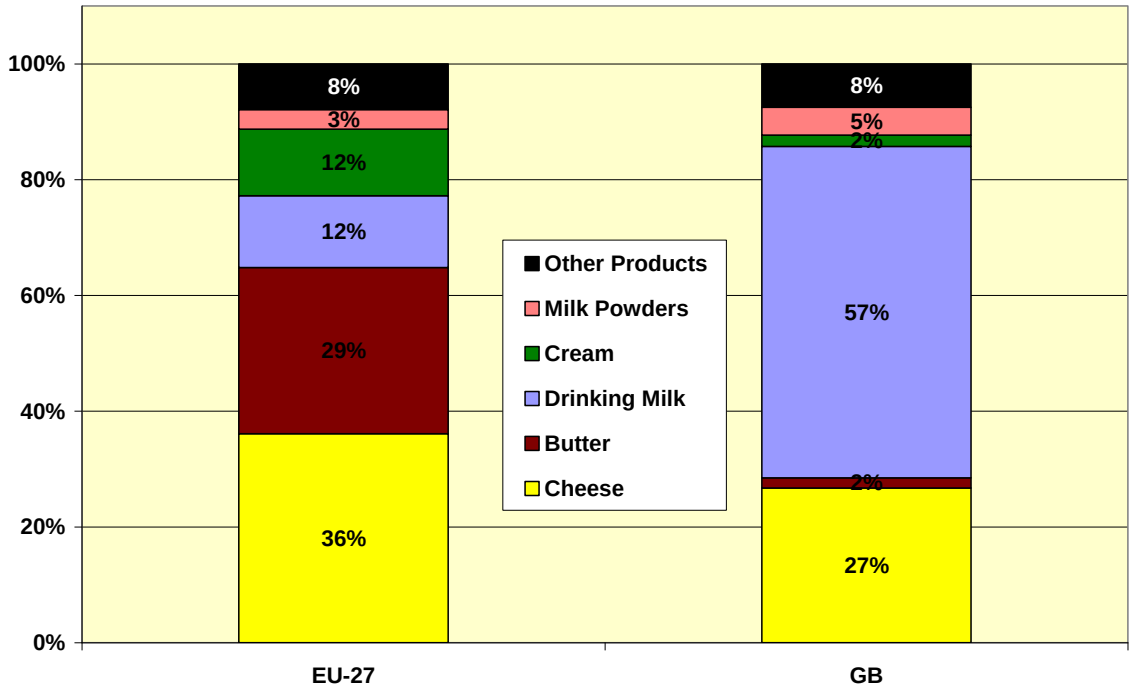
It can be seen that in the GB market, liquid milk is by far the most important category by volume. This is unusual. In most major milk countries the fresh liquid market is relatively small. It is a quirk of Great Britain's history, consumer tastes and size of dairy production sector that the liquid market is so dominant. This can be seen by reference to Figure 13 which shows a comparison of milk utilisation in Great Britain with the average for the EU-27.

Whether the large liquid market is a benefit to the GB dairy industry or a hindrance, has been a source of lively debate in recent years. It is beyond the remit of this report to try and answer this question definitively. It can be argued that historically GB processors have been fixated on what was thought to be the 'premium' liquid market and neglected to invest in the commodity market (investment both in terms of efficient plant and brands). As the liquid market has

become more competitive, then the lack of a globally competitive alternative manufacturing sector has become an issue.

However, it would be widely agreed that returns from the liquid market are less volatile than those from the manufactured market. This is because manufactured milk products, being easily tradable, are within the global commodity markets. Volatility on these markets is rapidly translated into farmgate price changes. Liquid milk is both bulky and perishable and therefore cannot easily be traded over long distances. In this respect the liquid market is insulated from external competition.

Figure 13: Comparison of utilisation of milk in GB and EU-27: 2010



Source: Defra, DARDNI, Eurostat

The effect of this can be seen in Figure 14. This shows the Fonterra (New Zealand co-op) price is widely regarded as the 'world price' for milk. What is shown is the average price for milk powders. The volatility of milk commodity markets in recent years can clearly be seen. The region in the UK with the most commodity milk production is Northern Ireland. The United Dairy Farmers (UDF) auction price is shown. This tracks the world price quite closely. The final line is the Defra average farmgate monthly Great Britain price (ie excluding N.I.). This comprises a 'basket' of all milk prices (both for the liquid and manufactured markets) but liquid milk will be a key element.

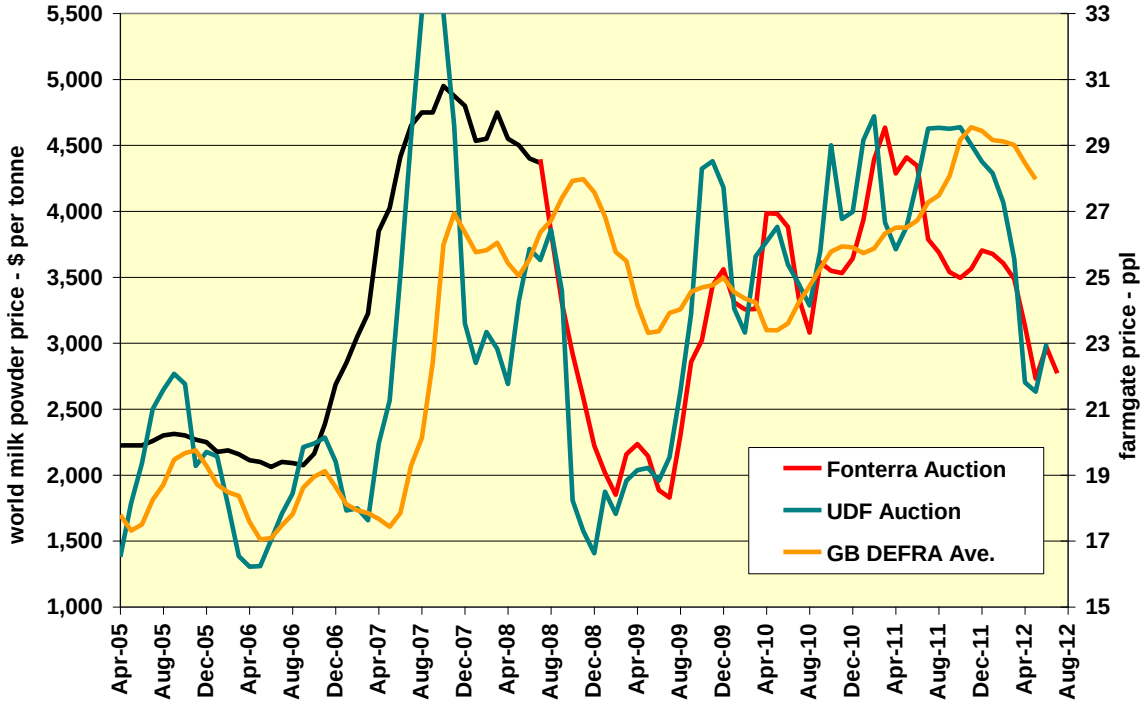
The GB price is affected by world commodity markets. This is due to the linkages between the different milk markets described above. However, there is usually quite a long time-lag before changes on global markets filter through. Also, the GB price does not tend to hit either the highs or lows of commodity markets. Although less clear on the chart, the 'lags' in the system are not equal when commodity prices move up and down. This is looked at in more detail in a recent DairyCo study – 'Asymmetric Price Transmission in Dairy Supply Chains' see

http://www.dairyco.org.uk/resources-library/market-information/apt-reports/apt-report-2011/. This found farmgate prices are quicker to react when commodity prices are falling than they do when commodity markets are rising.

Although the large liquid market provides some protection against price volatility for GB dairy producers, the structure of the market means that farmers are disadvantaged. This is due to the imbalance of power in the marketplace that is a result of its structure.

The milk market can also be characterised as having elements of monopsony (or oligopsony) as there are few significant purchasers in the marketplace, especially in some geographical areas. A monopsony is a market form where one buyer is able to dictate terms to its suppliers because suppliers do not have the choice to sell their product elsewhere (no other choice of buyer). This is accentuated by long notice periods binding suppliers to processors. In addition to this, the retail level has perhaps experienced the most extensive rationalisation with a small number of major supermarkets by far the dominant outlet for liquid milk in particular. While this market form does not mean buyers can indefinitely pay a price below the cost of production (supply still has to come from somewhere) it nevertheless passes back much of the risks of overproduction, natural losses and variations in cyclical demand to the primary producers.

Figure 14: Global, NI and GB milk prices: 2005 to 2012



Source: Fonterra/Defra/UDF

This has implications for structural change in the sector. If much of the risk is being passed down the dairy supply chain to farmers, they are less likely to invest in their businesses. Overall, returns in the long-run may also be lower as a greater proportion of the entire margin in the dairy supply chain is taken elsewhere. (For more discussion of this, see DairyCo report

'Supply Chain Margins 2011/12' - http://www.dairyco.org.uk/resources-library/market-information/dairy-supply-chain-reports/dairy-supply-chain-margins-2012/).

At a farm production level, the dominance of the liquid market requires steady supply year round, so milk pricing schedules are constructed to encourage this. Producing milk year-round is inherently more costly than seasonal production. This is not an issue if the market delivers a compensating higher price. However, if it does not, then this will reduce profitability and affect the ability of farmers to build sustainable businesses. The argument would be that if the liquid market does not deliver sufficient returns, farmers could change their systems and sell their milk into the commodity markets. In practice, this is very difficult in the short-term. Notwithstanding contract notice periods, the whole farm system in terms of cow type, calving patterns and even physical infrastructure may be set up to service a particular market. Changing this would be the work of years rather than weeks and there may be considerable intermediate costs incurred. Some farmers may decide to exit the industry rather than make such wholesale changes, while others may simply feel they do not have the technical or managerial skill to implement such a evolution in farming system.

DRIVERS OF CHANGE

2.8. BACKGROUND

The previous section looked at some of the historical trends in the GB dairy industry – especially in relation to producer numbers.

This section takes the available data and uses statistical techniques to investigate what factors influence decision-making and intentions, how important they are and whether they can be combined to create a robust economic model for forecasting structural change in the future.

2.9. DATA SOURCES

Two main sources of data have been used within the analysis in this project. The Farm Business Survey (FBS) and data produced by and for DairyCo.

2.9.1. Farm Business Survey

- **Farm Business Survey** (FBS) is an annual survey providing information on the financial position and physical and economic performance of farm businesses in England, to inform policy decisions on matters affecting farm businesses and to enable analysis of impacts of policy options. The sample of around 1,900 farm businesses covers all regions of England and all types of farming, with the data being collected by face to face interview with the farmer. Results are weighted to represent the whole population of farm businesses, as recorded in the annual June Survey, which have at least 25,000 Euros of standard output. Although the data relates to England only, it is the most extensive dataset available and likely to be representative of trends in both Scotland and Wales

- For the 2010/11 FBS, farmers were asked questions about their **future intentions** with regard to their business; this is the first time that farmers in the FBS have been asked these questions. The survey asked about the farmer's intentions with regards to changes to the whole business in the next 12 months and in the next one to three years. The farmers were also asked questions about their intentions for individual enterprises on farm eg milk production, beef production, diversification. The strength (low, medium, high) of these intentions and the reasons for doing so were also collected. Farm businesses were asked these questions between January and October 2011.
  Around 400 farms in England were surveyed, with the sample being stratified by region and farm type and drawn at random from the main FBS.
  Data for 'all farms with a dairy enterprise' (ie both specialist and mixed farms) was examined for farms having completed both the FBS accounts survey and FBS intentions survey (a total of 79 farms) in order to assess the relationship between 'economic' variables and more social/demographic factors.

2.9.2. DairyCo data

- **Segmentation research** data supplied by DairyCo, regarding demographic and intentions/beliefs, was used from a previous survey carried out in April 2011 by a third party. This aimed to collect detailed information on the values, attitudes and behaviours of dairy farmers in order to identify if clusters of farmers exist. The survey used 750 telephone interviews from a randomly selected list of dairy farmers supplied by DairyCo.

- **Milkbench+** is a fully independent and impartial benchmarking system, which takes into account full economic costs, including family labour, the opportunity cost of capital and a full rental value, in order to represent a true measure of profitability and sustainability. All data is collected on-farm by trained data collectors ensuring consistency and reliability of the outcome. It also establishes technical information such as yield per cow, labour hours and feed efficiency for example.

- **DairyCo: Farmer Intentions Survey (FIS)** has been conducted annually since 2004. The objective of this survey is to ascertain the views and intentions of dairy farmers within the industry; helping to identify threats and challenges that farmers face. The survey provides the opportunity to assess the impact their future plans will have on the industry in terms of future milk production. Participants are questioned on their level of confidence in both the industry and prospects on an individual farm business basis. The 2012 FIS was carried out in February 2012 using telephone interviews. 1200 UK dairy farmers were interviewed in total; approximately 600 in England and 200 from each of Scotland, Wales and Northern Ireland. The sample was drawn from farmers with 10+ cows and the respondents were the decision-makers responsible for the dairy enterprise. The results of the survey have been weighted in line with the number of holdings in the UK to be representative of the industry as a whole.

2.9.3. Limitations on the data

Milkbench+ and FBS data use different collection methods and recording categories and as a result are not directly comparable.

It is likely that there is an element of sampling-error in both the FBS figures and Milkbench+ as result of the non-random nature of selection. Milkbench+ is, of course, voluntary and is more likely to be taken up by more ‘forward-thinking’ businesses that recognise the value of benchmarking to identify ways in which to improve their business. While the FBS aims to be representative of the population as a whole, the reduction in sample size, as a result of only examining ‘dairy’ farms which have also completed the intentions survey, will increase the risk of sampling error, as again, participation is voluntary.

The overall effect of this is likely to be a skew towards more proactive and possibly slightly better performing businesses than the population as a whole.

The segmentation research survey and FIS used a large random sample of the population, which should ensure a high validity of results.

2.9.4. Data analysis

The analysis in this study aimed to identify the underlying factors behind stated intentions and to quantify the importance of these factors in producers' decision making and consequential structural change. A significant amount of intentions data exists with a considerable amount of understanding with regard to the social differences between respondents (eg age, herd size) and stated intentions. However, no previous study in the UK has attempted to combine these intentions data with economic data for the individual farmers concerned, to greater understand the reasons behind their stated intentions/behaviours and thus structural change.

A cross-reference was made to establish farms which had both Milkbench+ data and the social/intentional data supplied by the segmentation/FIS research, however only 47 farms fitted into this category, all of a similar demographic, ie progressive and intending to expand rather than decline or exit the industry. Thus, no robust statistical tests could be made on this data alone.

None of the available datasets contained all of the desired factors for analysis entirely, with particular difficulty incorporating both economic and social aspects for the same data. The FBS dataset incorporated the best combination of 'economic' and 'social' factors in sufficient quantity. This data set was split into two separate groups of producers based upon their dairy farming intentions with respect to milk production, in order to increase the explanatory power of the analysis. One group is classified as those producers that have indicated they plan to increase milk production by at least 10% in the next 3 years. The other group contains producers who have indicated no change in milk production levels, plan to reduce milk production or cease milk production (full results of this can be seen in Appendix II).

A linear model which attempts to explain and/or predict producers' decision making was created, however, the variation accounted for by all the factors included was very low suggesting that while many of the factors identified have a significant impact on decision making, there are still many more influencing factors which are not incorporated in any one dataset. These may be specific to individuals such as 'ill-health' forcing retirement or TB pressures in specific areas or indeed development pressures from urban areas, unaccounted for in data currently available. The total number of observations was also low, contributing to the low explanatory power of the model

While the overall variation in producer decision making cannot be explained entirely from the factors identified in this analysis, combining several sources, including the DairyCo Farmer Intentions Survey (FIS), provide a good indication of the impact of the various individual factors either directly on intentions and/or measures of competitiveness such as profitability. Chi-squared test and *t-tests* are used where appropriate to test the significance of variation in the distribution of data between populations, eg intentions between different age groups.

Historic trends in structural change are also analysed for correlation and finally data segmented on the basis of 'behavioural values', age, and farm size are examined in order to identify how these different segments may be affected by the various factors identified.

2.10. Drivers of Change: Summary of Results

A significant amount of literature exists from studies elsewhere in the world examining structural change and farm competitiveness, which was reviewed as part of this study (see Appendix I). From this review and also from existing industry knowledge, a set of possible drivers of business change was produced, split broadly into 'economic' and 'social' factors. These are summarised in Figures 15 and 16 alongside whether evidence for this was found in the current study and from the existing data sources specific to the UK.

2.10.1. Economic factors

Figure 15: 'Economic' drivers of change

	Identified impact on structural change and decision-making	
Economic factors	**Evidence from existing studies elsewhere**	**Supported by evidence of this study**
Business profitability	Yes	Yes
Milk price	Yes	Inconsistent
Cost levels	Yes	Yes
Support payments	Yes	No
Other income sources	Yes	No
Capital; Net worth and return	Yes	Limited
Technical parameters:		
Yield levels	Yes	Yes
Input and labour use	Yes	Yes
Herd size – output level	Yes	Yes

2.10.2. 'Social' factors

Figure 16: 'Social' drivers of change

	Identified impact on structural change and decision-making	
'Internal' social factors	Evidence from existing studies elsewhere	Supported by evidence of this study
Age of proprietor	Yes	Inconsistent
Business outlook; positive/negative	N/A	Yes
Education level	Yes	Limited
Presence of a successor	Yes	Yes
'External' social factors		
'Peer pressure' influences	Yes	Limited
Career opportunities outside agriculture	Yes	No
Bureaucracy/legislation	Yes	Yes
'Situational' factors		
Tenure	Yes	Limited
Availability of resources; labour/land etc.	Yes	Limited
Milk contract; supermarket aligned or not	N/A	Yes

The following sections provide further evidence and analysis of the factors identified in the table above.

2.11. DAIRY FARM PROFITABILITY - OVERALL

Most people would regard profitability as ***the*** key determinant of business change in the dairy sector. To some extent this is supported by the analysis as summarised above. However, the situation is less clear cut than might be expected. Firstly, some clarification of what is meant by profitability is required.

2.11.1. Profitability versus Profit

The terms profitability and profit often tend to be used interchangeably but in fact mean somewhat different things. Profit is a simple financial measure of revenues less costs over a defined period. Profitability is a wider concept measuring how efficiently a farm generates these profits or 'how much they make with what they've got'.

An illustration would be a business that made £1,000 profit for each of the last three years. In the first year the business environment might have been benign, but then it turned very difficult by year two (eg prices down, cost up). While the *profit* was the same in both years the *profitability* was better in year two because the same result was achieved in less favourable circumstances. Then, between years 2 and 3, the business doubled the investment it had made. Again, profits were unchanged, but profitability was poorer as it was failing to turn the

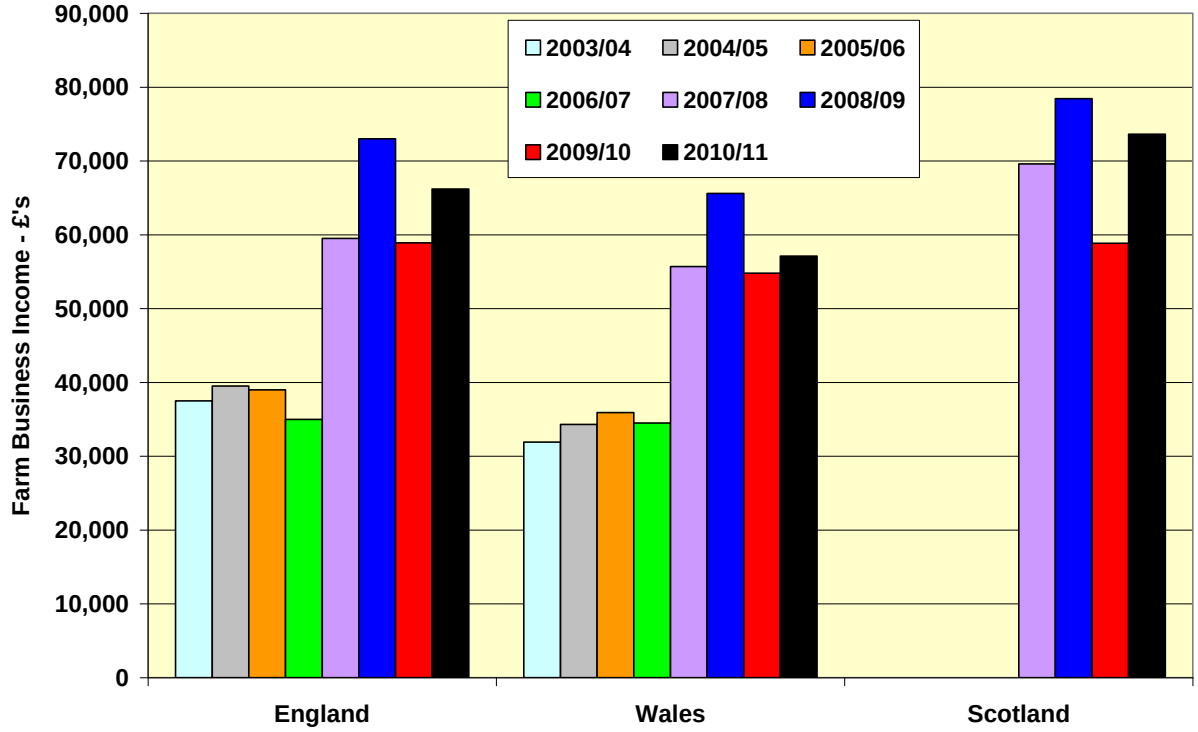
higher investment into better performance. In this example profit has remained unchanged while profitability has altered considerably.

As profitability is harder to measure than straight 'profit' it is the latter that is often looked at in analyses. This is done in the section below but a discussion of profitability is returned to later.

2.11.2. Profits

Whether farmers make a profit can simplistically be seen as a combination of incomes less costs. Figure 17 shows trends in profitability[4] over the last 9 years for dairy farms. It can be seen that, overall, profitability of farm businesses has improved over the years shown.

Figure 17: Dairy farm business income, England Scotland and Wales: 2003 to 2011



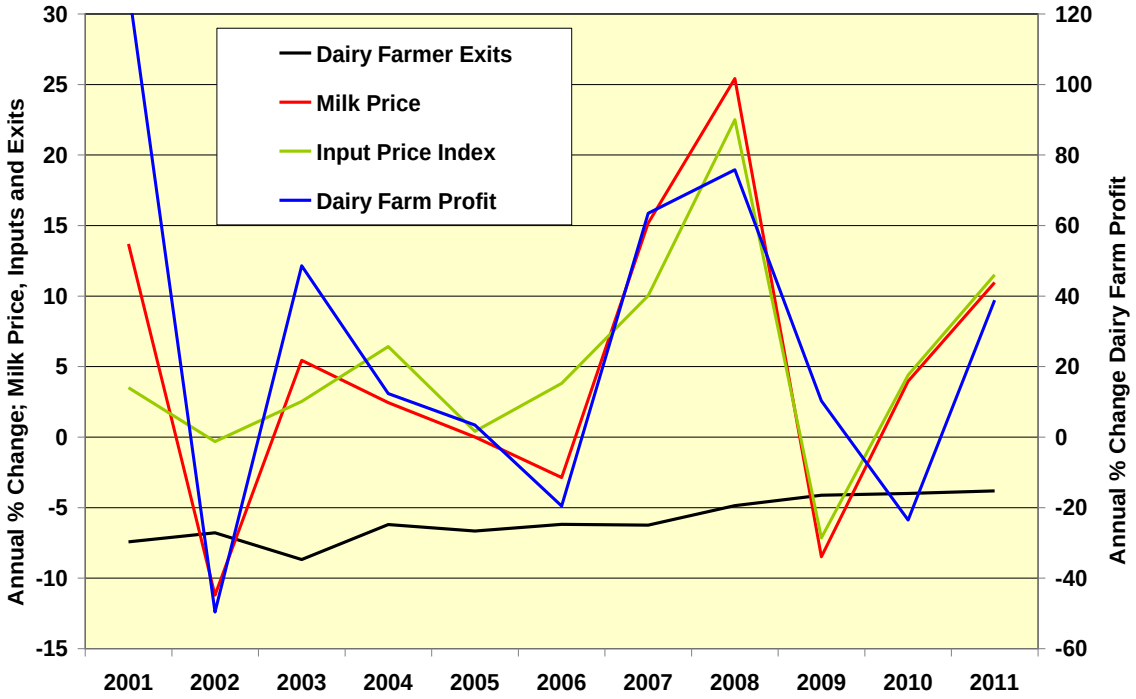
Source: Defra/Welsh Government/Scottish Government – *Note: England and Wales figures are in real terms at 2010/11 prices, Scotland data is at current prices. No FBI data for Scotland prior to 2007/08.*

It is interesting to note that despite the disparity in total milk production trends between regions outlined in section 2.4, the change in total dairy farm business profitability is relatively consistent between the three regions over the past four years. The difference in absolute values in profitability being representative of the relative size of enterprise (average herd size 2011; England 126, Wales 115, Scotland 153), rather than improved profitability per unit of production *per se.*

[4] *Although the FBS refers to 'Farm Business Income', this is actually a measure of 'profit' rather than income per se. It includes a return for all unpaid labour utilised in the business*

Classic economic theory suggests that in a perfectly competitive market, firms (farms) will continue producing as long as they cover their short-term variable costs. Figure 18 shows the annual % change in the number of dairy farmer exits against average dairy farm profitability (FBS annual data) and average milk and an input price index (Defra) from 2001 to 2011.

Figure 18: Annual % change in dairy farmer exits, milk price, input price and profit



Source: Defra – Farm Business Survey (FBS)

Firstly, it is evident that profitability fluctuates hugely - as depicted from the separate right side axis, by up to 80% year-on-year. As might be expected, profitability is also very closely correlated with both milk price and input prices (left side axis). Interestingly, milk price and input prices changes match very closely, especially in the last five years. Before this the periods with the most dramatic changes in dairy farm profits were when input price inflation has exceeded milk price or vice versa.

Dairy farmer exits show a relatively consistent decrease (ie the rate of decline in dairy producers is decreasing). However, in 2003 there appears to be a significant change in this trend correlated with a large decrease in dairy farm profitability in 2002. This suggests that a significant decrease in dairy farm profitability may increase the rate of decline in the subsequent period; as one would expect, according to economic theory. Conversely, it is also appears that the rate of dairy farmer exits slowed between 2007 and 2008 as profitability increased, this line has now levelled out somewhat following a decline in profitability in 2009. However, because this data is at an 'industry level average' it is not possible to draw robust conclusions from statistical testing (time-series data for a large consistent dataset of individual farms would be required), nevertheless, it is acceptable to hypothesise; that changes in profitability are only weakly associated with dairy farm exits.

Further justification for this is shown by the results of FBS intentions analysis results outlined in Appendix II, Table 1, indicating that while farms with a higher total profit level are more likely to have the intention to increase their production and *vice versa* it only represents a small proportion of the overall explanatory variation.

2.11.3. Influences on dairy farm profitability

Despite, the apparent correlation in Figure 18 of annual % change between both inputs and milk price with dairy farm profitability, statistical analysis of absolute values (as opposed to annual % change) shows the following effect on Net Farm Income (NFI = FBS measure of profitability).

Figure 19: Statistical output showing the interaction between; herd size, milk yield, milk price and input price

	Coefficients	Standard Error	t Stat	P-value	Significance
Intercept	-95667.3	42854.77	-2.23236	0.060759	
Ave herd size	213.1548	660.5282	0.322704	0.756345	NS
Average yield	2.660909	11.83613	0.224813	0.828547	NS
Milk price	6773.436	3078.795	2.200028	0.063728	*
Input price index	-461.582	712.8778	-0.64749	0.537962	NS

This gives the following equation for modelling Dairy Farm Profitability at an industry level:

NFI = -95667 + (213.2 x size) + (2.661 x yield) + (6773.4 x price) - (461.6 x Input.price)

This model explains 94% of the variation in NFI. However, perhaps surprisingly, only milk price is a significant variable suggesting that every 1ppl increase in the milk price would equate to a £6773.40 increase in average dairy farm profitability. This may initially appear in conflict with the recently published Milkbench+ report, which concluded that milk price was not the primary determinant of profitability. The difference is that the Milkbench+ analysis is for a large group of farms over a short time period (1 accounting period), ie all farms are exposed to the same market conditions and although there will be some variation between farms with regard to the milk price achieved, other management factors have a far greater role in explaining the variation in profitability between farms. However, the analysis above shows the variation in profitability for time series data (ie the last 10 years), at an average industry level. Thus, as would be expected, the variation in profitability as an average from year to year is significantly affected by the milk price. From this it is concluded that variation in milk prices have a significant impact on dairy farm profitability at an overall industry level but the ability of any individual farm to be profitable at any one time relative to their peers is not determined by milk price; but other management factors and total cost of production, as documented in the Milkbench+ report.

Equally, it could be hypothesised that the variation in profitability from year to year for individual farms is also significantly affected by milk price; ie assuming a farmer maintains the same system of production from year to year, any change in milk price achieved and indeed

input prices is likely to have a significant effect on that individual farms profitability relative to the previous year etc. No consistent historic data is currently available to test this in sufficient quantity but could no doubt be achieved using the Milkbench+ figures in the future.

Because the model explains profitability on a *whole farm basis* (as opposed to pence per litre or £/ha) both yield and herd size have a positive influence on farm profitability, as you would expect, ie the more milk produced the larger amount of total profit you would hope to achieve overall. Individually though, they are not significant parameters. Therefore, we cannot conclude on this analysis that higher yields or larger herd sizes lead to increased profits or efficiency on a ppl or per cow basis.

2.12. MILK PRICES

Most dairy farmers would state that the level of milk prices is the single biggest determinant of farm profitability. However, as discussed in the previous section, while milk prices clearly have an influence on the relative levels of profitability achievable over time, at any given point in time, milk price is not a significant determinant of profit differential between individual farms; i. certain farms are able to make a profit at lower prices than others dependant on management/systems etc. Therefore, it is perhaps unsurprising that the results in Table 1 of Appendix II shows no difference in milk price whatsoever between those intending to expand and 'others'. It is possible to hypothesise that fluctuations in milk price over time may have an effect at an individual farm level as it would appear to on an industry basis (above) but intentions data is only available for 1 year (2011) in the FBS dataset.

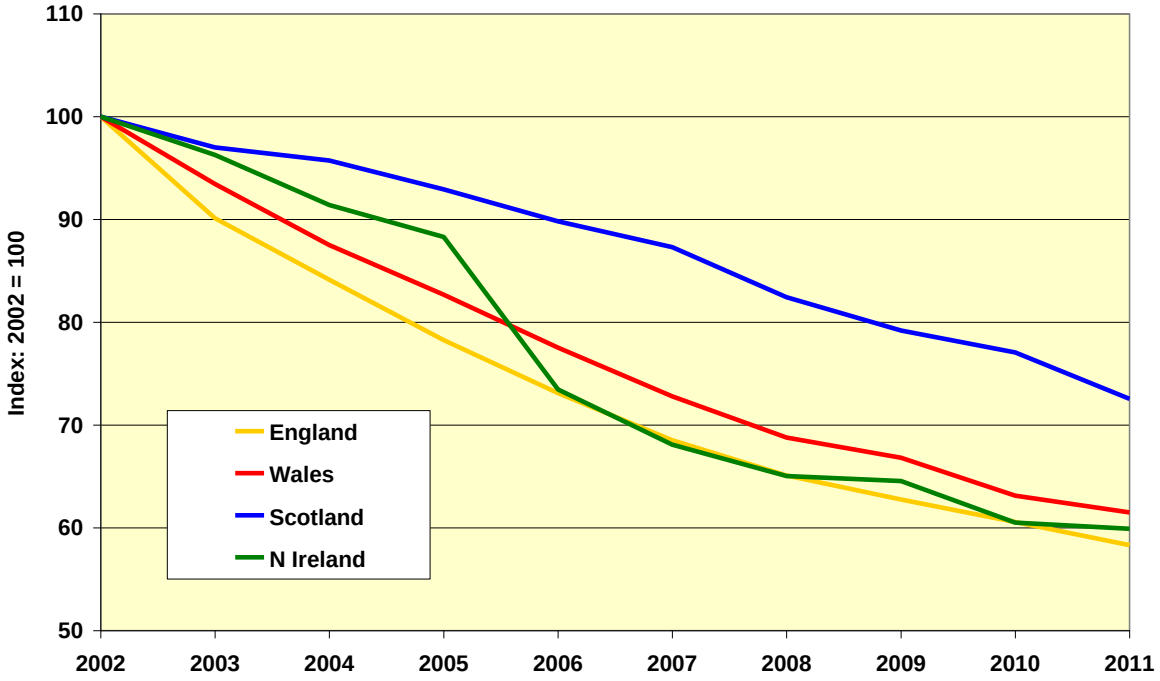
Looking at absolute values for milk price (as opposed to % annual change, in the previous section), it is interesting to revisit the price graph from Section 2.7 (Figure 14) showing the United Dairy Farmers auction prices in Northern Ireland relative to the GB average. As shown in Figure 6, milk production in Northern Ireland has increased overall but equally there is an apparent large effect of the milk price drop in 2009, resulting in significant decrease in production in Northern Ireland in 2010.

However, this significant decline in production is not matched by an equivalent increase in rate of dairy farmer exits for Northern Ireland (Figure 20), suggesting firstly that as outlined above, milk price variation is not entirely responsible for farmer exits rates and secondly that, farmers supplying an export orientated market may alter their use of inputs during periods of low prices resulting in a corresponding decrease in production levels.

Clearly, there is also disparity between both change in production and farmer exits (alongside increases in production) in both Scotland and Wales compared to England, despite there being no significant difference in milk price between the three regions, again reiterating the point that milk price is not singularly a driver of structural change alone.

Nevertheless, it is apparent that when questioned, producers frequently identify 'milk price' as the most important factor affecting their intentions as evidenced by both the FIS (influenced by relative milk prices at the time of the survey) and segmentation survey, examined in Section 4. Therefore, it would appear that the psychological effect of milk prices or more specifically milk price changes on individual producers' moods and consequently intentions is important. These intentions may not necessarily be translated into behaviour/action depending on the duration of the milk price level contributing to the intention

Figure 20: Change in dairy producer numbers since 2002



Source: DairyCo

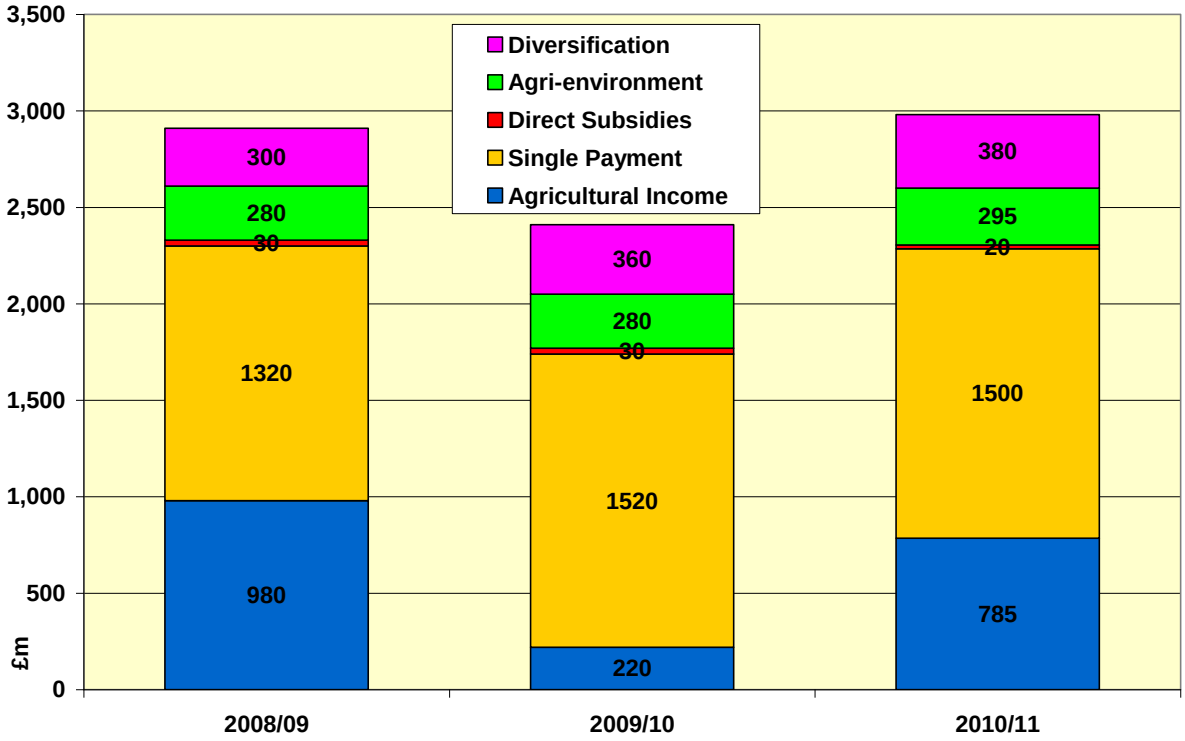
2.13. Cost Levels

As demonstrated in Figure 18, any changes in milk prices tend to be very closely matched by changes in input prices, suggesting that those producers with a lower intensity of input use and, indeed, a better ability to efficiently convert inputs into outputs, are better able to take advantage of any milk price increase and conversely withstand input cost rises. Although individual input cost are not available from the FBS dataset analysed, clearly there is a significant negative relationship between increasing farm variables costs and total profitability (Appendix II, Table 2). However, total cost levels had no effect on intentions to remain in the industry when analysed in the FBS dataset (Appendix II, Table 1).

2.14. Support Payments

One element that potentially distorts restructuring of the livestock sector is the relatively high support it enjoys. This is primarily through the Single Payment Scheme (SPS) but livestock farms also tend to receive significant amounts of Rural Development funding as well. Figure 21 shows where dairy farms derive their income (profit) from. It demonstrates the importance of support to dairy farms. The data is for England as no equivalent figures are available for Wales/Scotland. The situation in Wales and Scotland would be even more marked than that illustrated in Figure 21. England has moved to a regional payment system which has equalised payment rates between farms. With Wales and Scotland continuing with the 'historic' basis, support levels are far higher for beef farmers in particular (and to a lesser extent dairy and sheep producers).

Figure 21: Sources of farm income (England): 2008/09 to 2010/11



Source: Defra

As a result of the importance of subsidy payments illustrated above it is unsurprising that Single Farm Payment income is a significant positive variable for measures of business profitability in Appendix II, Table 2. Although it is not individually significant as a determinant of the intention to increase/decline production (see Table 1), those which intend to increase production are characterised by having a higher subsidy payment on average.

As previously highlighted, there is considerable discrepancy between the structural change (producer numbers, total milk production, cow numbers etc) between the four devolved regions of the UK and it has been suggested that this is a result of the difference in subsidy system between them as outlined above. In order to assess this it is worthwhile looking prior to the introduction the current subsidy system by looking at the milk production change since 2005. This can be seen in Figure 6 previously.

From that graph it becomes apparent that the increasing trend in milk production from Northern Ireland is significant. England, Wales and Scotland were all very consistent prior to 2000, before a clear divergence appears in 2001; however, this is prior to CAP reform and the introduction of the current 'decoupled' subsidy system in 2005. There appears to be no effect on the change in dairy farm numbers in Figure 14 for England, Wales and Scotland although there is a larger decrease in Northern Ireland in 2005.

If the distribution of support payments does have a direct affect, it is more likely to be psychologically, in terms of how different regions place different emphasis on production or the environment, for example and thus how farmers perceive their role and/or value as opposed to any direct economic effect.

One significant finding in England is that each additional pound of SFP per hectare increases Management and Investment Income (MII) by £4.04/ha, indicating that the return to SFP payments per hectare (ie on those farms receiving greater per hectare payments) leads to a greater than expected return to financial measures (see Appendix II, Table 3). This does have implications for profitability overall and consequential affect on structural change.

2.15. Other income sources (Farming and non-farming)

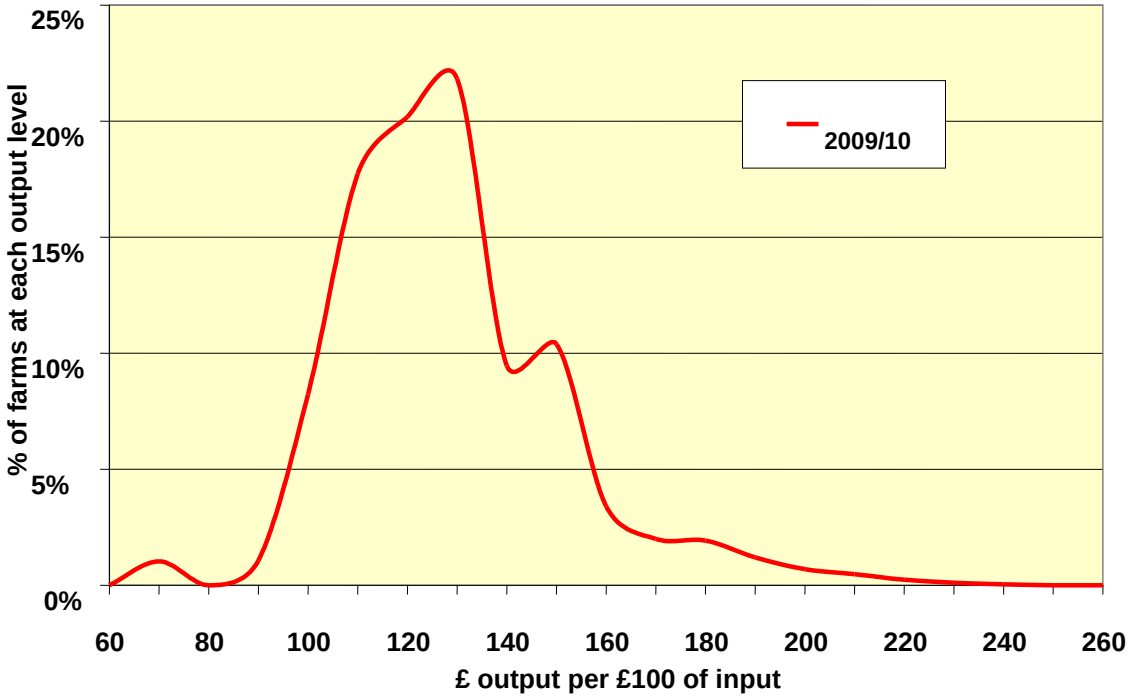
Non-dairy income is not significantly different as a determinant of the decision to expand production or decline (Appendix II, Table 1), although those which intend to increase production have a tendency towards higher values of non-dairy income overall. Added to this is the fact that non-dairy farm income contributes significantly towards total farm profitability. Although additional grazing livestock units (sheep/beef etc) have a negative effect on profitability, suggesting that benefit from non-dairy income is not coming from theses sources (therefore, most likely non-farming or arable) and supporting previous work which shows a higher level of specialisation to positively affect profitability.

2.16. Farm Performance/Efficiency

Looking at averages for a sector hides the differences in performance between farms. Figure 22 shows the relative performance of around 8,500 English dairy farms as calculated by the Farm Business Survey. Although the data relates to England (no comparable information is available for Wales), the results are likely to be equally relevant to Welsh dairying.

Obviously the £100 output for £100 of input is the business 'break-even' point. The vast majority of farms are to the right of this point – indicating a positive business return. However, it must be stated that these figures exclude unpaid labour from them (ie farmers and their families working on the farm). Therefore, the profits shown must provide a return to the managers' labour and capital invested.

Figure 22: Range in performance of English dairy farms: 2009/10 year



Although there are some anomalies, the underlying shape of the curve is the traditional 'bell shape'. Many dairy farms are clustered in the centre of the performance band, with some very poor and some very good producers. The point is that there is a very large range in performance – the worst producers were losing significant money in 2009/10 while the best dairy farmers were generating significant profits.

These figures are backed-up by DairyCo research. An analysis of figures from the Milkbench+ benchmarking system show significant differences in the net margins generated by all dairy farm types. A review of the difference between the top 10 farms and the bottom 10 farms under each production system identified differences in net margins ranging from 18.3ppl in forage-based systems to 14.4ppl for high-output systems. (For more details see - http://www.dairyco.org.uk/library/farming-info-centre/milkbenchplus/milkbenchplus-report-2012.aspx). These figures support the supposition in the previous section that the efficiency of input use is a significant determinant of competitiveness within the industry but this again is not an exclusive determinant of structural change:

Results from the statistical analysis in Appendix II, Table 1 do show a tendency towards higher percentile performance rank for those intending to expand compared to those who don't (51.25 v 46.36). However, this is not at all statistically significant, suggesting that many producers who are not necessarily in a high 'economic performance' category are still intending to expand and grow their business, ultimately aiming for better economic performance in the future.

2.17. Net Worth and Return on Capital

Similarly to previous results, although there is a tendency for those planning to expand to have a higher net worth this is not statistically significant as a determinant of intentions (Appendix II, Table 1).

Return on capital is not readily available for analysis in any of the available economic datasets and not widely used as a performance parameter in the UK. However, some studies elsewhere have shown an interaction between improved returns on capital and business prospects. This factor may benefit from closer attention in future.

2.18. Business Structure, Yield, Herd/Farm Size and Labour Use.

Both higher yields and a higher number of unpaid labour units (family labour) were observed to be significantly different for those intending to expand, as opposed to those who are not (Appendix II, Table 1). Herd size and indeed farmed area while being higher on average for those expanding, it was not significantly different to those looking to exit or decline. The effect of yield on profitability will be discussed later in relation to herd size. The observation of a higher number of family labour units in those expanding may well be driven by the need to create sufficient profit to accommodate additional family labour.

2.19. 'Social' Factors

2.19.1. Age

Possibly the most surprising finding of the FBS intentions survey is the lack of any significant difference in age between those intending to expand and 'others', especially in comparison to previously published research. However, most of this research has applied to the intention to exit or not and although this was examined in this case, the low number of observations for those that intend to exit (despite being representative as a proportion of the industry as a whole), may have contributed to the low statistical significance. An element of non-random sampling (outlined in 'Data limitations' section) may have also contributed to this outcome.

The FIS does show some influence of age category on intentions, with those 50 and over more likely to be exiting the industry, nevertheless, the proportion intending to expand, shows only a minor effect of age demographic, suggesting presence of a successor (below) may be more significant. Analysis of FBS data did show a negative economic effect of age with overall farm profitability decreasing by £6.81 for every additional year of age (Appendix II, Table 2).

There was also an effect of different age segments with regard to their prospects for the future and behavioural categorisation, which will be discussed later (Chapter 4). Nevertheless, the fact that there is lower age differential than perhaps expected in the examined intentions, suggest motivation to grow and expand is not simply the preserve of the young. An additional caveat is that while age category examined represents the principle person responsible for the business, it does not necessarily represent the age of the 'driving-force' in the business, ie there may a young successor already working in the business for example.

2.19.2. Education and alternative careers

There is a tendency towards those who are intending to expand having a higher proportion of college/university qualifications than those who will exit/decline/stagnate. No data is available to effectively analyse how higher educational qualifications increase the likelihood of employment outside of agriculture or not. Nevertheless, none of the producers questioned for the FIS cite 'to pursue a career outside of agriculture' as a reason for exiting the industry. Thus, it can be accepted that this is not a significant factor

2.19.3. Succession and the desire to pass the business on.

From the background research and evaluation with other comparable evidence, the presence of a successor (family or not) to provide continuation to the business is a very import factor in determining famer exits at an individual level and consequently industry level of restructuring. A lack of new entrants and family members wanting to carry on in the industry is postulated to be a significant reason in the decline in the number of dairy farmers (as well as other sectors). Succession of some type (family or otherwise) is imperative to ensure business continuity. However, there is an absence of historical data on the specific reasons of individuals for exiting the industry to analyse how important this is, in the absence of this, FIS data shows that those farms which already have a successor in place are far more likely (73% v 27%) to be intending to increase production. Conversely, those without a successor are far more likely to be intending to exit the industry. Furthermore, farms with a successor in place are more likely to have higher levels of milk output, currently compared to those who don't. The FBS intentions question asks whether the respondent is planning to hand over to a successor within the next '12 months' (Appendix II). As per a priori expectation, the figure shows a higher proportion for those intending to grow compared to those who do not, however, the total number of observations was too low for statistical analysis to be undertaken. This will be as a result of the fact that it excludes any respondents with a successor but likely to take over beyond the next 12 months.

The DairyCo segmentation survey asks the question of priority in relation to the desire 'to build healthy sustainable business to pass onto the next generation' (further examined in the following section), however, this does not exclusively suggest the presence of successor or not or indeed whether the potential successor will have a desire to 'take-over'. As expected, farmers which rank the above statement as there number one priority, are more positive about the prospects for their own farm and the dairy industry as a whole than the average but it is difficult to say whether one is a function of the other, equally while a respondent may iterate the desire to pass on 'a sustainable dairy business to the next generation' it is by no means unequivocal that this will actually happen. Additionally, it is also possible that while there may be a potential successor, that person may not wish to carry on in the dairy sector specifically, but in other agriculture sectors.

2.19.4. Tenure

No difference of tenure type was observed from the FBS data with regard to intentions; however, the FIS shows that while there is no effect of tenure on production intentions, there is a significantly higher proportion with a successor in place for those that are owner-occupiers

compared to tenants. This may indicate that the uncertainty involved with being a tenant farmer or the need to pay a rental thus reducing profitability, is discouraging the next generation.

3. INDUSTRY SEGMENTATION

3.1. PREVIOUS STUDIES

There have been numerous academic studies on farmer behaviour both in the UK and abroad. This is a recognition that farmer decision-making is driven not simply by economic pressures – the concept of the *homo economicus* in which individuals act purely on the basis of rational monetary based self-interest does not adequately explain real-world behaviour. Farmer decision-making is not simply driven by economic pressures.

Attitudinal differences between business owners will affect both how various economic factors influence them and how they manage the business independently of economic factors. Attitudes and behaviours change according to life-stage, interactions with partners/successors within the business and the influence of social peers outside the business. A summary of behavioural economics and factors affecting beliefs, attitudes and intentions are presented in Appendix III.

It is not intended to provide a full review of previous studies in this report. This has been done admirably in a study undertaken by Wilson, Harpur and Darling for the Farm Business Survey (FBS) and published by the University of Nottingham under the title '*Analysis of Farmer Segmentation across Farms Contributing to the Farm Business Survey: A Pilot Study*' (see http://www.fbspartnership.co.uk/documents/Analysis_of_Farmer_Segmentation_Research_within_the_Farm_Business_Survey.pdf).

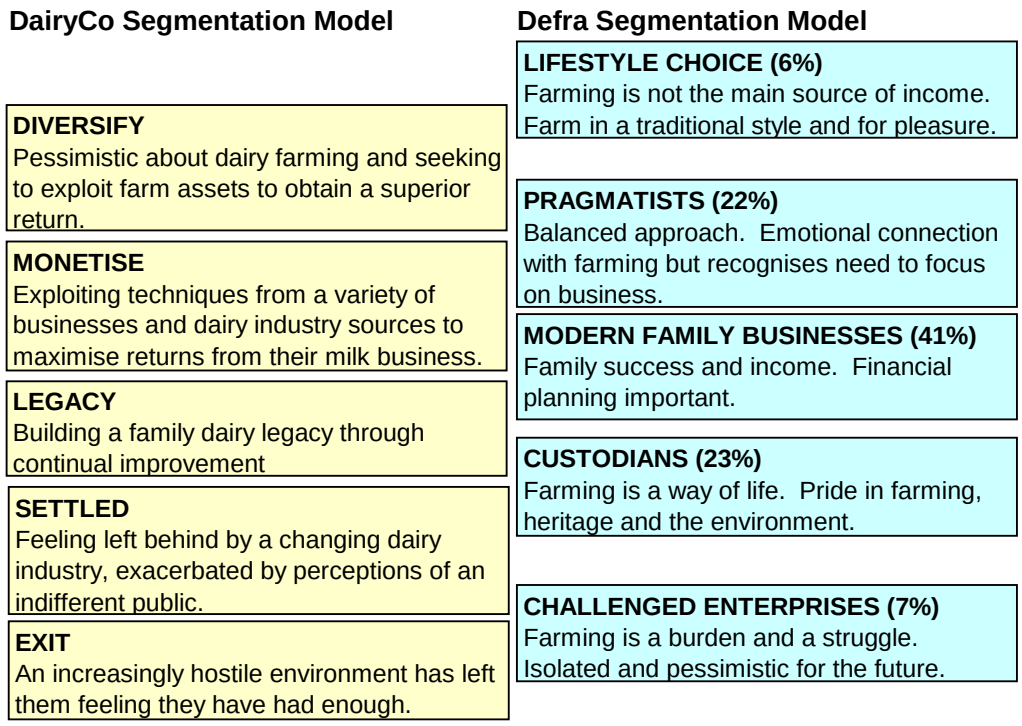
This work looked to integrate previous work undertaken on farmer segmentation by Defra with the financial and physical data collected by the FBS. It uses five farmer categories as developed under the Defra 'Observatory' programme in 2008. (For details see http://archive.defra.gov.uk/evidence/statistics/foodfarm/enviro/observatory/research/documents/ACEO%20Behaviours%20Discussion%20Paper%20(new%20links).pdf). This Defra work built in turn on an earlier study by Garforth and Rehman for the University of Reading looking specifically at farmer behaviours in relation to CAP reform (http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/Behaviour.pdf).

DairyCo has also undertaken preliminary work in this area. It has produced a segmentation model based on analysis of data from dairy farmers.

As the DairyCo analysis was looking at a different population (dairy farmers in Great Britain against all farmers in England, the segmentation exercises do not result in exactly corresponding categories. In any case, this would be expected as there is a degree of subjectivity within any such characterisation. It is explicitly recognised in the FBS/Defra work that, at the margins of categories there are 'grey areas' where a particular farm might fit into multiple categories (or none).

Figure 23 attempts to graphically compare the DairyCo and Defra/FBS segmentation models. In some cases the categories overlap with, for example, a Defra category comprising elements of more than one DairyCo grouping.

Figure 23: Comparison of segmentation analysis



Source: DairyCo/Defra/Andersons – *Note: Percentage in brackets denote the proportion of the total population that falls into each category.*

Despite the differences, there are also some strong similarities between the results of the two models. Common themes include groups of farmers who are focused on profit, others for whom continuity is important and some who are likely to fail in the longer-term.

One point to note is that, a previous study (Wilson *et al,* 2012) analysing the Defra segmentation model has shown that in relation to other agricultural sectors (arable, beef etc) dairy enterprises are more likely to associate themselves with either 'modern family businesses' or 'challenged enterprises', suggesting there is considerable divergence between the different sectors in terms of behaviours.

3.2. VALUES BASED BEHAVIOURAL SEGMENTATION

Figure 24 presents a summary of the different segments in the DairyCo Segmentation study; their physical characteristics, confidence and the factors most likely to affect their decision making.

Figure 24: DairyCo segmentation model summary results

Segment	Physical characteristics	Confidence in future	Factors important in driving structural change
Legacy	Similar to overall sample average; slightly larger herd sizes and slightly younger age.	The most optimistic segment for the dairy industry and their 'own farm'.	The milk price is by far the biggest obstacle to achieving their goals and thus, likely to have most effect on their decision-making and any structural change.
Monetise	Younger with larger herd sizes than the average, more likely to be specialist dairy producers. Frequent internet users.	Relatively confident in both their 'own farm' and the dairy industry.	Again milk price is very important, along with input costs and land availability. Supermarket power is viewed as a significant obstacle compared to the sample average.
Settled	Lower herd size and older than the average. More mixed enterprises and less internet use.	Predominantly neutral; slightly lower confidence overall than the average.	Milk price still the biggest factor but bureaucracy is also viewed as an important obstacle, as well as access to labour.
Diversify	Smaller herds, largely in the 'middle age' segment. More mixed enterprises.	Very low confidence in the dairy industry but slightly higher for their 'own farm'.	Access to capital is by far the largest factor, followed by bureaucracy. Whereas milk price is not at all significant.
Exit	Older than the average with lower herd sizes. Very low internet use.	Extremely pessimistic in both the dairy industry and their 'own farm'.	The most important obstacles to achieving their goals are 'animal/health and welfare', 'nothing' and knowing what to do next, suggesting this segment has already decided to exit the industry. Milk price, bovine TB and regulation of costs may have been important factors driving this decision as these are cited as areas for DairyCo action.

By far the most important factor likely to affect producers' decision making and structural change evidenced by this segmentation study is the milk price. This is evidenced by the fact that all segments, except the 'diversify' segment, have cited it as the most important obstacle to achieving their goals; it is also seen as the biggest threat to all segments. Input costs are also a significant obstacle and threat throughout the analysis. However, while both these 'headline variables' are assessed as very important, 'profitability' is not, with less than 5% (compared to 33% milk price) of the total sample citing it as the most important obstacle to achieving their goals.

There are several possible implications of this; firstly either producers simply do not rank profitability as very important to them or perhaps do not have a good knowledge of their relative profitability. Or secondly, perhaps by citing the two main variables of milk price and input cost they feel this represents the most significant determinant of their sustainability (profitability) and therefore do not cite it separately as an important factor. Whatever the reasoning, it cannot be ignored that, when asked, milk price is viewed by producers as the most important factor affecting their decision making and subsequently structural change. Input costs, bureaucracy, supermarket power, land and labour availability, as well as animal health and welfare issues such as bovine TB also have a significant impact at different levels according to segment.

3.3. Results of Segmentation; Age Effect

In order to gain a greater understanding of how different age categories affect decision making, data from the DairyCo Segmentation Study was analysed in relation to age segment (full results in Appendix IV). When asked to identify their 'number one priority', there is a significant difference in response against age group. In particular, younger farmers (under 40 years of age) demonstrate lower proportions who wish to leave dairying and additionally a greater proportion who wish to maximise financial returns by exploiting technology/finding new ways of working or expanding the business. The oldest group (60 years +) demonstrate a higher percentage that wish to leave dairy, albeit 24% of this age group are seeking to maximise returns as their number one priority.

There is also a significant difference across the age groups with respect to their ranking of prospects for their own farm (1 = poor prospects, 5 = very good prospects), with farmers over 50 more likely to cite scores of one or two than farmers under 50 years old. Additionally, those under 40 years of age are more positive about the future for their own farm, with 64% of this age group citing scores of 4 or 5.

Analysis of prospects for the entire dairy industry (as opposed to their own farm) against age groupings follows a very similar pattern; producers of 50 years and over are more likely to display lower prospect rankings than those less than 50 years of age. It is informative to note that the rankings for 'prospects for your own farm' ranks more positively than prospects for the dairy industry. This seems to suggest that individuals believe they can outperform the 'average'.

There is no significant correlation between herd size and producer age.

Producer rankings of prospects for both the industry and their own farm has a significant effect on their desire to either 'exit' or 'remain' in the industry and indeed whether to 'remain' or 'grow'.

Analysis was also undertaken as to whether the presence of a supermarket contract had an effect on behaviour. There is a significant difference across the supermarket aligned groups with respect to their ranking of prospects for their own farm, with farmers on aligned contracts more frequently citing scores of four or five than farmers who are operating without a supermarket aligned contract.

It is perhaps unsurprising to note that while a significant relationship was found with respect to presence or absence of a supermarket contract for prospects for own farm, no significant relationship is observed with respect to prospects for the dairy industry as a whole.

On the whole it is pleasing to note that younger producers are predominantly positive with regard to the future and their intentions for developing their businesses. However, it is not clear as to whether the evolution towards lower confidence with increasing age is simply a result of inherent psychological factors associated with aging and life stage, ie resistance to change and pessimism or whether this is a result of other factors/problems specific to the dairy sector.

3.4. SEGMENTATION BY HERD SIZE

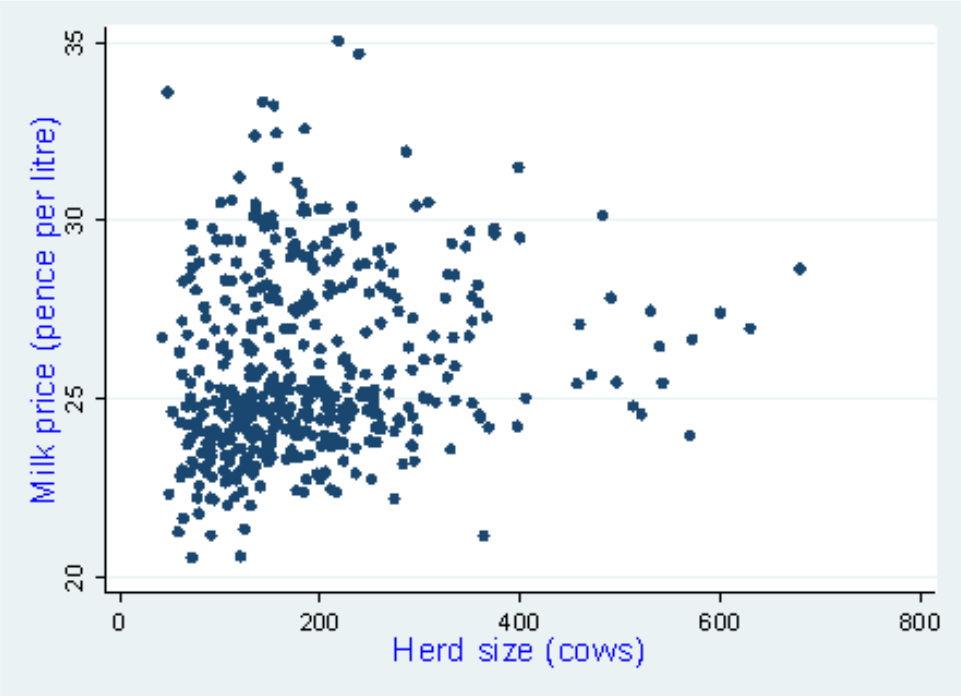
Although farm size is only a crude way of segmenting the dairy farm population, it was considered a worthwhile approach as there has been much discussion in recent times around the issue of whether the trend towards more large farms drives smaller units out of business.

Larger dairy units can only directly affect the viability of smaller ones by changing the market environment in which the smaller producers operate. This might be through increasing milk output and thus creating excess supply which forces farmgate prices down or by reducing available outlets for smaller farms to sell their milk. Also, if larger producers have fundamentally lower costs of production, milk prices may find equilibrium based on these lower costs, rather than those of smaller producers

3.4.1. Herd Size and Milk Price

On analysing the data there is no correlation between increasing average herd size in Great Britain and the average milk price. It would be unlikely to see a relationship between the two factors with milk price far more influenced by supply and demand at both a national, EU and global basis, as well as exchange rates and other macroeconomic factors. However, although the overall average price may not be influenced by farm size, it is possible that in certain markets (particularly liquid), larger herds are able to achieve a higher price through favourable volume bonuses, potentially increasing profitability and the ability to invest and/or expand (achieving a competitive advantage in terms of cost). However, analysis of Milkbench+ figures clearly shows there is no significant relationship between herd size and milk price, as shown by Figure 25.

Figure 25: Herd size and milk price



Source: DairyCo Milkbench+ analysis (unpublished)

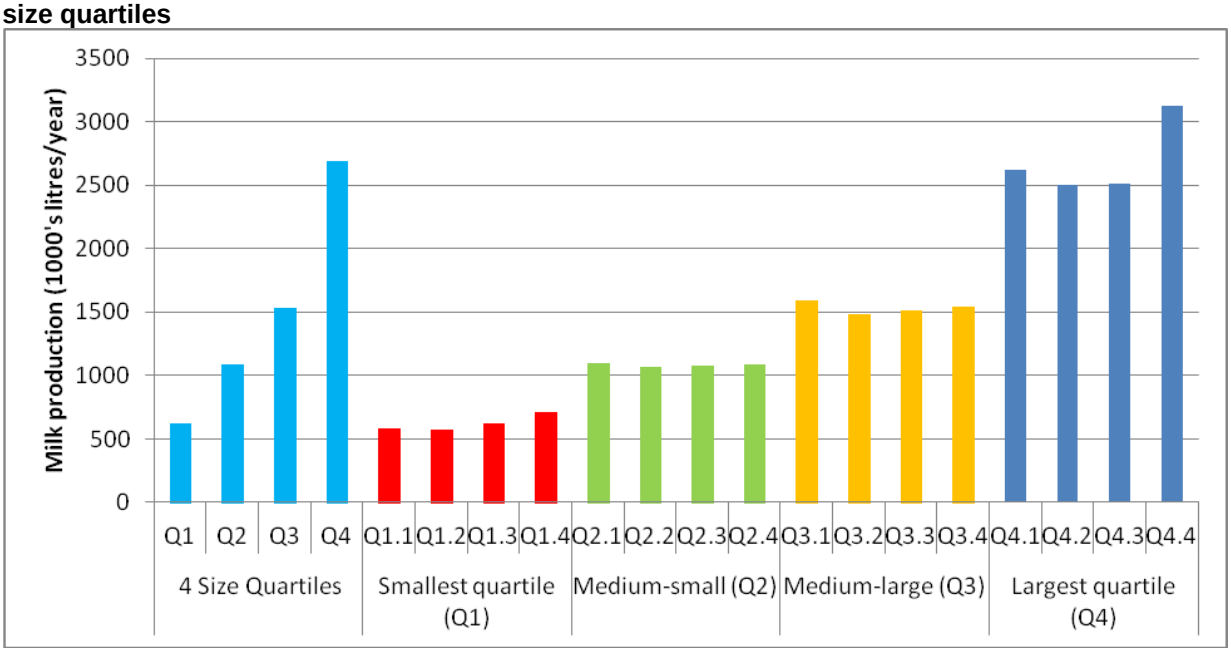
This demonstrates that other factors are far more significant than herd size in influencing milk price; namely milk constituents, hygiene, seasonality and type of milk contract.

3.4.2. Herd Size and Efficiency

While large herds do not, on average, achieve a higher milk price, it may be that that they are more efficient and have lower costs per litre of milk produced, providing improved profitability. In this way they would be more sustainable at a lower milk price than smaller businesses with higher costs. Additionally, while larger herds may not achieve a higher price they may be better able to attract a milk contract in certain areas, by offering the advantages in logistics of more milk per collection and lower transport costs.

The following two figures attempt to analyse the relationship between dairy farm size and enterprise profitability in more detail using the comprehensive data from Milkbench+. Firstly, the data was split into four size quartiles (based on volume of annual milk production) from a total 464 observations. Secondly each size quartile was further subdivided into four performance quartiles ranked on dairy net margin (profit). Figure 26 shows the average size of the four size quartiles on the left, with the average size of each performance quartile within it. The size of the largest performance quartile (c. 2.65 million litres) is over four times the size of the smallest (c.600,000 litres). Within each size quartile there is not a significant difference in annual milk volume between performance quartiles. An exception is the 4th size quartile which has the biggest variation in size between differently performing farms, with a larger average size in the highest performance quartile. This will account for some of the increase in economic performance at an enterprise level.

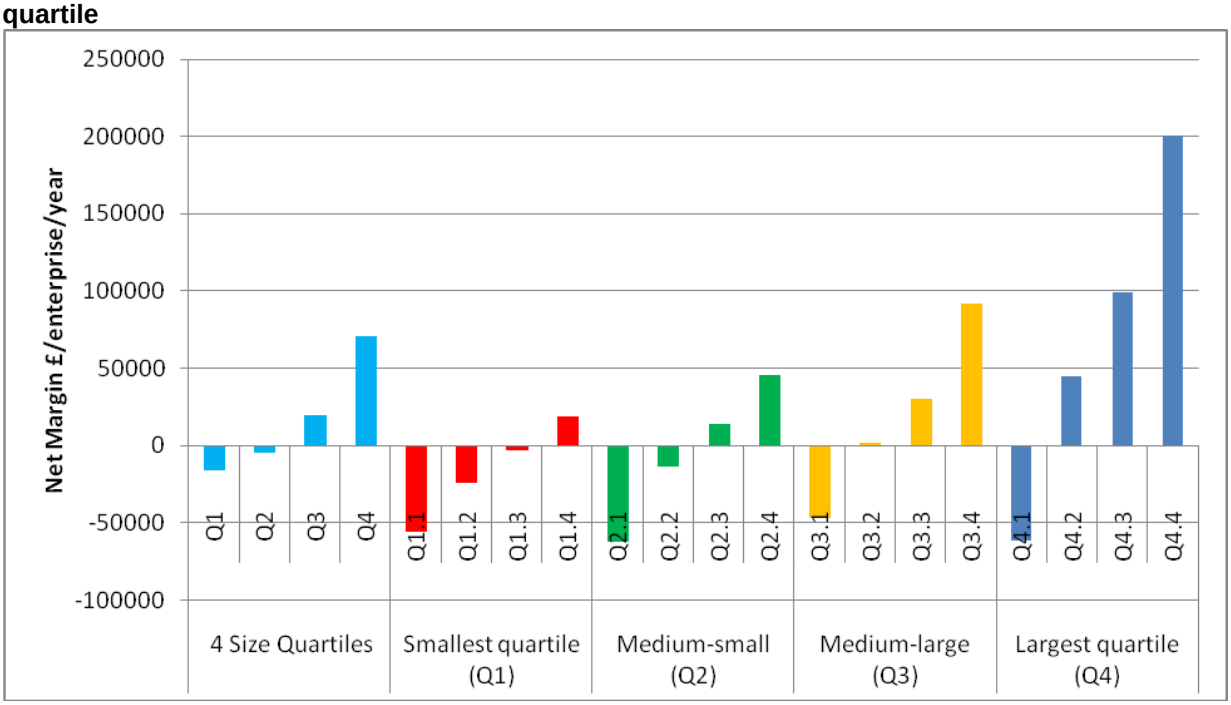
Figure 26: Variation in milk production between size quartiles and ranked by net margin wWithin size quartiles



Source: DairyCo Milkbench+

Figure 27 shows the variation in profitability of each size quartile and each performance quartile within it. Increasing herd size is associated with increasing overall profitability, the biggest jump being between quartiles 3 and 4. However, the performance of the lowest performing quartile in each size quartile is seemingly consistent across the observations. This suggests that, while increasing annual volume of output may enable higher profitability to be achieved, management will determine whether this is achieved or not.

Figure 27: Relationship between farm size and total dairy net margin ranked by performance quartile



Source: DairyCo Milkbench+

Analysis was undertaken of some key performance indicators behind the overall farm profit figures shown in Figure 28.

Figure 28: Performance parameters of size quartiles ranked by net margin.

Size quartile	Ave herd size	Ave feed and forage kg DM/l	Labour hrs/cow/yr	% share of family labour	Yield per cow (litres/year)	Net margin (ppl)
Smallest quartile						
Q 1.1	90	0.83	51.4	81	6490	-10.3
Q 1.2	88	0.76	45	84	6573	-4.9
Q 1.3	91	0.72	42.9	78	6842	-0.5
Q 1.4	104	0.64	36.7	76	7081	2.7
Medium-small						
Q 2.1	154	0.85	36.9	58	7606	-5.6
Q 2.2	143	0.76	34.3	58	7635	-1.2
Q 2.3	145	0.71	33.6	55	7714	1.3
Q 2.4	163	0.63	24.7	53	7014	4.2
Medium large						
Q 3.1	194	0.77	33.7	37	8359	-2.9
Q 3.2	182	0.78	33.5	36	8251	0.1
Q 3.3	204	0.72	28.1	47	7736	2
Q 3.4	210	0.61	24.9	38	7718	5.9
Large						
Q 4.1	311	0.81	32	28	8508	-2.3
Q 4.2	298	0.77	29.6	30	8525	2
Q 4.3	299	0.72	26.2	36	8647	4.2
Q 4.4	431	0.64	21.7	24	7700	6.7

A striking factor when looking at the 'competitiveness' of these farms segmented by size is the similarity across the *size quartiles* when comparing the performance parameters between the *economic quartiles*; ie whatever the size of the farm the better economically performing farms all use less labour per cow on average and feed less per litre; basically they are more efficient at what they do compared to others of a similar size.

With regard to feed efficiency there is very little difference at all between size quartiles, suggesting this is simply a factor of management. However, average labour hours per cow do decrease overall with size demonstrating that larger farms are able to achieve better labour efficiency; no doubt interacting with level of mechanisation and system operated.

As is to be expected the larger farms tend to have a lower % of family labour. What is perhaps interesting is the fact that in the two smaller size quartiles the higher economic performing farms have lower % family labour shares than those with lower profitability. Whereas the two larger size quartiles show a slightly different trend; while Q3.4 and Q4.4 still have a lower or average family labour level compared within the size quartile, Q3.3 and Q4.3 both show a significantly larger share of % family labour. The likely implications are that larger farms are more reliant on employed labour and thus more exposed to variation in the labour market both

in terms of availability of appropriate skills and costs. There is a suggestion that family labour can be an important beneficial input even at larger levels of output and this may be linked to finding the appropriate employed staff or not.

Most interesting perhaps is the relationship between average yield and economic quartile; the smallest herds showing a positive relationship between yield and farm net margin and increasing across the 4 performance quartiles. However, for the 3 remaining size quartiles the relationship is very different. In these, the average yield of the highest economic quartile significantly, less than that of the lowest economic quartile.

Firstly, this suggests that average yield per cow is only a significant factor for the smallest herd sizes in relation to farm net margin. This may be explained by the need to spread 'fixed' cost over more litres with a lower herd size because 'fixed' cost do not increase proportionally with cow numbers. For example, all herds require a milking parlour of sorts but a parlour capable of milking 200 cows does not necessarily cost twice as much as a parlour to milk 100 cows. Larger herds, however, exhibit a less straightforward relationship, suggesting that yield level needs to be examined in relation to inputs and where additional costs are incurred (predominantly variable; feed, etc. but also 'so-called fixed' cost such as feeding/housing infrastructure etc). Targeting increased yield alone will not necessarily result in automatically increased profit.

4. FUTURE INDUSTRY DEVELOPMENTS

4.1. SCENARIO ANALYSIS

4.1.1. Background

Chapter 2 illustrated the long-term changes in dairy farmer numbers in Great Britain. The following Chapters then looked at some of the drivers of these changes and how different factors affect different types of businesses. Although some of the factors are internal to the individual business involved, a number are a function of the wider environment in which dairy businesses are operating.

By definition, no broad conclusions can be drawn about the internal factors as they are business specific. However, by looking at some scenarios for the wider industry, it is possible to consider how certain ones may affect the pace of industry restructuring and farmer exits and what 'type' of businesses may be most affected by these.

Many of the arguments around larger farms assume the GB milk market is static. The assumption is that extra output from a large farm must, by definition, displace a number of smaller producers. With market constraints (such as quotas) this hypothesis may be true, but could be questioned in the current market. The milk market is actually dynamic and four plausible scenarios have been selected for analysis. The scenarios are;

- Abolition of quotas
- Increased GB participation in EU and world markets
- Increase in GB processing capacity
- Decrease in GB processing capacity.

Within all of the scenarios modelled above, it was assumed that the demand for milk and milk products within the domestic market will remain unchanged. Thus, the focus will be on changing trade flows of milk products.

This is by no means a complete list of scenarios and many others could have been considered. The Dairy 2020 report considers some of these issues in more detail.

4.1.2. Other scenarios

The list of possible future developments in the GB dairy sector is almost infinite. The four have been chosen as it is believed that they are plausible and will have an effect on the pace of industry change. Various other factors will influence the environment in which GB dairy farmers are operating. These include;

- Retailer/processor consolidation and balance of power in the dairy supply chain (including any effects of the Supermarkets Adjudicator)
- Developments in milk contracts
- Consumer trends, including economic outlook and new product development
- Global demand for dairy products

- Exchange rates
- CAP reform
- Speed of evolution in dairy farm production systems.

4.2. ABOLITION OF QUOTAS

4.2.1. Scenario description

Milk quotas were introduced in 1984 in order to curb the overproduction of milk in the European Union. It is proposed by the EU Commission that milk quotas in the EU will end on the 31 March 2015. Although there remains opposition to the removal of supply controls in some Member States, it seems likely that this policy will be implemented. As part of the plans for a 'soft landing' for the EU milk market after quota abolition, the CAP Health Check agreed that all quota allocations would be increased by 1% per year for 5 years starting at the end of the 2008/09 milk quota year.

By allocating extra quota, the idea is that there is so much in the system that quota eventually becomes meaningless in terms of a supply limit. To some extent this has already occurred. For the 2010/11 milk quota year only five countries out of the EU-27 went over quota – Denmark, the Netherlands, Austria, Cyprus and Luxembourg.

Whether countries are producing beyond quota is perhaps not the best test of the current impact of the quota regime, as the optimal position for producers and Member States is to produce just below their threshold. Interestingly, 14 Member States recorded deliveries at least 10% below their quota and overall EU production was 6% below the total EU quotas. This shows that quota is no longer the restrictive factor it once was – at least in many parts of the EU dairy industry. The UK was 12% below its national quota for the 2010/11 year.

With this background, it might be thought that the abolition of quotas would have little effect. However, some of the nations with large dairy industries are above quota (Denmark, Netherlands). Others are close to the quota limit, France was -5.1% but Germany was -0.7%. Our closest competitor, Ireland, was only 0.4% below national quota in 2010/11. Quotas are an artificial constraint on production. With their abolition, output across Europe should rise. In line with economic theory, greater output will lead to lower prices. While lower prices will, in turn, create greater demand, the market equilibrium is likely to settle at a lower price level. Overall, the abolition of quotas is expected to see milk output increase in Europe. This scenario has been the focus of a variety of economic modelling work in recent years.

4.2.2. Market effects and EU and UK

The European Commission financed a study by the *Institut d'Economie Industrielle* in Toulouse called *Economic Analysis of the Effects of the Expiry of the EU Milk Quota System*, which was published in spring 2008. (This can be found via http://ec.europa.eu/agriculture/analysis/external/milk/index_en.htm).

This study forecasts that with the removal of quotas, EU milk production would increase by 5.0% with a corresponding 10.3% decrease in the farm milk price by 2015/16. *However, this fall in the milk price is from the 'baseline' scenario which foresees milk*

prices increasing by around 1% per year from 2008/09. This would indicate a reduction of around 6% from today's 2012/13 values.

Like all models, the outputs depend on how the model is constructed and the variables used. A number of other studies have also attempted to model the end of milk quotas;

- A previous study using the same model as above forecast 12% production growth and a 40% decline in the EU milk price by 2015 relative to 2000. This study can be found at http://ec.europa.eu/agriculture/publi/reports/milkquota/inrawag_en.pdf. It was published in June 2002 so is now somewhat historic. *The reason that the price fall shown is so large is that it was undertaken before the recent global increases in milk prices*
- A study published in the EuroChoices Journal in May 2006 (see http://onlinelibrary.wiley.com/doi/10.1111/j.1746-692X.2006.00023.x/abstract;jsessionid=A963DFCD49904B87C31F12FCF51580E4.d02t02) concluded that production would increase by 3% and prices decline by 22%
- An analysis for Teagasc in Ireland undertaken in 2007 (see http://www.tnet.teagasc.ie/fapri/downloads/pubs2007/outlook2007/FAPRI-IRELAND_Milk_Quota_Sceanrio_2007.PDF) forecast that milk production would rise in the EU by 4% but there would only be a 7% decrease in milk prices.

The more recent studies tend to have a smaller milk price decrease. This is largely due to the better world market situation that has existed since 2007. This allows the additional EU milk production generated by quota removal to be sold on world markets rather than be sold at intervention values.

A recent report by Rabobank ('*Global Dairy Outlook: Show Me the Money*'), published in early 2012, forecasts that the global dairy market will expand at 2.4% per year over the next five years. However, the growth will be highly skewed to emerging markets, with countries like China, India and South East Asia expected to account for more than 80% of market volume growth, while western markets continue to mature. For the EU this means an increasing focus on export markets.

The GB price effect of quota abolition will operate via the single European market for manufactured milk products. British farmers are unlikely to increase output simply because quota is removed. Figure 29 shows the percentage difference between output and quota for the last ten years. Although the UK (and thus GB) was near quota at the start of this period, in recent years it has been some way away from the limit. If it was economically rational to increase production, GB farmers could have already done it without concern about quota.

Figure 29: Milk production against quota: 2001-2011

Year	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
% Difference	*-0.5%*	*-0.8%*	*0.2%*	*-1.0%*	*-1.9%*	*-3.0%*	*-5.3%*	*-9.9%*	*-12.1%*	*-9.7%*

Source: RPA

However, some EU Member States with large dairy industries are still above quota (eg Denmark, Netherlands). Ireland was only 0.4% below national quota in 2010/11 and has a national target for a 50% increase in milk production by 2020. This would see a growth in milk deliveries from an average of 5.1 billion litres over the 2007 to 2009 period, to 7.7

billion litres in 2020. Even if these plans are not fully realised, it can be seen that total milk output in the EU is likely to increase.

Output increases and price falls will impact on GB prices through the commodity milk market. It may be argued that parts of the GB milk sector such as liquid milk and high valued-added products are separate from this commodity market. Evidence shows that this is not the case (see recent DairyCo study – 'Asymmetric Price Transmission in Dairy Supply Chains' see – http://www.dairyco.org.uk/resources-library/market-information/apt-reports/apt-report-2011/). Because milk is 'substitutable' price changes for commodity milk products spill over into other markets. For example, if the value of raw milk for manufacturing products exceeds the 'liquid' price, supply will move into this market. Liquid buyers would have to raise prices to secure supply.

4.2.3. Effects on GB producers

There may be some residual fear of overproduction and superlevy and thus the removal of quotas may encourage more progressive producers ('Maximise Returns' or 'Legacy') to expand faster, to a greater extent, than otherwise. However, it is thought that this effect would be marginal as these types of producers are generally well-informed with regard to the quota situation.

The effects of quota removal may be more psychological, in that it would clearly signal a more 'free market' approach across the EU. Progressive businesses would see this as an opportunity, while other businesses ('Exit' or 'No Change') may feel they are being 'abandoned to the market'. This may encourage the latter to exit the sector.

It is worth noting that milk purchasers are likely to be more proactive in managing their milk supply in a post-quota world. Quotas effectively set an upper limit on what farmers would deliver and therefore processors could be reasonably confident of what milk they would receive. With quotas becoming increasingly irrelevant in Great Britain many milk buyers have already moved to managing the quantities of milk farmers can deliver. This is likely to become the norm after 2015 as processors seek to match milk inputs with outputs. Therefore, it may not be the case that progressive producers can simply increase output at will – they will have to find a processor willing to take the extra output.

Some producers may have regarded quota as a 'pension' – an asset to be sold when ceasing dairying to fund retirement. The ending of quotas would see the disappearance of this asset. This could make exits from the industry less likely. However, quota values have now been low for a number of years and are no longer an important driver of the decision to exit dairying. This is evidenced by the fact that they were not mentioned by any of the respondents to the Intentions Survey.

It will be the price effects of the abolition of quotas that will be by far the most important factor in industry change. As output increases are more likely to occur outside the GB market, then the greatest price effect within the GB will be seen on tradable 'commodity' milk products. Therefore, farmers supplying commodity markets are likely to face prices which increasingly converge with global and EU markets. In the short-run, this may result in price reductions if output increases in the EU are combined with static demand on EU markets. Only those

producers who could supply the market profitably at the lower price would survive – ie the most efficient.

As set out in the previous section, other market segments will not escape the price pressure due to the linkages between markets. However, they may take longer to manifest and may, depending on supply and demand conditions within that particular market segment, be at a different rate. This pre-supposes that there are no major changes in the GB milk supply chain such as the growing prevalence of 'ring-fenced' cost of production contracts.

Previous analysis within this report shows that farm size is not a determinant of farm profitability – there are efficient businesses at all scales of production. It also found that milk price and thus profits, were only loosely connected to dairy farm exits (at least in the short-term).

The implication is that abolition of quota and a consequent fall in milk prices would not per se lead to an acceleration in the rate of dairy farm exits. Nor would the effects be particularly focused on any particular size category. A caveat to this may be small dairy farms. Although they may be efficient on a unit-of-production basis, their small size may make them unable to generate enough aggregate return to support the proprietors. A drop in milk price (and revenue) may exacerbate this problem and lead to greater exits.

Over the longer-term lower milk prices would make it more difficult for dairy farmers to cover their long-run costs (including non-cash costs like depreciation). This will lead to a gradual accumulation of pressure on the poorest performing businesses. A greater number may take the decision to exit the industry that would have been the case without quota abolition. The extent of this is difficult to predict as the level of price drops and farmers' reactions to mitigate their effects, are unknown. As analysis shows that profitability is less of a driver of business change than is often believed, the effect may be relatively small – the businesses exiting dairying after 2015 may well have done so anyway.

Any additional pressure for business change will be felt at all size levels. It will be the least efficient businesses, whether large or small, which will face the most difficulties. It would therefore be expected that businesses of all sizes will exit the industry. One point to note is that there are proportionally more small and medium sized businesses in British dairying than large or very large businesses. If, for example, the bottom 15% of performers in each size category leaves the industry then, in terms of numbers, more small and medium producers would leave. This would give the impression that certain size categories are being disproportionately impacted.

4.3. Increased GB Participation in Dairy Markets

4.3.1. Scenario description

This scenario would see the GB dairy industry export a greater volume of dairy products into EU and world markets. The focus would be on exports of manufactured milk products as liquid milk is a product that is not easily transportable (or stored) and is less in demand abroad than in the Great Britain.

DairyCo (in collaboration with the NFU) is currently undertaking research looking into export market opportunities for British milk and dairy products. This will have a particular focus on small and medium-sized dairy enterprises.

The current participation of the Great Britain in world dairy markets can be difficult to gauge accurately. Firstly, most of the data presented is for the UK. As set out in Chapter 2, Northern Ireland has a somewhat different structure to its dairy industry than other parts of the British Isles. For example, looking at the milk utilisation figures for 2009/10 (those behind Figure 7), net exports of raw milk were nearly 330m litres. However, all of this (plus more) was from Northern Ireland, showing that GB is a net importer of raw milk. Most milk exported from Northern Ireland is transported across the border to Southern Ireland for processing, with a small amount coming into Great Britain. While the figures for the UK show it to be a net exporter of raw milk, for GB it is a net importer.

Looking at volumes of raw milk traded also fails to take account of the effect of milk products. Milk products are far more likely to be traded than liquid milk. As every milk product contains a volume of liquid milk it would be possible to convert these imported dairy products into liquid milk equivalents (and the same for exports). This would allow a total self-sufficiency in milk and milk products to be calculated for the UK or GB. In practice this is hard to achieve as the quantity of liquid milk used to create each dairy product is variable. Instead, the self-sufficiency within each product group (liquid milk, cheese, butter, yoghurts etc.) tends to be measured separately. This is also done on a UK basis rather than GB. In the important category of cheese, the UK has only tended to produce 60% of its requirements domestically. Other categories of manufactured goods also show net imports. As an *estimate* it is believed that the UK is roughly only 85-90% self-sufficient in milk and milk products. The large Northern Irish dairy sector is likely to result in a lower figure for Great Britain.

It is not only the quantity of milk being traded that is important but also the value of the products. As Figure 30 demonstrates, the UK (and therefore by implication, also Great Britain) has run considerable trade deficit in dairy products for at least the last 20 years. Some of the deficit will be due to the fact that the UK is less than self-sufficient in milk and milk products as outlined above. But part of it is due to the fact that the UK (and GB) tends to export low-value dairy products such as cream and milk powders and imports higher value ones like cheese and yogurt.

Figure 30: Balance of UK dairy trade

Year	Imports - £m	Exports - £m	Deficit - £m
1990	931	455	-476
1991	888	437	-451
1992	1,030	505	-525
1993	921	589	-332
1994	965	623	-342
1995	983	734	-249
1996	1,063	654	-409
1997	993	672	-321
1998	1,006	660	-346
1999	1,021	597	-424
2000	1,032	570	-462
2001	1,098	534	-564
2002	1,092	530	-562
2003	1,341	651	-690
2004	1,435	691	-744
2005	1,535	642	-893
2006	1,613	642	-971
2007	1,613	732	-881
2008	1,992	794	-1,198
2009	1,990	724	-1,266
2010	2,142	923	-1,219

Source: HM Customs

A number of scenarios of how the GB industry could become more involved in markets are possible.

Firstly and simplistically, the industry improves its products and/or marketing and sells a greater volume of dairy goods abroad. Assuming domestic demand for milk products remains unchanged, then GB dairy processors would require greater volumes of raw milk to produce the products to satisfy the new markets. The type of exports would have an influence on how GB milk prices react.

If the exports are of commoditised products then average farmgate prices would align themselves more closely to the world market as the market segment becomes a more important component of the GB industry.

An alternative is for the GB industry to grow exports of added-value dairy products. In this case, the price of the raw material (farmgate milk) is less important as product sales are not determined solely by price. As processors required more milk to satisfy the growing export demand and they could afford to pay for it due to reasonable margins, the farmgate price should rise.

This is static analysis and does not include any dynamic changes that might result from the farmgate price change. Higher GB farmgate prices are likely to encourage greater milk output; thus pushing prices back down. In addition, higher prices due to increased exports may decrease an element of domestic consumption of milk products. It is beyond the scope of this report to fully model such changes in the milk market. For simplicity it is assumed that, under the scenario described, GB milk output would settle at a new higher equilibrium with a slighter higher price level.

An alternative scenario is that the product mix being supplied by GB processors changes. This could be simple import substitution where imports of (high value) dairy products are replaced by domestically-sourced products. This would not, technically, involve greater participation in global dairy markets; in fact the opposite would be the case as GB milk is diverted to greater domestic use. However, the greater value being derived from the raw milk could deliver a higher milk price assuming that the higher returns find their way down the supply chain to farmers.

A third scenario is growth in total trade. This would see dairy exports to the rest of the world growing *at the same time* as an increase in imports. This could come about if the GB industry was successful in developing markets for high value products (eg Stilton and other territorials) while at the same time there was greater import penetration at the 'bottom end' of the market (unbranded butter, Cheddar etc.) from efficient commodity producers such as Ireland and New Zealand. This would see the *value* in the GB dairy supply chain rise but the *volume* of raw milk demanded may not increase.

The British dairy industry has been a 'late starter' in developing international dairy brands. A shift up the value chain would take a concerted effort and is likely to be a long-term undertaking. Thus, any changes would take some years to be felt by GB dairy farmers.

4.3.2. Market effects and effect on GB producers

It is difficult to predict whether there would be any benefit to British dairy farmers under the scenarios where the supply chain creates more added-value products. It might be assumed that some element of the extra revenue gained would flow down to the producer level as processors become less reliant on commodity markets and potentially receive a 'premium' price. There may also be less volatility in such markets. However, it seems naive to believe that this would necessarily be the result. Expense might be incurred in marketing and promotion to increase sales of value-added products. The processors would wish to recover these costs (and additional profit) before providing higher prices to producers.

However, if processors are producing a higher-value product, there is less chance of it being substituted. This is particularly true of a branded product. Continuity of supply is less of an issue with true commodity products, as the buyer is always able to purchase elsewhere (and may go elsewhere anyway simply due to price). Processors supplying added-value markets will wish to guarantee milk supply, so are likely to offer an element of price premium. Thus, there would be benefits to GB producers. It might be thought that higher farmgate prices would encourage output increases but the processors are likely to manage milk supply carefully to match demand for their products. Higher output may not automatically follow.

Processors in value-added markets may be looking for quite specific requirements in terms of milk composition and seasonality. This may offer an opportunity for smaller producers to achieve premium milk prices. This is not to say that large producers could not meet stringent buyers' requirements but that smaller producers may have an advantage in terms of flexibility and attention to detail.

It is difficult to make generalisations about the effect of all this on farmer exits, as the effect is likely to be localised. A processor that cultivates added-value markets is likely to offer attractive returns. There would be a greater economic incentive to stay in dairying. There may also be greater 'emotional' desire to continue as part of a growing, internationally successful element of the GB dairy industry but such a processor will be looking for supplying farmers within a geographically defined region. Farmers in similar circumstances may face very different business choices simply because one is located close to a successful exporting company, while another is not.

If the participation in export markets was simply greater export volumes of milk products then, as described above, there would be greater demand for GB milk and output would increase. There would be greater opportunities for expansion-minded dairy farmers to increase volumes delivered.

If exports were of commodity milk products, the greatest growth in demand would be in those geographic areas that already have the manufacturing capacity for such products. This tends to be the west of Great Britain. It is not inconceivable that new plants could be built (see section below), but upgrades of existing sites would seem more likely. Producers close to such sites would be best placed to meet the extra demand.

This does not mean that regions without manufacturing capacity would not benefit. Greater demand in one area would pull up prices in surrounding locations as milk was brokered to where its value could be maximised. Transport costs means that this effect becomes weaker with distance.

Processors exporting commodity products would be seeking contracts with individuals or groups of individuals able to supply large volumes of raw milk within a geographically defined region. The impact of greater export of dairy products will, therefore, be observed at the lower-end of the milk price range, whereby producers are focused upon volume first and foremost. This may favour large-scale producers focused on efficient production of relatively low value milk.

4.4. Increase or Decrease in GB Processing Capacity

4.4.1. Scenario description

The scenarios of an increase or decrease in dairy processing capacity in Great Britain will be looked at together, as they are two sides of the same coin.

In recent years there has been significant investment in processing capacity in the GB dairy industry. Major examples in the last decade include;

- Arla – Stoughton and Aylesbury
- Wiseman – Droitwich and Bridgwater

- Westbury
- Dairy Crest – Derbyshire (originally Amelca).

There have also been significant upgrades to existing dairy processing plants made in the last decade.

There has also been rationalisation in dairy processing. This especially occurred when Dairy Farmers of Britain became insolvent and a number of its facilities failed to find a buyer and were closed. Recently, Dairy Crest has announced the closure of its Fenstanton and Aintree liquid milk plants and the Crudgington spreads plant.

It is the ***net*** increase or decrease in dairy processing capacity which is the important factor in determining the market for dairy farmers. For example, Arla's new 1bn litre facility near Aylesbury is widely expected to lead to closures of the firm's Hatfield Peverel, Oakthorpe and Ashby plants – resulting in only a minor net increase in capacity.

It will be noted that most of the recent investments have been in the liquid milk sector. This has historically been seen as the 'premium' market by processors – one where profits should be high and investments are worthwhile. The economies of scale of 'superdairies' are also attractive to processors. However, squeezed margins in the liquid market have almost certainly made this part of the marketplace less attractive to processors. Any further major investments in the near future might well be considered unlikely.

4.4.2. Market effects

In common with most large-scale production systems, dairy processing plants are most efficient when running at or near capacity. The cost of land, buildings and plant are 'sunk' at the point of construction. Other costs such as labour, are relatively fixed in the short-term. Thus, a large proportion of total costs are committed whether the plant operates or not. As plant throughput increases, the cost per unit of production falls as costs are spread over a progressively large number of units. This means that dairy processors have a strong incentive to maximise factory throughputs in their facilities.

An increase in net GB processing capacity through new factories or upgrades to existing facilities would increase the competition for milk as processors sought to maximise throughputs. This puts upwards pressure on milk prices as greater competition for raw milk bids up prices.

This analysis is based on the assumption that there is sufficient market demand for the products any new factory is producing. This would either have to be growth in the domestic market or increased export activity (as discussed in the previous chapter). If new dairies were constructed on a 'speculative' basis and not in response to market demand this would lead to excess capacity in the industry. Without full utilisation then, inefficiencies will be greater and costs higher. The processors may offer low prices to their customers (retailers and foodservice companies) simply to boost market share. This could exert pressure on margins which might be passed back to farmers, as has recently been seen in the liquid milk market.

In the long-run the overcapacity would be unsustainable and the least efficient factories would go out of business. In this way the industry may reach a position of having a more modern and

efficient processing sector but face a period of considerable 'pain' in getting there. The 'long-run' might be also turn out to be an extended period as processors 'hang-on' in the hope that competitors reduce capacity first.

The issue of keeping dairies at maximum throughput is also more complex than the simplistic analysis above suggests. In many parts of the world (eg New Zealand), milk supply is very seasonal and processing plants are operated to match this. Some facilities are actually closed down for part of the year. This also happens in other parts of agriculture – eg the sugar beet industry. This is possible largely because of a more integrated approach through the supply chain. Rather than focusing solely on internal production efficiencies the processors look at what is the cheapest way overall of producing the product. Effectively, if seasonal milk production systems allow the processor to access raw milk at cheaper prices, they can afford to run factories at less than optimum efficiency by varying throughput during the year. This happens to some extent in Great Britain (eg Westbury), but there is still a very prevalent 'level production' mind-set. Thus, it is not only a question of the capacity of the GB processing sector but also how it is operated.

4.4.3. Effects on GB producers

For the purpose of this scenario, it will be assumed that the increase in GB processing capacity has been demand-led and does not result in overcapacity. In this case there should be increased competition between milk buyers for raw milk and prices would rise. This, in turn, would be a signal for progressive producers to expand production. Economic theory would suggest that the milk market would find equilibrium at higher output levels with only marginal or no price increases.

This scenario needs to be considered in the following context;

- Producers need the ability to be able to switch between milk buyers relatively easily for the benefits of milk buyer completion to be felt at the farm level. This has not always been the case in the past (see DairyCo report http://www.dairyco.org.uk/library/market-information/apt-reports/apt-report-2011.aspx). The subject of milk contracts and notice periods is a live issue at present but is beyond the scope of this report to consider it in detail
- The location of dairy processing plants is important – dairy farmers tend to benefit from buyer competition *in their localities* (as outlined in the previous section). Due to transport costs the trend has been to build commodity milk product manufacturing facilities close to milk fields (lessening transport distance for raw milk). Liquid milk is processed closer to consumers as the end product is equally (or more) bulky than the raw milk.

A situation of static prices, but a greater opportunity to increase output, will favour those expansion-minded producers. They will see a chance to expand output to increase the total revenue (and profit) of their business, even if the 'per litre' profit is not greatly changed. A larger business could be more efficient on a unit cost of production basis, but the analysis within this report shows that economies of scale in dairy production are marginal at best.

Businesses that are not expansion-minded are likely to face a broadly similar business environment whether processing capacity increases or not. The price level will not alter greatly

due to output increases matching extra demand. Therefore, trends in business exits and restructuring will be broadly unaffected.

There may be a slightly different outcome if there is a contraction in processing capacity. If there is less demand and competition for raw milk from processors then the price will fall. Economic theory would suggest that producers would reduce production in response to this, in the same way production increases when price rise.

In fact, this does not always occur;

- Producers may target a certain level of *revenue* (eg what is required to fund family drawings, etc.). When prices fall there may be an increase in output as farmers try to offset income falls by producing more.
- Higher milk prices encourage the 'expansion-minded' to expand. But lower milk prices may not cause them to reduce precisely because they have an expansion mind-set
- Lower demand, reduced milk prices, and falling profitability should put pressure on the least efficient businesses to exit. However, we have seen that milk prices and profitability are only weakly correlated with industry restructuring. These less efficient businesses decisions may not be greatly altered in the short-term.

For these reasons, the market adjustment to a fall in processing capacity may be much slower than to an increase. It could result in an 'over-supply' of raw milk for some time and thus lower prices. This may not greatly affect the pace of structural change but would make the business conditions for all dairy farms less favourable.

One final point concerning a reduction in processing capacity, is the effect on smaller producers. An oversupply of milk may allow processors to 'pick-and-choose' their farmer suppliers. As it is more expensive to collect milk from a large number of small farmers than a small number of large ones, then those with fewer cows may be adversely affected. At worst, some buyers may simply not offer very small producers contracts under any circumstances. It is more likely that they would be penalised with higher charges/lower milk price putting them at a competitive disadvantage to larger herds. This may accelerate structural change in this segment of the production base.

5. CONCLUSIONS AND RECOMMENDATIONS

To summarise;

- The decline in dairy farmer numbers is not a new phenomenon, nor is it exclusive to the UK. In fact, the rate of annual decrease in dairy producer numbers has been falling for some time. Similarly the increase in average herd size has been a long term trend but again, the rate of increase is falling
- There is, however, considerable disparity in production trends in different regions/countries with some areas growing considerably despite declining producer numbers overall; this appears to be because certain regions are able to exploit competitive or comparative advantage, eg western parts of the UK are able to grow more grass cheaply, while climatic conditions and topography may make the same area less suited to alternative agricultural sectors
- When analysed, the economic drivers of change appear to be less influential in determining dairy farmers' decisions than might be widely believed
- This suggests that decisions are rather more driven by the personal 'social' factors that producers face. This, however, is difficult to prove empirically; attempts to 'model' the inclination of producers within the industry based on both economic and social variables available only explains a very small proportion of the variation in producers intentions
- Segmenting farms by size shows that there is no 'correct' size for dairy production. However, larger farms/higher milk output gives the potential for higher total levels of profit; achieving this (or not) is dependent on the management of each individual business.

Based on this it is concluded that:

- Individual producer circumstance is more important in determining future intentions than any one, or combination of macro-industry factors such as milk price. A significant proportion of factors likely to affect individual producers situation cannot be encapsulated in any broad industry dataset, for example, individuals exposure to bovine TB, personal health issues or development pressure from urban areas and industry
- This is firstly because a number of these measures are so subjective and secondly, even when data could be gathered in a robust way, the current information is lacking. This could be an area for future work
- Categorising farms by the proprietor(s) attitudes and goals seems a useful counterpoint to merely thinking about business size. However, it must be acknowledged that this is an imprecise activity; additional studies show that many businesses associate 'across' segments (rather than fitting one precisely), furthermore, businesses evolve in such 'behavioural segmentation' according to business 'cycle stage' and maturity. Further work may be able to refine this and produce additional data for analysis

- Segmenting farms by size shows that there is no 'correct' size for dairy production. Both large and small farms can be profitable or loss-making. Equally, farms of all sizes can be efficient, progressive businesses. However larger farms/higher milk output gives the potential for higher total levels of profit; achieving this (or not) is dependent on the management of each individual business
- The trend towards increasing business size (herd size) parallel to a decrease in the total number of businesses (dairy farmers) is by no-means unique to agriculture; rationalisation in manufacturing in the UK, for example cars, shows significantly less but larger plants now than 30 years ago, undoubtedly driven by the economic pressures of achieving a sustainable return. As business owners lifecycles change and develop so to do profit expectations and requirements, as outlined above; larger farms/higher milk output facilitates one method of achieving this. Even without such 'economic' considerations, important psychological factors, such as Maslow's hierarchy of needs outlined in the 'Theory of Human Motivation', play a role. Ultimately, once our 'basic' needs are met, we are driven by the need for 'achievement', 'respect by others' and the need to challenge one-self. Increasing herd size and performance parameters such as yield is perhaps symptomatic of this inherent psychological motivation
- There is no evidence that large dairy farms make the business environment more challenging for smaller units and thus contribute to their exit
- It is not possible to state whether all producers have 'perfect knowledge' with regard to their own production costs, however, producers that regularly benchmark are observed to have higher profitability, indicating improved future sustainability as a result of this
- The GB dairy sector is a dynamic place. It would be naive to believe that the long-term trends in restructuring will not continue. However, the trend for farmer exits appears to be declining. There are a number of market developments that could make the business environment a more attractive place to operate. This would see the slowing trend in exits continue
- To achieve any significant reversal in the current trends of industry would require an increase in the desire of new entrants in the industry, to do this would require a 'sea-change' in two aspects: firstly, the signals regarding the prospects and future profitability within the industry will need to improve and much of this will depend on the outcome of the important future scenarios outlined above. Secondly, there will need to be much greater understanding and awareness of potential routes for new entrants into the industry, which reduces the barriers to entry due to the high capital requirements.

It is recommended that:

- For future research purposes, the DairyCo FIS is also conducted for those farmers completing Milkbench+, to gain a greater understanding of the factors influencing their beliefs, attitudes and intentions
- Measures of level of investment and return on capital are incorporated, to gain a greater understanding of the importance of this factor
- In order to gain an understanding as to whether producers do have ‘perfect knowledge’, both internally to their own business and externally, elements assessing this could be incorporated into the FIS
- As outlined above, the only way of reversing the decline in the number of dairy producers (as in New Zealand) is to attract more into the sector. Greater understanding of the factors affecting the potential for new entrants to the industry, both in terms of those currently within agriculture and those outside would be required and acted upon to achieve this.

APPENDIX I – REVIEW OF DRIVERS OF BUSINESS CHANGE

Chapter 2 in this report illustrated that the changing structure of the UK dairy industry is by no means unique; in fact, similar evolution is evident in the majority of developed dairy regions globally and thus, the factors influencing these changes have been widely studied. This section highlights some of these key studies before going on to look at the main drivers behind change in the British dairy industry.

Rahelizatova and Gillespie (1999) examined the declining milk production and dairy farm numbers in Louisiana (USA) since 1972 and concluded the factors which have affected the changing structure include prices (both milk price and inputs), milk supply reduction programmes (ie Government assistance for retiring), technology (that has affected dairy cow productivity) and interest rates. Similarly Foltz (2004) examined the effect of dairy price policy on entry, exit and farm size; reporting a significant effect of both input and output prices, as well as interest rates on exit decisions. Interestingly, variables describing 'the farm' showed higher productivity per cow (yield) was significantly associated with a lower probability of exit, however, the number of cows (herd size) had no significant effect, suggesting that a small herd or farm size per se is not a significant determinant of exit decisions. Unemployment rate also had a significant effect, suggesting outside labour opportunities and lack of a local labour supply influences farmer decision making. Local population density also had an effect, indicating problems with neighbours as well as the increasing competition for land influences farm exits.

In New Zealand, factors influencing peoples' decision to farm and industry change, identified by Shadbolt et al (2007), included milk price and volatility, land values and share prices (Fonterra), cow prices and lifestyle expectations. While New Zealand may have large average herd size in a global context, a study by Jaforullah and Devlin (1996) indicated an absence of a statistically significant relationship between farm size and technical efficiency, although subsequent studies by Jaforullah and Whiteman (1998) specify farms may be able to improve their efficiency by 6% by operating at their optimal scale.

Closer to the UK, a study presented by Peerlings and Ooms (2008), investigating the interaction between farm growth and exit with the EU dairy policy reform, with results indicating the decision to exit milk production is largely determined by household characteristics (demographic), specifically 'age' and 'size of household'. Determinants of profitability such as milk price also had an exit effect but to a lesser extent, while reducing quota constraints reduced the likelihood of exit, decoupled direct income payments had little effect. The same study suggests farm growth is 'strongly influenced by the availability of labour, capital and land'.

Similarly, Hansson et al (2008) also concluded that supply of qualified labour, as well as location, is an important determinant of milk production growth in Sweden. The study also found; 'farms accustomed to changes and more dependent on their milk production (specialist) were more likely to develop their milk production'. Those that choose to develop their milk production are more optimistic about profitability expectations and less risk adverse, while taking actions to evaluate their strategic decisions more seriously.

An estimate of the determinants of growth among German dairy farms between 1997 and 2005 by Breustedt and Mees (2010), suggest higher milk yield per cow, more family labour and higher milk prices increase the growth rate of growing farms, ceteris paribus. Older

farmers tend to grow at lower rates, with age impacting the choice between growth and stagnation but not between growth and exiting production, whereas subsidies affect the choice between growth and exiting milk production but not between growth and stagnation/decline. Gibrat's Law of relative firm growth being independent of initial firm size does not hold for the subsample in the study. However, Kostov et al (2005) found Gibrat's Law did indeed hold for dairy farms in Northern Ireland, except in the case of very small farms, suggesting small farms do not grow as fast as the rest of the sector.

APPENDIX II – FBS ANALYSIS: RESULTS

Table 1: Statistical analysis of dairy farm businesses completing intentions survey for FBS 2010/11 accounting year with 2011 intentions

	Intention			
	Remain same/reduce/exit	**Increase production by at least 10% in next 3 years**	**p-value**	**Significance**
Performance percentile (percentage rank)	46.36	51.25	0.49	
Utilised Agricultural Area [UAA] (hectares)	131.34	168.12	0.23	
Dairy cows (numbers)	134.99	155.57	0.38	
Milk yield (litres/cow)	6,564.64	7,290.71	0.08	*
Milk price (pence per litre)	25.58	25.54	0.95	
Milk sales (£/business)	229,718.35	298,195.88	0.12	
NFI (£/business)	31,758.81	63,289.38	>0.05	*
MII (£/business)	2,911.44	34,108.12	<0.05	**
FBI (£/business)	44,611.69	86,518.42	0.04	**
SFP (£/business)	27,611.66	34,082.00	0.34	
Non-dairy output (£/business)	110,737.32	140,383.69	0.33	
Net worth (£/business)	891,008.08	1,059,220.65	0.31	
Private drawings (£/business)	41,058.74	52,037.46	0.19	
Unpaid agricultural worker units (number)	2.01	2.44	0.07	*
Time worked farmers and partners	4,345.47	4,999.58	0.19	
Age (years)	51.08	50.08	0.67	
Proportion with college/university qualifications	0.51	0.69	0.13	
Proportion planning to hand over to successor in next 12 months	0.08	0.15	#	
Number of observations	*53*	*26*		

Key: FBI = Farm Business Income; NFI = Net Farm Income; MII = Management and Investment Income; SFP = Single Farm Payment; # = unable to undertake statistical test; Significance: * = 90%; ** = 95%; *** = 99%.

Table 1 provides results of the descriptive statistics for two separate groups of producers, based upon their dairy farming intentions with respect to milk production. One group is classified as those producers that have indicated they plan to increase milk production by at least 10% in the next 3 years. The other group contains producers who have indicated no change in milk production levels, plan to reduce milk production or cease milk production. The small sample sizes for producers citing that they intend to cease milk production (4) or reduce production (3) restricts analysis to grouping these together with those producers who have indicated no change in order to preserve data confidentiality.

Table 1 demonstrates that those producers who intend to increase milk production are characterised by operating a larger Utilised Agricultural Area (UAA), achieving a slightly higher percentile performance ranking, milking a greater number of dairy cows and achieving a greater milk yield per cow; however, only the latter variable of those cited is significantly different from the non-increase group of producers. Milk price is not significantly or substantially different between the two groups. Net Farm Income (NFI), Management and Investment Income (MII) and Farm Business Income (FBI) are each significantly greater on those farms citing that they intend to increase milk production. Non-dairy output, net worth and private drawings are greater for the group of farmers who intend to expand but there are no significant differences observed for these variables. The intend-to-expand group of farmers have a significantly greater average number of unpaid agricultural workers, while time worked in hours of the farmer and partners is numerically greater, but not significantly greater, for the intend to increase group. No substantial or significant difference is observed for age of farmers in the two groups. While not significantly different, those producers who are planning to increase production are, on average, more likely to hold a college or university qualification.

With both measures of overall farm profitability showing a highly significant difference for farms which intend to expand compared to those who don't, statistical analysis was undertaken to better understand the differences in the two measures of farm profitability. Table 2 provides the results of the preferred (high R2, significant parameter estimates) of models explaining Management and Investment Income (MII) and Farm Business Income (FBI) at per farm level. As shown in Table 2, the MII model explains 79.1% of the variation in MII at per farm level, while the FBI model explains 75.6% of the variation in FBI. Interpreting the parameter estimates, each additional agricultural worker is associated with an increase of £7,582 (£16,584) in MII (FBI), each additional dairy cow increases MII (FBI) by £1,267 (£1,126) and each additional unit of farmer and spouse labour increased MII by £58,894 (this variable being insignificant as an explanatory variable in the FBI model). Increasing farm variable costs by one pound, reduces MII (FBI) by 93.8 pence (38.5 pence), while each additional pound of farm fixed cost reduces MII (FBI) by £1.17 (£1.32).

Each additional grazing livestock unit on the farm reduces MII by £181, while each additional pound of livestock cost decreases MII by 61.1 pence. It is interesting to note that each additional pound of expenditure on machinery running costs increases MII (FBI) by £1.27 (£1.38), indicating that those farms with higher levels of mechanisation with respect to machinery, are associated with greater financial performance. Each additional pence per litre of milk price increases MII by £3,627 per farm. A one pound increase in non-dairy output which excludes Single Farm Payment (SFP), leads to an increase of 65.8 pence in MII and 67.9 pence in FBI. As SFP increases by one pound, MII (FBI) increases by £2.15 (£1.81), indicating benefits from economies of size given the direct nature of SFP payments not linked to enterprise performance and the per farm business results being presented. A one litre

increase in average milk production per cow is associated with an increase of £20.56 (£21.25) in MII (FBI) per farm. Time (hours) worked by the farmer and partner increases FBI by £9.54, indicating the value of farmer and partner labour to accounting profit (the value of unpaid labour is not accounted for in FBI, akin to accounting profit). Additionally, included in the models (albeit not statistically significant) is a binary variable to indicate farmer's intentions to increase milk production by at least 10% in the next three years. While not statistically significant, it is informative to note that this intention to increase production is associated with an increase in MII and FBI.

Table 2: Farm level regression of MII and FBI (preferred models FBS data 2010/11)

Explanatory/response variable	**MII**	***p-value***	**FBI**	***p-value***
Constant	-256,900	*<0.001*	-166,687	*<0.001*
Agricultural Working Units (AWU) (no/farm)	7,582	*0.111*	16,584	*0.015*
Dairy cows (no/farm)	1,267	*<0.001*	1,126	*<0.001*
Farmer and spouse AWU (no/farm)	58,894	*0.015*	-	-
Farm variable costs (£/farm)	-0.938	*0.007*	-0.385	*0.003*
Farm fixed costs (£/farm)	-1.166	*<0.001*	-1.322	*<0.001*
Farmer and spouse labour cost (£/farm)	-3.550	*0.002*	-1.382	*0.019*
Grazing livestock units (no/farm)	-181	*0.091*	-	-
Livestock costs (£/farm)	0.611	*0.082*	-	-
Machinery running costs (£/farm)	1.274	*<0.001*	1.379	*<0.001*
Milk price (pence per litre)	3,627	*0.027*	-	-
Non-dairy output exc. SFP (£/farm)	0.658	*<0.001*	0.679	*<0.001*
Single Farm Payment (£/farm)	2.154	*<0.001*	1.812	*0.001*
Milk yield (litres/cow)	20.56	*<0.001*	21.25	*<0.001*
Time worked by farmer and partner (hours/year)	-	-	9.54	*0.001*
Increase milk production intention by at least 10% in next 3 years (1,0)	10,530	*0.187*	9,389	*0.387*
R^2 (adjusted)	0.791		0.756	
Observations	79		79	

Table 3 provides results of the preferred models explaining MII and FBI per hectare. The age of the famer is statistically significant at the 90% level and indicates that for each additional year of farmer age, MII per hectare decreases by £6.81. Each additional dairy cow per hectare would lead to an increase of £783 (£752) in MII/ha (FBI/ha), while each additional pound of farm fixed costs per hectare would lead to a decrease in MII/ha (FBI/ha) by 91.2 pence (70.3 pence). Each additional pound value of famer and spouse labour decreases MII/ha by £1.13, while each additional pound of non-dairy output per hectare increases MII/ha (FBI/ha) by 15 pence (13 pence). Each additional pound of SFP per hectare increases MII/ha (FBI/ha) by £4.04 (£3.52), indicating that the return to SFP payments per hectare (ie on those farms receiving greater per hectare payments) leads to a greater than expected return to financial measures. Those farmers intending to increase milk production by at least 10% in the next three years are associated with greater MII and FBI returns, to the value of £223 and £245/ha respectively, with this variable having a significant impact on the explanation of the model. The

MII/ha model explains 57.4% of the variation in MII/ha returns, while the FBI model explains only 37.8% of variation in FBI/ha returns.

Table 3: Per hectare level regression of MII and FBI (preferred models FBS data 2010/11)

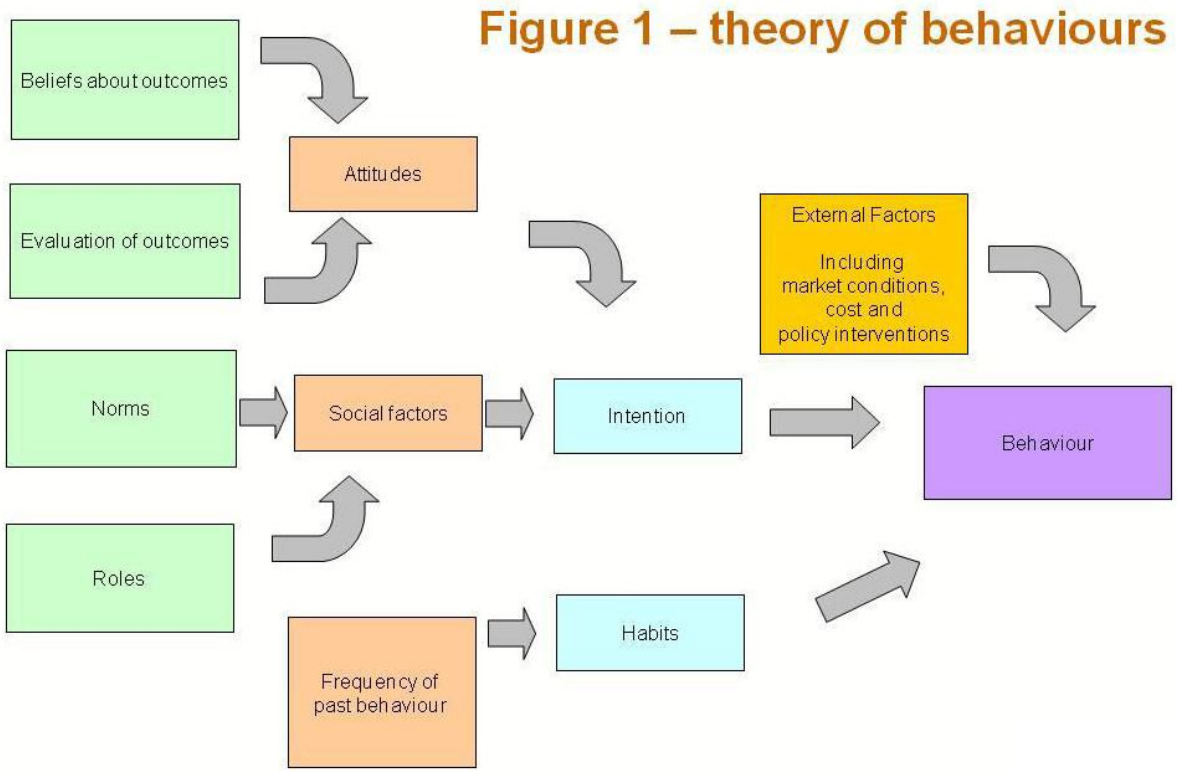
Explanatory/response variable	MII/ha	*p-value*	FBI/ha	*p-value*
Constant	-53	*0.845*	-419	*0.106*
Age of farmer (years)	-6.81	*0.090*	-	-
Dairy cows (no/ha)	782.7	*<0.001*	752	*<0.001*
Farm fixed costs (£/ha)	-0.912	*<0.001*	-0.703	*<0.001*
Farmer and spouse labour cost (£/ha)	-1.125	*<0.001*	-	-
Non-dairy output exc. SFP (£/ha)	0.1504	*<0.001*	0.130	*0.007*
Single Farm Payment (£/Ha)	4.04	*<0.001*	3.52	*0.015*
Increase milk production intention by at least 10% in next 3 years (1,0)	223	*0.011*	245	*0.027*
R^2 (adjusted)	0.574		0.378	
Observations	79		79	

Attempts to explain the intention to increase milk production using logistic regression from the variables in table 1, failed to generate any model that was statistically significant overall, suggesting that whilst some of the individual parameters are significant for the two distinct groups (expand/decline), they are not sufficient to explain the intention alone and there are additional variables not included in the dataset which must also be influencing the intention.

APPENDIX III – FARMER BEHAVIOUR AND DECISION MAKING

Although the scope of this project does not attempt to provide a complete analysis of the psychological issues which determine the 'behaviours' and 'actions' of farmers, it is important to have an understanding of the theory of behavioural economics, which encompass 'external' and 'internal' drivers as well as 'attitudes' and 'motivations'. Behavioural economics 'provides a common language that bridges economics, sociology and psychology' and 'seeks to challenge the standard neo-classical assumption of economic rationality' (Pike, 2008). This is pertinent to understanding the determinants of farm competiveness and specifically to the factors which influence farm entry and exit.

The Theory of Planned Behaviours (Ajzen and Madden, 1986) and the Theory of Reasoned Action (Fishbein and Ajzen, 1975) are widely used models which attempt to link underlying psychological issues with the main internal and/or external social influences on behaviour. Figure 1 is an adaption of the two models and depicts the interaction between different components which influence the decision to enter or exit the industry, for example or increase/decrease production.



Source: Defra

It is evident from the diagram that the external factors (milk price, input costs, etc.), which may be frequently cited as reasoning for major decisions such as exiting the industry or increasing herd size etc, are just a part of the decision making process. Equally, numerous studies recognise that people often aren't actually that 'rational' in their behaviours and decision making; reports which indicate a proportion of dairy farms failing to make and economic return but continuing to produce milk would seem to support this. The implication is that when making a decision, it is not based solely on economic rational (ie whether they are making a

profit or not) but also influenced by a range of personal factors, for example, the desire to achieve a certain lifestyle, preserve tradition or provide a continuation opportunity for a successor. The influence of friends and neighbours (societal norms), the media and indeed sheer impulse will also have an effect. Very rarely is a decision made in full knowledge of all the costs, benefits and risks, with the individual in isolation from outside influences. The majority of farmers, including to some extent family farm partnerships, are primarily 'individuals' and thus the theory of behaviours, as outlined above, is very applicable.

APPENDIX IV – SEGMENTATION BY AGE GROUP

Table 1 presents the results of statistical testing of a respondent's number one priority against age group. There is a significant difference in response against age group, in particular with respect to younger farmers (under 40 years of age), demonstrating lower proportions who wish to leave dairying and additionally, a greater proportion who wish to maximise financial returns by exploiting technology/finding new ways of working or expanding the business. The oldest group (60 years +) demonstrate a higher percentage that wish to leave dairy, albeit that 24% of this age group are seeking to maximise returns as their number one priority.

Table 1: Number one priority against age group

Observations	Build a healthy	Carry on	Diversify /other	Leave dairy	Maximise	Chi-squared t (pr)
Under 40	28	5	5	6	37	
40-49	72	26	23	23	59	
50-59	61	40	22	24	55	
60+	48	25	16	19	34	
						0.041
(Within age bracket)						
Under 40	34.6	6.2	6.2	7.4	45.7	
40-49	35.5	12.8	11.3	11.3	29.1	
50-59	30.2	19.8	10.9	11.9	27.2	
60+	33.8	17.6	11.3	13.4	23.9	

Table 2 demonstrates analysis of prospects for own farm against age groups. There is a significant difference across the age groups with respect to their ranking of prospects for their own farm, with farmers over 50 more likely to cite scores of one or two than farmers under 50 years old. Additionally those under 40 years of age are more positive about the future for their own farm, with 64% of this age group citing scores of 4 or 5.

Table 2: Prospects for own farm

Observations	One	Two	Three	Four	Five	*Chi-squared t (pr)*
Under 40	3	5	21	32	20	
40-49	10	17	56	90	30	
50-59	21	19	67	62	32	
60+	15	14	41	57	15	
						0.045
(Within age bracket)						
Under 40	3.7	6.2	25.9	39.5	24.7	
40-49	4.9	8.4	27.6	44.3	14.8	
50-59	10.4	9.5	33.3	30.8	15.9	
60+	10.6	9.9	28.9	40.1	10.6	

Table 3 provides analysis of prospects for the dairy industry against age groupings. A significant relationship is found between the age groups and the response scores. Following a similar pattern to that identified in Table 2, producers of 50 years and over are more likely to display lower prospect rankings than those under 50 years of age. It is informative to note that the rankings for “prospects for your own farm” ranks more positively than prospects for the dairy industry.

Table 3: Prospects for dairy industry

Observations	One	Two	Three	Four	Five	*Chi Squared t (pr)*
under 40	6	8	32	25	10	
40-49	15	32	77	65	13	
50-59	32	31	71	47	20	
60+	26	23	47	42	4	
						0.012
Percentages (within age bracket)						
under 40	7.4	9.9	39.5	30.9	12.3	
40-49	7.4	15.8	38.1	32.2	6.4	
50-59	15.9	15.4	35.3	23.4	10.0	
60+	18.3	16.2	33.1	29.6	2.8	

Herd size groupings against age brackets are provided in Table 4. There is no significant difference between the herd size groupings and producer age.

Table 4: Number of milking cows against age

Observations	**<59**	**50-99**	**100-199**	**200+**	***Chi-squared t (pr)***
Under 40	5	26	33	17	
40-49	35	51	90	27	
50-59	37	55	80	30	
60+	26	31	63	22	
					0.25
Percentages (Within age bracket)					
Under 40	6.2	32.1	40.7	21.0	
40-49	17.2	25.1	44.3	13.3	
50-59	18.3	27.2	39.6	14.9	
60+	18.3	21.8	44.4	15.5	

Table 5 presents analysis of the average ranking for prospects for the industry and prospects for the own farm on the basis of 'exit'/'remain' intentions group derived from the data, while Table 6 presents a similar analysis with respect to producers grouped as 'grow' and 'decline' from the data. As noted in Tables 6 and 7, producers intentions categorisation has a significant impact (as expected a priori) on their rankings for both the industry and their own farm, with those producers classified as remaining in the sector or growing, providing rankings significantly greater than those who are classified as wishing to exit the industry or decline respectively.

Table 5: Prospects for the industry and own farm against exit/remain 'intentions' groups

	Exit	**Remain**	**t (pr)**
Prospects for the Industry	2.10	3.15	<0.001
Prospects for own farm	2.44	3.58	<0.001
Observations	*72*	*546*	

Table 6: Prospects for the industry and own farm against grow/decline 'intentions' groups

	Decline	**Grow**	**t (pr)**
Prospects for the Industry	2.57	3.29	<0.001
Prospects for own farm	3.00	3.70	<0.001
Observations	*221*	*397*	

Table 7 presents the results of statistical testing of respondent's number one priority against presence or absence of a supermarket aligned contract. There is a significant difference (at 90% level of significance) in respect to the presence of a supermarket contract with higher proportions who wish to maximise financial returns by exploiting technology/finding new ways of working or expanding the business, and lower proportions seeking to carry on as current practice or leave the industry.

Table 7: Number one priority against presence or absence of supermarket aligned milk contract

Observations	Build a healthy	Carry on	Diversify /other	Leave dairy	Maximise	*Chi-squared t (pr)*
Aligned s'mkt	36	10	7	9	41	
Non-aligned	177	88	45	64	147	
						0.093
(Within contract bracket)						
Aligned s'mkt	35.0	9.7	6.8	8.8	39.8	
Non-aligned	34.0	16.9	8.6	12.3	28.2	

Table 8 demonstrates analysis of prospects for own farm against presence or absence of a supermarket aligned contract. There is a significant difference (at 90% significance level) across the supermarket aligned groups with respect to their ranking of prospects for their own farm, with farmers on aligned contracts more frequently citing scores of four or five than farmers who are operating without a supermarket aligned contract.

Table 8: Prospects for own farm against presence or absence of supermarket aligned milk contract

Observations	One	Two	Three	Four	Five	*Chi-squared t (pr)*
Aligned s'mkt	3	8	26	48	19	
Non-aligned	47	50	163	195	79	
						0.096
(Within contract bracket)						
Aligned s'mkt	2.9	7.7	25.0	46.2	18.3	
Non-aligned	8.8	9.4	30.5	36.5	14.8	

Table 9 provides analysis of prospects for the dairy industry against presence or absence of a supermarket aligned contract. It is informative to note that while a significant relationship was found with respect to presence or absence of a supermarket contract for prospects for own farm, no significant relationship is observed with respect to prospects for the dairy industry.

Table 9: Prospects for dairy industry against presence or absence of supermarket aligned milk contract

Observations	**One**	**Two**	**Three**	**Four**	**Five**	***Chi-squared t (pr)***
Aligned s'mkt	9	12	37	37	9	
Non-aligned	73	83	194	146	38	
						0.288
Percentages (Within contract bracket)						
Aligned s'mkt	8.7	11.5	35.6	35.6	8.7	
Non-aligned	13.7	15.5	36.3	27.3	7.1	

Farmer age groupings against the presence or absence of a supermarket contract are provided in Table 10. There is no significant difference between the age groupings and presence of a supermarket aligned contract.

Table 10: Age group against presence or absence of supermarket aligned milk contract

Observations	**<40**	**40-49**	**50-59**	**60+**	***Chi-squared t (pr)***
Aligned s'mkt	8	32	34	30	
Non-aligned	73	171	168	112	
					0.301
Percentages (Within contract bracket)					
Aligned s'mkt	7.7	30.7	32.7	28.8	
Non-aligned	13.9	32.6	32.1	21.4	

Table 11 presents analysis of the average ranking for prospects for the industry and prospects for own farm against presence or absence of an aligned supermarket contract. The mean scores for prospects for the industry and prospects for own farm are both significantly greater for those producers who have an aligned supermarket contract.

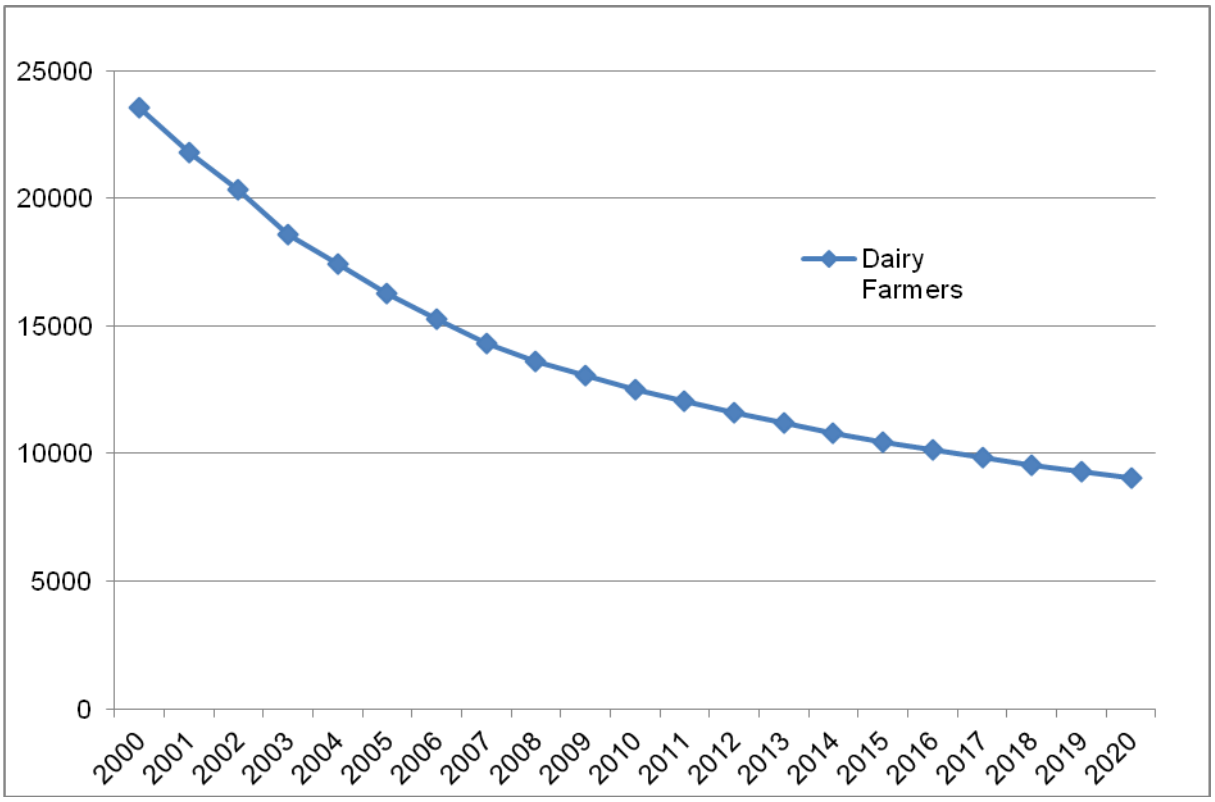
Table 11: Prospects for the industry and own farm against presence or absence of supermarket aligned milk contract

	Aligned	Non-Aligned	t (pr)
Prospects for the Industry	3.24	2.98	0.035
Prospects for own farm	3.70	3.39	0.009
Observations	*104*	*534*	

APPENDIX V – DAIRY PRODUCER TRENDS

Rate of dairy farmer numbers (percentage change) = -8.42 + (0.4178 x time trend)

For every year, the rate of dairy farmer exits falls by 0.41%, hence, we would expect exits to keep slowing on the basis of recent trends;



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