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**Title:****The effect of fully functional crops and feed intake control on growth, feed efficiency, mortality and profitability of broilers housed in large, modern, climate controlled houses****Summary:**

**Introduction** Population pressure and climate change are reducing the land area for arable crops yet the growing middle classes in China, India, etc are demanding more meat in the human diet. Big increases in feed efficiency will be required to reconcile these conflicting pressures. Commercial chicken can convert feed at an FCR of less than 1.5, making them a good candidate for this role.

A study of the digestive physiology of the fowl, the Indian Jungle Fowl and the history of broiler growing practices over the last century, revealed that current industrial broiler growing practices are sub-optimal. Moreover, Forbes (2003) showed that feed soaked in water to a porridge like consistency and fed to broilers, gave substantial improvements in FCR compared to controls fed equal dry matter. But feeding soaked feed proved commercially impractical. However dissection of the crops of broiler chicken fed regular meals a day instead of ad-lib feeding showed that their crop contents were also of porridge like consistency. A theory was developed that meal time feeding could lead to similar benefits to those found by Forbes. Stacey (et al) 2004 showed that control and daily feedback information of feed intake of broilers was essential in order to optimise their growth to preset targets.

**Material and methods** Nine pairs of broiler houses containing minimum 25,000 birds fed on standard commercial feeds were used. Farms 1 and 3 had 2 houses over 2 crops, Farm 2 had 2 houses over 1 crop and Farm 4 had 4 houses over 2 crops. The "paired comparison" technique was used because of known high variability between birds from different parent stock regarding mortality and performance parameters. Each house within a pair was the same regarding equipment, management, breed, sex, parent stock, stocking density and date of housing. Special control equipment interfaced existing feeding and lighting equipment in one house within each pair in order to enable meal-time and not ad-lib feeding. Live weight, feed consumed, mortality parameters and factory weight and weight of feed used (together with their costs), were recorded. Statistical analysis of the performance difference between the new system and the control house within a pair was carried out using the t-test. Financial parameters were analysed in the same way.

**Results** Birds on the new system had significantly less mortality, faster growth and better feed efficiency as measured by both Feed Conversion Ratio and European Performance Efficiency Factor (Table 1). Birds on the new system were visually cleaner and more active but no statistics are available. Financial parameters were also examined statistically. Participating growers were unwilling for the margin of bird value minus feed cost on the controls or the new system to be revealed. However they agreed to the difference between bird value and feed cost between controls and the new system to be published. The average benefit over all nine comparisons was 3.79 pence per bird and £1,083 per house. The p value was 0.002 and the 95% confidence limits were 2.59 to 4.98 pence per bird and £798 to £1,368 per house.

Table 1 Effects of the new system on performance

Parameter	New System	Control	Benefit	p value	95% confidence limits	
					Lower	Higher
Mortality	3.27%	4.28%	1.01%	0.0053	0.50%	1.52%
Liveweight	2057 g	2003 g	55 g	0.0010	30 g	80 g
FCR	1.642	1.696	0.053	0.00028	0.033	0.073
EPEF	331.9	311.4	20.5	0.00006	14.3	26.6

**Note** There were no farm interactions as all of the paired comparison differences lay within the normal distribution.

**Conclusions** The results show that the new system significantly improved bird performance and profitability. Confidence limits show a 97.5% probability that the new system improved mortality by a minimum of 0.5% and FCR by a minimum of 0.033 and an extra margin over feed cost by a minimum of £798 per house of 25,000 birds per crop. With 6-7 crops of broilers per year, this represents a satisfactory return on capital. Less feed intake also lowers scarce water and energy use and the carbon footprint of the meat produced.

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