

CHANGING PATTERNS OF LAMB DISTRIBUTION FROM FARM TO ABATTOIR

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Introduction

The main distribution channels from farm to abattoir in this country are direct sales from farm, those via livestock auction markets and those via electronic auction systems. Major changes with the livestock and meat producing industries have precipitated shifts in not only distribution channels utilisation, but also the patterns of livestock distribution within channels. This paper provides a synthesis of those factors effecting change and examines the implications for patterns of livestock distribution.

The results of a survey of complete journeys from farm to abattoir of over 18,000 lambs in all three channels are presented, together with the preliminary results of an experiment investigating the effect of journey type on animal welfare. These two studies provide new information which challenges current understanding of the relationship between distribution channels and animal welfare.

Livestock Marketing Channels

Within the three principal marketing channels, it was estimated that in 1995 over 64% of slaughterweight sheep were sold via livestock markets, 30% directly from farm to abattoir and the remainder via electronic auctions.

Historically, the fragmented nature of sheep production and the large number of farms involved (there are still over 80,000 producers) was the major reason for the dominance of the livestock markets. However, this sector has been in long term decline: in 1940 there were 554 markets in England and Wales, falling to 235 in 1993 and to 194 in 1998. For prime sheep there are currently 168 markets in England and Wales.

Whilst there are many factors affecting the decline in the livestock market sector, the emergence of vertical and horizontal linkages between producers, processors and retailers, resulting in increased sales direct from farm to abattoir, is undoubtedly important. The development of these linkages has been largely driven by the requirements of the Food Safety Act 1990, under which retailers are obliged to demonstrate "due diligence" in their procurement of livestock necessitating full traceability and quality assurance from farm to consumer.

Electronic auction systems, introduced into this country in 1989, employ a variety of technological mechanisms to link buyers and sellers with bidding conducted on a deadweight basis or liveweight and grade assessment with premia and deductions on slaughter. There are currently four electronic auction-

eering organisations operating in the UK, but penetration has been slow and market share remains limited.

The Slaughtering Industry

Changes within the slaughtering industry have exerted an influence on distribution channel utilisation. Abattoir numbers have fallen substantially in recent years and by April 1998, 448 plants remained in Great Britain - less than 24% of the number in 1972. Despite this decline in numbers, the industry remains over capacity and further concentration is expected.

Legislative changes in 1995 exacerbated the formal polarisation of the industry. Abattoirs are either licensed for Full Throughput¹, permitted to trade throughout the EU or for Low Throughput², permitted to trade only locally. In 1996 over 86% of all sheep were slaughtered in Full Throughput Approved plants and there are currently 208 such premises in Great Britain.

With over 80,000 producers and over 16 million slaughter sheep, this may have significant implications for the distribution of livestock throughout the country particularly in light of the changes within the livestock market sector and the increase in direct farm to abattoir sales.

Changes within the slaughtering industry are intricately associated with those occurring in the retail sector, which in turn have also contributed to shifts in distribution channel utilisation.

The Retail Sector

The multiple supermarkets have become increasingly dominant in the retail sector in recent years. In illustration, household purchases of meat from supermarkets have risen from 55.3% of all purchases to 69.9% since 1993 at the expense of all other outlets (Table 1).

Table 1
Household Purchases of Meat by Volume (Percentage) by Source of Purchase 1993 - 1997

	1993	1995	1997
Butchers	24.5	18.9	16.2
Co-ops	3.4	2.5	2.2
Supermarkets	55.3	65.1	69.9
Independent Grocers	2.2	1.4	1.0
Freezer Centres	6.7	5.7	5.2
Others	7.9	6.4	5.5

- 1 More than 1,000 ELUpa (European Livestock Unit). 1 ELU = 1 soliped, 1 adult bovine animal, 2 other bovine animals, 3 deer, 5 swine over 100kg liveweight, 7 other swine, 10 sheep or goats or 20 lambs or piglets under 15kg liveweight.
- 2 Less than 1,000 ELUpa.

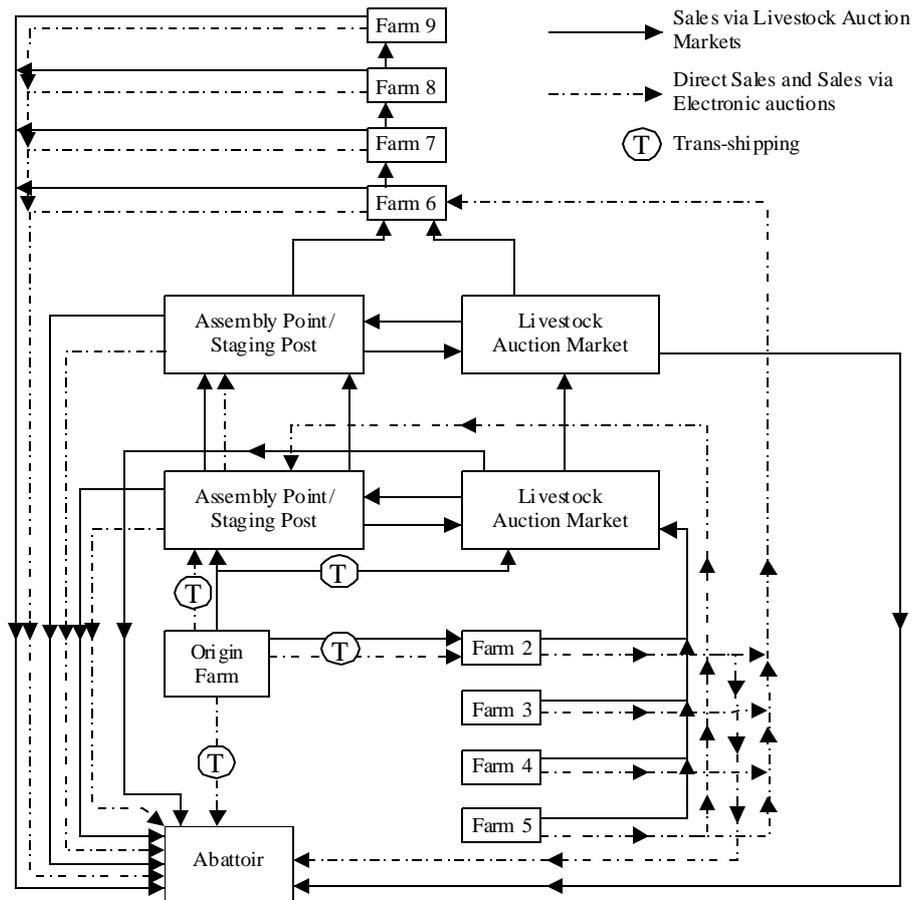


Figure 1. Distribution Patterns of Livestock Sold Direct from Farm to Slaughter, Via Electronic Auctions and Via Livestock Markets.

The major supermarkets have developed long term preferred supplier relationships to ensure a greater continuity of supply, quality assurance and traceability. These relationships involve both producers and abattoirs, thus reducing purchases via livestock markets and electronic auctions.

The Welfare of Animals between Farm and Abattoir

A number of studies have examined the welfare of animals sold direct from farm to slaughter and those sold via livestock markets (for example, see: Evans, Sains, Corlett and Kilkenny (1987), Cockram and Lee (1991), Knowles, Maunder, Warriss and Jones (1994) and Jarvis, Cockram and McGilp (1995), amongst others) but there is no evidence of any study relating to livestock sold via electronic auction systems.

There is a perception that animals sold via livestock markets experience a greater number of handling operations and more complex transportation processes than animals sold direct from farm to abattoir or via electronic auction systems, and that as a result welfare is reduced. Much of the evidence in the literature suggests that this is the case. However, whilst it is implicit that such journeys must necessarily involve a minimum of two periods of transport and their associated handling operations, no evidence has been found of investigations of actual journey structure from farm to slaughter in any channel.

Journey structures range from one single component: a direct uninterrupted journey from farm to abattoir to highly complex patterns (Figure 1).

Animals sold direct from farm and via electronic auction systems may experience similar distribution processes, including a single component journey. However, changes within all sectors of the industry suggest that many livestock may experience multi component journeys in the transfer from farm to abattoir. This was investigated in a survey of such journeys experienced by slaughterweight lambs.

Survey of Journey Structure from Farm to Abattoir

A survey, conducted between April and July 1997 identified complete journey structure of 7,647 lambs sold direct from farm to abattoir, 8,678 sold via livestock markets and 2,068 sold via electronic auctions. A total of 26 different journey types were identified: 18 in direct farm to abattoir sales, 9 in sales via livestock markets and 13 within electronic auction systems.

Median journey duration and distance were less in direct sales than in sales via livestock markets and those via electronic auctions (Table 2). However, the range of both parameters in all three channels was considerable and it is suggested, therefore, that animal welfare may also be highly variable.

Table 2
Median Time and Distance from Farm to Abattoir

	Median Time Farm to Abattoir (hrs)	Median Distance Farm to Abattoir (km)
Farm to Abattoir	1.08 ^a range 0.033 - 12.5	45.06 ^a range 0.8 - 700.1
Livestock Markets	7.83 ^a range 2.08 - 16.58	120.7 ^a range 17.7 - 600.3
Electronic Auctions	7.5 ^a range 2.75 - 14.5	349.23 ^a range 233.4 - 494.1

^a Values differ within columns (P<0.001)

In examination of the relationship between journey complexity and distance across all channels it was identified that as distance increased journeys became more complex (Table 3 - Contingency table chi-square, illustrated in percentage terms).

This has particularly important implications for the distribution of lambs from farm to slaughter in light of the increasing concentration and rationalisation within both the livestock market and abattoir sectors.

It is clear from the results of the above survey that there is no simple relationship between livestock distribution channels and journey nature and structure. Therefore, no assurance may be given that the welfare of lambs sold via one channel is better than that of those sold via another. The type of journey experienced may be more important than the distribution channel and, in the absence of published information, an experiment was conducted to examine the effect of journey structure on the welfare of slaughterweight lambs.

Table 3
The Relationship Between Journey Complexity and Distance from Farm to Slaughter.
Percentage of All Lambs.

	<50km	>50 - 100km	>100 - 250km	>250 - 400km	>400km
1-3 pickups	22.5	5.3	1.9	1.8	0.07
2 discrete journeys	3.0	20.3	12.0	7.2	12.3
4 - 8 pickups	3.0	0.6	2.0	2.8	2.3
3 discrete journeys	0	0	0	0.3	5.2

Values in *italics* > would be expected by chance.

Values in normal text < would be expected by chance.

Absolute values: df = 12, $\chi^2 = 13965.385$, $P < 0.0001$.

NB Due to rounding, values in the table do not add up to 100.

An Investigation of the Effects of Journey Structure on Animal Welfare

A total of 135 lambs (Charollais X, liveweight 41.26kg (SD \pm 3.05kg); 90 transported and 45 control) were used for three different journey types which were replicated three times within a randomised block design. The journeys were: direct and uninterrupted transfer from farm to abattoir, a journey involving three additional pickups *en route* and a journey involving a period of holding at a livestock market. Distances travelled were 262km, 138km and 181km, respectively and time from farm to abattoir was 4hrs in each case.

IGER Behaviour Recorders were used to identify jaw movements and lying and standing behaviours of two control animals and two transported animals in each replicate. Control animals spent more time ruminating than transported animals ($P < 0.0001$, 0.96hrs \pm 0.33 and 0.14hrs \pm 0.13, respectively), more time lying down during the transport period ($P < 0.0001$, 2.31hrs \pm 0.55 and 0.52hrs \pm 0.56, respectively) and lost less liveweight ($P < 0.0001$, 0.54kg \pm 0.35 and 0.86kg \pm 0.44, respectively).

Preliminary analyses of the effect of journey structure are summarised in Table 4 and indicate that those on direct transfer experienced less liveweight loss and had lower ultimate carcass pH than animals on the two more complex journey types ($P < 0.0001$ and $P < 0.005$, respectively). There were no significant differences in durations of the behavioural measures between the three treatments ($P > 0.05$).

It is clear from the results that transportation *per se* affected the behaviour and liveweight of the lambs. Whilst liveweight loss and ultimate pH were greater in animals on both the more complex journey types than on direct transfer from farm to abattoir, durations of ruminating and lying behaviour was not similarly affected.

Conclusions

The changes occurring in the livestock and meat producing industries are dynamic and interactive. The increasing concentration within the livestock market and abattoir sectors means that more animals are required to travel further from farm to slaughter and it has been demonstrated that as distances in-

Table 4
The Effect of Journey Structure on Ruminating, Lying, Liveweight Loss and Ultimate Carcass pH in Slaughterweight Lambs

	Direct Transfer	Multiple Pickups	Holding at Market
Ruminating (hrs)	0.21 ± 0.22 ^c	0.13 ± 0.15 ^c	0.09 ± 0.09 ^c
Lying (hrs)	1.1 ± 0.49 ^c	0.59 ± 0.56 ^c	9.06 ± 0.08 ^c
Liveweight loss (kg)	0.58 ± 0.37 ^a	0.99 ± 0.41 ^{a,c}	1.01 ± 0.42 ^{a,c}
Ultimate pH	5.49 ± 0.07 ^b	5.58 ± 0.12 ^{b,c}	5.57 ± 0.11 ^{b,c}

^a = P<0.0001; ^b = P<0.005; ^c = non-significant.

crease, journeys become more complex. Preliminary results of an experiment examining the effect of journey structure suggest that direct and uninterrupted transfer from farm to abattoir may be less deleterious to the welfare of lambs than journeys involving three additional pickups *en route* and those involving holding at a livestock markets or other holding facility. However, no significant differences have been identified between these two journey types. It has been demonstrated that patterns of lamb distribution from farm to abattoir are diverse in nature and range in complexity in all three distribution channels. It is, therefore, suggested that urgent priority be given to further studies investigating the effect of changing patterns of livestock distribution on animal welfare.

References

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