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Rural Business Research

The University of Nottingham

Farm Business Survey

2006/2007

Dairy Farming in England

Philip Robertson and Paul Wilson

RBR

independent research, data and analysis

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Foreword

This report is one of a series being produced based on the results of the Farm Business Survey (FBS) for England. The annual Farm Business Survey is the most comprehensive and independent survey of farm incomes and provides a definitive data source on the economic and physical performance of farm businesses in England. It is conducted by a Consortium comprising the Universities of Cambridge, Newcastle upon Tyne, Nottingham and Reading, and Askham Bryan, Duchy and Imperial Colleges. The Consortium is lead by the University of Nottingham and its members work in partnership, using uniform and standard practices in reporting on their findings to ensure consistent data quality, accuracy and validity. The Survey is financed by Defra and the Consortium values greatly the input of their staff.

These detailed reports for various farm types and enterprises are in addition to the comprehensive Farm Business Survey Reports for Government Office Regions published at www.farmbusinesssurvey.co.uk. The Consortium is seeking by these additional reports to ensure that timely and relevant information is available to farmers, consultants, advisers and other organisations and individuals interested in farming and land management. The analysis and publication of these reports uses data from farm businesses across England, with an individual member of the Consortium undertaking the research analysis. In line with the ethos of the Consortium, these reports present results in such a way as to ensure a significant element of continuity and consistency from one report to the other, whilst also ensuring that each report captures the contemporary issues of relevance to the sector of agriculture in England to which it relates.

We believe these new reports will make a valuable and useful contribution to the farming industry and we commend them to you.

Prof. Martin Seabrook

(Chief Executive of the Consortium)

Foreword to the Second Series

Launched in 2007, the farm types and enterprise reports based on the results of the Farm Business Survey (FBS) for England have quickly become established as the authoritative data source for a wide range of agricultural enterprises. The second series of reports builds upon the first by providing data for the most recent FBS accounting year (2006/07) and expanding the series coverage by including information on lowland grazing livestock production in addition to incorporating the well-established *Horticultural Business Data* report within this current series. Produced by **Rural Business Research**, a leading independent consortium comprising the Universities of Cambridge, Newcastle upon Tyne, Nottingham and Reading, and Askham Bryan, Duchy and Imperial Colleges, the reports draw directly upon the highly regarded annual Farm Business Survey financed by Defra.

These detailed reports, available via **Rural Business Research's** on-line service, www.ruralbusinessresearch.co.uk complement the comprehensive Farm Business Survey Reports for Government Office Regions published at www.farmbusinesssurvey.co.uk. As with the first series, **Rural Business Research** aims, via these reports and its other data and results services, to provide timely and relevant information to farmers, consultants, advisers and other organisations and individuals interested in farming and land management. Our expertise in independent research, data and analysis ensures that we understand the needs of the different agricultural and horticultural sectors. The reports have been thus developed to capture the issues of direct relevance to the farm type or sector presented whilst ensuring consistency in the treatment and presentation of key data and results. Building upon developments in the FBS, a key performance result of direct relevance to all sectors is the new headline income measure of Farm Business Income (FBI) which provides a financial accounting return measure and represents the return to unpaid labour and capital invested in the farm business, including land and farm buildings. It incorporates the four revenue and cost centres of farm businesses, these being i) agricultural production and agricultural diversification, ii) agri-environmental activity, ii) single farm payment and iv) non-agricultural diversification. We believe the FBI measure further enhances the results provided by the reports in the series, enabling readers to view the results within a financial accounting context.

As we present these results in the Spring of 2008, the industry is undergoing a period of change, with enhanced prices in some sectors considerably improving profitability, whilst for others, increased costs are leading managers to further analyse the performance of their enterprises and overall business. One issue common across all sectors is that the need for independent data upon which to base decisions remains a key tool to successful business management; **Rural Business Research's** outputs, incorporating this series, continue to lead the way in providing this independent data.

Prof. Martin Seabrook

(Chief Executive, Rural Business Research)

Acknowledgements

Rural Business Research thanks sincerely all the farmers who have voluntarily provided records and information on which the annual Farm Business Survey, and this report, is based.

The basic information on which this report is based was collected on behalf of, and largely financed by, the Department for Environment, Food and Rural Affairs and is Crown Copyright.

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Summary

- Dairy farming in England has faced a number of challenges during 2006/07, including market conditions of declining milk output price and increasing input costs
- Average data from published sources indicates that the average farmgate price of milk during 2006/07 ranged from 16.8 to 19.0 pence per litre, following the normal seasonal pattern of milk price movements observed in recent years
- In 2006/07 milk production fell to its lowest level for over a decade
- Average herd size decreased by 0.6% in 2006 with published data suggesting milk yields also were lower in 2006 than in 2005; producer numbers declined by 5.4% in 2006 continuing the downward trend in the number of dairy farms
- In 2006/07 the shortfall of total milk deliveries undershot total national quota by approximately 410 million litres representing the largest recorded quota undershoot
- Using data from the Farm Business Survey 2006/07, on average, Farm Business Income (FBI) was £321/ha, representing 17% of total farm output; of the £321/ha FBI, £221/ha is accounted for by the value of the farmer and spouse labour
- The higher input-output system of the lowland farms returns an average FBI of £340/ha in comparison to the average FBI of £255/ha for LFA farms
- Management and Investment Income (MII), (which represents an economic return after accounting for the value of unpaid labour and an imputed rent on owned land) is -£2/ha, down from £46/ha in 2005/06, flowing from reduced milk output value and increased costs
- Following the pattern noted for FBI, lowland dairy farms returned an average MII of £60/ha, substantially greater than the average loss (-£9/ha) made by the LFA dairy farm group
- On lowland farms, smaller farms, being more dairy specialist, returned a greater FBI than their larger counterparts, yet recorded substantially lower (and negative) MII results; whilst regional differences are present in the overall returns to dairy farming, these differences are less substantial than recorded for different farm size groups
- The most profitable (upper quartile as measured by FBI) lowland dairy farms recorded substantially greater milk output (£1828/ha) than the least profitable (£1053/ha); the upper quartile group, recorded overall concentrate costs of £500/ha (*cf* £360/ha lower quartile), with FBI differing by over £930/ha between the two groups
- For LFA farms, smaller farms tend to represent more intensive production systems than compared to larger LFA farms; whilst the smaller LFA farms recorded the highest FBI of £435/ha, they returned the lowest MII of -£161/ha, the difference flowing, to a large extent, from the higher value of farmer and spouse labour per hectare on smaller farms
- With respect to regional variation in LFA dairy farms, the North represents the more extensive larger farms, which following the analysis by farm size groups, returned a greater MII than farms in the West, albeit that MII returns are, on average, negative for both regions
- Profitability analysis for LFA dairy farms indicates that the upper quartile group have a smaller average area but achieved total farm output of £2170/ha in contrast to the £832/ha for the lower quartile; respective FBI returns were £647/ha and £28/ha
- Enterprise-level data indicates that lowland herds averaged 7198 litres/cow (l/cow) and LFA herd 6704 l/cow, giving an overall average of 7112 l/cow across England; respective gross margins were £708/cow, £637/cow and £696/cow
- Comparing 2006/07 with 2005/06 results indicates that the average milk price received in 2006/07 was 0.6 pence per litre (ppl) lower than in the previous year; contrasting with published data, results from the current study indicate that yields have increased by 5.5%,

leading to a small increase in output, albeit that cost increases eroded this output increase to return lower gross margins (by £50/cow) in 2006/07

- Gross Margin analysis for lowland herds indicates that concentrate use, milk yield, dairy output and gross margin per cow increase with herd size; regionally herds in the East region returned the greatest milk yield and gross margin
- Analysis of lowland herds by gross margin performance quartiles indicates that the upper quartile achieved yields of 8000 litres compared to 5700 litres for the lower quartile, and whilst concentrate costs was greater for the upper quartile, the respective gross margins are approximately £1000/cow and £400/cow
- For LFA dairy enterprises, the influence of herd size again indicates that larger herds achieved greater yields, have a more intensive production system and achieved greater gross margins on average than smaller LFA herds
- Regionally LFA herds in the North achieved greater milk output but their higher concentrate and replacement costs eroded any output advantage to return comparable gross margins with herds in the West
- Analysis of LFA herds by gross margin performance quartiles shows the upper quartile achieving yields of 8200 litres compared to 5600 litres for the lower quartile; considerably larger concentrate costs for the upper quartile led to respective gross margins of approximately £860/cow and £350/cow
- Summarising the results and comparing them with data from the 2005/06 Farm Business Survey shows that returns to dairy farming have fallen in 2006/07, resulting from increased milk yield, lower milk prices and increased costs
- Previous research on the 2005/06 data (Robertson and Wilson 2007) indicated that the more profitable producers tend to operate larger herds under a high-input – high-output system; the 2006/07 results reinforce this finding and those from previous studies examining profitability in dairy production
- Reduced milk supplies have led retailers to recently increase the milk price and 2007/08 looks set to produce a more enhanced economic return than 2006/07; however volatility and increases in input costs will erode some of the increased milk price and producers must seek to manage the costs and returns to the business, aided by independent data as provided in *Dairy Farming in England*.

Chapter 1: The Dairying Sector

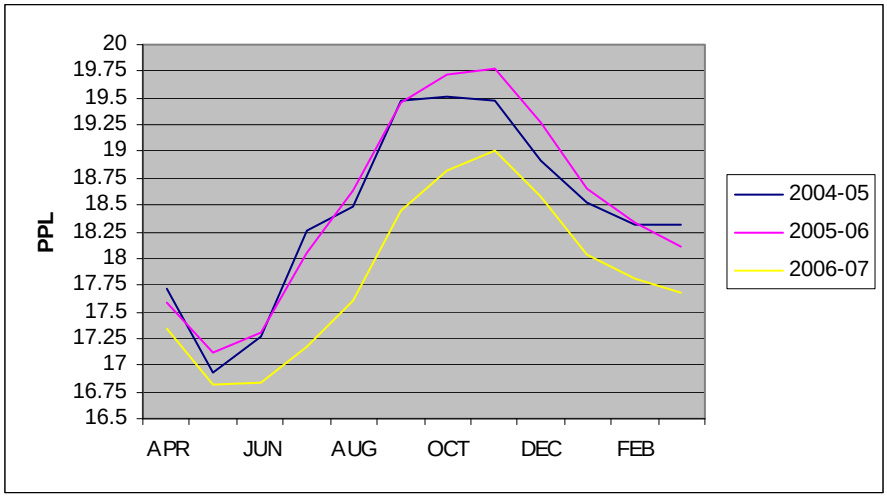
1.1: Introduction

In 2006/07, dairy farming in England continued in similar vein to that of recent years with farmers having to deal with falling milk prices and increasing input costs. The national scene saw a continuation of decreases in total cow numbers and the number of milk producers. Drawing upon information from a range of published sources together with analysis of data from the Farm Business Survey 2006/07, *Dairy Farming in England*, provides a contemporary analysis of the performance of dairy farms, and dairy production, in England for the 2006/07 financial year. The purpose of this introductory section of the report is to set out the market environment and key factors affecting the sector during this financial year. Specifically, this section of the report gives an overview of the UK dairying sector, focusing on:

- farmgate milk prices
- input prices
- annual milk production
- milk deliveries and national quota
- UK dairy herd and average milk yield
- producer numbers

1.2: Farmgate Milk Prices

Figure 1.1 shows the average producer ex-farmgate milk price (including seasonality; net of delivery charges). The average milk producer price for the period April 2006 to March 2007 followed the established trend associated with seasonality payments, albeit at lower levels than in recent years. The lowest average price occurred in May 2006 at 16.82 pence per litre (ppl), with the highest price occurring in November 2006 at 19.00ppl. These prices are a reflection of the periods of maximum (spring) and minimum (winter) production.



Source: Defra (2008a), Milk Price Surveys

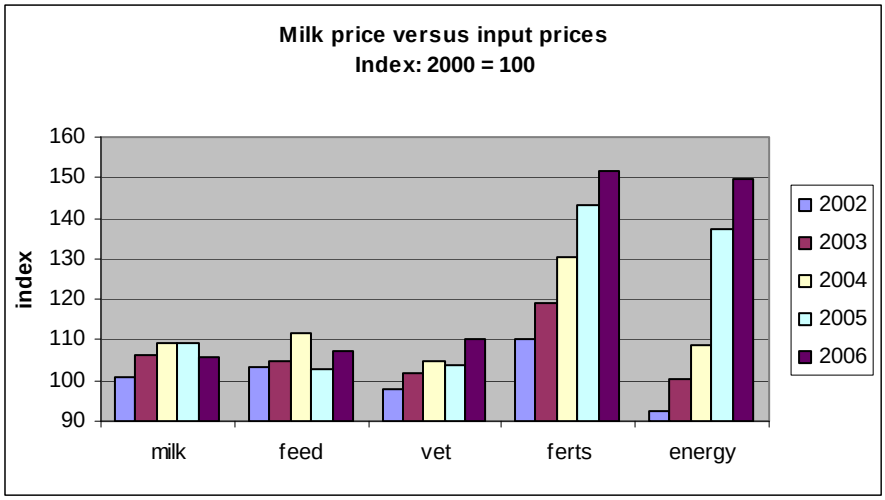
Figure 1.1: Farmgate Milk Prices (UK)

The 2006/07 milk year began with mixed messages about the prospects for farmgate prices. Total milk output in 2005/06 was approximately 2.5% below quota with supplies at a five-year low. This shortage of milk gave rise to hopes for a more competitive raw milk market. However, this optimism for the milk price was tempered by lower prices for commodities such

as butter and cheese and the prospect of a cut in intervention prices in July 2007; factors which would offset the competitive edge stemming from reduced raw milk supplies (Farmers Weekly; various (1)).

1.3: Input Prices

Figure 1.2 shows the trend in the farmgate price of milk and the prices of some key dairying inputs from 2002 to 2006, using the year 2000 as the base year (index = 100). In comparison with 2000, the milk price in 2006 was 6% higher, feed prices were 7% higher and veterinary services were 10% higher. The inputs with the most significant price increases were fertilisers and energy costs. In 2006, fertiliser and energy prices continued their recent upward trends to reach prices that were 51% higher (fertilisers) and 49% higher (energy) than in 2000. The continuation of the squeeze on profitability from dairying can be illustrated by comparing 2005 and 2006 prices. These comparisons are: milk -2.8%; feed +4.4%; veterinary services +6.2%; fertilisers +5.7% and energy costs +8.8%.

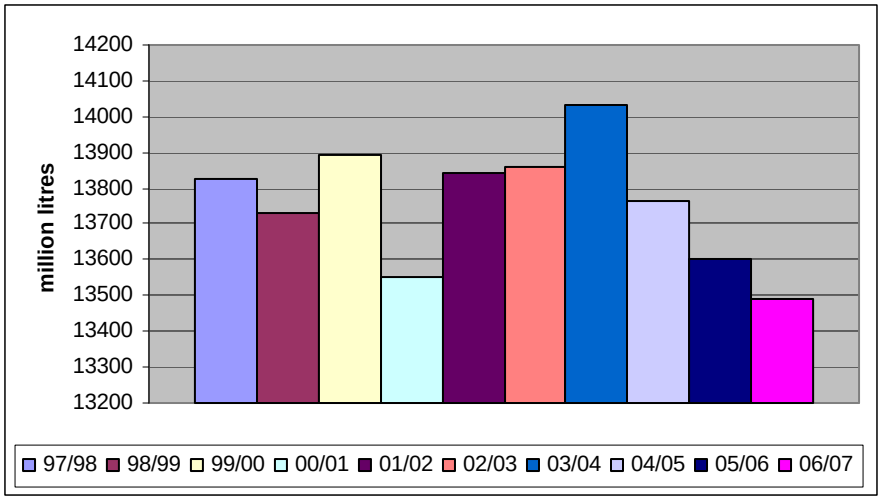


Source: Defra (2008b); Agriculture in the UK 2007

Figure 1.2: Milk and Input Prices (UK)

1.4: Annual Milk Production

Figure 1.3 shows annual milk production in the UK (defined as wholesale deliveries) for the years 1997/98 to 2006/07. In 2006/07, milk production fell to its lowest level for over a decade. A further reduction in the milk price, coupled with a continuing decline in total cow numbers that outpaced any increase in average yields, were significant factors that led to this low point in milk production.

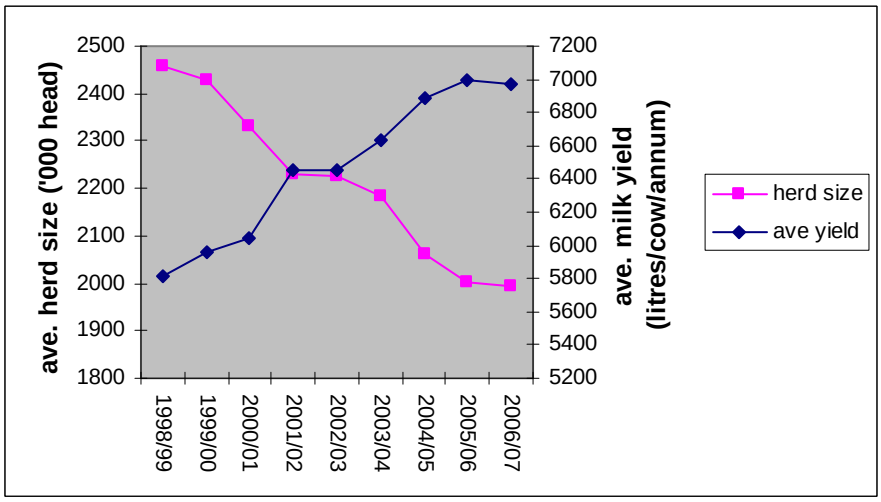


Source: MDC Datum (2008a)

Figure 1.3: Annual Milk Production (UK)

1.5: UK Dairy Herd and Average Milk Yield

Figure 1.4 illustrates the continuing decline of the UK total average herd size in 2006/07. Between 2005/06 and 2006/07 the UK total average herd size fell by 0.6% (approximately 12000 cows). The decline in cow numbers between 1998/99 and 2006/07 was 19% (approximately 466000 cows). In recent years, total milk supplies, although having fallen, have been supported by an increase in the average yield per cow. However, 2006/07 witnessed a slight decrease in the average milk yield per cow, which was a significant contributory factor to the low point in total milk production (Figure 1.3).

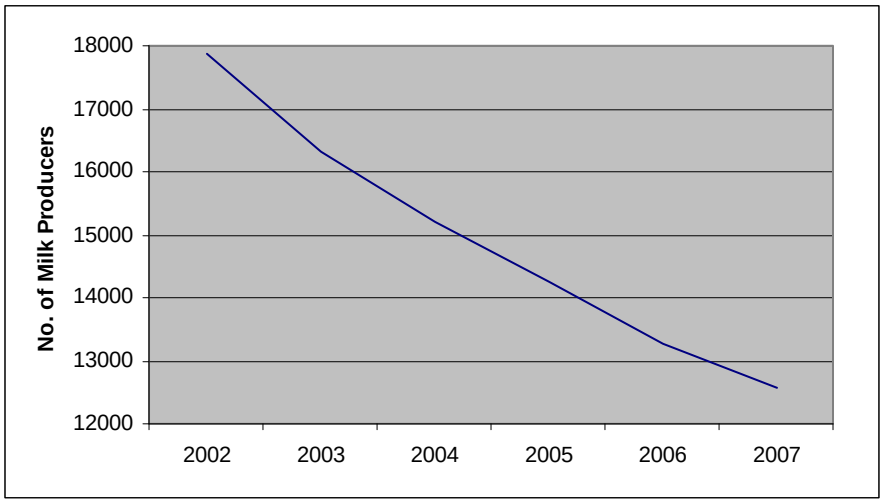


Source: MDC Datum (2008b)

Figure 1.4: UK Herd Size and Average Milk Yield

1.6: Producer Numbers (England & Wales)

Figure 1.5 shows a continuation of the decline in the number of milk producers in England and Wales. At December 2007, there were 12561 milk producers in these countries, compared with 13270 in December 2006. This represents a reduction of 5.4%. Since December 2002, the year on year decline in milk producers has been, 8.7%, 6.7%, 6.4%, 6.9% and 5.4%

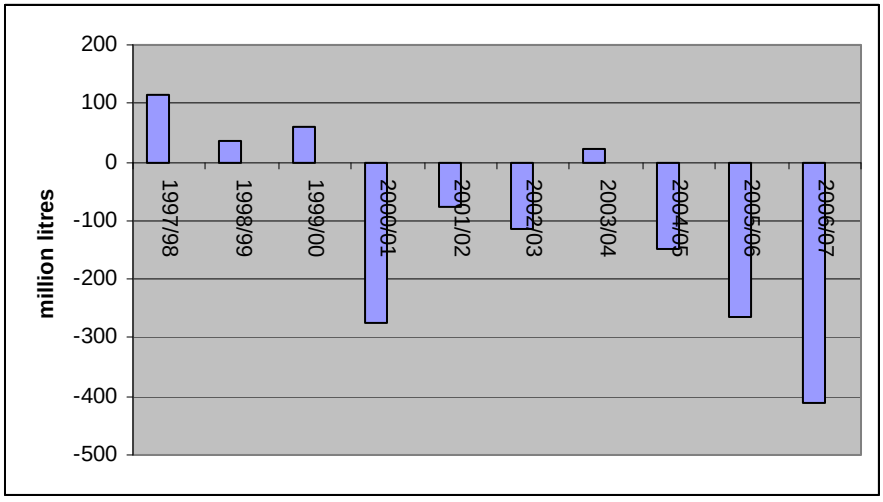


Source: MDC Datum (2008c)

Figure 1.5: Number of Milk Producers (England & Wales)

1.7: Milk Deliveries and Quota

Figure 1.6 shows that in 2006/07 the shortfall of total milk deliveries (butterfat adjusted) undershot total national quota by approximately 410 million litres. This means that in six of the last seven years, milk deliveries have been below quota, with 2006/07 recording the largest deficit for over a decade. The main reasons for this have been highlighted above (paragraph 1.4) but an additional factor has been the 0.5% increase in the 2006/07 national quota.



Source: MDC Datum (2008d)

Figure 1.6: Annual Deliveries and National Milk Quota (UK)

1.8: Structure of Report

The above sections have detailed the market environment in which dairy farmers have been operating during the 2006/07 financial year and additionally placed these in the context of recent developments. This structure of the remaining parts of the report is as follows: Chapter 2 details the data source and data analysis undertaken; Chapter 3 provides the results of the data analysis; Chapter 4 discusses the results of the analysis in context of previous research and identifies the main performance drivers in Dairy Farming in England.

Chapter 2: Data and Methodology

2.1: Data

The data used in this report are derived from the Farm Business Survey Returns for England for 2006/07 for those farms classed as Dairy Farms[1] and relate to the outputs, inputs and returns to each farm, together with total farm area and farm size data. For a sub-set of these results data is available at the enterprise level to produce output, variable input and Gross Margin (GM) data (total dairy output minus variable costs) together with cow numbers and physical yield (litres per cow). Table 2.1 below details the number of observations for the per hectare farm results, in each category by farm type (Lowland and Less Favoured Area (LFA)), by EU super region (North, East, West; see figure 2.1), by farm size categories, by lower and upper performance quartiles. Table 2.2 details the number of observations for the enterprise level results, in each category by farm type (Lowland and LFA), by EU super region (North, East, West), by herd size categories, by lower and upper performance quartiles.

Table 2.1: Observations by Category: Farm-Level Data

Category		Lowland	LFA
Number of farms		226	66
EU Super Region	North	63	38
	East	58	Ins. data
	West	105	17
Farm Size	<60 hectares	50	20
	60-120 hectares	94	21
	>120 hectares	82	25
Performance Quartile	Lower quartile	57	17
(by FBI)	Upper quartile	57	17

FBI = Farm Business Income: Ins. data = Insufficient data available (<15 observations)

[1] Holdings on which dairy cows account for more than two thirds of the total Standard Gross Margin for the farm. A holding is classified as a Less Favoured Area (LFA) holding if 50 percent or more of its total area is in the LFA and a lowland holding if less than 50 per cent of its total area is in the LFA. See http://statistics.defra.gov.uk/esg/asd/fbs/reference/farm_classification.pdf

Table 2.2: Observations by Category: Enterprise-Level Data

Category		Lowland	LFA
Number of farms		210	60
EU Super Region	North	61	36
	East	51	Ins. data
	West	98	16
Farm Size	<80 cows	73	32
	80-130 cows	68	19
	>130 cows	69	Ins. data
Performance Quartile	Lower quartile	53	15
(by Gross Margin)	Upper quartile	53	15

Ins. data = Insufficient data available (<15 observations).

2.2: Methodology

The farm and enterprise level data were weighted using the Farm Business Survey weights and the subsequent results presented on a per hectare (farm level analysis) or per cow (gross margin analysis) basis. The descriptive results with the mean (average) for each category being reported as detailed in Chapter 3.

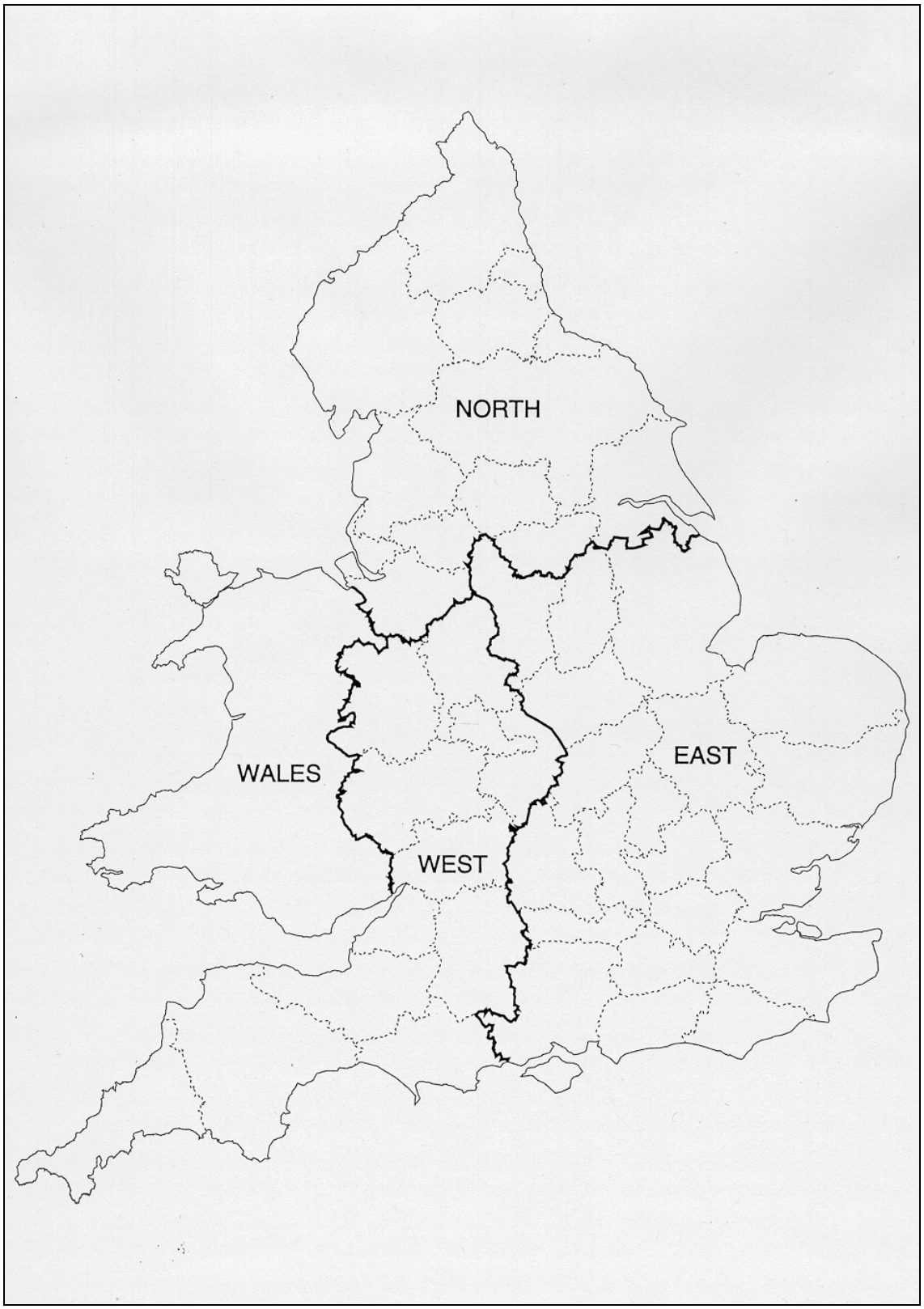


Figure 2.1: The EU Super Regions of England and Wales

Chapter 3: Results

3.1: All farms

Table 3.1 presents the results of the outputs, inputs, and margins from dairy farms in England on a per hectare (ha) basis. The table details the results for all farms, together with results for lowland and less favoured area (LFA) farms being considered separately. For all farms, Farm Business Income (FBI) is £321/ha, representing 17% of total farm output. Of the £321/ha FBI, £221/ha is accounted for by the value of the farmer and spouse labour. Management and Investment Income (MII), which represents an economic return after accounting for the value of labour and owned land is -£2/ha. This contrasts with the findings of Robertson and Wilson (2007) who note that MII for dairy farms from the 2005/06 FBS was £46/ha. Examining the breakdown of returns and costs, milk sales, at £1248/ha, account for 65% of total farm output; Robertson and Wilson note milk sales of £1325/ha, representing a 6% reduction from 2005/06 to 2006/07. The largest component of total variable cost derives from the combination of home-grown and purchased concentrates, which at £385/ha accounts for 53% of total variable costs. It is instructive to note that for 2005/06, Robertson and Wilson report home-grown and purchased concentrates at £348/ha; hence there has been an increase in concentrate cost accompanying the reduced milk output when comparing results from 2005/06 to 2006/07. Fixed costs, including the value of farmer and spouse labour, account for 62% of the overall total costs (and given an MII of -£2/ha, these costs also account for 62% of total output). Labour, including farmer and spouse labour, accounts for £454/ha or 24% of overall total farm output; this compares with £485/ha (25% of total farm output) from the 2005/06 results (Robertson and Wilson *ibid*).

3.2: Comparison of Lowland and Less Favoured Area (LFA) farms

Table 3.1 additionally shows the performance of lowland versus LFA dairy farms. The size structure of the average performance of these two groups does not differ, whilst a comparison of the outputs and inputs in production demonstrates considerable differences between these two groups. As expected, the lowland group represent a higher input-output system than the LFA group, with milk sales for the lowland group of £1354/ha representing a 53% increase over the milk sales for the LFA group (£884/ha). This increased output of the lowland group follows from both increased variable and fixed costs, with the combination of home-grown and purchased concentrate costs totalling £408/ha for the lowland group in comparison to £303/ha for the LFA group; without exception all variable costs are greater for the lowland group than the LFA group. Fixed cost structures also differ between the two groups with labour (including farmer and spouse labour) being approximately £100/ha greater for the lowland group than the LFA group. As noted for variable costs, fixed costs categories are also greater for the lowland group. These different input-output structures produce different performance results. The higher input-output system of the lowland group returns an average FBI of £340/ha in comparison to the average FBI of £255/ha for the LFA group. Examining MII, the lowland group returns a positive (£14/ha) return, whilst the LFA group records a loss (-£58/ha). These cost, returns and profitability averages largely concur with the findings of Robertson and Wilson (2007) who note that for 2005/06, lowland dairy farms returned a positive MII (£60/ha), compared to the loss made in the LFA dairy farm group (-£9/ha); overall profitability is lower in 2006/07 as noted in section 3.1 above.

Table 3.1: Outputs, Inputs and Margins for All Farms, Lowland and LFA

	All Farms	All Lowland	All LFA
Number of farms	292	226	66
Area (Ha)	104.60	104.72	104.19
	£/ha	£/ha	£/ha
Output			
Milk	1248	1354	884
Calf	53	56	44
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-90	-96	-69
Total Dairy Output	**1212**	**1314**	**859**
Other Livestock	255	262	232
Other	442	480	311
Total Farm Output	**1909**	**2056**	**1402**
Variable Costs			
Home-grown Concentrates	29	33	16
Purchased Concentrates	356	375	287
Coarse Fodder	29	32	20
Other Livestock Concentrates	8	10	2
Vet and Medicine	59	64	43
Other Livestock Costs	134	143	101
Seed	17	21	4
Fertiliser	63	67	51
Crop Protection	16	20	3
Other Crop Costs	14	15	10
Total Variable Costs	**726**	**780**	**538**
Fixed Costs			
Labour	233	252	168
Contract	88	100	50
Machinery Depreciation	108	116	82
Other Machinery	114	121	91
Miscellaneous	188	200	147
Rent and Rental Equivalent	233	249	179
Total Fixed Costs	**965**	**1036**	**718**
Net Farm Income	**219**	**240**	**147**
Farmer / Spouse Labour	221	225	204
Management & Investment Income	**-2**	**14**	**-58**
Farm Business Income (FBI)	**321**	**340**	**255**

3.3: Lowland: Influence of Farm Size

The results of the three lowland size groups are presented in Table 3.2. The outputs and costs of the three size groups are indicative of different degrees of specialisation in dairy production. Examining the per hectare results, the less than 60 hectare group return the greatest milk output (£1512/ha), whilst also recording the greatest total variable costs (£873/ha), total fixed costs (£557/ha), and largest value of farmer and spouse labour (£557/ha). These results indicate that the less than 60 hectare group represent farms that are typically more specialised in dairy production when compared with the 60 to 120 hectare and greater than the over 120 hectare groups. This finding is reinforced by examination of the variable costs, whereby the less than 60 hectare group records substantially greater concentrate, vet and medicine and other livestock costs; by contrast the two larger size groups record greater seed and crop protection costs per hectare indicating the presence of more arable enterprises on these larger dairy farms. These observations are also noted in Robertson and Wilson (2007) who argue that the costs and returns in relation to size group analysis indicate that the less than 60 hectare size group tend to be more specialised in milk production in comparison to the other size groups. Examining performance data, FBI ranges from £390/ha to £325/ha across the three size groups. However, with respect to economic returns, the less than 60 hectare size group records a MII of -£236/ha, which contrasts with -£18/ha (60 to 120 hectare group) and £94/ha (greater than 120 hectare group). The largest contributor to the difference in performance results indicated by these different measures is the value attributed to farmer and spouse labour, with the more dairy specialist less than 60 hectare size group recording £557/ha for this input; *a priori* it would be expected that the less than 60 hectare size group would record a greater value of farmer and spouse labour, particularly when acknowledging that this size group records the lowest average cost for paid labour.

3.4: Lowland: Influence of Region

Table 3.3 presents outputs, inputs and margins for lowland dairy farms across the three EU super regions. The East region records the greatest average area at 149 hectares, which is substantially greater than the average area in the North and West. Moreover, the East region returns the lowest milk output per hectare coupled with the lowest concentrate, vet and medicine and other livestock costs, indicative of a lower degree of specialisation in dairy production on farms in the East region. Seed and crop protection costs in the East region are greater than for the North and West groups, reinforcing the observation of a lower degree of dairy specialisation on Eastern dairy farms, and echoing the observations of Robertson and Wilson (2007) for the 2005/06 results. The greatest milk output per hectare is recorded for the West region (£1561/ha), and this region also records the greatest variable and fixed costs in addition to the greatest value of farmer and spouse labour. FBI ranges from £256/ha (East) to £403/ha (North), whilst MII ranges from £6/ha (West) to £25/ha (East), recording a small but positive economic return for lowland dairy farms, on average, across the regions.

3.5: Lowland: Comparison by Profitability Quartiles

The results by the lower and upper quartiles of lowland dairy farms as measured by FBI/ha are shown in Table 3.4. Farms in the upper quartile are slightly smaller (93 hectares) than those in the lower quartile (114 hectares). The largest influence on FBI performance derives from the upper quartile group recording substantially greater milk output (£1828/ha) compared with (£1053/ha) from the lower quartile. Other outputs are also greater for the upper quartile group and total farm output differs by approximately £1000/ha. The upper quartile group, with a greater degree of dairy specialisation / intensity of production, records overall concentrate costs of £500/ha, in comparison to the £360/ha for the lower quartile group. FBI differs between the two groups by over £930/ha, whilst the difference in MII between upper and lower quartiles is £580/ha.

Table 3.2: Outputs, Inputs and Margins: Lowland by Farm Size

LOWLAND	< 60 ha	60 – 120 ha	> 120 ha
Number of farms	50	94	82
Area (Ha)	42.66	85.75	202.20
	£/ha	£/ha	£/ha
Output			
Milk	1512	1348	1318
Calf	80	62	47
Lease Quota (net)	-2	0	0
Other Dairy	0	0	0
Herd Replacement	-108	-97	-91
Total Dairy Output	**1482**	**1312**	**1274**
Other Livestock	311	273	243
Other	486	470	484
Total Farm Output	**2279**	**2056**	**2001**
Variable Costs			
Home-grown Concentrates	28	31	34
Purchased Concentrates	447	366	364
Coarse Fodder	40	34	30
Other Livestock Concentrates	9	8	11
Vet and Medicine	71	59	65
Other Livestock Costs	163	151	134
Seed	11	21	24
Fertiliser	81	64	65
Crop Protection	7	13	27
Other Crop Costs	16	16	14
Total Variable Costs	**873**	**762**	**767**
Fixed Costs			
Labour	175	229	284
Contract	97	102	99
Machinery Depreciation	155	120	104
Other Machinery	136	111	123
Miscellaneous	251	213	179
Rent and Rental Equivalent	271	259	237
Total Fixed Costs	**1084**	**1033**	**1026**
Net Farm Income	**321**	**261**	**208**
Farmer / Spouse Labour	557	279	114
Management & Investment Income	**-236**	**-18**	**94**
Farm Business Income (FBI)	**390**	**345**	**325**

Table 3.3: Outputs, Inputs and Margins: Lowland by EU Super Region

LOWLAND	North	East	West
Number of farms	63	58	105
Area (Ha)	88.23	149.45	91.104
	£/ha	£/ha	£/ha
Output			
Milk	1358	1120	1561
Calf	63	41	65
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-111	-63	-115
Total Dairy Output	**1310**	**1098**	**1511**
Other Livestock	276	177	329
Other	497	509	442
Total Farm Output	**2083**	**1785**	**2281**
Variable Costs			
Home-grown Concentrates	30	27	40
Purchased Concentrates	397	312	419
Coarse Fodder	41	21	37
Other Livestock Concentrates	1	3	22
Vet and Medicine	73	51	69
Other Livestock Costs	141	116	168
Seed	16	24	22
Fertiliser	75	50	77
Crop Protection	15	26	18
Other Crop Costs	14	15	15
Total Variable Costs	**803**	**644**	**888**
Fixed Costs			
Labour	236	247	266
Contract	94	96	106
Machinery Depreciation	120	101	126
Other Machinery	119	110	132
Miscellaneous	203	190	206
Rent and Rental Equivalent	273	208	270
Total Fixed Costs	**1045**	**950**	**1107**
Net Farm Income	**236**	**191**	**286**
Farmer / Spouse Labour	223	165	281
Management & Investment Income	**13**	**25**	**6**
Farm Business Income (FBI)	**403**	**256**	**375**

Table 3.4: Outputs, Inputs and Margins: Lowland by Profitability Quartiles

LOWLAND	Lower quartile	Upper quartile
Number of farms	57	57
Area (Ha)	114.01	93.17
	£/ha	£/ha
Output		
Milk	1053	1828
Calf	46	74
Lease Quota (net)	0	0
Other Dairy	0	0
Herd Replacement	-87	-122
Total Dairy Output	**1011**	**1781**
Other Livestock	222	336
Other	416	545
Total Farm Output	**1649**	**2662**
Variable Costs		
Home-grown Concentrates	24	41
Purchased Concentrates	335	463
Coarse Fodder	30	46
Other Livestock Concentrates	11	16
Vet and Medicine	64	68
Other Livestock Costs	137	160
Seed	20	25
Fertiliser	59	74
Crop Protection	19	19
Other Crop Costs	18	17
Total Variable Costs	**719**	**931**
Fixed Costs		
Labour	241	295
Contract	94	92
Machinery Depreciation	109	141
Other Machinery	110	146
Miscellaneous	199	194
Rent and Rental Equivalent	232	293
Total Fixed Costs	**987**	**1161**
Net Farm Income	**-57**	**570**
Farmer / Spouse Labour	209	255
Management & Investment Income	**-266**	**315**
Farm Business Income (FBI)	**-54**	**877**

3.6: LFA: Influence of Farm Size

Table 3.1 above provided the results for all less favoured area (LFA) farms. Table 3.5 presents the result of LFA dairy farms according to the three size groupings. Milk output differs substantially across the three size groups when examined on a per hectare basis. Most notably the greater than 120 hectare group records substantially lower milk output (and overall farm output) per hectare than the other size groups. However, this more extensive production base is accompanied by substantially lower variable and fixed costs in addition to the lower value of farmer and spouse labour per hectare. The less than 60 hectare and 60 to 120 hectare groups record the value of farmer and spouse labour at £413/ha and £303/ha respectively, compared to £87/ha for the greater than 120 hectare group. Examining the results across the three size groups, the combination of returns and costs per hectare decreasing as farm size increases, suggests that within the LFA dairying sector, production (both dairy specific and other factors) becomes more extensive as farm size increases. This observation was also noted by Robertson and Wilson (2007) in their analysis of the 2005/06 data. Considering the financial returns to LFA farms by size groups, the greater than 120 hectare group record an average FBI of £182/ha in contrast to £435/ha and £284/ha for the less than 60 hectare group and the 60 to 120 hectare group respectively. Returns presented at MII level present a contrasting picture however, with the less than 60 hectare group recording the lowest MII at -£161/ha compared to -£111/ha for the 60 to 120 hectare group and -£3/ha for the greater than 120 hectare group. As can be noted from Table 3.5, the value of farmer and spouse labour differs across these groups and has a major influence on the MII returns.

3.7: LFA: Influence of Region

Table 3.6 presents the LFA dairy farm results by EU super region. Insufficient observations exist for the East region to present results. The average farm size for the North region is substantially larger than the average for the West region; 119 hectares and 83 hectares respectively. The larger average farm size in the North region is associated with lower milk and total farm output, reinforcing the findings in relation to farm size and output noted in section 3.6 above. The main differences between the North and West regions are the lower concentrate, labour and miscellaneous fixed costs and value of farmer and spouse labour in the North region. These results indicate that the more extensive LFA dairy farms identified in section 3.6 above tend to be located in the North region. Examining performance across the two regions presented in Table 3.6, the West region records the greater FBI (£318/ha in comparison to £236/ha for the North), however, with respect to MII, both regions record negative returns with the West returning an average MII approximately £150/ha lower than the North.

Table 3.5: Outputs, Inputs and Margins: LFA by Farm Size

LFA	< 60 ha	60 – 120 ha	> 120 ha
Number of farms	20	21	25
Area (Ha)	46.03	81.43	223.03
	£/ha	£/ha	£/ha
Output			
Milk	1319	1142	639
Calf	72	57	30
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-114	-86	-47
Total Dairy Output	**1277**	**1113**	**623**
Other Livestock	295	224	214
Other	470	255	278
Total Farm Output	**2043**	**1592**	**1115**
Variable Costs			
Home-grown Concentrates	16	17	16
Purchased Concentrates	417	371	212
Coarse Fodder	26	21	17
Other Livestock Concentrates	1	0	3
Vet and Medicine	54	53	36
Other Livestock Costs	149	108	82
Seed	3	4	4
Fertiliser	77	60	39
Crop Protection	3	3	4
Other Crop Costs	6	10	11
Total Variable Costs	**753**	**647**	**424**
Fixed Costs			
Labour	214	126	168
Contract	58	63	43
Machinery Depreciation	111	99	66
Other Machinery	125	86	82
Miscellaneous	242	180	103
Rent and Rental Equivalent	270	198	141
Total Fixed Costs	**1020**	**752**	**603**
Net Farm Income	**270**	**192**	**87**
Farmer / Spouse Labour	431	303	90
Management & Investment Income	**-161**	**-111**	**-3**
Farm Business Income (FBI)	**435**	**284**	**182**

Table 3.6: Outputs, Inputs and Margins: LFA by EU Super Region

LFA	North	East	West
Number of farms	38	Insufficient data	17
Area (Ha)	119.03		82.83
	£/ha	£/ha	£/ha
Output			
Milk	806		971
Calf	40		57
Lease Quota (net)	0		0
Other Dairy	0		0
Herd Replacement	-76		-56
Total Dairy Output	771		971
Other Livestock	249		174
Other	310		321
Total Farm Output	**1329**		**1466**
Variable Costs			
Home-grown Concentrates	17		19
Purchased Concentrates	260		296
Coarse Fodder	18		23
Other Livestock Concentrates	3		1
Vet and Medicine	47		36
Other Livestock Costs	96		106
Seed	4		3
Fertiliser	51		46
Crop Protection	4		2
Other Crop Costs	13		6
Total Variable Costs	**514**		**539**
Fixed Costs			
Labour	141		227
Contract	52		39
Machinery Depreciation	82		80
Other Machinery	95		80
Miscellaneous	122		191
Rent and Rental Equivalent	167		190
Total Fixed Costs	**659**		**807**
Net Farm Income	**156**		**120**
Farmer / Spouse Labour	162		278
Management & Investment Income	**-6**		**-158**
Farm Business Income (FBI)	**236**		**318**

3.8: LFA: Comparison by Profitability Quartiles

Table 3.7 presents the analysis of LFA farms by profitability quartiles, as measured by FBI performance. Note that with respect to LFA farms, the most profitable have a smaller average area, upon which they derive substantially greater milk and total farm output per hectare than the lower profitability quartile. Total farm output for the lower quartile at £832/ha contrasts with the £2170/ha from the upper quartile. The greater output of the upper quartile is accompanied by greater variable costs, particularly concentrate costs, other livestock costs and fertiliser costs, and additionally fixed costs are greater for the upper quartile group. All performance measures across the profitability groups demonstrate substantial differences, with the difference in FBI being £620/ha and MII differing by £320/ha between the lower and upper quartile groups. Note that in this analysis, the value of farmer and spouse labour is substantially greater for the upper performance quartile. The analysis in Table 3.7 indicates that the most profitable LFA dairy farms are relatively small with more intensive production than their larger lowland counterparts. The analysis in Tables 3.5 and 3.6 suggests that the more profitable LFA farms are most likely to be located in the West where LFA dairying is more intensive, than in the North.

3.9: Further Analysis: Lowland and LFA by Region and Farm Size

Sections 3.1 to 3.8 has explored the revenues, costs, incomes and margins for dairy farms as defined by production type (lowland versus LFA), and for each production type by farm groups, EU super regions and profitability quartiles. Whilst this provides a comprehensive coverage of the data, it is possible to further analyse the data for lowland dairy farms according farm size groupings for each EU super region. This analysis has been undertaken, and readers are directed to explore the results presented in Tables A1 to A3 in the appendix for these average results. Where the number of farms by EU super region and farm size group are less than 15, these data have not been provided to ensure that confidentiality of the data is not compromised. Due to sample size restrictions it was not possible to provide meaningful results for LFA production by EU super region and by farm size.

Table 3.7: Outputs, Inputs and Margins: LFA by Profitability Quartiles

LFA	Lower quartile	Upper quartile
Number of farms	17	17
Area (Ha)	174.93	69.66
	£/ha	£/ha
Output		
Milk	385	1511
Calf	21	84
Lease Quota (net)	0	0
Other Dairy	0	0
Herd Replacement	-35	-108
Total Dairy Output	**371**	**1486**
Other Livestock	181	249
Other	280	435
Total Farm Output	**832**	**2170**
Variable Costs		
Home-grown Concentrates	6	33
Purchased Concentrates	181	395
Coarse Fodder	16	28
Other Livestock Concentrates	0	1
Vet and Medicine	28	58
Other Livestock Costs	66	153
Seed	1	6
Fertiliser	27	84
Crop Protection	1	5
Other Crop Costs	13	7
Total Variable Costs	**339**	**770**
Fixed Costs		
Labour	125	242
Contract	16	69
Machinery Depreciation	67	107
Other Machinery	95	116
Miscellaneous	98	206
Rent and Rental Equivalent	119	216
Total Fixed Costs	**519**	**956**
Net Farm Income	**-26**	**444**
Farmer / Spouse Labour	128	276
Management & Investment Income	**-155**	**168**
Farm Business Income (FBI)	**28**	**647**

3.10: Dairy Enterprise Results: Gross Margin for All, Lowland, and LFA Farms

In the above sections, outputs, inputs and returns were presented for dairy farms, on a per hectare basis, whereby the results included data from the dairy enterprise and other enterprises on the farm to produce overall farm results. In this, and the following sections, results are presented that relate solely to the dairy enterprise. Results in this and the following sections are presented at enterprise level reporting to Gross Margin (GM) returns (total dairy output minus total variable costs). Table 3.8 provides the dairy enterprise results for all farms and for lowland and LFA as separate data. The pattern identified above for the per farm results, whereby the lowland farms returned greater output than LFA farms, is repeated at enterprise level. Specifically, lowland farms returned an average milk output of £1320/cow in comparison to £1201/cow from the LFA farms; these two results deriving from respective average milk yields of 7200 litres/cow and 6700 litres/cow. These output differences also reinforce the findings of Robertson and Wilson (2007) from their analysis of the 2005/06 data, albeit that overall yields from 2005/06 (for all farms) averaged 6738 litres/cow in comparison to 7112 litres/cow from the 2006/07 data, representing a 5.5% increase in physical output on the year; however financially milk output at £1299/cow for all farms in Table 3.8 compares with an output of £1275/cow from 2005/06 (Robertson and Wilson *ibid*), indicating that on average, the milk price received was lower in 2006/07 than in the preceding year. On the basis of the two financial years' data the average milk price received in 2005/06 was 18.9 pence per litre (ppl), whilst in 2006/07 this fell to 18.3ppl. Concentrate (and other variable costs) are greater for the lowland group then the LFA group as would be expected from the more intensive production of the lowland herds, and gross margins for the two groups differ by £71/cow (contrasting with a difference of £88/cow from Roberson and Wilson *ibid*).

Table 3.8: Gross Margin Results for All Farms, Lowland and LFA

	All Farms	All Lowland	All LFA
Number of farms	270	210	60
Average number cows	101.2	106.9	80.8
Average yield (litres)	7112	7198	6704
	£/cow	£/cow	£/cow
Output			
Milk	1299	1320	1201
Calf	57	56	61
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-94	-94	-93
Total Dairy Output	**1262**	**1282**	**1168**
Variable Costs			
Concentrates	324	328	309
Coarse Fodder	23	24	19
Vet and Medicine	50	51	45
Other Livestock Costs	110	111	108
Forage Costs	58	60	49
Total Variable Costs	**566**	**574**	**531**
Total Gross Margin	**696**	**708**	**637**

3.11: Dairy Enterprise Results: Influence of Farm Size on Lowland Herds

Gross margins results by three size categories for lowland farms are shown in Table 3.9. The clear trend in relation to milk yield and herd size is a positive correlation with average yields increasing as herd size increased. The increased physical output per cow, evident as herd size increases, is matched by increased financial output, concentrate and other variable costs. The difference in gross margin between the three size groups is in the order of £100/cow between each size group, such that the respective gross margins for the less than 80 cow, 80 to 130 cow, and greater than 130 cow groups are £580/cow, £688/cow and £780/cow respectively. Thus, the substantial difference in output is not fully eroded by increased variable costs, which results in variable costs varying by £140/cow across these average results. The greater than 130 cow herd size records the largest gross margin at £780/cow; approximately £200/cow more than the average gross margin from the less than 80 cow herd size group.

Table 3.9: Gross Margin Results: Lowland by Herd Size

LOWLAND	< 80 cows	80 – 130 cows	> 130 cows
Number of farms	73	68	69
Average number cows	52.9	100.5	227.4
Average yield (litres)	5974	7103	7843
	£/cow	£/cow	£/cow
Output			
Milk	1086	1292	1448
Calf	59	57	53
Lease Quota (net)	-1	0	0
Other Dairy	0	0	0
Herd Replacement	-88	-82	-102
Total Dairy Output	**1056**	**1267**	**1399**
Variable Costs			
Concentrates	267	325	358
Coarse Fodder	10	29	29
Vet and Medicine	40	52	56
Other Livestock Costs	107	111	112
Forage Costs	52	61	63
Total Variable Costs	**476**	**579**	**619**
Total Gross Margin	**580**	**688**	**780**

3.12: Dairy Enterprise Results: Influence of Region on Lowland Herds

Results for lowland herds by EU super region are presented in Table 3.10. The East region is characterised by a larger herd size, producing greater milk yields and financial output, whilst also incurring greater variable costs, particularly concentrate costs. Considering output across the regions, the respective milk outputs for the North, East and West regions are £1227/cow, £1445/cow and £1307/cow; respective average milk prices are 17.9pp, 18.9ppl and 18.3ppl for the three regions. A gross margin of £810/cow for the East region reflects the higher output (both yield and price) and slightly greater concentrate costs; by contrast the West returns a gross margin of £703/cow and the North £624/cow.

Table 3.10: Gross Margin Results: Lowland by EU Super Region

LOWLAND	North	East	West
Number of farms	61	51	98
Average number cows	95.8	116.9	109.4
Average yield (litres)	6873	7650	7147
	£/cow	£/cow	£/cow
Output			
Milk	1227	1445	1307
Calf	57	57	54
Lease Quota (net)	0	-1	0
Other Dairy	0	0	0
Herd Replacement	-101	-81	-96
Total Dairy Output	**1183**	**1420**	**1265**
Variable Costs			
Concentrates	315	355	320
Coarse Fodder	28	20	24
Vet and Medicine	56	50	49
Other Livestock Costs	101	122	110
Forage Costs	60	62	59
Total Variable Costs	**560**	**609**	**562**
Total Gross Margin	**624**	**810**	**703**

3.13: Dairy Enterprise Results: Lowland Herds by Performance Groups

Results measured by gross margin performance for lowland herds are presented in Table 3.11. The results are shown for the upper and lower quartiles as measured by gross margin performance. The upper quartile achieved substantially greater yields and thus milk output (by £650/cow) whilst incurring only £90/cow greater variable costs. The upper quartile is characterised by substantially larger average herd size, which at 144, is 125% greater than the average herd size for the lower quartile group. With yields averaging over 8000 litres for the upper performance group, in contrast to less than 5700 litres for the lower performance group, milk output is the clear performance driver in determining financial performance to gross margin level. In addition to achieving substantially greater yields, the upper quartile achieved an average milk price of 19.9ppl in contrast to 16.6ppl for the lower quartile. Hence, the upper quartile is characterised by larger herds, with more intensive production systems producing a higher quality milk product that achieves higher milk prices. Within this production environment it is worth noting that the upper quartile has lower replacement costs than the lower quartile. The pattern of production identified in Table 3.11 reinforces the findings from Robertson and Wilson (2007) who similarly find these underlying characteristics of the upper performance group for lowland herds in 2005/06.

Table 3.11: Gross Margin Results: Lowland by Performance Quartiles

LOWLAND	Lower quartile	Upper quartile
Number of farms	53	53
Average number cows	64.3	144.4
Average yield (litres)	5672	8009
	£/cow	£/cow
Output		
Milk	942	1594
Calf	53	59
Lease Quota (net)	-1	0
Other Dairy	0	0
Herd Replacement	-98	-75
Total Dairy Output	**895**	**1578**
Variable Costs		
Concentrates	281	351
Coarse Fodder	16	19
Vet and Medicine	40	50
Other Livestock Costs	104	119
Forage Costs	60	50
Total Variable Costs	**501**	**590**
Total Gross Margin	**394**	**988**

3.14: Dairy Enterprise Results: Influence of Farm Size on LFA Herds

Table 3.12 presents the results of the gross margin analysis LFA farms by herd size. The 80 to 130 herd size group achieved greater yields, by approximately 1000 litres/cow, and subsequently recorded greater milk output, than the less than 80 cow herd size group. The 80 to 130 herd size group also incurred greater variable costs, notably concentrate costs, however the increased variable costs of approximately £100/cow were not sufficient to off-set the increased total output of nearly £200/cow, leaving a gross margin for the 80 to 130 herd size group of £634/cow in comparison to the £575/cow for the less than 80 cow size group.

Table 3.12: Gross Margin Results: LFA by Herd Size

LFA	< 80 cows	80 – 130 cows	> 130 cows
Number of farms	32	19	Insufficient data
Average number cows	58.4	99.0	
Average yield (litres)	6134	7118	
	£/cow	£/cow	£/cow
Output			
Milk	1072	1279	
Calf	71	54	
Lease Quota (net)	0	0	
Other Dairy	0	0	
Herd Replacement	-89	-110	
Total Dairy Output	**1055**	**1224**	
Variable Costs			
Concentrates	280	352	
Coarse Fodder	18	20	
Vet and Medicine	42	45	
Other Livestock Costs	99	118	
Forage Costs	42	55	
Total Variable Costs	**480**	**589**	
Total Gross Margin	**575**	**634**	

3.15: Dairy Enterprise Results: Influence of Region on LFA Herds

Analysis of gross margin data for LFA farms by EU super region is presented in Table 3.13. Whilst insufficient observations are present for the East LFA region, comparison of the North and West regions is possible. Note that with respect to the average number of cows, the two regions are very similar. However, in respect to milk output, the North region achieves nearly 900litres/cow more than the West. Consequently, the North region records milk output approximately £160/cow greater than the West, whilst incurring £90/cow greater variable costs. Such analysis would suggest that the North region should accrue greater gross margins, however the average herd replacement cost at £155/cow (North) and £63/cow (West) leads to average gross margins that are almost identical across the two regions presented.

Table 3.13: Gross Margin Results: LFA by EU Super Region

LFA	North	East	West
Number of farms	36	Insufficient data	16
Average number cows	79.6		77.1
Average yield (litres)	6901		6028
	£/cow	£/cow	£/cow
Output			
Milk	1238		1076
Calf	63		64
Lease Quota (net)	0		0
Other Dairy	0		0
Herd Replacement	-115		-63
Total Dairy Output	**1186**		**1077**
Variable Costs			
Concentrates	324		273
Coarse Fodder	19		21
Vet and Medicine	54		33
Other Livestock Costs	114		98
Forage Costs	58		34
Total Variable Costs	**569**		**459**
Total Gross Margin	**618**		**619**

3.16: Dairy Enterprise Results: LFA Herds by Performance Groups

Table 3.14 provides the results for LFA herds by upper and lower performance quartiles as measured by gross margin. As noted above for lowland herds, the upper quartile is characterised by having a larger herd, achieving greater yields and milk output and incurring greater variable costs. Milk yields of 8237 litres/cow (upper quartile) and 5599 litres/cow (lower quartile) lead to respective milk outputs of £1392/cow and £868/cow. As noted above for lowland herds, the LFA upper quartile also achieved higher milk prices of 17.1ppl compared to 16.8ppl for the lower quartile, albeit that the difference in milk price between these groups of LFA farms is considerably smaller than for lowland farms (see section 3.13). Concentrate costs differ by £90/cow which ensures that the substantial difference in milk output is largely maintained at gross margin level whereby the upper quartile achieve a gross margin more than £500/cow greater than the lower quartile. Section 3.13 noted that for lowland herds, the replacement costs for the upper quartile were lower than for the lower quartile; this observation also holds for the LFA performance groups as shown in Table 3.14.

Table 3.14: Gross Margin Results: LFA by Performance Groups

LFA	Lower quartile	Upper quartile
Number of farms	15	15
Average number cows	64.2	102.2
Average yield (litres)	5599	8237
	£/cow	£/cow
Output		
Milk	940	1410
Calf	66	55
Lease Quota (net)	0	2
Other Dairy	0	0
Herd Replacement	-122	-75
Total Dairy Output	**884**	**1392**
Variable Costs		
Concentrates	302	392
Coarse Fodder	21	20
Vet and Medicine	46	67
Other Livestock Costs	112	146
Forage Costs	50	48
Total Variable Costs	**532**	**673**
Total Gross Margin	**353**	**863**

3.17: Further Analysis: Dairy Enterprise Results for Lowland by Region and Farm Size

Further analyses of the enterprise gross margin results (for lowland production) are presented in the appendix in Tables A4 to A6. The results are provided by EU super region by herd size groupings were sufficient observations exist to allow the results to be presented. Following the pattern adopted for the results presented for dairy farms on a per hectare basis, where the number of farms in a specific group are less than 15, these data have not been provided to ensure that confidentiality of the data is not compromised. Due to sample size restrictions it was not possible to provide meaningful dairy enterprise results for LFA production by region and herd size.

Chapter 4: Discussion and Conclusion

4.1: Introduction

The results of the outputs, inputs, and margins from dairy farms in England on a per hectare (ha) basis have been presented in Chapter 3 together with enterprise specific results to gross margin level. The purpose of this chapter is to consider the results presented above to identify key themes within the data and also make comparisons with previous research.

4.2: Lowland Dairying

The results for all farms in the sample indicated that the average Farm Business Income (FBI) was £321/ha and average Management and Investment Income (MII) was -£2/ha; lowland dairy farms make up the largest proportion of the sample, and the respective results for lowland production were £340/ha and £14/ha. Observing performance by farm size groupings shows that the smaller farms (<60 ha) tend to be more dairy specialist in their production in comparison to their larger counterparts. The smaller farms produce the highest FBI per hectare, however when examined in terms of MII the smaller farm size group returns the lowest average economic performance; this is largely due to the large value of farmer and spouse labour per hectare on smaller farms. Whilst the smaller farms returned an average MII of -£236/ha, the larger farms (greater than 120 hectare), returned an MII of £94/ha. With respect to regional analysis, those dairy farms located in the West tend to be more heavily reliant upon dairy production than other income; whilst FBI returns vary from £256/ha (East) to £403/ha (North), average MII performance per hectare varies little across the regions.

Performance analysis can shed considerable light on the observed variation in performance. At the farm level, the upper quartile of dairy farms achieve a total farm output £1000/ha more than the lower quartile, leading to an improvement in FBI returns of in excess of £900/ha over the lower quartile. The upper quartile are characterised by considerably greater milk output, greater concentrate costs and higher fixed costs, including the value of farmer and spouse labour. Gross margin analysis in lowland dairy production reveals an average gross margin of £700/cow for 2006/07. Analysis by herd size shows a clear trend of greater concentrate cost producing greater yields as herd size increases; hence larger herds tend to have a higher input-output production process. At gross margin level, the average performance of the greater than 130 cow group is £200/cow greater than the gross margin returns for the less than 80 cow group. Regional analysis reinforces the findings by herd size. Dairy enterprises in the East tend to be more intensive in their production, have larger herds and achieve higher gross margins than those in the North and West. The North region records the smallest average herd size across the regions corresponding with the lowest average milk output and gross margin. Performance group analysis highlights the importance of intensity of production that correlates positively with herd size. The upper quartile has an average herd size of 144 compared to an average of 64 cows for the lower quartile. Milk yield is a key performance driver, but this is also accompanied by a 3.3 pence per litre differential between the quartile groups, with the upper quartile accompanying their high yield with higher milk prices. Whilst the upper quartile incurred higher concentrate costs, they incurred lower replacement costs to produce an average gross margin approximately £600/cow over and above that of the lower quartile.

4.3: Less Favoured Area Dairying

The above section noted the small but positive economic return to lowland dairy farming as measured by MII; by contrast LFA dairying returned an average MII of -£58/ha. However, when considering the financial return as presented by FBI, LFA dairy farms achieved a positive return of approximately £250/ha, equating to an average of just over £26,000 per farm. Farm size analysis within LFA dairying shows a clear trend that the smaller farms tend to be more intensive in their production (of dairy and other outputs) than larger LFA farms. Given the structure and extensive nature of LFA farms, when considering results on a per hectare basis, the results clearly show that the average farm size of the greater than 120

hectare group is substantially greater than the average size of the remaining groups. Whilst the FBI per hectare results show a decreasing trend with farm size, the reverse is found when examined on a MII basis.

Regional analysis is only possible between the North and West regions due to the small sample size in the East. LFA dairy farms in the North are, on average, larger and more extensive in their production than those found in the West; considered on a per hectare basis the North records a lower FBI per hectare than the West, albeit over a larger area. Comparison by profitability quartiles in LFA dairying shows that the upper quartile farms a smaller area, and from this achieves per hectare output and income results substantially greater than the larger farms found in the lower quartile. This analysis demonstrates a clear difference in production systems yet one which leads to a difference in FBI between the two quartile groups of greater than £600/ha. The upper quartile incurred substantially greater variable and fixed costs per hectare in their production. To place these results in context, the upper quartile returned an average FBI per farm of £45,000, whilst the lower quartile returned an average FBI per farm of £5000. Considering gross margin returns, at £637/cow, returns are lower than observed in lowland dairying, largely resulting from slightly lower concentrate costs and yields approximately 500 litres/cow lower than recorded in lowland production. Herd size analysis (from the two groups where data can be presented) reinforces the finding for lowland production that yields increase with herd size, flowing from greater concentrate use, and resulting in greater gross margins. EU super region analysis shows that the more intensive LFA dairy enterprises are found in the North with greater milk output deriving from higher concentrate use, however the North incurs higher replacement costs and variable costs resulting in the milk output advantage being eroded when performance at gross margin is considered. Performance by quartile groups clearly shows that the most profitable LFA dairy enterprises have larger herd size, incur greater concentrate costs but lower replacement costs, and deliver substantially greater milk output. The difference in gross margin between the LFA quartile groups exceeds £500/cow; milk yield is the single most important factor, with milk price achieved varying by only 0.3 pence per litre between the LFA dairying quartile groups.

4.4: Comparison with Previous Research

This report is the second in the series *Dairy Farming in England* drawn from the Farm Business Survey results. The previous report (Robertson and Wilson, 2007) provides directly comparable results with the current report, containing the same analysis by production type (lowland versus LFA), region, farm / herd size, and performance quartiles. Additionally, whilst the sample of farms within the FBS changes from year to year, a large proportion of the sample remains in the survey for a number of years and hence the average data findings are observing real changes in the industry and not capturing sample changes. The broad findings in this report clearly indicate that dairy farming in 2006/07 provided an average financial return (FBI) of £321/ha, equating to £33,500 per farm. However, when considered with respect to an average economic return (MII) of -£2/ha (-£200 per farm), the economic return to dairy farming in 2006/07 was approximately zero. This compares with a small but positive economic return of £46/ha from 2005/06. Comparing per farm and per cow (at gross margin level) results in this report with those from Robertson and Wilson (2007), a 6% reduction in milk sales per hectare is observed. The gross margin analysis comparison indicates that yields increased by 5.5% from 2005/06 to 2006/07 however this was accompanied by a 3% fall in milk price. Overall, the comparison suggests that dairy farming in 2006/07 was, on average, less economically rewarding, albeit that the 5.5% milk yield improvement suggests that conditions and / or the management or potential of dairy cows were more conducive to production in 2006/07 than 2005/06. Robertson and Wilson observed some key findings from the 2005/06 data. The main findings noted were that the more profitable lowland producers tended to have larger herds, be in the East, have a greater concentrate use, incur lower replacement costs and achieve greater milk yields. With respect to LFA producers, Robertson and Wilson note that at gross margin level the higher input-output systems achieved greater gross margins than the lower quartile (and incurred lower replacement costs alongside their larger herd size); at farm level the more intensive producers on smaller farms recorded greater economic returns. The findings from this

current report largely concur with those of Robertson and Wilson. The key result often observed with agricultural production data that the more intensive input-output systems, most often found on larger farms or with larger units (e.g. herd size) tend to be the more profitable, is observed for contemporary dairy production. These observations, noted alongside the improved milk price for the upper quartile of lowland producers, indicates that the more profitable are technically and economically more efficient. Such findings serve to reinforce previous analyses. Colman *et al.* (2004) indicate that the upper quartile (as measured by net margin per cow) achieve a greater yield than the lower quartile from an associated greater concentrate usage; moreover these producers tend to operate larger herds as noted in this current study. Franks *et al.* (2002) which draws upon data 10 years previous to the current study (i.e. 1996/97), notes the substantial economies of scale present in dairy production, including the higher output borne from greater milk yields. In summary, the findings presented in this report, reinforced by the conclusions of Franks *et al.* (2002), Colman *et al.* (2004) and Robertson and Wilson (2007) provide a comprehensive analysis that suggests that the most profitable dairy farming in England is found on large lowland dairy farms who achieve considerable output per unit of input when compared to average performance.

4.5: Conclusion

Chapter 1 of this report provided an insight into the structure of the dairy industry and the market environment in which producers operate. In summary, producer numbers, herd size, milk output, and milk prices declined in 2006, whilst costs increased. Analysis of milk deliveries against quota shows that 2006 represented the largest delivery shortfall against quota since their introduction in 1984. Using data from the 2006/07 Farm Business Survey, this report indicates that profitability in dairy farming in 2006/07 was lower than in 2005/06, with, on average, an economic return (measured by MII) to dairy farms of -£2/ha; the lower milk price and increased costs outweighing the increase in milk yield observed from this data. In agreement with previous research, the most profitable producers operate larger herds, with more intensive production systems, achieve higher milk prices and consequently return substantially greater returns than those in the least profitable quartiles. The changes to the structure of the dairy industry have not gone unnoticed by the downstream processing and retailing sector. The previous report (Robertson and Wilson, 2007) highlighted the changes to milk price structures introduced by a major retailer at the start of 2007 with a view to securing milk supplies. At the time of writing in Spring 2008, the milk price currently offered to producers is substantially and significantly greater than 12 months previous, as the lack of milk supply (as noted in Chapter 1) leads to retailers having to react with higher milk prices in order to obtain supplies. Whilst the profitability of the sector therefore looks set to improve, increased costs, particularly in relation to concentrate feed, fertiliser and fuel, are likely to erode a substantial element of any increased milk price. Nonetheless, for those producers remaining in dairying, 2007/08 looks set to return a more fulfilling economic return than achieved in 2006/07. However, with continued structural change and volatility in input costs, managers will increasingly need to focus upon the costs and returns involved in their business, and in so doing seek independent data with which to compare their business and assess the market environment in which they operate. Such independent data is at the core of the Farm Business Survey and this report on *Dairy Farming in England*.

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Glossary

Output: Other Livestock is comprised of sales of non-dairy livestock and livestock products adjusted for valuation changes plus the value of produce used on the farm and consumed in the farmhouse or by the workers, less livestock purchases. Miscellaneous livestock receipts are also included.

Output: Other is the sales of crops adjusted for valuation changes, plus the value of produce used on the farm (other than forage crops and straw) and produce consumed in the farmhouse or by the workers. Income from land let and buildings let, hirework, non-allocated grants e.g. for environmental schemes, profit on resale of purchased agricultural produce and other miscellaneous farm income including the change in valuation of cultivations is also included.

Other livestock costs include livestock haulage, marketing charges, AI charges, straw and woodshavings for bedding and dairy sundries.

Other crop costs include silage bags, twine, all marketing costs including crop haulage, purchase of standing crops, soil analysis and potato sacks.

Labour is comprised of the gross cost of regular paid employees including an allowance for perquisites together with unpaid family labour (other than the farmer and spouse) manual labour.

Machinery depreciation is calculated using the current cost accounting method whereby each item of equipment is revalued by an index prior to the depreciation calculation.

Rent and Rental Equivalent consist of gross rent, imputed rent on the net cost of the tenant's own improvements, drainage rates and for owner-occupied land a rental value based on what a tenant would be paying for similar land with an equal length of occupancy.

Miscellaneous costs include water charges, vehicle tax, insurance, professional fees, bank commission, telephone charges, subscriptions, office expenses and pest control, general repairs.

Net Farm Income (NFI) is total output less total inputs as defined above. It represents the reward to the farmer and spouse for their own manual labour, management and a return on tenant's capital.

Farmer's and spouse's manual labour is the estimated value of their manual labour.

Management and Investment Income (MII) is Net Farm Income less the allowance made for the farmer's and spouse's manual labour. It represents the reward for management and a return on tenant's capital. MII therefore represents the return to management after all costs have been deducted, including the imputed cost of all unpaid manual labour and a notional rent on owner occupied land and buildings.

Farm Business Income (FBI) represents the return to all unpaid labour (farmers, spouses and others with an entrepreneurial interest in the farm business) and to all their capital invested in the farm business including land and farm buildings. It is defined as Total Farm Output (TFO) plus profit / loss on sale of assets minus cost (C): where TFO is defined as the sum of output from: crop enterprises, adjustment for disposal of previous crops, livestock enterprises, separable non-agricultural diversification, single farm payment, agri-environmental payments, other grants and subsidies, miscellaneous receipts; C is defined as variable costs plus fixed costs.

Total Gross Margin, presented for the dairy enterprise results, is total dairy output minus total variable costs.

Appendix 1: Results by Region and Farm Size

Table A.1: Outputs, Inputs and Margins: Lowland (North) by Farm Size

LOWLAND (North)	< 60 ha	60 – 120 ha	> 120 ha
Number of farms	21	24	18
Area (Ha)	43.44	89.84	174.23
	£/ha	£/ha	£/ha
Output			
Milk	1317	1244	1466
Calf	70	62	61
Lease Quota (net)	-1	0	0
Other Dairy	0	1	0
Herd Replacement	-125	-99	-114
Total Dairy Output	1261	1208	1413
Other Livestock	306	259	275
Other	694	468	424
Total Farm Output	2261	1935	2111
Variable Costs			
Home-grown Concentrates	36	36	22
Purchased Concentrates	409	352	427
Coarse Fodder	27	36	53
Other Livestock Concentrates	3	0	0
Vet and Medicine	58	64	87
Other Livestock Costs	135	132	152
Seed	6	16	21
Fertiliser	78	76	72
Crop Protection	6	12	21
Other Crop Costs	15	13	14
Total Variable Costs	771	737	869
Fixed Costs			
Labour	195	204	281
Contract	107	74	103
Machinery Depreciation	195	98	101
Other Machinery	141	91	129
Miscellaneous	250	200	182
Rent and Rental Equivalent	282	278	264
Total Fixed Costs	1169	946	1060
Net Farm Income	321	251	183
Farmer / Spouse Labour	464	216	110
Management & Investment Income	-143	35	72
Farm Business Income (FBI)	404	369	430

Table A.2: Outputs, Inputs and Margins: Lowland (East) by Farm Size

LOWLAND (East)	< 60 ha	60 – 120 ha	> 120 ha
Number of farms	Insufficient data	19	34
Area (Ha)		83.88	225.45
	£/ha	£/ha	£/ha
Output			
Milk		1285	1037
Calf		61	32
Lease Quota (net)		0	0
Other Dairy		0	0
Herd Replacement		-92	-56
Total Dairy Output		1254	1012
Other Livestock		166	175
Other		487	533
Total Farm Output		1908	1720
Variable Costs			
Home-grown Concentrates		22	29
Purchased Concentrates		348	288
Coarse Fodder		26	17
Other Livestock Concentrates		1	4
Vet and Medicine		53	48
Other Livestock Costs		156	103
Seed		24	24
Fertiliser		44	50
Crop Protection		11	32
Other Crop Costs		22	12
Total Variable Costs		709	607
Fixed Costs			
Labour		183	260
Contract		104	92
Machinery Depreciation		95	102
Other Machinery		110	108
Miscellaneous		261	171
Rent and Rental Equivalent		217	206
Total Fixed Costs		970	938
Net Farm Income		229	175
Farmer / Spouse Labour		297	107
Management & Investment Income		-68	68
Farm Business Income (FBI)		240	244

Table A.3: Outputs, Inputs and Margins: Lowland (West) by Farm Size

LOWLAND (West)	< 60 ha	60 – 120 ha	> 120 ha
Number of farms	24	51	30
Area (Ha)	40.51	84.52	191.72
	£/ha	£/ha	£/ha
Output			
Milk	1620	1434	1652
Calf	83	61	62
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-113	-99	-130
Total Dairy Output	1590	1396	1584
Other Livestock	327	331	327
Other	373	464	447
Total Farm Output	2291	2191	2358
Variable Costs			
Home-grown Concentrates	26	33	50
Purchased Concentrates	457	381	439
Coarse Fodder	47	36	34
Other Livestock Concentrates	17	15	30
Vet and Medicine	79	58	75
Other Livestock Costs	191	159	168
Seed	13	22	26
Fertiliser	86	66	83
Crop Protection	8	15	25
Other Crop Costs	16	15	16
Total Variable Costs	942	801	946
Fixed Costs			
Labour	122	263	322
Contract	82	115	108
Machinery Depreciation	130	143	108
Other Machinery	133	122	141
Miscellaneous	269	197	191
Rent and Rental Equivalent	281	268	268
Total Fixed Costs	1017	1109	1138
Net Farm Income	332	281	275
Farmer / Spouse Labour	644	305	127
Management & Investment Income	-312	-24	148
Farm Business Income (FBI)	340	381	382

Table A.4: Gross Margin Results: Lowland (North) by Herd Size

LOWLAND (North)	< 80 cows	80 – 130 cows	> 130 cows
Number of farms	26	19	16
Average number cows	51.2	98.7	221.9
Average yield (litres)	5665	6706	7769
	£/cow	£/cow	£/cow
Output			
Milk	990	1215	1392
Calf	60	55	56
Lease Quota (net)	0	-1	0
Other Dairy	0	0	0
Herd Replacement	-87	-97	-112
Total Dairy Output	**964**	**1172**	**1337**
Variable Costs			
Concentrates	252	325	351
Coarse Fodder	14	20	42
Vet and Medicine	41	44	73
Other Livestock Costs	93	105	103
Forage Costs	54	57	67
Total Variable Costs	**454**	**551**	**636**
Total Gross Margin	**509**	**620**	**702**

Table A.5: Gross Margin Results: Lowland (East) by Herd Size

LOWLAND (East)	< 80 cows	80 – 130 cows	> 130 cows
Number of farms	Insufficient data	20	19
Average number cows		103.4	208.4
Average yield (litres)		7449	8210
	£/cow	£/cow	£/cow
Output			
Milk		1378	1556
Calf		63	53
Lease Quota (net)		0	0
Other Dairy		0	0
Herd Replacement		-80	-76
Total Dairy Output		**1361**	**1534**
Variable Costs			
Concentrates		349	386
Coarse Fodder		27	21
Vet and Medicine		56	49
Other Livestock Costs		135	118
Forage Costs		66	62
Total Variable Costs		**632**	**636**
Total Gross Margin		**729**	**898**

Table A.6: Gross Margin Results: Lowland (West) by Herd Size

LOWLAND (West)	< 80 cows	80 – 130 cows	> 130 cows
Number of farms	35	29	34
Average number cows	52.6	99.8	242.5
Average yield (litres)	6040	7109	7684
	£/cow	£/cow	£/cow
Output			
Milk	1097	1280	1418
Calf	58	55	52
Lease Quota (net)	0	0	0
Other Dairy	0	0	0
Herd Replacement	-85	-75	-111
Total Dairy Output	**1070**	**1261**	**1358**
Variable Costs			
Concentrates	274	309	346
Coarse Fodder	9	37	26
Vet and Medicine	38	54	52
Other Livestock Costs	114	97	114
Forage Costs	48	61	62
Total Variable Costs	**484**	**558**	**601**
Total Gross Margin	**587**	**703**	**758**

Appendix 2: Reports in Series

Reports in this series:

Crop Production in England 2006/07

Dairying Farming in England 2006/07

Hill Farming in England 2006/07

Horticulture Production in England 2006/07 (Horticultural Business Data)

Lowland Grazing Livestock Production 2006/07

Pig Production in England 2006/07

Poultry Production in England 2006/06

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