Dietary approaches to reducing the carbon intensity of table egg production: A conservative approach

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Summary

Our study demonstrated that the overall carbon intensity of table egg production can be measurably reduced through modifying the composition of the diet, without jeopardizing productivity, egg quality or profitability.

The Problem

Food systems are under pressure to reduce their carbon footprint so as to contribute to societal efforts to address climate change.

A life cycle analysis (LCA) of the Alberta egg industry conducted by Alberta Agriculture suggested that 65% of the overall carbon footprint of table egg production is directly related to the carbon intensity of feedstuffs. As such, any reduction in carbon intensity of layer rations should translate into measurable reductions in the carbon intensity of the resulting eggs.

Our Approach

A standard AB table egg layer ration was formulated based on the survey data collected by Alberta Agriculture as part of the LCA project conducted for the AB egg industry. Diets were formulated to reduce carbon intensity by 5, 10 or 15% relative to the standard ration using readily available AB feedstuffs (Table 1). Carbon intensity values for feedstuffs were obtained from an international database based on verified LCA methods.

Test diets were fed to Lohmann LSL-Lite hens housed in conventional battery cages for a 16-week experiment.

Table 1. Ingredient composition (in %), cost and carbon intensity of test diets.

	Reduction in feed carbon intensity, %			
Ingredient	Control	5%	10%	15%
Wheat	48.75	32.50	16.25	-
Corn	10.00	17.50	25.01	32.51
Barley	5.00	11.83	18.65	25.48
Faba bean	-	1.36	2.72	4.08
Canola meal	5.00	3.33	1.67	-
Soybean meal	11.71	14.40	17.09	19.78
Canola oil	4.62	4.38	4.14	3.90
Limestone	11.37	11.38	11.38	11.39
Dicalcium phosphate	1.11	1.10	1.09	1.08
Choline premix	0.50	0.50	0.50	0.50
Vitamin/trace mineral premix	0.50	0.50	0.50	0.50
Salt	0.51	0.48	0.45	0.42
L-Lysine	0.12	0.08	0.05	0.01
D,L-methionine	0.20	0.22	0.25	0.27
L-threonine	0.56	0.38	0.21	0.03
Enzyme	0.05	0.05	0.05	0.05
Cost, $CDN/T feed	**327.70**	**327.70**	**327.70**	**327.70**
Carbon intensity, kg CO_2 eq/T feed	**626**	**595**	**563**	**532**

Our Observations

Hen productivity, egg quality and relative profitability were not adversely affected by reducing the carbon intensity of the ration (**Table 2**).

Table 2. Effect of feeding reduced-carbon intensity diets to laying hens on productivity, egg attributes, economic indicators and feed-attributable carbon intensity of eggs.

	Reduction in feed carbon intensity, %			
	Control	5%	10%	15%
Hen productivity				
Feed disappearance, g/hen•day	117.7	116.3	117.8	117.3
Lay percent, eggs/100 hen•days	95.43	95.50	95.30	96.00
Egg mass production, g/hen•day	59.01	60.33↑	60.16	61.21↑
Egg:feed ratio	0.503	0.518↑	0.512	0.523↑
Egg attributes				
Average egg weight, g	61.89	63.22↑	63.29↑	63.72↑
Albumen, % of egg weight	54.84	55.45	55.66↑	55.67↑
Shell, % of egg weight	14.26	13.93↓	14.16	13.93↓
Yolk, % of egg weight	30.87	30.65	30.19	30.34
Egg shell thickness, mm	0.477	0.478	0.488	0.487
Specific gravity	1.088	1.087	1.087	1.087
Haugh units, HU	87.0	85.7	86.9	87.8
Economic indicators				
Feed cost, ¢/hen•day	3.86	3.81	3.86	3.84
Income over feed cost, ¢/hen•day	12.79	12.93	12.86	13.02
Carbon intensity, feed attributable				
g CO_2 eq/kg egg mass produced	1250	1148↓	1109↓	1023↓
kg CO_2 eq/30 doz case (L eggs)	26.11	23.97↓	23.15↓	21.36↓

↓↑ Denotes statistically significant reductions or increases compared with the control.

Reducing the carbon intensity of layer rations by 5, 10 and 15% reduced the feed-attributable carbon intensity of eggs by **8.2**, **11.3** and **18.2%**, respectively.

What this means

Our study indicates that modifying the composition of laying hen rations is a practical and effective strategy for reducing the carbon intensity of table egg production. Our study further demonstrates that this can be accomplished without adverse impacts on productivity, egg quality or profitability.

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