Progress In Poultry
"THROUGH RESEARCH"

A COMPARISON OF ONE, TWO AND THREE CYCLES
OF EGG PRODUCTION

Donald Bell, Farm Advisor, Riverside County
Milo Swanson, Poultry Specialist, Riverside Campus
Gary Johnston, Staff Research Associate, Riverside Campus

Prior to 1965, most egg producers kept their flocks for one cycle of production and sold them at 18 to 20 months of age. During the past 10 years, we have seen an increase in the use of force molting to prolong the laying life of flocks and many variations in replacement programs.

It is now common to retain flocks for two or three cycles of production with final disposal at 2½ to 3 years of age. Whether or not these extended programs are economically sound is dependent upon many factors of performance and pricing. The results presented in this report constitute only an example of how a flock will perform under three types of replacement programs.

EXPERIMENTAL PROCEDURE

This experiment was conducted at the Moreno Ranch facilities of the Riverside Campus. It was designed to study the overall performance of two commercial strains of White Leghorn chickens under the following recycling schemes:

1. Non-molted to 76 weeks of age
   (NOTE: The 2-cycle flock's first cycle of production to 76 weeks of age constituted the non-molted treatment)

2. Molted once at 76 weeks of age and sold 44 weeks later at 120 weeks of age.

3. Molted twice, the first time at 56 weeks of age, and the second at 88 weeks; sold at 120 weeks of age. This program is commonly referred to as an 8-8-8 program, meaning eight months in each cycle.

Stock: 560 twenty-week-old pullets. Two strains - A & B.

Duration of experiment: 100 weeks (June 1973 to May 1975).

Housing: California open-type with curtains and hot weather foggers. Three and four hens per 12" x 16" cage, placed back to back.

Feeding: Ad libitum hand feeding, front feeder. 17 percent protein lay mash except for molting period.

Watering: One Hart cup for every two cages.

Molting procedure:

No artificial light:	days 1 - 28
No feed:	days 1 - 10
Ad lib cracked milo:	days 11 - 28

Experimental design:

Completely randomized block.
2 strains x 2 densities x 2 recycling programs x 4 blocks = 32 groups.
A group = 5 cages (15 or 20 hens).

Measurements:

Daily egg production, feed consumption, and mortality.
Every 8 weeks: egg size, egg quality, and body weight.
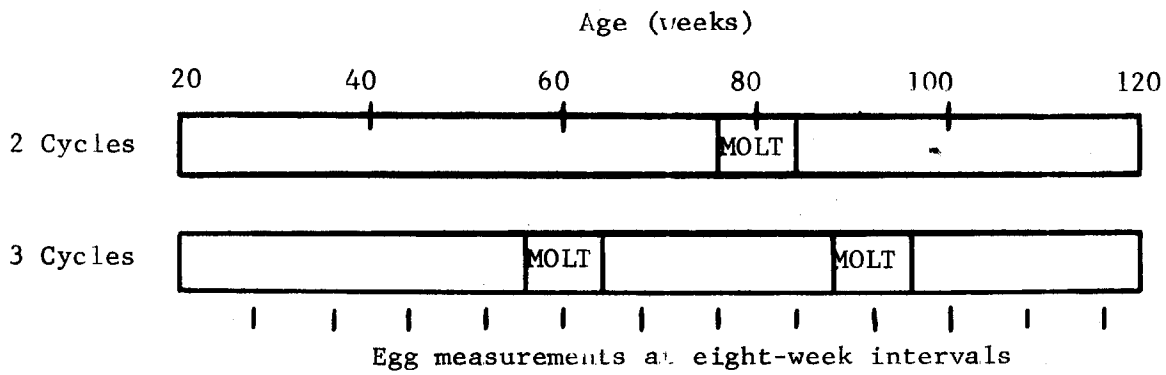Data summarized by 4-week periods.

(more)

Age (weeks)

Fig. 1. Diagram of recycling programs

RESULTS

Figure 2 illustrates the hen-day production curves for the two recycling programs (3 and 4 hens per cage and both strains combined).
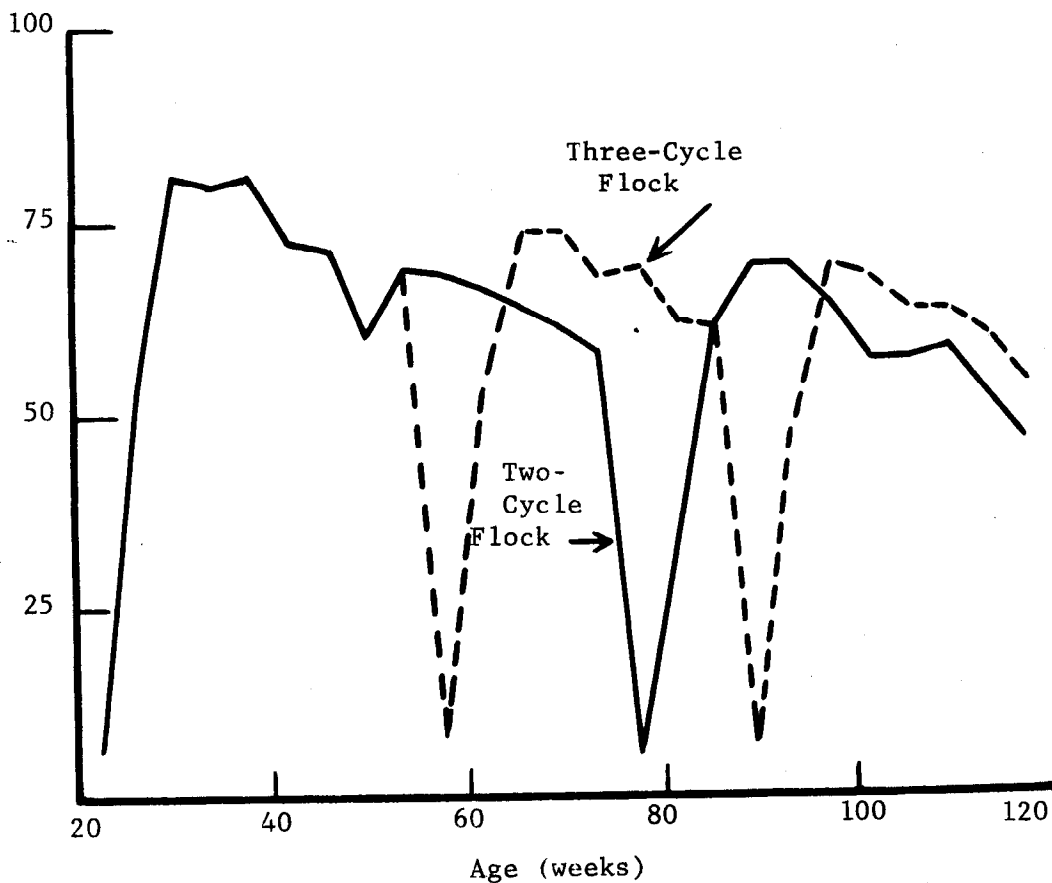

Fig. 2. Hen-day production curves for two- and three-cycle flocks

Table 1. Egg production, feed, and mortality results[1]

Treatment			Egg Production		Feed		Mortality
Cycles	Strain	Hens per cage	Hen-day (%)	Hen-housed eggs	Consumption lbs/hen/day	Conversion lbs/dozen	(%)
1	A	3	68.8	264	.227	3.97	6.7
		4	62.8	236	.224	4.28	10.0
	B	3	63.0	218	.212	4.04	25.0
		4	59.3	214	.203	4.11	20.0
2	A	3	62.1	414	.221	4.28	10.0
		4	58.2	366	.220	4.55	26.3
	B	3	59.7	329	.215	4.32	38.3
		4	55.2	326	.203	4.43	30.0
3	A	3	62.7	412	.223	4.27	18.3
		4	58.1	354	.207	4.28	27.5
	B	3	60.3	372	.214	4.26	25.0
		4	55.4	301	.205	4.43	41.3
One cycle			63.5	233	.216	4.10	15.4
Two cycles			58.8 ns	359 ns	.215 ns	4.39 ns	26.1 ns
Three cycles			59.1	360	.212	4.31	28.0
3 Per cage			61.2 **	382 **	.218 **	4.28 *	22.9 **
4 Per cage			56.7	337	.209	4.43	31.3
Strain A			60.3 **	387 **	.218 **	4.35 ns	20.5 **
Strain B			57.6	332	.209	4.36	33.6

1/ Cycle 1 = 20 to 76 weeks of age. Cycles 2 & 3 = 20 to 120 weeks of age.

ns = non-significant difference (P >0.05)
* = significant difference (P <0.05)
** = highly significant difference (P <0.01)

Tables 1, 2, and 3 summarize the performance results by recycling program, density, and strain. Statistical analysis is valid only within the 2- and 3-cycle groups because of the design of the experiment.

It is interesting that over the 100 weeks of production in the 2- and 3-cycle programs, there was a difference of only one egg in hen-housed production. On the other hand, the 3-bird-per-cage groups produced almost 4 dozen eggs more per hen housed than the 4-bird-per-cage groups at an improved efficiency of feed conversion.

Within the 1-cycle groups, note that there is a spread of 50 eggs per hen housed between combinations of cage density and strain of chickens in only 56 weeks of production. It should be emphasized that each of these four combinations is commonly used throughout the industry.
(more)

Another interesting point is that when mortality was expressed as a weekly mortality rate, there were no differences in any of the three replacement programs.

One-cycle average weekly rate was .275%, two-cycle .262%, and three-cycle .280%. Both the 4-bird cage group and Strain B showed a significantly higher mortality.

Table 2. Egg size, egg quality and body weight results (weighted averages)

Cycle	Strain	Hens per cage	Egg weight (ozs/dozen)	Cracked eggs (%)	Shell score[1]	Haugh Units	Shell thickness (inches)	Body wt[2] (lbs)
1	A	3	24.38	2.16	.45	80.7	.0153	4.03
		4	24.52	2.14	.32	81.4	.0150	3.90
	B	3	24.12	3.34	.43	77.1	.0149	3.48
		4	24.42	3.53	.43	77.0	.0151	3.73
2	A	3	24.08	2.40	.60	80.2	.0151	3.81
		4	25.10	4.01	.51	80.0	.0149	4.03
	B	3	25.17	3.63	.54	74.0	.0148	3.66
		4	25.47	5.13	.52	74.1	.0150	3.89
3	A	3	25.41	5.38	.45	81.2	.0147	4.05
		4	24.70	3.56	.38	80.2	.0150	3.82
	B	3	25.51	3.03	.46	72.2	.0151	4.09
		4	25.04	6.37	.35	74.6	.0150	4.31
One Cycle			24.36	2.82	.41	79.1	.0151	3.79
Two Cycles			25.20 ns	3.79 ns	.54 **	77.1 ns	.0149 ns	3.85 ns
Three Cycles			25.17	4.59	.41	77.1	.0149	4.07
3 Per cage			25.29 ns	3.61 ns	.51 *	76.9 ns	.0149 ns	3.90 ns
4 Per cage			25.08	4.77	.44	77.3	.0150	4.01
Strain A			25.07 ns	3.84 ns	.49 ns	80.4 **	.0149 ns	3.93 ns
Strain B			25.30	4.54	.47	73.8	.0150	3.99

1/   0 = Smooth shell; 3 = very rough
2/   One cycle at 76 weeks of age; two and three cycles at 120 weeks.

ns = non-significant difference (P >0.05)
* = significant difference (P <0.05)
** = highly significant difference (P <0.01)

The only quality differences noted between the 2- and 3-cycle groups concerned shell roughness. The 3-cycle groups produced a significantly smoother shell on the average. In addition, it is interesting that the hens placed 4 per cage also produced a significantly smoother shell. This may be attributed to their lower overall production. Even though we were unable to test the significance of differences between the all-pullet flock and the molted flocks, it would appear that the all-pullet flock produced smaller eggs, better albumen quality (Haugh Units) and thicker shells.

(more)

Table 3. Economic results

Treatment			Av. egg value	Hen-housed income from eggs & fowl	Hen-housed costs for feed & pullets	Profit per hen housed	Profit per hen housed/wk
Cycle	Strain	Hens per cage					
			¢/dozen	$	$	$	£
1	A	3	47.0	10.55	7.76	2.79	5.0
		4	46.7	9.42	7.60	1.82	3.3
	B	3	45.2	8.39	6.84	1.55	2.8
		4	45.9	8.38	6.85	1.53	2.7
2	A	3	47.7	16.69	11.76	4.93	4.9
		4	46.9	14.50	11.20	3.30	3.3
	B	3	46.3	12.85	9.81	3.04	3.0
		4	46.6	12.84	9.97	2.87	2.9
3	A	3	47.1	16.36	11.68	4.68	4.7
		4	46.7	13.97	10.37	3.60	3.6
	B	3	47.1	14.79	10.73	4.06	4.1
		4	45.8	11.64	9.35	2.29	2.3
One Cycle			46.2	9.19	7.26	1.93	3.4
Two Cycles			46.9 ns	14.22 ns	10.69 ns	3.53 ns	3.5 ns
Three Cycles			46.9	14.19	10.53	3.66	3.7
3 Per cage			47.1 ns	15.17 **	11.00 **	4.17 **	4.2 **
4 Per cage			46.5	13.24	10.22	3.02	3.0
Strain A			47.1 ns	15.38 **	11.25 **	4.13 **	4.1 **
Strain B			46.5	13.03	9.97	3.06	3.1

ns = non-significant difference (P >0.05)
* = significant difference (P <0.05)
** = highly significant difference (P <0.01)

Table 3 analyzes the economic significance of these results using the following prices:

Egg Prices:

	Large & above	$ .50/dozen
	Medium	.45
	Small	.35
	Pee Wee	.10
	Cracks	.25

17% protein lay mash	$6.63/100 lbs
Molt feed	6.55/100 lbs
20-week pullet prices	1.91
Fowl price	.25

There were no significant overall economic differences between the 2- and 3- cycle groups. The weekly profits for all 3 programs were remarkably similar, indicating no major advantage of using one over the other under the conditions of this experiment. If the 0.3 cents per week difference between the 1- and 3-cycle groups were significant, it would represent a difference in profit of 15.6 cents per hen housed per year.

Note that Strain B yielded very similar profits whether placed 3 or 4 per cage in the 1 and 2 cycle comparison but that when molted twice, the 4-bird cage suffered a major loss in profits because of higher mortality. An analysis of these relationships showed a significant 3-way interaction between density, cycles, and strain at the 5 percent level of significance.

DISCUSSION

An experiment of this type cannot be expected to answer the question, "How many times should I molt my flock?" But it does provide us with meaningful relationships which can be used along with other knowledge in resolving the question.

It would appear that the question has a variety of answers dependent upon the strain of chicken used and its performance, economic conditions, age at molt and length of cycle, and environmental factors associated with different stages of the program. Strain B at 3 hens per cage, for instance, would appear to be best suited to the 3-cycle program. On the other hand, when placed 4 per cage, the 2-cycle program would appear to be optimum. The exact opposite appears to be the case with Strain A.

These results emphasize that the selection of a replacement program must be based upon achievable performance for the farm in question, using realistic economic projections. The 12 combinations of results in this experiment represent a spread of $1.40 per hen housed per year difference in profit. Selection of the correct combination of management decisions is crucial to the success of a commercial egg farm.

SELECTED REFERENCES

Swanson, M.H. and D.D. Bell, 1974. Force Molting of Chickens III. Performance Characteristics. University of California Leaflet 2651.

_____, 1975. Force Molting of Chickens IV. Egg Quality. University of California Leaflet 2810.

_____, 1975. Force Molting of Chickens V. Replacement Programs. University of California Leaflet 2811.

_____, 1976. Force Molting of Chickens VI. Economics. University of California Leaflet 2874.

####

Milo H. Swanson, Editor-PIP
Cooperative Extension
University of California
Riverside, CA 92502