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THE EFFECT OF HOUSING SYSTEM ON PERFORMANCE, BEHAVIOUR AND WELFARE OF BEEF CATTLE

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OVERALL SUMMARY OF PROJECT

As a result of concerns from some major UK supermarkets regarding the welfare of beef cattle housed in slatted accommodation, studies were undertaken at the Agricultural Research Institute of Northern Ireland to address this issue. Four different housing systems were examined over two consecutive winter periods with finishing beef cattle.

The floor types studied were:

1) Concrete slats,

2) Slats covered with perforated rubber mats,

3) Slats to which rubber strips had been attached,

4) Straw-bedding.

Although the floor types tested varied dramatically, no significant differences in animal performance were observed between animals over-wintered on any of the housing systems when assessed in terms of liveweight or carcass gains, carcass conformation and fat classifications, or meat quality attributes. Furthermore, there was no consistent evidence of reduced welfare on slatted floors compared with the other floor types evaluated. However, in a complementary study carried out at the Institute, beef cattle offered a choice of flooring types were found to have a clear preference for straw-bedding rather than any other options available. The other floor types offered ranked, in order of preference, sawdust, slats covered with rubber mats or strips, and finally uncovered concrete slats. No incidences of clinical lameness were recorded with animals housed on any of the floor types in the studies reported presently, and furthermore, cattle on slats did not display a consistently higher dirt score than cattle on well-bedded straw systems.

The results of the study indicate that there is no additional return to farmers in terms of animal performance from using straw-bedded systems.

INTRODUCTION

The majority of beef cattle in Northern Ireland are accommodated on slatted floors during the indoor feeding period. However, due to consumer pressure regarding the welfare of farm animals, representatives of major UK supermarkets have expressed concern to the Northern Ireland beef industry about the purchase of beef from cattle which have been reared or finished in totally slatted accommodation.

In view of these concerns, studies were set up at the Agricultural Research Institute of Northern Ireland to examine the effect - **in terms of animal performance and welfare** - of housing finishing beef cattle on a range of floor types over the winter period following a summer at pasture. This booklet summarizes the findings from these trials and considers the practical implications for the beef industry.

METHODOLOGY

The influence of floor type over the winter period on animal performance and welfare

Systems Tested

Four different housing systems were examined using a total of 140 cattle over two consecutive winter periods. All animals were offered grass silage *ad libitum* supplemented with 4.0 kg concentrate/head/day throughout the trial. The floor types studied were:-

1) Concrete slats,

2) Slats covered with perforated rubber mats,

3) Slats to which rubber strips had been attached,

4) Straw-bedding.

Rubber strips secured to concrete

Perforated rubber mats over the slatted area

Cattle were accommodated at space allowances of 3.0 m^2/animal on the slatted floors and a higher space allowance of 5.3 m^2/animal on the straw-bedded floors.

A full range of production characteristics were examined for animals accommodated on each floor type, including food intakes, growth rates, carcass data, and evaluation of meat quality. An assessment of the animals' welfare in each housing system was undertaken via observational studies and recognized scientific tests.

REVIEW OF FINDINGS

Animal production and carcass parameters

Neither live weight nor carcass gains were significantly affected by housing system over the winter period (Table 1). Likewise, carcass grades (conformation and fat classifications), and composition (% lean and % fat), were similar for animals housed on each of the floor types examined (Table 1). Housing system also had no effect on meat quality parameters - assessed as pH (measure of acidity or alkalinity), cooking loss (indicator of juiciness) and shear force (measure of toughness).

Table 1 Mean food intake, animal performance and carcass data

	Floor type			
	Slats	Mats	Strips	Straw
Food intake (kg DM/day)	9.0	9.1	9.2	8.9
Live weight gain (kg/day)	1.06	1.14	1.13	1.12
Killing out %	55.2	54.7	54.9	54.9
Carcass gain (kg/day)	0.67	0.69	0.70	0.69
E.U. Conformation classification[a]	2.9	3.1	3.0	3.0
E.U. Fat classification[b]	3.6	3.6	3.6	3.5
Carcass composition (%)				
Lean	63.2	63.8	63.9	63.5
Fat	21.3	20.8	20.5	20.8

[a] 5 point scale: 1 = worst (P grade), 5 = best (E grade)
[b] 5 point scale: 1 = leanest, 5 = fattest

Cattle on slats performed as well as those housed on other floor types

Assessment of animal welfare

The welfare implications of housing animals on the different floor types were assessed through detailed recording of behavioural, physiological and pathological measures. These measures, taken together, provide an indication of the general level of welfare of the animals.

Behavioural and physiological measures

Floor type had no significant effect on the amount of time animals spent carrying out activities associated with poor welfare (e.g. aggressive or repetitive behaviours). However, physiological measures (e.g. blood hormone concentrations) gave some indication that animals housed on bare slatted floors may show greater stress responses compared to those accommodated on the other floor types.

An interesting observation was that cattle on straw got up and down significantly more often than those on slats, mats or rubber strips, while cattle on mats and strips got up and down more frequently than those on slats. It is thought that these observations reflect the difficulty of cattle in getting up and down on hard, slippery slatted floors, or to the pain and discomfort on the animals' knees when changing posture on concrete slats. In contrast, a rubber surface, or straw bedding, might offer both greater comfort for standing, as well as the necessary foothold and security to be able to get up and lie down.

Pathological measures - lameness

At an on-farm level, lameness is often perceived to be a greater problem in cattle housed in slatted accommodation compared to those accommodated on straw over the winter period. However, no incidence of clinical lameness was noted in any of the animals on any of the floor types throughout this study.

More detailed assessment of feet damage showed that while cattle housed on slats exhibited more hind foot lesions than cattle on the other floor types, animals on the straw-bedded system had more fore foot heel erosions than cattle on slats, mats or strips. The fore feet of cattle housed in slatted accommodation were also the least overgrown of all the animals in the study.

The preferences of beef cattle for different floor types

This project examined the preferred choice of animals for a particular floor type when offered a choice of lying areas. The floor types tested were slats, slats covered with rubber mats, slats covered with rubber strips, sawdust and straw.

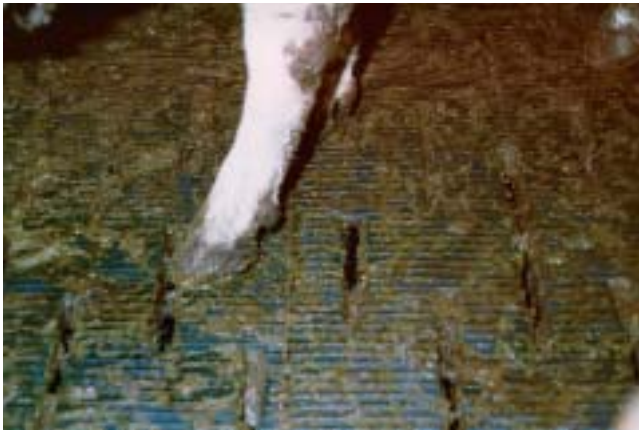
Cattle preferred straw to other floor types examined

When offered a choice of flooring type, there was a very clear **preference for animals to choose straw rather than any of the other options** (particularly when lying). Cattle preferred sawdust to either mats or slats, while mats were preferred to uncovered slats. No preference was found between rubber mats and rubber strips.

Effect of floor type on animal cleanliness

In view of the stringent specifications regarding the levels of cleanliness which must be achieved for cattle presented for slaughter in Northern Ireland, the effect of floor type on this attribute is an important factor to be considered. The extent of dirtiness of each animal was assessed at the beginning and end of the experiment using a specially developed scoring scale.

Overall, animals housed on slatted floors covered with perforated rubber mats were dirtier than those on the other floor types. However, in contrast to some other studies, cattle on slats (or slats covered with rubber strips) did not display a consistently higher dirt score than cattle on well-bedded (5-6 kg straw/head/day) straw systems in this study.



Cattle on slats covered with perforated rubber mats were dirtier than those on other floor types

SUMMARY AND IMPLICATIONS FOR THE INDUSTRY

- Floor type had no significant effect on animal performance or meat quality parameters when cattle were housed over winter following a summer at pasture. Therefore there is no additional return to farmers in terms of higher performance from using straw-bedded systems.
- Cattle on slats get up and down less often than those on other floor types, possibly due to difficulty getting sufficient grip, or to soreness of the knees on the concrete.
- When given a choice, cattle have a strong preference for straw, followed by sawdust and then rubber mats or strips. Cattle will rarely choose to spend time on a slatted floor when other options are available. However, there is only sufficient straw in Northern Ireland to bed 20% of the cattle.
- Floor type has a small effect on the incidence of damage to feet. The hind feet of cattle on slats exhibited more damage than those on straw or rubber strips or mats, while cattle on straw exhibited greater damage in their fore feet than those on the other floor types.
- Overall, cattle on slats covered with perforated rubber mats were the dirtiest but there were no consistent data to suggest that cattle on slatted systems are dirtier than those on well-bedded straw systems.

A full scientific report detailing the experimental tests and statistical analysis carried out in the present studies is available from AgriSearch.

AGRISEARCH BOOKLETS

1 SHEEP
The Effects of Genetics of Lowland Cross-Bred Ewes and Terminal Sires on Lamb Output and Carcass Quality
Objective: Cross-bred ewes compared in terms of food consumption, prolificacy, lamb conformation.

2 DAIRY
A Comparison of Four Grassland-Based Systems of Milk Production for Winter Calving High Genetic Merit Dairy Cows
Objective: Cost effective methods of feeding high GM cows.

3 DAIRY
Dairy Herd Fertility - Examination of Effects of Increasing Genetic Merit and other Herd Factors on Reproductive Performance
Objective: Establishing on-farm management routines to improve reproductive performance.

4 SHEEP
Developing Low Cost 'Natural-Care' Systems of Sheep Production
Objective: Comparing outdoor/indoor lambing systems in terms of performance and costs, considering shelter and feed strategies.

5 BEEF
An Examination of Factors affecting the Cleanliness of Housed Beef Cattle
Objective: Effects of dietary and housing factors on dirtiness of cattle.

6 BEEF
The Effects of Housing System on Performance, Behaviour and Welfare of Beef Cattle
Objective: To evaluate the welfare, behaviour and performance of beef cattle accommodation on a range of floor types over winter.

7 DAIRY
Developing Improved Heifer Rearing Systems
Objective: Considerations of calving weight and nutrition to improve performance of dairy herd replacements.

For further information or to request a copy of the full scientific report detailing the experimental tests and statistical analysis contact:

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