

Assessing roadway condition and associated cow flow

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Summary

- Roadway widths on-farm are sub-optimal for herd requirements, with only four per cent being the optimal width (or greater) relative to herd size.
- With regard to surface condition, just 14.2% of roadways on-farm are optimal.
- Roadway width and surface condition significantly affect cow flow.

Introduction

Irish dairy farming can maintain its global competitive edge by prioritizing low-cost grass-based milk production and continuing with compact spring-calving systems. The temperate climate allows for high-quality pasture production over a long growing season; pasture-based diets offer environmental benefits and improved animal welfare, making them more preferable to consumers. The efficient utilization of pasture is critical for profitability, and farm roadways are essential for rotational grazing systems. However, Irish dairy farmers face challenges with suboptimal roadway conditions that affect herd movement between paddocks and the milking parlour. The impact of varying roadway width and congestion points on herd movement was assessed in a recent study using commercial farms.

Table 1. On-Farm roadway survey results

Herd size (cows)	<100	100-149	150-199	200-249	≥250
Number of herds	11	18	8	5	13
Sample size of roadways (n)	130	260	124	87	292
Length of sections examined (m)	87	129	114	157	185
Mean roadway width (m)	2.97	2.94	3.30	3.6	3.89
Range roadway width (m)	1.7-6.0	1.2-5.0	1.8-7.7	2.5-5.3	1.9-10.0
Roadway width relative to herd size	0.76	0.70	0.69	0.74	0.62
Mean surface condition score	2.46	2.75	2.81	2.64	3.06
Public crossings	10	20	20	4	41
Mean total farm CPM	35.6	36.6	41.0	43.7	55.4

On-farm study

This study aimed to evaluate the current condition of farm roadways on Irish dairy farms. The study included farms with herd sizes ranging from 30-760 cows, which were contributing grassland management data to the Pasturebase Ireland platform. A total of 55 farms were selected based on their herd size and geographical location. The on-farm assessment of farm roadways took place from May to July 2021. A roadway quality metric was developed to evaluate the condition of farm roadways, which was based on three independent variables assessed on each section of the roadway; roadway width, surface condition score (Ranging from 1: inadequate for animal movement to 5: optimal), and the presence of a congestion point on a roadway (Table 1). The roadway quality metric was validated by assessing cow-flow on a range of roadway types on the Dairygold Research Farm. The impact of varying roadway width, surface condition and degree of congestion on cow-flow was evaluated. This information was used to estimate mean cow flow on each farm, defined as cows moved per minute (CPM). The findings of this study will provide valuable insights for farmers to improve their roadway infrastructure, which is crucial for efficient farm management and animal welfare.

Impact of roadway condition on cow flow

The study examined the impact of roadway width (RW) and surface condition (SC) score on herd movement; 893 roadway sections on 55 farms were assessed, many RW were suboptimal for herd size requirements. Farm roadways should be at least 3.5 m wide (for a 50 cow herd) with another 0.5 m allowed for each additional 50 cows. In practice roadways were, on average, 70% of the recommended width relative to herd size and only 4.0% of farm roadways were the optimal width (or greater) relative to herd size across all farms. Larger herd sizes tended to have wider roadways. The research found that RW and SC significantly affected the number of cows moved per minute (CPM), passing a given point on a farm roadway, with wider and better surface roads resulting in higher CPM (Table 2). Interestingly, congestion points did not have a significant impact on CPM, whereas public road crossings had a significant negative effect on CPM due to the additional time required for the herd to cross. A public road crossing was found to reduce CPM by 32.7% on average. With regard to surface condition, the study found that just 14.2% of roadways were in optimal condition for animal movement, with 24.4% being totally inadequate. Factors that positively affected SC included RW, congestion points, and the presence of a grass verge. The study suggests that farmers can evaluate their own roadway network in terms of roadway width and surface condition to calculate the maximum potential CPM and assess which aspects require upgrading.

Table 2. Measured Cow flow (cows per minute) with varying roadway width and surface condition

Width (m)	Surface condition index				
	1	2	3	4	5
1	12.4	13.8	15.2	16.6	21.3
1.5	13.4	15.6	21.5	25.1	32.1
2	14.4	17.4	27.8	33.6	42.9
2.5	15.5	21.2	34.0	42.2	53.6
3	16.5	25.0	40.3	50.7	64.4
3.5	17.5	28.8	46.6	59.3	75.2
4	18.5	32.6	52.8	67.8	86.0
4.5	19.6	36.4	59.1	76.3	96.8
5	20.6	40.2	65.4	84.9	107.6

Conclusion

Farm roadway infrastructure has not adapted to meet increased herd demands on commercial dairy farms. Roadway width and surface condition have a significant impact on cow throughput on farm roadways, with wider roadways and improved surface condition leading to increased cow throughput. Farmers should ensure that farm roadways are an optimal size for their herd size and in good condition to improve overall cow flow.