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Comparison of Layer Performance in Cage and Barn Systems

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Introduction

Housing of hens in cages is the current norm in the egg industry because of the space savings and reduced labour, equipment costs. Major criticisms of the cage systems are that they increase the incidence of feather damage, overgrown claws, foot lesions and brittle bones. These welfare issues have attracted considerable attention in recent years regarding cage systems and their effects on the quality of life of laying hens (Barnett and Newman, 1997). Barn systems, on the other hand, are an acceptable alternative to the public since they provide better opportunity for movement and social interaction and also answer the welfare concerns. The present paper reports data from a long-term monitoring study comparing the effects of in cage and barn systems on the performance of laying hens in a commercial farm.

Materials and Methods

The study was conducted on a commercial farm in the lower half of the North Island as part of a nationwide monitoring of layer farms. The system comparison presented in this paper was carried out over a 3-year period from 1995 to 1998. The report covers a laying cycle of 20 to 71 weeks of age, since the flocks were culled between week 71 to week 80 to fit with the farm replacement and refurbishment policy.

Prior to the monitoring period the farm was a 1960's vintage cage layer farm. Beginning in 1994 part of the farm was converted to a barn production system by modifying existing cage layer sheds. During the monitoring period approximately half the production was from the barn system and half from batteries. Seven flocks from batteries totaling 23,205 birds and seven barn flocks totaling 26,356 hens are included in this report. Average flock size was 3315 hens for the battery and 3765 for the barn.

All birds were of the same genetic stock (Hy-line Brown). The pullets were reared in battery cages and then transferred to the laying sheds. The birds were transferred to laying cages at 18 weeks of age and to the barns at 16 to 18 weeks of age. The birds were fed a commercial layer feed (Sharpes Feeds, Wellington). Three-phase feeding was practiced during the laying period. Phase 1 feeding (2850 kcal AME/kg, 17.6 % crude protein) was from housing to peak egg mass, phase two feeding (2780 kcal AME/kg, 16.7 % crude protein) until 65 to 70 weeks of age and a finishing ration (2720 kcal AME/kg, 15.7 % crude protein) to the end of lay. Diets have changed over the monitoring period, but the same diets were used in both production systems. The cage birds were fed manually once a day and the barn hens six times daily.

Jansen automatic egg collection systems and Big Dutchman automatic chain feeders were used in the barn. The sheds were approximately 75 % plastic slatting and 25 % deep litter. Barn sheds were only cleaned on flock turnover. Stocking density was 7 birds /m^2. The cage layer sheds contained single tier conventional 3-bird cages (30 x 45 cm). Feeding and egg collection was manual. Both sheds were poorly insulated. Accurate records of eggs laid, feed consumed and mortality were maintained. Egg weight was calculated as the average of the first 300 eggs collected from each flock one morning a week.

The performance data were analysed using two-tailed *t* test procedure. In all cases, samples were tested for homogeneity of variance. Arc sine transformation was used on percentage mortality prior to analysis.

Results and Discussion

Egg production was influenced by the housing system (Table 1). At 25 weeks, hen-day production was higher ($P < 0.05$) in cage birds compared to the barn birds. The reverse trend was observed at week 71 with barn birds producing more ($P < 0.05$) eggs than the cage birds. Hen-housed production to 71 weeks of age, on the other hand, was higher ($P < 0.05$) in cage birds due to the lower mortality in the system. Egg weight was not influenced by the housing system.

Hen-day egg production peaked over 90 % in both systems. The birds in the cage system peaked a week earlier and also declined more rapidly towards the end of lay than those in the barns (Fig. 1). The lower rate of production by the barns in early lay appears to be the result of the pullets adapting to the barn environment and a subsequent loss of uniformity.

Feed intake was influenced by the housing system. Cumulative average feed intake from 20 to 71 weeks was higher ($P < 0.05$; 123 vs 115 g/day) in the barn-housed birds compared to cage birds. This was largely due to a seasonal effect with barn housed birds consuming more over the winter months than over the summer period. The cumulative feed conversion ratio (g feed/ g egg) to 71 weeks, however, was not influenced (P > 0.05) by the housing system. The feed conversion ratio to 71 weeks in the barn and cage systems were 2.36 and 2.25, respectively.

Table 1: Effect of housing on production parameters to 25, 50 and 71 weeks of age.

Parameter	Week 25		Week 50		Week 71	
	Barn	Cage	Barn	Cage	Barn	Cage
Hen-day production, %	91[a](1.27)[1]	94[b](0.76)	86(2.31)	83(2.57)	78[a](2.19)	73[b](1.91)
Eggs/hen housed[2]	28(8.47)	36(2.91)	184[a](7.14)	192[b](3.42)	299[a](6.80)	305[b](4.65)
Egg weight, g	57.37(1.41)	57.17(0.78)	63.36(1.61)	63.56(1.28)	65.10(1.14)	65.06(1.13)
Egg mass, g/day	52.20(14.9)	53.73(6.72)	54.48(2.61)	52.75(2.10)	50.78(1.34)	47.49(2.20)
Feed intake, g/day[2]	110(4.86)	104(12.8)	124[a](6.60)	135[b](4.49)	123[a](5.93)	115[b](3.56)
Feed efficiency, g/g[2]	3.74(1.70)	2.63(0.30)	2.40[a](0.16)	2.19[b](0.09)	2.36(0.15)	2.25(0.09)
Mortality, %[2]	2[a]	0[b]	3[a]	1[b]	4[a]	3[b]
Floor eggs, %	2.7	-	0.9	-	0.8	-

[a,b]Within each age, means in a row bearing different superscripts are significantly different (P < 0.05).
[1]Values in parantheses refer to standard deviation.
[2]Cumulative data.

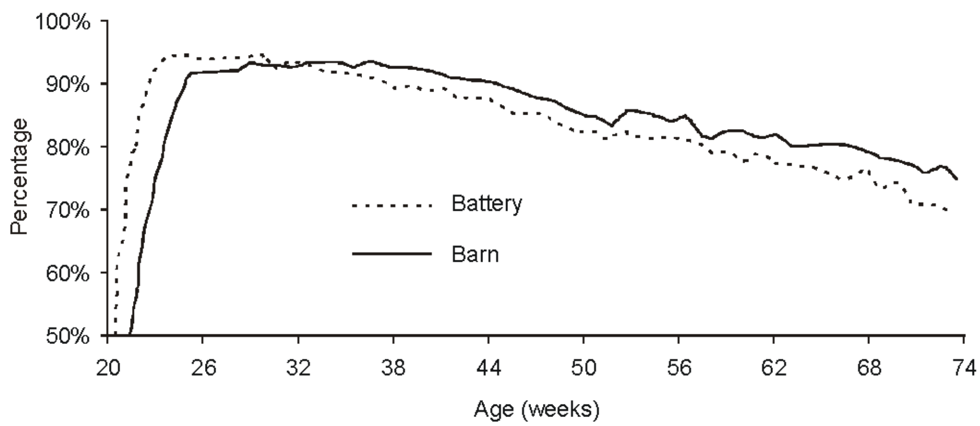

Fig. 1: Hen-day egg production in cage and barn systems

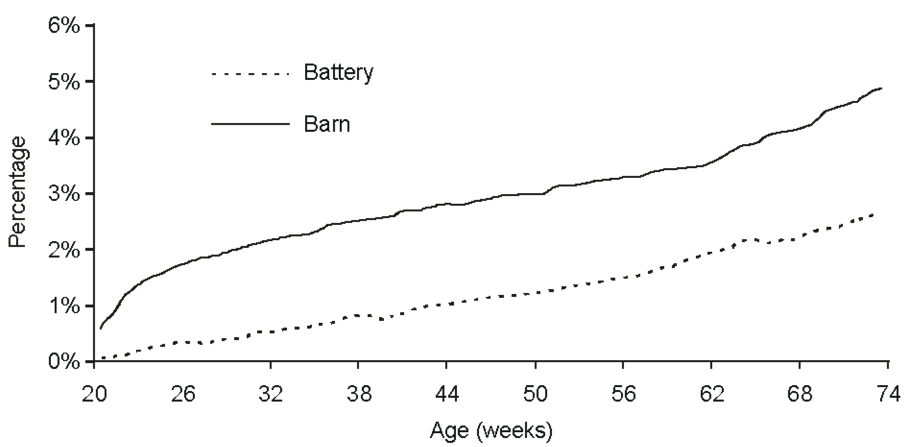

Fig. 2: Influence of housing system on the mortality of hens

Throughout the laying period, mortality was higher ($P < 0.05$) in the barn system (Fig. 2). Mortality within both systems, however, was within acceptable limits. The increased barn mortality appears to have been the result of cage reared birds having to adapt to the barn system. Flocks reared on floor subsequent to this data collection period have been found to have ~~had~~ lower mortalities.

Floor eggs in the barn system were initially high at 13 % but quickly declined to below 2 % by week 29 and to less than 1 % by week 34. Other studies comparing barn and cage egg production have reported higher levels of floor eggs (Barnett, 1999). Correct use of automated nest box systems, appropriate levels of lighting and good shed management was~~as~~ responsible for the low level of floor eggs in this farm. A light gradient within the shed which provided a lower light intensity in the nesting area encouraged the use of nest boxes by birds, as did early morning shed activity from point of lay to peak egg production.

The present data suggest that the relatively higher performance of the barn hens during the latter period of lay will allow for a longer profitable laying cycle than with the cage system. Caution is required in interpreting the data, however, since this study was conducted in different sheds on the one farm over a 3-year period. Recent data from four flocks on this farm (data not presented) indicate that the hen-housed production in the barns is similar to that in the cages by 78 weeks of age. It may be possible to reduce the higher mortality experienced in the barn system through a more appropriate rearing and acclimatisation regime. Recent experience in this farm suggest that mortality can be reduced by transferring the flocks to the barn at 6 weeks of age. Barn egg production systems appear to be a suitable approach to the increasing public concern with intensive cage egg production.

Acknowledgements

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Conclusion

The performance of hens housed in either traditional battery cages or a barn system on a commercial farm was monitored over a 3-year period. The report covered a laying cycle of 20 to 71 weeks of age and included data from 23,205 and 26,356 birds in cage and barn systems, respectively. Hen-day production at 71 weeks of age was higher ($P < 0.05$) in the barn system, whereas hen-housed production to 71 weeks was higher ($P < 0.05$) in cage birds due to the lower mortality in cage system. Egg weight was unaffected ($P > 0.05$) by the housing system. The average production at 71 weeks of age in the barn and cage systems was 299 and 305 eggs/hen, respectively. Mortality in both systems was within acceptable limits, but was higher ($P < 0.05$) in the barn system. Incidence of floor eggs was initially high in the barn, but declined to below 1% by week 34 of lay.

References

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